AFB/PPRC.20/16
4 March 2017

Adaptation Fund Board
Project and Programme Review Committee
Twentieth Meeting
Bonn, Germany, 14-15 March 2017

Agenda Item 8 j)

PROPOSAL FOR THE FEDERATED STATES OF MICRONESIA

Background

1. The Operational Policies and Guidelines (OPG) for Parties to Access Resources from the Adaptation Fund (the Fund), adopted by the Adaptation Fund Board (the Board), state in paragraph 45 that regular adaptation project and programme proposals, i.e. those that request funding exceeding US$ 1 million, would undergo either a one-step, or a two-step approval process. In case of the one-step process, the proponent would directly submit a fully-developed project proposal. In the two-step process, the proponent would first submit a brief project concept, which would be reviewed by the Project and Programme Review Committee (PPRC) and would have to receive the endorsement of the Board. In the second step, the fullydeveloped project/programme document would be reviewed by the PPRC, and would ultimately require the Board's approval.

2. The Templates approved by the Board (OPG, Annex 4) do not include a separate template for project and programme concepts but provide that these are to be submitted using the project and programme proposal template. The section on Adaptation Fund Project Review Criteria states:

> *For regular projects using the two-step approval process, only the first four criteria will be applied when reviewing the 1st step for regular project concept. In addition, the information provided in the 1st step approval process with respect to the review criteria for the regular project concept could be less detailed than the information in the request for approval template submitted at the 2nd step approval process. Furthermore, a final project document is required for regular projects for the 2nd step approval, in addition to the approval template.*

3. The first four criteria mentioned above are:
   1. Country Eligibility,
   2. Project Eligibility,
   3. Resource Availability, and
   4. Eligibility of NIE/MIE.

4. The fifth criterion, applied when reviewing a fully-developed project document, is:
   5. Implementation Arrangements.

5. It is worth noting that since the twenty-second Board meeting, the Environmental and Social (E&S) Policy of the Fund was approved and consequently compliance with the Policy has been included in the review criteria both for concept documents and fully-developed project documents. The proposals template was revised as well, to include sections requesting demonstration of compliance of the project/programme with the E&S Policy.

6. In its seventeenth meeting, the Board decided (Decision B.17/7) to approve "Instructions for preparing a request for project or programme funding from the Adaptation Fund", contained in the Annex to document AFB/PPRC.8/4, which further outlines applicable review criteria for both concepts and fully-developed proposals. The latest version of this document was launched in conjunction with the revision of the Operational Policies and Guidelines in November 2013.

7. Based on the Board Decision B.9/2, the first call for project and programme proposals was issued and an invitation letter to eligible Parties to submit project and programme proposals to the Fund was sent out on April 8, 2010.

8. According to the Board Decision B.12/10, a project or programme proposal needs to be received by the secretariat no less than nine weeks before a Board meeting, in order to be considered by the Board in that meeting.

9. The following fully-developed project document titled “Enhancing the climate change resilience of vulnerable island communities in Federated States of Micronesia” was submitted by the Secretariat of the Pacific Regional Environment Programme (SPREP), which is an accredited Regional Implementing Entity of the Adaptation Fund.

10. This is the fourth submission of the project proposal. It was first submitted as a project concept, using the two-step approval process, for the twenty-third Board meeting, and was not endorsed. It was then submitted as a project concept, using the two-step approval process, for the twenty-fifth Board meeting, and the Board decided to:

(a) *Not endorse the project concept, as supplemented by the clarification response provided by the Secretariat of the Pacific Regional Environment Programme (SPREP) to the request made by the technical review;*

(b) *Suggest that SPREP reformulate the proposal taking into account the observations in the review sheet annexed to the notification of the Board’s decision, as well as the following issues:*

(i) Despite having explicitly requested the project proponent to submit a revised project document, only a response sheet was provided as an additional document for the final technical review. Any revised proposal would need to incorporate, in the proposal itself, the changes suggested in the response sheet;

(ii) The proposal should clarify the validity of the proposed investment under output 3.1. In fact, according to the additional information provided, such investment rests upon the results and findings of the Pilot Programme for Climate Resilience’s (PPCR) Cost Benefit Analysis currently being undertaken. This situation makes it difficult for the Adaptation Fund to assess the legitimacy of the proposed project and to make a funding decision, as such study may bring key insights on the relevance, soundness, resilience and feasibility of such investment;

(iii) The proposal should encompass a consultative process specific to the proposed project. Such a consultation process should involve all direct and indirect stakeholders of the project/programme, including vulnerable groups and taking into account gender considerations. Particular attention should be given to minority groups, marginalized and vulnerable groups, and indigenous people in the project/programme target areas, where relevant. The results of the consultative process must be reflected in the project design. This is of the utmost importance as the support from communities

is outlined as a cornerstone in sustaining and maintaining the proposed investments;

(iv) The proposal should demonstrate, in a rational way, the proposed project's compliance with the environmental and social principles as outlined in the Fund's Environmental and Social Policy (ESP), including how relevant standards will be applied through the project implementation, when applicable. Further assessment is notably required for principles on access and equity, marginalized and vulnerable groups, gender equity and women's empowerment, indigenous peoples (if any), involuntary resettlement, protection of natural habitats, physical and cultural heritage and land and soil conservation. As a number of Environmental Impact Assessments (EIAs); and/or Environmental and Social Impact Assessments (ESIAs) are to be prepared during the project implementation, an Environmental and Social Management Plan (ESMP) will be requested at the full proposal stage;

(v) The proposal should clarify the implementation arrangements. If SPREP intends to provide a range of services to the project, it would be considered an executing entity. In such a case, Board Decision B.17/17 to "cap execution costs for projects/programmes implemented and executed by the same entity at 1.5 per cent of the project/programme cost" would apply. As a result, the execution costs that could be claimed by SPREP would be capped at 1.5 per cent of the total budget requested, before the implementing entity fees. In such a case, as per Board Decision B.17/17, SPREP should provide a letter from the government requesting direct services support and providing appropriate justification for such a request; and

(c) *Request SPREP to transmit the observations referred to in sub-paragraph (b) to the Government of the Federated States of Micronesia.*

(Decision B.25/7)

11. It was re-submitted as a fully-developed project document to the Board at its twenty-eighth meeting and the Board decided to:

(a) Not approve the project document, as supplemented by the clarification response provided by the Secretariat of the Pacific Regional Environment Programme (SPREP) to the request made by the technical review;

(b) Suggest that SPREP reformulate the proposal taking into account the observations in the review sheet annexed to the notification of the Board's decision, as well as the following issue:

(i) The proposal should provide consistent information throughout the proposal and supporting documents with respect to the final alignment of the road planned by the project, and provide a final environmental and social impact

assessment and environmental and social management plan consistent with such final alignment.

(c) Request SPREP to transmit the observations under item (b) to the Government of the Federated States of Micronesia.

(Decision B.28/15)

12. The present submission was received by the secretariat in time to be considered in the twenty-ninth Board meeting. The secretariat carried out a technical review of the project proposal, assigned it the diary number FSM/RIE/Coastal/2015/1, and completed a review sheet.

13. In accordance with a request to the secretariat made by the Board in its 10th meeting, the secretariat shared this review sheet with SPREP, and offered it the opportunity of providing responses before the review sheet was sent to the PPRC.

14. The secretariat is submitting to the PPRC the summary and, pursuant to decision B.17/15, the final technical review of the project, both prepared by the secretariat, along with the final submission of the proposal in the following section. In accordance with decision B.25.15, the proposal is submitted with changes between the initial submission and the revised version highlighted.

Project Summary

Federated States of Micronesia – Enhancing the climate change resilience of vulnerable island communities in Federated States of Micronesia

Implementing Entity: SPREP
Project/Programme Execution Cost: USD 788,018
Total Project/Programme Cost: USD 8,294,931
Implementing Fee: USD 705,069
Financing Requested: USD 9,000,000

Programme Background and Context:

The overall goal of the project is to build social, ecological and economic resilience of the target island communities of Federated States of Micronesia (FSM) and reduce their vulnerabilities to extreme drought, sea level rise and other climate risks through water resource management, coastal resource and development planning, and by promoting gender perspectives and ecologically sound climate resilient livelihoods. The overall objective of the project is to reduce the vulnerability of the selected communities to risks of water shortage and increase adaptive capacity of communities living in Woleai, Eauripik, Satawan, Lukunor, Kapingamarangi, Nukuoro, Utwe, Malem to drought and flood-related climate and disaster risks. The project strategy is to provide all four State Governments in FSM with development planning tools and institutional frameworks to help coastal communities prepare and adapt for higher sea levels and adverse and frequent changes in extreme weather and climate events. The project strategy is to also provide communities with the resources and technical support needed to adopt and manage concrete climate change initiatives and actions. The project is made of four components.

Component 1: Strengthening policy and institutional capacity for integrated coastal and water management at national and state levels (US$ 767,642)

Component 1 will support FSM in preparing necessary institutional and regulatory frameworks, policies, guidance and tools to help deliver a climate resilient FSM. Specific activities will include: development of legislation and policy paper to guide regulation of climate resilient coastal and marine management at national level; amendment of state regulations for development projects to consider climate change risks and resilience measures; endorsement of national water and sanitation policy with climate and disaster risks and resilience, mainstreaming of gender, and development and implementation of national water outlook and water sector investment plan.

Component 2: Demonstration of water security measures in outer islands of Yap, Chuuk and Pohnpei (US$ 2,479,226)

Component 2 will provide technical and administrative assistance to the States of Yap, Chuuk and Pohnpei to help strengthening water and livelihood security measures to help six outer atoll islands adapt to impacts of climate change related to water, health and sanitation. Specific activities will include: repairing and installing water harvesting and storage systems; construction of sanitation systems to improve water management; trainings in water conservation and management and development of a teacher's guide on climate change.

Component 3: Demonstration of Kosrae Inland Road Relocation Initiative (US$ 3,520,474)

This Component focuses specifically on providing communities with climate resilient infrastructure to help relocate from high risk coastal inundation sites. Specific activities include: construction to sub-base standard of an inland road and related access roads; construction of coastal protection infrastructures; establishment of a state support programme to access land in uplands areas; strengthening of community-based ecosystem management and access to finance for vulnerable households.

Component 4: Knowledge management for improved water and coastal protection (US$ 739,571)

This component will capture and share the local knowledge produced on climate change adaptation and accelerate the understanding about the kinds of interventions that work in island environments in FSM. Specific activities include: development and dissemination of climate resilient municipality development plans; development of resource materials for local communities; sharing of experiences on adaptation to climate change.

ADAPTATION FUND BOARD SECRETARIAT TECHNICAL REVIEW OF PROJECT/PROGRAMME PROPOSAL

PROJECT/PROGRAMME CATEGORY: Regular-sized Project

Country/Region: **Federated States of Micronesia**
Project Title: **Enhancing the climate change resilience of vulnerable island communities in Federated States of Micronesia**
AF Project ID: **FSM/RIE/Coastal/2015/1**
IE Project ID:
Requested Financing from Adaptation Fund (US Dollars): **USD 9,000,000**
Reviewer and contact person: **Dirk Lamberts**
Co-reviewer(s): **Daouda Ndiaye**
IE Contact Person: **Mr. Simon Wilson**

Review Criteria	Questions	Comments on 26 January 2017	Comments on 14 February 2017
Country Eligibility	1. Is the country party to the Kyoto Protocol?	Yes.	
	2. Is the country a developing country particularly vulnerable to the adverse effects of climate change?	Yes.	
Project Eligibility	1. Has the designated government authority for the Adaptation Fund endorsed the project/programme?	Yes. Letter dated 6 January 2017.	

	2. Does the project / programme support concrete adaptation actions to assist the country in addressing adaptive capacity to the adverse effects of climate change and build in climate resilience?	Yes.	
	3. Does the project / programme provide economic, social and environmental benefits, particularly to vulnerable communities, including gender considerations, while avoiding or mitigating negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Yes.	
	4. Is the project / programme cost effective?	Yes.	

	5. Is the project / programme consistent with national or sub-national sustainable development strategies, national or sub-national development plans, poverty reduction strategies, national communications and adaptation programs of action and other relevant instruments?	Yes. The project is consistent with the relevant strategies, plans and programmes described in the proposal.	
	6. Does the project / programme meet the relevant national technical standards, where applicable, in compliance with the Environmental and Social Policy of the Fund??	The proposal mentions relevant national technical standards, including the 2014 EIA guidelines for Kosrae but does not specify how the project will comply with these guidelines **CR 1:** Please clarify how the project will comply with the 2014 EIA guidelines for Kosrae, in particular with respect to Component 3.	**CR 1:** Addressed.
	1. Is there duplication of project / programme with other funding sources?	No.	
	2. Does the project / programme have a learning and knowledge management component to capture and feedback lessons?	Yes.	

	3. Has a consultative process taken place, and has it involved all key stakeholders, and vulnerable groups, including gender considerations in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Yes.	
	4. Is the requested financing justified on the basis of full cost of adaptation reasoning?	Yes.	
	5. Is the project / program aligned with AF's results framework?	Yes.	
	6. Has the sustainability of the project/programme outcomes been taken into account when designing the project?	Yes.	
	7. Does the project / programme provide an overview of environmental and social impacts / risks identified, in compliance with the Environmental and Social Policy and	Yes. The information on the alignment of the road (Component 3) is still limited to a Google Maps image presented without a scale or orientation. The location is still said to be approximate ("flexible") to within a few tens of meters. For some of the location-critical principles of the ESP, this amounts to	**CR 2:** Addressed. **CR 3:** Not addressed. The application was reviewed by KIRMA on 18 November 2015, while the present alignment maps were revised 18

	Gender Policy of the Fund?	considering the road construction component as an unidentified sub-project, for which there is no justification from a project preparation perspective. No justification is provided on why the final detailed alignment is not available at this stage. **CR 2:** Please provide detailed maps of the alignment of the road. **CR 3:** Please demonstrate that the application on which the KIRMA permit was obtained (Attachment 12), with its environmental and social safeguard conditions, is consistent with the alignment presented in the funding application, in particular with respect to the specific alignment of the road. Several of the environmental safeguard conditions that are listed in the KIRMA permit are not included in the ESMP. **CAR:** Please ensure that all environmental safeguards imposed in the KIRMA permit are incorporated in the ESMP. **CR 4:** Please provide detailed information on the process that would be followed in case of expropriation of commercial or residential buildings.	October 2016. A significant section of the present alignment shown in the detailed maps of Annex 11 was an alternative in the maps included in the EIA (Annex 4a), which served as the basis for the KIRMA application. It is unclear to what extent the findings of the EIA and the KIRMA permit are based on the risks associated with the final alignment. **CAR:** Not addressed. Some elements of the KIRMA conditions are still not reflected in the ESMP (e.g. on hazardous waste, protection of mature trees, buffer zone at rivers and streams) **CR 4:** Addressed (section XI. 5 of the Kosrae Constitution)

Resource Availability	1. Is the requested project / programme funding within the cap of the country?	Yes.	
	2. Is the Implementing Entity Management Fee at or below 8.5 per cent of the total project/programme budget before the fee?	Yes.	
	3. Are the Project/Programme Execution Costs at or below 9.5 per cent of the total project/programme budget (including the fee)?	Yes.	
Eligibility of IE	4. Is the project/programme submitted through an eligible Implementing Entity that has been accredited by the Board?	Yes.	
Implementation Arrangements	1. Is there adequate arrangement for project / programme management, in compliance with the Gender Policy of the Fund?	Yes.	
	2. Are there measures for financial and project/programme risk management?	Yes.	

	3. Are there measures in place for the management of for environmental and social risks, in line with the Environmental and Social Policy and Gender Policy of the Fund?	Yes. See CR 2-4 and CAR.	
	4. Is a budget on the Implementing Entity Management Fee use included?	Yes. Up to 30% of the IE management fee is allocated to costs related to project identification, development of the project concept, the detailed project document (assumingly the present funding application) and project approval and start up.	
	5. Is an explanation and a breakdown of the execution costs included?	Yes. Table 33 with Operating costs included in the execution cost appears incomplete. **CR 5:** Please correct Table 33 to justify the 24,000 USD not currently specified.	**CR 5:** addressed.
	6. Is a detailed budget including budget notes included?	Yes.	
	7. Are arrangements for monitoring and evaluation clearly defined, including budgeted M&E plans and sex-disaggregated data, targets and indicators, in compliance with the Gender Policy of the Fund?	Yes.	

	8. Does the M&E Framework include a break-down of how implementing entity IE fees will be utilized in the supervision of the M&E function?	Yes. **CR 6:** Please clarify the evaluation budget under the implementing entity fees, as mid-term and final evaluations are already budgeted under the execution costs.	**CR6:** Addressed.
	9. Does the project/programme's results framework align with the AF's results framework? Does it include at least one core outcome indicator from the Fund's results framework?	Yes.	
	10. Is a disbursement schedule with time-bound milestones included?	Yes.	

Technical Summary	The overall goal of the project is to build social, ecological and economic resilience of the target island communities of FSM and reduce their vulnerabilities to extreme drought, sea level rise and other climate risks through water resource management, coastal resource and development planning, and by promoting gender perspectives and ecologically sound climate resilient livelihoods. More specifically, the project would reduce the vulnerability of the selected communities to risks of water shortage and increase adaptive capacity of communities living in Woleai, Eauripik, Satawan, Lukunor, Kapingamarangi, Nukuoro, Utwe, Malem to drought and flood-related climate and disaster risks. The initial technical review found that the proposal needed to address some substantive issues related to the environmental and social risks and management plan. The document needed to be revised accordingly. A number of issues were raised, mostly related to compliance with the Environmental and Social Policy.

	The final technical review finds that most of the issues were addressed. The following outstanding issues could be addressed before inception of the project, to be included in the draft agreement between the Board and SPREP for this project: a) A number of safeguard conditions were imposed by the Kosrae Island Resource Management Authority (KIRMA) when approving the road infrastructure development component of the project. All of those conditions should be integrated in the project environmental and social management plan (ESMP); b) As KIRMA's approval was based on a plan and Environmental Impact Assessment (EIA) for which the current final alignment was considered only as an alternative alignment, KIRMA should confirm that the approval applies to the final alignment and that the permit conditions are adequate.
Date:	**14 February 2017**

RESPONSE FROM SPREP TO THE OBSERVATIONS MADE BY THE BOARD AT ITS 28TH MEETING

ADAPTATION FUND BOARD SECRETARIAT TECHNICAL REVIEW OF PROJECT/PROGRAMME PROPOSAL

PROJECT/PROGRAMME CATEGORY: REGULAR SIZE PROJECT

Country/Region: **Federated States of Micronesia**
Project Title: **Enhancing the climate change resilience of vulnerable island communities in Federated States of Micronesia**
AF Project ID: **FSM/RIE/Coastal/2015/1**
IE Project ID:
Requested Financing from Adaptation Fund (US Dollars): **USD 9,000,000**
Reviewer and contact person: **Hugo Remaury**
Co-reviewer(s): **Dirk Lamberts, Mikko Ollikainen**
IE Contact Person: **Peniamina Leavai**

Review Criteria	Questions	Comments final review	Response
Country Eligibility	3. Is the country party to the Kyoto Protocol?	Yes.	Addressed.
	4. Is the country a developing country particularly vulnerable to the adverse effects of climate change?	Yes.	Addressed.
Project Eligibility	7. Has the designated government authority for the Adaptation Fund endorsed the project/programme?	Yes.	Addressed.
	8. Does the project / programme support	In addition to delivering concrete adaptation	CR1: Addressed.

	concrete adaptation actions to assist the country in addressing adaptive capacity to the adverse effects of climate change and build in climate resilience?	infrastructures in the field of costal and water management, the project would provide all four State Governments (Kosrae, Yap, Chuuk and Pohnpei) in FSM with development planning tools and institutional and legislative frameworks to help coastal communities prepare and adapt for higher sea levels and adverse and frequent changes in extreme weather and climate events. The project would also provide communities with the resources and technical support needed to adopt and manage concrete climate change initiatives and actions. CR 1: Please describe further the appropriateness of activity 2.3 in responding to the impacts of climate change.	CR2: Addressed. CR3: Addressed. CR4: Addressed. CR5: Addressed. CR6: Addressed.

		CR 2: Please explain what the Water Sector Investment Plan (Activity 1.4.2) is planning to achieve in terms of building climate resilience and addressing the effects of climate change. CR 3: In case the assessment planned under activity 2.1.2. yields a local disagreement with respect to the implementation of activity 2.3, please elaborate, based on lessons learned from relevant projects such as ECOSAN and PACC projects, what will be the project strategy to ensure that alternative activities selected by the communities would align with the Fund's mandate. A list of potential alternatives adaptation activities may support such explanation.	

		CR 4: Please clarify how activities 3.3.1. and 3.1.1 will be coordinated in time during project implementation. CR 5: Please explain how the project will encourage the local communities to access the existing financing schemes, considering their current levels of income, vulnerability, and awareness of financing systems. CR 6: Some activities described in the proposal (4.3.1 “Organizing inception workshop and project trainings for all key stakeholders of the project”, 4.3.2 “Organizing bi-annual meeting of the project board and presentation of impact assessment studies by key stakeholders of the project”, 4.3.4 “Mid-term evaluation” and 4.3.5 “final	

		evaluation") should be budgeted either under the execution costs or the implementing entity fee. Please amend the proposal accordingly. For more information on costs and fees, please visit: https://www.adaptation-fund.org/generic/costs-and-fees/	
	9. Does the project / programme provide economic, social and environmental benefits, particularly to vulnerable communities, including gender considerations, while avoiding or mitigating negative impacts, in compliance with the Environmental and Social Policy of the Fund?	Yes.	Addressed.
	10. Is the project / programme cost effective?	Yes.	Addressed.
	11. Is the project / programme consistent with national or sub-national sustainable development strategies, national or sub-national development plans, poverty reduction	Yes.	Addressed.

	strategies, national communications and adaptation programs of action and other relevant instruments?		
	12. Does the project / programme meet the relevant national technical standards, where applicable, in compliance with the Environmental and Social Policy of the Fund?	A draft preliminary environmental impact assessment for the infrastructure planned under activity 3.1.1., has been provided. CR 7: Please identify any relevant technical standards that would apply to activity 3.2.1.	CR7: Addressed
	13. Is there duplication of project / programme with other funding sources?	No.	Addressed.
	14. Does the project / programme have a learning and knowledge management component to capture and feedback lessons?	Yes.	Addressed.
	15. Has a consultative process taken place, and has it involved all key stakeholders, and vulnerable groups, including gender considerations?	Yes.	Addressed.

	16. Is the requested financing justified on the basis of full cost of adaptation reasoning?	Yes. CR 8: Please make sure that the financial figures provided in that section are aligned with the project budget (table 29 of the proposal).	CR8: Addressed.
	17. Is the project / program aligned with AF's results framework?	Yes.	Addressed.
	18. Has the sustainability of the project/programme outcomes been taken into account when designing the project?	Yes.	Addressed.
	19. Does the project / programme provide an overview of environmental and social impacts / risks identified?	Yes. CR 9: Partly addressed. Information is provided that the alignment of the road has been finalized, with some space to accommodate issues that may arise during detailed design. Throughout the application document and the ESMP and EIA there is conflicting information on what the final alignment is. Please	Addressed. **CR9 Response.** Consistency of final alignment is addressed in all documents: the application document (full proposal), ESMP (Annex 7) and EIS (Annex 4a). Changes made to ensure consistency are found in the following sections: 1. Application document: page 58, 2nd para of Activity 3.1.1 updated: *Activity 3.1.1 will construct 3.6 miles (5.8 km) of inland road between Malem and Utwe. The road alignment for the inland road was carried out by the Department of*

		provide consistency throughout with the final and complete alignment information. Abandoned options need not be included or discussed. It remains unclear what has been the basis for the EIA and if all the risks associated with the latest design choice have been identified. The current design of the road still has some uncertainty about its exact location, and this means that the ESIA must be based on a clearly confined and identified corridor within which all risks associated with all possible variations are identified and impacts managed or mitigated. There is no justification for accepting incomplete risks identification and management measures for this project, and the ESP sections of the application and the related supporting documents should be	*Transport and Infrastructure, and finalised as part of the EIA, consulted and agreed to by government, municipal government and communities (Figure 12). This is confirmed in a letter to the Implementing Entity Coordinator (SPREP) from the Kosrae State Government (see Annex 3).* 2. Application document: Figure 12 updated 3. Application document: page 66, Para 1, Activity 3.4.1 updated as follows: *The community of Utwe raised concerns as to the potential impacts of the construction of the road and the location of the road on Utwe village's water supply during the EIA consultations. As a result, the alignment of the road through the southern part of the Kuplu Wan plateau (Palusrik catchment) has been re-aligned completing alignment for the inland road (DTI, 2016). According to the Environment Impact Statement report, the final realignment results in a minimum buffer of 150 m at the watershed between the two catchments and over 350 m for the majority of the section of inland road within the Palusrik catchment (Figure 17, also Annex 4a Fig.24). Given the distance to the Palusrik River, the only perennial stream in the catchment, and the characteristics of the likely catchment drainage pathways, there is unlikely to be any impact from the construction or operation of the road itself on Utwe's water supply.*

		finalized before resubmission. CR 10: Since the design details of the coastal defence activities (3.2) appear to be in a final stage, the proposal should identify any risks and impacts associated with that infrastructure. CR 11: The road infrastructure that would be funded by the Adaptation Fund is only the first stage of construction, and it is only a section of a larger road construction /upgrading project. In the case such activities take place during the implementation of the AF project, and has an impact on the outcomes delivered by the AF project, the proposal and the ESMP should explain how such process would	4. Application document: Figure 17 updated 5. Application document: Part III.K, ES Principle 14. Physical and Cultural Heritage. *While FSM does not have any World Heritage sites[1], the project will aim to be in compliance and identify any potential un-surveyed cultural or historic sites to conserve.* *Component 3: During the initial walkover of the road alignment with staff from the Historic and Preservation Office of KIRMA, no cultural or historic sites were identified. There may, however, be cultural and historic sites that may not have been identified in the initial walkover. The project will refer to relevant agencies if cultural and historic sites are identified during the construction stages. Some very minor shifts in the road alignment may be required at this stage over short sections (within a few 10s of metres) and will not impact on the findings of the EIS.* The following changes made to the EIS (previously the PEIA report, Annex 4a) are consistent with changes in the Application document as above. It also addresses the 'uncertainty about the exact location of the road.' 6. EIS document, page 21, Section 3.4:

[1] 10A: Final report on the results of the second cycle of the Periodic Reporting exercise for Asia and the Pacific, UNESCO, Periodic reports, whc.unesco.org/archive accessed on 30 July 2015

		be managed, both in terms of timeline but most importantly in terms of risks identifications and management, in line with the AF ESP. CR 12: The risk identification table in Section II.K is adequate for some principles (e.g. compliance with the law) but inadequate for most others. E.g. for the principle on Marginalised and Vulnerable groups: including such groups as project beneficiaries (with activities that mostly benefit the whole community like road construction) is not in line with the specific requirements of this principle of the ESP. The information provided for some principles includes management and mitigation measures, which are out of place here. The risks should be identified for the present proposal, and risks	*The final alignment of the inland road avoids the contours around the base of the volcanic part of the island at approximately the 10 m MSL contour and climbs up to the Kuplu Wan plateau at an elevation of up to 80m MSL (denoted by the dotted 'alternative' red line) (Figure 15). This final alignment denoted as the alternative avoids the typically alluvial or colluvial soils at the intersection between the upland, more erodible but better drained Fomseng and Tolonier soil types and the less well drained but less erodible Nansepsep-inkosr soil types, and between Kuplu and Utwe the Naniak soils associated with mangrove areas.* 7. EIS document, page 38, Section 4.2.3 Final road alignment: *The Utwe community identified that they would prefer the buffer zone to be as large as possible between the road and the main Palusrik river course above the water intake, with the Option 2 alignment (Figure 23) subsequently developed. This results in a minimum buffer of 150 m at the watershed between the two catchments and over 350 m for the majority of the section of inland road within the Palusrik catchment. Given the distance to the Palusrik River, the only perennial stream in the catchment and the characteristics of the likely catchment drainage parthways, there is unlikely to be any impact from the construction activities and storm run-off, or operation of the road itself, on Utwe's water supply. Given the analysis of the options and issues raised by the communities, Option 2 was*

		associated with abandoned design options are irrelevant. Given the sizable construction activities, including in the sensitive coastal habitats, the risk for pollution during construction and operation seems significant. Risks identification also seems inadequate for physical and cultural heritage, natural habitats and biodiversity, gender equality and women's empowerment and involuntary resettlement, and lands and soil conservation. Please amend the proposal taking into account such considerations. CR 13: The management measures of the Environmental and Social Management plan attached to the proposal should be more specific, and should assign roles and responsibilities more clearly.	*selected and completed the road aligment for the inland road as shown in Figure 24.* 8. EIS document, Figure 24 updated 9. EIS document, page 38, Section 4.2.6 Mitigation requirements for road alignment: *The final alignment of the road has been defined to minimise environmental, social or cultural impacts. During the design phase of the road, vegetation will be cleared along the easement alignment and a full topographic survey conducted. During the initial walkover of the alignment with Historic and Preservation staff, there were no cultural and historic sites identified. However, the project will refer to relevant agencies if cultural and historic sites are identified during the construction stages. Some very minor shifts in the road alignment may be required at this stage over short sections (within a few 10s of metres) and will not impact on the findings of this EIS. These changes may be required to:* *1. Avoid the need for the removal of any large tree species particularly endemic species such as Nunu (Horsfieldia).* *2. Avoid clearing of slopes greater than 30% and to minimise sustained road grading below 12% as defined in Kosrae's road design standards.* *3. Re-routed the alignment sufficiently around any identified new identified cultural and historical sites to enable them to be properly investigated.*

		CR 14: There are some contradictions between the ESMP, the proposal and the EIA. For instance, the ESMP states that construction materials are sourced locally while the proposal states that all aggregates and even the sand will be imported. This is a significant difference in terms of risks. Please clarify this issue and update the proposal accordingly.	10. The basis for the EIA has been revised and EIS updated (Annex 4a, p.8) with the following text: *This report presents the Environmental Impact[2] Statement (EIS) of the proposed inland road between Malem and Utwe[3].* *The purpose of the report is to:* *1. Assess environmental and social issues to support the construction activities of Phase I of the Malem to Utwe Inland Road Relocation Initiative.* *2. If any potential significant issues and impacts are identified, outline further assessment that will be required to understand or address these impacts.* *The report covers the assessment related to construction activities of the inland road to a sub-base standard pavement (Phase I). The report does not cover the assessment related to construction activities associated upgrading the inland road from a sub-base standard to hot-mix asphalt pavement (as is proposed if the Chinese funding is secured) (Phase II). This will require a further Development Permit and development of an Environmental Management Plan to address and mitigate potential construction and associated impacts during the*

[2] Taken here to include physical, ecological, aesthetic, cultural, economic, social, or health impacts

[3] The EIS also addresses the section of road between 'Malem and Pilyuul'. This section, however, will not be addressed under the Adaptation Fund project.

			planning phase. However, many of the mitigation requirements outlined in this report will be relevant. 11. The Environment and Social impacts and risks updated. **Part II.K table** replaced with a revised, complete and consistent table that is aligned with the EIS and ESMP. **Part III.C** section has also been completed and aligned accordingly. Please refer to the entire sections of **Part II.K and Part III.C in the application document.** **12. CR10 Response.** The risks and impacts associated with the coastal defense activities (3.2) now updated and are reflected in the table in **Part II.K** of the application document**, the ESMP;** and environmental impacts related to revetment design and construction outlined in **Annex 4b** of the application document**.** The revised and updated changes made in the application document and reflected in the ESMP are as follows: **13. Table II.K, ES Principle 9 Protection of Natural Habitats: Risk is low to moderate.** *The coastal defense activities (coastal revetments) (activity 3.2.1) may*

			impact on mangrove strands.(also reflected in ESMP Section 6.9, p12) **14. Table II.K, ES Principle 10 Conservation of Biological Diversity: Risk is low to moderate.** *There is potential increase in localized suspended sediment in the water column at high tide as a result of removal of the existing emergency armour material and re-grading the underlying beach (activity 3.2.1). This may impact on beach and coastal ecosystems. The project would not, however cause any impact on bio-diversity values overall.* (also reflected in ESMP Section 6.10, p13) **15. Table II.K, ES Principle 12 Pollution Prevention and Resource Efficiency: Risk is low to moderate.** *The inland road construction (activity 3.1.1) and coastal road defenses (activity 3.2.1) will generate waste materials including cleared vegetation, topsoil and geotextile materials. There is potential for surface and groundwater contamination from release or spills of fuel and lubricants during fueling and maintenance of construction equipment.* (also reflected in ESMP Section 6.12, p17) \ **16. Table II.K, ES Principle 15 Lands and Soil Conservation: Risk is low to moderate.** *Component 3: Construction activities 3.1.1 and 3.2.1 have potential for increased surface erosion of soils from areas cleared of ground-cover vegetation. For activity 3.1.1 there is the potential for catchment drainage pathways to be impacted*

			from changes to drainage alignment, and increased surface-water and sediment runoff. *The impacts of the transitional coastal defenses in Paal and Mosral (activity 3.2.1) may include increased suspended sediments in the nearshore water column and the potential for exacerbated erosion along adjacent (downdrift) sections of coast. The latter has been addressed in the design of the revetment to ensure the transition between defenses and beach does not exacerbate downdrift erosion.* *The defenses will be, as identified by the initial screening, affected by climate change impacts, particularly – the loss of land associated with ongoing shoreline change or coastal erosion, coastal flooding from high tides, large swells, storm or typhoon-related events; exposure of people or property to water related hazards such as flooding or tidal waves; and the effects of sea-level rise or other climate change influences of the hazards abovementioned.* (also reflected in ESMP Section 6.15, p23) CR11: Addressed. **17. CR12 Response**. Activity 1.3.1 has been revised to reflect clearly what the activity will undertake. This is to primarily undertake a gender assessment. The findings of which will inform the water and sanitation policy for FSM. The text changes made resulted in the final outlined below. **Revised text of the application document (pages 39-40):**

			Activity 1.3.1 Review the water policy framework to incorporate gender and climate change*. Experiences gathered from climate change adaptation projects from the Pacific show that mainstreaming of gender considerations is required at the outset of climate change adaptation planning. It has also shown that the benefits of such mainstreaming at the policy level will trickle down to the most vulnerable at the community levels. Taking on this lesson, this activity will carry out a gender review. The findings from this review will be used to inform and strengthen the Framework for National Water and Sanitation Policy for the FSM by mainstreaming gender aspects. This will ensure a gender-sensitive water and sanitation policy is produced (activity 1.3.2).* *This activity will use tools for integrating gender perspectives into climate change policies taken from the Pacific Gender & Climate Change Toolkit, developed by Pacific regional organizations4 - to gather targeted policy-relevant information relating to gender and climate change in FSM. The outline of a gender and climate change assessment for the policy is provided in table 4.* *This activity will strengthen the existing National Water Task Force (NWTF) to develop, complete and launch the policy through a gender-sensitised approach. It will also be applied to implementation of other activities of the project at the outer island / municipality level, for example under activity 2.1.1.*

[4] GIZ, SPC, SPREP, UNDP, GIZ, PACC Project (2015)

			18. Table 4 (page 40) updated to show the revised outline of the gender assessment work activity. **19. Activity 1.3.2** also updated to ensure consistency of the gender review activities. Page 44, the revised and additional text is in italics. The activity will engage the NTWF to facilitate a group of consultants or a Technical Team *(including a gender specialist)* to solicit views, put together the information and write the policy using the framework as the guide. Informaton will also be solicited from national and state level stakeholders. The national level consultations will identify national water resource management targets and performance indicators of the policy reaffirming the outline developed under the Framework. *The activity will follow up on the results of the gender review (activity 1.3.1) of the Framework for National Water and Sanitation Policy for the FSM, and ensure that the policy, the national water outlook program (activity 1.4.1) and the water sector investment plan (activity 1.4.2) factor in gender issues.* **20. Annex 7 ESMP**, Table 1 states 'Low Risk' against the Fund's ES Principle 5 – Gender Equity and Women's Empowerment. *Gender Equity and Women's Empowerment (ESP5) was identified as important to be mainstreamed into FSM's National Water & Sanitation Policy and executed within its follow up activities namely the National Water Outlook Program (activity 1.3.2) and the Water Sector Investment Plan (activity 1.4.2* (page 6, ESMP)

			21. ESMP (annex 7) **Section 6.5** (and Table (page 10, ESMP))updated as follows: ***Low Risk.*** *The design of the project and in particular community and stakeholder consultations has ensured equal and active participation, however, there is a risk that gender may not be mainstreamed into the Framework for National Water and Sanitation Policy for the FSM, the National Water & Sanitation Policy, National Water Outlook Program (activity 1.4.1), and the Water Sector Investment Plan (activity 1.4.2).* **22. Regarding introduction of invasive species associated with imported construction materials.** The inconsistent references have been omitted. The project does not and will not undertake any activity that includes importation of any construction materials. There is therefore no risk identification of introduction of invasive species. **23. CR13 Response** The ESMP (Annex 7) has been updated with consistent references of the risks identification with the EIS and application document. Particularly with information in the application document, Part II.K, Part III.C, the ESMP and EIS. The highlighted example of the principle of Gender Equity and Women's Empowerment has been corrected as follows: **24. Annex 7 ESMP**, **Table 1** states 'Low Risk' against the Fund's ES Principle 5 – Gender Equity and Women's Empowerment. *Gender Equity and Women's Empowerment (ESP5) was identified as important to be mainstreamed into FSM's National Water & Sanitation Policy and executed within its follow up activities namely*

			the National Water Outlook Program (activity 1.3.2) and the Water Sector Investment Plan (activity 1.4.2 (page 6, ESMP) **25. CR14 Response**. The ESMP and application documents have been revised to make a clear distinction of source of construction materials. The construction materials (aggregate and sand) for the Phase I activities (AF funded) are sourced locally (all of it). The construction materials for Phase II or second stage are imported, including sand (sea sand is not good for hot-mix asphalt). The EIS (Annex 4a), ESMP and application documents have all been updated accordingly.
Resource Availability	5. Is the requested project / programme funding within the cap of the country?	Yes.	Addressed.
	6. Is the Implementing Entity Management Fee at or below 8.5 per cent of the total project/programme budget before the fee?	Yes.	Addressed.
	7. Are the Project/Programme Execution Costs at or below 9.5 per cent of the total project/programme budget?	Yes.	Addressed.
Eligibility of IE	8. Is the project/programme submitted through an eligible Implementing Entity that has been accredited by the Board?	Yes.	Addressed.

Implementation Arrangements	11. Is there adequate arrangement for project / programme management?	Yes.	Addressed.
	12. Are there measures for financial and project/programme risk management?	Yes.	Addressed.
	13. Are there measures in place for the management of for environmental and social risks, in line with the Environmental and Social Policy of the Fund? Proponents are encouraged to refer to the draft Guidance document for Implementing Entities on compliance with the Adaptation Fund Environmental and Social Policy, for details.	Yes.	Addressed.
	14. Is a budget on the Implementing Entity Management Fee use included?	Yes.	Addressed.
	15. Is an explanation and a breakdown of the execution costs included?	Yes.	Addressed.
	16. Is a detailed budget including budget notes included?	Yes.	Addressed.

	17. Are arrangements for monitoring and evaluation clearly defined, including budgeted M&E plans and sex-disaggregated data, targets and indicators?	Yes.	Addressed.
	18. Does the M&E Framework include a break-down of how implementing entity IE fees will be utilized in the supervision of the M&E function?	Yes. CR 15: Please explain the relatively high costs planned for the mid-term evaluation (USD 106,938) and the final evaluation (USD 107,488).	CR15: Addressed.
	19. Does the project/programme's results framework align with the AF's results framework? Does it include at least one core outcome indicator from the Fund's results framework?	Yes.	Addressed.
	20. Is a disbursement schedule with time-bound milestones included?	Yes.	Addressed.

Technical Summary	The overall goal of the project is to build social, ecological and economic resilience of the target island communities of FSM and reduce their vulnerabilities to extreme drought, sea level rise and other climate risks through water resource management, coastal resource and development planning, and by promoting gender perspectives and ecologically sound climate resilient livelihoods. More specifically, the project would reduce the

	vulnerability of the selected communities to risks of water shortage and increase adaptive capacity of communities living in Woleai, Eauripik, Satawan, Lukunor, Kapingamarangi, Nukuoro, Utwe, Malem to drought and flood-related climate and disaster risks. In addition to fixing a few cosmetic changes, the proposal needs to address a couple of more substantive issues, such as the environmental and social risks and management plan, the coordination of activities during the implementation, the technical standards applying to some activities, and the inclusion in the project proposals of activities that relates to the RIE role during the implementation of the project. The document needs to be revised accordingly. A number of issues were raised through the initial review. The following Clarification Requests (CR) were raised: CR 1: Please describe further the appropriateness of activity 2.3 in responding to the impacts of climate change. CR 2: Please explain what the Water Sector Investment Plan (Activity 1.4.2) is planning to achieve in terms of building climate resilience and addressing the effects of climate change. CR 3: In case the assessment planned under activity 2.1.2. yields a local disagreement with respect to the implementation of activity 2.3, please elaborate, based on lessons learned from relevant projects such as ECOSAN and PACC projects, what will be the project strategy to ensure that alternative activities selected by the communities would align with the Fund's mandate. A list of potential alternatives adaptation activities may support such explanation. CR 4: Please clarify how activities 3.3.1. and 3.1.1 will be coordinated in time during project implementation. CR 5: Please explain how the project will encourage the local communities to access the existing financing schemes, considering their current levels of income, vulnerability, and awareness of financing systems. CR 6: Some activities described in the proposal (4.3.1 "Organizing inception workshop and project trainings for all key stakeholders of the project", 4.3.2 "Organizing bi-annual meeting of the project board and presentation of impact assessment studies by key stakeholders of the project", 4.3.4 "Mid-term evaluation" and 4.3.5 "final evaluation") should be budgeted either under the execution costs or the implementing entity fee. Please amend the proposal accordingly. For more information on costs and fees, please visit: https://www.adaptation-fund.org/generic/costs-and-fees/ CR 7: Please identify any relevant technical standards that would apply to activity 3.2.1.

	CR 8: Please make sure that the financial figures provided in that section are aligned with the project budget (table 29 of the proposal). CR 9: The design of the road is at an early stage, and there appear to be still several location options available. This pre-empts effective ESP risks identification and any impact assessment, both of which should be completed prior to submission of a funding application. In addition, the EIA process described in the ESMP does not include further impact assessment on the final design and location options. Please include in the ESMP the update of risks identification and completion of further impact assessments on the final design and location options. CR 10: Since the design details of the coastal defence activities (3.2) appear to be in a final stage, the proposal should identify any risks and impacts associated with that infrastructure. CR 11: The road infrastructure that would be funded by the Adaptation Fund is only the first stage of construction, and it is only a section of a larger road construction/upgrading project. In the case such activities take place during the implementation of the AF project, and has an impact on the outcomes delivered by the AF project, the proposal and the ESMP should explain how such process would be managed, both in terms of timeline but most importantly in terms of risks identifications and management, in line with the AF ESP. CR 12: The risk identification table in Section II.K is adequate for some principles (e.g. compliance with the law) but inadequate for most others. E.g. for the principle on Marginalised and Vulnerable groups: including such groups as project beneficiaries (with activities that mostly benefit the whole community like road construction) is not in line with the specific requirements of this principle of the ESP. The information provided for some principles includes management and mitigation measures, which are out of place here. The risks should be identified for the present proposal, and risks associated with abandoned design options are irrelevant. Given the sizable construction activities, including in the sensitive coastal habitats, the risk for pollution during construction and operation seems significant. Risks identification also seems inadequate for physical and cultural heritage, natural habitats and biodiversity, gender equality and women's empowerment and involuntary resettlement, and lands and soil conservation. Please amend the proposal taking into account such considerations. CR 13: The management measures of the Environmental and Social Management plan attached to the proposal should be more specific, and should assign roles and responsibilities more clearly. CR 14: There are some contradictions between the ESMP, the proposal and the EIA. For instance, the ESMP states that construction materials are sourced locally while the proposal states that all aggregates and even the sand will be imported. This is a significant difference in terms of risks. Please clarify this issue and update the proposal accordingly.

	CR 15: Please explain the relatively high costs planned for the mid-term evaluation (USD 106,938) and the final evaluation (USD 107,488).
Date:	**22 August 2016**

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The Appendix form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

Contents

ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Regular Project
Country/ies:	Federated States of Micronesia (FSM)
Title of Project/Programme:	ENHANCING THE CLIMATE CHANGE RESILIENCE OF VULNERABLE ISLAND COMMUNITIES IN FEDERATED STATES OF MICRONESIA
Type of Implementing Entity:	RIE
Implementing Entity:	SECRETARIAT OF THE PACIFIC REGIONAL ENVIRONMENT PROGRAM (SPREP)
Executing Entity/ies:	Office of Environment and Emergency Management (OEEM) on behalf of Kosrae State Government, Pohnpei State Government, Yap State Government, Chuuk State Government
Amount of Financing Requested:	**$9,000,000 (in U.S Dollars Equivalent)**

Project / Programme Background and Context:

Provide brief information on the problem the proposed project/programme is aiming to solve. Outline the economic social, development and environmental context in which the project would operate.

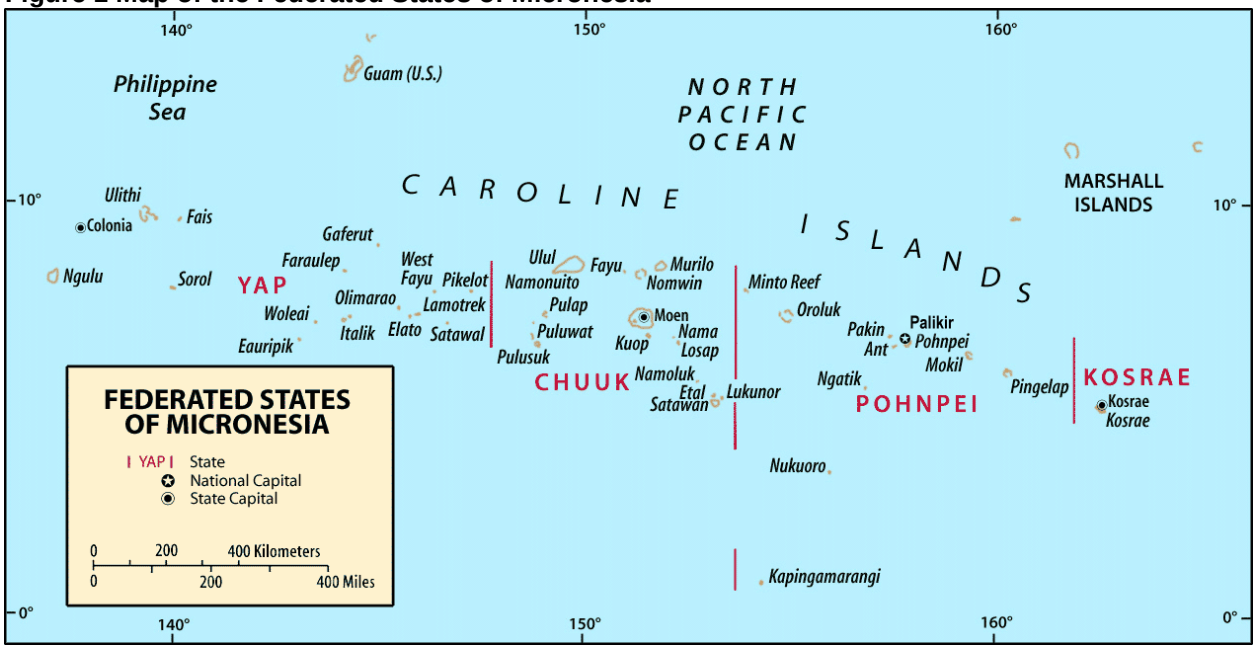
1. National and Local Level Context

1.1. Geography and Climate

The Federated States of Micronesia (FSM) is located near the equator about 4,000 km southwest of the Hawaiian Islands in the Western Pacific Ocean and within the Caroline Islands group. It is a group of approximately 607 islands covering 2,736 km^2 in the western Pacific Ocean (**Figure 1**). The land area totals 704.6 square kilometres, with 7,192 square kilometres of lagoon area. These islands vary from small islets are inundated at high tide, to atolls and large volcanic islands with land area of more than 80 km^2. Approximately 65 of the islands are inhabited. FSM's physical isolation, as well as the distance between states, and between islands within states, combined with limitations in transport, poses particular development challenges.

The FSM, located north of Papua New Guinea, south of Guam, and east of the Philippines, has an exclusive economic zone covering approximately 2,589,998 sq km (1,000,000 sq mi), yet the land mass of its 607 islands and atolls is only 704.6 square kilometres (270 sq mi). Four types of island occur: 1) Volcanic 'High islands' which can be highly rugged in their basalt interiors and typically surrounded by fringing or barrier reefs; 2) Low lying atolls and 3) Raised coral islands; and 4) Low coral islands. 'Low lying atoll and coral' 'outer islands' are especially isolated and require significant effort to reach from the main islands by boat or small plane. Of great biological significance are the coral fringing and barrier reefs that surround each island.

Figure 1 Map of the Federated States of Micronesia[1]



Each of the four States is centered on one or more main high islands (**Table 1**). All but Kosrae State includes numerous outlying atolls. The capital of FSM, Palikir, is located in Pohnpei State. Many of the islands in FSM are extinct shield volcanoes, with steep and rugged centers that are densely vegetated and eroded. Mangroves grow around the coastal fringes. Land elevations range up to about 2,500 feet (760m). Other islands are relatively flat, small and swampy, with low-lying, forested atoll islets, typically one to five m above mean sea level[2].

The major vegetation types in the FSM are native upland forest, agroforest, mangrove forest and savanna, other shrubs and grasslands. About a third of FSM's land area is suitable for agriculture, but less than 5% of agricultural land is arable. About half is used for permanent crops, with the remainder being used for other agricultural purposes.

[1] By U.S. Central Intelligence Agency - Federated States of Micronesia (Political) 1999 from Perry-Castañeda Library Map Collection: Federated States of Micronesia Maps, Public Domain, https://commons.wikimedia.org/w/index.php?curid=46492

[2] FSM Second National Communication under the UN Framework Convention on Climate Change, 2015

Table 1 Geography of FSM's four states[3] (* HV = high volcanics; A = atolls, **individuals per square kilometer).

STATE	# IS. GROUPS	# ISLANDS	# INHABITED IS.	TOPOGRAPHY (HV, A)*	LAND AREA (SQ.KM)	LAGOON AREA (SQ.KM)	POPN. (2010)	POPN DENSITY**
Yap	12	139	12	HV + A	119	1049	11,373	247
Chuuk	7	542	55	HV + A	127	2132	48,564	993
Pohnpei	6	26	6	HV + A	342	769	36,196	274
Kosrae	1	1	1	HV	117	0	6,616	156
Total	26	708	74		705	3,950	102,843	379

The tropical climate of FSM is due to its geographical location in the Western Pacific, just north of the equator, and the strong influence of northeast trade winds, thus generating consistently warm temperatures. The trade winds prevail from December through April. Periods of weaker winds and doldrums occur from May to November. Rainfall is generally plentiful, especially on the high volcanic islands of Kosrae, Pohnpei and Chuuk. It can exceed 400 inches (1,016 cm) annually, or 22 inches (559 mm) in any one day. The region is affected by storms and typhoons that are generally more severe in the western islands, as well as by periods of drought and excessive rainfall associated with different phases of the El Niño – Southern Oscillation (ENSO).

From May to November the rainfall is extremely high on the volcanic islands of Kosrae, Pohnpei and Chuuk. Yap lies in an area that generally experiences a monsoon climatic pattern, with more frequent periods of drought. The climate of Chuuk is hot and humid with an average temperature of 81°F (27°C), and little variation throughout the year. Average annual precipitation is 122 in (3,100 mm), with the months of January to March being drier. Pohnpei is generally hot and humid, also with a mean temperature of 81°F (27°C). Temperatures vary little from month to month. The mean annual rainfall is 190 inches (4826 mm), with January and February being slightly drier than the average of all months. Kosrae's climate is characterized by high temperatures, heavy rainfall and high humidity.

The average annual rainfall measured at the weather station in coastal Lelu is 203 inches (5000 mm). In the mountainous interior rainfall is estimated to be as high as 300 inches (7,500 mm) annually. Average temperature is again 81°F (27°C) at sea level. Average monthly temperatures vary from the annual average by no more than 0.5°F (1°C), and the difference between the average minimum and maximum temperatures is less than 14°F (8°C).

1.2. Political and Legislative

Since its inception in 1979, when it formed its own constitutional government, the FSM has worked with the United States government to achieve self-sufficiency through its primary source of assistance, the Compact of Free Association (1986-2003) and the subsequent Compact II (2004- 2023).

[3] Namakin, 2008; FSM Division of Statistics, 2012 *in* FSM Second National Communication under the UN Framework Convention on Climate Change, 2015, p.16)

The country's government is modelled after the federal system of the United States with a national president and four state governors with respective legislatures and judiciaries. The government has four levels of governance – National, State, municipal, and traditional.

The four states − Chuuk, Kosrae, Pohnpei and Yap – where the project is to be implemented, have considerable degree of autonomy. Each State Government has its own constitutional Government, consisting of the three branches: Executive, Legislative and Judicial.

Each FSM state has its own set of environmental laws and regulations geared to protect the islands form the effects of climate change. Under the Compact II, Article VI and section 161 of Title II, FSM is committed to applying the National Environmental Policy Act of 1969 and "to develop and implement standards and procedures to protect its environment."

In June 2012, FSM Environmental Protection Act became Public Law. Its purpose is to:

- reflect the current functions and responsibilities of the National Government in the area of environmental management and protection;
- eliminate duplication of responsibilities between the National and State Governments in the area of environmental management and protection; and
- provide the Office of Environment and Emergency Management (OEEM) with the necessary legal authority to implement, via regulation, the multilateral environmental agreements that FSM had already ratified, including the UNFCCC.

This project will be building on the existing legislative and policy framework that the national government and the state of Kosrae have already put in place.

The FSM Environment Sector Plan 2010-2015, prepared in accordance with the FSM Strategic Development Plan (SDP) 2004-2023, identifies achieving higher rates of compliance with environmental laws as a high priority for FSM National and State Governments. Among the most serious problems of environmental governance in FSM is that the laws and regulations are not enforced consistently or effectively. The new Environment Protection Act endeavors to address this and related issues, in part by strengthening enforcement action and by requiring the Director of OEEM to provide, on an annual basis, an environmental quality report covering the status and conditions of the environment of FSM, and a review of the programs and activities of the National Government, State Governments, municipal Governments and non-governmental organizations (NGOs), with particular reference to their effect on the environment of the country.

The FSM government has put in place national frameworks for adaptation: The Strategic Development Plan (SDP) 2004-2023 and the Infrastructure Development Plan (IDP) 2016-2025 are based on several frameworks which provide mitigation and adaptation measures to limit the impacts of climate change. Mitigation and Adaptation activities are on-going at the government and agency sectors.

The Strategic Development Plan (SDP) for FSM provides a road map for social and economic development for the 20 years, 2004 - 2023.

FSM adopted a national policy on climate change in 2009 and a policy on Disaster Risk Management and Climate Change Adaptation in 2013. Kosrae adopted a Shoreline

Management Plan in 2014. The State of Kosrae is the first state to develop a strategic plan that addresses coastal zone management in view of the adverse impacts of climate change.

The Kosrae Shoreline Management Plan (2014) states: “much development on Kosrae over the last two to three generations has occurred in low-lying coasal areas…many of the approaches we currently use…will be increadingly effective or inaffordable as sea levels rise. It will involve thinking differently than we have done in the past, particularly concerning where we locate infrastructure, our communities and our homes”.

There is an immediate need for capacity to support adaptation at the national level, and specific legislation, regulation and policy frameworks in the other 3 states so that they can deliver effective climate resilient measures for greater protection in the coastal zones.

1.3. Institutional Arrangements for Climate Change

FSM has ratified the UNFCCC and its Kyoto Protocol as well as Montreal Protocol (also known as the ozone treaty). FSM signed the Paris Agreement in 2016. In 2009, the FSM was awarded a Climate Protection Award from the U.S. Environmental Protection Agency for its contributions to Climate Protection under the ozone treaty.

FSM has a Multi-State Hazard Mitigation Plan 2005, which was developed after an extensive process of consultation, led by what was then the National Emergency Management Office, involving stakeholders across all states within and outside government.

FSM has commenced integration initiatives from a common institutional platform for disaster risk reduction and climate change adaptation overseen by the Office of Environment and Emergency Management.

A Nationwide Climate Change Policy was adopted by FSM in 2009. The focus is to mitigate climate change especially at the international level, and adaptation at the national, state and community levels to reduce the FSM’s vulnerability to climate change adverse impacts. The Policy outlines the integration of climate change into the Strategic Development Plan/Infrastructure Development Plan (SDP/IDP) and into other policies, strategies and action plans, including disaster preparedness and mitigation, as necessary. The Office of Environment and Emergency Management is designated as the focal point for all government climate change activities by law under Title 25 the FSM Environmental Protection Authority Act.

The Nationwide Climate Change Policy identifies the following sectors and the agency responsible for implementing climate change adaptation actions:

- Department of Education
- Department of Health and Social Affairs
- Department of Resources and Development
- Department of Transportation, Communication & Infrastructure
- FSM Weather Service Station
- National Oceanic Resource Management Authority
- Office of Environment and Emergency Management
- Office of President

FSM is presently in the process of developing a joint policy for climate change adaptation and disaster risk management.[4]

A Framework National Water and Sanitation Policy for the Federated States of Micronesia was developed in 2011. The objective of the framework is to provide the rationale and direction for a Comprehensive National Water and Sanitation Policy for the Federated States of Micronesia. Key elements of comprehensive policy will include a "Federated States of Micronesia National Water Outlook" and Water Sector Investment Plan. The intent of this policy is to mainstream the principles of Integrated Water Resource Management and Water Use Efficiency into national and state development planning and resource management.

1.4. Demography

The population of FSM reached 102,843 at the last census taken in 2010. This was a decline of 4,344 persons relative to the 2000 census total of 107,008. The rate of population growth in FSM and its composite states has declined dramatically over the past three decades. At the national level, annual growth had dropped from 3.0 percent in the 1980-89 period, to minus 0.4 percent over the 2000-2010 period. At the state level, Chuuk and Kosrae have negative growth while in Pohnpei and Yap the rate of growth is still positive but very low at 0.4 and 0.1 percent, respectively. While declining fertility has contributed to the drop in the population growth rate, out-migration to the United States and other parts of Micronesia is the primary cause of negative growth.

Table 2 Population and household distribution of FSM[5]

STATE	% OF TOTAL FSM POPULATION	% OF TOTAL NO. OF FSM HH
Yap	11.1	13.8
Chuuk	47.3	41.9
Pohnpei	35.2	37.5
Kosrae	6.4	6.8

The population of the FSM is unevenly distributed between states in terms of total numbers and per sq. km (Table 2). Chuuk State represents 47% of the population, Kosrae 6%, Pohnpei 35% and Yap 11%. The population is young, with 36% between 0 and 14 years, 59% 15-59 years and 5.5 percent 60 or older, though the average age is increasing. There are 4% fewer women of child bearing age in the FSM today than 10 years ago and the population is declining for the first time in recent history. This demographic change has been influenced by a Compact between the FSM and U.S. The Compact transfers significant funds to the FSM, and promotes outmigration by allowing FSM citizens to go to the U.S. and join its military (the FSM also has its own U.S. mailing zip code). In return it provides the U.S. strategic regional Asian and Pacific military considerations. On high islands a mariner culture and rough interior has concentrated populations along the coasts[6].

[4] GCCA:PSIS. 2013. Climate Change Profile. Federated States of Micronesia. Version 2, July 2013.
[5] Smith, W.J., J Mount, D. Bennet and P. Shed. 2014. Collaborative research methodologies and the construction of a national geospatial clearinghouse to conserve biodiversity in the Federated States of Micronesia. Applied Geography 54:198-208.
[6] Ibid.

1.5. Economy

The National and State governments account for over one-half of the nation's employment and 38% of its GDP. Agriculture is primarily subsistence farming. Natural resources available for economic purposes are limited to timber, marine products, deep-seabed minerals, and phosphate. Commercial fishing is an important source of revenue through licensing fees and exportation of fish. A wide range of financial and project assistance has been provided through a variety of governments, international institutions, and non-governmental organizations, resulting in limited success in developing an integrated, self-supporting, and sustainable economy.

In the era of Compact II (2004-2023) FSM is at a critical point in its development. In a relatively short time frame, each FSM State is challenged not only to continue developing a self-sufficient economy, but also to modernize without sacrificing valued cultural traditions and natural resource assets. Geographical isolation and poorly developed infrastructure are major impediments to FSM's long-term growth. Over the years, agriculture's socio-cultural role as a safety net for the disadvantaged has greatly diminished. Inequality of income and the incidence of families with incomes below the poverty line are among the highest in the Pacific region. Poverty is a concern and FSM has, in general, made only limited progress towards achieving the Millennium Development Goals (MDGs) by 2015.

The mainstays of the FSM economy are subsistence farming and fishing. There is limited tourism due to lack of access and facilities, although it has increased in recent years with a number of small hotels opening in Pohnpei, Yap and Kosrae. Geographic isolation and poorly developed infrastructure are major impediments to FSM's economic growth, and poverty is among the highest in the Pacific region. FSM has, in general, made only limited progress towards achieving the Millennium Development Goals by 2015.

The public sector plays a central role in the economy, the national and state-level governments employ over half of the country's workers and government services and public enterprises account for 38% of GDP. Since the 1995 Economic Summit, the private sector has been a focus of economic development. There are now 22 private locally owned construction companies that also undertake road maintenance.

Daily life in most of the FSM is run on an extended family scale, with village or island functions integrated into this routine. National and state levels of government lack a sustained influence in this routine in most islands. Thus, conservation efforts must connect to the local scale and people with traditional ties into communities if they are to be sustained. The human and physical geography that define the FSM make this a major challenge. Conversely, it is undeniable that given the relative autonomy of islands and villages, but mobile and common nature of many marine resources such as coral, sea turtles, and fish, that large-scale planning may need to span 'ecoregions'[7].

[7] Smith, W.J., J Mount, D. Bennet and P. Shed. 2014. Collaborative research methodologies and the construction of a national geospatial clearinghouse to conserve biodiversity in the Federated States of Micronesia. Applied Geography 54:198-208.

1.6. Education

Education in the FSM is compulsory for all children, including those with disabilities, from ages six to fourteen or until completion of grade eight. Secondary schooling (grades 9-12) is not compulsory.

Quality of education is a key concern as more than forty per cent of pupils in grade eight score far below the minimum benchmarks for math and reading in performance assessments.

As more people have migrated to the state capitals, urban schools have become crowded and outer-island schools depleted of students. Many school buildings are old and in poor repair, textbooks and other teaching aids are in short supply. Outer island schools are typically very small, access is slow and expensive, and they can only be contacted by short wave radio. This makes it difficult for state and national agencies to provide technical assistance and support.

1.7. The Water Security Problems in Outer Islands

Areas of small island countries, such as the FSM, exceed well over 5000 mm of precipitation annually. These communities are in some of the wettest places on earth. Nevertheless, their geologic and geographic settings, technology, government capacity, village-scale governance and knowledge base can still make accessing safe drinking water exceedingly difficult. Despite billions of dollars in aid, labour, and local spending, inadequate progress has been made in recent years in much of the less wealthy communities in improving access to safe drinking water[8].

Despite high national precipitation rates, water supplies on smaller, low-lying atoll islands are extremely vulnerable to droughts and to saltwater inundation caused by high tides. Water for drinking and other uses comes from two sources: rainwater catchments and shallow wells that draw from a layer or “lens” of freshwater that is underlain by brackish water or saltwater. Groundwater in the part of the lens that is near the ground surface in the central depression of the island is also important for taro cultivation. On some atoll islands, the freshwater lens is thin and highly vulnerable to contamination from the saltwater below, especially if too much freshwater is drawn from the lens.

The El Niño event of 1997–1998 caused severe droughts and water shortages on many of the Pacific Islands including FSM. During the drought, public were concerned about high level of demand and increased groundwater withdrawals because of the potential impact of saltwater intrusion on taro, breadfruit, and banana crops. The case demonstrates the vulnerability of freshwater resources on atoll islands. Data from monitoring are needed to manage rainwater and groundwater resources conjunctively and increase the adaptive capacity of low islands to meet the challenges posed by climate variability and change.

The water resources of the islands composing the 32 atolls of the FSM are under continual threat due to El Niño-induced drought events and potential sea-level rise. The contamination from septic tanks and waste-water runoff from pig pens is also a major issue.

[8] Smith, W.J. 2008. *Geographical Journal* Vol. 174 No. 3, pp. 251–268, 2008

Another risk is the high-sea/surf events. In December 2007 and again in 2008, several atoll islands in the Federated States of Micronesia were flooded by series of high wave events. These saltwater floods had a significant impact on taro crops that are commonly cultivated in a depression near the center of the island. In December 2007, on the outer islands of Chuuk State, where 13,000 people or one-fourth of the state population resides, an estimated 90% of all taro crops were destroyed by saltwater inundation[9].

Water use within atoll island communities is derived from either captured rain water (typically through a roof-gutter system that feeds a large storage tank) or groundwater. Rain catchment water is preferred for most domestic purposes such as drinking and cooking, whereas groundwater, typically accessed through hand-dug wells lined with concrete or rocks, is used for bathing and washing clothes. Communities may also use coconut juice to supplement drinking water.

Rain catchment tanks vary in construction material and size. Older tanks are made from concrete, whereas newer ones are made from fiber glass. Depth to water in the hand-dug wells ranges from 1 to 3 m, and fluctuates with the rise and fall of the tides. The water is extracted by either a rope and bucket or a small electric pump, and is typically shared by several households.

In general, only large leeward islands appear to be able to maintain substantial freshwater lens during both average and drought conditions. The majority of FSM atoll islands are windward and hence contain only a thin lens, irrespective of the rate of rainfall. These results provide water-resources managers of atoll island communities with important generalizations regarding the sustainability of island resources, and can be used for future planning within these communities.

The sustainability of water resources on atoll islands is therefore of serious concern due to their small catchment area, low-lying topography, isolation from other island communities, and the continual threat of El Niño-induced droughts. Most of the 32 atolls within the FSM are permanently inhabited, but their residents have always been continually at risk of water shortages. Groundwater resources are particularly important reserves, since the small exposed area of the island land surface and the high permeability of the carbonate sediments preclude the development of natural surface-water bodies or reservoirs. Man-made storage tanks are used to collect rainwater, but these can become depleted quickly during droughts. At such times, island residents rely on groundwater to fulfill their domestic water needs. The fresh ground-water, residing in the “freshwater lens”, however, is itself subject to stress and threat of depletion during El Niño-droughts. Atoll island groundwater is thus an inherently precarious resource.

The FSM government seeks to make each atoll island community sustainable in regards to water resources. Success obviously depends on maintaining sufficient potable water on each atoll island during even the most severe droughts. Therefore, the volume of freshwater reserves must be predicted for periods of scarce rainfall rather than for normal climate conditions.

[9] Keener, V. W., Marra, J. J., Finucane, M. L., Spooner, D., & Smith, M. H. (Eds.). (2012). Climate Change and Pacific Islands: Indicators and Impacts. Report for the 2012 Pacific Islands Regional Climate Assessment. Washington, DC: Island Press.

1.8 Proposed Focus Area

The Government of FSM has identified two outer islands each in Pohnphei, Chuuk and Yap states as priorities for the water security component of this proposal to the Adaptation Fund. These are Kapingamarangi and Nukuoro in Pohnpei; Satawan and Lukunor in Chuuk and Eauripik and Woleai in Yap. The majority are among the atolls most remote from their respective main lands. The government has also focused on building the capacity of the communities of Malem and Utwe in Kosrae to respond to climate as well as improving the resilience of its infrastructure and natural environment to climate change under the coastal component of the proposal. The socio economic profiles of each of the States and the proposed sites are summarised below.

1.9 Yap State

Yap State consists of four main islands of Yap Island, Tomil-Gagil, Maap and Rumung and eight smaller islets sharing a common coral reef. Colonia is the capital of Yap State. It administers both Yap proper and 14 atolls reaching to the east and south for some 800km, namely Eauripik, Elato, Fais, Faraulep, Gaferut, Ifalik, Lamotrek, Ngulu, Olimarao, Piagailoe (West Fayu), Pikelot, Sorol, Ulithi, and Woleai atolls, as well as the island of Satawa. Yap accounts for 84 percent of the state's total landmass, is home to two-thirds of Yap State's population of 12,055 (FSM 2010 Census).

The significance of climate change to the State of Yap is set out in the Joint State Action Plan. As the westernmost state of FSM, Yap is exposed to a range of threats that create significant vulnerabilities for the state. Yap is located in 'Typhoon Alley', is likely to be disturbed by earthquakes and tsunamis, and suffers droughts due to the impact of El Niño Southern Oscillation (ENSO). ENSO is also the cause of both excessive and below average rainfall. Yap is drier than the other states of FSM, and is highly susceptible to drought. The lack of adequate water storage capacity on the outlying islands increases the inhabitant's vulnerability to the impacts of drought. Yap is very vulnerable to flooding during typhoons and storm surges. The state does not regularly receive large amounts of rain and thus the damage from extreme surge and rainfall events is usually much more intense.

The distances between islands makes it difficult to get much-needed food, water and medical supplies to residents after a disaster, meaning Yap is more vulnerable to health and other secondary impacts of disasters than the other FSM states. Through July 2015 and January 2016 island leader and community consolations, facilitated by the government of Yap through the Department of Resources & Development and SPREP, the atoll islands of Eauripik and Woleai are nominated for water security measures (Section II.H). The most recent impacts caused by Typhoon Maysak and the recent 2015-2016 El Nino phenomena was felt strongly at these islands requiring water resources to be secured.

1.10 Chuuk State

Chuuk is located (830nm) to the west of Yap state, with Pohnpei (1208nm) and Kosrae (1500nm) to the east. It is the most populated state of FSM. Chuuk State consists of several island groups with a combined population of 48,615 (FSM Census, 2010). The 2010 Census reported fewer residents in the state compared to 2000 (-1.0 percent decline) as a result of substantial net-migration to neighboring US Territories, Hawaii and US Mainland. This was associated with the recent mixed economic fortunes of the state.

Satawan with a population of 692 and Lukunor with 848 are the two Chuuk atoll communities that will be addressed by the project. These islands are only three to five meters above sea level and are therefore prone to impacts of sea level rise. The islands water wells are brackish and provide only limited water. Some wells are only used to draw water for washing and cooking during drought, as it is unsafe for general consumption. Most water wells are not covered, and therefore contamination from sea water, e-coli, and humus is common. Most of the households on both islands have at least one water tank, which has found to be unsustainable during drought. The rainwater harvesting systems are in poor condition as a result of sustaining damage from typhoons, lack of spare parts and poor maintenance, leaving these communities highly vulnerable to drought. During periods of drought, people and animals often resort to coconuts and root trees for water and hydration.

1.11 Pohnpei State

Pohnpei is a "high" volcanic island, having a rugged, mountainous interior with some peaks as high as 760 meters. It measures about 130 kilometres in circumference and is roughly circular in shape. Pohnpei Island is the largest, highest, most populated, and most developed island in FSM. A coral reef surrounds the island, forming a protected lagoon. There are no beaches on Pohnpei – the coast is surrounded by mangrove forests/stands growing on muddy substrate eroded from interior wetlands in the rainy environment. Several smaller islets, many of them inhabited, lie nearby within the lagoon-reef complex. The population of Pohnpei is approximately 34,840. Pohnpei is more ethnically diverse than any other island in the FSM. This is largely due to it being home to the capitol of the national government, which employs hundreds of people from the other FSM States having distinct ethnic and cultural origins.

Kapingamarangi and Nukuoro are the two Pohnpei atolls that will be addressed by the project, with a population of 350 and 210 respectively. The atoll's ground water resources are already susceptible to sea water intrusion, underground water pollution and surface water pollution from agricultural practices. The western reef rim of Kapingamarangi atoll is almost submerged at high water. Much of the islets on this western reef that is used for growing fruit and vegetables are now under threat. As a result, the islanders are now looking to move the growing of such fruit and vegetables to the same islets where they are raising livestock, as well as on the main island of Touhou where people reside. This is already putting pressure on the water resources on Touhou, where the highest point is only 90 cm. On Nukuoro, the staple food crop is taro. Taro is highly susceptible to salt water intrusion. During drought, the communities use raised swamp taro patches as water reservoirs to catch water for cooking and washing. Buckets and recycled oil-drums are a common method of storing water at the household levels. The population of Nukuoro are highly vulnerable to water and vector-borne diseases as a result of poor quality of water.

1.12 Kosrae State

Kosrae is the easternmost and second largest island of the FSM, located approximately 372 miles southeast of Pohnpei. Kosrae has a land area of 42 square miles (112 square km) and an EEZ of 200 nautical miles. Between 1997 and 2010, Kosrae's population declined by 12 percent to its current population of 6,616 people (FSM Census 2010), and constitutes 6 percent of FSM's population. The negative population growth is largely due to considerable out-migration to the US and its territories. Accordingly, the working population age has dramatically declined, significantly reducing the productive work force and local production (UNFPA, 2013). This trend is mainly attributed to poor economic performance and reductions in the public sector, which

has traditionally been the main employer. As at 2010, the unemployment rate in Kosrae was significantly high at 23 percent.

Kosrae is the only state without an outer island. It is divided into four municipalities, with respective populations as follows: Lelu (2,160), Malem (1,300), Tafunsak (2,173) and Utwe (983). Geographically, the state is characterized by steep mountains and deep valleys covered with thick, fertile tropical vegetation and forests, and dense mangrove forests in coastal areas. The island's main natural resources are its abundant forests with significant agricultural potential, marine products and deep-seabed minerals[10].

Kosrae is a high volcanic island surrounded by a fringing reef, mangroves and coastal strand forests that have been historically used for lumber and fuel by residents. There is a shallow fringing reef spotted with boulders of coral heads that have been dislodged from the fore – reef during occasional cyclone events. There are no outer islands. The island has steep, heavily vegetated watersheds, which in the mid to upper parts of the catchment are in relatively natural state. Where clearing or deforestation on sloping areas does occur, however, intense rainfall quickly denudes exposed soil. Invasive vegetation is a significant problem and has taken a foothold in many of the lower parts of many of the catchments.

[10] Federated States of Micronesia Infrastructure Development Plan FY2016-FY2025. Volume 6 Yap State Infrastructure Development Plan

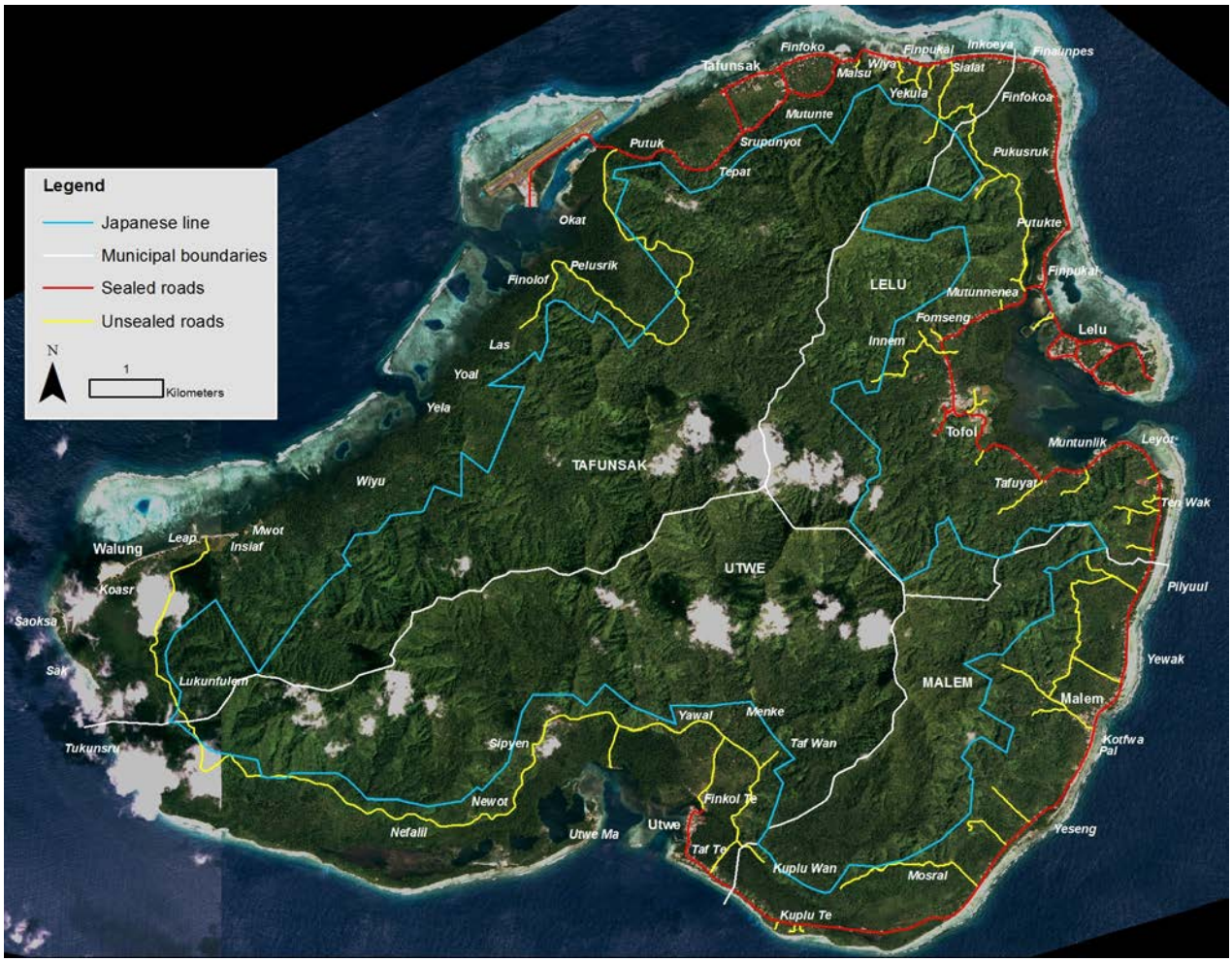


Figure 2 Kosrae location map showing extent of the existing paved and unpaved (farm-road) road network. (Source: KIRMA, 2014)

The lack of a lagoon and the rugged interior are among the factors that have led Kosraens to become more dependent on earnings from wage and salary employment than other Micronesians. The estimated population of Kosrae in 2014 stood at 5,758 persons living in 1,089 households (HH). The urban to rural ratio in 2010 was 48.5%. The population increased steadily from the 1920s to a peak of 7,676 in 2000 but has declined sharply since. Outmigration is driving the decline, and is related to the drop in formal sector employment associated with the transition to an Amended Compact arrangement with the United States. The remaining population remains largely dependent upon fishing, subsistence farming, remittances and the state sector for their livelihoods.

Geographic isolation and poorly developed infrastructure are major impediments to Kosrae's (and FSM's) economic growth, and poverty is among the highest in the Pacific region. The 2010 MDG Report (based on 2005 data) places 34.1% of Kosrae's population (27.1% of HH) below the Basic Needs Poverty Line with 8.8% or people (7.1% of HH) below the Food Poverty Line. It should be noted, however, that while this is measured against more conventional definitions of poverty that most people through their extended family have some access to land and subsistence agriculture. 80.4% of HH were categorised as Working Poor (HH with one or more workers and in the lowest 30% expenditure bracket). While access to piped drinking water and

improved sanitation is generally higher in Kosrae than in the other FSM States, of concern is the relatively lower access to health dispensaries and other health facilities and higher rates of childhood obesity combined with under-nutrition. Although educational quality and attainment tend to be higher in Kosrae than in the other states, 63% and 51% of children leaving primary school fall below minimum competency levels for maths and reading respectively.

Kosrae's GDP growth has declined by 0.7% per annum since the beginning of the Amended Compact. A major issue is the size of the public sector in the economy, accounting for 40 percent of GDP activity. Salary and wage expenditure is high, and represented 53% of KSG's current expenditure in FY2013. These factors suggest the Kosrae economy is in a highly volatile state as it approaches 2023 and has no significant financial reserves to fall back on.

While FSM currently has no national strategy for coastal zone management, Kosrae has developed a strategic plan that addresses coastal zone management in view of adverse impacts of coastal hazards and climate change on development and infrastructure of Kosrae. Known as the Kosrae Shoreline Management Plan (SMP) this was initially developed with considerable community consultation between 1998 and 2000 and updated with further consultation in each Municipality in 2013. The SMP sets out the principles for coastal development in Kosrae over the coming decades, and details eight key strategies for responding to climate change and sea level rise and increasing the resilience of Kosrae's coastal communities over the next one to two generations (20 – 50 years) .

Over the last century changes in the position of the shoreline around Kosrae shows considerable variability. The most significant long-term coastal retreat over this time has occurred along the eastern front facing Lelu and Malem coastlines. Much of the east and south coastline on Kosrae has been built by storm and typhoon events over many years. The east coast is characterised by relatively narrow fringing reef, a narrow storm berm upon which the coastal road and most development has occurred, with areas of low lying infill swamp, farmland or lagoon mangrove, behind the berm to the volcanic part of the island. This coastal retreat is both related to natural changes primarily linked to a series of typhoon events (seethe Kosrae SMP) and due to human impacts including past offshore mining of coral rubble and sand over the fringing reef flat for construction materials, beach mining for sand and gravel resources, and interruptions to alongshore sediment transport by engineering projects whilst sand and gravel removal from beaches and reef flat have long been controlled ,the impacts from activities in the period between 1950s to 1980s are still being felt. The rate of coastal retreat is also being exacerbated by sea-level rise and this will continue to have an even greater influence on the rate of coastal change, and associated impacts on coastal infrastructure and development located on the berm, going forward.

Similarly overwash on the berm, and hence flooding of the road and property, due to high tide and wave conditions are extremely sensitive to sea-level rise. For example a high tide level of 2 m (relative to vertical land datum on Kosrae) is presently a very high tide on Kosrae, and typically results in overwashing and flooding problems. Such a high tide is experienced on average 2.8% of all high tides at present. Put another way, approximately 97% of all high tides in Kosrae are less than 2m high. With a mid-range sea level rise scenario, however, these statistics will change, by the:

- 2030s, the high tide level of 2m will be exceeded by 12% of all high tides
- 2050s, the high tide level of 2m will be exceeded by 27% of all high tides
- 2070s, the high tide level of 2m will be exceeded by 69% of all high tides

- 2090s, the high tide level of 2m will be exceeded by 95% of all high tides

In 2009 the Pacific Adaptation to Climate Change (PACC[11]) project focused on coastal zone management in Kosrae, and specifically on 'climate proofing' a section of the Tafunsak to Walung circumferential road. The circumferential road on Kosrae plays a vital transport role for the people of the island, and also directs the location of other infrastructure and development. It is therefore critical to the resilience of the community that the road be able to withstand current and future impacts of climate and sea. The choice of project was influenced by earlier work under the Asian Development Bank (ADB)-funded Climate Adaptation in the Pacific (CLIMAP) project in 2005, which identified the need for climate proofing of the road, and carried out various assessments and analyses, but did not complete the on-the-ground work. Lessons from the PACC project have been considered by the project during its planning and design stages (see Annex 1)

The CLIMAP analyses found that the original road design had been based on inaccurate rainfall data, i.e. they had not accounted for increases in rainfall in the design and engineering. The road had been built with drainage works designed for a maximum hourly rainfall of 178 mm, which supposedly had a return period of 25 years. An analysis of more reliable data indicated that an hourly rainfall with a return period of 25 years is 190 mm. By 2050, however, the hourly rainfall with a 25-year return period is projected to increase to 254 mm as a consequence of climate change. Based on these results some aspects of the road design were amended, specifically the culverts were redesigned to accommodate the higher rainfall. These lessons are incorporated in to the proposed Kosrae component of the Adaptation Fund Project.

Kosrae's proposed project within the Adaptation Fund proposal targets the municipalities of Malem and Utwe for construction of a climate-proofed inland road, with the long-term objective of enabling the gradual relocation of households to safer inland areas. Of Kosrae's four municipalities Malem and Utwe are considered to be the most vulnerable to climate change-related impacts. The majority of households in both municipalities, along with all essential infrastructure are currently located close to the current shoreline and exposed to frequent coastal-related flooding. .

Box 1. Land in FSM

Land in FSM is managed under a complex mix of modern and traditional systems. Land is intricately connected to people's perception of inheritance and community. This needs to be tackled with a long-term perspective. The majority of transactions for commercial ventures transpire with survey; titling and documentation completed under modern land management institutions. Chuuk is an exception, due to long-standing unresolved disputes between individuals and clan groups. Disputes also arise periodically in the other states and can take an inordinately long period of time to resolve.

In Kosrae, Chuuk and Yap land rights may be legally sold to FSM citizen, but in Pohnpei land can only be sold to Pohnpeians. The FSM Constitution forbids the ownership of land by foreigners, but they are permitted to lease land. Multiple ownership of land still exists throughout the FSM, requiring the consensus of families, clans and traditional leaders for

[11] www.sprep.org/pacc

leases and development. This can present a constraint to development depending on the ability to achieve consensus. In all states the market for land is characterized by few transactions, limited market information, no formal mechanisms for public dissemination of market transaction data and price demands from (often multiple) landowners. As a result of these conditions, together with prevailing cultural factors influencing the perceived value of land, it can be said that transactions are only partly influenced by economic market forces and the potential productive value of land.

Distortions and rigidities in land market transactions will be difficult to reduce and change will undoubtedly be gradual. A focus on public education and information dissemination may result in accelerating this process It is important that the current program of surveying and recording land titles of land available for development in the states is completed. Improvements in mortgage laws, leasehold mortgages and land management in general require actions within each state.

Chuuk State has taken action by passing leasehold mortgage law but has not yet promulgated regulations to implement the law. The extent to which land can be leveraged and mortgaged is important for increasing productive activity and incomes. Land assets that become locked outside the modern market economy cannot be leverage or redeployed for production. The overall effect is that many landowners are asset rich and income poor.

Currently all land in Kosrae above the so-called *Japanese Line* (indicated in blue in map at right) is under government control. During the Japanese occupation of Kosrae, public lands were expanded to include the shoreline below the mean high water mark, the mangroves and the upland forests above the Japanese Line, which includes approx. 67% of the total land area of Kosrae. As much as 50% of this area is too steep for any development and should be maintained as forest for watershed protection. A recent Constitutional amendment (Amen 19, 1995) was passed which allows reclamation of land above the Japanese Line by the original landowners. Land will be awarded by issuing a Certificate of Title to an individual or to the Tenancy-in-Common. A procedure for reclamation must be established by law before any advancement can be made and should be guided by this land use plan.

Sources: FSM 2023 Action Plan (pgs 47-48); Kosrae State Land Use Plan 2003

2. Climate change impacts and risks

The future for FSM does not look favourable for any development that is based on a business as usual approach. In the current period to 2100, according to PCCSP and PACCSAP (Australian BoM and CSIRO, 2011, 2014); the latest global climate model (GCM) projections and climate science findings for FSM indicate that:

- Surface air temperature and sea surface temperature are projected to continue to increase (very high confidence)
- El Niño and La Niña events will continue to occur in the future (very high confidence), but there is little consensus on whether these events will change in intensity or frequency;
- Average annual rainfall is projected to increase (medium confidence), with more extreme rain events (high confidence);
- Drought frequency is projected to decrease (medium confidence);
- Ocean acidification is expected to continue (very high confidence);
- The risk of coral bleaching will increase in the future (very high confidence);
- Sea level will continue to rise (very high confidence); and
- Wave height is projected to decrease in December–March (low confidence), and waves may be more directed from the south in June–September (low confidence).

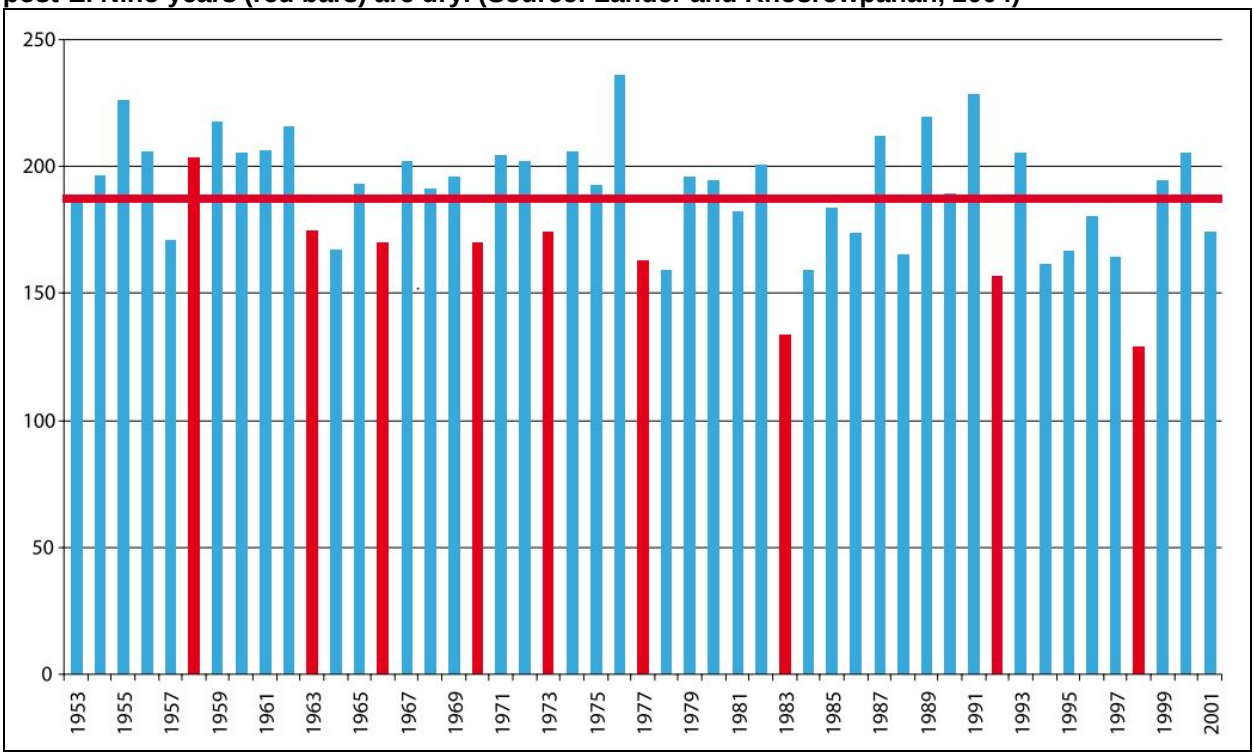
A number of studies suggest that global warming could accentuate the current climate regimes and the changes that come with ENSO events (e.g. Hay and Pratt, 2013). This will mean that the inherited and natural coping strategies that the inhabitants of the atoll islands and the atoll environment of FSM will not be enough to respond to these new climate regimes. It will be an ongoing challenge and burden to maintain and sustain the sensitive balance between ecosystem dynamics, the health of the marine environment, human settlement patterns and coastal resource use.

FSM's climate and sea level are both strongly modulated by the ENSO. Following El Niño conditions the country typically experiences drought. Severe drought events have resulted in water and food shortages as well as the occurrence of fires. Effects of El Niño on the FSM involve the persistence of a high-pressure weather zone over the Western Tropical Pacific for many months, blocking low-pressure, rain-bearing air masses. Nearly all extremely dry years in the FSM occur during the year following an El Niño event (Figure 3). In some years, drought conditions have continued through the wet season.

The driest year on record in Pohnpei and throughout most of Micronesia occurred in 1998, following the major El Niño of 1997. Some El Niño years are very wet depending upon the behaviour of typhoons and the monsoon trough. Most La Niña and neutral years have precipitation that is near normal to slightly above normal, unless it is a year following an El Niño, when rainfall is below normal. Deleterious effects include desiccation of grasslands and forests, draw-down of streamflow and well-heads, and wildfires[12].

[12] FSM Second National Communication Report to the UNFCCC, 2015.

Figure 3 Time series of annual rainfall at the Pohnpei Weather Service Observatory (WSO). Most post-El Nino years (red bars) are dry. (Source: Lander and Khosrowpanah, 2004)

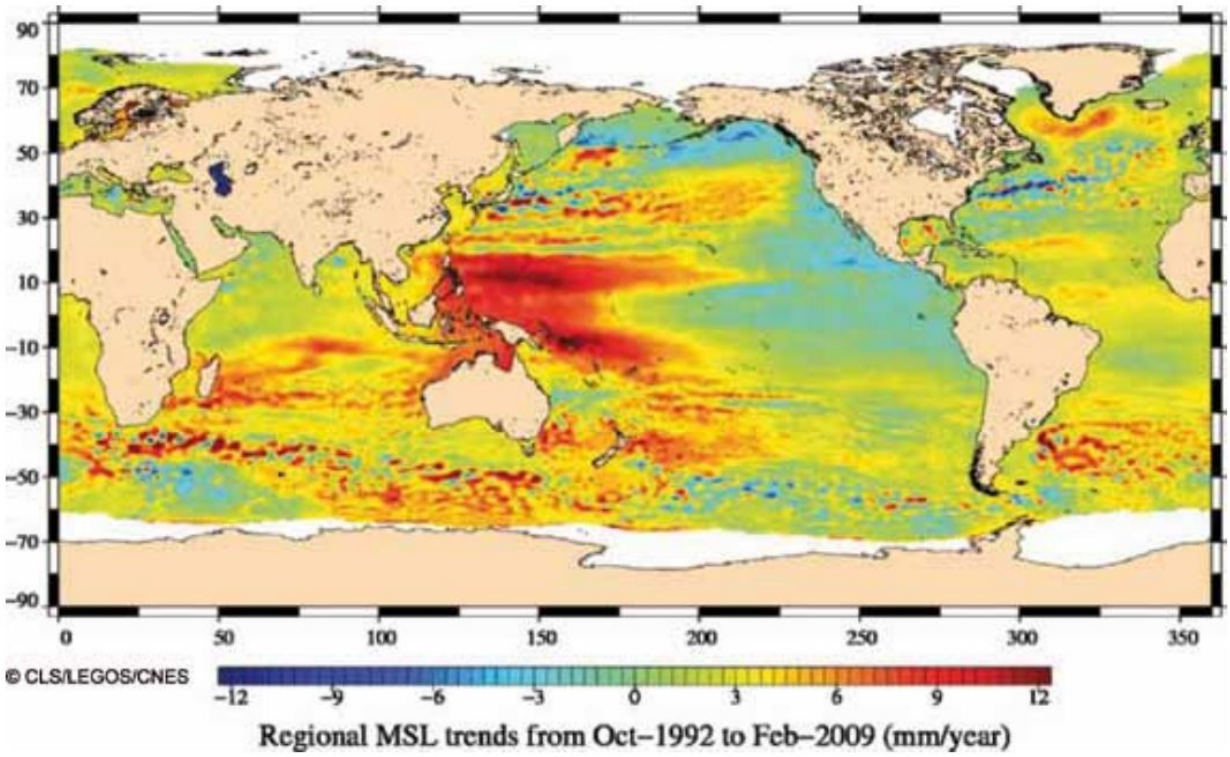


The droughts of 1982-1983 and 1997-1998 were especially severe on terrestrial habitats, increasing localized threats to biodiversity. Groundwater sources were taxed, agricultural systems damaged and problems associated with wildfires and invasive species were greatly aggravated. Insufficient rainfall caused water and food shortages, including staples such as taro, coconut, breadfruit, banana, yam, sweet potato, citrus, and sugar cane. Communities in the atolls survived because bottled water, food supplies, and reverse osmosis pumps were imported. Water rationing for only two hours a day in Pohnpei was necessary. High near-surface lagoon and ocean water temperatures, especially associated with low water spring tides, caused coral bleaching and damage to inshore marine ecosystems (Falanruw, 2001). Poor potable water quality resulted in cases of typhoid and cholera. There was also a decrease in fish catch, possibly due to the variations in water temperature that occur during El Nino events.

2.1 Sea Level and Extreme High Tides

FSM is located in part of the global ocean that has experienced some of the highest rates of sea-level rise (Figure 4) over the period of available satellite and tide gauge monitoring. Data from the Topex/Poseidon and Jason-1 satellites makes it possible to determine rates of sea-level change between 1992 and 2016.

Figure 4 Rate of Sea Level Change, 1992 - 2009



Monthly averages of the historical tide gauge, satellite (since 1993) and gridded sea-level (since 1950) data agree well after 1993. These data indicate an interannual variability in sea level around FSM of about 10 in (26 cm) (estimated 5–95% range), after removal of the seasonal cycle.

The average of the observed in situ relative sea-level records is indicated in red, with the satellite record (since 1993) in light blue. The gridded sea level data at FSM since 1950, from Church and White (in press), is shown in orange. The projections for the A1B (medium) emissions scenario (5–95% uncertainty range) are shown by the green shaded region from 1990–2100. The range of projections for the B1 (low), A1B (medium) and A2 (high) emissions scenarios by 2100 are also shown by the bars on the right. The dashed lines are an estimate of interannual variability in sea level (5–95% range about the long-term trends). These indicate that individual monthly averages of sea level can be above or below longer-term averages[13]. FSM's climate and sea level are both strongly modulated by the ENSO. These variations are important as drought, floods and marine inundation due to high sea levels may damage soil and degrade food resources and drinking water. During an El Niño year, the mean sea level drops across most of Micronesia. During La Niña, the sea level is elevated above its normal value. These changes in sea level are highly coherent across the region from Yap to Guam, Chuuk, Pohnpei, and Kosrae.

[13] Australian Bureau of Meteorology and CSIRO, 2011

2.2 Rainfall

For FSM, wet season (May-October), dry season (November-April) and annual average rainfall amounts are projected to increase over the course of the 21st century. There is high confidence in this direction of change. The majority of models used in the study indicate little change (-5% to 5%) in rainfall by 2030. However, by 2090 the majority simulate an increase (>5%) in wet season, dry season and annual rainfall, with up to a third simulating a large increase (>15%) for eastern FSM under the A2 (high) emissions scenario. There is moderate confidence in this range and distribution of possible futures.

There is an inconsistency between the projected increases in rainfall described above and the recent declining (Pohnpei) or relatively steady (Yap) trends observed at individual meteorological stations. This may be related to local factors not captured by the models (e.g. topography), or the fact that the above projections represent an average over a relatively large geographic region. Models do not agree on future ENSO conditions and therefore on the effect of ENSO on future rainfall patterns. However, models do agree that as a global average, tropical settings are likely to see increased rainfall and rainstorm intensity

3. Vulnerability Assessment

Like many Pacific islands countries, the FSM's low-lying atolls and coral islands are very vulnerable to natural hazards and disasters such as cyclones, sea surges, and droughts. On average, annual economic losses due to natural disasters amount up to three per cent of GDP.

Top five disasters in the FSM by total number of people affected

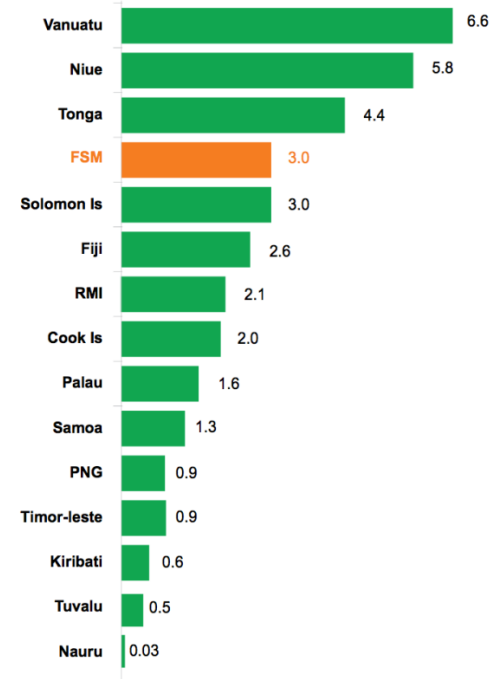
Number of people affected by disaster, 1987-2008

	People Affected
Drought (Marr. 1998)	28,800
Cyclone (Apr. 2004)	6,008
Cholera epidemic (Apr. 2000)	3,431
Cyclone (Jul. 2002)	1,448
Cyclone (Nov. 2003)	1,000

Source: EM-DAT: The OFDA/CRED International Disaster Database, www.emdat.be - Université catholique de Louvain - Brussels – Belgium

FSM's annual economic losses due to natural disasters are significant

Annual average economic losses due to tropical cyclone, earthquake, and tsunami as a percentage of GDP by Pacific island country



The islands of FSM Islands are categorized locally into three groups: 1) Volcanic 'High islands' which can be highly rugged in their basalt interiors; 2) 'Low' coral-based 'reef islands;' and 3)

'Low' coral-based 'outer islands' that are especially isolated and require significant effort to reach from the main islands by boat or small plane. Of great biological significance are the coral fringing reefs attached to land and extending watersheds into the marine environment in lagoons and Open Ocean[14].

The distinction between "high" islands and "low" atoll islands is essential to explain the different climates on islands, their many specialized terrestrial and marine ecosystems, and the forms of human communities they currently support. The terrain of high islands is characterized by abrupt elevation changes (mountains, sheer cliffs, steep ridges and valleys), with the altitude and size of these features varying according to the age of the island. On high islands, orographic rainfall (rain associated with or induced by the presence of mountains) can cause the island to receive much higher rainfall than the surrounding ocean, and is responsible for large differences between leeward and windward rainfall. The landscape on high islands is conducive to the formation and persistence of freshwater streams and the development of soils that can support large and diverse plant and animal populations.

In contrast, the low atoll islands are small and flat. They are not tall enough to generate orographic rain, and thus the amount of rainfall on low islands is close to that for the surrounding ocean. The atolls generally lack the freshwater and fertile soils that are characteristic of volcanic islands and have limited terrestrial resources. Low islands are especially prone to drought, but their varied coral reef, mangrove, and lagoon environments support rich marine ecosystems. Because high islands have more land and freshwater resources than low islands do, they have more long-term options for responding to changes in sea level, rainfall, and other climate variables. The amount of land on volcanic islands that is flat enough for large-scale settlement, development, and agriculture is limited, however, resulting in high concentrations of population, infrastructure, and commercial development in low-lying coastal areas. Thus, while communities on high islands and low islands have somewhat similar short-term challenges associated with climate change, they have different degrees of flexibility in how they can adapt.[15]

Most of the 32 atolls within the FSM are permanently inhabited, but their residents have always been continually at risk of water shortages. Groundwater resources are particularly important reserves, since the small exposed area of the island land surface and the high permeability of the carbonate sediments preclude the development of natural surface-water bodies or reservoirs.

Atoll aquifers consist of a layer or "lens" of freshwater floating on saltwater. Recharge from rainfall typically forms a thin lens of freshwater that is buoyantly supported by denser, underlying saltwater, and mixing forms a zone of transitional salinity. The thickness of this mixing zone is determined by the rate of recharge, tidal dynamics, and hydraulic properties of the aquifer.

Water use within atoll island communities is derived from either captured rain water (typically through a roof-gutter system that feeds a large storage tank) or groundwater. Rain catchment water is preferred for most domestic purposes such as drinking and cooking, whereas groundwater, typically accessed through hand-dug wells lined with concrete or rocks, is used for

[14] Ibid

[15] Keener, V. W., Marra, J. J., Finucane, M. L., Spooner, D., & Smith, M. H. (Eds.). (2012). Climate Change and Pacific Islands: Indicators and Impacts. Report for The 2012 Pacific Islands Regional Climate Assessment. Washington, DC: Island Press.

bathing and washing clothes. Communities may also use coconut juice to supplement drinking water. The tanks used to collect and store rainwater can become depleted quickly during droughts. At such times, island residents rely on groundwater to fulfil their domestic water needs. However, this groundwater, residing in the freshwater lens, is itself subject to stress and threat of depletion, particularly during El Niño-droughts. Atoll island groundwater is thus an inherently precarious resource.

In general, only large Leeward Islands appear to be able to maintain a substantial freshwater lens during both average and drought conditions. The majority of FSM atoll islands is windward and hence contains only a thin lens, irrespective of the rate of rainfall.[16]

The FSM government seeks to make each atoll island community sustainable in regards to water resources. Success depends on maintaining sufficient potable water on each atoll island during even the most severe droughts as well as other extreme weather events such as tropical cyclones; however results from a recent study by a team of researchers from FSM, Guam and the USA, indicate that out of 105 major islands on FSM atolls, only six would likely retain sufficient groundwater to sustain the local community during an intense drought.[17,18]

Box 2 The Special Challenges of FSM's Atolls[19]

Low-lying atoll islets pose special management challenges in FSM. Dozens of remote atoll islets are occupied by human communities of a few hundred people each.

These islets are composed of sedimentary accumulations of calcium carbonate sands and cobbles derived from the skeletal fragments of reef-dwelling organisms including coral and various carbonate-secreting algae. Some sediments are loose, and others are lithified by natural cements. Loose sedimentary deposits may be transported in various directions (seaward, lagoon ward, or along the shore) and redeposited on the island surface by storm overwash and winds.

Some researchers hypothesize that the tendency for high water events to carry sediment from the reef margin into island interiors may allow these islands to accrete upward with rising sea level. The islet landform might thus persist under a regime of accelerated sea-level rise associated with global warming. Other researchers speculate that atoll islets are pinned on the reef by rock ramparts and when rising waters breach these cemented deposits on oceanic shores, the islet will become unstable and rapidly erode out of existence.

The debate among geologists regarding the fate of atoll islets neglects a key point that is critical to the communities living on these islands: marine inundation, the same process that carries sediment to the island interior, is extremely damaging to atoll freshwater supplies, the soil, the forests that supply food, and the wetlands in which island residents

[16] Bailey, R.T, J. W. Jenson & D. Taboroši. 2013. Estimating the freshwater-lens thickness of atoll islands in the Federated States of Micronesia. Hydrogeology Journal (2013) 21: 441–457.

[17] For example, the severe El Niño-induced drought conditions of 1997-1999 in FSM caused water and food shortages including staples such as taro, coconut, breadfruit, banana, yam, sweet potato, citrus, sugar cane, and others. Communities among the atolls survived because bottled water, food supplies, and reverse osmosis pumps were imported. This was an extreme event, and provides a worst-case scenario for use in planning for future droughts.

[18] Ibid.

[19] Fletcher C.H. and B.M Richmond. 2010. Climate Change in the Federated States of Micronesia: Food and Water Security, Climate Risk Management, and Adaptive Strategies. Center for Island Climate Adaptation and Policy.

grow taro as a consumable staple. Long before the question of atoll landforms surviving sea-level rise is settled, human communities could be forced to abandon these environments unless a climate adaptation strategy is developed and implemented that provides them with potable water and sufficient food.

The following strategies for adapting to drought and improving sustainability under restricted water conditions have been recommended, with all but strategy 2 directly relevant to FSM's atoll communities[20]:

1. Implement a water resources research program that improves understanding of groundwater, surface water, and their sustainable use.
2. Improve high island water accessibility and retrofit and replace infrastructure in the context of climate risk management.
3. Predict drought events and plan for increased frequency and duration of drought including improvements to emergency services.
4. Plan for more intense rains and the impacts that accompany them: flash flooding, mass wasting, inundation, drainage problems, cut-off communities, and others.
5. Improve low island water planning, usage, and conservation.
6. Identify data gaps in water resources and steps to fill these.
7. Support hydrologic modeling of island aquifer systems.
8. Support down-scaled climate modeling that emphasizes water resources.
9. Expand network of water monitoring instrumentation.
10. Develop a water management plan for each island including each inhabited atoll islet and neighboring resource islets.

3.1 National level response to vulnerability

The FSM Strategic Development Plan addresses climate change by raising awareness of climate change among the general population; developing coastal management plans in all four states; and developing ways to 'climate proof' facilities and structure that support social and other services. In 2012, the Presidential Task Force for Disaster Management decided that a Disaster Risk Management (DRM) and Climate Change Policy should be developed for the FSM, building on the Climate Change Policy 2009, and the Disaster Relief Act 1989 to provide overarching policy guidance for joint DRM and Climate Change Action Plans at state level.

The Strategic Development Plan (SDP) for FSM provides a road map for social and economic development for the 20 years 2004−2023[i]. The SDP and the Infrastructure Development Plan 2016-2025 (IDP) both recognise the need for mitigation and adaptation measures to limit the impacts of climate change. FSM developed a Multi-State Hazard Mitigation Plan in 2005, and in 2009 a national Climate Change Policy was adopted. The country developed a combined Policy for Climate Change Adaptation and Disaster Risk Management in 2013. This is being implemented through State Joint Action Plans for Climate Change and Disaster Risk Management. The Office of Environment and Emergency Management (OEEM) is the focal point for all government climate change activities.

While each state has its own strategic development plan, Kosrae is the only State with a climate-responsive Strategic Development Plan (2013−2024). The SDP recognises that "the

[20] Fletcher C.H. and B.M Richmond. 2010. Climate Change in the Federated States of Micronesia: Food and Water Security, Climate Risk Management, and Adaptive Strategies. Center for Island Climate Adaptation and Policy.

most prudent approach to addressing effects of naturally occurring events (climate change or disaster risks) long term would be to divert development and settlement along the coast to inland and higher grounds" (SDP 2013−2024, p. 29). The Environmental Results and Targets No. 6 states that by 2023 capacity is strengthened at all levels to climate change adaptation, and management and mitigation of risks of disasters enhanced so that communities are resilient to impacts of climate change and disaster risks. Resilience to climate change is also included within strategies for agriculture.

