ADAPTATION FUND

PROJECT PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT INFORMATION

Project Category:	Small-sized
Country:	Namibia
Title of Project:	Pilot desalination plant with renewable power and membrane technology
Type of Implementing Entity:	National
Implementing Entity (IE):	Desert Research Foundation of Namibia (DRFN)
Executing Entity (EE):	Namibia Water Corporation Ltd (NamWater)
Amount of Financing Requested:	USD 750,000

Short Summary

This proposed project aims to test a method for improving the assured supply of good quality groundwater to small towns and villages in Namibia. This will improve the resilience of such communities against the increased variability in rainfall that is expected with climate change.

As an arid country, Namibia depends heavily on its groundwater resources. This brings two challenges: high rainfall variability makes recharge into aquifers also variable, so groundwater reserves in many places are not reliable. Secondly, groundwater quality is poor in many places, below the thresholds for certain chemicals (e.g. fluoride, total dissolved solids and salinity) for safe human consumption. This requires water treatment techniques, such as filtration or desalination. These in turn demand energy in the form of electricity.

Two sample villages were selected for this pilot project, i.e. Uis and Bethanie. The Uis water supply, which is currently unreliable and high in TDS, will be complemented with purified water from a local aquifer high in salinity. The water will be desalinated using power from a small-scale hybrid solar- and wind-driven electricity generation plant. This will enable provision of water of the required quality and assurance of supply. In Bethanie water from the local aquifer, with high levels of fluoride, will be purified by a similar but adjusted desalination plant to the required level to meet the Water Quality Standards.

If successful, this project will demonstrate a useful method that can be rolled out to meet similar needs in off-grid communities in Namibia and elsewhere to improve the water situation for remote villages and settlements in the face of climate change.

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Abbreviations and Acronyms

AF	Adaptation Fund
CAPEX	Capital expenditure
CRSES	Centre for Renewable and Sustainable Energy Studies, Stellenbosch University
DEA	Directorate of Environmental Affairs, MET
DRFN	Desert Research Foundation of Namibia
EE	Executing Entity
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
ERP	Enterprise Resource Planning
GSAP	Gender and Social Action Plan
IFRS	International Financial Reporting System
IWRMP	Integrated Water Resources Management Plan
km	kilometre
kW	kilowatt
l	litre
m^3	cubic metre
MDG	Millennium Development Goal
mg	milligram
MET	Ministry of Environment and Tourism
NAD	Namibia Dollars
NIE	National Implementing Entity
NCCP	National Climate Change Policy
NGO	Non-Governmental Organisation
OPEX	Operational expenditure
PoN	Polytechnic of Namibia
PRS	Poverty Reduction Strategy
PM	Project Manager
PT	Project Management Team
PSC	Project Steering Committee
SADC	Southern Africa Development Community
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WASSP	Water Supply and Sanitation Policy
WML	Weder Meyer Louw Consulting Engineers

Project Background and Context

Climate change vulnerability in Namibia

Namibia is the most arid country in Africa south of the Sahara. Annual average rainfall ranges from about 600 mm in the north-east to less than 50 mm in the south and along the coast. About 22% of the land area is classified as desert, 70% is arid to semi-arid, and the remaining 8% is dry sub-humid (Mendelsohn et al 2002). Obviously, water in Namibia is a scarce resource.

In a country where surface water is scarce and only reliably found in the perennial rivers along the borders, groundwater is an important resource. Approximately half of all water used by people in Namibia is abstracted from aquifers, whilst 78% of the water used by livestock is also abstracted from groundwater sources (Christelis & Struckmeier 2001).

A typical feature of arid climates is high variability in rainfall. Across Namibia, the coefficient of variation in annual rainfall varies from about 30% in the north-east (where it is wettest) to over 100% in the driest parts, namely in the Namib and the south of the country (Mendelsohn et al 2002). Securing supply of water in this unpredictable environment places strong dependence on groundwater resources, which are subject to less fluctuation in availability.

It is predicted with a high degree of certainty that Namibia can expect an increase in temperature and evapo-transpiration at all localities, with the maximum increase (2 – 6ºC) in the interior (MET 2010). Most global circulation models and the median of these models project that Namibia will become drier, rainfall variability is likely to increase, and extreme events such as droughts and floods are likely to become more intense (MET 2010). Namibia's most recent National Communication to the UNFCCC (MET 2015) confirms that Namibia will be exposed to an increase in temperature and increased uncertainty in rainfall patterns. These conditions will increase Namibia's reliance on groundwater, since ephemeral surface water resources will become even more temporary, and will be subjected to higher evaporative losses.

The climate change predictions are also likely to have consequences for groundwater quantity and quality. The impacts on groundwater recharge are unclear, but one confirmed consequence is that bush encroachment, which will accelerate due to carbon fertilisation, reduces groundwater recharge rates (Bockmühl 2007).This will likely reduce the overall capacity and recharge of aquifers. On the issue of water quality, decreased recharge (whether caused by bush encroachment or not) is likely to cause concentrations of solutes to increase, which will exacerbate the situation of places which already have inadequate supply from groundwater sources in terms of quantity and quality. High levels of total dissolved solids, and elevated concentrations of fluoride and nitrates, are experienced in many parts of the country (Christelis & Struckmeier 2001). These chemical contaminants may reach higher concentrations with climate change.

Water and electricity

Namibia's population is partly concentrated in urban centres, and partly dispersed in small towns and rural villages and settlements (Mendelsohn et al 2002). The average population density is 2.7 persons/km^2, one of the lowest densities in the world. The scattered pattern of towns and villages across the large area of the country means that electricity provision through a grid of power lines extending to all settlements, including remote villages, is not cost-effective. In such a setting, local, small-scale generation of energy offers advantages in terms of the cost of electricity supply.

A positive consequence of Namibia's arid climate is an abundance of sunshine. Wind energy is less reliable in the interior of the country, but can be combined with solar power through hybrid renewable energy technology to offer a possible solution to electricity generation in remote areas. Pumping of underground water needs to be done regularly and this can happen at those times of the day which match the periods of optimum solar and wind energy generation. Therefore, renewable energy is a promising candidate for powering the abstraction of groundwater in Namibia's remote villages and settlements.

For water users that rely on groundwater with high levels of contaminants, the water must be purified by methods such as flocculation or desalination. This requires considerable energy. For most towns, electricity can be provided from the national electricity grid (although this supply will be less reliable in future, see below). Other settlements that are off-grid must rely on local electricity generation.

Reducing cost of providing good quality water

As Southern African economies and populations grow, the region is facing an overall power deficit. This will also affect Namibia, whose current electricity generation capacity is no longer able to meet the rising demand, and neighbouring Southern African countries where most of the supplementary electricity is currently sourced, will soon not be able to export electricity as and when Namibia requires it (Electricity Control Board 2012). This situation is likely to cause load-shedding and unexpected power cuts in the country in the near future.
Renewable energy technologies can address such electricity supply gaps, and the cost of the technologies has significantly declined in the past decade, making them competitive with existing conventional generation methods (von Oertzen 2014). The use of renewables will help to lessen the approaching power shortages, and enable off-grid settlements to access power. Obviously, they are also preferable from an environmental perspective due to their smaller carbon footprint.

In short: climate change is likely to worsen the availability and quality of groundwater. Desalination can help to make more groundwater of the required quality available for human use. Renewable energy sources – sun and wind – can power small-scale desalination plants in a cost-effective way. This project aims to test an approach that will harness such 'green energy' to improve the water situation of selected small villages which experience problems with

groundwater quality and quantity. If the pilot project is successful, further roll-out could help to reduce Namibia's vulnerability to the effects of climate change.

Socio-economic context

The two towns that are selected for the pilot project have high poverty levels, typical of many small towns and villages in central and southern Namibia. The situation is caused by their low level of economic activity (very low agricultural potential due to aridity, little manufacturing and industrial activity, with corresponding low levels of services and tertiary economic activities). They also experience in-migration from surrounding rural areas, which cannot sustain the increasing numbers of people, but have a gender ratio that is biased towards women because men tend to seek employment in larger urban centres. Very often, children are tended by their grannies, whose only means of support are their monthly state pensions.

The Daures Constituency where Uis is situated has a very low median level of expenditure (N$ 2,000 – 3,000 per year), showing that income levels are very low (CBS 2011). The Bethanie Constituency is the same. The Daures Constituency also has a relatively higher level of women-headed households than surrounding constituencies.

Prevalence of HIV–AIDS in Namibia averages 18.8%, and there is a higher prevalence of HIV and AIDS in women than men in Namibia (MHSS 2010). There are no direct data for the HIV prevalence in the two towns of this proposal, but the nearby towns of Omaruru (80 km from Uis) and Keetmanshoop (120 km from Bethanie) give reasonable proxy data. In Omaruru, HIV prevalence rate is 18.6%, and in Keetmanshoop it is 11.7%. Assuming these figures to be an accurate representation of the two villages, then there are about 240 people living with AIDS in Uis, and about 350 in Bethanie.
Vulnerability to climate change is greatest among the poor sectors of the population, and is exacerbated by disease such as HIV-AIDS (MET 2015). Due to their poverty, the communities in Uis and Bethanie are vulnerable to the more variable and extreme conditions that climate change will bring. This situation is typical of many other villages in Namibia.

Site selection and description

The water sector in Namibia is faced with many challenges related to the affordability of water supply to specifically villages, settlements and communities in rural areas.

In terms of the Namibia Water Corporation Act, No 12 of 1997, the tariff for the service of water supply (water tariff) is determined by the principle of cost recovery. As such, the available quantity and quantity of water in close proximity of the user to a large extent determine the water tariff.

The answers to the following questions determined the site selection:

“At which NamWater schemes can pilot projects be run whose outcomes can be rolled out as a solution to supply water at a quality in compliance with the Namibian Water Quality Standards, in sufficient quantities and at affordable water tariffs.”

Uis was selected as the first site to set up a pilot plant due the following reasons:

i The current water source for Uis is stressed due to poor run-off in the Omaruru River.
ii Despite Uis having an annual average of 50 mm rain per annum, the rainfall is also subject to a high degree of variability.
iii The Uis community can be described as vulnerable due to the high degree of unemployment.
iv The solar power potential at Uis is more than sufficient to generate enough renewable energy for a pilot plant.
v A secondary and un-used water source is available in close proximity to Uis which has the potential to be treated successfully to complement the primary water source to Uis.

The one disadvantage of Uis as a pilot site was that the available water at Uis did not contain high levels of fluoride. Since fluoride is the one natural element which has a negative health impact especially on babies and young children, it was important to find a suitable NamWater scheme where a similar pilot plant, but adjusted to remove fluoride from the water, could be tested. Based on this need, Bethanie was selected since it also complied with requirements (ii), (iii) and (iv) above.

Therefore the sites where this pilot project is proposed are Uis and Bethanie, with their locations indicated on the map of Namibia in Figure 1.

Figure 1: Map of Namibia

Their respective water situations are as follows:

Uis

Uis is a village in Erongo Region, north-western Namibia, on the inland edge of the Namib Desert. It was established at the site of a tin mine that has been closed since 1990. The Nei-Neis – Uis borehole scheme supplies groundwater to the Uis Village Council, for the town's population of about 1,300 people (Water Master Plan for the Central East and West of Namibia

2010). The scheme comprises a local well-field; (40 km from Uis) pump stations and reservoirs, and piped reticulation to the town. The ten operational boreholes, with individual yields ranging between 8 m^3/h and 20 m^3/h, are between 16m and 54 m deep in the dry bed of the Omaruru River. The borehole yields apply to periods of good run-off. For the 2014/15 financial year 160 472 m^3 of water was sold from this scheme. The town is responsible for 95% of the total demand from the Omaruru River well field at Nei-Neis, with the remainder going to a small number of private consumers along the main pipeline route.

The scheme is operated manually. The operator starts the borehole and booster pumps manually, on demand, and shuts off when the reservoirs are full. Electric power to the scheme is supplied from the local NamPower grid. The infrastructure is in good to reasonable condition and, with normal maintenance, is expected to last.

Due to poor run-off in the Omaruru River during the past 10 years, the natural recharge of the aquifer was inadequate and therefore the sustainable abstraction of the aquifer had to be reduced. A further reduction in the sustainable abstraction will be required if this poor run-off pattern continues. Additional ground water is available in and adjacent to Uis, however it is not suitable for human consumption without significant treatment.

Bethanie

Bethanie is in the far south of the country, in the //Karas Region. Bethanie obtains its water from two boreholes in the Konkiep River, approximately 2 km away from the town. The water supply scheme is managed by NamWater and the Bethanie Village Council is responsible for the management of the water reticulation. The current population is estimated at 2,978 persons.

Past and current operation of the boreholes makes no major impact on the aquifer, and there is sufficient capacity to meet the present and future demand. The scheme currently runs at a maximum of 53% of its recommended abstraction rate, and even in a high-growth scenario this is expected to be about 60% in 2030. The borehole pumps are activated and de-activated automatically via ball valves in the reservoir, and the scheme has an operator that checks on a daily basis that the systems are functional.
Water is reticulated to the town where it is metered at its discharge points to the end consumers. There is waterborne sewage in the town, while a bucket system is used in the toilets in the informal settlement. The condition of the existing infrastructure is rated as sufficient until at least 2030.

The main problem with the water supply situation is the quality. The fluoride level is high (in the order of 3.3 mg/l), which does not comply with the Namibia Water Quality Standards for human consumption which requires fluoride to be < 1.5 mg/l. Turbidity also sometimes exceeds the water quality standards and chlorination is occasionally inadequate, leading to the presence of bacteriological contamination by coliforms. Options to rectify these problems have been found to be financially non-viable, and a solution still needs to be found.

Extensions that have been recommended to cater for future demand and water quality improvement include a treatment unit (filtration through activated alumina), and installation of a telemetry and monitoring system to reduce operational losses. Alternatively, at greater cost, a desalination plant could be established to improve the water quality. The elevated tower reservoir has a capacity for only 8 hours supply in the event of power outages, and additional storage capacity should be considered for emergencies. It has been suggested that water only for human consumption needs to be treated. This would reduce the cost of the treatment facilities. Small plants could be provided at strategic positions to supply drinking water for collection by residents.

Project Objectives

The main objective of this project is to test the effectiveness of a system that will combine renewable energy with the needs of the water sector to improve resilience against climate change. The project will refine small-scale solar- and wind-driven desalination plants to improve the quality of selected groundwater sources for human consumption, and will attempt to reduce the cost of water to communities served by these schemes. A successful demonstration of the methods will enable further roll-out to other sites in the country.

Thermal desalination technology does exist in Namibia. Led by ISOE – Institute for Social-Ecological Research in Frankfurt am Main (Germany), the CuveWaters international project team has installed four different small-scale groundwater thermal desalination plants in the Omusati Region at Amarika and Akutsima. In addition to ISOE, the Technical University Darmstadt, partners from industry, the Namibian Ministry of Agriculture, Water and Forestry (MAWF) and the Desert Research Foundation of Namibia (DRFN) were also involved in the plants' development and implementation. The joint project is being funded by the German Federal Ministry of Education and Research (BMBF).

From available information it is understood that although solar driven thermal desalination technology is applied in Namibia, examples of solar and wind driven membrane desalination plants could not be identified in Namibia. Therefore the proposed plants will be developed and tested by the team consisting of consulting engineers, NamWater staff members, and students from the PoN and associated academics.

The motivation for establishing two pilot plants is:

- The water source at Uis is stressed and a local unused source, currently not suitable for human consumption due to high total dissolved solids and salinity, is available. The purpose of the plant is to utilise this resource.
- The water source for Bethanie is not stressed but has a high fluoride content, which does not meet Namibia's Water Quality Standards, and impacts on the health of the local population, especially children. The plant will improve the product water to be used by the community.

- Both communities are relatively poor with high levels of unemployment and women-headed households, making them more vulnerable to climate change.

