ADAPTATION FUND BOARD SECRETARIAT TECHNICAL REVIEW OF PROJECT/PROGRAMME PROPOSAL

PROJECT/PROGRAMME CATEGORY: Regular-sized Project Concept

Country/Region: Benin
Project Title: Strengthening Meteorological Services and Establishing a Multi-Hazard Early Warning System to Enhance the Climate Resilience of Local Communities in Benin
Thematic Focal Area: Early Warning System (EWS)
Implementing Entity: National Fund for Environment and Climate (FNEC)
Executing Entities: National Meteorological Agency (METEO BENIN)
AF Project ID: AF00000429
IE Project ID:
Requested Financing from Adaptation Fund (US Dollars): 4,011,561
Reviewer and contact person: Alexandra Muñoz
Co-reviewer(s):
IE Contact Person:

Technical Summary	The project "Strengthening Meteorological Services and Establishing a Multi-Hazard Early Warning System to Enhance the Climate Resilience of Local Communities in Benin" aims to enhance the climate resilience of local communities in Benin, by improving meteorological services and setting up a multi-hazard Early Warning System (EWS) that is tailored to the needs of vulnerable groups and based on impact. This will be done through the three components below: Component 1: Enhancing and modernizing the observation network to improve weather and climate services (USD 2,513,050); Component 2: Strengthening capacity for the production, dissemination, and adoption of meteorological and climate information (USD 683,000); Component 3: Sustainability of project results and knowledge management (USD 150,000). Requested financing overview: Project/Programme Execution Cost: USD 351,242 Total Project/Programme Cost: USD 3,697,292 Implementing Fee: USD 214,269

	Financing Requested: USD 4,011,561 The proposal includes a request for a project formulation grant and of USD 91,800. The initial technical review raises several issues, such as the need for strengthening the adaptation rationale of the various components, the identification of potential risks and impacts of the project, the lack of information about potential overlapping projects, and the project's cost-effectiveness, as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review. The second technical review raises some issues, such as the lack of detail for potential overlapping projects, the lack of mitigation actions for the identified risks, and how the project will secure an equitable distribution of the benefits, as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review. The third technical review raises some issues, such as the identification of risks and mitigation plans, how the project will secure an equitable distribution of the benefits and amendments to risk and alignment tables as is discussed in the number of Clarification Requests (CRs) and Corrective Action Requests (CARs) raised in the review. *Please be advised that the findings of the AFB Secretariat's review of the funding proposal(s) do not reflect, indicate, or prejudge the outcome of the reaccreditation process currently underway. The Implementing Entity (IE) shall acknowledge that the funding proposal will not be approved by the Board if the IE's accreditation has expired, and reaccreditation has not been achieved at the time of the Board's decision. Notwithstanding this potential risk, the IE has elected to proceed with the development of the funding proposal.*
Date:	August 15, 2025

Review Criteria	**Questions**	**First Technical Review Comments** **April 10, 2025**	**Second Technical Review Comments** **July 7, 2025**	**Third Technical Review Comments** **August 15, 2025**
Country Eligibility	1. Is the country party to the Kyoto Protocol, and/or the Paris Agreement?	**Yes.**	-	-

	2. Is the country a developing country particularly vulnerable to the adverse effects of climate change?	**Yes.** Benin ranks among the most vulnerable countries to climate change. Drought, flooding, strong winds, extreme heat waves, and rising sea levels are the main climate risks, with significant consequences on the population.	-	-
Project Eligibility	1. Has the designated government authority for the Adaptation Fund endorsed the project/programme?	**Yes.** As per the Endorsement letter dated January 28th, 2025.	-	-
	2. Does the length of the proposal amount to no more than Fifty pages for the project/programme concept, including its annexes?	**Yes.** The concept note is 50 pages including its annexes.	**No.** The concept note is 57 pages including its annexes. **CR (NEW1):** Please amend to at a maximum of 50 pages including annexes.	**CR (NEW1): Cleared.** The concept note is 50 pages including its annexes.
	3. 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.** **However additional information is required.** The concept note provides general information about the relation between objectives, components and activities. **CR1:** Although the vulnerability of the country to climate change extremes and the resultant meteorological	**CR1: Not Cleared.** Although the concept note provides more information, it remains broad and needs	**CR1: Cleared.**

		and hydrological impacts, it would be useful to strengthen this narrative in the component descriptions. Please strengthen the link of the proposed activities to adapting to climate change extremes in the component descriptions. **CAR1:** Please indicate the estimated number of beneficiaries (direct and indirect) which will be supported. **CR2:** Kindly provide more details for each project activity, for example: clarify stakeholders to be involved), and which specific actions will be taken to ensure enhanced coordination and support, and the locations where the instrumentation will be placed if already known at this stage. **CR3:** **Under Component 1:** 1. Please strengthen the linkage to the specific international standard for example, clarify if this supports Global	specific linkages between objectives and activities. Please address the following: 1. Even though EWS impacts across sectors, please aim for the main objective of the program to meet a single purpose/outcome. 2. Also, please differentiate between outcomes and outputs, and strengthen them in line with SMART indicators. **CAR1: Cleared.** As per revised Part II.B – Economic, social, and environmental benefits, page 33. **CR2: Cleared.** As per revised Annex 1.	**1. Cleared.** As per information provided in section A.2.B, "Project Objectives" (page 15). The main objective was renamed to: "*enhance the climate resilience of local communities in Benin, by improving meteorological services and setting up a multi-hazard Early Warning System (EWS) that is tailored to the needs of vulnerable groups and based on impact.*" **2. Cleared.** As per information provided in section II.A, pages 18 to 23.

		Basic Observation Network (GBON). **Under Component 2:** 1. On activities 2.1.1. and 2.1.2, please clarify the following What strengthening implies is this re-skilling, or training, short courses etc. 2. On activities 2.2.1 and 2.2.2 please clarify how they are markedly different from each other? **Under component 3:** 1. Please clarify if the partnership under activity 3.1.2 will include monetary arrangements for the sustainability of the equipment. 2. Please clarify if maintenance will commence during project implementation based on the timeline of when instrumentation is first installed. 3. On component 3 outcome 3.2 please provide further details	However, more details are required at the FP stage. **CR3:** **Under Component 1: Cleared.** As per revised Part II.A – Project components, page 26. **Under Component 2: Not Cleared.** Kindly clarify the aim differentiation of 2.2.1 and 2.2.2 and how they are markedly different from each other. **Under component 3:** 1- **Cleared.** As per revised Part II.J – Sustainability, page 48. 2- **Cleared.** As per revised the answers in the review sheet. However, this should be clearly	**CR3:** **Under Component 2: Cleared.** As per information provided in section II.A, page 22. There is only one activity, 2.2.1, under output 2.2.1. The two past activities were combined into one.

		of what the toolkit will look like and in addition provide further information on the facilities to be established. It is unclear from the narrative what these facilities could be. **CR4:** Kindly strengthen the alignment between the specific activities and all the objectives and components. **CR5:** Kindly add a Theory of Change/vertical logic of the project under Part II: Project Justification. **CAR2:** Please, kindly add explicitly the alignment with the Adaptation Fund Results Framework a at Part I B on page 22.	stated at the FP stage. 3- **Cleared.** As per revised Annex 1, page 54. **CR4: Cleared.** As per additional information provided in Annex 1. However, please fix the title of Annex 1 as it states 'AND Endorsement Letter'. **CR5: Cleared.** As per revised Part II.A – Project Components, page 32. **CAR2: Cleared.** As per revised Part I.B – Project Objectives, pages 22-23.	
	4. Does the project / programme provide economic, social and environmental benefits, particularly to vulnerable communities, including gender considerations, while avoiding or mitigating negative impacts, in	**Yes.** **However additional information is required.** The concept note outlines some project's economic, social, and environmental benefits; however, the explanation is too general	**CR6: Cleared.** As per information in Part II. B. **CAR3: Not Cleared.** Please include an initial gender assessment	**CAR3: Not Cleared.** While an Initial Gender Assessment was

	compliance with the Environmental and Social Policy and Gender Policy of the Fund?	and with no estimated benefits. The document does not provide information on the expected total number of beneficiaries of the project and the specific vulnerable groups targeted. The concept note does not include an Initial Gender Assessment. **CR6:** Please include in the economic benefits section, how many people will benefit in each community and what is the dollar-value of the economic benefit to them for each of the target communities. It would also be useful to present overall figures. **CAR3:** Please include an initial gender assessment which is required at the concept note stage. **CR7:** 1. Please clarify how the data generated will "limit the intensity and frequency of natural disasters" as is indicated at the first paragraph on the environmental perspective.	which is required at the concept note stage in compliance with the Gender Policy requirements of the Adaptation Fund. Please refer to the consultations made. **CR7: Cleared.** As per revised Part II.B – Economic, social, and environmental benefits, page 35. **CAR4: Not Cleared.** While the data on expected beneficiaries and disaggregated by gender is provided, there is still need information on marginalized and	incorporated in the concept note under section II.B, pages 26-30, alongside information for each of the twelve targeted communes, more details are needed for some communes. Please include statistics to characterize the people with disabilities, when corresponds to all communes. Also, kindly include gender statistics in communes: Dangbo, Djidja, and Dogbo, if not available at this time please provide commitment in ***the proposal document*** to complete at full proposal stage and as a gap to be filled during the PFG implementation. At this stage, data on people with disabilities and gender statistics are not available for the communes of Dangbo, Djidja, and Dogbo in their third-generation Plan de Développement Communal (PDC3) and other consulted documents. However, the upcoming fourth-

		2. Please strengthen the social, and environmental benefits with specific and quantifiable data where possible. **CAR4:** Kindly provide specific information on the expected beneficiaries, disaggregated by gender and age, where possible. Also, whether marginalized and vulnerable groups and indigenous communities have been identified in the project area and if so, to specify how the project benefits those groups. **CR8:** Kindly explain how the project will ensure the equitable distribution of benefits.	vulnerable groups. Please provide more details on the specific project areas identified with marginalized and vulnerable groups, as well as indigenous communities. **CR8: Not Cleared.** Kindly provide a brief explanation on how the project will secure an equitable distribution of the benefits.	generation PDCs and the results from the ongoing General Population and Housing Census in Benin will provide more comprehensive and detailed local-level information. Information for the other nine communes was mainly obtained from the fourth-generation Plan de Developpement Communal (PDC) and the 2017–2018 Demographic and Health Survey of Benin (EDSB-V). When possible, this was supplemented with the latest results from the Multiple Indicator Cluster Survey (MICS 2021–2022). We are dedicated to incorporating these additional data sources during the full proposal stage through Project Formulation Grant (PFG) implementation. This will ensure that the specific situations of women, men, young people, and disabled individuals in Dangbo, Djidja, and Dogbo are thoroughly documented and properly

				addressed in the final project plan. Please see commitment in Concept note_FNEC-BENIN-Review 3rd round_Track Changes_2025.08.25, page 28 **CAR4: Not Cleared.** While information for each of the twelve targeted communes is included in Section II.B (pages 26–30) of the concept note, additional details are required for some communes. Please include relevant statistics to characterize marginalized and vulnerable groups—including indigenous communities—where applicable. If a specific project area does not include marginalized or vulnerable groups, please state this clearly. If not available at this time please provide commitment in ***the proposal document*** to complete at full proposal

				stage and as a gap to be filled during the PFG implementation. Statistics on vulnerable groups, such as women-headed households, elderly individuals, households in extreme poverty, and those affected by recurrent floods or droughts, have been compiled for nine communes using data from the Plan de Development Communal (PDC), the 2017–2018 Demographic and Health Survey (EDSB-V), and the MICS 2021–2022 report. However, for the communes of Dangbo, Djidja, and Dogbo, more detailed information on marginalized groups is not currently available, as their third-generation Communal Development Plans (PDC3) do not include this data. The upcoming fourth-generation PDCs and the results of the ongoing General Population and Housing Census in Benin are expected to provide more comprehensive

				statistics. We plan to incorporate these additional data sources during the full proposal stage through the project formulation grant (PFG) process. This will ensure that the profiles of marginalized and vulnerable groups in Dangbo, Djidja, and Dogbo are fully documented and considered in the project design. No indigenous or autochthonous groups have been identified in the twelve communes. However, where applicable, statistics characterising marginalised and vulnerable groups, including indigenous communities, will be provided during PFG implementation. These will be completed at the full proposal stage, filling the gap. Please see commitment in Concept note_FNEC-BENIN-Review 3rd round_Track

				Changes_2025.08.25, page 28 **CR8: Not Cleared.** Kindly provide a brief explanation on how the project will ensure an equitable distribution of benefits, independent of the involvement of the GSI specialist within the PMU. Done, the following paragraph has been included in the concept, see Concept note_FNEC-BENIN-Review 3rd round_Track Changes_2025.08.25, page 30. “Through its design and operational strategies, the project promotes the fair distribution of benefits among vulnerable groups. It adopts an approach that specifically includes women. It specifically targets vulnerable groups, including women, youth, the elderly, people with disabilities, and those living

				in extreme poverty, to receive climate services and capacity-building support. Inclusive information sharing, tailored training, and decentralized local focal points ensure all communities can access and act on climate information. The project is aligned with community development plans and local stakeholder involvement to enhance sustainability and community ownership. A gender-responsive stakeholder engagement and participatory plan will be developed to ensure that marginalized and vulnerable individuals are fully involved. Likewise, the Gender and Social Inclusion (GSI) specialist will join the Project Management Unit (PMU) to ensure that the necessary indicators and outputs are met." Saying that equity and equal distribution of benefits require integrating gender considerations into

				the project's core elements, including its structure, theory of change, governance, indicators, beneficiary criteria, and accountability mechanisms. This way, equitable benefits become a shared responsibility rather than an individual one. The gender specialist's role during project implementation is to ensure that indicators and outputs are achieved, but the strategy goes deeper, influencing the project's overall framework.
	5. Is the project / programme cost effective?	**Unsure.** The concept note provides a broad explanation of the project cost-effectiveness, without information on the specific components. It does not specify clearly the scope and approach, nor method for the calculation. It is not possible to demonstrate the cost-effectiveness of the selected measures. **CAR5:** Kindly provide a sound justification for the cost-effectiveness of the project and selected measures, including scope,	**CAR5: Cleared**. As per information in Part II.C and explanation in the review sheet.	

		approach, alternative options to the proposed measures, and estimates of the evaluation where possible.		
	6. 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.** **But further information is needed.** The project identifies relevant adaptation-related plans and strategies as well as sectoral country's policy and strategies. **CAR6:** Kindly provide specific linkage about how the project supports the implementation of the SDGs and justify the link between the project and the PNS.	**CAR6: Cleared.** As per information in Part II.D.	
	7. Does the project / programme meet the relevant national technical standards, where applicable, in compliance with the Environmental and Social Policy of the Fund?	**Unsure.** The concept note identifies several national regulations relevant to the project as described in Section E, Part II. However, more specific information is required for compliance. **CAR7:** Kindly describe the technical standards (e.g., building codes, regulations) that are to be followed for the proposed outputs/activities and state the project's compliance, for each regulation/law identified.	**CAR7: Cleared.** As per revised section II.E – National technical standards and environmental and social policy, page 40.	

	8. Is there duplication of project / programme with other funding sources?	**No.** **However additional information is required.** Although relevant information is described to the minimum extent in Section F, Part II, all potentially overlapping projects are not clearly identified in the concept note, therefore, there is not an analysis of being complementary, nor the linkages and potential synergies. **CR9:** Kindly include a comprehensive list of projects that are or have been implemented in Benin and are related to the proposed project utilizing a tabular format. It should include details such as; 1. main project interventions, timeline, and location. 2. potential synergies and lack of overlap with the proposed project 3. lessons from the earlier initiatives.	**CR9: Not Cleared.** Although relevant information is described and identified in Table 3, the difference of this proposed project to the other ones identified is not clearly established. Please include: (i) the duration for the project ReWarD; (ii) clear explanation for the potential synergies and lack of overlap with the proposed project; and	**CR9: Cleared.** As per revised section II.F, table 3, page 37. All required information under items (i), (ii), and (iii) have been incorporated into the updated table.

		4. information on how this project is different/ or will build on other projects.	(iii) how this project is different from the ones in the list.	
	9. Does the project / programme have a learning and knowledge management component to capture and feedback lessons?	**Yes.** As per information provided on section G, Part II. The project has knowledge and dissemination-related activities throughout the three components. The third includes learning and knowledge management to share the best practices and disseminate lessons.	-	-
	10. 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.** **However, further information is needed.** Initial consultations were conducted through five workshops during October and November 2024, attending 19 municipalities and 280 people. The consultative process has included local authorities, government entities, and Technical and Financial Partners (such as GIZ). **CR10:** Kindly indicate the composition of the participants who attended each workshop, with some	**CR10: Cleared.** As per revised Part II.H – Consultative process, page 43.	

		background information, to verify if marginalized and vulnerable groups have been consulted. If so, how their concerns have been included in the design of the project, including if gender considerations have been incorporated.		
	11. Is the requested financing justified on the basis of full cost of adaptation reasoning?	**Unsure.** The concept note provides general arguments for the funding of the project and its impact on Benin. However, the demonstration of how the project will address its adaptation objective is not fully clear with the resources provided is not clear. **CR11:** Please present information to indicate how this project will meet its objectives solely with the resources of the adaptation fund. **CR12:** Kindly clarify whether the project requires co-financing or not. If co-financing is being considered, please clearly indicate how the project with the AF resources only, will be able to	**CR11: Cleared.** As per revised Part II.I – Justification for funding, pages 46-47. **CR12: Cleared.** As per revised Part II.I – Justification for funding, page 47. The concept note justifies funding for the project and its impact on Benin. The expected results will rely solely on Adaptation Fund	

		effectively meet its objectives.	Resources, with no co-financing.	
	12. Is the project / program aligned with AF's results framework?	**Yes.** As per the information provided on section C, Part III. However, amendment is required. **CAR8:** 1. On outcome 1: Please delete indicator 1.2 as this is an output level indicator. 2. Please amend the third column of the table corresponding to outcomes 2.1, 2.2, 3.1 and 3.2 to read fund outcomes. 3. Please amend the fourth column of the table corresponding to outcomes 2.1, 2.2, 3.1 and 3.2 to read fund outcome indicator. 4. Please include additional rows to reflect fund outputs underneath the fund	**CAR8: Cleared.** As per revised Part III.A – Alignment with the Adaptation Fund Results Framework, page 50.	**CAR8 (reopened):** 1. At Part III A please include the grant amounts in the output section of the table. Done, the table 6 (Part III A- Strategic Framework alignment Table) has been updated. See Concept note_FNEC-BENIN-Review 3rd round_Track Changes_2025.08.25, pages 48, 2. Currently the total components costs at Table 1 is $3,346,050, however the total components cost is presented as $3, 493, 000 at Part III A-Strategic Framework alignment Table. Please address. The two figures should be the same. Done, the table 6 (Part III A- Strategic Framework alignment Table) has been updated. See Concept note_FNEC-BENIN-

		outcomes with the output indicators corresponding to the outcomes selected. This will be the second part of the table. The first part captures the project information against the fund outcome and outcome indicators. The second part captures the project information against the fund output and output indicators corresponding to the fund outcomes identified. 5. Please ensure that the grant amount for each fund outcome is separated in the final column. Currently outcome 2 and outcome 3 grant amounts are merged.		Review 3rd round_Track Changes_2025.08.22, page 48.
	13. Has the sustainability of the project/programme outcomes been taken into account when designing the project?	**Yes.** However additional information is required. The project seeks to sustain its benefits through the involvement of national and local stakeholders, fostering community ownership, and		

		building capacity for end users. However, there is no mention of regulations and resources, and therefore, it is not clear how the project will be sustained in the long run. **CR13:** Kindly identify the adaptation benefits that can be sustained after this project ends and explain if this can be replicated and/or scale up. **CR14:** Kindly refer to how sustainability resources (for example, financial, social, regulatory, institutional) play a role in the sustainability and maintenance of the project.	**CR13: Cleared.** As per information provided in Part II. J. **CR14: Cleared.** As per information provided in Part II. J.	
	14. Does the project / programme provide an overview of environmental and social impacts / risks identified, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	**Yes.** However, further information is required. The concept note does not state the project classification (A, B or C) from the screening. The proposal has not identified all potential risks and impacts but rather provides some general information about some of the environmental and social principles from the checklist. For the concept note, the ESP overview should start by identifying potential risks,		

		even if the project aims not to affect issues related to the principles. The initial gender assessment is not included. **CAR9:** Please kindly state the project classification from the screening in Section K, Part II. **CAR9:** Please review Table 4 and assess all the principles that may apply to the project, and state and describe all potential impacts (direct, indirect, transboundary and cumulative) and risks. It should also identify the magnitude of the risks and impacts and how it is planned to mitigate and manage them. For more information, please visit: AF's ESP guidance: https://www.adaptation-fund.org/wp-content/uploads/2016/07/ESP-Guidance_Revised-in-June-2016_Guidance-document-for-Implementing-Entities-on-compliance-with-the-Adaptation-Fund-Environmental-and-Social-Policy.pdf	**CAR9: Cleared.** As per revised Part II.K – Environmental and social impact risks, page 48. **CAR9: Not Cleared.** 1. Please review Table 5 and describe all potential impacts (direct, indirect, transboundary and cumulative) and risks. 2. Please state the risk, instead of saying "The project places particular emphasis on women and youth groups…" you may say 'There is a low risk in involving women and youth groups because …' 3. It should also describe how it is planned to mitigate and manage each risk.	**CAR9: Not Cleared.** Kindly amend table 5 in section II.K, page 4. For each principle, include only a checkmark or an X if no further compliance is needed. clearly In cases where no further assessment is deemed necessary, please provide a sound justification in column 3. Conversely, if any potential risk is identified, even if considered low, the table should include at column 3 a clear statement of the risk along with a precise mitigation plan/actions. It should be clearly outlined how that plan/action effectively addresses the identified risk. Please note that ESPs 1, 4 and 6 will always require

				further assessment based on AF policy. Done, the table 5 in section II.K, page 44 has been updated. See Concept note_FNEC-BENIN-Review 3rd round_Track Changes_2025.08.25, pages 45, 46.
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.** *However amendment is required.* **CAR10:** Kindly update the summary section of Table1: Components of the project to be consistent with template available at: • Template for Concept Note Project Proposals (181 kB, DOC) For further clarification on the costs and fees please refer to More information, please visit: https://www.adaptation-fund.org/generic/costs-and-fees/.	**CAR10: Not Cleared.** The budget is currently under revision (CAR11), so this CAR will be addressed at a later time. To verify all fees, please use the IE and EE Fees Calculator: https://www.adaptation-fund.org/document/ie-and-ee-fees-calculator/	**CAR10: Cleared.** As per information provided in table 1, pages 16-17. The total amount of financing requested was amended to USD 4,011,561.
	3. Are the Project/Programme Execution Costs at or below	**Yes.**		

	9.5 per cent of the total project/programme budget (including the fee)?	*However amendment is required.* **CAR11**: Please refer to CAR4 above. For additional clarification please refer: https://www.adaptation-fund.org/generic/costs-and-fees/. ***CAR12:*** 1. *Please utilize and submit the appropriate PFG template with the re-submission available at Request for Project Formulation Grant (PFG) (57 kB, DOC).* 2. *Further information of PFG approved activities and thresholds can be found at https://www.adaptation-fund.org/readiness/readiness-grants/project-formulation-grants/*	**CAR11: Not Cleared.** Kindly fix the Total Financing requested. Currently, Benin has available 4,011,711 USD. As per Decision B.36/41, there is a maximum level of US$ 10 million for an individual funding request for single country concrete adaptation projects. Moreover, a total of up to US$ 40 million from the Adaptation Fund becomes available once a country has accessed funding amounting to at least US$ 8 million for concrete single-country adaptation projects or programmes or once four years had passed since approval of the first concrete single-country adaptation project(s)/(programme(s) by the Board, whichever occurred earlier.	**CAR11: Cleared.** As per information provided in table 1, pages 16-17. The total amount of financing requested was amended to USD 4,011,561.