FSM currently has no national strategy for coastal zone management. The State of Kosrae, however, is the first state to develop a strategic plan that addresses coastal zone management in view of the adverse impacts of climate change. Kosrae has a Shoreline Management Plan (SMP), first developed in 2000 and revised and updated in 2014 (Ramsay et al., 2014). The SMP sets out the principles for coastal development in Kosrae over the coming decades, and details *eight key strategies* for increasing the resilience of Kosrae's coastal communities. Taking on board lessons and practices from the Pacific Adaptation to Climate Change programme (PACC) and other coastal projects, this proposal aims to upscale and replicate lessons learned and best practices through guidance of these eight strategies of the SMP for Kosrae. The eight key strategies are:

(i) Continued development and strengthening of community awareness including outreach activities with a focus on effective natural coastal defence and Kosrae-relevant climate change impacts and adaptation options.
(ii) Amendment of the Kosrae Island Resource Management Authority (KIRMA) Regulations for Development Projects to incorporate climate change considerations and strengthening of regulation implementation to support successful long-term risk reduction and adaptation.
(iii) Over the next one to two generations the primary coastal road network and associated infrastructure currently located on the beach/storm berm is developed inland away from long-term erosion and coastal inundation risk.
(iv) Ensure new development (property, infrastructure) is located away from areas at risk from present and future coastal hazards or is designed with coastal hazards in mind.
(v) Implement a program to encourage existing residential property owners to reposition homes away from areas of high risk from present and future hazards. This may be a staged approach over time as homes are routinely replaced or renovated. Objective prioritization of properties most at risk should also be explored.
(vi) Incorporate a grant component in to the housing loan program to help encourage new property to be constructed in areas not exposed to coastal, river floor or landslide hazards.
(vii) Commence community and state discussions to develop a relocation strategy and identify potential approaches to support relocation from areas exposed to coastal hazards where no alternative land is available.
(viii) A strategic approach is adopted for the ongoing provision of coastal defences. These should be considered only where it is sustainable long-term option, or where it is accepted as a transitional approach to protecting areas over the short to medium term to enable relocation strategies to be implemented.

4. Water and Sanitation

There are significant differences in water and sanitation coverage between and within the four States of the FSM. Chuuk and the outer islands of Yap are especially lagging behind. Access

also varies according to socio-economic status; poorer households are less likely to use improved sanitation facilities than wealthier households.

Water quality and resultant health concerns remain a major challenge in the FSM. Only five out of the approximately 70 public or community water systems serving the main islands feature any type of treatment and even here, water is not consistently "safe" due to inadequate system maintenance and irregular supplies (FSM 2010 MDG Report, p. 80). Moreover, two of the five public sewerage systems available in the FSM pump raw sewage directly into the lagoons without treatment.

The FSM's Strategic Development Plan 2004-2023 gives high priority to water and sanitation issues with significant infrastructure development funding earmarked to the sector. However, FSM did not meet its own national targets, set for 2010, to provide universal access to safe drinking water and reach 50 per cent of rural and 100 per cent of urban households with sanitary latrines (urban 100%, rural 50%).

4.1 The Significance of Local Decision-Making to Water Security Adaptation in FSM

Throughout FSM but especially on the small, low islands, land is scarce. Decision-making has traditionally rested with landowners. Land equals power and land possession and occupancy influence political relationships and decision-making. Complex, diverse, and often competing tenure systems governing ownership and access rights to land have developed throughout the islands. Traditionally, inheritance of land rights depended on membership in a lineage or clan and often subject to chief-centered authority and control, but in most cases, the oldest male member of the lineage managed the estate. However, after a century of colonial rule, systems of land tenure followed a path away from descendant group ownership toward a western model of individualized tenure. Greater individual self-interest accompanying westernization is weakening traditional systems of land tenure based on lineage. However, authority regarding land use lies also with the local community. Hence, the implementation of any adaptation strategies requires that landowners, local communities, and decision-making bodies are all in agreement with regard to the problem, the need for a solution and the design of adaptation steps. Envisioning changes within the familiar framework of the existing system is more likely to engender greater trust, willingness, and acceptance compared to an approach that does not incorporate familiar elements.[21]

5. Discussions with Communities

OEEM carried out five sets of consultative meetings with all stakeholders including community, government and NGOs. This was during June to July 2015, January –February, and May-June 2016. The objectives of the consultations were to systemically identify and subsequently confirm the priorities that project will take up that will improve and enhance the resilience of the coastal village and island communities and their environment. The consultations involved prioritization and ranking of community and island needs to adapt to climate extremes from each of the four states.

[21] Ibid.

This approach ensures that local communities, including men, women, youth, persons with disabilities, are supportive of these identified priorities. The discussions focused on community beneficiaries to identify alternatives or priorities and whether or not these alternatives or priorities take precedence over the initial priorities of the project (prioritization and ranking). Consultations were carried out in all four states. The Kosrae consultations required community views and responses to their vulnerabilities on island, including experiences on hazards, risks, coping strategies and their needs today. These were over and above the prioritization and ranking, output and activity-based discussions.

The stakeholders of the project include local community (farmers, housewives, youth representatives, senior citizens, village food inspectors, landowners, teachers, etc.), municipal government representatives (council members, council chairman) and government agencies (department of agriculture, fisheries, environment, island resources management authority, resources and economic affairs, land court, health services, state legislature, transport and infrastructure) and the business community. The summary of the meetings is provided in Section II.H.

6. Existing resilient practices in water security

The following table (Table 3) shows a summary of country experiences and practices that have improved resilience and reduce vulnerability to threats in the water and food security and food productions sector from the Pacific. These are accepted or prescribed as being correct or most effective (i.e., best practices)[22]. This project would refer to and consider these interventions to improve the selection and implementation of activities that will provide the most effective, efficient, sustainable and more relevant approach to improve resilience of communities to climate change.

Table 3 Relevant adaptation measures for water security in the Pacific

COUNTRIES IMPLEMENTED	DEMONSTRATED ADAPTATION MEASURES FOR WATER SECURITY
Nauru	By improving resilience to drought by improving management of the island's water supply, Nauru introduced solar water purifier purifiers. The units which have solar panels linked to a water distillation circuit, produce clean drinking water from non-potable sources such as seawater or contaminated groundwater. Nineteen households had solar purifier units fitted, providing 80 L of additional potable water per day per household. During a drought, this can be used for drinking, cooking and if in sufficient quantity, personal bathing. Even when not under drought conditions this is a useful and safe potable water supply. The system is operated by the household and does not require any major maintenance. The lifespan of the solar purifier is 15 years and no replacement of material is expected during this time.

[22] The PACC publication series have been reviewed to ensure all information about on-the-ground demonstration activities of the project are best practices (http://www.sprep.org/pacc/publicatoins/technical-reports). Lessons learned have been captured in the Experience series of the project and is available online in the same address as well.

Niue	A process of research, consultation and analysis led to the decision to build a tank moulding facility and begin manufacturing water tanks in Niue. Tanks could be made at half the price of importing them, and this would further increase resilience by reducing dependence on imports. The PACC team joined forces with the Global Climate Change Alliance: Pacific Small Island States project, which is funded by the European Union and implemented by the Secretariat of the Pacific Community (GCCA PSIS – SPC), to implement the project. The facility is capable of producing up to eight 5,000 litre tanks each day. The tanks are made of a robust plastic called high-density polyethylene (HDPE), which is imported in powder form before it is processed and moulded into tanks. The tanks are lightweight, there are no joints that can split, and the plastic material complies with New Zealand and Australian safety standards. Properly maintained, the tanks will last for many decades.
Tokelau	Tokelau's three atolls total about 12 km2 of land, rise to no more than 5 m above sea level, and are home to about 1,400 people. With drought a major threat, the PACC project improved water security in terms of both quantity and quality, and at both the household and community levels. Activities on all three atolls have included renovating or replacing water infrastructure such as pipes, guttering, and water tanks; and installing 'first flush diverters' which ensure that contaminants from the roofs do not enter the drinking water tanks.
Tonga	The objective of the Tonga project was to improve the water supply system to provide Hihifo residents of the main island of Tongatapu with better access to water in terms of reliability and pressure, and better water quality; and to enhance the capacity of the residents to sustainably manage their water resources and to effectively operate and maintain the improved water supply system. From a survey of all 354 households and a focus group discussion with key members of the communities, the SEA found that the problems were due to a combination of natural, governance and technical factors: the fragile and thin water lens which is increasingly vulnerable; a lack of community participation in the management of the precious water resources; and technical issues, such as breakdown of pumps and leakages. Solutions proposed included: ■ Putting a water meter in every household; ■ Installing solar water pumps in villages; ■ More water tanks; ■ Strengthening governance capacities of water committees; and ■ Better transparency and communication between water consumers and water committees.

Tuvalu	Tuvalu built a water harvesting system using church building roof as water catchment, with guttering and downpipes. Capacity: 700,000 L ground cistern compartmentalized. Community ownership 100%. Management plan between government and community to alleviate drought risks. Replication on another community - Tekavatoetoe community and church with a capacity of 288,000L storage system succeeded. Launched July 2014. The project targeted Funafuti atoll, Lofeagai community, Target population, 637 (97 households, female 323, male 314). The project impacted on 90% of the village population with indirect benefits to the rest of Funafuti atoll. Individuals of the village now meet the minimum water supply of 40 L per household per day during dry periods and droughts

7. Existing resilient practices in coastal management

Kosrae, PACC Project - The PACC project in Kosrae identified a 7 km section of the road in the Tafunsak municipality which was being progressively damaged by flooding from heavy rains and high tides. The original road had been designed to withstand a maximum hourly rainfall of 178 mm. Analysis of climate and sea level data, and projections to 2050, concluded that the road should be redesigned to withstand maximum hourly rainfall of 254 mm. Following a socio-economic assessment, community consultations, and input from expert coastal engineers, the road was redesigned and rebuilt to withstand the anticipated heavier rainfall and higher sea levels. Adaptations included raising parts of the road by up to one and a half metres, fitting larger culverts, and improving drainage. The improved road was officially opened in May 2014. The PACC developed guidelines to share experiences with climate proofing the road, which will help others to replicate this success[23].

The project also installed tide gauge and rainfall gauges in 2011 to improve availability and quality of local climate and sea level data. These now feed into climate-sensitive decision making and development for the state. The project team based in KIRMA also promoted the mainstreaming of climate risk into all development in the state and the country. The team supported development of the Kosrae State Climate Change Act, which was endorsed in 2011; and amendments to Kosrae's Regulations for Development, which now require all development projects to consider the potential impacts of climate change. The team also contributed to the revision of the 2014 Kosrae Shoreline Management Plan that provides comprehensive strategies for building resilience of Kosrae's coastal communities and infrastructure and now will guide this project.

The PACC project trialled the implementation of its relocated roads, using this manual as a guide and the purpose is to develop and promote appropriate methods of road engineering that gives the best possible access to communities at minimum cost.

Kosrae has a standard for road design (*Design standards for Kosrae circumferential road extension project*) developed when the circumferential road from Okat to Walung to Utwe was proposed (Barrett Consulting Group Inc, 1987). The standards cover the road pavement design, and associated structures such as drainage, bridges, culverts and rock revetment for coastal protection. The design standards have been applied for updating sections of the circumferential

[23] http://www.sprep.org/attachments/Publications/CC/PACCTechRep18.pdf

road, including the section completed under the previous PACC project. These standards are still applicable and have been updated and adjusted based on experience and as new information has become available. This includes:

- Updating rainfall design conditions used in the design of drainage, culverts and bridge to account for new analysis of extreme rainfall and climate change projections based on the information developed under the Asian Development Bank project: Climate Proofing. A risk based approach to adaptation. Appendix 1: Federated States of Micronesia Climate Risk Profile[24]
- Refined coastal defence design guidelines and design criteria developed during associated activities related to the development of the original Kosrae Shoreline Management Plan in 1998-2000. These changes are based on best-practice guidelines outlined in *Manual on the use of rock in coastal and shoreline engineering*[25]...

The nature and success of coastal interventions to enhance resilience to impacts of climate change are, as shown by examples from Cook Islands, Samoa and Vanuatu; very site-specific. The activities of this project that address coastal resilience would base it's design and implementation against this backdrop of experiences given the similar circumstances, vulnerability, capacity, state of the natural environment, economy and certain social aspects of FSM.

8. Project / Programme Objectives:

List the main objectives of the project/programme.

Project goal: The overall goal of the project is to build social, ecological and economic resilience of the target island communities of FSM and reduce their vulnerabilities to extreme drought, sea level rise and other climate risks through water resource management, coastal resource and development planning, and by promoting gender perspectives and ecologically sound climate resilient livelihoods.

Project objective:

The overall objective of the project is to reduce the vulnerability of the selected communities to risks of water shortage and increase adaptive capacity of communities living in Woleai, Eauripik, Satawan, Lukunor, Kapingamarangi, Nukuoro, Utwe, Malem to drought and flood-related climate and disaster risks.

The proposed project will contribute to relevant outcomes and outputs of the Adaptation Fund Strategic Results Framework (AFB/EFC.2/3 from 31 August 2010), and corresponds particularly to the following higher order fund-level objectives as follows:

Project Objective 1: Prepare the necessary institutional and regulatory frameworks, policies, guidance and tools to help deliver a climate resilient FSM

[24] ADB, 2005
[25] CIRIA/CUR, 1991

Project Objective 2: Strengthen water and livelihood security measures to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation

Project Objective 3: Provide communities with climate resilient infrastructure to help relocate from high risk coastal inundation sites.

Project Objective 4: Capture and share the local knowledge produced on climate change adaptation and accelerate the understanding about the kinds of interventions that work in island environments in FSM

Project strategy: The project strategy is to provide all four (4) State Governments in FSM with development planning tools and institutional frameworks to help coastal communities prepare and adapt for higher sea levels and adverse and frequent changes in extreme weather and climate events. The project strategy is to also provide communities with the resources and technical support needed to adopt and manage concrete climate change initiatives and actions.

Project / Programme Components and Financing:

Fill in the table presenting the relationships among project components, activities, expected concrete outputs, and the corresponding budgets. If necessary, please refer to the attached instructions for a detailed description of each term.

For the case of a programme, individual components are likely to refer to specific sub-sets of stakeholders, regions and/or sectors that can be addressed through a set of well-defined interventions / projects.

PROJECT COMPONENTS	EXPECTED OUTCOMES		EXPECTED OUTPUTS	AMOUNT (US$)
1. Strengthening policy and institutional capacity for integrated coastal and water management at national and state levels	Strengthened policy and institutional capacity of government to integrate climate risk and resilience into its water and coastal management legislative, regulatory and policy frameworks	1.1	Legislation and policy paper to guide regulation of climate resilient coastal and marine management at national level	150,000
		1.2	State regulations for development projects amended to consider climate change risks and resilience measures	175,000
		1.3	National Water and Sanitation Policy endorsed with climate and disaster risks and resilience, and gender mainstreamed	128,000
		1.4	National Water Outlook and Water Sector Investment Plan developed and implemented	314,642
2. Demonstration of water security measures in outer islands of Yap, Chuuk and Pohnpei	(A) Water conservation and management technology & practices adopted, responding to drought, sea level rise and early recovery from	2.1	Outer island communities oriented to CC, SLR, and adaptive capacity measures involving water, health, sanitation and environment	285,233
		2.2	Water Harvesting and Storage System (WHSS) repaired and installed in 6 atoll islands	1,044,646

PROJECT COMPONENTS	EXPECTED OUTCOMES		EXPECTED OUTPUTS	AMOUNT (US$)
	cyclones	2.3	Self-Composting Waterless Toilets constructed to conserve water, improve soil environment, and reduce marine eutrophication on the lagoon side	732,982
		2.4	3,253 people trained on water conservation and management including coastal protection and livelihoods in 6 outer islands	260,052
	(B) Increased awareness of climate change through formal climate education	2.5	Teacher's Guide on Climate Change developed to improve climate change learning in FSM schools and training institutions	156,313
3. Demonstration of Kosrae Inland Road Relocation Initiative	Increased resilience of coastal communities and environment to adapt to coastal hazards and risks induced by climate change	3.1	3.6miles (5.8km) of Malem-Utwe inland road and access road routes constructed to sub-base roading standard for future relocation	3,005,474
		3.2	Transitional coastal protection at Mosral and Paal upgraded for immediate coastal protection	315,000
		3.3	State support program to access land in upland areas established	55,000
		3.4	Community-Based Ecosystem Management strengthened	105,000
		3.5	State support program to assist access to finance for vulnerable households established	40,000
4. Knowledge management for improved water and coastal protection	Capacity and knowledge enhanced and developed to improve management of	4.1	Climate resilient Municipality Development Plans developed and communicated	205,332

PROJECT COMPONENTS	EXPECTED OUTCOMES		EXPECTED OUTPUTS	AMOUNT (US$)
	water and coastal sectors to adapt to climate change	4.2	Resource materials developed, tailored to local context, translated, published and shared amongst various stakeholders	238,943
		4.3	Stakeholders brought together to share, learn and exchange knowledge and skills on climate change, adaptation planning, monitoring, vulnerability assessments and climate change	295,296
4 Total Project Activity Cost (A)				**7,506,913**
5. Project Execution Cost (B)				**788,018**
6. Total Project Cost (A+B)				**8,294,931**
7. Project Management Fee charged by the Implementing Entity				**705,069**
Amount of Financing Requested				**9,000,000**

Projected Calendar:

Indicate the dates of the following milestones for the proposed project/programme

Milestones	Expected Dates
Start of Project/Programme Implementation	October 2017
Mid-term Review (if planned)	May 2021
Project/Programme Closing	September 2022
Terminal Evaluation	December 2022

PART II: PROJECT /PROGRAMME JUSTIFICATION

A Project Activities of the Project

Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.

Component 1. Strengthening policy and institutional capacity for integrated coastal and water management at national and state levels

Outcome 1: Strengthened policy and institutional capacity of government to integrate climate risk and resilience into its water and coastal management legislative, regulatory and policy frameworks

Output 1.1 Legislation and policy paper to guide regulation of climate resilient coastal and marine management at national level

Activity 1.1.1 Review of legislation and policies for infrastructure to identify climate change requirements

Current environmental legislation does not necessarily require environmental impact assessments on all projects[26]. All infrastructure development projects are left to their own willingness to comply with relevant environmental planning provisions. A thorough legal and regulatory policy assessment shall be undertaken to assess the status of legislation and regulations established at the national and state level on development projects and its impacts on the environment including coastal and marine. It will also assess to what extent it will protect developments from impacts of climate change.

Activity 1.1.2 Regulatory and policy framework for climate change at national level

Kosrae state was the first state to amend its Regulations for Development Projects (No. 67-05) in 2014 to incorporate climate change impacts and adaptation measures. The regulations set specific requirements and establish standard procedures for the formal review of development projects relative to climate risks and adaptation measures. The Okat Bridge in Kosrae ($12.7 million in FY2014) was the first development project that this was regulation was applied to. Lessons from Kosrae will therefore be applied where possible[27], and will be used to identify legal, regulatory and policy opportunities and approaches that will be applicable at National, State, Municipal and Outer island levels. This activity will aim to optimally produce a legsilative framework for coastal and marine resource management at the national level that will introduce a Bill that aim at protecting and securing the coastal and marine resources of FSM from the impacts of climate change.

[26] IDP 2016-2025, Government of FSM

[27] PACC experiences are documented in the Technical Report and Experience Series found online at http://www.sprep.org/pacc/publications

A review of defined regulatory inspection procedures and protocols will be undertaken. This will work to improve clarity on the regulatory responsibilities within the government structures, and to identify ways to improve enforcement performance. A detailed consultation and participatory stakeholder engagement exercise, along with a desk review of existing information will be conducted to produce a detailed report / road map and action plan for the national government. This will accentuate climate resilient mainstreaming within government processes.

Activity 1.1.3 Develop policy and guidance documents for national and states; and

Activity 1.1.4 Endorse and adopt regulations, policy and guidance documents established for national and state levels

Following the outcomes of the review and framework development in activities 1.1.1 and 1.1.2, the project will seek to have policy and guidance documents developed at the National and State level, where required under the developed legilsative framework. The project will proceed through the legal programmatic procedures of adopting all legal requirements produced by the project. In doing so, the project will aim to institutionalize certain government agencies - including Environment Protection Agency (EPA), Department of Resources & Development (R&D) to be responsible and carry out these works.

Activity 1.1.5 Lobby and advocate regulation and policy changes in media campaign and public awareness activities; and

Activity 1.1.6 Monitor and report feedback and progress

The project will build the resilience of coastal and marine management at all levels by supporting compliance of development projects to FSM's Climate Change Law (2013). These activities will lobby and and educate relevant stakeholders on the changes made at the legislative and regulatory levels of decision making. It will ensure all development proponents participating in any development along the coastline and on marine environment are aware of and enforce these regulations. In doing so, the project will gather feedback and report to relevant national and state government departments.

Output 1.2 State regulations for development projects amended to consider climate change risks and resilience measures

Activity 1.2.1 Consultations and regulations at state level – Yap, Chuuk and Pohnpei

Currently, only Kosrea has regulations for development projects. The other three States of Yap, Chuuk and Pohnpei do not. In 2014 the Kosrae Pacific Adaptation to Climate Change (PACC) Project developed the Kosrae Regulations for Development Project (No. 67-05). These regulations which incorporate climate change impacts and adaptation measures will be considered and used as guidance in this project. One of the key lessons of the Kosrae PACC project was the revision of existing EIA Guidelines and its review processes to incorporate climate change considerations into the process.

This activity involves a series of consultations workshops with all key relevant stakeholders in each of the three states Yap, Chuuk and Pohnpei. The consultations will discuss and develop the required regulations, policy and guidance documents as well as a regulatory framework to effectively take these changes on board at the state congress level. These consultations will follow on from a completed review of the existing regulations on the environment protection in each of the three states. The review will seek to what extent climate risks are addressed and if any resilient measures can be identified and or strengthened. The consultations will provide recommendations as to the development of a regulatory framework that will aim to incorporate climate risks and resilience measures and provide a roadmap on the development of state regulation for development projects.

Activity 1.2.2 Develop, endorse and adopt regulatory framework on development projects at state level; and

Activity 1.2.3 Initiate development of regulations, policy and guidance documents identified and adopt institutional changes to existing arranagements; and

Activity 1.2.4 Endorse and adopt regulations, policy and guidance documents established for national and state

During the priority consultations in July 2015 and January 2016, Yap, Chuuk and Pohnpei stakeholders re-emphasised the need for regulation, policy and guidance documents to address climate change impacts, similar to those developed by Kosrae. Activities 1.2.2 – 1.2.4 will produce Regulations for Development Projects for Yap, Chuuk, and Pohnpei , to be approved by State cabinet. The project will ensure that institutional arrangements are developed, enacted and supported. Capacity building for these changes at the individual, systemic and institutional levels will be addressed under Component 4 of the project through the provision of training, workshops and other activities.

Activity 1.2.5 Lobby and advocate regulation and policy changes through media campaigns and public awareness activities

Activity 1.2.6 Monitor and report feedback and progress

Similar to activity 1.2.7, this activity will lobby and advocate for the changes made at the legislative and regulatory levels of decision makers, the general public and through relevant stakeholders. This will address stakeholders at both the state and natoinal levels. It will ensure all development proponents participating in any development along the coastline and on marine environment of all islands belonging to the states are aware of and enforce the regulations established. In doing so, the project will gather feedback and report to the project and to relevant state government departments and other relevant national departments.

Output 1.3 National Water And Sanitation Policy endorsed with climate and disaster risks and resilience, and gender mainstreamed

Activity 1.3.1 Review the water policy framework to incorporate gender and climate change

Experiences gathered from climate change adaptation projects from the Pacific show that mainstreaming of gender considerations is required at the outset of climate change adaptation planning. It has also shown that the benefits of such mainstreaming at the policy level will

trickle down to the most vulnerable at the community levels. Taking on this lesson, this activity will carry out a gender review. The findings from this review will be used to inform and strengthen the Framework for National Water and Sanitation Policy for the FSM by mainstreaming gender aspects. This will ensure a gender-sensitive water and sanitation policy is produced (activity 1.3.2).

This activity will use tools for integrating gender perspectives into climate change policies taken from the Pacific Gender & Climate Change Toolkit, developed by Pacific regional organizations[28] - to gather targeted policy-relevant information relating to gender and climate change in FSM. The outline of a gender and climate change assessment for the policy is provided in table 4 below.

Table 4: The outline of the Gender Assessment work activity follows:

GENDER ASSESSMENT OUTLINE
Introduction, Background
Gender and climate change in FSM: the social dimensions of resilience and adaptive capacity
Why integrate gender? (policy and planning)
Methodology
Limitations
Findings of the Assessment
Policy design and planning
Policy implementation
Key recommendations

This activity will strengthen the existing National Water Task Force (NWTF) to develop, complete and launch the policy through a gender-sensitised approach. It will also be applied to implementation of other activities of the project at the outer island / municipality level, for example under activity 2.1.1.

Activity 1.3.2 Preparation of the National Water and Sanitation Policy (NWSP)

This activity will be the top-down implementation of water and sanitation measures designed to improve capacity of the government, state, municipality and outer islands to respond to impacts of climate change under the water sector. A Framework for National Water and Sanitation Policy was established in 2011. It institutionalised a National Water Task Force (NWTF) chaired by the Department of Resources & Development. Measures to finalise a comprehensive policy. The outline of the existing framework follows:

FRAMEWORK FOR WATER POLICY	STRATEGY
1. Rationale for a National Water Policy	

[28] GIZ, SPC, SPREP, UNDP, GIZ, PACC Project (2015)

FRAMEWORK FOR WATER POLICY	STRATEGY
2. Overview of Freshwater Resources and their their management in the Federated States Of Micronesia	
3. Developing a strategic approach for the management of the FSM's freshwater resources	Policy Statement, Vision Goals Guiding Principles Priority Areas for Action, Priority Tasks for the National Water Policy Officer and National Water Task Force
4. Strengthening national coordination of water and sanitation service delivery	4.1 Proposed Features of a Coordinating Body for Water and Sanitation 4.2 Proposed Membership of a Federated States of Micronesia National Water Task Force
5. Proposed components of a national water and sanitation policy	4.3 Joint Communiqué/Resolution on National Water and Sanitation Policy Development and Implementation 4.4 Overarching Strategic Water and Sanitation Policy Statement 4.5 Federated States of Micronesia National Water Outlook 4.6 Federated States of Micronesia Water Sector Investment Plan 4.7 Water Utility and Environmental Protection Agency Codes of Conduct (as required)
6. Monitoring, evaluation and dissemination	

The activity will engage the NTWF to facilitate a group of consultants or aTechnical Team (including a gender specialist) to solicit views, put together the information and write the policy using the framework as the guide. Informaton will also be solicited from national and state level stakeholders. The national level consultations will identify national water resource management targets and performance indicators of the policy reaffirming the outline developed under the Framework.

The activity will follow up on the results of the gender review (activity 1.3.1) of the Framework for National Water and Sanitation Policy for the FSM, and ensure that the policy, the national water outlook program (activity 1.4.1) and the water sector investment plan (activity 1.4.2) factor in gender issues.

This activity will develop a Joint Communiqué / Resolution on 'National Water and Sanitation Policy Development and Implementation'[29] . This will serve as the political instrument for the implementation of National Water and Sanitation Policy. The resolution will be developed as a result of consultations on the policy at the state and national level, facilitated by the Technical Team. It will also develop an 'Overarching Strategic Water and Sanitation Policy Statement'[30]. This statement will provide the agreed strategic approach for the management of water and

[29] This is currently stated as Component 4.3 of the policy per the Framework of the NWSP 2011.
[30] This is currently stated as Component 4.4 of the policy per the Framework of the NWSP 2011.

sanitation in FSM. Information gathered from national and state consultations facilited by the Technical Team will help develop this statement.

Thirdly, this activity will intiate work on 'Water Utility and Environmental Protection Agency Codes of Conduct'. Based on consultation results, water utilities environment agencies may be instructed to develop these codes as part of implementing the national water policy.

The activity will aim to get the policy endorsed by the President and Congress of FSM, publish and disseminate the policy through public awareness and media campaign activities.

Output 1.4 National Water Outlook and Water Sector Investment Plan developed and implemented

Activity 1.4.1 Implementation of the National Water Outlook Program

The activity will engage the NWTF in implementing the policy elements 4.5 - National Water Outlook, and 4.6 – Water Sector Investment Plan. The Water Outlook Program will be an annual program where as the Investment Plan will be comprised of prioritised costed actions for water and sanitation in each state[31]. The NWTF will finalize action plans of these components of the Water and Sanitation Policy and implement the activities.

The Water Outlook Program is an analysis of current trends and future projections of the state of water resources, demand, management issues in view of climate change risks and climate planning. The Program aims to strengthen the monitoring role of government and state owned enterprises in service delivery for water and sanitation throughout FSM. The activity will develop tailored information on water outlook, integrated with climate science and meteorology, providing monthly advisory support across FSM to be updated quarterly. The project will implement and monitor the Program and report results on a quarterly basis.

Activity 1.4.2 Implementation of the WSIP Program

The Water Sector Investment Plan is expected to guide all future investments in the sector to improve the government's fiscal and physical effectiveness for more efficient achievement of the sector's climate resilient targets and goals. The Plan will consolidate existing State Investment Plans to help address the impacts of climate change such as increased variability in rainfall and prolonged droughts, as well as minimise duplication and contradictions, assess the consequences of reduced sector funding compared to plans, population growth, increased demand, and impact of water resources management on the economy. It will acknowledge the highly diverse and vastly different resources and capacities to address the impact of climate change on the supply and treatment of freshwater on the main islands and outer islands of each State. The WSIP will identify investment needs according to the climate resilient strategies, targets and goals of the water sector, to build its resilience to climate change.

The Investment Plan activity will procure a technical team to develop and finalise the Water Sector Investment Plan (WSIP) as per the Policy and policy guidelines / implementation plan. The project will ensure that the WSIP emphasises equal consideration of support for the Outer

[31] Framework of the National Water and Sanitation Policy, 2011

Islands. As a component of the Water and Sanitation Policy, the activity will also be monitored and results shared. Monitoring and evaluation planning process and reports on progress of the activities will be carried out under the activity.

Component 2. Demonstration of water security measures in outer islands of Yap, Chuuk and Pohnpei

Outcome 2a Water conservation and management technology & practices adopted, responding to drought, sea level rise and early recovery from cyclones

Output 2.1 Outer island communities oriented to CC, SLR, and adaptive capacity measures involving water, health, sanitation and environment

Activity 2.1.1 Arrangements for demonstrations of water and sanitation technologies

The activity will organise inception and orientation meetings at the outer island level led by the island governing council and facilitated by the State project management unit. Tools to ensure the consultations are gender-sensitised will be applied by the project. The objective of the training will clarify the overall project strategy, its objectives, outcomes, outputs, inputs, activities and roles and responsibilities of all stakeholders nivolved incluing transporation and logistics.

The communities will be actively involved in the orientation on climate change, sea level rise, vulnerability and adaptive capacity measures involving water, health, sanitation and environment on the island. Sex-disaggregated and age-disaggregated group sessions will be carried out in learning, training and awareness workshops within the communities. The approach will include everyone, through their traditional community-based organizations to actively participate and have their say in activities and strategies of the plan. This will include women, men, youth and elderly and those persons living with disabilities. The meetings may use a vareity of tools, including participatory rapid appraisals (PRAs), socio-economic assessment surveys, and gender-sensitisation tools.

Through these consultations, other community needs may be identified and addressed to support the activities of the project. These may include basic skills training on managing and implementing project activities on a day to day basis. The results from all activities here will be collated to inform a much larger whole-of-island workshop on the development of a potential whole-of-island development plan for the atoll islands (see activities under Output 4.1). This whole-of-island approach has been trialled and found to be highly successful in outer island of Abaiang atoll of Kiribati and Choiseul island of the Solomon Islands.

With the knowledge and skills developed from the orientation workshops and having clarified and contextualised the social, cultural and environmental aspects of the islands and communities during the inception workshop, the communities will lead in the identification of community, schools, household infrastructures for demonstration of activities of the project. This activity may be repeated under activity 2.1.2 depending on the particular island(s) of the atoll identified for the project.

Activity 2.1.2 Carry out ground-truthing assessments

In order to reaffirm data and recommendations gathered from the consultations carried out during planning stages (July, November 2015; January, February 2016), and from recent rapid assessments carried out by the Department of Resources & Development, and International Organisation for Migration (IOM) in March 2016, **a ground-truthing assessment** will be carried out. This will include carrying out technical surveys on water, water use in the community villages on island, sanitation and health incidences related to water. These surveys will also collect information on social aspects such as traditional knowledge, cultural and politcal governance and how these may influence the implementation and management of the project.

This activity will carry out a two-step ground-truthing assessment of data collected from a rapid assessment carried out in March 2016 in the atoll islands of Eauripik, Ifalik and Woleai. The ground truthing assessment will identify household and community infrastructures for demonstration. It will be undertaken in two parts, firstly to conduct hydrological assessments for each island that include interviews and site surveys. The **interviews** will be carried out with key personnel that hold responsibilities for water, health and sanitation on each island. It will also interview women, men and youth in sample households. The survey will ground truth data on:

Water storage capacity (wells, tanks, etc)
Available rainwater catchment area
Water seal toilets (contirbuting to output 2.3 activities)
Sewage disposal systems

The **site surveys** will be carried by a technical team made up of a team of one local and one international expert. They will be accompanied by the committee on island community selected by the island municipal council with equal representation of women, men and youth. The main responsibilities that will be undertaken include:

- Global Position Survey
- Elevation survey
- Flora and fauna survey
- Well survey (depth, conductivity)
- Groundwater survey quality testing
- Water quality testing (chloride testing)
- Rain catchment inventory
- Household interview
- Photo documentation
- Drone survey (village setting, entire atoll, for video, 3D modelling)
- Project logistics: solar power setup, food and camp

There will be at least two people for each task (one main person, one backup) but the actual task may be carried out by more people. The information from this work will also inform activities of Output 2.3 for building and constructing self-composting toilets on the island.

The second step will be active consultations with the community for finalisation of the site selection for the installations of the water tanks at the household and community levels. Lessons from PACC Nauru have shown that once sites have been established and agreed to, signed agreements between households / community organizations and the island government council should be put in place to ensure the sustainability of the activities throughout and beyond the life of the project. The basic conditions of the agreements are as follows:

Community / private owners agree to:

- undergo training on water conservation practices and maintenance
- carry out maintenance of the installed systems over time per maintenance schedules
- agree to lead in collection of data and participate in monitoring and evaluation of data.
- provide feedback on benefits and challenges of the systems.

Project agrees to:

- provide training on water conservation practices and maintenance
- provision of resources (materials, services)
- provision of spare parts / materials

The results of the community consultations will also produce short (maximum 3 years) or long-term action plans (5 years or more) for managing of water resources on the island. These plans will include three key components – 1 water infrastructure and maintenance (including maintenance schedules), 2 – water and health and 3 awareness and education. The plans will be linked to the community development climate change adaptation plan to be developed under output 4.1. The activities outlined under the signed agreements between households and community and the project will also form a part of these implementation of the plans.

Output 2.2 Water Harvesting and Storage System (WHSS) repaired and installed in 6 atoll islands

The water harvesting and storage systems will address the climate stresses, namely the prolonged periods of drought such as those experienced in the 1997-1999, 2003-2005, 2015-16 El Nino events, and the extreme weather events leading to high intensity rainfall, and lengthening of the dry season months. These climatic stresses necessitated review of atoll water resources that include design and status of wells, sanitation and rainwater tanks and their water holding and storage capacities.

At present, various types of water harvesting systems exist in poor conditions on the islands and people resort to coconut juices to meet their water demands[32]. The rainwater harvesting and ground water wells that exist are largely privately owned. The current rainwater harvesting systems and storage elements include roofing, guttering, downpiping, water tanks and concrete tanks. All systems are in poor, basic or unusable conditions as a result of damage from cyclones, extreme high tide events damaging infrastructure coupled with no maintenance due to lack of equipment and spare parts[33]. In Yap for example, 40% of water tanks on all nine outer islands including Woleai and Eauripik do not have proper rain harvesting systems (tin roofs for collecting rainwater and gutters including down spout, fasteners and clips). Nearly 90% of water wells had very low water levela; all are brackish and nearly all were uncovered.

[32] Rapid Assessment Report, March 2016, FSM
[33] ibid

Figure 5 Sample of water tanks and wells from outer islands – Eauripik, Woleai atoll, Ifalik, and Feraulap atoll (Source: Rapid Needs Assessment, March 2016, Yap, FSM)

Activity 2.2.1 Repairing household rainwater harvesting and storage system

The constituents of the water harvesting and storage systems include roofing, guttering, downpipes, first flush diverters, cisterns or tank and tank base. The systems are linked to and part of housing infrastructure.

Figure 6 Installing a rainwater harvesting system at the household level (source, PACC Niue,2014)

This activity will rehabilitate and repair existing materials of the households selected from activity 2.2.1, to close leaks and improve efficiency of existing rainwater harvesting systems. It

will extend the gutters to the full dimensions of the catchment to capture more water; increase the catchment area to improve long-term water security and storage tank size if overflow is frequent.

The repair of household level rainwater harvesting systems and construction of community tank activities will be undertaken under the following minimum requirements:

HOUSEHOLD LEVEL	SUB-ACTIVITIES
Rainwater catchment systems	
Key activities	Repair household rainwater catchment systems
Minimum requirements	• Repair existing systems to ensure that there is: • 2 HDPE[34] tanks per household criteria for maintenance without • Extend gutters to full dimension • Increase catchment area by using reliability curves[35] • Increasing storage tank volume using reliability curves • Clean up awareness campaign • Clean up and maintenance training • Maintenance schedules established • Project and Household agreement for monitoring and maintenance through duration of project
Wells	
Minimum requirements	• Construct rim walls extending up off the ground for wells without walls • Build covers for wells without and repair damaged covers

The repair and installation of rainwater harvesting systems has worked successfuly in many low-lying atoll islands around the Pacific such as the Marshall Isalnds, Tuvalu, Niue, Nauru and Tokelau - in the face of drought. A full rainwater harvesting system successfully demonstrated in Niue under the PACC / EU-GCCA PSIS projects is shown in the picture below will be similar to what will be carried out in the six islands at the household level.

[34] HDPE – high density polyethylene tanks known for stiffness, strength, toughness, resistance to chemicals and moisture, permeability to gas, ease of processing, and ease of forming.

[35] Beikmann, A., Bailey, R., (2015) Freshwater Resources for Selected Atolls - Recommendations based on Modelling Study. In: Beikmann, A., Bailey, R., Jenson, J., Kottermair, M., Taboroši, D., Bendixson, V., Flowers, M., Jalandoni, A., Miklavič, B., and Whitman, W. (2015). Enough Water for Everyone? A Modelling Study of Freshwater Resources for Selected Atolls of Yap State, FSM. WERI Technical Report 157. Water and Environmental Research Institute of the Western Pacific, University of Guam, Mangilao, Guam.

Figure 7. A fully installed rainwater harvesting & storage system (source: PACC Niue, 2014)

Activity 2.2.2 Constructing community rainwater harvesting and storage systems

Community tanks are recommended to assist the larger community in times of drought to relieve pressure on individual household water tanks, and to meet basic water requirements for medium-term survival needs (activity 2.2.3). These include meeting not only the short-term survival requirements of drinking and cooking, but personal washing, washing clothes, cleaning home, growing food, and sanitation and waste disposal[36].

The construction of community tank activities will be undertaken under the following minimum requirements:

	COMMUNITY LEVEL
Rainwater catchment systems	
Key activities	Install community tanks

[36] Based on Maslow's hierarchy of water requirement needs, WHO 2013.

	COMMUNITY LEVEL
Minimum requirements	• Minimum 2 x 5,000 L / 2,000 Gallon HDPE tanks per atoll island > 100 population • <100 population requires re-assessment • > 400 population = 4 tanks • HDPE tanks preferred over concrete tanks • Extend gutters to full dimension • Catchment area sized appropriately to tank volume using reliability curves. • Encourage standalone catchment areas to shelter tanks and fence for protection • Access and maintenance rules established and to include cleaning each tank on a rotation basis, cleaning to be 3 times per year • Rules for access to include access by neigboring villages in times of drought • Maintenance schedules established
Wells	
Minimum requirements	• Municipal council review, assessment and executive orders on environmental advice on burials to encourage use of existing cemeteries and reconsider burials in private residences and plots • Exceptions to consider sites down hydrological gradient from wells.

Activity 2.2.3 Monitoring and maintenance

The project management unit on island will collect information on a monthly basis on the repair and construction work and prepare monitoring progress reports on a quarterly basis. A monitoring and maintenance plan will be developed followng completion of repair and construction. Data on water saved, quality, use and distribution, will be collected against the baseline from the surveys. Throughout the duration of the project, the maintenance schedules will be used to monitor the quality and use of assets, and provide solutions to maintain the assets using spare parts collected by the project. Climate related extremes and environmental conditions will be recorded as well. The climate extreme events that may occur during the life of the project will be reported against the project and communicated. This will be used to develop lessons and practices of the project and provide any corrective actions.

Output 2.3 Self Composting Waterless Toilets constructed to conserve water, improve soil environment, and reduce marine eutrophication on the lagoon side

The latest global climate model (GCM) projections and climate science findings for FSM indicate El Niño and La Niña events will continue to occur in the future (very high confidence), but there is little consensus on whether these events will change in intensity or frequency[37]. El Niño event for FSM means longer drought periods. Drought is a major threat to water resources and water supply in the small outer atoll islands of FSM with no surface water, heavy reliance on rainwater and vulnerable groundwater. The recent drought that struck the northern Pacific including FSM, the Marshall Islands and Palau in early 2015 until early 2016 is a reminder of the disastrous potential of long lasting droughts. In the outer islands, the education sector is affected by drought period when schools have no other choice but close because of insufficient water to run flushing toilets.

The community leaders of the outer islands chose to invest in technologies to conserve water as much as possible to respond to the drought periods driven by El Nino. At the same time, strengthen the resilience of their environment to withstand increases in sea level rise, and buffer storm surges. Self-composting toilet technologies has been chosen as one of the investments along with RWHSS. The technologies have been proven in communities in Tuvalu and Nauru through the Integrated Water Resource Management (IWRM) project in partnership with PACC, as one of the best solutions to conserve water as it uses no water at all and the technology avoids sewage contamination of the groundwater. It therefore promotes replenishment of groundwater useful for bathing, washing, planting, and depending on the environment for cooking. The current practice of using the lagoon side as toilets will be reduced significantly as the schools and community halls or public places – will be targeted by the project to install these units. This practice contributes to reducing marine eutrophication on the lagoon side. The expected environmental benefit will be healthy lagoon environments ultimately strengthened to buffer storm surges, and provide for the sources of protein and livelihood of the communities in times of dire need such as droughts and cyclones brought about by the impacts of climate change.

This project will therefore aim to develop a plan to promote self-awareness on the benefits of self compositing toilets to adapt to and respond to climate change in the immediate to long-term. It will demonstrate the units at schools and or community halls, churches. It will train teachers, boys, girls and community members on the use of the units and its functions. It will train the beneficiaries on WASH and water conservation practices in school and communities as well as monitoring and care after.

The cultural diversity amongst the six outer islands of the three states suggests there may be diverse preferences for the types of sanitation technologies used on the islands. The absence of pit toilets on some of the islands on the atoll in Woleai and Eauripik in Yap and Satawan in Chuuk are a blessing for the local groundwater and its quality. These practices should not change if the groundwater is to be retained as a clean and viable source for showering, washing, and cooking, as well as an emergency source for drinking water. The concern, however, is that beaches and shallow seawater are used instead. There is possible evidence of eutrophication during low tide on the lagoon side. At such time when circulation with the ocean is reduced, solar heating of the water is increased, and water can hold less dissolved oxygen. When algal metabolism removes oxygen at night it can cause fish to suffocate. Algal growth in the lagoon is boosted by excessive nutrient input from human waste. Local people have reported that dead fish wash up on the beach following very low tide events on the lagoon side

[37] Australia Bureau of Meteorology and CSIRO, 2011

of the island[38].The onset of climate stresses that include increase in sea surface temperatures will exacerbate this problem contributing to food security issues as well as water, sanitation and health issues.

Note: The ground-truthing assessments in activity 2.1.2 may yield some results on disagreement to proceeding with output 2.3 and its activities. The result may come from any of the six island communities as a result of cultural and social barriers. In the event that this output is not entertained, the project team will refer the community / island to other community potential alternative adaptation priorites they identified, and the activities therein. The community will consult in agreement based on these priorities and that are within the scope of the project and aligned with the Fund's mandate. Lessons from PACC, ECOSAN and IWRM, suggests that the project will need to consult with communities on alternative activities at the outset before implementation. This was carried out by the project during the planning stages and a list of alternative adaptation activities that are considered livelihood security measures was produced and is listed in Annex 2. The project will seek Project Board endorsement of the revised community activitiy prioirities based on meeting criterias of the project that include alignment with the Project's objectives, the Fund's mandate, and within scope of time, budget, risks and capacity of the project.

Activity 2.3.1 Developing plans/ guidelines for self-composting water less toilets (SCT) awareness, installation and maintenance

The community consultations carried out under the ground truthing assessments of output 2.1.1 will include identification of school, community or household sites for installation of self-composting toilets supported by this activity. Special sessions for developing and agreeing to plans and guidelines for SCTs will be developed for the outer island targeting women, men and youth of the communities. An awareness, installation and maintenance component will be part of these guidelines and manuals. A demonstration unit will be carried out on the main island of the atoll.

Training workshops on construction will be carried out as required. These training events will be coupled with Basic Water, Sanitation and Health (WASH) practices and water conservation awareness sessions outlined under Activity 2.3.4. The plans and guidelines review and site – specific context will be developed by the team, but based on the established *'Sustainable sanitation manual and construction guidelines for a waterless composting toilet'* (SPREP, 2007). Lessons from Nauru and Tuvalu under the Integrated Waters Resource Project ECOSAN component and PACC projects will be applied to improve on the construction designs of the project as well.

Activity 2.3.2 Constructing self composting toilets – using plans (1 unit each per gender)

The construction of the units will act as a demonstration measures. There will be separate unit for females and a separate unit for males. Each unit is a superstructure for a freestanding toilet building. The toilet house is built on top of the composting chambers that includes a ventilation and drainage system.

[38] Based on Maslow's hierarchy of water requirement needs, WHO 2013.

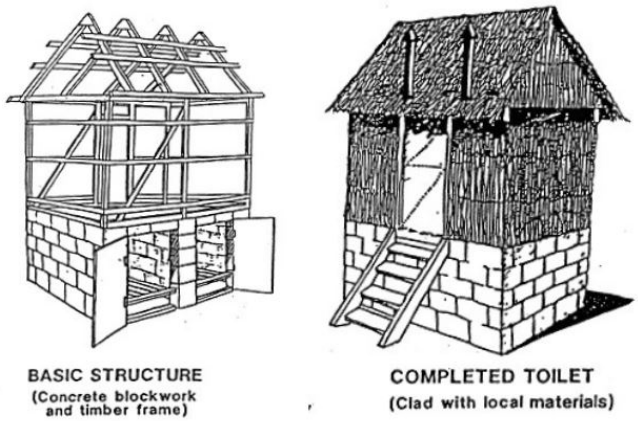


Figure 8 Basic and completed structure of self-composting toilets (source: SPREP, 2007)

The frame of the unit or superstructure will be built to storm resistant standard and suitable for covering with natural materials such as pandanus thatch or permanent materials such as fibro, plywood, or corrugated iron. The toilet rooms will provide a cool setting that allows cool air to settle and push down the hot air in the chambers up the tall ventilation pipes and out. The toilet rooms will be spacious, ventilated and allow for natural light. The roof will either be in zincalume, corrugated iron, or thatched with local materials. The materials and design of the superstructure toilet room can be varied to suit local building regulations and the practicalities and aesthetics of the site, as long as it does not compromise the function of the composting chamber and the drainage system.

A lead builder / carpenter on each main island will be identified with a team of men, women and youth to undertake the construction of the self composting toilets. The 'Sustainable sanitation manual and construction guidelines for a waterless composting toilet'[39] will be used to guide the construction.

[39] International Waters Project – Pacific Technical Report no.52, http://www.sprep.org/att/publication/000560_IWP_PTR52.pdf

Figure 9 Images of self-composting systems in the Pacific. L-R, a SCT using the roof as a catchment area for rainwater harvesting in Tuvalu (source: IWRM, Nauru). The toilet room, completed SCT in Tuvalu (IWRM, Nauru); construction of chambers, IWP Samoa and Vanuatu

The by-products of the SCTs will be managed through a soil improvement program led by communities.

Activity 2.3.3 Training on WASH and water conservation practices in school and communities

The training for Water, Sanitation and Health is particularly essential in the outer islands because of existing water storage infrastructures that are not maintained and are in very poor condition. A WASH survey tool will be used to collect information over the duration of the project and measure WASH baseline and changes as a result of the project intervention. Results of the WASH survey will contribute to evaluation results of the project overall. The tool will look at the following four indicators:

- Water & sanitation access.
- Water quality.
- Behaviour change.
- Health outcomes.

It will carry out the survey activities that include:

- Sanitary survey / Rainwater tanks survey
- H_2S tests for water quality

- Diarrheal/skin sore information
- Direct observation of sanitation facilities/ hygiene & household water storage & treatment practices

The WASH survey will be undertaken by a survey team lead by the Health department of each state, and those responsible for health on the outer islands. Teams will be assembled on each outer island and trainings carried out. Key experts will be sought from the Pacific WASH Coalition[40] program to assist. The project will work in partnership with IGOs such as the Red Cross Society and the State Health Services of each state. Women, men and youth members will be encouraged to form the teams and carry out the work. Following training, there will be at least four (4) rounds of surveys where round 1 will establish the baseline information. Monitoring behavioural change will need strong emphasis and how this will be catalogued will form an important part of the training programmes. This activity will need to be carried out subsequently, however, and not concurrently due to an unavailability of WASH experts in FSM and the region. As such, this activity may have to be carried out by one state or two outer islands each time.

Activity 2.3.4 Monitoring and after care

Data and information will be collected on a monthly basis and provided to the Outer Island Coordinator (OIC). The OIC will compile the quarterly progress report and update the Team Leader on the main island. The Team Leader will compile his/her quarterly report and submit to the Project Manager based in Pohnpei.

The after care activities will include maintenance checks and runs to the water harvesting systems installed, as well as the self composting toilets constructed. Caring for the assets developed by the project will be undertaken by the beneficiary themselves with assistance from the project, through provision of resources and materials agreed to during consultations. Any issues, risks and problems will be reported and corrective actions taken.

Output 2.4 3, 253 people trained on water conservation and management including coastal protection and livelihoods in 6 outer islands

The activities of this output are training workshops on skills and knowledge required to improve the ability of women, men and youth to carry out the work required for all activities under outputs 2.1, 2.3 and 2.4. The men, women and youth of the communities will be trained on skills and knowledge required for demonstration of water harvesting and storage systems, water data collection, quality testing and survey developments. This training will also include comonents on monitoring and maintenance and the after care of systems.

The trainings will be undertaken concurrently under each of the three areas of training needs as follows:

Activity 2.4.1 Water data collection and quality testing and survey developments	Activity 2.4.2 Construction, operations and maintenance of systems	Activity 2.4.3 Monitoring and maintenance / after care of systems
• **Well survey (depth, conductivity)**	• Operation and maintenance of rainwater harvesting	• Gender and climate change tools training

[40] Pacific WASH Coalition is a partner platform of various agencies formed in 2007 which supports/collaborates, coordinated regional initiatives for WASH

- **Groundwater survey quality testing**
- **Water quality testing (chloride testing)**
- **Rain catchment inventory training**
- **Flora and fauna survey training**
- **WASH survey techniques and tools**

systems
- Construction guidelines for building self-composting toilets (SCTs)
- Operation and maintenance of SCTs

- Climate change impacts on low-lying atoll island environments
- Project management basics course training – importance of roles and responsibilities
- Coastal geospatial assessment survey
- Data collection, reporting and non-reporting.

Outcome 2b. Increased awareness of climate change through formal climate education

Output 2.5 Teacher's Guide on Climate Change developed to improve climate change learning in FSM schools and training institutions

The activity will produce a guide that will advance climate education at the state and outer island level and enhance the capacity of teachers to be able to teach climate and incorporate them into current curriculum on the environment.

Activity 2.5.1 Organizing climate change education planning workshops; and
Activity 2.5.2 Teacher's Guide on Climate Change translated in six outer island languages

The project management unit at state level of the project will be responsible for organising a series of state wide climate change education planning workshops. The objective of the workshops will be to develop a specific teacher's guide on climate change for each state. The guide will be translated to the local language in each of the outer islands. The aim of this guide is to deliver nationally prioritised key messages relevant to climate change science, the effects of climate change on FSM and the outer islands, and options to adapt to expected changes and awarenes on optinos mitigate its causes. It targets teachers, trainers or lecturers, and will be made easy for anyone to teach their students about climate change and increase their resilience to the effects of global warming.

The activity will undertake a collective review by participants of the workshops of the existing Pacific Guide developed by Regional SPC/GIZ/SPREP Programme called, Coping with Climate Change in the Pacific Island Region (CCCPIR)' . The *'Learning about climate change the Pacific way: A guide for Pacific teachers*'. The Pacific resource consists of a set of 16 colourful pictures with a description each. It descibes each picture with suggested learning outcomes, suggestions for teaching and learning activities; definitions and background information presented in colorful boxes. A glossary of key terminology is provided at the end of the guide. The FSM resource will consider these features and suplement and complement them with FSM-specific information.

Activity 2.5.3 Training of Trainers / Teachers on Teacher's Guide on Climate Change.

Following the review and finalisation of a FSM-specific resource, the activity will undertake at least a 3-day certified “train the trainer” workshop at each state. The objective of the training will be to train pre-service and in-service trainers in the teaching of climate change using the new FSM-tailored education resource: *Learning about climate change the FSM way*. Where appropriate the workshop will incorporate associated climate change education tools and topics.

Activity 2.5.4 Implement Teacher's Guide in Schools; and
Activity 2.5.5. Monitoring effectiveness of Teacher's Guide development system, and Guide itself

Following certified teachers and trainers, the activity will support schools on island proper and outer island in implementing the guide. A monitoring activity will be undertaken by providing evaluation forms for feedback by both teachers –on the use of the guide, and students – on the knowledge and lessons they learned on climate change from the new and added curriculum activity.

Component 3. Demonstration of Kosrae Inland Road Relocation Initiative

Over 6,680 inhabitants of Kosrae are likely to benefit from the intervention measures proposed (direct or indirect benefits) under Component 3.

Outcome 3. Increased resilience of coastal communities and environment to adapt to coastal hazards and risks induced by climate change

The Kosrae Shoreline Management Plan developed a prioritised list of inland road and essential infrastructure development (Figure 10) to be implemented over the next one to two generations as an essential component for developing resilience to coastal-related hazards and sustained adaptation to climate change. Developing and upgrading the inland road between Malem and Utwe was considered the highest priority due to the current threats posed to vulnerable populations and infrastructure due to wave overwashing and potential breaching of the narrow coastal berm upon which present infrastructure and much of the population of Utwe and Malem Municipalities are located.. At Paal and Mosral,there is a very real present day risk that a breach in the berm could occur, resulting inroad access to Utwe being cut off and the potential loss also of power and telecommunications which are located alongside the road. Relocating infrastructure is a key enabling mechanism to allow gradual relocation over the next 10-20 years of Malem and Utwe communities exposed to ever increasing coastal erosion and inundation impacts. In addition to developing the inland road and supporting infrastructure complimentary activities will be conducted to begin to streamline the process and help both communities relocate inland.

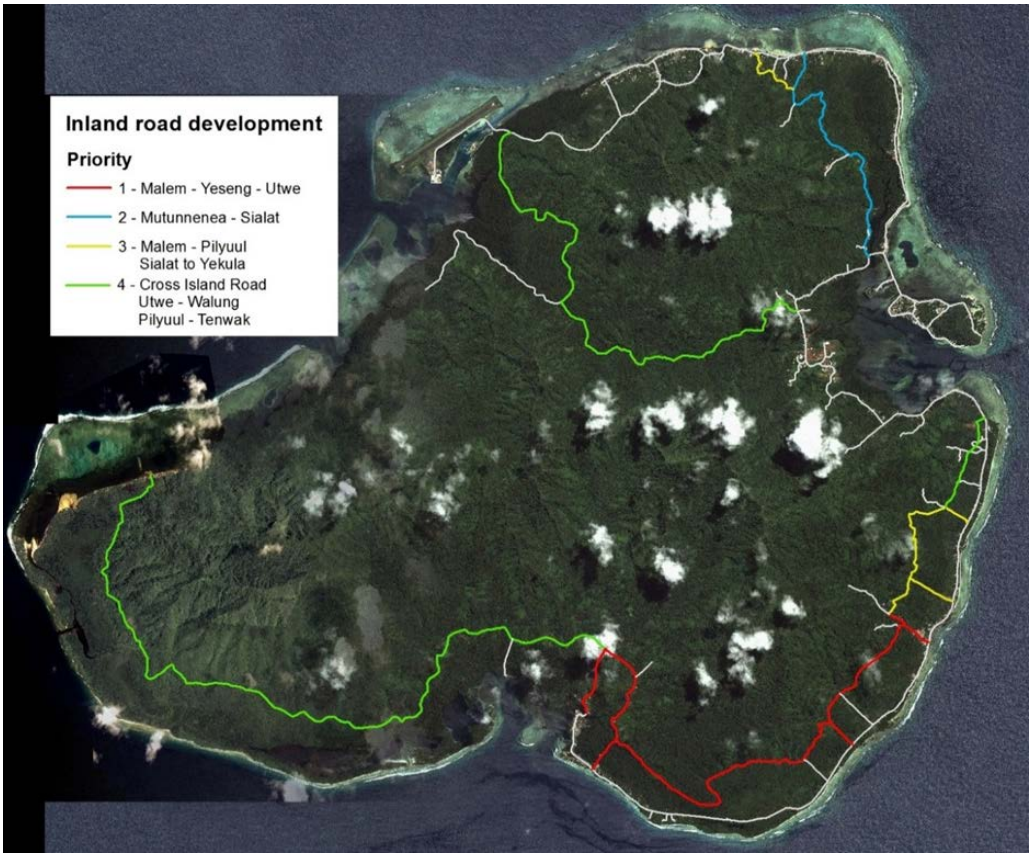


Figure 10: Priority sections of the development of the inland road on Kosrae (as identified in the Kosrae Shoreline Management Plan).

The beneficiary populations will be the entire Kosrae population. The specific and immediate and daily beneficiaries, however, will be the Malem and Utwe municipal village communities. According to the 2000 census, the Malem population was 1300 with males 663 and females 637 and the number of households at 238. The Utwe population stands at 983 on the 2000 census and was composed of 458 males and 525 females. Twenty three percent (23%) of the Utwe population is high school age. These potential beneficiaries, coupled with about 90 employed by National Government require daily access to go to the only high school located in Tofol and to the government administration district in Tofol.

There are other potential beneficiaries, approximately less than 100 people who reside in Walung municipal. Walung village community does not have access to the main roads of the island. Everyone at present uses boats to travel to Tafunsak. The only road from Walung to the rest of Kosrae is via Utwe and ultimately this will be the only road to Walung as the road south from Tafunsak is now suspended due to the Yela area being protected. In essence there are two out of five villages reliant on the road access as the only connection to the rest of Kosrae including the health services, high school, Government centre, airport and port.

Output 3.1 ***3.6 miles (5.8 km) of Malem-Utwe inland road and access road routes constructed to sub-base roading standard for future relocation***

Activity 3.1.1 Survey, design, construction, reconstruction and maintenance of road and related infrastructure to ensure climate change resilience

Given the investment required, a staged approach based on the priorities identified in the Kosrae Shoreline Management Plan is being adopted to the development of the relocated road, associated infrastructure and ultimately village infrastructure and residential development. Ultimately the intention is to develop the road to the same standard as the existing two lane paved road based on the design standards developed for the Kosrae Circumferential Road Extension Project (Barret Consulting Group Inc, 1987), and located around the base of the volcanic part of the island (as presently occurs between the airport and Tafunsak village - shown in Figure 11, left). Over the next one to two generations the inland road will become the primary road access from Utwe and Malem to the main Government Centre at Tofol and to the airport and port..

Activity 3.1.1 will construct 3.6 miles (5.8 km) of inland road between Malem and Utwe. The road alignment for the inland road was carried out by the Department of Transport and Infrastructure, and finalised as part of the EIA, consulted and agreed to by government, municipal government and communities (Figure 12). Based on the road alignment (and other details) details presented in the EIA the KIRMA development review board have issued a development permit (Annex 10). The road alignment has been determined based on observational field surveys including GPS tracking. GPS coordinates for the road alignment are available and will used as the basis for further site specific topographic surveying and design. Maps of the Road alignment are provided in Annex 11 of this proposal. This is confirmed in a letter to the Implementing Entity Coordinator (SPREP) from the Kosrae State Government (see Annex 3). The inland road would be developed around the perimeter of the lower slopes of the volcanic part of the island and well above the inland boundary of freshwater swamp or mangrove areas ~~along a~~following the ~~pproximately~~ the 10 m contour. alignment of the road is final, with only very minor and location specific variations expected, to be determined upon full topographic road design and surveying Road construction will involve a mix of widening of existing farm roads (Figure 13) and construction of new road sections typically following existing footpaths.

Figure 11: Paved inland road between the airport and Tafunsak village (left) and on the narrow storm berm at Mosral, Malem (right).

The inland road will be well above areas likely to be directly impacted by sea-level rise over the next century and beyond (Ramsay et al, 2014). Following the natural contour of the topography

minimizes any significant road slopes, need for substantial cut and fill, and reduces erosion potential and land slipping hazard. The intention is that the road, when complete, will be similar to the present inland sections of road for example between the airport and Tafunsak village (see Figure 11).

Figure 12: Alignment of inland road between Utwe and Malem. The sections in yellow require upgrading and widening of existing farm roads. The sections in red are new sections of road.

Figure 13: Typical farm road which will be widened and upgraded to a sub-base standard by the project.

Activity 3.1.1 will construct the 3.6 miles (5.8 km) of inland road up to an unsealed rural road standard (sub-base standard) (see Figure 13). This is the first stage of inland road construction. Upgrading the road to a hot-mix asphalt surface is expected to be subsequently completed with additional development funding assistance[41]. The upgrading of the sub-base road will be the second stage of the Malem-Utwe Inland Road Relocation Initiative.

[41] Refer to Annex 8

Figure 14: PACC road in Tafunsak completed to sub-base surface standard.

The road design of the **first stage** of inland road construction is basedon the design standard developed for Kosrae circumferential road extension project (Barret Consulting Group Inc., 1987) and is consistent in design to other part of Kosrae's primary road network. It assumes:

- A 60 feet standard easement width.
- A 12 foot standard lane width.
- A 3% cross-section drainage gradient for the sub-base surface.
- Existing sections of inland farm roads will be widened to obtain a roadway width of 30 ft., and include construction of roadway drainage structures (bridges and culverts) and resurfacing to sub-base course level.
- An integrated infrastructure approach is adopted which includes relocation of power distribution, and any water or telecom service infrastructure.

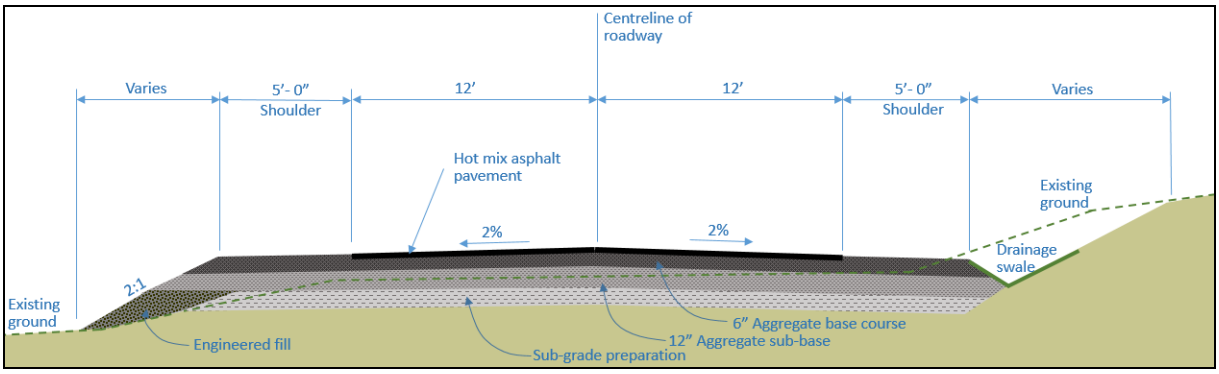


Figure 12: Typical road cross-section. Based on the design standard developed for Kosrae circumferential road extension project (Barret Consulting Group Inc., 1987).

The first stage of the inland road construction will be implemented by the Department of Transport and Infrastructure. DTI will lead in designing the road and provide equipment to construct the road to sub-base level. The second stage of the inland road construction will require external construction support and this **latter stage will not be implemented nor funded by the project**. The aggregate or fill material for the sub-base construction will be sourced from existing permitted quarries adjacent to the proposed inland road, for example at Yeseng, and aggregates from the PUK quarry in Tenwak.

A number of activities will be undertaken to construct the total distance of Malem-Utwe inland road and access routes as follows. Firstly, the project will conduct vegetation clearing, using local Municipal workforce, along the easement alignment for the road. A full topographic survey will be conducted by Kosrae's Land and Survey Department as well as full survey by Kosrae's Historic Preservation Office (part of KIRMA) along the easement length to re-confirm there are no unknown historical or cultural sites that would be affected (Annex 4a, annex 7)).

The Department of Transport & Infrastructure (DTI) will then move to design each section of the inland road and access routes from Malem to Utwe via Kuplu Wan to sub-base. Procurement of companies to provide the goods and services to support DTI in construction of the road will follow. The design, procurement and construction will include minor upgrade to access road from from Utwe to Finsrem and the Yeseng access road. The Malem Municipal Council will be providing co-financing support by upgrading the access road at Malem which stems from the coastal road inland towards the starting point of the inland road from Malem.

New and relay works of water mains along the Malem - Yeseng - Mosral - Kuplu section will be carried out under DTI. The new mains will be connected to existing water supply at Malem and Finfokoa. The Kosrae Utilities Authority (KUA) will then install new electricity lines along entire length of inland road from Malem to Utwe via Kuplu Wan. The power lines will be installed together with new telecommunciation lines where required once the roads have completed construction.

Once construction is completed, the project will carry out monitoring and provision of support for road maintenance within the project life. This will assist the government under its Infrastructure Maintenance Fund budget to maintain the road until the end of the project in approximately June 2022. Thereafter the Government will maintain the road to the appropriate standard through its own resources.

DTI will coordinate the implementation of this activity in partnership with KIRMA, Land and Survey Department and the two Municipal Governments..

Output 3.2 Transitional coastal protection at Mosral and Paal upgraded for immediate coastal protection

Activity 3.2.1 Coastal protection works

The Kosrae Shoreline Management Plan identified that over the short-term the effect of sea-level rise on the ability of existing coastal defences to provide a "satisfactory" level of protection is likely to be manageable through, for example upgrading the level of protection of these existing defences. However, beyond this time the magnitude of sea-level rise is expected to be too great to enable such protection to be effective or affordable other than at locations where

there are no other management or adaptation options. The SMP plan developed a coastal defence strategy identifying:

- Long-term defences: a priority on protecting sections of road or other critical infrastructure where there is no other feasible option to reposition away from coastal hazards.

- Transitional defences:
    - Upgrading sections of existing defences to provide adequate temporary protection for the road or highly developed areas over the short to medium term to enable longer-term adaptation strategies (such as inland road development) to be implemented.
    - Limiting any new sections of coastal defences only to the areas where the road is critically threatened at present (e.g., at Paal and Mosral). This would be undertaken only with a view to provide short to medium term protection

Emergency works were subsequently conducted in response to high tides and waves undermining the road at Paal and Mosral in early 2014. This was an emergency measure involving dumped and roughly placed recycled concrete slabs from the upgrading of the runway hardstanding, and at Mosral placement of large concrete filled bags to create a wall.

Whilst the emergency works has stabilised the immediate undermining of the road, the ad hoc nature of the construction, does not provide an adequate level of protection to the road, with areas still being undermined and the potential for significant damage to the occur during storm conditions. The communities of Malem and Utwe discussed this at length during consultations and concluded that given the poor nature of the emergency works that a component of the project to upgrade the emergency defences at both Paal and Mosral was necessary to ensure continued access between Malem and Utwe until the alternative inland road was in place.

Mosral section of Malem road. mass concrete bags, loose boulders and broken concrete, placed randomly to reduce surge impact and prevent wave overtopping and erosion of road (photo credit: Simpson Abraham, 2015)

Paal section of the coastal road. Existing dumped concrete rubble. A low reef flat breakwater to 'stabilize' shoreline will also be required further south to prevent outflanking and downdrift erosion. (photo credit: Simpson Abraham, 2015)

At Paal, the 160 m length of the emergency defences will be reconstructed. This will involve:

1. Remove the existing dumped concrete rubble to enable the underlying sand and coral rubble material to be regraded approximately 1:2 slope.

2. Geotextile filter layer will be laid between the underlying material and the armour layer to prevent wash out and winnowing of fine material between the armour layer.
3. The concrete slabs are of a sufficient size to withstand design wave conditions over the reef flat at Paal. These will be reused as the armour layer for the base and lower part of the face of the revetment and will be laid at a slope of 1:2 in a stepped manner.
4. There are insufficient concrete slabs to complete the full stepped revetment. Basalt rock armour, sourced from an existing permitted quarry inland between Paal and Mosral, will be used to complete the crest of the revetment. Armour rock will be a minimum of 0.66 m in diameter and will be laid at a 1:2 slope with the crest of the revetment at least 3 rocks wide. The crest of the defence will be above the elevation of the road.
5. At the southern end of the reconstructed defence the revetment the road curves inward with a wider coastal buffer protecting it, with the shoreline position at this location, “held” by a small strand of reef flat mangroves. The revetment will extend behind the existing shoreline at this point to ensure that outflanking and down drift erosion does not occur.

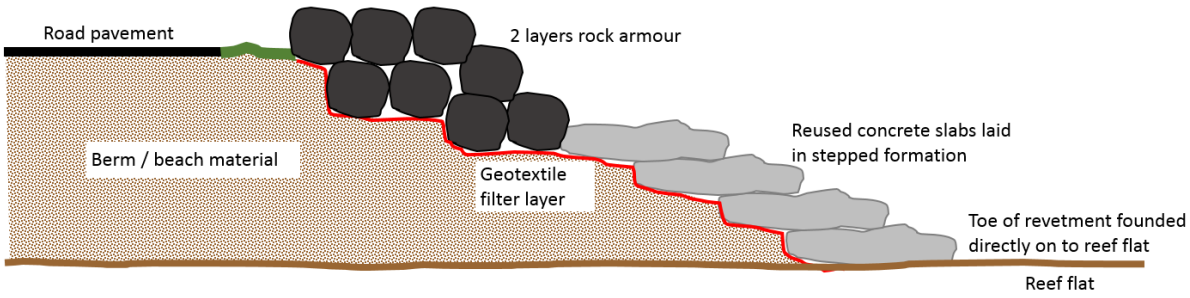


Figure 15. Cross-section of the proposed reconstructed revetment at Paal.

At Mosral, the 110 m length of the emergency defences will be reconstructed. This will involve:

1. Remove the existing dumped large concrete blocks and rubble to enable the underlying sand and coral rubble material to be regraded to approximately a 1:2 slope.
2. The small fillet of sand beach in front of the existing defence will be stockpiled on the adjacent reef flat and re-instated in front of the reconstructed defence on completion.
3. Geotextile filter layer will be laid between the underlying graded slope and the armour layer to prevent wash out and winnowing of fine material between the armour layer.
4. The concrete blocks are of a sufficient size to withstand design wave conditions over the reef flat at Mosral. These will be reused as the armour layer for the base of the revetment and will be laid to form the base of the revetment.
5. There are insufficient concrete blocks to complete the full revetment. Basalt rock armour, sourced from an existing permitted quarry inland between Paal and Mosral, will be used to complete the crest of the revetment. Armour rock will be a minimum of 0.66 m in

diameter and will be laid at a 1:2 slope with the crest of the revetment at least 3 rocks wide. The crest of the defence will be above the elevation of the road.

6. At the southern end of the reconstructed defence the revetment there is potential for down drift erosion to occur and outflanking of the defence. To prevent this, the slope of the revetment will be constructed at a shallower slope and the armour rock used to construct a wider and flatter toe on the reef flat. This will ease the transition from defence to beach and prevent any exacerbated erosion on the coastline immediately to the south.

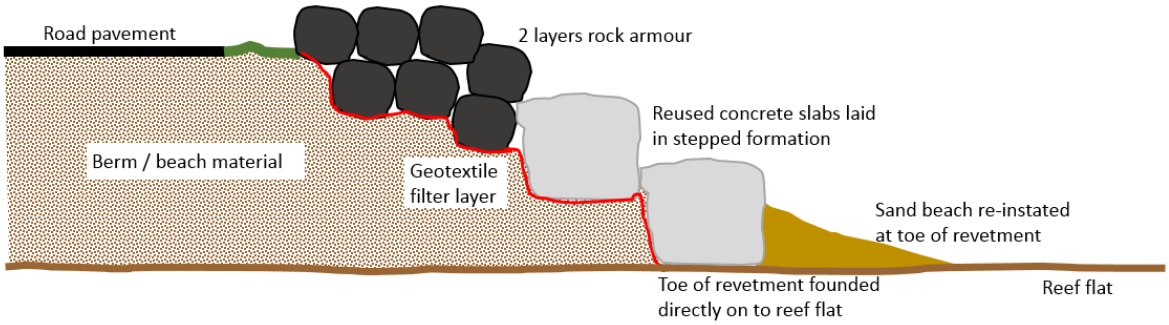


Figure 16. Cross-section of the proposed reconstructed revetment at Mosral

DTI will be in charge of design and construction of the coastal protection works at Paal and Mosral.. It will provide oversight of the work ensuring quality control and the activity will be in compliance with the protective engineering structure design standards of the Kosrae circumferential road extension project (ADB, 2005). The proposed works have been permitted through KIRMA's Development Review and permitting process and KIRMA will provide oversight to ensure all design and environmental requirements are adhered to during the construction.

Output 3.3 State support program to access land in upland areas established

Activity 3.3.1 Land consultations, surveys, mapping and regulatory framework for future inland movement of vulnerable coastal people and infrastructure

It is normal practice for the people of Kosrae to swap land. They do this regularly between landowners, and between landowners and the Kosrae State Government. The practice to relocate land between the government of Kosrae and a private land owner to faciliate a municipal waste dump for the capital is a recent and succesful example. The Kosrae State Government has therefore been able to successfully negotiate with private land owners for appropriate sites and appropriate prices for their land.

At present, there is no program to facilitate land access anywhere except the socially agreed method of 'land swap'. The consultations from all stakeholders during the planning stages of Inland Road Relocation Inititiative (IRRI) identified the need for a State program to systematically support access to land in upland areas for inland road access.

Capacity support will be provided to the Land Court to help facilitate the development of a land registry, including procedures and policy and guidance documents that may be required. The project will ensure that consultations with be an active participation involving all community stakeholders, including landowners, women, men and youth.

A mapping exercise of all households in vulnerable areas that are without land in inland areas will be undertaken as a first step. This will be followed by a community infrastructure relocation planning exercise with both Malem and Utwe municipalities. The options for a land provision for households who are without upland land will be highly considered. A land purchase and swap registry to be used by Malem and Utwe households who own no land inland in inland areas for homes and public infrastructure (schools, municipal govt buildings) will need to be established to support the implementation of the community infrastructure relocation plans. KIRMA in association with the Department of Resources and Economic Affairs will undertake coordination of this activity closely with Activity 3.1.1 during project implementation (see Activity 3.1.1.)

Output 3.4 Community-Based Ecosystem Management strengthened

Activity 3.4.1 Palusrik / Kuplu Wan watershed protection strategy, native vegatation buffer zones and stream health monitoring program to strengthen sustainable use of upland areas

The community of Utwe raised concerns as to the potential impacts of the construction of the road and the location of the road on Utwe village's water supply during the EIA consultations. As a result, the alignment of the road through the southern part of the Kuplu Wan plateau (Palusrik catchment) has been re-aligned completing alignment for the inland road (DTI, 2016). According to the Environment Impact Statement report, the final realignment results in a minimum buffer of 150 m at the watershed between the two catchments and over 350 m for the majority of the section of inland road within the Palusrik catchment (see Figure 17 below, also Annex 4a Figure 24). Given the distance to the Palusrik River, the only perennial stream in the catchment, and the characteristics of the likely catchment drainage pathways, there is *unlikely* to be any impact from the construction or operation of the road itself on Utwe's water supply.

The community of Utwe agreed that this activity will develop a community-led Watershed Protection (Management) Strategy for the Palusrik and Kuplu Wan area as a proactive adaptation measure to protect its water supply now and into the future. The strategy will take into consideration immediate, long-term and future potential developments in the area. It will promote ecosystem-based adaptation services, practices and activities that aim to maintain the ecosystem services that the area provides.

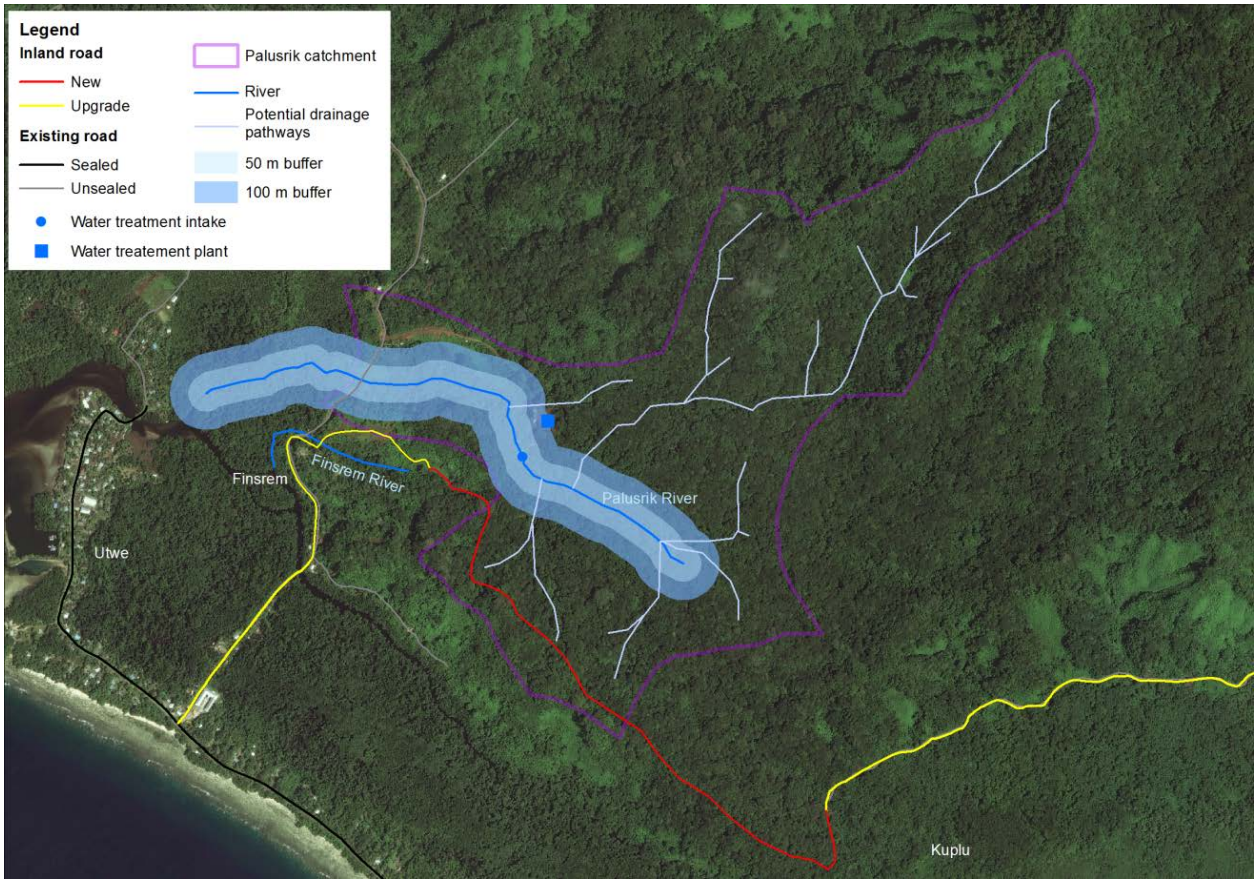


Figure 17 Kuplu Wan road alignment and buffer zones from the Palusrik River.

The communities with technical assistance provided by the Kosrae Conservation Society Organization (KCSO) will lead in developing, implementing and monitoring native vegetation buffer zones along sensitive areas where roads and rivers meet. The community will:

1) re-plant endemic vegetation around river and stream areas at road crossings; and
2) develop community gardens along road easement strip to stabilise cleared land; and
3) raise awareness about climate-resilient food crops and nutrition.

A community-led stream health monitoring program will engage schools, women and youth organization of the communities to be able to monitor the surrounding environment effectively, particularly where the new inland road is constructed. The program will educate, train and provide hands-on collection of data along the rivers and streams to gauge the level of water quality. The program will implement bio-assessment techniques such as sampling a body of water to find the biodiversity of macroinvertebrates in the water, providing strong indication of the water quality.

Awareness campaigns implemented throughout the project to support continued sustainable use of upland areas, catchments, waterways, swamp and mangrove ecosystems will be carried out by KCSO and community based organization working under the guidance of the municpality governments and project.

Output 3.5 State support program to assist accessing finance for vulnerable households established

Activity 3.5.1 Preparation of support program for accessing finance

The Kosrae Housing Authority (KHA) and the FSM Development Bank (FSMDB) currently have existing loan mechanisms that can be accessed by those that are eligible to apply. Currently most applicants are not eligible for loans under the FSMDB because they do not meet income criteria of USD 10-30,000 per adult. The Consumer loans are for up to USD 30,000; 5 yr term, 15% flat rate. If declined, one can apply under personal/consumer loan category or go to KHA.The KHA loan sizes are small relative to home construction costs.

The following table (table 5) summarizes current mechanisms that are available from the only two funding institutions operating in Kosrae:

Table 5 Current Finance Mechanism available

	CURRENT FINANCE PROGRAMS	BASIC CRITERIA	ELIGIBILTIY
FSM Development Bank	1) Housing Loan Program 100k/yr	USD $30,001+ Term: 20 years Interest Rate (IR): 9% (fixed)	Income fo USD10-30,000 per adult Currently most applicants are not eligible – do not meet the income criteria; move to – Personal / Consumer Loan
		USD $20-30,000 Term: 5 years IR:15% (fixed)	
	2) Personal / Consumer loan	USD 5-19,999 Term: 5 years IR: 15% (fixed)	If ineligibile, refer to Kosrae Housing Authority loan programs
Kosrae Housing Authority	1) Housing Loan Program Disbursment of $200-300K per year.	USD $7-10,000. Term: 15-20 years IR: 7% (fixed) # of disbursed loans / yr: 15-20	Eligible applicants are provided a promissory note and deed of trust and explained. Most loan takers are aged 25-40 yrs.
	2) USDA-funded Rural Development Program	These are “rural development” loans that can be used to improve home sites. IR: 4%	For senior citizens (over 62) with funding from the USDA.
	3) (new loan program) USDA-funded 50-80,000/yr program in development	Not yet qualified by USDA	Unknown

FSMDB’s national lending target has a USD 9 million per year. In Kosrae lending target is 1.5 million per year; Housing Loans make up 20% of the National portfolio but only 1% of the Kosrae portfolio.

This activity will impact 1,476 people in Malem and Utwe communities. It will contribute to the high level target of the project of gradual inland relocation over the next 10-20 years of the 236

households in Malem and 161 households in Utwe, starting with the 93 households - 83 in Malem and 10 in Utwe, currently extremely exposed to coastal hazards. The objective of the activity is to help vulnerable and poor households to be able to afford finance for inland relocation by establishing an enabling program from the state government.

The activity will carry out a review of existing finance mechanism and identify options including financial incentives to support upland residential development. The activity will be implemented by the Department of Resources & Economic Authority (DREA). Firstly, the project will carry out a review of existing access to finance (for home construction) programs and schemes in Kosrae and Pacific Island Countries. This will be carried out in partnership with the financial institutions (KHA, USDA, FSMDB, Bank of Guam) utilizing their networks to collate information on best practices. Secondly, the activity will take the findings and case studies from these reviews and adapted them to existing local schemes. A key part of this adaptation is localizing and tailoring the schemes to encourage engagement of the vulnerable households in coastal zones by incorporating their current levels of income, vulnerability and understanding and awareness of financing systems in Kosrae into the programs. DREA, the Kosrae House Authority and the FSM Development Bank will partner to consider applications to GEF 6 via grant and non-grant instruments. The project activity will explore this assistance in its review.

The Kosrae State Government identified a number of strategies within the IRRI program that it will implement with the view to encourage the local communities to access the existing financing schemes considering their vulnerability to coastal hazards (Annex 5). These include:

- Support adaptations to existing local schemes, ensuring they cater for vulnerable households in coastal hazard zones
- Proper application and enforcement of regulations aimed at managing infrastructure development in coastal hazard zones.
- Strengthen and/or develop regulations for management of infrastructure development in coastal hazard zones
- Develop plan to site public infrastructure in upland areas
- Develop funding proposals for public infrastructure (e.g. schools, municipal offices, health dispensaries) in upland areas

Component 4 **Knowledge management for improved water and coastal protection**

Outcome 4. **Capacity and knowledge enhanced and developed to improve management of water and coastal sectors to adapt to climate change**

Output 4.1 ***Community resilient (Municipality) Development Plans developed and communicated***

Activity 4.1.1 **Organizing development of Island / Municipal Government Development Plan**

The eight Development Plans developed by and for the eight communities of the project (Woleai, Eauripik, Satawan, Lukunor, Nukuoro, Kapingmarangi, Malem and Utwe) will serve as the overall strategic plans of the communities. These will be climate and disaster resilient plans that link all sectors plans that exist currently for the islands integrating approaches with the view

to reduce vulnerability and promote risk reduction measures to island water and municipality coastal resources. Each Plan will encompass not just the priority sectors identified during the planning stage, but other sectors that the communities have identified as required climate resiliency measures to be incorporated. The new Plans will update the old and existing plans. These plans will be explicitly linked to state and national sector plans, policies, regulations and relevant legislations. An Action Plan outlining clear actions, timeframe and responsible community and partners, as well as a Communication strategy will be key components of each Plan.

An organizing community planning workshop will be used to form a Working Committee to develop, or review existing Island / Municipal Government Development Plans. A terms of reference for the Working Committee will be agreed upon at this Inception workshop and submitted to the Chief Magistrate seeking an Executive Order for the establishment of the Working Committee. A consultative planning processes by the Working Committee on island involving all stakeholders will be established under this working committee. This will ensure ownership of the process and document to be developed. The activity will promote partnership with Non Government Organizations and Community Based Organziations to work together to develop the Plans.

Activity 4.1.2 Implement institutional changes to existing arrangements and establish effective communications based on new/ revised Plan and communications strategy

At the finalisation of the Plan, the working committee will recommend to the Municipal Council is adoption. The activity will implement the adoption by establishing new institutional arrangements on island. It will require the improvement of existing municipal government council offices, roles and responsibilities will be revised, and personnel set up. It will install key relevant basic communication equipment required to communicate effectively to stakeholders on the main island, including to other islands of the atoll.

Activity 4.1.3 Share and disseminate Plan to partners and stakeholders

The activity will implement the communication strategy of the Plan, by launching, and implemeting outreach programs firstly within the atoll island, amongst the population. It will then disseminate this Plan and any progress reports and success stories, outwards to supporting partners, through government and NGO networks.

The Plans will complement activities that will be carried out by the outer island as outlined under Components 2 for all six outer islands and Component 3 where applicable for Malem and Utwe communities in Kosrae. The plans will also complement and link to relevant plans, policies and guidance notes developed under component 1.

Output 4.2 Resource materials developed, tailored to local context, translated, published and shared amongst various stakeholders

The activities under this output are expected to produce two kinds of resource materials: visibility and knowledge-based. Resource materials that promote visibility of the project, its lessons and best practices include project briefs, brochures, booklets for leaders, pamphlets in english and local languages targeting the communities, and success stories that are shared through national and regional newsletters (e.g., SPREP Climate Change Matters) on a frequent basis (monthly, quarterly). It may also include prints on pens, drives that include information

about the project, calendars, shirts, hats, and other items that may increase awareness and support media campaigns about the project.

Knowledge-based products capture the adaptation knowledge generated by the project and from project processes and results. These include documentaries about the project and the results it has achieved. It includes peer-reviewed technical reports, manuals, guides, training modules, etc developed as a result of the interventions of the project.

The key areas of learning and knowedge generation, its documentation and sharing, would be as follows:

1. Legislation and regulation assessment on coastal and marine resource management at national and state levels in FSM.
2. Water harvesting and storage infrastructures and capacity in outer islands, FSM.
3. Water quality maintenance relative to water resources in outer islands – focusing on wells and tanks.
4. Water quantity relative to water harvesting systems in outer islands.
5. Success of reducing vector and water-borne diseases from changes in water and sanitation practices in outer islands, FSM.
6. Willingness to reloctate, and linkages to access to land and finance, and provision of utility services (inland roads, water mains, telecommunications and power)

At least 20 knowledge products will be produced by this activity, including an Operations and Maintenance Guide for rainwater harvesting and storage systems, and climate resilient design guidelines for inland road access routes.

Activity 4.2.1 Capture and document data and information generated by the project

The project will, through this activity, develop a project communication and knowledge management strategy that will guide and ensure the project is visible to partners and stakeholders and the work that they do. It will also guide the capturing, development, production and disemmination of knowledge products of the project.

The data and information generated, lessons learned and best practices of the project will be captured and developed into products that will be peer-reviewed, scientifically edited and published in journals or online and through existing government and regional publication series. The project will learn from the knowledge management process of the PACC project where a Technical Series and Experience Series[42] was established, published, and shared online and in hard copies where possible.

The activity will engage a local expert on knowledge management and communications to be based within OEEM project management unit of the project, to capture, store and collate data and information incoming from state project management units. This will be through monthly

[42] The PACC Technical Report Series and the Experience Series can be found online at https://www.sprep.org/pacc/publications. The products can also be found by searching within the regional climate change portal, https://www.pacificclimatechange.net; and the SPREP Information Resource Center and Pacific Environment Information network https://www.sprep.org/pacific-environment-information-network/pein

and quartlery progress reporting. Data and information including metadata, pictures, sound recordings, maps, vidoes from ground truthing assessments, technical surveys, consultation workshops, reports carried out will be captured and stored. This will be useful for measuring against the baseline of the project and annually for changes, to measure results of the project against its strategic results framework. Communication equpiment required to effectively carry out the required work will be addressed under this activity.

Activity 4.2.2 Organizing consutlancy support to edit scientific and peer reviewed knowledge products from the project

Previous projects such as the PACC and GCCA:PSIS learned that engaging a knowledge management expert early in the process once results are generated, is more effective, especially for when production of knowledge management products and technical climate change adaptation information is required by decision and policy makers. Preivous and current project experiences show that the project manager, and finance officers are always tied up in the day to day management of the project, that often times, the results of the project is never catpured effectively, nor is it shared to those concerned and would benefit from it. This project will learn from that lesson by engaging an expert early in the process to edit and peer review information

The activity will enage a knowledge and communications officer after the first year of the project, prior to the mid term evaluation, and when results are generated from the commuity level. The knowledge management expert will write technical reports based on data and information collected from activity 4.2.1 and carry out interviews, visits, triangulating and revalidating data. The officer may propose specific technical experts to carry out technical review on processes and designs of adaptation interventions proposed by stakeholders. The aim is also to generate targeted lesson reports, practical guides, and manuals that help reduce risks and improve resliency to climate change within the sectors. These will become knowledge products that will be captured and produced and shared locally, nationally, regionally and internationally.

The activity will also engage local experts including NGOs and community-based organizations (CBOs) that include women, men, and youth as partners to catpure and produce knowledge products from the project, at the state and community level. The products will focus on documenting results of the project with the aim to target the local community population, the younger age groups, and/or specifically to women, elderly, men, youth, and people living with disabilities.

Activity 4.2.3 Print, publish, produce and share materials through public awareness and media campaigns

OEEM will carry out a peer-reviewed process for the knowledge products to ensure the information and package is of high quality, before it can be printed for public consumption. OEEM will reach out to regional partners such as SPREP and SPC for their technical review of these products. The activity will launch the products at various events locally, regionally and abroad. It will invite key stakeholders and hold public awareness activities and media campaigns to ensure wide range of audience is captured. Once printed in hard copies and in soft copies, the materials will be distributed widely to stakeholders including communities involved. Each product will be assigned ISSN and ISBN numbers with the aim to distribute widely amongst key library and academic institutions within FSM and the Pacific.

The project will utilize existing distribution networks such as through the SPREP's award winning network - Pacific Environment and Informations Network (PEIN); the Informations Resouce Center, the Pacific Climate Change Portal (www.pacificclimatechange.net); and the Pacific Disaster Net (www.pacificdisaster.net).

Output 4.3 ***Stakeholders brought together to share, learn and exchange knowledge and skills on climate change, adaptation planning, monitoring, vulnerability assessments and climate change***

Activity 4.3.1 **Trainings on climate change, sea level rise and adaptive capacity measures on water and coastal sectors**

The activity will carry out training workshops at the state level on climate change impacts, both global and localised changes on water resources for the water sector based states and coastal sectors for Kosrae. The workshops will be carried out in Kosrae with technical assistance from key partners such as SPREP and SPC North Pacific Regional Office, the Micronesian Trust and Micronesian Challenge program. These will be sector and state specific workshops that will address impacts of climate change and sea level rise on the proposed sectors. It will provide experiences from elsewhere in the Pacific.

The activity will carry out a number of varied and applicable refresher trainings during the course of the project for water priority states. The trainings will include the use of gender and climate change tools, improving communications between main and outer island, application of regulations and policis and basic financial management for state and community based organizations. There will also be opportunities to provide hands on basic plumbing, water tank cleaning and maintenance schedule trainings for water priority states. This will be a proactive adaptive capacity building measure that will be learned from other islands and applied to others. The project will partner with women's council groups on main island as well as other non governmental organizations to carry out these trainings.

There will also be an opportunity to carry out a participatory 3-dimension modelling approach during consultations. This will be completed as one of the first activities of the project during inception phase. The activity will aim to map the bathymetry of the atoll islands as well as the surrounding islands of the atoll. This will assist in decision and policy making by members of the community.

B Benefits

Describe how the project / programme provide economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The project is expected to deliver a set of targeted and interlinked economic, social and environmental benefits, as well as serve as a model for future replication throughout the four states of the country in other sectors (food security, marine resource management). The project will promote a set of innovations, together with partner institutions / organisations that will help create better living conditions for the outer island and coastal communities of FSM.

The project will be implemented in the six outer islands namely Woleai and Eauripik in Yap State, Satawan and Lukunor in Chuuk State, and Nukuoro and Kapingamarangi in Pohnpei State. The project will also be implemented in Malem and Utwe communities of Kosrae. The relevant demographic details of the villages collected throughout the planning stages are given in the tables below. The key indicators for improved water and toilet access are given below in percentage per households. The figures include the average percentage of households in outer islands.

Table 6 Relevant demographics of the two outer islands of Yap State, Eauripik and Woleai

NAME OF ISLAND >	EAURIPIK	WOLEAI	TOTAL
Population	110	800	910
Male	54	425	479
Female	56	375	431
Households	18	85	103
Source of drinking water, % per household	Improved[43]		99.5
	Not Improved[54]		0.5
Toilet facility - % per household	Improved[44]		24.7
	Not Improved[55]		75.3
No. of Rubber / Plastic Water Tanks	13	67	80
No. of Concrete tanks	0	8	8
No. of Concrete wells	6	55	61

Table 7 Relevant demographics of the two outer islands of Chuuk State, Satawan and Lukunor

NAME OF VILLAGE >	SATAWAN	LUKUNOR	TOTAL
Population	692	848	1540
Male	353	432	785
Female	339	416	755
Households	97	119	169
Sources of drinking water, % per household	Improved[54]		94.7
	Not Improved[54]		5.3
Toilet facility - % per household	Improved[55]		34.2
	Not Improved[55]		65.8
Rubber / Plastic Water Tanks	Incomplete information. Will be assessed in ground-truthing assessment activities		

[43] '*Improved*' includes sources from public water supply, community water supply, household tank, protected well, bottled water, and household water tank. '*Not improved*' is water truck, rivers, lakes, springs and other sources of drinking water. (source: Divisions of Statistics, SBOC, FSM, 2014)

[44] *Improved* includes flush toilet, water sealed and ventilate improved pit. '*Not improved*' are not-ventilated-improved pit, any 'other' form of toilet and not having a toilet (source: Divisions of Statistics, SBOC, FSM, 2014)

NAME OF VILLAGE >	SATAWAN	LUKUNOR	TOTAL
Concrete tanks			
Concrete wells			

Table 8 Relevant demographics of the two outer islands of Pohnpei State, Kapingamarangi and Nukuoro

NAME OF VILLAGE >	KAPINGAMARANGI	NUKUORO	TOTAL
Population	350	210	560
Male	179	107	286
Female	171	103	274
Households	60	36	95
Sources of drinking water, % per household	Improved[54]		98.4
	Not Improved[54]		1.6
Toilet facility - % per household	Improved[55]		55.2
	Not Improved[55]		44.8
Rubber / Plastic Water Tanks	Approximately 60 units of various water holding mechanisms on island	-	-
Concrete tanks		-	-
Concrete wells		-	-

Table 9 Relevant demographics of the two outer islands of Kosrae State, Malem and Utwe

NAME OF VILLAGE >	MALEM	UTWE	TOTAL
Population	1300	983	1476
Male	663	458	715
Female	637	525	761
Households	224	169	393
Sources of drinking water, % per household	Improved[54]		92.4
	Not Improved[54]		7.6
Toilet facility - % per household	Improved[55]		98.3
	Not Improved[55]		1.7

The vulnerable groups expected to benefit from this project include:

Women, Men and Youth - The 2010 census finds that the domestic chores and responsibilities at the domestic level in households in FSM are largely owned and carried out by women and youth. It is in the range of 85-90% of the population reside in low-lying coastal areas in volcanic islands such as Kosrae, and 100% in the low-lying targeted atoll islands of Yap, Chuuk and Pohnpei which are highly exposed to climate extreme events. Women and children are therefore highly vulnerable to climate hazards and their impact. The proposed interventions in Yap, Chuuk and Pohnpei, that address water with indirect benefits to food security will be targeting and supporting the young and elderly women and youth to adapt.

Over 6,680 inhabitants of Kosrae are likely to benefit from the intervention measures proposed (direct or indirect benefits) in Component 3. The specific and immediate and daily beneficiaries will be the Malem and Utwe municipal village communities. According to the 2000 census, the Malem population was 1300 with males 663 and females 637 and the number of households at 238. The Utwe population stands at 983 on the 2000 census and was composed of 458 males and 525 females. Twenty three percent (23%) of the Utwe population is high school age. These potential beneficiaries, coupled with about 90 employed by National Government require daily access to go to the only high school located in Tofol and to the government administration district in Tofol.

There are other potential beneficiaries, approximately less than 100 people who reside in Walung municipal. Walung village community does not have access to the main roads of the island. Everyone at present uses boats to travel to Tafunsak. The only road from Walung to the rest of Kosrae is via Utwe and ultimately this will be the only road to Walung as the road south from Tafunsak is now suspended due to the Yela area being protected. In essence there are two out of five villages reliant on the road access as the only connection to the rest of Kosrae including the health services, high school, Government centre, airport and port.

Business owners and general local consumers:

Kosrae: It is anticipated that the livelihood benefits shall include the creation of over 450 employment opportunities across these communities on coastal protection engineering support and monitoring, community engagement / business diversity opportunities. For example, through hired labour in the municipalities for vegetation clearing, manual laboring through road construction, provision of services, such as aggregate and rock armor from local quarry operators and local contractors to support DTI. Micro finance renovation loan schemes such as Palau's successful Renewable Energy Subsidy Loan program would be one of the programs that the project will learn from and how it may assist homeowners and land owners in relocating into the new inner roads development. Water lines will be installed at the same time it is constructed and to be followed by electricity and telecommunication lines in the next stage when the road is upgraded to hot-mix asphalt. It will build economic resilience by providing assurance to business by enabling them to naturally and autonomously migrate inland and away from the coastal hazard zones. Furthermore it will improve access to key agro-forestry areas around the lower-slopes of the volcanic parts of the island increasing potential for food security and agricultural development.

Yap, Chuuk, and Pohnpei: Stabilization of water and food production before, during and after extreme events will make available more nutritional and balanced food at affordable rates. This will allow the more vulnerable and poor populations of the outer islands to better sustain the supply of food, water and rich-protein food more consistently over time.

Schools in Outer Islands - The communication and awareness raising activities will engage local and national media, and will also target the primary and secondary schools in the island communities, reaching out to different generations of the country. For the purpose of the project the term "gender" will focus on men, women and children, including the elderly and people living with disabilities that are living in and deriving an income from the strip of land along the coastal zone. The project would emphasize women and children.

In summary, the main social, economic and environmental benefits from the project are given below, compared to the baseline scenario:

Table 10 Social, Economic and Environmental Benefits for the outer islands of Yap, Chuuk and Pohnpei

Type of Benefits	Baseline Scenario	Key Benefits
Social	Lack of outer island development plan addressing climate change impacts	Community mobilized, organized and trained for improved management of water resources, sanitation and health practices
	Lack of island water resource management plan incorporating climate and disaster risks	Capacity is built to work collectively for water security, water management, climate change risks and vulnerabilities
	Lack of leadership quality to address issues relating to natural resource management and climate change related issues	Specific training will be offered related to water rainwater harvesting systems repair, maintenance and cleaning of water assets (tanks, gutters, downpipes, first flush diverters)
	No trained personnel on water conservation and management practices, health and sanitation including water harvesting systems maintenance and care	Specific training on construction of self-composting toilets to it can be replicated in other islands and communities
	'Dependency' approach to development with high reliance on a diminishing US Compact funds for development (ending 2023).	Specific training on water, sanitation and health practices and monitoring and survey skills targeting women and youth

Type of Benefits	Baseline Scenario	Key Benefits
Economic	Costs of health treatment and services high for treatment of water and vector borne diseases (hepatitis, polio yellow skin, can't eat, crippled, bacteria salmonella, E-coli boils, sores, infections in ears and eyes, protozoa giardia vomiting, runny stomach, no energy, round worms, whip worms) Low income from crops and capture fishery due to depletion of fishery resources from algal bloom as a result of use of lagoon and seas as toilets. Loss of income and livelihood assets from food drought (loss of crops, agriculture fields) as a result of water drought from prolonged days of no rain	Reduced health problems as a result of improved access to clean water and sanitation. Reduced heath cost as a result of availability of safe potable water Employment in rainwater harvesting repairs and maintenance, community water tank maintenance Employment in construction of self-composting toilets during and after the life of the project Sustained income for maintenance of water and SCT systems in schools and community governing council properties. Reduced the loss of livelihood assets like farms and agriculture fields from drought, cyclones and high waves Reduced loss of health services to the communities Reduced health costs as a result of availability of safe potable water

Type of Benefits	Baseline Scenario	Key Benefits
Environmental	Eutrophication of lagoon side during low tide – as a result of use of lagoon as toilets	Restored areas of lagoon side, increasing aesthetic and ecosystem services
	Less dissolved oxygen available in lagoon and mangrove areas leading to incidences of suffocated fish and other marine life	No pollution of groundwater and underground to the reef from wastewater from pit toilets on island
	Algal growth boosted around lagoon and mangrove areas as a result of excessive nutrients from human waste	No pollution of surface water and lagoon from human waste
	Dead fish wash up on shore during very low tide events on lagoon side	No excessive drawing of water from groundwater and wells allowing water in ground for plants and animals, improving the ecosystems during drought and post cyclones.

Table 11 Social, Economic and Environmental Benefits for Beneficiaries of Kosrae State

Type of Benefits	Baseline Scenario	Key Benefits
Social	High risk of communities being cut off from access to capital and utilities (power, water, electricity, hospital, main high school, port, airports) Malem and Utwe communities inaccessible to inland farm and land Landless unable to access land and finance to purchase and build on land 'Dependency' approach to development with high reliance on a diminishing US Compact funds for development (ending 2023).	Increase coastal resilience to inundation and erosion and guaranteed improved access to services benefiting 2,283 inhabitants of Malem and Utwe Landless, women, men and youth will have representation at municipality institutions Landless, women, men and youth will have access to land upland Landless, women, men and youth will have access to finance to support relocation Participation of women, men and youth in decision making processes ensured
Economic	Economically poor, low to non-existent level of agricultural labour, highly reliant on imported foods labour also only on a season basis Low-cost but high risk random bouldering seawall construction along high risk coastal road areas High risk to assets, safety, and livelihoods from unprotected exposure to risk of natural disasters High risk to infrastructures during cyclones and other natural disasters Eroding/disappearing beaches negatively affects tourism potential	Employment in road construction and community based ecosystem management activities for poor families in the project villages Sustained income from potential tourism and agriculture in upland areas Reduced loss to income, time and stress as a result of continued access to key utility services on island (water, electricity, telecommunications, hospital, ports, schools, safety (police)) Lower risk as a result of coastal zone protection measures. Ability to access land and increase income by investing in agriculture or tourism in upland areas Ability to access finance to build inland voluntarily as a result of state support program on access to finance. Coastal zone protection and potential finance for tourism in alternative areas.

Type of Benefits	Baseline Scenario	Key Benefits
Environmental	Frequent sea water inundation of coastal environment as a result of breaches of coastline from king tide, high tide events as well as storm surges Saltwater inundation on coastal environment and plantations and residential areas Lack of community-based ecosystems management practices at community level to manage ecosystems in lowland and upland areas Existing farm tracks in upland and access roads does not consider excessive water runoff and blocks catchment drainage pathways	Coastal road strengthened to withstand waver over topping, overwash, inundation and severe erosion. Protection of coastal areas from cyclones, erosion Limited inundation and overwash as a result of the transitional coastal defences Road relocated and constructed inland withstanding and safe from accelerated sea level rise impact on roads at sea level areas. Road designs improved, draining improved preventing water logging and flash flooding downstream.

A number of indirect environmental benefits are also expected to accrue from the project, especially under components 2 and 3. Firstly, the project will utilise the available rain water to the best possible extent for plants (crops, trees) and animals (livestock, local species). Secondly improving water quality maintenance, tank water protection for utilisation in dry condition and potentially act as carbon sinks. Thirdly, preventing of water run off by improving (repairing, installing new) catchment areas, as well as wastewater control would be helpful to minimise soil erosion, better soil water holding capacity, excessive nutrient runoff, minimise top soil erosion and overall maintaining soil quality and fertility. Fourthly, as further outlined in the Environmental Impact Statement (Annex 4a) and cost benefit analysis summary report (Annex 6) developing a watershed management strategy for the upland areas in Kosrae, will help maintain the diversity in the upland ecosystem by prohibiting agricultural activities and other development activities that will harm the environment.

Table 12 Key Social, Economic, Environmental Benefits from the project, at the output level

OUTPUT	KEY BENEFITS (DIRECT)		
	Social	Economic	Environmental
Component 1 Strengthening policy and institutional capacity for integrated coastal and water management at national and state levels			
Legislation and policy paper to guide regulation of climate resilient coastal and marine management	Adaptation legislation, policies, and plans recognize the social imperatives of the communities in outer islands and municipalities		National legal standards for application country wide.

OUTPUT	KEY BENEFITS (DIRECT)		
State regulations for development projects amended to consider CC risks and resilience			Better management of the local coastal and marine environment by developers
National Water & Sanitation Policy developed	Policy recognizes the susceptibility of outer island communities to drought, El Nino, and typhoons and cyclones		National guidance on the principles to be followed for sustainable water access and sanitation practices
National Water Outlook and Water Sector Investment Plan	Proactive and systematic planning at the municipality levels for farmers, fisher folks, women, youth based on sound climate and water information	Concerted and targeted investment for cost-effective and efficient responses from partners and stakeholders to water related crisis	
Component 2. Demonstration of water security measures in outer islands of Yap, Chuuk and Pohnpei			
Climate Change adaptation plans	Women, men and youth involved in decision making on managing their own island resources	Targeted and directed support by partners	
Water harvesting and storage systems installed in 6 islands	Plenty of good quality water, sanitation and health benefits for women and men of the islands in atoll during climate extreme events (drought, post cyclones, etc.).	Reduced cost of shipping in water during long dry spells	Pressure on underground water is reduced and is replenished for benefit of the natural ecosystems
Self-composting toilet programs established	Improved health and sanitation	Cost-saving on water purchases	Good soils with no pathogens, excellent for soil replenishment, gardening and plantation
Trained stakeholders on water conservation and management	Skilled and resourceful community to respond and address their water needs	Cost-saving on water purchases	
Teacher's Guide on Climate Change	Skilled and resourceful community to respond and address climate change for at least the next two generations		

OUTPUT	KEY BENEFITS (DIRECT)		
Component 3 Demonstration of Kosrae Inland Road Relocation Initiative			
Design and construction of 3.6 miles (5.8km) of inland and access road routes	All residents of Malem and Utwe are able to commute to and from capital and where services are provided (government, business district, hospital, port, airport, schools, etc.).		Design considers mitigation of impact of road on catchment drainage pathways, avoiding inundation and flash floods impact on the environment and residential areas
Transitional coast protection at Mosral and Pal upgraded	Allows for immediate to future commute by all Kosrae commuters, in particular access by Utwe to and from central business district	Reduce cost and pressure on project to hasten construction and	Protection of coastal areas from inundation and severe coastal erosion.
State support program to access land in upland areas established	Landless people from affected coastal zone are able to access safe land in in upland areas		
Community-based ecosystem management strengthened	Knowledge and skills at the municipality level to be able to manage changes of the natural environment, ecosystems from development in the short to long term		Protected watershed areas and managed development of upland areas to minimize environmental impacts and maintain ecosystem services of the natural forests and mangrove areas
State program to assist access to finance for vulnerable households established	State government recognizes and assists the needs of the poor and vulnerable households	Reduced costs for state government, private sector and households in relocating in upland areas	
Component 4 Knowledge management for improved water and coastal protection			

OUTPUT	KEY BENEFITS (DIRECT)		
Community Plans developed	Adaptation plans at the community level recognize climate change impacts and the need for proper adaptation planning under development for the islands and communities. Finance and supporting resources to implement the plans are provided by the project		
Resource materials developed	Knowledge and information captured and shared for replication and upscaling to other island communities and secure future support for adaptation. Dissemination of information country wide.		
Stakeholders brought together to share, learn and exchange	Knowledge, awareness and skills developed for communities to be able to undertake implementation, monitoring and future planning of concrete adaptation activities for their islands, homes and environment		

As may be seen from above, implementation of the project will not cause any negative social and environmental impacts. Outer Island communities and municipalities have been consulted in the design of the project components and are in line with the prevalent regulations, policies and standards of National and State Governments. Components proposed under the project have been designed with consideration towards the Social and Environmental Policy of Adaptation Fund.