The project will contribute to the main objective through the following outputs:

- Establishment of functional desalination plants and delivery pipeline, delivering 100 m3 of desalinated water per day;
- Establishment of a functional hybrid solar- and wind-energy system, capable of delivering 3.5 kW/m3;
- Improvement of technical abilities and skills of the officials responsible for the water schemes;
- Acceptance of desalinated water by the consumers;
- Operation of the pilot plant, including data analysis;
- Replication of the new system at Bethanie, adapted to its specific requirements.

Project Components and Financing

Project Components	Expected Concrete Outputs	Expected Outcomes	Amount (USD)
1. Desalination plant and distribution of water	1.1 Functional desalination plant established, delivering 100 m^3 of desalinated water per day. *Activities:* *1.1.1 Site selection and technical engineering design (by NamWater, Stellenbosch)* *1.1.2 EIA to obtain Environmental Clearance* *1.1.3 Procurement and installation of water abstraction equipment* *1.1.4 Construction of desalination plant*	Improved security of water supply for Uis.	80,000

	1.2 Functional pipeline established, connecting the groundwater supply to the existing reticulation system. *Activities:* *1.2.1 Construction of 5 km distribution pipeline, and connection to the existing Uis network*	Delivery of water of required quality and quantity to Uis residents.	120,000
2. Hybrid solar + wind power plant	2.1 Functional hybrid solar + wind energy system established, capable of delivering 3.5 kW/m^3 *Activities:* *2.1.1 Site selection and technical engineering design with involvement of tertiary institutions in studies* *2.1.2 EIA to obtain Environmental Clearance* *2.1.3 Procurement and construction of solar farm and wind turbines, feeding into integrating unit*	Power supply for water provision, with improved economics and reduced environmental impact compared to a conventional grid-based system.	80,000
3. Training	3.1 Improved technical ability and skills of the officials responsible for the water scheme. *Activities:* *3.1.1 Training provided to Uis Village Council officials, by NamWater and project team* *3.1.2 Production of training and maintenance manuals, so that the information is formalised and can be passed on.*	Responsible officials capable of managing all components of the water delivery system.	5,000

4. Sensitisation	4.1 Acceptance of desalinated water by the consumers, with insignificant or no resistance. *Activities:* *4.1.1 Sensitisation of village community about desalinated water, through public meetings, pamphlets, and demonstrations at the desalination and power plants*	Socially acceptable water supply system in place.	1,000
5. Pilot phase operation (2 years)	5.1 Operation of the pilot plant. *Activities:* *5.1.1 Operation of the system for 2 years, with quarterly inspections and reports*	A fully functioning system	90,000
	5.2 Data analysis report showing all the necessary facts and figures of the pilot project. *Activities:* *5.2.1 Compilation of all the significant steps and components during construction and operation, with involvement of PoN students. This will include consultations with communities to assess their perceptions*	Refined design available for replication in other towns.	10,000
	5.3 Knowledge management and lessons learnt feedback *Activities:* *5.3.1 Student engagement program* *5.3.2 Publication of lessons learnt*	Knowledge shared with interested and affected parties.	10,000
6. Replication	6.1 New systems installed, adapted for the specifics of Bethanie *Activities:* *6.1.1 Design, procurement and construction and operation of a similar pilot plant at Bethanie adjusted for fluoride reduction.*	Customised design and operation Renewable energy – membrane technology water supply systems fully installed and operating at Bethanie. Community at this town provided with safe and secure water supplies.	219,576

	6.2 Knowledge management and lessons learnt feedback *Activities:* *6.2.1 Student engagement program* *6.2.2 Publication of lessons learnt*	Knowledge shared with interested and affected parties.	10,000
7. Project Activities Cost (A)			625,576
8. Project Execution Cost (B)			65,668
9. Total Project Cost (A+B)			691,244
10. Project Management Fee (C)			58,756
Amount of Financing Requested (A+B+C)			**750,000**

Projected Calendar

Milestones	Expected Completion
Start of project (Inception workshop)	January 2016
Mid-term revue (if required)	September 2017
Project closing	June 2019
Terminal revue	April 2019

PART II: PROJECT JUSTIFICATION

A. Describe the project components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience.

Justification of the project

The water situation at Uis is currently tenuous, as the available source of groundwater in the Omaruru River has very limited capacity. Climate change will increase rainfall variability and the severity of droughts, and bush encroachment in the catchment will reduce groundwater recharge. All these factors will make the present source of water more unreliable, increasing the vulnerability of Uis residents.

The proposed project aims to increase the reliability of the domestic water supply scheme by installing a small desalination plant powered by solar and wind energy that would enable more convenient local groundwater sources to be exploited. This would increase the amount of available potable water, and secure water provision for the local community in Uis.

The water situation at Bethanie is sub-standard because of the high level of fluoride in the groundwater. Attempts to remedy the situation in the past, by flocculation using activated alumina at another scheme with similar water, have been only partially successful. Desalination (membrane treatment) is considered to be a preferable solution, but is prohibitively expensive due to the high energy costs if it uses electricity from the national grid.

For both sites, it is not planned to make any water available for agricultural use, mainly because it is believed that the agricultural use of water will not be feasible in terms of the cost of water. There is also no evidence at present that the agricultural activities in which the beneficiary communities are involved will benefit from a better quality of water. However, the possibility to reclaim the salts from the brine produced by the membrane plant as supplements for the cattle, sheep and goats in the vicinity of the plant will be investigated. The possibility to treat water to a lesser quality than for potable use to encourage agriculture may be considered during a next phase of the project once the potable application is established.

These two small towns, and other villages and settlements where future roll-out could occur, share one significant factor that limits their adaptive capacity. Small towns have little capacity to cope with providing essential services because of their low economic activity and small income base.

The livelihood of the Uis community is dominated by mainly the following two groups of people: (i) a group of people who are older that the official retirement age and dependant on the income

from the interest on their savings and pension and (ii) a group of people who are unemployed and dependant on income from different sources keeping them on the breadline.

The livelihood of the Bethanie community is dominated by mainly a group of people who are unemployed and dependant on income from different sources keeping them on the breadline.

The Uis community will not benefit significantly from a better quality of water because the water quality does not deviate so much from the acceptable standard. It has to be noted that the objective of the project is to test the technology for roll out to other off-grid communities and not primarily to benefit Uis.

Contrary to Uis, the Bethanie community will benefit significantly from a better quality of water because the high levels of fluoride in the water supplied to Bethanie causing brown teeth and a brittle bone structure. It is likely that the level of health will be impacted significantly.

Achieving 'balanced' urbanization as described in Vision 2030 is difficult because of very high levels of unemployment in small towns.

Inception phase

The opening phase of the project will involve formalising the partners who make up the team. They comprise a consortium of engineering companies, tertiary institutions and NamWater, as follows:

- WML Consulting Engineers (Windhoek)
- NRGen Advisors (Stellenbosch, South Africa)
- Centre for Renewable and Sustainable Energy Studies (CRSES) of Stellenbosch University
- Polytechnic of Namibia (PoN) (transforming into the Namibia University of Science and Technology) (Windhoek)

The project sites will be confirmed, and the agreed-upon schedule of the project and deliverables will be compiled in an Inception Report.

Component 1: Desalination plant

Desalination of groundwater is an important method of increasing resilience to climate change, as it increases the available water resource for use by communities where local sources are of poor quality. Climate change is likely to exacerbate this situation. Therefore finding affordable methods to access groundwater is useful adaptation.

Output 1.1: Functional desalination plant established, delivering 100 m^3 of desalinated water per day.		
Expected Outcome: Improved security of water supply for Uis.		
Activity 1.1.1	Site selection and technical engineering design	USD80,000
	Test rig refinements for arid climates	
	Identify potential site for boreholes and for desalination plant	
	Compile plant design, including CAPEX and OPEX	

	projections	
	Consider alternatives for disposal of the brine. The brine possibly has potential for adding to animal licks or other useful products. If this is not feasible, disposal must be achieved with minimal environmental impact.	
	Record all significant factors and specifications, as part of the documentation to inform replication at other sites.	
Activity 1.1.2	EIA to obtain Environmental Clearance	
	Compile project information and environmental and social baseline	
	Scoping of issues	
	Public consultation	
	Assessment of impacts	
	Consideration of alternatives and mitigatory measures	
	Compilation of Environmental Management Plan	
	Submission for Environmental Clearance	
Activity 1.1.3	Equipping of boreholes	
	Procure pumping equipment and installation services to install water abstraction equipment	
	Equipping to suit power specifications of the hybrid power plant	
	Commissioning of pumping equipment	
Activity 1.1.4	Construction of desalination plant	
	Procure desalination plant to specifications (See Activity 1.1.1) and services to install on site	
	Commissioning of desalination equipment (only)	
	Commissioning of desalination equipment (complete with pumping equipment)	
Output 1.2: Functional pipeline established, connecting the groundwater supply to the existing reticulation system		
Expected Outcome: Delivery of water of required quantity and quality to Uis residents.		
Activity 1.2.1	Construction of 5 km distribution pipeline and connection to the existing Uis network	USD120,000
	Procure pipeline and services to install on site	
	Excavate, lay and test pipeline	
	Commissioning of pipeline	

Component 2: Hybrid solar and wind power plant

Namibia is well endowed with solar radiation yet this resource is still largely under-utilised. This is mainly due to the high capital cost of installing the infrastructure, but that situation is now changing as conventional electricity becomes more expensive, and renewable technologies become cheaper as their uptake grows. Also, the technology for combining solar and wind systems is improving. Economically and technically, renewables are now more affordable and practical, and of course they carry environmental advantages for global climate change.

This situation favours combining renewable energy with water abstraction to improve resilience against water shortages brought on by climate change. Involvement of students in such work gives them exposure to the practicalities of the technology, which will help to get renewables more established and accepted in future.

Output 2.1: Functional hybrid solar and wind-energy system established, capable of delivering 3.5kW / m^3.		
Expected Outcome: Power supply for water provision, with improved economics and reduced environmental impact, compared to a conventional grid-based system.		
Activity 2.1.1	Site selection and technical engineering design, with involvement of tertiary institutions in studies.	USD80,000
	Identify site(s) for solar farm and wind turbines	
	Compile plant design, including CAPEX and OPEX projections	
	Record all significant factors and specifications, as part of the documentation to inform replication at other sites.	
Activity 2.1.2	EIA to obtain Environmental Clearance (See 1.1.2 above)	
Activity 2.1.3	Construction of solar farm and wind turbines feeding into integrating unit	
	Procure solar unit and wind turbines to specifications (See Activity 1.1.1) and services to install on site	
	Commissioning of solar unit and wind turbines (only)	
	Commissioning of integrated system i.e. renewable power unit, pumping equipment and desalination plant	

Component 3: Training

It is necessary to instil the capacity for local officials and technical staff to manage the system. This helps to raise the adaptive capacity of the authorities, which is an important component of resilience.

Output 3.1: Improved technical ability and skills of the officials responsible for the schemes.		
Expected Outcome: Responsible officials capable of managing all components of the water delivery system.		
Activity 3.1.1	Training provided to Uis Village Council officials by NamWater and the project team.	USD5,000
	Identification of suitable persons to be trained	
	Initial training session	
	Continuous monitoring on training needs	
Activity 3.1.2	Production of training and maintenance manuals so that the information is formalised and can be passed on.	
	Drafting of Operational and Maintenance manuals	
	Review of Operation & Maintenance manual to ensure efficient communication to users	

Component 4: Sensitisation

Sensitisation of local communities is an important part of the project, so that there is acceptance of the different taste and hardness of the water. Consumers who have learned about the system behind the 'new' water will be more likely to discuss it with pride, thereby helping the wider uptake of renewables.

Output 4.1: Acceptance of desalinated water by the consumers.		
Expected Outcome: Socially acceptable water supply system in place.		
Activity 4.1.1	Sensitisation of village community about desalinated water through public meetings, pamphlets and demonstrations at the desalination and power plants.	USD1,000
	Phase 1: Sensitisation of Village community (Introduction in EIA process)	
	Phase 2: Sensitisation of Village community (Demonstration during commissioning)	
	Phase 3: Review public acceptance during operation	
	Phase 4: Revise sensitisation process if required	

Component 5: Pilot plant operation

If the project demonstrates that this method is successful and viable, it will deliver an assured supply of water of good quality for the Uis community. The supply will be more reliable than at present, with less variability in the capacity of the aquifer. This will increase the resilience of the Uis consumers against climate change.

Output 5.1: Operation of the pilot plant.		
Expected Outcome 5.1: Fully functioning system.		
Activity 5.1.1	Operation of the system for 2 years with quarterly inspections and reports	USD90,000
	Operation of plant	
	Quarterly inspections & Reporting	
Output 5.2: Data analysis report showing all the necessary facts and figures of the pilot project.		
Expected Outcome 5.2: Refined design available for replication in other towns.		
Activity 5.2.1	Compilation of all the significant steps and components during construction and operation, with involvement of PoN students. This will include consultations with communities to assess their perceptions	USD10,000
	Processes to be documented: *Public awareness* *EIA* *Design* *Procurement* *Construction* *Commissioning* *Operation and Maintenance Manual (including spares and service providers)* *Operation* *Inflow and Production data review* *Review* *Changes to improve*	
Output 5.3: Knowledge management and lessons learnt feedback		
Expected outcome 5.3: Knowledge shared with interested and affected parties		
Activity 5.3.1	*Student engagement program*	USD 5,000
Activity 5.3.2	*Publication of lessons learnt*	USD 5,000

Component 6: Replication

The key to achieving the most value from this demonstration project will be making the intervention replicable in other villages and settlements that have water quality problems. This component of the project therefore tests the effectiveness of the technology in another further situation. If successful, this will raise the adaptive capacity of the relevant authorities. It will demonstrate a useful approach to improving the resilience of many other remote settlements in the country.

Output 6.1: New systems installed, adapted for the specifics of Bethanie.		
Expected Outcome 6.1: Customised design and operation of renewable energy – membrane technology water supply systems installed and operating at Bethanie. Community at this town provided with safe and secure water supplies.		
Activity 6.1.1	Design, procurement and construction and operation of a similar pilot plant at Bethanie, adjusted for fluoride reduction.	USD219,576
	Similar to components 1-5.	

Output 6.2: Knowledge management and lessons learnt feedback		
Expected outcome 6.2: Knowledge shared with interested and affected parties		
Activity 5.3.1	*Student engagement program*	USD 5,000
Activity 5.3.2	*Publication of lessons learnt*	USD 5,000

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

Introduction

At present, the bulk water tariff for the 2 villages is as follows (based on N$12 = 1 USD):

- Uis - USD 0.78/m^3
- Bethanie - USD 0.73/m^3

The project will have an economic, social and environmental impact at sites where this project will be rolled out which is currently not served with a water supply scheme.

If this projected is tested successfully, it will open up opportunities at other settlements in Namibia which are currently deprived from sufficient quantities of good quality water.

The projected impacts of climate variability and change in Namibia include amongst others a possible scarcity of water suitable for human consumption. Potential for drought events associated with anticipated seasonal shifts is not excluded. The projections are of particular concern for those areas and populations in Namibia in villages, settlements and rural areas already vulnerable and subject to this scarcity.

Project sites have been selected only on the basis of their vulnerability to drinking water. The project sites are characterised by: i) extremely high levels of unemployment and poverty; ii) a significant proportion of female-headed households; iii) informal settlements; iv) degraded ecosystems; and v) an overall lack of resources, knowledge and capacity within vulnerable groups to undertake successful strategies to adapt to climate variability and change.

The Project will result in improved resilience of vulnerable communities and groups to climate change impact e.g. increase in scarcity of water and/or decrease in water quality of existing water sources. In addition to providing benefits to vulnerable communities in the target areas, the project will also serve to increase the capacity of government agencies to integrate climate change adaptation considerations into municipal planning and policy processes and in so doing, to sustain the delivery of benefits to vulnerable communities within and beyond the project target sites.

Economic benefits

By providing water with improved water quality and quantity and at reduced cost will increase their preparedness and adaptive capacity and ultimately reduce negative impacts and limiting costs to the individuals, the community and nationally at large.