			Once Benin has met any of the 2 conditions, it can unlock the remaining US$ 30 million. Once the budget is fixed, please ensure all numbers are consistent throughout the document. Please refer to the IE and EE Fees Calculator: https://www.adaptation-fund.org/document/ie-and-ee-fees-calculator/ **CAR12: Not Cleared.** 1. In the PFG budget, please include the IE fee. 2. Please confirm that METEO BENIN will be the executor of the PFG.	**CAR12: Cleared.** As per the information provided in the PFG Application form. The IE fee requested is USD 6,800. Also, METEO BENIN was confirmed as the executor of the PFG as per response sheet.
Eligibility of IE	1. Is the project/programme submitted through an eligible Implementing Entity that has been accredited by the Board?	**No.** FNECs accreditation expired on 19 March 2025.Please be advised that the findings of the AFB Secretariat's review of the funding proposal(s) do not reflect, indicate, or prejudge the outcome of the reaccreditation process currently underway. The Implementing Entity (IE) shall	-	-

		acknowledge that the funding proposal will not be approved by the Board if the IE's accreditation has expired, and reaccreditation has not been achieved at the time of the Board's decision. Notwithstanding this potential risk, the IE has elected to proceed with the development of the funding proposal.		
Implementation Arrangements	1. Is there adequate arrangement for project / programme management, in compliance with the Gender Policy of the Fund?	n/a at concept stage		
	2. Are there measures for financial and project/programme risk management?	n/a at concept stage		
	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?	n/a at concept stage		
	4. Is a budget on the Implementing Entity Management Fee use included?	n/a at concept stage		
	5. Is an explanation and a breakdown of the execution costs included?	n/a at concept stage		

	6. Is a detailed budget including budget notes included?	n/a at concept stage		
	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?	n/a at concept stage		
	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?	n/a at concept stage		
	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?	n/a at concept stage		
	10. Is a disbursement schedule with time-bound milestones included?	n/a at concept stage		

ADAPTATION FUND

CONCEPT NOTE PROPOSAL FOR SINGLE COUNTRY

PART I: PROJECT INFORMATION

Title of Project: Strengthening Meteorological Services and Establishing a Multi-Hazard Early Warning System to Enhance the Climate Resilience of Local Communities in Benin

Country: Benin

Thematic Focal Area: Early Warning System (EWS)

Type of Implementing Entity: National Implementing Entity

Implementing Entity: Fonds National pour l'Environnement et le Climat (FNEC)

Executing Entity: National Meteorological Agency (METEO BENIN)

Amount of Financing Requested: 4,011,561 (in U.S Dollars Equivalent)

Project Formulation Grant Request (available to NIEs only): Yes ☒ No ☐

Amount of Requested financing for PFG: 91,800 (in U.S Dollars Equivalent)

Letter of Endorsement (LOE) signed: Yes ☒ No ☐

NOTE: LOEs should be signed by the Designated Authority (DA). The signatory DA must be on file with the Adaptation Fund. To find the DA currently on file check this page: https://www.adaptation-fund.org/apply-funding/designated-authorities

Stage of Submission:

☒ This concept has been submitted before

☐ This is the first submission ever of the concept proposal

In case of a resubmission, please indicate the last submission date: ~~6/7/2025~~8/25/2025

Please note that concept note documents should not exceed 50 pages, including annexes.

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List of Acronyms

Acronyms	Meaning
AFD	French Development Agency
ABPC	Benin Agency for Civil Protection
CAP	Common Alert Protocol
CLP	Local Project Committee
CPS	Project Monitoring Committee
DGEau	Directorate General for Water
DGEC	Directorate General of Environment and Climate
EE	Executing Entity
EIA	Environmental Impact Assessment
EU	European Union
EWS	Early Warning Systems
FAO	Food and Agriculture Organization.
FNEC	National Fund for the Environment and Climate

GIZ	Deutsche Gesellschaft für International Zusammenarbeit
HPI	Human Poverty Index
IE	Implementing Entity
IFDC	International Fertilizer Development Center
IGN	National Geographic Institute
INStaD	National Institute of Statistics and Demographics
IRHOB	Fishery/Halieutic and oceanography research institute of Benin
MAEP	Ministry of Agriculture, Livestock, and Fisheries
MEEM	Ministry of Energy, Water, and Mines
METEO BENIN	National Meteorological Agency
MS	Ministry of Health
NAP	National Climate Change Adaptation Plan
NDC	Nationally Determined Contributions
NDP	National Development Plan
NFCS	National Framework for Climate Services
PNS	National Health Policy
RNA	National Agricultural Census
SDGs	Sustainable Development Goals
SIHAM	Hydro-Agro-Meteorological Information System
SNRRC	National Strategy for Disaster Risk Reduction
SPI	Standardized Precipitation Index
TFPs	Technical and Financial Partners
WRF	Weather Research and Forecasting

A. Project 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 – Context of Benin

Climate change is one of the greatest challenges to nations' socio-economic development[1]. It has caused significant harm and increasingly irreversible losses to terrestrial, aquatic, cryospheric, coastal, and oceanic ecosystems. Additionally, it has threatened food security and disrupted water resource management, hindering efforts to achieve sustainable development goals[2].

West Africa, including Benin, is experiencing heightened vulnerability to climate change, facing its impacts at a rate faster than the global average[3]. Like other countries in the region, Benin is enduring climate variability and change that disrupt various key sectors[4]. These disruptions are evident in intensifying climate variability and an increase in the frequency of extreme events, particularly heavy rains, flooding, prolonged droughts, and heat waves[5]. In 2019, the losses and damages from floods to the Beninese economy were estimated at USD 91,103 million. The sectors most affected include agriculture, livestock, fisheries, industry, trade, and other services. The agricultural subsector bore the brunt of the impact, with 4,899.1 hectares of crops destroyed across all types. Besides affecting livelihoods, the floods also led to loss of life[6].

1 IPCC, 2019: Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.- O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. https://doi.org/10.1017/9781009157988.001.
2 IPCC (2023). Synthesis report of the IPCC sixth Assessment Report (AR6): summary for policymakers. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 36 p.
3 https://pscc.fes.de/fileadmin/user_upload/images/publications/2023/FES-ReportClimate-A4-FR-MedRes.pdf, accessed January 12, 2025.
4 MCVDD (2022), Plan national d'adaptation aux changements climatiques du Bénin, Direction Générale de l'Environnement et du Climat (DGEC), Cotonou, Bénin, 175p.
5 Akponikpè et al. (2019). Etude de Vulnérabilité aux changements climatiques du Secteur Agriculture au Bénin. Report produced under the project "Projet d'Appui Scientifique aux processus de Plans Nationaux d'Adaptation dans les pays francophones les moins avancés d'Afrique subsaharienne", Climate Analytics gGmbH, Berlin.
6 ANPC (2020) Inondations de 2019 au Bénin : rapport d'évaluation des besoins post catastrophe, Cotonou, Bénin, 133p.

In this context, implementing adaptation measures is crucial. Among these measures, particularly in the short term, is the establishment of Early Warning Systems (EWS)[7]. Recognized by the Paris Agreement as a key tool for enhancing adaptive capacity, strengthening resilience to climate change, and reducing vulnerability to climate risks, these systems play a vital role in preventing human losses and represent a strategic and cost-effective investment[8]. Given the losses and damages caused by extreme climatic events, deploying such systems is essential, especially for developing countries like Benin.

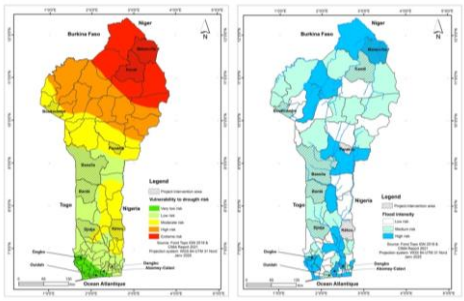
1.1 – Benin's vulnerability to climate change and section of project intervention areas

1.1.1 – Benin's vulnerability to climate change

Benin ranks among the countries most vulnerable to climate change, experiencing negative impacts on all socio-economic sectors and geographical areas. The National Adaptation Plan (NAP) of Benin has identified seven (7) priority sectors: agriculture, water resources, energy, health, infrastructure and urban development, tourism, forestry, and the coast. Various vulnerability studies indicate that drought, flooding, strong winds, extreme heat waves, and rising sea levels are the main climate risks facing Benin. These hazards have significant consequences, leading to the degradation of natural resources, displacement of populations, increased coastal erosion, and considerable disruption of economic activities, particularly in the agricultural sector, which results in escalating economic and social costs[9].

With an ND-GAIN Index of 38.3[10], Benin ranks 159th out of 185 countries. Its high vulnerability score (0.572) and low preparedness score (0.338) underscore significant climate risks. Consequently, Benin is the 17th most vulnerable country in the world and ranks 135th in its preparedness to address climate change. These indicators emphasize the urgent need for substantial investments and innovations to enhance the adaptive capacity of Benin's population. Future projections indicate that dry and wet seasons will become more extreme, heightening the risk of flooding. Under a business-as-usual scenario, by 2070, 98% of Benin's territory would be exposed to extreme temperatures, making it one of the most affected countries globally in terms of land area impacted.

Map 1 below illustrates Benin's vulnerability to drought and the associated risk of flooding.



Map 1: Benin's vulnerability to drought and flood risks
Source: Report on the national consultation in Benin, CIMA (2021)[11]

7 IPCC, 2019: Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.- O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. https://doi.org/10.1017/9781009157988.001.
8 GCF et CREWS (2023) GCF- SAP CREWS scaling up framework for early warning, 20 p.
9 MCVDD (2022), Plan national d'adaptation aux changements climatiques du Bénin, Cotonou, Bénin, 175p.
10 https://gain-new.crc.nd.edu/country/benin, consulted on 24 December 2024.
11 https://www.floodmanagement.info/floodmanagement/wp-content/uploads/2021/02/Rapport_National_BN_reviewCIMA_17Jan2021_clean.pdf, consulted on 13 January 2025.

The left side of Map 6 depicts the drought risk in Benin based on precipitation patterns. Analysis indicates that Alibori and the far northeast are the most vulnerable areas, facing an extreme risk of drought. Moving southward, vulnerability gradually decreases, with risks ranging from low to moderate. The right side of Map 6 illustrates the flooding in Benin's municipalities during October 2010. It shows that southern regions face a high risk of flooding, while the north, although also impacted, experiences less intense flooding overall. Low to moderate flood-risk areas are primarily located in central Benin. Map 6 emphasizes that the project's target areas are exposed to at least one of these risks, highlighting the need for region-specific adaptation strategies.

1.1.1 – Choice of project intervention areas

The project will benefit twelve (12) municipalities in eight (8) departments of Benin: ***Abomey-Calavi***, ***Ouidah*** (Atlantique department), ***Dangbo*** (Ouémé department), ***Kétou*** (Plateau department), ***Dogbo*** (Couffo department), ***Djidja*** (Zou department), ***Bantè*** (Collines department), ***Bassila*** (Donga department), ***Boukoumbé*** (Atacora department), ***Malanville***, ***Kandi*** (Alibori department), and ***Parakou*** (Borgou department). These municipalities were chosen due to their high vulnerability to climate hazards, including floods, droughts, delayed rainfall, strong winds, and lightning. The selection process also considered the presence and coverage of meteorological stations in these areas.

1.1.1.1 – Climate change vulnerability in targeted municipalities

To analyze the evolution and variability of precipitation in the project's beneficiary areas and assess their vulnerability to climate hazards, particularly drought, we used the Standardized Precipitation Index (SPI). This tool, developed by McKee et al. (1993, 1995)[12], enables monitoring of meteorological drought at various temporal scales. The SPI is based on a local classification of recent precipitation (daily or monthly) by comparing it to historical records from a specific site. The method involves statistically classifying the volume of water accumulated over a given period against all volumes observed over similar periods, thus assigning a severity index. Using the SPI index is essential for monitoring droughts over different time scales.

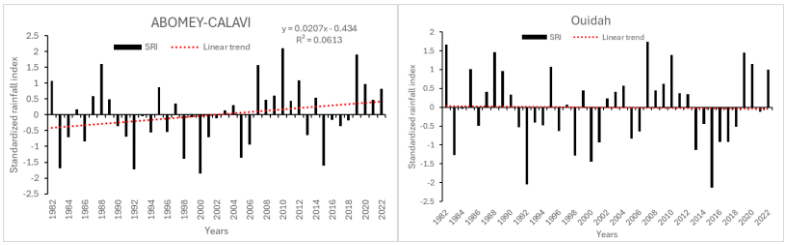
- ***1982–2022 Standardized Precipitation Index for southern Benin's beneficiary communes***
  - ***Abomey-Calavi and Ouidah***

A time series analysis of the Standardized Precipitation Index, utilizing precipitation data from Abomey-Calavi (Figure 1a), reveals a linear upward trend over the study period from 1982 to 2022. Severe droughts were recorded in 1983, 1992, 1998, 2000, 2005, and 2015, while 1988, 2007, 2010, and 2019 were the wettest years. The period between 1992 and 2006 experienced more frequent droughts in this region of southern Benin. However, from 2006 to 2022, precipitation patterns became more stable, showing a balanced alternation of wet periods and relatively consistent rainfall levels.

From 1982 to 2022, Ouidah's SPI exhibits strong fluctuations around a nearly zero trend, indicating no clear movement toward either flooding or drought. The period from 1980 to 1990 is characterized by several distinctly positive values (SPI > +1), suggesting wet seasons, as well as negative values (SPI < –1), indicating occasional droughts. From the late 1990s to 2020, there is a clear alternation between precipitation deficits and surpluses (SPI falling to -1.5 or rising above +1) (Figure 1b), reflecting significant interannual variability. The nearly flat trend line indicates no notable long-term change in precipitation, evidenced by a very low R^2 value. Despite this apparent stagnation, Ouidah continues to experience climatic extremes, with very dry periods occurring alongside very wet years, sometimes leading to flooding or water stress risks. Effective water management and Early Warning Systems are crucial to address both droughts and heavy

12 McKee, T.B., N.J. Doesken et J. Kleist (1993). The relationship of drought frequency and duration to time scale. In: *Proceedings of the Eighth Conference on Applied Climatology*, Anaheim, California, du 17 au 22 janvier 1993. Boston, American Meteorological Society, 179–184.

rainfall events.



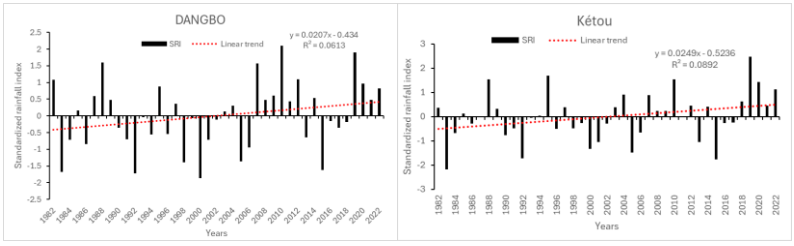
(a) (b)

Figure 1: 1982–2022 Standardized Precipitation Index for Abomey-Calavi and Ouidah (Atlantique Department)
Source: METEO BENIN, 2025.

- ***Dangbo and Kétou***

The Standardized Precipitation Index for Dangbo during the study period from 1982 to 2022 indicates an upward trend. The years 1984, 1992, 1998, 2000, 2005, and 2015 were particularly dry, characterized by scarce rainfall (Figure 2a). In contrast, 1998, 2008, 2010, and 2019 experienced heavy rainfall in this southern region. From 1982 to 2008, droughts alternated with some wet years. From 2008 to 2022, a regular alternation of wet years was observed; however, between 2016 and 2018, there was an irregularity in rainfall, leading to a slight drought.

Between 1982 and 2022, the Standardized Precipitation Index (SPI) for Kétou (Figure 2b) generally fluctuates between slightly negative values and positive peaks, reaching or exceeding +1, highlighting significant inter-annual variability. The period from 1980 to 1990 shows several negative indices (SPI < -1), indicating moments of moderate rainfall deficit, balanced by wet periods (SPI > +1) during the same timeframe. From the 2000s onward, there is a consistent alternation between slightly negative SPI values and positive ones, with some exceeding +1, indicating wetter periods. Despite a slight increase in the average, inter-annual variability remains high, suggesting the potential for both droughts and occasional heavy rainfall events, underscoring the need for adaptive strategies and effective water resource management to address these issues fluctuations.



(a) (b)

Figure 2: 1982–2022 Standardized Precipitation Index for Dangbo (Ouémé department) and Kétou (Plateau department)
Source: METEO BENIN, 2025.

- ***Dogbo***

From 1982 to 2022, the Dogbo Standardized Precipitation Index (SPI) (Figure 3) fluctuated around zero, exhibiting both negative values (indicating rainfall deficits) and positive peaks

(indicating excess rainfall). The linear trend reveals a very slight negative slope with a low coefficient of determination, meaning that only 2% of the variability is explained by this trend. The 1980s and 1990s show a series of negative indices approaching -1 (indicating moderate droughts) and a few positive peaks above +1 (indicating wet periods). From 2000 to 2020, this alternation continues without any strong indication of a trend toward wetter or drier conditions. Overall, Dogbo exhibits significant interannual variability but no considerable long-term climatic change, though occasional droughts or excessive rainfall events remain possible.

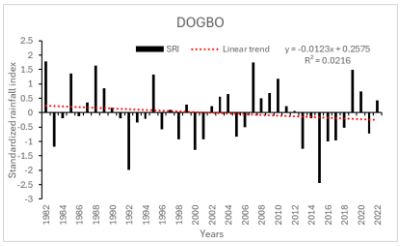
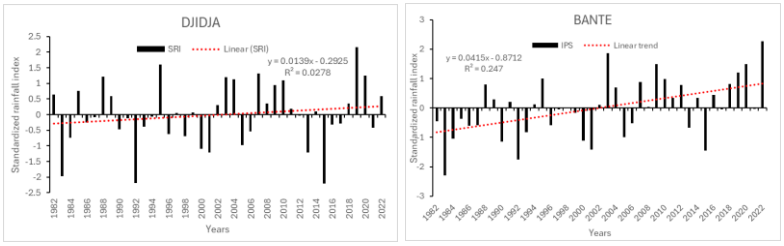


Figure 3: 1982–2022 Standardized Precipitation Index for Dogbo (Couffo department)
Source: METEO BENIN, 2025.

- ***1982–2022 Standardized Precipitation Index for Central Benin's beneficiary communes***
  - ***Djidja and Bantè***

Time series analysis of Djidja's Standardized Precipitation Index (SPI) (Figure 4a) reveals a slightly increasing linear trend over the study period from 1982 to 2022. Severe droughts occurred in 1983, 1992, and 2015, while 1995 and 2019 saw exceptionally high rainfall in this central region. Four key periods emerge: 1982-2003, marked by persistent droughts; 2004-2012, characterized by stable precipitation; 2012-2019, with a return of drought; and 2020-2022, featuring alternating wet and dry years.



(a) (b)

Figure 4: 1982–2022 Standardized Precipitation Index for Djidja (Abomey department) and Bantè (Collines department)
Source: METEO BENIN, 2025.

In Bantè, the analysis indicates a steeper slope and a higher coefficient of determination, suggesting a significant shift towards wetter conditions, although interannual variability remains high. The period from 1980 to 1990 is marked by negative SPI values (often below -1), followed by a more balanced alternation in the 2000s (Figure 6b). Since 2010, the frequency of wet years has increased, with 2022 recording an SPI close to +3, categorizing it among the "extremely wet" episodes. This trend confirms an increased risk of flooding, while moderate droughts may still occur, emphasizing the need for adaptation strategies and integrated water management.

- ***1982–2022 Standardized Precipitation Index for northern Benin's beneficiary communes***
  - ***Bassila***

From 1982 to 2022, the Standardized Precipitation Index (SPI) at Bassila indicates a slight trend toward wetter conditions (positive slope of 0.0331), yet it is characterized by significant interannual variability (Figure 5). The period from 1980 to 1990 shows several negative indices (SPI < -1), linked to instances of moderate to severe drought. In the 2000s, the SPI fluctuated between negative values and positive peaks. Starting in 2010, this variability continues, with an SPI of about +2.5 in 2022, indicating a highly rainy episode. Despite an overall trend toward increased humidity, these fluctuations leave the commune susceptible to both water shortages and flood risks.

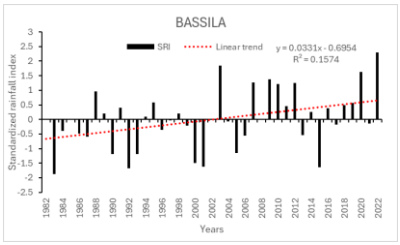
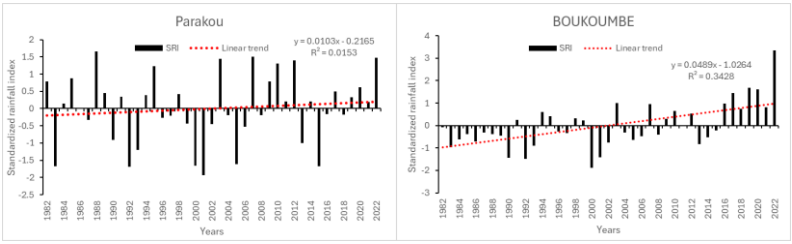


Figure 5: 1982–2022 Standardized Precipitation Index for Bassila (Donga department)
Source: METEO BENIN, 2025.

  - ***Parakou and Boukoumbé***

In Parakou, extremely high precipitation indices were recorded in 1988 (SPI > 1.5), with positive and significant indices noted in 1995, 2003, 2007, 2010, 2012, and 2022 (Figure 6a). Conversely, very dry years (SPI between -1.5 and -1.99) were noted in 1983, 1992, 2000, 2001, and 2015.



(a) (b)

Figure 6: 1982–2022 Standardized Precipitation Index for Parakou (Borgou department) and Boukoumbé (Atacora department)
Source: METEO BENIN, 2025.