C Cost-effectiveness

Describe or provide an analysis of the cost-effectiveness of the proposed project.

Component 1 focuses on mainstreaming of climate change at the national and state levels, through operationalizing the policy and planning processes for infrastructure, water and

sanitation services. **Component 2** focuses on two main activities of increasing access to (and storage of) good quality water and reducing water wastage through installation of self-composting toilets. The benefits of the activities are expected to reach over 3,253 individuals across the 6 selected atolls during the course of the project. The impact of both components is expected to reach the 103,000 population of FSM beyond the life of the project.

The per capita cost of the water security activities (component 2) will be high given the inherent demographic (low population density) and geographical (distance to outer islands is only accessible by boat) nature of FSM, as is in other Pacific island countries. The costs are justified given the interventions of the project are of immediate to long-term need and are sustainable. The activities under **Component 4** will invest in knowledge management that will ensure sustainability, replication and up scaling of programs and activities.

The 'cost effectiveness' of the project based on the component outputs of the project for components 1 and 2 only is given in the following table (table 13). The cost effectiveness of **component 3** activities is outlined separately below.

Table 13 Cost Effectiveness of the project for Components 1 and 2 only.

CURRENT ADDRESSING MECHANISM	HOW IS IT ADDRESSED BY THE PROJECT	COST EFFECTIVENESS
Component 1, Output 1.1 Legislation and policy paper to guide regulation of climate resilient coastal and marine management at national level		

CURRENT ADDRESSING MECHANISM	HOW IS IT ADDRESSED BY THE PROJECT	COST EFFECTIVENESS
FSM has a national climate change and disaster risk management policy. The Strategic Development Plan provides for the macro-economic framework and the policies for each sector; the sector planning matrices; and the Infrastructure Development Plan. Of the four states, only Kosrae and Pohnpei have SDPs. FSM does not have legislation either at the national or state level to enact climate resilient management of its coastal and marine resources. With the exception of Kosrae state, there are no laws and regulations at the national level to protect and conserve FSM's coastal and marine resources from business as usual development. Kosrae only has a climate change law, climate change policy, climate mainstreamed Regulation for Development Projects 2014 and EIA Guidelines	Development of a national and or state legislative framework, legislative draft that identifies and recognizes the social, economic and environmental imperatives to FSM's future development. The project may not be able to achieve the endorsement of a law on management of its natural resources, as there is likelihood it will be beyond the scope (time) of the project. The project, however, will develop a legislative framework / draft that will direct the national and state governments to initiative legislative and regulatory work to guide and govern its resources. The national government will continue the development of this framework beyond the lifetime of the project	The legislative framework/draft will introduce climate resilient factors into its environmental governance and development frameworks. In particular it will assist its SDP and IDP 2016-2025 in its governance aspects. Greater efficiency of expenditure will be achieved through the clarity and standards provided by a nation-wide approach. The legislative framework/draft developed by the project will trigger and push for state governments to develop their regulations for development projects – similar to Kosrae's RDP 2014 and EIA Guidelines. It will initiate actions to review, improve, and strengthen the SDP and IDP to ensure developments, especially infrastructure developments along the coastal and marine areas – are climate resilient.
Component 1, Output 1.2 State regulations for development projects amended to consider climate change risks and resilience measures		

CURRENT ADDRESSING MECHANISM	HOW IS IT ADDRESSED BY THE PROJECT	COST EFFECTIVENESS
With the exception of Kosrae State, existing EIA regulations of Yap, Chuuk and Pohnpei have not yet incorporated climate change and disaster. None of three states have a climate resilient Regulations for Development Projects. There is no mechanism to keep development in check with climate resiliency, environment impact assessment at a minimum. The current practice is largely voluntary	The project will consult, review, develop, endorse and promulgate regulations for development projects in each of the three states. It will take on board lessons from Kosrae State under the PACC project the developed, and revised the RDP 2014 for Kosrae. The project will look at existing regulations including the EIA regulations and update those regulations to incorporate climate risks and resilience factors to strengthen them. The project will see to it that the regulations are adopted, institutionalized and applied to any development in the each of the state	Long term contribution of the project in the on-going development of climate change environmental monitoring and governance at national and state level Opportunity of government stakeholders to review their existing regulations, policies and practices in light of climate change factors
Component 1, Output 1.3 National Water and Sanitation Policy endorsed with climate and disaster risks and resilience, and gender mainstreamed		
FSM has a framework for a policy but does not have a policy on water and sanitation. It has institutionalized the framework but has made no progress on developing and finalizing a policy. There is no mention in the framework of mainstreaming of climate change into the policy. The components of the policy proposed for under the framework does not incorporate climate risks and resilience, governance and support programs for water and sanitation issues across FSM, including the highly vulnerable outer islands	The project will incorporate climate risks and resilience factors into the national water and sanitation policy. It will do so by reactivating the national water task force. The project will aim to finalize the policy, and submit to congress for endorsement and launch nation-widely. The project will attempt to link its work under other outputs to the policy. Activities under output 1.3, component 2 and 4 will be part and parcel of the implementation plans of the policy.	The policy will enable the water plans at the national, state and municipality level to be better streamlined into development work. The policy will enable climate change adaptation programs for water, food, health and sanitation to be formally considered and addressed not only by government but by its partners.

CURRENT ADDRESSING MECHANISM	HOW IS IT ADDRESSED BY THE PROJECT	COST EFFECTIVENESS
Component 1, Output 1.4. National Water Outlook Program (and Water Sector Investment Plan developed and implemented)		
There is no outlook program in FSM to inform and assure stakeholders of the availability and distribution of water. This will have a major impact on both the main island and outer island population. There is no mechanism that will inform farmers, businesses, village communities of what El Nino and La Nina will mean for different parts of FSM, and therefore its attribution on water resources. Current practices rely on weather information and climate information provided by NASA, NOAA and SPREP. The scale by which information is provided and the time lapse is not enough to prepare and take decisions. This continues to have a detrimental effect on society, the economy (agriculture, tourism) and environment.	The project will work in partnership with NOAA, NASA, SPREP Climate Change Center through its Pacific Meteorology Desk to develop climate and weather based products that inform scenarios of water availability on account of rainfall, temperature, wind, and ENSO. It will also work to develop the capacity of local stakeholders.	The project will contribute to developing products tailored to sectors (tourism, agriculture, transportation, etc.) that will inform choices for the different development sectors. The project will create a shift in paradigm by building individual and systematic capacities of the local institutions, to develop the products. This will increase the sustainability beyond the life of the project. The information provided will contribute to facilitate improved protection against loss of income on account of anticipated climate change based impacts.
Component 1, Output 1.4 : (National Water Outlook Program) and **Water Sector Investment Plan developed and implemented**		

CURRENT ADDRESSING MECHANISM	HOW IS IT ADDRESSED BY THE PROJECT	COST EFFECTIVENESS
There is poor consideration of investment planning required to ensure sustainability of services of the water sector throughout FSM and across its islands.	The project will develop a water sector investment plan that FSM can prioritise costed actions for water and sanitation in each state and at all island levels – main, lagoon and outer islands.	The plan will produce prioritised and costed actions for water and sanitation in each state and at the island level including all islands – main, lagoon and outer islands.
FSM lacks human capacity development that is needed for integrated water resource management and sustainable water supply solutions.	The project will improve institutional capacity for monitoring and support for action on findings from the water investment planning workshops	The plan will minimise costs for future water supply upgrades by maximising the use of existing assets as far as possible, and respond to its human capacity development needs
The states are unable to systematically upgrade and utilize their existing assets for the supply of water in a sustainable manner across all islands (main, lagoon and outer islands)	The project will consider in the plans the need to acquire external financial assistance to meet its safe water and sanitation goals to build resilience of the water sector to climate change impacts	The plan will build on lessons and best practices gathered from the water demonstration activities in the six outer islands of the project. It will help inform and develop the investment plan, particularly in strengthening the outer island components of the plans. The plans will also ensure the effective use of resources based on informed and evidence based decision making.
FSM lacks an investment plan at state level to be able to manage internal finances and acquire external financial assistance to meet safe water and sanitation goals.		
Component 2. Output 2.2 Water harvesting and storage systems (WHSS) installed in 6 atoll islands		

CURRENT ADDRESSING MECHANISM	HOW IS IT ADDRESSED BY THE PROJECT	COST EFFECTIVENESS
Almost all households in the outer islands have water tanks that are either in very poor conditions or are not used at all. There are water tanks but very poor or no rainwater harvesting systems. Nearly 40% of the tanks in the outer islands of Woleai and Eauripik do not have proper rainwater harvesting systems Nearly 90% of water wells had very low water level, all brackish and all uncovered	Repairing of existing rainwater harvesting systems Training of women, men and youth on maintenance and cleaning of existing systems Establishing maintenance schedules with families / households Building community tanks to alleviate pressure on individual household water tanks during drought Ensure minimum 2 tanks per household / 2 community tanks per island to serve maximum 100 population	Repairing the existing rainwater harvesting systems will be cost-effective as it will utilize existing resources that are currently underutilized. Applying the optimal 2 water tanks per household rule will assist with cleaning of one tank interchangeably while the other is being utilized. The same rule is applied at the community level but for 10,000L capacity, plastic tanks, 2 minimum per maximum population of 100 persons. Communities will be involved in the development of tank maintenance protocols to ensure full community ownership.
Component 2, Output 2.3 Self-Composting Waterless Toilets constructed to conserve water, improve soil environment, and reduce marine eutrophication on the lagoon side		
There are no self-composting toilets installed on the islands, i.e. where no use of water is required. There are three common types of toilets that exist in the outer islands - flush toilet, water sealed and ventilate improved pit. These toilets use a lot of water that could have been conserved for other use (washing, bathing, watering, etc.). It is also not healthy and sanitary, and the wastewater contribute to pollution and contamination of the underground water, reef and lagoons	Install waterless self-composting toilets at the school level. These will act as demonstration structures. There will be one unit for girls / women and one for boys / men. The project will also install these toilets at community and household level	Saves a lot of water from ever being used in a toilet It provides pathogen-free rich compost that can be added to plantation and agriculture fields or enriches the thin atoll island soil environment. It reduces environmental costs by containing waste in a closed system (chambers) It reduces health costs by containing and killing pathogens within its closed system and avoids a visit to the medical clinic for diarrhoea, yellow eyes, etc.

The elements of cost-effectiveness and efficiency of the activities under the particular outputs 2.2 and 2.3 are further outlined in the following table (table 14).

Table 14 Specific elements of cost effectiveness and efficiency for key activities under outputs 2.2 and 2.3

OUTPUT / ACTIVITY	ELEMENTS OF COST-EFFECTIVENESS	EFFICIENCY
For: Water Harvesting and Storage system		
Household rainwater harvesting system	Increasing catchment area Keeping all elements of the catchment systems clean Choosing right tank size relative to catchment area	Improving guttering of existing rainwater collection systems
Community water tanks	Increasing catchment area Plastic tanks (HDPE) with man-hole covers are easy to clean, maintain and moved allowing for use of land for other livelihood activities Choosing the right tank size relative to catchment area	Increased number of the same size of tank Easier to clean versus concrete tank.
For: Self-composting toilets		
Household, Community / school / church / health dispensary unit	SCTs are cheaper to build and maintain than a septic system Water savings — CTs don't need water for flushing, which means precious water can be saved for essential needs. Built above ground — the SCT chambers must be constructed above ground, so stairs or a ramp are needed to access the toilet room.	SCTs don't smell when properly used and maintained. Safe —SCTs can destroy all pathogens, including worm eggs and viruses.

The project interventions under component 2 would result in the following positive externalities:

- The impact of drought and aftermath of typhoons on water resources, have caused out migration from outer island to the main islands. Social impacts of the residue population include family and community disintegration, health issues for women and school dropouts. Improved water security and sanitation and health will assist to relieve these conditions over time, during drought and immediately in early recovery following cyclones and typhoons. Water will be essential to support all livelihood activities including food security, sanitation and health.

- Improved village and school level organization and training will assist communities to gain confidence and find solutions. It will improve the willingness to work collectively to address emerging socio-economic and environmental threats

- Water and land resources remain degraded and unproductive. Project investments will directly help to rehabilitate some unproductive areas.

- Current concrete tanks that have leaked cannot be repaired including those that have been repaired previously but leak again. The community concrete tanks are too large to maintain and have incapacitated land that could have been put to better use. Investing in HDPE plastic tanks versus concrete tanks at community level will improve the ability to clean and carry out maintenance. They can also be moved from one location to another, allowing land to be used for alternative purposes.

- Natural and social systems remain exposed to vulnerabilities. Project investments will improve the community's capacity to improve and manage the local natural resources on a sustainable basis. Alternatives for achieving long-term water storage and efficiency savings where considered. For example through the consultations communities considered the following:

Table 15 Alternative Options

ACTIVITY PROPOSED	ALTERNATIVES	BENEFITS
Water Harvesting & Storage Systems		
Repairing existing rainwater harvesting systems at household / private level, minimal purchase of just one other PVC to allow cleaning interchangeably *Cost per household including maintenance cost for at least a year comes to $560 USD*[45].	Construction of new systems per household with two HDPE tanks to allow cleaning interchangeably The cost per household will come to $1,120 USD plus added logistical coverage of about $5,000 minimum to import all new equipment required to install and monitor, comes to $6,000-$7,000 USD per household Install Reverse Osmosis Units. The installation of RO Units has been considered in other Pacific island contexts. While the effectiveness of RO units has been proven in some instances, they are accompanied by prohibitively high purchase installation, and maintenance costs and ownership issues. Spare parts are expensive and difficult to replace in outer islands. Filters have short-life span (6 to 12 months).	Repairing existing systems is less expensive Requires less maintenance Spare parts are easily attainable and shipped within FSM

[45] Capital cost of water tanks in FSM ranges from $350 to $750. The project takes the lowest cost, typical cost if a new water tank size is required of $350 for 1,000 gallon capacity. $210 for repairs and maintenance. The $560 is total activity budget for repair activities of Eauripik outer island divided by the number of households. This is used as the baseline by the project. Transportation costs of the equipment are born by the project.

ACTIVITY PROPOSED	ALTERNATIVES	BENEFITS
Constructing community tanks to serve and alleviate pressure on private systems *Cost comes to $750 USD per 2,000 gallon, minimum 2 required to serve a minimum population of 100. Total with guttering and down pipes comes to $3,000 USD per tank*	Construct new systems for all households on all islands of the atoll without need for any community tanks Provision of systems for all will exceed the budget of the project per state.	Community tanks system is less expensive to import, construct, maintain, clean and own 2 community tanks / 100 population easier to manage, clean and maintain compared to many household systems without spare parts

ACTIVITY PROPOSED	ALTERNATIVES	BENEFITS
Construction of 2 SCT units each at a school, community building and 1 unit at a household select *$4000 USD[46] per unit x 5 total per outer island, total range in costs $25,000 - $50,000 based on outer island distance of shipment of materials*	Build either the following: Bush toilet — this is a hole in the ground with a simple cover around the hole. Pit toilet — pit toilets are usually covered with a concrete slab and have a "house" on the slab. The house needs to be moved when the pit fills up. VIP toilet — VIP stands for ventilated improved pit toilet. These are really the same as pit toilets, but have a PVC pipe added to improve airflow and reduce flies and smells. Water seal — A pit covered with a concrete slab and a concrete toilet seat. A bucket of water is used to flush the waste into the pit. Flush/Septic toilet — A porcelain toilet with a water cistern. These require piped water to flush the waste into a concrete septic tank, where solids settle in the tank. The water collects in the tank and then passes out into a "soak", or straight into the soil and groundwater. The discharged water should be treated in a properly constructed trench to destroy the pathogens.	• Self-compost toilet (SCT) — The waterless compost toilet (SCT) works just like a compost heap for your garden. In the garden compost heap you mix pig manure with dead leaves and chopped up branches, and leave if for a few months until it decomposes and makes a good fertiliser. In the SCT it is human manure instead of pig manure, mixed with leaves and left for at least six months so that all the pathogens are killed by the composting process.

The PACC programme delivered a similar set of activities to the ones proposed for this project. The terminal evaluation found that that the community driven and managed interventions "successfully….reduced water insecurity through better catchment regularity and retention; rainwater tanks and roof catchment systems". Results were more mixed with solar purifiers,

[46] Based on cost of 1 whole unit built in Nauru $4,500-$5000 AUD. Not including transportation and shipping costs to be borne by the project through execution costs and other activity costs

especially those targeting individual households. The evaluation also acknowledges the relatively high cost of increased water availability achieved by the project, though does not provide a reference baseline. Given the geographic location, de-centralized and often non-existent water supply systems a relatively high cost for provision of water in such environments is to be expected.

Alternative options are either very expensive or socially unacceptable to the outer island communities and against local and World Health Organization health and sanitation standards. The major advantage of the proposed project as against alternative options is in its ability to provide sustainable livelihoods through increased provision of enough safe drinking water to not only for human consumption but to plants and animals. The project, therefore, is environmentally sound and socially acceptable. It addresses the immediate threats faced as a result of drought, sea level rise, typhoons and cyclones.

In summary, the following key characteristics of the project, particular to components 1 and 2, that would considerably enhance its cost effectiveness:

1. The major component 2 activities of water harvesting and storage systems and installation of self-composting toilet programs are highly replicable under similar outer island environments and conditions
2. The implementation mechanism by involving experienced NGOs, intergovernmental organizations such as IOM, and linking with the Micronesian Challenge (MC) to strengthen the state and community ownership and achieve high level of local ownership is highly cost-effective. These organizations have been very active during the planning stages of this proposal and very involved with work in the outer islands.
3. Being cost-effective, government departments would convince interest in up-scaling of the project through various programmes such as those under IOM and MC.

Under **component 3**, a detailed cost-benefit analysis study[47] has been completed for the proposal to construct and operate an inland road from Malem to Yeseng to Utwe. A copy of the cost-benefit analysis study is provided at Annex 6. The main purposes of the study were to:

- 'ground-truth' whether the inland road development is a priority investment (strategic rating of 8.9/10) as stated in the State's Infrastructure Development Plan (IDP), Volume 4 of the FSM IDP (DTCI 2015);
- inform how the design of the inland road development can be refined and improved; and
- further develop the evidence-base needed to support funding applications for this infrastructure investment.

[47] The cost-benefit analysis study was supported through the Pilot Program for Climate Resilience: Pacific Regional Track (PPCR-PR) - a regional program which aims to strengthen integration of climate change and disaster risk considerations into 'mainstream' planning and related budgetary and decision-making processes (i.e. 'climate change and disaster risk mainstreaming'). The PPCR-PR is being implemented by the Secretariat of the Pacific Regional Environment Program (SPREP) and the Asian Development Bank (ADB), and is funded through the Climate Investment Fund (CIF). More information on this program can be found at https://www.climateinvestmentfunds.org/cif/node/7295

The cost-benefit analysis examined the proposal to construct and operate an inland road from Malem to Yeseng to Utwe. This option includes 20 years maintenance and revetment of the existing coastal road in order to provide time for households to relocate to safer areas, as is the intention of the proposed IRRI program.

The analysis also examined an alternative option to upgrade the existing coastal road, including elevating it and ramparting segments that are particularly exposed to erosion and over-wash.

A wide range of cost and benefit categories for each option were considered, reflecting the many dimensions of coastal hazard risks faced by Malem and Utwe coastal communities and of relocating communities and infrastructure inland. A summary of these costs and benefits for each infrastructure option is provided in Table 16 below.

Table 16 Summary of cost-benefit analysis results (PV$ @ 4% discount rate)

	INLAND ROAD DEVELOPMENT - PHASE 1 MALEM TO YESENG TO UTWE	UPGRADE EXISTING COASTAL ROAD - MALEM TO YESENG TO UTWE
(1) Costs		
establishment and operational costs, including awareness programs	5,846,667	5,307,444
impacts on inland environment from inroad development	Not valued	0
impacts on coastal environment from upgrading existing coastal road	0	Not valued
	5,846,667	5,307,444
(2) Benefits		
avoided clean-up costs from coastal flooding events	15,576	12,192
avoided damages to cars	Not valued	Not valued, but lower than inland road option
avoided damages to home gardens	Not valued	Not valued, but lower than inland road option
avoided damages to housing infrastructure	177,472	91,742
avoided damages to road infrastructure	278,375	1,517,936
avoided trauma and loss of life from major typhoon event	Not valued	Not valued, but lower than inland road option
avoided income losses associated with road damages (preventing access to workplaces)	1,452	1,185
avoided disruptions to schooling	Not valued	Not valued, but lower than inland road option

	INLAND ROAD DEVELOPMENT - PHASE 1 MALEM TO YESENG TO UTWE	UPGRADE EXISTING COASTAL ROAD - MALEM TO YESENG TO UTWE
avoided disruptions to accessing hospitals	Not valued	Not valued, but lower than inland road option
increased food production achieved through improved access to inland areas	2,446,134	0
other benefits (e.g. tourism and cultural) achieved through improved access to inland areas	Not valued	0
migration out of Kosrae and associated economic implications	Not valued, but lower than upgrading coastal road option	Not valued
Avoided replacement of coastal road at existing design standard	3,194,855	3,194,855
Avoided maintenance of existing coastal road	22,580	22,580
	6,136,444	4,840,490
(3) NPV = (2)-(1)	289,777	(466,954)
(4) BCR = (2)/(1)	1.05	0.91

As can be seen from Table 16 above, the quantitative results show that only the inland road option is expected to generate net benefits for the Malem and Utwe communities - relative to the status quo scenario - whereby the existing coastal road is retained at its current design specifications and a protective rampart (revetment) constructed to protect sections of the road most exposed to over-wash.

The CBA report also emphasizes that a number of important costs and benefit categories were not valued due to a lack of data, and hence are not reflected in the quantitative results. These costs and benefit categories include:

- benefits of the inland road relating to (i) avoided damages to cars and home gardens; (ii) avoided trauma and loss of life from major typhoon events; (iii) avoided disruptions to schooling; (iv) avoided disruptions to accessing hospitals; and (v) a range of other benefits expected to be generated from improving access to inland areas (e.g. tourism and culture);
- environmental costs of upgrading the existing coastal road, especially in terms of downstream coastal erosion; and

- broader economic implications relating to outmigration from Kosrae if the existing coastal road is maintained or upgraded.[48]

When these categories are taken into account, the inland road option would be expected to show a much stronger return on investment and represents a worthwhile use of resources. The social and environmental impacts will also be avoided, minimized, reduced through the proper application of the mitigation factors outlined in the Environmental Social and Management Plan (Annex 7).

The CBA report further stresses that a number of other (non-public-infrastructure related) barriers are constraining households capacity to relocate to inland areas - and that these barriers will need to be addressed if the infrastructure investment is to fully realize its intended objectives.

Key barriers identified as part of community consultations were a lack of access to finance (e.g. to construct a new house) and a lack of access to land located upland. Moreover, if households are slow to relocate inland, then the Government will likely be required to re-establish the coastal road - when it meets the end of its economic life in approximately 20 years' time. This would represent a substantial additional cost for the Government - in the order of US$3.4 million. This reinforces the need for complementary measures to address non-infrastructure-related barriers to relocation.

The project will address these by developing state support programs to access land and finance under outputs 3.3 and 3.5., to enable and facilitate the re-location preferences of the communities. These activities are considered essential in order to be able to realise the cost-effectiveness of the project

The key findings and conclusions outlined in the CBA report are consistent with the recommendations made in the Kosrae Shoreline Management Plan (2014). The key findings have also been peer-reviewed by a number of different stakeholders, including technical officials from SPREP, the Pacific Community (SPC), German International Co-operation Agency (GIZ), and the National Institute of Water and Atmospheric Research (NIWA).

Based on the CBA results, the Inland Road Development - Phase 1 Malem to Yeseng to Utwe is confirmed as a high priority investment for Kosrae. Moreover, the CBA results suggest that this project should be pursued ahead of some other infrastructure projects ranked higher than in the Infrastructure Development Plan 2016-2025. One example is the Lelu water systems improvement project for which a CBA study was also completed and shown to be economically unviable.

The project will not be able to fully fund Phase 1 of the inland road development which is the establishment and operational costs, including awareness programs with a total cost of $5,846,667 USD. The remaining allocation of $9 million USD under the AF for FSM will not suffice the concerted implementation of all components of the project. Component 3 alone constitutes 47% of the total project activity costs. The Kosrae State Government with assistance of the National FSM government continues to pursue discussion with development partners to

[48] households located seaward of the coastal road have advised they will leave Kosrae if their safety remains compromised.

support implementation of Phase II of the inland road development. The national state government has confirmed this commitment through a letter to the AF Board dated 8 July 2016 (see Annex 8).

D Consistency with Development Strategies

Describe how the project is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

Key Policies of Central and State Government, on which this project is based, are as follows

NO.	NATIONAL / STATE GOVERNMENT POLICY, *RESPONSIBLE AGENCY*	PROJECT ELEMENTS CONSISTENT WITH THE POLICY
1	Nationwide Climate Change Policy, *Office of Environment and Emergency Management (OEEM)*	1. Developing legislation and regulation frameworks for climate resilient development in coastal and marine areas 2. Developing climate resilient water and sanitation policies 3. Implementing water outlook program to prepare and manage water resources in advance of climate variability and changes
2	National Strategic Development Plan,	1. Protection, conservation of freshwater, marine and terrestrial ecosystems, inland road relocation, coastal protection from erosion, training and awareness of CC, SLR, vulnerability, issues and causes of increasing hazards 2. Developing climate resilient regulations for development projects – to ensure developments at the coastal areas are climate-proofed
3	Nation Wide Integrated Disaster Risk Management and Climate Change Policy, *OEEM*	1. Cross-sectoral climate change coordination mechanisms within office of environment and emergency management at national level, state environment protection agencies 2. Preparation of outer islands against onset of El Nino periods that bring long dry spells. 3. Training of outer island communities on water and sanitary monitoring and other disaster preparedness and response measures
4	Kosrae Climate Change Act, *Kosrae State Government*	1. Cross-sectoral climate change coordination mechanisms amongst Kosrae State Government departments and utilities 2. Abide with regulations for development projects requirements to meet EIA guidelines and standards 3. Apply climate change hazard mitigation actions to protect society and the environment
5	Kosrae Shoreline Management Plan, *Kosrae Island Resource & Management Authority (KIRMA)*	1. Implementing the first priority of the shoreline management plan under the Inland Road Relocation Initiative (IRRI) program

NO.	NATIONAL / STATE GOVERNMENT POLICY, *RESPONSIBLE AGENCY*	PROJECT ELEMENTS CONSISTENT WITH THE POLICY
6	KSG Regulations for Development Project, *KIRMA*	1. Abide by regulation rules and requirements under the project
7	Kosrae Strategic Development Plan, *Office of Development Assistance*	1. Mainstreaming climate change into development through design and construction of roading infrastructure 2. Revetment of existing coastal roads to prolong the shelf life of the roads from sea level rise and resultant tidal surges, king tides and extreme high tide events.
8	Pohnpei State Strategic Development Plan , *Pohnpei State Government*	1. Integrated water resource management in the outer islands helping to conserve safe drinking water. 2. Implementing simple and effective wastewater treatment technologies such as self-composting toilets. It does not use water but it effectively decomposes off of wastewater in environmentally-friendly set up. 3. Constructing potable water source facilities in outer islands that will provide significant support to environmental improvement and economic growth on main island.
9	National Infrastructure Development Plan , *Ministry of Transport, Infrastructure and Communication*	1. Implementing cost-effective, safe, reliable and sustainable infrastructure (environmentally sound and climate proof) 2. Implementing high priority infrastructure needs of the states that is submitted to national government under guidance of the NIDP
10	National Climate Change and Health Action Plan, *Department of Health*	1. Reducing incidences of water and vector-borne diseases in outer islands / hard to reach places 2. Building capacity of women, men and youth to better water, sanitation and health conditions and assets on island through trainings, survey assistance, construction and carrying out monitoring roles
11	Kosrae Shoreline Management Plan, *KIRMA*	1. Implementing the priority strategy identified by the KSMP
12	Yap Joint State Action Plan, *Department of Resources & Development*	1. Implementing the water goals for the outer islands
13	National Framework on Water and Sanitation Policy	1. Integrated water resource management helping to conserve water 2. Optimise water use by increasing water use efficiency by at least 20% 3. Enhancing storage, both above and below ground, special effort to increase water storage capacity

NO.	NATIONAL / STATE GOVERNMENT POLICY, *RESPONSIBLE AGENCY*	PROJECT ELEMENTS CONSISTENT WITH THE POLICY
14	"Endorsing Access and Right to Safe Drinking Water and Sanitation in the Micronesia Region" - Micronesian Traditional Leaders Conference	1. Providing access to safe drinking water and sanitation in the outer island regions of Micronesia 2. Providing training and awareness amongst the women, men and youth of the outer islands 3. Building capacity of the traditional leaders, island governing councils to manage climate change adaptation projects relating to water, sanitation and health
15	Second National Communication Report to the UNFCCC	1. Providing water and water tanks to outer islands immediately including improving food security by provisions of water to plants and crops
16	National Biodiversity Strategy and Action Plan	1. carry out a community-based ecosystem management program with municipal communities 2. work with leading NGOs to carry out monitoring and surveying of ecosystems
17	National Action Plan to Combat Land Degradation	1. Develop and implement water shed protection strategies 2. build capacity of communities to lead and manage community-based ecosystem management programs
18	Joint National Action Plan for climate change adaptation (CCA) and disaster risk management (DRM) (developing)	1. carry out coordination mechanisms at national and state levels involving the national office of environment and emergency management, state EPAs and departments of resources and development and department of transport, infrastructure and communications
19	National Environmental Policy Act of 1969	1. Protection, conservation of freshwater, marine and terrestrial ecosystems, inland road relocation, coastal protection from erosion, training and awareness of CC, SLR, vulnerability, issues and causes of increasing hazards 2. Developing climate resilient regulations for development projects – to ensure developments at the coastal areas are climate-proofed

E Consistency with Technical Standards

Describe how the project / programme meet relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and comply with the Environmental and Social Policy of the Adaptation Fund.

The overall objective of the project is in line with the Climate Change Policy of the FSM Government 2009, the Framework for National Water and Sanitation Policy 2011, and the Infrastructure Development Plan 2016-2025. At the state level, the Climate Change Act 2011 and the Regulations for Development Project 2014 and EIA Guidelines 2014 of the State of Kosrae as well as adhering to the recommendations of the Joint Strategic Action Plan on Climate Change and Disaster Risk Management of each state. Secondly, the project will be governed as per the policy and preference of the Government of FSM in adherence to all the specific local criteria. Apart from that, the project would also adhere to the recommendations

communicated by FSM's Second National Communication report 2015 to the UNFCCC with regard to climate change adaptation benefits.

The National Government provides guidance and technical assistance to the States when needed and requested on matters related to planning, economic development, natural resources, fisheries, and the environment."[49] The National Climate Change Policy of 2009 for instance provides guidance related to infrastructure:

Adaptation
a. All development activities in FSM to take into account projected climatic changes in the design and implementation as stipulated in the FSM Strategic Development Plan/Infrastructure Development Plan (SDP/IDP); and
b. To use eco-system based approaches where applicable.

Technology Transfer
a. To optimize the use of local technologies where available.
b. To identify technology that is locally appropriate.
c. To enhance easy access to, and sustainable use of new technologies

Finance
a. To maximize the use of local resources through establishment of sustainable financing mechanism to support adaptation, mitigation and resource management initiatives.

The involvement of the key stakeholders in the technical teams, working committee and project steering committee will ensure compliance with policies, guidance and law. The monitoring of compliance to technical standards where applicable would be done at field level units by the Outer Island Project Working Committees for Yap, Chuuk and Pohnpei, and by the Kosrae Island Resource Management Authority (KIRMA). SPREP as RIE and OEEM as EE would monitor the adherence to the technical standards during its period field visits.

The following table (table 17) provides a summary of the key activities and the applicable standards that are applied by the relevant government department supporting the project.

Table 17 Key Activities

NO.	ACTIVITY	APPLICABLE STANDARDS	APPLICATION TO PROJECT BY
	Component 1		
1	Legislative framework and draft	Apply normal procedural standards in draft legislation and replicate lessons from Kosrae State Climate Change Act (refer to further description below)	Division of Litigation, Department of Justice

[49] Federated States of Micronesia State-Wide Assessment and Resource Strategy 2010-2015+. Undated. p. 10. http://www.wflccenter.org/islandforestry/fsm.pdf

NO.	ACTIVITY	APPLICABLE STANDARDS	APPLICATION TO PROJECT BY
2	State regulations for development projects	Apply normal procedural standards in draft legislation and replicate lessons from Kosrae State Regulations for Development Projects. (Refer to further description below)	Offices of the Attorney General Yap State, Chuuk State, Pohnpei State
	Component 2		
3	Rainwater harvesting systems	Minimum standards of the Rainwater Catchment Design And Installation Standards (ARCSA, 2009) State EPA Regulations Climate Adaptation Guide for Infrastructure 2014	Environment Protection Agency – Yap, Chuuk and Pohnpei States
4	Self-composting toilet programs constructed	Sustainable sanitation manual and guidelines for a waterless composting toilet (SPREP, 2007) State EPA Regulations Climate Adaptation Guide for Infrastructure 2014	Environment Protection Agency – Yap, Chuuk and Pohnpei States
	Component 3		
5	Construction of 3.6 miles of road to sub-standard level and transitional coastal protection	Design standards for Kosrae circumferential road extension project. Standards cover the road pavement design, and associated structures such as drainage, bridges, culverts and rock revetment for coastal protection – ADB 2005	Department of Transport, Communications & Infrastructure
		Refined coastal defence design guidelines and design criteria developed during associated activities related to the development of the original Kosrae Shoreline Management Plan in 1998-2000. *Manual on the use of rock in coastal and shoreline engineering* (CIRIA/CUR, 1991	Department of Transport, Communications & Infrastructure

NO.	ACTIVITY	APPLICABLE STANDARDS	APPLICATION TO PROJECT BY
		Engineering design standards: subsurface conditions, material specifications, cross section and standard dimensions and drainage and erosion – ADB 2011	Department of Transport, Communications & Infrastructure
		Non-engineering design standards: maintenance planning and early warning, land use planning, community-based ecosystems management – ADB 2011, KSG (KIRMA) 2015	Department of Transport, Communications & Infrastructure, Kosrae Island Resource Management Authority
		Climate Adaptation Guide for Infrastructure 2014	Department of Transport, Communications & Infrastructure
	Component 4		
	Key stakeholder participation	IDP strategic consideration of 'Involvement of States'	OEEM, State EPA and R&D offices, KIRMA
	Generation of evidence based learning	SNC Report adaptation recommendations, National Climate Change Policy suggested benefits	RIE, OEEM
	Sharing of learning	Government protocols for participation in learning sharing events	OEEM, State EPA offices, R&D office, KIRMA
	Development of knowledge products	Knowledge standards established by SPREP and other agencies	SPREP and OEEM

FSM does not have a formal building code. At present projects are generally designed in accordance with international codes, standards and guidelines, but with only limited account taken of the specific circumstances of FSM. Some guidelines have been developed for specific aspects including seismic and wind loading and are summarized in Climate Adaptation Guide for Infrastructure. FSM through the Department of Transport and Infrastructure, under the guidance of the IDP 2016-2025, plans to develop a National Building Code with State specific requirements where appropriate. The Code will be based on the International Building Code and other US based codes and standards, but will also take account of the requirements of FSM and incorporate existing state and national guidelines.

Without any national or state level rainwater catchment design and installation standards, the project will attempt to apply and meet minimum standards of the American Rainwater Catchment Systems Association (ARCSA) and the American Society of Plumbing Engineers (ASPE) based on its Rainwater Catchment Design and Installation Standards manual (ARCSA, 2009). The standard will be applied to new rainwater catchment installations, alterations,

additions, maintenance and repairs to existing installations. The standards are designed to assist engineers, designers, plumbers, builders, developers, local government and users in safely implementing a rainwater catchment system. The environmental norms (water quality) notified with regards to rainwater harvesting systems, will be in conformity with the pollution norms outlined under each state of the State Environmental Protection Agency regulations.

F Duplication of project

Describe if there is duplication of project / programme with other funding sources, if any.

The project target areas are not the focus of any other climate change adaptation initiatives. In fact, this is the first, focused effort to implement a climate change adaptation project based on identified priorities on the ground in these remote and vulnerable islands of Yap, Chuuk and Pohnpei. In Kosrae state, this will be the second time a project will be focused on climate-proofing roading infrastructure, but a first time on the southern and most vulnerable coastlines of Malem and Utwe. The first project was a pilot project, that was successfully demonstrated under the PACC project in the northern coastline of Tafunsak from 2009 – 2015[50].

This project would be the first one to explicitly focus on improving water security as an adaptation strategy in the selected outer islands of FSM. The protection and preservation of ecosystems (lagoon and mangrove areas) and reduction of incidences of water and vector-borne diseases are complementary adaptation measures of the project. It will complement on-going government programs that are being implemented to improve outer island water resource management, agricultural productivity and conservation of biodiversity. The project will take required measures to avoid potential fund duplication with other funding sources for similar activities. Some of the potential schemes/programmes of Government that have complimentary components are as follows:

PROJECT	OBJECTIVES	COMPLEMENTARITY	GEOGRAPHICAL COVERAGE / AGENCY
Micronesia Challenge (MC)	Sub-regional conservation initiative which enhances community resiliency by using traditional knowledge and ecosystem strategies to conserve vulnerable coastal land resources by 2020; goals are to effectively conserve at least 30% of near-shore resources and 20% of terrestrial resources.	Construction of inland road with a community-based ecosystem management focus to reduce climate change impacts on road and community infrastructure and contribute to conserving terrestrial resources (mangrove forests and swamps) from future flooding events as a results of climate-proofing designs of the inland roads. Reducing impact of wastewater runoff into mangrove and lagoon effectively conserving vulnerable outer island environments	FSM, Palau, CNMI, Marshall Islands / KIRMA, KCSO – Kosrae State

[50] See Technical Report No.18 https://www.sprep.org/pacc/publications/technical-reports

Micronesia Conservation Trust (MCT)	A charitable and irrevocable corporation organized to manage and provide funds for the accomplishment of the following mission: "to support biodiversity conservation and related sustainable development for the people of Micronesia by providing long term sustained funding."	Promoting community-based ecosystem management practices complementing coastal infrastructure development Promoting conservation of biodiversity in outer islands by changing common practices that pollute the surrounding environment and ground water resources	All States / KIRMA – Kosrae State EPA – Chuuk, Pohnpei States EPA, R&D – Yap State
Pacific Adaptation to Climate Change Project (PACC)	To enhance the capacity of the FSM to adapt to climate change and climate variability in coastal management Kosrae was chosen as pilot State focusing on coastal infrastructure	Replication of the PACC activity in Tafunsak – climate proofing coastal road by relocating and constructing inland road. Building capacity of communities and coastline to climate variability.	Kosrae State / KIRMA
International Climate Change Adaptation Initiative-Pacific Adaptation Strategy Assistance Program (ICCAI PASAP)	To enhance the capacity of partner country to assess key vulnerabilities and risks, formulate adaptation strategies and plans and mainstream adaptation into decision making. For FSM: adaptive strategies informed by best practice methods and improved knowledge: community participatory surveys conducted in Yap which included Ulithi and Fais Atolls; evidence-based field research conducted on drought and salt tolerant varieties of sweet potatoes and sweet taro in Dinay and Wugeem, Yap	Water harvesting and storage systems informed by best practices, methods and surveys. Ground truthing assessments based on rapid assessments of water resources in response to drought	All States / EPA in Yap, Chuuk and Pohnpei States
Geospatial Analysis for Food Security Adaptation	Trying to find suitable places to relocate the agricultural areas (particularly taro) with the help of geospatial analysis (GPS, remote sensing) and geographic information systems.	Repairing rainwater harvesting systems and installing community tanks for outer island communities. Watershed protection strategy to identify areas out of bounds for agriculture, residential and other developments	All States / EPA – Yap, Chuuk, Pohnpei KIRMA, KCSO – Kosrae
Pacific - Australia	Supporting the government	Establishing National Water	All States / OEEM

Climate Change Science and Adaptation Planning Program	of FSM develop improved climate change projections and adaptation planning activities. FSM and 14 other Pacific countries are part of this AUD$32 million project which builds on the foundation of the Pacific Climate Change Science Programme and the Pacific Adaptation Strategy Assistance Programme.	Outlook Program	
Implementing Sustainable Water Resources and Wastewater Management in Pacific Island Countries	The FSM's GEF Pacific IWRM Demonstration Project entitled "Ridge to Reef: Protecting Water Quality from Source to Sea" has strengthened national coordination in the water and sanitation sector and has enhanced community collaboration to improve water resource management. It has three main foci—(i) protected areas (improving existing ones and creating new ones), (ii) managing ecosystems outside protected areas, and (iii) improving agro ecosystems.	Develop and endorse National Water and Sanitation Policy Develop and implement national water outlook program Develop and implement national water sector investment plan Repair and construct water harvesting and storage systems at the outer island level Train and build capacity of national water task force and relevant stakeholders at the state level	Outer islands of Yap, Chuuk, Pohnpei States / R&D and EPA of each of the 3 states
Water and Environmental Research Institute of the Western Pacific (WERI)	Mission is to seek solutions through research, teaching and outreach programs, to issues and problems associated with the location, production, distribution and management of freshwater resources in Micronesia. Current projects and programs include watershed management program, rooftop rain catchment sizing, groundwater and aquifer research, atoll hydrologic modelling, water quality production and distribution, water resources management and GIS	Ground truthing assessments on water harvesting and storage systems	Outer islands of Yap, Chuuk, Pohnpei States / R&D and EPA of each of the 3 states
Global Climate	To support the governments	Develop and implement national	Outer islands of Yap,

Change Alliance: Pacific Small Island States	of nine Pacific smaller island states, including FSM, in their efforts to tackle the adverse effects of climate change.	water outlook program Develop and implement national water sector investment plan Repair and construct water harvesting and storage systems at the outer island level Train and build capacity of national water task force and relevant stakeholders at the state level	Chuuk, Pohnpei States / R&D and EPA of each of the 3 states
University of the South Pacific European Union Global Climate Change Alliance Project	To develop and strengthen the Pacific ACP countries' capacity to adapt to the impacts of climate change.	Ground truthing assessments on water harvesting and storage systems	Outer islands of Yap, Chuuk, Pohnpei States / R&D and EPA of each of the 3 states
Coping with Climate Change in the Pacific Island Region (CCCPIR)	Undertaking mainstreaming climate change, and integrated land and marine resource management at the national and local level. Addressed six components ranging from regional and national mainstreaming of climate change, implementation of adaptation activities on the ground, and climate change related to tourism, energy and education	Develop and endorse National Water and Sanitation Policy Train and build capacity of national water task force and relevant stakeholders at the state level Developing a Teacher's Guide on Climate Change at the state level	All States/ OEEM
Technical Assistance (TA) to FSM for Strengthening Infrastructure Planning and Implementation	support state utilities within the FSM) in executing infrastructure projects more effectively by having an agreed upon approach to systems and procedures for project planning, design, and management across the country; and build capacity in the Department of Transportation, Communications and Infrastructure (DTCI) to plan, design, and oversee project execution.	Design and construct the Malem-Utwe inland road Build capacity of DTI in implementing CCA projects	Kosrae State / OEEM, KIRMA, DTI
Second National Communications to	National obligation under the UNFCCC to produce status report on national	Implement water, sanitation and health adaptation activities in outer islands	All States / OEEM

the UNFCCC	climate change measures and priorities. FSM is using a consultative approach involving a range of stakeholders to produce this report.	Develop climate resilient infrastructure	
MAPCO2 Project	A MAPCO2 was deployed within the Chuuk Lagoon in November 2011. The goal of this joint effort is to establish a long term monitoring station in Micronesia as part of global ocean monitoring network system for coral reef areas.	Developing legislative framework to oversee enforcement of coastal and marine resource management, including protection of environment from development projects National Water Outlook Program	All States / OEEM
Pacific Islands Climate Education Partnership (PCEP)	Educates students and citizens across the Pacific about the urgency of climate change impacts in ways that exemplify modern science and honour indigenous cultures and environmental knowledge, so that students and citizens within the region will have the knowledge and skills to improve understandings of climate change and adapt to its impacts	Developing a Teacher's Guide on Climate Change at the state level	All States / OEEM, Department of Education
Unite for Climate Pacific Regional Integrated Sciences and Assessments (Pacific RISA)	To enhance Pacific Island communities' abilities to understand, plan for, and respond to a changing climate. Emphasizing the engagement of communities, governments, businesses, and scientists by translating scientific research into information and materials that are valuable for stakeholders in key sectors such as water resources. Climate focused water sector education and outreach is part of Pacific RISA's core mission	Ground truthing assessments carried out for water resources in the outer islands will contribute to water sector education and will be excellent for outreach activities in FSM Technical reports and other knowledge products developed from results of the project will contribute to information and materials valuable for future adaptation planning under water, health, sanitation and coastal zone management.	All states / OEEM
Schools of the Pacific Rainfall Climate Experiment	To increase awareness of the younger generations about global environmental	Developing a Teacher's Guide on Climate Change at the state level	All States / OEEM, Department of Education

(SPaRCE)	issues, such as climate change, with hands-on experience by involving them in the collection of rainfall data.		
Climate Adaptation, Disaster Risk Reduction and Education (CADRE)	Aims to build resilience of vulnerable communities to natural hazards particularly those that are climate induced.	Developing a Teacher's Guide on Climate Change at the state level Ground truthing assessments carried out for water resources in the outer islands will contribute to water sector education and will be excellent for outreach activities in FSM Technical reports and other knowledge products developed from results of the project will contribute to information and materials valuable for future adaptation planning under water, health, sanitation and coastal zone management.	All States / OEEM, Department of Education
U.S. Peace Corps Small Project Assistance (SPA) for Adaptation	Reaching out to remote communities by supporting the following efforts of Peace Corps volunteers: (1) development of youth camps that promote environmental awareness, knowledge and skills among the youth to become responsible natural resource stewards; (2) trainings that support community adaptation to climate change and build capacity for disaster risk reduction (DRR); and (3) small-scale community projects that can demonstrate application of climate change and DRR principles	Implementing water harvesting and storage systems program in the outer islands Installing / constructing self-composting toilets in outer / remote island environments, applying climate change and DRR principles	All States / EPA, R&D, KIRMA
Coastal Community Adaptation Project (C-CAP), 2013-2017	To build the resiliency of vulnerable coastal communities in the Pacific region to withstand more intense and frequent weather events and ecosystem degradation in the short-term, and sea level rise in the long-term.	Inland Road Relocation Initiative program Building capacity of landless to access land upland , and access to finance to assist with relocation Constructing inland road away from low and exposed coastal roads degraded from impacts of sea level rise	Kosrae State / KIRMA
Pacific Catastrophe	To provide the Pacific	Developing the Water Outlook	All States / OEEM

Risk Assessment and Financing Initiative (PCRAFI)	Island Countries (PICs) with disaster risk modeling and assessment tools to help them better understand, model, and assess their exposure to natural disasters, and to engage in a dialogue on integrated financial solutions for the reduction of PICs financial vulnerability to natural disasters and to climate change.	Program. Application of adaptation planning models and tools that include EIA, CBA, MEF, V&A assessment tool, mainstreaming, gender and climate change tools GIS spatial mapping exercise Implementing Participatory 3 Dimension mapping exercise as a consultation tool	

Box 3 Climate proofing Kosrae's coastal road

Kosrae, one of the four States comprising the Federated States of Micronesia (FSM), was selected to host the country's PACC project. Kosrae has a population of 6,616 (2010 census), and more than 75% of the island's people and infrastructure are located in the coastal zone. The demonstration project focused on improving a section of Kosrae's coastal road, which is the main transport route on the island.

The project identified a 7 km section of the road in the Tafunsak municipality which was being progressively damaged by flooding from heavy rains and high tides. The original road had been designed to withstand a maximum hourly rainfall of 178 mm. Analysis of climate and sea level data, and projections to 2050, concluded that the road should be redesigned to withstand maximum hourly rainfall of 254 mm.

Following a socio-economic assessment, community consultations, and input from expert coastal engineers, the road was redesigned and rebuilt to withstand the anticipated heavier rainfall and higher sea levels. Adaptations included raising parts of the road by up to one and a half meters, fitting larger culverts, and improving drainage. The improved road was officially opened in May 2014. The PACC team is now developing guidelines to share their experiences with climate proofing the road, which will help others to replicate this success.

Also under the PACC project, a tide gauge and rainfall gauges were installed on Kosrae in 2011 to improve availability and quality of local climate and sea level data. These will also feed into climate-sensitive decision making and development for the state.

The project team has also been promoting the mainstreaming of climate risk into all development in the state and the country. The team supported development of the Kosrae State Climate Change Act, which was endorsed in 2011; and amendments to Kosrae's Regulations for Development, which now require all development projects to consider the potential impacts of climate change. The team also contributed to the recently revised Kosrae Shoreline Management Plan, which provides a comprehensive strategy for building resilience of Kosrae's coastal communities and infrastructure into the future.

The project is to field test the above lessons of the PACC to create models which could be replicated and up-scaled through a similar program such as the Inland Road Relocation Initiative of Kosrae.

For more information on the FSM PACC project, please visit the project webpage: https://www.sprep.org/pacc/fsm

G Learning & KM

If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.

The project proposes a dedicated component aimed at improving knowledge management and develop capacity at all levels of development intervention (individual, island, municipal, state and national). Component 4 will provide a systematic approach at the country level, to improving understanding on climate change impacts on water and coastal zones. In doing so, the goal here is to enhance and activate participation of key stakeholders to address the risks and challenges of climate change in the coastal sector in a holistic manner.

The project, through its management units at the national and state levels will each develop a project-based Knowledge Management and Communication Strategy that will guide the implementation of its work in capturing and disseminating lessons learned of the project. It will act as a media outreach strategy. It will be the overall guide to facilitating, monitoring and evaluating all knowledge, communication and learning works of the project. Each state will develop an action plan matrix that help guide and report against the work of the strategy. Each municipal and outer island community will also develop a similar action plan matrix, and will form part of the Community Plans under a knowledge and communications strategy component.

An action plan matrix will outline clear learning objectives, the desired learning, knowledge and communication outcomes, target audience, key messages for each communication outcome, knowledge product and knowledge sharing tools, and indicators. The strategy and action plan matrix will mirror the Communication Plan developed under the PACC project for FSM.

The key areas of learning and knowledge generation, its documentation and sharing would be as follows:

1. Legislation and regulations assessment on coastal and marine resources management at national and state levels in FSM
2. Water harvesting and storage infrastructures and capacity in outer islands, FSM
3. Water quality maintenance relative to water resources in outer islands – wells and tanks
4. Water quantity relative to water harvesting systems in outer islands
5. Success of reducing vector and water-borne diseases from changes in water and sanitation practices in outer islands, FSM
6. Willingness to relocate and its linkages to access to land and finance and provision of utility services (inland road, water mains, telecommunications, power)

The knowledge products that will be developed by the project include:

1. Legislation paper to guide regulation of marine and resource management
2. Policy and guidance documents on regulations for development projects
3. National Water and Sanitation Policy
4. National Water Outlook Program
5. Water Sector Investment Plan
6. Community Development (Climate Change Adaptation) Plan for Eauripik Atoll
6. Community Development (Climate Change Adaptation) Plan for Woleai Atoll
7. Community Development (Climate Change Adaptation) Plan for Satawan Atoll
8. Community Development (Climate Change Adaptation) Plan for Nukuoro Atoll
9. Community Development (Climate Change Adaptation) Plan for Kapingamarangi Atoll

10. Operations and maintenance guide for rainwater harvesting and storage systems in the outer islands, FSM
11. Sustainable sanitation manual and construction guidelines for self-composting toilets in the outer islands, FSM
12. Operations and maintenance guide for self-composting toilets in outer islands, FSM
13. Climate resilient water conservation and management practices in low-lying atoll island environments, FSM
14. Teacher's Guide on Climate Change, FSM
15. Climate resilient design guidelines for inland road and access routes on a volcanic island, Kosrae FSM Case study
16. Community-based ecosystems management guidelines for upland forested areas, Kosrae, FSM
17. Land registry, Kosrae, FSM
18. State support program on access to finance for vulnerable households
19. Training Manual for Carpenters and Plumbers on Installing, Repairing, Cleaning and Maintenance of Community Water Tanks, and Household Water Tanks and Wells
20. Training Manual on Construction, Operations and Maintenance of self-composting toilets in outer islands, FMS
21. Awareness materials on climate change and water
22. Awareness materials on climate change and coastal management
23. Awareness materials on climate change, legislation and regulations

The project's knowledge management systems will adapt what previous projects have carried out under the PACC project and elsewhere. It will utilize technology-based systems through setting up of blog spots (popular in FSM projects and programmes) on internet, website, and library linkages through EE and RIE (SPREP) networks. It will also use Facebook, Twitter and other forms of social media to link and share its success stories and knowledge products. The few knowledge products outlined in the list above will be peer-reviewed and published and assigned ISSN and ISBN codes so that it can be shared globally. Throughout the project, the learning and knowledge sharing will be through interactive seminars, workshops, conferences in many climate change programs internally in FSM, in the region through SPREP and other regional agencies, as well as internationally through FSM's reporting obligations (National Communications to the UNFCCC).

This project would focus on developing materials and information that requires capturing, review and share lessons learned and best practices applies – output 4.2. The products that are translated into both English and the local dialect and native language which consider the cultural diversity of the target islands of the project will include science, traditional knowledge and educational materials such as brochures, booklets, technical reports that capture data and information that inform policy and management plans at the island and community levels. The lessons from the development of knowledge management products of other projects will be considered. For example the PACC Technical and Experience Series developed to capture the adaptation demonstration process of various adaptation projects, in the very key areas that this project is focusing on least of which is coastal zone management.

The training of stakeholders will include module-based trainings on important social capacity building skills such as gender and climate change tools. The department of social affairs will be working closely with EPA / KIRMA to carry out refresher trainings on gender perspective in coastal management and coastal monitoring. This comes as a result of existing technical training guides and modules that the project will utilise, for example the Pacific Gender and Climate Change Toolkit, developed by regional agencies and with assistance of the PACC

project and are now available online through the climate change portal (www.pacificclimatechange.net).

Complementary products will be developed to capture processes of implementation of the projects. Documentaries, rradio and TV programmes, leaflets and posters will target the public with special attention to audio-visual presentations in DVDs using English and local languages. The project will strengthen existing agency website already established with links targeting development professionals, teachers and schools at state level and including outer island communities. Peer-to-peer exchange of knowledge through web-based platforms such as Pacific Environment Information Network, the Micronesian Challenge Trust, the Pacific Climate Change Portal; the Adaptation Learning Mechanism will be encouraged to be used to share information and also promote project findings within the country.

An exchange visit amongst islanders within the island communities will be part of the learning program of the project. It will encourage members of other outer island communities amongst the three states under the water component for example to (where travel arrangement permit) visit the programmes work sites and observe the technologies used. For example, this will be part of the extension services work in the country and will stimulate learning and sharing of practices.

H. Consultation Process

Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The stakeholders of the project include local community, traditional community leaders, municipal government council, NGOs; research institutions such as the College of Extension Services of Micronesia; women's council; sub-regional organizations such as the Micronesian Challenge and International Organization for Migration, and government agencies such as the departments of Environment (EPA), Office for Internal Affairs, Planning & Budget, Resources & Development, Youth and Social Affairs, Transport & Infrastructure and Communications.

The stakeholders identified and consulted include the following:

Table 18 Stakeholders consulted

STATE	COMMUNITY	GOVERNMENT	NGOS, IGOS
Yap State	- Village community – Woleai, Eauripik - Council of Pilung (Yap Proper) chief leaders - Council of Tamol (Outer islands) chief leaders	- Office of Internal Affairs (OIA) - Fishing Authority (FA) - Office of Planning & Budget (OPB) - Environment Protection Agency (EPA) - Department of Agriculture & Forestry (DAF) - Resources & Development (R&D)	- International Organization for Migration (IOM)
Chuuk State	- Satawan community (Women, men) - Lukunor community (Women,	- DAF - EPA	- Chuuk Women's Council

	men)	- ODA - R&D - College of Micronesia (COM) - College Extension Services (CES-COM) - College Research Extension (CRE-COM)	- IOM
Pohnpei State	- Traditional leaders Nukuoro - Women leaders Kapingamarangi - Chief leader Pingelap atoll - Church minister	- CES-COM - CRE-COM - Department of Lands and Natural Resources (LNR) - Department of Transport and Infrastructure (DTI) - FSM Youth and Social Affairs - DAF - Conservation Society of Pohnpei (CSP) - Office of Emergency and Environment Management (OEEM) - Pingelap atoll conservation	- IOM - Micronesian Challenge (MC) - Red Cross Society
Kosrae State	- Malem Community (Elderly, Women, Men, Youth) - Utwe Community - Farmers - Landowners - Fisherman - Council Chairman - Bankers - Food Inspectors	- KIRMA - DREA - Kosrae Land Court - Kosrae Governor's Office - Senator - DTI - DAF - Dept. Health Services - Dept. Environment - Kosrae Utilities Authority - ODA	- Micronesian Challenge Trust – Kosrae Office - Kosrae Conservation Society Organization - COM - IMO - MCT
National government and high level officials	- Vice President of the Federated States of Micronesia - Secretary (Minister) of the Department of Foreign Affairs, serving as NDA of AF - Secretary of Finance - Secretary of Resources and Development - Secretary of Overseas Development Assistance - Governor and Lieutenant Governors of Yap, Chuuk, Pohnpei and Kosrae - Traditional Leaders and Mayors of Malem, Utwe, Woleai, Eauripik, Satawan, Lukunor, Kapingamarangi and Nukuoro - United States Embassy of FSM		

The details of the consultations with stakeholders are described below. There were five sets of consultative meetings with all stakeholders including community, government and NGOs. As shown in table 19 below, the first set of consultative meetings (July 2015) was to re affirm the adaptation priorities of the project from the communities and government against their development plans and priorities to address climate change in the specific sites. These priorities were identified by the state governments during the concept planning stage in 2013 and 2014. The second consultative meeting (November 2015) was to work with the national

and Kosrae state government in securing a development partner to assist in the construction of the Malem-Utwe inland road and access roads.

The third consultative meeting (November 2015) was with the Kosrae state government and community in establishing an Inland Road Relocation Initiative (IRRI) adaptation strategy. The objectives of this meeting were twofold: firstly, examining the methodology, results and findings of the completed cost-benefit analysis (CBA) study for the Malem to Utwe inland road component (Annex 6), and secondly developing a Monitoring and Evaluation Framework (MEF) for the project to reduce climate risks faced by the Malem and Utwe communities (Annex 5). The results of the consultation contributed to the strategic results framework elements of component 1, 3 and 4.

The fourth set of consultative meetings (January – February 2016) was a repeat of the MEF objective of the meeting in Kosrae, but for Yap, Chuuk and Pohnpei states addressing water resource management, food security and marine resource management as priorities for adaptation in the outer islands of the states. As a result, three more MEFs were developed which contributed to strategic results framework for component 2. All the findings of the consultative and follow up meetings contributed to framing the strategic results for components 1, 3 and 4.

The fifth consultative meeting (May 2016) was part of the environment impact assessment for Kosrae given the potential for risks proposed for the construction of the inland road. The consultations were carried out for both Malem and Utwe communities.

Two sets of follow-up visits and one partnership and due diligence meeting was carried out from November-December 2015, January-February 2106 and June 2016 respectively. These visits included high level government officials such as the Vice President of FSM, Secretary (Minister) and officials of the Office of Overseas Development Assistance, Resources & Development, Finance and Department of Foreign Affairs serving as the National Designated Authority of the Adaptation Fund for FSM,. Special attention was paid to Kosrae given the potential risks of the activities under Component 3. As such, follow up meetings with Kosrae included high level state government representatives that included the Governor, Lieutenant Governor, Cabinet members, Speaker and Legislature, Attorney General, the Infrastructure Planning and Implementation Committee (IPIC); and mayors and traditional leaders of Malem and Utwe communities. The follow up visits in Pohnpei also included the United States Embassy to FSM and the College of Micronesia.

Table 19 Key Meetings and Findings

MEETING	DATES	CONSULTED	KEY FINDINGS
Consultative Meeting 1.1	22 June 2015	Pohnpei stakeholders	- Re-affirming community support of project priorities - Ranking of priorities of the project - Role of community, island governing council and representatives on island proper (main island) - Coordination mechanism of the department with other

			government departments and NGOS/IGOs
Consultative Meeting 1.2	24 June 2015	Chuuk stakeholders	- Community confirmation of project priorities - Ranking of priorities of the project by the community - Role of community, island governing council and representatives on island proper (main island) - Coordination mechanism of the department with other government departments and NGOS/IGOs
Consultative Meeting 1.3	25 Jun 2015	Yap stakeholders	- Community confirmation of project priorities - Ranking of priorities of the project by the community - Role of community, island governing council and representatives on island proper (main island) - Coordination mechanism of the department with other government departments and NGOS/IGOs
Consultative Meeting 1.4	6 July 2015	Kosrae stakeholders	- Community confirmation of project priorities - Ranking of priorities of the project by the community - Role of community, island governing council and representatives on island proper (main island) - Coordination mechanism of the department with other government departments and NGOS/IGOs
Consultative Meeting 2	16-19 November 2015, Palikir, Pohnpei, Colonia, Pohnpei	Vice President, Secretary Department of Foreign Affairs, Secretary Overseas Development Assistance,	- Update Infrastructure Development Plan for Kosrae State and FSM - Plan for FSM Development Partner's Forum meeting in March 2016 to secure donor support to co-finance and construct the Malem-Utwe

		Secretary Ministry of Finance Governor Pohnpei Lieutenant Governor Pohnpei Director, EPA Pohnpei	road\ - Coordination and collaboration mechanisms between national and state levels
Follow up Meeting 1.1	23 November 2015 Kosrae State	Governor, Lt. Governor Kosrae Infrastructure Planning and Implementation Committee, Speaker of the Legislature Mayor of Malem Municipal Government Director DTI, Engineers DTI Director KIRMA and KIRMA Permitting Unit	- Updated Infrastructure Development Plan for Kosrae State - Reviewed Malem-Utwe inland road within the priority listing of the IPIC list as one of two high infrastructure priorities of the state requiring immediate implementation - Review of CBA results, costings and benefits of the Malem - Utwe inland - Identified potential risks of the Malem-Utwe inland road and agreed to carry out an Environmental Impact Assessment (EIA)
Consultative Meeting 3	24-26 November 2015, Kosrae State	Kosrae State Government, NGO, IGO stakeholders	- Improved the accuracy and usefulness of the cost benefit analysis - Developed the IRRI program - Formulated 'logic model' and developed monitoring and evaluation framework of the IRRI program
Follow-up Meeting 1.2	27 November 2015, Kosrae State	Mayor of Malem Municipal Government Director DTI, Engineers DTI Director KIRMA and KIRMA Permitting Unit	- Legislature approval of Malem-Utwe inland road as one of two high infrastructure priorities of the state - Review of CBA results, costings following consultation meeting with Kosrae stakeholders (consultative meeting 3) - Developed Terms of Reference for EIA

Follow Up Meeting 1.3	30 November – 3 December 2015, Pohnpei State	Vice President, Ministry of Finance, Department of Foreign Affairs, ODA, OEEM, Secretary Resources & Development, United States Embassy Secretariat of the Pacific Community (SPC) Deputy Director General	- Considered the Government of China as a potential donor to co-finance and construct the Malem-Utwe road - Coordination and collaboration mechanisms between national and state levels - Coordination between national, state and US Compact activities related to infrastructure priorities of states - Briefed potential collaboration with SPC sector related projects on food security, water resource management in outer islands, marine resource management (Marine Protected Areas, Fish Aggregating Devices)
Follow Up Meeting 1.3	30 November – 3 December 2015, Pohnpei State	Vice President, Ministry of Finance, Department of Foreign Affairs, ODA, OEEM, Secretary Resources & Development, United States Embassy Secretariat of the Pacific Community (SPC) Deputy Director General	- Considered the Government of China as a potential donor to co-finance and construct the Malem-Utwe road - Coordination and collaboration mechanisms between national and state levels - Coordination between national, state and US Compact activities related to infrastructure priorities of states - Briefed potential collaboration with SPC sector related projects on food security, water resource management in outer islands, marine resource management (Marine Protected Areas, Fish Aggregating Devices)
Follow Up Meeting 1.4	3 December 2015, Pohnpei State	College of Micronesia (COM) College Extension Services (CES-	- Training of Agriculture Extension Officers for outer islands - Potential outer island

		COM) College Research Extension (CRE-COM)	activities on Food Security activities - Raised taro patches technology for outer islands - Coordination and collaboration with Food Security related projects
Consultative Meeting 4.1	20-22 January 2016	Yap stakeholders	- Trained government and community stakeholders on logic model and development of the Monitoring & Evaluation Framework - Re-confirmed community priorities for the outer islands - Formulated 'logic model' and developed the MEF for water security, marine resource management and food security priorities - Identified no potential social, economic and environmental risks to any of the activities of the project
Consultative Meeting 4.2	26-28 January 2016	Chuuk stakeholders	- Trained government and community stakeholders on logic model and development of the Monitoring & Evaluation Framework - Re-confirmed community priorities for the outer islands - Formulated 'logic model' and developed the MEF for water security, marine resource management and food security priorities - Identified no potential social, economic and environmental risks to any of the activities of the project
Consultative Meeting 4.3	1-3 February 2016	Pohnpei stakeholders	- Trained government and community stakeholders on logic model and development of the Monitoring & Evaluation Framework - Re-confirmed community priorities for the outer islands

			- Formulated 'logic model' and developed the MEF for water security, marine resource management and food security priorities - Identified no potential social, economic and environmental risks to any of the activities of the project
Follow Up Meeting 2.1	3 February 2016	Vice President FSM, ODA, R&D, MOF, OEEM, DFA	- Brief update of the proposal - Further discussions with Government of China' support for co-finance and construction of the road to the tune of $5m USD in technical assistance - Confirmed support for a environmental impact assessment required for the project.
Consultative Meeting 5	23-27 May 2016	Malem and Utwe communities of Kosrae – via the EIA process	- Concerns were raised by the Utwe community over alternative road alignments through the Kuplu Wan plateau resulting in potential contamination of their water supply which is sourced from the Palusrik catchment due to: - 1. The location of the road and construction resulting in increased sediments or other contaminants entering the Palusrik River and the Utwe water supply. - 2. The improved access to the Kuplu Wan area created by the road subsequently leading to increased development in the Kuplu Wan area, including land clearing, septic tanks, pig pens etc., resulting in increased potential for contamination of the Utwe water supply. - The alignment of the road

			through the southern part of the Kuplu Wan plateau (Palusrik catchment) has been re-aligned to ease community concerns on potential impacts on Utwe village's water supply. This results in a minimum buffer of 150 m at the watershed between the two catchments and over 350 m for the majority of the section of inland road within the Palusrik catchment. Given the distance to the Palusrik River, the only perennial stream in the catchment and the characteristics of the likely catchment drainage pathways, there is unlikely to be any impact from the construction or operation of the road itself on Utwe's water supply.
Follow Up Meeting 3.1	20 June 2016	Vice President FSM, DFA, ODA, OEEM; US Embassy	- Brief update of the proposal – appraisal stage - Letter confirming co-financing support pursued by national government at the November 2016 FSM Development Partner's Forum Meeting
Follow Up Meeting 3.2 – SPREP Appraisal phase	21 June 2016	Lieutenant Governor Cabinet members IPIC Mayors of Malem and Utwe and Municipal Government representatives Malem Community, landowners	- Brief update of the proposal - Support to development of the proposal to SPREP provided by the USAID USADAPT Asia-Pacific Project - National government acknowledgement of endorsement by Kosrae State of the Malem-Utwe road under the AF proposal as one of the top two priorities of infrastructure requiring immediate support for implementation - Re-affirmation of the priorities of the project by the

			Utwe Municipal government, women, men, elders and youth of the community of Malem
Follow Up Meeting 3.3	22 June 2016	Director and staff, KIRMA Director and staff, DTI IPIC and ODA Utwe Community and landowners	- Brief update of the proposal - Support to development of the proposal to SPREP provided by the USAID USADAPT Asia-Pacific Project - IPIC, ODA acknowledgement of endorsement by Kosrae State of the Malem-Utwe road under the AF proposal as one of the top two priorities of infrastructure requiring immediate support for implementation - Re-affirmation of the priorities of the project by the Utwe Municipal government, women, men, elders, youth, landowners of the community of Utwe
7Site Visit	23 June 2016	Malem-Yeseng-Utwe inland road, access routes, ADB Utwe Water Reservoir, Kuplu Wan plateau where road will access, coastal points Paal and Mosral, settlement areas, upland areas	- Visited Palusrik catchment in Utwe municipality - Visited inland roads that are accessible of the Malem-Utwe inland road stretch, including Kuplu Wan plateau - Visited all access routes coastal-inland - Visited PACC Tafunsak climate-proof road

I Justification for funding

Provide justification for funding requested, focusing on the full cost of adaptation reasoning.

The design of the four components is largely influenced by results of the consultative and follow-up visits as outlined in Section II.H of the proposal.

Component 1. Strengthening policy and institutional capacity for integrated coastal and water management at national and state levels

Baseline Scenario
The 2009 national climate change policy exists at the national level and only one state – Kosrae - has strengthened its state legal and regulatory policies. This was possible under the PACC project and it became successful as it is now guiding and regulating development projects of the State. The Okat Bridge in Kosrae ($12.7 million in FY2014) was the first development project to have applied the regulation.

FSM has been carrying out coastal zone protection and enforcement of existing regulations largely through EPA (and KIRMA for Kosrae). The regulations are, however, based on scope and frameworks of EPA United States of America, many of which are not applicable or the resources required by the island to effect these regulations are not realistic.

There are initiatives that are carried out in isolation and 'in-silos' that require a concerted effort from a project of all of FSM. For example, the ecological surveys and monitoring activities in Yap State only will have benefited if there were enough resources to monitor and implement any actions identified, in particular, with coastal marine resource management program for the fishing population on the island.

Where initiatives exist to protect the island coasts including low-lying atoll islands, these are carried out relatively through an individual approach. There is less or no concerted effort to identify and demonstrate activities that are done in an integrated fashion.

Yap, Chuuk and Pohnpei currently do not have state-level policy frameworks, let alone legal and regulatory instruments that have climate risks incorporated, enforced or monitored. As a result, development in these three states, in particular construction and infrastructure related, 95% of which are along the coastal and urban areas are carried out through a business-as-usual approach development.

The current generation's experiences with their water, coastal and marine resources have been voiced at community consultations of the project. There are no management plans at the island community levels to assist in managing these natural resources, against threats of climate change. There are community calls and recent scientific studies that have concluded the urgent need for water and coastal management plans if good quality drinking water, coral reefs, fishes are to provide any support for food security for the outer islands.

Review and assessments of legal and regulatory frameworks and instruments is needed by the government and states in order to position it strongly to implement mainstreaming of climate risks into its sector development programs.

Adaptation Alternative
The project is planning to develop a national legislative draft, regulations for development projects for Yap, Chuuk and Pohnpei as a lesson learned from Kosrae under its PACC project. It will develop a legislation draft and policy paper to strengthen the concerted effort to manage coastal and water resources as a whole of country response to climate change. This is budgeted at $325,000 USD

The project will develop a National Water and Sanitation Policy, and implement two components of the policy. These are the National Water Outlook and Water Sector Investment Plans. The development and implementation of these two components of the policy will be integrated with and inform the demonstration activities of the outer islands in Component 2 and altogether,

budgeted at $442,642 USD. The lessons learned and best practices from activities in Component 2 will inform and improve the policy. All these activities will incur high costs because of the extensive consultation meetings and logistical and procurement costs involved due to the vast distance and isolation of the four states, and the time required to carry out, development, consolidate, produce and implement the two components of the plans.

The total cost for delivering legislation and regulation changes, as well as providing the tools, scope and frameworks to deliver effective management of coastal, marine and water resources is budgeted at $767,642 USD.

Component 2 – Demonstration of water security measures in outer islands of Yap, Chuuk and Pohnpei

Baseline Scenario

Of the six outer islands, only Kapingamarangi atoll of Pohnpei attempts to address climate change adaptation in its community development plan. A portable water reservoir system is the number one climate change adaptation priority activity for Kapingamarangi according to its 'Utamadua Development Plan' 2015. This is followed by shoreline erosion prevention, food security and natural disaster preparation.

All of the six outer islands have rainwater harvesting systems but are either no longer in use, in poor condition, cannot be maintained or harbour harmful pathogens that carry vector and water-borne diseases. Within one month of drought, the communities resort to drinking coconut juices to quench their thirst. Stagnant water in water tanks and saline water from wells are used for washing and cooking. Women and youth are required to fetch for water from neighbours or travel long distances to fetch water from dry and salinated wells. Rainwater harvesting systems often do not have spare parts available on island to assist with maintenance. Concrete tanks and cisterns are no longer supported by the communities as a feasible option to store water. It is difficult or useless to maintain and takes up valuable space on island that becomes useless for any development.

The six islands either have bush, pit, VIP, water seal, flush / septic or no toilets at all. The islands that do not have any toilet facilities use the lagoon or the ocean side beaches. The safety and health concerns on both the environment (lagoon side beaches, mangrove areas, terrestrial ecosystems) and people (hepatitis, polio, salmonella, e-coli, giardia, round worms, whip worms, etc.) are therefore a high concern with the Ministry of Health for these outer islands. In times of drought and other climate change impacts, these negative health and sanitary effects have been exacerbated. Other toilets that require water puts pressure on individual family-owned water tanks and therefore compete with washing, cooking and other needs.

Adaptation alternative

Investing in repairing of existing household and private rainwater harvesting systems by providing equipment, training and establishing maintenance support plans and educating all members of the community will assist in expanding and maintaining good supply of drinking water that will prove useful during drought periods. This was the highest recommendation from the recent rapid assessment of water resources in the outer islands of Yap following the drought experienced as a result of the 2015/16 El Nino. The project will, at the same time, review and recommend installation of a minimum of 2 community tanks at 10,000L capacity to serve a minimum of 100 people population. This will provide enough potable water to also cater and meet not only the minimum threshold of water per capita for survival (30L/capita/day) but also

able to water plants, crops and feed livestock (70L/capita/day). At the household level, the project will ensure through its ground-truthing assessment that repair and installation will allow for a minimum of two storage tanks. This will assist with interchangeable maintenance schedules. Where one tank is emptied and maintenance carried out, the other tank is being used. The same approach will be applied for community tanks.

Saving water and promoting health and sanitation habits is an adaptation strategy that the project will apply at the individual and household level that is very much required and will become useful when impacts of climate change are at its worse. The project will target the younger generation to build this habit and impact behavioural change. As such, the installation of self-composting toilets aims to promote water conservation, improve health and sanitation, as well as improve the island environment, through a significant reduction in pollution of the water ways and reefs. It will demonstrate the construction of self-composting toilets at schools and other community infrastructure such as community halls or church buildings.

The six target islands of the three states are distant from the main islands where the key government and central business district is located. Logistics and procurement activities will cost the project significantly, in areas such as transportation and communications and time. The consultations, and ground truthing social and environment assessments will take time and will require expert involvement to identify and demonstrate adaptive agriculture crops, water harvesting, and coastal marine resources management practices. Over the duration of the project, it is expected to incur costs totalling $2,479,226 USD.

Component 3 – Demonstration of Kosrae Inland Road Relocation Initiative

Baseline Scenario
A full review of the Kosrae coastline has been carried out. The review has led to the development of the Kosrae Shoreline Management Plan 2014 which has since been endorsed by the Governor of the State.

A number of priority interventions were identified and, in following up for upscaling of the PACC project results, all stakeholders (communities, government, NGOs, etc.) agreed to the priority intervention measures of the PACC project be implemented.

Adaptation Alternative
The people of Malem and Utwe community have clearly outlined, reiterated and repeated themselves in saying for the need to implement the priorities identified in the KSMP 2014. The communities and government had identified five key outputs to be implemented to achieve the alternative of relocating the coastal road inland. After a series of community and government consultations spanning two years, the construction of the 3.6 mile (5.8km) Malem-Utwe inland road and access road routes is to be carried out in two phases as agreed by all stakeholders.

The first phase it to construct to substrate base standard road, and the second phase is sealing of the road. A series of surveys, design and construction will be implemented by the project in close collaboration of government and community stakeholders. The activity will cost the project a total of $3,005,474 USD to be implemented over the course of three to five years. While the increase in sea level rise will mean destructive storm surges in Mosral and Paal in the immediate term and throughout the next five years, the project will upgrade the protection of these vulnerable points of the existing coastal road. This important alternative activity will cost $315,000 USD.

Kosrae requires a proactive enabling environment that will support the community and people in accessing land and finance to assist relocation in the immediate to long-term. This will be carried out by the project, contributing to the adaptation objective to move to safe grounds in view of accelerating sea level rise and its related effects. The state support programs to access land and access finance for vulnerable households will be carried out. Training and awareness of conservation practices and sustainable practices for the communities is equally important as the ecosystem and surrounding environment will need to be protected, monitored and sustainably managed. Together, the total cost is $200,000 USD and altogether, Kosrae's IRRI program will cost the project $3,520,474 USD.

Component 4 – Knowledge management for improved water and coastal protection

Baseline Scenario

All States of FSM have projects that provide lessons and information only for the project and is largely for visibility of the project during the time of the project. There is no programmatic approach and institutional and systemic capacity program that ensures climate change information continues to be made available and produced for the benefit of the communities and state in water and coastal zone management areas.

Yap, Chuuk and Pohnpei have programs and schemes that promote water conservation but is business as usual and do not have climate change clearly incorporated. Some outer islands, for example, Kapingamarangi have their own community development plans. These address economic and social development, and political reform. Climate Change adaptation, however, is only addressed under the economic development section. Climate change is not seen in a holistic manner in these development plans.

Kosrae State have, during the conceptualising and planning stages of this project, decided on the importance of addressing climate risks in infrastructure plans and community development plans.

All islands have resources in English and less in the local context. Traditional knowledge is also not equally captured as the science and social science of the impacts of climate change.

The mainstreaming of climate change in national and state curricula is carried out voluntarily and there are no specific and targeted materials that will improve climate education amongst the young and future generations of FSM.

Capacity development in terms of training personnel in key sectors of society and the economy on climate change is addressed largely at the project level. There is no programmatic approach to building capacity within the water and coastal sector with the exception of Kosrae for the latter development sector.

There is a technology framework that has already been developed and assisted to by regional partners of FSM. For example SPREP developed a knowledge management online database through the Pacific climate change portal (https://www.pacificclimatechange.net). These will be used to store and capture information developed and collected by the project.

Adaptation Alternative

The project will address the institutional, individual and systemic capacities of key stakeholders (governments, NGOs, communities) to be able to develop, capture and disseminate learning and knowledge from the project outputs.

Systemically, the project will invest in climate resilient municipality development plans that will address sustainability in responding to climate change during and beyond the life of the project. It will consult, solicit and collate views of all stakeholders under each plan. The plans will be linked to outer island plans and outer island development goals of sector plans owned by the state. The project will ensure linkages of these community development plans to state plans relative to water and or coastal and marine management. It will ensure that community development plans link its goals to those of the water and sanitation policy, regulations for development project and other relevant legislation and regulatory frameworks that address climate change. It will link the plans to the national climate change policy. It will set realistic goals that are achievable with support of development partners and secure political will and commitment of local municipality, state and national governments. This activity will cost $205,332 USD addressing all eight municipality communities of the project.

The project will capture lessons learned and best practices at the legislation, regulatory and governance levels. It will capture and share knowledge management products that capture demonstration practices of water and livelihood security measures, as well as inland road relocation initiatives. The products will be shared and disseminated amongst local, state, national, sub-regional and regional levels. The products will be tailored to local context, translated, published and shared amongst various stakeholders. This will allow usability amongst a wide range of audience in the FSM and the Pacific. The development and distribution of resource materials will be budgeted at $238,943 USD under the project.

Stakeholders from each of the states will come together to share, learn and exchange knowledge and skills on climate change, adaptation planning, monitoring, vulnerability assessments and climate change. Institutional and individual capacity will be built via a number of trainings, lessons and learning workshops of the project. The knowledge and skills built from these workshops will engage the national, state and local teams deliver on the adaptation activities of the project. Exchange visits to sites will be a key part of building knowledge and sharing it as quick as possible. These will allow exposure to methods, tools, hands-on learning of the various coastal management techniques that are available and being trialled at the different island environments of the project. The project will focus on enhancing two-way communication between scientists and traditional knowledge holders, educating the modern scientists and appreciating knowledge of the indigenous beneficiaries in natural resource management in the outer islands. The sustainability, relevance, effectiveness and efficiency of the project will rely on a large part to this component that will complete the bottoms-up and top-down approach of the project. This share, learning and exchange of knowledge activities are budgeted at $295,296 USD.

J: Sustainability

Describe how the sustainability of the project outcomes has been taken into account when designing the project.

The project has, over the course of the concept and planning stages - December 2013 until June 2016, gathered strong community, government, political and partnership support to push for and put in place measures to sustain the investments of the project. Through a community consultation to reconfirm priorities, all stakeholders agreed to redesign the project to ensure elements of sustainability are incorporated. As such, the project has incorporated sustainability

practices and activities that will ensure the investments it are sustained beyond the life of the project, and are resilient to future climate change.

Project Redesign

Stakeholder discussions that ranged from the individual women, men and youth of the municipalities, to community based organizations such as traditional leaders to the highest political support from the Vice President of FSM; His Excellency Yosiwo George resulted in changing the design of the project from three components to four. In order to capture the process and results of the project, a knowledge management component must be explicit in the design of the projects, managed from state to community level. The lessons and practices from the community level will be captured and used to inform the policies at the mainstreaming, state and national government levels.

Sustainability: Legislation, regulation and policies

Strengthening legislation, regulations and policies at the national level to address and respond to climate change impacts on coastal and water sectors will impart two sustainability benefits. Firstly, from a bottom-up approach, it will strengthen FSM's stance on responding to climate change threats as a nation, contributing to the region's solidarity efforts to mainstream climate change and disaster risks into its development. FSM's position and stance on enhancing resilience will attract development and bilateral partners to invest in a climate resilient development for FSM. As a result, it will help implement its goals under the Paris Agreement and set a process of mainstreaming climate into policy, to achieve its intended nationally determined contributions under the UNFCCC. It will, at the same time, sustain support of it's the top-down benefits as a result.

In spite of the autonomous governance at the state level, a national legislation will channel support of resources to protect and conserve its natural resources, and promote climate resilient development of its people, at the capital and outer island communities.

State regulations for development projects will support national legislation and implement best practices, replicated from the Kosrae example. Future development such as infrastructure projects, along the coastline of the main islands as well as the outer islands will need to comply with these regulations. Policy and guidance documents that will be identified and or those existing, are linked to these regulations will help development partners and those providing technical assistance to FSM, to comply.

The National Water and Sanitation Policy will strengthen the work of the National Water Task Force. This will now provide continuous basis of the Force to continue its work through proper training, institutionalisation of processes, and implements components of the policy. These include the Water Outlook Program and Water Sector Investment Plan. The latter plan is a sustainability plan in place for the water sector of FSM. It will be the platform that all stakeholders, including development partners will need to work from in providing technical and funding assistance, resource and services to the water sector. The project will work to mainstream climate change in to the investment plan to ensure future investments are climate resilient.

Sustainability: Climate Change adaptation plans in six island communities for optimal management of resources

The activity to develop climate change adaptation plans for the six outer islands of Yap, Chuuk and Pohnpei is a popular community suggestion that has been incorporated into the project design to address exactly the issue of sustainability. The community group themselves raised the issue of addressing their water priority and other important concerns such as health, nutrition, outer-island migration, transportation, communications, yet are outside of the scope of the project. Other communities wanted to review their existing community development plans, and incorporate climate change.

The climate change adaptation plans will be an overarching plan that allows other priorities of the islands to be captured and targeted to reduce its vulnerability from impacts of climate change. The plans will contain a strategic results framework and action plan matrix that will assist its development partners to fund and implement its work activities and at the same time, align the activities of its government sectors. The plan will therefore allow continued support of activities of the project once it has been closed.

The plans will be linked to state sector plans and will be aligned to the national climate change policy, and linked to legislation and regulations relating to water and coastal management. This will ensure that the state and development partners will recognize and continue to support the adaptation needs of the islands beyond the life of the project.

In the latter stages of the project – Years 3, 4 and 5, the project will undergo a review of the plan. This will allow a review of what has been achieved, lessons learned and how to secure support for implementing any urgent and future activities.

Sustainability: Water Harvesting and storage systems

Building the capacity of the community through training on how to repair, clean, care and maintain parts of their water harvesting systems will ensure long-term use of the 20 year shelf-life of the water tanks. Each island will have spare parts stored in an island governing council storage facility. A maintenance schedules will also be incorporated into the training, and the island's water committee that will be set up, will assign roles and responsibilities to members of the community in caring for their assets.

The water harvesting systems themselves will be made resilient to climate change by locating them in safe localities around the island for community tanks. The individual household water tanks will be assigned two HDPE tanks. This will serve two purposes; allow serviceability of one while the other is being used. This is useful when drought is expected and one other tank provides the sustenance. There is also the fifty percent chance of one of the tanks to survive a typhoon/hurricane. The minimum of two x 10,000L HDPE tanks per island population of 100 has been calculated to suffice the community with safe drinking water. Again, when one other tank is being emptied and cleaned, one other suffices the supply, easing the pressure on individual family water tanks. HDPE plastic themselves are kown for stiffness, strength, toughness, resistance to chemicals and moisture, permeability to gas, ease of processing, and ease of forming. It can therefore withstand high temperatures and salt spray conditions. The project will ensure these assets are sheltered, secured and protected.

In response to accelerated sea level rise within the next 10-20 years, the ground-truthing assessment that will be carried out will determine the location where the tanks will be safe from threats of erosion, king tide high wave impacts, wave over topping and over washing

Sustainability: Self-composting toilet programs

The protection, security, maintenance provided to the water harvesting and storage systems will also be applied to the self-composting toilets. Training and educational, awareness and media campaign programs on island will assist with awareness, acceptance, and proper treatment of the facilities. This will ensure sustainable use of the toilets.

These investment themselves will be made resilient from future climate change by constructing the infrastructures away from areas where they are exposed to high wave over topping, overwash, erosion of ground soil and protected from the sun as much as possible.

The installation at schools program has shown to be successful in Nauru and Tuvalu. Results show that the use of self-composting toilets is highly successful when installed at the community level relative to household level. It is more so in outer islands – atoll environments, than on main islands /volcanic settings. Monitoring and maintenance program will be developed to allow for results to be shared. This will encourage change of behaviour and promote good conservation habits, for water, soil and the environment.

Sustainability: Teacher's Guide on Climate Change

Developing a Teacher's guide on climate change, contextualised to outer islands and state level has shown from application in other Pacific island countries, to be successful in developing awareness and understanding of the issue of climate change.

The five year period of the project will not be enough to develop a fully-fledged curriculum on climate change to be applied at the primary and high school levels. This project therefore is to contribute to developing materials that will target this long-term goal by the Department of Education. The development of, and translation into the local languages ensures the results of the teaching and training will be more sustaining, than simply printing, publishing and disseminating the knowledge product.

Sustainability: 3.5 miles (5.8km) of Malem-Utwe inland road and access routes constructed to sub-base roading standard for future relocation

According to the cost benefit analysis report carried out under the PPCR project, the road could be expected to benefit communities beyond the 50 year period of the analysis, benefitting the community for generations to come. Repositioning the road to higher ground ensures a long-term sustainable all weather access for the whole community as well as removing a significant barrier to the long-term development and relocation of residential property to higher ground.

The investment itself will be made resilient to climate change by climate proofing the design and avoid risks and hazards as a result of impacts of climate change. The alignment of the road has been designed to be well above any potential impacts of sea-level rise and coastal hazards over at least the next century based on guidance in the Kosrae Shoreline Management Plan which has been incorporated in to January 2014 amendments to the *Regulations for Development Projects*. This requires new infrastructure on the volcanic parts of the island to be at an elevation of at least 4 m above mean sea level datum of Kosrae, which is approximately around

2 m above mean high spring tide level. The alignment of the road is typically at the 10 m contour and should minor shifts be required during the detailed survey it should not extend below the 4 m contour or require fill of land areas below the 4 m contour[51].

Further, to improving the resiliency of the road to impacts of climate change, the next phase of construction will be to upgrade the Malem to Utwe inland road to hot-mix asphalt. The Kosrae State Government will be securing its development partner, through assistance of the national government, at FSM's Development Partner's Forum in May 2017 to carry out this second phase of the road (Annex 8).

Sustainability: Transitional coast protection at Mosral and Paal upgraded

Upgrading of the coastal protection at Mosral and Paal will buy time' not only for the project to carry out the first phase of the inland road construction, the second phase in tar sealing the road, but also to allow people to voluntarily resettle inland and discourage further development along this coastline. At present, around 120 metres of road at Mosral and 200 metres of road at Paal are critically exposed and at risk of being breached at any time. Such a breach cuts off the village of Utwe (population approximately 983) and removes road access to Walung (population approximately 268), as well as potentially disrupting utilities (power and telecommunications) which run parallel to the road. It is assumed for illustrative purposes that, because of the perilous state of the road around Paal and Mosral and towards Utwe, the revetment is be implemented immediately and the road is replaced now over a two year period, subsequently being replaced again in re-replaced 35 years' time (the average of 30 and 40 years)[52].

Sustainability: State support programs to access land and finance

The state support programs are themselves sustainability measures to facilitate the government support for voluntary resettlement from the community. The project will develop the content of the support programs for the state. It will not be a means to an end, rather it is to initiate an obligatory role of the State government for the welfare of its communities and protect them from impacts of climate change.

The project will review the support programs towards the latter half of the project; to ensure the institutional set up and relevant capacity and consultations developed and carried out within government and with private and business community stakeholders. This will facilitate opportunities for people to be able to relocate voluntarily overtime.

Based on consultations with the communities concerned (Annex 5) community members are completely in favour of relocating because the threat of coastal inundation and harm to person security, health and well-being is high. Discussions were held with government representatives – some of whom are based in the affected communities – to consider potential scenarios for relocation, should an inland road be established. Based on these discussions together with discussions with the State Government of Kosrae (Lipar George, personal communication, October 2015), a *conservative* base case relocation rate was estimated in which two

[51] Environment Impact Statement, Department of Transport and Infrastructure, Kosrae State Government, 2016
[52] Cost-Benefit Analysis In Coastal Zone Management In Kosrae (FSM): Economic Assessment Of Coastal Road Relocation In The Face Of Climate Change, SPREP 2016

householders relocate every five years *following the completion* of the road. This would result in an average relocation over fifty years of 18 households (18 per cent)[53].

Sustainability: Community-based Ecosystem Management

The project will facilitate a community-based ecosystem management program at the outset of the project with communities. The activities will be a replication of activities already carried out under similar ongoing programs facilitated by the Kosrae Conservation Safety Organization (KCSO). In fact, KCSO will be the lead responsible agency for implementing the program for Malem and Utwe. It will build on lessons and practices from other programs that have been completed and ongoing. The women, youth and schools will be lead community beneficiaries of the activities.

Community ecosystem based adaptation activities that will help manage road construction impacts on the environment will include fringing mangrove restoration / protection / and permitting. Also spatial planning for expanding / creating new upland/mangrove/nearshore coastal protected areas. To address sustainability of the activities, the project will aim to reduce vulnerability of food security and avoid unintended impacts of relocation by creating and improving community gardens, nurseries and raise awareness about climate-resilient food crops and nutrition. Project financial management skills for women, men and youth will be encouraged. This will ensure sustainability of activities beyond the life of the project, as management skills in food and nutrition, and improved knowledge on the linkages of food security and ecosystem services provided by the upland forested areas will ensure a well-managed resource.

The management activities themselves will be made resilient to future climate change impacts by implementing community-based risks management responses to risks such as landslides, flooding, and agricultural development. For example, regulation of timber harvesting, water catchment activities, requirements for agriculture buffer zones, control of pesticides / herbicide use, and more. The skills and knowledge in reduction of these risks will be institutionalised by the project through integrating these into roles and responsibilities of the various community based organizations of the project.

Replication and Scaling up

The institutional arrangement for implementation of the project is based on the institutional capacity and its operational mandate given by State and National Government. This will help to synergise the outcome in future plan and policy of Government. Based on the data and analysis that will be undertaken during implementation, the viability, sustainability and replicability of the model will be tested.

The capacity of the executing entities at national, state and municipality / outer island level, particularly the institutional capacity has been designed to allow for future and similar programs to be operationalized. The institutions, that include Working Committees, department management units on water, roading construction will synergise these works in future plan and policy of Government. In Kosrae, the project is already replicating the climate-proofing of road infrastructure. It will continue to improve on the process building on the capacity of individuals that started with the PACC project. The situation is similar for water-related projects of Yap, Chuuk and Pohnpei. It is already learning lessons from GCCA: PSIS project and has

[53] ibid

incorporated this into its design. It has learned to plan around transportation and logistical schedules with the Department of Transportation when organizing for shipments of equipment and services to the outer islands.

The process documentation and evidence-based assessments and studies, gathered from monitoring activities as well, will provide the necessary information to develop peer-reviewed information and knowledge products that users, including academic institutions, policy and decision makes at all levels, will capitalise on and enable wider replication of success stories from the project.

K Environment and Social Impacts and Risks

Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

CHECKLIST OF ENVIRONMENTAL AND SOCIAL PRINCIPLES	JUSTIFICATION	POTENTIAL IMPACTS AND RISKS
1 Compliance with the Law	**No** The Project complies with the FSM Environmental Protection Act 1999 (FSM EPA 1999); Environmental Impact Assessment Regulations 1989; Further the project complies with Yap State Environmental Quality Protection Act (Y.S.L. 3-73); Kosrae Regulations for Development Project (No. 67.05); Kosrae State Building Code (Section 11.2104); Chuuk EIA Regulations (CSL 2-94-0)	**None**
2 Access and Equity	**No** The project will provide fair and equitable access to the project benefits for men, women and children across the target communities, and will not impede access to any of the other requirements like health clean water, sanitation, energy, education, housing, safe and decent working conditions and land rights. The project ensures that women, men and youth, including people living with disabilities have equitable access to capacity building activities (training, meetings, surveys, monitoring) and project benefits.	**None**
3 Marginalized and Vulnerable Groups	**No** The project works with and supports vulnerable groups that have limited capacity to withstand impacts of climate change. The vulnerable groups include women, girls, children, men,	**None**

	elderly, and people living with disabilities living in atoll island environments and those that do not own land in upland areas. The project interventions pose no risk to the vulnerable groups. The project has incorporated into the decision making bodies of the project key representatives of each of the vulnerable groups. There are no marginalized groups in FSM such as those groups in other societies that are excluded from normal economic / social fabric.	
4 Human Rights	**No** The Project is in compliance with all applicable FSM and international laws relating to human rights. The proposed interventions respect and where applicable, promote international human rights. It does not foresee any violation of human rights	**None**
5 Gender Equity and Women's Empowerment	**Yes.** The design of the project and in particular community and stakeholder consultations has ensured equal and active participation, however, there is a risk that gender may not be mainstreamed into the Framework for National Water and Sanitation Policy for the FSM, the National Water & Sanitation Policy, National Water Outlook Program (activity 1.4.1), and the Water Sector Investment Plan (activity 1.4.2).	**Low**
6 Core Labor Rights	**No.** The Project is in compliance with all applicable FSM and international labour laws. All labour payments including ad hoc labour payments will adhere to State laws as promulgated by labour regulations defining the relevant wage rate, workers benefits and other relevant working conditions.	**None**
7 Indigenous Peoples	**No.** All applicable international and national instruments relating to indigenous peoples would be adhered to by the project. Component 3: All landowners affected by activities proposed in Component 3 of the project have been fully involved during community consultations in the planning stages and have committed to providing easements for the inland road. This was re-iterated each time consultations were carried out during the planning stages of this project (2014, 2015, and 2016).	**None**
8 Involuntary Resettlement	**No.** No project components require involuntary resettlement. The	**None**

	inland road between Malem and Utwe is adjacent to 7 properties and the indicative line and easement of the inland road has sufficient space to align the road and avoid any relocation or removal of property.	
9 Protection of Natural Habitats	**Yes.** Component 3: The possible risks from inland road construction (activity 3.1.1) may include habitat destruction, including removal of any large tree species particularly endemic species such as Nunu (*Horsfieldia*), mangrove or wetland ecosystems. The coastal defense activities (coastal revetments) (activity 3.2.1) may impact on mangrove strands.	**Low to moderate**
10 Conservation of Biological Diversity	**Yes** Component 3: There is risk of increased sediment run-off and siltation impacting on down stream ecosystems including streams, wetlands, mangrove & coastal areas, as a result of construction work of the inland road (activity 3.1.1). There is potential increase in localized suspended sediment in the water column at high tide as a result of removal of the existing emergency armour material and re-grading the underlying beach (activity 3.2.1). This may impact on beach and coastal ecosystems. The project would not, however cause any impact on bio-diversity values overall.	**Low to moderate**
11 Climate Change	**No.** The project will not result in any significant increase in greenhouse gas emissions.	**None**
12 Pollution Prevention and Resource Efficiency	**Yes.** There will be minimal material waste generated from the construction works under Component 2. It will include timber and other materials that will be re-used by the project and community. The inland road construction (activity 3.1.1) and coastal road defenses (activity 3.2.1) will generate waste materials including cleared vegetation, topsoil and geotextile materials. There is potential for surface and groundwater contamination from release or spills of fuel and lubricants during fueling and maintenance of construction equipment.	**Low to moderate**
13 Public Health	**Yes.** The risks include unlikely possible injury to the community / public from construction works, contamination of water sources, and public health disease out-break. Prevention, precautionary and participatory approaches are taken	**Low**

	nonetheless to safeguard the community and public.	
14 Physical and Cultural Heritage	**Yes.** While FSM does not have any World Heritage sites[54], the project will aim to be in compliance and identify any potential un-surveyed cultural or historic sites to conserve. Component 3: During the initial walkover of the road alignment with staff from the Historic and Preservation Office of KIRMA, no cultural or historic sites were identified. There may, however, be cultural and historic sites that may not have been identified in the initial walkover. The project will refer to relevant agencies if cultural and historic sites are identified during the construction stages. Some very minor shifts in the road alignment may be required at this stage over short sections (within a few 10s of metres) and will *not impact* on the findings of the EIS.	**None to Low**
15. Lands and Soil Conservation	**Yes.** Component 3: Construction activities 3.1.1 and 3.2.1 have potential for increased surface erosion of soils from areas cleared of ground-cover vegetation. For activity 3.1.1 there is the potential for catchment drainage pathways to be impacted from changes to drainage alignment, and increased surface-water and sediment runoff. The impacts of the transitional coastal defenses in Paal and Mosral (activity 3.2.1) may include increased suspended sediments in the nearshore water column and the potential for exacerbated erosion along adjacent (downdrift) sections of coast. The latter has been addressed in the design of the revetment to ensure the transition between defenses and beach does not exacerbate downdrift erosion. The defenses will be, as identified by the initial screening, affected by climate change impacts, particularly – the loss of land associated with ongoing shoreline change or coastal erosion, coastal flooding from high tides, large swells, storm or typhoon-related events; exposure of people or property to water related hazards such as flooding or tidal waves; and the effects of sea-level rise or other climate change influences of the hazards abovementioned.	**Low to Moderate**

There are four out of the fifteen ES principles of the Adaptation Fund show a risk rating of '**low to moderate**' and include Protection of Natural Habitats (ESP9), Conservation of Biological Diversity (ESP10), Pollution Prevention and Resource Efficiency (ESP12) and Lands and Soil

[54] 10A: Final report on the results of the second cycle of the Periodic Reporting exercise for Asia and the Pacific, UNESCO, Periodic reports, whc.unesco.org/archive accessed on 30 July 2015

Conservation (ESP15). Gender Equity and Women's Empowerment (ESP5) was identified as important to be mainstreamed into FSM's National Water & Sanitation Policy and executed within its follow up activities namely the National Water Outlook Program (activity 1.3.2) and the Water Sector Investment Plan (activity 1.4.2). The risk for ESP5 and Public Health (ESP13) is **low**. Physical and Cultural Heritage (ESP14) has **none to low** risk rating.

In view of this, the project is categorized as **"Category B".** To ensure that the project conforms to the AFP's Environmental and Social Policy (approved in November 2013) an Environment Social Management Plan (ESMP) has been developed (Annex 7) to manage the impacts and risks of the project throughout implementation. A precautionary and prevention approach has been applied in management and mitigation measures to address all risks as outlined in the ESMP.

PART III: IMPLEMENTATION ARRANGEMENTS

A Institutional arrangements

A. Describe the arrangements for project / programme implementation.

The project will implement its activities through the four levels of governance of FSM – National, State, municipal, and traditional. The municipal and traditional levels are really one and the same. This project will refer to the municipal communities of Malem and Utwe of Kosrae state as municipals. It will refer to the six outer islands of Woleai and Eauripik (in Yap), Satawan and Lukunor (in Chuuk), and Nukuoro and Kapingmarangi (in Pohnpei) as traditional or the outer island level.

The institutional arrangements will have clear lines of authority from the RIE to the communities who are the key beneficiaries of the project. The arrangements will also ensure that the objectives of the project contribute directly to FSM's climate change objectives.

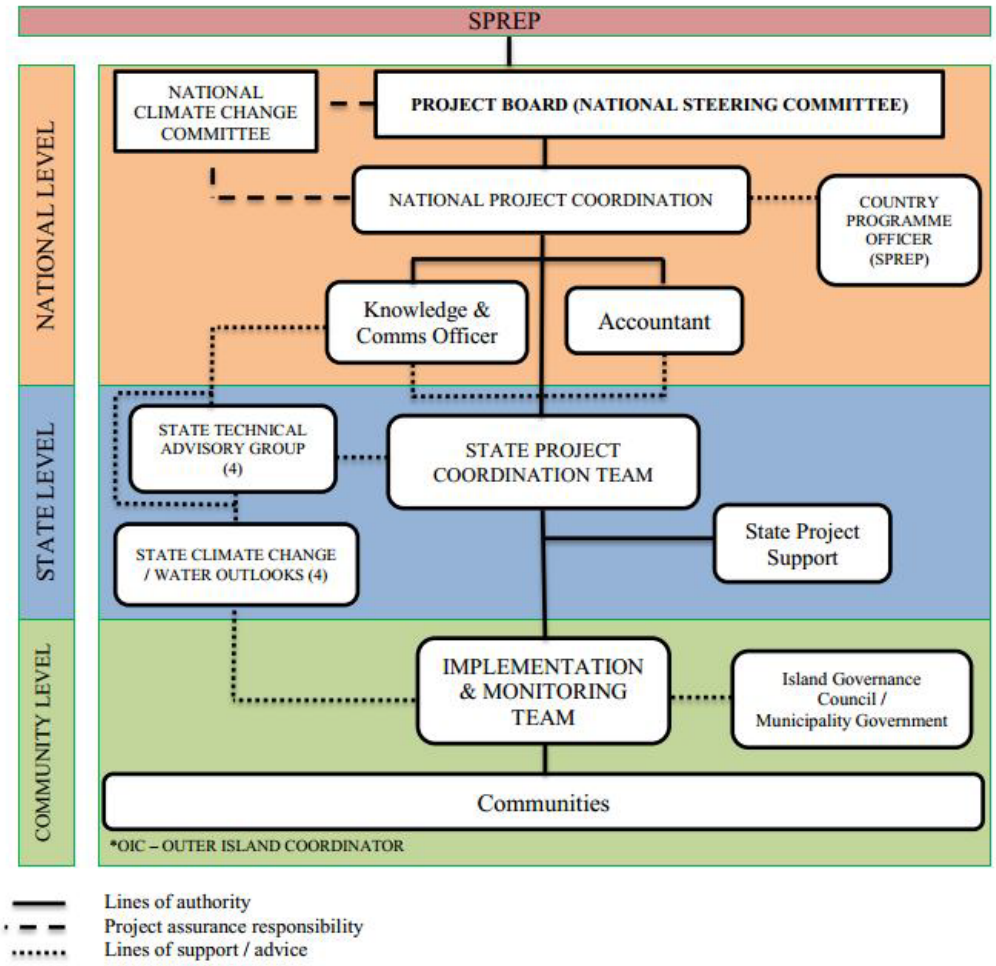


Figure 18. Institutional arrangement for the project

The Executing Entities of the project are:

- Office of Environment and Emergency Management (OEEM) at the national level

- Kosrae State Government in Kosrae
- Pohnpei State Govt in Pohnpei;
- Yap State Government, Yap; and
- Chuuk State Govt, Chuuk

In summary, the institutional arrangements and their roles and responsibilities under the project are as follows:

Table 20. Roles and responsibilities of the project management

INSTITUTIONAL STRUCTURE	COMPOSITION/MEMBERSHIP	ROLE AND RESPONSIBILITY
Project Board (PB)	Senior officials from OEEM; Department of Resources and Development Yap; Environment Protection Agency Chuuk; Environment Protection Agency Chuuk; Environment Protection Agency Pohnpei; Kosrae Island Resource Management Authority (KIRMA) Kosrae; Department of Transport & Infrastructure Kosrae; Office of Development Assistance (ODA) Kosrae; Office of Attorney General, National Government; SPREP as RIE Observers: Micronesian Challenge, IOM, MCT, COMS FSM SPC NPRO, UNDP, GIZ Substitutes: National government representatives of R&D, EPA, DTI, KIRMA, ODA	• Being accountable for the success or failure of the project in terms of the objectives of the project • Providing unified direction to the project. • Approving the resources and authorizing the funds necessary for the successful completion of the project • Ensure effective decision making • Providing visible and sustained support for the National Project Manager • Ensure effective communication both within the project team and with external stakeholders • Provide assurance that all activities have been delivered satisfactorily • Approve the Terminal Report and ensure that any issues, lesson and risks are documented and passed on to the appropriate body • Support approval of project closure and send project closure notification to SPREP as RIE.

INSTITUTIONAL STRUCTURE	COMPOSITION/MEMBERSHIP	ROLE AND RESPONSIBILITY
State Technical Advisory Groups (STAGs)	Experts with qualification and experience in: Legislation & Regulations • Institution Development Specialist • Environment Legislative and Regulation drafters • Climate Change Scientist • Climate & Environmental Law • Water Sector • Water Engineering • Rainwater harvesting systems • Outer island development • Civil Engineering • Atoll Island Soil Scientists • Gender and Education • Climate Education Specialist • Curricula Development specialist • Gender & CC Trainers • Coastal Infrastructure • Civil Engineering • Agricultural Engineer • Geo Hydrology • GIS Specialist	• Provide technical inputs to the team members • Assess relevance and impact of the climate adaptive strategies and advice the NPD, NCCC and NPM • Make recommendation to the Project Team on technical matters to incorporate into activities and implementation plan Each STAG will be constituted for the purpose of the project and will be convened by the Project Manager to draw upon the expertise from this group
Climate Change / Water Outlook Advisory Group (WOG)	Experts with qualification and experience in: • Water Engineering / Specialist • Climate Forecaster / Seasonal Climate Forecasting • Geo / Hydrologist • Climate Modeler • Programmer	• Provide technical and advisory information to inform decisions of the STAG • Provide timely information and advice to the KCO to the project team • Provide three monthly advance advice on climate and water outlooks for project sites / islands The WOG will be constituted for the purpose of the project and for implementing the National Water Outlook Program of the Water Policy. It will be convened by the Project Manager to draw upon the expertise from this group to provide advice to the water priority state activities.

INSTITUTIONAL STRUCTURE	COMPOSITION/MEMBERSHIP	ROLE AND RESPONSIBILITY
Country Programme Officer (CPO)	The CPO will be based at SPREP.	• Advise on selection of project team members • Advise on stakeholders engagement • Ensure that the Communication Management Strategy is appropriate and that planned communication activities actually take place
Country Project Team	The Country Project Team will exist at three governance levels: (i) at the national level comprising the National Project Coordination Team is the National Project Manager, Knowledge & Communications Officer and the Accountant; (ii) at the state level, each of the four states with a State Project Coordination Team comprising of the Team Manager acting as the Field Manager, the Operations and Finance Officer and Junior Communications Officer. The latter two officers make up the State Project Support team; and (iii) at the community level, each of the eight communities will have an Implementation and Monitoring Team (IMT)	• Overall responsibility for the implementation of the project • Engage with external stakeholders to achieve project objectives • Responsible to the NIE for fulfilling monitoring and evaluation activities under the project.