Since this purpose of this project is to set up a pilot plant to test the financial, environmental and social feasibility of supplying water with an improved quality and at reduced costs, specific economic benefits for specific communities have not been assessed. However, it can be concluded with certainty that the following economic benefits will result from this project if rolled out on a national basis:

- Reduction in cost to the individual as a result of a lower water tariff
- Reduced medical expenses due to improved health
- Increase in revenue as a result of additional employment opportunities
- Reduction in urbanisation with associated reduction in cost to local governments as a result
- Increase economic activities in community e.g. production of subsistence food production and high value crops
- Improvement of national economy by reducing costs of services (water and power) to vulnerable communities.

To put “lower water tariffs” in perspective at off-grid schemes, water vendors are buying water at water supply points in 20 litre containers at the prevailing water tariff of circa USD 0.8/m^3 (USD 0.0008/litre) , transport it by road to the off-grid communities with bad quality water and resell at circa USD 1.6 per 20 litre (USD 0.08/litre). Therefore the tariff to the end user is increased by a magnitude of 100. Based on current cost of water from desalination plants, the cost recovery water tariff from these planned off-grid plants will be in the order of USD 0.003/litre versus the USD 0.08/l which is the present going water tariff from water vendors.

The current practise is that the rural communities largely consist of the less economic active people since the more active people move temporary move to towns to find jobs. Therefore the communities consist largely of women, children and the elderly who are also expected to raise their grandchildren. Therefore it is safe to state that the economic benefits will impact most on the vulnerable communities.

Social benefits

The project will deliver social benefits to vulnerable communities and groups, officials and other public stakeholders, fostering community resilience to the impacts of climate variability and change. This will be realised by improving health, saving lives, improving livelihoods and building community cohesion through the supply of improved water quality and quantity and reduced cost to vulnerable communities, fostering the participation of women in the value chain of water supply and other social activities in the vulnerable communities.

Apart from the economic benefits, the outcome of the project may also improve food security and associated health benefits. It may also result in introducing climate-resilient crops and climate-smart farming techniques on a subsistence scale not necessary by using treated water but untreated water available in the area.

Important social benefits of the project will result from the capacity building and knowledge generating activities, which are designed to facilitate the meaningful participation of beneficiary communities and vulnerable groups. This participatory approach will encourage a sense of ownership, supporting the sustainability of project interventions and strengthening community cohesion, the empowerment of women and gender equity.

Capacity building activities will focus on working with communities, local and traditional authorities to explore and identify a range of adaptation options and strategies, focusing on improving the effective and efficient use of water.

Gender equity will be fostered by the inclusion of a Gender and Social Expert in the Component 4 team (see Section III.A). Project training and capacity building activities will help to ensure meaningful opportunities for women and other vulnerable groups participation in project planning, implementation and community decision making structures. A recent and reliable source for gender-disaggregated data and socio-economic data on potential beneficiaries could not be found and therefore the Gender and Social Expert will gather this data for each specific site and include it in their output.

Environmental benefits

The project will deliver a range of environmental benefits. These may include reducing adverse impacts associated with poor and inappropriate use of water. However, it is believed that the most significant impact will be as a result that the following will not be required as a result of this project: additional generation of electricity, expansion of the national electricity grid, manufacturing and construction of water supply infrastructure to connect to the current water supply grid. It is estimated that the CO_2 not emitted from conventional generation would be approximately 0.9 kg/m^3 of water (Zhou et al 2009). This will inevitably reduce the carbon print required if connections to the national electricity and regional water supply grid would be required.

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

To show cost-effectiveness, the table below explains the cost of the alternative options that would need to be implemented if the current water resources at the 2 villages became insufficient due to quantity or quality.

Component	Alternatives	Cost USD	Outcome of the alternative
Components 1-5 Pilot Desalination plant at Uis. Anticipated cost: USD386,000	Implement a water scheme from the Omdel Terminal Reservoir, i.e. connecting Uis to the Omdel Aquifer and thereby trading ground water in exchange for desalinated water from the Wlotzkasbaken Desalination Plant with a design capacity of 20 million m^3/annum. The alternative Omdel-Reservoir/Uis scheme will consist of the following: - Off-take from Omdel Terminal Reservoir and - Conveyance system to Uis consisting of a 3 booster pump stations complete with 3 balancing reservoirs and 93 km long pipeline - Power line including power points at each of the booster pump stations	4.6 million	The outcome of this intervention is that the operational cost of water will increase at least 4 times due to the cost of desalinated water (driven by the cost of electricity from the National grid) and the longer conveyance system excluding capital redemption of the new scheme.
Component 6: Pilot Desalination plant at Bethanie	Implement a water scheme from the Water Treatment Plant at Naute Dam, i.e. connecting Bethanie to the Naute Dam. The new Naute Dam - Bethanie scheme will consist of the following: - Off-take from Naute Water Treatment Plant - Conveyance system to Bethanie consisting of 3 booster pump stations complete with 3 balancing reservoirs and 106 km long pipeline - Power line including power	6.4 million	The outcome of this intervention is that the operational cost of water will increase significantly due to the significantly longer conveyance system.

Component	Alternatives	Cost USD	Outcome of the alternative
	points at each of the booster pump stations		

Despite the fact that the NamWater Act requires that NamWater is operated on cost recovery principles, the water tariffs for individual rural supply schemes are determined in terms of the average cost of water and not by the actual cost of water supply at these specific schemes. The current water tariffs for Uis and Bethanie are USD 0.78/m^3 and USD 0.73/ m^3 respectively and therefore it is not envisaged that the water tariff for water from the plants will be more that the current tariff despite the cost that may be higher.

One of the objectives of the pilot plant approach is to draw an actual comparison on the cost effectiveness of the proposed interventions (including operation and maintenance, technology life span, etc.) with the above conventional alternatives. NamWater does not have sufficient information available at this stage to draw a realistic comparison.

D. 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 programmes of action, or other relevant instruments, where they exist.

In a broad context, the intentions of Vision 2030 are relevant. More specifically, the national policies on water provision and energy are relevant to this project, as well as the national commitments made when Namibia became a signatory to the UNFCCC.

National policies and commitments

Vision 2030

In 2004 the government launched Namibia's Vision 2030 which provides the overarching framework for the development of Namibia with the main goals of improving the quality of life of its people and achieving the status of a developed country by the year 2030. Water resources development will significantly contribute to the achievement of the Vision 2030 goals and in this respect will provide the framework for the water sector policy and strategy goals and objectives. The overarching goals for the water sector are fully aligned to meeting the Millennium Development Goals (MDGs) and the sub-regional goals articulated in the SADC protocol.

Water Supply and Sanitation Policy

The WASSP (2008) policy has four main components:

- Essential water supply and sanitation services should be available to all Namibians, at an affordable cost.
- Provision of water and sanitation services should be based on community participation, mutual responsibility between government and the beneficiaries, and by outsourcing services under the supervision of government.
- Communities have the right to decide what water and sanitation services are acceptable to them, and they should pay towards their cost at increasing rates above basic needs.
- Efficient utilization of water, and environmentally sustainable development of sanitation services, should be pursued.

The objective for water supply is to develop reliable and accessible sources of safe water, with sufficient capacity, on a sustainable basis, to serve all in Namibia, at an affordable cost.

Integrated Water Resources Management

The Integrated Water Resources Management Plan (IWRMP) for Namibia (2014) is based on "a process that promotes the co-ordinated development, management and use of water, land and related natural resources in order to optimize the resultant economic, social and environmental

welfare in an equitable manner without compromising the sustainability of vital ecosystems". The overall long-term goal of IWRM in Namibia is to achieve a sustainable water resources management regime contributing to social equity, economic efficiency and environmental sustainability. In adopting IWRM, Namibia recognises that water is a key national asset.

Energy White Paper

The Namibian White Paper on Energy Policy (1998) stipulates 6 goals for the energy sector in Namibia; effective governance, security and supply, social upliftment, investment and growth economic competitiveness and efficiency, and sustainability. For the electricity sector, it states that the country should implement a variety of generation methods, including renewable energy technologies, to make appropriate use of the natural resource base. Energy from renewable sources was targeted to reach 10% of the national generating capacity by 2012.

Poverty Reduction Strategy

The Poverty Reduction Strategy (PRS) for Namibia, published in 1998, identified six structural problems that make poverty reduction difficult and which exacerbate vulnerabilities to climate change as well as limit adaptive capacity of Namibians. Amongst others, the structural problems included: a) a highly skewed distribution of income, b) a weak agricultural resource base, characterized by limited and highly variable annual rainfall as well as sandy soils with low fertility and c) a high population growth rate and the *resulting pressure this puts on scarce resources such as water*. As one of the strategies, the PRS considers new ways of using water more efficiently to be important.

UN Framework Convention on Climate Change

Namibia became a signatory to this international convention in 1998. Namibia is a non-Annex 1 country under the UNFCCC classification of developed and developing nations, and therefore does not have binding carbon dioxide emission limits. Nevertheless, the pollution produced by generating electricity by conventional methods (i.e. fired by coal or diesel) is still a factor, therefore investments in energy technologies must consider this impact on the environment.

Current and locally relevant recommendations

Vulnerability and Adaptation Assessment – Second National Communication to the UNFCCC (2008)

Namibia's Second National Communication to the UNFCCC (2008) notes that small towns have little capacity to cope with in-migration from the surrounding rural areas, because they have limited economic opportunities. The desired 'balanced' urbanisation as described in Vision 2030 is difficult to achieve because of high levels of unemployment in small towns, and the exodus of people from rural areas takes them more to the capital city or a few selected large towns where there are more readily accessible economic opportunities.

Importantly, the Second Communication suggested increasing the exercise of the best technical options available at any given time. This could include financing for targeted options which are deemed critically important to improve adaptive capacity.

Vulnerability and Adaptation Assessment - Namibia's Third National Communication to the UNFCCC (2015)

Country-wide, increased water demand is expected as the population, industry, mining, agriculture and other sectors grow. The Third National Communication confirms that, on top of this, climate change is likely to limit the availability of water in the country, and recognises that poverty is an important driver in the sensitivity of people to climate change and their adaptive capacity to cope with it. Poor people are usually marginalized in various ways (socially, economically, culturally, politically and institutionally), and have relatively lower access to essential resources such as crops, bought food, and health support. For the poor generally, climate change is superimposed on their existing vulnerabilities. For example, people living with HIV/AIDS will be made more vulnerable by water shortages, or by having to use poor quality water.

The Third National Communication also notes that water scarcity may trigger increases in the cost of water and sanitation provision. This will be most keenly felt by poorer sectors of the population, such as those living in informal settlements that will have to spend an even larger part of their income on water supply and sanitation services.

There are certain socio-economic and demographic groups which exhibit particular vulnerability in the face of climate change. These include women and female heads of household, children and the elderly, the chronically sick and indigenous people. They also typically have low adaptive capacity through high levels of dependence on others for their survival, including their food security, mobility, and access to information. Together these factors tend to render these groups more vulnerable when exposed to climate change.

National Climate Change Policy(NCCP) and Climate Change Strategy and Action Plan

Namibia's policy framework to enable adaptation is formalised through the National Climate Change Policy of 2011. It mandates that sectoral climate change strategies be devised to address issues such as *sustainable access to water*, food security, agriculture, biodiversity and ecosystem services, *health*, fisheries and marine resources, *infrastructure, sustainable energy* and *low carbon development*. It also directs that activities be undertaken to ensure that the necessary elements needed to drive effective climate action are developed, for example with respect to education, training, *institutional strengthening*, policy and legislative development, disaster reduction and *risk management*, research, *technology advancement*, public awareness and access to information, international cooperation and *financial resource mobilisation*.

The Ministry of Environment and Tourism (MET) has developed, using an extensive stakeholder consultative process, a Climate Change Strategy and Action Plan for the period from 2013 to

2020, to implement the NCCP. The Plan is organised around the three key areas of adaptation, mitigation and cross-cutting issues. Adaptation is addressed through four themes:

- food security and sustainable biological resource base;
- *sustainable water resources base;*
- human health and well-being; and
- *infrastructure development.*

The Plan identifies the need to maximise government financing instruments at the national and local levels; leverage private sector investment; and access scaled-up, new and additional (external) financial resources.

Promotion of renewable energy

Currently Namibia obtains its electricity from the following sources (2010-2011 figures, from NamPower Annual Reports, cited in von Oertzen 2012):

- 64% from imports from mainly South Africa, as well as small amounts from Zimbabwe, Zambia and Mozambique;
- hydropower (35%) from Ruacana, on the Kunene River on the northern border)
- remaining ~1% from a coal-fired power station (van Eck, in Windhoek), and power stations fuelled by heavy fuel-oil (Paratus and Anixas, in Walvis Bay).
- These proportions differ slightly from year to year. As from 2016, South Africa will not export any more electricity to Namibia.

E. 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.

Renewable energy technologies are being introduced, such as solar generation plants (e.g. at Tsumkwe and Omaruru) and a slowly rising number of solar water heaters and solar photo-voltaic panels on buildings throughout the country. Several proposals for solar and wind farms are being considered. Even with these, the level of implementation of renewable energy generation is far below the intended goal of 10% of national generating capacity by 2012.

The diminishing cost of renewable energy technologies makes them more competitive with conventional sources of generation (von Oertzen, 2012), creating an opportunity to implement more green energy which is environmentally preferable. Additionally, the pending power shortage in Namibia specifically and southern Africa more generally, demands that this route should be followed.

To comply with Namibia's Environmental Management Act (2007) and Regulations (2012), the project will be the subject of an Environmental Impact Assessment during the planning and design phase. Components that are mandatory under the Act include public participation to

address public concerns, and compilation of an Environmental Management Plan to ensure that mitigatory recommendations are carried out. According to the Act, the project will not be allowed to proceed without an Environmental Clearance Certificate issued by the Directorate of Environmental Affairs, Ministry of Environment and Tourism.

Fulfilling this requirement will simultaneously bring compliance with the Environmental and Social Policy of the Adaptation Fund. Relevant points of this Policy, and notes on how they will be addressed, are included in the table below.