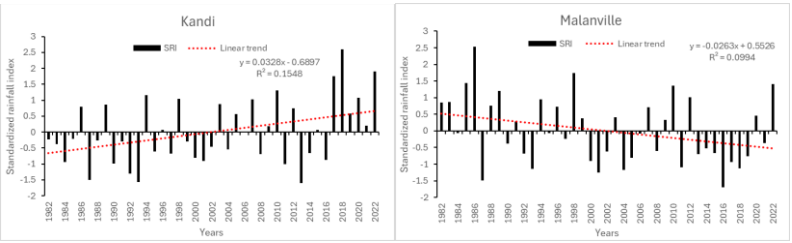
Boukoumbé is in a region characterized by significant rainfall variability. An analysis of the Standardized Precipitation Index (SPI) from 1982 to 2022 reveals important trends that warrant the implementation of an adaptation and resilience project in response to climate change. Between 1980 and 1990, several negative SPI values (below -1) indicate periods of precipitation deficit, ranging from moderate drought (-1.0 to -1.49) to very severe drought (-1.5 to -1.99). Precipitation during this time is generally below normal (see Figure 6b), underscoring a predominantly dry and irregular pattern. Since the 2000s, SPI values have fluctuated more frequently between near zero (normal) and positive SPIs, occasionally reaching +1 or +1.5.

These values reflect “moderately wet” episodes and signal a gradual return to more favorable precipitation conditions. From the 2010s onward, positive SPI values have become more common, sometimes exceeding +2.0. In 2022, the SPI surpasses +2, classifying this year as “extremely wet”, with exceptional rainfall events likely leading to flooding, landslides, and infrastructure damage. These extreme conditions underscore the necessity of effective water management strategies to address both excessive rainfall and potential droughts.

- ***Kandi and Malanville***

Analysis of the SPI index for Kandi from 1992 to 2022 reveals that 2018 is marked by a significant surplus (SPI > 2.5). This reflects the extremely wet periods recorded. Additionally, in 2017 and 2022, indices of ≥ 1.5 were noted (Figure 7a), indicating continued flooding and excessively wet conditions. However, severe drought periods were recorded in 1987, 1993, and 2013 (SPI ≤ -1.5). These varying indices highlight the commune of Kandi's exposure to both flooding and drought risks.

The SPI curve for Malanville reveals significant interannual variability from 1982 to 2022 (Figure 7b). The year 1986 is notable as an exceptionally wet year (SPI > 2). The years 1985, 1988, 2010, 2012, and 2022 also experienced significantly positive indices (SPI ≥ 1). In contrast, the years 1987 and 2016 are marked by episodes of severe drought (SPI ≤ -1.5). Additionally, the primary hydroclimatic risks faced by the residents of the Malanville commune include floods (92.33%), erosion (89.64%), drought (57.11%), excessive heat (40.21%), and violent winds (33.22%). Specifically, in the agricultural sector, onion farmers in Malanville are particularly vulnerable to excessive heat, which affects around 88% of them. Droughts and dry spells impact approximately 80% of farmers, leading to reduced agricultural output.



(a) (b)

Figure 7: 1982–2022 Standardized Precipitation Index for Kandi and Malanville (Alibori department)
Source: METEO BENIN, 2025.

All target municipalities experience significant climate variability, with occasional droughts (SPI < -1) and intense rainfall periods (SPI > +1 or even +2). This irregular alternation between dry and wet conditions underscores the unpredictability of the local climate. Although some linear trends are positive, they remain moderate and account for only a small portion of the variability. This highlights the need for adaptation initiatives to prepare for extreme weather risks and enhance the resilience of local communities in the face of climate change.

1.3.1.2 – Future climate trends in targeted communes

In the absence of specific climate projections for the beneficiary municipalities, the future climate analysis relied on available projections at the departmental level.

- ***Future climate of beneficiary communes in southern Benin***

As mentioned earlier, five municipalities in southern Benin, spanning four departments, will benefit from this project. These municipalities are ***Abomey-Calavi*** and ***Ouidah*** (Atlantique department), ***Dangbo*** (Ouémé department), ***Kétou*** (Plateau department), and ***Dogbo*** (Couffo

department). Figure 8 displays the projected variability of precipitation throughout the seasonal cycle, while Figure 9 illustrates the projected deviation from the natural variability of the average mean surface air temperature for the four beneficiary departments in southern Benin.

Climate projections for southern Benin indicate an earlier onset of the rainy season in April and a substantial increase in precipitation during the peak months of June and September. While rainfall is expected to rise slightly between 2020 and 2039, the most significant intensification is anticipated for the periods of 2040-2059 and 2080-2099, with rainfall in June and July potentially reaching up to 400 mm, double the historical average of 200 mm. This increase could elevate the risk of flash floods and flooding, particularly in June and July. Precipitation is also projected to rise in September and October, extending the rainy season. In the departments of Mono and Atlantique, the two rainy seasons will remain distinct, whereas in Plateau and Couffo, the distinction between the seasons will become less clear, accompanied by frequent rainfall throughout the year. The main dry season remains relatively unchanged in the projections, with minimal rainfall during this period; however, light rains could begin in March during the 2040-2059 and 2080-2099 periods.

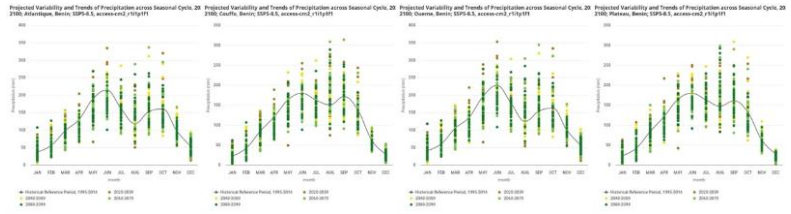


Figure 8: Projected variability of precipitation across the seasonal cycle for Atlantique, Couffo, Ouémé, and Plateau departments

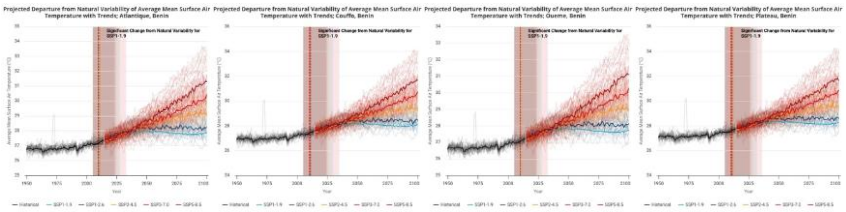


Figure 9: Projected departure from natural variability of average mean surface air temperature for Atlantique, du Couffo, Ouémé, and Plateau departments.
Source: Climate Change Knowledge Portal[13]

- ***Future climate of beneficiary communes in central Benin***

In the central region, the project targets the communes of ***Djidja*** (Zou department) and ***Bantè*** (Collines department). Figure 10 below displays the projected variability of precipitation throughout the seasonal cycle (left) and the anticipated departure from the natural variability of the average surface air temperature (right) for the Zou and Collines departments.

In the Collines, climate projections indicate a single rainy season, concentrated from May to October, with a distinct peak in June and July. Unlike other regions of Benin, there is no second rainy season. Precipitation progressively increases over the 2040-2059 and 2080-2099 periods, reaching as much as 350 mm during the peak time. The main dry season (December to March) remains unchanged. These trends indicate an intensification of rainfall during the rainy season, heightening the risk of flash floods and erosion, particularly in June and July.

13 https://climateknowledgeportal.worldbank.org/country/benin/trends-variability-projections, consulted on 13 January 2025.

For the Zou region, climate projections confirm the presence of two rainy seasons: the first, from May to mid-July, peaks notably in June (up to 300 mm by 2080-2099), followed by a dry spell in August. The second season occurs from September to October, which is evident but less intense. The main dry season, lasting from December to March, remains unchanged. Future projections suggest an intensification of rainfall, particularly during the peak in June, elevating the risk of flash floods and surface runoff, while the distinction between the two rainy seasons stays clear.

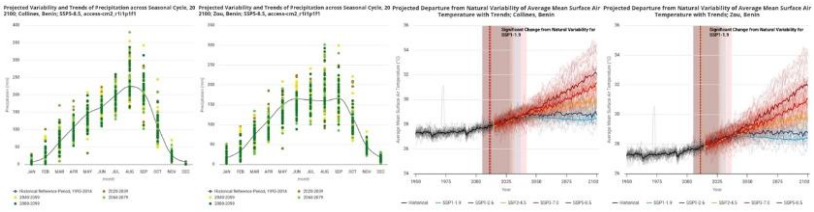


Figure 10: Projected variability of precipitation across the seasonal cycle (left) and the projected departure from the natural variability of the average mean surface air temperature (right) for the departments of Zou and Collines.
Source: Climate Change Knowledge Portal[14]

- ***Future climate of beneficiary communes in northern Benin***

Like the South, five municipalities across four northern departments will benefit from this project. They are ***Bassila*** (Donga Department), ***Boukoumbé*** (Atacora Department), ***Malanville*** and ***Kandi*** (Alibori Department), and ***Parakou*** (Borgou Department).

Figures 11 and 12 illustrate the projected variability of precipitation throughout the seasonal cycle (top) and the projected deviation from the natural variability of the average mean surface air temperature (bottom) for the four beneficiary departments in northern Benin.

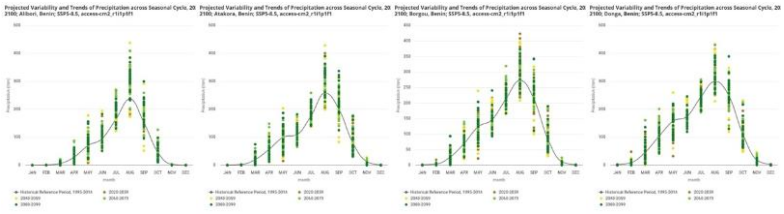


Figure 11: Projected variability of precipitation across the seasonal cycle for Alibori, Atacora, Borgou, and Donga departments.

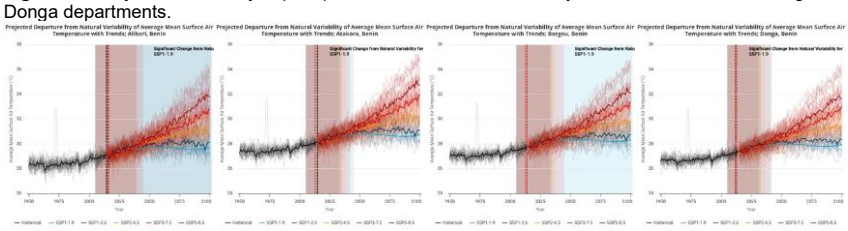


Figure 12: Projected departure from natural variability of average mean surface air temperature for Alibori, Atacora, Borgou, and Donga departments
Source: Climate Change Knowledge Portal[15]

14 https://climateknowledgeportal.worldbank.org/country/benin/trends-variability-projections, consulted on 13 January 2025.
15 https://climateknowledgeportal.worldbank.org/country/benin/trends-variability-projections, consulted on 13 January 2025.

In northern Benin, rainfall remains scarce from December to February in all future periods (2020-2039, 2040-2059, etc.). The rainy season remains well-defined, peaking between July and August, as it has in the historical period. This peak continues across all three future scenarios before tapering off toward October. However, rainfall intensity is expected to increase from 2040-2059, reaching its peak around 2080-2099, with peak precipitation exceeding 400 mm. Future projections also indicate significant intra-seasonal variability, featuring more irregular rainfall patterns. While overall trends are consistent across the four departments, Atacora and Alibori may experience slightly higher peaks than Borgou and Donga.

Furthermore, projections suggest that the start of the rainy season will be slightly earlier starting in 2040, with a notable rise in precipitation as soon as April by the 2080-2099 timeframe. Simultaneously, the rainy season is anticipated to last longer, with ongoing rainfall extending into October and, in some instances, early November. These alterations lead to increased intra-seasonal variability and a greater risk of extreme weather events, highlighting the need for improved adaptation strategies and climate risk management measures.

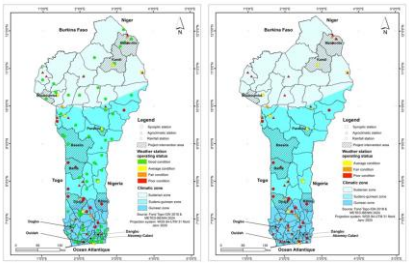
Climate variability analyses indicate that the population in the twelve (12) target communes is already suffering from the negative impacts of climate change. Climate projections suggest that these impacts will worsen unless appropriate adaptation measures are implemented. With more frequent and severe floods, strong winds, increasing unpredictability of rainfall, and prolonged droughts, it is critical to:

- Establish early warning systems through regular monitoring of the SPI index and other climate indicators to anticipate extremes.
- Strengthen local governance by ensuring effective coordination among key stakeholders (local authorities, technical services, and farmers) and promoting the sharing of relevant climate information.

The success of these actions depends on identifying, modernizing, and optimizing the network for observing and monitoring extreme weather and climate events.

1.3.1.2 – Overview of the Meteorological Stations in Benin

The map below illustrates the location of meteorological stations in Benin. The left side displays the overall condition of the weather stations based on their typology and functionality within the country's three climatic zones. The right side emphasizes the necessity to rehabilitate dilapidated weather stations across the nation.



Map 2: Overview of the meteorological stations in Benin
Source: METEO BENIN, 2025.

Analysis of Map 7 indicates that Benin's meteorological observation network includes various types of stations spread across the national territory, such as synoptic, climatological, agro-meteorological, and rainfall stations. This infrastructure is essential for climate monitoring, weather forecasting, and Early Warning Systems. However, an examination of this network uncovers several significant deficiencies in terms of coverage, geographical distribution, and

station diversity (left side of the map).

Benin's meteorological observation network has an uneven and insufficient distribution, especially in rural and northern areas. Although the World Meteorological Organization (WMO) does not impose strict standards for station spacing, it encourages each country to design its network based on specific goals, geographic limitations, and its ability to maintain equipment. Nonetheless, established practices and studies provide guidance for network planning. A fundamental principle is that station density should be tailored to user needs and align with the geographic and climatic characteristics of the region. For instance, WMO recommendations advise placing one station per 100 km² in plains, with denser concentrations in complex areas like mountainous or coastal regions.

For an effective Early Warning System (EWS), it is typically advised that synoptic stations be positioned 30 to 60 km apart. This arrangement provides extensive regional coverage while considering local climatic variations. A notable example is the Oklahoma Mesonet network, which maintains an average station spacing of 30 km to ensure thorough data collection and monitoring[16].

These examples illustrate the necessity of enhancing Benin's meteorological network, especially to boost extreme weather monitoring and forecasting at the community level. Considering the vital role of rainfall in agriculture, a sparse network compromises the reliability of early warning systems and localized forecasts.

2 – Project selection

Benin, a developing country characterized by significant climatic diversity, faces increasing vulnerability to both the current and future impacts of climate change and extreme weather events. Principal risks include water stress, intensified flooding, heatwaves, and extreme precipitation, which directly affect populations, livelihoods, ecosystems, and infrastructure. Communities in the twelve targeted communes are especially at risk due to their heightened sensitivity to climate variability, recurrent flooding, prolonged droughts, heatwaves, strong winds, wildfires, and erosion (including both runoff and coastal erosion).

Given their heightened vulnerability, Benin has identified several sectors as priorities for climate change adaptation, including agriculture, water resources, energy, health, infrastructure, urban development, tourism, forestry, and coastal zone management. Rising temperatures are anticipated to directly affect the livelihoods of local communities, with disproportionate impacts on women and girls. Additionally, climate change is worsening ecosystem degradation, loss of biodiversity, and the spread of climate-sensitive diseases, adversely affecting community well-being.

To build climate resilience and mitigate risks, Benin must ensure access to accurate, timely meteorological data and people-centered, impact-based Early Warning Systems. Strengthening and modernizing the national observation network while enhancing stakeholder capacities will improve climate services. These efforts will assist vulnerable communities in making informed decisions, managing climate risks, and adapting effectively while protecting lives and livelihoods.

Benin's hydrometeorological observation network faces significant limitations, including **inadequate geographic coverage**, **outdated** and **non-automated stations**, the **lack of marine meteorological** and **radar systems**, and **insufficient telemetry infrastructure**. The country does not have **impact-based forecasting** or **advanced hydrological modeling for extreme weather events**, both of which are vital for climate resilience and essential for managing the worsening effects of climate change. Additionally, there is an absence of an institutional framework that connects climate information producers (METEO BENIN, DGEau, IRHOB) and intermediate users (ABPC, MAEP, MS, MEEM, etc.) to create forecasting and warning products based on the impacts of extreme weather and climate phenomena. Furthermore, the existing processes for producing and sharing climate services are inefficient, obstructing rapid and

16 https://www.campbellsci.fr/mesonets/mesonet-design, consulted on 28 January 2025.

widespread access to critical information.
Regarding Early Warning Systems (EWS), Benin faces considerable fragmentation. Existing EWS operate in isolation, failing to coordinate and integrate across various sectors and stakeholders. This lack of synergy restricts their ability to provide consolidated, timely, and relevant information vital for anticipating risks and responding effectively to disasters. Moreover, none of the EWS in Benin comply with international standards such as the Common Alert Protocol (CAP), which is essential for issuing, ensuring interoperability, and distributing multi-hazard alerts. The absence of a CAP-compliant EWS substantially diminishes the effectiveness of alerts both nationally and internationally, impeding Benin's ability to align with global best practices.
These vulnerabilities jeopardize lives, livelihoods, ecosystems, and infrastructure. To tackle these issues, it's crucial to set up a national, integrated, multi-hazard Early Warning System that complies with Common Alert Protocol (CAP) standards.

B. Project Objectives

List the main objectives of the project/programme.

This project aims to enhance the climate resilience of local communities in Benin, by improving meteorological services and setting up a multi-hazard Early Warning System (EWS) that is tailored to the needs of vulnerable groups and based on impact.

This project specifically seeks to:

- strengthen and modernize the weather observation system while establishing a multi-hazard Early Warning System (EWS) to improve the dissemination and utilization of weather forecasts;
- Enhance skills for producing, sharing, and adopting meteorological and climatological services;
- ensure the sustainability of the project's results and oversee knowledge management.

The project aligns with the Adaptation Fund Results Framework, specifically with the following outcome:

- **Outcome 1: Reduced exposure to climate-related hazards and threats:**
  By establishing a multi-hazard Early Warning System (EWS) explicitly designed to enhance the dissemination and utilization of weather forecasts, the project will directly contribute to reducing community vulnerability and exposure to climate-related risk hazards.
- **Outcome 2: Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses:**
  The project directly contributes to building institutional capacities and community skills for managing and reducing climate risks by strengthening and modernizing the weather observation infrastructure and enhancing the ability to produce, disseminate, and adopt meteorological and climatological services.
- **Outcome 3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level:**
  The project promotes awareness, ownership, and community-based action through targeted training, capacity building, and tailored communication of meteorological information. This directly strengthens local adaptation efforts and mitigates vulnerability to the impacts of climate change.
- **Outcome 8: Support the development and diffusion of innovative adaptation practices, tools and technologies:**
  The project explicitly incorporates Knowledge and Learning Management (KLM) mechanisms to ensure the capitalization, sharing, and dissemination of lessons learned and best practices.

More details on the project alignment with Adaptation Fund Results Framework are provided in the table of section C, Part III.

C. Project 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.

Table 1: Components of the project

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
Component 1: Enhancing and modernizing the observation network to improve weather and climate services	**Output 1.1.1:** 10 synoptic weather stations, 12 agroclimatic stations, 60 rain gauges stations, 2 marine stations, and 3 hydrometric stations have been installed	**Outcome 1.1:** High-quality, impact-based weather and climate forecasts are available in a changing environment.	2,513,050
	Output 1.1.2: 5 synoptic weather stations, 1 agrometeorological station, and 6 precipitation monitoring stations have been rehabilitated		
	Output 1.1.3: The IT equipment is acquired		
	Output 1.1.4: The server and calibration rooms at METEO BENIN are upgraded to meet standards		
	Output 1.1.5: Weather forecasting models tailored to the specific needs of local communities are developed		
	Output 1.1.6: Multi-risk forecasting tools and capabilities based on risk impacts are available		
	Output 1.1.7: Sector-specific climate analyses and differentiated meteorological services for public and private sectors are co-produced		
	Output 1.2.1: A multi-risk Early Warning System based on impacts is established, operational, and accessible to a broad public, including vulnerable populations	**Outcome 1.2:** Specific meteorological and climatological services are available to local communities to enhance their adaptive capacity	
	Output 1.2.2: The channels for producing and disseminating various existing Early Warning Systems (EWS) are aligned with those of the newly developed multi-risk EWS.		
	Output 1.2.3: A national strategy for the production and dissemination of meteorological and climatological information is developed		
	Output 1.2.4: Web and mobile applications for real-time early warning dissemination are developed and operational		
	Output 1.2.5: Local communities have access to reliable meteorological and climatological services and use them to enhance their resilience.		
	Output 1.2.6: The partnership between municipalities and local media is strengthened for the rapid and reliable dissemination of information and early warnings		
	Output 1.2.7: Early warning protocols based on impacts and utilizing collaborative methods tailored to specific needs are developed and operational		
Component 2: Strengthening capacity	**Output 2.1.1:** The capacity of METEO BENIN's specialized staff on forecasting models tailored to the specific needs developed is strengthened	**Outcome 2.1:** The technical and organizational capacity of stakeholders is strengthened to enable the effective implementation of a multi-	683,000

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
for the production, dissemination, and adoption of meteorological and climate information	**Output 2.1.2:** All stakeholders involved in the existing Early Warning Systems (EWS) are trained on the newly developed multi-risk EWS	risk early warning system tailored to local needs	
	Output 2.2.1: Local communities are sensitized and trained on climate risks, the multi-risk EWS and risk management to strengthen their resilience	**Outcome 2.2:** Local communities have the necessary knowledge to better understand climate risks, use the multi-risk early warning system, and strengthen their resilience to the impacts of climate change	
	Output 2.2.2: Community leaders are trained in climate risk preparedness and response		
Component 3: Sustainability of project results and knowledge management	**Output 3.1.1:** An operational maintenance and upkeep plan for all acquired infrastructure and equipment is developed and implemented	**Outcome 3.1:** Meteorological and climatological infrastructure and equipment are sustainably maintained and preserved through an effective operational plan, ensuring their long-term functionality	150,000
	Output 3.1.2: A public-private partnership plan for the sustainability of meteorological and climatological services is developed		
	Output 3.2.1: A toolkit summarizing the best practices and successes of the project is developed	**Outcome 3.2:** The best practices and successes of the project are capitalized and made available in the form of practical tools, facilitating their dissemination and replication	
	Output 3.2.2: Mechanisms for knowledge sharing and management are established		
6. Project activities cost			3,346,050
7. Project execution cost (9.5% of total project cost)			351,242
8. Total project Cost			3,697,292
9. FNEC management cost (8.5% implementation cost)			314,269
Amount of Financing Requested			**4,011,561**

D. Projected Calendar

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

Table 2: Projected Calendar

Milestones	Expected Dates
Start of Project/Programme Implementation	2026
Mid-term Review (if planned)	2029
Project/Programme Closing	2030
Terminal Evaluation	2030

PART II: PROJECT JUSTIFICATION

A – Project Components

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.