INSTITUTIONAL STRUCTURE	COMPOSITION/MEMBERSHIP	ROLE AND RESPONSIBILITY
Implementation and Monitoring Team (IMT)	The composition of the IMT for the Outer Islands - comprising of the Outer Island Coordinator, the Women's group representative, Men's group representative, Youth group representative, Persons living with disabilities group representative, and traditional leader / elderly representative. For Malem and Utwe communities, a community working committee will be under the coordination of the Team Manager in KIRMA.	• Carry out the technical surveys and assessments of the project based on consultations and direction from the communities and island governing council in relation to project outputs. • Assess relevance and impact of the climate adaptive strategies • Make recommendation to the Project Team on technical matters to incorporate the same in the implementation plan • Improve the design of the activities • Develop climate change adaptation plans specific for the island and sector • Train and lead in implementing adaptation activities • Report to the OIC progress, risks and issues of the activities
National Climate Change Committee	All relevant stakeholders of government, NGO, Inter government organizations, and Community Based Organizations and private sector	• Advise on other climate change projects and programs ongoing with the view to integrate, synergize and not duplicate efforts • Assure liaison with stakeholders of the project is maintained • Ensure Applicable standards are being used • The needs of specialist interests (for example, vulnerable groups) are being observed. •

The organizational structure for the implementation of the project requires staffing at three levels: national level will provide direction of the project through the project board. The National Project Manager and the project support team will manage the project from the national level with assistance of the coutnry programme officer (CPO) based at SPREP. The delivery of the project will be at the state and community levels. There will be four Team Managers posted at state level with a coordination team comprising of an Operations and Finance Officer and a Junior Communciations Officer. The Outer Island Coordinator will provide oversight of the implementation of the project at the community level, as well as carrying out monitoring and reporting. The organization structure of the staff is presented in the diagram below:

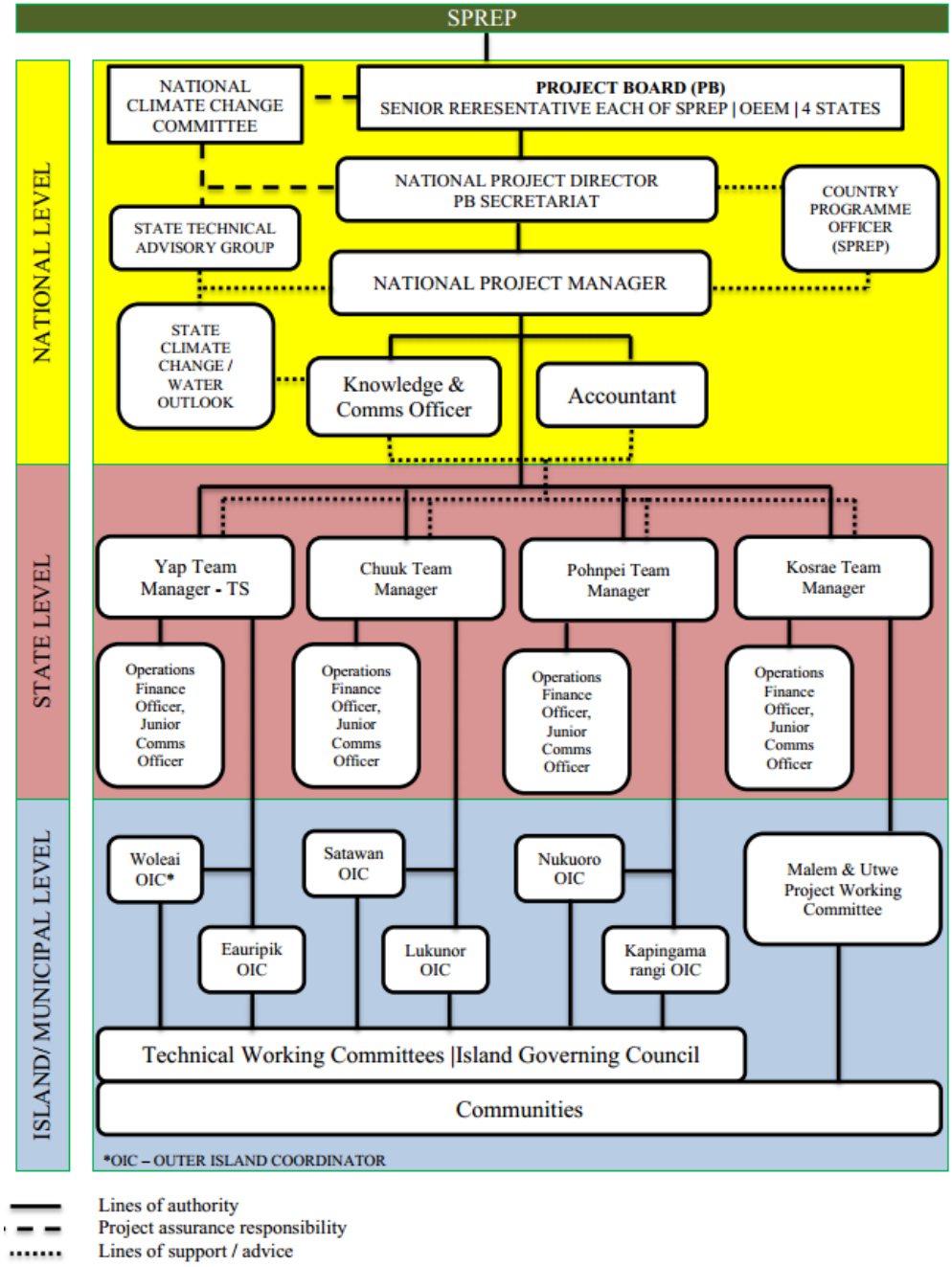


Figure 19. **Staffing structure of the project**

The key roles and responsibilities of the key staff are summarised in Table 21 below

Table 21. Key roles and responsibilities of Project Staff

POSITION	KEY ROLES & RESPONSIBILITY
National Project Director	- Organize and co-chair the Project Board reviews - Provides high-level advice to the Board on progress, risks and issues against the objectives of the project. - Monitor and control the progress of the project at a strategic level, in particular reviewing the objectives of the project regularly - Appoint the project management team - Ensure overall objective and goals of the project remains on target, is achievable and will be completed within the agreed scope of the project
National Project Manager	- Secretary to the Project Board - Overall responsibility for the implementation of the project - Engage with external stakeholders to achieve project objectives - Responsible to the NIE for fulfilling monitoring and evaluation activities under the project. - Liaise with SPREP Country Programme Manager and account managers - Lead and motivate the project management team - Manage the information flows between the directing and delivering levels of the project - Provide oversight to the project activities of each component, taking responsibility for overall progress and use of resources and initiating correction action where necessary - Advise the Project Board through the National Project Director of any deviations of the project. - Unless appointed to another person(s), perform the Team Manager role - Unless appointed to another person(s), perform the Project Support roles - Prepare and maintain quarterly, semi-annual, annual and bi-annual reports of the project - Schedule and respond to annual financial audits
Team Managers (TMs) (technical specialists)	- Responsible for delivering the activities of the project to an appropriate quality and completion within a planned and agreed timescale and cost. - Authorize and responsible for planning project activities and managing a team of specialists / experts - Unless appointed to another person(s), perform the Project Support roles - Assist in schedule and responding to annual financial audits - Report to the NPM, KCO and Accountant - Carry out technical reviews where required - Prepare and maintain quarterly, semi-annual, annual and bi-annual reports of the project

POSITION	KEY ROLES & RESPONSIBILITY
Knowledge & Communications Officer (KCO)	- Collect, collate and document data and information from management team at national and state levels - Assist in managing development of knowledge products and visibility materials - Provide administrative support for the project management team at national level - Provide advice to Team Managers at state level
Accountant	- Manage and advice the financial situation of the project - Develop and communicate (forecast) financial situations and reports to relevant stakeholders on a timely basis - Provide financial advice to NPD via the NPM and TMs - Provide administrative support for the project management team at national level
Communications Officer (CO)	- Based at state level, the CO is to - Capture, collect and document data and information from management team at state and community levels and share with national office - Update database of the project and ensure activities of the communication strategies take place. - Assist in development of knowledge products and visibility materials Provide administrative support for the project management team at national and state level - Report risks, issues and progress of the project against the communication plan and strategy
Operations & Finance Officer (State level)	- Provide administrative support for the project management team
Outer Island Coordinator (OIC)	- Coordinate execution of activities and services on island with the island / municipal governing council - Report progress, risks and issues of the project to the Team Manager - Communicate project data and information to the TM

B Risk Management

B. Describe the measures for financial and project / programme risk management.

Table 22. Project Risk Management Measures

Expected Risk	Rating of Risk	Risk Management Strategy
Institutional		
Limited or no buy-in from national and state government stakeholders	Low	- The inception workshop will invite high level key stakeholders from national and state. - A capacity needs assessment will identify those that are relevant to the project and those with limited input

Expected Risk	Rating of Risk	Risk Management Strategy
Lack of capacity within executing agencies cause delay or insufficient level of implementation	Med – Low	- Contracts will be for three years and notice for leaving will be for longer duration; recruitment of local persons at the State and community level so that they do not have motivation to leave and build ownership; - Regular project team meetings and capacity building to ensure that all staff understand their role in the project
Environmental		
Extreme natural disasters affect the implementation of the project	Medium	- The current practice in responding during and post-disaster phases is that all of the government functions will be diverted to emergency response measures. - The project will communicate in advance expected delays and actions required to minimise the risk and impact on the project activities, assets and personnel. - The national project manager will inform all key stakeholders in advance.
Climate hazards are more severe than anticipated leading to higher climate-proofing related costs for building the inland road	Medium	- The project will address the climate hazards in advance under this project. It will minimize the risk to people and infrastructure by revetment of the coastal road as planned under activity 3.2.1 of the project
Social		
Logistical/transport problems and/or prohibitive costs leading to delays in arrival of people and/or materials	Med-High	- Identify annual travel plans of the community around community occasions, events and celebrations. Incorporate into project plans - Work with the transportation shipping companies on the schedules in advance to avoid planning around delayed or no sailing days
Traditional values and governing structures restrict the participation of women	Low	- Break up into gender-based working groups will be applied to community consultations. - There will be an elderlies / traditional leaders only group, women's only group, youth only group discussions. Where youth are required to break further into girls and boys, that will also be carried out

Expected Risk	Rating of Risk	Risk Management Strategy
Limited or no buy-in from communities or island council	Low	- The inception workshop will clarify the project goals, strategies, objectives, activities, roles and responsibilities of all stakeholders involved. - Annual meetings and refresher meetings will be called by the Outer Island Coordinator for the project to update progress and report on risks, issues and assistance required by the project from the community and vice versa
Theft of assets from the water systems	Low	- Build fencing around assets where required - Awareness and education of the importance of the assets - Enforce community by-laws
Financial		
Delays in expediting funds to state and community project units to execute project activities	Low-Med	- Carry out refresher training on financial reporting - SPREP to assist in direct modality in advance and in support of the Finance departments of national and state
Delays in acquitting funds	Low-Med	- SPREP and OEEM to convene meetings to address the issue and aim to 1) utilize funds for other planned activities, 2) divert funds to other community, state or national activities that have been completed and ready to implement other planned activities
Operational		
State run ships to outer islands are unreliable and very slow to get to many outer islands, and only stay on island for half a day (on average).	Med – High	- The project will explore options of collaborating with the shipping companies with assistance of key government stakeholders. These may include chartering of ships and agreement to a working schedule such as frequencies, length of stops, and unloading processes
Team/ island communication difficulties (e.g., only have shortwave radio)	Medium	- Project will improve communication equipment of existing government office which is required by the project to effect timely reporting of project aspects including progress, risks and issues monthly and quarterly

Expected Risk	Rating of Risk	Risk Management Strategy
Difficult to reach out and train teachers in Outer Island schools	Low-Med	- A progressive plan of developing the Teacher's Guide will be carried out at state level and training carried out at state level. - The project will trial out training of teacher's in only 2 of the six islands. Identify issues and lessons to improve the conducting of training in other islands. - One other strategy is to bring volunteer and or selected teachers from both islands from each state to the main island for training. Upon return with materials and competency-based training have been undertaken
Land issues (disagreement/conflicts over access of land for installation tanks/reserves)	Low-Med	- Consultation and awareness prior to agreement - Letter of agreement between landowner and island governing council acting as the Principal of the agreement on behalf of the project, at the outset of the project.
Unsuitable infrastructure (e.g., house roofs can't support catchment systems)	Low	- Ground truthing assessments will include baseline and technical surveys to identify suitable housing infrastructure and modify design of installation of water harvesting systems
Agreement cannot be reached with all landowners on easements required for building the inland road	Low	- The June 2016 consultations with Malem and Utwe communities addressed this risk. The municipal governments have initiated development of agreements with all the relevant landowners. All landowners have already signed agreements to building the road during consultations in the planning stage of the proposal.
Phase II (upgrade to hot-mix asphalt pavement) starts during implementation of AF project	Low	- AF Project team to provide assistance to DTI to ensure all issues and risks are identified assessed and a revised Risk Management Plan is developed before Phase II project starts.
Implementing partner has inadequate capacity	Low	- The capacity of NGOs delivering the activities will be developed through training and or recruitment of a local consultant to carry out the activities required - Training with CBOs will address the capacity issues. Emphasis will be placed on women councils and women's organization that will be requesting to assist.

Expected Risk	Rating of Risk	Risk Management Strategy
Locally available printing, video and audio production capacity	Low	- The project will seek printing companies from within FSM to assist. The project will also seek services from nearby neighbouring countries to assist, in particular Guam where such services have the capacity
Political		
There is no capacity on island to carry out needed trainings	Medium	- The project units at state level will work with NGOs and consultants to develop a team of trainers to go into the islands and carry out 'Train the Trainers', module and competent-based trainings. This will build capacity of the island teams to be able train and build capacity of the local population.
There is no political will and commitment from island leaders, and municipal government	Low	- The proposal has been on the agenda of the Vice President for 12 months since July 2015. The communications from the Vice President to the high level officials of government has been supportive to move with the project. - Mayors, traditional leaders have issued high political support of their local governments to the project. Their support letters are provided in Annex 9

The project has noted the key social risk with regards to the installation of self-composting toilets as an alternative adaptation option to conserve water, improve the thin soil environment and reduce marine eutrophication on the lagoon side of the atolls.

The project's risk response strategy will be to further identify, assess and control the risk during inception and adaptation planning meetings. The project will ensure that there is a common understanding of the risks to the project and community, carry out a survey and put control measures in place and communicate widely before further work is carried out. The control measures may include the enhancing the understanding of community members on the benefits and costs between the current practices and the new alternative technology introduced as part of adapting to impacts of climate change. Another control measure is to fallback to food security and marine resource management priorities identified by the communities in the planning stages.

C Environmental and Social Risk

C. Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.

The project is categorized as **"Category B"** with 'low to moderate' impacts and social risks (refer to Part II. K). In line with the Fund's Environment and Social Policy, the measures for management of environmental and social risks are outlined in the project's Environment and Social Management Plan (ESMP) annexed to this proposal (Annex 7).

The ESMP outlines risks and measures to mitigate the risks of activities under each relevant ES Principle of the Fund. The ESMP will be shared as a key document to project stakeholders

particularly those that are responsible for management of the identified risks. The roles and responsibilities will be briefed by the national and state project coordination teams with technical advisory support provided by SPREP through its Country Programme Officer (refer to Figure 18).

The low risk identified for gender equality and women empowerment under component 1 will be managed by the national project coordination team with monitoring oversight provided by SPREP country programme officer (see Figure 18.).

The 'low to moderate' impacts and risks identified against the Protection of Natural Habitats and Conservation of Biological Diversity Principles of the Fund refer to activities under Component 3. In particular, the inland road construction (activity 3.1.1) and coastal defenses (activity 3.2.1) have been subjected to risk management under the Title 19 of the Kosrae State Code and the Regulations for Development Projects. The Kosrae Board of Commissioners has issued a development review permit with conditions that have been assigned to avoid, minimize or eliminate the effects or impacts of the proposed activity (3.1.1) on the environment (Annex 10). This was a result of the Kosrae Board approval of the Environment Impact Statement (Annex 4a). The approval signals relevant consultations and public disclosure of the impacts and risks of the project process completed (see also section 7 of the ESMP).

Under its Development process, Kosrae also has a grievance redress mechanism outlined under the State's existing EIA Guidelines. The states of Yap, Chuuk and Pohnpei do not have grievance redress mechanism or EIA Guidelines, but are, however guided by the EPA regulations. The project will apply the five step grievance management process outlined in the ESMP, complimented by the Kosrae EIA process.

Managing environmental and social risks for the different stages of the inland road relocation initiative. The project identified during the planning consultations the important measures to be taken to manage the Kosrae inland road construction stages in which activity 3.1.1 of this project will undertake the *first stage*. This is the construction of the Kosrae inland road to an unsealed rural road (sub-base standard) to be followed by the *second* stage which is sealing the road using hot-mix asphalt pavement. The project does not address the environment and social risks of the latter stage. The Kosrae Regulations for Development Project 2014 and the Environment Impact Assessment Guidelines 2014 proposes that the second stage will require a separate and new Development Permit.

In the event that stage two commences within the implementation period of the AF project, to the extent at which it may impact on the outcomes delivered by the AF project, the project will provide assistance in assessing any additional environmental and social risks identification and management plan. It will devise a Risk Management Plan with relatively minor changes to update the documentation as will likely to be required. The key information will be the risks, mitigation measures and clear timelines and responsibilities on implementation and managing of risks. The scope of the ESMP (Annex 7) provides guidance on how to assist the second stage to be compliant to the Fund's ES Policy. One proactive measure for that the project will undertake sharing and referencing mitigation measures and lessons from the project to inform the second stage *at least six months prior to implementation of the second stage* of the inland road construction.

The full environment and social risks management plan for the project is outlined in detail in the ESMP (Annex 7).

D Monitoring & Evaluation
Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.

The monitoring and evaluation (M&E) scheme will be applied in accordance with the established SPREP procedures throughout the project lifetime. This shall ensure the timeliness and quality of the project implementation. The M&E plan will be implemented as proposed in Table 24 below.

The following sections outline the principle components of the Monitoring and Evaluation scheme and indicative cost estimates related to M&E activities.

Project Inception Phase

Inception Workshops (IW): A national and all state Inception Workshop will be carried out by the project within three months of project start and the first tranche of funds have been received. A full project team with assigned roles in OEEM, KIRMA, EPA Pohnpei, Chuuk and Yap, and where appropriate and feasible, collaborating partners of the project and technical advisors will lead the workshop. The IW is crucial to building ownership for the project results and to plan the first year annual work plan.

The overall objective of the inception phase is for key stakeholders to take ownership of the project's goals and objectives, as well as finalize preparation of the project's first annual work plan on the basis of the project's strategic results framework (Table 25). The key objectives of the workshop are:

- To review stakeholder analysis for each project;
- To review and check through the logic of the Project Framework;
- To draft a stakeholder capacity needs assessment in management of the project;
- To clarify the monitoring protocol for indicators; and
- Clarify clear project boundaries (both technical and geographical).

The activities of the workshop include:

- Reviewing the strategic results framework (indicators, means of verification, assumptions), imparting additional detail as needed;
- Agree upon the first Annual Work Plan (AWP) with measurable performance indicators;
- Introduce support processes and technical backstopping mechanisms available;
- Agree on elements of the project's communication strategy, including requirements of the communication infrastructure for project implementation;
- Agree on the monitoring and evaluation process including provisions of training on project management skills and execution;

The inception workshop would be the opportunity to understand the project roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff and decision-making structures will be discussed and clarified, as needed, in order to clarify for all, each party's responsibilities during the project's implementation phase

The national inception workshop will also provide the first annual meeting of the Project Board (PB) with responsibilities over management decisions including approving implementation work plans and budget revisions, identifying problems, suggesting actions to improve project performance (see **Project Board and Project Board meetings**)

Inception Report. A Project Inception Report (IR) will be prepared immediately following the series of Inception Workshops. It will include a detailed first year/AWP divided in quarterly time-frames detailing the activities and progress indicators that will guide implementation during the first year of the project The Report will also include Appendixes of detailed project budget for the first full year of implementation, prepared on the basis of the AWP, and including any monitoring and evaluation requirements to effectively measure project performance during the targeted 12 months' time-frame.

The Inception Report will include the agreed detailed narrative on the institutional roles, responsibilities, coordinating actions and feedback mechanisms of project related partners that were discussed in the workshops.

Annual Progress Report (APR): The APR shall be prepared by the National Project Manager and is to be presented at the Annual Review Meeting for endorsement. The APR will be prepared with progresses against set goals, objectives and targets, lessons learned, risk management and detailed financial disbursements.

Project Annual Review (PAR) Meeting: An Annual Review Meeting shall be conducted annually, with the first meeting a year after the National inception workshop. The meeting will be a high-level review meeting where key representatives of major stakeholders of the project are represented. The objective of the meeting is to review progress, discuss results, challenges and opportunities. Recommendations of the progress review meeting will be the key outcome of the meeting. The recommendations and report of the annual review meeting is submitted to the Project Board for endorsement for action.

Project Board and Project Board meetings: The Board is represented by high-level representatives of the implementing entity SPREP and the executing entities (OEEM, KIRMA Kosrae, R&D Yap, EPA Chuuk, EPA Pohnpei). It is chaired by the Director General of SPREP or a senior adviser directed by the Director General. It is co-chaired by the Director of OEEM acting as the Director of the Project. The National Project Manager acts as the secretariat to the Board. The Board will agree and adopt a coordinated implementation strategy of the project and its partners, as well as endorse the project's first year's annual work plan.

The Board will also include high level representatives of the communities in the project proposed areas. The Board will meet annually at the auspices of the PAR. The Board will call meetings immediately following the PAR meetings. The objective of the board meetings is to discuss recommendations of the project progress and way forward as agreed to and presented by the PAR meeting outcomes. Agreement and approval of the direction and way forward from the Board in view of the recommendations of the PAR will be key outcomes. The outcomes of the Project Board, including approved APR of the project is shared and submitted to the Donor via SPREP as the RIE.

Independent Evaluation

The project would carry out at least two independent external evaluations as follows:

Mid-term Evaluation: The project will undergo an independent Mid-Term Evaluation (MTE) at the mid-point of project implementation. The MTE will determine progress being made toward the achievement of outcomes and will identify course correction if needed. The evaluation will address effectiveness, efficiency and timeliness of project implementation. It will check the relevancy of the project activities so far carried out by the project. It will outline risks and issues that relate to the management and implementation of the project. The list of recommendations will highlight decisions and actions that require responses and execution. The evaluation will review and suggest lessons in relation to the design, implementation and management of the project. The findings of the evaluation will inform the final half of the project period.

Final Evaluation: The project will undergo a final evaluation that will be carried out within three months following implementation closure of the project. The evaluation will be carried out by an independent evaluation time. A final project annual review (PAR) meeting will be conducted following the completion of the final evaluation report. All stakeholders will review the report and the final PAR meeting will be to present, discuss, finalize and endorse the final evaluation report of the project.

The content of the evaluation report will include progress towards the outcome of the project. It will review any immediate impact and sustainability of results of the project. It will outlines results against the strategic results framework and provide a conclusion, of whether or not the project has achieved its goal, objectives, outcomes and outputs it set out to implement. A review on the contribution to capacity development and knowledge management in FSM would be presented in the report. The report will outline key management and capacity recommendations highlight results, lessons learned, best practices. It must amalgamate these results into a section of the report, designed to be useful for future projects and or programs of FSM.

As the regional implementing entity, SPREP will be in charge of organizing the management of both the mid-term and final evaluation activities. This will include drafting of the terms of reference, procure the evaluation team, manage the logistics maintain the time period of the review, and ensure reports are submitted on time.

Table 24. Budget for Monitoring and Evaluation Plan

BUDGET FOR M&E PLAN:								
Monitoring and evaluation plan Activity	**Responsible person**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total $**	**Timeframe**
Inception workshops (activity 4.3.1)	Project Manager	30,000					30,000	Within 6 months of project starting
Inception report	Project Manager						part of execution cost	Within 3 months after inception stage
Participatory Monitoring & Evaluation by beneficiaries	Project Manager and Team Leaders						part of execution cost	Quarterly
Quarterly Progress Reports	Project Manager and Team Leaders						part of execution cost	Quarterly
Six monthly Progress Reports	Director OEEM						part of execution cost	6 monthly
Audits	External auditor						part of execution cost	Every year - starting 2018
Annual Project Advisory Committee Meetings	Project Manager						part of execution cost	Annual
Bi-Annual field visits by representatives of Project Advisory Committee (under activity 4.3.7)	Project Manager	-	-	18,000		18,000	36,000	Bi-annual - starting 2019
Minutes of Advisory Committee Meeting	Project Manager						part of execution cost	annually, twice starting 2019

BUDGET FOR M&E PLAN:								
Impact assessment** (under activity 4.3.7)	Director OEEM			4,500		4,500	9,000	Bi-annual - starting Oct 2018
Mid-term Evaluation	External Consultant			106,938			106,938	Mid term
Final evaluation	External Consultant					107,488	107,488	3 months before end of project
	TOTAL	**30,000**	**-**	**129,438**	**-**	**129,988**	**289,426**	

E. Results Framework

Include a results framework for the project proposal, including milestones, targets and indicators.

A fully endorsed stakeholder results framework for the project proposal, including milestones, targets and indicators is presented in the following table.

Table 25. Projects Strategic Results Framework

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Component 1: Strengthening policy and institutional capacity for integrated coastal and water management at national and state levels					
Outcome 1: Strengthened policy and institutional capacity of government to integrate climate risk and resilience into its water and coastal management policy and regulatory frameworks	Number of national and state level stakeholders participating in EPA, R&D, NWTF meetings, planning and implementation of activities. Number of relevant sector and community based consultations carried out to identify institutional capacity gaps and capacity needs Number of staff across sectors trained and build their awareness on the new regulations enforcement Number of regulatory framework drafts developed for development projects regulations at state level	FSM regulations for development projects does not consider climate risks and resilience, with the exception of the Kosrae State Regulations for Development Projects 2014 Existing policy lacks consideration of existing climate change risk and disaster risk and projected risks A framework for developing a water and sanitation policy, water outlook, and water sector investment plan exists but no plans that integrate climate risks and consider gender-sensitive approaches	At least two relevant regulatory frameworks endorsed and adapted to guide and support development of regulations on development projects at national and state level. Climate change is mainstreamed into the FSM National Water & Sanitation Policy, Water Outlook Program, Water Sector Investment Plan, national and state development projects.	Legal and regulatory policy assessment report President and Government Resolution on National Water & Sanitation Policy, National Water Outlook Program, National Water Sector Investment Plan Stakeholder consultation reports Annual reports of ministries and other government agencies.	**Assumptions:** Political will and commitment that encourage full participatory participation of key government stakeholders at national and state level **Risks:** Limited or no buy-in from national and state government stakeholders

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 1.1 Legislation and policy paper to guide regulation of climate resilient coastal and marine management at national level	Number of stakeholder organizations participating in legal and regulatory assessment meetings Number of regulation, policy and guidance documents drafted at national level	No current and future climate risks mainstreamed into current legislation, regulation, policy and guidance documents for development projects in FSM	A legislative framework to guide national level regulation of climate resilient coastal and marine resource management at national level A national level regulation for development projects with climate risks and resilience incorporated developed, endorsed and adopted	Legal and regulatory policy assessment report President and Government Resolution on legislative and regulatory frameworks on development projects Stakeholder consultation reports Annual reports of ministries and other government agencies.	**Assumptions:** Political will and commitment to ensure plans and planning "tools" are prepared in a fully participatory manner. Strong national and state leadership and support for, and engagement in project activities in all 4 States. **Risks:** Limited or no buy-in from national and state government stakeholders
Output 1.2 State regulations for development projects amended to consider climate change risks and resilience measures	Number of stakeholder organizations participating regulatory framework workshops at state level Number of regulation, policy and guidance documents drafted at state level	No current and future climate risks mainstreamed into current legislation, regulation, policy and guidance documents for development projects in Yap, Chuuk and Pohnpei States	At least one state has endorsed and adopted changes to its state regulation for development project that consider climate risks and resilience	Stakeholder Consultation Reports State Level resolutions on regulatory frameworks, policy and guidance documents Annual reports of ministries and other government agencies.	**Assumptions:** Political will and commitment to ensure plans and planning "tools" are prepared in a fully participatory manner. Strong national and state leadership and support for, and engagement in project activities in all 4 States. **Risks:** Limited or no buy-in from state government stakeholders

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 1.3 National Water and Sanitation Policy endorsed with climate and disaster risks and resilience, and gender mainstreamed	Number of stakeholders participating in NWTF meetings, planning and implementation of activities Number of women, men, and youth participating in gender and climate change trainings, meetings and public awareness activities Number of stakeholders (organizations) participating in NWSP awareness activities	No national climate resilient water and sanitation policy No gender-focused policy on water and sanitation	NWSP with climate risks and resilience, and gender incorporated, is endorsed and adopted by a resolution of the President and Government of FSM (Four state endorsement)	Stakeholder Consultation Reports President and Government Resolution on National Water & Sanitation Policy Official National Water & Sanitation Policy document NWSP Gender Assessment and Action Plan report	**Assumptions:** Political will and commitment Strong national and state leadership and support for development of the NWSP and its elements **Risks:** Limited or no buy-in from state government stakeholders in finalising the NWSP Traditional values and governing structures restrict the participation of women
Output 1.4 National Water Outlook and Water Sector Investment Plan developed and implemented	Number of women, men and youth and stakeholder organizations participating in NWTF meetings, planning and implementation of activities Number of stakeholder organizations participating and implementing water outlook programs Number of partnerships strengthened under the water sector investment plan	No water and sanitation policy Limited emphasis on the importance of social roles and responsibilities of women, men and youth in water, sanitation and climate change policies	NWSP with climate risks and resilience, and gender incorporated, is endorsed and adopted by a resolution of the President and Government of FSM (Four state endorsement) National Water Outlook Program endorsed adopted and implemented National Water Sector Investment Plan endorsed, adopted and implemented	Stakeholder Consultation Reports Annual reports of ministries and other government agencies. President and Government Resolution on National Water & Sanitation Policy Official National Water & Sanitation Policy document NWSP Gender Assessment and Action Plan report	**Assumptions:** Political will and commitment Strong national and state leadership and support for development of the NWSP and its elements **Risks:** Limited or no buy-in from state government stakeholders in finalising the NWSP Traditional values and governing structures restrict the participation of women
Component 2: Demonstration of water security measures in outer islands of Yap, Chuuk and Pohnpei					

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Outcome 2a: **Water conservation and management technology & practices adopted, responding to drought, sea level rise and early recovery from cyclones**	Available capacity (volume in cubic litres) of water per person per day Storage capacity for potable and grey water at household and community level Rainfall data collected on a monthly basis used to provide advice on water conservation practices and advice on other development sectors (farming, fishing, etc.).	Poorly maintained traditional water harvesting and conservation infrastructure and technology available. It cannot cope with the dry seasons. No monitoring stations on island to collect and monitor rainfall data to advice on water conservation practices including advice on other sectors	By end of project, at least 80% of households have collected enough water to respond to drought events By end of project, at least five project islands and its communities have increased storage capacity to store potable and grey water. By end of project, women, men, and youth know how to use and read rain gauges	Participatory evaluation report, survey report progress report developed by Municipal Government quarterly reporting Data collected by the Island municipal government office through rain gauges (on water resources, quality, use and maintenance of water conservation and management technologies)	**Risks:** Theft of water resources Logistical/transport problems and/or prohibitive costs leading to delays in arrival of people and/or materials (R2) **Assumptions:** Household / Individuals accept the need to limit water usage Maintenance plans can be implemented
Output 2.1 Outer Island communities orientated to CC, SLR and adaptive capacity measures involving water, health, sanitation and environment	Number of men and women in six outer islands trained in CC, SLR and adaptive capacity measures for water, health, sanitation and environment	The six island sites have limited understanding of the impacts of climate change and sea level rise on the water, health, sanitation and environment sectors Limited knowledge and experience in the application of climate change information to adaptation planning in outer islands	At least 60% of the community population in the six outer islands (of which close to 50% are women) are educated on the impacts of CC and SLR on water, health, sanitation and the environment, and have their capacity enhanced to develop adaptation measures to address these impacts At least 80% of those that participate in the above capacity building activities have acquired knowledge and skills to develop and implement adaptation plans and actions	Training and awareness materials. Workshop reports, including participants lists and evaluation results Community adaptation plans developed and endorsed Progress reports on implementation of adaptation actions	**Risks:** Community engagement is low **Assumptions:** Community are receptive to training and are able to engage

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 2.2 Water Harvesting and Storage System (WHSS) installed in 6 atoll islands	Number of WHSS installed in 6 islands Capacity of storage water (in m3 and ft3) constructed / maintained, per household and per community Number of women, men and youth with access to water from WHSS systems installed at household and community level (church, school, community halls) Agreed maintenance schedules for installed WHSS	Water cisterns and tanks exist on the islands in poor conditions (leakages, contaminated), including poor guttering and down piping There is no culture of maintenance of water harvesting systems at community level due to lack of specialised equipment and maintenance planning. Very limited awareness of WASH techniques useful for application during drought periods and post-typhoon situations	100% of target population have access to enough potable water from the WHSS At least 20% members of the island council and women, men, and youth community groups trained in maintenance of community water harvesting and storage systems	Training documents including visuals and reports Surveys and interviews Progress reports Monitoring reports Visibility materials – awareness programs Picture of WHSS installation Maintenance schedules and guidelines	**Risks:** Logistical / transport problems and /or prohibitive costs leading to delays in arrival of people and /or materials Team/ island communication difficulties (e.g., only have shortwave radio) Unsuitable infrastructure (e.g., house roofs can't support catchment systems) **Assumptions**: Availability of skilled facilitators Community involvement including participation of women and elders Most HH benefit
Output 2.3 Self-composting waterless toilets constructed to conserve water, improve soil environment, and reduce marine eutrophication on the lagoon side	Number of SCT units constructed and in working condition Changes in level of nutrients in soil and groundwater Percentage of change in dissolved oxygen in the lagoon levels	Currently the majority of people use the lagoon for toileting. The existing water-flushed toilets or pit-latrine toilets are in poor condition, with leakage into soil and lagoon. Contamination / eutrophication of lagoon from excessive nutrient input from human waste	By the end of the soil quality and lagoon water quality have improved as a result of reduced leakage from toilets.	Soil management reports Lagoon water quality reports Surveys and interviews Progress reports Monitoring reports	**Risks:** Logistical / transport problems and /or prohibitive costs leading to delays in arrival of people and /or materials Accessibility to labs to validate soil and lagoon monitoring tests Team/ island communication difficulties (e.g., only have shortwave radio) **Assumptions:** Availability of skilled facilitators Community involvement including participation of women and elders

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 2.4 3, 253 people trained on water conservation and management including coastal protection and livelihoods in 6 outer islands	Number of women , men, youth trained in demonstration of water harvesting and storage systems Number of women, men, youth trained in water data collection and quality testing Number of women, men and youth carrying out survey of potable and non-potable water needs, water use (quality & quantity), storage capacity, sanitation, conservation methods, practices Most significant understandings[55] gained by youth, women and men through climate change adaptation training	Business as usual knowledge exists on water conservation and management methods and practices Limited awareness about climate change impacts on water use and water resources on low-lying island environments and communities	By the end of the project, at least 80% of targeted women men and youth trained in water conservation and management methods and technology	Training documents including visuals and reports Survey reports Training evaluation reports (interviews, feedbacks) Progress reports Monitoring reports	**Risks:** Logistical/transport problems and or/prohibitive costs Team/Island communication difficulties **Assumptions:** Availability of skilled staff to carry out, analyse & present survey results Community involvement, including participation of women and elders Availability of skilled staff to develop & deliver training a/o resources

[55] What did each group learn during the training that has made the most practical difference to their lives?

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Outcome 2b: Increased awareness of climate change through formal climate education	Number of schools with climate education curriculum introduced Level of awareness of climate education in schools at different elementary and all grades Number of teachers trained in climate education at elementary and all grade schools	Climate education materials are available Lack of systematic training on climate education for teachers	By end of project, at least two schools participated in the development of the curriculum plan At least 60% of teachers trained on climate education under the new climate education curriculum. At least 80% of students enrolled and taken climate education have a pass rate of 65%	School reports Department of Education report Teacher's training report	**Assumptions:** Teachers have sufficient knowledge & resources to teach the CCA curriculum The Department of Education communication system to outer island teachers are reliable and efficient **Risks:** Difficult to reach out and train teachers in Outer Island schools
Output 2.5: Teacher's Guide on Climate Change developed to improve climate change learning in FSM schools and training institutions	Number of climate change education planning workshops carried out to identify tailored education resources to enhance learning about climate change in schools and training institutions Number of State-specific versions that is culturally relevant to teachers and students distributed to schools, providers of technical and vocational education and training (TVET) and libraries in FSM.	There are very few educational resources that address adaptation measures that are specific to FSM. *Learning about climate change the Pacific way:* A guide for Pacific teachers exists and has been applied in Fiji, Kiribati, Samoa, Tonga and Vanuatu.	By the end of the project, at least 80% of teachers employed in all schools of the targeted six islands have access to the correct specific version of the Guide. By the end of the project, at least 25% of schools in the six targeted islands and 50% of targeted training institutions have used and applied the guide to enhance climate change learning	Workshop reports Training workshops Reports Electronic version of the Teacher's Guide available online on Department of Education websites Distribution report of the Guides Survey on use of the Guide by teachers in schools of the targeted islands.	**Risks:** Limited or no buy-in from communities or island council Logistical/transport problems a/o prohibitive costs leading to delays in arrival of people a/o materials Team/Island communication difficulties **Assumptions**: Islands & communities have existing social & institutional structures to assist with project implementation Community involvement including participation of women and elders The model Teacher's Guide developed for other PICs is appropriate for FSM
Component 3: Demonstration of Kosrae Inland Road Relocation Initiative					

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Outcome 3: Increased resilience of coastal communities and environment to adapt to coastal hazards and risks induced by climate change	Number of women, men and youth benefitting from the access provided by inland road Quality condition of road after extreme rainfall event	Malem-Utwe coastal road highly exposed to severe coastal erosion and is in high risk of being washed away within the next 10 - 30 years Unsealed inner road limits access of communities inland	At least 1,476 inhabitants of Malem and Utwe have increased coastal resilience to inundation and erosion. At least one landslide, flooding or agriculture-related risk management response has been implemented by Malem and/or Utwe By the end of the project replication and up-scaling activities are explicitly informed by lessons learned and good practices relating to gender in Kosrae Targeted beneficiaries are the 2,283 people resident in the Malem[56] and Utwe[57] municipalities. Indirect beneficiaries include 4,333 residents of other Kosrae Municipalities	Documents on lessons learned, best practices and case studies Records and reports of government executing partners in Kosrae Project monitoring and evaluation reports documenting lessons learned and good practices in climate change mainstreaming that comprehensively addresses gender Independent evaluation reports Training evaluation reports Reports of State Governors. Community , public, stakeholder perception surveys that are sex-disaggregated	Island stakeholders and key players (e.g.: Kosrae State Government) have a high interest in, support for, and engagement in capacity building activities in Kosrae. Political will and commitment from the community and government Continuous support provided by the government and development partners.

[56] Gender and age breakdown for Malem: Adult men 286; Adult women 284; Youth 252; Children 478

[57] Gender and age breakdown for Utwe: Adult men 196; Adult women 241; Youth 180; Children 366

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 3.1: 3.6 miles (5.8km) of Malem-Utwe inland road and access road routes constructed to an unsealed rural road standard for future relocation	Number of road easements obtained against number of road easements required Number of kilometers of inland road constructed to an unsealed rural road standard Length of new and re-lay water mains along Malem - Yeseng - Mosral - Kuplu section installed and connected to existing water supply at Malem and Finfokoa. Length of new power line along entire length of inland road from Malem to Utwe via Kuplu Wan installed Length of new tele-communication lines along entire length of inland road from Malem to Utwe via Kuplu Wan installed	Current inland road (1.5 km) is gravel only, in poor condition, and does not meet climate resilience standards No water mains are connected from Malem and Utwe except old water mains. No power lines and telecommunication lines from Malem to Utwe via Kuplu Wan	Approximately 8.5 km of inland road of the Malem-Utwe road constructed to climate resilient unsealed rural road standard with access routes to the two villages Water running through connected and completed mains for the Malem – Yeseng – Mosral – Kuplu section New power and telecommunication lines installed along the entire length of the inland from Malem to Utwe via Kuplu Wan	DREA and DT&I reports Progress reports Records of landowner agreements on easements Road, water, power and telecommunication progress reports Pictures of construction and installation Climate resilient engineering design and reports	**Risks:** Agreement cannot be reached with all landowners on easements required for building the inland road Climate hazards are more severe than anticipated leading to higher climate-proofing related costs for building the inland road **Assumptions:** DT&I has adequate capacity DT&I can secure quality contractors to design and build the road KSG is able to fund maintenance of the new road
Output 3.2: Transitional coast protection at Mosral and Paal upgraded for immediate coastal protection	Length (in metres/miles) of coastline revetted	Ineffective loose boulder defences at Mosral and Paal patched only after extreme events	Mosral and Paal coastline revetted in the order of 2.5 km or 1.6 miles	DT&I reports	**Assumptions:** KSG is able to fund maintenance of the transitional defences

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 3.3: State support program to access land in upland areas established	Percentage of household without land inland who accessed land inland Area (m^2) of safe land inland identified for access	No state government program to assist access land in upland for those without land	At least 30% of the household in the coastal hazard zone with no land inland access land (18 HH in Malem; 9 in Utwe)	DREA records and reports	**Assumptions:** Land swaps occur (between private owners and between private owners and KSG) KSG is able to successfully negotiate with private land owners for appropriate sites and appropriate prices
Output 3.4: Community-Based Ecosystem Management strengthened	Number of women, men and youth trained on community-based ecosystem management tools Number of women, men and youth participating in planning and consultation meetings on rehabilitation of streams through community and school-led stream health monitoring programs Number of women, men and youth participating in planning meetings, implementation and monitoring of Malem and Utwe watershed management strategies	No watershed managements strategies and municipal government policies to guide community-based and community-led ecosystem management programs	At least 90% of the 1,476 inhabitants (50%) are women) of Malem and Utwe community participated in community-based ecosystem management planning meetings, implementation and monitoring activities At least one landslide, flooding or agriculture-related risk management response has been implemented by Malem and/or Utwe By the end of the project replication and up-scaling activities are explicitly informed by lessons learned and good practices relating to gender in Kosrae Malem and Utwe Watershed Management strategies developed, endorsed by Municipal Government Council and adopted for implementation and monitored	CBO work plans KSCO progress reports Progress reports Awareness activity reports Success stories on media School newsletters	**Risks**: Implementing partner has adequate capacity **Assumptions**: Communities and CBOs participate in initiatives for community-based ecosystem management

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 3.5 State support program to assist access to finance for vulnerable households established	Number of stakeholder organizations (including development banking institutions) participating in planning meetings of the adapted finance mechanisms, implementation and monitoring Number of women, men and youth participating in community consultations on the state program No. of people who have used the adapted finance mechanism Existing housing finance mechanisms adapted Recommendations are produced by a review of programs and practices in Kosrae and other Pacific Island Countries	Existing loan mechanisms are offered by Kosrae Housing Authority[58] and FSM Development Bank[59] Most applicants for the FSM Development Bank loans do not meet eligibility criteria; Kosrae Housing Authority loan sizes ae small relative to home construction costs	At least 20% of people enrolled and participated in consultations (50% are women) have used the adapted finance mechanism At least 1 existing program is adapted to improve affordability of finance for house construction inland Recommendations address affordability of finance Recommendations identify ways to serve needs of vulnerable household in coastal risk zones	DAF study and reports KHA reports, newsletters FSM Development Bank reports and newsletters	**Assumptions:** Schemes prioritise vulnerable household in coastal hazard zones
Component 4: Knowledge management for improved water and coastal protection					

[58] Kosrae Housing Authority (HA) currently offers loans through two mechanisms: 1) Housing Loan Program; 2) USDA-funded Rural Development Program. The HA house loan lending target is 200-300K/yr; Disburse 15-20 loans/yr between USD 7-10,000. Loan terms are 15-20 yrs with a fixed rate (7%). Most loan takers are aged 25-40 yrs. Staff explain the T&C, particularly related to the promissory note and deed of trust. A second type of loan is for senior citizens (over 62) with funding from the USDA. These are "rural development" loans that can also be used to improve home sites. Interest rate is 4%. HA would like to add new program, with USDA funding of USD 50-80,000/yr; does not currently qualify. Main requirement: USD 500,000 escrow; Have only USD 300,000

[59] FSM Development Bank has capitalization from the FSM National Govt plus USD 2M and 5M loans (5 yr term) from China EXIM and the European Investment Bank. FSMDB's national lending target is USD 9 M/yr. In Kosrae lending target is 1.5 M/yr; Housing Loans make up 20% of the National portfolio but only 1% of the Kosrae portfolio; Housing Loans: up to USD 100,000; terms of up to 20 yrs; Interest rate: 9% flat. Currently most applicants are not eligible (do not meet income criteria of USD 10-30,000 per adult). If declined, can apply under personal/consumer loan category or go to Housing Authority. Consumer loans are for up to USD 30,000; 5 yr term, 15% flat rate; Have translated legal docs to Kosraen to help clients understand T&C; Options for FSM Dev Bank to increase affordability are 1) seeking additional sources of funding; 2) advocate for govt social housing scheme (standard housing).

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Outcome 4: Capacity and knowledge enhanced and developed to improve management of water and coastal sectors to adapt to climate change	Awareness materials on CC, SLR, Vulnerability and Adaptive capacity, and about the project is prepared in local language and distributed to community and other stakeholders Number of success stories developed and shared on briefs, brochures, pamphlets, posters prepared and distributed Number of men, women and youth participating in trainings and planning meetings	Programs carried out by various stakeholders (government, private sectors, and academic institutions) in the Outer Islands are not consolidated and implemented under island development plans that exist. No systematic approach to awareness of opportunities and issues around climate change in outer islands and community / municipal government levels There is lack of gender-sensitized management and execution of climate-related projects and programs. The approaches with existing projects are only in pilot and in silo approaches without integration across program planning	At least eight (50%) success stories, or knowledge products generated on lessons learned and best practices have been produced, published and shared with targeted stakeholders each project year At least 50% of perception responses (at least 50% are from women) to significant level of awareness and acknowledgement of gender and climate change benefits – compliance with natural resource management and gender dimensions of climate change	Site/field visits and surveys. Project reports Project monitoring and evaluation reports. Project monitoring and evaluation reports documenting lessons learned and good practices in climate change mainstreaming that comprehensively addresses gender Independent evaluation reports Training evaluation reports	**Assumptions:** Local capacity exists to produce training materials that are of a high standard. Strong island and community interest in, support for, and engagement in capacity building activities in the Outer Islands of each State. **Risks:** Locally available printing, video and audio production capacity

OUTCOME / OUTPUT	INDICATOR	BASELINE	TARGET	SOURCE OF VERIFICATION	RISKS AND ASSUMPTIONS
Output 4.1: climate resilient municipality development plans developed and communicated	Number of women, men and youth participating in development and review of existing island / municipal government development plans Number of meetings and workshops held Number of brochures and pamphlets prepared and distributed	Existing island and municipal government development plans have not mainstreamed climate risks and resilience	Climate change (including risks and resilience factors) are mainstreamed into Island and Municipal Government Development Plans Development plans are printed and disseminated to various stakeholders	Brochures, pamphlets Workshop reports Island / Municipal Development Plans Progress reports	**Risks:** There is no political will and commitment from island leaders, and municipal government **Assumptions:** All community groups are supportive of the plans Government departments assist in review of community / municipality development plans
Output 4.2 Resource materials developed, tailored to local context, translated, published and shared amongst various stakeholders	Number of knowledge products (training materials, etc.) generated on lessons learned and best practices published and shared Percentage of women and men staff trained on the various technical and skill-building trainings	0 awareness materials available and no resources to distribute	By the end of the project, at least 60 awareness materials and knowledge management products on the project results, on CC, V&A results, gender-based results are produced and disseminated to all relevant key stakeholders.	Printed awareness materials Workshop proceedings and reports Visuals Training evaluation reports	**Risks:** There is no capacity on island to carry out needed trainings **Assumptions:** The trainees are willing to learn and absorb the skills based trainings. English is the common language used in trainings
Output 4.3: Stakeholders brought together to share, learn and exchange knowledge and skills on climate change, adaptation planning, monitoring, vulnerability assessments and climate change	Number of trainings, workshops and learning programs developed and carried out on CC, V&A, gender, coastal, water, project management, and climate education Number of women, men, youth trained at national, state and community level	0 workshops organized on CC, SLR, vulnerability to CC and CC adaptive capacity 0 trained or aware of gender and CC, CC adaptation techniques on the environment, water resources and coastal rehabilitation	13 training and learning workshops, 8 at community level (municipality, outer island), one each at state and one national At least 1 inter-state experience exchange on lessons learned and best practices on practical and concrete island intervention At least 2 learning course programs targeting environment champions /ambassadors on CC, water resource management, or integrated coastal management course At least 1 Participatory 3D Mapping & Community Workshop	Workshop proceedings and reports Visuals 3D Map of Island	**Risks:** Logistical / transport problems and /or prohibitive costs leading to delays in arrival of people and /or materials Team/ island communication difficulties (e.g., only have shortwave radio) **Assumptions**: Community involvement including participation of women and elders

F. Alignment with AF RF

Demonstrate how the project aligns with the Results Framework of the Adaptation Fund

Table 26. Program alignment with AF Result Framework

PROJECT OBJECTIVE(S)[60]	PROJECT OBJECTIVE INDICATOR(S)	FUND OUTCOME	FUND OUTCOME INDICATOR	GRANT AMOUNT (USD)
Project Objective 1: Prepare the necessary institutional and regulatory frameworks, policies, guidance and tools to help deliver a climate resilient FSM	Number of institutional, regulatory and planning policies, frameworks and tools introduced to implement climate resiliency for all FSM States	Outcome 2 Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses Outcome 7. Improved policies and regulations that promote and enforce resilience measures	2.1 No. and type of targeted institutions with increased capacity to minimize exposure to climate variability risks 7.2. No. or targeted development strategies with incorporated climate change priorities enforced	767,642
Project Objective 2: Strengthen water and livelihood security measures to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	Number of risk-exposed communities in Yap, Pohnpei and Chuuk protected through adaptation measures	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	3.2. Modification in behavior of targeted population 4.1. Development sectors' services responsive to evolving needs from changing and variable climate	2,479,225
Project Objective 3: Provide communities with climate resilient infrastructure to help relocate from high risk coastal inundation sites.	Length of climate-resilient infrastructure (road, power lines, water mains, telecommunication lines) constructed	Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	2.2. Number of people with reduced risk to extreme weather events 4.2. Physical infrastructure improved to withstand climate change and variability-induced stress	3,520,474

[60] The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

PROJECT OBJECTIVE(S)[60]	PROJECT OBJECTIVE INDICATOR(S)	FUND OUTCOME	FUND OUTCOME INDICATOR	GRANT AMOUNT (USD)
Project Objective 4: Capture and share the local knowledge produced on climate change adaptation and accelerate the understanding about the kinds of interventions that work in island environments in FSM	Number of knowledge products developed and men, women and youth trained on CC, SLR, vulnerability and adaptive capacity	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.1. Percentage of targeted population aware of predicted adverse impacts of climate change, and of appropriate responses	739,571

Table 27. Project Outcome and indicators in relation to the AF RF Fund Output and Output Indicators

PROJECT OUTCOME[61]	PROJECT OUTCOME INDICATOR(S)	FUND OUTPUT	FUND OUTPUT INDICATOR	GRANT AMOUNT (USD)
Outcome 1: Strengthened policy and institutional capacity of government to integrate climate risk and resilience into its water and coastal management policy and regulatory frameworks	Number of national and state level stakeholders participating in EPA, R&D, NWTF meetings, planning and implementation of activities. Number of regulatory framework drafts developed for development projects regulations at state level	**Output 2.1:** Strengthened capacity of national and regional centres and networks to respond rapidly to extreme weather events **Output 7:** Improved integration of climate-resilience strategies into country development plans	**2.1.1.** No. of staff trained to respond to, and mitigate impacts of, climate-related events **7.1.** No., type, and sector of policies introduced or adjusted to address climate change risks **7.2.** No. or targeted development strategies with incorporated climate change priorities enforced	767,642
Outcome 2a: **Water conservation and management technology & practices adopted, responding to drought, sea level rise and early recovery from cyclones**	Available capacity (volume in cubic litres) of water per person per day Storage capacity for potable and grey water at household and community level Rainfall data collected on a monthly basis used to provide advice on water conservation practices and advice on other development sectors (farming, fishing, etc.).	**Output 4:** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	**4.1.1**. No. and type of health or social infrastructure developed or modified to respond to new conditions resulting from climate variability and change (by type)	2,037,680

[61] The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

PROJECT OUTCOME[61]	PROJECT OUTCOME INDICATOR(S)	FUND OUTPUT	FUND OUTPUT INDICATOR	GRANT AMOUNT (USD)
Outcome 2b: Increased awareness of climate change through formal climate education	Number of schools with climate education curriculum introduced Level of awareness of climate education in schools at different elementary and all grades Number of teachers trained in climate education at elementary and all grade schools	**Output 3:** Targeted population groups participating in adaptation and risk reduction awareness activities	**3.1.1** No. and type of risk reduction actions or strategies introduced at local level	156,313
Outcome 3: Increased resilience of coastal communities and environment to adapt to coastal hazards and risks induced by climate change	No. of people benefitting from the road Quality condition of road after extreme rainfall event	**Output 2.2:** Targeted population groups covered by adequate risk reduction systems **Output 4:** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	**2.2.1.** Percentage of population covered by adequate risk-reduction systems **2.2.2.** No. of people affected by climate variability **4.1.2**. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	3,520,474
Outcome 4: Capacity and knowledge enhanced and developed to improve management of water and coastal sectors to adapt to climate change	Awareness materials on CC, SLR, Vulnerability and Adaptive capacity, and about the project is prepared in local language and distributed to community and other stakeholders Number of success stories developed and shared on briefs, brochures, pamphlets, posters prepared and distributed Number of men, women and youth participating in trainings and planning meetings	**Output 3:** Targeted population groups participating in adaptation and risk reduction awareness activities **Output 2.2:** Targeted population groups covered by adequate risk reduction systems	**3.1.1** No. and type of risk reduction actions or strategies introduced at local level	739,571

Table 28. Project Impact

IMPACT	INDICATOR
	Number of beneficiaries (direct and indirect)
AF Impact: Increased resiliency at the community, national, and regional levels to climate variability and change.	**Direct Beneficiaries:** • At least 2,365 women and 2,365 men oriented to CC, SLR and adaptive capacity concepts and measures – in relation to water resource management, coastal and ecosystem sectors • At least 14 communities participating in adaptation planning, project management meetings, implementation and monitoring activities have the tools, knowledge and skills to respond to new conditions results from climate variability and change
Project Impact: The atoll communities of Woleai & Eauripik, Yap; Kapingamarangi & Nukuoro, Pohnpei; and Satawan and Lukunor, Chuuk have sufficient safe, clean water to ensure resilience to natural disasters	• At least 1,627 women and 1,627 men participated in planning, implementation and monitoring of activities of the project in the six outer islands of Yap, Chuuk and Pohnpei • At least six water harvesting and storage systems infrastructure developed or modified on six outer islands to respond to new conditions resulting from climate variability and change
Project Impact: The Kosrae communities most vulnerable to coastal climate change-related hazards (Malem and Utwe) are relocating inland to safer village areas	• By end of project, at least 5% of the populations of Utwe and Malem have considered measures for relocating inland to safe village areas. • At least 185 women and 185 men (25% of total population) are aware of the risk reduction systems in place to respond to impacts of climate change • 5.8km of inland road constructed and strengthened to withstand conditions resulting from climate variability and change

G. Detailed Budget

Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Table 29. Budget

Component		Activity	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL ($, USD)
1. Strengthening policy and institutional capacity for integrated coastal and water management at national and state levels	**Output 1.1: Legislation and policy paper to guide regulation of climate resilient coastal and marine management at national level**							
	1.1.1	Review of regulatory inspection procedures, protocols and enforcement	15000	22500	22500	7500	7500	75,000
	1.1.2	Regulatory and policy framework for climate change at national level	6,000	9,000	9,000	3,000	3,000	30,000
	1.1.3	Develop policy guidance documents for national and states	1,000	1,500	1,500	500	500	5,000
	1.1.4	Endorse and adopt regulations, policy and guidance documents established for national and state levels	5,000	7,500	7,500	2,500	2,500	25,000
	1.1.5	Lobby and advocate regulation and policy changes in media campaign and public awareness activities	1,000	1,500	1,500	500	500	5,000
	1.1.6	Monitor and report feedback and progress	2,000	3,000	3,000	1,000	1,000	10,000
	Output 1.2: State regulations for development projects amended to consider climate change risks and resilience measures							
	1.2.1	Consultations and regulations at state level - Yap, Chuuk and Pohnpei	5,000	7,500	7,500	2,500	2,500	25,000
	1.2.2	Develop, endorse and adopt regulatory framework on development projects at state level	10,000	15,000	15,000	5,000	5,000	50,000
	1.2.3	Initiate development of regulations, policy and guidance documents identified and adopt institutional changes to existing arrangements.	4,000	6,000	6,000	2,000	2,000	20,000
	1.2.4	Endorse and adopt regulations, policy and guidance documents established for national and state	12,000	18,000	18,000	6,000	6,000	60,000
	1.2.5	Lobby and advocate regulation and policy changes in media campaign and public awareness activities	2,000	3,000	3,000	1,000	1,000	10,000
	1.2.6	Monitor and report feedback and progress	2,000	3,000	3,000	1,000	1,000	10,000

	Output 1.3: National Water and Sanitation Policy endorsed with climate and disaster risks and resilience, and gender mainstreamed							
	1.3.1	Review the water policy framework to incorporate gender and climate change	12,400	18,600	18,600	6,200	6,200	62,000
	1.3.2	Preparation of the National Water and Sanitation Policy	13,200	19,800	19,800	6,600	6,600	66,000
	Output 1.4: National Water Outlook and Water Sector Investment Plan developed and implemented							
	1.4.1	Implementation of the NOW Programme	31,464	47,196	47,196	15,732	15,732	157,321
	1.4.2	Implementation of the Water Sector Investment Plan (WSIP) Programme	31,464	47,196	47,196	15,732	15,732	157,321
		Total: Component 1						**767,642**
2. Demonstration of water security measures in outer islands of Yap, Chuuk and Pohnpei	**Output 2.1: Outer island communities orientated to CC, SLR, and adaptive capacity measures involving water, health, sanitation and the environment**							
	2.1.1	Arrangements for demonstrations of water and sanitation technologies	20,620	10,310	30,930	30,930	10,310	103,100
	2.1.2	Carry out ground-truthing assessments	36,427	18,213	54,640	54,640	18,213	182,133
	Output 2.2: Water Harvesting and Storage System (WHSS) installed in 6 islands							
	2.2.1	Repairing household rainwater harvesting and storage system	53,342	26,671	80,013	80,013	26,671	266,709
	2.2.2	Constructing community rainwater harvesting and storage system	117,227	58,613	175,840	175,840	58,613	586,135
	2.2.3	Monitoring and maintenance	38,360	19,180	57,541	57,541	19,180	191,802
	Output 2.3: Self-composting waterless toilets constructed to conserve water, improve soil environment, and reduce marine eutrophication on the lagoon side							
	2.3.1	Developing plan/ guideline for self-composting toilets (SCT) awareness, installation and maintenance	27,180	13,590	40,770	40,770	13,590	135,901
	2.3.2	Constructing self-composting toilets - using plans (1 unit each per gender)	86,458	43,229	129,688	129,688	43,229	432,292
	2.3.3	Training on WASH and water conservation practices in school and communities	18,413	9,207	27,620	27,620	9,207	92,066
	2.3.4	Monitoring and care after	14,544	7,272	21,817	21,817	7,272	72,722
	Output 2.4: 3, 253 people trained on water conservation and management including coastal protection and livelihoods in 6 outer islands							

	2.4.1	Selecting stakeholders (men, women, youth) for training	-	-	-	-	-	-
	2.4.22	0rganizing training in water data collection and quality testing and survey developments	18,692	9,346	28,038	28,038	9,346	93,459
	2.4.33	Organizing training in construction, operations and maintenance of systems	21,128	10,564	31,692	31,692	10,564	105,641
	2.4.44	Monitoring and maintenance / after care of harvesting systems	12,190	6,095	18,285	18,285	6,095	60,952
	Output 2.5: Teacher's Guide on Climate Change developed to enhance climate change learning in FSM schools and training institutions							
	2.5.1	Organizing climate change education planning workshops	3,836	1,918	5,754	5,754	1,918	19,181
	2.5.2	Develop Teacher's Guide on Climate Change in English and translation in six main island languages	14,000	7,000	21,000	21,000	7,000	70,000
	2.5.3	Training of Trainer's / Teachers on Teacher's Guide on Climate Change.	5,754	2,877	8,631	8,631	2,877	28,771
	2.5.4	Implement Teacher's Guide in Schools	3,836	1,918	5,754	5,754	1,918	19,181
	2.5.5	Monitoring effectiveness of Teacher's Guide development system, and Guide itself	3,836	1,918	5,754	5,754	1,918	19,181
		Total: Component 2						**2,479,225**
3. Demonstration of Kosrae Inland Road Relocation Initiative	**Output 3.1: 3.6 miles (5.8km) of Malem-Utwe inland road and access road routes constructed to unsealed rural road standard for future relocation**							
	3.1.1	Survey, design, reconstruction and maintenance of road and related infrastructure to ensure climate change resilience	300,547	901,642	901,642	751,369	150,274	3,005,474
	Output 3.2: Transitional coast protection at Mosral and Paal upgraded for immediate coastal protection							
	3.2.1	Coastal protection works	31,500	94,500	94,500	78,750	15,750	315,000
	Output 3.3: State support program to access land in upland areas established							
	3.3.1	Land consultations, surveys, mapping and regulatory framework for future inland movement of vulnerable coastal people and infrastructure	5,500	16,500	16,500	13,750	2,750	55,000
	Output 3.4: Community-Based Ecosystem Management strengthened							

	3.4.1	Plusrik / Kuplu Wan water shed protection strategy, native vegetation buffer zones and stream health monitoring programme to strengthen sustainable use of upland areas	10,500	31,500	31,500	26,250	5,250	105,000
	Output 3.5: Develop state program to assist access to finance for vulnerable households established							
	3.5.1	Preparation of support programme for accessing finance, Identify options and Kosrae workshops for developing financial incentive mechanisms to support upland residential development to complement existing programmes/schemes in Kosrae providing access to finance	4,000	12,000	12,000	10,000	2,000	40,000
		Total: Component 3						**3,520,474**
4. Knowledge management for improved water and coastal protection	**Output 4.1: Community Resilient (Municipality) Development Plans developed and communicated**							
	4.1.1	Organizing development of Island/Municipal Government Development Plan	6,632	13,264	19,895	13,264	13,264	66,318
	4.1.2	Implement institutional changes to existing arrangements and establish effective communications based on new/revised Plan and communications strategy	10,523	21,046	31,569	21,046	21,046	105,230
	4.1.3	Share and disseminate to partners and stakeholders	3,378	6,757	10,135	6,757	6,757	33,785
	4.2 Resource materials developed, tailored to local context, translated, published and shared amongst various stakeholder							
	4.2.1	Capture and document information generated by the project	9,602	19,205	28,807	19,205	19,205	96,024
	4.2.2	Organizing consultancy support to edit scientific and peer reviewed knowledge products from the project	8,060	16,120	24,180	16,120	16,120	80,601
	4.2.3	Print, publish, produce and share materials through public awareness and media campaigns	6,232	12,464	18,695	12,464	12,464	62,318
	4.3 Stakeholders brought together to share, learn and exchange knowledge and skills on climate change, adaptation planning, monitoring, vulnerability assessments and climate change							
	4.3.11	Trainings on climate change, sea level rise and adaptive capacity measures on water and coastal sectors	29,529.6	59,059	88,589	59,059	59,059	295,296
		Total: Component 4						**739,571**

		Total Components (1- 4)	**1,063,113.1**	**1,678,413.2**	**2,252,073.9**	**1,852,423.0**	**660,889.7**	**7,506,913**
5. Project Execution Cost (B)	5.1	Salary of Project Staff	50,000	147,764	147,768	147,768	147,768	641,068
	5.2	Financial Audit	-	11,099	11,098	11,098	11,098	44,393
	5.3	Operating Costs	24,000	1,200	700	650	1,700	28,250
	5.4	Bi-annual Meeting Costs	-	-	7,500	-	7,500	15,000
	5.5	Inception, Meetings, Workshops	1,300	900	1,300	900	1,300	5,700
	5.66	Mid Term Evaluation Costs	-	-	26,735	-	-	26,735
	5.77	Terminal Evaluation Costs	-	-	-	-	26,872	26,872
		Total Project Execution Cost (5)	**75,300.0**	**160,963.0**	**195,101.0**	**160,416.0**	**196,238.0**	**788,018**
6. Total Project Cost			**1,150,678**	**1,843,234.6**	**2,447,148.8**	**2,008,980.6**	**844,862.77**	**8,294,931**
7. Regional Implementing Entity Fee (RIE Fee)			**97,807.6**	**156,674.99**	**208,009.88**	**170,763.33**	**71,813.33**	**705,069**
8. Amount of Financing Requested from AFB			**1,248,485.6**	**199,909.5**	**2,655,184.7**	**2,179,743.9**	**916,676.00**	**9,000,000**

Table 30. Project Execution Costs breakdown

Project Execution Activities	USD	Budget Note Table
Salary of Project Staff	641,068.00	31
Financial Audit	44,393.00	32
Operating Costs	28,250.00	33
Bi-annual Meeting Costs	15,000.00	34
Inception, Meetings, Workshops	5,700.00	35
Mid Term Evaluation Costs	26,735.00	36
Terminal Evaluation Costs	26,872.00	37
TOTAL*	**$ 788,018.00**	

Table 31. Salary of Project Staff

	Location	*START*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*TOTAL (US$)*
		2017	**2018**	**2019**	**2020**	**2021**	
Project Manager	P-OEEM	24,214	24,214	24,214	24,214	24,214	121,068
Accountant	P-OEEM	12,000	12,000	12,000	12,000	12,000	60,000
Knowledge & Comms Officer	P-OEEM	12,000	12,000	12,000	12,000	12,000	60,000
Operations & Finance Officer	Kosrae	-	10,000	10,000	10,000	10,000	40,000
Operations & Finance Officer	Yap	-	10,000	10,000	10,000	10,000	40,000
Operations & Finance Officer	Chuuk	-	10,000	10,000	10,000	10,000	40,000
Operations & Finance Officer	Pohnpei	-	10,000	10,000	10,000	10,000	40,000
Outer Island Coordinator 1	Y-Woleai		10,000	10,000	10,000	10,000	40,000
Outer Island Coordinator 2	Y-Eauripik		10,000	10,000	10,000	10,000	40,000
Outer Island Coordinator 3	C-Satawan		10,000	10,000	10,000	10,000	40,000
Outer Island Coordinator 4	C-Lukunor		10,000	10,000	10,000	10,000	40,000
Outer Island Coordinator 5	P-Nukuoro		10,000	10,000	10,000	10,000	40,000
Outer Island Coordinator 6	P-Kapinga		10,000	10,000	10,000	10,000	40,000
TOTAL		**50,000**	**147,764**	**147,768**	**147,768**	**147,768**	**641,068**

Table 32. Financial Audit

Description	Location	START	Year 1	Year 2	Year 3	Year 4	TOTAL (US$)
		2017	2018	2019	2020	2021	
Financial Audit - Kosrae	**Kosrae**	NA	6,342.0	6,342.0	6,342.0	6,342.0	25,368
Financial Audit - Yap, Chuuk, Pohnpei	**Yap, Chuuk, Pohnpei,**	NA	4,757.0	4,756.0	4,756.0	4,756.0	19,025
TOTAL		**-**	**11,099**	**11,098**	**11,098**	**11,098**	**44,393**

Table 33. Operating Costs

Description	*START*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*TOTAL USD$*
Land Telephone Charges	500	200	200	200	200	1,300
Stationery and other Office Supplies	500	500	500	450	500	2,450
Audio & Visual Equipment, Productions	18,000	-	-	-	500	18,500
Acquisition of Communication Equipment	5,000	500	-	-	500	6,000
TOTAL	**24,000**	**1,200**	**700**	**650**	**1,700**	**28,250**

Table 34. Bi-annual Meeting Costs

Description	Location	START	Year 1	Year 2	Year 3	Year 4	TOTAL (US$)
		2017	**2018**	**2019**	**2020**	**2021**	
6 members Travel	**All**	NA		7,500		7,500	15,000

Travel miscellaneous costs (venues, catering)				1,500		1,500	3,000
TOTAL		**-**	**-**	**9,000**	**-**	**9,000**	**18,000**

Table 35. Inception, Meetings, Workshop Costs

	Location	**START**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**TOTAL (US$)**
		2017	**2018**	**2019**	**2020**	**2021**	
Stationery, Venue, Catering and sundries	**P-OEEM**	400	300	400	300	400	1,800
Stationery, Venue, Catering and sundries	**Kosrae**	300	150	300	150	300	1,200
Stationery, Venue, Catering and sundries	**Yap**	200	150	200	150	200	900
Stationery, Venue, Catering and sundries	**Chuuk**	200	150	200	150	200	900
Stationery, Venue, Catering and sundries	**Pohnpei**	200	150	200	150	200	900
TOTAL		**1,300**	**900**	**1,300**	**900**	**1,300**	**5,700**

Table 36. Mid-term Evaluation Costs

	Location	***START***	***Year 1***	***Year 2***	***Year 3***	***Year 4***	***TOTAL (US$)***
		2017	**2018**	**2019**	**2020**	**2021**	
Mid Term Evaluation - Coastal Specialists	Kosrae	NA	NA	5,363	NA	NA	**5,363**
Mid Term Evaluation - Water Specialists	Yap, Chuuk, Pohnpei,	NA	NA	8,938	NA	NA	**8,938**
Travel Costs (ticket, DSA) (both specialists	All	NA	NA	11,185	NA	NA	**11,185**

Misc.	NA	NA	1,250	NA	NA	**1,250**
TOTAL	**0**	**0**	**26,735**	**0**	**0**	**26,735**

Table 37. Terminal Evaluation Costs

	Location	**START**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**TOTAL (US$)**
		2017	**2018**	**2019**	**2020**	**2021**	
Terminal Evaluation - Coastal Specialists	Kosrae	NA	NA	NA	NA	5,500	**5,500**
Terminal Evaluation - Water Specialists	Yap, Chuuk, Pohnpei,	NA	NA	NA	NA	8,938	**8,938**
Travel Costs (ticket, DSA) (both specialists)	All	NA	NA	NA	NA	11,185	**11,185**
Misc.		NA	NA	NA	NA	1,250	**1,250**
TOTAL		**0**	**0**	**0**	**0**	**26,872**	**26,872**

Project Management fee

The project management fee (8.5% of the total budget) will be utilized by SPREP, the Regional Implementing Entity, to cover the costs associated with the provision of general management support. Table 36 below provides a breakdown of the estimated costs of providing these services.

Table 36. RIE Fee

Project Cycle Management Fee	**Amount (US$)**	**Distribution**
Project Identification	35,253	5%
Preparation of Project Concept	49,355	7%

Preparation of the detailed Project Document	56,406	8%
Project Approval and Start Up	70,507	10%
Project Implementation and supervision	423,041	60%
Evaluation	70,507	10%
TOTAL	**705,069**	**100%**

a) Project identification

(i) Consult with appropriate stakeholder's in-country, including the AF operational focal point, Director of the Office of Environment & Emergency Management (OEEM); identify opportunities for AF financing, using country dialogue and other country planning/sector strategy documents as a basis.
(ii) Review options for co-financing and partnerships.
(iii) Incorporate AF opportunities in appropriate planning/country assistance strategy documents of the AF Agency.

b) Preparation of project concept

(i) Discuss AF eligibility criteria with FSM project operational focal point (OEEM) and other stakeholders.
(ii) Undertake brief in-country consultation mission if necessary.
(iii) Consult within the AF Agency.
(iv) Assist OEEM to prepare project concept, in consultation with appropriate stakeholders, including the AF operational focal point and the AF Secretariat.
(v) Assist with the preparation of the project concept.
(vi) Obtain endorsement letter(s) from the operational focal point (OEEM).
(vii) Discuss with the AF Secretariat on clearance and approval.

c) Preparation of the detailed Project Document

(i) Prepare and execute legal agreements for project concept activities. Keep OEEM informed.
(ii) Help OEEM write Terms of Reference for consultant(s), if required, to undertake project concept activities.
(iii) Assist the project proponent (OEEM) to identify and recruit consultants to assist with project preparation, if necessary.
(iv) Supervise project preparation, in consultation with all appropriate stakeholders, including missions to the field, with particular focus on risk assessment, governance issues, execution arrangements, co-financing, capacity development, partnership building and outreach.
(v) Negotiate and reach agreement on incremental cost with government and other relevant stakeholders.
(vi) Submit Project Document with Request for CEO endorsement template to the AF Secretariat.

vii) Coordinate with relevant stakeholders in formulating a programmatic approach (PA); prepare a Program Framework Document (PFD) for submission to the AF Secretariat for work program entry and Council approval; implement the PA; monitor and report on progress of the PA, prepare and submit for approval; complete implementation of all projects under the PA.

d) Project Approval and Start-up

(i) Appraise the project and finalize project implementation arrangements, including mission travel.
(ii) Prepare legal and other documentation for approval by the AF Agency approval authority.
(iii) Advise the project proponent on the establishment of a project management structure in the recipient country.
(iv) Assist project management to draft TORs and advise on the selection of experts for implementation.
(v) Advise on and participate in project start-up workshop.

e) Project implementation and supervision

(i) Mount at least one supervision mission per year, including briefing operational focal points on project progress.
(ii) Provide technical guidance, as necessary, for project implementation.
(iii) As necessary, include technical consultants during supervision missions to advise government officials on technical matters and provide technical assistance for the project as needed.
(iv) Pay advances to the executing entity and review financial reports.
(v) Oversee the preparation of annual project implementation reports (APIR) for submission to the AF Secretariat.
(vi) Monitor and review project expenditure reports.
(vii) Prepare periodic revisions to reflect changes in annual expense category budgets.
(viii) Undertake the mid-term review, including possible project restructuring. Send a copy to the AF Secretariat.
(ix) Undertake the terminal / closing review (refer to (f) below) and where possible hold a Lessons Learnt Workshop.

f) Project completion and evaluation

(i) Oversee the preparation of the Project Completion Report/Independent Terminal Evaluation; submit the report to AF Secretariat.
(ii) Prepare project closing documents.
(iii) Prepare the financial closure of the project.

H. Include a disbursement schedule with time-bound milestones

Table 37 below presents the proposed disbursement matrix for the project. The funds disbursements schedules closely follow the initiation of activities as per the Gantt chart provided in Appendix H. The funds required upon agreement for example will initiate the inception workshops of the project, initiate assessments, develop the knowledge management and capacity development strategy and plan of the project and carry out required trainings. For example, monitoring and evaluation trainings on the strategic results

framework (log frame) that would be refined following inception workshops. Technical meetings and terms of references for all activities will be developed earlier before actual procurement can commence in into the first 12 months after the project initiation. Implementation on the ground is expected to start in the second year of the project and would be well underway by the third year. Monitoring and evaluation and capturing of lessons and practices with setting up of the project for closure and terminal evaluation would be the focus of the last eighteen months of the project.

The matrix and clear time-bound milestones will be refined during the inception phase of the project.

Table 37. Project Disbursement Matrix

S. NO	MAJOR ACTIVITY	TIME LINE
1	Inception Phase: Inception Workshops at national, state, municipality	0-12 month
2	Hiring staff, project management unit set up	0-12 month
3	National Water & Sanitation Policy - development, implementation & monitoring	7-24 month
4	Developing legislation, regulations, policy and guidance documents	7-24 month
5	Identification of sites for WHSS and SCTs - for Yap, Chuuk and Pohnpei islands	9-15 month
6	Climate proof designing of WHSS, SCTs	15-20 month
7	Procurement of Materials for WHSS, SCTs	15-29 month
8	Construction of WHSS, SCTs , maintenance and monitoring	23-30 month
9	Finalisation of road easements, survey clearing & topographical surveys - Kosrae	7-12 month
10	Climate proof design inland road section / transitional defences - Kosrae	7-18 month
11	Procurement of Construction Company, Equipment & Materials	13-36 month
12	Construct to design - inland road section / transitional defences - Kosrae	19-47 month
13	State Support Program on Access to Land - Kosrae	12-51 month
14	Community-Based Ecosystem Management program - Kosrae	14-51 month
15	State Support Program on Access to Finance - Kosrae	14-51 month
16	Capacity building and training programmes	3-51 month
17	Programme Management activities including reporting	3-64 month
18	Mid-term monitoring by stakeholder	28-39 month
19	Final evaluation	52-60 month

S. NO	MAJOR ACTIVITY	TIME LINE

Table 38. Disbursement Schedule

DISBURSEMENT SCHEDULE						
	Upon Agreement Signature	One Year after Project Start	Year 2	Year 3	Year 4	Total (USD)
Scheduled Date	**April 2017**				**March 2022**	
Project Funds	1,150,678.0	1,843,234.6	2,447,174.8	2,008,980.6	844,862.7	**8,294,931**
Implementing Entity Fee	97,807.6	156,674.9	208,009.8	170,763.3	71,813.3	**705,069**
Total	**1,262,172.5**	**2,519,832.1**	**2,638,099.3**	**1,597,044.3**	**982,851.9**	**9,000,000**

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[24]

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an Appendix to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Lorin. S. Robert Secretary Department of Foreign Affairs, Federated States of Micronesia	Date: 6 January 2017 Note: please see endorsement letter and certification attached separately.

B. Implementing Entity certification

Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans, the 2004 National Strategic Development Plan, 2013 National Policy on Disaster Risk Management Plan and Climate Change Adaptation, 2011 Kosrae State Climate Change Act, 2014 Kosrae Shoreline Management Plan and other relevant regulations, and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Kosi Latu, Director General SPREP Implementing Entity Coordinator Note: please see endorsement letter and certification attached separately.	
Date: *6 January, 2017*	Tel. and email:+685 21929; kosil@sprep.org
Project Contact Person: Simon Wilson	
Tel. And Email: +685 21929simonw@sprep.org	

[24] Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

ACRONYMS

List of Acronyms used in the project proposal

- ADB Asian Development Bank
- AF Adaptation Fund
- AFB Adaptation Fund Board
- AF RF Adaptation Fund Results Framework
- APR Annual Progress Report
- AWP Annual Work Plan
- BOM Bureau of Meteorology
- CBO Community Based Organisation
- CC Climate Change
- CCCPIR Coping with Climate Change in the Pacific Region
- CDM Country Development Manager
- CEO Chief Executive Officer
- CLIMAP Climate Adaptation in the Pacific project
- CROP Council of the Regional Organisations of the Pacific
- CSIRO Commonwealth Scientific and Industrial Research Organisation
- CSO Civil society organisations
- DAC Development Cooperation Directorate
- DAF Department of Administration & Finance
- DREA Department of Resources and Economic Authority
- DRM Disaster Risk Management
- DTI Department of Transport and Infrastructure
- ECOSAN Ecological sanitation
- EE Executing Entity
- EEZ Exclusive Economic Zone
- EIA Environmental Impact Assessment
- ENSO El Nino Southern Oscillation
- EPA Environment Protection Agency
- EU European Union
- FSM Federated States of Micronesia
- FSMDB Federated States of Micronesia Development Bank
- GCCA Global Climate Change Alliance
- GDP Gross Domestic Product
- GEF Global Environment Facility
- GIZ Deutsche Gessellschaft fur International Zusammernarbiet
- SPC Secretariat of the Pacific Community
- HDPE High Density Poly Ethylene

- HH Households
- HMA Hot Mix Asphalt
- IDP Infrastructure Development Plan
- IGO Inter-Governmental Organisation
- IOM International Organisation for Migration
- IR Interest Rate
- IR Inception Report
- IRRI Inland Road Relocation Initiative
- ISBN International Standard Book Number
- ISSN International Standard Serial Number
- IW Inception Workshop
- IWRM Integrated Water Resources Management
- KCSO Kosrae Conservation Society Organisation
- KIRMA Kosrae Island Resource Management Authority
- KHA Kosrae Housing Authority
- KSG Kosrae State Government
- KSMP Kosrae Shoreline Management Plan
- KUA Kosrae Utilities Authority
- LAN Local Area Network
- MDG Millennium Development Goals
- M&E Monitoring and Evaluation
- MTE Mid Term Evaluation
- NWOP National Water Outlook Programme
- NCCC National Climate Change Committee
- NECC National Environmental Coordinating Committee
- NGO Non-Governmental Organisation
- NIW National Inception Workshop
- NPM National Project Manager
- NWTF National Water Task Force
- OECD Organisation for Economic Cooperation and Development
- OEEM Office of Environment and Emergency Management
- OIC Outer Island Coordinator
- PAC Project Advisory Committee
- PACC Pacific Adaptation to Climate Change Project
- PACCSAP Pacific Climate Change Science and Adaptation Programme
- PAR Project Annual Review
- PB Project Board
- PCCSP Pacific Climate Change Science Project
- PEIN Pacific Environment and Information Network
- PIC Pacific Island Country
- PIU Project Implementation Unit
- PMU Project Management Unit

- PNG Papua New Guinea
- PRA Participatory Rapid Response
- R&D Resources and Development
- RTSM Regional Technical Support Mechanism
- RIE Regional Implementing Entity
- SCT Self Composting waterless Toilets
- SDP Strategic Development Plan
- SIS Small Island State
- SLR Sea Level Rise
- SMP Shoreline Management Plan
- SPREP Secretariat of the Pacific Regional Environment Programme
- TWG Technical Working Group
- UNDP United Nations Development Programme
- UNFCCC United Nations Framework Convention on Climate Change
- UNFPA United Nations Population Fund
- US United States
- USD United States Dollars
- WASH Water Sanitation and Health
- WHSS Water Harvesting and Storage System
- WSIP Water Sector Investment Plan
- V&A Vulnerability and Adaptation
- 3D Three dimensional

ANNEXES

Annexes referred to in the proposal:

Annex 1	Pacific Adaptation to Climate Change Lessons Learnt
Annex 2	List of Alternative Adaptation Activities to Support Community Objectives under the Project
Annex 3	Letter of Support, Kosrae Inland Road Alignment, 29 August 2016
Annex 4a	Malem to Utwe Inland Road Initiative. Environment Impact State for the inland road. Prepared for the Kosrae State Government and the Secretariat of the Pacific Regional Environment Programme, May 2016, NIWA
Annex 4b	(Appendix C of Annex 4a)
Annex 5	Malem-Utwe Inland Road Relocation Initiative, Kosrae, Monitoring and Evaluation Framework, SPREP, 2016
Annex 6	Cost-Benefit Analysis in Coastal Zone Management in Kosrae (FSM): Economic Assessment of Coastal Road Relocation in the Face of Climate Change
Annex 7	Environment and Social Management Plan – FSM Adaptation Fund Project
Annex 8	Official correspondence from Federated States of Micronesia Department of Foreign Affairs, to Mr Naresh Sharma (Chair), Adaptation Fund Board Secretariat, endorsing the priorities identified in the AF Project Proposal (8 July, 2016)
Annex 9a	Official correspondence from Utwe Municipal Government endorsing the project, April 13, 2016
Annex 9b	Official correspondence from Malem Municipal Government endorsing the project, July 6, 2015
Annex 10	KIRMA Board Decision (approval) and Issuance Permit

ADDITIONAL DOCUMENTS ATTACHED, FOR THE INFORMATION OF THE ADAPTATION FUND

1. Kosrae Shoreline Management Plan, 2014
2. Federated States of Micronesia Infrastructure Development Plan 2016 – 2025
3. Kosrae Island Resource Management Authority (KIRMA) Regulations for Development Projects.
4. Kosrae State Climate Change Act, 2011
5. Development Review Permit Application
6. Official correspondence from Government of Kosrae (Office of the Governor) to President of FSM, with regards to Prioritisation of Inner Roads within the Infrastructure Development Plan Framework for Kosrae State (November 6, 2015)
7. Legislative Resolution No.11-106, Endorsing the inner road construction projects as one of the highest infrastructure priority projects for the State of Kosrae and for other purposes (November 24, 2015).
8. Workshop Report, Developing a Monitoring and Evaluation Framework for a Project to Reduce Climate Risks Faced by Malem and Utwe Communities, 2015.
9. Summary findings from consultations, held with Yap, Chuuk, Pohnpei and Kosrae communities (June, 2015)

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Development Review Permit Application

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Kosrae Environmental Impact Assessment guidelines

Kosrae Island Resource Management Authority (KIRMA) Regulations for Development Projects

Kosrae Shoreline Management Plan, 2014

Kosrae State Climate Change Act, 2011

Kosrae State Joint Action Plans for Climate Change and Disaster Risk Management

Kosrae State Land Use Plan, 2003

Kosrae State Regulations for Development Projects (No. 67-05), 2014 Amendment

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Pacific Gender and Climate Change Toolkit, GIZ, SPC, SPREP, UNDP, GIZ, PACC Project, 2015

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Summary findings from consultations, held with Yap, Chuuk, Pohnpei and Kosrae communities (June, 2015)

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RELEVANT WEBSITES:

http://www.sprep.org/attachments/Publications/CC/PACCTechRep18.pdf

Pacific Climate Change Portal, www.pacificclimatechange.net

Pacific Disaster Net, www.pacificdisaster.net

Http://www.sprep.org/pacc/publications/technical-reports

International Waters Project, Pacific Technical report no.52,
http://www.sprep.org/publication/000560_IWP_PTR52.pdf

DEPARTMENT OF FOREIGN AFFAIRS

of the

FEDERATED STATES OF MICRONESIA

P.O. Box P.S. 123
Palikir, Pohnpei FM 96941
Telephone: (691) 320-2641/2613 Fax: (691) 320-2933

Letter of Endorsement by Government

January 6, 2017

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for "Enhancing the climate change resilience of vulnerable island communities in Federated States of Micronesia".

In my capacity as designated authority for the Adaptation Fund in the Federated States of Micronesia, I confirm that the above national project/programme proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the Federated States of Micronesia.

Accordingly, I am pleased to endorse the above project/programme proposal with support from the Adaptation Fund. If approved, the project/programme will be implemented by the Secretariat of the Regional Environment Programme (SPREP) and executed by the Office of Environment and Emergency Management (OEEM) on behalf of Kosrae State Government, Pohnpei State Government, Yap State Government, and Chuuk State Government.

Sincerely,

Lorin S. Robert
Secretary (Minister) of Foreign Affairs

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[24]

Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an Appendix to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

Lorin. S. Robert Secretary Department of Foreign Affairs, Federated States of Micronesia	Date: January 6, 2017

B. Implementing Entity certification

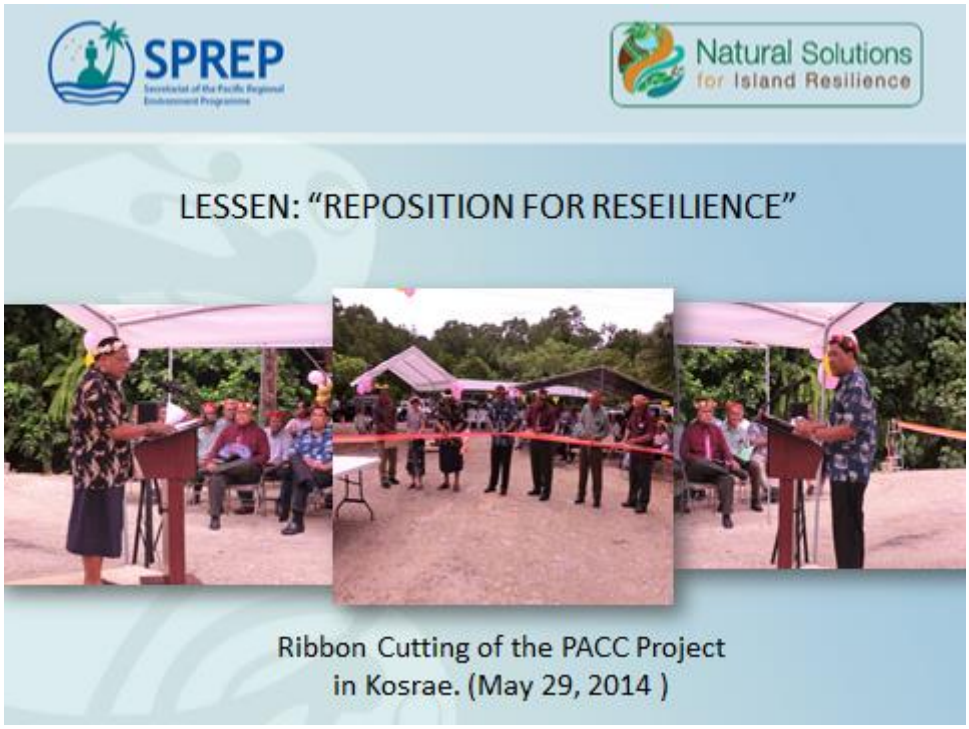
Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans, the 2004 National Strategic Development Plan, 2013 National Policy on Disaster Risk Management Plan and Climate Change Adaptation, 2011 Kosrae State Climate Change Act, 2014 Kosrae Shoreline Management Plan and other relevant regulations, and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Kosi Latu, Director General SPREP Implementing Entity Coordinator	
Date: *6 January, 2017*	Tel. and email:+685 21929; kosil@sprep.org
Project Contact Person: Espen Ronneberg	
Tel. and Email: +685 21929, espenr@sprep.org	

[24] Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

ANNEX 1

PACIFIC ADAPTATION TO CLIMATE CHANGE LESSONS LEARNT



Federated States of Micronesia

Prepared by: Simpson Abraham, SPREP DESK OFFICER, FEDERATED STATES OF MICONESIA

Coordinator, FSM PACC Project (2010-2014)

Executive Summary

FSM is one of fourteen countries taking part in the five years United Nations Development Program Global Environment Fund Pacific Adaptation to Climate Change (PACC) programme. The overall objective of the FSM PACC project was to Increase climate change resilience of coastal roads and coastal assets in Kosrae. This objectives was achieved through the mainstreaming of climate change into national polices, on-ground demonstration measures and community education and capacity building.

The main policy mainstreaming outcomes included the creation of the Shoreline Management Plan which considers climate change impacts and responses for future shoreline development. Environmental Impact Assessment (EIA) guidelines were modified to include climate change adaptation and disaster risk reduction. The FSM Climate Change policy (2009) was also replaced with a revised FSM Climate Change Act.

The main demonstration measure delivered was to climate proof (upgrade) an existing 7km stretch of road that would in the past regularly be impacted by flooding. The road was completed in 2014 and road users have reported an increase in safety and no flooding since the improvement.

The project provides a number of lessons and recommendations for consideration by future projects. Common themes through these lessons and recommendations include the importance of engagement of both politicians and community members is a key ingredient for project success in passing new legislation and gaining community support. CBA and V&A are useful tools that need to be employed during project planning and design phase to justify project design choices. PACC has been a successful demonstration project, but there is a need to replicate to the work to other road segments to increase coastal resilience. In the long run there will need to be a greater attention to asset management and maintenance to ensure sustainability.

Introduction

The FSM PACC project focused on the coastal management sector, specifically transport infrastructure in Kosrae State. The objective of the FSM PACC project was to Increase climate change resilience of coastal roads and coastal assets in Kosrae.

The project consisted of three broad outcomes.

- Outcome 1: Policy/plans mainstreamed to build resilience in the context of emerging climate risks.
- Outcome 2: Climate proofed road segment is resilient to extreme rainfall events and sea-level rise.
- Outcome 3: Increased understanding of climate change impacts and awareness of how to adapt and build resilience at pilot sites (community level)

Project Results & Products

A summary of key products and project results from the PACC FSM project are documented below for each key outcome.

Outcome 1 Policy mainstreaming: A list of products created is documented below:

- Revised EIA guidelines created incorporating CCA/DRR to be used against all infrastructure projects in Kosrae.
- Existing environmental regulations modified to include CC
- Climate proofed Shoreline Management Plan (2000) developed and approved.
- The revised Kosrae Strategic Development Plan 2013-2023 incorporated CCA/DRR and it requires all sectors to consider CCA/DDR as per the new Climate Change Act (2011)
- FSM Climate Change Act Public Law No. 18-34 replaced FSM CC policy (2009)
- All IDP now mandated by law to comply with the new EIA guideline
- CCA/DRR incorporated in the School Curriculum
- Kosrae CC legislation provided to Yap to use as model. Now FSM State of Yap recently enacts a climate change legislation.
- Pohnpei, Chuuk still in the process.

Outcome 2: Climate proofed road segment is resilient to extreme rainfall events and sea-level rise.

The demonstration measure consisted of upgrading a 7 km section of road that was prone to flooding. The climate proofed road can withstand extreme rainfall event (<254mm/hour) or high tide/sea-level rise. The road has already been exposed to heavy rainfall events and performed well with no flooding. The climate proofed road has provided access to services (farms, markets, schools) every day since its launch. Ten households and 50 landowners are currently benefiting from the upgraded road. The local community are highly satisfied with PACC project. Increased access to markets has increased livelihoods

A list of products created is documented below:

- 7 km section of climate proofed (upgraded) road.

Outcome 3: Increased understanding of climate change impacts and awareness of how to adapt and build resilience at pilot sites (community level)

The PACC FSM project developed a communication plan to guide its communication activities. The first phase of the communication plan was on visibility products (refer to the list below). The aim was to raise awareness of the issue of climate change and how to address it, advocate about adaptation and the PACC project often at the national level, through radio talkback shows, in schools, and at global and national awareness days. It did not, however, put a strong focus on community awareness. This task was made more difficult when the project officer responsible for community awareness left the project in 2012 and was not replaced. No pre and post-project survey work was undertaken to determine if an increase in climate change awareness has been created by the project.

Visibility products created as part of Outcome 3 are listed below:

- National communications plan developed and actioned
- Sharing of best practice at both national, regional, International through meetings and presentations.
- Climate change has been incorporated into school curriculum
- Annual Environment/Education/Health Conference (all FSM States, 100+ people) have included information and resources about climate change.
- Climate change fact sheets
- 'Living with a changing coastline: Past, present & future' presentation
- 'PUSHING THE LIMITS: Pioneering Study Shows Evidence Of Loss & Damage In Vulnerable Communities' case study in United Nations University in Bonn, Germany publication
- Newsletters
- Use of existing 'ADAPTING TO A CHANGING CLIMATE' toolkit

The project not only focused on visibility materials for the issue of climate change and about the project, but it also concentrated its efforts on building knowledge management products such as publications and documentaries, that will serve to capture, share and inform experiences, lessons, practices and knowledge gained throughout the project process long after the project has closed. One of the main products that the project set out to do was to write up a guide that aimed at capturing the experience of the demonstration component of the project, what was done and the reasons certain approaches were taken. The goal of this guide is to communicate the climate vulnerabilities that were identified and appropriate climate adaptation responses through the piloting of on-ground demonstration measures.

A list of major knowledge management products produced by the PACC FSM project is listed below:

- 'Climate proofing Kosrae's coastal road' case study in PACC Experiences No. 5: Reducing vulnerability of island coasts
- Trip report 'Climate and Sea Level Monitoring in Kosrae to underpin infrastructure decision-making and design'
- PACC Technical Report No. x Enhancing resilience in Coastal Management in Federated States of Micronesia (FSM) (released June 2015)
- PACC FSM documentary (Vital Access)

Most knowledge management products can be downloaded from the official PACC website http://www.sprep.org/pacc/publications and http://www.sprep.org/pacc/publications/experiences.

Monitoring & Evaluation

Project monitoring was conducted on a quarterly basis to inform status reports requested from the PACC Regional Project Management Unit. A log frame matrix was used to document indicators to track along with baseline and target values. In 2014 the log frame matrix was expanded to record a summary of results for each indicator (See Annex 2). A short community impact survey was conducted in late 2014 to obtain direct feedback from approximately X community members who use the upgraded road. Additionally, tide and rain monitoring devices were installed to collect accurate local data to inform long term decision making.

A mid-term project evaluation was conducted in 2012 and the main findings and considerations for FSM and FSM's response are documented in Annex 3. A terminal evaluation was undertaken between November and December 2014. The draft terminal evaluation report noted a small number of achievements from FSM.

Climate change was integrated into numerous plans and creation of a Climate Change Unit.

The FSM project successfully upgraded 7km of inland farm road in Tafunsak municipality, installing larger capacity culverts, enhancing side drainage and lifting 1.6km of low-lying road sections to enhance resilience to flooding. This road can now cater for increased intensity rainfall exceeding the projected 1-25 year rainfall level in 2050, drawing on earlier modelling conducted by ADB. Side-sloping was not completed however due to issues with accessing sufficient land from landowners

Sea-level monitoring gauges were also installed at Lelu Harbour, Okat, Walung and Utwe together with an automatic rainfall station at the Kosrae airport.

Demonstration guidelines to integrate climate risks into road design and construction were not completed at the time of review.

A comprehensive strategy was developed to increase understanding and awareness of climate change impacts and adaptation strategies in Kosrae from school children to policy makers, land owners, and teachers through a variety of knowledge products (posters, factsheets, newsletters) and outreach activities; presentations were made in 5 villages in addition to ad-hoc presentations during mass gatherings. An online blog was regularly updated to increase outreach. PACC Vital Series video currently being filmed to capture all results of the project

Lessons Learned & Recommendations

Lessons and recommendations were documented during the life of the project and a summary of key lessons and recommendations are presented below. Additional lessons and recommendations were also sourced from the terminal evaluation report.

Lessons:

- The engagement of key decision makers within the State of Kosrae, including the Governor and Senators has enabled the State to taking decisive action in enacting climate resilient legislation and expanding regulatory powers of the state environmental protection agency (KIRMA).
- Collaboration and partnerships with technical agencies and donors has allowed the project to seek additional technical support and funding to progress adaptation efforts on the ground.
- Participatory vulnerability assessment should be conducted at the start of any adaptation projects in order to incorporate local knowledge and input on adaptation measures.
- Having both a project coordinator with an advocacy background and project assistant with a communications background greatly assisted the project to disseminate project information and lessons learnt to a wide audience. The use of various media (video, radio, online, print) and presentations at various conferences ensured wide uptake of knowledge products.
- It is very crucial to apply CBA that to all the projects enable the sustainable financing and give realistic information for donors and decision makers.
- Using all means of mass media approach is very crucial to build up the KM and assist people to understand why decisions based CCA/DDR are made.
- Focus on CCA/DRR as a cost saving in the long term and means to minimise vulnerability to livelihoods
- Mainstreaming does not stop with PACC- it is an ongoing process
- Develop CC legal framework to the other 3 FSM states- legitimizes Kosrae CC policy, and helps attract donors
- The application of local climate data to inform modelling and project design is an essential element of success.
- To change mindsets - Involve people in planning process, lots of hands-on activities, involve municipal governments
- Attract more backstopping support from other CC donors
- Importance to build more CC partnerships
- More Local support – Involve communities in partnership and collaboration, involve women's groups
- Take it a step at a time, adjust as new information is obtained
- Needs to start now and build on the many good examples of results we have already attained

Recommendations:

- Need to replicate to other road segments to increase coastal resilience. Replication to other 3 FSM states
- Future road designs must be based on both CBA and future climate projections integrated into adaptation measures.
- The incremental cost for "climate proofing" road works should be determined for future interventions so that accurate budget estimates can be made in CCA proposals.

- There should be greater attention to asset management and maintenance to ensure sustainability. Noting limited budget for maintenance, road clearance could be a joint responsibility of DT&I and Tafunsak Municipality under a government-community partnership.
- What are the options (priorities) for this next generation? Talk about what we want Kosrae to look like for our children and grandchildren
- Plan where to build things, plan how to build things. Think about what needs to move, retrofitted or protected, by when and have a plan on how we are going to get there.
- Completion of the PACC demonstration guideline will be crucial in order to ensure that appropriate CCA design considerations are taken into account for future road projects in Kosrae and FSM more generally.
- Additional technical support is required to assist both KIRMA and DT&I integrate climate risk considerations in development approvals and infrastructure design and construction respectively, in order to give effect to legislative requirements.

Challenges and Future Risks

Some of the main challenges faced by the PACC project included:

- FSM is a complex political environment to operate in with both national and 3 State Governments. There was a need to continually lobby politicians and multi-lateral CC support to promote the outcomes of the Kosrae PACC project so that they could be replicated in other states.
- Coordination between the state and the national government still need to be improved.
- The financial procedures used against the PACC project fund are not consistent with the SPREP/UNDP. That sometimes delayed the project implementation.

Future risks and challenges that may impact the sustainability of project impacts include:

- The upgraded road needs to be continually monitored to assess its performance and identify design weaknesses (mentioned above) that may need addressing. Failing to do so may see the effectiveness of the road decreasing over time. Additionally, if guidelines are produced and used for replication, then there is a risk that any design shortfalls will be replicated in other road upgrade projects unless the weaknesses are identified and corrected in the guidelines.
- The Kosrae State Government needs to create a road maintenance plan and set aside an adequate road maintenance budget. Failure to do so could see the upgraded road deteriorate over time and be less clime proof.

ANNEX 2

LIST OF ALTERNATIVE ADAPTATION ACTIVITIES TO SUPPORT COMMUNITY OBJECTIVES UNDER THE PROJECT

The following alternative adaptation activities were identified by communities during community consultations undertaken during the planning stages of the project (Consultations in July, November 2015 and January and February 2016). All stakeholders in each of the states of Yap, Chuuk and Pohnpei ranked the following priorities to be implemented under the project as

1. water security,
2. food security and food production; and
3. marine resource management

The limited scope of the project that included limited resources and capacities in-country and on-island led to the decision by each of the States to include only the water security priorities given the urgency and immediacy of adaptation needs of the communities. The activities under the food security and production and marine resource management sectors, were agreed to be listed as fall back alternative adaptation activities for the island communities to re-consider, should the planned activity 2.1.2 not yield a local agreement. The table shows the alternative adaptation activities and its linkages to the relevant project objective and Adaptation Fund outcome and outcome indicator.

ALTERNATIVE ADAPTATION ACTIVITY	PROJECT OBJECTIVE	FUND OUTCOME	FUND OUTCOME INDICATOR
YAP OUTPUT 1: IMPROVED WATER CONSERVATION MANAGEMENT PRACTICES			
Activity 1.1. Develop and endorse a Community Water Resource Systems & Management Plan to respond to climate change (including communication plan with clear roles and responsibilities of community and project)	Project Objective 2: Strengthen *water* and livelihood security measures to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
YAP OUTPUT 2: ENCOURAGE COMMUNITY SUSTAINABLE AGRICULTURE & GARDENING PROGRAM			
Activity 2.1. Undertake Community Consultations and Management Training	Project Objective 2: Strengthen water and	Outcome 3: Strengthened awareness and ownership of	3.2. Modification in behaviour of targeted population

on Community Sustainable Farming & Gardening Program (taro production traditional/modern cultivation methods, planting unseasonal variety of crops, data collection, monitoring and maintenance)	*livelihood security measures* to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	adaptation and climate risk reduction processes at local level	
Activity 2.2. Demonstrate agriculture and gardening practices and methods including crop planting using salt-tolerant varieties (improving artificial taro patches, vegetable gardening) led by women, men and youth groups		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 2.3. Strengthen distribution network of planting materials and monitoring amongst women, men and youth groups and produce a training guide for food gardening in the outer islands		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 2.4. Ongoing data collection and monitoring activities to evaluate social and economic benefits of community sustainable agriculture & gardening program		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
YAP OUTPUT 3: COMMUNITY COASTAL AND MARINE RESOURCES MANAGEMENT			
Activity 3.1. Undertake Community Consultation, Learning, Training and Awareness Workshop on MPAs and solar FADs targeting fisher folks including women, men and youth and strengthen networks with LMMA and PIMPAC	Project Objective 2: Strengthen water and *livelihood security measures* to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
Activity 3.2. Local consultancy services to facilitate community coastal and marine resources management planning workshop with a (Marine Resource Management)		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local	3.2. Modification in behaviour of targeted population

Plan drafted for Woleai and Eauripik		level	
Activity 3.3. Construct, manage, deploy and maintain MPAs, solar FADs and register MPAs under the Micronesian Challenge Goal and Protected Areas Network (PAN) legislation program Ongoing data collection and monitoring activities on catch and stock and to evaluate social, economic, and environment benefits of solar FADs and MPAs		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 3.4. Ongoing data collection and monitoring activities on catch and stock and to evaluate social, economic, and environment benefits of solar FADs and MPAs;		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
CHUUK OUTPUT 1: ENCOURAGE COMMUNITY SUSTAINABLE AGRICULTURE & GARDENING PROGRAM			
Activity 1.1 Undertake Community Consultations and Training in Management Workshop on Community Sustainable Agriculture & Gardening Program (Alternative Food Preservation & Production Methods, Compositing, Seed Production, Quarantine & Invasive Species, data collection, monitoring and maintenance)	Project Objective 2: Strengthen *water* and *livelihood security measures* to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
Activity 1.2 Demonstrate agriculture and gardening practices and methods including crop planting using salt-tolerant varieties (improving artificial taro patches, vegetable gardening) led by women, men		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate

and youth groups			
Activity 1.3 Strengthen distribution network of planting materials and monitoring amongst women, men and youth groups and produce a training guide for food gardening in the outer islands		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 1.4 Ongoing data collection and monitoring activities to evaluate social and economic benefits of community sustainable agriculture & gardening program		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
CHUUK OUTPUT 2: COMMUNITY COASTAL AND MARINE RESOURCES MANAGEMENT			
Activity 2.1 Undertake Community Consultation, Learning, Training and Awareness Workshop on MPAs and FADs targeting fisher folks including women, men and youth	Project Objective 2: Strengthen water and *livelihood security measures* to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
Activity 2.2 Local consultancy services to facilitate community coastal and marine resources management planning workshop with a Plan drafted for Lukunor and Satawan		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
Activity 2.3 Construct, manage, deploy and maintain MPAs, FADs and register MPAs under the Micronesian Challenge Goal and Protected Areas Network (PAN) legislation program		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 2.4 Ongoing data collection and monitoring activities to evaluate social and economic benefits of FADs and MPAs;		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local	3.2. Modification in behaviour of targeted population

		level	
Activity 2.5 Carry out community-assisted geospatial assessments based on actions and direction from the management Plan for soft-engineering coastal protection measures of Lukunor and Satawan communities		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 2.6 Implement a community-endorsed soft engineering coastal protection measure recommended by the geospatial assessment report		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
POHNPEI OUTPUT 1: MEASURES TO IMPROVE AND INCREASE FOOD PRODUCTION AND PRESERVATION OF LOCAL AND CLIMATE RESILIENT VARIETIES APPLIED			
Activity 1.1 Undertake Community Consultations and Management Training Workshop on Community Traditional (Milling, Drying, Planting) and Modern (Milling, Solar Drying, Vacuum Packing) Methods of Food Preparation and Preservation and Seeds Distribution Program	Project Objective 2: Strengthen water and *livelihood security measures* to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
Activity 1.2 Demonstrate food practices and methods including establishment and trainings on community nursery and community seedling distribution program led by women, men and youth groups		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 1.3 Strengthen distribution network of planting materials and monitoring amongst women, men and youth groups and produce a training guide		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate

for food gardening in the outer islands			
Activity 1.4 Ongoing data collection and monitoring activities to evaluate social and economic benefits of community sustainable agriculture & gardening program		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
POHNPEI OUTPUT 2: COMMUNITY COASTAL AND MARINE RESOURCES MANAGEMENT			
Activity 2.1 Undertake Community Consultation, Learning, Training and Awareness Workshop on MPAs and solar FADs targeting fisher folks including women, men and youth and strengthen networks with LMMA and PIMPAC	Project Objective 2: Strengthen water and *livelihood security measures* to help 6 outer atoll islands adapt to impacts of climate change related to water, health and sanitation	Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
Activity 2.2 Local consultancy services to facilitate community coastal and marine resources management planning workshop with a (Marine Resource Management) Plan drafted for Kapingamarangi and Nukuoro		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 2.3 Construct, manage, deploy and maintain MPAs, solar FADs and register MPAs under the Micronesian Challenge Goal and Protected Areas Network (PAN) legislation program		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate
Activity 2.4 Ongoing data collection and monitoring activities on catch and stock and to evaluate social, economic, and environment benefits of solar FADs and MPAs;		Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	3.2. Modification in behaviour of targeted population
Activity 2.5 Carry out feasibility study for widening port channel in Kapingamarangi		Outcome 4: Increased adaptive capacity within relevant	4.1. Development sectors' services responsive to evolving

as guided by the Kapingamarangi Development Plan		development and natural resource sectors	needs from changing and variable climate
Activity 2.6 Demonstrate planting scheme for common locally available coastal species (mangrove, pandanus, coconut) to prevent coastal erosion		Outcome 4: Increased adaptive capacity within relevant development and natural resource sectors	4.1. Development sectors' services responsive to evolving needs from changing and variable climate

The community consultations to re assess these alternative activities will include the refinement of a logical framework for the activities. The activities put forward in a log frame will be put forward with work plan costings (within budget of each State), clear roles and responsibilities and seek endorsement of the Project Board. The Board will ensure that the new activities put forward meet the Project's Objectives and the Fund's mandate.

KOSRAE STATE GOVERNMENT
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Ph: (691) 370-3165/3011; Fax: (691) 370-3058

Letter of support: "Kosrae Inland Road Alignment"

August 29, 2016

To: **Kosi Latu**
Director General, SPREP
Implementing Entity Coordinator

Subject: Kosrae Inland Road Alignment

In my capacity as the Director of Department of Transportation & Infrastructure (DT&I), I am pleased to confirm the following with regards the proposed inland road alignment between Malem and Utwe:

- The road alignment is finalized and agreed by both the state Government and the communities of Malem and Utwe.
- There may be some very minor lateral shifts in alignment at the time of the detailed survey to best account for the localized topography, avoid any new cultural areas identified etc. These shifts are only going to be of the order of a few 10s of meters if that (and within the available buffer zone between the steep upland areas and the low-lying wetland areas).
- These shifts will not change any aspect of the EIA or ESMP.

Sincerely,

Osamu Nedlic
Acting Director
Department of Transportation & Infrastructure (DT&I)

NIWA
Taihoro Nukurangi

Malem to Utwe Inland Road Relocation Initiative

Environmental Impact Statement for the inland road

Prepared for the Kosrae State Government and the Regional Technical Support Mechanism administered by the Secretariat of the Pacific Regional Environment Programme, with funding from the Asian Development Bank

May 2016

Prepared by:
Doug Ramsay

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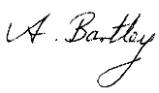
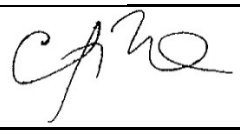
NIWA CLIENT REPORT No: 2016032HN
Report date: May 2016
NIWA Project: SER16201

Quality Assurance Statement		
	Reviewed by:	Dr Rob Bell
	Formatting checked by:	A. Bartley
	Approved for release by:	Dr C. Baker

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Executive summary

The Federated States of Micronesia (FSM), with support from the Regional Technical Support Mechanism administered by the Secretariat of the Pacific Regional Environment Programme (SPREP) and funded by the Asian Development Bank is developing a project proposal for submission to the Adaptation Fund (AF) to assist coastal communities in all four states in the FSM prepare and adapt for higher sea levels and adverse and frequent changes in extreme weather and climate events.

A significant component of the Kosrae part of the AF proposal will focus on implementing activities in Malem Municipality around supporting the commencement of a long-term and staged strategy of relocating essential infrastructure (road, power, telecommunications) back from the coastline, which presently poses significant coastal-hazard risks in low-lying sections. Specifically, this will look to construct the first phase of inland road development between Malem and Utwe up to a two-laned sub-base standard.