Adaptation Fund Environmental and Social Policy (Nov 2013)		How it will be addressed in this project
Clause number	**Stipulation**	
8	The project must be categorized according to its potential environmental and social impacts.	Preliminary assessment places this project in Category B (projects with potential adverse impacts that are less adverse than Category A, because for example they are fewer in number, smaller in scale, less widespread, reversible or easily mitigated.) A proper screening exercise will be undertaken to confirm this categorisation.
8	Regardless in which category a project is screened, all environmental and social risks should be adequately identified and assessed in an open and transparent manner with appropriate consultation.	An EIA shall be undertaken in the planning and design phase, in full compliance with Namibia's Environmental Management Act (EMA) (2007).
9	The scope of the environmental and social assessment should be commensurate with the scope and severity of potential risks.	The scope of the assessment will be determined during the Scoping Phase of the EIA. Under the EMA, this requires approval from the Environmental Commissioner for the EIA to proceed.
9	In some Category B projects, where the assessment cannot be completed before the document is submitted for approval, there must be assurances in the agreement that any environmental and social risks will be adequately and timely addressed through a management plan or changes in project design.	These assurances must be included in the agreement.
10	All implementing entities shall (i) have an environmental and social management system that ensures environmental and social risks are identified and assessed at the earliest possible stage of project design, (ii) adopt measures to avoid or where avoidance is impossible to minimize or mitigate those risks during implementation, and (iii) monitor and report on the status of those measures during and at the end of implementation. There shall be adequate opportunities for the informed participation of all stakeholders in the	(i) An EIA will be undertaken in the planning and design phase of the project. (ii) The EMA states that identified negative impacts must be minimised through recommended mitigatory measures. (iii) An Environmental Management Plan (EMP) is mandatory in an EIA. The EMP will include monitoring and reporting to the relevant authorities. Under the EMA, public consultation is a mandatory component of an EIA.

	formulation and implementation of projects supported by the Fund.	
12	*Compliance with the Law* Projects shall be in compliance with all applicable domestic and international law.	The EIA to be undertaken in the planning and design phase will comply with Namibia's Environmental Management Act (EMA) (2007). International commitments made by Namibia, such as to the UNFCCC or the Convention on Biological Diversity, will be addressed and met through the EIA. There are no other international laws relevant to this proposed development.
13	*Access and Equity* Projects shall provide fair and equitable access to benefits in a manner that is inclusive and does not impede access to basic health services, clean water and sanitation, energy, education, housing, safe and decent working conditions, and land rights. Projects should not exacerbate existing inequities, particularly with respect to marginalized or vulnerable groups.	The water provided by the project will be distributed through the normal system managed by the relevant Village Councils. No residents will be denied access to the service that is provided. Women and children are identified as being vulnerable to climate change impacts (MET 2015). All consumers served by the project will be subject to the tariff system managed by the relevant Village Council or Regional Council. This follows a 'rising scale', where a minimum amount adequate for health and sanitation is provided at a basic fee. Consumers who use more (according to set thresholds) pay for the water at higher rates. This is part of the demand management system which seeks to provide a minimum amount of water for basic needs at an affordable fee, while curbing excessive use with higher fees.
14	*Marginalized and Vulnerable Groups* Projects shall avoid imposing any disproportionate adverse impacts on marginalized and vulnerable groups including children, women and girls, the elderly, indigenous people, tribal groups, displaced people, refugees, people living with disabilities, and people living with HIV/AIDS. In screening any proposed project, the implementing entities shall assess and consider particular impacts on marginalized and vulnerable groups.	The EIA will include a social component which must ensure that all social categories are adequately included in the planning. People living with HIV/AIDS is a group that is recognised as requiring specific attention during EIAs (UNDP 2012).
15	*Human Rights* Projects shall respect and where applicable promote international human rights.	This is a principle which underlies Namibia's Constitution, Vision 2030 and the Environmental Management Act.
16	*Gender Equity and Women's Empowerment* Projects shall be designed and implemented in such a way that both women and men (a) are able to participate fully and equitably; (b) receive comparable social and economic benefits; and (c) do not suffer disproportionate adverse effects during the development process.	The social component of the EIA will determine the prevailing situation with respect to gender equity in the local populations. The EMP will address any issues to ensure that gender equity is achieved. The role of local communities and other concerned civil society stakeholder with due consideration to gender issues will also be defined during this process

17	*Core Labour Rights* Projects shall meet the core labour standards as identified by the International Labour Organization.	The EIA will ensure that any relevant principles of the ILO are adhered to.
18	*Indigenous Peoples* The Fund shall not support projects that are inconsistent with the rights and responsibilities set forth in the UN Declaration on the Rights of Indigenous Peoples and other applicable international instruments relating to indigenous peoples.	The social component of the EIA will determine if there are any indigenous people in the affected parties. If so, principles of the UNDRIP will be adhered to.
19	*Involuntary Resettlement* Projects shall be designed and implemented in a way that avoids or minimizes the need for involuntary resettlement.	No resettlement will be needed in the pilot projects or as a result of the project.
20	*Protection of Natural Habitats* The Fund shall not support projects that would involve unjustified conversion or degradation of critical natural habitats, including those that are (a) legally protected; (b) officially proposed for protection; (c) recognized by authoritative sources for their high conservation value, including as critical habitat; or (d) recognized as protected by traditional or indigenous local communities.	The EIA will ensure that the projects do not impact any critical natural habitats.
21	*Conservation of Biological Diversity* Projects shall be designed and implemented in a way that avoids any significant or unjustified reduction or loss of biological diversity or the introduction of known invasive species.	The EIA will ensure that there will be no significant impacts on biodiversity. Recommendations will also address preventing the introduction of invasive species.
22	*Climate Change* Projects shall not result in any significant or unjustified increase in greenhouse gas emissions or other drivers of climate change.	The project is designed to decrease greenhouse gas emissions by adopting solar and wind energy generation.
23	*Pollution Prevention and Resource Efficiency* Projects shall be designed and implemented in a way that meets applicable international standards for maximizing energy efficiency and minimizing material resource use, the production of wastes, and the release of pollutants.	The project is designed to improve energy efficiency, and to minimise generation of wastes and pollution. The EIA will address any waste and pollution issues, which will be most likely in the construction phase.
24	*Public Health* Projects shall be designed and implemented in a way that avoids potentially significant negative impacts on public health.	The EIA will address this through its public consultations.
25	*Physical and Cultural Heritage* Projects shall be designed and implemented in a way that avoids the alteration, damage, or removal of any physical cultural resources, cultural sites, and sites with unique natural values recognized as such at the community, national or	The EIA will ensure that there is no harm done to heritage aspects.

	international level. Projects should also not permanently interfere with existing access and use of such physical and cultural resources.	
26	*Lands and Soil Conservation* Projects shall be designed and implemented in a way that promotes soil conservation and avoids degradation or conversion of productive lands or land that provides valuable ecosystem services.	The EIA will ensure that land degradation is prevented and that ecosystem services are not jeopardised.
27	*Environmental and Social Management System* The implementing entities shall be responsible for screening all projects to determine the extent to which they present environmental or social risks, including all risks associated with the Fund's environmental and social principles identified above. Implementing entities proposing projects that present environmental and social risks shall ensure that the environmental and social impacts of such projects are thoroughly assessed; that measures are identified for avoiding, reducing or mitigating all environmental and social impacts; and that the implementation of such measures is monitored and reported on through the life of the project. The environmental and social risk management system shall be commensurate in scope and ambition to the potential scope and severity of environmental and social risks inherent in the project design.	The EIA will compile an Environmental Management Plan, as per the requirements of the EMA. This will set out the measures recommended to minimise or prevent the environmental and social risks of the projects. See Appendix B for heads of ToR
28	*Environmental and Social Policy Delivery Process* *Screening of Environmental and Social Risks by the Implementing Entity* All proposed projects shall be screened by the implementing entities to determine their potential to cause environmental or social harm. The screening process shall seek to identify potential environmental and social impacts and risks, taking into consideration the Fund's environmental and social principles outlined above. The screening process shall consider all potential direct, indirect, transboundary, and cumulative impacts in the project's area of influence that could result from the proposed project. All proposed projects shall be categorized according to the scale, nature and severity of their potential environmental and social impacts. Projects likely to have significant adverse environmental or social impacts that are for example diverse, widespread, or irreversible should be categorized as Category A projects.	It is likely that this will be a Category B project. This will be confirmed during the Screening process at the first stage in the EIA.

	Projects with potential adverse impacts that are less adverse than Category A projects, because for example they are fewer in number, smaller in scale, less widespread, reversible or easily mitigated should be categorized as Category B. Those projects with no adverse environmental or social impacts should be categorized as Category C.	
29	The screening will determine the extent to which the project requires further environmental and social assessment, mitigation, and management. The results of the environmental screening shall be included in the project proposal initially submitted by the implementing entity to the Adaptation Fund Board secretariat (the secretariat). If during the project review process the Board or secretariat determines that further information on the environmental and social assessment, mitigation, and management of risks is required, the implementing entities can be asked to provide it. If appropriate, this will be reflected in the agreement between the Board and the implementing entity. Regardless of the outcome of the screening procedure, all proposed projects shall comply with the Fund's environmental and social principles and applicable national and local laws and regulations.	Only an initial categorization as a Category B project has been made thus far. This needs to be confirmed if and when the project goes ahead.
30	*Environmental and Social Assessment* For all projects that have the potential to cause environmental or social harm (i.e. all Category A and B projects), the implementing entity shall prepare an environmental and social assessment that identifies any environmental or social risks, including any potential risks associated with the Fund's environmental and social principles set forth above. The assessment shall (i) consider all potential direct, indirect, transboundary, and cumulative impacts and risks that could result from the proposed project; (ii) assess alternatives to the project; and (iii) assess possible measures to avoid, minimize, or mitigate environmental and social risks of the proposed project. As a general rule, the environmental and social assessment shall be completed before the project proposal submission to the Adaptation Fund. In some Category B projects where the proposed activities requiring such assessment represent a minor part of the project, and when inclusion in the proposal	A full EIA has not yet been done on the project, because the time to develop the proposal has been inadequate for that process. Therefore an agreement setting out the terms and schedule for the EIA will be made as soon as the project is approved. The full outcome of the EIA and its recommendations in the EMP will be communicated to the Fund upon completion of the EIA. The EIA will address the three main issues identified in the Fund's Environmental and Social Policy, namely (i) all potential direct, indirect, transboundary, and cumulative impacts and risks that could result from the proposed project (ii) alternatives to the project; and (iii) possible measures to avoid, minimize, or mitigate environmental and social risks of the proposed project.

	is not feasible, a timeline for completing the environmental and social assessment before construction begins shall be incorporated in the agreement between the Board and the implementing entity following the project approval, and reported through the annual project performance report. A copy of the environmental and social assessment shall be provided to the secretariat as soon as the assessment is completed.	
31	*Environmental and Social Management Plan* Where the environmental and social assessment identifies environmental or social risks, the assessment shall be accompanied by an environmental and social management plan that identifies those measures necessary to avoid, minimize, or mitigate the potential environmental and social risks. A commitment by the implementing entity to implement the management plan shall be a condition of the project approval and reflected in the monitoring and reporting plan for that project.	An EMP will be compiled, to fulfil the requirements of both Namibia's Environmental Management Act and the Fund's Environmental and Social Policy. A commitment to implementing the EMP will be made upon completion of the report.
32	*Monitoring, Reporting, and Evaluation* Implementing entities' monitoring and evaluation of projects supported by the Fund shall address all environmental and social risks identified by the implementing entity during project assessment, design, and implementation. The implementing entities' annual project performance reports shall include a section on the status of implementation of any environmental and social management plan, including those measures required to avoid, minimize, or mitigate environmental and social risks. The reports shall also include, if necessary, a description of any corrective actions that are deemed necessary. The mid-term and terminal evaluation reports shall also include an evaluation of the project performance with respect to environmental and social risks.	The activities and outcomes of the EMP will be reported in the required project monitoring reports.
33	*Public Disclosure and Consultation* Implementing entities shall identify stakeholders and involve them as early as possible in planning any project supported by the Fund. The results of the environmental and social screening and a draft environmental and social assessment, including any proposed management plan, shall be made available for public consultations that are timely, effective, inclusive, and held free of	A mandatory part of an EIA in Namibia is public consultation, including identification of Interested and Affected Parties, a process that allows them the opportunity to comment on and address issues of concern in the project, and reporting back to them on how the issues are addressed. Public disclosure of the outcome and recommendations of the EIA is also legally required. These aspects will need to be covered in the EIA

	coercion and in an appropriate way for communities that are directly affected by the proposed project. The secretariat will publicly disclose the final environmental and social assessment through the Fund's website as soon as it is received. The implementing entity is responsible for disclosing the final environmental and social assessment to project-affected people and other stakeholders. Project performance reports including the status on implementation of environmental and social measures shall be publicly disclosed. Any significant proposed changes in the project during implementation shall be made available for effective and timely public consultation with directly affected communities.	process, in order to receive Environmental Clearance for the project.
34	*Grievance Mechanism* The implementing entities shall identify a grievance mechanism that provides people affected by project supported by the Fund with an accessible, transparent, fair and effective process for receiving and addressing their complaints about environmental or social harms caused by any such project. The mechanism can be pre-existing, national, local, or institution- or project-specific i.e. establishment or operational and to include NamWater. Complaints regarding projects supported by the Fund can also be filed with the secretariat.	The government authority for overseeing EIAs is the Directorate of Environmental Affairs (DEA), in the Ministry of Environment and Tourism. There is an appeal procedure set out in the EMA that allows complaints about an EIA to be heard by the Environmental Commissioner. Parties who feel aggrieved by a project or the response from the DEA, may also take complaints to the Office of the Ombudsman.
35	The secretariat will respond promptly to all such complaints. Where appropriate, the secretariat will refer complainants to a grievance mechanism identified by the implementing entity as the primary place for addressing complaints.	The process described for 34 above is relevant.

Namibia's Water Resources Management Act (2014) is due to be brought into operation soon when its Regulations are promulgated. This will make it mandatory for all water provision for human consumption to comply with the new Water Quality Standards. Many NamWater schemes will have to bring themselves up to these new standards. This project will achieve that for the 2 identified villages.

F. Describe if there is duplication of project with other funding sources, if any Fund.

The identified technology excluding the wind power plant does exist in Namibia. Led by ISOE – Institute for Social-Ecological Research in Frankfurt am Main (Germany), the CuveWaters international project team has installed four different small-scale groundwater desalination plants in the Omusati Region at Amarika and Akutsima. In addition to ISOE, the Technical University Darmstadt, partners from industry, the Namibian Ministry of Agriculture, Water and Forestry (MAWF) and the Desert Research Foundation of Namibia (DRFN) were also involved in the plants' development and implementation. The joint project is being funded by the German Federal Ministry of Education and Research (BMBF).

With the help of various different technologies, the desalination plants were tailored to local conditions. The plants use solar power as a source of energy and produce up to 3.3 m^3 of drinking water per day. Now all the drinking water which Amarika and Akutsima need is entirely supplied by the plants.

NamWater has completed a pilot test run with a pilot membrane unit made available by the PALL Company, in the United Kingdom and powered from the National Power Grid. The outcome of this pilot test only confirmed that it was indeed technically possible to produce water in compliance with the Namibian Water Quality Standards. The financial, environmental and social feasibility was not addressed.

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

This is a pilot project that will be used to test the effectiveness of the technology and to address problems that may be encountered in implementation and further roll-out to other sites in the country. It is therefore important that the process is fully documented, to provide guidelines and instructions for further implementation.

From paragraph F above, the experience of NamWater is limited as described and the financial, environmental and social impacts were not assessed or documented. Therefore it is not possible to demonstrate how lessons learned will be utilized for effective implementation of the planned interventions in this project

The guidelines will include the following aspects:

- Climate criteria that must be met at the site (e.g. average hours of sunshine per day through the seasons, typical wind profile through the year, likelihood of extreme events such as wind or hail storms that might damage the generation apparatus).
- Characterisation of the energy resources to assess their feasibility for combining in a hybrid system.

- Description of the power storage capacity required.
- Topographic characteristics (e.g. gradient [flat or gently sloping] and attitude [N-facing]), conditions that facilitate wind flow).
- Groundwater quality characteristics (e.g. within certain chemical limits, to allow effective treatment by the reverse osmosis process)
- Human resources needed to run and maintain the system when it is operational. This must also specify the skills and technical capacity of the staff.
- Maintenance requirements of the system.
- Trouble-shooting points and points to be careful about during construction and implementation.
- Robustness of the complete system to ensure minimal maintenance due to the application in remote areas
- Brine disposal and re-use system
- Environmental and social impacts of the project, for mitigation at new sites.

Further roll-out will be undertaken by NamWater. The fact that this is the same organisation implementing the pilot project, that it has a structured hierarchical staffing system, and that it has local representation in almost all towns in Namibia, facilitates the duplication of the technology at other sites in the country. These features will facilitate the passing on and dissemination of the relevant information for wider uptake.

The justification for the decision not to run the two operations in Uis and Bethanie in parallel, besides the obvious benefit of operationalising the plant in Bethanie building on lessons learned from the first experience in Uis is follows:

- Uis is 211 km to the north west of Windhoek and Bethanie is 644 km to the south west of Windhoek. The layout of the main road network is such that if one has a need to travel from Uis to Bethanie one has to return to Windhoek from where one has to progress to Bethanie. Therefore in terms of risk mitigation, it is preferred to commission the plant at Uis before the team commence with the work required for Bethanie.
- Due to the limited human resources available for this project and the challenge of the long distance between Uis and Bethanie via Windhoek, it is planned that the same team will duplicate the work required for Uis at Bethanie. Therefore in terms of cost and time optimisation, it is preferred to commission the plant at Uis before the team commences with the work required for Bethanie.