This project aims to improve meteorological services and establish an impact-based, multi-hazard Early Warning System (EWS) tailored to the specific needs of vulnerable populations, enhancing the climate resilience of local communities in Benin. For this purpose, these adaptation activities are described below.

To ensure relevance, interinstitutional coordination, and effective planning, each proposed project action includes a preliminary identification of stakeholders, specific interventions, and targeted geographical areas for equipment installation where applicable. This structure is designed to ensure that implementation is suited to local realities, beginning from the project preparation phase. A summary table outlining these elements is included in Annex 1.

Component 1: Enhancing and modernizing the observation network to improve weather and climate services

The first component of the project aims to enhance the provision of reliable meteorological and climatological services. This will be accomplished through investments in modern meteorological infrastructure and equipment, as well as advanced digital technologies. The project also seeks to create an integrated platform that consolidates real-time data, forecasts, and alerts while ensuring differentiated access for users. Component 1 is designed to ensure that acquired or rehabilitated stations meet the Global Basic Observing Network (GBON)[17] standard. This enhances the coverage and quality of essential observations, such as pressure, temperature, wind, humidity, and precipitation, which are transmitted to regional and global numerical forecasting centers.

Furthermore, this component aims to strengthen modeling capacities for meteorological, hydrological, and climatic phenomena to operationalize the National Framework for Climatological Services (CNSC) of Benin. This is essential for issuing multi-risk early warnings based on impacts following the priorities of the “Early Warnings for All”[18] program.

Extreme weather events such as floods, strong winds, and prolonged droughts adversely affect all socioeconomic sectors in Benin, hindering its development. In 2023 alone, floods caused 46 deaths, impacted 182,803 individuals, damaged 211 schools and 29 health centers, and resulted in significant agricultural and livestock losses[19]. The destruction of livelihoods and human losses could be mitigated if the population had access to high-quality meteorological and climatic services as well as Early Warning Systems. Indeed, the climate and meteorological services provided by the National Meteorological Agency (METEO BENIN) are inadequate and poorly suited to the needs of users. Benin lacks the infrastructure and advanced equipment necessary for effectively studying, analyzing, and forecasting weather and climate, as well as identifying atmospheric constituents. The current network is aging and insufficient. Coverage is lacking, with agro-meteorological stations limited to rainfall posts. There is also a shortage of equipment, particularly radars and lightning sensors.

In this context, strengthening METEO BENIN’s infrastructure, equipment, and skills, along with establishing a multi-risk early warning system, will help mitigate the adverse effects of climate change. Consequently, it will prevent the loss of life and the destruction of livelihoods for current

[17] https://community.wmo.int/en/activity-areas/wigos/gbon, consulted on 22 May 2025.
[18] https://www.un.org/en/climatechange/early-warnings-for-all,consulted on 22 May 2025.
[19] Arrêté 2024 N°032/MISP/DC/SGM/ANPC/SA/0135GG24 du 1er février 2024 portant déclaration d’état de catastrophe au titre des inondations de l’année 2023.

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and future generations.

Outcome 1.1: ***High-quality, impact-based weather and climate forecasts are available in a changing environment***

- **Output 1.1.1: Hydrometeorological observations network (about 15 synoptic weather stations, 12 agroclimatic stations, 66 rain gauges, 2 marine stations, 3 hydrometric stations, 1 agrometeorological station, and 13 hydrometric stations) modernized/established, nationwide numerical weather prediction models developed, and sector-specific climate analyses and tailored meteorological services co-produced**

Output 1.1.1 emphasizes the critical need to improve coverage and modernize of the observation and monitoring network for extreme meteorological and climatological events at the national level. This enhancement will provide reliable and tailored data for localized forecasts that address the needs of local communities. The proposed investments will support the creation of precise forecasts and warnings, climate risk alerts, and relevant climate analyses for key adaptation sectors in Benin, including agriculture, water resources, energy, health, tourism, forestry, infrastructure, urban planning, and coastal management.

Additionally, this output will allow Benin to develop national models and tools for multi-hazard weather forecasting based on impact. This approach clearly highlights the necessity of transitioning from deterministic forecasting techniques to probabilistic methods, which not only identify the most likely impacts but also outline reasonable worst-case scenarios that often result in avoidable disasters. Adopting a probabilistic approach instead of the traditional deterministic model improves forecast reliability and provides timely warnings for effective disaster risk reduction.

This outcome will also further scientific understanding of various climate risks, as well as the exposure and vulnerability of local communities. Scientific information on meteorological and climate risks will be co-produced, facilitating the creation of accurate, specific, and impact-based forecasting and warning products, which are essential for establishing an effective multi-hazard early warning system.

This result will be achieved through the following two activities:

- ***Activity 1.1.1:*** *Acquisition and installation of automatic stations, including 10 synoptic weather stations, 12 agroclimatic stations, 60 rain gauges, 2 marine stations, and 3 hydrometric stations*

This activity aims to expand the hydrometeorological and oceanographic observation and monitoring network, enabling accurate real-time data collection and improving its spatial coverage.

- ***Activity 1.1.2:*** *5 synoptic weather stations, 1 agrometeorological station, 6 rain gauges, and 13 hydrometric stations have been rehabilitated*

This activity involves replacing outdated instruments in existing stations and setting up a remote transmission system in traditional stations. These measures will improve the quality of the collected data and optimize monitoring operations.

- ***Activity 1.1.3:*** *Development of nationwide numerical weather prediction models tailored to the specific needs of local communities and enhance multi-hazard forecasting capabilities based on risk impact*

Activity 1.1.3 aims to develop high-resolution meteorological models that can capture hydrometeorological, oceanographic, and local microclimatic phenomena (fine-mesh models with a final resolution of 3 km). These models will incorporate specific data such as land use, local vegetation, and geographic features. They will also integrate data from local weather stations and satellites to connect short-term (3 to 7 days) hydrometeorological and

oceanographic forecasts with seasonal climate trends, thereby facilitating better planning of local economic activities. This activity will implement a fine-scale modeling system based on the Weather Research and Forecasting (WRF) model, consisting of four (4) subcomponents for applications in general weather forecasting, hydrology, oceanography, and climate.

This activity also aims to create a multi-hazard database that centralizes data on natural hazards (high winds, heavy rains, floods and flash floods, droughts and late rains, heat waves, earthquakes, etc.) and their historical impacts. This database will integrate socio-economic data, including population density, critical infrastructure, and livelihoods. Digital early warning platforms will be developed to provide an accessible interface that consolidates multi-hazard forecasts and their likely impacts. The system will include interactive maps and personalized alerts. Tools will also be developed to visualize potential impacts on communities, infrastructure, and ecosystems.

- ***Activity 1.1.4:*** *Co-production of sector-specific climate analyses and tailored meteorological services for both public and private sectors*

Based on the outcomes of stakeholder consultations and existing documents such as the National Framework for Climate Services (CNSC), vulnerability profiles for each sector will be refined in collaboration with stakeholders to identify the types of hydrometeorological and climate information needed, including short-term forecasts, seasonal analyses, and long-term climate scenarios. Workshops will be organized to bring together public and private sector actors to collaboratively design relevant meteorological and climate analyses and services, integrating local and sector-specific knowledge whenever possible. Following these workshops, multidisciplinary working groups will be established to ensure the joint development and validation of impact-based forecasts and warnings for extreme hydrometeorological and oceanographic phenomena at the sectoral level throughout the project.

Outcome 1.2: ***Specific meteorological and climatological services are available to local communities to enhance their adaptive capacity***

- **Output 1.2.1: A multi-hazard Early Warning System is designed and operationalized**

The project will establish a multi-hazard Early Warning System tailored to the specific needs of local communities and focused on reducing disaster risks. It will ensure the efficient and coordinated implementation of hydrometeorological and climatological data production and dissemination at the national level by strengthening the organizational and decision-making processes of all stakeholders. Furthermore, the project will seek to harmonize and align existing EWS with international standards to optimize resource allocation for early warning production and dissemination. Additionally, a national strategy will be developed to coordinate, facilitate, and enhance collaboration among national institutions, thereby improving access to and effective utilization of meteorological and climatological services.

To achieve these objectives, three main activities will be implemented:

- ***Activity 1.2.1:*** *Implementation of an impact-based multi-hazard Early Warning System (EWS)*

All forecasting tools and capabilities developed in activities 1.1.3 and 1.1.4 will facilitate the creation of an integrated platform that consolidates real-time data, forecasts, and warnings. This platform, designed with a community-based information dissemination approach, will offer differentiated access to users, including local authorities, NGOs, and communities.

- ***Activity 1.2.2:*** *Harmonizing the production and dissemination channels of existing Early Warning Systems (EWS) with those of the newly developed multi-hazard EWS*

To achieve its objective, this activity aims to:

- Identify existing Early Warning Systems (EWS) in Benin (floods, droughts, wildfires, epidemics, etc.), inventory their Standard Operating Procedures (SOPs), and assess their compatibility with the Common Alerting Protocol (CAP);

- Evaluate these systems to identify redundancies, inconsistencies, or gaps in the production and dissemination processes;
- Integrate the forecasting models of existing EWS into a unified framework tailored for multi-hazard approaches to develop harmonized models that account for the interconnected impacts of multiple risks;
- Develop a single interface to enable simultaneous and standardized dissemination across all communication channels.

- ***Activity 1.2.3:*** *Development of a national strategy for producing and sharing meteorological and climatological information*

This activity will allow Benin to establish a clear vision for producing and disseminating meteorological and climatological information while setting objectives that align with national priorities (food security, climate resilience, and disaster risk reduction). It will also ensure that the strategy supports the Sustainable Development Goals (SDGs) and Benin's climate commitments.

- **Output 1.2.2: Multilingual web and mobile applications are designed, municipal-local media partnerships are strengthened, and early warning protocols are implemented**

The three activities to be implemented here will enhance communities' access to meteorological and climatological services by developing web and mobile applications designed to automate the distribution of weather forecasts and communicate alerts. By improving existing dissemination platforms, the project will deliver risk-specific, geographically targeted alerts for each area impacted by a particular hazard.

- ***Activity 1.3.1:*** *Development of web and mobile applications for the real-time dissemination of early warning alerts*

Activity 1.3.1 aims to:

- Design a robust and secure system to host applications using modern technologies for real-time alert transmission;
- Develop an application compatible with both Android and iOS platforms, incorporating key features such as push notifications for urgent alerts, geolocation for sending location-specific alerts, and multilingual options to include local languages;
- Create an intuitive web user interface that allows users to access alerts, risk maps, and practical advice, while integrating dashboards for local authorities to monitor and manage the alerts.

- ***Activity 1.3.2:*** *Strengthening the partnership between municipalities and local media for the swift and dependable dissemination of information and early warnings*
- ***Activity 1.3.3:*** *Developing early warning protocols by transitioning from a hazard-based approach to an impact-based approach, employing collaborative methods tailored to specific needs*

Component 2: Strengthening capacity for the production, dissemination, and adoption of meteorological and climate information

This component focuses on strengthening the technical capacity of stakeholders involved in producing, disseminating, and using meteorological and climatological services, with two key outcomes. Stakeholder consultations revealed that many populations in the project intervention areas have difficulty accessing and interpreting the services provided by METEO BENIN. These barriers hinder the adoption of these services and the implementation of appropriate measures in response to extreme climate events. Therefore, to enhance the resilience of local communities, it is essential to educate them about climate risks and early warning systems and train them to prepare for and respond to these risks.

Additionally, the lack of national expertise in impact-based forecasting limits the availability of the detailed information required to organize an effective response to risks. Training the technical staff responsible for disseminating hydrometeorological products and services is essential to ensure real-time access to information. This enables local communities to anticipate and adapt to increasing climate risks.

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Outcome 2.1: ***The technical and organizational capacity of stakeholders is strengthened to enable the effective implementation of a multi-risk early warning system tailored to local needs***

- **Output 2.1.1: The technical and organizational capabilities of METEO BENIN, DGEau, IRHOB, and decentralized governmental services staff are strengthened**

The goal of this output from Component 2 is to enhance the modeling capabilities of meteorological, hydrological, and oceanographic phenomena for METEO BENIN, DGEau, and IRHOB to improve the accuracy of forecasts using an impact-based approach. Reliable modeling indeed enables more effective anticipation of environmental risks and optimizes resource and infrastructure management in the face of increasingly severe climate challenges. To achieve this outcome, the following two activities will be undertaken:

- ***Activity* 2.1.1:** *Strengthen the capabilities of specialized staff at METEO BENIN, DGEau, and IRHOB regarding the forecasting models developed in Activity 1.1.3, as well as the maintenance processes for installed stations and for data collection and processing*
  The capacity building to be implemented through Activity 2.1.1 involves a series of training sessions lasting from two to 12 weeks. These sessions will address numerical modeling, data assimilation, and the management of meteorological, hydro, and marine databases. They will also include maintenance of meteorological stations and equipment.
- **Activity 2.1.2:** *Strengthen the capacities of decentralized governmental services as intermediary users to facilitate the adoption, use, and communication of impact-based forecasting and early warning products developed through the Multi-Hazard Early Warning System (EWS)*
  The aim of this activity is to offer short-term training to decentralized state services for managing climate information, as well as for impact-based forecasting and alert products.

Outcome 2.2: ***Local communities have the necessary knowledge to better understand climate risks, use the multi-risk early warning system, and strengthen their resilience to the impacts of climate change***

- **Output 2.2.1: The technical capacity of local communities to adopt improved meteorological services is enhanced**

This output emphasizes enhancing the technical capacity of local communities to adopt improved meteorological services. By implementing specific actions such as increasing awareness of climate risks and training community leaders in risk management and crisis preparedness, this initiative aims to bolster the resilience of local communities. The outlined activities will enhance their ability to anticipate and respond effectively to extreme climate events, supported by the Multi-Hazard Early Warning System.

- ***Activity 2.2.1:*** *Enhancing the awareness and education of local communities and community leaders on climate risks, Early Warning Systems, and preparedness and response strategies for climate risks*
  This activity aims to strengthen the response capacity to extreme climate events and the resilience of local communities through simulation exercises and awareness-raising campaigns on the use of hydrometeorological services.

Component 3: Sustainability of project results and knowledge management

Implementing this component will effectively strengthen communities' resilience to climate change at both national and regional levels. Indeed, the lack of defined measures to ensure sustainability from the project design phase will result in a situation worse than the initial one after the project. Similarly, insufficient knowledge management hinders the dissemination of lessons learned, restricting the replication and adoption of best practices.
This component is structured around two main outcomes.

Outcome 3.1: ***Meteorological and climatological infrastructure and equipment are sustainably maintained and preserved through an effective operational plan, ensuring their long-term functionality***

- **Output 3.1.1: A strategy is developed and implemented to ensure the sustainability of the project's outcomes**

As a result, the sustainability of the project results will be ensured through the durability of the infrastructure and services that are essential for the optimal climate risk management. Developing and implementing an operational plan for equipment maintenance will ensure the necessary tools for detecting, observing, and monitoring extreme weather events. Furthermore, fostering the establishment of a public-private partnership will enhance the sustainability of meteorological and climatological services, thereby reinforcing the longevity of the Early Warning System (EWS). This will guarantee its long-term effectiveness and promote a rapid, coordinated response to multi-hazard threats. The following activities are outlined to achieve this objective:

- ***Activity 3.1.1:*** *Develop and implement an operational plan for the maintenance and upkeep of all acquired infrastructure and equipment*
- ***Activity 3.1.2:*** *Support in establishing a public-private partnership to ensure the sustainability of meteorological and climatological services*

Outcome 3.2: ***The best practices and successes of the project are capitalized and made available in the form of practical tools, facilitating their dissemination and replication***

- **Output 3.2.1: Knowledge management and experience are shared at the national level**

Output 3.2.1 highlights the significance of knowledge management and experience sharing at the national level. Developing a toolkit that compiles best practices and successes from the project enables the capitalization of lessons learned to optimize risk management and response to climate threats. Moreover, establishing facilities for knowledge sharing and management will promote the smooth flow of information between beneficiary and non-beneficiary local communities, thereby ensuring strengthened coordination and continuous improvement of the Early Warning System (EWS) at the national level. To achieve this, the following activities are defined:

- ***Activity 3.2.1:*** *Development of a toolkit including all the best practices and successes from the project*
- ***Activity 3.2.2:*** *Establishment of the Knowledge and Learning Management (KLM) mechanisms*

By integrating these three components, the project aims to establish reliable and cohesive national meteorological and climate services capable of effectively tackling the challenges posed by climate change. The first component will not only deliver high-quality meteorological and climate forecasts but also ensure their optimal utilization to protect lives, infrastructure, and livelihoods. The second component will enhance technical capacities and guarantee the sustainable use of meteorological and climate services, while the third component will concentrate on ensuring the long-term viability of the project's accomplishments. These integrated services will empower Benin to anticipate, prevent, and respond effectively to climate risks while fostering sustainable and inclusive development.

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The theory of change diagram below (Figure 13) presents the paradigm-shifting goal of the project and illustrates the project's proposed intervention logic, detailing the causal links and pathways between activities, outputs, and outcomes. It also describes the intervention's underlying assumptions, barriers, and risks.

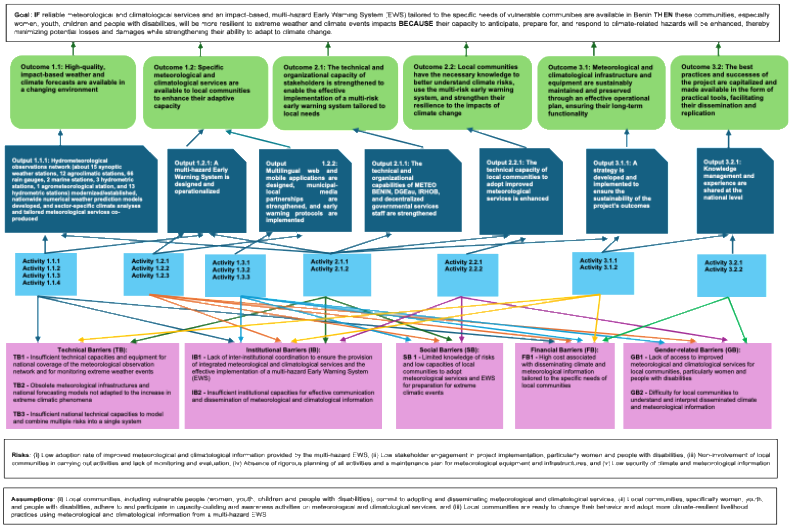

Figure 13: Theory of change

B – Economic, social, and environmental benefits

Describe how the project would 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 would avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The project will provide significant and measurable economic, social, and environmental benefits to vulnerable communities, including women, youth, rural populations, and public services. It aims to reduce the loss of life and damage to livelihoods caused by extreme climate events, improve access to information, and enhance ecosystem resilience by implementing an integrated, multi-risk early warning system.

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Economic benefits: Implementing the project will yield substantial economic advantages for several vulnerable sectors, thus contributing to sustainable and inclusive development. In the agricultural sector, it will enhance water management efficiency and improve the forecasting of extreme climate events, particularly during rainy seasons and drought periods. This enhancement will minimize production losses caused by droughts and excessive rainfall. Consequently, more than half of the population in the study area will see an increase in their income, as over 50% of residents in the targeted communes rely on agriculture for their livelihoods.

For instance, the commune of Djidja serves as a significant agricultural hub, with food crops making up around 63% of plant production, while industrial crops such as cotton and groundnuts account for 33%. However, the absence of effective water control remains a substantial challenge. By collecting and analyzing climatic data, the project will enable farmers to better

manage their agricultural calendar, resulting in increased productivity and more stable incomes. According to the FAO, improved water management could reduce agricultural losses by 15-20%. Furthermore, the Early Warning System will assist in better managing reservoirs, dams, and irrigation systems, thereby lowering costs associated with water crises and repairs to damaged infrastructure.

In the health sector, this system will lead to a 10-15% reduction in health costs by preventing epidemics related to climate disasters and reducing mortality by 20-30%. It will also alleviate pressure on health infrastructures, decrease emergency treatment costs, and enhance economic productivity by lowering absenteeism from work, especially in rural areas. Finally, the project will optimize infrastructure management, minimizing spending on emergency repairs and ensuring preventive maintenance. These actions will strengthen the economic resilience of vulnerable communities, particularly those in rural areas, thereby promoting inclusive and sustainable development.

The project aims to improve the country's ability to predict and respond to natural disasters by expanding the national meteorological and climatological observation network. This expansion will be achieved through the installation and rehabilitation of meteorological, agroclimatic, marine, and hydrometric stations. Real-time data collected from these stations will inform high-resolution weather forecasting models, such as the Weather Research and Forecasting (WRF) model. These models will enable the precise prediction of weather hazards, including floods, prolonged droughts, heatwaves, and extreme rainfall. The models will be integrated into a multi-hazard early warning system, supported by impact-based alert protocols that trigger targeted community responses, particularly in high-risk areas.

These community responses, grounded in reliable meteorological information, will contribute to reduce losses and damages from flooding, which were estimated at 91.103 million USD in 2019[20]. The most affected sectors, including agriculture, livestock, fisheries, industry, commerce, and other services, will become less vulnerable. Similarly, a decrease in agricultural losses is expected by adjusting cropping calendars and mitigating damage from extreme events. Additionally, the project will facilitate increased monitoring of wetlands and vulnerable shorelines across the twelve targeted communes, contributing to ecosystem protection and flood prevention.

Approximately 3,000,000 inhabitants of the targeted communes will benefit from access to reliable climate information and localized early warnings, with 600,000 being direct beneficiaries of the project's interventions. These beneficiaries will include women farmers, youth, peri-urban and rural populations, as well as persons with disabilities. Furthermore, more than 500 community leaders, municipal agents, and local facilitators will receive training on interpreting alerts and coordinating local responses. In addition, more than 100 community radios, focal points, and local facilitators will participate in disseminating alert messages, thereby enhancing media coverage in rural areas. Ultimately, the project will enhance the monitoring of wetlands and vulnerable riverbanks in the 12 targeted communes, thereby contributing to ecosystem protection and flood prevention.

The estimated number of direct beneficiaries is based on the tasks to be performed for each activity. For activities 1.1.1 and 1.1.2, for example, direct beneficiaries include engineers from METEO BENIN, the DG-Eau~~Water~~, and IRHOB, totaling 166 individuals. This category also includes civil engineering professionals, such as masons, formworkers, steelworkers, and laborers. The number of beneficiaries in each category has been further detailed. Based on this, 12% of the 600,000 beneficiaries are women, and 5% are individuals with disabilities. Indirect beneficiaries are estimated by considering all residents of the twelve targeted communes, excluding direct beneficiaries. Of the indirect beneficiaries, 52% are women and 5% are individuals with disabilities.

[20] ANPC (2020) Inondations de 2019 au Bénin : rapport d'évaluation des besoins post catastrophe, Cotonou, Bénin, 133p.