This report presents an Environmental Impact Statement (EIS) for the proposed inland road between Malem and Utwe and also includes the section between Malem and Pilyuul[1]. The purpose of the EIS is to provide an Environmental Impact Assessment (EIA) to support the Development Consent process for the inland road development, and the development of the Environmental and Social Management Plan required for AF proposal submission.

This EIS builds on existing studies and identified State, Municipal and community concerns. The overall conclusion is that environmental impacts from the proposed inland road are **low to moderate** and can be adequately controlled through:

- Adhering to the mitigating recommendations made in this EIS, particularly around erosion, sediment control, storm water runoff, and any other aspects of construction activities subsequently specified in the Development Permit conditions.
- Maintaining the alignment of the road between Malem and Kuplu close to that proposed following approximately the 10 m contour
- Maintaining the alignment of the road between Kuplu and Finsrem on Kuplu Wan plateau close to that proposed maintaining minimum buffer of 150 m at the watershed between the two catchments and over 350 m for the majority of the section of inland road within the Palusrik catchment.

At this stage no potential significant issues have been identified that would require further assessment to understand or address potential impacts.

[1] Note: The Malem to Pilyuul section of the inland road, however, will not be addressed under the Adaptation Fund.

1 Introduction

1.1 Project background

The Federated States of Micronesia (FSM), with support from the Regional Technical Support Mechanism administered by the Secretariat of the Pacific Regional Environment Programme (SPREP) and funded by the Asian Development Bank, is developing a project proposal for submission to the Adaptation Fund (AF) to assist coastal communities in all four states in the FSM prepare and adapt for higher sea levels and adverse and frequent changes in extreme weather and climate events.

The Kosrae component of the proposal has an indicative budget of US$3.0 m to begin the process of implementing necessary adaptation activities identified in the Kosrae Shoreline Management Plan (Ramsay et al. 2013). This will specifically focus on implementing activities in Malem Municipality (Figure 1) around supporting the commencement of a long-term and staged strategy of relocating essential infrastructure back from the coastline. The specifics of the Kosrae component of the AF proposal are still being finalised but is expected to include some or all of the following aspects:

- Construction of the first phase of inland road development between Malem and Utwe up to a two-lane sub-base standard.
- Upgrading of existing coastal defences at Paal and Mosral.
- Inland Municipal Development planning and identification of land availability.
- Awareness and strengthening of complementary ecosystem-based adaptation activities.
- Identifying incentive options to assist households relocate inland.

At present implementation of the inland road and associated infrastructure may also be supported by a Chinese grant for up to $5 m for each State for infrastructure development currently being negotiated by the FSM. Kosrae is committed to prioritising up to $4 m of this funding to complete the Malem to Utwe road to hot-mix asphalt pavement. Hence the assumption through the development of the AF proposal has been to develop a standalone project, but one where further implementation could be achieved if the Chinese funding (or other donor support) is secured.

As part of the Adaptation Fund Proposal a number of supporting activities are required, including a cost-benefit analysis (Holland, 2015), a monitoring and evaluation framework (Braun, 2015) and an environmental and social management plan (ESMP). This EIS will contribute to the development of the ESMP. Terms of Reference are included in Appendix A.

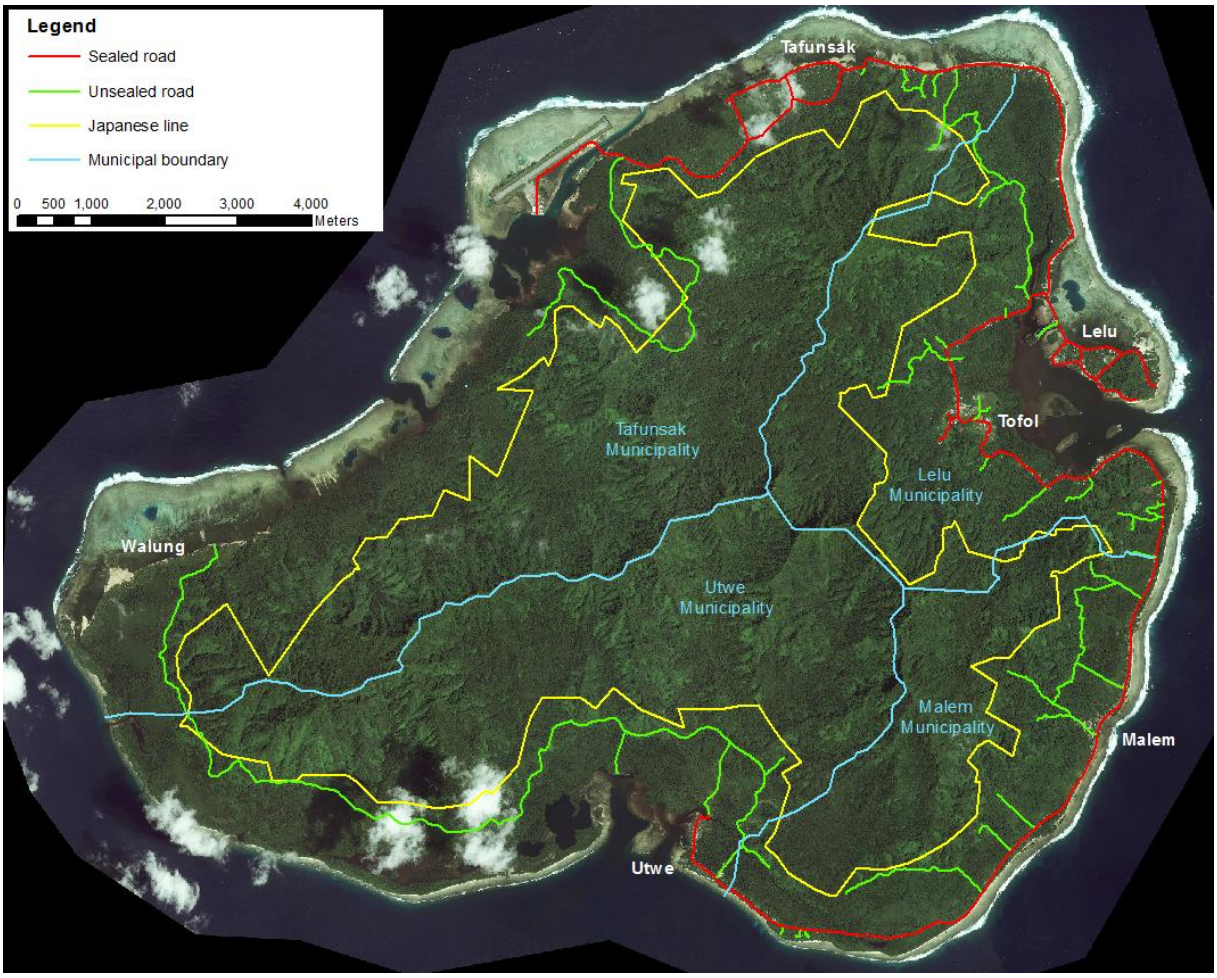

Figure 1: Kosrae location map including municipality areas.

1.2 Legislative framework in Kosrae

Kosrae has enacted legislation and prepared a range of resource and management plans to give effect to its responsibilities in relation to the management, protection and conservation of the environment and natural resources (KIRMA, 2014). These responsibilities are principally implemented by the Kosrae Island Resource Management Authority (KIRMA), a semi-autonomous government agency, which is mandated to:

> *"protect the environment, human health, welfare and safety and to abate, control and prevent pollution or contamination of air, land and water by balancing the needs of economic and social development with those of environmental quality and adopting regulations and pursuing policies which, to the maximum extent possible, ensure that economic and social development is environmentally sustainable"* (Kosrae State Code, Section 19.101).

Under Title 19 of the Kosrae State Code and the *Regulations for Development Projects*, KIRMA has responsibilities and powers to administer a development permit system. Where a potential project may have significant impact on the environment, these regulations require an Environmental Impact Assessment (EIA). This assesses the physical, ecological, aesthetic, cultural, economic, social, or health effects or impacts of a proposed activity on the environment, whether the effects are direct, indirect or cumulative. The EIA describes the potential effects or impacts on the environment in

sufficient detail so as to allow the assessors (KIRMA, the Board of Commissioners, and stakeholders) to make a comparison of the alternatives that can be taken to avoid, minimize, rectify, reduce or eliminate, or compensate for the impact of the proposed activity. This assessment process concludes with a decision by the Board of Commissioners to issue a development review permit, subject to conditions that will avoid, minimize or eliminate the effects or impacts of the proposed activity on the environment. The process is detailed in full in KIRMA's guidance document*: Environmental impact assessment in the State of Kosrae*, FSM (KIRMA, 2014).

Determining whether an impact is significant includes consideration of the following:

- the number of people affected
- the duration of an effect (short and long-term)
- the proportion of a natural resource that is damaged or consumed
- the location of a project in a sensitive area (historic site, coastal area, marine conservation area)
- the relationship to other components of the project or other projects in the region, and
- the intensity of severity of an impact (irreversible and cumulative).

1.3 Scope of the present report

This report presents the Environmental Impact[2] Statement (EIS) of the proposed inland road between Malem and Utwe[3].

The purpose of the report is to:

1. Assess environmental and social issues to support the construction activities of Phase I of the Malem to Utwe Inland Road Relocation Initiative.
2. If any potential significant issues and impacts are identified, outline further assessment that will be required to understand or address these impacts.

The report covers the assessment related to construction activities of the inland road to a sub-base standard pavement (Phase I). The report does not cover the assessment related to construction activities associated upgrading the inland road from a sub-base standard to hot-mix asphalt pavement (as is proposed if the Chinese funding is secured) (Phase II). This will require a further Development Permit and development of an Environmental Management Plan to address and mitigate potential construction and associated impacts during the planning phase. However, many of the mitigation requirements outlined in this report will be relevant.

[2] Taken here to include physical, ecological, aesthetic, cultural, economic, social, or health impacts
[3] The EIS also addresses the section of road between 'Malem and Pilyuul'. This section, however, will not be addressed under the Adaptation Fund project.

2 Description of the proposed inland road

2.1 Introduction

The road network on Kosrae is a mix of two-laned paved road linking the villages of Utwe, Malem, Tofol, Lelu and Tafunsak to the port and airport at Okat, supplemented by generally single lane unsealed access roads and farm tracks (Figure 1).

The paved road network is located either around the base of the volcanic part of the island, (Figure 2) such as the road from the port/airport behind Tafunsak village, or on the narrow storm berm located on the reef flat along much of the eastern coastline of Lelu and Malem Municipalities (Figure 2).

Much of this latter section of road is at risk from shoreline change and wave overwash. To date the response to the most critically eroded sections has been to build seawalls, typically rock revetments which provide varying degrees of protection. At present further sections at Paal and Mosral are also under threat with concrete rubble dumped along the most critical section to provide temporary protection. In the foreseeable future, both ongoing coastal shoreline change and the exacerbating effects of sea-level rise and climate change, will inevitably result in further sections of road becoming increasingly exposed to damage and flooding, for example at Pilyuul. Given the low elevation of much of the existing coastal road relative to future sea levels, and its location on the narrow beach/storm berm, continued reliance on seawall protection of all sections of the present paved coastal road and communities located there, will become progressively ineffective, more expensive and not sustainable.

Figure 2: Paved inland road between the airport and Tafunsak village (left) and on the narrow storm berm at Mosral, Malem (right).

The road network plays a fundamental role in encouraging development both historically and in the future e.g., infrastructure (water, electricity and telecommunications) and residential and commercial development. Over the last two to three generations the majority of residential property is located alongside or close to the main paved sections of road. This has resulted in residential development, particularly in Malem Municipality, occurring in areas exposed to high risk of damage due to coastal change and flooding, a risk which will continue to increase (both consequences and frequency) with ongoing climate change and sea-level rise.

Due to these interdependencies, continuing to maintain the single main road in its present location on the narrow beach/storm berm will leave the whole community increasingly vulnerable to being isolated and unable to move between locations / villages, and make responding to emergencies and

continued development very difficult if not impossible during coastal-hazard events. Repositioning the road to higher ground ensures a long-term sustainable all weather access for the whole community as well as removing a significant barrier to the long-term development and relocation of residential property to higher ground.

The Kosrae Shoreline Management Plan developed a prioritised list of inland road and essential infrastructure development to be implemented over the next one to two generations (Figure 3). Developing and upgrading the inland road between Malem and Utwe was considered the highest priority due to the risks posed due to wave overwashing and potential breaching of existing road sections at Paal and Mosral. There is already a risk that road access to Utwe could be cut off. The natural storm berm to the south of Malem also tends to be lower in elevation resulting in the road being more prone to wave overwashing during high tides (Figure 2).

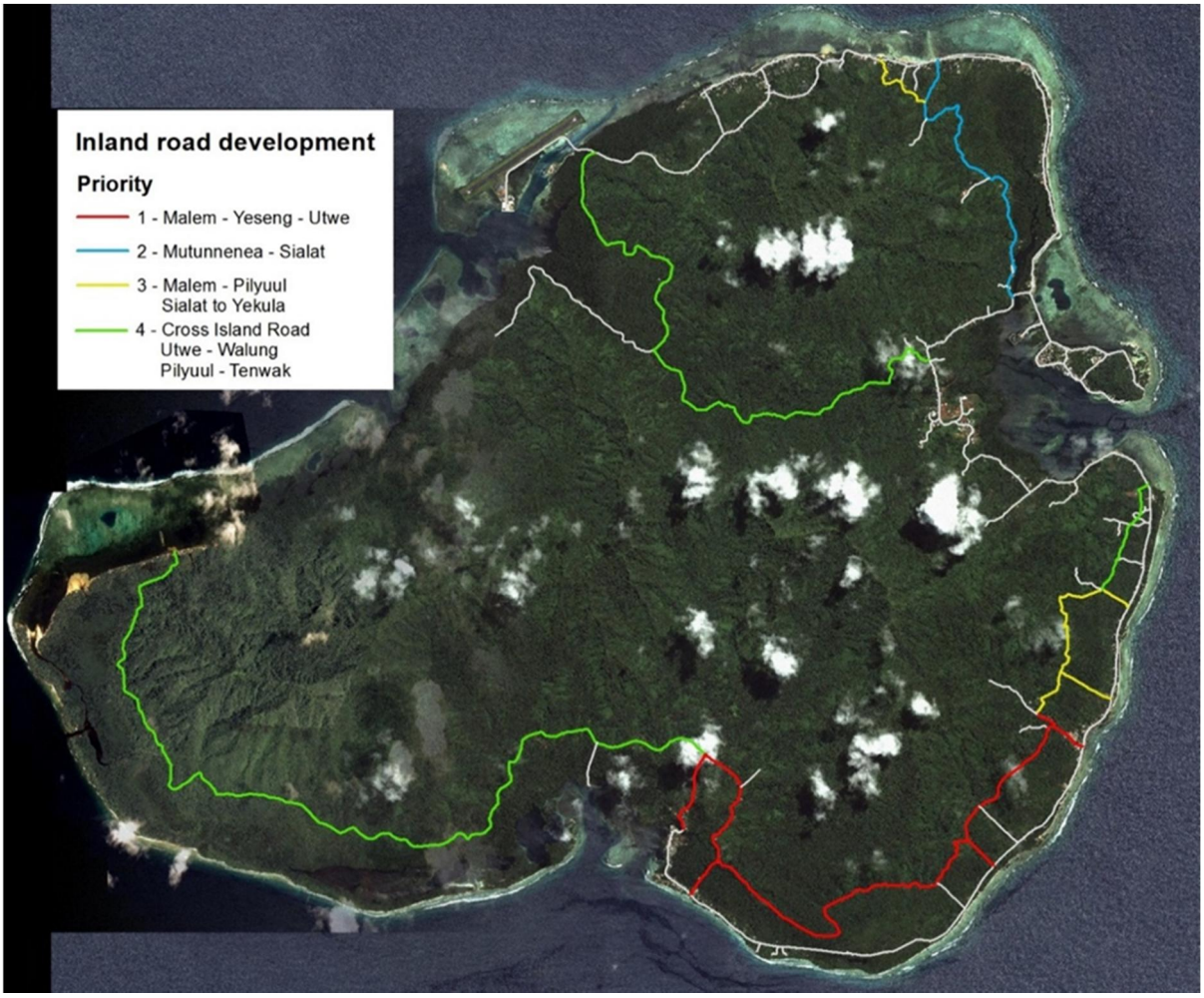

Figure 3: Priority sections of the development of the inland road on Kosrae.

2.2 Initial inland road alignment

The initial alignment of the road proposed in the KSMP is along approximately the 10 m contour shown in Figure 4**Error! Reference source not found.**. The EIA has explored alignment options of the inland road and are considered within this report as shown and discussed in the following sections.

Figure 4 Initial alignment of inland road sections between Utwe, Malem and Pilyuul as defined in the KSMP. Dashed lines indicate further alternative road alignments / options considered within the EIA.

2.3 Proposed inland road design

The proposed inland road will be located well above the inland boundary of freshwater swamp or mangrove areas along approximately the 10 m contour. This would also be well above areas likely to be directly impacted by sea-level rise over the next century and beyond (Ramsay et al. 2014). A staged approach is being adopted to deliver the various sections of relocated road (identified in Figure 4) and associated infrastructure and ultimately village infrastructure and residential development. Ultimately the intention is to develop the road to the same standard as the existing two lane paved road based on the design standards developed for the Kosrae Circumferential Road Extension Project (Barrett Consulting Group Inc, 1987), as shown in Figure 5. Over the next one to two generations the inland road will become the primary road access from Utwe and Malem to Tofol.

The road design assumes:

- A 60 feet standard easement width.
- A 12 foot standard lane width.
- A 2% cross-section drainage gradient for hot mix asphalt pavement and 3% gradient for a sub-base surface.

- Existing sections of inland farm roads will be widened to obtain a roadway width of 30 ft., and include construction of roadway drainage structures (bridges and culverts) and resurfacing to sub-base course level.
- (Phase II) Upgrade to Hot Mix Asphalt (HMA) pavement includes base course preparation on top of the sub-base and 2" thick asphalt pavement. It is assumed that all aggregates including sand are imported.
- Where required an integrated infrastructure approach is adopted which includes relocation of power distribution, and any water or telecom service infrastructure within the road easement alignment.

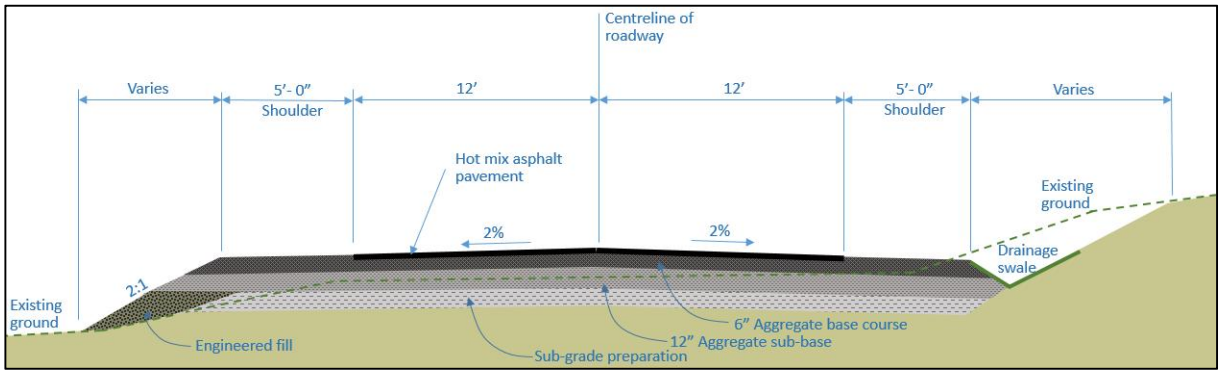

Figure 5: Typical road cross-section. Based on the design standard developed for Kosrae circumferential road extension project (Barrett Consulting Group Inc., 1987).

The inland road would be developed around the perimeter of the lower slopes of the volcanic part of the island. Following the natural contour of the topography minimizes any significant road slopes, need for substantial cut and fill, and reduces erosion potential and land-slip hazards. The intention is that the road, when complete, will be similar to the present inland sections of road for example between the airport and Tafunsak village (see Figure 2).

Figure 6: PACC road in Tafunsak completed to sub-base surface standard.

The Department of Transport & Infrastructure plans to construct the inland road up to a sub-base standard (Figure 6) in the immediate future to be followed by upgrading the road to a hot-mix asphalt surface. The Department will have the expertise and equipment to design and construct the road up to sub-base level (external construction support will be required to upgrade the road to hot-mix asphalt). Fill material is available from existing permitted quarries adjacent to the proposed inland road, for example at Yeseng, and aggregates from the PUK quarry in Tenwak.

3 Description of the Environment

3.1 Introduction

Kosrae is a high volcanic island with a land mass totalling approximately 109 km^2. The highest point is Mount Finkol at 633 m with steep mountain ridges and deep valleys covering approximately 70% of the land surface. Foot slopes, alluvial fans, freshwater swamp and bottom land around the base of the high volcanic land areas make up a further 15% of land area with the remainder mangrove areas and coastal strands (US Department of Agriculture, 1983).

The island is surrounded by a fringing coral reef with the distance between the reef flat and shoreline strand varying in width depending on exposure to the incident wave climate. The fringing reef is dissected by four natural breaks (harbours) that occur at the mouths of the four main catchment systems (Okat, Yela, Finkol and Innem Rivers). A narrow modern, and in places remnant, coastal strand separates the reef system from the lagoon mangrove and swamp infill areas that fringe the volcanic parts of the island. Much of the development of Kosrae has occurred on this narrow coastal strand.

Average daily temperature is around 27°C and generally varies less than 1-2°C from month to month. Humidity is also high, with relative humidity typically above 80% throughout the year. Trade winds from the north-east blow throughout the year and are strongest during the December to February period. An increase in westerly winds and reduction in trade winds tends to occur during periods of El Niño with stronger trade winds experienced during La Niña periods.

Average annual rainfall is in excess of 5000 mm and is likely to be higher in the interior with slightly less rain experienced on the leeward southern side of the island. Rainfall is generally well distributed throughout the year with April tending to be the wettest month (Figure 7). During periods of El Niño, Kosrae can experience drought conditions, with the typical pattern being reduced rainfall between October and December of the El Niño year and significantly reduced rainfall between January and March in the year following continuing with lower than normal rainfall to the middle of the year.

Heaviest rainfall tends to occur between July and October, particularly when the West Pacific Monsoon extends eastwards towards Kosrae, as can occur when El Niño conditions are developing. Short period extremely high intensity convective rainfall is common, for example an hourly rainfall of 100 mm has an estimated return period of 6 years (or approximately a 16% chance of occurring in any year), Figure 8. Typhoons, tropical depressions and storms that track close to Kosrae can also cause heavily rainfall. The last typhoon to directly strike Kosrae occurred in 1905 but a number of severe typhoons have affected Kosrae prior to 1905[4]. Many of the typhoons that affect the western parts of Micronesia often originate around Kosrae as tropical depressions or storms developing into full typhoons to the west and north of the island. These events typically occur between June and November and are more likely to form or track closer to Kosrae during El Niño phases.

[4] http://kosraecoast.com/damaging-events/

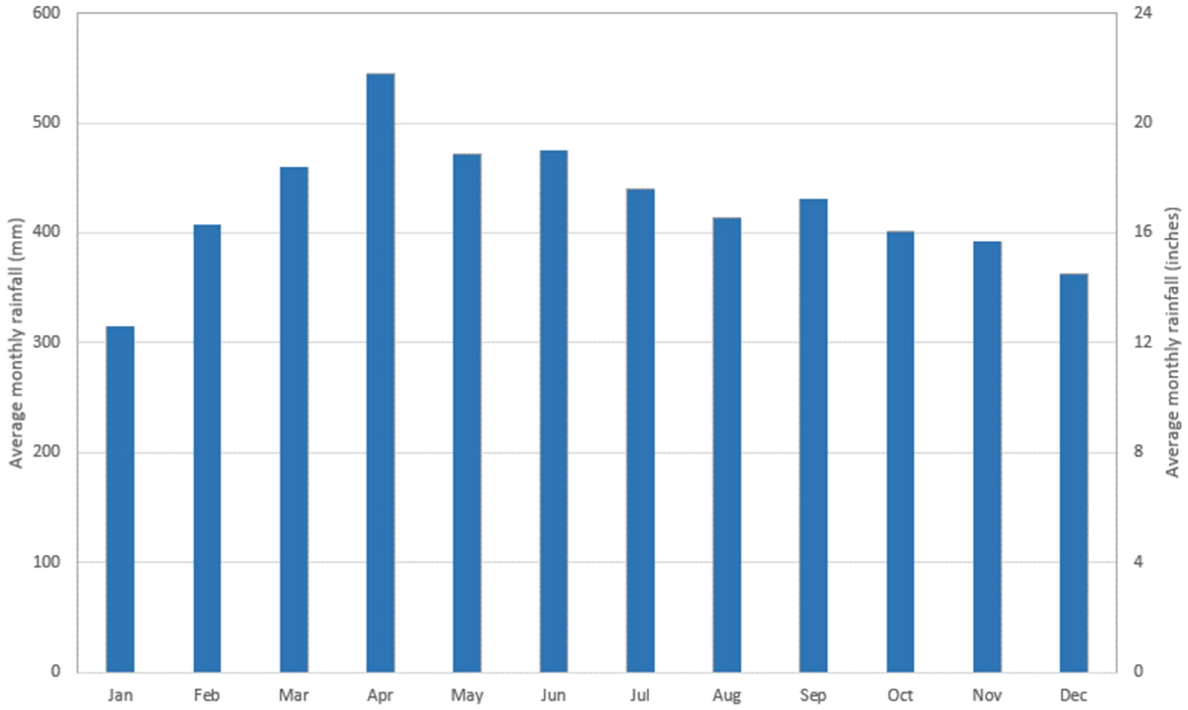

Figure 7: Average monthly rainfall for Kosrae. Based on monthly long-term average rainfall amounts provided by the Pacific ENSO Application Centre (http://www.weather.gov/peac/) from observations at Kosrae Airport supplemented by observations at Lelu between 1933 and 1977 and Japanese observations between 1933 to 1937.

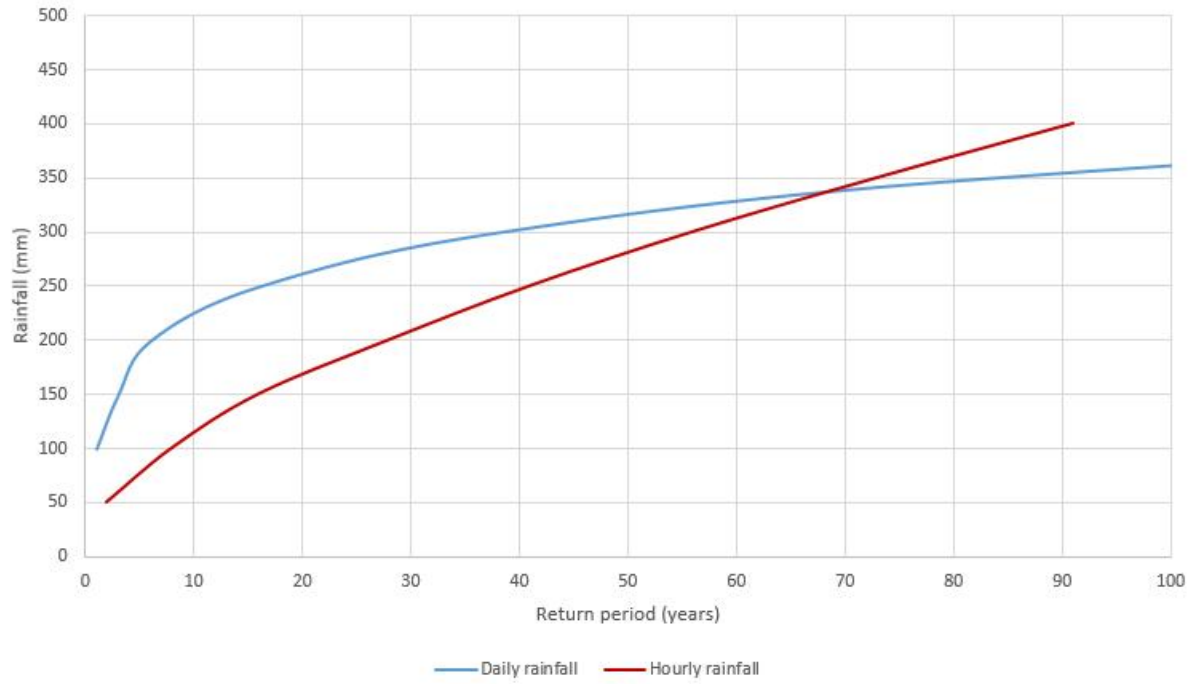

Figure 8: High intensity extreme daily and hourly rainfall amounts for Kosrae. Source: Asian Development Bank (2005).

3.2 Overview of Malem and Utwe municipalities

Malem and Utwe Municipalities are located on the south-east and southern areas of Kosrae respectively (Figure 1) with the majority of the proposed inland road project located in Malem Municipality. At the last census (2010), Malem Municipality had a population of 1300, with 983 people recorded in Utwe Municipality.

The majority of this population and associated houses, together with the coastal road and other infrastructure, is located on land less than 5 m above mean sea level on a narrow storm berm (Figure 9). This berm was likely formed within the last 1000-3000 years due to storm/typhoon events depositing coral rubble and sediment on the reef flat, which has then been reworked to build up the storm berm. The development of the storm berm has enabled the infill swamp and mangrove areas to develop between the storm berm and the base of the mountainous part of the island. The berm, and hence degree of infilling and associated ecosystem behind it, varies in age being older formations around Malem and much younger to the south. Radiocarbon dating of the peat swamp deposits suggests that the areas around Malem did not become swamp until between the 5th and 9th century AD, and between the 7th to 12th century AD further south (Athens, 1995). This is reflected in the level of infill with well-developed but younger lagoon mangroves in the south from Utwe, through Kuplu to Mosral, and a brackish and freshwater swamp, which has had a longer period to develop from a mangrove to a swamp system, from Mosral northwards (Figure 10).

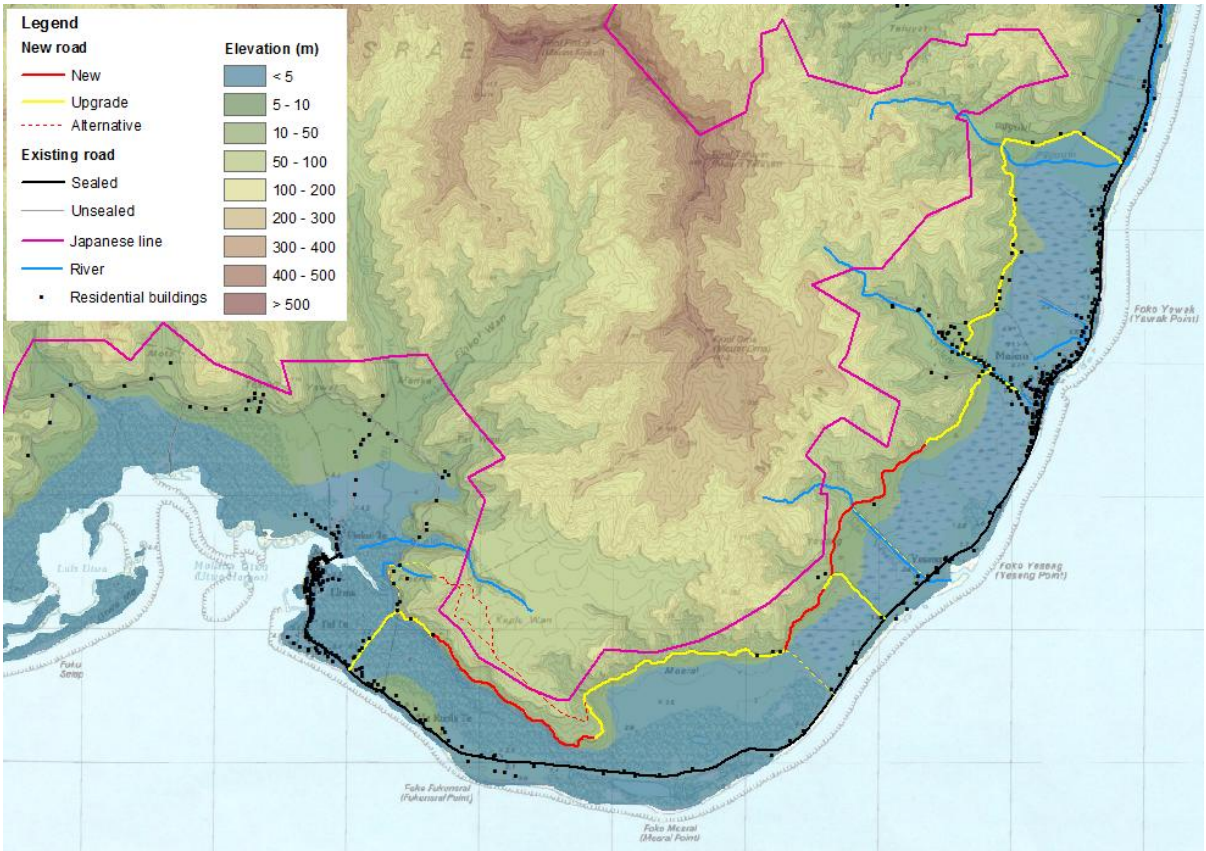

Figure 9: Topography map and distribution of residential properties in Malem and eastern part of Utwe Municipalities. Residential property locations taken from the 2010 census.

A narrow colluvial/alluvial plain provides the transition between the swamp and mangrove areas and the steep, mountainous part of the island and the peaks of Mount Oma (448 m) and Mount Tafuyat (500 m), Figure 9.

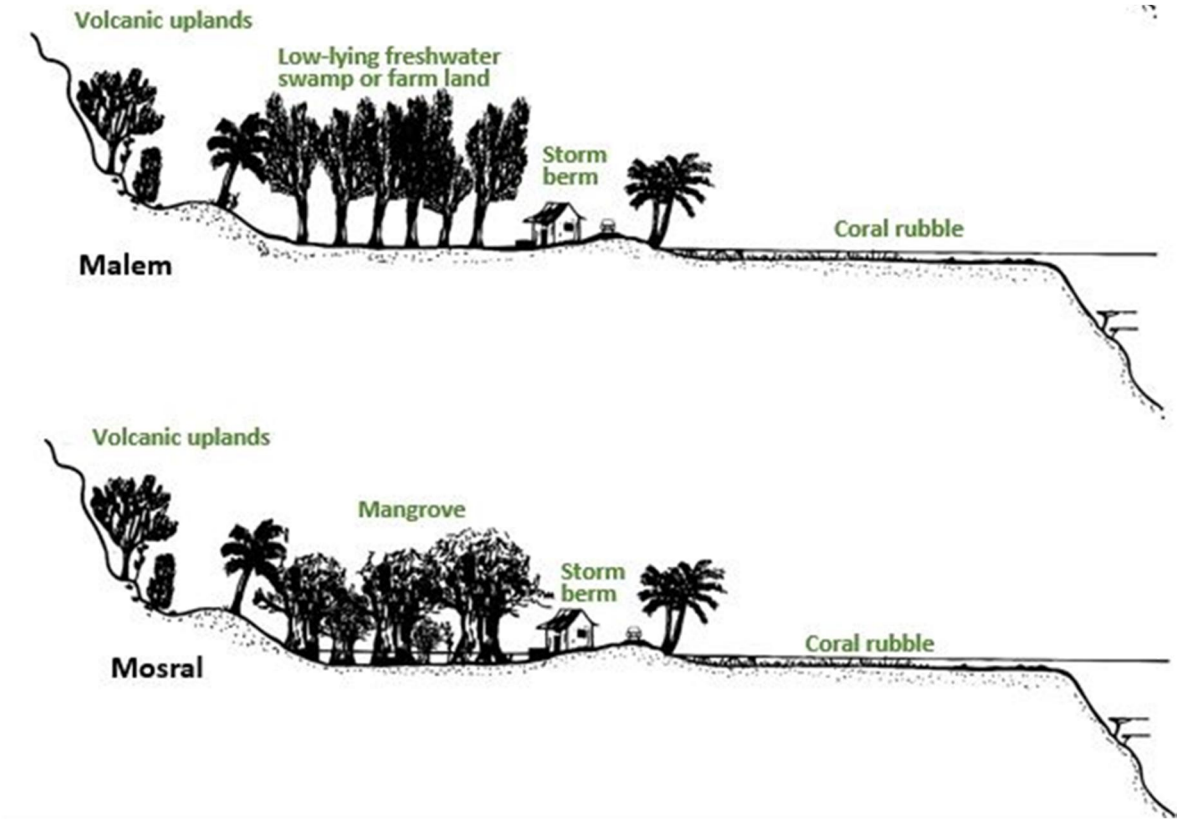

Figure 10: Typical cross-section of the low-lying coastal areas at Malem and Mosral.

3.3 Watersheds

The main watersheds along the area of the proposed inland road are shown in Figure 11 and summarised in Table 1, along with noted drainage infrastructure along sections of existing farm road in each of the catchments.

The majority of each of the catchments is above the so-called Japanese Line. During the period of Japanese occupation (1930 to 1945), public lands were expanded to include all upland forest areas above an arbitrary line, the "Japanese Line" (Figure 11) and the shoreline below mean high water. This was to restrict access to upland areas and manage the development of upland forest areas, with all land above the Japanese line removed from traditional ownership and declared state land.

This land above the Japanese line is still under control of the Kosrae State Government with minimal development having occurred above it. As a result large parts of the catchments have essentially been protected from development and other land-use activities, and are in a relatively natural state providing significant watershed protection. Amendment 19 of the 1995 Kosrae State Constitutional Convention now allows reclamation of land above the Japanese line by the descendants of the original landowner. However, the process for reclamation have not been established yet by law and is not yet underway.

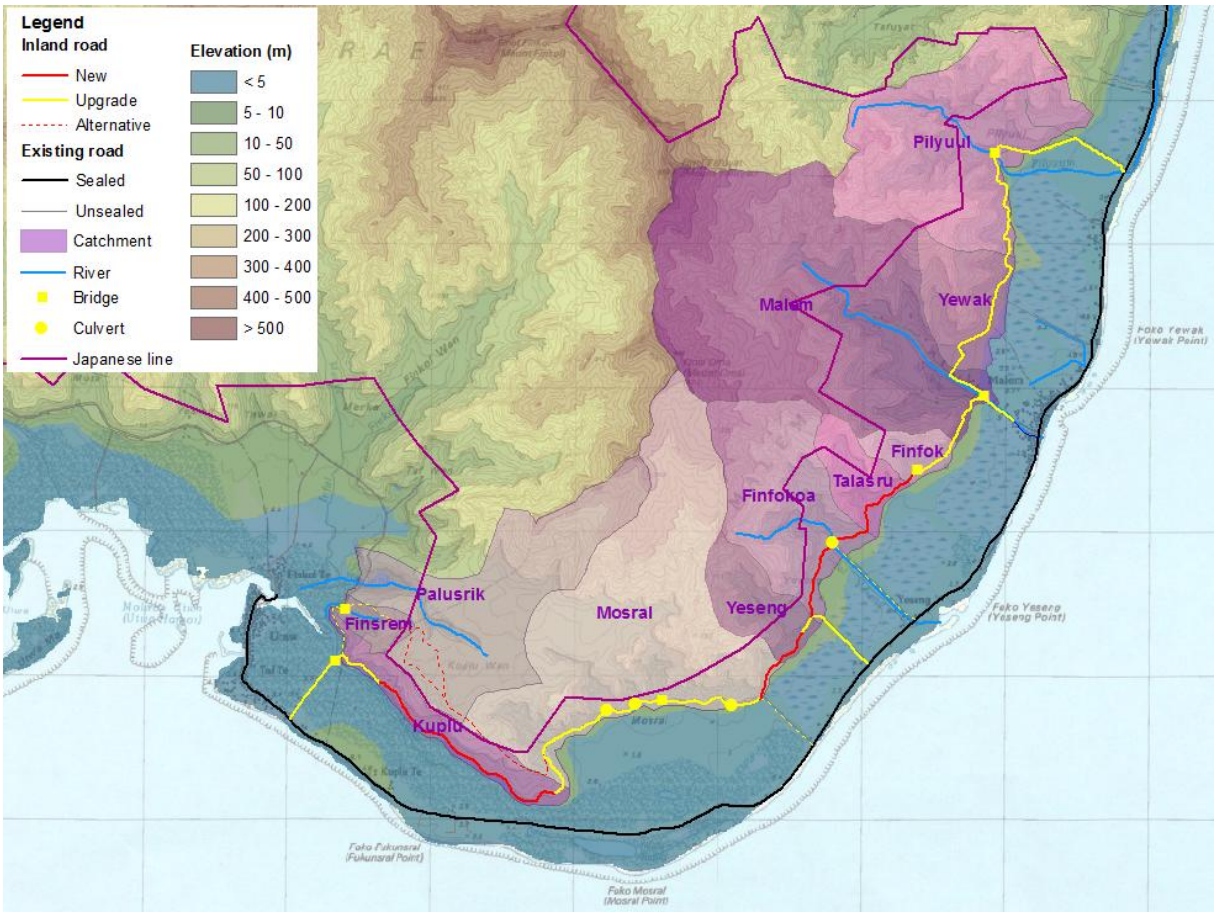

Figure 11: **Main watersheds within the proposed inland road area.**

Table 1: **Catchment characteristics and existing drainage infrastructure.**

Catchment	Area (km^2)	Water supply	Drainage infrastructure
Pilyuul	1.65		Single lane bridge over Pilyuul river
Yewak	0.46		
Malem	3.02	Malem village & Pilyuul	Double lane bridge over Malem river
Finfok	0.17		
Talasru	0.27		
Finfokoa	0.99	Yeseng	Culvert over Yeseng River
Mosral	2.43		3 culverts and one single-lane bridge
Kuplu	0.36	Private water supplies from inland springs feeding properties at Kuplu and Finsrem	Double lane bridge over the Kuplu mangrove channel.
Palusrik	1.41	Utwe village	
Finsrem	0.12		Single lane bridge over Finsrem River

Much of the upland areas in the Malem catchments, with the exception of the Kuplu Wan area, are too steep for any form of development or intensive agriculture (Figure 12). Where slopes are greater than 30% no clearing of land is permitted and row cropping avoided and between 15-30% land management practices, such as minimum tillage, use of terraces and diversions, contouring and cropping systems that can control erosion, are required (Laird, 1983).

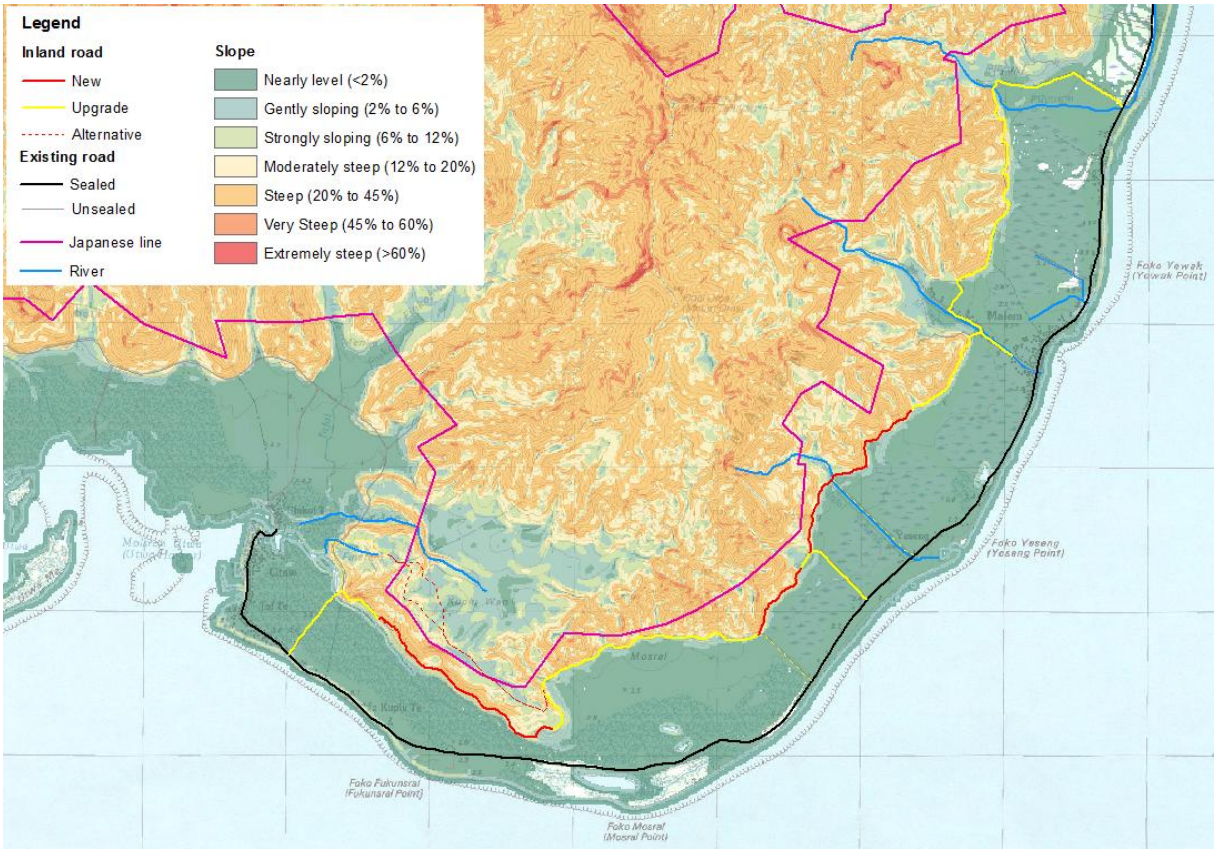

Figure 12: Slope classification. Classification based on Laird (1983).

The high relief of central Kosrae results in a radial drainage pattern through small catchments, with the Malem catchment the largest at around 3 km^2. The main rivers (Pilyul, Malem, Yeseng and Palusrik) are perennial owing to the year-round prevailing high rainfall, dense vegetative cover and steep uplands leading to high level of drainage in the uplands. A number of other smaller perennial and intermittent streams and springs occur around the base of the volcanic part of the islands (Figure 13). Variations in discharge of the rivers and streams can be significant and rapid due to the high rainfall intensities, small catchment sizes and steep slopes.

Streams and rivers discharging from the catchments are filtered through the various areas of freshwater, brackish and mangrove swamp. The hydrology of these low-lying swamp and mangrove areas is complex but essentially the area from Mosral to Utwe drains westwards through the main mangrove channel *Inya Kuplu* and into Utwe Harbour. However, during the Japanese era, many of the main rivers and streams, such as Pilyuul, Masis, Malem and Yeseng Rivers were straightened to aid drainage to support intensive agriculture and the development of a runway within the freshwater swamp between Yeseng and Mosral (Figure 14). This results in the main rivers since this time discharging straight to the reef flat which, despite the healthy vegetative cover in the catchment, can result in high suspended sediment loads during periods of heavy rain.

Figure 13: Typical examples of rivers, streams, springs and water supplies. Top left: Malem River at Malem Village; Top right: Typical perennial stream in Yeseng catchment; Bottom left: Spring providing water supply to residents in Finsrem; Bottom right: Recently upgraded Utwe water supply inlet on the Palusrik River.

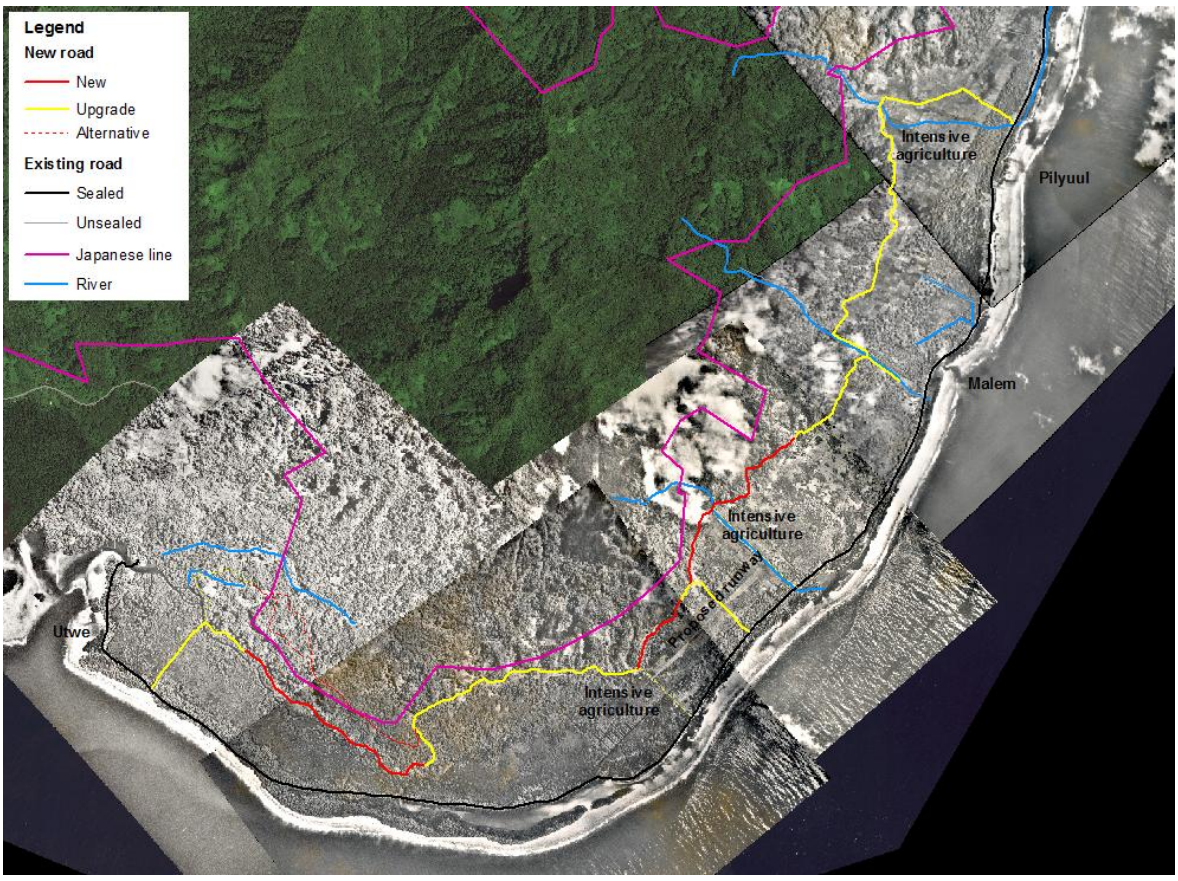

Figure 14: Agriculture and airstrip development in the freshwater swamp areas in 1944.

Most houses in Kosrae have access to water from the municipal systems as well as from roof catchment water tanks, with a small number of people having private, gravity-fed piped sources where they have springs on their land (Figure 13). Municipal supplies are sourced primarily from Malem and Finfokoa catchments (Malem) and Palusrik (Utwe). The former are simple small dam systems in the upper reaches of the river and a gravity-fed pipe system. No treatment is conducted of the water resulting in unacceptable water quality for consumption in terms of frequent high levels of suspended sediments. The majority of residents tend to use roof-catchment tank water for consumption and the municipal water supply for other activities such as bathing, laundry and toilet flushing. The Utwe supply is currently being upgraded under an ADB loan project with a new intake and sand-filtration system being presently constructed (Figure 13).

3.4 Soils

Soil types based on the US Department of Agriculture (Laird, 1983) soil survey are shown in Figure 15 with corresponding soil erosion potential and drainage classification show in Figure 16 and Figure 17 respectively. Soil erosion potential and drainage are strongly related to slope. The final alignment of the inland road avoids the contours around the base of the volcanic part of the island at approximately the 10 m MSL contour and climbs up to the Kuplu Wan plateau at an elevation of up to 80m MSL (denoted by the dotted 'alternative' red line) (Figure 15). This final alignment denoted as the alternative avoids the typically alluvial or colluvial soils at the intersection between the upland, more erodible but better drained Fomseng and Tolonier soil types and the less well drained but less erodible Nansepsep-inkosr soil types, and between Kuplu and Utwe the Naniak soils associated with mangrove areas.

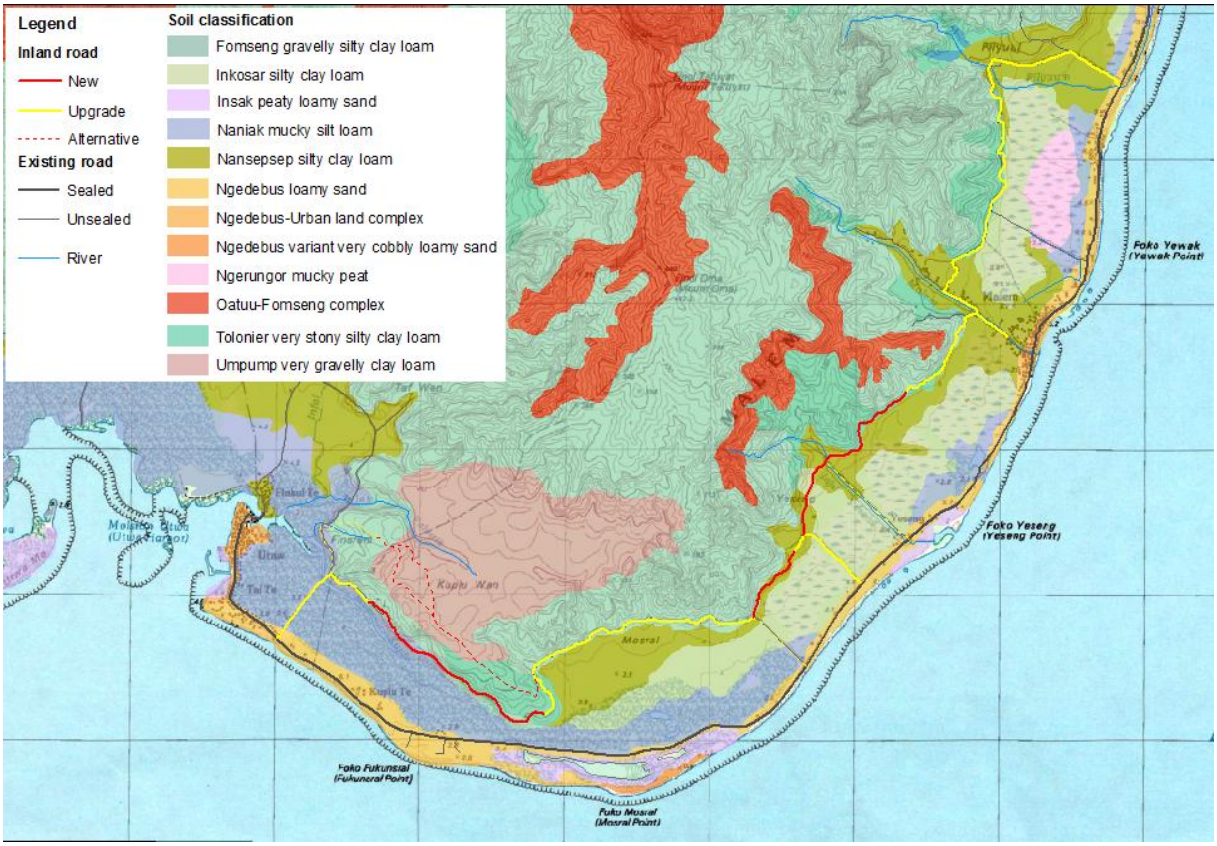

Figure 15: Soil classification. Source: Laird (1983).

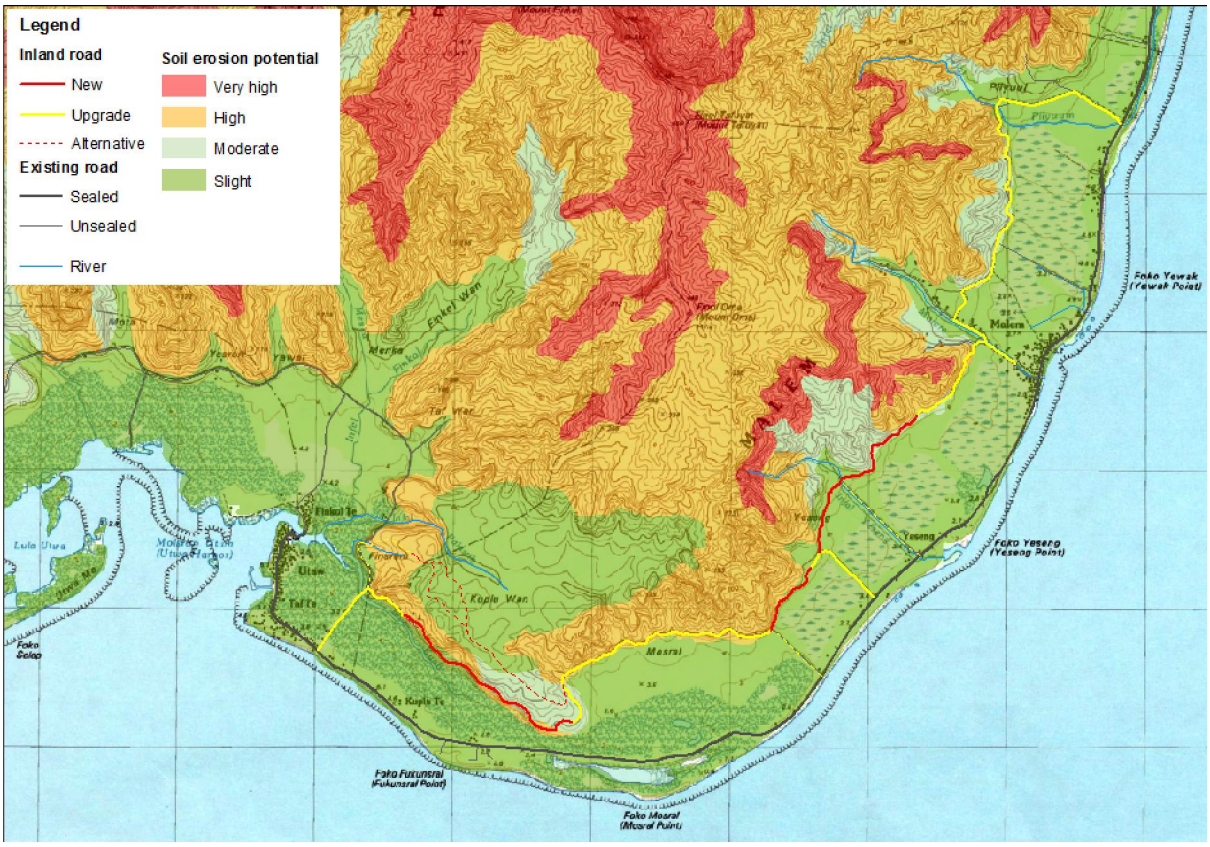

Figure 16: Potential soil erosion categorisation. Source: Laird (1983).

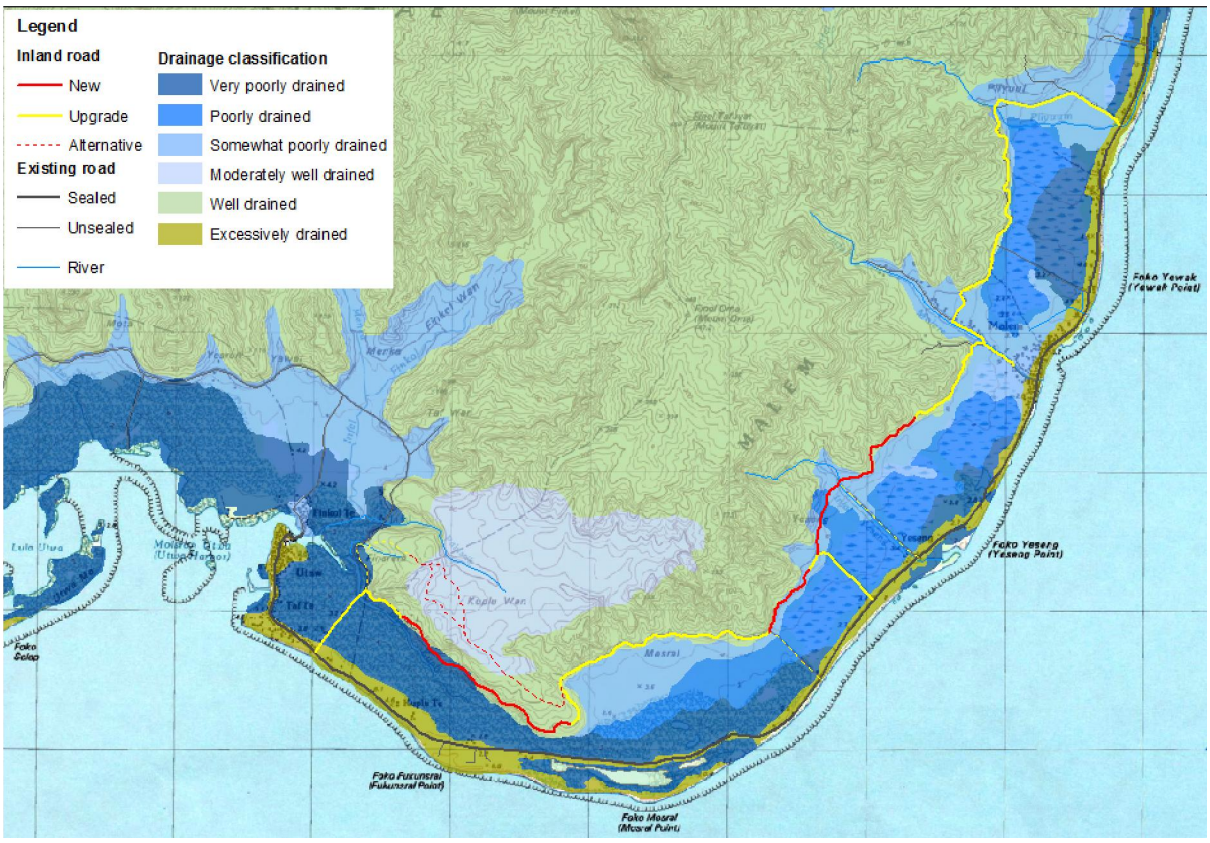

Figure 17: Soil drainage classification. Source: Laird (1983).

Specific soil characteristics for each of the relevant classifications from the US Department of Agriculture (1983) soil survey are summarised in Table 2.

Table 2: Proposed inland road route soil classification descriptions. Source: Laird (1983).

Name	Description
102-Fomseng gravelly silty clay loam, 30 to 60 percent slopes.	Shallow, well-drained soil on mountainsides. Formed in residuum derived dominantly from basic igneous rock. Slopes generally are concave. Areas are irregular in shape and are 2 to 1O hectares in size. The native vegetation is mainly mixed forest. Elevation is 10 to 300 meters. Typically, the upper 5 cm of the surface layer is dark brown gravelly silty clay loam and the lower 7 cm is brown silty clay loam. The subsoil is dark yellowish brown silty clay loam 33 cm thick. Highly weathered basalt is at a depth of 45 cm. Depth to basalt ranges from 25 to 50 cm. Included in this unit are small areas of Oatuu soils and soils that are similar to this Fomseng soil but are deeper. Also included are small areas of Fomseng soils that have stones or cobbles on the surface. Included areas make up about 25% of the total hectarage. The percentage varies from one area to another. Permeability of this Fomseng soil is moderately rapid. Available water capacity is low. Effective rooting depth is 25 to 50 cm. Runoff is rapid, and the hazard of water erosion is high. This unit is used for subsistence farming and as woodland and watershed.
114-Tolonier very stony silty clay loam, 6 to 30 percent slopes.	Very deep, well-drained soil on toe slopes and foot slopes. Formed in residuum and colluvium derived dominantly from basic igneous rock. Slopes are concave. The vegetation in areas not cultivated is mainly mixed forest. Elevation is 6 to 50 m. Typically, the surface layer is very dark brown very stony silty clay loam 12 cm thick. The upper 8 cm of the subsoil is dark brown cobbly silty clay loam, and the lower 67 cm is dark yellowish brown very cobbly silty clay loam. The substratum to a depth of 150 cm or more is strong brown very cobbly silty clay loam. Included in this unit are small areas of Dolen soils. Also included are small areas of Fomseng and Final soils that have slopes of more than 30 percent. Included areas make up about 20% of the total hectarage. Permeability of the Tolonier soil is moderately rapid. Available water capacity is moderate to high. Effective rooting depth is 150 cm or more. Runoff is medium, and the hazard of water erosion is moderate. This unit is used for subsistence farming.
115-Umpump very gravelly clay loam, 2 to 8 percent slopes	Moderately deep, moderately well drained soil on plateaus. It formed in residuum derived dominantly from basic igneous rock. Areas are irregular in shape and are 5 to 20 hectares in size. The native vegetation is mainly mixed forest. Elevation is 50 to 100 meters. Typically, the surface layer is dark brown very gravelly clay loam 13 cm thick. The upper 25 cm of the subsoil is strong brown gravelly silty clay loam, and the lower 32 cm is mottled, red silty clay loam. Highly weathered basalt is at a depth of 70 cm. Depth to basalt ranges from 50 to 100 cm. Included in this unit are small areas of Umpump soils that have stones or cobbles on the surface. Also included are small areas of Umpump and Tolonier soils that have slopes of more than 8 percent. These included areas make up about 20 percent of the total area. Permeability of this Umpump soil is moderate. Available water capacity is moderate. Effective rooting depth is 50 to 100 cm. Runoff is slow, and the hazard of water erosion is slight. The water table fluctuates between depths of 60 and 100 cm throughout the year.

Name	Description
	This unit is used as woodland and watershed.
107-Nansepsep silty clay loam, 0 to 2 percent slopes.	Very deep, somewhat poorly drained soil on bottom lands. Formed in alluvium derived dominantly from basic igneous rock. Areas generally are long and narrow in shape and are 5 to 20 hectares in size. The vegetation in areas not cultivated is mainly mixed forest. Elevation is 2 to 10 meters. Typically, the surface layer is dark brown silty clay loam 17 cm thick. The subsoil is mottled, dark grayish brown and strong brown silty clay loam 43 cm thick. The substratum to a depth of 150 cm or more is dark greenish gray silty clay loam. Included in this unit are small areas of lnkosr and Sonahnpil soils. Also included are small areas of soils that are similar to this Nansepsep soil but have stones and cobbles on the surface. Included areas make up about 20% of the total hectarage. The percentage varies from one area to another. Permeability of this Nansepsep soil is moderate. Available water capacity is high. Effective rooting depth is limited by a high water table that is at a depth of 50 to 75 cm. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to occasional, very brief periods of flooding throughout the year. This unit is used mainly for subsistence farming. It is also used as watershed and for wildlife habitat.
104-lnkosr silty clay loam, 0 to 2 percent slopes.	Very deep, poorly drained soil is on bottom lands. Formed in alluvium derived dominantly from basic igneous rock. Areas are irregular in shape and are 2 to 10 hectares in size. The native vegetation is mainly swamp forest. Elevation is 1 to 10 meters. Typically, the surface layer is dark yellowish brown silty clay loam 17 cm thick. The subsoil is mottled, dark brown and dark gray silty clay loam 28 cm thick. The substratum to a depth of 150 cm or more is dark greenish gray silty clay loam. Included in this unit are small areas of Ngerungor and Nansepsep soils. Also included are small areas of soils that are similar to this lnkosr soil but have stones and cobbles on the surface. Included areas make up about 20% of the total hectarage. Permeability of this lnkosr soil is moderate. Available water capacity is high. Effective rooting depth is 150 cm or more for water tolerant plants. Runoff is slow, and the hazard of water erosion is slight. The water table is at a depth of 15 to 60 cm throughout the year. This soil is subject to occasional, brief periods of flooding throughout the year. Most areas of this soil unit are idle, but some areas are used for wetland taro and as woodland. The unit can be used for coconuts and bananas if artificial drainage is provided to lower the water table.
106-Nanlak mucky silt loam, 0 to 2 percent slopes	Very deep, very poorly drained soil is in coastal tidal marshes. It formed in alluvium derived dominantly from basic igneous rock. Areas are irregular or oval in shape and are 1 to 100 hectares in size. The native vegetation is mainly mangrove forest. Elevation is sea level. Typically, the soil is black mucky silt loam that ex1ends to a depth of 150 cm or more. It is underlain by basalt or coral rock at a depth of 100 to 150 cm or more. Included in this unit are small areas of lnsak soils and Chia soils that formed in moderately deep organic deposits overlying coral sand and gravel. Also included are small areas of soils that are similar to this Naniak soil but are shallower over bedrock. Included areas make up about 20 % of the total hectarage. The percentage varies from one area to another. Permeability of this Naniak soil is moderate. Available water capacity is high. Effective

Name	Description
	rooting depth is 100 to 150 cm or more. Runoff is slow, and the hazard of water erosion is slight. The water table is 30 cm above the surface to 30 cm below the surface. This soil is flooded daily with ocean saltwater during periods of high tide. It has a high content of sulfidic material, which makes it extremely acidic if drained. This unit is used for mangrove wood production and wildlife habitat.

3.5 Terrestrial flora and fauna

The Malem area is characterised by a number of landforms and associated ecosystems. From the ocean, these include:

- the fringing coral reef
- an intertidal reef flat which is generally between 100 m to 150 m wide
- a narrow coastal berm upon which most human development is located,
- well-developed lagoon mangrove strands between Mosral and Utwe in the south and brackish and freshwater swamp areas north of Mosral
- a narrow colluvial/alluvial plain
- narrow valleys along the main rivers
- steep mountainous areas, and
- at Kuplu Wan a relatively flat upland plateau.

The terrestrial environment is comprised mostly of upland forest (Figure 18), which along with areas of agroforestry account for close to 70% of Kosrae's vegetation (Kosrae State Government, 2003). Kosrae has at least 511 vascular plant species, of which 261 are indigenous, with 31 endemic species (FSM DR&D, undated), including Nunu (*Horsfieldia Nunu*), Nahnek (*Elaeocarpus carolinensis*) and in the Yela watershed the only remaining stand of Ka trees (*Terminalia carolinensis*).

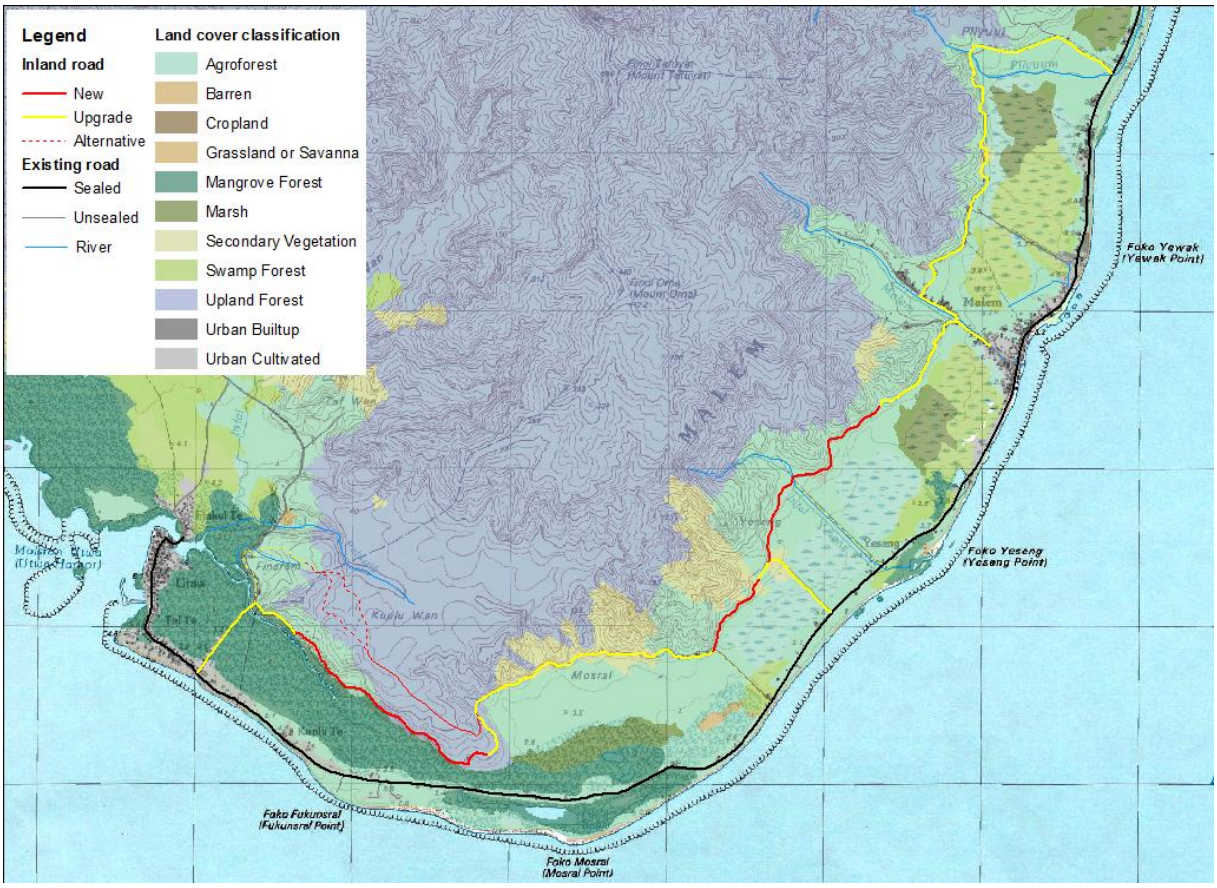

Figure 18: Land cover classification. Source: Kosrae Island Resource Management Authority.

Table 3: Summary of vegetation type characteristics. Source: Merlin et al. 1993; FSM DR&D, undated; Falanruw, 2001).

Vegetation type	Description
Native upland forests and dwarf forests	The undisturbed upland native forest on Kosrae provides a good example of tropical oceanic island rain forest. The principal forest genera here include *Horsfieldia*, *Neubergia*, *Psychotria*, *Syzgium*, *Campnosperma*, *Macaranga*, *Cyathea*, *Dendrocnide*, *Boehmeria*, and *Ficus*, and the only indigenous palm, *Ptychosperma ledermanniana*. Species diversity is high and many different species of ferns, both terrestrial and epiphytic, are present Dense vegetation covers much of the uplands, with plant types and species changing with elevation Species diversity is high and many different species of ferns, both terrestrial and epiphytic, are present. Above approximately 480 m elevation, dwarf or moss forests occur. Much of the upland forest up to about 100 m elevation has been altered through centuries of agroforestry and other human activities. This is particularly the case along much of the immediate upland areas in Malem. In Kuplu Wan the forest is dominated by tall Horsfieldia (*Nunu*), False Sandalwood (*Mwetkwem*), Elaeocarpus carolinensis (*Nahnek*), Banyan tree (*Kohnyah*), Strangler Fig (*Shrah*), Neubergia (*Tohoh*) and thickets of Hibiscus (*Lo*) and Parinari laurina (*Ahset*), (Bell, 1992). Tree ferns, lianas, vines and terrestrial ferns characterise the mid and ground levels. Minimal agroforestry occurs currently within the interior of Kuplu Wan but there has been greater use historically, including during the Japanese period.

Vegetation type	Description
Secondary vegetation	Generally occurring on the lower slopes of the volcanic part of the island where previously disturbed or cultivated areas have been abandoned. Vegetation consists of fast-growing small trees, shrubs and vines, such as hibiscus and bamboo.
Agroforestry	Agroforests occur primarily on the fertile lower slopes, characterized by a spatial and temporal mix of introduced and native trees and cultivated areas (fields, plantations, gardens, groves of trees or farms). Cultivated areas and tree crops (typically breadfruit, coconut palms and other fruit trees, banana, papaya, cassava, sugar cane, taro and yam), are typically interspersed with older, structurally complex forests of mixed species.
Grassland or Savana	Generally occurring on the lower slopes of the volcanic part of the island where vegetation is characterised by scattered shrubs, few trees, many ferns and various species of grasses and other small plants. The soils are often infertile and poorly drained with the areas likely to have been the result of repeated human cutting or burning resulting in erosion and loss of the humus layer.
Swamp and swamp forests	Swamp forests occur where soils are inundated with fresh or slightly saline water. They are most commonly found just inland of mangroves, above tidal influence but lower in elevation than the surrounding terrain. Forest plants are dominated by Terminalia (*Ka*), Horsfieldia (*Nunu*) and Barringtonia (*Kenguhl*). Kosrae has some of the most well developed and important swamp forests in the Pacific, for example in the Yela watershed on the north-west coast. Forest areas occur to the north and south of Malem. However, much of the freshwater swamp areas in Malem are covered in secondary vegetation having been heavily disturbed by intensive agriculture and associated drainage activities during the Japanese era (Figure 14) and their proximity to inhabited areas. Aquatic and marsh vegetation also includes grasses, sedges and reed grasses. Freshwater wetland areas are also an important area for cultivation where traditional root crops such as sweet and swamp taro are grown and replace the native vegetation.
Mangroves	Nine species of Mangrove occur on Kosrae with some of the largest and oldest mangrove trees in the Pacific found. Between Mosral and Utwe, back lagoon mangroves have developed in the lee of the coastal berm. The entire Mosral-Utwe mangrove system drains to the west via Inya Kuplu to Utwe Harbour. Along the channel margins, and indeed over much of the area Rhizophera species dominate, with Bruguiera gymnorhiza found in less salty water along the margins. Close to the current road between Malem and Utwe, over-harvesting of parts of the mangrove have created gaps in the canopy and areas where mangrove has died off.

The only indigenous mammal is the Kosrae flying fox (*Pteropus mariannus ualanus*) which is endemic. The species is protected under the Convention against International Trade in Endangered Species (CITES), and listed under Appendix I and II of the Convention. It is found in both swamp and mangrove forest areas, such as within Lelu Harbour, and in higher elevation forests including the Kuplu Wan area. At present a large colony has recently established in the mountainous areas above the Yeseng catchment, with numbers reduced in other commonly observed areas. It is uncertain whether this is related to the severe drought conditions that have been experienced over the end of 2015 to the beginning of 2016 due to El Niño.

Kosrae has approximately 56 recorded bird species, with one endemic species, the Dusky White Eye. Within historic times the Kosrae Rail and Kosrae Mountain Starling have both become extinct with a number of other species declining in number. Of particular concern is the Micronesia Imperial Pigeon which was extensively hunted for food during the Japanese era, is now protected but still poached, and is generally now found only in the more remote upland areas. Most of the forest bird species are found throughout the Malem and Kuplu Wan regions and elsewhere in Kosrae. Whilst larger populations are found in areas of less disturbed mature forest, most are generally found through a variety of habitats including agro-forested areas.

Kosrae's benthic stream communities contain a limited number of species, likely due to the comparative isolation of the island. Nine species of fish, two shrimp and one snail species have been recorded in a study of the Innem River in Lelu. The benthic insect community was also particularly low in taxonomic richness (March et al. 2003). This is likely to be representative of the stream and rivers in the Malem and Kuplu Wan regions also.

Other species have all been introduced either as invasive species (African snail, cane toads, frogs, rats, mice and monitor lizards) or common domestic animals (pigs, dogs, goats, cats, fowl) with feral pigs, cats and fowl common.

3.6 Conservation and culturally important areas

The Kosrae State Land Use Plan (Kosrae State, 2003) has identified and delineated 'Areas of Particular Concern' (Figure 19) and 'Special Consideration Districts' (Figure 20) to help guide the development of management and conservation strategies covering the following areas: Forests, Shoreline and Reef, Waste Management, Utwe-Walung Marine Park, and Historical Site Preservation.

Areas of Particular Concern include Mangrove Reserves, Shoreline Erosion Hazard Areas, Rivers and Water Resources (water supply catchments), mouths of Rivers, the Trochus Sanctuary, the Green Snail Sanctuary, Cultural & Historical Sites. These areas are identified as Areas of Particular Concern because of their sensitive ecological, cultural, and social requirements. It also includes areas identified in the FSM Conservation Blueprint as Areas of Biological Significance, (TNC, 2003). This was produced to identify species, natural communities, and ecological systems that represent the biodiversity of FSM; to record the best remaining examples of where these species, natural communities, and ecological systems occur; and to define, delineate, and prioritize "Areas of Biological Significance" (ABS) or clusters of high quality examples of species, natural communities, and ecological systems. Among the 130 Areas of Biological Significance (ABS) identified in the FSM, 12 are located in Kosrae (Figure 21 and Table 4).

Figure 19: Areas of particular concern. Source: Kosrae State Land Use Plan (Kosrae State, 2003).

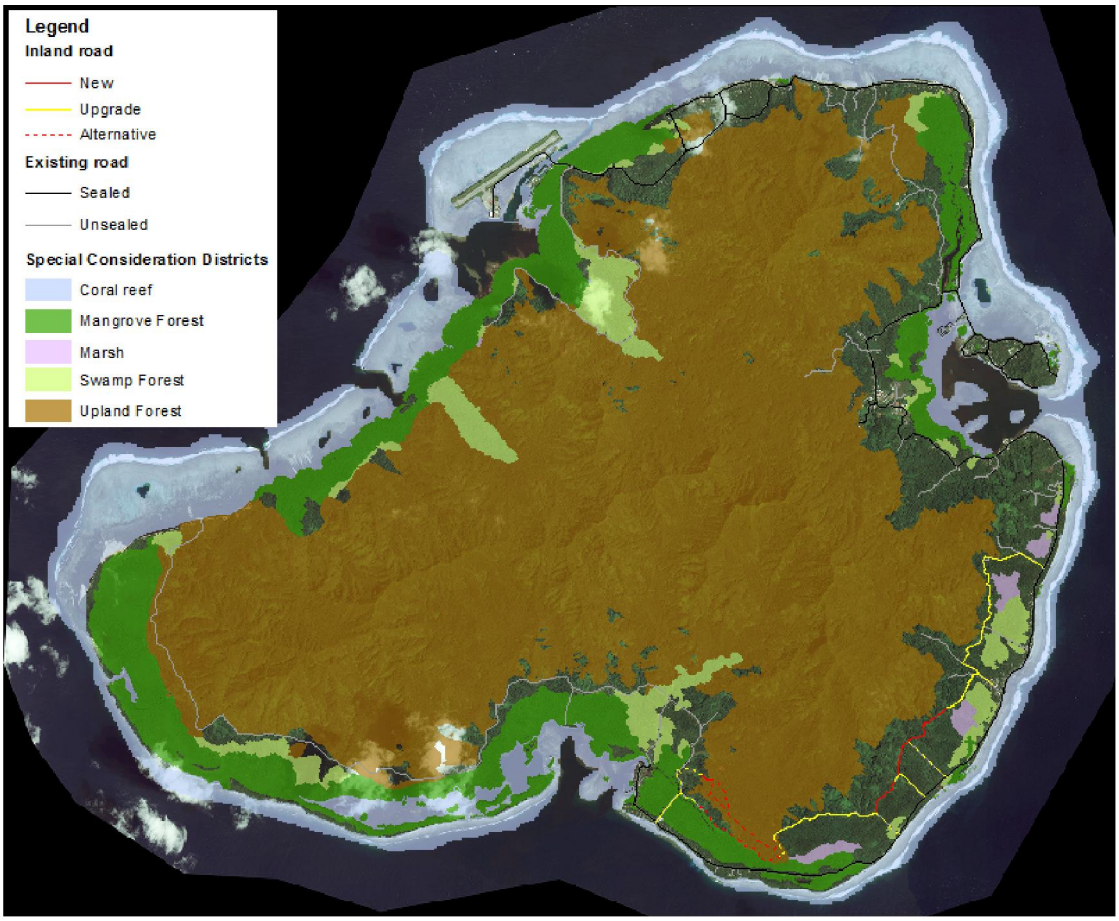

Figure 20: Special consideration districts. Source: Kosrae State Land Use Plan (Kosrae State, 2003).

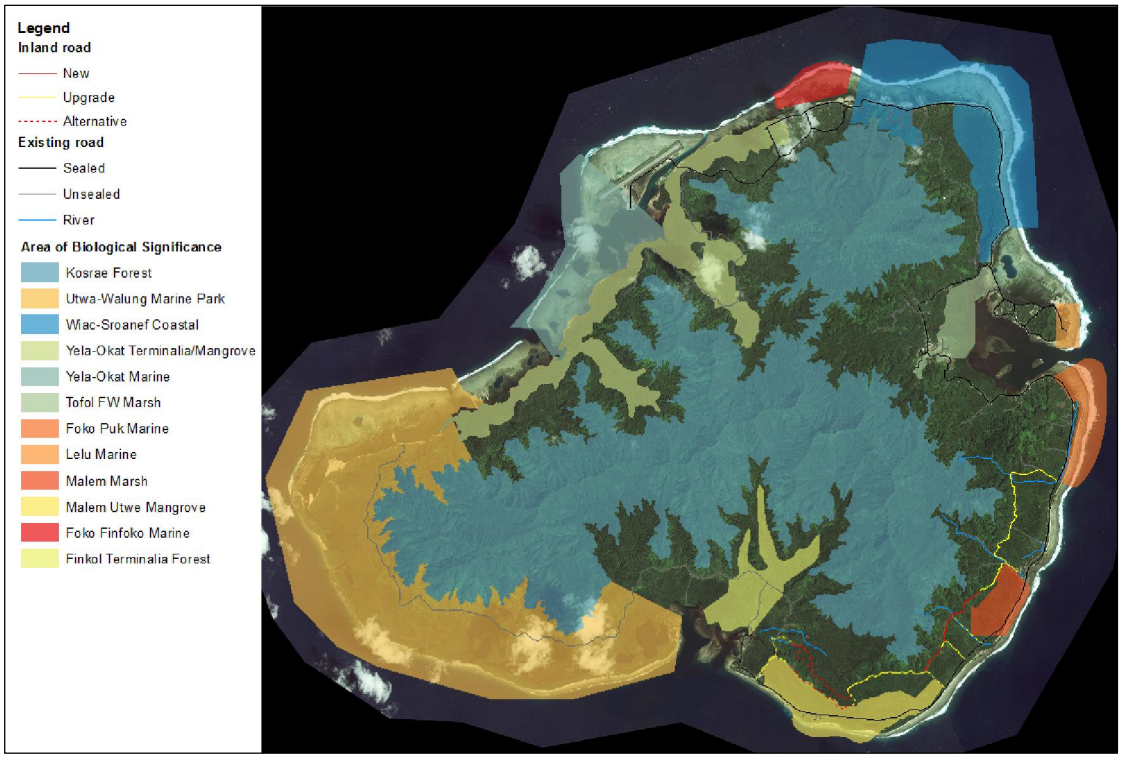

Figure 21: Areas of biological significance. Source: TNC (2003).

Table 4: Summary of areas of biological significance. Source: TNC, 2003. Relevant ABS within or close to the inland road are highlighted in blue. Red ranking indicates highest priority, orange: medium, and yellow: low.

Area	Description	Targets	Ranking
Kosrae Forest	All central forest above 100 m	Upland broadleaf forest, Montane cloud forest Micronesian Imperial Pigeon	
Utwe-Walung Marine Park	Existing boundaries of Utwe-Walung Marine Park boundaries	Turtle nesting beach. High-island nearshore marine, Kosrae flying fox, Micronesian Imperial pigeon	
Wiac-Shroanef Coastal	From shore to 100m out past reef	High-island nearshore marine	
Yela-Okat Terminalia / Mangrove	Yela and Okat Terminalia, Okat to Walung Mangroves	Terminalia swamp forests, mangrove forests	
Yela-Okat Marine	Shore to reef from Yela passage to airport	High-island nearshore marine	
Tofol Freshwater Marsh	Entire marsh below College of Micronesia / High School	Coastal freshwater marsh	
Foko Puk Marine	Shore to 100 m off reef	High island nearshore marine	
Lelu Marine	Coast and lagoon out to outer reef	Coconut crabs, Napoleon Wrasse	
Malem Marsh	Freshwater marshes and beach in Central Malem	Turtle nesting beach, Coastal freshwater marsh	
Malem-Utwe Mangrove	Mangroves and lagoon to outer reef	Mangrove forest, Kosrae flying fox, Humphead Parrot fish	
Foko Finfoko Marine	Finfoko coast to outer reef	Grouper Spawning	
Finkol Terminalia Forest	Terminalia forest at mouth of Finkol River	Terminalia swamp forests, mangrove forests	

Table 4 also shows a ranking for priority action based on a The Nature Conservancy MARXAN[5]analysis of the ABS (Kosrae DR&D, undated). This is being used to prioritise initial support under the US Forestry Service Forest Legacy Program with a proposal for the Yela Terminalia forest prepared and underway. Underpinning these initiatives is the Micronesia Challenge, the goal of which is to effectively conserve at least 30% of the near-shore marine resources and 20% of the terrestrial resources across Micronesia by 2020[6].

[5] http://www.marineplanning.org/pdf/marxan_tutorial_expert.pdf
[6] http://themicronesiachallenge.blogspot.co.nz/

3.6.1 Historical and cultural sites

The locations of known historical and culturally important sites are shown in Figure 22. The majority are military installations from the Japanese era with prehistoric sites at Lela and Kuplu/Mosral.

Figure 22: Location of known historical sites. Source: KIRMA.

The Kuplu and Lela areas (known as *facl*) were previous settlements before people moved to the present Malem village location. The Lela area is thought to have been first occupied from the Kuplu and Kuplu Wan regions between A.D. 1282 to 1440, becoming the residence of the four low chiefs. The Lelu ruin contains five walled enclosures and fifteen internal features, including canoe landings, cooking areas, dwellings, graves and breadfruit preservation (Swift et al. 1997). Much of the coral rock used in the construction was removed during the Japanese era for construction projects. The commoners lived inland at Kuplu and Kuplu Wan practicing upland subsistence farming. Evidence of inhabitation in the form of stone house foundations, walls and cooking areas are evident. Generally these tend to be close to water sources, occur within the narrow valleys and around the base of the volcanic part of the island, for example at Mosral Wan where the foundations of a residential dwelling have been surveyed (Swift et al. 1997). Use of the Mosral uplands dates between A.D. 1432-1687 (Swift et al. 1997). Bell (1992) notes an initial cultural resource survey of the Kuplu Wan area in 1980 which identified 18 similar sites with a further 6 located during a survey in 1991, the majority of which are close to the Pukusrik River.

The occupation of Lela continued through the late 1700s to early 1800s with it thought that a severe cyclone that occurred during the late 1700s may have led to the abandonment of the settlement. There are also historical records that indicate that the majority of people moved from the Lela and Kuplu areas to Malem in 1852 at the request of the King.

4 Screening of potential environmental and social impacts and mitigation measures

4.1 Introduction

The EIA was conducted between Monday 16 May to Friday 27 May 2016. Details of the activities conducted during the week and consultations held are contained in Appendix B. During the visit, GIS and other relevant information was collected and consultations held with key State, Municipal and community representatives. Field visits were undertaken with KIRMA (Permitting, Forest & Wildlife, and Historic & Preservation) and Department of Transport and Infrastructure staff along the proposed alignment of the inland road. This included all sections of existing farm road and along parts of the proposed new sections, specifically between Kuplu and Finsrem and through the Kuplu Wan plateau.

During the visits general observations were made of biophysical characteristics at each site, identification of potential issues and potential impacts that could occur from the development of the inland road.

Initial screening of potential environmental impacts was conducted using the KIRMA Regulations for Development Projects – Initial Environmental Impact Assessment Checklist, with potential impacts and mitigation measures discussed in more detail in the following sections.

Environmental Impacts – will the proposed project result in…		*Yes*	*No*	*May be*
Earth	a. Destruction, covering or modifications of any unique geological or biophysical features?		X	
	b. Contamination of soils or disturbance of previously or potentially contaminated soils?		X	
	c. Creation of steep slopes or other unstable land conditions?			X
	d. Any potential for increased wind or water erosion (including in coastal areas) or soils, either on or off the site?			X
	e. Changes in the channel of a stream, or the bed of the ocean or lagoon?			X
Air	a. Substantial air emissions, including greenhouse gas emissions, or deterioration of existing air quality?		X	
	b. Creation of objectionable odours?		X	
Water	a. Changes in currents, or the course or direction of water movements in either the marine or fresh waters?		X	
	b. Changes in absorption rates, drainage patterns, or the amount of surface runoff?	X		
	c. Cause or exacerbate coastal, stream or river flooding or land drainage impacts?			X
	d. Alterations to the course of flow of flood waters?			X
	e. Discharge into surface waters or any alteration of surface water, water quality, including, but not limited to, temperature, dissolved oxygen, bacteria or turbidity?	X		
	f. Change in the quality or contamination of ground waters or wells, either through direct additions, withdrawal, seepage, or through interception of an aquifer by cuts or excavations?			X
Plant life	a. Destruction of any upland or mangrove forest communities?			X
	b. Destruction of other important plant communities, such as sea grasses, or plants having potential commercial or medicinal value?		X	
	c. Destruction of or reduction in the numbers of any unique, rare or endangered plant species?		X	
	d. Introduction of a new plant species into an area?		X	
	e. Result in a barrier to the normal replenishment or movement of existing plant species?		X	
	f. Increase in acreage of any agricultural crop?		X	

Animal life	a. Destruction of any coral reef areas?		X	
	b. Destruction of or reduction in the numbers of unique, rare or endangered animal species?		X	
	c. Introduction of new animal species into an area?		X	
	d. Result in a barrier to the migration or movement of animals through the environment?		X	
	d. Substantial deterioration in the quality of fish or wildlife habitat?		X	
Alien invasive species	a. The potential introduction of an alien invasive species?		X	
	b. The risk of spread or movement of an alien invasive species from an infested site to an un-infested site?		X	
Risk of upset	a. A risk of an explosion or the release of hazardous substances, including, but not limited to, oil, pesticides, chemicals or radiation, in the event of an accident or perturbed conditions?			X
Climate change – will the proposed project be affected by…				
	a. Loss of land associated with ongoing, or storm or typhoon-related, shoreline change or coastal erosion?		X	
	b. Coastal flooding from high tides, large swells, storm or typhoon-related events?		X	
	c Exposure of people or property to water related hazards such as flooding or tidal waves?		X	
	c. Extreme rainfall and associated flooding, including from rivers and streams, or waterlogging and drainage of low-lying land?	X		
	d. The effects of sea-level rise or other climate change influences of the hazards in (a) to (c)?		X	
Social impacts – will the proposed project result in…				
Earth	a. Exposure of people and property to geological hazards such as landslides, ground failure or similar hazards?		X	
Water	a. Substantial reduction in the amount or quality of water otherwise available for public water supplies?		X	
Noise	a. Increase in existing noise levels or exposure of people to severe noise levels?		X	
Land use	a. Substantial alteration of the present or planned land use of an area?			X
	b. Incompatibility or conflict with adjacent land use(s)?		X	
Population	a. Relocation or altered distribution, density or growth rate of the human population of the area?	X		
Housing	a. Changes in existing housing or create a demand for additional housing?	X		
Transportation	a. Generation of substantial additional vehicular movement?		X	
	b. Substantial impact on roads and existing transportation system?	X		
	c. Alteration to present patterns or movement of people and/or goods?	X		
Human health	a. Creation of any health hazard or potential health hazards?		X	
	b. Improvement in human health?		X	
Aesthetics	a. Obstruction of or deterioration of any scenic vista?		X	
Recreation	a. Changes in the quality or amount of existing recreational opportunities, including those recommended sites for nature-based tourism?		X	
Cultural resources	a. Alteration or destruction of archaeological sites?			X
	b. Adverse physical or aesthetic effects to a historic resource?			X
	c. Potential to cause a physical change that would affect unique cultural values?		X	
	d. Restriction of existing religious or sacred uses within the affected area?		X	
Economic impacts – will the proposed project result in…				
Natural resources	a. A noticeable increase in the rate of use of any natural resource?			X
	b. Substantial depletion of any non-renewable natural resource?		X	
Public services – will the proposed project affect or result in the need for new or altered services in the following areas?				
	a. Police or Fire Protection?		X	
	b. Schools?		X	
	c. Parks or other recreational facilities?		X	
	d. Hospital?		X	

	e. Other government services?		X	
Utilities – will the proposed project result in the need for new systems or substantial changes in the following?				
	a. Power?	X		
	b. Communications?	X		
	c. Water?	X		
	d. Sewage disposal?	X		
	e. Solid waste disposal?		X	

4.2 Environmental impacts and mitigation related to the road alignment

4.2.1 Initial road alignment

The alignment of the inland road was initially defined in the KSMP along the base of the volcanic part of the island at approximately the 10 m contour in a similar manner to other existing sections of inland road on Kosrae. This is generally located on the narrow strip of land between:

- the landward boundary of freshwater swamp / mangrove areas and on land above areas potentially affected by sea-level rise over the next century and beyond
- below the steep uplands and areas exposed to slope instability and landslipping.

Following the natural topographic contour also helps minimise the potential erosional impact of the road.

Between Malem and the end of the inland farm road at Kuplu, the alignment follows existing farm roads with connecting new sections. No significant environmental effects are anticipated due to the alignment. Maintaining a relatively consistent road level avoids any significant cut and fill and increased maintenance issues associated with steeper road grades. It also limits any significant slope stability issues and as a result soils with significant erosion potential. The alignment is also through an area of secondary or agroforestry vegetation with no direct impact on wetland or mangrove areas, and does not directly impact on known environmentally or culturally important areas.

During the field visit for the new section of road between Kuplu and Finsrem, it was apparent that for much of this section there was insufficient width to accommodate the road without either:

1. cutting in to the steep ridge that borders the southern boundary of the Kuplu Wan plateau. There was existing evidence of landslipping on land cleared for agroforestry at the Finsrem end and such activity would likely lead to further instability, as well as substantially increasing the cost of road construction, or
2. creating additional width through filling the landward edge of the Mosral-Utwe mangrove area. This would require a substantial amount of fill to be sourced and transported to site, significantly increasing costs. The mangrove area is a defined medium priority area of biological significance and would be directly impacted, requiring mangrove removal, with further impacts likely due to associated sediment run-off during construction, even with sediment and erosion controls in place. Concern was also raised by the KIRMA Forestry staff over increased access leading to accelerated mangrove harvesting (and dumping) in an area that is presently only accessible by canoe. Given present pressure on mangrove harvesting in Kosrae this could be a likely consequence.

There was also of evidence of groundwater springs discharging at the base of the slope along this section (Figure 13; bottom left) which are used for private water supply in Finsrem and are important sources of water for Utwe residents during drought conditions when the water supply from the Palusrik River can dry up.

4.2.2 Kuplu Wan road alignment options

To mitigate these possible effects, road alignment options were explored via the Kuplu Wan plateau. The options required elevation of the road to around 80 m above mean sea level on the plateau and be located on State land above the Japanese line. An initial route was proposed (Kuplu Wan Option 1 in Figure 23) which aimed to minimise road grade on both flanks leading up to the Kuplu Wan plateau, and build on an existing farm track extending up the small Finsrem River catchment.

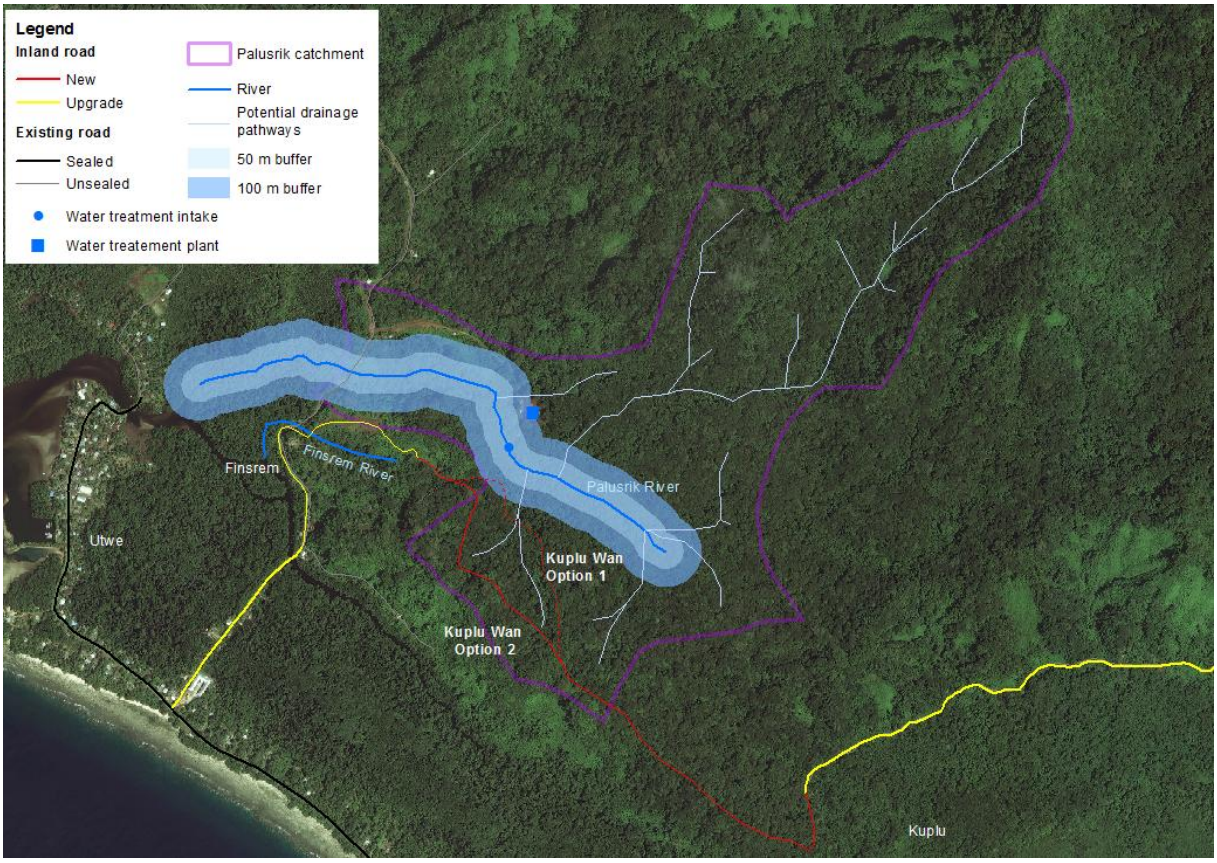

Figure 23: Kuplu Wan road alignment options and buffer zones from the Palusrik River.

During all discussions with the State, Malem and Utwe communities, this option through Kuplu Wan plateau was identified as the preferred option. However, significant concerns were raised by the Utwe community concerning potential contamination on their water supply which is sourced from the Palusrik catchment from:

1. The location of the road and construction effects resulting in increased sediments or other contaminants entering the Palushrik River and the Utwe water supply.
2. The improved access to the Kuplu Wan area created by the road subsequently leading to increased development in the Kuplu Wan area, including land clearing, septic tanks, pig pens etc., resulting in increased potential for contamination of the Utwe water supply.

4.2.3 Final road alignment

The Kosrae State Land Use Plan (Kosrae State, 2003) recommends a development buffer of 15 m for rivers in watersheds above municipal dams. However, a minimum of 50 m would be more typical for perenial flow waterways used as a drinking water source where there is minimal risk of highly contaminant or hazardous pollutant sources. The closest point of the proposed road alignment (Option 1) (Figure 23) to the Palusrik River upstream of the Utwe water treatment plant intake is where the road alignment crosses the watershed boundary between the Finsrem and Palusrik catchments. There the road is located approximately 75 m from the river just above the intake.

The Utwe community identified that they would prefer the buffer zone to be as large as possible between the road and the main Palusrik river course above the water intake, with the Option 2 alignment (Figure 23) subsequently developed. This results in a minimum buffer of 150 m at the watershed between the two catchments and over 350 m for the majority of the section of inland road within the Palusrik catchment. Given the distance to the Palusrik River, the only perennial stream in the catchment, and the characteristics of the likely catchment drainage parthways, there is *unlikely* to be any impact from the construction activities and storm run-off, or operation of the road itself, on Utwe's water supply. Given the analysis of the options and issues raised by the communities, Option 2 was selected and completed the road aligment for the inland road as shown in Figure 24 below.

Figure 24 Final road alignment from Malem to Utwe (showing the final option for road along the Kuplu Wan plateau from Malem to Finsrem).

4.2.4 Implications for other infrastructure

In developing the inland road an integrated infrastructure approach will be adopted. At present power, water and telecommunications are currently to residential property along parts of the existing inland farm roads to the south of Malem, Yeseng and Mosral. The water supply within the road shoulder between Malem and Kuplu (sourced from the existing water supplies in Malem and Finfokoa) will be installed at the same time as the road development. Upgrading and extending the power supply and telecommunications, along the entire length of the inland road from Malem to Utwe will be conducted under the next stage when the road is upgraded to hot-mix asphalt.

4.2.5 Implications for existing landowners and residents

Land below the Japanese line is typically privately owned with landowners holding legal title. For approximately 1.4 km of the exisiting farm road from Mosral to Kuplu, an easement for the farm road is in place and surveyed, with similar easements in place along the existing access roads at Utwe and Malem. In Malem Municipality the 60 ft wide easement for the proposed inland road alignment, and access road at Yeseng crosses approximately 70 land parcels, with a further 4 at Finsrem in Utwe. This represents a small proportion of each parcel with landowners not considered vulnerable by economic, minority or gender status. The State and Municipal Governments have legal procedures in place to negotiate and establish easements with landowners. Previous consultations, both in the development of the AF proposal, and prior to that during the development of the KSMP, with affected landowners have been fully supportive of the road development as it will provide much improved access to their land. Malem Municipal Council have also completed easement discussions with the landowners.

Between Malem and Finsrem, there are a total of 7 residential properties adjacent to the alignment and easement of the inland road. However, there is sufficient space to align the road to avoid any relocation or removal of buildings.

4.2.6 Mitigation requirements for road alignment

The final alignment of the road has been defined to minimise environmental, social or cultural impacts. During the design phase *of the road*, vegetation will be cleared along the easement alignment and a full topographic survey conducted. During the initial walkover of the alignment with Historic and Preservation staff, there were no cultural and historic sites identified. However, the project will refer to relevant agencies if cultural and historic sites are identified during the construction stages. Some very minor shifts in the road alignment *may be* required at this stage over short sections (within a few 10s of metres) and will *not impact* on the findings of this EIS. These changes may be required to:

- Avoid the need for the removal of any large tree species particularly endemic species such as Nunu (*Horsfieldia*).
- Avoid clearing of slopes greater than 30% and to minimise sustained road grading below 12% as defined in Kosrae's road design standards.
- Re-routed the alignment sufficiently around any identified new identified cultural and historical sites to enable them to be properly investigated.

4.3 Environmental impacts & mitigation related to road design

Kosrae has a standard for road design developed when the circumferential road from Okat to Walung to Utwe was proposed (Barrett Consulting Group Inc, 1987). The design standards are applicable and will be updated to incorporate the latest design rainfall information available (see next section). Key design issues relate to impacts on catchment drainage pathways and the operational management of rainwater runoff from the road.

4.3.1 Mitigating impacts on catchment drainage pathways

The inland road will cross a number of perennial and intermittent streams that drain the upper catchments in to freshwater swamp / mangrove areas. Appropriate drainage structures will be required to ensure no changes to stream channels, impacts on upstream (or downstream) drainage characteristics, and downstream ecological function.

Where there are farm tracks at present, single lane bridges or box culverts are typically in place to cross the main streams. It is anticipated approximately 10 new/replacement bridges or culverts will be required between Malem and Utwe.

The road design standards include appropriate bridge/culvert design and methodologies to calculate extreme flow rates for the design of drainage structures based on extreme rainfall amounts (1 hour, 1 in 10 year return period event) and the area of the relevant catchment. However, rainfall intensity amounts contained in the standards are out of date and do not include allowance for increased intensity rainfall for climate change. To mitigate potential design impacts on drainage flows:

- Bridge and culvert design should be based on the most recent extreme rainfall intensity amounts available for Kosrae (ADB, 2005) and shown in Figure 25. Given the “present day” is considered to be the 1980-1999 period it is suggest that the 2025 projections are now considered “present day”, and the design accommodate rainfall intensities to the 2050 projections.

- Bridges and culverts are designed to accommodate a 25 year return period flow. This is higher than the 10 year return period specified in the design guidance. However, the intensities in Figure 25 are based on a mid-range climate-change emission scenario and there are also typically considerable uncertainty levels associated with extreme rainfall projections, hence the additional allowance would cover uncertainties and surprises in rainfall response to climate change. Based on Figure 25 this would increase the design hourly rainfall intensity used from 150 mm to 256 mm.

- The road design standards include specifications for bridge and culvert wing walls to avoid bank erosion immediately upstream/downstream of each structure.

- Where necessary rock mattresses or equivalent should be installed to prevent any erosion of either the upstream or downstream water course. If exit velocities from the any of the culverts of bridges are likely to be significantly increased above normal, energy dissipation measures should also be included to minimise downstream erosion.

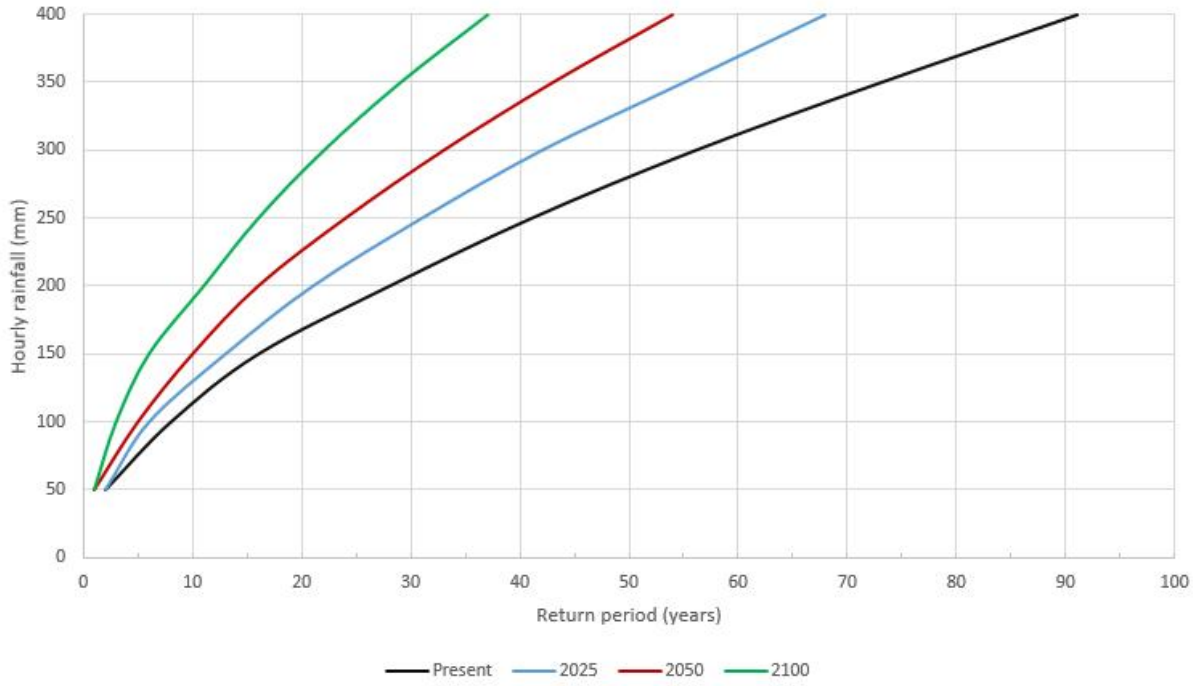

Figure 25: Hourly extreme rainfall amounts for the present day and years 2025, 2050 and 2100. Projections based on the IPCC AR4 SRES A1B Scenario. Source: ADB (2005).