Investment in tertiary students is a lifelong investment and partnerships created between with institutions will persist beyond project end. Therefore it is planned to engage with the students of the PoN at the start of the project. The PoN have already confirmed their support and commitment as a partner to this project, as demonstrated in the concept proposal. Providing platforms for lessons-sharing will catalyse learning, sharing and networking, investing in the development of a culture that supports adaptation. This will support learning beyond the project.

Students in the fields of Environmental Sciences, Engineering and Social Sciences will be formally invited to apply for participation in the project. In the event that the response is more than can be accommodated, a selection process will be carried out. The selected students will be encouraged to use aspects of or the complete project as a topic for their own research or to engage in research that may be identified during the project.

The project will also provide an opportunity to the selected students to do fieldwork associated with the project during the periods dedicated by the PoN for job attachments, field work or similar exposure.

The students will be encouraged and supported to share their findings with the project team, NamWater Management, the PoN, the media, the local community members and policy makers. To support the sharing of knowledge and lessons learned, the NamWater website will be utilised for publication.

The Knowledge Management Strategy to be developed at project inception as per the guidelines outlined in the AF Results Framework and Baseline Guidance will specifically provide for the engagement of the students.

Lessons learned throughout the life of the project will be captured in publications, case studies and as policy recommendations. Locally, presentations on progress and lessons learned will be made at existing forums. Lessons learned will also be shared nationally and internationally through national learning exchanges and participation in NIE and AF learning events.

H. 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.

A consultative meeting was held in Uis on 4 June 2015, to discuss the water situation and solutions being considered. A list of the 45 stakeholders that attended is provided in Appendix A. A summarised abstract of the minutes are quoted below.

A similar consultative process was also followed with the community of Bethanie on the 24th of August 2016 to discuss the water quality situation and proposed solution by NamWater. A list of the 5 stakeholders who attended is provided in Appendix A. a summarised abstract of the minutes are quoted below.

Uis

Some interested and affected parties (I&APs) expressed their concerns on the availability of water as well as the general problems experienced with the supply of water to Uis. The community in general is worried about water not being enough and how it will be supplied. Mr Willem Venter (Representative of NamWater) gave a comprehensive explanation on the water supply situation of Uis with a presentation on *Planning and Water Resources Management of Uis.*

It was explained that enough water can be supplied for the current needs of the town, including a proposed new lifestyle residential development. The town's water infrastructure (distribution pipes, storage dams, pumps) needs to be checked as NamWater's statistics show unaccounted water losses/leakages which should be fixed and managed.

Mr Venter explained that NamWater intends to start a research project to purify water from local sources in various towns in Namibia. This is to resolve the problem where there is a local water resource which is not suitable for human consumption due to salinity or other natural contaminants in the water. Uis has been identified as one of the towns which will be used as pilot project in the research. Mr Venter explained the research project to the meeting and asked if they would have objections to be included in it. There were no objections from the public, although some people were concerned about the eventual price of this water. Mr Venter indicated that NamWater will only know the cost of this water once the research has been completed, but it is possible that the cost of water will decrease because the method is likely to be economically preferable to other more conventional methods. The research project is to assess whether the method is viable."

Bethanie

Mr J Sirunda opened the consultative meeting by welcoming all the attendees to the meeting. He explained to the attendees the purpose of the meeting, and why it is so important that they should attend the meeting. Mr J Sirunda gave a short description on the technicality of the project. He briefly explained the purpose of the project in solving the water quality challenges currently existing in Bethanie and its benefit to the health of the people. He further explained that if the pilot is successful it will then be replicated in other areas facing similar water quality challenges within Namibia.

Some interested and affected parties (I&APs) expressed their concerns about the quality of the water supplied to them by NamWater. It was mentioned that, the general public complains about the water quality issues at every Council meetings. However, there are no incidents of death or illness found to be due to the quality of water consumed by the residents. The Council Chairperson strongly expressed her support for the pilot on behalf of the Health Centre and Village Council.

It was further mentioned that female residing in Bethanie are so scared of using the water for drinking and even washing their hairs, because they are scared of developing brown colour on their teeth and also possible losses of their hairs due to the chemical content of the water. Despite the expressed concern about the water quality challenges, a question was asked from some of the interested and affected parties as to who will cover the expenses of the pilot plant and what will be the implication on the price of water? Mr J Sirunda responded that, the pilot project will be funded by the Adaptation Fund. No funding will be requested from the Village Council and they will be no implication on the price of water.

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

This funding is being sought to improve the resilience of communities living in small, remote towns in Namibia by improving the quantity and quantity of the assured water supply from local groundwater sources. As shown above, the cost of conventional water supply (i.e. by pipelines) from the nearest bulk water point with adequate quality, is significantly higher than the cost of the proposed solution using renewable energy. Furthermore, solar energy is an abundant resource in Namibia and is under-utilised. The project aims to demonstrate that this type of water supply problem can be addressed by means of a desalination system using hybrid wind-and-solar driven low technology components. The successful outcome of the small desalination plants could also provide a solution to some wastewater outflows of water treatment and small sewage works in other parts of Namibia, to improve the re-use and/or safe disposal of waste waters.

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

Sustainability ensured by the policy / legal framework

NamWater manages a large number of groundwater schemes across Namibia. Newly proposed water quality standards contained in the recently promulgated Water Resources Management Act (2014) mean that many of the NamWater schemes do not comply with the required standards. This brings an imperative to urgently find ways to improve groundwater quality standards, at an affordable cost. The project achieves this requirement, and the necessity to comply with the law will bring its own incentive to NamWater to ensure that the systems continue to deliver.

As shown in Section D above, the project conforms with Namibia's policy framework for adapting to climate change. A strong factor pushing greater application of renewable energy is Namibia's White Paper on Energy Policy and the looming shortages in electricity, which will be experienced in Namibia and other Southern African countries.

Sustainability ensured by the institutional framework

The institutions that will be directly responsible for maintaining the infrastructure and the functionality of the systems are NamWater and the respective Village Councils. To facilitate continuous and problem-free delivery of water, the supply schemes are inspected and maintained on a daily basis by on-site contractors. At each town there are actually two people contracted for this work, so that if one is away, the tasks are carried out by the other. This arrangement will be kept in future, so that there will be a physical presence of responsible staff to respond to any problems that arise.

Capacity for sustainability

Capacity in the responsible institutions will be raised during the implementation of the project, especially through the training component. The training will obviously include the on-site contractors for ongoing maintenance. Overall, the training to all involved officials will help to ensure that there is institutional memory, and skills on the ground to maintain the systems. Knowledge that is generated through this project will be acquired by officials in NamWater and the respective Village Councils, which all have permanency in the institutional framework for water delivery. The records created during the planning, construction and operational phases, with the involvement of students from the PoN, will help to ensure that the information is available for future application.

Economic and social factors ensuring sustainability

The project intends to prove that a small-scale desalination system powered by renewable energy is economically viable, especially in remote regions. If it is successful, similar plants will be established at schemes where improvement in water security is required, or will become necessary as climate variability increases. This will improve the water security of the communities in those towns, and reduce the cost of water supply compared to implementing the conventional yet more expensive technology. These are strong economic and social motivations for continuing the further roll-out of the technology. In addition, promotion of the system to the public through various media, such as articles in the media and magazines, will help to bring popular support for wider application.

Even if the economics are demonstrated to be not strongly favourable, the technology is likely to find application in remote places, where there simply is no grid electricity to power a water treatment process.

Environmental factors assisting sustainability

Globally, any project that brings development with a significantly reduced carbon footprint, is environmentally preferred. This factor adds to the positive impacts of the project, and helps the justification for maintaining the system so that environmental damage is prevented.

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

The table below briefly sets out a preliminary list of the issues that will probably require attention in an EIA of the project, and suggests possibilities for their mitigation.

Activity / feature of the development	Risks / Impacts	Prevention or mitigation measures
Desalination plant		
Evaporation ponds for disposal of brine	Possibility of leakages into soil and groundwater, or flooding of the ponds during episodic heavy rainfall events	Design must include a proper lining to prevent leakage, and adequate capacity for heavy rainfall events.
Clearing of land	Loss of plants and habitat	Careful selection of site to avoid sensitive habitats or disturbance to priority species.
Security	Need to secure the evaporation ponds from entry by livestock and people, to prevent them using the saline water.	Fencing to be installed and properly maintained
Solar and/ or wind generation plant		
Clearing of land	Loss of plants and habitat	Careful selection of site to avoid sensitive habitats or priority species
Visual intrusion	Degradation of scenic views	Can be partially mitigated by careful site selection, and trying to minimise breaking the skyline.
Construction camp	Social disruption to the local community	Difficult to mitigate. Impact can be reduced by hiring locals in the construction team as much as possible.
Installation of new pipelines	Dust and future soil erosion from earthmoving	Apply dust suppression practices. Do not leave steep slopes after completion – all slopes to be evened out and made gradual to enhance natural revegetation and rehabilitation processes.
Operation	Pollution of ground water sources	Provision of evaporation ponds to prevent brine entering ground water sources
Operation	Pollution as a result of the human activity	Apply NamWater Environmental Management Plan Code of Conduct for activities related to the operation of the plant.
Solar panels		
	Use of water to clean panels regularly (~weekly)	Can't be mitigated. This is a minor impact.
	Need for security to prevent theft of panels	
Wind turbines		
	Collisions of birds and bats	Careful site selection needed to avoid any

		movement corridors of birds. Guidelines for avoiding such impacts are available from Birdlife South Africa.
Social		
Gender equity	Need to ensure gender equity	Social assessment to address gender equity
Public health	Need to improve public health	Social assessment to address public health implications due to human consumption of treated water

The negative impacts of the proposed development are expected to be relatively small, possibilities for mitigation exist and the project is thus categorised as Category B. The planning process will need to assess the site options carefully so that certain impacts (e.g. visual impacts, bird collisions) are avoided or minimised.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law		The project must undergo an Environmental Impact Assessment, to receive an Environmental Clearance Certificate before commencement.
Access and Equity	The project will improve the future access of the local populations to an assured water supply. Equity of the supply is ensured by the fact that the 2 villages fall under the jurisdiction of the Village Councils (Uis and Bethanie). These official institutions have the responsibility to provide essential services to their constituents, and already do so. No specific compliance issues required.	Public participation during the EIA will establish if any members of the public feel that their access and equity are put at risk. If so, the EIA will address the issue.
Marginalized and Vulnerable Groups	People that are relatively more vulnerable to the impacts of climate change, as identified in Namibia's Third Communication to the UNFCCC, are the poor, particularly poor women and children. The project addresses the relevant aspect of this vulnerability, i.e. security of water supply. No specific compliance issues required.	Public participation during the EIA will establish if any members of marginalised or vulnerable groups feel that their situation is made worse by the project. If so, the EIA will address the issue.
Human Rights	No human rights are violated through the project. No specific compliance issues required.	Public participation during the EIA will establish if any members of the public feel that any human rights are being violated. If so, the EIA will address

		the issue.
Gender Equity and Women's Empowerment	By improving the assured water supply, the situation of women, who are more vulnerable in situations where water is scarce, will be improved. No specific compliance issues required.	Public participation during the EIA will establish if any women feel that their social situation is made worse by the project. If this situation arises, the EIA will address the issue.
Core Labour Rights	NamWater itself, and any contractors it contracts in projects, are bound institutionally to comply with the requirements of the NamWater Human Resources Policy and Namibia's Labour Act (2007). No further compliance issues required.	
Indigenous Peoples	The project will not affect any Indigenous Peoples. No specific compliance issues required..	Public participation during the EIA will establish if any Indigenous Peoples feel that their social situation is made worse by the project. If this situation arises, the EIA will address the issue.
Involuntary Resettlement	It is unlikely that any resettlement will be required.	The EIA will include a social component. If any resettlement is required, the impacts and mitigations for this must be assessed in the EIA.
Protection of Natural Habitats		Impacts on the natural habitats impacted by the project, will be assessed in the EIA. Recommendations to mitigate any negative impacts will be outlined in the EMP. Major negative impacts are not expected, but if they are identified, then alternative sites or designs may need to be considered.
Conservation of Biological Diversity		Impacts on the biodiversity impacted by the project will be assessed in the EIA. Recommendations to mitigate any negative impacts will be outlined in the EMP. Major negative impacts are not expected, but if they are identified, then alternative sites or designs may need to be considered.
Climate Change	This project will have a positive impact by reducing greenhouse gas emissions that would be needed to power the desalination process if conventional energy sources were to be used. The project fully complies with Namibia's obligations to the UNFCCC.	

Pollution Prevention and Resource Efficiency	The project is in line with Namibia's Energy White Paper which aims to increase the contribution of renewable energy generation.	Any pollution produced by the project will be assessed in the EIA, and mitigatory recommendations given in the EMP.
Public Health		Water provided by the schemes will need to comply with the National Water Quality Standards as contained in the new Water Resources Management Act. Water quality testing is done as a standard process in NamWater supply schemes. Water is sampled at specific intervals and sent to the NamWater laboratory for internal or external testing in terms of bacterial and chemical analysis. The results will be made available to the project team to attend to as part of the operational regime of the plants. In the event of non-compliance, NamWater is obliged to terminate the operation of the plant and attend to all defect processes before operation may continue. See Appendix C for Water Quality Standards
Physical and Cultural Heritage		Any impacts on significant heritage sites will be assessed in the EIA. The public participation process will alert the study to any such issues of concern by the public. Mitigatory activities, if required, will be specified in the EMP.
Lands and Soil Conservation		Land clearing is one of the issues that the EIA will address. Activities to mitigate any negative impacts will be recommended in the EMP.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project implementation.

Institutional arrangements

National Implementing Entity (NIE)

The Desert Research Foundation of Namibia (DRFN) is accredited as the NIE for Namibia, and is contracted by the AF to execute an oversight role for project implementation in Namibia. The NIE bears full responsibility for overall project management, monitoring and evaluation, including financial monitoring, and reporting responsibilities associated with the project. Some specific roles and responsibilities of the NIE include, *inter alia*:

- Advise and oversee project implementation
- Liaise with and report to AF
- Establish protocols for annual progress reporting
- Facilitate formal scheduled project evaluations
- Ensure compliance with the ESP of the AF, and other essential operational frameworks
- Disburse funds to the EE and monitor expenditure

The EE (NamWater for this project), through the Project Steering Committee (PSC), will inform the NIE on project performance through submission of quarterly reports. The EE and NIE will meet to discuss these reports within one week after the reporting period. The two entities will endeavour to maintain effective communication flow and will undertake *ad hoc* consultations as a routine operational procedure.

The EE will be responsible for financial management of the project. Procurement of goods and services will comply with the Procurement Policy of NamWater. All tender documents and recommended award of tenders will be submitted to the NIE for approval in order to ensure that internationally accepted procurement principles and practices are applied.

This NamWater *Pilot Desalination with renewable power project* (the Project) will be implemented as a first phase at Uis in the Swakopmund district within the Erongo Region. The second phase will be rolled out to Bethanie in the Karas Region.

Implementation will involve stakeholders from government, local communities, business and civil society. The management arrangements of the project have been designed to provide for coordination and close collaboration among project partners and key stakeholders, and wherever possible, alignment with other ongoing initiatives and programmes of work.

Regular feedback and communication on progress with project implementation on the project level will be maintained through the Project Management Team (PT) reporting structures, and through the task teams that will be established at constituency and project level.

Executing Entity (EE)

NamWater has been assigned as Executing Entity (EE) for the project with overall responsibility for project implementation over the three year period and will thus stand accountable for both project and financial management.

NamWater was established in 1998 by the Namibia Water Corporation Act No 12 of 1997, an act of the Namibian Parliament.

In term of the said act, the objects of the Corporation shall be to carry out efficiently, and in the best interests of the Republic of Namibia -

i. the primary business of bulk water supply to customers, in sufficient quantities, of a quality suitable for the customers' purposes, and by cost-effective, environmentally sound and sustainable means; and
ii. the secondary business of rendering water-related services, supplying facilities and granting rights to customers upon their request.