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On a social level, the project aims to strengthen social ties within local communities by improving meteorological services and establishing a multi-hazard Early Warning System. It seeks to enhance access to essential climate information, particularly for vulnerable populations such as women and young people. By providing reliable weather services and resources to handle extreme events, the project promotes community solidarity, especially in rural areas. Particular attention will be given to gender mainstreaming, ensuring that women, who often manage agricultural and food resources within households, benefit from improved access to climate information. This approach will not only empower them to better manage climate risks but also enhance their economic autonomy while reducing gender inequalities in climate change adaptation.

Moreover, the project will provide young people, particularly young agricultural entrepreneurs, with training opportunities and access to reliable weather information, allowing them to develop specific skills and secure their professional futures. This strategy will foster a true dynamic of intergenerational and gender cooperation, which is crucial for strengthening the resilience of communities against climate crises. Additionally, through awareness-raising and capacity-building initiatives, the project will facilitate the broad sharing of knowledge on climate risk management, thereby reducing individuals' long-term vulnerability. It will also generate local employment in sectors related to climate change adaptation, helping to increase incomes and reduce food insecurity and poverty, especially for women and young people. By enhancing the resilience of communities to extreme weather events, the project promotes more inclusive and sustainable economic development while reinforcing social cohesion and local solidarity.

Access to clear, understandable messages is crucial for the civil protection chain. Early warnings, particularly in cases of flooding, enable effective preventative mobilization of populations. This allows people to evacuate high-risk areas before floodwaters arrive, thereby protecting their livelihoods. This significantly decreases loss of life and material damage. Families also have time to reinforce their homes against events such as strong winds and floods. This preventive approach transforms potential disasters into manageable situations, significantly reducing their impact on communities and the local economy, while promoting gender equality.

- **Gender assessment**

The gender assessment and action plan align with Benin's national policies on gender and climate change, which include the National Gender Promotion Policy (PNPG) and the Gender and Climate Change Action Plan of Benin (PAGCCB) for the years 2023-2025. In Benin, 50.21% of the population is female, with the majority employed in agriculture (54.8%), while 17.24% are children under the age of five[21]. Women primarily manage subsistence farming activities, water collection, and household resources, exposing them to greater climate risks such as droughts and floods. Their vulnerability to climate change impacts is heightened by limited access to productive resources and climate adaptation mechanisms. The 2019 floods destroyed 4,899.1 hectares of crops, disproportionately impacting female farmers, who are responsible for 70% of food crop production. Rural poverty (40.6%) disproportionately affects female heads of households, who have reduced access to meteorological technologies and early warning systems. Despite national efforts to promote gender equality, women are still largely excluded from local decision-making bodies and participate in almost none of them. This is primarily due to deeply rooted socio-cultural and religious norms that restrict women to domestic roles and hinder their political and economic progress. The aim of this project is to promote gender mainstreaming by ensuring that marginalized and vulnerable groups, including women and people with disabilities, have access to more accurate climate information, enabling them to manage risks and enhance their economic independence. This will foster more inclusive and sustainable development.

[21] INStaD (2022). Projections démographiques de 2014 à 2063 et perspectives de la demande sociale de 2014 à 2030 au Bénin, Direction des Statistiques Démographiques et Sociales, Cotonou, Bénin, 137 p.

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The targeted communes of Abomey-Calavi, Ouidah, Dangbo, Kétou, Dogbo, Djidja, Bantè, Bassila, Boukoumbé, Malanville, Kandi, and Parakou possess specific socioeconomic characteristics. In these communes, stakeholder consultations and diagnosis based on the communal development plan revealed that socio-cultural and religious constraints force women to stay at home and be subordinate to men, leading to the near absence of women in local decision-making bodies.

- ***Abomey-Calavi***

The commune of Abomey-Calavi is experiencing steady population growth, with 1,253,000 residents in 2023, reflecting a 5.38% increase from 2022[22]. In 2022, women accounted for 50.7% of the total population, indicating a nearly balanced gender distribution. While women are more represented in higher administrative levels (A to C), they remain considerably underrepresented in decision-making positions, holding only 10% of municipal council seats. Women are prominently represented in the informal sector, often taking on roles that are typically declined by men. Opportunities for economic empowerment are supported at the municipal level through microcredit schemes that target disadvantaged groups and small-scale income-generating activities (SGA). Gender-based violence (GBV) is a pervasive issue, manifesting in physical, sexual, economic, psychological, and cultural/patrimonial forms. Girls are particularly vulnerable, especially to early and forced marriages and sexual violence, including the rape of minors. Of 916 GBV cases handled in April 2023, 82.6% involved women, including all cases of sexual violence[23].

- ***Bantè***

In Bantè, women represent nearly half of the population (51%) and are very involved in agriculture (2,178 female heads of agricultural households), trade, and artisanal activities like weaving[24]. Water shortages mainly affect women and girls, who often travel long distances and wait in line. Youth and female unemployment rates are high, primarily due to skill gaps and a lack of entrepreneurship opportunities. Women also participate less in decision-making because of societal views of them as “sub-men,” which causes their specific concerns to be overlooked. Initiatives such as promoting women’s leadership, professional integration, especially in agro-pastoralism, and access to credit aim to empower them. From 2019 to 2022, 77.77% of the 924 reported gender-based violence cases to the commune’s *Centre de Promotion Sociale* (CPS) were perpetrated against women.

- ***Bassila***

Agriculture is the main economic activity in the commune of Bassila. It employs around 62.8% of the workforce, generates over 80% of household income, and is the main source of jobs[25]. Women play a significant role in managing subsistence farming activities, water collection, and household resources, which exposes them to higher climate risks, such as droughts and floods. Despite their vital role, women have limited access to productive resources, meteorological technologies, and early warning systems. Socio-cultural and religious norms restrict women, often confining them to the home and making them subordinate to men, which leads to their near absence in local decision-making bodies. Rural poverty in Bassila is 40.6% and disproportionately affects female-headed households.

- ***Boukoumbé***

In 2022, women made up 51.25% of the population and 53% of the active workforce[26]. They participate in agriculture, transport, commerce, and services, often entering the labour market earlier due to marriage and dropping out of school. Both youth and women experience high levels of underemployment, with most women in informal or precarious jobs. Around 86.4% of women

[22] Mairie d’Abomey-Calavi (2023). Plan de Développement de la Commune 2023-2027 – PDC4. CREDD-Bénin Sarl.
[23] Mairie d’Abomey-Calavi (2023). Plan de Développement de la Commune 2023-2027 – PDC4. CREDD-Bénin Sarl.
[24] Mairie de Bantè (2023). Plan de Développement Communal 4ème génération de Bantè (PDC 4), Bénin, 201 p.
[25] Mairie de Bassila (2023). Plan de Développement Communal (PDC) de Bassila : 4ème génération de Bantè 2024-2028, Bénin, 201 p.
[26] Mairie de Boukoumbé (2023). Plan de Développement Communal 4ème génération de Bantè 2024-2028, Bénin, 199 p.

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are self-employed, with 93% operating in the informal sector. Their challenges include high poverty rates, women's lack of representation in the communal council, unequal access to production resources such as land, capital, and equipment, and low literacy levels among women. Cases of gender-based violence (GBV) and child maltreatment are serious issues in Boukoumbé. The commune plans to promote women's leadership, support social centers that address GBV and child maltreatment, and improve social and professional inclusion for people with disabilities.

- ***Dangbo***

Dangbo women are described as energetic and active within social, professional, and political organizations. However, women are completely absent from the communal council and are generally underrepresented in decision-making bodies. Traditional sexist divisions of roles and tasks for children remain, with girls often assigned to market activities or childcare duties. The commune also faces issues related to sexual predators in schools, which lead to unwanted pregnancies, gender-based violence, child labor, child trafficking, and a lack of women's participation. In 2017, the Dangbo Social Promotion Centre cared for 71 abused girls and women. Low literacy rates have also been observed. The commune's strategic goal is to achieve gender equality and empower all women and girls. The project commits to collecting data on gender, disability, and marginalized groups during the PFG implementation and to integrating them comprehensively at the Full Proposal stage.

- ***Djidja***

Women actively contribute to the local economy and manage household water resources in Djidja. However, their presence in the political realm and decision-making bodies is described as 'critical,' with no women represented on the communal council. Persistent socio-cultural constraints and low empowerment of uneducated women hinder progress, leading to women's specific issues being excluded from budgets and communal development efforts. Women also participate minimally in local affairs and decision-making. The commune plans specific actions to empower women, including management and leadership training and support for women's nutrition projects. Likewise, the municipality aims to designate a gender focal point and collect and analyze gender data. The project commits to collecting data on gender, disability, and marginalized groups during the PFG implementation and to integrating them comprehensively at the Full Proposal stage.

- ***Dogbo***

In Dogbo, women actively participate in all sectors, including commerce, agriculture, crafts, and culture. They significantly contribute to the community's social and economic well-being. Women are especially dynamic within the community. However, they are underrepresented in local decision-making bodies. Women and young people also struggle to access agricultural land. Food insecurity remains a problem, forcing households to adopt coping strategies such as cutting back on essential non-food expenses or selling assets. Marginalized social groups are an increasing concern. The commune plans to help women and young people secure land use rights and will organize an annual literacy contest for women. The project commits to collecting data on gender, disability, and marginalized groups during the PFG implementation and to integrating them comprehensively at the Full Proposal stage.

- ***Parakou***

Although women accounted for 60.9% of literacy program participants in 2018[27], they still face

[27] Mairie de Parakou (2019). Plan de Développement Communal 2019-2023, Bénin, 146 p.

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high illiteracy rates, which limit their access to climate information and educational opportunities. Female political representation remains low: as of 2019, there were no women on the communal council, despite the commune's aim to reach 20% female participation in decision-making bodies and 30% in appointed positions by 2023. Deeply rooted socio-cultural and religious norms continue to restrict women's access to leadership and public decision-making spaces. Climate-related vulnerabilities further exacerbate gender inequalities. During the 2019 floods, female farmers were disproportionately affected because of limited access to adaptive resources and safety nets. In the Borgou Department, where Parakou is located, there is a high rate of gender-based violence: 9.3% of women aged 15–49 reported experiencing physical assault, and 5.0% reported theft in the past 12 months[28]. These risks hinder women's ability to participate in early warning systems or access emergency support. Despite these challenges, Parakou's PDC outlines opportunities to advance gender equality, including micro-projects for women's employment and climate resilience training, and the development of climate information tailored to women and non-literate populations.

- ***Kandi***

Despite comprising a large proportion of Kandi's population, women have persistently low literacy rates, which hinder their access to climate-related information and economic opportunities. Deep-rooted socio-cultural norms continue to limit their participation in local governance and decision-making processes. Between 2019 and 2021, although more women's groups received support than men's groups on average (10 versus 2), the outreach remained sporadic and insufficient. This highlights the lack of structured, sustained capacity-building initiatives targeting women. Women are underrepresented in political spheres, and they are disproportionately affected by climate-induced shocks due to their reliance on rain-fed agriculture. Gender-based violence remains a pressing issue, with 13 cases reported in 2019, 16 in 2020, and 12 in 2021, while existing support mechanisms are largely inadequate[29]. In the Alibori department (which includes Kandi), 11.4% of women reported experiencing physical assault, and 5.7% reported theft in the preceding 12 months[30]. These vulnerabilities significantly constrain women's ability to engage with early warning systems and access emergency assistance. Nevertheless, Kandi's Communal Development Plan (PDC) outlines several strategies to promote gender equality, such as encouraging income-generating activities for women, strengthening local committees to combat trafficking, and increasing access to social protection and climate services for vulnerable groups.

- ***Malanville***

Despite their key role in agricultural production, cross-border trade, and family welfare, women in Malanville face significant structural barriers to equality. The commune has one of the lowest literacy rates in the country, with only 18% of people aged 15 and over being literate. This disproportionately affects women, limiting their access to climate information and economic opportunities. Girls are more likely to drop out of school due to early marriages and household responsibilities[31]. Women are underrepresented in local governance, and traditional norms continue to restrict their participation in decision-making processes. Women's livelihoods are more severely affected by climate-related hazards such as floods and prolonged droughts, particularly in agriculture, where 88% of onion producers report impacts from excessive heat. Gender-based violence and child marriage are prevalent, and social protection services lack the staff and resources necessary to address these issues effectively. People with disabilities and vulnerable children face marginalization. However, the PDC highlights opportunities to enhance gender inclusion, including developing women-led microprojects, reinforcing female cooperatives, running targeted literacy programs, and supporting climate adaptation initiatives tailored to women and other at-risk groups.

- ***Kétou***

[28] INStaD (2023). Enquête par Grappes à Indicateurs Multiples, Bénin, 2021-2022, Rapport des résultats de l'enquête. Cotonou, Bénin : INStaD.
[29] Mairie de Kandi (2024). Plan de Développement Communal quatrème génération (PDC 4), Bénin, 199 p.
[30] INStaD (2023). Enquête par Grappes à Indicateurs Multiples, Bénin, 2021-2022, Rapport des résultats de l'enquête. Cotonou, Bénin : INStaD.
[31] Mairie de Malanville (2023). Plan de Développement Communal quatrème génération (PDC 4), Bénin, 343 p.

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Kétou is a predominantly rural commune where women play a key role in the local economy, especially in selling agricultural products and Nigerian imports. They accounted for 51.8% of the population in 2017[32] and contribute significantly to farming, assisting men in agricultural activities, and taking part in traditional crafts, notably the processing of cassava. Despite their important economic contributions, women's representation in political and decision-making spheres remains alarmingly low. Socio-cultural norms continue to hinder women's social and economic progress. In agriculture, structural challenges such as limited water control, declining soil fertility, and land tenure insecurity further constrain productivity and inclusive growth.

- ***Ouidah***

Women constitute 51.5% of Ouidah's population. Despite this, only one woman out of 77 elected officials serves on the council, due to a reluctance among women to assume leadership roles. The commune faces underfunded social services, ongoing gender-based violence (GBV), child abuse, and challenges in integrating people with disabilities. A total of 165 cases of abuse, violence, and exploitation of vulnerable people were documented in 2023[33]. Youth unemployment is exacerbated by poor training, financing, and policy gaps. The commune aims to boost women's and youth's participation in local governance and support women's income-generating groups through awareness campaigns and technical assistance.

This preliminary gender assessment is based on a desk review of the Communal Development Plans of the 12 beneficiary communes, data from Benin's DHS[34] and MICS[35] surveys, and information gathered during stakeholder consultations. It shows that across the beneficiary communes, several types of marginalized and vulnerable individuals face increased risks due to social, economic, and structural challenges. These include children under five, orphans and vulnerable children, and youth, especially those exposed to child labor, trafficking, early and forced marriages, or street life. Women and girls are also at significant risk, particularly those affected by gender-based violence, early pregnancies, and harmful cultural practices like female genital mutilation. Elderly individuals, especially those in rural or informal sectors without social protection, often experience exclusion and poverty. People with disabilities, including those with physical, intellectual, or mental impairments, are frequently marginalized because of inaccessible infrastructure, limited care services, and low participation in education and employment. Other vulnerable groups include people without access to communication tools, disaster victims, and those living in extreme poverty. Many of these populations are illiterate and have limited access to climate information, economic opportunities, emergency aid, and proper social protection services. They are also among the most vulnerable to climate change and are largely underserved by meteorological services and early warning systems.

~~This project aims to strengthen the resilience of marginalized and vulnerable individuals in the targeted communes by providing them with access to climate information, local capacity building, and livelihood protection through planned activities.~~ Through its design and operational strategies, the project promotes the fair distribution of benefits among vulnerable groups. It adopts an approach that specifically targets vulnerable groups, including women, youth, the elderly, people with disabilities, and those living in extreme poverty, to receive climate services and capacity-building support. Inclusive information sharing, tailored training, and decentralized local focal points ensure all communities can access and act on climate information. The project is aligned with community development plans and local stakeholder involvement to enhance sustainability and community ownership. ~~The~~ A gender-responsive stakeholder engagement and participatory plan will be developed to ensure that marginalized and vulnerable individuals are fully involved. Likewise, the Gender and Social Inclusion (GSI) specialist will join the Project Management Unit (PMU) to ensure that the necessary indicators and outputs are met.

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[32] Mairie de Kétou (2018). Plan de Développement Communal de la troisième génération de Kétou, Bénin, 247 p.
[33] Mairie de Ouidah (2024). Plan de Développement Communal (PDC 4) de Ouidah, Bénin, 292 p.
[34] INSAE et ICF (2019). Enquête Démographique et de Santé au Bénin, 2017-2018. Cotonou, Bénin et Rockville, Maryland, USA : INSAE et ICF.
[35] INStaD (2023). Enquête par Grappes à Indicateurs Multiples, Bénin, 2021-2022, Rapport des résultats de l'enquête. Cotonou, Bénin : INStaD.

~~these populations have appropriate access to project benefits.~~

From an environmental perspective, implementing the project through the Multirisk Early Warning System will yield significant benefits. By providing real-time climate information, the project aims to reduce the damage caused by extreme weather events. Having access to more accurate climate information will enable local communities to anticipate climate phenomena and respond efficiently to climate risks. Project activities will bolster community resilience against climate risks by enhancing the forecasting of extreme weather events. This involves developing more reliable forecasting models, which will contribute to better management of environmental risks. Indeed, the installation and rehabilitation of 112 meteorological, agro-climatic, marine, and hydrometric stations (activities 1.1.1 and 1.1.2) will enhance the monitoring of precipitation, flow rates, and climatic parameters. The resulting data will be used to predict floods, droughts, strong winds, and heatwaves. This improved monitoring system will support agricultural planning, integrated watershed management, and wetland preservation. Additionally, activities 3.2.1 and 3.2.2, which aim to capitalize on best practices and establish knowledge management systems, will promote the sustainable adoption of implemented solutions. Climate education and sharing platforms will play a crucial role in disseminating environmental resilience practices, especially in agriculture, water management, and rural areas planning.

Providing more accurate forecasts and effectively disseminating them will enable communities to adopt better-targeted adaptation strategies in the face of extreme climatic events. This approach will reduce long-term environmental risks and contribute to the sustainable management of natural resources. At the same time, the project will incorporate environmental and social safeguards consistent with the requirements of the Adaptation Fund. These measures aim to avoid or reduce any potential negative impacts on the environment and local populations. Activities will be designed to minimize harmful effects on ecosystems and promote sustainable management of natural resources, ensuring that the principles of environmental sustainability are upheld throughout the project. This way, the implementation of the project will not only reduce the immediate environmental impacts of natural disasters but also enhance the resilience of communities to future climate challenges while ensuring the long-term sustainability of local ecosystems.

Overall, the project will take a sustainable, socially inclusive, and equitable approach to benefit distribution. To this end, it will actively engage local actors, technical institutions, and national stakeholders to ensure that the developed services address the needs of the most vulnerable populations and contribute to lasting structural changes in climate risk management in Benin.

C – Cost-effectiveness analysis of the proposed project

Describe how the project would 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 would avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.

The current project is designed to maximize economic efficiency while ensuring the long-term sustainability of its operations. It focuses on modernizing and extending the meteorological network, which enables more accurate and extensive data collection, leading to significant improvements in weather and climate services. This modernization enhances the ability to predict extreme weather events, thereby reducing potential human and economic losses. The project also strongly emphasizes making climate and weather information accessible to all segments of the population, including women, youth, the elderly, and disabled individuals. This will encourage widespread dissemination of the project's benefits and enhance the resilience of vulnerable communities. By mitigating losses caused by natural disasters, the project will also yield significant savings, particularly by lowering the costs associated with agricultural damage, directly benefiting small-scale farmers. Furthermore, anticipating climate-related disasters will cut emergency expenses by decreasing the frequency of relief and reconstruction efforts.

The project will also foster value creation by enhancing agricultural productivity and diversifying income sources, thereby bolstering household economic security. By boosting incomes and alleviating poverty, the project will aid in sustainable and inclusive economic development.

- ***An integrated and cost-effective approach to the growing climate losses***

The project adopts a systemic approach combining the modernization of hydrometeorological infrastructure, strengthening institutional and community capacities, and developing an impact-based multi-hazard Early Warning System (EWS). This strategy aims to produce reliable data, transform it into usable information, and ensure community ownership of the information. Each component is essential to ensuring sustainable benefits that far exceed the initial investment costs.

- ***A Cost-Benefit Analysis included in the full proposal***

The full proposal will include a Cost-Benefit Analysis (CBA) to quantify and determine the monetary value of direct benefits, such as reduced agricultural losses and decreased emergency response costs related to natural disasters, as well as indirect benefits, such as increased resilience, the empowerment of women and youth, and the sharing of intervention outcomes. A Cost-Effectiveness Analysis (CEA) will be conducted for non-monetizable benefits, such as preservation of human life, injury prevention, improved decision-making, and social cohesion. This analysis will allow us to calculate the cost per person who benefits from a reliable early warning, for example.

- ***Expected benefits***

The following benefits can be anticipated from general information:

- Agricultural sector:
  - A reduction in crop losses by an estimated 15% to 25%;
  - Improvement in agricultural yields by 5% to 10% through climate planning;
  - Reduction in livestock losses caused by floods.
- Infrastructure sector: reduce repair costs by 10-20% with proactive measures.
- Public health: A 5% to 15% reduction in costs associated with climate-sensitive diseases due to health alerts.
- Relief and emergency interventions: An estimated decrease of 20-30% in logistical and human resource expenses due to prior alerts.
- Human lives, while difficult to quantify, hold significant social and moral value when saved.

- ***Controlled and targeted costs***

The estimated total cost cost of activities, $ 34,346~~187~~,050~~740~~ in planned investments will be allocated to the following:

- Modernizing the hydrometeorological observation network;
- Developing the impact-based multi-hazard Early Warning System (EWS);
- Strengthening local and institutional capacities;
- Knowledge management to ensure the sustainability of intervention outcomes.

Operating and maintenance costs are included from the beginning to ensure the durability of the infrastructure and services.

- ***A lever for long-term sustainable development***

The project aligns with the priorities of Benin's National Adaptation Plan (NAP) and Nationally Determined Contributions (NDCs). It will contribute to reducing climate risks, as well as to local planning, food security, poverty reduction, and gender equality. By enabling better anticipation and management of climate risks, the project will reduce future costs associated with natural disasters, prevent the loss of public and private investments, and enhance the resilience of vulnerable communities. Thus, it represents a wise, effective, and economically justifiable investment in the Beninese context.

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Overall, the project is extremely cost-effective in upgrading meteorological infrastructure and incorporating climate risks into local planning. It guarantees broad access to information and a focused response to the needs of the most vulnerable communities while significantly minimizing economic and social losses caused by climate-related disasters.