4.3.2 Mitigating storm water runoff and surface erosion

Construction of the proposed inland roads will increase the amount of impermeable surface areas, which increases the superficial water runoff. Increased storm water can lead to increased stream erosion and flooding and may also be contaminated by oil and grease, metals from vehicle residues such as brake linings (e.g., lead, zinc, copper, cadmium, chromium, and nickel), particulate substances and other pollutants released by vehicles on the roadway.

The standard cross-section design allows for a 3% cross fall for a sub-base road surface and should be no less than this to enable sufficient drainage from the carriageway. The design also allows for vegetated swales on one or both sides of the road. These vegetated swales need to be sized to accommodate design rainfall per unit area of road (see above), enable collected storm water to drain away within a few hours to a day, and facilitate water quality improvement through infiltration, filtration and sedimentation within the swales.

The design guidelines also suggest that any sustained longitudinal gradient of the road should be no greater than 12%. The road alignment through Kuplu Wan raises the road elevation from around 10 m relative to mean sea level at Finsrem and Kuplu to around 80 m on top of the plateau. Average sustained gradient at the Kuplu side is between 11-12% and around 8% at the Finsrem side.

Preventing longitudinal water movement is critical on sloping sections of road, particularly on unpaved roads, where ruts will typically develop leading to increased sediment run-off. Designing the road and associated drainage to minimise water running along the road will be critical on all the sloping sections and will need to include some or all of the following:

- Aligning the road to minimise long sloping sections, where necessary having shorter steep sections interspersed with flatter sections that follow the topographical contours.

- Having in- or out-sloping road surfaces to encourage greater lateral flow.
- Intercepting longitudinal water movements with dips or cross drains.
- Slowing drainage flows in the swales or drains at the side of the road to prevent erosion of the drainage channel, through for example construction of regular check dams along sloping sections of road. These are typically made out of graded rock, with other material such as sandbags able to be used as a temporary measure until the rock check dams are installed.

4.3.3 Mitigating impacts of sea-level rise and future coastal hazards

The alignment of the road has been designed to be well above any potential impacts of sea-level rise and coastal hazards over at least the next century based on guidance in the Kosrae Shoreline Management Plan which has been incorporated in to January 2014 amendments to the *Regulations for Development Projects*. This requires new infrastructure on the volcanic parts of the island to be at an elevation of at least 4 m above mean sea level datum of Kosrae, which is equivalent to being around 2 m above mean high spring tide level. The alignment of the road is typically at the 10 m contour and should minor realignment be required during the detailed survey and construction stages, it should not extend below the 4 m contour or require fill of land areas below the 4 m contour.

4.4 Environmental impacts and mitigation associated with construction

4.4.1 Fill and construction materials

Fill and aggregate material suitable for road construction to sub-base levels (Phase I, AF Proposal) is available from two existing KIRMA permitted quarries adjacent to the proposed inland road at Yeseng, with aggregate materials available from the KIRMA permitted PUK quarry in Tenwak.

There is limited suitable aggregate material on Kosrae for upgrading the road (Phase II, development partner) to hot-mix asphalt with aggregate typically imported (for example as occurred for the recent re-surfacing of the airport runway). This will need to be investigated as part of any EIA for the subsequent stage to upgrade to hot-mix asphalt.

4.4.2 Erosion and sediment control

The most significant impacts related to construction activities relate to potential excessive runoff of soil and silt and soil erosion of cleared or exposed soils during construction. The alignment of the proposed road (discussed above) was, as far as possible, located on soils with lower erosion potential and to follow the natural topographic contour which helps reduce potential erosion.

The downstream environments are adapted to a certain amount of natural soil and silt runoff. Despite the relatively natural state of the catchments, stream turbidity can increase substantially during periods of intense rain. Measurements in streams leading to the Lelu water supply in Tofol indicated variations in turbidity from < 10 NTU[7] to > 250 NTU over short periods of time following rainstorms. These storm events are generally short duration with streams reverting to typical flows and low turbidity and do not appear to have significant impact on stream biota or downstream ecosystems. However, the temporary increase in sediment run-off will need to be controlled during all phases of construction to ensure elevated stream turbidity levels do not linger any longer than normal.

[7] Nephelometric Turbidity Units. Drinking water is generally less than 5 NTU and highly murky water > 200 NTU

Within the KIRMA EIA process all projects with earthmoving must have an erosion and sediment control plan. Key requirements are outlined below.

- No burning of ground cover for clearing shall be practiced.
- Stockpiles of sand, soil or other aggregates/materials will not be located where material can be washed in to a drain, stream or wetland area, including on a road pavement, on an overland flow path or within 15 m of a stream bank, wetland or mangrove.
- Geotextile sediment fencing will be erected around all areas where vegetation has been cleared and soil exposed. The fence should be installed prior to clearing, as close to the contour of the site as possible, with the bottom edge of the fence buried to at least 150 mm, and the fence posts installed on the down-side of the fabric. The fences will be checked regularly and where sediment has built up, this will be removed.
- If required, for example for larger exposed areas, sediment fencing will be complimented by some or all of the following: temporary drains or bunds around areas to prevent discharge of storm water, sediment traps to slow run-off containing sediment and allow settlement of coarse sediment, erosion control matting or mulch on any exposed batter slopes prior to revegetation.
- As soon as possible after works are completed, rehabilitation of exposed areas on the shoulder and adjacent areas will be undertaken. Excavated topsoil will be stockpiled and re-used and revegetation completed of bare areas. Revegetating buffer areas around streams and other catchment drainage pathways will be prioritised. The discussions with KIRMA and Kosrae Conservation and Safety Organisation suggest that as part of the AF project, community engagement and involvement to assist with revegetation activities including the planting of native species around streams and potential food trees along the edge of the road shoulder would be undertaken.

4.4.3 Control and disposal of wastes and hazardous materials

Construction design and planning should aim to ensure waste is minimised as much as possible. Also where possible the opportunity should be taken to use other recycled materials on Kosrae, such as crushed glass and crushed concrete in the road sub-bases.

The following controls will be undertaken:

- All non-hazardous, non-recyclable waste will be placed in containers and regularly emptied and disposed of to a permitted landfill site.
- Lubricants and used oil will be stored in approved containers and promptly removed from site and disposed of as directed by KIRMA.
- Care will be taken to prevent any releases or spills of fuel and lubricants during fuelling and maintenance of construction equipment and will be prevented from entering the ground, drainage areas or water courses by using appropriate containers and bunds.
- Any oily debris and contaminated soils will be recovered and disposed of as directed by KIRMA.
- Adequate sanitary convenience that meets public health and environmental requirements will be provided for construction staff on site.

On completion of the works all surplus materials and construction debris shall be removed and recycled or disposed of in an appropriate manner. Any remaining exposed earth surfaces shall be reinstated to match the surrounding topography and revegetated.

4.4.4 Dust control

For dust emissions, prevention and control techniques will include:

- Land clearing, removal of topsoil and excess materials and construction activities will be planned with due consideration to meteorological factors (e.g., rainfall, temperature, wind conditions) and location of residential property or other sensitive receptors.
- During periods of dry conditions water spraying of roadways, other exposed areas and any stockpiles will be implemented. Exposed surfaces of stockpiled material will be covered during prolonged periods of dry conditions.
- During construction, roads will be adequately compacted and periodically graded and maintained with speed limits for trucks and other vehicles applied if necessary.

4.4.5 Haulage and construction vehicle movements

The impacts of construction traffic on Malem and Utwe villages and other residential areas will be minimised as much as possible:

- Equipment and trucks passing through Malem village and other residential areas will slow to an appropriate speed to avoid noise and vibration disturbance as far as possible.
- Construction vehicles using public and private roads will be clean with loads secured to prevent accidental spillage. Any accidental spillage of material or soil transported on to roads beyond the immediate construction area will be promptly cleaned up.
- Establishment of machinery storage and washdown areas will be kept to a minimum and will be removed and the area reinstated and vegetated after construction. Any washdown areas shall be a minimum of 15 m from any natural water course and washdown runoff will not be discharged in to natural waterways.

4.4.6 Noise control

Construction activities will be conducted by DT&I and will take all reasonable steps to ensure minimum nuisance to adjacent land users and property owners during construction.

Construction activities will be limited to daytime working hours during standard working days, with no work on weekends or public holidays except for necessary emergency work.

4.4.7 Access by residents

DT&I will ensure that reasonable access is maintained to land and property affected by construction activities and that health and safety is not compromised at any time.

4.5 Environmental impacts associated with operation

The road will become the responsibility of the DT&I who are responsible for maintenance of the primary road network in Kosrae.

Under the first phase of the inland road to a sub-base surface, regular maintenance of the road and road drainage structures is essential to minimise erosion and damage to the road surface and sediment runoff. Regular inspections, particularly after periods of heavy rain, need to be conducted of the road, drainage and drainage infrastructure. For as long as the road surface remains to a sub-base standard, remedial maintenance involving regrading and compacting will be required to ensure the main road carriageway is kept free of vegetation, the slope of the road crossfall is maintained to ensure adequate drainage and rills or scouring of the road surface are promptly addressed. Ensuring sediment has not built up in drainage swales and that no road-related sediments are entering waterways will also be required. Equipment is available within DT&I to adequately carry out all maintenance activities.

4.6 Environmental monitoring

KIRMA Permitting staff conduct routine monitoring of development activities to ensure that development permitting conditions are being adhered to. KIRMA also conducts various environmental monitoring activities including related to forestry inventory, invasive species, shoreline change. They also conduct water turbidity testing, using a turbidity tube, of the various water supplies including the upgraded water treatment plant at Utwe.

In additional to KIRMA's regulatory monitoring, discussions with KIRMA and KCSO have identified a number of direct monitoring opportunities to aid community engagement, particularly around stream and watershed protection. This is likely to include:

- Extending routine turbidity monitoring and visual or photographic inspections off all downstream perennial streams and rivers along the length of the proposed inland road to ensure no increase in the amount or frequency of sediment runoff.
- Development of a community-based stream health toolkit based on visual and biota indicators to assess long-term changes in stream health and support the necessary ecosystem approaches, such as riparian buffers, to protecting stream, wetland and other downstream ecosystems from increased inland development.

5 Conclusion

This Environmental Impact Assessment builds on existing studies and identified State, Municipal and community concerns. The overall conclusion is that environmental impacts from the proposed inland road are low to moderate and can be adequately controlled through:

- Adhering to the mitigating recommendations made in this EIS, particularly around erosion, sediment control, storm water runoff, and any other aspects of construction activities subsequently specified in the Development Permit conditions.
- Maintaining the alignment of the road between Malem and Kuplu close to that proposed following approximately the 10 m contour
- Maintaining the alignment of the road between Kuplu and Finsrem on Kuplu Wan plateau close to that proposed maintaining minimum buffer of 150 m at the watershed between the two catchments and over 350 m for the majority of the section of inland road within the Palusrik catchment.

At this stage no potential significant issues have been identified that would require further assessment to understand further or address potential impacts.

A further environmental management plan will be required to address the specific issues if development partner funding is secured for the next phase of construction to upgrade the Malem to Utwe inland road to hot-mix asphalt.

6 Acknowledgements

Funding for the preparation of this EIA was provided by the Regional Technical Support Mechanism administrated by the Secretariat of the Pacific Regional Environment Programme with funding from the Asian Development Bank. I would also like to thank Peniamina Leavai and Simpson Abraham of SPREP for their assistance.

The considerable support and assistance provided by the Kosrae State Government, Kosrae Conservation and Safety Organisation, Mayors and Municipal Councils of Malem and Utwe, and communities of Malem and Utwe is gratefully appreciated.

Finally my thanks to Director Robert Jackson and the staff of KIRMA for all their support, friendship and sharing of information and their considerable expertise. I'd particularly like to thank Blair Charley for all his assistance in arranging meetings and field visits, providing GIS and other information, and all the other support provided during before, during and after my visit.

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Appendix A Terms of reference

Location:	Kosrae State, Federated States of Micronesia.
Project:	Proposed Malem Inland Road and Relocation Initiative.
Type of Contract:	Technical, Svc In – Natural Resources & Environmental Services – Environment Impact Assessment
Duration of Contract :	27 working days (6 May – 16 June 2016).

Background

The Kosrae State Government (KSG) of the Federated States of Micronesia (FSM) is undertaking several inter-related programs to improve the functionality and resilience of its priority development sectors that include infrastructure (roads, airport, and ports), ecosystems management, community development and agriculture. These programs are being developed to guide KSG in responding to extreme events such as coastal and river flooding, king tides, droughts and tropical cyclones and the exacerbating effects of climate change and sea-level rise on these hazards. Climate change projections for FSM suggest that these hazards and risks may significantly increase in the future, and if infrastructure developments continue as business as usual, the impacts will also increase which will result in significant loss for Kosrae in terms of key infrastructure, loss of ecosystems (through coastal erosion and salt water intrusion) economic and social disruptions and may also include loss of lives.
KSG developed an Inland Road and Relocation Initiative (IRRI) as a result of a government and community effort to identify, prioritize and respond to climate change and disaster risk elements of the State.The IRRI program is largely a combination of strategies from the Kosrae Shoreline Management Plan which includes the relocation of the Pilyuul-Malem-Utwe road (and community) as a high priority response to climate hazards. The Malem-Utwe section requires immediate attention. This priority is also emphasised in the more recent FSM Infrastructure Development Plan 2016-2025. The main strategies from the KSMP (incorporated into the IRRI) are:

- Inland repositioning of a priority section of the road (the Malem-Utwe section and if possible also the Malem to Pilyuul section (KSMP section 4.2.4.).
- Transitional revetment defences, specifically the highest priority defences at Mosral and Paal to enable the only road access to the villages of Utwe and Walung to remain passable until the inland road is constructed (KSMP section 5.1.2).
- Develop a relocation strategy (KSMP section 4.3.2).
- Create incentives to relocate to safer areas (KSMP section 4.3.1).

A Monitoring and Evaluation Framework, detailing the sequence of activities, risks and assumptions, required, and associated with the IRRI has been developed. The MEF aligns activities with the KSMP, as well as the FSM Action Plan for 2023, and the climate-responsive Kosrae Strategic Development Plan (KSDP) for 2014-2023.In addition to mapping the logically connected sequence of activities to achieve the objectives of the IRRI, the purpose of the MEF is fourfold: assisting management and adaptation, while supporting learning and accountability. To implement the Initiative, five strategies have been developed and agreed with Kosrae stakeholders that are aligned with the Kosrae Shoreline Management Plan (KSMP):

- Strategy 1: Construction of inland road and related public infrastructure.
- Strategy 2: Increase access to land.

- Strategy 3: Increase access to affordable finance.
- Strategy 4: Community-based ecosystem management.
- Strategy 5: Limit further coastal development.

The Kosrae State Government wishes to implement the five strategies and is working to secure a number of donors to assist with implementation of these strategies. The donors are the government of China and the United Nations Framework Convention on Climate Change Kyoto Protocol Adaptation Fund (AF).

Some of the activities associated with implementing the above strategies trigger Kosrae's Environmental Impact Assessment(EIA) requirements due to possible direct or indirect impacts on the natural environment as well as communities. The trigger comes within Kosrae's 'Regulations for Development Projects' and will require the social and environmental impacts of the IRRI (relevant activities), to be assessed prior to development approval from the authorising department KIRMA. In addition, the regulations require that EIAs assess the effects of climate change and impacts of extreme weather events on proposed development activities. Where required, avoidance and mitigation management measures will need to be identified.

The Kosrae State Government wishes to progress the IRRI as priority climate resilience building measure and this assignment is requested to carry out the EIA for relevant activities identified in the above 5 strategies. Regulation 1.4(l) of the Kosrae State EIA Guidelines defines EIA as :

"*the process by which all environmental, social, cultural, and economic impacts of a project, including project alternatives, are identified and analyzed before the decision to approve the project is made. The EIA is used to predict the likely economic, social, cultural and ecological consequences of a proposed activity; that is, the effect on the environment. The EIA is also used to assess the effects of natural change, impacts of extreme weather and climate events, and climate change on the proposed activity and the need to incorporate adequate climate change adaptation measures for the proposed operating life of the project. The EIA is intended to take a precautionary approach to help in planning to prevent or reduce adverse effects to acceptable levels, including the potential for maladaptation, before investment is committed.*"

Objective and Purpose

The objective of this assignment is to carry out an EIA of the Inland Road and Relocation Initiative (IRRI) program. The purpose of the assignment is to lead the 'EIA process' by consulting, researching, assessing the affected communities and environment of the proposed IRRI project.

Product / Output

The Consultant will produce the following outputs:

1. Development Review Permit Application for applicable identified activities.
2. Initial EIA Checklist.
3. Environment Social Management Plan (ESMP), and
4. Summary reports on meeting outcomes, including any information and data collected during consultations and interviews with all relevant stakeholders

Methodology:

With guidance, provision of information and support provided by the Kosrae Island Resource Management Authority (KIRMA) Permitting Unit and the State Department of Transport & Infrastructure; the Consultant will carry out the following tasks:

- Consult with relevant stakeholders to confirm, and refine where necessary, the activities identified under each of the five strategies, as an input into the Development Review Permit

Application (DRPA). Refer to Annex 1 for the list of activities.

- Articulate and clearly report the project activities listed in Annex 1 to be provided as inputs into the DRPA. Note: not all activities listed require a permit application or need to be screened through the EIA checklist. KIRMA's Program Office will advise on these activities.
- Carry out field visits / studies and stakeholder consultations for the following:
  - Access road Malem.
  - Access road Yeseng.
  - Inland Yeseng to Finsrem.
  - Access road Utwe to Finsrem.
  - Malem-Utwe coastal roads including Mosral and Pal points.
  - Malem village community.
  - Utwe village community.
- Ensure field visits /studies and stakeholder consultations incorporate climate change risk assessments, to assist with the identification of appropriate climate change mitigation and adaptation measures for integration with IRRI activities.
- Prepare a Development Review Permit Application (with the relevant proponents), and
- Complete an Initial EIA Checklist (see guidance below) for each relevant activity.
- Draft an Environment Social Management Plan (ESMP) that identifies potential environmental and social impacts and risks of the project. The ESMP may identify the scope, or range of actions, alternatives, and impacts to be considered by the project proponent – DT&I. It should be clear on which environmental and social impacts and risks are triggered by the project as requiring more detailed environmental and social assessment, and which impacts and risks do not require any further assessment. The ESMP must clearly identify measures necessary to avoid, minimize, or mitigate the potential environmental and social risks identified. The Consultant is to work with KIRMA to ensure that the ESMP will assist the government (DTI) in preparation of an Environment Impact Statement (EIS) per the Kosrae EIA Guidelines.
- Prepare summary report of consultations with key stakeholders.

Deliverables and Time Schedule

The consultant is expected to deliver the following by the end of the consultancy and/or as required:

Task	**No. of days**	**Deliverable Due Date**	**Deliverable**
<u>PRE-VISIT</u> 1. Agree with Kosrae Government and SPREP,	2	6 May 2016	**Pre-mission agreement** detailing schedule of consultations, methods and list of stakeholders to be consulted
<u>FIELDWORK – KOSRAE</u> 2. Carry out field visits / studies and stakeholder consultations to revise and confirm Kosrae	12	9-22May2016	

specific activities 3. Carry out field visits / studies and stakeholder consultations to assist with preparation of Development Review Permit Applications and Initial EIA Checklists for each activity (where required by KIRMA's Program Office). The field visits /studies and stakeholder consultations should incorporate climate change risk assessment, to assist with the identification of appropriate climate change mitigation/adaptation measures.			
<u>POST FIELD WORK</u> 4. Draft Development Review Permit Applications. 5. Draft Initial EIA Checklists for each activity or group of activities. 6. Draft Summary Report of consultations with stakeholders. 7. Draft ESMP .	10	03 June 2016	**Draft Documents:** - **Development Review Permit Applications.** - **Initial EIA Checklists.** - **Draft summary report of consultations with stakeholders.** - **Draft ESMP.**
8. Principal review period by Kosrae/SPREP		6 - 13June 2016	
9. Finalize and submit all documents – Development Review Permit Applications, Initial EIA Checklists, ESMP	3	14 – 16June 2016	**Final Documents:** - **Development Review Permit Applications** - **Initial EIA Checklists** - **Summary report of**

			consultations with stakeholders - **ESMP**
TOTAL	**27**		

Guidance for preparation of the Development Review Permit Application and Initial EIA Checklist

1. The Development Review Permit Application and Initial EIA Checklist must be produced in accordance with the Kosrae EIA Guidelines, and pay particular attention to section 2.3.6 of the Guidelines which highlights key climate change impact issues that must be considered.
2. Development Review Permit Application and Initial EIA Checklist templates can be found in the Kosrae EIA Guidelines.
3. Completed documents are to be submitted to the Kosrae Island Resource Management Authority's Program Office, through the Department of Transport & Infrastructure as the principal proponent. The KIRMA Program Office will review the Application and Checklist and determine if an EIS is required. (Note, if an EIS is required it will need to be completed at a later date.)

The purpose of the Development Review Permit Application is to:

(a) Provide a description of the project, including its location, environmental setting, key activities.
(b) Describe the purpose and reason for undertaking the project.
(c) Outline the intended project schedule (i.e., start and completion dates) and estimated project costs, and
(d) Specify if earthmoving will be required (an Erosion and Sediment Control Plan must be attached for any earthmoving activities).

The purpose of the Initial Environmental Impact Checklist is to:

a) Identify environmental, social, climate change, economic, public services and utilities impacts.
b) Facilitate environmental assessment early in the design of a project.
c) Enable the project proponent to modify a project activity design, mitigating potentially significant impacts (including the impacts of climate change on the project itself) before an EIS is conducted.
d) Identify actions that will be taken to mitigate identified impacts – these should be incorporated in an attachment, i.e., the ESMP.

GENERAL ADVICE

- The documents should reflect the basis provided in the Kosrae EIA Guidelines on Key Environmental Considerations; and Environmental Impacts and Avoidance, Mitigation and Compensating Measures. The EIA Guidelines should be referred to and utilized as a resource.
- The level of detail provided should reflect the significance of the project's potential environmental impacts, and it should allow government and interested stakeholders to clearly

understand the project's likely environmental and social consequences.

- Information provided should be objective, clear and easily understood by the general reader.
- Maps, plans and diagrams should be prepared using an appropriate scale, resolution and clarity. There should be no unnecessary formatting.
- Technical jargon should be avoided or accompanied by a clear, understandable explanation.
- Cross-referencing should be used to avoid unnecessary duplication of text.
- Key project impacts should be explained in a widely acceptable format, using graphics and illustrations to assist with interpretation, where relevant.
- Spatial data presented in the report should be provided to KIRMA as importable Geographic Information System shape files.
- List the name of the person or persons who prepared or participated in preparation of the documents.

Appendix B Summary of activities and consultations.

Summary of in-country activities

Date	Meeting	Purpose
Monday 16 May	Arrive Kosrae at 3 pm	
Tuesday 17 May	Meeting with, Governor Lyndon Jackson, Acting Attorney General Carson Sigrah & KIRMA Director, Robert Jackson.	Courtesy meeting and discussion around the AF Proposal, linkages to potential Chinese funding and other proposed activities including Compact Funding.
	KIRMA staff & DT&I Director Robert Jackson Blair Charley, GIS.	Review purpose of the visit, finalise and plan schedule for the week.
Wednesday 18 May	Malam Inland Road initiative workshop, Kosrae State Government.	1 day workshop to discuss and refine AF proposal and EIA requirements.
Thursday 19 May	Field visit to inland road alignment with KIRMA, DTI & Survey & Mapping staff.	Assess alignment of road and potential environmental impacts.
Friday 20 May	Working in DT&I.	Working on road alignment and AF costings with DT&I.
	Meeting with Housing & Renovation Division, Department of Resources & Development.	
Saturday 21 May	Field visit to update coastal change assessment including Paal and Mosral sites.	
Monday 23 May	Meeting with KIRMA Permitting staff Meeting with KIRMA Historic & Preservation staff. Meeting with Malem Municipal Council. Malem Community Meeting.	AF project update identification and discussion around potential environmental impacts.
Tuesday 24 May	Field visit to Kuplu Wan area with KIRMA and DTI staff.	Assess alignment of road and potential environmental impacts.
Wednesday 25 May	Working in KIRMA office.	
Thursday 26 May	Meeting with Utwe Municipal Council Utwe Community Meeting.	AF project update identification and discussion around potential environmental impacts.

Date	Meeting	Purpose
Friday 27 May	Malam Inland Road initiative workshop, Kosrae State Government.	¾ day workshop to revise and finalise AF proposal.
Saturday 28 May	Depart Kosrae to Guam.	

Meeting attendees

Kosrae Government Stakeholder meeting Wednesday 18 May 2016.

Name	Affiliation	Email
Blair Charley	KIRMA	charleyblair@gmail.com
Leonard Sigrah	KIRMA	leonsigrah@yahoo.com
Swenson Thomson	Historic Preservation Office, KIRMA	swenthom@gmail.com
Andy George	Kosrae Conservation and Safety Organisation	kcsodirector@gmail.com
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Name	Affiliation	Email
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Erick E Waguk	KIRMA	wakukerick@yahoo.com
Kiobu K Luey	KIRMA	lkiobu@hotmail.com

Malem Municipal Meeting – Monday 23 May 2016

Likiaksa Elesha, Chairman Malem Municipal Council
Grant Jonas, Malem Municipal Council
Ruben Charley, Malem Municipal Council
Arthur Talley, Malem Municipal Council
Charlton Timothy, Malem Municipal Council
Paliuoa Sigrah, Malem Municipal Council
Shrue Jonas, Women's Organisation
Tina Timothy, Women's Organisation
Nixon Jonas, Malem Elementary School
Lipar George, Overseas Development Assistance
Stanton Andrew, Historic Preservation Office, KIRMA
Blair Charley, KIRMA
Artin George
Alex Philip
Castro Tara
Roert Jonas

Utwe Municipal Meeting – Thursday 26 May 2016

Bruce Andrew, Chairman Utwe Municipal Council
Patterson Benjamin, Mayor, Utwe
George Tulenkum, KIRMA
Likiak Tulenkum, Utwe Senior Citizens
Vernet Waguk
Larson Livae
Andy Martin
Kesla Tulenkun
Andon Warren
William Tara
Bolly Andrew
Truman Waguk
Blair Charley
Josiaiah Waguk
Randy Edmond

Kosrae Government Stakeholder meeting Friday 27 May 2016.

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Hairom Livae	Kosrae Utility Authority	hlivae@hotmail.com
Gerry Protacio	Kosrae Utility Authority	kuaeng@mai.com
Aimee Hall	KIRMA	aimeehall@gmail.com
Leandro Olano	Department of Transport and Infrastructure	olankos@yahoo.com
Lipar L George	Overseas Development Assistance	Lgeorge_kos@mail.fm
Erick E Waguk	KIRMA	wakukerick@yahoo.com
Kiobu K Luey	KIRMA	lkiobu@hotmail.com

Annex **: Paal and Mosral coastal defence upgrade: Initial environmental impact screening and management plan for new Development Permit

Project overview

The Kosrae Shoreline Management Plan identified that over the short-term the effect of sea-level rise on the ability of existing coastal defences to provide a "satisfactory" level of protection is likely to be manageable through, for example upgrading the level of protection of these existing defences. However, beyond this time the magnitude of sea-level rise is expected to be too great to enable such protection to be effective or affordable other than at locations where there are no other management or adaptation options. The SMP plan developed a coastal defence strategy identifying:

- Long-term defences: a priority on protecting sections of road or other critical infrastructure where there is no other feasible option to reposition away from coastal hazards.
- Transitional defences:
  - Upgrading sections of existing defences to provide adequate temporary protection for the road or highly developed areas over the short to medium term to enable longer-term adaptation strategies (such as inland road development) to be implemented.
  - Limiting any new sections of coastal defences only to the areas where the road is critically threatened at present (e.g., at Pal and Mosral). This would be undertaken only with a view to provide short to medium term protection

Emergency works were subsequently conducted in response to high tides and waves undermining the road at Paal and Mosral in early 2014 (Figures 1 and 2). This was a short term measure involving dumped recycled concrete slabs from the upgrading of the runway hardstanding, and at Mosral placement of large concrete filled bags to create a wall.

Figure 1: Emergency coastal defences at Paal (left) and Mosral (right)

Whilst the emergency works has stabilised the immediate undermining of the road, the ad hoc nature of the construction, does not provide an adequate level of protection to the road, with areas still being undermined and the potential for significant damage to the occur during storm conditions. The communities of Malem and Utwe discussed this at length during consultations and concluded that given the poor nature of the emergency works that a component of the project to upgrade the emergency defences at both Paal and Mosral was necessary to ensure continued access between Malem and Utwe until the alternative inland road was in place.

Figure 2: Location map showing the sectiosn of emergency defences at Paal (left) and Mosral (right) to be reconstructed.

At Paal, the 160 m length of the emergency defences will be reconstructed (Figure 3). This will involve:

1. Remove the existing dumped concrete rubble to enable the underlying sand and coral rubble material to be regraded to approximately a 1:2 slope.
2. Geotextile filter layer will be laid between the underlying material and the armour layer to prevent wash out and winnowing of fine material between the armour layer.
3. The concrete slabs are of a sufficient size to withstand design wave conditions over the reef flat at Paal. These will be reused as the armour layer for the base and lower part of the face of the revetment and will be laid at a slope of 1:2 in a stepped manner.
4. There is insufficient concrete slabs to complete the full stepped revetment. Basalt rock armour, sourced from an existing permitted quarry inland between Paal and Mosral, will be used to complete the crest of the revetment. Armour rock will be a minimum of 0.66 m in diameter and will be laid at a 1:2 slope with the crest of the revetment at least 3 rocks wide. The crest of the defence will be above the elevation of the road.
5. At the southern end of the reconstructed defence the revetment the road curves inward with a wider coastal buffer protecting it, with the shoreline position at this location, “held” by a small strand of reef flat mangroves. The revetment will extend behind the existing shoreline at this point to ensure that outflanking and downdrift erosion does not occur.

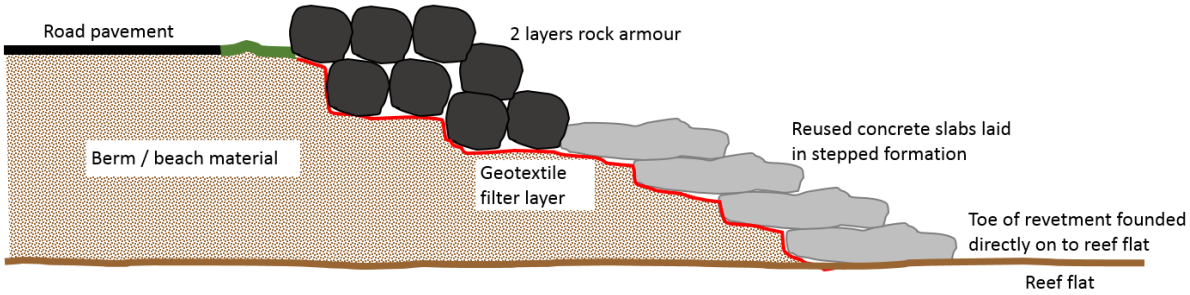

Figure 3: Cross-section of the proposed reconstructed revetment at Paal.

At Mosral, the 110 m length of the emergency defences will be reconstructed (Figure 4). This will involve:

1. Remove the existing dumped large concrete blocks and rubble to enable the underlying sand and coral rubble material to be regraded to approximately a 1:2 slope.
2. The small fillet of sand beach in front of the existing defence will be stockpiled on the adjacent reef flat and re-instated in front of the reconstructed defence on completion.
3. Geotextile filter layer will be laid between the underlying graded slope and the armour layer to prevent wash out and winnowing of fine material between the armour layer.
4. The concrete blocks are of a sufficient size to withstand design wave conditions over the reef flat at Mosral. These will be reused as the armour layer for the base of the revetment and will be laid to form the base of the revetment.
5. There is insufficient concrete blocks to complete the full revetment. Basalt rock armour, sourced from an existing permitted quarry inland between Paal and Mosral, will be used to complete the crest of the revetment. Armour rock will be a minimum of 0.66 m in diameter and will be laid at a 1:2 slope with the crest of the revetment at least 3 rocks wide. The crest of the defence will be above the elevation of the road.
6. At the southern end of the reconstructed defence the revetment there is potential for downdrift erosion to occur and outflanking of the defence. To prevent this, the slope of the revetment will be constructed at a shallower slope and the armour rock used to construct a wider and flatter toe on the reef flat. This will ease the transition from defence to beach and help prevent potentially exacerbated erosion on the coastline immediately to the south.

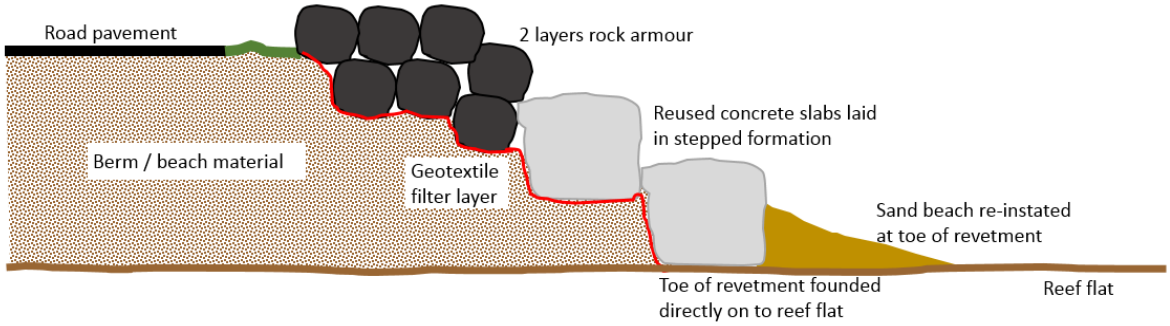

Figure 4: Cross-section of the proposed reconstructed revetment at Mosral.

Description of the Paal and Mosral environments

Paal and Mosral are both located on the south-east facing coast of Kosrae. This coastline has been built by storm and typhoon events over many years. It is characterised by relatively narrow fringing reef (140 wide at Paal and 180 m wide at Mosral), a narrow storm berm upon which the coastal road and most development has occurred, with areas of low lying infill swamp, farmland or at Mosral lagoon mangrove, behind the berm to the volcanic part of the island.

The KSMP provides a detailed description of the coastal processes affecting this shoreline, the history of how the coastal erosion issues have arisen and assessed the potential coastal hazard risks and impacts to the road and community at Malem in the near to mid-future. Of specific relevance to the proposed activities is the tendancy for a nett southerly movement of sand and gravel along this coastline due to the predominant wave direction from the north-east. Where there is an obstruction to this longshore movement of sand and coral rubble along the beach, areas of downdrift erosion can occur.

At Paal the reef flat is covered in coral rubble, with little soft substrate over the reef flat, and is exposed at low tide. A relic coral rubble storm berm located approximately half way over the fringing reef. This storm berm was in place for much of the 20th century and enable strands of mangroves to establish on the reef flat. With the breakdown of the rubble ridge (both naturally and due to removal in the period between 1950-1980 for construction material) the wave environment over the reef is too rough to enable mangrove habitat to be maintained with only a few reef individual mature trees remaining.

Along much of the Malem village frontage, to the immediate north of Paal, a sloping rock revetment currently protects the road and village from continued shoreline retreat, although wave overtopping still occurs when high tide conditions coincide with larger than normal waves. This has been constructed in various stages since 1998 to the standard revetment design on Kosrae.

At Mosral coral rubble likewise covers much of the reef flat. Coral rubble also makes up much of the beach berm with a small amount of sand found at the lower part of the beach. The outlet of the Mosral River occurs at the northern end of the area where emergency works have been undertaken. The outlet has had a history of being blocked by the beach exacerbating flooding of the low-lying land behind the beach berm. In response during the 1980s, two pipes were laid through the beach and tidflex outlet installed to enable the stream to discharge on the lower part of the tide. However, as the coastline has continued to retreat, the pipes now act as a groyne, holding the beach to the north but exacerbating erosion along the section of coast to the immediate south where emergency works have been subsequently required. Removal of the outlet pipes would ease the situation to the south for a short time but would cause a very rapid retreat of the shoreline to the north.

The Paal site is adjacent to the Malem Marsh Area of Biological Significance (ABS) and the Mosral site adjacent to the Malem-Utwe Mangrove ABS. The beach berm, upn which the road is located forms the boundary to both these site. In addition all reef and reef flat areas on Kosrae are defined. Both areas are within the defined areas of particular concern (Shoreline Erosion Hazard Areas) and the shoreline and reef special consideration districts. There are no defined historical or cultural sites at or immediately adjacent to both locations.

Initial screening

The screening of potential enviroinmental impacts was also conducted between Monday 16 May to Friday 27 May 2016 during the EIA for the inland road. It was conducted with KIRMA (Permitting, Forest & Wildlife, and Historic & Preservation) and Department of Transport and Infrastructure staff. Initial screening of potential environmental impacts was conducted using the KIRMA Regulations for Development Projects – Initial Environmental Impact Assessment Checklist, with potential impacts and mitigation measures discussed in more detail in the following sections.

Environmental Impacts – will the proposed project result in…		*Yes*	*No*	*May be*
Earth	a. Destruction, covering or modifications of any unique geological or biophysical features?		X	

	b. Contamination of soils or disturbance of previously or potentially contaminated soils?		X	
	c. Creation of steep slopes or other unstable land conditions?		X	
	d. Any potential for increased wind or water erosion (including in coastal areas) or soils, either on or off the site?			X
	e. Changes in the channel of a stream, or the bed of the ocean or lagoon?		X	
Air	a. Substantial air emissions, including greenhouse gas emissions, or deterioration of existing air quality?		X	
	b. Creation of objectionable odors?		X	
Water	a. Changes in currents, or the course or direction of water movements in either the marine or fresh waters?		X	
	b. Changes in absorption rates, drainage patterns, or the amount of surface runoff?		X	
	c. Cause or exacerbate coastal, stream or river flooding or land drainage impacts?			X
	d. Alterations to the course of flow of flood waters?		X	
	e. Discharge into surface waters or any alteration of surface water, water quality, including, but not limited to, temperature, dissolved oxygen, bacteria or turbidity?		X	
	f. Change in the quality or contamination of ground waters or wells, either through direct additions, withdrawal, seepage, or through interception of an aquifer by cuts or excavations?		X	
Plant life	a. Destruction of any upland or mangrove forest communities?		X	
	b. Destruction of other important plant communities, such as sea grasses, or plants having potential commercial or medicinal value?		X	
	c. Destruction of or reduction in the numbers of any unique, rare or endangered plant species?		X	
	d. Introduction of a new plant species into an area?		X	
	e. Result in a barrier to the normal replenishment or movement of existing plant species?		X	
	f. Increase in acreage of any agricultural crop?		X	
Animal life	a. Destruction of any coral reef areas?		X	
	b. Destruction of or reduction in the numbers of unique, rare or endangered animal species?		X	
	c. Introduction of new animal species into an area?		X	
	d. Result in a barrier to the migration or movement of animals through the environment?		X	
	d. Substantial deterioration in the quality of fish or wildlife habitat?		X	
Alien invasive species	a. The potential introduction of an alien invasive species?		X	
	b. The risk of spread or movement of an alien invasive species from an infested site to an un-infested site?		X	
Risk of upset	a. A risk of an explosion or the release of hazardous substances, including, but not limited to, oil, pesticides, chemicals or radiation, in the event of an accident or perturbed conditions?		X	
Climate change – will the proposed project be affected by…				
	a. Loss of land associated with ongoing, or storm or typhoon-related, shoreline change or coastal erosion?	X		
	b. Coastal flooding from high tides, large swells, storm or typhoon-related events?	X		
	h. Exposure of people or property to water related hazards such as flooding or tidal waves?	X		
	c. Extreme rainfall and associated flooding, including from rivers and streams, or waterlogging and drainage of low-lying land?		X	
	d. The effects of sea-level rise or other climate change influences of the hazards in (a) to (c)?	X		
Social impacts – will the proposed project result in…				
Earth	a. Exposure of people and property to geological hazards such as landslides, ground failure or similar hazards?		X	
Water	a. Substantial reduction in the amount or quality of water otherwise available for public water supplies?		X	
Noise	a. Increase in existing noise levels or exposure of people to severe noise levels?		X	

Land use	a. Substantial alteration of the present or planned land use of an area?		X	
	b. Incompatibility or conflict with adjacent land use(s)?		X	
Population	a. Relocation or altered distribution, density or growth rate of the human population of the area?		X	
Housing	a. Changes in existing housing or create a demand for additional housing?		X	
Transportation	a. Generation of substantial additional vehicular movement?		X	
	b. Substantial impact on roads and existing transportation system?		X	
	c. Alteration to present patterns or movement of people and/or goods?		X	
Human health	a. Creation of any health hazard or potential health hazards?		X	
	b. Improvement in human health?		X	
Aesthetics	a. Obstruction of or deterioration of any scenic vista?		X	
Recreation	a. Changes in the quality or amount of existing recreational opportunities, including those recommended sites for nature-based tourism?		X	
Cultural resources	a. Alteration or destruction of archaeological sites?		X	
	b. Adverse physical or aesthetic effects to a historic resource?		X	
	c. Potential to cause a physical change that would affect unique cultural values?		X	
	d. Restriction of existing religious or sacred uses within the affected area?		X	
Economic impacts – will the proposed project result in…				
Natural resources	a. A noticeable increase in the rate of use of any natural resource?		X	
	b. Substantial depletion of any non-renewable natural resource?		X	
Public services – will the proposed project affect or result in the need for new or altered services in the following areas?				
	a. Police or Fire Protection?		X	
	b. Schools?		X	
	c. Parks or other recreational facilities?		X	
	d. Hospital?		X	
	e. Other government services?		X	
Utilities – will the proposed project result in the need for new systems or substantial changes in the following?				
	a. Power?		X	
	b. Communications?		X	
	c. Water?		X	
	d. Sewage disposal?		X	
	e. Solid waste disposal?		X	

Environmental impacts & mitigation related to revetment design

Kosrae has a standard for revetment design developed as part of the circumferential road (Barrett Consulting Group Inc, 1987). These guidelines were refined during associated activities related to the development of the original Kosrae Shoreline Management Plan in 1998-2000 based on best-practice guidelines outlined in Manual on the use of rock in coastal and shoreline engineering (CIRIA/CUR, 1991).

The design has been adapted to take account to re-use the original concrete rubble used for the emergency works. For both defences a critical aspect of the design is to ensure that the constructed defence does not exacerbate downdrift erosion beyond the southern end of each defence. This can be achieved through careful design of the end of each defence. Dt&I have access to an experienced Coastal Engineer who will provide assistance at the detailed design stage to ensure best practice design of the transition between the defence and the beach to the south.

At the southern end of the revetment at Paal the road curves inward with a wider coastal buffer protecting it. The shoreline position at this location is “held” by a small strand of reef flat mangroves. The revetment will extend behind the existing shoreline at this point to ensure that outflanking and downdrift erosion does not occur.

At Mosral the slope of the revetment at the southern end will be constructed at a shallower slope and armour rock used to construct a wider and flatter toe on the reef flat. This will ease the transition from defence to beach and help prevent downdrift effects and outflanking of the coastline immediately to the south.

Environmental mitigation associated with construction

Minimisation of construction footprint

For both defence section construction activities will take place from the edge of the road, over the beach that will underlie the revetment and on the immediate reef flat at the toe of the beach/defence. The construction footprint on the reef flat will be minimized to no more than 10 m in width from the toe of the beach/revetment and will not extend beyond the southern or northern extent of the proposed defence section. Access to the reef flat by construction plant will be over the beach within the area of proposed defence reconstruction.

At Paal additional care will be taken to ensure no heavy equipment encroaches close to, or impacts on the root system of the mangrove strand that is located further seaward on the reef flat at the southern end of the proposed defence extent.

Erosion and sediment control

Exposed areas during reconstruction of the defences are related to natural sand, gravel and coral rubble material that comprises the beach and coastal berm. Stirring of this material due to wave action at high tide is a natural occurrence with the size of sand, grand and coble material resulting in it quickly falling out of suspension. Removing the existing emergency armour material and re-grading the underlying beach will result in some addition localized suspended sediment in the water column at high tide. This is not anticipated to be significant, will not be above naturally occurring limits, and will not impact on sensitive coastal ecosystems such as coral and mangrove areas.

However, this will be controlled, along with other potential sedimentation and erosion issues within the erosion and sediment control plan outlined below:

- No burning of ground cover for clearing shall be practiced.
- No vegetation should be removed from the shoreline berm beyond the southern extent of the proposed defences at Paal and Mosral.
- Stockpiles of beach sand, coral rubble or rock armour will not be located where material can be washed in to a drain, stream or wetland area, including on a road pavement, on an overland flow path or within 15 m of a stream bank, wetland or mangrove.
- All rock used in the construction of the defenses will be volcanic in origin, come from licensed quarry sites, and will be clean and free from silt and other loose terrestrial material.
- A staged approach will be adopted to removing the existing armour layer, reprofiling the underlying beach, laying the geotextile filter layer and replacing the concrete slab/bock and rock armour layer. This will ensure that there is a minimal length of beach exposed at any time reducing the potential for increased suspended sediments at high tide.

- Where stockpiling of sediment material is conducted on land or any land areas are cleared of vegetation, geotextile sediment fencing will be erected around all areas. The fence will be installed prior to stockpiling/clearing, as close to the contour of the site as possible, with the bottom edge of the fence buried to at least 150 mm, and the fence posts installed on the down-side of the fabric. The fences will be checked regularly and where sediment has built up, this will be removed.

- As soon as possible after works are completed, rehabilitation of and exposed areas, such as the road verge will be undertaken.

Control and disposal of wastes and hazardous materials

Construction design and planning should aim to ensure waste is minimised as much as possible. The following controls will be undertaken:

- All non-hazardous, non-recyclable waste will be placed in containers and regularly emptied and disposed of to a permitted landfill site.

- Lubricants and used oil will be stored in approved containers and promptly removed from site and disposed of as directed by KIRMA.

- Care will be taken to prevent any releases or spills of fuel and lubricants during fuelling and maintenance of construction equipment and will be prevented from entering the ground, drainage areas or water courses by using appropriate containers and bunds. No such activities will be undertaken within at least 15 m of the coast.

- Any oily debris and contaminated soils will be recovered and disposed of as directed by KIRMA.

- Adequate sanitary convenience that meets public health and environmental requirements will be provided for construction staff on site.

On completion of the works all surplus materials and construction debris shall be removed and recycled or disposed of in an appropriate manner. Any remaining exposed earth surfaces, such as the road verge, shall be reinstated and revegetated.

Haulage and construction vehicle movements

Main haulage activities will involve transport of rock armour from the permitted quarry at Yeseng to the sites at Paal and Mosral. This will not pass through built up residential areas but will pass a small number of residential properties

The impacts of construction traffic on Malem village and other residential areas will be minimised as much as possible:

- Equipment and trucks passing through Malem village and other residential areas will slow to an appropriate speed to avoid noise and vibration disturbance as far as possible.

- Construction vehicles using public and private roads will be clean with loads secured to prevent accidental spillage. Any accidental spillage of material transported on to roads beyond the immediate construction area will be promptly cleaned up.

- Establishment of machinery storage and washdown areas will be kept to a minimum and will be removed and the area reinstated and vegetated after construction. Any

washdown areas shall be a minimum of 15 m from any natural water course and washdown runoff will not be discharged in to natural waterways.

Noise control

Construction activities will be conducted by DT&I and will take all reasonable steps to ensure minimum nuisance to adjacent land users and property owners during construction.

Construction activities will be limited to daytime working hours during standard working days, with no work on weekends or public holidays except for necessary emergency work.

Access

DT&I will ensure that access is maintained along the Malem to Utwe road and that health and safety is not compromised at any time.

Malem-Utwe Inland Road and Relocation Initiative Kosrae Monitoring and Evaluation Framework

SECRETARIAT OF THE PACIFIC REGIONAL ENVIRONMENT PROGRAMME (SPREP)

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Acronyms and Abbreviations

AF	Adaptation Fund
CBEM	Community-Based Ecosystem Management
CCA	Climate Change Adaptation
DAF	Department of Administration and Finance
DREA	Department of Resources and Economic Affairs
DT&I	Department of Transport and Infrastructure
EOPO	End-of-project (or program) outcome
FE	Final Evaluation
FSM	Federated States of Micronesia
FSP	Financial Service Provider
FY	Financial Year
GDP	Gross Domestic Product
HH	Household(s)
HIES	Household Income and Expenditure Survey
IRR	Inland Road and Relocation
KCSO	Kosrae Conservation and Safety Organization
KIRMA	Kosrae Inland Resource Management Authority
KSDP	Kosrae Strategic Development Plan
KSG	Kosrae State Government
KSMP	Kosrae Shoreline Management Plan
M&E	Monitoring & Evaluation
MEF	Monitoring & Evaluation Framework
MTE	Midterm Evaluation
N/A	Not Applicable
OEEM	Office of Environment and Emergency Management (National)
PPCR	Pilot Program for Climate Resilience
SBOC	Office of Statistics, Budget and Economic Management
SPREP	Secretariat of the Pacific Regional Environment Programme
TBD	To be determined
VAW	Variation Against Workplan

Table of Contents

1. INTRODUCTION

This document is the Monitoring and Evaluation Framework (MEF) for the Malem-Utwe Inland Road and Relocation Initiative (IRRI) of the Kosrae State Government (KSG), Federated States of Micronesia (FSM). The Framework is aligned with the FSM Action Plan for 2023[1], the climate-responsive Kosrae Strategic Development Plan (KSDP) for 2014-2023, and the Kosrae Shoreline Management Plan (KSMP) updated in 2014. The KSMP sets out the principles for coastal development in Kosrae over the coming decades, and details key strategies for increasing the resilience of Kosrae's coastal communities.

The preparation of the Malem-Utwe IRRI is supported by the Secretariat of the Pacific Regional Environment Programme (SPREP), an intergovernmental organisation charged with promoting cooperation among Pacific Island Countries and territories to protect and improve their environment and ensure sustainable development. The PPCR includes an initiative to build the capacity of an interdepartmental team in the use of monitoring and evaluation frameworks. The team is comprised of representatives from the Governor's Office and from the Departments of Administration and Finance (DAF), Resources and Economic Affairs (DREA), Transport and Infrastructure (DT&I) and the Kosrae Island Resource Management Authority (KIRMA), to jointly implement the Monitoring and Evaluation (M&E) in the infrastructure sub-sector. This MEF was developed to support this effort.

IRRI is largely a combination of strategies from the KSMP, which is specifically aimed at the Malem to Utwe area. The main strategies from the KSMP are:

- Inland repositioning of a priority section of the road (the Malem-Yeseng-Utwe section (KSMP section 4.2.4.)
- Transitional revetment defences, specifically the highest priority defences at Mosral and Paal (KSMP section 5.1.2)
- Develop a relocation strategy (KSMP section 4.3.2)
- Create incentives to relocate to safer areas (KSMP section 4.3.1).

[1] The 2023 Action Plan is a response to the economic challenge facing FSM to reverse the trend over the first 10 years of the Amended Compact where real gross domestic product growth (GDP) averaged -0.5 percent per annum. Implementing a long-term sustainable growth strategy is the Government's top priority. However, the challenge of growing the private sector at a rate sufficient to produce jobs and entrepreneurial opportunities and to close the fiscal gap in FY2024 is daunting. The Action Plan targets average real growth of 2 percent per annum over the remaining years of the Amended Compact. From 2024 onwards the FSM states will face serious fiscal deficits without any interventions or reforms. A key challenge in fiscal reform is that fiscal policy is formulated individually by the national and state governments, with separate expenditure and revenue policies. However, in order to meet the 2023 challenge, all five governments will need to undertake both revenue and expenditure reforms that reflect the nations long term goals and aspirations. Surpluses for the National Government prior to FY2024 will allow it to achieve two goals. Firstly, it will be able to set aside $15 million per annum into the 2023 Investment Development Fund which will be used to stimulate economic growth. A further $15 million will be invested into the FSM Trust Fund to assist with financing State deficits from FY2024 and beyond. The fiscal challenge in FY2024 occurs at the State level and in particular in Chuuk and Kosrae. The economies of Pohnpei and Yap are stronger and have the capability to partially absorb the fiscal gap of FY2024. The centerpiece of the national strategy for achieving private sector growth is to "ignite tourism" by upgrading over 100 tourism sites, and, obtaining World Heritage Site status for Nan Madol in Pohnpei (and the associated Lelu site in Kosrae). The intent is to link agriculture and fisheries production to tourism as part of FSM's unique destination, offering the supply of fresh fruits, vegetables and fisheries produce. This will require development of farmers' and shipping supply chains to boost supply of local food to hotels and restaurants. Source: FSM 2023 Action Plan; http://whc.unesco.org/en/tentativelists/5652/ (Accessed 9 Dec 2015)

Several Development Partners will contribute to the initiative. One of the Development Partners is the Adaptation Fund[2] (AF), and IRRI is part of a wider proposal for AF funding. The elements to be included in the AF proposal and in complementary proposals will be determined in early 2016. The AF aims to provide all four (4) State Governments in FSM with development planning tools and institutional frameworks to help coastal communities prepare and adapt for higher sea levels and adverse and frequent changes in extreme weather and climate events. These tools and frameworks may include national, state, island, municipal, community and sector plans, policies, regulations, guidelines, standards and protocols.

The MEF was prepared following a Guidance Note prepared by SPREP[3] (see Appendix section 0 for a brief outline of the methodology).

1.1 Objective

The objective of this MEF is to guide a KSG Team and partners, to conduct M&E of the proposed inland road and relocation initiative (IRRI) for the municipalities of Malem and Utwe. The purpose of the MEF is fourfold, assisting management and adaptation, while supporting learning and accountability.

- **Management**: tracking progress of intervention implementation against plans and to be able to, in a timely manner, adjust program inputs, activities and outputs to successfully achieve expected outcomes where needed.
- **Adaptive Management**: improving the design and performance of an intervention during its implementation and making overall assessments as to its quality, value and effectiveness.
- **Accountability**: reporting on the use of allocated resources to Government, funders, members of the public and intervention beneficiaries.
- **Learning**: inform future planning and revisions of the KSG's IRRI by generating knowledge about good practice, learning from experience as to what works and what does not, and why the intervention has been successful or not, in its particular context.

A particular emphasis of the MEF is to support adaptive management and learning. This is because the IRRI is a new area of work for KSG and will serve as a pilot for future relocation initiatives involving other areas of Kosrae as identified in the KSMP.

1.2 MEF Audiences and Use

The primary audiences for this MEF and the resulting information and knowledge are the Kosrae State Government and its non-governmental partner in the Malem-Utwe IRRI, the Kosrae Conservation and Safety Organization (KCSO) and the Adaptation Fund-related Project Board, Director and Manager at the National Level and other Development Partners who may contribute to the initiative. A key use by the relevant state government departments and KSCO is for ongoing

[2] The Adaptation Fund was established under the Kyoto Protocol of the UN Framework Convention on Climate Change, and has committed US$ 331 million in 54 countries since 2010 to climate adaptation and resilience activities. The Fund is financed in part by government and private donors, and also from a two percent share of proceeds of Certified Emission Reductions issued under the Protocol's Clean Development Mechanism projects.

[3] SPREP. 2015. M&E Guidance Note Kosrae.

planning and adaptive management. Table 1 summarizes the main audiences, uses and main activities of the MEF[4].

Table 1. Audience, Use and Main Activities of the Monitoring and Evaluation Framework

Audience		M&E Framework Use	Main Activities
Primary	Directors and Heads of Divisions of DAF, DREA, DT&I, KIRMA; Director and staff of KCSO;	Build consensus on the purpose, outcomes and strategies of the, initiative; Planning and adaptive management; Assess progress against expected outcomes; evaluate risks and assumptions; identify lessons and recommendations	• Monitoring • Planning and review meetings • Quarterly Report • Annual Progress Report
	Development Partners including the AF National Project Board, Director, Manger and Technical working group; Governor's Office; Divisions of DAF, DREA, DT&I, KIRMA Director and staff of KCSO	Assess progress against expected outcomes; evaluate risks and assumptions; inform future climate change adaptation- related initiatives, revisions of the KSDP, and strategic planning for the next KSDP, and future investment	Monitoring Visits Annual Progress Report Project Annual Review Project Board Meetings[5] Independent Mid-term Evaluation[6] Independent Final Evaluation[7][8]
Secondary	FSM, Kosrae, Yap, Chuuk and Pohnpei state leaders	Lessons and recommendations to inform future climate change adaptation-related initiatives	Monitoring Visits Independent Mid-term Evaluation Independent Final Evaluation
	Regional organisations	Assess progress against outcomes; identify areas for support; identify effective practices for knowledge sharing	
	Donors/funding partners	Assess progress against outcomes; identify effective practices for knowledge sharing; inform future investment	

[4] The activities are based on the draft proposal to the Adaptation Fund (v.010915)
[5] Annually after PAR; also after MTE and FE
[6] After 2 years of implementation
[7] Within 3 months following implementation closure
[8] SPREP will manage implementation of the MTE and FE

2. INTERVENTION PROFILE AND LOGIC MODEL

2.1.1 Problem Statement[9]

The Malem to Utwe coastal zone area of Kosrae is an 'unstable' storm berm that was created in large part by a series of large typhoons in 1891 and 1905. This coastal margin area is dynamic and subject to continuous change. The rate of change and structure of this area is also affected by climate change-related sea-level rise and changing frequencies and intensities of typhoon events. Uncontrolled mining of beach aggregate and inappropriately designed coastal protection measures are also contributing to coastal erosion in these areas.

The coastal road and a significant number of homes and other infrastructure are located on this narrow (10-50 m wide) berm, with wetland or mangrove between the berm and the upland part of the island. The establishment of the coastal road encouraged settlement along the exposed coastline. Unfortunately, limited information and understanding about the magnitude of flooding hazards and related risks in this area existed at the time of urbanization. Consequently, homes and other infrastructure located in these coastal zone areas are increasingly vulnerable to erosion and associated overwash from king tide events and typhoons. According to a recent Cost-Benefit Analysis (CBA) of infrastructure options (Holland, 2015); potential overwash events are expected to result in the following consequences:

- impacts (damage) on housing, school and church infrastructure
- impacts (damage) on road, power and other essential public infrastructure
- impacts (damage) on safety of the community including potential loss of life
- indirect impacts (losses) associated with damage to road infrastructure. These include reduced earnings and educational opportunities and health effects, when access to work, school and the hospital are hampered by road breaches, and reduced food security, through the destruction of home gardens, which are an important element of food security on the island.

The magnitude of these expected impacts is significant. A conservative estimate of this impact for the next 50 years is around US$146,000 per annum - and this expected impact is increasing in line with increasing frequencies of overtopping and flooding events.

The impact of these effects is exacerbating the already lower economic status of the residents of Malem and Utwe, who have lower average earnings than the residents of the other Kosrae municipalities of Lelu and Tafunsak.

KIRMA estimates that approximately 98 households (HH) (25% of the total number of HH in Malem and Utwe based on the 2010 Kosrae Census) are potentially under threat of overwash/inundation on the stretch of coastal road from Malem to Utwe.

In community consultations, families in Malem and Utwe stated that if the coastal threats were not addressed the area would cease to be a safe and sustainable place to live, and that emigration from

[9] Sources for this section: 1) Holland, P. 2015. Cost-Benefit Analysis in Coastal Zone Management in Kosrae (FSM): Economic Assessment of Coastal Road Relocation; 2) Ramsay et al. 2013. Kosrae Shoreline Management Plan; 3) KSG. 2013. Kosrae State Strategic Development Plan 2014-2023. 4) SBOC. 2014. Federated States of Micronesia Household Income and Expenditure Survey 2014/14. Main Analysis Report.

Kosrae and/or FSM would be the most feasible option remaining to them. Considering that Kosrae is FSM's smallest state, and that the island lost a quarter of its population between 2000 and 2014 due to economically motivated outward migration, further migration to avoid coastal hazards to could have serious consequences.

The capacity of the Malem and Utwe communities to adapt to/manage these risks through relocation to safer areas inland in particular, is considered low.

2.1.2 Barriers to Adaptation

The key barriers and constraints affecting the adaptive capacity of the Malem and Utwe communities include:

- Lack of an inland road to provide access to safer areas inland
- Lack of land in safer inland areas. Approximately 50% of households located in the vulnerable coastal area do not own land inland. This is complicated by legal restrictions affecting the use and sale of land inland[10].
- Lack of access to affordable finance

2.1.3 Objective and Strategies of the Malem-Utwe Inland Road and Relocation Initiative

The primary objective of the IRRI is to increase the capacity of the Malem and Utwe communities to adapt and manage risks associated with coastal erosion and coastal flooding. More specifically, the IRRI aims to create conditions to enable the Malem and Utwe communities located in coastal hazard zones to gradually relocate to safer areas inland over the coming 50 years.

The IRRI consists of five key strategies for achieving this objective:

Strategy 1: Construction of an inland road and related public infrastructure
Strategy 2: Increase access to land
Strategy 3: Increase access to affordable finance
Strategy 4: Community-Based Ecosystem Management
Strategy 5: Limit Further Coastal Development

The first three address the three barriers constraining relocation. The fourth is aimed at ensuring that relocation is environmentally sustainable and building resilience to primary climate risks in the inland areas. These primary risks are extreme rainfall events and related flooding and landslide risks.

[10] Currently all land in Kosrae above the so-called *Japanese Line* is under government control. During the Japanese occupation of Kosrae, public lands were expanded to include the shoreline below the mean high water mark, the mangroves and the upland forests above the Japanese Line, which includes approx. 67% of the total land area of Kosrae. As much as 50% of this area is too steep for any development and should be maintained as forest for watershed protection. A Constitutional amendment (Amen 19, 1995) was passed which allows reclamation of land above the Japanese Line by the original landowners. Land will be awarded by issuing a Certificate of Title to an individual or to the Tenancy-in-Common, however, a procedure for reclamation must be established by law before any advancement can be made. (Sources: FSM 2023 Action Plan (pgs 47-48); Kosrae State Land Use Plan 2003)

The fifth strategy is limiting further development of public and private infrastructure in the Malem-Utwe coastal hazard zone.

2.2 Logic model

The Logic Model (Figure 1) provides a graphic illustration of the IRRI design. It was developed through a process summarized in Appendix 2. It shows how a five-year project focused on construction of an inland climate-proofed road with power and water lines supplying designated inland village areas, supported by efforts to 1) improve access to land and finance, (particularly for Malem and Utwe HH who have no land in safer inland areas); 2) protect ecosystems and 3) carefully manage land converted for agriculture are expected to enable the gradual inland relocation of Malem and Utwe HH over the subsequent 5-50 years. Revetment of the existing coastal road would permit continuity of access to services in the meantime. The main strategies for achieving inland relocation are supported by Public Information and Capacity Development. The model also identifies plausible linkages between a road and inland relocation initiative, intended to increase resilience to climate-change, and the KSG/FSM national priority of private sector development.

Before the end of the first five years, KSG will also need to develop plans and access finance for provision of the other critical public infrastructure required for inland village areas; and review this approach to identify gaps and opportunities.

The initiative is intended to generate learning to help provide a roadmap for the eventual relocation of other Kosrae communities to safer inland areas, and contribute to the 50-year vision of:

A sustainable population of Kosraens is living in inland village areas safe from coastal climate change hazards, protecting their ecosystems, participating in a growing private sector, including the development of inland agriculture, and experiencing rising social well-being and equity.

The expected outcomes for the initial five-year period fall in the time zone labeled inception to five years. The outcomes in the ten-year band represent the expected impact of the initiative.

Risks and assumptions relating to each strategy and outcome of the IRRI are also made explicit in the model. A key risk is the potential for environmental degradation associated with inland development. The magnitude of this risk in Kosrae is clear from several older proposals and studies.[11] The environmental risks together with social and cultural issues including land tenure and access are summed up by Monnereau and Abraham (2013)[12] and in the CBA of coastal infrastructure options.

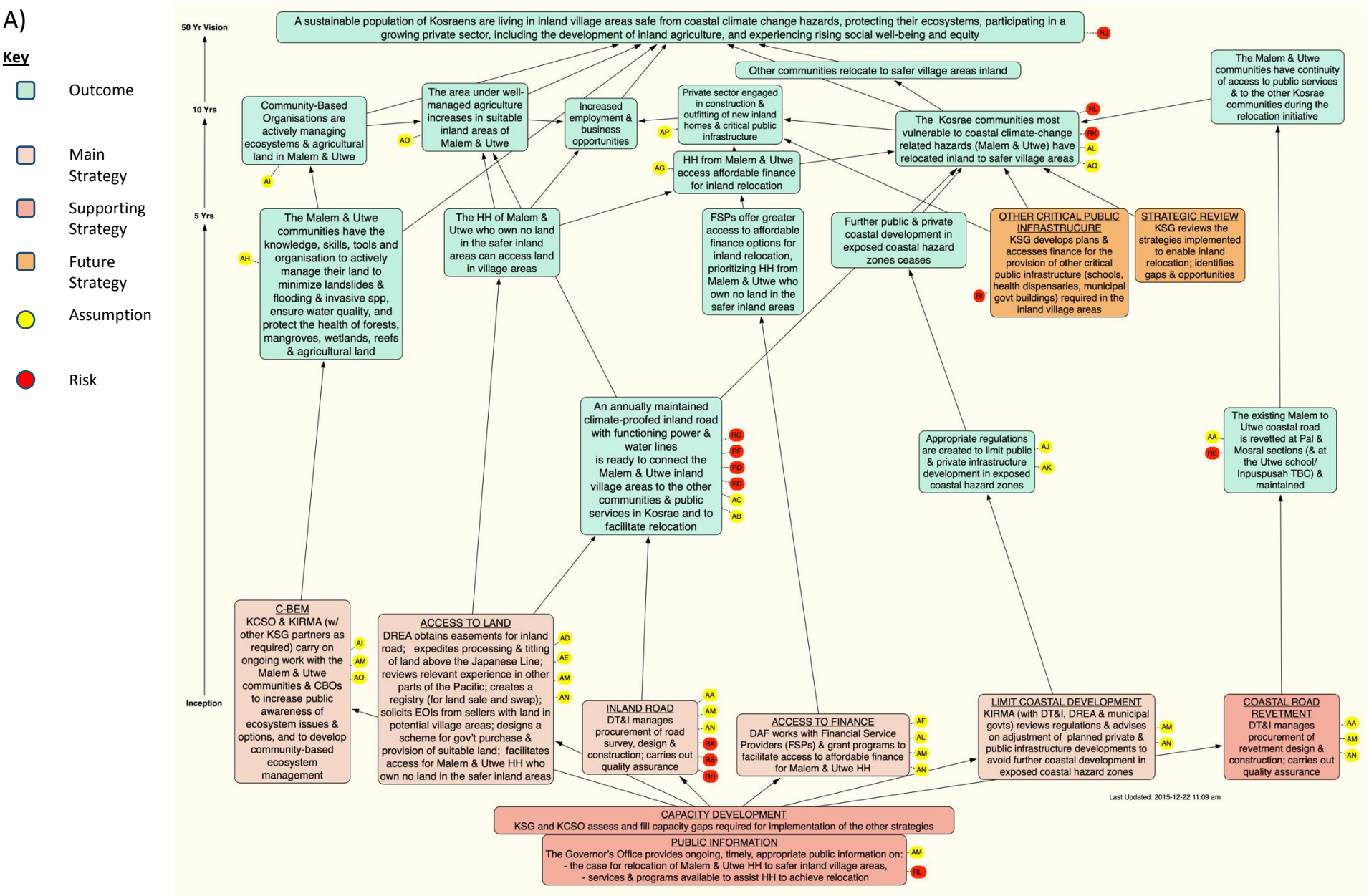
The importance of finding culturally sound solutions to land access matters and the avoidance of degradation through effective community-based ecosystem management cannot be overemphasized.

[11] 1) Bell F, 1992. Environmental Analysis for Kuplu Wan Golf Course Proposal Unpublished report USDA Forest Service); 2) Gorenflo LJ. 1993 Demographic Change in Kosrae State, federated states of Micronesia. Pacific Studies 16(2):67-118; 3) Naylor RL, KM Bonine, KC Ewel and E Waguk. 2002. Migration, Markets and Mangrove Resource Use o Kosrae, Federated States of Micronesia. Ambio 31(4):340-50.

[12] Monnereau I and S Abraham. 2013. Loss and damage from coastal erosion in Kosrae, Federated States of Micronesia. Loss and Damage in Vulnerable Countries Initiative. Case Study Report. Bonn: United Nations University Institute for Environment and Human Security.

Figure 1. A) Logic Model for Malem to Utwe Inland Road and Relocation Initiative; B) Assumptions and Risks

A)



B)

Assumptions:

Infrastructure:
AA: KSG can secure quality contractors to design & build the road/revet the existing road
AB: KSG is able to fund maintenance of the inland road
AC: KSG is able to fund maintenance of the other new power & water infrastructure in Malem & Utwe

Access to Land:
AD: Land swaps happen (between private owners & between private owners and KSG)
AE: KSG is able to successfully negotiate with private land owners for appropriate sites & appropriate prices

Access to Finance:
AF: KSG will be able to apply for GEF6 and other funding in relation to housing and broader development
AG: HH taking loans for relocations have adequate levels of financial literacy

Environmental Management:
AH: Communities & CBOs participate in initiatives for Community-Based Management of ecosystems
AI: Community-based Management of ecosystems is effective

Coastal Development:
AJ: HH will not invest money to build permanent homes in the coastal risk area
AK: Landowners, FSPs & Municipal Govts comply with regulations limiting infrastructure development in coastal hazard zones

Cross cutting:
AL: Malem & Utwe HH willing and able to relocate
AM: Implementing partners have adequate capacity
AN: TA required is available and of adequate quality
AO: Landowners in the inland area opened by the road engage in agriculture
AP: The private sector plays a role in increasing the affordability of house construction
AQ: Relocation occurs gradually with the HH in the most exposed coastal risk zones relocating first

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Risks:

RA: Agreement can not be reached with all landowners on easements required for building the inland road

RB: Climate hazards are more severe than anticipated leading to higher climate-proofing related costs for building the inland road

RC: Landslides damage new inland road

RD: Climate proof-design for the road is not effective

RE: Road revetment de-incentivises and delays inland movement by Malem and Utwe HH

RF: Utwe municipal government fails to permit use of water to supply Malem needs related to inland relocation

RG: Private HH are not willing to negotiate access for to enable power line installation passing through their land

RH: KSG is unable to access sufficient funding for the entire Malam to Utwe inland road

RI: KSG is unable to access sufficient funding for the other public infrastructure needed to facilitate inland relocation

RJ: The opening of the new road and inland area facilitates environmental problems such as incursion of invasive species, forest degradation or erosion

RK: Discord/conflicts between communities and or individuals emerge in relation to land, finance or other issues

RL: Adequate rate and/or density of relocation is not achieved

3. EVALUATION QUESTIONS

The logic model shows that achieving relocation to safer inland areas of two of Kosrae's four municipalities is a complex, long-term strategic initiative with several embedded projects, each corresponding to a component strategy, and requiring coordination at both the individual and overall levels. This complexity implies a considerable burden of data collection and analysis for M&E. To focus the effort, and reduce the risk of overwhelm, it is critical to develop an M&E framework that is flexible and addresses the most critical information and learning needs. The formulation of priority evaluation questions helps to focus the M&E effort and to ensure it addresses the most critical information and learning needs.

The priority evaluation questions identified by KSG and KSCO are shown in Table 2. The "How Addressed" column shows which questions require the collection of monitoring data that will be fed into evaluation (M→E), and which questions will be handled exclusively through evaluation (E).

Table 2. Priority Evaluation Questions

	Questions & Sub-questions	**How Addressed**
Efficiency	1) To what extent were the key actions associated with each strategy (access to land, access to finance, construction of inland climate proof road, revetment, control of further coastal development; community-based ecosystem management, public information, capacity development) achieved? a) Was the new road completed as designed and planned?	1: M→E
Effectiveness	2) How effective were the strategies? a) What community based ecosystem management projects/actions are being implemented, and what are they achieving? b) What depth and quality of community participation is being achieved in community-based ecosystem management work? c) How suitable are the sites designated as village areas? d) How well were the Malem and Utwe HH with no land in the inland area served by the actions to enable access to land? e) How well were the Malem and Utwe HH served by actions to enable access to finance? i) How well were the Malem and Utwe HH with no land in the inland area served? f) How effective are the Public Information efforts at facilitating community participation and ownership? g) How well did changes in new and existing policies and regulations function in limiting further coastal development?	2a: M→ E 2b: M→E 2c: E 2d: M→E 2e: M→E 2f: M→E 2g: M→E
	3) What worked well and less with each of the strategies and why?[13]	3: E

[13] Prioritise Inland Road Construction, Access to Land and CBEM strategies if not feasible to analyze all during the Mid-term and final evaluations

	Questions & Sub-questions	How Addressed
Impact	4) What proportion of Malem and Utwe HH are planning, preparing, ready to relocate, or have already done so? 5) What is enabling and constraining readiness for relocation by HH from Malem and Utwe? 6) How are agricultural issues influencing readiness for relocation by HH from Malem and Utwe? 7) How is the private sector influencing readiness for relocation by HH from Malem and Utwe? 8) Were there any unintended effects of the KSG inland road and relocation initiative (positive and negative)?	4: M→E 5: E 6: M→E 7: E 8: E
Sustainability	9) How resilient is the new road to the heavy/extreme rainfall events and associated climate-change related hazards? 10) What, if any, were the gaps in the overall approach? i) What if any are the gaps in the individual strategies? 11) What opportunities exist for addressing these gaps? 12) How sustainable are the strategies implemented by KSG to enable relocation?	9: M→E 10: E 11: E 12: E
Synthesis	13) What are the key lessons for Kosrae from the inland road and relocation initiative?	13: E

4. MONITORING PLAN

Good quality information and data is required to address the key evaluation questions outlined in Section 3 (i.e. questions 1; 2a,b,d,e,f,g; 4; 6; 9). This section outlines a plan for ensuring that **the basic data** needed to help answer these questions is collected. The basic data collected as part of monitoring are 'performance indicators' - quantitative or qualitative variables that measure progress in a specific area of intervention performance.

The 'Monitoring Plan' can also serve to collect information needed for regular progress reporting - for the purposes of informing routine management decision-making, as well as accountability.

To be consistent with the formats utilised by the Adaptation Fund, the Monitoring Plan is presented as a 'Project Results Framework'. The detailed Monitoring Plan or Results Framework is provided at Appendix 3.

5. EVALUATION PLAN

Monitoring information on its own is generally not sufficient to provide answers to all relevant evaluation questions. In particular, monitoring information is not able to explain the reasons why or why not objectives (or performance areas more generally) were achieved, or identify specific success factors or barriers. More in-depth information collected at discrete points in time is needed for this.

This section outlines a plan to ensure the in-depth information needed to fully answer the evaluation questions (and complement indicators collected as part of Monitoring) is collected, and that the methods for doing this are appropriate. For the purposes of this M&E Framework, this is called an 'Evaluation Plan'.

The Evaluation Plan is presented in Table 3 below. This format is different from, but also related to, that used in the Monitoring Plan. It specifies the evaluation questions (column 1); a summary of relevant indicator information collected as part of Monitoring (column 2); and the suggested data

collection tool/method for collecting in-depth information needed to fully answer the evaluation question (column 3).

Table 3 Evaluation Plan

	Questions & Sub-questions	Summary of Monitoring	Data collection tool/method
Efficiency	1) To what extent were the key actions associated with each strategy (access to land, access to finance, construction of inland climate proof road, revetment, control of further coastal development; community-based ecosystem management, public information, capacity development) achieved? b) Was the new road completed as designed and planned?	Performance indicators for *Outputs* 3.1.1, 3.2.1, 3.3.1, 3.4.1, 3.5.1, and 3.6.1	1: Analysis of Progress Reports - no additional data collection required
Effectiveness	2) How effective were the strategies? a) What community based ecosystem management projects/actions are being implemented, and what are they achieving? b) What depth and quality of community participation is being achieved in community-based ecosystem management work? c) How suitable are the sites designated as village areas? d) How well were the Malem and Utwe HH with no land in the inland area served by the actions to enable access to land? e) How well were the Malem and Utwe HH served by actions to enable access to finance? i) How well were the Malem and Utwe HH with no land in the inland area served? f) How effective are the Public Information efforts at facilitating community participation and ownership? g) How well did changes in new and existing policies and regulations function in limiting further coastal development?	Performance indicators for *Outcomes* 3.1, 3.2, 3.3, 3.4, 3.5, and 3.6.	2.a: Analysis of Progress Reports; Key informant interviews to learn about achievements; and Most Significant Change (MSC) stories 2.b: Analysis of Progress Reports; case studies of CBO leaders and of a purposeful sample of CBO members; and possible use of MSC stories 2.c: Analysis of Progress Reports; Key informant interviews comparing views against Village Area Designation Criteria, Direct observation/Expert Opinion 2.d: Key informant interviews 2.e: Survey and/or key informant interviews with Malem and Utwe HH. Include sample of HH with no land inland (prioritized for relocation assistance); Case studies illustrating key learning 2.f: Analysis of Progress Reports; Key informant Interviews 2.g: Analysis of evidence complemented by Key Informant interviews if necessary
	3) What worked well and less with each of the strategies and why?[14]	Builds on monitoring information collected for 1 and 2, mentioned above	3: Analysis of progress reports; and key Informant Interviews

[14] Prioritise Inland Road Construction, Access to Land and CBEM strategies if not feasible to analyze all during the Mid-term and final evaluations

Questions & Sub-questions		Summary of Monitoring	Data collection tool/method
Impact	4) What proportion of Malem and Utwe HH are planning, preparing, ready to relocate, or have already done so? 5) What is enabling and constraining readiness for relocation by HH from Malem and Utwe? 6) How are agricultural issues influencing readiness for relocation by HH from Malem and Utwe? 7) How is the private sector influencing readiness for relocation by HH from Malem and Utwe? 8) Were there any unintended effects of the KSG inland road and relocation initiative (positive and negative)?	4: Performance indicator for *Impact*	4: Analysis of Progress Reports; and Key informant interviews 5: Analysis of progress reports; and Key informant interviews 6: For change in areas: Rapid survey (Malem, Utwe); Aerial photographs For views: Key informant interviews 7: Key informant interviews and survey of private sector actors, Most Significant Change (MSC) stories 8: Analysis of progress reports; and Key Informant Interviews
Sustainability	9) How resilient is the new road to the heavy/extreme rainfall events and associated climate-change related hazards? 10) What, if any, were the gaps in the overall approach? i) What if any are the gaps in the individual strategies? 11) What opportunities exist for addressing these gaps? 12) How sustainable are the strategies implemented by KSG to enable relocation?	9: Performance indicator for Outcome 3.1	9: Analysis of progress reports; and Key Informant Interviews 10, 11: Stakeholder workshop; Analysis and synthesis of evidence 12: Analysis and synthesis of evidence
Synthesis	13) What are the key lessons for Kosrae from the inland road and relocation initiative?	All performance indicators	13: Analysis and synthesis of evidence

An independent evaluation specialist will be responsible for collecting the evaluation information. This will be undertaken as part of the mid-term evaluation and the final/terminal evaluation.

Indicative Terms of Reference for the independent MTE including a cost estimate are in Appendix 4. The team size, the process outline and the associated budget reflect a very comprehensive approach that can be scaled down. The Terms of Reference for the FE would be similar but subject to adjustment depending on the evolution of the initiative and learning from the commissioning of the MTE.

6. COMMUNICATION & KNOWLEDGE MANAGEMENT

Given the interdepartmental nature of the IRRI, the creation of a common repository for reports, resources and monitoring data is recommended. This could consist of an online password-protected folder accessible to all partners (e.g., via Google Docs or Dropbox) with a clear directory structure for

key data, progress, evaluation and research reports. The system could be set up and overseen by the lead agency.[15] Each department would be responsible for managing relevant subfolders.

A plan for communication and knowledge management related to the MTE and FE reports is outlined below in Table 4. It recommends ways to pre-package and repackage information and knowledge from these evaluations to ensure effective communication and increase the probability of use.

[15] The lead agency remains to be determined.

Table 4. Communication and Knowledge Management Plan

Report type	Audiences	Timeline	Pre-packaging & Repackaging	Dissemination	Cost (USD)	Knowledge Management
MTE & FE	KSG/KCSO and Development Partners (MTE/FE Steering Committee)	Inception Phase	Consultation on strategies to ensure achieve effective dissemination and use findings	N/A	See MTE TOR	N/A
	KSG /KSCO implementing team	Before MTE/FE report is finalised	Validation Workshop (see TOR, Appendix section 0)	Workshop for feedback on findings & recommendations & to create ownership. Gather recommendations on dissemination approaches and modify this plan accordingly.	TBD	See recommendation above on creation of repository for IRRI related information
	KSG policy makers	After Validation Workshop	Briefing for Governor	Short presentation of key findings and recommendations accompanied by short written brief. Obtain recommendations for dissemination approaches to FSM national government audience.	See MTE TOR	Knowledge products become part of KSG/KCSO IRRI repository
	FSM policy makers	After finalization of MTE/FE report	Action approaches recommended by MTE Steering Committee, implementing team and Governor		TBD	
	Kosrae communities		Depending on recommendations, develop press releases to disseminate via Kosrae radio, posters with infographics, and possibly video, photo essay and web material as appropriate. Churches are powerful institutions in Kosrae and should be considered in the dissemination strategy.		TBD	
	Development Partners		Depending on recommendations develop website, infographics, video etc. material		TBD	

7. CONCLUDING REMARKS

This framework outlines the approach that the KSG will take - working with Development Partners - to monitor and evaluate the implementation of the Malem-Utwe Inland Road and Relocation Initiative (IRRI).

A key feature of the framework is to focus the M&E work on answering a number of key evaluation questions and sub-questions - which were discussed and agreed by stakeholders during a workshop in November 2015.

The intention for this M&E framework is to be a 'living document' that will be periodically updated and adjusted according to the priority learning needs of KSG.

Appendix 1 Methodology

This M&E Plan was prepared following the Guidance Note for Developing Monitoring and Evaluation Frameworks: Strengthening the effectiveness and Resilience of Development Efforts in Kosrae. (SPREP, 2015)

Step 1: Summarise the evidence and logic of intervention design

Step 2: Incorporate external factors and risk into the Logic Model

Step 3: Formulate key evaluation questions

Step 4: Prepare a Monitoring Plan

Step 5: Prepare an Evaluation Plan

Step 6: Prepare Terms of Reference for key evaluative analyses

Step 7: Prepare a Communication, and Knowledge Management Plan

Step 8: Putting it all together

Appendix 2 Development of the Logic Model

The logic model for the Malem-Utwe IRRI was developed through a two-step process: 1) initial framing and, 2) refinement. The initial framing occurred at a workshop with key stakeholders attended by the key KSG Departments of Infrastructure and Transport (DT&I), Finance and Administration (DFA) Resources and Economic Affairs (DREA) and the Kosrae Inland Resources Management Authority (KIRMA), the Governor's Office and a representative from the NGO, Kosrae Conservation and Safety Organization (KCSO). The facilitation style involved the use of plain language and avoidance of M&E jargon. A report of the workshop was prepared by SPREP and is available upon request.

The initial facilitation questions were:

- **What changes do you intend to achieve by the end of the project.** These were referred to as EOPOs (End-of-Project Outcomes)
- **What needs to be in place to achieve the EOPOs: What barriers must be overcome?**

These questions led to the identification of a series of outcomes that were grouped into three time horizons: within five, ten and fifty years. The outcomes desired within 50 years were formulated into a broad, guiding statement of vision linked to the KSDP. Achievement of gradual relocation of Malem and Utwe HH inland was seen as being a 10-year process, and the five-year project lifecycle was seen, as a first phase, and the time required creating conditions to enable relocation. The principal outcomes identified were construction of an inland climate-proofed road, and achievement by Malem and Utwe HH of access to land and finance for inland relocation. Once the desired outcomes were identified for these at 10 and 5-year time horizons, a new facilitation question was introduced.

- **What are the main strategies (related groups of activities required to bring about the EOPOs)**

The main strategies identified were Inland Road (Malem to Utwe) Construction; Access to Land, Access to Finance, Limiting Further Coastal Development, and Community-Based Ecosystem Management (CBEM). Three supporting and crosscutting strategies were added: Coastal Road

Revetment, Public Information and internal Capacity Development. Main activities together with institutional responsibilities were identified for the strategies of Inland Road Construction and Revetment, Access to Land, Access to Finance and Limiting Further Coastal Development. Further work will be required to identify the main activities to be carried out under the CBEM, Public Information and internal Capacity Development.

A visualization of the emerging logic model was prepared based on the discussions up to this point, shared, discussed and refined further.

Using the logic model visualization as the basis for discussion, assumptions and risks were identified in relation to the strategies and EOPOs. The facilitation questions were

- **What are our beliefs** (assumptions) **about how things will work in this project?**
- **What are the foreseeable risks** (factors beyond our control that may be manageable) **associated with implementation of this project?**

Assumptions and risks were identified in relation to both strategies and outcomes.

The process of creating the logic model led to the identification of several outcomes, strategies and related stakeholders that had not been envisioned initially as being within the scope of project (Access to Land, Access to Finance and the supporting strategies of Public Information and Capacity Development). Financial Service Providers (FSPs) were identified as a key stakeholder group that needed to be brought into the process.

The refinement phase of the logic model involved meetings with each KSG department, KCSO, and with FSPs to revisit or present the logic model. The meetings were also used to collect information for constructing a baseline situation analysis. The discussions and information gathered at these meetings pointed to the need to align the model more closely with the KSDP, and with the national level FSM 2023 Action Plan, which both emphasize the fiscal and economic development challenges facing Kosrae and FSM, and the need to reduce dependency on the public sector by developing the private sector.

The following facilitation question was used at the M&E workshop with KSG and KCSO to make a first cut at prioritizing information needs:

- **What are the questions you would like to be able answer at the 5-year mark to guide the next phase of the 10-year Malem & Utwe relocation initiative?**

The evaluation questions prioritised by two working groups at the M&E workshop and draft questions prepared by the M&E Specialist were compared and discussed until consensus was reached.

Appendix 3 Monitoring Plan/Project Results Framework

Notes:

- This PRF assumes that the cross cutting areas of public information and capacity development are covered under Component 4 of the overall project
- Total numbers of HH and residents in Malem, Utwe and other Kosrae municipalities are based on 2010 census and can be updated based on the HIES if we receive an information from SBOC in time. Alternatively, DREA might be able to supply the latest figures
- The numbers of HH in the coastal hazard zone, the number of road easements required were supplied by DREA and are current
- In a number of cases the activities corresponding to each output (listed at the end) have been broken down into more steps compared to the budget table set to KSG
- Yellow highlighting indicates one of the following: 1) missing information that needs to be supplied; 2) info that could be updated based on the HIES; 2) baselines or targets requiring checking or endorsement by KSG

Design Summary	Performance Indicators	Baseline	Target	Sources of Verification	Risks and Assumptions
Impact: The Kosrae communities most vulnerable to coastal climate change-related hazards (Malem and Utwe) are relocating inland to safer village areas	% of Malem and Utwe HH relocated inland	0	Gradual inland relocation over the next 10-20 years of the 236 HH in Malem and the 161 HH in Utwe, starting with the 93 HH (83 in Malem and 10 in Utwe) currently in the coastal hazard zone	DREA and Municipal Govt records	**Risks:** Discord/conflicts between communities and/or individuals emerge in relation to land, finance or other issues Adequate rate of relocation is not achieved **Assumptions:** Malem and Utwe HH are willing and able to relocate Relocation occurs gradually with HH in the most exposed coastal zones relocating first
Outcome 3.1. An annually maintained climate-proofed inland road with functioning power and water lines is servicing the municipalities of Malem and Utwe and enabling relocation to safer inland areas	No. of people benefitting from the road Condition of road after extreme rainfall event (xx mm)	0	Targeted beneficiaries are the 2,283 people resident in the Malem[16] and Utwe[17] municipalities. Indirect beneficiaries include 4,333 residents of the other Kosrae Municipalities A rubric[18] for assessing road conditions after rainfall events will be developed and the target set based on this	DREA and Municipal Govt records	**Risks:** The opening of the new road and inland area facilitates environmental problems such as incursion of invasive species, forest degradation, and erosion. KSG is unable to access sufficient funding for other public infrastructure (in addition to road, power, water) needed to facilitate inland relocation Landslides damage the new inland road

[16] Gender and age breakdown for Malem: Adult men 286; Adult women 284; Youth 252; Children 478
[17] Gender and age breakdown for Utwe: Adult men 196; Adult women 241; Youth 180; Children 366
[18] For definition and examples of rubrics see: http://betterevaluation.org/evaluation-options/rubrics

Design Summary	Performance Indicators	Baseline	Target	Sources of Verification	Risks and Assumptions
				Expert opinion from DT&I assessment report	The climate-proof design for the road is not effective
Output 3.1.1. Malem-Utwe road section plus access routes to the two villages produced	No. road easements obtained/No. road easements required Agreement with Utwe municipal government for provision of water to supply Malem No. power line access agreements obtained/No. power line access agreements required No. of km of inland road produced to climate resilience standards standard	0 Current inland road (xx km) is gravel only, in poor condition, and does not meet climate resilience standards No agreement currently exists 0 0	71 road easements (estimate of the number required[19]) are produced Utwe-Malem water supply agreement produced 100% of required powerline access agreements are produced X km of inland road produced to climate resilience standards	DREA and DT&I reports	**Risks:** Agreement cannot be reached with all landowners on easements required for building the inland road Utwe municipal govt fails to permit use of water to supply Malem needs related to inland relocation Private HH are not willing to negotiate access to enable power line installation passing through their land Climate hazards are more severe than anticipated leading to higher climate-proofing related costs for building the inland road **Assumptions:** DT&I has adequate capacity DT&I can secure quality contractors to design and build the road KSG is able to fund maintenance of the new road KSG is able to fund maintenance of the new power and water infrastructure in Malem and Utwe
Outcome 3.2. The Malem and Utwe communities have continuity of access to public services and to the other Kosrae communities while new inland road is being built and over the course of	Number of people benefitting from the transitional defences at Mosral and Pal	0	Targeted beneficiaries are the 2283 children resident in the Malem and Utwe municipalities who are affected by the vulnerable state of the coastal road at Mosral and Pal, particularly during extreme	DREA and Municipal Govt records	**Risks:** Construction of transitional defences at Mosral and Pal de-incentivises and delays inland movement by Malem and Utwe HH

[19] This estimate will need to be adjusted after the road route is finalised

Design Summary	Performance Indicators	Baseline	Target	Sources of Verification	Risks and Assumptions
gradual inland relocation			tidal surge events. Indirect, potential beneficiaries include the 4,333 resident in the other Kosrae Municipalities who may use the coastal road.		
Output 3.2.1 Transitional coast protection at Mosral and Pal produced	No. of m of transitional defences produced	0 Ineffective loose boulder defences at Mosral and Pal patched only after extreme events	X m of transitional defences produced	DT&I reports	**Assumptions:** KSG can secure quality contractors to design and build the transitional defences KSG is able to fund maintenance of the transitional defences
Outcome 3.3. The HH of Malem and Utwe who own no land in safer inland areas can access land to enable relocation	% of HH without land inland who accessed land inland Area (m^2) of safe land inland identified for access	0 0	100% of the HH in the coastal hazard zone with no land inland access land (18 HH in Malem; 9 in Utwe) TBD	DREA records and reports	**Assumptions:** Land swaps occur (between private owners and between private owners and KSG) KSG is able to successfully negotiate with private land owners for appropriate sites and appropriate prices
Output 3.3.1. A State program established to facilitate access to land in inland areas for homes and public infrastructure (schools, municipal govt buildings)	Land purchase/swap registry used by Malem and Utwe HH who own no land inland Legislative amendment(s) to enable access to and use of land above Japanese line are produced	No program currently exists to facilitate land access. Land above the Japanese line is currently owned by KSG and cannot be used; however, there is a legislative request to amend the constitution to facilitate access to land above the Japanese line	100% of the HH in the coastal hazard zone with no land inland use the land purchase/swap registry (18 in Malem; 9 in Utwe) All legislative amendment(s) required to enable access to and use of land above Japanese line are produced	DREA records and reports Legislative Amendment(s)	

Design Summary	Performance Indicators	Baseline	Target	Sources of Verification	Risks and Assumptions
Outcome 3.4. The Malem and Utwe communities have the tools, skills, and organisation to actively manage their land to minimize landslides and flooding, and manage environmental risks associated with conversion of land for agriculture	Participation by CBO members in management of environmental risks CBEM skills of CBO members improved CBOs established	No CBEM is occurring presently. Several existing plans & studies[20] provide a starting point for CBO establishment, tools & skills development	Assessments of CBO participation quality for a cross-section of members using 1-5 scale[21]; Target: moderate to high Self-assessments by a cross-section of members using 1-5 scale[22] on extent of improvement of key skills; Target: moderately to mostly improved Two CBOs established (in Malem and Utwe)	KSCO reports	**Assumptions:** Community-based ecosystem management skills development is effective
Output 3.4.1. CBO members trained	No. of CBO members trained (by type e.g., women's group, school group, elders etc.) in application of environmental risk management tools or methods CBO tools and/or methods	0	At least X% of Malem and Utwe adults and youth are trained in application of each environmental risk management tool or method	CBO work plans and KSCO newsletters and reports	**Risks:** Implementing partner has adequate capacity **Assumptions:** Communities and CBOs participate in initiatives for community-based ecosystem management

[20] Utwe biosphere Reserve Management Plan (2011); Draft Olum Watershed (in Malem) Management Plan (2013); Feasibility study for management of Invasive Species in Kosrae (2012)

[21] 1: No participation; 2: low participation; 3: Moderate participation; 4: high participation; 5: very high participation. Scale rubric TBD

[22] 1: Not improved; 2: Somewhat improved; 3: Moderately improved; 4: Mostly improved; 5: Fully improved. Scale rubric TBD

Design Summary	Performance Indicators	Baseline	Target	Sources of Verification	Risks and Assumptions
	produced No. CBO members by type: (women's group, school group, elders etc.)		At least 1 tool or method is produced for each key dimension of risk management (landslides, flooding, agricultural land); with 1-5 scale[23] used for reporting progress on tools development At least X% of Malem and Utwe adults and youth become members of the CBOs		
Outcome 3.5. HH from Malem and Utwe can access affordable finance for inland relocation	No. of people who have used the adapted finance mechanism Existing housing finance mechanisms adapted	Existing loan mechanisms are offered by Kosrae Housing Authority[24] and FSM Development Bank[25]	At least XX people have used the adapted finance mechanism At least 1 existing program is adapted to improve affordability of finance for house construction inland	DAF reports	**Assumptions:** Schemes prioritise vulnerable HH in coastal hazard zones
Output 3.5.1. Mechanisms for improving access to affordable finance for inland relocation identified and support provided to adapt these mechanisms	Recommendations are produced by a review of programs and practices in Kosrae and other Pacific Island Countries	Most applicants for the FSM Development Bank loans do not meet eligibility criteria; Kosrae Housing	Recommendations address affordability of finance Recommendations identify ways to serve needs of vulnerable HH in coastal risk	DAF and study reports	

[23] 1: Not produced; 2: Somewhat produced; 3: Moderately produced; 4: Mostly produced; 5: Fully produced

[24] Kosrae Housing Authority (HA) currently offers loans through two mechanisms: 1) Housing Loan Program; 2) USDA-funded Rural Development Program. The HA house loan lending target is 200-300K/yr; Disburse 15-20 loans/yr between USD 7-10,000. Loan terms are 15-20 yrs with a fixed rate (7%). Most loan takers are aged 25-40 yrs. Staff explain the T&C, particularly related to the promissory note and deed of trust. A second type of loan is for senior citizens (over 62) with funding from the USDA. These are "rural development" loans that can also be used to improve home sites. Interest rate is 4%. HA would like to add new program, with USDA funding of USD 50-80,000/yr; does not currently qualify. Main requirement: USD 500,000 escrow; Have only USD 300,000

[25] FSM Development Bank has capitalization from the FSM National Govt plus USD 2M and 5M loans (5 yr term) from China EXIM and the European Investment Bank. FSMDB's national lending target is USD 9 M/yr. In Kosrae lending target is 1.5 M/yr; Housing Loans make up 20% of the National portfolio but only 1% of the Kosrae portfolio; Housing Loans: up to USD 100,000; terms of up to 20 yrs; Interest rate: 9% flat. Currently most applicants are not eligible (do not meet income criteria of USD 10-30,000 per adult). If declined, can apply under personal/consumer loan category or go to Housing Authority. Consumer loans are for up to USD 30,000; 5 yr term, 15% flat rate; Have translated legal docs to Kosraen to help clients understand T&C; Options for FSM Dev Bank to increase affordability are 1) seeking additional sources of funding; 2) advocate for govt social housing scheme (standard housing).

Design Summary	Performance Indicators	Baseline	Target	Sources of Verification	Risks and Assumptions
		Authority loan sizes ae small relative to home construction costs	zones		
Outcome 3.6. Further public and private infrastructure development in coastal hazard zones in Malem and Utwe ceases	No. of new developments (public, private) in Malem and Utwe coastal zone	Planned developments will be identified as part of the review	Once regulations are in place no new developments are initiated in the Malem and Utwe coastal zones	KIRMA records	**Assumptions:** Landowners, Financial Service Providers and Municipal Governments comply with regulations limiting infrastructure development in coastal hazard zones
Output 3.6.1. Coastal development infrastructure regulation measures are produced and/or strengthened	Regulations are produced and/ or strengthened	Existing regulations will be identified as part of the review	At least 1 regulation limiting public and private coastal development is produced or strengthened	Text of official regulations	**Assumptions:** Draft regulations developed after the review are approved by the Kosrae State Government

Activities for Output 3.1.1.
1. Reconnaissance survey to determine road route
2. Finalise road easement terms and conditions (DREA)
3. Topographic Survey
4. Procure engineering design for road, water and powerlines (civil, geotechnical and environmental) including climate-proofing
5. Quality assurance for engineering design for road, water and powerlines
6. Procure construction of road, water and power lines
7. Construct road including water and power lines
8. Quality assurance for road, water and power line construction
9. Develop maintenance plan
10. Yearly maintenance of road

Activities for Output 3.2.1
1. Procure services for review to finalise design for transitional coastal protection at Mosral and Pal
2. Quality assurance for transitional coastal protection designs for Mosral and Pal
3. Procure construction of transitional coastal protection at Mosral and Pal
4. Quality assurance for construction of transitional coastal protection at Mosral and Pal
5. Develop maintenance plan
6. Yearly maintenance of transitional coastal protection at Mosral and Pal

Activities for Output 3.3.1
1. Obtain easements for the inland road
2. Identify private land owners in upland areas including those with traditional ownership claims above the Japanese Line
3. Identify vulnerable HH in coastal hazard areas that are without land inland
4. Set up a registry to facilitate land purchases and swaps
5. Expedite legislative amendments related to land above the Japanese line
6. Expedite processing, titling related to land above the Japanese line
7. Research and develop options for a land provision scheme that prioritises vulnerable HH from the coastal hazard zone who are without land inland
8. Swap/purchase land inland that can be used for schools and municipal government buildings
9. Swap/purchase land inland that can be accessed by vulnerable HH from the coastal hazard zone through the land provision program

Activities for Output 3.4.1
1. Review existing assessments related to landslide, flooding and agricultural development risks in upland areas and identify gaps; based on assessments determine community-based risk management responses
2. Undertake additional assessments (to fill gaps) related to management of risks associated with landslides, flooding and agricultural development in upland areas; based on assessments determine community-based risk management responses
3. Implementation of community-based landslide and flooding risk management responses (invasive species management, regulation of timber harvesting, water catchment activities etc.)
4. Implementation of community-based agricultural risk management responses (e.g. requirements for buffer zones control of pesticide/herbicide use etc.)

Activities for Output 3.5.1
1. Review existing access to finance (for home construction) programs/schemes in Kosrae
2. Review access to finance schemes (for home construction) programs/schemes in other Pacific Island Countries
3. Support adaptations to existing local schemes, ensuring they cater for vulnerable households in coastal hazard zones
4. Develop applications to the GEF6 via non-grant instrument

Activities for Output 3.6.1
1. Review regulations relevant to management of infrastructure development in coastal hazard zones
2. Strengthen and/or develop regulations for management of infrastructure development in coastal hazard zones
3. Review planned public infrastructure developments in the Malem and Utwe municipal areas (e.g. schools, municipal offices, health dispensaries)
4. Develop plan to site public infrastructure in upland areas
5. Proper application and enforcement of regulations aimed at managing infrastructure development in coastal hazard zones
6. Develop funding proposals for public infrastructure (e.g. schools, municipal offices, health dispensaries)

Appendix 4 Draft Terms of Reference for Mid-Term Evaluation

DRAFT

Background and Context

The island of Kosrae is the easternmost island in FSM. Kosrae is a 112 km^2 volcanic island surrounded by mangroves and coastal strand forests that have been historically used for lumber and fuel by residents. There is a shallow fringing reef spotted with boulders of limestone quarried from the fore-reef by high-energy wave events (storms, tsunamis, and other overwash processes). There are no outer islands. The island has steep, heavily vegetated watersheds with unstable slopes. Intense rainfall denudes exposed soil in areas of deforestation. Invasive vegetation is prolific and has taken a foothold in every watershed.

The Kosrae Inland Road and Relocation Initiative (IRRI) is a long-term undertaking by the Kosrae State Government (KSG) to increase the resilience of Kosrae to climate change. The Long term vision is:

A sustainable population of Kosraens are living in inland village areas safe from coastal climate change hazards, protecting their ecosystems, participating in a growing private sector, including the development of inland agriculture, and experiencing rising social well-being and equity.

Within 5 years, the IRRI aims to create the conditions necessary to enable gradual inland relocation, starting with the most vulnerable households in the most vulnerable communities of Malem and Utwe.

The Program Logic is summarised in Table 1.

Table 1: [Insert Program Logic including diagram and assumptions & risks chart]

The initiative consists of five main and three supportive strategies. The main strategies are Construction of a Climate-Proofed Inland Road, Access to Land, Access to Finance, Community-Based Ecosystem Management and Limitation of further Coastal Development.

Land access issues are critical to the initiative. The construction of the inland road requires easements for approximately 71 privately owned parcels. Some of the households located in the coastal hazard zone have no land inland for the building of a new home. The relocation of the Malem-Utwe section of the circumferential road to the interior and the relocation of the Malem and Utwe households to the interior (with priority given to those currently living in the coastal hazard zone) both mean engagement with complex issues of land rights and titling. Land in Kosrae is managed under a complex mix of modern and traditional systems and intricately connected to people's perception of inheritance and community. This needs to be tackled with a long-term perspective and disputes also can take an inordinately long period of time to resolve.

Some of the land required for the IRRI is above the so-called *Japanese Line*, which delineates an undeveloped zone consisting of 65% of the interior of the mountainous island. The Government owns all the land above the Japanese Line and the health of Kosrae' forests, mangroves, reefs and watersheds are due in large part to its existence.

A key risk for IRRI is the potential for environmental degradation associated with inland development. Other risks are that (i) the revetment of the coastal road, essential to keep it

functioning while the inland road is built, de-incentivizes inland relocation, and (ii) the engineering design of the inland road is not 'proofed' from flooding and landslide hazards.

Access to finance for housing and other household relocation costs is also a challenge because the income levels of borrowers is often below the threshold needed to qualify for the loan products that are currently available.

In addition to Coastal Road Revetment, the other supportive strategies are Public Information and Capacity Development. The role of Public Information is to build a case for inland relocation to safer village areas, and to inform people of the services and programs available to assist households to achieve successful relocation. The role of Capacity Development is to ensure that KSG and partners have the capacity to able successfully implement the other strategies.

The first five year phase of IRRI began in [201X] with a total funding envelope of [USD] from [donor1, donor2] and [donor].

A 'Framework' has been developed to assist monitor and evaluate the IRRI in a systematic and focussed manner. The development of this M&E framework was supported by the Secretariat of the Pacific Regional Environment Program (SPREP) and Asian Development Bank through the Pilot Program for Climate Resilience (PPCR): Pacific Regional Track. A copy of this M&E framework document is provided at [Annex A].

Purpose and Use

The main purpose of this midterm evaluation is learning for adaptive management. The evaluation will identify practices, opportunities, lessons and corrective actions needed for the next phase of implementation and to ensure the realization of the expected outcomes.

The findings and recommendations will be used by KSG and IRRI Development Partners to identify key strategic adjustments to the overall approach and/or to the component strategies.

Scope

The Midterm Evaluation covers the entire period since inception of IRRI, and will evaluate the efficiency, effectiveness, impact and sustainability of the five main strategies and the three supportive strategies. In line with the learning purpose of the evaluation, priority will be given to the evaluation criteria of effectiveness, impact and sustainability.

The Evaluation will aim to include all the relevant stakeholder groups including the implementing KSG departments (DT&I, DREA, KIRMA, DAF, Governor’s Office), contractors and consultants, and KCSO, Malem and Utwe municipal governments, households and Community-Based Organizations, Financial Service Providers, The Chamber of Commerce and other Private Sector actors.

Evaluation Questions

During the inception phase the KSG and its partner, the Kosrae Conservation and Safety Organisation (KSCO) identified the following key evaluation questions. It is intended that this will be the primary focus of the mid-term evaluation.

Efficiency	1) To what extent are the key actions associated with each strategy (access to land, access to finance, construction of inland climate proof road, revetment of the coastal road, control of further coastal development; community-based ecosystem management, public information, capacity development) being achieved? a) Has the new road been completed as designed and planned?
Effectiveness	2) How effective are the strategies? a) What community based ecosystem management projects/actions are being implemented, and what are they achieving? b) What depth and quality of community participation is being achieved in community-based ecosystem management work? c) How suitable are the sites designated as village areas? d) How well are the Malem and Utwe HH with no land in the inland area being served by the actions to enable access to land? e) How well are the Malem and Utwe HH being served by actions to enable access to finance? i) How well are the Malem and Utwe HH with no land in the inland area being served? f) How effective are the Public Information efforts at facilitating community participation and ownership? g) How well are changes in new and existing policies and regulations functioning to limit further coastal development?
	3) What is working well and less with each of the strategies and why?[26]
Impact	4) What proportion of Malem and Utwe HH are planning, preparing, ready to relocate, or have already done so? 5) What is enabling and constraining readiness for relocation by HH from Malem and Utwe? 6) How are agricultural issues influencing readiness for relocation by HH from Malem and Utwe? 7) How is the private sector influencing readiness for relocation by HH from Malem and Utwe? 8) Were there any unintended effects of the KSG inland road and relocation initiative (positive and negative)?
Sustainability	9) How resilient is the new road to the heavy/extreme rainfall events and associated climate-change related hazards? 10) What, if any, are the gaps in the overall approach? i) What if any are the gaps in the individual strategies? 11) What opportunities exist for addressing these gaps? 12) How sustainable are the strategies implemented by KSG to enable relocation?
Synthesis	13) What are the emerging lessons for Kosrae from the inland road and relocation initiative?

[26] Prioritise Inland Road Construction, Access to Land and CBEM strategies if not feasible to analyze all during the Mid-term and final evaluations

Timing

The evaluation will be carried out over a three-month period between [when] to [when] during the last quarter of the initiative.

Management and Governance

The evaluation will be managed by [insert]. [Insert relevant title or role] will be responsible for contracting the evaluation tea and monitoring the evaluation process against the TOR deliverables. An Advisory Committee comprised of a Senior KSG official from the implementing team, representatives of [Development Partner 1, Development Partner 2…] and [Development Partner X], and a Peer Evaluation Adviser designated by SPREP. The Advisory Committee will be responsible for reviewing and approving the MTE TOR, the Inception report and the draft Evaluation reports.

Methodology

Effective methodologies engender stakeholder ownership, build evaluation capacity, support accountability, foster independence, and ensure the transparency and reliability of findings. These are the principles that SPREP and KSG expect to be upheld over the course of this evaluation:

Partnership: Work in partnership with development partners and other stakeholders to design and implement the evaluation.

Transparency and independence: Ensure the evaluation process is transparent (open and understood by all partners), and independent (carried out in a way that avoids adverse effects of political or organizational influence).

Participation: Ensure that stakeholders are appropriately involved at all stages of the review or evaluation

Capacity building: Design the evaluation so that KSG capacity to participate in evaluations is enhanced through involvement in the process.

After identification of the team leader and member, the Midterm Evaluation will be conducted in three stages described below. Drawing on the Monitoring and Evaluation Framework, the Evaluation Questions, analysis of relevant document and inception meetings the team leader will prepare the evaluation design and schedule (Evaluation Plan).

The team leader as part of the evaluation plan will determine the time requirements after the inception phase.