As EE, NamWater will sign the grant agreement with the NIE and will be accountable to the NIE for the disbursement of funds and the achievement of the project objective and outcomes according to the approved work plan. In particular, NamWater will be responsible for the following functions:

i. coordinating activities to ensure the delivery of agreed outcomes;
ii. certifying expenditures in line with approved budgets and work-plans;
iii. facilitating, monitoring and reporting on the procurement of inputs and delivery of outputs;
iv. approval of Terms of Reference for consultants and tender documents for sub-contracted inputs in compliance with the NamWater Procurement Policy
v. reporting to the NIE on project delivery and impact;
vi. and monitoring compliance with the AF.

A separate project account will be opened in Namibian dollars with the First National Bank of Namibia, a financial institution that has been providing banking services to NamWater since inception in 1998. This will provide that all tranches for the project can be deposited directly into this account and all costs related to this project can be claimed from this account on a monthly basis. This separate bank account will be included in the annual organisational audits of the EE and the NamWater financials system will also be available for an audit if required.

The role of CRSES will be of an engineering nature and they will be responsible for the design, of the plant, supervision of the assembly and continuous improvement after commissioning as described below in each of the components. The role of the students from the PoN will be to assist in Components 1, 2 and 5 as described below.

Project implementation will however be managed by the Project Manager in close collaboration with project Task Teams and partners as described below. (See Partners under the column heading "**Who**" below

Component 1 *(Environment & Social* and *Engineering Design Task Teams)*

Output 1.1: Functional desalination plant established, delivering 100 m^3 of desalinated water per day.

Activity 1.1.1: Site selection and technical engineering design

What	Who
Test rig refinements for arid climates	CRSES
Identify potential site for boreholes and for desalination plant	NamWater, Village Council, EIA consultant
Compile plant design, including CAPEX and OPEX projections	WML, NRGen, CRSES
Consider alternatives for disposal of the brine. The brine possibly has potential for adding to animal licks or other useful products. If this is not feasible, disposal must be achieved with minimal environmental impact.	NamWater, PoN students, EIA consultant
Record all significant factors and specifications, as part of the documentation to inform replication at other sites.	NamWater, PoN students

Activity 1.1.2: EIA to obtain Environmental Clearance

What	Who
Compile project information and environmental and social baseline	NamWater, EIA consultant
Scoping of issues	EIA consultant
Public consultation	EIA consultant, interested and affected parties
Assessment of impacts	EIA consultant
Consideration of alternatives and mitigatory measures	NamWater, NRGen, CRSES, PoN, EIA consultant
Compilation of Environmental Management Plan	EIA consultant
Submission for Environmental Clearance	EIA consultant, Ministry of Environment and Tourism

Activity 1.1.3: Equipping of boreholes

What	Who
Procure pumping equipment and installation services to install water abstraction equipment	NamWater, NRGen, CRSES
Equipping to suit power specifications of the hybrid power plant	Contractor
Commissioning of pumping equipment	NamWater, NRGen, CRSES & Contractor

Activity 1.1.4: Construction of desalination plant

What	Who
Procure desalination plant to specifications (See Activity 1.1.1) and services to install on site	NamWater, NRGen, CRSES
Commissioning of desalination equipment (only)	NamWater, NRGen, CRSES& Contractor
Commissioning of desalination equipment (complete with pumping equipment)	NamWater, NRGen, CRSES

Component 2 (*Engineering Design Task Team)*

Output 1.2 Functional pipeline established, connecting the groundwater supply to the existing reticulation system.

Activity 1.2.1: Construction of 5 km distribution pipeline, and connection to the existing Uis network.

What	Who
Procure pipeline and services to install on site	NamWater
Excavate, lay and test pipeline	Contractor
Commissioning of pipeline	NamWater & Contractor

Output 2.1: Functional hybrid solar + wind energy system established, capable of delivering 3.5 kW/m^3

Activity 2.1.1: Site selection and technical engineering design with involvement of tertiary institutions in studies

What	Who
Identify site(s) for solar farm and wind turbines	NamWater, Village Council, EIA consultant
Compile plant design, including CAPEX and OPEX projections	WML, NRGen, CRSES, PoN
Record all significant factors and specifications, as part of the documentation to inform replication at other sites.	NamWater, PoN

Activity 2.1.2: EIA to obtain Environmental Clearance
See Activity 1.1.2 above.

Activity 2.1.3: Construction of solar farm and wind turbines, feeding into integrating unit

What	Who
Procure solar unit and wind turbines to specifications (See Activity 1.1.1) and services to install on site	NamWater, NRGen, CRSES
Commissioning of solar unit and wind turbines (only)	NamWater, NRGen, CRSES& Contractor
Commissioning of integrated system i.e. renewable power unit, pumping equipment and desalination plant	NamWater, NRGen, CRSES

Component 3 **(***Capacity Building & Learning and the Engineering Design Task Teams)*

Output 3.1: Improved technical ability and skills of the officials responsible for the water scheme.

Activity 3.1.1: Training provided to Uis Village Council officials, by NamWater and the project team.

What	Who
Identification of suitable persons to be trained	NamWater, NRGen, CRSES
Initial training session	NamWater
Continuous monitoring on training needs	NamWater

3.1.2 Production of training and maintenance manuals, so that the information is formalised and can be passed on.

What	Who
Drafting of Operational and Maintenance manuals	NamWater, NRGen, CRSES
Review of Operation & Maintenance manual to ensure efficient communication to users	NamWater

Component 4 **(**Environment and Social Task team)

Output 4.1: Acceptance of desalinated water by the consumers, with insignificant or no resistance.

Activity 4.1.1: Sensitisation of village community about desalinated water, through public meetings, pamphlets, and demonstrations at the desalination and power plants.

What	Who
Phase 1: Sensitisation of Village community (Introduction in EIA process)	EIA Consultant
Phase 2: Sensitisation of Village community (Demonstration during commissioning)	NamWater
Phase 3: Review public acceptance during operation	NamWater
Phase 4: Revise sensitisation process if required	NamWater

Component 5 **(***Engineering Design and Operation and Water Quality Task Teams)*

Output 5.1: Operation of the pilot plant.

Activities:
5.1.1 Operation of the system for 2 years, with quarterly inspections and reports

What	Who
Operation of plant	Trained operators and PoN students
Quarterly inspections & Reporting	NamWater, NRGen, CRSES

Output 5.2: Data analysis report showing all the necessary facts and figures of the pilot project.

Activities:
5.2.1 Compilation of all the significant steps and components during construction and operation, with involvement of PoN students. This will include consultations with communities to assess their perceptions

What	Who
Processes to be documented: Public awareness EIA Design Procurement Construction Commissioning Operation and Maintenance Manual (including spares and service providers) Operation Inflow and Production data review Review Changes to improve	NamWater, PoN

Output 5.3: Knowledge shared with interested and affected parties.

Activities:
5.3.1 Student engagement program

What	Who
	NamWater, PoN

Activities: 5.3.2 Publication of lessons leanred

What	Who
	NamWater, PoN

Component 6 **(**repetition of Components 1 to 5 at the Bethanie site executed as indicated by all Task Teams)

Output 6.1: New systems installed, adapted for the specifics of Bethanie

Activities:
6.1.1 Design, procurement and construction and operation of a similar pilot plant at Bethanie adjusted for fluoride reduction.
(Similar to Components 1 to 5)

Oversight, Governance and coordination

Oversight of project activities will be the responsibility of the Project Steering Committee (PSC) which will be accountable to the NIE. This will include a focus on social and environmental risk management and execution progress. NamWater will take responsibility for establishing and maintaining the PSC on the basis of a Terms of Reference which will be negotiated at project launch. It is envisaged that the Head: Program Management, or his or her delegate, will serve as the Chair for the PSC.

The PSC will include key partner institutions, NamWater, WML, NRGen, CRSES, PoN, representative of the local authority at Uis and Bethanie that will support project governance and ensure coordination and integration across relevant partners. As a matter of principle, the project will work with and strengthen existing coordination, decision support and learning structures where these exist.

NamWater will report any unintended social and environmental risks that are detected through the project monitoring, evaluation and reporting processes to the NIE via the PSC, together with a proposed risk management plan that shows how these risks will be mitigated. In response to this, the NIE and PSC may propose the redirection of project funds to risk management activities, or the withholding of the next tranche of payment until satisfactory risk management actions are determined and agreed.

Project stakeholders will be made aware of the project's grievance procedures should they wish to raise any issues and concerns, including those related to project risk management.

At the project and component levels, Task Teams will be established to support local-level coordination and governance (for the former), and technical integration across partner organisations and with related initiatives and ongoing programmes of work (for the latter).

The Task Teams will be as follows:

- Environmental and Social Task Team;
- Engineering Design Task Team;
- Operation and Water Quality Review Task Team; and
- Capacity Building and Learning Task Team.

The PSC, PT and Task Teams will ensure that the project is appropriately linked to local (constituency), local authority, regional and National structures. Strategic and operational oversight will be ensured by the NIE.

The PSC has the following functions:

- Accountable to NIE to ensure overall compliance with the spirit, policies and procedures of the AF.
- Setting up and oversee the project review process, including guiding the development of terms of reference for reviewers, setting up the review panel, and considering the recommendations of reviewers.
- Ensuring appropriate linkages with AF criteria and facilitating appropriate consultation with and, where necessary, endorsement from relevant spheres of government. From time to time this may involve promoting agreement on the roles of relevant institutions in implementing AF projects and facilitate the resolution of disputes among project partners.

Grievance Procedures

During project inception workshops and component launch workshops, stakeholders will be informed that any concerns relating to the design or management of the Project, including social and environmental risks, should be raised with NamWater. Where these are not adequately addressed, these may be escalated to the PSC and if necessary the NIE.

Project Management

The project will be managed by a Project Manager (PM) leading a Project Team (PT) that is housed within NamWater and reports to the NamWater Program Manager. The PT will be responsible for providing technical leadership to the project, managing and coordinating project activities, reviewing quarterly forecasts and risk assessments and providing oversight on the day to day operations of the project including procurement, financial management and reporting,

communications, monitoring and evaluation of project performance, reporting and serving as secretariat for the PSC.

The PT will be led by a Project Manager and assisted by a Supply Chain Manager (part time) and Project Accountant with representatives from each technical discipline.

Indicative Terms of Reference for the Project Manager:

- Provide strategic leadership to the implementation of the Project.
- Ensure management of all project management processes, deliverables, finances, procurement and contracting of service providers.
- Ensure compliance with NIE and AF requirements, including ensuring effective procurement, administration, reporting, disbursement and financial management procedures.
- Ensure the coordination and effective implementation of project activities, through effective governance structures.
- Build relationships with the Ministry of Agriculture, Water & Forestry and local and regional government ministries in order to sustain and replicate project outcomes, and to capture these in ongoing and future policy processes.
- Manage relationships with a diverse range of partners and stakeholders (private sector, public, sector, NGOs and academic), resulting in their continued mobilisation and support of the project.

A Gender and Social Expert will from part of the Environment & Social Task Team, and will work closely with the other project partners to ensure that there is equitable representation of women and other vulnerable groups as project beneficiaries, in training and capacity-building programmes, and in project decision-making structures at all levels. The Gender and Social Expert will be responsible for developing a Gender and Social Action Plan (GSAP).

This will include:

- a rapid assessment undertaken in beneficiary communities;
- indicators and targets regarding the inclusion of vulnerable groups in project activities, training, representation on project structures and receipt of project benefits;
- measures to ensure transparency, fairness and equity in selection processes for project benefits; and
- measures to encourage and support the participation of identified vulnerable groups and individuals in the various project activities; training/building the capacity of implementing partners to incorporate gender and social concerns into their work on the project; playing an ongoing advisory role to these partners during the 3 years of project implementation; ensuring compliance with the project's Environmental and Social Risk Management Plan; and monitoring the progress on achieving project targets relating to gender and social indicators.

Most project staff will be assigned to the project for a period of maximum 3 years periods with release periods in between when their inputs are not required, however, the Project Manager will update them on regular intervals regarding the progress of the projects. The Project Manager, Supply Chain Manager and Project Accountant will be assigned for a longer period to allow for project closure. The Project Manager will report directly to the Program Manager within NamWater, who will be responsible for providing day-to-day supervision of the Project Manager.

NamWater will provide suitable office space for all NamWater project staff on full-time service contracts, as well as the necessary office furniture and support services. The NamWater Enterprise Resource Planning system (ERP), SAP PS, will also be utilised as the project accounting system for the project which has the added advantage that the project financials are subject to the annual external audit.

The appointment of the Project Manager, Supply Chain Manager and Project Accountant will be a precondition of grant effectiveness between the NIE and NamWater.

Core project staff will be trained to ensure compliance with AF policies and procedures. Focus will be placed on ensuring that NamWater and other project partners are able to competently detect environmental and social risks in future project planning, monitoring, evaluation and reporting processes. All project staff will be assigned to the PT in terms of their responsibilities and functions within the respective partnering institution. It is not planned to appoint any staff member outside of the partnering institutions.

See **Fig 1** and **2** below for the respective organograms of the Project Steering Committee and Project Team.

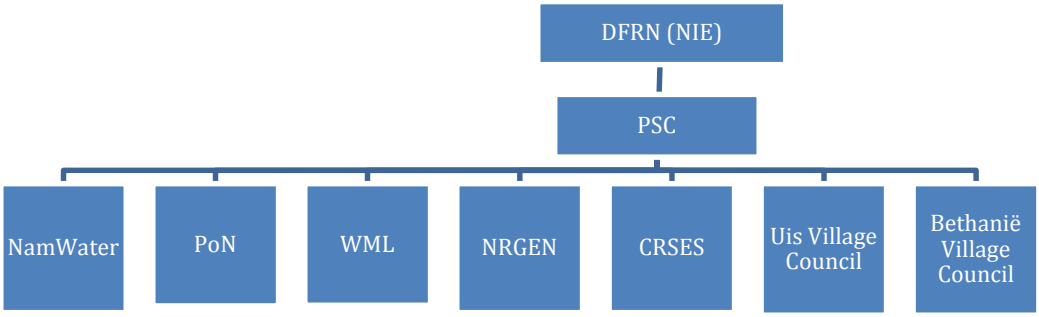

Figure 1: Project Steering Committee organogram

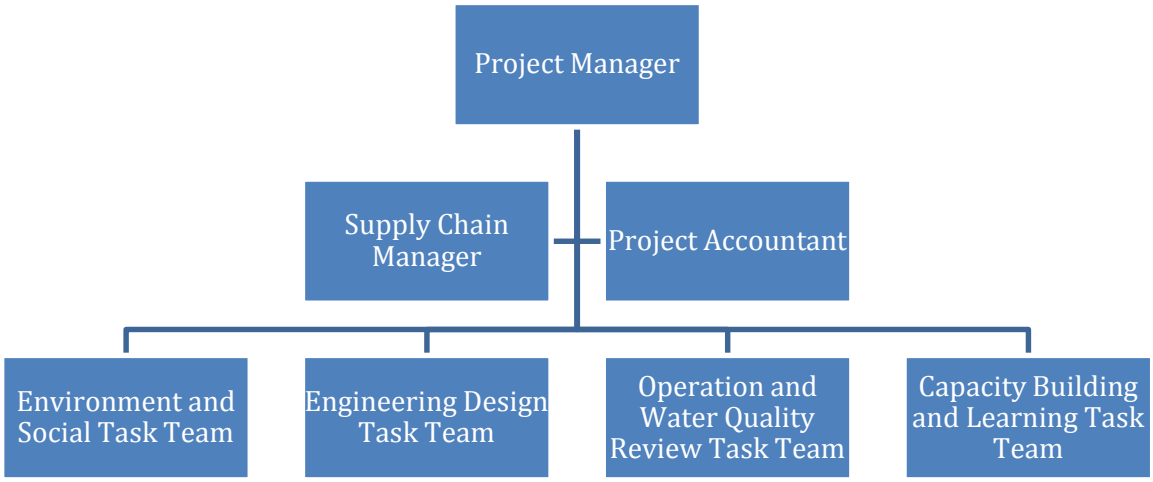

Figure 2: Project Team organogram

In terms of the project accounting and procurement processes, NamWater will be responsible for undertaking the fiduciary responsibilities of the project. Some of the partners may operate different accounting systems, but they shall maintain sound financial records in accordance with applied accounting standards acceptable to NamWater.