D – Project Alignment with national or sub-national sustainable 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. If applicable, please refer to relevant regional plans and strategies where they exist

The project "Strengthening Meteorological Services and Establishing a Multi-Hazard Early Warning System to Enhance the Climate Resilience of Local Communities in Benin" aligns with several development plans and programs in Benin, particularly those related to climate risk management, adaptation to climate change, and the resilience of vulnerable communities. Among these strategy documents, the policy and action plan include:

- The *National Development Plan (NDP 2018-2025):* Benin's NDP incorporates climate change considerations into both its adaptation and mitigation aspects. Paragraph 316 outlines the disaster risk management challenges in Benin. Regarding the Strategic Orientations of the Specific Objective: "to ensure better management of the environment and climate change", the NDP intends to enhance resilience to climate change and other disaster risks, as detailed in paragraphs 554 and 555. The initiative to establish a multi-hazard early warning system is rooted in these various sections of Benin's NDP.
- The *National Climate Change Adaptation Plan (NAP):* Benin's NAP serves as the country's roadmap for adapting to the impacts of climate change. It highlights the most vulnerable sectors, including agriculture, water resources, energy, health, tourism, forestry, infrastructure, and urban and coastal development, while suggesting adaptation options for each sector. The project closely aligns with this plan by enhancing early warning systems, improving climate monitoring, and increasing community awareness of climate risks.
- *Nationally Determined Contributions (NDC 2021-2030):* this project fully aligns with the implementation priorities of the Nationally Determined Contributions (NDC). By focusing on establishing an Early Warning System, it directly addresses the NDC's objectives, which aim to create information and warning systems concerning the harmful effects of climate change. Indeed, through the Early Warning System, the project enhances climate risk management, enabling communities to respond swiftly to natural disasters and minimize economic and human losses. It also bolsters food security by providing accurate meteorological data to improve agricultural planning, which aligns with Benin's commitments to promote climate-resilient agriculture. Furthermore, the project strengthens institutional and local capacities for climate risk management, aligning with the NDC's priorities of building the capacities of national and local authorities' stakeholders.
- *Strategic Plan of METEO BENIN (2022–2026):* this project aligns with the strategic priorities of METEO BENIN's 2022–2026 Strategic Plan by contributing to infrastructure modernization, enhancing forecasting capabilities, and strengthening capacities for improved climate resilience. It supports the modernization and reinforcement of the observation network through the installation and rehabilitation of meteorological and hydrological stations, thereby improving the monitoring and anticipation of extreme weather events. Additionally, the project bolsters forecasting and modeling capabilities by integrating advanced numerical models (WRF and WRF-Hydro), optimizing the accuracy of meteorological and hydrological predictions. In terms of technical and institutional capacity building, targeted training programs are implemented for METEO BENIN staff, decision-makers, and local communities, ensuring better ownership of climate services. Furthermore,

the project improves the dissemination of climate services through a multi-hazard Early Warning System (EWS), digital platforms, and mobile applications, ensuring timely and targeted access to critical information. Finally, it guarantees the sustainability of achievements by developing an infrastructure maintenance plan, fostering public-private partnerships, and leveraging best practices for the continuous improvement of meteorological services. By aligning with these strategic directions, the project effectively enhances meteorological and climate services in Benin, thereby increasing resilience to climate change.

- *National Framework for Climate Services (NFCS):* the project fully aligns with the priorities of Benin's National Framework for Climate Services (NFCS), enhancing the production and delivery of climate services through high-resolution forecasting models and an impact-driven multi-hazard Early Warning System (EWS). This approach improves the anticipation of extreme weather events and supports informed decision-making. The project also enhances observation and forecasting infrastructure by installing and rehabilitating meteorological and hydrological stations, ensuring broader coverage and greater accuracy of climate data. Furthermore, it emphasizes human and institutional capacity-building by providing specialized training to METEO BENIN staff, institutional stakeholders, and local communities, fostering a better understanding and application of climate information. To ensure effective dissemination of climate services, the project plans to deploy digital platforms and mobile applications while strengthening partnerships with media outlets and local communication networks, guaranteeing quick and equitable access to meteorological information. Finally, the project supports the establishment of a governance and coordination framework by harmonizing existing EWS systems and developing a national strategy for producing and disseminating climate services, thereby enhancing synergy among national institutions. By aligning with these priorities, the project aids in the effective implementation of the NFCS and the sustainable enhancement of climate services in Benin.
- The *Strategic Plan for the Development of the Agricultural Sector (PSDSA)* recognizes that the agricultural sector is particularly vulnerable to the impacts of climate change. The PSDSA aims to modernize agriculture, improve yields, and enhance producers' resilience to climatic hazards. This project supports this vision by providing farmers with better access to relevant climate information, facilitating improved management of climate risks and proactive adaptation of farming practices. Additionally, to bolster the national agricultural statistics system, this plan calls for the implementation of an Agricultural Geographic Information System, which includes the Agrometeorological and Climate Forecasting and Warning System. This initiative aligns perfectly with the activities of this project.
- The *National Health Policy (PNS 2018-2030)*: the health sector's vision is stated as follows: "By 2030, Benin will have a regulated, efficient, and resilient health system based on the permanent availability of quality, equitable, and accessible promotional, preventive, curative, rehabilitative, and palliative care throughout the life cycle and at all levels of the health care system, with the active participation of the population." The project will strengthen the country's capacity to anticipate and respond to extreme climate events by promoting a multisectoral approach, involving various stakeholders in climate risk management, targeting vulnerable populations, and improving access to precise, real-time information. This will facilitate better preparedness for the health consequences of these events, such as injuries and an increased incidence of climate-sensitive diseases. Thus, it will help reduce the pressure on health systems during natural disasters.
- The *National Strategy for Disaster Risk Reduction 2019-2030 (SNRRC)* aims to significantly and sustainably enhance the resilience of Benin's communities, national institutions, and local authorities to disasters. Accordingly, through its first action, "Strengthening the capacities of warning production and dissemination institutions," within Axis 1: Improving the policy, institutional, legislative, and regulatory framework, the SNRRC seeks to create a national framework conducive to DRR initiatives and innovations. This includes the

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rehabilitation, strengthening, densification, modernization, and maintenance of the meteorological, hydrometeorological, and oceanographic observation network, as well as translating hydro-meteorological information products into a language and format accessible to end-users. Consequently, this project is fully aligned with the NTSRC in all its components.

- *Sustainable Development Goals (SDGs):* this project directly supports several SDGs, particularly SDG 13 (Climate Action), SDG 2 (Zero Hunger), and SDG 3 (Good Health and Well-Being). Through its multi-hazard approach, the project enhances community resilience to the impacts of climate change and ensures the food security, health, and well-being of vulnerable populations, thereby aiding Benin's progress in achieving the SDGs.

  - ***SDG3: Climate Action***

    The project will enhance the adaptation capacity of local communities in the targeted communes to climate hazards by improving network coverage, modernizing infrastructure for observing and monitoring extreme meteorological and climatological phenomena at the national level in Benin, and deploying a multi-risk early warning system. Thus, it will contribute to achieving SDG 13 in Benin.

  - ***SDG 2: Zero Hunger***

    The project will bolster food security and support the achievement of SDG 2 in Benin by minimizing crop and livestock losses and enhancing agricultural yields through climate change-adapted planning.

  - ***SDG 3: Good Health and Well-Being***

    The project will reduce health risks associated with extreme climate events by strengthening early warning systems and enhancing community resilience to natural disasters. With the availability of reliable meteorological information, management of injuries and the rising incidence of climate-sensitive diseases will also improve. This will enhance the health system's ability to anticipate and effectively address these situations.

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E – National technical standards and environmental and social policy

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

The proposed project aligns with the Adaptation Fund's environmental and social policy and Benin's environmental and social regulations. An analysis of national texts, particularly framework law no. 98-030 of February 12, 1999, concerning the environment and the principles and criteria of the Adaptation Fund, reveals that the national categorization completely reflects that of the Adaptation Fund. Assessments and feasibility studies will outline national environmental standards and demonstrate how the project will adhere to them. Additionally, these studies will explain how the project will establish an environmental and social management plan that complies with both national and Adaptation Fund standards. Controls will be implemented to ensure that the project does not worsen inequalities, negatively affect marginalized populations, or harm the environment. The main applicable national laws and regulations are as follows:

- **Law no. 98-030 of February 12, 1999, the framework law on the environment in the Republic of Benin:** It establishes fundamental environmental protection principles in Benin, including the precautionary principle, the right to environmental information, and the obligation to conduct environmental impact assessments for projects that could affect the environment. This law serves as the primary reference for conducting environmental assessments within the project framework.
- **Law no.2018-18 of August 06, 2018 on climate change in the Republic of Benin:** It establishes the legal framework for national climate policy and mandates that public

institutions consider climate issues in their planning. The law promotes the development of adaptation and resilience mechanisms and actively supports the project's goal of enhancing local communities' climate resilience.

- **Decree n°2022-211 of March 30, 2022 approving the statutes of the National Meteorological Agency (*Agence nationale de la Météorologie*):** Through this Decree, METEO BENIN is officially mandated to produce, disseminate, and enhance meteorological data, including early warning services. This underscores its central role as the project's executing entity, ensuring the quality and standardization of climate information.
- **Law No. 2020-01, enacted on January 6, 2020, concerning fees for non-aeronautical services provided by Météo Bénin,** authorizes the mobilization of financial resources through fees on meteorological services offered to private sector entities, such as those in agriculture, energy, and construction. The law establishes a foundation for financial sustainability for project activities, particularly for maintaining the services and platforms developed.

- **Law no.2010-44 of October 21, 2010 on water management in the Republic of Benin:** establishes the principles of integrated water resources management. It supports project actions related to flood early warning, hydrometeorological monitoring, and reducing the vulnerability of water supply systems.
- **Law no. 87-015 of September 21, 1987 on the public health code:** supports the incorporation of health alerts into the multi-risk early warning system, particularly for climate-related epidemics like vector-borne diseases following floods or heat waves.
- **Law no.97-029 of January 15, 1999 on the organization of Communes in the Republic of Benin:** defines the responsibilities of the communes in local development, with a focus on disaster and environmental management. It supports the project's decentralization strategy, particularly in establishing local alert committees and promoting climate governance.
- **Law no. 2011-26 of January 9, 2012 on the prevention and repression of violence against women:** guarantees the protection of women's rights across all sectors, including fair access to climate adaptation resources and services. This information aids in developing the project's gender action plan.
- **Law no. 98-004 of January 27, 1998 on the Labor Code in the Republic of Benin:** Governs working conditions, employee protection, and workplace safety. It is particularly important for field agents involved in installations or surveys to ensure that the project is implemented in a manner that respects workers' rights.

F – Duplication

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

During consultations with stakeholders, including technical and financial partners, as well as donors funding various projects, we identified SAP projects that have already been implemented to prevent any duplication of effort, resources, or geographical coverage, ensuring synergy between ongoing initiatives and the proposed project. Benin has established an Early Warning System (EWS), known as EWS Benin, which has facilitated the installation of 25 hydrometric stations, 20 meteorological stations, and 3 teletransmitted oceanographic stations, along with the implementation of a Standard Operating Procedure for communication, training for stakeholders at various levels, and the establishment of five visualization platforms. Additionally, a buoy has been installed for oceanographic monitoring. Meanwhile, the Ministry of Health and the Ministry of Agriculture have developed warning systems for epidemic response and food safety, respectively.

However, despite these measures, the existing EWS have several shortcomings: they are not fully operational in some intervention zones due to unreliable connectivity and a lack of

continuous electrical power, which disrupts their regular functioning. Additionally, information about climate change is not systematically integrated, making it challenging to anticipate climate risks and respond quickly to extreme events. The centralization and dissemination of climate and weather data at the national level is also limited, hindering widespread communication of warnings to all stakeholders.

Furthermore, the lack of specific forecasting models for Benin undermines the reliability of information, and the consistency of warnings among the different systems is sometimes inadequate. Finally, while the SAP Benin system primarily focuses on climate and hydrometeorological alerts, it does not sufficiently incorporate health risks associated with climate events (such as vector-borne diseases, post-flood epidemics, or health crises following prolonged droughts). Thus, the proposed project will enhance existing early warning systems (EWS) by reinforcing equipment across the country, expanding platforms to inform and raise awareness of climate risks among local communities, and providing training programs and simulations to improve their ability to respond to alerts and disasters. It will also strengthen the coordination of multi-hazard warnings and integrate climate change information, enabling more robust data centralization and better dissemination through digital and community channels. Additionally, the project will broaden the scope of EWS by incorporating health alerts, particularly to mitigate the risk of diseases related to floods or droughts and will enhance collaboration with all sectors vulnerable to climate change, including Health, Agriculture, and Water, for coordinated crisis management in the aftermath of extreme climatic events.

Previous and ongoing initiatives in Benin have led to the development of sector-specific early warning systems (EWS), such as SAP-Benin, the VFDM project, ADAPT-WAP, PAPC, and PUGEMU. While these systems have enhanced the management of certain climate risk categories, their coverage, interinstitutional coordination, and multi-hazard integration remain limited. Instead of merely replicating these existing mechanisms, this project builds on their achievements and lessons learned to create an integrated, multi-risk, interoperable national system that includes both meteorological and hydrological dimensions. The project introduces significant innovations, such as multi-sectoral co-production, local modeling, inclusive alert dissemination, and improved governance.

The following table summarizes the identified projects, their interventions, synergies, complementarities, lessons learned, and the added value of this project.

Table 3: Complementarity with other ongoing or implemented projects

Projects	Main Interventions / Duration / Location	Potential synergies and lack of overlap	Lessons learned	Link or added value to the proposed project
Projet REWarD (*Inversion des tendances à la Dégradation des Écosystèmes et des Ressources en eaux dans le Bassin de la Volta*)	**Goal:** Aims to reverse ecosystem and water resource degradation and support ecosystem-based development in the Volta River Basin, including the development of a detailed project document on the integrated management of invasive aquatic species. **Duration:** 2023–2028 **Targeted communes:** Cobly, Kérou, Kouandé, Matéri, Natitingou, Tanguiéta, Toucountouna, Djougou, Bassila, Copargo and Ouaké.	While REWarD focuses on broader water and ecosystem management in a Volta basin, including climate-related issues like invasive aquatic species, this project aims to improve meteorological services and early warning systems to reduce the direct risks of climate change. Although the two projects have different scopes and themes, REWarD's goals can benefit indirectly from the enhanced climate data.	- REWarD's EWS has limited coverage and lacks adequate coordination. - There is a need for an integrated, multi-risk national system. - Institutional capacities are weak, and dissemination systems often prove ineffective for vulnerable groups.	The proposed project will improve coordination across sectors, include all major climate risks, and implement a tailored, impact-based, multi-hazard early warning system (activity 1.3.3). It will strengthen infrastructure and local capacity for data collection and dissemination, promoting a more integrated, inclusive, and sustainable approach to climate resilience in Benin.
Project SAP-Benin: "*Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change*"	**Objectives:** The objective of SAP-Benin was to enhance national capabilities in meteorological, hydrological, and climate monitoring, as well as to establish multi-hazard early warning systems. Key actions included installing 25 hydro stations, 20 weather stations, and three tele-transmitted oceanographic stations. The project developed flood forecasting models for 21 municipalities identified as highly vulnerable to flooding, conducted full-scale simulations in Covè and Zangnanado, and trained both national and local stakeholders. Additionally, five data visualization platforms were set up. The project also supported the distribution of seasonal forecasts in 14 local languages and carried out studies on Public-Private Partnerships (PPPs) and the economic value of climate services. **Duration:** 2017–2017 **Targeted departments:** Borgou et Zou	The SAP-BENIN project established the technical and infrastructural foundations for early warning systems in Benin. Building on these foundations, the proposed project expands community-level engagement, integrates institutional coordination mechanisms, and strengthens multi-hazard alerting. It will ensure alignment with territorial planning and improve connections between tools and users at the community level.	SAP-Benin emphasized the importance of local forecasts, infrastructure investment, and communicating in the local language. However, it also identified gaps in sustainability, limited ownership by local governments, and insufficient community involvement. The lack of a legal and institutional framework hindered the long-term impact and upkeep of the systems.	This project builds on SAP's achievements by introducing inclusive governance, applying the Common Alerting Protocol (CAP), and establishing community-based early warning systems. It emphasizes impact-based forecasting and long-term sustainability through training local stakeholders, engaging municipalities, and developing financial viability strategies. The initiative transitions the national system toward a fully integrated, people-centered, and climate-resilient structure. Additionally, it establishes interinstitutional protocols based on impact (Activity 1.3.3).

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"Volta Flood and Drought Management (VFDM)"	The project aimed to improve flood and drought risk management by enhancing data collection, hydrometeorological modeling, early warning systems, and regional cooperation. Key outputs included hydrological modeling tools, transboundary forecasting platforms, community-based flood risk mapping, and institutional capacity building. **Duration:** 2019–2023 **Targeted departments:** Atacora, Donga	VFDM established the groundwork for regional hydrological forecasting and highlighted the importance of cooperation between upstream and downstream areas. The proposed project complements VFDM by strengthening national infrastructure, such as weather and climate services, and by expanding early warning coverage to other hazards and regions. Instead of being redundant, it creates vertical and horizontal links between regional and national systems.	The VFDM demonstrated the importance of regional coordination and stakeholder engagement but also highlighted the challenges of maintaining systems without national ownership. Another key lesson was the significance of integrating meteorological and hydrological components to ensure coherent, multi-hazard warning systems at all levels.	The proposed project enhances national institutions by unifying meteorological and hydrological services into an integrated Early Warning System (EWS) and implementing the CAP protocol to ensure the quick and interoperable dissemination of alerts. It builds on regional progress from VFDM within a national framework, expanding its coverage to include coastal, wind, and drought risks. The project also broadens the scope of alerts to address various meteorological hazards and incorporates additional communes.
PUGEMU Urban Early Warning Systems (EWS) and the mapping of flood-prone areas	The project focused on developing urban early warning systems and mapping unbuildable flood-risk zones in 21 high-risk communes, including Boukoumbé, Cobly, Karimama and Malanville. **Duration:** 2020–2022 **Targeted communes:** Cotonou, Sèmè-Kpodji	PUGEMU provided valuable information on spatial flood risk and urban SAP pilots. However, there was a lack of integration with national alert systems. The proposed project builds on this by developing interoperable, multi-hazard alert protocols and ensuring all national stakeholders are involved in a harmonized system.	A key lesson from PUGEMU was that integrating urban alert tools into national frameworks posed challenges. While these tools were valuable at the city level, limited coordination with national meteorological and disaster agencies diminished their long-term effectiveness. Effective institutional support and technical interoperability were missing.	The current project addresses gaps in institutional integration by establishing formal coordination mechanisms and centralizing alerts. It expands PUGEMU's urban focus to a national, multi-hazard system with standardized procedures and an increased geographical and sectoral scope.

G – Learning, knowledge management, and lessons learned

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

Effective communication, proactive knowledge management, and continuous learning are critical to the project's success, particularly in ensuring the sustainability and dissemination of best practices. These elements have been incorporated into the project design from the beginning and are considered in components 1, 2, and 3. Component 1, which facilitates the implementation of a multi-hazard Early Warning System, aims to optimize the dissemination and use of weather forecasts. It includes specific actions for: (i) developing a national strategy for the production and dissemination of weather and climate information, (ii) creating web and mobile applications for real-time distribution of early warnings, and (iii) enhancing partnerships between municipalities and local media to ensure rapid, reliable, and accessible communication. These activities will improve knowledge management by enabling information production, dissemination, and sharing through various channels, including social media and websites. Using community radios, social networks, and official METEO BENIN pages will allow for real-time sharing of project updates, success stories, and best practices in various local languages. Additionally, the establishment of a knowledge portal on the METEO BENIN website will provide centralized and quick access to project resources for both stakeholders and the public, thereby promoting knowledge management and information transparency.

Component 2, which focuses on enhancing the production and adoption capacities of weather and climate services, offers targeted training for all stakeholders involved in current early warning systems. These training sessions will raise awareness and educate local communities about climate risks and the use of Early Warning Systems and risk management. Community leaders will receive specific training designed to strengthen their ability to prepare for and respond to climate risks. These initiatives are also structured as participatory learning and knowledge-sharing activities, aimed at increasing community resilience and equipping them with swift and effective adaptation strategies for climate hazards. All training materials will be tailored to local languages and made accessible through audiovisual formats, thereby ensuring broad accessibility and improved knowledge retention among community members beneficiaries.

Finally, component 3, which ensures the sustainability of the project's achievements and knowledge management, includes the creation of a toolbox that synthesizes the project's best practices and successes, as well as establishes facilities for sharing and managing knowledge. Archives will be created to preserve a record of the project, ensuring sustainable monitoring and allowing lessons learned to be communicated to future projects and

stakeholders. Thus, through these various components, the project guarantees effective knowledge management and a continuous learning process, which are essential for sustainable climate adaptation and the resilience of vulnerable communities Benin.

H – Consultative 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 stakeholder consultation mission took place in five communes in Benin. The team comprised four members, including two women, and represented the National Fund for the Environment and Climate (FNEC), METEO BENIN, and a consultant. The visited communes include Parakou, Bantè, Ouidah, Abomey, and Cotonou, collectively representing a total of nineteen communes from twelve departments, as shown in the table below. Each stage of the consultation was organized in three phases: (i) a meeting with local authorities, (ii) discussions with potential project beneficiaries, and (iii) a field visit. A total of 280 individuals participated in the stakeholder consultations, including 24% women and 4% people with disabilities. The lists of participants are presented in annex 2.

The stakeholder discussions provided crucial insights into the climate challenges faced by municipalities across the country. All regions reported their vulnerability to various climate events, including floods, high winds, erratic rainfall, and droughts. These events have led to crop destruction, loss of human and livestock lives, infrastructure damage, and agricultural calendar disruptions. In response to these challenges, communities recognized the value of the weather information provided by METEO BENIN but emphasized several issues. They pointed out problems with access, comprehension, and the reliability of the weather data. Additionally, communities raised concerns about the limited coverage of METEO BENIN facilities and their deteriorating condition, affecting the information's reliability. They also noted the lack of specific information tailored to the needs of various sectors, which reduces the effectiveness of climate alerts. To address this situation, it was suggested that the accessibility of weather information be enhanced by diversifying dissemination channels. Suggestions included community radios, town criers, prefectures, community relays, and social networks. Furthermore, it was recommended that adapted formats, such as videos and audio messages in local languages, be utilized to ensure better comprehension of the information by the target populations.

Table 4: Distribution of consulted stakeholders

N°	Phases	Dates	Municipalities visited	Total number	Male	Female	People with disabilities
1	Parakou	28-29/10/ 2024	Parakou, Malanville, Kandi, N'Dali and Boucoumbé	71	55	16	04
2	Bantè	30-31/10/ 2024	Bantè, Glazoué and Bassila	61	48	13	02
3	Ouidah	04-05/11/2024	Ouidah, Grand-Popo and Allada	52	43	09	02
4	Abomey	06-07/11/2024	Abomey, Dogbo, Bohicon, Djidja and Kétou	50	38	12	00
5	Cotonou	12/11/2024	Cotonou, Abomey-Calavi and Dangbo	46	29	17	02
Total				**280**	**213**	**67**	**10**

Women who are illiterate and individuals with disabilities have voiced concerns regarding the format and distribution channels of the meteorological information that the project will produce. These groups highlighted the necessity for accessible formats, such as audio and video messages in local languages, pictograms, and Braille materials. They also recommended disseminating the information through town criers, women's groups, disability organizations, and community radio stations. Activities 1.3.2, 2.2.1, and 2.2.2 have been designed to meet these specific needs.

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The following photos highlight key moments from the stakeholder consultations.