Phase	Processes	Deliverables
Inception (Team Leader Only)	Contextual Analysis: Reading/analysis of relevant documents	
	Inception meetings in Kosrae with steering group and with key KSG, KCSO and SPREP staff including stakeholder analysis, identification of key informants potential case studies, use and dissemination of findings and recommendations	**Inception Report**
	Preparation of Inception Report and Evaluation Plan including interview guides, surveys, and participatory tools as required	
	Revision of Evaluation Plan based on feedback	**Evaluation Plan**

Phase	Processes	Deliverables
Field Work (Full evaluation team)	Orientation of team member	
	Engagement with implementers, contractors, consultants, municipal govts, communities, CBOs, FSPs and private sector actors: Carry out interviews, meetings, workshops, field trips, case studies, surveys etc. as per evaluation plan with emphasis on the evaluation questions related to effectiveness, impact and sustainability	
	Processing and preliminary analysis of data from field work and review of stakeholder surveys/feedback	
	Carry out remote interviews (skype/phone) as required. Further field work to fill information gaps, check hypotheses	
Briefing	Workshop with the KSG/KCSO implementing team and SPREP to review the program model in light of the findings and identify key strategic changes	
	Preparation of briefing to Steering Group	
	Briefing of Steering Group	**Briefing: Preliminary Findings**
Analysis and Writing (at SPREP for at least part of the time; to enable team to work together)	Processing and analysis of data	
	Draft Report preparation	**Draft Report**
	Preparation of Advanced Draft Report	**Advanced Draft Report**
Validation (Team leader only)	Preparation of validation workshop	
	Validation workshop in Kosrae Briefing for Governor	
	Preparation of Final Report	**Final Report**
Total Days		

Evaluation Team

The evaluation team will consist of two members with the following profiles:

Team Leader (TL): A senior evaluator with a minimum of 10-15 years of experience in designing and managing program theory-based evaluations, plus experience of conducting evaluations of Community based Ecosystem Management (or similar programs), and access to finance and/or land programs. Pacific experience is essential. Experience with designing evaluations for road infrastructure and/or climate change adaptation programs is highly desirable.

Infrastructure Specialist (IS): A road infrastructure specialist with a minimum of 10-15 years' experience including experience with climate-proofing designs. Experience in evaluating infrastructure projects is highly desirable. Pacific experience is essential.

Deliverables

See above

Indicative Budget

Tasks	**Days, TL**	**Days, IS**	**Total Days**	**Cost** @ 550 USD/day
Planning and Preparation	6	1	7	
Field work	10	5	15	
Preliminary analysis & Briefing	2	2	4	
Analysis	5	4	9	
Reporting	5	4	9	
Validation	0	0	0	
SUBTOTAL	28	16	44	24,200
Travel	**TL**	**CCS**	**Total**	**Cost**
Kosrae @ USD 5000/trip	1	1	2	10,000
Samoa @ USD 3000/trip	0	0		
Rental car days @ USD 50/day	20	10	30	1,500
Per diem days @ USD 166/day	20	10	30	4,900
SUBTOTAL				16,400
TOTAL				**40,600**

Key Documents

- IRRI project design document
- FSM 2023 Action Plan
- Kosrae Strategic Development Plan
- Kosrae Shoreline Management Plan
- Infrastructure Cost Benefit Analysis
- IRRI Progress Reports
- [insert other relevant documents]

COST-BENEFIT ANALYSIS IN COASTAL ZONE MANAGEMENT IN KOSRAE (FSM):

ECONOMIC ASSESSMENT OF COASTAL ROAD RELOCATION IN THE FACE OF CLIMATE CHANGE

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ACRONYMS

CBA	Cost-benefit analysis
FSM	Federated States of Micronesia
KIRMA	Kosrae Island Resource Management Authority
NIWA	National Institute of Water and Atmospheric Research
PPCR	Pilot Program for Climate Resilience: Pacific Regional Track
SPC	Pacific Community
DREA	Department of Resources and Economic Affairs

GLOSSARY

Storm berm	nearly horizontal or landward-sloping portion of a beach formed by the deposition of sediment by storm waves
Revetment	retaining wall, barricade or facing of masonry, earth, sandbags or other material, to support or protect

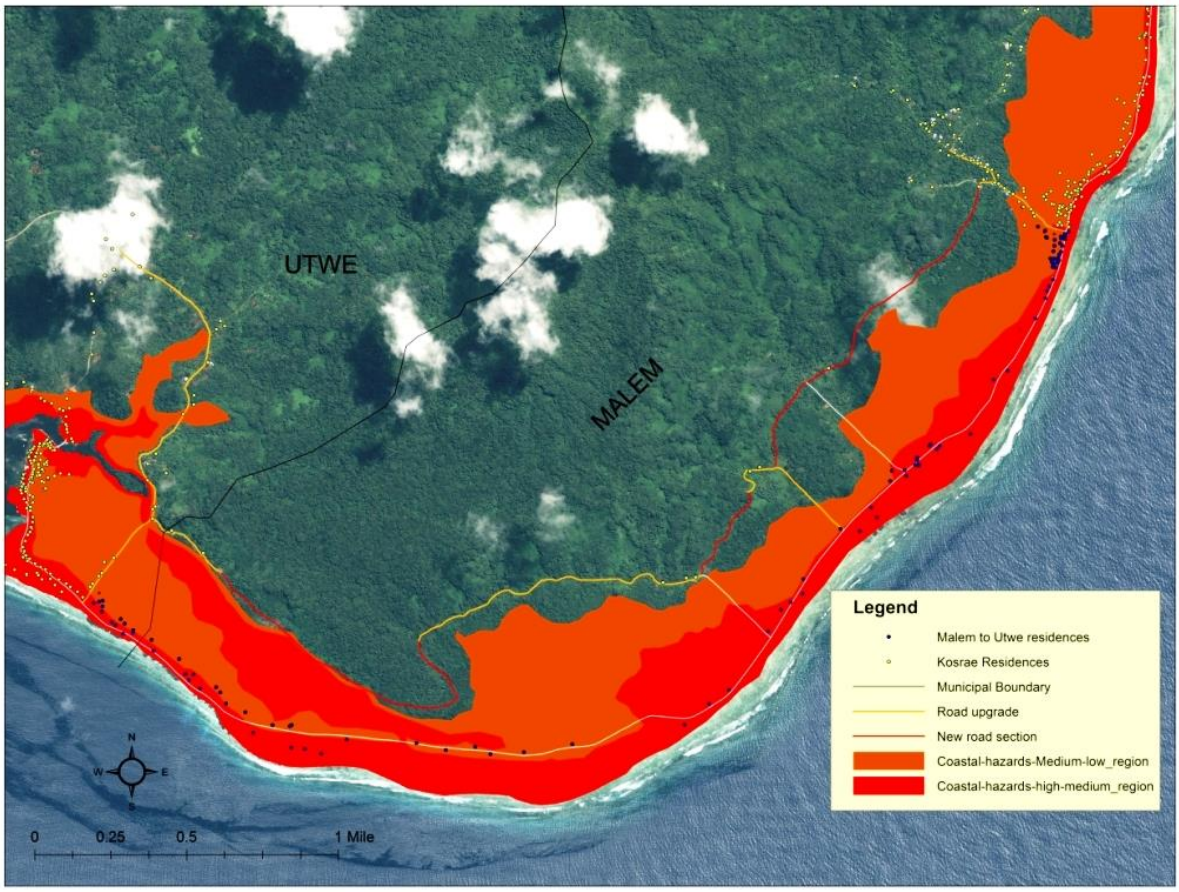
EXECUTIVE SUMMARY

Background

Much community and infrastructure development in Kosrae over the last few decades has occurred within the coastal margins. However, much of the area in which this coastal development has occurred is susceptible to coastal hazards, such as long term coastal change and episodic coastal inundation. The effects of climate change and, in particular, sea level rise, are likely to exacerbate the threat of inundation to coastal developments and loss of infrastructure such as sections of the road network.

The areas most vulnerable to coastal inundation include the coastal area between Malem and Utwe (Image). The community, road and infrastructure in the area face numerous inundation events, with coastal homes in Malem and Utwe (98 houses plus businesses and amenities) exposed to regular over wash. The effects of this include flooding of homes, damage to vehicles and blockages/ breaching of the road, cutting off villagers from homes, work and access to amenities.

Image Areas at risk of inundation



The SPREP-executed Strategic Program for Climate Resilience: Pacific Regional Track (SPCR-PR) aims to strengthen integration of climate change and disaster risk considerations into 'mainstream' policy making and related budgetary and decision-making processes. In light of the coastal threats being faced along the Malem to Utwe coastal corridor, the State Government of Kosrae – in tandem with SPREP and the Programme – is developing a proposal to establish an interior road that links Malem to Utwe, by passing the need for citizens to rely on the existing 4.5 kilometre coastal road for access, while ensuring the

safety of people in the coastal area. A secondary but important objective in the road project is to protect the long term wellbeing of the Kosrae community by facilitating the relocation of families by opening up the interior.

Cost benefit analysis

In support of proposal development, an economic assessment of the benefits and costs of the road project has been undertaken. The relocation option has been compared against a series of alternative adaptation options including coastal protection with revetment and upgrading the coastal road. In reality, the form of that these options and an inland road could take can vary. For example, revetment could cover the entire coastline or just parts; new coastal roads could be built to existing design standards or to new design standards. This analysis assesses selected forms of the adaptation options to consider a way forward for Kosrae:

- Establishing a protective rampart (revetment) to protect the affected coastline, in accompaniment of a new coastal road built to existing specifications;
- Upgrading the coastal road (including elevating it) while revetting segments of the existing road that are particularly vulnerable to erosion;
- Establishing an inland road while maintaining the existing coastal road for various lengths of time and revetting segments of it that are particularly vulnerable to erosion;
- Establishing an inland road at various points in the future instead of today;
- Establishing just part of an inland road.

Data for this exercise was sourced principally from direct consultations with government departments, and supplemented by expert opinion from National Institute of Water and Atmospheric Research (NIWA) and the Pacific Community (SPC). Estimates of the value of the different adaptation options in Kosrae were based on expert opinion on the effect that the options would have on costs faced by the Kosrean community from present over wash trends (impacts of road, houses, earnings and so on). The fact that data was not generated for all impacts means that the quantified benefits of adaptation options were underestimated.

Results

The analysis provides conservative estimates of the potential payoffs from the adaptation options. This is because:

- The analysis is based on the quantified benefits from the different adaptation options arising from only three types of events – 1:5 year events, 1:40 year events and 1:100 year over wash events. However, the adaptation options could also generate benefits when other events occur;
- Some benefits of adaptation – avoided injuries/ fatalities arising from severe events, damage to cars and crops or ongoing access to schooling – have not been quantified. Significantly, the calculations are based on the assumption that only families located around the coastal road from Malem to Utwe relocate over time with improved access to the interior via a new inland road. In practice, relocation might not be restricted to these communities. Families from other parts of Kosrae might also benefit from improved access to the interior through relocating or using their own inland sites for agriculture production;
- By opening up access to the interior of Kosrae – facilitating enhanced agricultural production while changing the dynamic of development away from the hazardous coastline and into the safer and more sustainable interior – the road could be expected to benefit communities beyond the 50 year period of this analysis, benefitting the community for generations to come.

As a result of these three issues, the potential benefits from developing an inland road now or in the future are quite certain to be higher than quantified.

Based only on those benefits quantified over a 50 year period and applying a 4 per cent discount rate, establishing an inland road now offers a modest payoff (NPV) of USD$0.37 million. When non-quantified benefits are taken into account, this payoff is expected to substantially higher.

The option to establish the inland road now is shown to be preferable to establishing the inland road 10 years in the future (NPV=-USD$0.56 million) and 20 years in the future (NPV=-USD$0.23 million) - reflecting, in part, the increasing risks presented by sea-level rise and (potentially also) cyclones.

- The option to establish the inland road now is also shown to be superior to the alternative course of action - to protect or upgrade the existing coastal road. These options were shown to generate a negative payoff (NPV = -USD$2.16 million and -USD$0.85 million respectively). Moreover, there are a number of important limitations associated with these responses that are not fully captured in the aggregate results. Most importantly: the benefits of an upgraded coastal road specifically would only accrue to those families located *landward* of the road who would benefit from reduced inundation. By comparison, families located *seaward* of the upgraded road would remain in the direct line of the waves and continue to be affected by over wash, with potential harm to family members or properties worsening over time as the sea level rises. As a result, these families would eventually still have to find an alternative means to adapt to the coastal threats. In community consultations, families in Malem and Utwe stated firmly that – if the coastal threats are not addressed – the area will cease to be a safe and unsustainable place for them to inhabit. They viewed that migration out of Kosrae or FSM is the only option remaining (Annex 2). Considering that Kosrae already represents the smallest state in FSM and that the island is presently experiencing a net loss of population due to outward migration (Division of Statistics undated), increased migration as a result of coastal threats may not be desirable both in terms of economic potential, but also in terms of retaining Kosrean culture.

- protecting or upgrading the coastal road can risk generating a false sense of security in the community, allowing families to believe that the area is now safe from inundation and *implicitly encouraging* further coastal development. Such an option is therefore counter to the State development plan intent of encouraging inland development as it can hamper relocation in the medium term. By comparison, establishing an inland road network facilitates relocation and opening up on the interior; and

- there are likely to be additional environmental costs from establishing construction work such as protecting or upgrading of the road along the coast (such as downstream erosion). In the face of ongoing sea level rise, this would appear to be unwise.

Furthermore, the analysis shows that the inland road should only be pursued if funding can be secured for the full section of the road from Malem to Yeseng to Utwe. The calculated NPVof establishing a shortened road (from Malem, to Yeseng) only is shown to be negative and is substantially lower than those that could be achieved by establishing a complete road. This reflects the fact that a smaller proportion of the community will benefit while ongoing treatment of the existing coastal road remains. Equally importantly, establishing a portion of

the inland road from Malem to Yeseng will leave the community of Utwe cut off from the rest of the community if the road becomes unpassable in future over wash events. This is important for two reasons.

- First, ongoing threats will continue to undermine quality of life in the village, risking health and damaging possessions. In particular, damage to the road takes time to repair. While 'minor' over wash events may cut off families for one or two days, extreme events (such as a near cyclone) could cause extensive damage which could take from days to weeks to repair. Ongoing interruption to family life, earnings and education – especially in a community less advantaged than the rest of the Kosrae community – is important.

- And secondly–as already indicated – the poor condition of the existing inland access roads brings into question the safety of the community in using these roads as escape routes. As a result, establishing a partial inland road does not address the quality of all the inland access and the immediate safety of the community. An advantage of establishing an entire inland road is rather that – should a sudden storm surge or over wash event occur – families will all have immediate access to safe inland roads as an escape route – while also having long term access to the interior of the island for development or establishing new homes.

Distributional considerations

Based on the quantitative analysis conducted, by far the greatest beneficiaries from the establishment on an inland road established today are families (compared to government), principally in the form of access to the interior of Kosrae to extend agricultural production. This is important because the communities of Utwe and Malem who stand to benefit first from the new road project already have the lowest average earnings in Kosrae, compared with communities in Lelu and Tafunsak. The opportunity to increase income and or food security through increased agricultural would directly improve the wellbeing of these families.

Moreover, these families already presently suffer a variety of harmful effects from over wash, including reduced earnings (when access to work by hampered by road blocks), reduced educational opportunities (when access to school by hampered by road blocks) and reduced access to food (through the destruction of home gardens). The harmful impacts from these effects have a disproportional impact upon these communities as they already have the lowest average earnings in Kosrae, compared with communities in Lelu and Tafunsak. Ongoing over wash can therefore suppress the economic vulnerability of the community. By comparison, a continually accessible road will minimise this harm and facilitate change, increasing the economic resilience of the community. While items values were not valued in the analysis in theory at least, an inland road project would contribute positively to both the food security and economic security of the community.

Relocation considerations

Consultations held with stakeholders from Malem and Utwe revealed in resounding support for an inland road and for relocation to the interior for safety and security. This support has also been affirmed in the present draft of the proposal for the road project (SPREP 2015b).

However, the rate at which families can move in practice will not be known with any certainty until the community can work through issues in collaboration with government and policy makers. Key issues here are:

- Relocation is likely to take time. The analysis presumes that relocation will be gradual. During this time, families who have not yet moved will continue to need access to the

wider Kosrae community through a functioning road. Data analysis suggests that the cost of maintaining the existing coastal road for a few years will have a negligible impact upon the payoffs of a road. On the other hand, retaining a functional coastal road could act as a deterrent to relocation to safer ground and can implicitly discourage relocation. After 20 years, retention of the existing coastal road would require a new coastal road to be established which is expensive. There would therefore be logic in establishing a new inland road network while (i) advising the community of the cessation of existing road maintenance at a specific point in time (eg., 20 years or less) (ii) delivering a strategic campaign on relocation and agricultural development inland and (ii) providing the community with reasonable lead time for their relocation while minimising costs.

- An average house in Kosrae has a replacement value of around USD$43 000 (Section 4.7). Few family members have access to such money to establish a new house once an inland road is established. However, with financial assistance, relocation could be rapid as the community are keen to relocate for safety's sake. As indicated in Section 5, the faster the relocation, the higher the net benefits from relocation. There is therefore logic in the Kosrae State government reviewing access to housing loans or resources for relocation.
- Relocation from the hazardous coast is unlikely to happen while development continues unconstrained along the coast. In the face of sea level rise and climate change, it is unsustainable and unsafe for any new developments to be allowed to continue in hazardous areas such as the Malem to Utwe coastline. In the interest of public safety, no new developments should be permitted here. This constraint would then create a higher drive for developments in safer areas.
- Interim development in hazardous areas such as the Malem to Utwe coastline should be subject to appropriate building standards. In the face of sea level rise, ground level developments would appear to be unsound. Engineers in the State and or national government should be able to recommend clear standards which State government should actively enforce for the safety of the community.
- To support a new inland road and address the points raised above, a strategic communications campaign is required. This should include messages such as why the old road will eventually not be maintained, why new developments along the coastline are not supported, how government can support families in relocation and so on.
- Ultimately – and as indicated in SPREP (2015b), a relocation committee is needed to clarify relocation issues.

Food security considerations

The largest component of quantified potential benefits from establishing an inland road from today is increased agricultural activity from opening up the interior of the island. At the same time, the impact most commonly reported from over wash was loss of subsistence crops in existing home plots. The cost of lost crops was not quantified in this analysis. However, considering that home gardens provide a common source of food in Kosrae, and in view of the likelihood that a representative home includes at least three young dependents, the negative impact of coastal inundation on food security is likely to be increasingly significant over time.

Ongoing damage to food gardens harms food security for the affected communities and this is likely to worsen with time. Efforts to open up the interior for safe agricultural development would assist in this. There is therefore likely to be value in accompanying the establishment of an inland road with a campaign to encourage the adoption of sustainable inland agriculture.

Other issues

A number of issues concerning the road relocation are uncertain. First, the impacts of climate change adaptation projects are unclear. What is the potential environmental impact of major construction work along the coast or inland? While the potential exists that major projects have bring potential risks, they might also bring opportunities. Would opening up the interior of Kosrae provide access to cultural sites hitherto denied to the community because they could not access the area? Would this bring harm? What are the potential environmental impacts of different adaptation options? These matters would presumably need to be considered in an EIA should the road project proceed. Any identified risks would need to be built into a monitoring plan for the project to optimise benefits for the State.

Similarly, the rate of relocation promised by the road project is still unclear. While community enthusiasm for the project is high, relocation depends on access to resources. It is therefore logical that the means and speed of relocation of the community should be monitored as part of the project, should it proceed.

Government presently routinely collects little documentation of the actual effects of over wash on the government, private sector or community. This analysis relied heavily on a key 2008 assessment of the effects over wash. Documentation of disaster events provides the foundation and business case for future remedial action. Government should consider documenting the impact of future events including noting impacts such as impacts of housing and estimated cost of repairs or other remedial action. This data should be stored for future reference.

ACKNOWLEDGEMENTS

Blair Charley, Kosrae Island Resource Management Authority
Lipar George, Department of Administration and Finance
Nena M. William, Office of the Governor
Leandro Olando, Civil Engineer, Department of Transport and Infrastructure
Hairom Livaie, Department of Transport and Infrastructure
Heidi Sigrah, Department of Resources and Economic Affairs
Palokoa George, Department of Resources and Economic Affairs
Joston Edmond, Department of Administration and Finance

Andrew Standon, Kosrae Island Resource Management Authority
Community of Malem
Community of Utwe
Doug Ramsay, Manager Pacific Rim, National Institute of Water and Atmospheric Research (NIWA) for technical data and review
Staff of SPREP especially Aaron Buncle, Peniamina Leavai and Simpson Abraham for technical input and review
Marita Manly for review

INTRODUCTION

This report documents a cost benefit analysis (CBA) of coastal road relocation in Kosrae. The report builds on and extends preliminary economic analysis conducted with the Kosrae State Government in early 2015, conducted as part of a capacity building exercise (SPREP 2015a).

The objective in the CBA presented here is to identify economic issues around a project to relocate a coastal road in the face of climate change and sea level rise, identifying:

- The value for money of alternative coastal infrastructure options in the face of sea level rise and climate change;
- The degree to which any coastal infrastructure option might be pursued as a high priority infrastructure investment;
- The extent to which key risks and uncertainties might potentially affect the realisation of potential benefits and value for money.

1 BACKGROUND – MALEM COASTAL ZONE MANAGEMENT PROJECT PROPOSAL

1.1 Coastal development threats around Kosrae

According to the Kosrae Shoreline Management plan (KIRMA 2014), much community and infrastructure development in Kosrae over the last few decades has occurred within the coastal margins. However, much of the area in which this coastal development has occurred is susceptible to coastal hazards, such as long term coastal change and episodic coastal inundation (especially during spring high tides) (KIRMA 2014, p. 11). For the foreseeable future, the effects of climate change, particularly sea level rise, are likely to exacerbate the threat of inundation to coastal developments and loss of infrastructure such as sections of the road network.

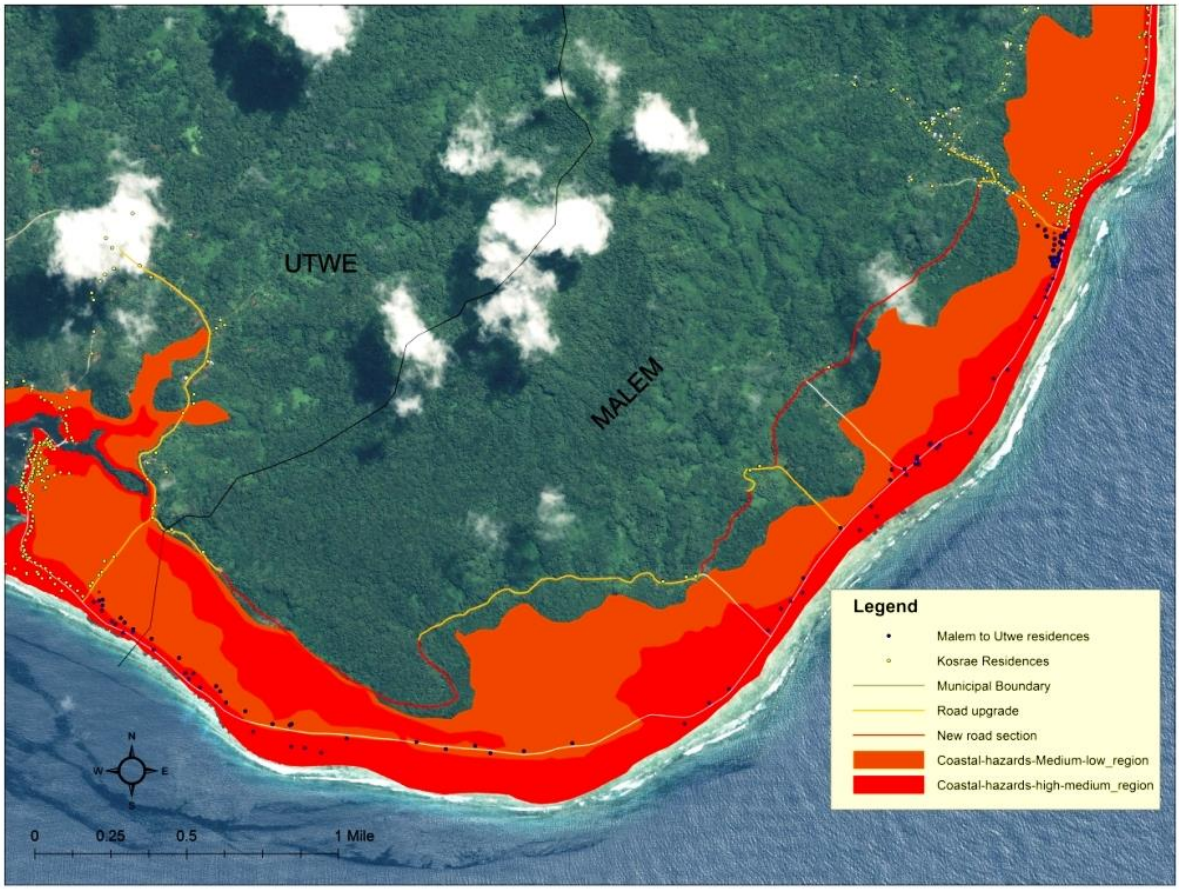
Based on the Kosrae Shoreline Management Plan, the areas most vulnerable to coastal inundation include the coastal area between Malem and Utwe (Image 1). The road connecting these two communities runs parallel to the coast, on a narrow storm berm (raised bank), and is precariously close to the sea, at risk of over wash and increasingly at risk of being breached (Image 2). The community, road and infrastructure in the area have faced numerous inundation events, with coastal homes in Malem and Utwe exposed to regular (annual) over wash, particularly during spring high tides when larger waves can reach the shoreline. Severe damage due to tropical cyclones is a rare occurrence on Kosrae, with the last notable event occurring in 1905. However, cyclones often form close to Kosrae or track close to the island as they develop with increased risk during El Nino conditions, the last being Tropical Storm Dolphin in May 2015. Whilst wind damage from these events is relatively minor, large swell waves can cause damage along the Utwe and Malem coasts.

Work conducted by KIRMA has identified that – in a potential inundation event – around 104 buildings are potentially exposed to over wash/ inundation on the stretch from Malem to Utwe. These include: 98 houses, one church, three businesses, one playground and one school (Image 1). 25 homes are located seaward of the road and 73 are located behind (landward of) the road.

The effects of wave over wash and inundation events include flooding of homes, damage to vehicles and blockages/ breaching of the road. At present, around 120 metres of road at Mosral and 200 metres of road at Paal are critically exposed and at risk of being breached at any time. Such a breach cuts off the village of Utwe (population approximately 983) and removes road access to Walung (population approximately 268), as well as potentially

disrupting utilities (power and telecommunications) which run parallel to the road (often precariously close to the shoreline – Images 3 and 4).

Image 1 Areas at risk of inundation



Source: KIRMA (unpublished).

Ongoing shoreline change is also expected to result in an ever increasing length of road becoming critical exposed to wave damage within the next decade and beyond, including a further 450 metres section south of Mosral to Kuplu, 500 metres from Pal to Malem river mouth, and approximately 1 kilometre from Kuplu to Utwe (Doug Ramsay, Manager Pacific Rim, NIWA personal communication personal communication, June 2015).

The infrastructure exposed to shoreline change and wave over wash damage in Malem encompasses road, power, water and telecommunication lines which run parallel to the road. The power lines at certain sections like Paal and Mosral are fully exposed to wave damage and corrosive salt spray. (Image 3). Inundation and over wash from large waves and spring tides, particularly in the November to February period, are normal occurrences given the increasingly receding coastline and low elevation of the road in this area. Some households are inundated during such events, and exposure of vehicles, running over sea water inundation and over wash happens yearly.

Image 2 Road exposed to over wash

Image 3 Exposed power lines alone coastal road

Image 4 Power utilities propped up on nearby shoreline

Image 5 Barely discernible access road (Finsrem inland access road)

Images © Paula Holland.

1.2 Causes of the problem

The problem of coastal inundation is founded in a number of contributory causes. First, the southern coastline is naturally exposed to active wave action and ongoing erosion. The establishment of the coastal road in late 1940s and early 1950s and other development on Kosrae involved the removal of large amounts of coastal rubble from the beach and reef flat, resulting in the loss of natural protection along much of the eastern-facing coastline (KIRMA 2014, pp. 65-66).

Second, the road and much development are located on a narrow (10-50 m wide) storm built berm, with inter-tidal wetland or mangrove between the berm and the volcanic part of the island. This land area is highly dynamic and highly exposed to coastal change and coastal inundation. With sea-level rise, present-day very high tide levels that cause inundation problems at present will become ever more frequent (KIRMA 2014, p. 93).

Third, the establishment of the road and associated infrastructure has focussed development along this exposed coastline. Unfortunately, over the period of significant development since the Second World War, limited information and understanding existed at the time of settlement about the scale of hazard risks in this area. Not only are houses now exposed to the coastal hazards, but infrastructure critical to the livelihoods and well-being of coastal villagers is also now at increasing risk from inundation and coastal change.

Fourth, much of the land in Kosrae is privately owned. This means that some families occupying the coastline cannot automatically relocate inland where they do not themselves own the land. In truth, even if families had access to land inland, the fact that the public road infrastructure focuses on coastal access constrains householders from independently adapting to climate risks by moving inland away from the coast.

1.3 Climate change

According to Government of Australia (2011; 2014), temperature rise has been recorded as increasing generally for FSM in recent years, while a clear decreasing trend in annual and wet season rainfall has been observed.

For the future, the Government of Australia (2011; 2014) predicts that:

- Air temperature and sea-surface temperature will increase.
- The number of hot days and warm nights will increase.
- There will be an increase in average annual and seasonal rainfall.
- Droughts will become less frequent.
- Extreme rainfall days are likely to occur more often.

Sea-levels are also rising around Kosrae and can be expected to continue to do so for the next few decades (See for example, Government of Australia 2014). In light of this, the probability of over wash events and inundation of low-lying coastal land will likely increase with climate change, especially given sea level rise.

1.4 Objective of the project

The Strategic Program for Climate Resilience: Pacific Regional Track (SPCR-PR) is a regional program that aims to strengthen integration of climate change and disaster risk considerations into 'mainstream' policy making and related budgetary and decision-making processes. The SPCR-PR is being implemented by the Secretariat of the Pacific Regional Environment Program (SPREP) and Asian Development Bank (ADB,) and is funded through funded through the Climate Investment Funds (CIF). In light of the coastal threats being

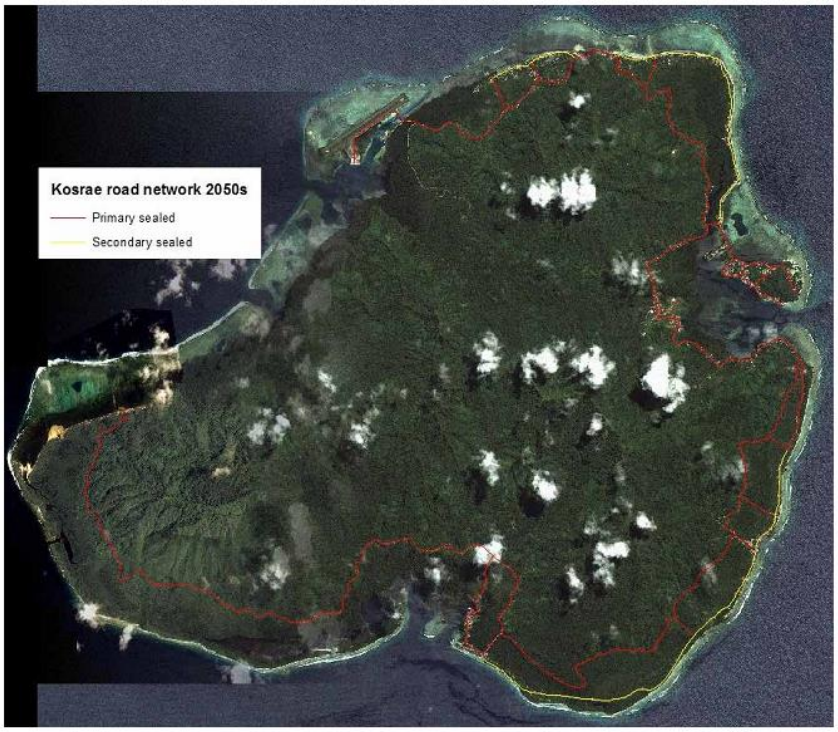
faced along the Malem to Utwe coastal corridor, the State Government of Kosrae – in tandem with SPREP and the SPCR-PR – is developing a proposal to establish an interior road that links Malem to Utwe, by passing the need for citizens to rely on the 4.5 kilometre coastal road for access, while ensuring the safety of people in the coastal area.

A secondary but important objective in the road project is to protect the long term wellbeing of the Kosrae community by facilitating the relocation of families by opening up the interior. While relocation inland is presently difficult due to limited access, the opening up of the interior through an inland road would enable families to plan to relocate community infrastructure and properties, as new buildings are constructed or as existing buildings are upgraded, enabling new settlements to develop in areas not exposed to coastal hazards and the ongoing effects of sea-level rise. The importance of developing the interior of Kosrae island is presently in the Kosrae Strategic Development Plan which stipulates that it is a national priority to 'divert development and settlement along the coast to inland and higher grounds … diverting development and settlement inland: improving inner roads and encouraging the citizenry to settle inlands" (Division of Economic Planning 2013, p. 29).

1.5 Options

In view of ongoing natural coastal erosion processes, existing sea level rise trends and the present precarious location of the road, the establishment of an inland road has been identified as an option for adaptation in Kosrae that is sustainable in both reducing the impacts of coastal hazards for Malem and Utwe while ensuring access to the removing essential infrastructure from being impacted by coastal hazards in Malem and Utwe while ensuring access to the community of Utwe (Image 6). The establishment of an inland road is also a recognised national priority. The need for a new road inland to replace the present coastal road has been stipulated as the priority of the Kosrae Shoreline Management Plan (KIRMA 2014, p. 32), and reinforced in the Kosrae Joint State Action Plan for Disaster Risk Management and Climate Change (Government of Kosrae, in press).

Image 6 Proposed inland road



Source: KIRMA (2014).

To consider the economic implications of the new road project, and reflecting the terms of reference for this economic assessment (CBA) of it, several climate change adaptation scenarios are compared against a series of alternative adaptation options including coastal protection with revetment and upgrading the coastal road. In reality, the form of that these options and an inland road could take can vary. For example, revetment could cover the entire coastline or just parts; new coastal roads could be built to existing design standards or to new design standards. This analysis assesses selected forms of the adaptation options to consider a way forward for Kosrae:

- The value of *business as usual* – ongoing retention of the coastal road in the face of climate change and natural hazards. This scenario would result in ongoing (and potentially increasing) costs from coastal over wash and breaching of the road. These impacts are described more in Section 2;
- The value of mitigating coastal threats through the establishment of a new inland road or coastal defences. These scenarios would potentially reduce risks to the community (see Section 2). Considerable interest surrounds the inland road option which has already been the focus of preliminary costings (KIRMA 2014, pp. 32). In detail, the options compared are as follows.

1. Establishing a protective rampart (rock armoured **revetment**) to protect the coastline between Malem and Utwe. Revetment is a common form of coastal protection in the Pacific generally as well as specifically on Kosrae. (This adaptation option would accompany replacing the existing coastal road to its existing specifications – see Section 2.1 – *Revetment of the coastal road* below);
2. Construction of **inland road starting now** and ending in 2017[1] (thus allowing two years for construction from the present day) **and abandoning the existing coastal road**;
3. Construction of **inland road starting now** and ending in 2017[1] (thus allowing two years for construction from the present day) and **maintaining the existing coastal road for a period of 10 years** (after completion, to 2027);
4. Construction of **inland road starting now** and ending in 2017[1] (thus allowing two years for construction from the present day) and **maintaining the existing coastal** road for a period of 20 years (after completion, to 2037);
5. Construction of **inland road starting now** and ending in 2017[1] (thus allowing two years for construction from the present day) **and maintaining the existing coastal road for a period of 50 years**;
6. Construction of the **inland road in 10 years' time** (commencing construction 2026; completed 2028);
7. Construction of an **inland road in 20 years' time** (commencing construction 2036; completed 2038);
8. Additionally, a new option is being included in this analysis – that of **upgrading the existing coastal road to** accommodate sea level rise and storm surge. This would involve elevation and strengthening of the road based as well as the use of Asphalt. An upgrade of this form was recently delivered by the Kosrae State Government in 2015 at the airport, although this did not include the asphalt layer.

Details are summarised in Annex 1.

[1] SPREP terms of reference requested assessment of an inland road established from 2016. However, as it takes two years to construct the road, assessment of a functioning road would actually not be possible until from 2017.

2 METHODOLOGY

CBA is a systematic process for identifying, valuing, and comparing costs and benefits of a project. Multiple references exist on the methodology and principles of CBA (see for example, European Commission, 1997; HM Treasury, 2003; Tietenberg, 2006; OECD, 2006; Australian Government Department of Finance, 2006; UNECE, 2007; USEPA, 2010). However, broadly speaking, the key features of a CBA are:

- All related costs (losses) and benefits (gains) of an project are considered, including potential impacts on human lives and the environment;
- Costs and benefits are assessed from a whole-of-society perspective[1], rather than from one particular individual or interest group (that is, a public and not a private perspective is taken);
- Costs and benefits are expressed as far as possible in monetary terms[2] as the basis for comparison; and
- Costs and benefits that are realised in different time periods in the future are aggregated to a single time dimension (discounting) (Buncle et al. 2013).

The first issue of considering all costs and benefits from a project is fundamental to effectively interpreting any CBA. In theory, all the potential benefits and costs of a project are supposed to be assigned dollar figures when doing a CBA. However, it is common for cost benefit analyes to be completed in practice without all the benefits or costs of a project being values due to lack of data. This is because, in such cases, it is frequently impractical to assign values to certain benefits or costs because:

- the physical or monetary values can simply not be reliably measured or established;
- the cost or benefit items are not significant to the analysis;
- it is judged that the cost of attempting to value the cost or benefit outweighs the benefit of including them in the analysis (Buncle et al 2013).

Where values cannot be quantified in practice for this analysis, they will be listed and analysed qualitatively. Their impact in relation to the value of climate change adaptation will be considered in more detail in the Implications Section.

2.1 Costs and benefits

Without change

Considering the precarious state of the road in places already, it seems unrealistic to assume that the State Government of Kosrae could continue to merely maintain the existing coastal road into the long term without investing in some major form of remedial work. It is more realistic to recognise that the government would ultimately need to at least replace the road in its current form. If this was done, ongoing impacts from over wash would be expected to continue over time but at least the road would not be crumbling into the sea as it is presently in some places.

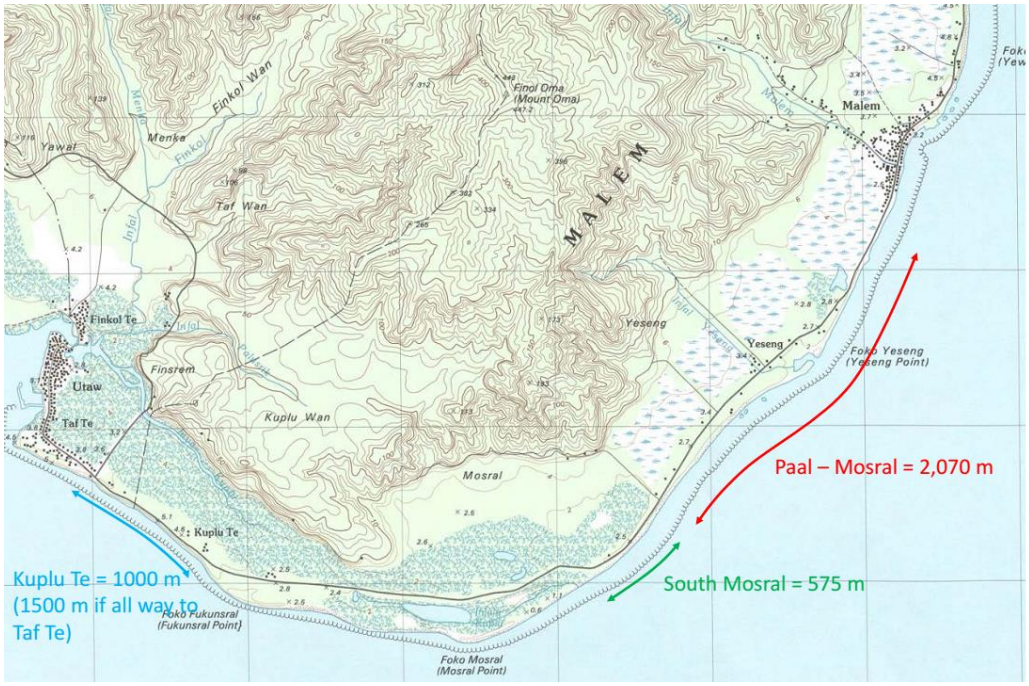
Kosrae State Government advised that replacing the road in its present form would require substantial investment by the government, involving upgrading the road sub-base wearing course to a hot mix asphalt pavement (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). Additionally, NIWA (Doug Ramsay, Manager Pacific Rim, NIWA personal communication, January 2016)

[1] For this reason, some people refer to CBA as *social* CBA.

[2] Note that costs and benefits that cannot be quantified in monetary terms are still considered during decision making.

advises that revetment along the most exposed parts of the coast (between Paal and Mosral, plus an additional stretch around the corner towards Utwe (Image 7) is unavoidable in order to prevent ongoing damage. This is a length of coastline in the order of 2.5 km or 1.6 miles.

Image 7 Revetment targets



Source: Doug Ramsay, Manager Pacific Rim, NIWA personal communication, personal communication, January 2016.

Ongoing sea level rise and climate related hazards would continue to threaten the condition and operation of the present coastal road, resulting in an increased frequency and magnitude of over wash and leading to road breaches and possible harm to both the community and their possessions (Table 1).

At present the negative impacts from coastal over wash include inundation and the risk of loss of sections of the road (Table 1). Over wash leads to damage to property, households, crops and vehicles. The frequency and severity of over wash and resulting damage will increase with sea level rise. Maintenance of the existing road will likely to become more costly.

Additionally, exposed sections of the road at Paal and Mosral are presently susceptible to being breached during and over washing event. The likelihood of this happening and the length of road section over which it could occur will continue to increase. Residents in Utwe and affected areas around Malem then lack access to commercial, health and education facilities, as well as the seaports and airports since these facilities are predominantly located in northern part of the island. Furthermore, power and telecommunication lines built parallel to the existing road will also be affected, threatening services to the residents in Utwe and Malem. Ultimately, this infrastructure could be permanently unusable with road failure. Finally, access by people to the hinterland for farming is presently limited without a decent road. The existing inland roads are predominantly farm tracks poor quality (Image 5).

Table 1 Broad potential benefits and costs with and without the new road project

Without scenario/ existing road replacement	**General with scenarios**		
	Revetment with coastal road replaced to existing specifications	*Coastal road upgrade (elevated)*	*Inland road*
Debris blocking the road and cost to remove	Reduction in over washing and associated debris for lower return period events	No or reduction in over washing and debris for lower-moderate return period events	No coastal-related debris to remove
Inundation of coastal houses	Limited expected change	Reduced risk of over washing for landward homes No reduction in high tide flooding which will increase in frequency with sea level rise	Reduced risk of over washing for landward side homes No reduction in high tide flooding which will increase in frequency with sea level rise
Damage to cars, garden crops	Some minor reduction in car damage. Reduced risk of over washing affecting garden crops under lower return period events	Some minor reduction in car damage. Reduced risk of over washing affecting garden crops under lower return period events	No car damage, no crop damage
Inability to get to work (Utwe and Malem) resulting in lost income	Continued access under lower/moderate return period events. Loss of access under more extreme events	Continued access under lower/moderate return period events. Loss of access under more extreme events	Continued access, no lost earnings
Inability to reach schools and hospitals	Continued access under lower/moderate return period events. Loss of access under more extreme events	Continued access under lower/moderate return period events. Loss of access under more extreme events	Continued access
Interruption of power, telecommunications – inconvenience for households, loss of earnings to utilities	No expected change under lower return period events. Interruptions and loss likely under moderate-high return period events	No expected change under lower return period events. Interruptions and loss likely under moderate-high return period events	No interruption for families No lost earnings for utilities
Damage to road and need for repairs	Reduced damage under lower return period events. Damage to roads will still occur under moderate-high return period events	Reduced damage under lower return period events. Damage to roads will still occur under moderate-high return period events	No repairs needed
Trauma and inconvenience	Reduced trauma / inconvenience under lower return period events No expected change under higher return periods	Reduced trauma / inconvenience under lower return period events No expected change under higher return periods	No trauma or inconvenience
Limited access to interior	No expected change	No expected change	Land access for increased farming
Road maintenance	Limited expected change	Costs to upgrade road	Costs to establish road
			Land Acquisition
	Require ever increasing maintenance	Require ever increasing maintenance to	Maintenance

	to provide serviceable road as sea level rise increases	provide serviceable road as sea level rise increases	
	Possibility for increased erosion at the southern end of the wall	Possibility for increased erosion at the southern end of the wall	Environmental impacts?
			Awareness cost
			Cultural site impacts?
Land loss due to natural processes	Land retained	No expected change	No expected change

Sources: Blair Charley, KIRMA; Lipar George, ODA; Nena M. William, Office of the Governor, Kosrae State; and Doug Ramsay, NIWA, personal communication, October 2015.

Much property and community development landward of the road is located on low-lying land or has been reclaimed from inter-tidal mangrove or wetland areas and is barely above present-day high tide levels. High tide inundation will become an ever-more frequent and significant occurrence as sea-levels increase, irrespective of continued protection of the current road.

Upgrade of the coastal road

An alternative to replacing the road in its current form would be to replace the road but seek to protect it from sea level rise by elevating the road (around 6 inches to 1 foot) (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). Establishing an upgraded costal road would be expected to reduce the damaging effect of minor inundation events on the road (reducing road repair and clearance costs) and reducing the frequency at which the coastal road is blocked. The effect on housing would vary, with homes seaward of the road receiving no benefit, but those behind it potentially benefitting from some reduction in over wash.

Establishing an upgraded coastal road could potentially encourage further development of the coastal strip between Malem and Utwe. This is because of the perception that coastal over wash and inundation will no longer be a threat so families can safely invest further. In such a case, household numbers along the coastal fringe could be expected to increase. Discussions between State Government of Kosrae representatives and SPREP (Buncle 2015) confirm that government believe this would happen if any major construction – such as an upgraded coastal road and revetment – is established.

Establishing an upgraded coastal road would involve costs, including upgrading the sub-wearing course to Hot mix asphalt pavement as well as elevating the road. Theoretically, such an elevated road would limit the scope for over wash and damage from severe events. Additionally, NIWA advise that revetting of the critical 1.6 miles of highly vulnerable coast between Paal and Mosral and around the corner towards Utwe would still be required.

Additionally NIWA states that any major construction work along the Malem coastline would likely result in down drift erosion impacts. The extension of the existing rock wall along the southern part of Malem village has been a significant factor in the accelerated erosion problems at Paal. Likewise the engineering structures at the outlet of the Mosral stream have increased the erosion immediately to the south (Doug Ramsay Manager Pacific Rim, NIWA personal communication, personal communication, January 2016). Consequently there are likely to be some environmental costs from coastal road works.

Revetment of the coastal road

A cheaper alternative might be to revet the coastal area to limit the potential for breaching of the road and provide increased protection from over washing. This would provide short-medium term protection of coastline and road.

The level of protection provided to over washing will depend on the design of the revetment, but it would be expected that overtopping could be significantly reduced for low to moderate severity events. On the other hand, revetment alone would be unlikely to reduce overtopping volumes sufficiently to prevent damage from large swell caused by cyclones forming or tracking close to Kosrae or due to cyclone passing directly over Kosrae (Doug Ramsay Manager Pacific Rim, NIWA personal communication, personal communication, January 2016).

Moreover, the level of protection would ultimately decrease as sea levels rise and, given the low-lying nature of the land levels behind the revetment, this option would not stop the

increased frequency and severity of high-tide inundation that will occur with sea-level rise. As a result, NIWA (Doug Ramsay Manager Pacific Rim, NIWA personal communication, personal communication, January 2016) recommend that revetting the coastline should only be considered as an adaptation option that *accompanies* other solutions – not considered on its own as its effectiveness relies on accompanying measures. To this end, revetment of the entire coastline is only considered in this analysis as an accompaniment to the replacement of the coastal road in its present state.

As suggested for the upgraded coastal road option, establishing revetment could potentially encourage further development of the coastal strip between Malem and Utwe because of the perception that coastal over wash and inundation are no longer threats. In such a case, revetment works could reduce the likelihood of households relocating voluntarily (potentially increasing them over time, in fact), and increase the difficulty and timeframes available for relocation to occur in the future. Discussions between State Government of Kosrae representatives and SPREP (Buncle 2015) confirm that government believe this would happen if any major defensive coastal infrastructure – such as an upgraded coastal road and revetment – is established.

Establishing revetment would involve construction costs and might have some impact upon the coastal environment. Additionally – and as indicated for coastal road upgrades – NIWA linear construction along the Malem coastline would risk down drift erosion impacts (Doug Ramsay, Manager Pacific Rim, NIWA personal communication, personal communication, January 2016). Consequently there are likely to be some additional environmental costs from coastal road works.

Inland road network

Compared to protecting the existing road, re-establishing the road inland would remove essential infrastructure from being impacted by coastal hazards or the impacts of sea-level rise for this century and beyond (Table 1). It would ensure permanent access to Utwe and the Malem community south of Malem village

In the medium term, opening the interior through a new road network could facilitate community and relocation away from the hazardous coast. It is impractical for families to relocate presently since no access road or other essential infrastructure exists for the hinterland and families need to be located near to public infrastructure. With a new road, power and telecommunications lines would be expected to be permanently relocated with the new road, thereby ensuring continued long run utility access to residents in the affected areas. It would also mean that inundation of homes and crops would cease as people would move away from the coast.

Establishing an inland road would involve construction costs and require the purchase of the land. KIRMA (2014) propose that an inland road project be accompanied by an awareness campaign to maintain support from stakeholders to share land for road construction as well as to allow the opening up of the interior for relocation.

If an inland road network were established today, a replacement coastal road would not need to be established. However, given the state of the existing coastal road, delays in the establishment of a coastal road network or long term of the existing road while migration occur would mean a replacement coastal road would be needed as the road is presently is poor condition in places.

Potentially, environment and cultural impacts could arise from the construction of a road inland. According to the Kosrae State Government (Andrew Standon, Heritage Protection Office, personal communication, October 2015), the interior of Kosrae has not be surveyed

for cultural amenities although it is known that many of the pre-missionary villages were located around the base of the volcanic part of the island (Rainbird 2004; Swift et al. 1997). It is presently unclear if the proposed route for the inland road would threaten any culturally valuable sites. For the same reason, it is also unclear the extent to which access to the interior by a new road would increase access by the local community and or tourists to cultural sites for social benefit. These matters would presumably need to be considered in an EIA should the road project proceed.

3 DATA

3.1 Baseline data

Costs assosicated with the existing road

According to DT&I, the engineering standard of the present coastal road should allow for a life span of around 30-40 years, provided it is adequately maintained (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). However, the road is already long established and parts of the road around Paal and Mosral and around the corner towards Utwe are already perilously close to the sea and crumbling. Consequently, the existing coastal road would ultimately need to be replaced. DT&I consider that the existing road would barely last another five years if these areas are not revetted. However, with revetment of the more vulnerable parts of the road and sufficient maintenance, the existing coastal road could perhaps last up to another 20 years (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). After this, the entire road would need to be replaced anyway.

In practice, it is unclear when the revetment of the areas around Paal and Mosral would be conducted and when the road would be replaced to its present technical specifications. Upon agreement with stakeholders (Buncle 2015), it is assumed for illustrative purposes that, because of the perilous state of the road around Paal and Mosral and towards Utwe, the revetment occurs immediately and the road is replaced now over a two year period, subsequently being replaced again in re-replaced 35 years' time (the average of 30 and 40 years).

Replacing the road in its current form would involve upgrading the road sub-base wearing course to Hot mix asphalt pavement at a standard cost if around USD$ 520 000 per mile (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). It is assumed that upgrading the coastal road between Malem and Utwe would take two years.

The coastal road would need to be maintained over time. The existing road is presently maintained using a share of Government's annual provision for road up keep. However, no record is kept of the amount spent to maintain that portion of the state's road network. KIRMA (2014) indicate that upkeep of an inland road would be in the vicinity of two to five per cent of the total road construction costs, over the life of the road (50 years). A similar approach was taken by Rios Wilks (2013). Using this approach, the upkeep of the road between Malem and Utwe is estimated as two per cent of the construction cost of a replacement road, spread over the life of the road (50 years).

3.2 Coastal protection construction

Revetment

Data on construction costs was sourced from the Kosrae State Government (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). According to DT&I, the normal expected lifespan of revetment along the coast of Kosrae is in the order of 50 years. Costs to establish it are summarised in Table 2. Costs for revetment are based on a standard cost formula of US$ 600 000 per mile used by the state government. Revetment of the coastline from Malem to Utwe is assumed to take two years whereas revetment of the small portion of land around Paal and Mosral is expected to occur within a year. Maintenance for revetment is assumed at two per cent per cent of total construction costs, spread over 50 years. This is consistent with the principle by KIRMA (2014) of assigning two per cent maintenance costs towards effective maintenance of a new inland road.

Where revetment is delivered in support of other options, revetment of the entire coast would not be necessary – only specific parts of the road most at risk. As indicated in Section 2.1, these are the coastal area between Paal and Mosral, plus an additional stretch around the corner towards Utwe (Image 7). This generates a length of coastline to be revetted in the order of 2.5 km or 1.6 miles

Coastal road upgrade

According to DT&I, the normal expected lifespan of an upgraded coastal road is in the order of 50 years (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). Estimated costs to upgrade the coastal road are based on state government estimates to upgrade the sub-wearing course and upgrade the sub-wearing course to Hot mix asphalt pavement (see Table 2). This represents a cost of around USD$ 820 000 per mile – USD$ 300 000 per mile to elevate (around 6 inches to 1 foot) the road, plus $520,000 per mile to upgrade the sub-wearing course to hot mix asphalt pavement (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). Additionally, based on discussions with NIWA (Doug Ramsay, Manager Pacific Rim, NIWA personal communication, personal communication, January 2016), establishment of an upgraded road would require revetment around the 1.6 miles of critically exposed areas of the coastal road around Paal and Mosral and the stretch around the corner towards Utwe.
As with revetment:

- It is assumed that upgrading the coastal road between Malem and Utwe would occur over two years;
- Maintenance for upgrading the road is assumed at two per cent of total construction costs, spread over 50 years which is consistent with the principle by KIRMA (2014) of assigning two per cent maintenance costs towards effective maintenance of a new inland road.

Table 2 Alternative coastal protection costs

Form of protection	US$
Costs to revet coastal road Utwe to Malem	960 000
Costs to upgrade coastal road Utwe to Malem	5 338 200

Source: Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015.

3.3 Inland road

Establishment costs

According to DT&I, and based on the engineering data provided in KIRMA (2014), a new inland road network should have a life span of around 50 years, provided it is properly maintained. Depending on speed at which communities relocate from the hazardous coastal area, DT&I consider that an inland road would need to be accompanied by revetment of the most vulnerable coastal areas (eg., the area between Paal and Mosral – see Section 3.1). This is because neglect of this portion of the road will ultimately result is road failure. This move would 'buy time' for the community to relocate (SPREP personal communication with Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, November 2015). Based on consultations held with multiple stakeholders in 2015 (Buncle 2015), the State Governance of Kosrae believe that the existing coastal road would need to be maintained generally and revetted specifically at specific locations if relocation of the community away from the hazardous coastal area is not sufficiently fast.

The Kosrae State Government initially estimated the costs to establish an inland road network in 2014 (KIRMA 2014), but updated these costs in 2015 (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). Revised cost estimates include road and utility construction, water, power and telecommunications facilities (Table 3). Lifetime maintenance costs for the new road are assumed at two per cent of total construction costs, spread over the life of the road (KIRMA 2014).

Table 3 Estimated inland road network construction costs
(Includes water, power and telecommunications)

	Total US$
Malem to Yeseng	1 467 039.54
Access Road Malem	475,986.29
Access Road Yeseng	273 555.35
Inland Yeseng to Finsrem	3 183 177.56
Access road Utwe to Finsrem	328 266.40
Total construction cost	5 728 025.14

According to DT&I, it would take approximately two years to construct the inland road and utilities. As a result, construction costs were annualised over these years.

The costs to revet the area between Mosral and Paal were taken from DT&I. Additionally, values were estimated for land purchase (see Land Values) and an awareness raising campaign. According to DT&I, an awareness campaign costs an average of US$5,000 given that the target group is all 4 villages of Kosrae. It would usually be delivered in two rounds – one before implementation and one after implementation. As a result, costs were divided into two blocks of US$2500 – one prior to construction (year 0) and the second at the completion of the road (year 2). Total estimated costs are summarised in Table 4.

No estimates were made of environmental or cultural impacts associated with any of the construction options.

Table 4 Road and utility establishment costs (2015 prices)

Item	US$
Road construction	5 728 025
Land purchase	342 571
Awareness campaign	5 000
Environmental impacts	Not costed
Maintenance costs	2% construction costs over time

3.4 Population growth

Population along the coastal fringe between Malem and Utwe is assumed to remain stable, except when extensive defensive coastal developments – such as upgrading the coastal road or revetment – occur. In this case, it is assumed that household numbers for the coastal fringe between Malem and Utwe increase gradually over time as families perceive that the threat of over wash or inundation no longer exists. Such a population increase implies that – while the damage or losses (eg., lost earnings) to households from over wash would be expected to fall with enhanced coastal roads or revetment – these lower costs would nevertheless grow slightly over time as the number of households in the hazard areas swells.

Government representatives (Buncle 2015), recommend using an annual population rate of increase along the coastline of three per cent per annum. This is also the target indicator for GDP growth (Division of Economic Planning 2013). In practice, it is unlikely that the population of families along the coastline would continue without end. There is limited space for families to settle. For the purpose of illustration, it is assumed that additional growth along the coastline would remain stable once total household numbers swell to from the present level by 150 per cent (from the present 98 households to 147 by 2031).

3.5 Land values

The price to secure land for a new road was based on a 2006 assessment of land valuation conducted by ADB (ADB 2006). Costs were indexed to 2015 using CPI data from the Department of Statistics and presuming an average ongoing CPI of 4 per cent per year.

3.6 Cost of damage from coastal over wash

Frequency of over wash events

Estimates of the likely costs of inundation that would be faced without adaptation to climate change were founded on estimates of the regularity (return frequency) of over wash events. Return frequencies were estimated on the basis of observed inundation events reported in KIRMA (2014), as well as expert opinion from:

- The Kosrae State Government (Blair Charley, KIRMA; Lipar George, ODA; Nena M. William, Office of the Governor, Kosrae State); and
- NIWA (Doug Ramsay, Manager Pacific Rim, NIWA personal communication, personal communication).

The events used to underpin estimates of impacts costs are noted in Table 5, with the assumptions used noted in the final column.

Table 5 Expert opinion-based assumed return frequencies for inundation events

Event	Impact	Return period	Return period assumed	Values quantified?
General over wash	▪ Minor – road temporarily blocked with sea water – vehicles able to wade through, but can sustain damage, minor debris	Several times per year when larger than normal waves coincide with high tides	Nov to April (high tide season) with vulnerable areas like Pal and Mosral affected daily	No
Extreme high tides (high king tides) eg., 2008 event	▪ minor-moderate damage to the road damaging part of the carriageway eg., at Mosral and at Pal ▪ vehicle passage still possible in some areas but road breaches around Mosral given receding shoreline in that area ▪ Some over washing damage, flooding: - 2 home destroyed, 4 with major damage,5 with minor damage, 7 affected*	5-7 yearly	5 yearly	Yes, based on Government of Kosrae (2008)*
Cyclone tracing close to Kosrae causing large swell waves	▪ breaching of the road around Mosral and Pal – vehicle passage not possible ▪ minor-moderate road damage, over wash damage to road ▪ moderate damage to property located landward of the road between Malem and Utwe (toppings/roofing damage but walls potentially still standing; associated flooding impacting homes) and some minor damage to properties located behind the road: - 25 homes are located seaward of the road** sustaining major damage - 73 located behind the road** sustaining minor impact.	1:30-40 yearly	40 yearly	Yes
Cyclone with a direct hit on Kosrae	▪ Has not happened since 1905 ▪ Multiple breaching of the road around Mosral, Pal, Malem ▪ Vehicle passage not possible ▪ Extensive damage expected for home seaward of the road (toppings/roofing ripped off but walls potentially still standing. Associated flooding impacts.) Lesser damage for homes landward of the road: - 25 homes are located seaward of the road** completely destroyed - 73 located behind the road** sustaining major impact.	75-100 yearly	100 yearly	Yes

Sources: Blair Charley, KIRMA; Lipar George, ODA; Nena M. William, Office of the Governor, Kosrae State; and Doug Ramsay, NIWA, personal communication, October 2015; * Government of Kosrae (2008); ** KIRMA database.

In practice, more over wash events than these three types would occur over the life of a road and in the future. Smaller annual events, biannual events and other events would also be mitigated by adaptation options. These three events will be used as the basis of the minimum costs of over wash but logically, it means that any quantified payoffs for adaptation options are likely to be substantially underestimated.

Climate change effects on the frequency of over wash events

Reviews of climate change assessments (Government of Australia 2011, 2014) indicate that there is very high confidence that mean sea-level rise around FSM will continue as a result of climate change. More recently, KIRMA (2014, p. 93) estimate that, by the:

- 2030s, the high tide level of 2 metres will be exceeded by 12 per cent of all high tides;
- 2050s, the high tide level of 2 metres will be exceeded by 27 per cent of all high tides; and
- 2070s, the high tide level of 2 metres will be exceeded by 69 per cent of all high tides.

It is assumed that a 1:5 year event is represented by such an extreme high tide. As a result, these increases in frequency are used to illustrate future increases of 1:5 year over wash events (Table 6).

Table 6 Future % increases in 1:5 year-type over wash events

	2030	2040	2050	2060	2070
% increase	12	19.5	27	48	69
Data source	KIRMA (2014)	Average of increases between 2030 and 2050	KIRMA (2014)	Average of increases between 2050 and 2070	KIRMA (2014)

Compared with an expected increase in high tides, Government of Australia (2014) states that tropical cyclone numbers can be expected to decline in the future. However, such a projection is only made with low to moderate confidence as individual assessments vary in the extent to which they project cyclones staying the same or decreasing. Based on the qualitative assessment provided in 2014 and consultations with staff familiar with the field (Gillian Cambers, Project Manager, Global Climate Change Alliance: Pacific Small Island States Project, SPC, personal communication, October 2015) a conservative rate of change in the frequency of tropical cyclones is provided for illustrative purposes:

- No change in the frequency of tropical cyclones is assumed before 2050;
- A five per cent reduction in the incidence of tropical cyclones is assumed to occur between 2050 and 2100. This is assumed to be a steady reduction over the 50 year period to 2100 (Tables 7 and 8).

The change in impacts resulting from ongoing climate change is assigned each decade for indicative purposes.

Table 7 Future % decreases in 1:40 year-type over wash events

2030	2040	2050	2060	2070
0	0	0	-1	-3

Source: SPC interpretations of Government of Australia (2014)

Table 8 Future % decreases in 1:100 year-type over wash events

2030	2040	2050	2060	2070
0	0	0	-1	-3

Source: SPC interpretations of Government of Australia (2014)

Impact of over wash events on clean up costs

Kosrae State Government estimate clean-up costs for a large swell event (1:25-1:30 year recurrence) event in the vicinity of USD$ 10 000 (Norinston Joe ODA, personal communication with Abraham M. Bahillo, Department of Transport and Infrastructure, March 2015). These costs would likely underestimate the cost of cleaning up debris after a 1:40 year event but are used as a conservative estimate.

Estimates for the cost of cleaning up after a 1:100 year event were not available but are logically to be higher than those of a 1:25-30 year event. An illustrative clean-up cost of USD$20 000 is imputed for cleaning up after a 1:100 year event.

Estimates for a 1:5 year event were not available. An illustrative cost of USD$ 2 000 has been imputed for clean-up costs following a 1:5 year event in the absence of any other data.

Value of homes at risk

According to the Pacific Risk Information System (PacRIS – see http://pcrafi.sopac.org/about/), around 348 dwellings are assigned to Utwe municipality with an estimated total replacement value of US$11,815,521 in 2009 terms (Litea Biukoto, Hazard Specialist, SPC, personal communication, March 2015). This means the average cost of a dwelling is around US$33,953 – or US$43119 each in 2015 values.

Impact of over wash events on housing

State of Kosrae (2008) indicates the scale of impact from an extreme high tide event that hit Kosrae in 2008. As indicated in Table 5, the 2008 event was estimated to be expected to recur on average every five to seven years (Doug Ramsay, Manager Pacific Rim, NIWA personal communication). The damage information documented in the 2008 report was used as the basis of estimates of the expected costs of future five yearly (1:5 year) over wash events, if no adaptation occurred. State of Kosrae (2008) documents considerable damage from over wash to housing around the southern coast between Malem and Utwe (Table 5), resulting in two houses totally destroyed, four houses sustaining major impact, five sustaining minor impact and seven houses affected.

In practice, the meaning of houses sustaining ‘major damage’, ‘minor damage’ or ‘affected’ by the 2008 event was unclear, making it difficult to estimate the actual cost of housing damage. As a result, discussions were held with representatives of the Kosrae State Government (KIRMA, ODA, Office of the Governor) to generate ‘representative’ estimates of the extent of damage implied by major damage, minor damage or affected. The resulting indicative rates of damage for the terms are presented in Table 9, with assumptions noted in the final column.

Table 9 Levels of harm to housing (2008)

Impact term	Type of damage	Illustrative extent of housing damage %	Assumption used %
Destroyed	Amount of damage requires new construction or complete renovation	80-100%	90
Major Damage	Unsafe to live in until repairs are made	40-80%	60
Minor damage	Inhabitable but need repairs, cleaning and clearing	20-40%	30
Affected	Need cleaning and clearing	5-20%	12.5

Source: Blair Charley, KIRMA; Lipar George, ODA; Nena M. William, Office of the Governor, Kosrae State, personal communication, October 2015.

For less common, more extreme events (1:40 year event, 1:100 year event), no documentation exists on the observed impact on housing. As a result, discussions were held with officials of the Kosrae State Government to consider the likely effects of over wash/ from storms. Staff drew on accounts of previous events including the 1905 typhoon that hit Kosrae. Drawing on data from KIRMA of the number of houses seaward of the road and landward of the road, illustrative estimates of possible damage were generated (Table 6).

Impacts of over wash events on road repair costs

Over wash over time can result in damage to the coastal road. Based on discussions (Doug Ramsay, Manager Pacific Rim, NIWA personal communication, October 2015):

- A 1:5 year event could result in minor to moderate damage of the road requiring reinstatement of the shoulder or damage to part of the carriageway;
- A 1:40 year event could result in moderate damage along seaward edge of road along exposed sections (1.6 miles – see Section 3.2), affecting the shoulder as well as undermining the carriageway (loss of parts of the tar surface);
- A 1:100 year event could cause significant damage along the 1.6 miles seaward edge of road along exposed sections.

State Government of Kosrae advised that over wash events leading to potholes etc. along the main paved road of Kosrae would incur road repair costs in the order of USD$5,500 per mile (Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015). These figures were used to calculate road repair costs for a 1:5 year event. By comparison, damage from a 1:40 and 1:100 year event would likely require major structural repairs including replacement of the sub-wearing course (Doug Ramsay NIWA personal communication January 2016). The costs for replacement of these items were based on the full costs of road repaid power mile affected (USD$ 520 000 per mile – see Section 3.1) and expert opinions of the extent (length) of road damage (Doug Ramsay personal communication, January 2016) (Table 10).

Impact of over wash events on the community

Recorded data on the impact of inundation events on families does not appear to exist. In its absence, consultations were conducted with the communities most impacted by inundation on the affected coastline – Malem and Utwe (Annex 2). Community representatives were invited to complete a questionnaire on the effect of coastal inundation and over wash, as well as share views on how the issue should be tackled. Based on the data provided, it would appear that a representative household in Malem or Utwe:

- Contains 7 family members of whom at least 3 are under the age of 18;
- Has been affected by inundation of the coastline, with their home garden being harmed or totally destroyed, affecting their access to food;
- Has experienced negative impacts on utilities from over wash – most likely power outages – but otherwise affecting their access to shops, work or other facilities.

According to the consultations, 63 per cent of respondents had had experience the effects of over wash, with the 2014 over wash event being the most commonly recalled event (affecting a third of affected respondents). The 2014 event was a high (King) tide, similar to the 2008 over wash event which has with an expected return frequency of around 1:5 years.

Table 10 Road damage and other costs without adaptation

Minor events	5 yearly events	40 yearly events	100 yearly events
▪ Road passable ▪ No inundation (but high-tide flooding of property will increase with frequency and potential magnitude with sea level rise ▪ Ongoing coastal retreat resulting in increasing length of road being exposed and ongoing permanent damage to the road	▪ Road mostly passable (although may affect cars) ▪ Debris to be removed ▪ 2 homes destroyed, 4 with major damage,5 with minor damage, 7 affected (2008 report) ▪ Minor road repair costs along seaward edge of road / road pavement along exposed sections ▪ Ongoing coastal retreat ▪ Some loss of earnings	▪ Significant damage (assume 25%) along seaward edge of road along exposed sections, damage to pavement and potential breaching of the road ▪ Potential for Utwe to be cut off for a short period of time until road is made passable (or is passable only on lower parts of the tide until road is fully repaired). ▪ Debris to be removed ▪ 25 homes located seaward of the road expected to sustain major damage ▪ 73 located behind the road expected to sustain minor impact ▪ Road repair costs ▪ Ongoing coastal retreat / breaching of berm ▪ Increased loss of earnings	▪ Significant damage (assume 60%) along seaward edge of road along exposed sections, damage to pavement and complete loss of road sections due to multiple road breaches ▪ Potential for road access and power to Utwe to be cut off for a substantial length of time ▪ Debris to be removed ▪ 25 homes located seaward of the road expected to be completely destroyed ▪ 73 located behind the road expected to sustain major impact ▪ Road repair costs ▪ Ongoing coastal retreat / breaching of berm ▪ Increased loss of earnings

70 householder representatives provided data at the community consultations. Those who completed the questionnaires provided basic data on negative impacts from over wash such as impacts on power, access to work and schools as well as impacts on home gardens. As an example:

- 10 per cent of all household respondents having to spend time to clear yards and or homes of debris. On average, respondents reported spending six days on clean-up;
- 23 per cent of all household respondents stated that power was interrupted as a result of inundation. On average, the outage lasted for three days;
- 10 per cent of respondents reported losing income due to road blockages, power outages, clean-up or other inconveniences from the over wash. The average days' earnings lost was three days.

Considering that the minimum hourly wage for employment with the national government in Kosrae is USD$1.42 per hour – or approximately USD$ 10 for a seven hour day (Bureau of Democracy, Human Rights, and Labour 2010), the diversion of time to clean up and or loss of income is noteworthy.

Extrapolating the survey data to estimate community costs from such effects presumes that the sample of community representatives completing the questionnaire are statistically representative of the entire community affected. This is not certain at this point. Nevertheless, at the explicit request of SPREP, cost estimates for power loss and interrupted earnings are estimated in this analysis using this approach. While they will certainly go some way to indicate the social harm from over wash increasingly faced by the coastal community, the numbers – while modest – must nevertheless be treated with caution.

Lost earnings were estimated by multiplying the average days lost of work in the community by the minimum wage rate. As some of these individuals lost earnings due to time spent cleaning-up after an event, the cost of remaining clean-up activities was calculated separately (Table 11).

Table 11 Lost earnings

Reason for loss	Total days lost	Households affected	Average lost	% survey affected	# households represented between Malem and Utwe
Clean up	8.0	4.0	2.0	5.7	5.6
Other	9.0	3.0	3.0	4.3	4.2
Total	17.0	7.0	2.4	10.0	9.8

For 1:40 and 1:100 year events, there was little frame of reference to estimate probable higher impacts upon earnings. As a result, an illustrative increase of costs of 100 per cent was applied for a 1:40 year event and an increase of 400 per cent for a 1:100 year event for indicative purposes.

Summary findings from the community consultations and questionnaire are provided in Annex 1.

3.7 Existing coastal ersion rates

The coastal area between Malem and Utwe is subject to coastal erosion and the retreat of land. According to KIRMA, aerial imagery analysis by SOPAC and KIRMA reveals that land loss between Utwe and Malem has varied over time with:

- Around 45 to 50 metres lost to erosion between 1944-1976;
- Around 15-19 metres from 1976 to 1997; and
- Around 5-17 metres from 2000 to 2014.

If nothing changes, the coast line would continue to retreat over time because of erosion. Some adaptation options would be expected to affect this change (for instance, revetment would stop coastal retreat), while others would not (such as an inland road).

Based on the figures presented, KIRMA estimates that average historic land loss is around 0.8 m^2 per year (Blair Charley, KIRMA, personal communication, October 2015). This figure was used to quantify the value of different adaptation options in reducing coastal retreat (if any). Bearing in mind that the average value provided by KIRMA reflects historic coastal change over a long period of time, this average is assumed to reflect the impact on coastal retreat of a variety of over wash events, including those with damaging waves (such as a cyclone).

3.8 Impacts of adapation options on over wash/ inundation impacts

The absence of baseline recorded data on over wash events and the fact that the detailed designs of adaptation options will only be finalised during project implementation means that it cannot be known with certainty the effect of the options on present trends in over wash costs. Nevertheless, based on the information presented so far and discussion, some logical deductions can be made about the form of change on the community – principally, that damages to homes will be reduced from destruction to major damage, or major damage to minor damage, or minor damage to affected and so on.

Road repairs using an upgraded road are assumed to be avoided for smaller over wash events of 1:5 and 1:40 year recurrences. For larger 1:100 year events, the effectiveness of adaptation options in mitigating damage varies according to the technology. Road repairs for an upgraded road are assumed to fall for 1:40 and 1:100 year events. In the absence of reports or experience by government officials, indicative savings in road repairs for 1:40 and 1:100 year events are assumed at 50 per cent.

Based on consultations with Kosrae State Government officials and NIWA, the assumed impacts of alternative adaptation options used in there analysis are presented in Table 12.

Possible rates of relocation

A key objective in the road relocation project is to facilitate the relocation of the communities at risk in Malem to Utwe of coastal over wash and inundation, especially in the face of ongoing sea level rise and climate change. Theoretically, establishment of an inland road would facilitate relocation from the threatened coastline and reduce the number of families and homes at risk of over wash, reducing the costs of over wash events. At present, the rate of relocation from the villages or coast to the interior is entirely hypothetical – no relocation strategy has been devised. Relocation would be affected by a variety of factors, not least of which is ownership of or access to, land in the interior for building, as well as access to finance to support the establishment of new housing.

Based on consultations with the communities concerned (Annex 2) community members are completely in favour of relocating because the threat of coastal inundation and harm to person security, health and well-being is high. On the other hand, until it is clear what kind of assistance would be available to assist relocation, the ability of families to relocate is uncertain. Discussions were held with government representatives – some of whom are based in the affected communities – to consider potential scenarios for relocation, should an inland road be established. Based on these discussions together with discussions with the

State Government of Kosrae (Lipar George, personal communication, October 2015), a *conservative* base case relocation rate was estimated in which two householders relocate every five years *following the completion* of the road. This would result in an average relocation over fifty years of 18 households (18 per cent).

DT&I add that – if relocation of the community away from the hazardous area is slow (less than five households every five years, starting five years after completion of the road) – the present access roads would not likely be adequate to provide transport connections for all families still in the process of relocating away from the coastal hazard zone after 20 years (Buncle 2015). As a result, the existing coastal road would have to be replaced after 20 years. This analysis then includes replacement of the entire existing coastal road after 20 years so slow migration levels.

Agricultural impacts of opening up the interior

The State Government of Kosrae observes that agriculture production was undertaken by the Japanese in the Malem and Utwe areas during World War II. Aerial imagery indicates that around 160 acres was farmed at the time (Blair KIRMA communication with SPREP – Image 7). However, agricultural activity in the area ceased following the removal of the Japanese from the island. Drawing on the experience provided, the State Government of Kosrae consider that – once access to the interior is facilitated and agriculture is able to develop – this same scale of agricultural could be targeted again in the future, for subsistence or commercial harvesting purposes (Buncle 2015).

Department of Agriculture officials suggest that tangerine would be a representative/ typical crop type for future inland production. Department of Agriculture representatives proposed average expected annual yields in the area of 2 400 pounds of fruit per acre (Remos Livaie, Agriculture Division, Department of Resources and Economic Affairs – DREA – personal communication via SPREP, November 2015).

Table 12 Impacts on over wash assumed for options

	Minor events	5 yearly events	40 yearly events	100 yearly events
Status quo (no change)	▪ Road passable ▪ No inundation ▪ Ongoing coastal retreat	▪ Road mostly passable (although may affect cars) ▪ Debris to be removed ▪ 2 homes destroyed, 4 with major damage,5 with minor damage, 7 affected (2008 report) ▪ Minor road repair costs ▪ Ongoing coastal retreat ▪ Some loss of earnings	▪ Some breaching of the road ▪ Debris to be removed ▪ 25 homes located seaward of the road expected to sustain major damage ▪ 73 located behind the road expected to sustain minor impact ▪ Road repair costs ▪ Ongoing coastal retreat ▪ Increased loss of earnings	▪ Multiple road breaches ▪ Debris to be removed ▪ 25 homes located seaward of the road expected to be completely destroyed ▪ 73 located behind the road expected to sustain major impact ▪ Road repair costs ▪ Ongoing coastal retreat ▪ Increased loss of earnings
Entire road revetment and new coastal road to existing specifications	▪ Road passable ▪ No inundation ▪ No coastal retreat	▪ Road passable (although may affect cars) ▪ Debris to be removed ▪ Ongoing harm to houses ▪ Ongoing minor road repair costs ▪ No coastal retreat ▪ Some loss of earnings	▪ Road breaches continue ▪ Debris to be removed ▪ 25 homes located seaward of the road continuing to sustain ‘major damage’ ▪ 73 located behind the road continuing to sustain ‘minor impact’ ▪ Ongoing road repair costs ▪ No coastal retreat ▪ Increased loss of earnings	▪ Road breaches ▪ Debris to be removed ▪ 25 homes located seaward of the road continuing to be completely destroyed ▪ 73 located behind the road continuing to sustain major impact ▪ Ongoing road repair costs ▪ No coastal retreat ▪ Increased loss of earnings
Road upgrade (elevated) with selective revetment	▪ Road passable ▪ No inundation ▪ No coastal retreat	▪ Road passable ▪ No debris removal costs ▪ Compared to 2008, no homes impacted ▪ No road repair costs ▪ No coastal retreat ▪ No loss of earnings	▪ No road breaches/ debris removal costs ▪ 25 homes located seaward of the road continuing to sustain ‘major damage’ ▪ 73 located landward of the road go from ‘minor damage’ to ‘affected’ ▪ Road repair costs reduced by 50 per cent ▪ No coastal retreat ▪ Loss of earnings reduced by 50 per cent	▪ Road breaches now avoided ▪ Debris on road reduced by 50 per cent ▪ 25 houses located seaside of the road contuse to be completely destroyed ▪ 73 houses located landward of the road go from major damage to ‘minor’ ▪ Road repair costs reduced by 50 per cent ▪ No coastal retreat ▪ Loss of earnings reduced by 50 per cent
Inland road with selective revetment	▪ Road passable ▪ No inundation ▪ Ongoing coastal retreat	▪ Road passable ▪ No debris removal costs ▪ No road repair costs* ▪ Gradual reductions in inundation with	▪ No road breaches/ debris removal ▪ No road repair costs* ▪ Gradual reductions in inundation with relocation ▪ (Ongoing coastal road damage)* ▪ No coastal retreat	▪ No road breaches/ debris removal ▪ No road repair costs* ▪ Gradual reductions in inundation with relocation ▪ (Ongoing coastal road damage)*

		relocation ▪ (Ongoing coastal road damage)* ▪ No coastal retreat ▪ No loss of earnings	▪ No loss of earnings	▪ No coastal retreat ▪ No loss of earnings

Sources: Blair Charley, KIRMA; Lipar George, ODA; Nena M. William, Office of the Governor, Kosrae State; and Leandro Olando, Civil Engineer, Department of Transport and Infrastructure, personal communication, October 2015

* Any retention of the coastal road while the inland road exists would require ongoing maintenance and repairs in the interim

Discussions with government representatives (Blair Charley, KIRMA; Nena M. William, Office of the Governor, Kosrae State, Remos Livaie, Agriculture Division, DREA) were used to identify a scenario where increasing areas of land (10 acres extra per year) gradually transfer over to tangerine agriculture until the area formerly used by the Japanese for agriculture is filled. Price information to determine the potential value of this new agricultural production was obtained from local market survey (US$0.55 per pound) and from export monitoring datasheets (US$0.50 per pound at quarantine in 2012).

Image 7 1944 cultivated areas from Malem to Utwe

Source: Blair Charley, SPREP personal communication, November 2015).

A summary of values estimated and their importance to the overall picture of adaptation are provided in Table 13.

Table 13 Values estimated

Impact	Valued?	Comment
Debris blocking the road and cost to remove	Yes	
Inundation of coastal houses	Yes	These values are indicative. Actual values are likely to be significant since repeated events would undermine the structural integrity of homes and also potentially result in damage to possessions
Damage to cars	No	
Damage to garden crops	No	
Inability to get to work (Utwe and Malem) resulting in lost income	Yes	Likely to be important to the community as the government is the key employer and average incomes are low
Inability to reach schools and hospitals	No	Important from the perspective of decreasing poverty
Interruption of power, telecommunications – inconvenience for households, loss of earnings to utilities	No	Important – power outages were the utility most commonly noted by community representatives power as a result of over wash (almost a quarter of all respondents reported interruptions to power as a result of inundation.)
Damage to road and need for repairs	Yes	
Trauma and inconvenience	No	
Limited access to interior	No	This is a significant benefit that would affect generations into the future
Road maintenance	Yes	KIRMA (2014)
Land Acquisition	Yes	
Road and utility construction	Yes	
Maintenance of new and existing	Yes	
Awareness cost	Yes	
Environmental impacts?	No	

4 PRELIMINARY RESULTS AND SENSITIVITY ANALYSIS

In the first instance, different adaptation options are assessed for their value:

- In comparison to a *status quo* situation in which the coastal road is replaced, with replacement of the road occurring in the first two years;
- Using a 4 per cent discount rate;
- Assuming that relocation of the coastal community as a result of opening up the interior of the island through a new inland road occurs at a conservative rate of two households moving every five years, starting five years *after* the road has been completed;
- Assuming that this conservative rate of relocation away from the coastal area would require replacement of the existing road after 20 years, if the option continues after 2035, in order to support families who remain in the area and who relocate slowly;
- Assuming that there is no increase in the number of developments of the coastal area unless otherwise stated;
- Assuming that revetment of critical parts of the coastline will proceed regardless of delays in adaptation.

As indicated in Sections 2 and Table 13, not all benefits or costs from an adataption option may be readily identified in practice. In such cases, these values are considered qualitatively and their significance is discussed in detail in the Implications Section. In this analysis, some critical values were not quantified. These include the benefit of adaptation to smaller over wash events (not just the 1:5 year, 1:40 year and 1:100 year events), and the benefits over the next 50 years – and future generations – of access to the interior of Kosrae for both safe harbour and also for economic development. Since omitting values from a CBA is not ideal, interpreting the findings of this CBA must be conducted responsibly. Accordingly, readers are reminded that CBA numbers only tell part of the story about the merits of adaptation; the other part of the story lies in the Implications Section where those items not valued are described and what this means for the overall merit of the activities and their design are considered.

Details findings of the quantified analysis can be found in Annex 5 with a summary of the key findings presented here and in section 6. Summarised values are presented in Table 14 which displays the estimated and payoffs of alternative adaptation options as far as they could be quantified in the form of:

- Net benefits of the adaptation option after costs over time have been accounted for. This is referred to as the bet present value of the option – or NPV;
- The payoff per dollar invested in each option. This is the value benefits of the option in terms of each dollar infested – benefit: cost ration or BCR.

Based on data available, establishing and inland road network now offers the highest quantified NPVs over a 50 year period (Table 14). This option offers an NPV of USD$ 0.37 million. This is equivalent to a payoff per dollar (BCR) of 1.05. In other words, for every dollar invested in an inland road, the people of Kosrae gain back USD$1.05 in savings[2].

Establishing the road in the future offers lower net payoffs than establishing it sooner as a result of the effect of delaying benefit flows. BCR for establishing the inland road in 10 years time and in 20 years time is 0.91 and 0.96 respectively.

[2] Quantified savings; some benefits were not quantified. See Table 13.

It is important to highlight here that – and as indicated in Table 13 – many of the critical benefits for the inland road options have not been quantified in this analysis. First, benefits from avoiding small scale over wash events, from opening up the interior and avoiding damage to possessions, amenities etc. are not included which means that the value of an inland road now (as well as in the future) is underestimated. Moreover, considering the ongoing nature of sea level rise, the long term benefits of opened access to the hinterland by an inland road is a benefit that would be experienced for generations to come. In addition – and as indicated in Section 2.6 – the benefits of an inland road today (as well as in the future) will likely be felt for many more smaller over wash events than just the three types used to quantify benefits. As a result, the true benefits of road relocation now and in the future are certainly much higher.

Based on data available, the option to upgrade the existing coastal road is not expected to generate a positive net benefit. This option offers a quantified NPV of -USD$0.85 million, or a BCR of 0.86 (that is, USD$0.86 in savings/ benefits per USD$1 invested).

Table 14 Quantified payoffs (4 per cent discount rates[3])
(Assumes relocation following completion on an inland road of two households every five years)
(Ranking: 1 is best)

		Revetment with coastal road replaced to existing specifications	Coastal road upgraded (elevated)	Inland road from 2017				Construction of inland road in 10 years' time (2026)	Construction of inland road in 20 years' time (2036)
				No maintenance of old road	10 years' maintenance of old road	20 years' maintenance of old road	50 years' maintenance of old road)		
NPV	Value	-2156561	-849020	387330	380785	371039	-1767740	-556570	-225349
	Rank	8	6	1	2	3	7	5	4
BCR	Value	0.58	0.86	1.06	1.06	1.05	0.94	0.91	0.96
	Rank	8	7	1	1	3	5	6	4

[3] The Kosrae State Government does not have an official discount rate. In the absence of such an official discount rate, a 4% rate is used. The rationale for selecting this rate is that it represents the average worldwide real interest rate over the last 150 years (Sources: N.G. Mankiw. Macroeconomics. 2007). Moreover, a 4% discount rate has been used in other CBA studies recently completed for Kosrae and so applying the same discount rate here will provide for easier comparison and prioritisation of investments within Kosrae.

Impact of maintaining the old road of the value of a new inland road

The payoffs of establishing a new inland road network were scrutinised if the old coastal road was maintained for various periods (not maintained, or maintained for 10, 20 or 50 years). In these cases, the benefits from establishing the road remain much the same while the costs slightly increase. Nevertheless, the costs of road maintenance are not high and these costs are diminished with time, with the effect that the impact on payoffs is negligible, provided that maintenance does not extend beyond 20 years. Maintaining the existing coastal road does, however, have an impact if the road is maintained for 50 years since, as indicated in Section 3.1 (Baseline data – Costs associated with the existing road), maintenance of the existing road after 20 years would require a major replacement of the existing road after 20 years (Table 14). This is discussed further in the Sensitivity Analysis under *Speed of relocation* below. At this point, the value of avoiding having to replace the existing road (say, by speeding up migration) or investing in other adaptations might be considered.

4.1 Sensitivity analysis

The biggest uncertainties in valuing the road project particularly are:

- Costs for the road;
- The discount rate;
- The frequency of severe weather events (direct hits by a tropical cyclone);
- The degree to which it facilities relocating of families away from the threatened coastline and into the interior (or elsewhere for that matter) of Kosrae;
- The availability of funding for the entire proposed road project. If funding is not accessed, this may affect implementation of the proposed road network.

These matters were subjected to a sensitivity analysis.

Costs for the road

The costs to establish an inland road network were first estimated by KIRMA (2014) and then updated by DT&I. These costs therefore represent the most up to date figures for the State Government of Kosrae. On the other hand, the island is reliant upon imports and – as a small island state – is subject to the fluctuations of the international market. To account for the possibility that imported materials might increase in price and consider their impacts upon the value of an inland road, a sensitivity analysis was conducted in which the cost of constructing the road increased by 10 per cent.

In this case, the quantified net costs of an inland road network established today are somewhat sensitive to costs. An increase of 10 per cent in construction costs results in a net cost of around –USD$0.16 million – or a payoff of 0.98 – that is, USD$0.98 worth of benefits per dollar invested (Table 15). This does not change the ranking of the inland road network relative to other adaptation options.

Table 15 Quantified payoffs with higher construction costs (4 per cent discount rates)
(Assumes relocation following completion on an inland road of two households every five years)

	Inland road from 2017 (maintenance of old road for 20 years)	Inland road from 2017 old road abandoned, costs 10% higher
NPV	371,039	-159,395
BCR	1.05	0.98

Discount rate

The State Government of Kosrae does not have a preferred discount rate for investment analysis. In the absence of this, the base case to appraise options involves a 4 per cent discount rate to consider the economic impact of time on impacts. The rationale for selecting this rate is that it represents the average worldwide real interest rate over the last 150 years (Sources: N.G. Mankiw. Macroeconomics. 2007). Moreover, a 4% discount rate has been used in other CBA studies recently completed for Kosrae and so applying the same discount rate here will provide for easier comparison and hence prioritisation of investments within Kosrae.

In practice, the results in this analysis are sensitive to the discount rate used. Lower discount rates generally improve the quantified payoffs for adaptation because they assign greater importance to future benefit flows (Table 16). As a result, with a discount rate of 0 per cent, an inland road established today is shown to generate a significantly higher pay off (NPV=8,842,563; BCR=2.23) provided that maintenance of the existing coastal road does not exceed 20 years (as this requires a new replacement of the existing coastal road).

By contrast, a higher discount rate reduces the quantified payoffs for adaptation because they assign less importance to future benefit flows (Table 16). As a result, with a discount rate of 10 per cent, an inland road established today is shown to generate a negative pay off (NPV=-US$2,086,839; BCR=0.67) and delaying the construction of the road becomes the highest ranked option. Again, it is emphasised that a number of important benefit categories are not reflected in the quantitative results due to a lack of data.

Table 16 Quantified payoffs with different discount rates

(Assumes relocation following completion on an inland road of two households every five years)

(Ranking: 1 is best)

Discount rate		Revetment with coastal road replaced to existing specifications	Coastal road upgraded (elevated)	Inland road established today				Construction of inland road in 10 years' time (2026)	Construction of inland road in 20 years' time (2036)
				No maintenance of old road	10 years' maintenance of old road	20 years' maintenance of old road	50 years' maintenance of old road)		
10	NPV	**-1325868**	**-2161309**	**-2074635**	**-2082481**	**-2086839**	**-5251561**	**200982**	**1259470**
	Rank	3	7	4	5	6	8	2	3
	BCR	**0.69**	**0.64**	**0.67**	**0.67**	**0.67**	**0.66**	**1.06**	**1.58**
	Rank	3	8	4	4	6	7	2	3
4	NPV	-2156561	-849020	387330	380785	371039	-1767740	-556570	-2156561
	Rank	8	6	1	2	3	7	5	8
	BCR	0.58	0.86	1.06	1.06	1.05	0.94	0.91	0.58
	Rank	8	7	1	1	3	5	6	8
0	NPV	-4371735	3522576	8858529	8859954	8842563	5407040	2724143	-158169
	Rank	8	6	1	2	3	7	5	4
	BCR	0.44	1.55	2.24	2.24	2.23	1.51	1.26	0.99
	Rank	8	7	1	1	3	5	6	4

Frequency of severe weather events

Consultations conducted between SPREP and the State Government of Kosrae reveal that there is some uncertainty around how often tropical cyclones will directly hit Kosrae in the future. The base case for this analysis assumes that a direct hit can be expected round every 100 years (Table 5) although this could be as regular as every 75 years (Buncle 2015).

Based on the data available, the findings are not sensitive to changes in assumptions about the return frequencies of direct tropical cyclone hits. If a direct hit was sustained every 75 years instead of just every 100 years, the payoffs and ranks for adaptation options remain virtually the same (Table 17).

Table 17 Quantified payoffs with more frequent direct cyclone hits (4 per cent discount rates)
(Assumes relocation following completion on an inland road of two households every five years)
(Ranking: 1 is best)

Discount rate		Revetment with coastal road replaced to existing specifications	Coastal road upgraded (elevated)	Inland road established today				Construction of inland road in 10 years' time (2026)	Construction of inland road in 20 years' time (2036)
				No maintenance of old road	10 years' maintenance of old road	20 years' maintenance of old road	50 years' maintenance of old road)		
NPV	Value	-2232538	-827679	432137	425591	415846	-1678126	-531542	-211737
	Rank	8	6	1	2	3	7	5	4
BCR	Value	0.56	0.87	1.06	1.06	1.06	0.95	0.92	0.96
	Rank	8	7	1	1	3	5	6	4

Speed of relocation

The base case to value the inland road was that – five years after the road is completed – two households would relocate every five years to the interior. This estimate is potentially conservative considering that:

- Some of the families along the threatened coastline already own land in the interior around the proposed road;
- The community have expressed absolute commitment to relocating inland;
- Consultations undertaken in the preparation of the proposal, in particular, with landowners, show full support for the development into their land (SPREP 2015b).

In light of this, a sensitivity analysis has been conducted to assess the potential quantified payoff from the road with a faster relocation. In this case, the payoff has been assessed assuming two alternative faster payoff scenarios:

- That five households move every five years, starting five years after road completion; and
- That one household moves every two years, starting two years after road completion.

On the other hand, community consultations (Annex 2) confirm that the ability of the community to relocate hinges upon a number of factors including:

- Access to land – not all families own land in the interior near the proposed inland road;
- Access to finances – as noted in Section 2.6, an average house in Kosrae has a replacement value of around USD$43 000. Few family members have access to such money to establish a new house once an inland road is established. Frankly, they would likely need some form of financial assistance in order to be able to take up the opportunity provided through an inland road to move.

As can be seen from Table 18, the quantified payoffs from an inland road are not very sensitive to relocation rates. This is likely because the assumed transition of families to the interior is so gradual that – once discounting is taken into effect – there is little impact on the present value of benefits. A more rapid rate of relocation improves the NPV of establishing a new inland road, but not by much.

Table 18 Inland road from 2017 with different relocation rates (4% discount rate)

	Most likely?	Faster relocation?
	2 hhs move every 5 years starting 5 years after establishment	5 hhs move every 5 years starting 5 years after establishment
NPV	371,039	645,958
BCR	1.05	1.10

* Established 2017, no maintenance of coastal road

A more important change arises under a scenario where the existing coastal road needs to be re-instated[4] because of slow migration. As can be seen from Table 19, the expenses

[4] i.e. replaced due to substantial degradation

associated with establishing an inland road climb substantially if the existing coastal road has to be retained for more than 20 years.

A clear lesson from this is that any inland road strategy should – if practical – seek to avoid having to maintain the existing coastal road for over 20 years. For example, government might want to develop a strategy to facilitate rapid migration over a 20 year period to avoid having to replace the old coastal road in the long term.

Table 19 Benefits from speedier relocation: the case of maintaining the coastal road for 50 years
4 per cent discount rate

	Inland road from 2017 (50 years' maintenance of old road; 2 households move every 5 years; coastal road replacement)	INLAND ROAD (old road maintained for 50 years; no road replacement (displays savings of faster migration)
NPV	**-1,767,740**	**360,170**
BCR	**0.94**	**1.05**

Targetting the Malem-Yeseng portion of the inland road only

At the request of SPREP, an estimate was made to assess the potential value of establishing the inland road network connecting only Malem to Yeseng. This option becomes important if only part of the funding for the road project becomes available in the first instance. This raises the question of the kind of benefits that staged road relocation might offer Kosrae state.

Targeting the Malem to Yeseng component of the proposed inland road network involves upgrading the two existing access roads as well as establishing a short portion of the inland road (around 39 per cent of the costs of the entire proposed road network from Malem to Utwe). In order to estimate the impact of inundation events occurring with a return frequency of every five, 40 and 100 years:

- It is assumed that construction of this partial road network takes one year, compared to two for the entire proposed Malem and Utwe inland road network.
- The portion of the coast not covered by an inland road – Yeseng to Utwe – would still require road replacement.
- The proportion of the Malem-Utwe coastline covered by Malem to Yeseng was used to attribute:
  - Its share of the road replacement costs.
  - Its share of estimated road clean-up and repair costs in the event of over wash.
  - Its share of old road maintenance applicable to that small road area.
- The proportion of Malem-Utwe households represented over Malem to Yeseng was used to attribute its share of agricultural production facilitated in the interior.
- The maintenance costs of the new shorter inland road are estimated at two per cent of total construction costs, annualised over 50 years;
- The distribution of damage to housing from 1:5, 1:40 and 1:100 year events along the Malem-Utwe coastline was applied to the Malem-Yeseng stretch of coastline, and then scaled down according to the proportion of houses represented in the Malem-Yeseng portion.
- It is assumed that coastal harm will continue unimpeded to be experienced along the Yeseng-Utwe stretch of the coast.

With a 4 per cent discount rate, a partial road from Malem to Yeseng is estimated to generate a net cost of around -USD$6.6 million, offering a lower per dollar invested payoff than a full inland road network established now and in the future. The limited payoff represents the fact that a smaller proportion of families would benefit from the road while the government would still have to replace the existing coastal road to support those families who do not benefit as well as to cope with slow migration.

5 EQUITY AND DISTRIBUTIONAL IMPLICATIONS

Stakeholders experiencing the benefits of a new road are divided between the private sector (principally residents of Utwe and Malem) and the public sector (government departments responsible for repairs to the existing coastal road and clean up following an over wash event) (Table 20).

Based on the 2010 census, which is the latest on hand, householders in Utwe and Malem who stand to benefit from the new road are at the lowest spectrum in terms of socioeconomic status, compared with the people of Lelu and Tafunsak. The 2010 census shows the average income for the people of Utwe at $7,833 and $11,745 for Malem, while Lelu and Tafunsak stand at $14,065 and $13,159, respectively. The costs of lost earnings from road blocks to these families is therefore likely to be more harshly felt than in more affluent communities. Lost education effects are also likely to be important in the longer term as education is essential for development opportunities. Additionally, community consultations revealed that over wash commonly harmed subsistence crops of families. In view of the limited income of the families concerned, ongoing or worsening loss of food crops as a result of over wash will logically be felt more keenly by this community.

Ongoing impacts of road cut offs, lost food and lost education opportunities associated with over wash will harm the economic resilience of an already disadvantaged community. The proposed new road would thus be expected to contribute positively to improved equity within the Kosraean community by minimising lost present and future earnings and improving long term food security.

The benefits of the new road are expected to be felt primarily by families, principally through access to increased agricultural production opportunities. This is significant as it implies both a potential increase in food security to an isolated but also the potential increase in income/ saving in food purchases for a less privileged community. Nevertheless, it is possible that other unanticipated impacts may also arise from the new road (such as environmental impacts), although this is not clear as no Environmental Impact Assessment has yet been undertaken. Certain impacts will be felt by more specific groups.

Table 20 Potential stakeholders in the road project

Cost/benefit	Stakeholder	Comments
Debris blocking the road and cost to remove	DT&I	
Inundation of coastal houses	Householders (Utwe, Malem)	
Damage to cars	Householders (Utwe, Malem) School buses General public	
Damage to garden crops	Householders (Utwe, Malem)	All household members take care of garden – there is no perceived burden on one particular group of society in this
Inability to get to work (Utwe and Malem) resulting in lost income	Householders (Utwe, Malem)	
Inability to reach schools and hospitals	Householders (Utwe, Malem)	Estimated at 300 plus students (School year 2014 Enrolment, Kosrae Statistics Office)
Interruption to power/ telecommunications – inconvenience for households	Householders (Utwe, Malem)	
Interruption to power, telecommunications – loss of revenue to utilities	Utilities (public sector)	
Standard maintenance of old road	DT&I	
Repairs to the road following over wash events	DT&I	
Trauma and inconvenience	Householders (Utwe, Malem)	
Limited access to interior	Land owners	
Land Acquisition	Government	
Road and utility construction	Government	
Maintenance of new road	Government	
Awareness campaign	Government	

Table 21 Population of Malem and Utwe

Village	Male	Female	Total
Malem	257	236	493
Utwe	458	525	983
TOTAL	715	761	1476
% of total	48	52	100

6 IMPLICATIONS

A number of options exist for the coastal communities of Malem and Utwe to adapt to climate change. The form of that these options could take can vary. For example, revetment could cover the entire coastline or just parts. New coastal roads could be built to existing design standards or to new design standards. This analysis considers selected adaptation options to consider a way forward for Kosrae. In so doing, the analysis provides conservative estimates of the potential payoffs from the adaptation options.

This is because:

- The analysis is based on the quantified benefits from the different adaptation options arising from only three types of events – 1:5 year events, 1:40 year events and 1:100 year over wash events. However, the adaptation options could also generate benefits when other events occur;
- Some benefits of adaptation – avoided injuries/ fatalities arising from severe events, damage to cars and crops or ongoing access to schooling – have not been quantified. Significantly, the calculations are based on the assumption that only families located around the coastal road from Malem to Utwe relocate over time with improved access to the interior via a new inland road. In practice, relocation might not be restricted to these communities. Families from other parts of Kosrae might also benefit from improved access to the interior through relocating or using their own inland sites for agriculture production;
- By opening up access to the interior of Kosrae – facilitating enhanced agricultural production while changing the dynamic of development away from the hazardous coastline and into the safer and more sustainable interior – the road could be expected to benefit communities beyond the 50 year period of this analysis, benefitting the community for generations to come.

As a result of these three issues, the potential benefits from developing an inland road now or in the future are quite certain to be higher than quantified.

Based only on those benefits quantified over a 50 year period and applying a 4 per cent discount rate, is shown to generate the highest payoff (NPV) of USD$0.37 million.

This is shown to be higher than establishing the inland road 10 years in the future (NPV=-USD$0.56 million) and 20 years in the future (NPV=-USD$0.23 million) - reflecting, in part, the increasing risks presented by sea-level rise and (potentially also) cyclones.

The option to establish the inland road now is also shown to be superior to the alternative course of action - to protect or upgrade the existing coastal road. These options were shown to generate a negative payoff (NPV = -USD$2.16 million and -USD$0.85 million respectively). Moreover, there are a number of important limitations associated with these responses that are not fully captured in the aggregate results. Most importantly:

- the benefits of an upgraded coastal road specifically would only accrue to those families located *landward* of the road who would benefit from reduced inundation. By comparison, families located *seaward* of the upgraded road would remain in the direct line of the waves and continue to be affected by over wash, with potential harm to family members or properties worsening over time as the sea level rises. As a result, these families would eventually still have to find an alternative means to adapt to the coastal threats. In community consultations, families in Malem and Utwe stated firmly that – if the coastal threats are not addressed – the area will cease to be a safe and unsustainable place for them to inhabit. They viewed that migration out of Kosrae or FSM is the only option remaining (Annex 2). Considering that Kosrae already represents the smallest state in FSM and that the island is presently experiencing a net loss of population due to outward migration (Division of Statistics undated), increased migration as a result of coastal threats may not be desirable both in terms of economic potential, but also in terms of retaining Kosrean culture.

- protecting or upgrading the coastal road can risk generating a false sense of security in the community, allowing families to believe that the area is now safe from inundation and *implicitly encouraging* further coastal development. Such an option is therefore counter to the State development plan intent of encouraging inland development as it can hamper relocation in the medium term. By comparison, establishing an inland road network facilitates relocation and opening up on the interior; and

- there are likely to be additional environmental costs from establishing construction work such as protecting or upgrading of the road along the coast (such as downstream erosion). In the face of ongoing sea level rise, this would appear to be unwise.

There are also other considerations. The payoffs for an inland road established today appear to be sensitive to assumptions about the discount rate. If the discount rate is 10 per cent, the quantified payoffs for an inland road established today become negative - but delaying construction for 10 or 20 years still remains positive.. The issue of discount rate is important since discussions with State Government of Kosrae officials (Buncle 2015) reveal that – while the government does not have a preferred discount rate – some departments consider that a discount rate of 4% is more appropriate than a higher rate of around 10%. Amongst other considerations, this is because inter-generational equity is a major consideration in Kosrae culture.

As some of the unquantified payoffs from an inland road network – particularly in terms of lives and safety ensured and food security increased – are likely to be significant (see Table 12), it is reasonable to expect that the NPV for establishing an inland road system is actually higher. Considering (i) that it will take time for the community to relocate away from the coast, and (ii) that an upgraded coastal road would likely *encourage* development in a hazardous area, risking lives and well-being, there would appear to be sense in targeting the establishment of an inland road now, rather than waiting for the future. This suggests the need for a long planning period for relocation (both in general, as well as with the road specifically). Consequently long term government commitment to this would be essential. Moreover, government might want to develop a strategy to facilitate rapid migration over a 20 year period to avoid having to replace the old coastal road in the long term as this generates considerable costs. In this respect, there would logically be value in conducting a strategic campaign to support community relocation to avoid existing coastal road replacement and get the most benefits from an inland road network.

The sensitivity analysis conducted in this study reveals that the quantified benefits of establishing a shortened road (from Malem, to Yeseng) are not positive and are lower than those that could be achieved by establishing a complete road. This likely reflects the fact that a smaller proportion of the community will benefit while ongoing treatment of the existing coastal road remains. Equally importantly, establishing a portion of the inland road from Malem to Yeseng will leave the community of Utwe cut off from the rest of the community if the road becomes unpassable in future over wash events. This is important for two reasons.

First, ongoing threats will continue to undermine quality of life in the village, risking health and damaging possessions. In particular, damage to the road takes time to repair. While 'minor' over wash events may cut off families for one or two days, extreme events (such as a near cyclone) could cause extensive damage which could take from days to weeks to repair. Ongoing interruption to family life, earnings and education – especially in a community less advantaged than the rest of the Kosrae community – is important. Second – and as already indicated – the poor condition of the existing inland access roads brings into question the safety of the community in using these roads as escape routes. As a result, establishing a partial inland road does not address the quality of all the inland access and the immediate safety of the community. An advantage of establishing an entire inland road is rather that – should a sudden storm surge or over wash event occur – families will all have immediate access to safe inland roads as an escape route – while also having long term access to the interior of the island for development or establishing new homes.

Distributional considerations

Based on the quantitative analysis conducted, by far the greatest beneficiaries from the establishment on an inland road established today are families (compared to government), principally in the form of access to the interior of Kosrae to extend agricultural production. This is important because the communities of Utwe and Malem who stand to benefit first from the new road project already have the lowest average earnings in Kosrae, compared with communities in Lelu and Tafunsak. The opportunity to increase income and or food security through increased agricultural would directly improve the wellbeing of these families.

Moreover, these families already presently suffer a variety of harmful effects from over wash, including reduced earnings (when access to work by hampered by road blocks), reduced educational opportunities (when access to school by hampered by road blocks) and reduced access to food (through the destruction of home gardens). The harmful impacts from these effects have a disproportional impact upon these communities as they already have the lowest average earnings in Kosrae, compared with communities in Lelu and Tafunsak. Ongoing over wash can therefore suppress the economic vulnerability of the community. By comparison, a continually accessible road will minimise this harm and facilitate change, increasing the economic resilience of the community. While items values were not valued in the analysis in theory at least, an inland road project would contribute positively to both the food security and economic security of the community.

Relocation considerations

Consultations held with stakeholders from Malem and Utwe revealed in resounding support for an inland road and for relocation to the interior for safety and security. This support has also been affirmed in the present draft of the proposal for the road project (SPREP 2015b).

However, the rate at which families can move in practice will not be known with any certainty until the community can work through issues in collaboration with government and policy makers. Key issues here are:

- Relocation is likely to take time. The analysis presumes that relocation will be gradual. During this time, families who have not yet moved will continue to need access to the wider Kosrae community through a functioning road. Data analysis suggests that the cost of maintaining the existing coastal road for a few years will have a negligible impact upon the payoffs of a road On the other hand, retaining a functional coastal road could act as a deterrent to relocation to safer ground and can implicitly discourage relocation. After 20 years, retention of the existing coastal road would require a new coastal road to be established which is expensive. There would therefore be logic in establishing a new inland road network while advising the community of the cessation of existing road maintenance at a specific point in time (eg., 20 years or less), providing them with reasonable lead time for their relocation while minimising costs.
- An average house in Kosrae has a replacement value of around USD$43 000 (Section 4.7). Few family members have access to such money to establish a new house once an inland road is established. However, with financial assistance, relocation could be rapid as the community are keen to relocate for safety's sake. As indicated in Section 5, the faster the relocation, the higher the net benefits from relocation. There is therefore logic in the Kosrae State government reviewing access to housing loans or resources for relocation.
- Relocation from the hazardous coast is unlikely to happen while development continues unconstrained along the coast. In the face of sea level rise and climate change, it is unsustainable and unsafe for any new developments to be allowed to continue in hazardous areas such as the Malem to Utwe coastline. In the interest of public safety, no new developments should be permitted here. This constraint would then create a higher drive for developments in safer areas.
- Interim development in hazardous areas such as the Malem to Utwe coastline should be subject to appropriate building standards. In the face of sea level rise, ground level developments would appear to be unsound. Engineers in the State and or national government should be able to recommend clear standards which State government should actively enforce for the safety of the community.
- To support a new inland road and address the points raised above, a strategic communications campaign is required. This should include messages such as why the old road will eventually not be maintained, why new developments along the coastline are not supported, how government can support families in relocation and so on.
- Ultimately – and as indicated in SPREP (2015b), a relocation committee is needed to clarify relocation issues.

Food security considerations

The largest component of quantified benefits from establishing an inland road from today is increased agricultural activity from opening up the interior of the island. At the same time, the impact most commonly reported from over wash was loss of subsistence crops in existing home plots. The cost of lost crops was not quantified in this analysis. However, considering that home gardens provide a common source of food in Kosrae, and in view of the likelihood that a representative home includes at least three young dependents, the negative impact of coastal inundation on food security is likely to be increasingly significant over time.

According to the Office of Statistics, Budget and Economic Management (2009a), Kosrae exported around USD$ 1.2 million worth of agricultural products in 2012 (Table 24). The value of food imports into Kosrae specifically is not presently clear on government web sites, although it is apparent that food imports into FSM in total were around USD$ 58 million in 2012 (Office of Statistics, Budget and Economic Management (2009b) (Table 25). If Kosrae's share of that total was estimated according to its share of national population, Kosrae would be a net importer of food. Ongoing damage to food gardens harms food security for the affected communities and this is likely to worsen with time. Efforts to open up

the interior for safe agricultural development would assist in this. There is likely to be benefit in the state Government of Kosrae accompanying any inland road project with a strategic campaign to encourage sustainable agricultural development, as a result.