A separate project will be entered on the NamWater project accounting system. The meeting will be planned between NamWater and the NIE to agree on inter alia the following:

i) financial management systems and financial flows;
ii) AF reporting requirements;
iii) audits and revenue management;
iv) Standard Chart of Accounts and AF account categories;
v) sub-Executing Entity agreements; and
vi) capacity requirements (financial, processing and procurement capabilities).

The following is planned:

- To create a separate bank account with FNB for the project which will ensure that project funds received from the NIE are clearly separated from NamWater funds.
- NamWater will formally claim expenses on a monthly basis from the FNB account supported by recorded actual expenses.
- All service and goods will be procured in compliance with the NamWater Procurement Policy.
- The NamWater project expenses will be subject to the normal internal and external audit.

The discussion will be continued during the project inception phase. NamWater must comply with the Namibian State Finance legislation and NamWater procurement procedures and will adhere to the relevant requirements under the Namibian legislation and NamWater policies.

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

DRFN will have an overarching role as the NIE in overseeing and ensuring financial and project risk management. These risks, and associated mitigation/management measures, will be assessed on an ongoing basis. The following risks, their potential impacts, and proposed responses in mitigation/management are as follows:

Risk	Level	Management/Mitigation
FINANCIAL		
Ineffective Financial Management Systems	Low	The following measures will mitigate the risk: (i) The separate bank account with FNB for the project will ensure that project funds received are clearly separated from NamWater funds. (ii) NamWater will formally claim expenses on a monthly basis from the FNB account supported by recorded actual expenses. (iii) All service and goods will be procured in compliance with the NamWater Procurement Policy. (iv) The NamWater project expenses will be subject to the normal internal and external audit.
Delays in the disbursement of funds, procurement and institutional inefficiencies (e.g. lengthy approval processes) result in delayed delivery of equipment and other services and hence project implementation.	Low	The NIE and NamWater will work closely to ensure optimum conditions for timely disbursement of funds contracting, monitoring and financial reporting. The Project Manager and Supply Chain Manager will develop and regularly update a Procurement Plan in line with NamWater guidelines. Key project staff will be in place prior to the project inception meeting.
Fluctuations in exchange rate (USD: NAD) which could affect the funding available for implementation and lead to budgetary constraints.	Medium	The Project Accountant will closely monitor the USD: NAD exchange rate and communicate any implications to the Project Manager so that project management can be adaptive. NamWater will collaborate closely with the NIE should exchange rates fluctuate to the extent that budget reallocations are required. In this event, budget reallocations shall be made in such a way that the achievements of project outcomes are compromised as little as possible.
Ineffective management of project funds affects project implementation.	Low	A Supply Chain Manager and Project Accountant will be assigned to the Project Team to ensure appropriate management of project funds. In addition, NIE oversight and account audits will ensure that there is no ineffective use of project funds.

PROJECT		
Failure to achieve milestones and provide deliverables on time	Low	A dedicated NamWater project manager will be appointed to manage the project to ensure adequate project planning, coordination and integration of all activities to prevent time frame overruns.
Long distances to the sites results in logistically challenging implementation of project interventions.	Medium	Access to Uis and Bethanie was considered as one of the criteria when selecting project sites. The road to Uis consists of 211 km of tarred road and 122 km of gravel road. The road to Bethanie consists of 644 km of tarred road. Whilst the accident rate on Namibian roads is at an unacceptable high level, the following mitigation measures will apply for project staff to do site visits: (i) Driving after sunset and before sun rise will not be permitted. (ii) Motor vehicles used for driving have to be road worthy and in good condition. (iii) Drivers of motor vehicles must be in possession of a valid driving license issues by the Namibian Authorities. (iv) Drivers have to comply with all traffic rules, with specific reference to the speed limits on these roads. (v) It will be expected from drivers to rest for at least 10 minutes after driving of a period of 2 hours.
Failure to involve adequate representation of vulnerable communities, particularly women, and therefore failure to create ownership of the project at the community level at project sites.	Low	The project will avoid a „top down" approach and create community ownership of the project interventions by building the capacity of community members at an early stage in the project. Engagement and capacity building will adopt a gender-sensitive approach, as guided by the Gender and Social Expert. The development of detailed implementation plans will be undertaken in a participatory manner, encouraging input from all community members, including women.
Communities are incapable of managing and maintaining assets and structures built through the project.	Medium	Capacity building programmes will include training on maintenance and management techniques. Robustness of infrastructure will be an important value as from the design stage. Specific measures will be put in place to prevent theft of solar panels which are subject to theft throughout Namibia, e.g. fitting a movement and GPS to the panels to give an alarm when moved and track the movement if removed.
Technology transfer with its associated uncertainties	Medium	The point of departure is that the communities at Uis and Bethanie have not been exposed to high technology. Therefor technology transfer is a risk that will be assessed during the training given to the operators. From previous experiences it is likely that with the correct selection process, persons with the correct aptitude will have success with the operation

		of the plant.
Operation and maintenance of the plant	Medium	Since it is planned for the plant to be robust of nature, it is expected that the operation will have a lower risk than the maintenance. To mitigate the maintenance risk, it is planned to hire the services of technical equipped contractors in the vicinity to be responsible for the scheduled and break down maintenances.
Water Quality	Low	Water will be sampled at specified intervals and sent to the NamWater laboratory for internal or external testing in terms of bacterial and chemical analysis. The results will be made available to the project team to attend to as part of the piloting of the plants. In the event of non-compliance, NamWater is obliged to terminate the operation of the plant and attend to all defect processes before operation may continue. In terms of the Water Resource Management Act, the specified water quality testing regime has to be continued for the lifetime of the plant. See Appendix C for Water Quality Standards.
Sustainability of the plant	Medium	One of the objectives of the pilot plant is to test the sustainability of the plant. The sustainability will be reviewed during the pilot project and mitigation measures will be recommended to ensure sustainability.
INSTITUTIONAL		
Low capacity, awareness and acceptance of the need to tackle the impacts of climate change among key stakeholders limit the support for the project and limit likelihood of project outputs being mainstreamed into plans and budgets.	Low	The project includes a capacity building programme for community members, councillors, traditional authorities and district and local municipal officials on the importance of mainstreaming adaptation responses into planning, budgeting and policy development processes. This capacity building programme will build on the awareness generated and the support already raised amongst municipal officials.
Poor coordination with other climate change projects in Namibia limits the potential to learn from and build on the experiences of climate change related projects.	Low	During implementation, Project Managers and key team members from climate change projects within Namibia will be invited to group discussion with engagement of the NIE, to coordinate efforts, ensure that projects deliver complementary and mutually reinforcing outcomes and have a collective knowledge sharing experience.
Limited capacity of project partners to deliver project outputs.	Low	Project partners all have experience in coordinating, implementing and delivering outputs in their relevant spheres of expertise, as demonstrated by the successful implementation of previous projects. Additionally, the NIE will play an oversight role, providing further expertise if required.

Staff turnover within NamWater, Local Municipalities, project Partners, Consultants and Contractors may hamper progress.	Low	Institutional rather than individual relationships will be built between NamWater and Local Municipalities and with project partners, limiting the negative impact of staff turnover.

The financial and project risks in NamWater are primarily governed by the following:

- NamWater Procurement Policy.
- The project management business processes.
- Continuous audit by the NamWater Internal Audit office
- Annual external audit
- Compliance to International Financial Reporting System (IFRS)
- Governance of NamWater by a Board of Directors appointed by the Minister of Agriculture, Water and Forestry
- Water Resources Management Act 2013
- NamWater Act 1997 as amended 2001

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

The main unknown at this stage is the outcome of the EIA. While the bio-physical impacts are, at this very early stage of assessment, able to be identified and mitigated, the responses in the social component of the EIA are less knowable. However, a thorough public consultation process will be run during the EIA to identify key stakeholders, their respective roles and to resolve any issues. It must be remembered that the project holds strong advantages for the affected communities, which must be weighed up against any negative social impacts which might arise.

Full compliance with the Environmental and Social Policy of the AF will be sought, as described in Part II E.

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

Project start-up

An Inception meeting with all key partners and stakeholders will be held to agree on the overall goals, outputs and outcomes of the project. The programme outline and activities will be presented and verification of baselines that underpin the M&E plan will be undertaken. This will ensure full understanding and ownership of the programme by all partners.

The schedule of progress, indicating important milestones and deliverables, will be compiled and will constitute the annual project work plan. It will contain qualitative, quantitative and financial information. The NIE will provide clear guidelines on procedures that will apply to implementation of programme activities.

Indicators to help measure the alignment of the project with the AF Environmental and Social Policy will be agreed on through discussions with the DRFN, NamWater and team entities (i.e. WML, NRGen, PoN), and the partners (e.g. Village Councils).

All team entities and partners (e.g. Village Councils) to commit to their responsibilities. These must include compiling scheduled progress reports as prerequisites for continued funding.

An Inception Report will document the proceedings and will form the basis for the contractual arrangements between the various organisations.

Quarterly monitoring

The construction and commissioning of the infrastructure at Uis needs to happen promptly in the early stages of the project, the installations at Uis and the Bethanie site are the main deliverables in the first year.

These critical milestones will be monitored from the beginning through quarterly inspections with the participation of the team entities as well as the relevant staff of the Village. The inspections will form the basis of the condition and performance monitoring that will be reported on every 3 months.

Overall progress will therefore be monitored throughout the 3-year project through reports that are submitted by the EE (NamWater) to the IE (DRFN) on a quarterly basis. A template for routine reporting will be developed by NamWater in close consultation with the NIE and with due consideration given to the requirements of the AF. All sub-Executing Entities will provide their inputs to NamWater in a timeous manner.

The quarterly reports will give attention to any unanticipated events or problems, and will raise these as risks requiring further monitoring. In particular, these issues will be brought to the attention of the IE in case they cause any alterations to the milestones and financial schedule. The reports will also include forecasting for the next quarter to underpin disbursement of funds for project activities. The EE and the NIE will meet to discuss these reports within one week after the reporting period.

Site visits

Periodic site visits by DRFN will be made to verify the substance of the Quarterly Reports. Site visits will not follow a set schedule, but will be dictated by need and should not be less than once per year.

Annual reporting

Annual reporting templates will be developed by the NIE in cooperation with the EE. The EE will prepare Annual Implementation Reports in order to track progress according to programme objectives and outcomes, using the information from the Quarterly Reports and any consequences.

The Annual Implementation Report will include:

- Progress made on the infrastructure installations and training of relevant NamWater and Council staff to maintain it (= outputs)
- Information on the outcomes, as measured by specified indicators
- Emphasis on possible challenges and risks that deserve attention
- Expenditure reports
- Reporting on alignment of the project with the AF Environmental and Social Policy, using the indicators identified in the Inception phase.
- Lessons learnt
- Assessment of beneficiaries in terms of gender and vulnerability

Account audits will be undertaken annually as part of the financial management procedures of both the EE and the NIE. Final audits will be undertaken at programme completion.

Mid-term Evaluation

By the end of the first 1.5 years, all the infrastructure at the two sites should be installed and functioning and training of local representatives should be underway. This marks a logical point to assess project implementation and whether the intended outcomes are being reached.

Alignment with the AF Environmental and Social Policy, and with the intended outcomes of the project, will be emphasised. Scrutiny will be given to the indicators of this progress that were identified in the Inception phase.

The Mid-term Evaluation will be undertaken by an external evaluator to be appointed and funded by the NIE (DRFN). Any necessary alteration in the deliverables or the schedule will be discussed and resolved at this point.

Final Evaluation

A Final Evaluation report will be produced within 3 months after project completion. Again, this will be undertaken by an external evaluator to be appointed and funded by the NIE.

This should focus on the delivery of the project's results as originally planned and possibly altered during the Mid-term Evaluation. They will be assessed in the context of the vulnerabilities that were identified before commencement, and how the project has actually contributed to improving resilience.

The Final Evaluation will also concentrate on the sustainability of the outputs. Take-over by the affected communities is important, so their capacity to manage and maintain the systems will be assessed. Also, all documentation of the process for the benefit of replicating the systems in other small villages should be in place.

The table below is a break-down of how NIE fees will be utilised in the supervision of the M&E function.*

M&E activity	Responsible parties	NIE budget (USD)	Timeframe
Inception Workshop and report (Start of project implementation)	NIE, EE	3 161	Workshop: Jan 2016. Report: Feb 2016
Community inception meetings	EE, NIE	2 298	Within 3 months of project start
Verification of baselines	EE, NIE	790	2016 1
Community meetings	EE	0	Quarterly
Progress reports & meetings	NIE, EE	3 951	Quarterly
Project meetings	EE, NIE	3 556	Quarterly
Annual performance reports	NIE, EE	3 556	Feb 2017, Feb 2018
Annual financial audit of EE	EE, External auditor	0	2017, 2018
Annual financial audit of NIE	NIE, External	8 592	2017, 2018

	auditor		
Mid-term review	NIE, External evaluator	4 444	Sep 2017
Terminal review	NIE, External evaluator	6 913	Apr 2019
Project completion report	NIE, EE	1 185	Jun 2019
Terminal financial audit	PM, NIE, Local audit firm	7 666	Jun 2019
Site visits	EE, NIE	4 098	At least annually by NIE
Continuous routine monitoring	EE, NIE	654	Ongoing
Documentation and archiving	NIE, EE	1 185	Ongoing
Public information	NIE, EE	1 125	Ongoing
Control of tendering process and procurement	NIE	2 765	Ongoing
All		**55 939**	

* Excludes staff costs for invoice verification and disbursements; project closure; feedback to DRFN management and Board, as well as office services and supplies.

E. Include a results framework for the project proposal, including milestones, targets and indicators.

Objective / Output / Outcome	Indicator	Baseline	Target	Means of verification
Objective: To refine small-scale solar- and wind-driven desalination plants to improve the quality of selected groundwater sources for human consumption, and to reduce the cost of water to communities served by these schemes	Number of small-scale solar and wind driven desalination plants established in Namibia	0	2 pilot plants	Number of plants successfully commissioned
Component 1: Desalination plant and distribution of water				
Output 1.1: Functional desalination plant established, delivering 100 m3 of desalinated water per day	Number of small-scale desalination plants established in the 2 towns	0	2	Number of plants successfully commissioned
Outcome 1.1: Improved security of water supply in Uis	Number of days of interrupted water supply per year	12	0	Review historic level records of terminal reservoir (Scheme performance information system)
Output 1.2: Functional pipeline established, connecting the groundwater supply to the existing reticulation system	Length of installed pipeline between pilot plant and reticulation system	0	5 km	Measure length of pipeline
Outcome 1.2: Delivery of water of required quality and quantity to Uis residents	Volume of water delivered from pilot plant to Uis, in compliance with Water Quality Standards.	0	100m3/day	Review production figures and water quality analysis of pilot plant.
Component 2:				

Objective / Output / Outcome	Indicator	Baseline	Target	Means of verification
Hybrid solar and wind power plant				
Output 2.1: Functional hybrid solar + wind energy system established, capable of delivering 3.5 kW/m3	Number of hybrid solar = wind energy systems established in the 2 towns	0	2	Number of systems successfully commissioned
Outcome 2.1: Power supply for water provision, with improved economics and reduced environmental impact compared to a conventional grid-based system.	i) Water tariff at the 2 towns. ii) Source of the power supplied to the plant	i) Current tariff = USD0.78/m3 ii) Conventional grid power, which comes from a combination of fossil fuels, hydropower and nuclear.	i) 10% reduction from the current tariff ii) System powered entirely from locally generated solar and wind power.	i) Comparison of tariff of water from the new plant, with the current water tariff. ii) Review output of renewable hybrid power plant
Component 3: Training				
Output 3.1: Improved technical ability and skills of the officials responsible for the water scheme	i) Number of training sessions provided to a) operators and b) maintenance staff ii) Successful completion of training and deployment of contract operators.	i) 0 ii) 0	i) 2 sessions for both operators and maintenance staff ii) 2 contract operators hired and in place	i) Reports on training sessions by technical Task Teams. ii) Assess skill level of contract operators
Outcome 3.1: Responsible officials capable of managing all components of the renewable power plant and the water delivery system.	Number of call-outs per year related to operator errors.	6	0	Review number of call-outs logged as notifications on the ERP system.
Component 4: Sensitisation				
Output 4.1: Acceptance of desalinated water by the consumers, with insignificant or no resistance.	Number of complaints about the quality of the supplied water.	Sporadic complaints about lime build-up in geysers and kettles, resulting in failures.	0 complaints	Review number of complaints to the Area Manager.
Outcome 4.1: Socially acceptable water supply system in place.	Number of complaints about the quality of the supplied water.	Sporadic complaints about lime build-up in geysers and kettles,	0 complaints	Post-project social assessment to assess water acceptability.