- **Parakou phase**

- **Bantè phase**

- **Ouidah phase**

- **Abomey phase**

- **Cotonou phase**

The consultation also provided an opportunity to engage with five (5) Technical and Financial Partners (TFPs) and four (4) government entities, totaling twenty (20) participants. Among the TFPs present were the French Development Agency (AFD), the Embassy of the Netherlands, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the European Union (EU), and the International Fertilizer Development Center (IFDC). These meetings sparked discussions about ongoing projects, particularly the Hydro-Agro-Meteorological Information System (SIHAM) in Togo, an active SAP project that encouraged an in-depth exchange with

METEO BENIN executives, including its General Manager. The SIHAM project, which resembles the one planned for Benin, underscored the importance of learning from the insights provided by the IFDC. Establishing a multi-risk Early Warning System (EWS) in Benin is considered essential for enhancing resilience against climate risks in the agricultural, livestock, and fisheries sectors. However, it is crucial that this system considers the existing EWS while conducting a thorough evaluation of its shortcomings. Additionally, adapting the formats and channels for disseminating meteorological information to local contexts, utilizing suitable media, and improving the technical capacities and infrastructure of METEO BENIN are priorities to ensure the accuracy and effectiveness of the EWS. A strengthened coordination framework among the various stakeholders involved, along with an optimized information distribution circuit, will ensure clear, accessible, and reliable communication to target populations.

I – Justification for funding

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

The requested funding is vital to ensure sustainable and effective adaptation to the impacts of climate change in Benin by implementing measures to strengthen the resilience of vulnerable communities and strategic economic sectors. This funding request arises from the urgent need for the country to tackle the growing challenges related to climate change, marked by intensifying climate risks and the significant losses they entail. The funding will enable the deployment of a comprehensive adaptation strategy focused on reducing current vulnerabilities and enhancing the resilience of populations. It will also foster the creation of long-term sustainable development opportunities in alignment with the objectives of the Adaptation Fund, which seeks measurable, sustainable, and inclusive outcomes. The total project costs are justified by various interdependent factors, including the complexity of climate challenges, the increasing vulnerability of the country, and the considerable economic benefits tied to adaptation actions.

The complexity of climate risks and the diversity of impacts: Benin faces a wide array of climate risks, including prolonged droughts and areas of dryness, frequent floods, powerful winds, heat waves, and coastal erosion. These phenomena have serious consequences for communities, particularly those in rural and coastal regions, as well as for socio-economic sectors such as agriculture, livestock, and fisheries. The multiplicity and intensity of these challenges necessitate an integrated and specific approach that can simultaneously address the needs for resilience and adaptation across various sectors. This rationale for adaptation, rooted in a collective and multisectoral response, justifies significant investment to ensure comprehensive coverage of needs and a targeted response.

Increased vulnerability of populations and ecosystems: climate change is worsening Benin’s susceptibility to extreme weather events, especially for rural populations, crucial infrastructure, and delicate ecosystems. With climate events growing in intensity and frequency, the country is experiencing heightened vulnerability, particularly in regions already affected by droughts, floods, and erratic rainfall patterns. As a response, investments in adaptation and resilience are necessary to enhance the capacity of communities to anticipate, respond to, and recover from climate impacts, particularly for those most at risk, such as women and youth in rural areas.

Socio-economic costs of climate damage: extreme climate events, worsened by climate change, have significant economic consequences for Benin. For instance, the 2023 flood impacted 45.66% of municipalities, leading to human losses, widespread destruction of infrastructure (schools, health centers), and losses in agriculture and livestock. These losses result in substantial economic costs, disrupting essential services and undermining the stability of communities' livelihoods. The requested funding aims to mitigate these potential losses by enhancing the adaptive capacity of communities, infrastructure, and production systems, which will reduce the financial and human impacts of future disasters. Thus, the project's approach seeks to alleviate long-term costs by acting proactively, before these events escalate into large-

scale crises.

Long-term sustainable development opportunities: in addition to minimizing climate impacts, investments in well-designed adaptation measures offer significant prospects for sustainable development. These investments yield positive effects, such as creating green jobs, promoting resilient and sustainable agricultural practices, protecting fragile ecosystems, and encouraging lifestyles that are more resistant to climate shocks. Therefore, the project aims to leverage these opportunities to foster inclusive and sustainable development, producing enduring economic and social benefits for communities and future generations.

In total, the proposed project aims to enhance meteorological services and implement a multi-risk early warning system tailored to the specific needs of vulnerable populations in Benin, based on their impacts. The project has an estimated budget of $4,187,740. In the current context, the lack of funding from the Adaptation Fund will impede the achievement of this goal, particularly in strengthening local community climate resilience. Benin lacks high-performance hydrological modeling software combined with ocean-atmosphere forecasting to predict flash floods, as well as impact-based weather forecasts for extreme events. These tools are essential for anticipating and mitigating the consequences of these events on populations and infrastructure. Additionally, the absence of an institutional coordination framework between climate information producers and users limits the delivery of relevant, tailored meteorological services. The fragmentation of early warning systems (EWS), their lack of intersectoral coordination, and their noncompliance with international standards, such as the Common Alerting Protocol (CAP), significantly diminish their effectiveness. This situation constrains the country's ability to disseminate reliable and timely alerts, anticipate risks, and activate appropriate responses.

In this context, financial support from the Adaptation Fund is crucial for addressing these strategic gaps. This funding would protect vulnerable populations, their livelihoods, and ecosystems, while strengthening national resilience to the growing impacts of climate shocks. Without this funding, Benin will be unable to align with international best practices in climate risk management or ensure adequate protection for the most vulnerable communities. Thus, the Adaptation Fund serves as a key lever to transform vulnerability into resilience through concrete, coordinated, and sustainable actions. The cost of each action has been calculated, and the total cost of the project by component is as follows:

- **Component 1:** Enhancing and modernizing the observation network to improve weather and climate services ($2,513,050)
- **Component 2:** Strengthening capacity for the production, dissemination, and adoption of meteorological and climate information ($683,000)
- **Component 3:** Sustainability of project results and knowledge management ($150,000)

Thus, the total budget of $4,011,561 guarantees the implementation of the planned activities and the achievement of the expected results without requiring co-financing. The selected actions have been prioritized and organized around a strategic core to maximize the impact of adaptation. Furthermore, rather than creating new entities, the project leverages existing institutional structures (METEO BENIN, DG ~~Water~~Eau, IRHOB, ABPC, communes, etc.) by enhancing their capacities, which lowers implementation costs. The project integrates proven technical solutions tailored to the local context to ensure cost optimization and enhance efficiency.

In conclusion, this project is entirely feasible with the requested funding from the Adaptation Fund. It employs a practical, focused, and integrated approach to ensure the viability and sustainability of interventions within the planned budget.

J – Sustainability

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

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The sustainability of the project results has been carefully integrated from the design phase through the active involvement of national and local stakeholders, along with the implementation of a participatory approach. Ministries, municipalities, civil society, the private sector, and the beneficiaries themselves will be engaged at each implementation stage, ensuring that the actions undertaken meet the real needs of communities and stakeholders. The participation of central and regional directorates, in collaboration with community organizations, NGOs, and private actors, guarantees local and inclusive management of the initiatives. In particular, the regional meteorological centers will be connected to urban communities, ensuring proximity to local populations. Additionally, the network of rain gauges will be managed by the municipalities under the supervision of METEO BENIN, promoting the appropriation of the infrastructures by local actors and their sustainability. The project will also focus on building capacity for end users through training and awareness-raising actions for the better dissemination of climate products in the municipalities, as well as the popularization of agrometeorological tools for producers. Thus, the sustainability of the results will be ensured by the continued involvement of local stakeholders, decentralized management of resources, and capacity-building actions aimed at perpetuating the benefits of the project in the long term.

The project aims to enhance the resilience of local communities to climate change by providing high-quality weather services tailored to their specific needs. Thus, by the end of the project, several adaptations benefits will emerge, including:

- **Strengthening national capabilities for forecasting extreme meteorological, hydrological, and climatological phenomena in a sustainable manner:** The modern equipment acquired and installed will continue to provide reliable data for climate risk management. Beneficiary institutions, including METEO BENIN, the Directorate General of Water (DG~~-Water~~Eau), the National Hydrometeorological Service (IRHOB), the National Meteorological and Hydrological Service (ABPC), and local municipalities, will sustain their enhanced technical and operational capacities. This ensures the continuous production and distribution of high-quality meteorological services. These capabilities can be leveraged to scale up the project.
- **Interoperable, multi-hazard Early Warning System (EWS) that complies with international standards (CAP):** This system will facilitate the automated and rapid dissemination of standardized alerts, ensuring their sustainability beyond the project's duration. Forecasting models, tools, and platforms that are developed will be maintained and regularly updated by trained national institutions, ensuring replicability at the national level and within the subregion.
- **Local Ownership and Inclusive Access to Information:** Based on the variety of formats for disseminating information, including audio and video messages in local languages, pictograms, and Braille materials, vulnerable populations will have continued access to the information necessary for climate resilience. They will also develop the skills to interpret meteorological services. Through repeated training and simulations, they will cultivate appropriate response reflexes.
- **Knowledge and Learning Management (KLM):** A structured KLM mechanism will be established through activities 3.2.1 and 3.2.2 to leverage best practices, ensure ongoing training, and enhance national adaptation policies.

In addition to the project's lasting benefits, the sustainability of its interventions will be ensured through public-private partnerships (activity 3.1.2) and the implementation of a non-aeronautical meteorological fee. This will guarantee stable resources for maintenance and service continuity. The sustainability of these actions also depends on a strengthened regulatory framework. The project aligns with current national laws and promotes the harmonization of alert systems by developing a national strategy (activity 1.2.3). Finally, social anchoring is driven by the active participation of vulnerable groups, the co-construction of alert tools, and the use of community relays to disseminate and promote ownership of messages. This ensures the sustainability of

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the interventions.

K– Environmental and social impact risks

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

The project entails the installation of hydrometeorological equipment and infrastructure, which may have social and environmental impacts. Based on the available information, the project is categorized as Category B, as it permits the completion of the environmental and social risks and impacts table. However, in line with Decree No. 2017-332 of July 6, 2017, which regulates environmental assessment procedures in the Republic of Benin, a thorough environmental and social assessment will be conducted during the preparation of the final project document to ensure compliance with the Adaptation Fund's fifteen environmental and social principles. If needed, this assessment may be supplemented by an Environmental and Social Management Plan (ESMP).

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Table 5: Environmental and social impacts and risks identified

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Principle 1: *Compliance with the Law*	~~*As detailed in Part II.E, the project will be in compliance with the relevant national legislation, including the environmental framework law, the climate change law, and the regulations governing climate services. Moreover, during its implementation, special attention will be given to ensuring strict compliance with decentralization laws to preserve institutional coherence and effective governance.*~~	**Risk:** Low **Potential impact:** Low Although the project is designed to comply with all applicable national and international legislation, including environmental framework law, climate change law, and climate services regulations, potential risks of noncompliance may arise during implementation and require continuous clarification. **Mitigation Plan:** A comprehensive environmental and social assessment will be carried out at the full proposal stage to ensure compliance with the Adaptation Fund's 15 ESP principles and national standards. Particular focus will be placed on strict adherence to decentralization laws to maintain institutional coherence and effective governance. **Further assessment required to ensure continued compliance.** ~~None of the components and corresponding interventions/activities of the proposed project fall under the first category of projects requiring a full Environmental Impact Assessment (EIA).~~
Principle 2: *Access and Equity*	~~*The project will ensure equitable access for all vulnerable groups targeted in the beneficiary communes. The climatological services provided will be available to all vulnerable segments in the targeted areas.*~~	**Justification:** The project will ensure fair, equitable, and inclusive access to climatological services for all vulnerable groups in the targeted communes. ~~**Risk:** Low **Potential impact:** Low~~ ~~The project's activities will be equally accessible to the target communities without discrimination.~~ It will take a number of transparent ~~steps~~ measures ~~that will help~~to ensure that the benefits of the project are being distributed fairly with no discrimination nor favoritism. **No further assessment required.**
Principle 3: *Marginalized and Vulnerable Groups*	~~*The project will contribute to reducing existing inequalities in meteorological services and Early Warning Systems (EWS) for floods and droughts, particularly those affecting marginalized or vulnerable groups who are dependent on agriculture or who live in rural areas. It will develop and implement a gender-responsive stakeholder engagement strategy. The project will prioritize the most vulnerable segments of the population, especially men and women whose livelihoods have been significantly impacted by climate shocks.*~~	**Risk:** Low **Potential impact:** Low Illiterate populations and people with disabilities might not fully benefit. ~~There is a risk that some target populations who are illiterate may not benefit~~ from certain outputs, such as weather bulletins and forecasts. ~~To address this challenge, the messages will be translated into local languages. Similarly,~~ Similarly, vulnerable and marginalized groups may lack sufficient knowledge and access to technological devices like mobile phones or have poor telephone connections, which are especially needed for access to information. **Mitigation Plan:** Messages will be translated into local languages and communicated using traditional methods, such as griots and community relays, as well as Braille. The most vulnerable groups, whose livelihoods are heavily affected by climate shocks, will be prioritized in the gender-responsive stakeholder engagement strategy. **Further assessment required due to the specific characteristics of target populations.** ~~This risk will be alleviated by using traditional communication methods, such as griots, etc.~~
Principle 4: Human Rights	~~*No further assessment is required. The proposed activities do not or will not violate any of the established human rights. Furthermore, the proposed project will promote the basic human rights of information.*~~	**Risk:** ~~None~~ Low **Potential impact:** ~~None~~Low While the project promotes fundamental human rights (right to information), pre-existing social dynamics (~~The prevalence of~~e.g., gender-based violence~~violence against women and girls is~~ rooted in patriarchal and traditional communities) may limit some vulnerable groups' participation in the project. **Mitigation Plan:** Human rights training will be incorporated into all activities, namely during the education of local communities and community leaders on climate risks, Early Warning Systems, and preparedness and response strategies for climate risks activities. The project will provide universal access to timely and reliable weather and climate information while addressing relevant human rights issues identified in UN human rights procedures, when applicable. **Further assessment required.** ~~The project will integrate human rights training into all its activities.~~
Principle 5: *Gender Equality and Women's Empowerment*	~~*A gender assessment will be conducted, and an action plan will be developed in accordance with the fund's gender policy. The project aims to promote gender equity and empower women through a gender-*~~	**Risk:** Medium **Potential impact:** Medium In targeted communes, leadership roles are predominantly held by men. ~~The project focuses on communes where men predominantly hold leadership roles.~~ Cultural and social norms may restrict ~~often limit~~ women's participation in disaster preparedness and decision-making, limiting ~~. As a result, there is a risk that women will not receive~~ equal benefits ~~from~~ to the proposed meteorological services and EWS. **Mitigation Plan:** ~~A gender assessment will be conducted, and an action plan will be developed in accordance with Fund's Gender Policy.~~ A gender-responsive stakeholder engagement and participatory ~~plan~~ strategies will ~~be developed to~~ ensure that marginalized and vulnerable groups, particularly women and representatives of women's organizations, are fully included. **Further assessment required due to existing gender dynamics.**

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Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
	~~responsive stakeholder engagement strategy and a tool developed by the World Meteorological Organization (WMO). This approach will increase the participation of women, girls, and other vulnerable groups in flood and drought management activities and decision-making processes.~~	
Principle 6: *Core Labour Rights*	~~✓The project will not affect the working conditions, health, or safety of workers. All international and Beninese labor law requirements concerning working conditions will be honored and included in the environmental and social assessment when the funding proposal is developed.~~	**Risk:** Low **Potential impact:** Low While the project commits to respecting ILO core labor standards and national labor law, there is ~~To reduce the~~residual risk of mistreatment or discrimination, particularly for field workers involved in installations or surveys. **Mitigation Plan:** T~~t~~he project will consistently respect and uphold workers' rights according to relevant national laws and international labor standards. All activities will ~~follow~~ comply with recognized labor laws and codes in order~~to~~ create a safe, fair, and inclusive workplace for everyone. **Further assessment required.**
Principle 7: *Indigenous Peoples*	~~✓There are no indigenous peoples in the project area. However, further investigations will be conducted during the environmental and social assessment for the full project to confirm the absence of minorities or marginalized ethnic groups in the area.~~	**Risk:** Low **Potential impact:** Low No indigenous peoples have been identified at this stage in the project area. However, further investigations will be conducted during the environmental and social assessment for the full project to confirm the absence of minorities or marginalized ethnic groups in the area. **Mitigation Plan:** ~~Local and national institutions will conduct a~~A detailed analysis will be carried out during project implementation to confirm or rule out the presence of minorities or marginalized ethnic groups in the area, and appropriate measures will be taken in line with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). **Further assessment required.**
Principle 8: *Involuntary Resettlement*	~~✓The project will not involve resettlement. Although not all locations for the proposed network of hydrometeorological stations have been identified yet, the site selection process will mainly focus on the rehabilitation and modernization of existing sites and areas earmarked for community infrastructure.~~	**Justification: The project will not involve resettlement. But activities relating to the rehabilitation and installation of new stations (Component 1) are likely to have a negative impact on land acquisition and restrictions on land use. However, the project will ensure that no private land is used. No further assessment required.** **Risk:** ~~None~~ Low **Potential impact:** ~~None~~Low **Justification:** The project will not involve resettlement. But a~~Activities relating to the rehabilitation and installation of new stations (Component 1) are likely to have a negative impact on land acquisition and restrictions on land use. However, the project will ensure that no private land is used.~~ **Mitigation Plan:** ~~Site selection will prioritize existing sites or those designated by the community. Private land will not be used, and sites will be provided by the State or municipalities.~~ **No further assessment required.**~~According to METEO Benin, the land in question belongs to the state or the community.~~
Principle 9: *Protection of Natural Habitats*	~~✓Installing hydrometeorological stations and related infrastructure (Component 1) may cause partial damage or destruction to natural habitats, especially in ecologically sensitive areas like wetlands, forests, and riverbanks.~~	**Risk:** Low **Potential impact:** Low Installing hydrometeorological stations and related infrastructure (Component 1) may cause partial damage or destruction to natural habitats, especially in ecologically sensitive areas like wetlands, forests, and riverbanks. **Mitigation Plan:** ~~Natural habitats are areas composed of viable assemblages of predominantly native plant and/or animal species, where human activity has not significantly altered the area's primary ecological functions or species composition.~~ The Environmental and Social Management Plan (ESMP), to be prepared at the Full Proposal stage, will detail specific measures to avoid, reduce, or offset any impacts. **Further assessment required due to infrastructure installations.**
Principle 10: *Conservation of Biological Diversity*	~~✓The installation of the hydrometeorological stations may impact biodiversity. Environmental and social impact studies will assess these risks, and an action plan will be implemented.~~	**Risk:** Low **Potential impact:** Low As mentioned earlier, the project will apply site selection criteria that prioritize existing sites and areas designated for community infrastructure with low ecological sensitivity. **Mitigation Plan:** ~~However, p~~Pre-installation ecological screening will be included in the Environmental and Social Management Plan (ESMP) to help avoid critical habitats and protected areas. The ESMP will also specify measures such as minimizing vegetation clearance, restoring disturbed areas after installation, and monitoring local biodiversity throughout the project's implementation. **Further assessment required due to infrastructure installations.**

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Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Principle 11: *Climate Change*	~~X The project will not exacerbate climate change, as its goal is to enhance the resilience of local communities to climate change by providing them with high-quality, tailored weather.~~	**Justification:** The project is designed to strengthen local communities' resilience to climate change by providing high-quality, tailored climate services. Rather than contributing to greenhouse gas (GHG) emissions, it will strengthen resilience through flood alerts, extreme weather warnings, and nature-based solutions. **No further assessment required.** ~~**Risk:** Low **Potential impact:** Low~~ ~~The project's activities will be developed to strengthen the resilience of ecosystems and communities to climate change, with a focus on providing flood alerts and warnings for extreme weather events. In addition, actions aimed at increasing the resilience of populations will be planned at the local level with a focus on nature-based solutions.~~
Principle 12: *Pollution Prevention and Resource Efficiency*	~~X Depending on the project's activities, the foreseeable impacts include noise, tree removal for infrastructure construction, pollution of water and soil linked to the construction, and electronic waste generation. Environmental impact studies will identify all negative effects and suggest mitigation measures.~~	**Risk:** Medium **Potential impact:** Medium Depending on the project's activities, the foreseeable impacts include noise, tree removal for infrastructure construction, pollution of water and soil linked to the construction, and electronic waste generation. **Mitigation Plan:** The project will implement a comprehensive set of mitigation measures within the Environmental and Social Management Plan (ESMP). This will involve enforcing environmentally responsible construction practices, such as noise control, erosion prevention, and proper waste management; establishing a tree replanting program to offset vegetation loss; ensuring the safe storage and disposal of hazardous and electronic waste in accordance with national and international standards; and carrying out regular environmental monitoring to ensure compliance throughout the project lifecycle. **Further assessment required due to construction-related impacts.**
Principle 13: *Public Health*	~~X The project will be designed and implemented to avoid any negative effects on public health. Instead, it will help prevent natural disasters, increase incomes for access to health services, and more. However, installing hydrometeorological stations may pose health risks. Environmental and social impact studies will assess these risks, and an action plan will be put into place.~~	**Risk:** Medium **Potential impact:** Low Installing hydrometeorological stations may pose occupational health risks for workers and nuisance for nearby communities. **Mitigation Plan:** The project will ensure strict occupational health and safety protocols are followed, including the use of personal protective equipment (PPE), safety training, ~~training workers and local stakeholders on safe~~ installation procedures, and continuous monitoring during installation. These measures will be integrated into the Environmental and Social Management Plan (ESMP) and aligned with national health and safety standards. **Further assessment required due to infrastructure installations.**
Principle 14: *Physical and Cultural Heritage*	~~X The project intervention area will exclude archaeological, religious, or other sites of physical or cultural heritage.~~	**Justification:** The project intervention area will exclude archaeological, religious, or other sites of physical or cultural heritage. A "chance finds" procedure will be included in contracts to handle any unforeseen risks. **No further assessment required.** ~~**Risk:** None **Potential impact:** None~~
Principle 15: *Lands and Soil Conservation*	~~X The proposed project will not harm the land or soil.~~	**Justification:** The project will not damage the land or soil. Instead, it will promote conservation by providing climate services that support climate-resilient decision-making. The project's outcomes will contribute positively to soil conservation. **No further assessment required.** ~~**Risk:** Low **Potential impact:** Low~~ ~~The project will improve community resilience by providing hydrometeorological products and services tailored to their specific needs, and by supporting them in decision-making processes to enhance resilience.~~

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PART III: IMPLEMENTATION ARRANGEMENTS

A. Alignment with the Adaptation Fund Results Framework

Demonstrate how the project/programme aligns with the Results Framework of the Adaptation Fund

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Table 6: Alignment with the Adaptation Fund Results Framework