Table 24 Value of Exports (FOB), FSM: Value ($USD'000s)

Major commodity groups	2008	2009	2010	2011	2012
Agricultural Produce	21	38	27	46	59
Marine Products	-	1	1	464	1,175
Other Products	-	-	-	-	-
TOTAL	21	38	27	509	1,234

Source: Office of Statistics, Budget and Economic Management (2009a).

Table 25 Food imports to FSM ($USD'000s)

Description	2008	2009	2010	2011	2012
Animals and animal products	7,182	9,727	9,915	11,126	12,490
Vegetable products	10,524	12,278	9,592	11,760	13,877
Animal or vegetable fats	930	920	708	856	1,107
Prepared foodstuff, beverages and	27,924	29,594	26,234	29,925	30,593

Source: Office of Statistics, Budget and Economic Management (2009b).

Other issues

A number of issues concerning the road relocation are uncertain. First, the impacts of climate change adaptation projects are unclear. What is the potential environmental impact of major construction work along the coast or inland? While the potential exists that major projects have bring potential risks, they might also bring opportunities. Would opening up the interior of Kosrae provide access to cultural sites hitherto denied to the community because they could not access the area? Would this bring harm? What are the potential environmental impacts of different adaptation options? These matters would presumably need to be considered in an EIA should the road project proceed. Any identified risks would need to be built into a monitoring plan for the project to optimise benefits for the State.

Similarly, the rate of relocation promised by the road project is still unclear. While community enthusiasm for the project is high, relocation depends on access to resources. It is therefore logical that the means and speed of relocation of the community should be monitored as part of the project, should it proceed.

Government presently routinely collects little documentation of the actual effects of over wash on the government, private sector or community. This analysis relied heavily on a key 2008 assessment of the effects over wash. Documentation of disaster events provides the foundation and business case for future remedial action. Government should consider documenting the impact of future events including noting impacts such as impacts of housing and estimated cost of repairs or other remedial action. This data should be stored for future reference.

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ANNEX 1 SCENARIOS ASSESSED

Cases quantified using a 1:5 year event, 1:40 year event, and 1:100 year event

1	Entire existing coastal road revetted only – this was not realistic because revetment really requires a functional road of some form – so this was not reported on
2	**ENTIRE COASTAL ROAD REVETMENT accompanied by a new coastal road built to existing specifications** Construction over two years Replaced coastal road lasts for 35 years Coastal population increases so increasing damage
3	**COASTAL ROAD UPGRADE (ELEVATED), accompanied by selected revetment** Construction over two years Upgraded road lasts for 50 years Coastal population increases so increasing damage
4	**INLAND ROAD ESTABLISHED NOW (old road abandoned – this is unrealistic)** Construction over two years Immediate abandonment of the coastal road (so no revetment or its maintenance around the vulnerable Paal and Mosral and Utwe areas) Five years after road completion, two households move every five years
5	**INLAND ROAD (old road maintained for 10 years)** Construction over two years Existing road is not replaced as only maintaining the existing coastal road for 10 years (and yet it could last for up to 20 with adequate maintenance) Five years after road completion, two households move every five years

6	**INLAND ROAD (old road maintained for 20 years)** Existing road is not replaced as only maintaining the existing coastal road for 20 years at which point the old road expires Five years after road completion, two households move every five years
7	**INLAND ROAD (old road maintained for 50 years)** Construction over two years Old road re-established to existing specifications after 20 years because of slow migration (displays costs of slow migration) Five years after road completion, two households move every five years
9	**INLAND ROAD CONSTRUCTED IN 10 YEARS' TIME** Commence construction in 2026, complete in 2028 Old road re-established once only after 20 years because of slow migration; maintained thereafter for 20 years Revetment and its maintenance of vulnerable areas around Paal and Mosral and Utwe – allows 20 year maintenance Five years after road completion, two households move every five years
10	**INLAND ROAD CONSTRUCTED IN 20 YEARS' TIME** Commence construction in 2036, complete in 2038 Old road re-established after 20 years because of slow migration; maintained thereafter for 20 years Revetment and its maintenance of vulnerable areas around Paal and Mosral and Utwe – allows 20 year maintenance Five years after road completion, two households move every five years

Sensitivity analysis

8	**INLAND ROAD (old road maintained for 50 years with no existing road replacement** Construction over two years Old road not re-established to existing specifications after 20 years to display potential cost savings from faster migration Five years after road completion, two households move every five years

11	**Scenario 4 with inland road construction costs 10 per cent higher**
12	**Scenario 4 with faster relocation** Five years after road completion, five households move every five years
13	**Scenario 4 with faster relocation** Two years after road completion one household moves every two years Re-establishment of old road after 20 years because still has slow migration
14	**Scenario 4 with slower relocation** Five years after road completion, one household moves every five years
15	**SHORTENED INLAND ROAD (FROM MALEM TO YESENG ONLY)** One year to buy land; one year construction period Maintenance of old road between Malem and Yeseng as people still need to reach each other Five years after road completion, two households move every five years Re-establishment of old road after 20 years because of slow migration, maintained for 20 years
16	**Scenario 15 with faster migration** One year construction period Two years after road completion, one household moves every two years
17	**Scenario 4 with slower agricultural production take up**

ANNEX 2 IMPACTS OF INUNDATION ON COMMUNITIES

Recorded data on the impact of inundation events on families does not appear to exist. In its absence, consultations were conducted with the communities most impacted by inundation on the affected coastline – Malem and Utwe. The purposes in the consultations were to:

- Generate some statistics about how over wash events present affect the community (eg., cutting them off, affecting their property); and
- Get a feel for how the communities might be affected by a new inland road.

To achieve this, community representatives were invited to:

- Complete a questionnaire (Annex 3) on the effect of coastal inundation and over wash;
- Focus group discussions on how the issue should be tackled, with groups providing views and feedback on four key questions (Annex 4), followed by a general discussion.

Data cleaning

Responses in some questionnaires were internally inconsistent, with respondents stating that they had never experienced an inundation event but then explaining impacts they had experienced of inundation. These individuals were then recorded as having experienced inundation.

Where respondents described impacts of inundation in terms of weeks and months rather than days, a week was interpreted as 7 days and a month as 30 days unless otherwise obvious. Where respondents stated that they relocated because of inundation or spent time cleaning up after an event but did not specify the length of time, a minimum time of 1 day were assigned. Where respondents provided a range of time (eg., 1-2 weeks), a numeric average was assigned.

Results of the questionnaire

70 completed questionnaires were used: 36 from Malem and 34 from Utwe. Two thirds of respondents identified themselves as heads of household. These were virtually all male. Only two of the 19 women responding identified themselves as heads of households.

Table 1 General information on respondents

	Male	**Female**	**Head of household?**
Malem	67%	33%	64%
Utwe	79%	21%	74%
Total	73%	27%	69%

The households represented by respondents averaged six family members, although the size ranged from one in a household to 10, with seven members being the most common size. Not all questions on the other members of the household were completed, so it was not possible to determine the nature of dependents in each household. From what was provided, a representative household included at least three children under the age of 18.

Not surprisingly for such small communities, many of the families completing the questionnaire were related. Over 80 per cent of all respondents stated that they had always lived in their present village. Just over half stated that they had access to other land in Kosrae.

Impacts of inudation

Of all those responding, 63 per cent advised that they had directly experienced a coastal inundation event or had been affected by one (say, through an impact to services). The proportion of families affected was virtually identical in both villages, with 64 per cent of Malem respondents reporting effects and 62 per cent of Utwe respondents reporting effects. The most commonly recalled event was that of 2014 which a third of affected respondents named.

Of those affected by inundation, the most commonly reported impact on housing was debris in the yard and resulting damage to crops (breadfruit, fruit trees). Considering that home gardens provide a common source of food in Kosrae, and in view of the likelihood that a representative home includes at least three young dependents, the impact of coastal inundation on food security is likely to be increasingly significant over time. Not surprisingly, the impact of coastal inundation on food security was raised several times in group discussions as being a major concern (Table 3).

In addition to damage to food supplies, some affected respondents stated that some household possessions were harmed during inundation, with damage to vehicles and furnishings (including television sets) the most commonly reported. Occasionally, items that were damaged in the past by inundation were cited as irreplaceable. These were commonly photographs but also a passport (raised once).

Of those respondents who reported some experience of coastal inundation, the most commonly reported impact on families was clean up, with over 10 per cent of all respondents having to spend time to clear yards and or hoes of debris. On average, respondents reported spending 6 days on clean up, with Utwe villagers reporting a longer time spent cleaning on average (7 days in Utwe compared to 5 in Malem).

The impact of inundation on utilities was notable. On balance, power was the utility most commonly reported affected, with almost a quarter of all respondents stating that power was interrupted as a result of inundation. Power outages resulted in the spoiling of food as freezers thawed, the inability to prepare food and affected work. A smaller proportion of families lost water, due to broken pipes or power outages (pumping water).

Road breaches affected transport for families, affecting a fifth of all families surveyed. The effect was an inability to get some children to school or employees to work. A reported 10 per cent of respondents stated that they had to take time off work following the event, either because they could not access work due to road breaches or because they had to clean up their compounds. This resulted in a loss of earnings to families.

Nine per cent of all respondents stated that their children missed some schooling. This was either – again – because of road breaches or because uniforms and school items were harmed in the flooding. The average affected child missed two or three days of school. Considering that families usually pay school fees up front, this is a financial cost to families as well as a lost learning opportunity for children.

Table 2 Interruptions to utilities from inundation experienced

	Transport	**Water**	**Electricity**	**Telephone**
Malem	35	9	26	17
Utwe	18	26	29	24
Total	20	16	23	17

The damage to utilities, access or sheer flooding of homes meant that some families relocated temporarily for safety or convenience. Almost one fifth of all respondents surveyed (19 per cent) stated that they had to relocate, with families relocating on average for two days.

Health and safety

The impact of coastal inundation on health was not extensively reported in the questionnaires. On the other hand, this issue was actively discussed in break out groups. As well as concerns about food security and damage to homes, focus groups stressed the issue of family safety and how this could be harmed by ongoing inundation threats. A key issue here was pollution arising from the inundation of pig pens and septic tanks. On this issue, a couple of respondents had stated in their questionnaires that family members had in the past experienced skin rashes after the floods.

Relcoation and other solutions

Focus group discussions identified that families in the Malem/ Utwe area felt that – unimpeded – coastal inundation would likely worsen and continuity in the community would be untenable. All representatives suggested that homes would become unsafe, food security harmed, businesses damaged and – ultimately – families would not be able to stay in the area. Representatives suggested that families would either have to find a way to move inland or overseas.

Both in questionnaires and in focus groups, community representatives expressed complete support for the establishment of an inland road that would allow families to relocate. They also suggested other options to support ongoing coastal access such as the establishment of wave breakers. Relocation raised several issues:

- Access to land – not all representatives had access to land elsewhere. Only half (52 per cent) of respondents had access to other land outside their existing home, and – of those that had land elsewhere – this was not always in the vicinity of the proposed road. As a result, representatives queried who would access land for them.
- Relocation of the road would enable families to access the interior but the proposed road project did not include the establishment of new houses for the affected population. Representatives expressed a need for financial assistance to establish new homes in the interior once the road was established. Several groups raised the need for there to be a change to the criteria for government housing loans and or the need for financial assistance to build new homes.

Summary results of focus groups

1 What is your biggest concern/ fear about coastal over wash and coastal inundation?

Malem Men's group #1	**Malem Men's group #2**
▪ Damage to: - Food crops - Housing ▪ Inundation of pig pens leading to contamination of area from animal waste and the outbreak of disease ▪ Safety of human life (dead or alive)	▪ Damage to properties/ housing ▪ Risk of fatalities from storm surge (where people are right near the coastline and waves are strong, or where strong winds bring down trees onto houses)
Malem Women's group #1	**Malem Women's group #2**
▪ Safety of the family ▪ Damage to properties/ housing/ food crops ▪ Damage to vehicles ▪ Damage to road	▪ Damage to: - Housing - Food and root crops ▪ Lives of families (safety)

Utwe Men's group #1	**Utwe Men's group #2**
▪ Damage to houses ▪ Food security	Coastal erosion: - Food security - Home safety Health issues Public infrastructure; - School - Utilities and water
Utwe Men's group #3	**Utwe Women's group #1**
▪ Impact on residences ▪ health issues ▪ infrastructure damage ▪ food security	▪ damage to environment, crops, roads, homes ▪ impact on health

2 What do you think is the answer to over wash/ coastal inundation is? What should the government do? What should families and businesses do?

Malem Men's group #1	**Malem Men's group #2**
▪ Government needs to: - relocate housing - improve the access road (main road) - immediately maintain power and water system (during a flood) - Establish a wave breaker - set policy direction ▪ There is a need for housing loans to promote movement inland ▪ Families need to promote a move inland by sharing access to interior land ▪ Relocation would be an opportunity for people to get into real estate and for people to lease out properties for business	▪ We need to relocate families, road and other utilities and infrastructure ▪ There is a need for technical assistance to facilitate relocation ▪ Government needs to access financial assistance to facilitate relocation ▪ We need to adjust the housing loan criteria to enable access to funds ▪ On the matter of relocation, we are concerned about the need for families on the coast to have access to land in the interior
Malem Women's group #1	**Malem Women's group #2**
▪ We need experts to inform relocation etc. ▪ Government needs to fund: - relocation - the building of a sea wall ▪ We need to conserve natural resources to better protect the coast: - Sand and gravel - Mangrove trees - River (canals)	▪ Government needs to: - strengthen/ add a seawall - strengthen enforcement of laws governing coastal activities eg., preventing sand mining ▪ Businesses need to help victims of inundation ▪ Families and business need to work together to develop inundation preparation plans and bring to local government ▪ In the aftermath of an inundation event, businesses need to assist affected families of inundation

Utwe Men's group #1 ▪ Relocate homes,. Businesses and infrastructure ▪ Climate proof the road	**Utwe Men's group #2** ▪ Relocate upland ▪ Build a wave breaker ▪ Enforce regulations
Utwe Men's group #3 Relocate – design and implement programmes for relocation	**Utwe Women's group #1** ▪ Relocate. ▪ Government should provide funding support (roads, power) ▪ Families should support relocation

3 If over wash and coastal inundation continue but nothing is fixed, what will happen to your family/ business? Would you stay?

Malem Men's group #1	**Malem Men's group #2**
If nothing changes: ▪ Families would suffer hunger (because of the impact on crops) ▪ Properties would be damaged ▪ The schools would be closed (because of lack of access) ▪ There would be no access to the public services (eg., hospitals) ⇨ Ultimately, people would have to out migrate from Kosrae ▪ Businesses would be harmed as food and commodities are spoiled. ⇨ Ultimately, they would go bankrupt	If nothing changes: ▪ We would need to out-migrate (abroad)
Malem Women's group #1	**Malem Women's group #2**
▪ If nothing changes, we would continue to have disruptions to family because of fear, hunger and death ⇨ We would definitely not be able to stay ⇨ Housing policies are needed to discourage housing construction near coast	▪ If nothing changes, family relationships disrupted or despair, which will lead to people to leave the island ⇨ We could not stay

Utwe Men's group #1	**Utwe Men's group #2**
▪ Continued damage to housing ▪ No more businesses ▪ A move to higher ground	[discussed in forum]
Utwe Men's group #3	**Utwe Women's group #1**
▪ Life is at risk. ▪ We could not stay	▪ Health issues ▪ Food problems ▪ Businesses affected

4 What do you think of the idea of establishing a new inland road? What would be the biggest change to you and your family/ or business?

Malem Men's group #1	**Malem Men's group #2**
▪ We support the idea of an interior road However: - Families tied could be weakened if people are not located close together as before. This would harm social events and functions - Families would face higher fuel expenses as they now live further away from facilities	▪ We support the idea of an interior road. We see advantages and disadvantages: - Advantages include that we could increase farming with improved interior access, we would have access to a clean environment and we would be safe - However, moving would be costly and there is a risk that – with freer access to the interior, people from other communities might trash the interior or might steal from others' inland farms
Malem Women's group #1	**Malem Women's group #2**
▪ We fully support the idea of an interior road because we know that we would be safe	▪ It is good to go ahead with an inland road because it will lessen their worries

Utwe Men's group #1	**Utwe Men's group #2**
▪ Healthier population ▪ Safety ▪ Cost savings (avoided damage) ▪ Lower transportation costs ▪ Incomes	100 per cent agree that we should move upland. This would lead to: ▪ Improved health ▪ Better food production ▪ safety
Utwe Men's group #3	**Utwe Women's group #1**
[discussed in forum]	▪ 100 per cent support relocation ▪ Cost – we need financial support

ANNEX 3 KOSRAE HOUSEHOLDER QUESTIONNAIRE ON COASTAL INUNDATION

The questionnaire was broken into three parts. Section targeted information on stakeholder connections to the area and their experiences of coastal inundation. This section also sought information on access to interior land by stakeholders as a means to indicate whether communities would have the opportunity to relocate if they chose.

Section B collected information about how families suffer as a result of coastal inundation. This section collected information on possible impacts in the form of harm to personal effects (possessions, crops etc.), how or if possessions were fixed/ replaced, clean up and evacuation impacts, injuries, loss of earnings and access to services and interruption to utilities and schooling. Section C invited any general comments community representatives wanted to share.

Data entry only
(questionnaire #)

Data entry only
Consultation session (village name): _____

KOSRAE HOUSEHOLDER CONSULTATION ON COASTAL INUNDATION

Date	

A PERSONAL BACKGROUND

The purpose in this section is to understand your connection to the area and your experiences of coastal inundation.

A1 Your name _____

A2 Your position in the household (circle)

head of household student/ youth Other (please state) _____

A3 Are you male or female? (circle) Male or Female

A4 Your village (eg., Utwe, Malem) _____

A5 Including yourself, how many people normally live in your house?

	Age	**Male/ female**
Person 1		
Person 2		
Person 3		
Person 4		
Person 5		
Person 6		
Person 7		

(Continue on another sheet if necessary)

A6 When did you come to live in this house? (circle/complete)

(i) Always lived here

(ii) Moved here from (town, island) _____ in (year) _____

A7 If you came here to live from elsewhere, why did you move here to begin with?

_____
_____

A8 Please indicate if you or your family own land elsewhere in Kosrae. Please give us a general idea of the location of the area (eg., coastal area near other village, interior etc.)

_____
_____

A9 Who in your family owns this land? (circle)

Me My parents Other (please indicate) _____

A10 Have you experienced coastal inundation (coastal floods) in this area in the past? (Circle) (If NO, go to Section C).

Yes No

A11 In what year did you last suffer a coastal inundation event?

_____

B PERSONAL IMPACTS FROM PREVIOUS INUNDATION EVENTS

The purpose in this section is to get an understanding of how families suffer as a result of coastal inundation. To answer these questions, it may help you if you think back to the last time a storm surge hit the area.

Personal effects

B1 In previous inundation events, did your house get harmed in anyway (flooded, damaged etc.)? If NO, go to question B2. If YES, please state how:

_____
_____
_____

B2 Please indicate any types of item that were destroyed or damaged. Eg., TV, telephone, refrigerator, Furniture, livestock/animals, cash crops that you were producing, subsistence crops, vehicles etc.). If NONE of your items were destroyed or damaged, please go to question B6.

_____
_____
_____
_____
_____

B3 How did you cover the cost of replacing or fixing the damaged items?

(i) Didn't replace/ fix (ii) Insurance (iii) Private savings

(iv) Extended family (v) Charity donations (vi) Government assistance

(vii) Other (specify) _____
_____
_____

B4 If you spent money to fix or replace items, roughly how much did you spend? _____

B5 Did you lose any items that are irreplaceable and difficult to value (photos, records, heirlooms etc.)? If YES, which items?

_____
_____
_____

B6 How many days did it take to clean up your house and land after the inundation? _____days

B7 Did you have to live somewhere else at any point because of the inundation? Yes No

If NO, go to question B11.

B8 If YES, why did you have to stay elsewhere? And for how long did you stay there?

I stayed away because _____
_____
_____

I stayed away for_____ days

B9 Did staying elsewhere cost you anything? If NO, go to question B11. If YES, what did you have to pay for?

_____
_____
_____

Physical impacts

B11 Did you or other members of your household suffer any sickness or injury because of the inundation? (circle) Yes No

If NO, go to question B14.

B12 If YES, what kind of the sicknesses/ injuries occurred (e.g., cuts, injuries and infections from slipping in the water, etc.)?

_____
_____
_____

B13 Did you have to pay for medical treatment as a result?(circle) Yes No

Earnings

B14 Were any of your household unable to work because of the inundation? Yes No

If NO, go to question B16.

If YES, why were they unable to work? (eg., road block, staying home to clean up etc.)

_____
_____
_____

B15 Roughly how many days did they miss? _____ days

Services and utilities

B16 Did you experience disruption in basic services? If YES, what services were disrupted? (Circle all that apply.)

Transport Water supply Electricity Telephone

B21 What problems did these outages cause you?

_____
_____

B22 On average, how long did you have to wait for the services to resume?

_____
_____
_____

B23 Did you have any issues with blocked roads because of the inundation? If YES, what problems arose?

_____
_____

B24 Did any children in the household miss any days of school as a result of the inundation?

If NO, go to Section C.

If YES, why? _____
_____
_____
_____

B25 How many children missed school? _____ children

B26 How many days did they miss each? _____ days

C FINAL COMMENTS

C1 Would you like to add any comments about the inundation?

_____
_____
_____
_____
_____
_____
_____
_____
_____

This is the end of questionnaire. The results of the survey will be made available to the government around October/ November 2015 and these will be released in a report that goes to the government later in the year.

If you would like to find out more about the survey, please contact in the first instance:

Mr Lipar George, Government of Kosrae

THANK YOU FOR HELPING US IN THIS WORK.

ANNEX 4 KEY QUESTIONS FOR FOCUS GROUPS

Consider the responses you have individually given in the questionnaire about coastal inundation in Kosrae. In your groups, please can you now discuss and consider the following questions. Please write your answers on the paper provided:

1 What is your biggest concern/ fear about coastal over wash and coastal inundation?

2 What do you think is the answer to over wash/ coastal inundation is?:

- What should the government do?
- What should families and businesses do?

3 If over wash and coastal inundation continue but nothing is fixed:

- What will happen to your family/ business?
- Would you stay?

4 What do you think of the idea of establishing a new inland road? What would be the biggest change to you and your family/ or business?

ANNEX 5 RESULTS TABLES

Base cases								
	Revetment with coastal road	Coastal road upgraded (elevated)	Inland road from 2017				Construction of inland road in 10 years' time (2026), 2 hhs move every 5 years	Construction of inland road in 20 years' time (2036), 2 hhs move every 5 years
			No maintenance of old road	10 years' maintenance of old road	20 years' maintenance of old road	50 years' maintenance of old road		
Total value impacts (discounted @10%)		1044630	728876	721995	719342	717876	1751859	3474953
Total value impacts (discounted @4%)		2091170	323598	313436	306571	297691	4473786	6249642
Total value impacts (undiscounted)		4631956	-1485983	-1499534	-1513085	-1548318	12472606	14305783
Total value benefits (discounted @10%)	-420837	3866497	4182251	4189132	4191785	4193251	3159268	1436174
Total value benefits (discounted @4%)	-1237609	5364262	7131833	7141995	7148860	7157740	2981646	1205790
Total value benefits (undiscounted)	-3462030	9907217	16025156	16023801	16023801	16087491	2066567	233390
Total value costs (discounted @10%)	919822	4165834	6256506	6256506	6256506	7803850	2476360	1855467
Total value costs (discounted @4%)	949418	4299875	6743591	6743591	6743591	9469265	4792047	3824014
Total value costs (undiscounted)	978816	4433016	7164390	7164390	7164390	11975235	7871462	7464550
NPV (discounted @10%)	-1340659	-299337	-2074256	-2067374	-2064721	-3610599	682908	-419294
NPV (discounted @4%)	-2187028	1064387	388242	398404	405270	-2311524	-1810401	-2618224
NPV (undiscounted)	-4440846	5474201	8860766	7529190	7534611	4112256	-5804895	-7231160
BCR (discounted @10%)	-0.46	0.93	0.67	0.67	0.67	0.54	1.28	0.77
BCR (discounted @4%)	-1.30	1.25	1.06	1.06	1.06	0.76	0.62	0.32
BCR (undiscounted)	-3.54	2.23	2.24	2.24	2.24	1.34	0.26	0.03

	Base case and sensitivity analysis						
	Inland road from 2017 old road abandoned, costs 10% higher	Inland road from 2017 with faster relocation (5 households every five years from five years after establishment)	Inland road from 2017 (no maintenance of old road; 1 hh moves every 2 years)	Inland road with slower relocation (no maintenance; 1 hh every 5 years after 5 years from establishment)	Partial inland road from Malem to Yeseng from 2017 (no maintenance of old road; 2 hhs move every 5 years)	Partial inland road from Malem to Yeseng from 2017 (no maintenance of old road; 1 hh moves every 2 years)	Inland road from 2017, (no maintenance of old road; 2 hhs move every 5 years) - slower agricultural production (4 acres per year)
Total value impacts (discounted @10%)	728876.23	671024.15	226237	725238	3175985	238397	1080810
Total value impacts (discounted @4%)	323598.44	64970.58	-1281213	289202	3287072	-221256	1365483
Total value impacts (undiscounted)	-1485982.84	-2433750.91	-5180973	-1641867	2996165	-1597236	969217
Total value benefits (discounted @10%)	4182251	4240103	4684890	4185888	1735141	1656578	3830317
Total value benefits (discounted @4%)	7131833	7390461	8736645	7166229	4168360	3783100	6089949
Total value benefits (undiscounted)	16025155.78	16972923.85	19720146	16181040	11543008	10132301	13569956
Total value costs (discounted @10%)	6753566	6256506	6256506	6256506	3745994	3745994	6256506
Total value costs (discounted @4%)	7283771	6743591	6743591	6743591	5026751	5026751	6743591
Total value costs (undiscounted)	7737193	7164390	7164390	7164390	7204799	7204799	7164390
NPV (discounted @10%)	-2571316	-2016403	-1571616	-2070618	-2010853	-2089416	-2426189
NPV (discounted @4%)	-151937	646870	1993054	422639	-858391	-1243652	-653642
NPV (undiscounted)	8287963	9808534	12555756	5530604	4338209	2927502	6405566
BCR (discounted @10%)	0.62	0.68	0.75	0.67	0.46	0.44	0.61
BCR (discounted @4%)	0.98	1.10	1.30	1.06	0.83	0.75	0.90
BCR (undiscounted)	2.07	2.37	2.75	2.26	1.60	1.41	1.89

DEPARTMENT OF FOREIGN AFFAIRS

of the

FEDERATED STATES OF MICRONESIA

P.O. Box P.S. 123
Palikir, Pohnpei FM 96941
Telephone: (691) 320-2641/2613 Fax: (691) 320-2933

8 July 2016

Mr. Naresh Sharma
Chair
Adaptation Fund Board Secretariat
C/O: Global Environment Facility Mail
N 7-700 1818 H Street NW Washington DC
20433 USA

Dear Adaptation Fund Secretariat Board,

The Government of the Federated States of Micronesia's (FSM) Infrastructure Development Plan (IDP) 2016-2025ranks as one of the most important and significant plans of the next 10 years for the FSM as a nation. It documents the priority projects in standalone State Plans providing a direct connection to communities and their needs. The Plan outlines a realistic level of funding representing 70 percent of FSM's infrastructure needs over a 10 years period. It is the first time a climate change adaptation project on infrastructure is included and is being implemented in the State of Yap. A second infrastructure climate change adaptation project is now planned for the State of Kosrae.

The State of Kosrae Legislature endorsed the construction of the Kosrae State inner roads as one of its top priority infrastructure projects and has declared its intention to mobilize all available resources, including development partners' support. The Legislative Resolution No. 11-106 adopted by the Eleventh Kosrae State Legislature, Fourth Special Session 2015 came as a result of a series of national, state and municipal level consultations on the impact of sea level rise on coastal roads, particularly at Malem and Utwe and the need for relocation of the roads. The State Government undertook a Cost Benefit Analysis, an Environmental Impact Assessment and a Monitoring and Evaluation Framework workshop and produced an Inland Road Relocation Initiative (IRRI) as a result of this priority. These are clearly linked to the IDP 2016-2025, Kosrae Shoreline Management Plan 2014 and the Kosrae Strategic Action Plan.

The FSM Government is committed to these State priorities and as a result will be holding a development partners forum this year which will present 2 priority projects from each of the four FSM States for support from partners. Cognizant of the Adaptation Fund to implement the strategies identified under IRRI, the government of Kosrae is including the IRRI as one of the two priority projects from Kosrae.

The Government of the Federated States of Micronesia wishes to take this opportunity to thank you Chair, and the Adaptation Fund Board Secretariat for assisting FSM in building our resilience and adapt to climate change.

Sincerely,

Lorin Robert
Secretary

Copy: Mr. KosimitiLatu
Director General
Secretariat of the Pacific Regional Environment Programme
Adaptation Fund Regional Implementing Entity
Vailima, Apia
Samoa

MALEM MUNICIPAL GOVERNMENT
OFFICE OF THE MAYOR
P.O. BOX 339
TOFOL, KOSRAE FM 96944
FEDERATED STATES OF MICRONESIA

TELEPHONE 691 370 450

July 06, 2015

General Endorsement from Mayor Jonas and Council Chairman Elesha.

It gives us great pleasure to communicate our full support and endorsement of the propose climate adaptation project now considered under the Climate Adaptation Fund.

We acknowledge and support the adaptation measure identified in the Kosrae State Shoreline Management Plan. We have lived in Malem our whole lives and have experienced the effects of rising sea level eroding our beach fronts, increased of rain fall with yearly inundation of our farm lands, inundation of certain road sections, especially at Paal and Mosral, and from damages these events brought to our homes and properties. Also a need to upgrade the existing road from Malem to Yeseng is a priority to relocate their settlements and infrastructure during the extreme climate events.

Responding to the unaddressed questions and issues arising out of the project proposal, representatives of the community have gathered tonight during our community consultation meeting to discuss these issues and provide their individual perspectives. This community consultation meeting witness the presents of the woman, person with disabilities, youth, senior citizens groups, community leaders , land owners and other stakeholders.

We recognize and take note of the full support and enthusiasm shown by the participants during the consultation. It is our objective that this message provide further evidence of our official support to the position taken by the community as represented by the parties mentioned above.

Grant Jonas
Mayor

Likiaksa Elesha
Council Chairman

UTWE MUNICIPAL GOVERNMENT
P.O. Box 447030
UTWE, KOSRAE STATE
FEDERATED STATES OF MICRONESIA 96944
Phone: (691) 370-3207; Fax: (691) 370-3000
OFFICE OF THE MAYOR

April 13, 2016

General Endorsement from Mayor Benjamin and Council Acting Chairman Andrew

We, the undersigned, on behalf of the People and Municipal Government of Utwe Municipality, Hereby express our full support and endorsement of the proposed climate adaptation project, namely, the construction of an inland road connecting Utwe to Malem and the rest of Kosrae. This project proposal, we understand, is put together by SPREP on behalf of the Federated States of Micronesia.

We acknowledge and support the construction of this inland road as a long term adaptation measure to climate change and sea level rise on our coastal village of Utwe. We are fully aware of the continuing erosion of our beach fronts, yearly inundation of our properties and the likely breach of the main road connecting our Utwe community to the rest of the island.

The construction of the inland road will ensure our community continued access to health, educational, commercial services and other critical services located in the northern parts of Kosrae. The construction of the inland road will also provide our people ease of access to Inland land areas for farming and development, and especially the opportunity to relocate upland from the coastal areas.

In these respects, we put our hands hereunder to show our official endorsement of the Proposed inland road project.

Patterson Benjamin, Mayor

Bruce Andrew, Council Acting Chairman

Kosrae Island Resources Management Authority
KOSRAE STATE GOVERNMENT
P.O. Box 480
Tofol, Kosrae State
Federated States of Micronesia 96944

September 15, 2016

Mr. Weston N. Luckymis
Director, DT&I
Kosrae State Government
Federated States of Micronesia

Dear Mr. Weston

I am glad to inform you that your application for your Malem –Utwe Inland Road Project had been reviewed and approved on November 18, 2015 by the Board of the Kosrae Island Resource Management Authority. The issuance of permit number KIRMA16-09IRP-01 (Inland Road Project) had confirmed the approval of the project. You may proceed with the project however you are requested to comply with the following permit conditions to minimize environmental impact.

Project proposal:

1. The proposed project will be upgrading total length pf 4.68 miles. 20 feet travel way and new road will be build with a total length of 2.77 miles, 20 feet travelled way. The inland road sections connecting the village in Malem and Utwe (Yeseng, Mosral, Kuplu, Sroanyap, Finsrem, and Finkol) Upgrading of the Inland Road will deal with sub base wearing course and to hot mix asphalt pavement.
2. During the development of the project the following list of materials will be used:
   a) Base Course
   b) Aggregate (gravel)
   c) Sand
   d) Reinforcing steel bars
   e) Lumbers
   f) Hot mix asphalt
   g) Cement
   h) Sub –Base Common fill material
3. The typical road cross dimensions are 20 feet travelled way, 12 inches thick sub base coarse, 6 inches base course and 2 inches Hot mix asphalt. Typical reinforced concrete box culverts are 3'x2'x 32' long, 3'x3'x32' long, 3'x4'32' long.
4. Public Utility will be needed during the development of the project, therefore temporary lightning will be secure and all public utility shall be protected.
5. Noise,Construction noise shall be controlled and minimize to prevent any unreasonable disturbance in residential areas, and near school and other areas used for community acitivities.

6. Safety: appropriate signage, temporary fencing and lighting shall be installed around development site to prevent and control movement of traffic and pedestrians.
7. Traffic management: appropriate signage and direction shall be provided to ensure that traffic, including pedestrian move safely.

1. Waste Management

1.1 The permit holder shall ensure that all waste materials generated during , or incidental to, the project are properly contained, managed and disposed of in accordance with the laws of the State of Kosrae.

1.2 All solid waste including, but not limited to, food scraps, paper wrapper, cans, bottles, and other trash generated from the project area shall be placed in closed container, and shall be emptied at the end of each working days.

1.3 The permit holder shall ensure that all hazardous waste generated during or incidental to, the project are stored in approved containers and properly labeled to identify the type of waste, including any hazards.

2. Hazardous waste includes, but is not limited to:

a) Any substance which is toxic, corrosive, an irritant, a strong sensitizer, flammable, combustible, or generates pressure through decomposition, heat or other means, if such substances or mixture of substances may cause substantial personal injury or substantial illness during or as proximate result of any customary or reasonably rorsesable handling or use, including reasonably foreseeable ingestion by children.
b) The permit holder shall comply with the requirement of the Pollution Regulations 2013, including providing notice to KIRMA in the event of the spill or release of pollutants, and the containment and remediation of spills.
c) The permit holder shall notify KIRMA of a proposed hazardous waste storage site and the site may not be used unless and until approved by KIRMA. Hazardous waste shall be transferred to appropriate secure storage container, which shall be stored inside an appropriate building or warehouse, or if outside covered by a heavy duty tarpaulin, on a concrete foundation surrounded by a concrete retaining wall, and with internal drainage that will prevent the outflow of contaminated water or other materials.

3. Sedimentation and Erosion Control.

3.1 The permit holder shall limit disturbance when exaction, preserved as much of the vegetated area as possible. Vegetation improves the appearance of the site, greatly reduces the erosion hazard and can be a very effective natural sediment filter.

3.2 Where possible to do so, divert upslope storm water around all lands that do not have a protective vegetative cover. Water sheeting over the ground is one of the most effective causes of soil erosion and should be minimized.

3.3 Install sediment fences down slope of all disturbed lands to filter coarse sediment before it gets into the gutters, drains, and watercourses.

3.4 Place all stockpiles totally on the site well away from drainage paths and, where they comprise erodible materials such as sand and soil, behind a sediment barrier, Ensure soil and cement bags are covered at the end of each day of development.

3.5 Limiting Exposed Area: All earthmoving activities shall be planned in such a manner as to minimized he area of disturbed land, mangrove, reef, or lagoon.

3.6 Velocity Control: All permanent facilities for the conveyance of water around, through, or from the project site shall be designed to reduce the velocity of flow in the facility to speed that will not cause significant erosion.

3.7 Stabilization: Within a section or area of the project, all slopes channel, ditches, or any disturbed area shall be stabilized as soon as possible after the final grade or final earthmoving has been completed.

3.8 Interim Stabilization: Where it is not possible to permanently stabilize a disturbed area immediately after the final earthmoving has been competed or where the activity stops for more than fourteen days, interim stabilization measures shall be promptly implemented.

3.9 Containment of fills and Reclaimed Land Within Bodies of Water or Tidal Zones: Before filling or development activities occur within a body of water or tidal zone, adequate seawalls and/or breakwater facility shall be constructed to safely contain the fill without failure and to prevent accelerated sedimentation.

3.10 Solids Separation: Runoff from a project area shall not be discharge into the waters of Kosrae state without effective means to prevent sedimentation.

3.11 Sedimentation Retention Boom: These facility must be used to restrict accelerated sedimentation around earthmoving or related activities on reefs or in lagoons in all cases, except when a finding has been made after actual demonstration that no facilities are needed to prevent accelerated sedimentation.

3.12 Solid Separation Facilities:

(i) A basin for settling solids out of water shall be structurally sound and have sufficient capacity to hold he water that drains into the basin until the solids have settled out.

(ii) The basin shall be cleaned when the settling of solid has reduced the capacity of the basin by 25 percent.

(iii) Outlet structure shall be designed to allow only adequate settled water to be discharged, and at a rate that will not cause accelerated erosion.

4. Restoration:

4.1 Stabilization: Upon Completion of the project, all areas which were disturbed by the project shall be stabilized so that accelerated erosion and. Or accelerated sedimentation will be prevented.

4.2 Interim Control Measure: Any erosion and sedimentation control facility required or necessary to protect areas from erosion during the stabilization period shall be maintained until stabilization is completed.

4.3 Final measures: Upon completion of stabilization, all unnecessary or unstable control facility shall be removed, the areas shall be graded, and the soils shall be stabilized.

4.4 The permit holder shall ensure that all stockpiles of materials, such as gravel or sand, are covered with heavy duty tarpaulins or another appropriate covers to prevent the spread of materials and erosion of the stockpiles.

5. Vegetation Protection and Invasive Species:

5.1 The permit holder shall ensure that mature trees are protected from the impacts of construction activities, including by the marking our of exclusion zones around mature trees.

5.2 Vegetation is not permitted to be removed within a 15 meter buffer along streams or rivers, unless authorize by the State Forester.

5.3 All equipment, including but not limited to excavators and dump trucks, and all materials shal be cleaned before or after transporting from one site to the development site.

6. Historic Resources:

6.1 The permit holder shall immediately stop construction activities in the vicinity of such find if any historic resource is found, and shall notify the Historic Preservation Office at 37—3078 or Mr. Standon Andrew at 370-6300 after working hours.

6.2 Construction activity may not resume in the vicinity of the historic resource until the Historic Preservation Office advises that a resumption of activity is permitted.

6.3 All historic resources shall be presumed to be the property of the Historic Preservation Office, on behalf of the Kosrae State Government.

7. Monitoring and Compliance with the Law:

7.1 The permit holder shall consent to an authorized representative of KIRMA entering the work site, or any area where materials to be used in the project are held, stored or prepared, for the purpose of monitoring compliance with the conditions of this permit, environmental conditions, investigating any alleged non compliance with the permit or the laws and regulations of the State of Kosrae.

7.2 Permit holder shall comply with the applicable laws and regulation of the State of Kosrae and the Federated States of Micronesia.

7.3 Permitting Unit or representative from the program office shall have access to the project site to monitor and ensure that all conditions are complied accordingly.

8. Validity, Suspension and Cancellation:

8.1 This permit is valid from the date of commencement until the project is completed.

8.2 The permit may be suspended by KIRMA if KIRMA commences investigation into the permit holder's compliance with the conditions of the permit, or a relevant law.

8.3 The permit may be cancelled by KIRMA if:

(i) The permit holder is found to have breached the conditions of the permit; or

(ii) The permit holder is found to have breached any applicable law or regulation.

8.4 Reasonable efforts shall be made by KIRMA and the permit holder to negotiate remediation of any non-compliance with the conditions of the permit, or a relevant law or regulation, prior to KIRMA proceeding with a suspension or cancellation of the permit. The program office shall have the rights to amend and implement new conditions base on the findings or result of the environmental impact experience during the project.

8.5 The permit holder shall immediately cease construction activities on being notified in writing by KIRMA of the suspension or cancellation of the permit.

8.6 The permit shall be construed in accordance with the laws of the State of Kosrae.

8.7 All rocks, filling materials, sands shall come from KIRMA approved projects only.

Respectfully yours

Robert H. Jackson
Program Director, KIRMA

KOSRAE STATE
FEDERATED STATES OF MICRONESIA
KOSRAE ISLAND RESOURCE MANAGEMENT AUTHORITY

DEVELOPMENT REVIEW PERMIT

~~KIRMA16-09IRP-01~~
Permit Number

Mr. Weston Luckymis (Name of Applicant) of **Lelu** (Municipality) is hereby granted permission to Malem-Utwe Inner Road Projec (Description of Activity) at Malem-Utwe Municipality (Location)

Subject to the requirements of the Federated Sates of Micronesia code and Kosrae State Code and regulations of the Kosrae Island Resource Management Authority and special requirements under this permit, as listed on the attached letter (if any).

This permit may be revoked at any time by a duly authorized representative of the Authority, for non-compliance with the Federated States of Micronesia code and Kosrae State Code and regulations of the Kosrae Island Resource Management Authority, K.S.C. Title 7, Chapter 4.

~~September 15, 2016~~
Date of Issue

Daniel Thomson
Chairman, KIRMA or His/Her Authorized Representative

THIS PERMIT SHALL BE POSTED FOR PUBLIC DISPLAY
PERMIT VALID FOR ONE YEAR FROM DATE OF ISSUE

KOSRAE ISLAND RESOURCE MANAGEMENT AUTHORITY

ENVIRONMENTAL IMPACT ASSESSMENT IN THE STATE OF KOSRAE, FSM

2014

Table of Contents

Acknowledgements

These EIA Guidelines 2014 were prepared by Blair P. Charley (KIRMA GIS Specialist and Forest Legacy Program Officer) and the employees of the Kosrae Island Resource Management Authority, following the Workshop for Mainstreaming Sustainable Land Management and Climate Proofing Principles, Objectives and Best Practices into EIA Guidelines at Chuuk in May 2012, organized by the FSM Office of Environment & Emergency Management (OEEM) and sponsored by the FSM Sustainable Land Management Project and Secretariat of the Pacific Regional Environmental Programme (SPREP). Additional assistance and guidance was provided by Ms. Emily Gibson of the Australian Volunteer International and SPREP's Environmental Governance and Monitoring Division, and supported by the Pacific Adaptation to Climate Change Program - Kosrae.

Cover photo: Lelu Island from Mt Oma, Emily Gibson.

Abbreviations

DREA	Department of Resources and Economic Affairs
FSM	Federated States of Micronesia
GIS	Geographical Information System
KIRMA	Kosrae Island Resource Management Authority
KLUP	Kosrae Land Use Plan
KSBAP	Kosrae Strategic Biodiversity Action Plan
KSC	Kosrae State Code
KSMP	Kosrae Shoreline Management Plan (2014)
NBSAP	National Biodiversity Strategic Action Plan
PACC	Pacific Adaptation to Climate Change Program
Regulations	*Regulations for Development Projects*
SPREP	Secretariat of the Pacific Regional Environmental Programme
SWARS	State-wide Assessment and Resources Strategy for Forest

Note: legislative references throughout this Guideline are to the Kosrae State Code, and Regulations for Development Projects, unless otherwise indicated.

Governor's Acknowledgement

The living wealth of our island State is our environment and natural resources. Maintaining the habitats and ecosystems that nurture these is vital for improving the quality of life of our people and sustaining our traditions. It is profoundly significant that we uphold and implement our Environmental Impact Assessment (EIA) policy to conform social and economic developments to environmental safeguarding and thereby ensuring sustainable development. Impacts from development on the environment are ever increasing; in view of the fact that development and urbanization are an ever – rapidly growing process here in the Micronesian islands, moreover the Pacific region. Our island sustains us, and it is highly crucial that we constantly direct environmental impact assessment, a priority in our strive to maintain the integrity of ecological services and diversity of natural resources; and in our aspirations for sustainable development.

As a developing State of the Federated States of Micronesia (FSM), and particularly vulnerable to adverse effects of climate change, we must address adaptation measures in the context of our critical overarching goals. Sea level rise is accelerating and already having significant effects on our human - coastal communities, infrastructures, and coastal ecosystems. While we implement environmental assessment on development projects, it is highly significant to consider viable scopes to employ environmental assessment guidelines as a vehicle for enhancing resiliency to the impacts of climate change.

I am pleased to present these EIA Guidelines for use here in Kosrae State, FSM. The development of these EIA Guidelines will strengthen our capabilities to conduct environmental assessments and serve as a valuable reference for decision-makers and developers alike. It shall further serve to inform the general community of our EIA process and requirements. We must use these Guidelines to inarguably ensure that environmental considerations are explicitly considered and incorporated into the development decision making process.

I acknowledge the Board and Management of the Kosrae Island Resources Management Authority (KIRMA) for their leadership in directing the development of these Guidelines and also, I thank tremendously, the staff of the KIRMA Environmental Assessment and Permitting Unit, with assistance from Ms. Emily Gibson, Australian Volunteer International (AVI) for their diligence to seeing that this Guidelines document is produced and finalized. All stakeholders from various the Departments, Agencies and Non-Governmental Organizations that have contributed their valuable time, collective ideas and effort throughout the consultations to produce this document are gratefully acknowledged as well.

I thank and extend my profound gratitude to the Office of Environment & Emergency Management (OEEM) of our National Government for their guidance and enabling support to getting funding from the United Nations Convention to Combat Desertification to the state-level to support the development of these Guidelines under the FSM Sustainable Land Management Project. The Secretariat of the Pacific Regional Environment Programme (SPREP) has provided technical assistance to support the development of these Guidelines, and I thank SPREP very much also for their assistance.

Kulo ma lulap,

_____ _____

Honorable Lyndon H. Jackson Date

Governor

PART 1 KOSRAE'S EIA SYSTEM

1.1 Introduction

1·1·1 Legal and Institutional Framework

Each of the four States of the Federated States of Micronesia (FSM) is responsible for regulating environment-related issues within its jurisdiction, with the exception of the "ownership, exploration, and exploitation of natural resources within the marine space of the FSM beyond 12 miles from island baselines" and "powers of such an indisputably national character as to be beyond the power of a state to control" such as a prohibition on radioactive substances (*Constitution of the Federated States of Micronesia* 1987, Article VIII Sections 1 and 2). Each of the four States function as a semi-autonomous government, with the national government retaining responsibility for negotiating and entering into multilateral environmental agreements (MEAs), and acting as the national focal point, on behalf of the States (NBSAP, 2002).

The Kosrae Constitution (1984) recognizes the rights of citizens "to a healthful, clean and stable environment" and the principle of sustainable development:

> "*while providing for the orderly development and use of natural resources, the State Government shall by law protect the State's environment, ecology, and natural resources from impairment in the public interest*" (Article XI Section1).

Kosrae has enacted legislation and prepared a range of resource and management plans to give effect to its' responsibilities in relation to the management, protection and conservation of the environment and natural resources. These responsibilities are principally implemented by the Kosrae Island Resource Management Authority (KIRMA), a semi-autonomous government agency, which is mandated to:

> "*protect the environment, human health, welfare and safety and to abate, control and prevent pollution or contamination of air, land and water by balancing the needs of economic and social development with those of environmental quality and adopting regulations and pursuing policies which, to the maximum extent possible, ensure that economic and social development is environmentally sustainable*" (Kosrae State Code, Section 19.101).

KIRMA's responsibilities and powers are consolidated in Title 19 of the Kosrae State Code (KSC), including the requirement to "*adopt and provide for the continuing administration of a development permit system, including the requirement of development proposals, for the construction, expansion or alteration of a development, including alteration of land or marine space, that may significantly affect, directly or indirectly, natural or historic resources, significantly alter the landscape or be incompatible with surrounding air, land or water uses*" (Section 19.102(b)). The development permit system and environmental impact assessment (EIA) requirements are provided in Chapter 2 of Title 19 and the *Regulations for Development Projects* that were promulgated under Chapter 2 and amended in January 2014 to mainstream climate change considerations.

Two additional provisions of Title 19 require project proponents to inform and consult with KIRMA; firstly proposed developments or activities that may affect the environmental quality of the fishery waters and developments (Section 19.303), and secondly, activities that will affect antiquities and traditional culture (Section 19.402). The information and consultation process has been absorbed within the approval process for the Regulations for Development Projects.

The Kosrae Land Use Plan (KLUP), developed in 1993 and revised in 2003, is a type of strategic environmental assessment, which means that it explicitly considers environmental issues as part of an over-arching government policy. The KLUP provides guidance for decisions in relation to development within Kosrae and the issue of development and conditions thereof. The KLUP aims to:

- Assist with the orderly physical development of the resources of Kosrae;
- Protect ecologically important or unique natural resources and habitat areas;
- Assist with the review and permitting of development projects; and
- Provide guidelines for the sustainable use of natural resources in development projects.

The recommendations and restrictions identified in the KLUP in relation to active use districts, special consideration districts, and areas of particular concern are taken into account by KIRMA in determining whether and where particular types of development are appropriate.

1.1.2 Use of this Guideline

The Guidelines for Conducting EIA in the State of Kosrae is intended for use primarily by KIRMA's Permitting Unit and other related governmental agencies and non-governmental organizations engaged in environmental assessments and impact mitigation. The Guidelines may also be used as a reference document for developers and investors (project proponents), EIA consultants, and the general community to ensure they understand Kosrae's EIA process and requirements.

The first part of the Guideline explains the procedure to be followed when a project proponent proposes an activity or development that may have a significant impact on the environment, and should be read in conjunction with Title 19 of the Kosrae State Code and the *Regulations for Development Projects*.

1.2 What is an EIA?

Environmental Impact Assessment or "EIA" is defined in the *Regulations for Development Projects* as:

> "*the process by which all environmental, social, cultural, and economic impacts of a project, including project alternatives, are identified and analyzed before the decision to approve the project is made. The EIA is used to predict the likely economic, social, cultural and ecological consequences of a proposed activity; that is, the effect on the environment. The EIA is also used to assess the effects of natural change, impacts of extreme weather and climate events, and climate change on the proposed activity and the need to incorporate adequate climate change adaptation measures for the proposed operating life of the project. The EIA is intended to take*

a precautionary approach to help in planning to prevent or reduce adverse effects to acceptable levels, including the potential for maladaptation, before investment is committed." (Regulation 1.4(l))

The EIA analyses the impact of a development on the existing environment. The project proponent prepares a document called an Environmental Impact Statement ("EIS"), that addresses the physical, ecological, aesthetic, cultural, economic, social, or health effects or impacts of a proposed activity on the environment, whether direct, indirect or cumulative. The EIS describes the potential effects or impacts on the environment in sufficient detail so as to allow the assessors (KIRMA, the Board of Commissioners, and stakeholders) to make a comparison of the alternatives that can be taken to avoid, minimize, rectify, reduce or eliminate, or compensate for the impact of the proposed activity. This assessment process concludes with a decision by the Board of Commissioners to issue a development review permit, subject to conditions that will avoid, minimize or eliminate the effects or impacts of the proposed activity on the environment.

1.3 Kosrae's EIA Process

1·3·1 Introduction

Kosrae's EIA process is intended to help project proponents and government decision-makers to make timely decisions about development proposals with an understanding of the environmental consequences of their respective actions or decisions, and to take actions consistent with the goal of protecting, restoring, and enhancing the environment. The process also allows for stakeholder participation in the process, through providing information about development proposals and allowing stakeholders to make comments about proposals.

The EIA process is illustrated in diagram on the following page.

1·3·2 Outline of EIA Process

Step 1 – Consultation and Preparation of Application

The first step in the EIA process is for the project proponent to have an initial discussion with the Program Office, KIRMA's Permitting Unit, to determine whether a development review permit is required.

Permits are required for the following activities:
(a) Projects involving earthmoving activities;
(b) Projects located within a "coastal development risk area". Note: this area is illustrated in the "Coastal Development Risk Area Map", which is provided as Schedule 1 to the Regulation;
(c) Projects which cost over $5,000;
(d) Projects which are incompatible with surrounding land uses;
(e) Projects involving the disposal or removal of dredged materials, including all sand-mining operations;

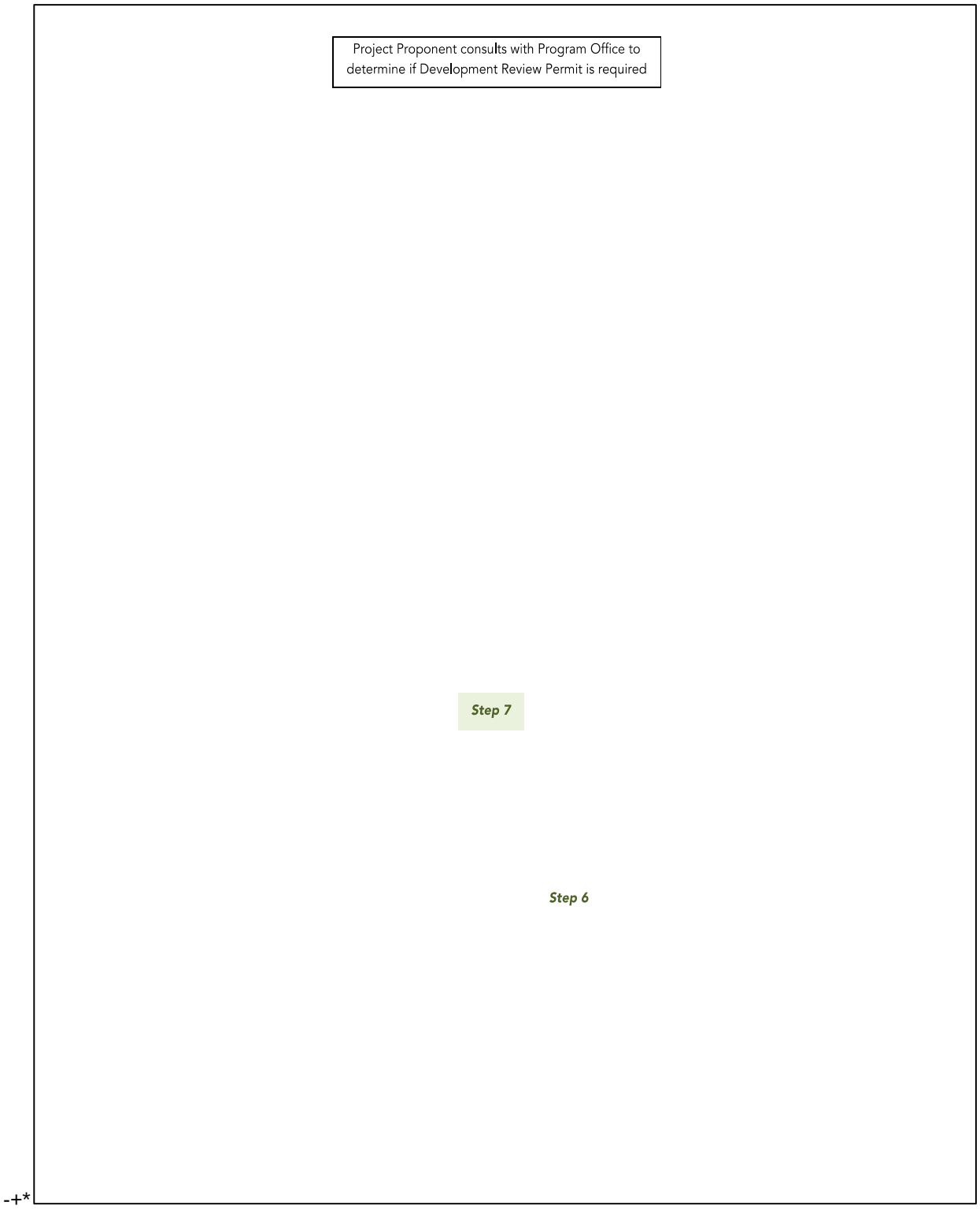
(f) The use, handling and disposal of toxic or hazardous chemicals, pesticides, petroleum, oil and lubrication; and

(g) *Projects involving the commercial harvest of aquatic, marine or timber resources (Regulation 3.1).*

There are exemptions for small-scale agricultural purposes and modifications to residential buildings.

There is also a requirement to notify KIRMA of any development or activity that is likely to have a significant impact on the environment, even if it doesn't fit in one of the above categories (Regulation 3.1A).

Diagram 1: Kosrae's EIA Process



Step 2 – Submission of Application and EIA Checklist

If advised that an application is necessary, the project proponent must then prepare and submit an application for a development review permit and an Initial EIA Checklist. Regulation 3.3 specifies the information that must be provided.

The aim of the Initial EIA checklist is to help the project proponent identify potential environmental impacts, so that they consider avoidance, adaptation and mitigation measures at an early stage in project development (Regulation 2.1).

Copies of the Application and Initial EIA Checklist are provided in Appendices 2.1 and 2.2.

Step 3 – Review of Application by Program Office

The Program Office then reviews the application and Initial EIA Checklist. The Program Office will refer the application to other Units of KIRMA such as the Marine Conservation Surveillance Unit, the Forestry and Wildlife Unit and Historic Preservation Office for comments and proposed conditions.

If the checklist indicates that the proposed activity is likely to have a significant impact on the environment, including the triggers specified at Regulation 4.1, then the Program Office will determine and advise the project proponent of the scope of the EIS to be prepared.

If an EIS is not required, the Program Office will compile the comments from other Units and prepare recommendations for the KIRMA Board (proceed to Step 7).

Determining whether an impact is significant includes considering the following:	
(i) The number of people affected;	*(ii) The duration of an effect (short and long-term);*
(iii) The proportion of a natural resource that is damaged or consumed;	*(iv) The location of a project in a sensitive area (historic site, coastal area, marine conservation area);*
(v) The relationship to other components of the project or other projects in the region; and	*(vi) The intensity of severity of an impact (irreversible and cumulative).*

Key screening and scoping issues

The Program Office screens each application based on the information provided in the application and the Initial EIA Checklist. If the project appears likely to have a significant impact on the environment, the Program Office will identify the "scope", or range of actions, alternatives, and impacts to be considered in the EIS by the project proponent. This assists the project proponent to address the issues of concern.

Some of the important environmental impact issues that must be considered by project proponents when developing a project and preparing an EIS are outlined in Table 2.

More information about environmental impacts, grouped around the sustainable land management themes, and the existing plans, policies, laws and regulations that aim to avoid, minimize or compensate for these impacts are provided in Appendix 2.3.

In addition, there are numerous existing resources that provide guidance to KIRMA, other agencies, and project proponents. These include a range of plans and policies about development issues and their impacts on the environment. These are summarized in Appendix 2.4.

There are also a number of existing monitoring programs undertaken by KIRMA and its partner agencies. These programs provide baseline information about the state of the environment and change over time, and could also be used by project proponents to gain a greater understanding of the Kosraean environment, as well as the potential impact of proposed activities on the environment. Examples of these monitoring programs are provided in Appendix 2.5.

Table 1: Key environmental considerations

Key Issues	Impacts	Mitigation	Avoidance
Earthworks, including compaction or filling	*Disturbance of soil can cause erosion and sedimentation, which results in the loss of nutrient-rich topsoil, and when discharged into a stream or river and ultimately the reef flats can smother fragile aquatic organisms and sea grass beds. Earthworks can also change the flow of surface water and groundwaters.* *In filling of mangroves areas reduces the coastal protection provided by healthy mangrove ecosystems.*	*All projects with earthmoving must have an Erosion and Sedimentation Control Plan. This requires the project proponent to consider how erosion might be caused during construction and to implement measures to minimize erosion.*	*There are restrictions on earthmoving in the steep upland forests, watershed areas and coastal areas, and alterations to the course of streams and rivers are prohibited.* *Permit conditions prohibit earthmoving activity on rainy days.*
Clearance of Vegetation	*Removal of vegetation can cause erosion and sedimentation, as the plants no longer protect the topsoil from the impacts of wind and heavy rainfall. It also affects nutrient cycling, and causes loss of soil fertility, a reduction in storage organs for carbon sequestration, loss of habitat for fauna and creates more extreme micro-climatic conditions.* *The poorly-managed selective removal of favored species can cause the loss of this species and its' replacement by a less favored species.*	*Conditions on the commercial harvest of timber are based on principles of sustainable forest management.* *Project proponents could consider offsetting the clearance of vegetation by replanting degraded areas, planting buffers around the development, and replanting after construction.*	*There are restrictions on clearing vegetation along streams and rivers, as well as in steep upland forests and watershed areas.*
Spread of Invasive Species	*Invasive species, whether plants, animals or diseases, can affect staple crops and trees that are relied upon by the local community for subsistence and small export market. Invasive species can also impact on native biodiversity and conservation values.*	*Invasive species eradication and control programs are being implemented for several priority species.*	*Biosecurity requirements and permit conditions require the inspection of machinery and equipment to prevent the introduction of potentially invasive species.*
Overharvesting of natural resources	*The unsustainable harvest of terrestrial and marine species means that the activity will provide only a short-term rather than on-going benefits to the local economy. The overharvesting of species also disrupts local ecosystems and food chains, which may impact on the ability of the favored species to recover.*	*Catch and size limits and closed seasons are in place for some species, while certain damaging harvest methods are prohibited.*	*Management plans for the sustainable harvest of natural resources, based on sound and up-to-date scientific data, must be in place before natural resources harvest activities can commence. These plans provide the basis for the development of economically feasible projects.*
Disposal of waste – municipal and hazardous	*The inappropriate disposal of municipal waste and hazardous substances causes contamination of land and waters, as well as impacting the health of the community*	*Permit conditions can impose discharge limits on the release of hazardous substances and require the project proponent to export hazardous substances*	*Project proponents should aim to substitute potentially polluting substances with less harmful ones.*

	and the plants and animals it relies upon for subsistence.	*generated in the activity to an appropriate handling and disposal facility.* *Regulations for pollution require a proactive response to pollution events, while there are controls on the use of certain pesticides and ozone-depleting substances.*	
Climate change	*Changes in climate patterns are impacting on rainfall, as well as the frequency of extreme weather events. Since most development activities are in vulnerable coastal areas, they are particularly susceptible to these impacts and projected sea level rise.*	*Buildings and infrastructure should be designed to cope with rainfall extremes.* *Buildings and other infrastructure should be sited away from vulnerable coastal areas or designed to cope with potential impacts over their intended life.*	

Step 4 – Environmental Impact Statement

If required, the project proponent must prepare an EIS, addressing the issues (or scope) identified by KIRMA. Generally, an EIS must contain:

(a) Brief summary of the proposed action and its consequences (including the major conclusion of the EIS, areas of controversy, issues to be resolved, the choice among alternatives, and mitigation of unavoidable significant impacts);

(b) Description of the proposed project (including the goals and objectives of the project, specific location and boundaries of the project (including a topographic map or GIS file where possible), impact on natural resources and duration of project, and the specific requirements for utilities and infrastructure);

(c) Description of the environment (including the natural and man-made environment and in particular sensitive areas such as historical sites, endangered species and socio-cultural resources, and inconsistencies between the proposed project and current land-use plans and policies);

(d) Environmental impacts (including the direct or indirect impacts on natural resources, ecological systems, environmental quality and physical resources, socio-economic and socio-cultural impacts and cumulative impacts);

(e) An analysis of project alternatives that might reduce environmental impacts (including mitigation and adaptation measures); and

(f) A list of individuals and organizations consulted.

Refer to Regulations 5.2, 5.3 and 5.3A for more detail.

There are numerous government agencies and civil society groups who may be consulted by the project proponent. These include:

- *Department of Health*
- *Department of Resources and Economic Affairs*
- *Department of Transportation and Infrastructure*
- *Department of Resources and Development (FSM National Government)*
- *Office of Environment and Emergency Management (FSM National Government)*
- *Municipal governments*
- *Municipal Resource Management Committees*
- *Pacific Adaptation to Climate Change – FSM*
- *Disaster Coordination Office*
- *Kosrae Conservation and Safety Organization*
- *Yela Environmental Landowners Authority*
- *Kosrae Women's Association*
- *Chamber of Commerce*
- *Kosrae Women's Christian Association*
- *Municipal church groups*
- *Municipal fishing associations*
- *Municipal recreation associations*
- *Kosrae Village Ecolodge*
- *Nautilus Resort*
- *Pacific Treelodge Resort and Micronesia EcoDive*

Step 5 – Draft EIS and Consultation

KIRMA will determine whether a public hearing or consultation is required. This will be the case if the project is likely to create public controversy or meets the criteria in Regulation 4.1.

The project proponent will be required to provide the completed draft EIS to KIRMA, key stakeholders (such as other government departments and community members who indicate their objection to the project) and make it available for public consultation. Stakeholders and the community will have a minimum of 30 days to provide comments on the proposal. KIRMA will compile these comments, together with comments from its own Units, and provide these to the project proponent.

Step 6 – Final EIS

The project proponent must then review the EIS in light of the comments received and prepare a Final EIS. The Final EIS must contain a response to all of the comments received. The Final EIS must be provided to KIRMA and released to the public. KIRMA's Units and the community then have 14 days to provide comments.

Step 7 – Assessment and Decision

The Program Office compiles all of the comments received on the Final EIS and prepares final recommendations to the KIRMA Board. The Board has 14 days from receiving the Program Office's final recommendations on the Final EIS to make a written decision on whether to approve or disapprove the proposed project and to specify conditions. Conditions can include environmental management and monitoring plans and all projects involving earthmoving are required to have an Erosion and Sediment Control Plan (Regulation 6.2(b)).

Step 8 – Appeal

The project proponent has the right to appeal the decision of KIRMA Board, by requesting a review of the decision in writing within 30 days of the decision being made.

In addition, any one affected by the decision of KIRMA also has the right to request review of the decision under the Administrative Procedures Act (Title 2 Chapter 4), which includes agency review and further rights of appeal to the Kosrae State Court and Supreme Court of the FSM.

Step 9 – Monitoring and Enforcement

The Program Office is responsible for monitoring development projects to ensure that all permit and operating conditions are met (Regulation 3.11). Permit holders who are found to be in breach of their permit are subject to administrative, civil and criminal penalties, including suspension and cancellation of their permit and fines of up to $10,000 per day.

(a) "Acceptable level" means that:
   (i) All significant environmental effects that can feasibly be avoided have been eliminated or substantially lessened.
   (ii) KIRMA, or the Program Office, have found that any remaining, not feasibly avoidable significant impacts are acceptable considering the balance of the benefits of a proposed project against the not feasibly avoidable environmental risks.

(b) "Areas of Particular Concern" mean areas depicted in the Land Use Plan signifying importance to the health of the environment or lifestyle of Kosraeans. Until the Land Use Plan is officially adopted, "areas of particular concern" will include mangroves, coral reefs, harbors, shorelines, and any historical site.

(c) "Climate change" means a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

(d) "Climate change adaptation measures" mean responses that seek to reduce the vulnerability of natural and human systems to existing and changing climate and weather variability and extremes, and minimize the predicted impacts.

(e) "Cumulative impact" means the impact on the environment, which results from the incremental impact of an activity when added to other past, present, and reasonably foreseeable future activities regardless of what agency or person undertakes such other activities. Cumulative impacts can result from individually minor but collectively significant activities taking place over a period of time.

(f) "Cultural impact" includes the impact of a proposed development or activity on sites registered or eligible for registration as an historic property, and the impact on intangible cultural heritage.

(g) "Development Project" means any plan, proposal or intention by any person to embark on any activity, scheme, construction, development, or undertaking. It includes, but is not limited to, activities such as the:
   (i) Construction, alteration, movement, fill, removal, disposal or any other modification to the land, coastal or marine area;
   (ii) Installation, placing or building of surface structure, land reclamation, navigational channels, harbors, utility lines, piers, shopping centers, clearing land, causeways, golf courses, apartment complexes, hotels, schools, roads, parking area, or any other similar activity;
   (iii) Commercial harvesting of marine resources and/or aquaculture or mariculture of marine resources (including where a permit may be required under Title 19 Chapter 3);
   (iv) Harvest of mangrove or other timber resources (including where a permit may be required under Title 19 Chapter 8).

(h) "Development review permit" means a permit issued by KIRMA for an activity or development in accordance with the *Regulations for Development Projects*.

(i) “Earthmoving” means any construction or other activity which disturbs or alters the surface of the land, a coral reef or bottom of a lagoon, including but not limited to excavations, land development, subdivision development, mineral extraction, ocean disposal, and the moving, depositing, or storing of soil, rock, coral or earth.

(j) “Effects” means direct or indirect results that are reasonably foreseeable, are caused by an activity and occur either close to the time and place of the activity, or are manifested at a subsequent time. Effects may include development effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects of the air, land and water and their associated natural systems and ecosystems. The effects of an activity may also be subject to climate change impacts such as sea level rise, extreme swell events and increased frequency or intensity of typhoon events. Effects and impacts used in the *Regulations for Development Projects* have the same meaning. Effects may be physical, ecological, aesthetic, cultural, economic, social, or health, whether direct, indirect, or cumulative.

(k) “Environment” includes the physical, biological, heritage, cultural, social, health, safety and economic aspects of human surroundings, including the wider ecological and physical systems within which humans live. It includes any waters, including surface water, marine water, ground water or drinking water supply, and the land surface and substrata, any ambient air, and any organisms within the State of Kosrae.

(l) “Environmental Assessment” or “EA” means the completion of a Development Review Permit Application and subsequent critical review by the Program Office staff to determine if a more comprehensive EIS should be conducted.

(m) “Environmental Impact Assessment” or “EIA” means the process by which all environmental, social, cultural and economic impacts of a project, including project alternatives, are identified and analyzed before the decision to approve a project is made. The EIA is used to predict the likely economic, social, cultural and ecological consequences of a proposed activity; i.e. the effect on the environment. The EIA is also used to assess the effects of natural change, impacts of extreme weather and climate events, and climate change on the proposed activity and the need to incorporate adequate climate change adaptation measures for the proposed operating life of the project. The EIA is intended to take a precautionary approach to help in planning to prevent or reduce adverse effects to acceptable levels, including the potential for maladaptation, before investment is committed.

(n) “Environmental Impact Statement” or “EIS” means a comprehensive and detailed document that describes a proposed development project, the types of impacts likely to be caused by the proposed project, consequences of those impacts and ways to modify the project or otherwise to lessen the impacts. The requirements of an EIS are listed under Part VI of the *Regulations for Development Projects*.

(o) “Erosion” means the natural process by which the surface of the land is worn away by the action of water, wind or chemical action.

(p) “Feasible” means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social and technological factors.

(q) “Human environment” means the natural and physical environment and the relationship of people with that environment.

(r) “Kosrae Island Resource Management Authority” or “KIRMA’s Board” means the five-member group appointed by the Governor that is responsible for overseeing the wise use and protection of Kosrae’s resources, balancing the needs of economic and social development with those of environmental quality and respect for traditional ways.

(s) “Maladaptation” means any change in natural or human systems that inadvertently increases vulnerability to the effects of natural change, impacts of extreme weather and climate events, and climate change; an adaptation that does not succeed in reducing vulnerability but increases it instead.

(t) “Mitigation” means the reduction in the adverse effects of a proposed action by considering the following in sequential order:

  (i) Avoiding the impact altogether by not taking a certain action or parts of an action (i.e. building in another location or not at all);

  (ii) Minimizing impacts by limiting the degree or magnitude of the action and its implementation (i.e. scaling down a project size or impact);

  (iii) Rectifying the impact by repairing, rehabilitating or restoring the affected environment (i.e. return impacted area to original state or close to it); and

  (iv) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action by monitoring and taking corrective measures (i.e. repair siltation screens and continually implement ways to reduce impacts); and if none of the other are possible;

  (v) Compensating for the impact by replacing or providing substitute resources or environments (i.e. repair lost function and values of impacted areas).

(u) “Person” means an individual, partnership, trust, corporation, association, clan, lineage, or any other private entity, a government or any of its subdivisions or entity thereof.

(v) “Practicable” means available or capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

(w) “Precautionary approach” means that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

(x) “Program Office” means the staff of the Kosrae Island Resource Management Authority and other staff who are delegated by the Program Director to assist in their duties.

(y) “Scope” means the range of activities, alternatives, and impacts to be considered in an environmental impact assessment. Scoping is a process whereby the range of impacts and alternatives to be considered in the EIS are defined.

(z) “Significant impact” is defined in the context of considering the harmful results of a development project on the human and natural environment. In determining whether an impact is significant, the following criteria may be considered:

(i) The number of people affected;

(ii) The duration of an effect (short and long-term);

(iii) The proportion of a natural resource that is damaged or consumed;

(iv) The location of a project in a sensitive area (historic site, coastal area, marine conservation area);

(v) The relationship to other components of the project or other projects in the region; and

(vi) The intensity of severity of an impact (irreversible and cumulative)

PART 2 Appendices

2.1 Initial EIA Checklist

Regulations for Development Projects – Initial Environmental Impact Assessment Checklist

The Initial EIA Checklist must be submitted to the Program Office with each application for a development review permit.

Project Proponent: _____

Person(s) completing EIA Checklist: _____

Project Name: _____ Project Number: _____

Instructions: indicate, to the best of your knowledge, whether the proposed project will have the following effects or impacts.

Environmental Impacts – will the proposed project result in…		*Yes*	*No*	*May be*
Earth	a. Destruction, covering or modifications of any unique geological or biophysical features?			
	b. Contamination of soils or disturbance of previously or potentially contaminated soils?			
	c. Creation of steep slopes or other unstable land conditions?			
	d. Any potential for increased wind or water erosion (including in coastal areas) or soils, either on or off the site?			
	e. Changes in the channel of a stream, or the bed of the ocean or lagoon?			
Air	a. Substantial air emissions, including greenhouse gas emissions, or deterioration of existing air quality?			
	b. Creation of objectionable odors?			
Water	a. Changes in currents, or the course or direction of water movements in either the marine or fresh waters?			
	b. Changes in absorption rates, drainage patterns, or the amount of surface runoff?			
	c. Cause or exacerbate coastal, stream or river flooding or land drainage impacts?			
	d. Alterations to the course of flow of flood waters?			
	e. Discharge into surface waters or any alteration of surface water, water quality, including, but not limited to, temperature, dissolved oxygen, bacteria or turbidity?			
	f. Change in the quality or contamination of ground waters or wells, either through direct additions, withdrawal, seepage, or through interception of an aquifer by cuts or excavations?			
Plant life	a. Destruction of any upland or mangrove forest communities?			
	b. Destruction of other important plant communities, such as sea grasses, or plants having potential commercial or medicinal value?			
	c. Destruction of or reduction in the numbers of any unique, rare or endangered plant species?			
	d. Introduction of a new plant species into an area?			
	e. Result in a barrier to the normal replenishment or movement of existing plant species?			
	f. Increase in acreage of any agricultural crop?			
Animal life	a. Destruction of any coral reef areas?			
	b. Destruction of or reduction in the numbers of unique, rare or endangered animal species?			
	c. Introduction of new animal species into an area?			
	d. Result in a barrier to the migration or movement of animals through the environment?			
	d. Substantial deterioration in the quality of fish or wildlife habitat?			

Alien invasive species	a. The potential introduction of an alien invasive species?			
	b. The risk of spread or movement of an alien invasive species from an infested site to an un-infested site?			
Risk of upset	a. A risk of an explosion or the release of hazardous substances, including, but not limited to, oil, pesticides, chemicals or radiation, in the event of an accident or perturbed conditions?			
Climate change – will the proposed project be affected by…				
	a. Loss of land associated with ongoing, or storm or typhoon-related, shoreline change or coastal erosion?			
	b. Coastal flooding from high tides, large swells, storm or typhoon-related events?			
	h. Exposure of people or property to water related hazards such as flooding or tidal waves?			
	c. Extreme rainfall and associated flooding, including from rivers and streams, or waterlogging and drainage of low-lying land?			
	d. The effects of sea-level rise or other climate change influences of the hazards in (a) to (c)?			
Social impacts – will the proposed project result in…				
Earth	a. Exposure of people and property to geological hazards such as landslides, ground failure or similar hazards?			
Water	a. Substantial reduction in the amount or quality of water otherwise available for public water supplies?			
Noise	a. Increase in existing noise levels or exposure of people to severe noise levels?			
Land use	a. Substantial alteration of the present or planned land use of an area?			
	b. Incompatibility or conflict with adjacent land use(s)?			
Population	a. Relocation or altered distribution, density or growth rate of the human population of the area?			
Housing	a. Changes in existing housing or create a demand for additional housing?			
Transportation	a. Generation of substantial additional vehicular movement?			
	b. Substantial impact on roads and existing transportation system?			
	c. Alteration to present patterns or movement of people and/or goods?			
Human health	a. Creation of any health hazard or potential health hazards?			
	b. Improvement in human health?			
Aesthetics	a. Obstruction of or deterioration of any scenic vista?			
Recreation	a. Changes in the quality or amount of existing recreational opportunities, including those recommended sites for nature-based tourism?			
Cultural resources	a. Alteration or destruction of archaeological sites?			
	b. Adverse physical or aesthetic effects to a historic resource?			
	c. Potential to cause a physical change that would affect unique cultural values?			
	d. Restriction of existing religious or sacred uses within the affected area?			
Economic impacts – will the proposed project result in…				
Natural resources	a. A noticeable increase in the rate of use of any natural resource?			
	b. Substantial depletion of any non-renewable natural resource?			
Public services – will the proposed project affect or result in the need for new or altered services in the following areas?				
	a. Police or Fire Protection?			
	b. Schools?			
	c. Parks or other recreational facilities?			
	d. Hospital?			
	e. Other government services?			
Utilities – will the proposed project result in the need for new systems or substantial changes in the following?				
	a. Power?			

	b. Communications?			
	c. Water?			
	d. Sewage disposal?			
	e. Solid waste disposal?			

Please specify other effects or impacts:

_____

_____

_____

_____

If you identified that the project will or may impact the environment or be affected by climate change, attach a separate page(s) describing the actions you will take to mitigate the impacts.

2.2 Application for Development Review Permit

Development Review Permit Application

This form is to be used for applications for a Development Review Permit under the Regulations for Development Projects.

Office Use Only					
Application No.:			Permit No.:		
Date Received:			Date Issued:		
Fee Receipt sighted:	Yes	No			
EIA Checklist Received:	Yes	No	EIS Required:	Yes	No
Status: Approved	Approved with Conditions		Declined		

INSTRUCTIONS: *KIRMA's* Guideline for Conducting Environmental Impact Assessment in the State of Kosrae FSM *contains information about the EIA process and who requires a permit. Please complete this form as fully as possible, as failure to do so may delay consideration of your application. Each application must be accompanied by an Initial EIA Checklist. Providing false information in this application is an offense under the Kosrae State Code.*

1. Details of Applicant

Name: _____ Phone No.: _____

Business and position (if applicable): _____

Address: _____

2. Location of Project

Municipality: _____ Area (Inkul): _____ Parcel / Tract No.: _____

3. Ownership

Please attach documents certifying proof of ownership (Certificate of Title or other documents). If the land is not owned by the applicant, please provide the owner's name, address, and attach a Land Use Certificate signed by the owner/s.

4. Name and Outline Briefly describe your project.

_____

_____

_____

_____

5. Areas The project will be on: (*tick appropriate* □)

(i) On land ☐ (ii) In freshwater swamp ☐

(iii) In water ☐ (iv) In mangrove ☐

(v) Other (specify): _____

6. Activity involved The project will involve: (*tick appropriate* □)

(i) Fill ☐ (ii) Toilets ☐ (iii) Water / sewer connection ☐

(iv) Dredging ☐ (v) Forest clearing ☐ (vi) Altering / blocking stream flow ☐

(vii) Discharge of pollutants ☐ (viii) Quarrying ☐ (ix) Construction of structures (e.g. buildings) ☐

(x) Earthmoving ☐ (xi) Waste disposal ☐

7. Project time

Estimated start date: _____ Estimated completion date: _____

8. Estimated cost of project: _____

9. Description *Attach separate page(s) with the following information:*

- Purpose and reason for undertaking the project
- Materials to be used (list)
- Describe all structures to be erected (including dimensions)
- An accurate, scaled site plan or sketch of the project site, including all buildings, roads and natural features (mangroves, shoreline, rivers, streams, reef, etc.); and the distance of the project from the natural features if the project is adjacent to the ocean, lagoon or mangroves
- Describe proposed earthmoving and/or alteration to land and water landscapes, including works below the mean high water mark
- State whether trees and mangroves will be removed, estimate the number of trees and size of area to be cleared
- Describe the public utilities needed, including toilet facilities and sewage disposal systems and the distance from any stream, river, mangrove, shoreline or other water body
- Intended operating life of the project, including intended actions at the end of the project (e.g. removal, redevelopment and continued use, abandonment)

10. Earthmoving

If your project will involve earthmoving, attach an **Erosion and Sediment Control Plan** that describes the measures you intend to take to prevent, minimize and control erosion and escape of sediment from your project site. Contact KIRMA's Permitting Unit for more information.

11. Signature and certification

I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief, such information is true, complete and accurate. I certify that the project will be undertaken in accordance with the plans and specifications described in this application and that I will notify KIRMA immediately if it is proposed to vary or alter the project.

I give permission to KIRMA to obtain any other information, including inspection of the proposed project site, as they deem necessary for the review and assessment of the environmental and social impacts of the proposed project.

I certify that I will comply with all relevant municipal, State and National laws during the construction and operation of the project.

I understand that I have the right to appeal a decision to deny, imposed conditions on, or suspend or cancel this permit.

Applicant's / Agent's Signature	Date
Program Office Receipt	Date

KIRMA Chairman Signature

Date

2.3 Environmental Impacts and Avoidance, Mitigation and Compensating Measures

2.3.1 Soils, Geology and Geomorphology

<table>
<tr><th>Development activities</th><th>Impacts</th><th>Avoidance policies, regulations, plans and best practices</th><th>Minimizing policies, regulations, plans and best practices</th><th>Compensation and off-setting policies, regulations, plans and best practices</th><th>Coordinating / administering agency(ies)</th></tr>
<tr><td>• Quarrying and extraction
• Bulldozing and compaction
• Vegetation clearance
• Disposal of solid and hazardous waste</td><td>• Loss of vegetation / forest cover
• Erosion and sedimentation
• Pollution and contamination</td><td>(1) The SWARS recommends that vegetation clearance from soil types with high to very high erosiveness should be avoided. The clearing of vegetation and general disturbance of these soils will lead to the instability of the soils and may cumulatively result in loss of fertility and functions, leading to excessive erosion and land degradation. These soil types are:
<table><tr><th>Soil #</th><th>Soil Name</th><th>Erosiveness</th></tr><tr><td>100</td><td>Dolen silty clay loam</td><td>High</td></tr><tr><td>101</td><td>Fomseng gravelly silty clay loam</td><td>High</td></tr><tr><td>102</td><td>Finol very gravelly silty clay loam</td><td>High</td></tr><tr><td>103</td><td>Fomseng gravelly silty clay loam</td><td>Very high</td></tr><tr><td>112</td><td>Oatuu-fomseng complex</td><td>Very high</td></tr></table>The Soil Maps of Kosrae are available from KIRMA's GIS Unit.</td><td>(1) Kosrae Soils Survey recommends:
(i) Activities on areas with slope of 15 degrees or more should be restricted to minimal tillage, use terraces, diversions and contouring, and plant close-growing grass and crops to minimize erosion and sedimentation
(ii) A prohibition on the growing of crops on areas with slopes of 16 to 30 percent
(iii) Vegetation cover should be maintained on soil types 100-104, 106 and 113-115 as these soil types are particularly susceptible to erosion</td><td></td><td>KIRMA
DREA
KCSO</td></tr>
<tr><td></td><td></td><td>(2) The KLUP recommends the following prohibitions in watershed areas:
(i) No development activities in areas with slope greater than 30 percent
(ii) Adoption of special construction techniques on projects involving earthmoving and landscaping to minimize erosion
(iii) No use of chemicals, fertilizers and pesticides on private agricultural land</td><td>(2) KBSAP Objective 4 seeks to minimize waste contributing to the pollution of the environment, with:
(i) Action 4: prevent unsafe discharge of hazardous chemicals on land and in aquatic areas
(ii) Action 5: prevent dumpsites in mangrove and swampy areas</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(3) KSC contains the following prohibitions:
(i) Littering (19.502)
(ii) Willful or negligent discharge of pollutants (19.504)
(iii) No fires in mangrove, upland or wetland or watershed forests without authorization (19.805(1))
(iv) No harvest of trees or other plants from State owned forests</td><td>(3) SWMP Action 14 aims to promote backyard composting as a waste management technique; this will also promote nutrient recycling and retention of soil biomass</td><td></td><td></td></tr>
</table>

		without authorization (19.805(3), 19.806(1), 19.809) (v) No earthmoving or clearance of vegetation in watershed forests with slop of 30% or greater (19.807(2))		
	(4)	The Persistent Organic Pollutants Act provides for the banning of POPs substances and introduction of controls around other hazardous substances	(4)	Best Practices: KIRMA and KCSO are promoting reforestation activities in degraded areas and the use of selective harvesting. The program is partially funded by the US Forest Service Forest Stewardship Program
	(5)	The Pesticides Regulations introduce controls on the use of restricted use pesticides so as to ensure their proper use and minimize detrimental impacts on the environment and human health	(5)	Best Practices: Pacific Adaptation to Climate Change Program road improvement project aims to increase awareness of climate change planning for infrastructure projects and develop cost-effective measures for adaptation of existing infrastructure.
	(6)	Best Practices: • Contours and diversion channels may be appropriate on steeper slopes to minimize erosion while still allowing use of arable land • The promotion of agroforestry techniques provides for the retention of over-storey trees and ground cover, while allowing rotation planting of mid-storey and ground crops • Use of sediment traps and silt screens minimizes erosion and outflow of sediment • Recycling and waste minimization strategies have been introduced, with some success • Community-led cleanups of marine and terrestrial areas are conducted regularly		

2·3·2 Biodiversity and Ecological Resources

Development activities	*Impacts*	*Avoidance policies, regulations, plans and best practices*	*Minimizing policies, regulations, plans and best practices*	*Compensation and off-setting policies, regulations, plans and best practices*	*Coordinating / administering agency(ies)*
• **Generation of solid waste** • **Earthmoving and landscaping** • **Land reclamation** • **Clearance of natural forest** • **Inappropriate development**	• Pollution or contamination • Erosion and sedimentation • Habitat destruction • Loss of native biodiversity • Loss of genetic resources • Introduction and spread of invasive species • Food insecurity • Land degradation	(1) KSC contains the following prohibitions: (i) Littering (19.502) (ii) Willful or negligent discharge of pollutants (19.504) KSC Title 19 Chapter 5 and 6 regulate hazardous wastes and waste management, including banning certain hazardous substances (POPs) and creating the Kosrae Recycling Program.	(1) KBSAP's Objective 4 seeks to minimize waste contributing to the pollution of the environment, with: (i) Action 4: prevent unsafe discharge of hazardous chemicals on land and in aquatic areas (ii) Action 5: prevent dumpsites in mangrove and swampy areas Objective 6 calls for the development of programs to restore biodiversity and species habitat, including: (i) Action 1: establish mangrove tree planting programs in each municipality; and (ii) Action 2: rehabilitate and enhance stewardship for species habitat. (iii) Action 4: establish terrestrial and marine reserves.	(1) Best Practices: The Kosrae Recycling Program is a deposit scheme providing for the collection and export of certain recyclable materials (aluminum cans, plastic bottles (Class 1), lead acid batteries). The scheme also extends to glass bottles, which are crushed and used as a sand substitute in construction and building.	KIRMA DREA Public Safety KCSO
		(2) Pollution Regulations require reporting of pollution incidents, create a number of pollution offenses, and require the polluter to mitigate the spill.	(2) KSWMP aims to: (i) Promote backyard composting to minimize biodegradables entering the waste stream; (ii) Develop waste collection guidelines; (iii) Deliver waste awareness programs; and (iv) Increase capacity to enforce littering and pollution laws.	(2) Best Practices: Kosrae State Government has expressed its commitment to the *Micronesia Challenge* which aims to protect 30% of the near-shore marine area and 20% of terrestrial areas in Micronesia by 2020	
		(3) KLUP recommends the following prohibitions: (i) Development buffer of 15m from each side of the mouth of a river; (ii) Development buffer of 30m from coastlines.	(3) Best Practices: the following practices minimize sedimentation: (i) Use of buffer zones along rivers, streams and the coastline; (ii) The use of silt curtains or screens to minimize flow of sediment into water ways; and (iii) A prohibition on earthmoving activities on rainy days.	(3) The NBSAP Theme 3 concerns the use of genetic resources, with Objective 1 calling for the equitable sharing of the benefits of genetic resources and their potential use and development. The KBSAP also calls for improved protection of genetic resources and the equitable sharing of their benefits. Objective 5 calls for the implementation of programs and practices for the security of our genetic resources and local knowledge, with:	

						(i) Action 1: develop regulations for the research and use of genetic resources; (ii) Action 2: develop mechanisms and access and benefit sharing regimes to manage and protect traditional knowledge. These objectives and actions are consistent with the United Nations Convention on Biological Diversity and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization.
	(4)	KSC imposes the following prohibitions: (i) No fires in mangrove, upland, wetland or watershed forests without authorization (19.805(2)); (ii) No harvest of trees or other plants from State owned forests without authorization (19.805(3), 19.806(1), 19.809) (iii) No in-fill of mangrove areas without authorization (19.806(2)) (iv) No development in 30m buffer along rivers and streams upstream of dams in watershed forests (19.807(1)) (v) No earthmoving or clearance of vegetation in watershed forest with slope of 30% or greater (19.807(2))	(4)	Best Practices: RARE Pride community education programs in Tafunsak and Utwe are increasing awareness of issues around the unsustainable harvest of mangroves.	(4)	Best Practices: KIRMA is developing a Natural and Cultural Research Policy which will establish a clear policy in relation to research priorities of Kosrae State, procedures for applying for permits, requirement for Access and Benefit Sharing Agreements where access is sought to genetic resources or traditional knowledge associated with genetic resources, and requirements for equitable sharing of research benefits. This policy will also require researchers to provide timely reports of their research programs and to share those results with the community.
	(5)	Several regulations provide for the protection of endangered or vulnerable species, as well as prohibit the use of certain methods of harvesting marine species: (i) The *Endangered Species Regulations* provide for the protection of four species of Giant Clams; (ii) The *Komokut Protection Regulations* provide for the protection of the Humphead parrot fish; (iii) The *SCUBA Fishing Regulation* prohibits the					

		use of SCUBA equipment when taking fish.
	(6)	KIRMA is empowered to control and implement preventative measures to minimize and eradicate, where feasible, introduced alien invasive species (19.102(19)).
	(7)	Best Practices: The Kosrae Invasive Species Taskforce (KIST) is a multiagency and community based group that is aiming to ensure that all preventative measures are undertaken so that the introduction of new species is minimized, and via collaboration across all levels of society, and cooperation with neighboring countries, will work to prevent, and minimize, the impact of existing and/or new invasive species. The KIST Strategic Action Plan outlines the group's plans for 2013 to 2015, with a strong emphasis on community awareness and education.

2·3·3 Water Resources

Development activities	*Impacts*	*Avoidance policies, regulations, plans and best practices*	*Minimizing policies, regulations, plans and best practices*	*Compensation and off-setting policies, regulations, plans and best practices*	*Coordinating / administering agency(ies)*
• **River and stream diversion** • **Quarrying** • **Vegetation clearance** • **Earthmoving and landscaping** • **Road construction** • **Pollution** • **Piggeries**	• Loss of vegetation cover, particularly forest cover • Contamination of surface and ground water • Draw-down and increased extraction of ground water • Erosion and sedimentation	(1) KLUP recommends the following prohibitions in watershed areas: (i) Development buffer of 15m from each side of rivers in watershed areas above municipal dams (ii) No clearing of land or removal of forests on public land (iii) No clearing of land with a slope of greater than 30 percent (iv) No use of fire to clear vegetation (v) No use of chemicals and pesticides on agricultural lands	(1) KLUP recommends the use of: (i) Special earthmoving, landscaping and construction techniques to minimize erosion in watershed areas (ii) An erosion and sedimentation plan for all road construction proposals in watershed areas	(1) Best Practice: Kosrae State Government has expressed its commitment to the *Micronesia Challenge* which aims to protect 30% of the near-shore marine area and 20% of terrestrial areas in Micronesia by 2020	KIRMA DREA KCSO
		(2) KLUP recommends the following prohibitions: (i) Development buffer of 15m from each side of the mouth of a river (ii) Development buffer of 30m from coastlines (iii) No changes in the outflow or alignment of rivers	(2) KSWMP aims to: (i) Promote backyard composting to minimize biodegradables entering the waste stream (ii) Develop waste collection guidelines (iii) Deliver waste awareness programs (iv) Increase capacity to enforce littering and pollution laws	(2) *Protected Area Act 2010* establishes the Kosrae State Protected Areas System which aims to establish terrestrial and marine protected areas in areas of biological significance	
		(3) KBSAP Objective 4 seeks to minimize waste contributing to the pollution of the environment, with: (i) Action 4: prevent unsafe discharge of hazardous chemicals on land and in aquatic areas (ii) Action 5: prevent dumpsites in mangrove and swampy areas	(3) Kosrae Soils Survey recommends: (i) Activities on areas with slope of 15 degrees or more should be restricted to minimal tillage, use terraces, diversions and contouring, and use close-growing grass and crops to minimize erosion and sedimentation (ii) Prohibition on the growing of crops on areas with slopes of 16 to 30 percent		
		(4) KSC imposes the following prohibitions: (i) No disposal of liquid or solid waste in the Protected Areas System (19.805(1)) (ii) No fires in mangrove, upland, wetland or watershed forest without authorization (19.805(2)) (iii) No harvest of trees or other plants from State owned forests without authorization (19.805(3), 19.806(1), 19.809) (iv) No in-fill of mangrove areas without authorization (19.806(2)) (v) No development in 30m buffer along rivers and streams upstream of dams in watershed forests (19.807(1))	(4) KSC Chapter 2 "Planning" requires all development proposals to adhere to the Regulations for Development Projects. These regulations require explicit consideration of potential environmental impacts and identification of mitigation measures and make mandatory the preparation of an erosion and sedimentation control plan for all earthmoving activities		

		(vi) No earthmoving or clearance of vegetation in watershed forest with slope of 30% or greater (19.807(2))	
	(5)	KSC contains the following pollution prohibitions: (i) Littering (19.502) (ii) Fouling of public rivers and public water supply (19.503) (iii) Willful or negligent discharge of pollutants (19.504)	(5) Best practices: (i) the use of buffer zones along rivers, streams and mangrove areas (ii) use of silt curtains/screens to minimize inflow of sedimentation (iii) restrictions on earthmoving during rain events
	(6)	*Pollution Regulations 2013* create positive reporting requirements for pollution incidents, require polluters to mitigate and remedy the impact of pollution incidents and create a range of offences for material and serious pollution	
	(7)	*Sanitary Pig Pen Regulations* require that pig pens to: (i) Have concrete floors and be equipped with proper drainage and a covered disposal pit (ii) Not be located within 50ft of any residence, place of assembly or public road, or 15ft of a property boundary (at the time of construction) (iii) If not in accordance with (a), be located not less than 50ft from any source of water	

2·3·4 Coastal and Marine Resources

Development activities	*Impacts*	*Avoidance policies, regulations, plans and best practices*	*Minimizing policies, regulations, plans and best practices*	*Compensation and off-setting policies, regulations, plans and best practices*	*Coordinating / administering agency(ies)*
• **Commercial fisheries (unsustainable harvest or management)** • **Landfilling of coastal areas** • **Extraction of sand and cobbles** • **Dredging**	• Coastal erosion • Over-harvesting of coastal and marine resources • Clearance of coastal vegetation • Pollution and contamination	(1) The KLUP recommends the following prohibitions in relation to coastal mangroves: (i) All development projects within mangrove areas shall adhere to the EIA process; (ii) Over-water benjos and animal pens should not be allowed to discharge water into mangrove areas; (iii) Clear cutting of mangroves should be prohibited; (iv) No harvesting of seaward fringe mangroves; (v) No harvesting of mangroves between the road and shore, if the strip is less than 50 meters wide; (vi) No cutting of mangroves within 15-30 meters of any river or stream that is less than 3 meters across; (vii) No cutting of mangroves within 30 meters of the shoreline or within 15 meters of mangrove channels; and (viii) No diversions or restrictions of flow of fresh or marine waterways.	(1) Regulations for Development Projects require permits for development activities in coastal development risk areas, as well as the explicit consideration of climate change impacts and adaptation and mitigation measures in EIS.		KIRMA DREA Public Safety KCSO
		(2) The KLUP recommends the following prohibitions for shoreline erosion hazard areas: (i) All development proposals within a 30 meter buffer zone of a hazard area shall adhere to the EIA process; (ii) In order to protect the inner portion of the reef flat and shoreline, coral boulders and live corals should not be removed; (iii) No new structures should be sited in areas experiencing severe erosion; (iv) Construction of seawall or other forms of coastal defenses for private use should be prohibited; (v) Vegetation clearance should be discouraged for at least 50 meters behind the vegetation line; (vi) All development projects within 30 meters of the beach berm should be discouraged; and (vii) The mining of beach sand should be prohibited.	(2) Best Practice: the Regulations for Development Projects allow for KIRMA to require management and monitoring plans to be prepared as conditions of development project review permits.		

	(3)	KSMP (2014) recommends the following: (i) Continued development and strengthening of community awareness and outreach activities with a focus on an effective natural coastal defense and Kosrae-relevant climate change impacts and adaptation options; (ii) Relocation of the primary coastal road network and associated infrastructure currently located on the beach/storm berm away from long-term erosion and coastal inundation risk; (iii) Ensure new development is located away from areas at risk from present and future coastal hazards; (iv) Incorporate a grant component in the housing loan program to help encourage new property to be constructed in areas not exposed to coastal, river flood or landslide hazards.	(3)	Best Practice: the Kosrae State Trochus Regulations 2013 and Kosrae State Sea Cucumber Regulations 2013 require that the issue of harvest permits is consistent with the recommendations of a properly prepared management plan. This ensures appropriate up-to-date scientific information is considered in determining quotas, that restocking occurs, and that the harvest has a minimal impact on the surrounding environment and species.
	(4)	KBSAP includes the following actions: (i) Ban the use of poisonous chemicals such as bleach, cyanide, local plant roots and leave, and other destructive fishing methods; (ii) Ban the use of modern fishing equipment and devices such as SCUBA gear for fishing; (iii) Ban the use of gill nets with a mesh size of less than approximately one (1) inch; (iv) Prevent the unsafe discharge of hazardous chemicals on land and in aquatic areas; (v) Prevent dumpsites in mangrove and swampy areas.	(4)	Best Practices: the introduction of regulations restricting the use of gillnets with small net size will select for larger size fish and allow juveniles to escape capture.
	(5)	KSC requires the issuing of a permit for: (i) Fishing from foreign fishing vessels (19.305); (ii) Other fishing (19.306); (iii) Import and export of fish or other marine resources (19.306); (iv) Aquaculture (19.306); (v) Marine research (19.306).	(5)	Best Practice: the Recycling Program includes glass bottles; these are crushed as used as a sand alternative for concrete and construction purposes
	(6)	KSC prohibits the following: (i) Commercial fishing by foreign fishing vessel in inland waters (19.316); (ii) Commercial fishing in State fishery zone without State permit (19.317); (iii) Development or activity that may affect environmental quality of the fishery water without		

		environmental approval (19.321); (iv) Contamination of fishery water (19.324); (v) Damage to reef by dredging, mining, removing coral or rocks, or grounding a vessel (19.326); (vi) Use of drift nets in fishery waters (19.326); (vii) Use of poison, explosives, electric charge device or other substances to kill, take, stun, immobilize or in any other way render fish more easily caught (19.328).
	(7)	KSC establishes the following prohibitions: (i) Littering (19.502) (ii) Fouling of public rivers and public water supply (19.503); (iii) Willful or negligent discharge of pollutants (19.504)
	(8)	*Pollution Regulations* require reporting of pollution incidents, create a number of pollution offenses, and require the polluter to mitigate the spill.

2·3·5 Land Ownership and Use

Development activities	*Impacts*	*Avoidance Preventative policies, regulations, plans and best practices*	*Minimizing policies, regulations, plans and best practices*	*Compensation and off-setting policies, regulations, plans and best practices*	*Coordinating / administering agency(ies)*
• **Government land lease processes** • **Unplanned and uncontrolled development** • **Land tenure and security issues**	• Inappropriate development • Pollution or contamination • Erosion and sedimentation • Habitat destruction • Loss of native biodiversity • Land degradation	(1) The *Regulations for Development Projects* require development project review permits for certain types of activities or projects and establish an EIA process. The conditions attached to the permits aim to minimize, avoid or compensate for negative impacts on the environment.	(1) KLUP establishes "active use districts", "special consideration districts" and "areas of particular concern" that provide guidance about the types of activities that are suitable in different areas. Each of these districts is accompanied by recommendations that aim to minimize negative impacts on the surrounding environment.		KIRMA DREA Land Court
			(2) The Regulations for Fill and Construction Below the High Water Mark, administered by DREA, require the acquisition of a lease or land use agreement before an adjoining landholder can undertake activities in areas below the ordinary high water mark.		
			(3) The Kosrae Land Court was established by the Land Court Act of 2000 to investigate, determine and register interests in land. The issuing of titles over land, together with the parcelization of land, provides greater security of tenure to landholders and lessees. The Court may also adjudicate disputes over land.		
			(4) Best Practices: the KLUP is due for revision in 2014. The identification and mapping of zones and clear prescriptions for development and activities in each zone will assist in effectively managing the available area of productive and "developable" land.		

2·3·6 Climate Proofing Guidelines

Climate Change Theme	Key climate change impact issues	Key vulnerability issues of the environment, economy and society	Policies, regulations, plans and best practices to prevent vulnerabilities	Policies, regulations, plans and best practices to minimize vulnerabilities	Policies, regulations, plans and best practices to build resilience	Coordinating / administering agency(ies)
Short-term climate change impacts	• Drought	• Reduced potable water available for subsistence purposes, with increased risk of water-borne disease due to lack of flushing of pipes and tanks • Reduced surface water flows available for agroforestry and commercial agriculture • Reduced potable water available for water-intensive activities such as aquaculture • Changes in water quality of near-shore marine and estuarine environments, such as increased salinization, affecting spawning areas for fish, crustaceans and other species • Increased risk of forest fires that may impact infrastructure	(1) KLUP recommends the following prohibitions in watershed areas: (i) Development buffer of 15m from each side of rivers in watershed areas above municipal dams; (ii) No clearing of land or removal of trees on public land; (iii) No clearing of land with a slope of greater than 30 percent; (iv) No use of fire to clear vegetation;	(1) Best Practices: (i) KSWMP aims to increase awareness of composting which will improve soil biomass and allow for greater retention of moisture (ii) The Department of Health can conduct water quality testing of individual catchments to ensure water is potable	(1) Best Practices: (i) Increase community awareness of climate change issues including impacts on food security and water quality and availability (ii) Improve communication of information about weather events to allow the community to prepare for droughts, king tides, typhoons, etc. (iii) Encourage replanting of mangrove and coastal fringe forest to provide protection against tidal surge	KIRMA DREA State Disaster Office Department of Transport and Infrastructure Department of Health
	• Heavy rainfall and flooding	• Increased surface water flows causing higher rates of erosion and sedimentation (and work stoppages for earthmoving) • Increased risk of landslips in sloped and steep areas • Flooding of vulnerable coastal areas, including of residential properties and their kitchen gardens • Flooding of coastal infrastructure, affecting transport (roads, airport), power and communications • Increased risk of water-borne diseases due to presence of standing water bodies and contamination of surface waters	(2) KLUP recommends the following prohibitions: (i) Development buffer of 15m from each side of the mouth of a river; (ii) Development buffer of 30m from coastlines; (iii) No changes in the outflow or alignment of rivers.	(2) KSMP recommends a policy of relocating infrastructure and new residential development to inland areas, away from vulnerable coastal areas		
	• King tides	• Flooding of coastal infrastructure, affecting transport (roads, airport), power and communications • Flooding of vulnerable coastal areas, including residential properties	(3) KSC imposes the following prohibitions: (i) No fires in mangrove, upland, wetland or watershed forest without authorization (19.805(2)); (ii) No harvest of trees or other plants from State owned forests without authorization (19.805(3), 19.806(1), 19.809);			

				(iii) No in-fill of mangrove areas without authorization (19.806(2)); (iv) No development in 30m buffer along rivers and streams upstream of dams in watershed forests (19.807(1)); (v) No earthmoving or clearance of vegetation in watershed forest with slope of 30% or greater (19.807(2)); (vi) No fouling of public rivers and public water supply (19.503); (vii) No willful or negligent discharge of pollutants (19.504).
	• Typhoons	• Stripping of agroforestry and agricultural crops due to intense winds • Damage to infrastructure including utilities and buildings (e.g. roofs) due to intense winds • Flooding of vulnerable coastal areas, including residential properties • Contamination of surface water flows and catchments		
Long-term climate change issues	• Sea level rise	• Increased inundation of vulnerable coastal areas, in conjunction with higher high tides • Intrusion of salt water into fresh water aquatic environments and salinization of ground water		
	• Rising temperatures	• Increased demand for electricity to power air conditioners, fans and refrigerators • Increased consumption of potable water for subsistence agriculture		

2.4 Kosrae Plans

Plan	*Purpose*	*Key objectives*
Biodiversity Strategy and Action Plan 2004	• To conserve biodiversity and address its loss through conservation programs, protection of biodiversity, sustainable use of natural resources, restoration of endangered species, and build up individual capacity for conserving biodiversity through awareness programs	• To develop, review and enforce policies and regulations for sustainable harvesting of natural resources • To create and implement educational and awareness programs in the community that address biodiversity conservation • To improve, manage and preserve vital ecosystems • To minimize waste contributing to the pollution of our environment • To implement programs and practices for the security of our genetic resources and local knowledge • To develop programs for restoring biodiversity and species habitat
Land Use Plan 2003	• To assist with the orderly physical development of the resources of Kosrae • To protect ecologically important or unique natural resources and habitat areas • To assist in the review and planning of development projects and Government activities and resources • To provide guidelines for the sustainable use of natural resources	• Identify existing uses of land areas and natural resources • To designate “active use districts” where certain development and land uses will be encouraged • To designate “special consideration districts” to include ecosystem types requiring technical advice for management and conservation of natural resources • To designate “areas of particular concern” for the protection of specific areas • To provide recommended management strategies or prescriptions for the districts
Shoreline Management Plan 2014	• Provides a framework for coastal defense policies and sets objectives for future development and resource management within the context of coastal erosion and coastal hazard management	• To assess a range of strategic coastal management options, in terms of limiting the future impacts of coastal erosion, flooding and storm damage • Inform the government and community about potential of future coastal erosion and coastal hazard risks to aid planning for future development • Identify opportunities for maintaining and enhancing natural coastal environment
Solid Waste Management Plan 2010 - 2015	• To reduce solid waste generation and manage residual materials in a way that maximizes opportunities for resource recovery	• Develop, implement and maintain a system of solid waste management that is appropriate to local conditions

2.5 Kosrae's Environmental Monitoring Programs

Assessment / Program	*Details*
Kosrae Soils Survey 1983 (USDA Soil Conservation Service)	• Identified soil types across the island and prescribed management recommendations according to erosion risk
State-wide Assessment and Resources Strategy 2010 - 2015 (USFS)	• Identifies highest priorities for forest resource management • Provides an analysis of forest conditions and trends and delineates priority rural and urban forest landscape areas • Provides long-term strategies for managing priority landscapes
Beach Profiling Project * (KIRMA)	• Six monthly monitoring of selected coastal sites for erosion impacts
Coral Monitoring Program * (KIRMA and KCSO)	• Quarterly and annual monitoring of selected sites for coral health, invertebrates, and fish species
Forest Health Monitoring Program * (KIRMA)	• Quarterly monitoring of control plots for growth, health and invasive species • Monitoring of mangrove health, replacement and forest gaps
Erosion and Sedimentation Monitoring * (KIRMA)	• Monitoring of erosion and sedimentation in stream flows at Okat (Yela River as control), Lelu and Utwe
Protected Areas Management Plans * (Municipal Resource Management Committees)	• Regular monitoring of biological indicators such as presence of invasive species, turbidity, as well abundance of coral and fish

** Ongoing programs.*

PART 3 References

Laws and Regulations

Constitution of the Federated States of Micronesia (1978)

Kosrae State Code (as amended)

Kosrae State Constitution (1984, as amended)

Endangered Species Regulations (1988)

Komokut (Humphead Parrot Fish) Protection Regulation (2008)

Regulations for Development Projects (2005, as amended)

Regulations on Fill and Construction Projects Below the High Water Mark (October 2010)

Sanitary Pig Pen Regulations (1997)

SCUBA Fishing Regulations (2010)

Pesticides Regulations (2013)

Pollution Regulations (2013)

Plans and Strategies

Kosrae Land Use Plan (2003)

Kosrae Solid Waste Management Plan (2010-2015)

Kosrae State Biodiversity Strategy and Action Plan (2004)

Kosrae State Land Policy: Draft for Consultation (Private Sector Development Programme Land Administration and Management Project), BGSI (2007)

Kosrae Shoreline Management Plan: Summary of recommendations (2000)

Kosrae Shoreline Management Plan: Repositioning for resilience; Ramsay, D., Webb, A., Simpson, A., Jackson, R.H. and Charley, B. (2014)

FSM National Biodiversity Strategy and Action Plan (2002)

Other Useful Documents

Assessing the Effectiveness of Kosrae Island Resource Management Plan; Brady Phillips (1994)

Blueprint for Conserving the Biodiversity of the Federated States of Micronesia; The Nature Conservancy (2003)

Climate Change in the Pacific: Scientific Assessment and New Research, Volume 2: Country Reports, Chapter 4: Federated States of Micronesia; Australian Bureau of Meteorology and CSIRO (2011)

Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies; United Nations Environment Program (1998)

SEM-Pasifika: Socioeconomic monitoring guidelines for coastal managers in Pacific Island countries; Wongbusarakum, Supin and Pomeroy, Bob (2008)

PACC Report of In Country Consultations – Kosrae State (*Draft*) *(2006)*