Project objective(s)	Project objective Indicator(s)	Fund Outcome	Fund Outcome Indicator	Grant Amount (USD)
Strengthen and modernize the weather observation system while establishing a multi-hazard Early Warning System (EWS) to enhance the dissemination and utilization of weather forecasts	1. Benin's weather observation system strengthened and modernized 2. Number of functional multi-hazard Early Warning Systems established and operational	**Outcome 1**: Reduced exposure to climate-related hazards and threats	**1.** Relevant threat and hazard information generated and disseminated to stakeholders on a timely basis	**2,513645,05000**
Enhance skills for producing, sharing, and adopting meteorological and climatological services	Number of institutions engaged in training for the production and dissemination of meteorological and climatological information to enhance climate risk management effectiveness	**Outcome 2:** Strengthened institutional capacity to reduce risks associated with climate-induced socioeconomic and environmental losses	2.1. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	**430,000**
	Percentage of local communities exhibiting heightened awareness of weather- and climate-related risks, along with appropriate response strategies	**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	**25368,000**
Ensure the sustainability of the project's results and oversee knowledge management	Sustainable maintenance of meteorological and climatological infrastructure and equipment is ensured, and a structured Knowledge and Learning Management (KLM) mechanism is established	**Outcome 8:** Support the development and diffusion of innovative adaptation practices, tools and technologies	8. Innovative adaptation practices are rolled out, scaled up, encouraged and/or accelerated at regional, national and/or subnational level	**150,000**
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**	**Grant Amount (USD)**
Outcome 1.1: High-quality, impact-based weather and climate forecasts are available in a changing environment	Number of impact-based weather and climate forecasts available	**Output 1.1:** Risk and vulnerability assessments conducted and updated	**1.2** No. of early warning systems (by scale) and no. of beneficiaries covered	**2,436,500**
Outcome 1.2: Specific meteorological and climatological services are available to local communities to enhance their adaptive capacity	Number of multi-hazard Early Warning Systems established and operational			
	Number of local communities covered by multi-risk Early Warning System established	**Output 1.2:** Targeted population groups covered by adequate risk reduction systems	**1.2.1.** Percentage of target population covered by adequate risk-reduction systems	**76,550**
Outcome 2.1: The technical and organizational capacity of stakeholders is strengthened to enable the effective implementation of a multi-risk early warning system tailored to local needs	Number of staff of METEO BENIN, DG-Eau, IRHOB, and ABPC trained in the production and dissemination of meteorological and climatological information for effective climate risk management	**Output 2.1:** Strengthened capacity of national and sub-national centres and networks to respond rapidly to extreme weather events	**2.1.1.** No. of staff trained to respond to, and mitigate impacts of, climate-related events (by gender)	**683,000**
Outcome 2.2: Local communities have the necessary knowledge to better understand climate risks, use the multi-risk early warning system, and strengthen their resilience to the impacts of climate change	Number of local communities trained on the developed multi-risk Early Warning System	**Output 3.1:** Targeted population groups participating in adaptation and risk reduction awareness activities	**3.1** No. of news outlets in the local press and media that have covered the topic	
Outcome 3.1: Meteorological and climatological infrastructure and equipment are sustainably maintained and preserved through an effective operational plan, ensuring their long-term functionality	Meteorological and climatological infrastructure and equipment sustainably maintained and preserved	**Output 8:** Viable innovations are rolled out, scaled up, encouraged and/or accelerated	**8.1.** No. of innovative adaptation practices, tools and technologies accelerated, scaled-up and/or replicated	**150,000**
Outcome 3.2: The best practices and successes of the project are capitalized and made available in the form of practical tools, facilitating their dissemination and replication	Best practices and successes of the project scaled up			

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. Record of endorsement on behalf of the government[2]

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 annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:

(AND endorsement letter attached as annex ~~21~~)

Pr Martin Pépin AÏNA, Designated National Authority, General Director for Environnement and Clinate	January, 28th, 2025

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 (*National Development Plan (NDP 2018-2025), The National Climate Change Adaptation Plan (NAP) ; Nationally Determined Contributions (NDC 2021-2030) ; Strategic Plan of METEO BENIN (2022-2026), and National Framework for Climate Services (NFCS)*) and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy and the Gender 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

Name & Signature

Implementing Entity Coordinator:

Le Directeur Général

Dr Appolinaire D. GNANVI
General Director

Date: *February, 24, 2025*	Tel. +229 97192464 and email: gnanviappolinaire@yahoo.fr

Project Contact Person: **Fortunée DOSSOU WOROU**
Director of Financial Resource Mobilization

Tel. +229 95966314 And Email: ellidos@yahoo.fr

[6] 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 2: AND Endorsement Letter

MINISTERE DU CADRE DE VIE
ET DES TRANSPORTS
EN CHARGE DU DEVELOPPEMENT DURABLE
REPUBLIQUE DU BENIN

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N° 0026/DGEC/MCVT/PF-CC/SD

28-01-2025

ADAPTATION FUND

Letter of Endorsement by Government

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for **strengthening meteorological services and establishing a multi-risk early warning system to improve the climate resilience of local communities in Benin.**

In my capacity as designated authority for the Adaptation Fund in Benin, 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 Benin.

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 FNEC and executed by METEO-BENIN.

Sincerely,

Martin Pépin AÏNA
Designated National Authority
General Director for Environment and Climate

Revised PFG Submission Form[1] (additions in red)

Project Formulation Grant (PFG)

Submission Date: 28 July 2025

Adaptation Fund Project ID:
Country/ies: BENIN
Title of Project/Programme: Strengthening Meteorological Services and Establishing a Multi-Hazard Early Warning System to Enhance the Climate Resilience of Local Communities in Benin
Type of IE (NIE/RIE/MIE): NIE
Implementing Entity: National Fund for Environment and Climate (FNEC)
Executing Entity/ies: National Meteorological Agency (METEO BENIN) (Agence nationale de la Météorologie

A. Project Preparation Timeframe

Start date of PFG	September 2025
Completion date of PFG	March 2026

B. Proposed Project Preparation Activities ($)

List of Proposed Project Preparation Activities	Output of the PFG Activities	US$ Amount	Budget note[2]
1. Feasibility studies and project design	Climate vulnerability and impact study, Cost-Effectiveness Analysis (CEA), Cost-Benefit Analysis (CBA), the locations where the equipment and infrastructure will be placed report, and institutional role matrix and coordination plan	40,000	Includes technical, financial, and legal feasibility, the identification of the impact-based forecasting framework, and identification of the locations where the equipment and infrastructure will be placed. Covers also the role distribution, governance framework, and integration of probabilistic risk modeling

[1] As presented in AFB/PPRC.33/40 Annex 1.
[2] The proposal should include a detailed budget with budget notes indicating the break- down of costs at the activity level. It should also include a budget on the Implementing Entity management fee use.

2. Environmental and Social Impact Assessment (ESIA)	Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP)	20,000	Covers impact assessments, risk classification, and compliance with Adaptation Fund and national safeguards
3. Stakeholder engagement and participatory planning	Stakeholder mapping, consultation reports, local consultation summaries	15,000	Covers inclusive participatory workshops and capacities needs assessment of key institutions
4. Gender Assessment and Gender Action Plan	Gender Assessment (GA) report and Gender Action Plan (GAP)	10,000	Covers identification of the specific roles, needs, and challenges faced by different genders in the context of climate resilience and the development of the GAP.
5. IE fee	Implementing Entity management fee	6,800	Covers coordination and supervision of project preparation activities, reports validation workshops, monitoring, and reporting on the use of PFG.
Total Project Formulation Grant		**91,800**	

1. Feasibility Studies (40,000 USD)

A comprehensive assessment of the project's technical, financial, legal, and economic feasibility is crucial for a deeper understanding of the vulnerability of local communities in the intervention area. This study will provide an in-depth analysis of climate hazards, exposure, and community vulnerabilities, as well as their impact on livelihoods. By comparing climate scenarios with and without the project, it will assess the project's transformational impact and examine the effects of climate change on communities and key economic sectors across the twelve targeted municipalities. Observed trends and projected climate impacts on livelihoods will serve as a basis for defining and comparing impact-based forecasts.

Furthermore, the feasibility study will demonstrate the relative viability and efficiency of the climate interventions outlined in the project. It will also assess the costs and benefits at a national, societal, or global level, while capturing non-market externalities that are not easily monetized. Lastly, the locations designated for the installation of equipment and infrastructure will be identified and documented.

Additionally, a comprehensive analysis of institutional roles and governance structures will be conducted to establish a well-defined framework that enhances coordination and ensures a precise allocation of responsibilities throughout project implementation. The objective is to clearly define roles, propose a coherent governance model, and integrate the Adaptation Fund's requirements into existing national arrangements. Additionally, an in-depth evaluation of institutional needs for incorporating impact-based forecasts and early warnings, along with probabilistic risk analysis, will be undertaken. This approach aims to facilitate the transition from a deterministic to a probabilistic model, thereby enhancing the ability to anticipate and manage climate risks effectively.

Five main deliverables will be provided:

- **Deliverable 1.1:** Climate vulnerability and impact study report
- **Deliverable 1.2:** Cost-Effectiveness Analysis (CEA) report

- **Deliverable 1.3:** Cost-Benefit Analysis (CBA) report
- **Deliverable 1.4:** Site identification and justification report for the installation of meteorological and climate equipment and infrastructure
- **Deliverable 1.5:** Institutional analysis and implementation planning report

2. Environmental and Social Impact Assessment (20,000 USD)

The objective is to assess the potential environmental and social impacts of the project's planned interventions and to establish a framework for avoiding, preventing, or mitigating associated risks. This assessment will also include a gender analysis, providing recommendations to ensure effective gender mainstreaming throughout project implementation. The proposed management measures will align with Benin's environmental and social regulations, as well as the requirements of the Adaptation Fund. Additionally, the assessment will draw on existing studies regarding gender-related challenges and priorities related to access to meteorological services.

Three main deliverables will be provided:

- **Deliverable 1.1:** Environmental and Social Impact Assessment (ESIA) report
- **Deliverable 1.2:** Environmental and Social Management Plan (ESMP)

3. Stakeholder Engagement and Participatory Planning (15,000 USD)

The stakeholder analysis and the development of an engagement plan will help identify the most effective strategies to mobilize potential beneficiaries, particularly focusing on the most vulnerable groups, central and local structures, as well as state institutions that ensure the project's sustainability. To achieve this, multi-stakeholder consultations will be conducted in the twelve targeted communes through workshops at both national and local levels to gather stakeholder insights and refine the implementation strategy in collaboration with partner entities (government institutions, local authorities, NGOs, and the private sector). Additionally, a capacity-building needs assessment will be conducted for key institutions to accurately identify gaps in training and resources, thereby ensuring the project's long-term sustainability.

Three main deliverables will be provided:

- **Deliverable 3.1:** Stakeholder consultation report
- **Deliverable 3.2:** Stakeholder Engagement Plan (SEP)
- **Deliverable 3.3:** Institutions' capacity-building needs assessment report

4. Gender Assessment and Gender Action Plan (10,000 USD)

To integrate gender considerations into the project, a Gender Assessment (GA) will be conducted to identify the specific roles, needs, and challenges that different genders face in the twelve communes within the context of climate resilience. The assessment will focus on understanding gender dynamics in the project area and the barriers that women, girls, and marginalized groups encounter regarding climate resilience and adaptation measures. It will also address the gender barriers to the meteorological and climatological services offered by METEO BENIN.

The GA will assess existing gender disparities related to access to resources, decision-making processes, and climate adaptation opportunities. The GA will also investigate how these disparities affect the efficacy of Early Warning Systems (EWS), highlighting the necessity for targeted actions to tackle gender-based vulnerabilities.

A comprehensive Gender Action Plan (GAP) will be developed, outlining specific actions, responsibilities, indicators, and timelines to promote gender equality within the project's scope. The GAP will set measurable targets to improve the participation of women, girls, and marginalized groups in climate resilience.

The GAP will be regularly monitored to ensure its objectives are met, with clear implementation responsibilities outlined for relevant stakeholders. This approach will promote gender equality at every stage of the project, addressing existing disparities and contributing to more inclusive and sustainable climate resilience outcomes.

Two main deliverables will be provided:

- **Deliverable 4.1:** Gender Assessment (GA) report
- **Deliverable 4.2:** Gender Action Plan (GAP)

C. Implementing Entity

This request has been prepared in accordance with the Adaptation Fund Board's procedures and meets the Adaptation Fund's criteria for project identification and formulation.

Implementing Entity Coordinator, IE Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Dr. Appolinaire D. GNANVI General Director of FNEC		28 July 2025	Fortunée DOSSOU WOROU	+229 0195966314	ellidos@yahoo.fr

ANNEXES

Annex 1: Overview of stakeholders, actions, coordination mechanisms, geographic targets, and tinkages to climate extremes adaptation

Activity	Objective of the Activity	Stakeholders to Involve	Specific Actions	Coordination Mechanisms	Target Areas for Installations	Link with Climate Change Adaptation
1.1.1: Acquisition and installation of 87 automatic stations (10 synoptic, 12 agro-climatic, 60 pluviometric, 2 marine, 3 hydrometric)	Extend and modernize the national observation network to enhance climate risk monitoring and support the establishment of a multi-hazard early warning system	METEO BENIN, DG-Eau, IRHOB, ABE, Beneficiary municipalities, and private sector	- Site selection according to WMO standards - Field studies and civil engineering works for site installation and security - Acquisition and installation of equipment - Construction of security infrastructure (fences) - Community awareness to secure sites	- Establishment of project governance bodies - Regular meetings with all stakeholders	**- North:** Malanville, Kandi, Boukoumbé, Bassila, Parakou **- Center:** Djidja, Bantè **- South:** Abomey-Calavi, Dangbo, Dogbo, Kétou, Ouidah	- Improved rapid detection of extremes - Enhanced access to reliable information for population protection - Reduced vulnerability to climate risks
1.1.2: Rehabilitation of 5 synoptic stations, 1 agro-meteorological station, 6 precipitation monitoring stations, and 13 hydrometric stations	Improve data quality and optimize the functioning of the existing network	METEO BENIN, DG-Eau, equipment suppliers	- Technical diagnosis of existing stations - Replacement of defective instruments - Integration of automatic transmission systems	- Technical coordination between METEO BENIN and suppliers - Monitoring by regional technical services	**- Reference synoptic stations:** Kandi, Parakou, Natitingou (Péporiyakou), Savè, Bohicon (Cana) **- Agro-meteorological station:** Malanville (Bodjécali) **- Rainfall stations:** Djidja, Bantè, Ouidah **- Other localities linked to the stations:** Cotonou, Bohicon, Djougou, Natitingou, Savè, Allada **- 13 hydrometric stations:** on the main watercourses according to DG-Eau diagnosis	- Better precision of local forecasts - Enhanced integration of data into modeling systems - Operational continuity of the network in case of extreme events
1.1.3: Development of national-scale numerical weather prediction models adapted to local needs and strengthening of multi-hazard impact-based forecasting capacities	Improve the modeling capacity of extreme phenomena and anticipate multi-sectoral impacts	METEO BENIN, DG-Eau, IRHOB, universities, International partner institutions (AGRHYMET, ACMAD, WMO, UK Met Office, NOAA, etc.), Sectoral technical services	- Development of high-resolution numerical weather and climate prediction models - Integration of data from the national observation network (improved through activities 1.1.1 and 1.1.2) and satellite data - Establishment of a multi-hazard database - Creation of visualization platforms	- Partnerships with universities and research centers both nationally and internationally - Validation with user sectors	National Meteorological Forecasting Center (METEO BENIN)	- Better anticipation of floods, droughts, heatwaves - Improved accuracy of impact-based alerts
1.1.4: Co-production of sectoral climate analyses and tailored meteorological services for the public and private sectors	Improve the relevance and adoption of climate services by vulnerable sectors (agriculture, health, water, etc.)	METEO BENIN, Sectoral ministries: Agriculture, Health, Energy, Transport, Environment; Professional organizations and private companies (agricultural cooperatives, transport companies, insurance companies, etc.); Targeted municipalities and user populations (farmers, women, youth)	- Organization of sectoral co-production workshops - Development of personalized bulletins according to needs - Training in the interpretation and use of products	- Establishment of multidisciplinary working groups - Joint monitoring of developed products	National and pilot areas by sector (to be specified in the PF)	- Strengthening the resilience of key sectors - Integration of climate risks into local planning
1.2.1: Implementation of a multi-hazard early warning system based on impacts	Establish an integrated impact-based early warning system for major climate risks	METEO BENIN, ABPC, DG-Eau, IRHOB, Sectoral ministries, IFDC, Municipalities	- Design of the EWS platform - Interconnection of observation, modeling, and impact data - Parameterization of impact thresholds	- Consultation with end-users - Participatory validation testing	National with community relays	- Better responsiveness to climate risks - Early warning based on the actual effects of events
1.2.2: Harmonization of production and dissemination channels of existing alert systems with the new multi-hazard system	Improve the coherence, efficiency, and accessibility of existing alerts through a harmonized platform	METEO BENIN, ABPC, DG-Eau, IRHOB, Sectoral ministries	- Inventory of existing EWS systems - Integration into a common CAP protocol - Development of a unified dashboard	- Validation workshops with stakeholders - Technical coordination between systems	National	- Reduction of duplication, confusion, and dissemination delays - Simplified access to alerts for all target groups
1.2.3: Development of a national strategy for the production and dissemination of climate information	Establish a national strategic framework for coordinating the dissemination of climate services	METEO BENIN, ABPC	- Analysis of sectoral needs - Drafting of the strategy with stakeholders - Alignment with SDGs and climate commitments	- National validation process - Dissemination through ministries and municipalities	National	- Institutional appropriation of climate services - Anchoring EWS governance in public policies
1.3.1: Development of web and mobile applications for real-time dissemination of early warnings	Facilitate access to early warnings through modern and inclusive digital tools	METEO BENIN, IFDC, telecom operators, OPA, Sectoral ministries	- Design of a multilingual mobile application with geolocation - Integration of push notifications and a community dashboard - Development of an intuitive web interface	- User testing - Collaboration with telephone operators for network integration	National targeting with emphasis on the 12 beneficiary municipalities	- Better accessibility of alerts, including in local languages - Empowerment of communities through real-time information

Activity	Objective of the Activity	Stakeholders to Involve	Specific Actions	Coordination Mechanisms	Target Areas for Installations	Link with Climate Change Adaptation
1.3.2: Strengthening the partnership between municipalities and local media for alert dissemination	Improve media coverage of alerts in rural and peri-urban areas	Municipalities, community radios, local press, METEO BENIN	- Signing agreements with local radios - Training journalists to read alert bulletins - Establishment of rapid relay protocols	- Animation of relay networks - Monitoring the quality of local dissemination	12 beneficiary municipalities	- Reduction of the information gap between urban and rural areas - Strengthening community vigilance
1.3.3: Development of impact-based alert protocols tailored to the specific needs of users	Enable communities and institutions to act quickly according to the identified danger level	METEO BENIN, ABPC, DG-Eau, IRHOB, Sectoral ministries, Local NGOs, end-users	- Participatory definition of impact thresholds - Drafting of reflex sheets by type of risk - Dissemination of protocols in local languages	- Co-creation workshops with populations - Institutional and community validation	To be specified in the PF	- Adaptation of responses to local realities - Strengthening the effectiveness of the alert chain
2.1.1: Capacity building for specialized technicians (METEO BENIN, DG-Eau, IRHOB) on models and maintenance	Ensure local mastery of forecasting tools and the sustainability of installed infrastructure	METEO BENIN, DG-Eau, IRHOB, WMO, Agrhymet, ACMAD, NOAA	- Practical training on developed models - Equipment maintenance workshops - Development of technical manuals	- Partnership with regional training centers - Annual refresher sessions	Cotonou and in WMO Specialized Training Centers	- Maintenance of technical capacities post-project - Reduced external dependence for maintenance
2.1.2: Capacity building for decentralized technical services for alert dissemination	Ensure proper dissemination and adoption of alerts at the local level	Departmental technical services (ABPC, MAEP), communal RRC-ACC cells, Municipalities, NGOs	- Training on alert interpretation - Support for the dissemination of weather messages - Monitoring the adoption of local bulletins	- Coordination with prefectures and town halls - Networking of community relays	12 targeted municipalities and surrounding areas	- Strengthening the local transmission chain - Better community preparedness for extremes
2.2.1: Awareness and education of local communities on climate risks and early warning systems	Promote a risk culture and community ownership of EWS tools	METEO BENIN, ABPC, NGOs, community facilitators, local leaders	- Awareness campaigns (radio, theater, posters) - Educational sessions in schools and markets - Dissemination of multilingual brochures	- Partnerships with local radios and schools - Monitoring through vigilance committees	Rural areas of the 12 municipalities	- Empowerment of citizens in the face of risks - Integration of local knowledge into community responses
2.2.2: Training of community leaders in preparation and response to climate hazards	Strengthen local capacities to anticipate, alert, and act in case of extreme events	Village chiefs, group leaders, women leaders, youth, ABPC	- Training on alert reading - Simulation of evacuation and community mobilization - Creation of local risk management plans	- Coordination with emergency services - Support from civil society and local authorities	High-risk municipalities (Malanville, Bassila, Ouidah, etc.)	- Reduction of human and material losses - Social inclusion in risk management
3.1.1: Development and implementation of an operational maintenance plan for installed equipment	Ensure the sustainability of infrastructure implemented under the project	METEO BENIN, Suppliers, Municipalities	- Development of a preventive maintenance plan - Contracts with service providers for annual maintenance - Budgeting of post-project operations	- Establishment of a technical monitoring unit - Participatory monitoring with municipalities	Equipment installation sites	- Extension of station lifespan - Continuous reliability of data and alerts
3.1.2: Support for the establishment of a public-private partnership for service sustainability	Involve the private sector in the management and enhancement of climate services	METEO BENIN, Ministry of Finance, private operators	- Development of standard PPP contracts - Negotiations with ICT and logistics actors - Promotion of the economic model of EWS services	- Public-private working groups - Sectoral dialogue led by FNEC	National, in connection with intervention areas	- Financial sustainability of services - Strengthening multi-stakeholder governance
3.2.1: Development of a toolkit capitalizing on the project's best practices and successes	Promote the dissemination, duplication, and appropriation of project achievements	METEO BENIN, Universities, NGOs, FNEC	- Collection of successful experiences - Drafting of methodological sheets and practical guides - Design of visual and digital tools	- Participatory validation workshops - Dissemination via digital and paper platforms	National	- Provision of concrete tools for other actors - Reduction of local reinvention costs
3.2.2: Establishment of knowledge sharing and management mechanisms	Create a permanent learning space for climate resilience	METEO BENIN, FNEC, Research centers, Actor networks	- Organization of forums, webinars, climate clubs - Development of a national sharing platform - Continuous documentation of lessons learned	- Inter-institutional collaboration - Platform managed by METEO BENIN	National platform; local relay groups	- Continuous circulation of knowledge - Anchoring the culture of adaptation in local practices

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Annex 3: List of participants in the stakeholder consultations

Annex 3.1: List of participants in the stakeholder consultations in Parakou

Annex 3.2: List of participants in the stakeholder consultations in Bantè

Annex 3.3: List of participants in the stakeholder consultations in Ouidah

Annex 3.4: List of participants in the stakeholder consultations in Abomey

Annex 3.5: List of participants in the stakeholder consultations in Cotonou