Objective / Output / Outcome	Indicator	Baseline	Target	Means of verification
		resulting in failures.		
Component 5: Pilot phase operation				
Output 5.1: Operation of the pilot plant	Number of technical issues attended to and recorded during the 24 month pilot phase.	Not possible to state what this might be.	0 issues attended to and recorded in the last 6 months of the 2-year pilot period.	Log of issues and how they were resolved.
Outcome 5.1: A fully functioning desalination and hybrid renewable energy system	Security of supply adequate for coping with increased climate variability, particularly during periods of poor runoff.	Level of security at risk after 4 years of poor runoff.	Risk of poor runoff does not jeopardise the water supply.	Water supply records, by NamWater (bulk water sold per month) and by Village Council (consumption per household).
Output 5.2: Data analysis report showing all the necessary facts and figures of the pilot project.	Completeness of the data showing functioning of the system.	No reports at project commencement	Thorough and complete record, detailing all eventualities.	Assessment of completeness by external expert.
Outcome 5.2: Refined design available for replication in other towns.	Readiness of design for replication.	No readiness in NamWater at present.	Complete readiness, manifested in	Design being fully ready to replicate, as assessed by an external technical expert.
Component 6: Replication				
Output 6.1: New pilot plant installed, adapted for the specifics of Bethanie.	Level of success of newly commissioned plant at Bethanie.	No plant yet established.	Reliable treatment system in place.	Water supply records kept by NamWater and /or by Bethanie Village Council.
Outcome 6.1: Bethanie community provided with safe water supplies.	Water quality analysis.	Water supplied to Bethanie is below the threshold for safe human consumption (fluoride levels too high).	Compliance with Water Quality Standards for safe human consumption.	Water quality results, following the standard NamWater testing regime.

F. Demonstrate how the project aligns with the Results Framework of the Adaptation Fund.

Project Objective	Project Objective Indicator	Fund Outcome	Fund Outcome Core Indicator	Grant Amount (USD)
To refine small-scale solar- and wind-driven desalination plants to improve the quality of selected groundwater sources for human consumption, and to reduce the cost of water to communities served by these schemes.	Number of small-scale solar and wind driven desalination plants established in Namibia	**Outcome 4:** Increased adaptive capacity within relevant development and natural resource sectors	4.2. Physical infrastructure improved to withstand climate change and variability-induced stress	750,000
Project Outcomes	**Project Outcome Indicators**	**Fund Output**	**Fund Output Indicators**	**Grant Amount (USD)**
Outcome 1.1: Improved security of water supply in Uis	Number of days of interrupted water supply per year	**Output 4**: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	80,000
Outcome 1.2: Delivery of water of required quality and quantity to Uis residents	Volume of water delivered from pilot plant to Uis, in compliance with Water Quality Standards.	**Output 4**: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	120,000

Outcome 2.1: Power supply for water provision, with improved economics and reduced environmental impact compared to a conventional grid-based system.	i) Water tariff at the 3 towns. ii) Source of the power supplied to the plant	**Output 4**: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	80,000
Outcome 3.1: Responsible officials capable of managing all components of the renewable power plant and the water delivery system.	Number of call-outs per year related to operator errors.	***Output 2.1***: Strengthened capacity of national and regional 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	5,000
Outcome 4.1: Socially acceptable water supply system in place.	Number of complaints about the quality of the supplied water.	***Output 3***: Targeted population groups participating in adaptation and risk reduction awareness activities	3.1.1 No. and type of risk reduction actions or strategies introduced at local level 3.1.2 No. of news outlets in the local press and media that have covered the topic	1,000

Outcome 5.1: A fully functioning desalination and hybrid renewable energy system	Security of supply adequate for coping with increased climate variability, particularly during periods of poor runoff	***Output 4:*** Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.1. No. and type of health or social infrastructure developed or modified to respond to new conditions resulting from climate variability and change (by type) 4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	90,000
Outcome 5.2: Refined design available for replication in other towns.	Readiness of design for replication.	***Output 2.2:*** Targeted population groups covered by adequate risk reduction systems	2.1.2. Capacity of staff to respond to, and mitigate impacts of, climate-related events from targeted institutions increased	10,000
Outcome 5.3				
Outcome 6.1: Bethanie community provided with safe water supplies.	Water quality analysis.	***Output 7:*** Improved integration of climate-resilience strategies into country development plans	7.2. No. or targeted development strategies with incorporated climate change priorities enforced	269,576
Outcome 6.2				

G. *Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.*

Project components, outputs and activities	Budget (USD)	Budget Notes
Component 1: Desalination plant and distribution of water		
Outcome 1.1: Improved security of water supply in Uis	5,000 40,000 5,000 30,000	• *Site selection and technical engineering design (by NamWater, Stellenbosch)* • *EIA to obtain Environmental Clearance* • *Procurement and installation of water abstraction equipment* • *Construction of desalination plant*
Outcome 1.2: Delivery of water of required quality and quantity to Uis residents	120,000	• *Construction of 5 km distribution pipeline, and connection to the existing Uis network*
Component 2: Hybrid solar and wind power plant		
Outcome 2.1: Power supply for water provision, with improved economics and reduced environmental impact compared to a conventional grid-based system.	5,000 5,000 70,000	• *Site selection and technical engineering design with involvement of tertiary institutions in studies* • *EIA to obtain Environmental Clearance* • *Procurement and construction of solar farm and wind turbines, feeding into integrating unit*
Component 3: Training		
Outcome 3.1: Responsible officials capable of managing all components of the renewable power plant and the water delivery system.	2,000 3,000	• *Training provided to Uis Village Council officials, by NamWater and project team* • *Production of training and maintenance manuals, so that the information is formalised and can be passed on.*

Component 4: Sensitisation		
Outcome 4.1: Socially acceptable water supply system in place.	1,000	• *Sensitisation of village community about desalinated water, through public meetings, pamphlets, and demonstrations at the desalination and power plants*
Component 5: Pilot phase operation		
Outcome 5.1: A fully functioning desalination and hybrid renewable energy system	90,000	• *Operation of the system for 2 years, with quarterly inspections and reports*
Outcome 5.2: Refined design available for replication in other towns.	10,000	• *Compilation of all the significant steps and components during construction and operation, with involvement of PoN students. This will include consultations with communities to assess their perceptions*
Outcome 5.3	10,000	•
Component 6: Replication		
Outcome 6.1: Bethanie community provided with safe water supplies.	219,576	• *Design, procurement and construction and operation of a system at Bethanie*
Outcome 6.2	10,000	•
Project Activities Cost (A)	**625,576**	
Project Execution Cost (9.5%) (B)	**65,668**	
Total Project Cost (A+B)	**691,244**	
Project Management Fee (8.5%) (C)	**58,756**	
Total Financing Requested (A+B+C)	**750,000**	

Notes:

1. All procurement will be done in compliance with the NamWater Procurement policy which requires that for all items with a cost of more than USD12,000, a public open tender must invite bids.

2. All fees for Consultants shall be limited to USD 115 as published by Government Gazette.

Implementing Entity Budget

The NIE has submitted a budget for project management activities associated with this project, as indicated below.

Fee Category	Cost category	Total (USD)
Management Fees	Project management, finance administration and office administration	32,667
Operating Expenditure	Travel, daily subsistence allowances and workshops associated with project oversight and governance	1,975
Office Services and Supplies	Utilities, telecommunications and office supplies	2,818
Auditing and consulting	External auditing, project evaluation and technical support	21,296
Total		**58,756**

H. Include a disbursement schedule with time-bound milestones.

	Upon signature of agreement	End Year 1	End Year 2	Total (USD)
Scheduled Date	Nov 2015	Jan 2017	Jan 2018	
Project Funds	421,004	184,000	86,240	691,244
NIE Fee	16,190	18,659	23,907	58,756
Total Financing (A+B+C)	**437,194**	**202,659**	**110,147**	**750,000**

Milestones	Expected Completion
Start of project (Inception workshop)	January 2016
Mid-term revue	September 2017
Project closing	June 2019
Terminal revue	April 2019

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

A. Record of endorsement on behalf of the government[1]

Mr. Teofilus Nghitila, *Environmental Commissioner,* *Ministry of Environment and Tourism,* *Namibia*	**Date:** *21 July 2015* ***Signature:***

MINISTRY OF ENVIRONMENT AND TOURISM
Private Bag 13306
Windhoek, Namibia
2015 -07- 24
Office of the
Environmental Commissioner

B. Implementing Entity certification

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 namely National Development Plan 4, National Policy on Climate Change for Namibia 2011 and National Climate Change Strategy and Action Plan 2013-2014 and subject to the approval by the Adaptation Fund Board, commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.

S Aldrich

Implementing Entity Coordinator

Date: 23 July 2015	Tel.: +264811220671 E-mail: schreuderaldrich@hotmail.com
Project Contact Person: Dr M Schneider	
Tel. :+264812460379, or +26461377500 E-mail: martin.schneider@drfn.org.na	

Project title: Pilot desalination plant with renewable power and membrane technology

Executing entity: Namibia Water Corporation Ltd (NamWater).

[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.

ADAPTATION FUND

Letter of Endorsement by Government

Ministry of Environment and Tourism

21 July 2015

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

Subject: Endorsement for the project "Pilot desalination plant with renewable power and membrane technology"

In my capacity as Designated Authority for the Adaptation Fund in Namibia, I confirm that the above national project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in the Namibia.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by the Desert Research Foundation of Namibia (DRFN) and executed by Namibia Water Corporation Ltd (NamWater).

Sincerely,

MINISTRY OF ENVIRONMENT AND TOURISM
P/Bag 13306
Windhoek, Namibia
2015 -07- 24
Office of the
Environmental Commissioner

Teofilus Nghitila
Environmental Commissioner

APPENDIX A

REGISTER OF STAKEHOLDERS AT UIS CONSULTATIVE MEETING

Name	Affiliation / Interest
L Olivier	Resident
G Olivier	Resident
D Barty	Resident
N Barty	Resident
Mr A Tjai-Tjai-Mau	Community member
W Rokitta	Resident
T Schoonbee	Resident
N Roux	Resident
P Fergrier	Resident
L Weimann	Resident
R Duvenhage	Resident
A D Duvenhage	Resident
K Altmann	Uis White Lady Guest House
H Josty	Resident
L Josty	Resident
E V Grumbkow	Resident
A Leuschner	Resident
B Calitz	Brandberg Rest camp
M Balt	Resident
E Mueller	Resident
B Coetzee	Resident
P S Coetzee	Resident
J A J van Vuuren	Resident
N J du Plessis	Resident
Hennie Coetzee	Resident
Karin Coetzee	Resident
M van der Smit	House owner
Riana Scholz	Resident
Nico Scholz	Resident
Mr Henry Cecil Brandt	Resident
Fondasie Engelbrecht	Resident
Conrad Brandt	Resident

Ronnie Robert Touob	Resident
Mukoya Vision	Resident
G Maye	Resident
E Maye	Resident
B Haseb	Resident
J Gaseb	Resident
H Guriab	Resident
H Tourob	Resident
S Boois	Resident
R Hochobes	DD Traditional Authority
E S Gowaseb	DD Traditional Authority
H E U Pritzen	Resident
P J N Pritzen	Resident
Paulien //Gases	Resident
Inecia Brandt	Business owner
Philip Henry Gaseb	DD Traditional Authority
Gabriel KontradNdjambo	Oudorp resident
Luarencia Geises	Resident
KalvienaTsaraes	Resident
Piet Kenny	Resident
Bonny Gaseb	Resident
Ignatius Witbooi	Resident
Johannes M Gariseb	Resident
Stanley Taniseb	Resident
Malamu M	Resident
Jacobs Alex	Resident
Patricia //Gurises	Resident
G Amingo /Honeb	Resident
D van Wyk	Erongo Regional Council – Development Planner
Dimari van Rensburg	Erongo Regional Council – Town & Regional Planner
S K N Nawinda	Erongo Regional Council – CAO
Mike van der Meer	Developer
P van der Meer	Developer
Ismael //Gaseb	DDT
Carien van der Walt	Environmental consultant
Willem Venter	NamWater

REGISTER OF STAKEHOLDERS AT BETHANIE CONSULTATIVE MEETING

Name	Position	Organisation	Cell no	Email Address
Aletha Frederick	Chairperson of Bethanie Village Council and Superintendent at Bethanie Health centre	Bethanie Health Centre and Bethanie Village Council	0816847802	alethafrederick@gamil.com
Ndamononghenda Namulo	Acting CEO at Bethanie Village Council	Bethanie Village Council	0813634917	ndnamulo@gmail.com
Frans Windstaan	Town Foreman	Bethanie Village Council	081273537	windstaanfrans@gmail.com
Piet Frederick	Fireman	Bethanie Village Council	0817438900	pietfrederick@gmail.com
Abraham Eixab	Artisan	Bethanie Village Council	0815579572	
Johannes J Sirunda	Research and Development	NamWater	0811450613	sirundaj@namwater.com.na

APPENDIX B

Terms of Reference for an Environmental Impact Assessment and compilation of an Environmental Management Plan for the project

Table of Contents

APPENDIX C

WATER QUALITY STANDARDS

APPENDIX A: WATER QUALITY STANDARDS AND GUIDELINES FOR POTABLE WATER

Table 1: CHEMICAL AND BIOLOGICAL REQUIREMENTS

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
PHYSICAL AND ORGANOLEPTIC REQUIREMENTS					
Temperature	° C		E	Ambient temperature	
Colour	PTU	or mg/litre	E	10	<15
Taste			O,E	No objectionable taste	
Odour			O,E	No objectionable odour	
Turbidity (treated surface water)	NTU	or TU	H,I	< 0.3	< 0.5
Turbidity (groundwater)	NTU	or TU	H,I	< 0,5	<2
pH @ 20 °C	pH		I	6.0 to 8.5	6 to 9
Electric Conductivity @ 25 °C	mS/m***	E.C.	H,I	< 80	< 300
Total Dissolved Solids (treated surface water)	mg/litre		H,I	< 500	< 2 000
Total Dissolved Solids (groundwater)	mg/litre		H,I	< 1000	< 2 000
INORGANIC MACRO DETERMINANTS					
Ammonia	mg/litre	N	H	< 0.2	< 0.5
Barium	mg/litre	Ba	H	0.5	< 2
Calcium	mg/litre	Ca	I	< 80	< 150
Chloride	mg/litre	Cl	H,I	< 100	< 300
Fluoride	mg/litre	F	H	< 0.7	< 1.5
Magnesium	mg/litre	Mg	H	< 30	< 70
Nitrate	mg/litre	N	H	< 6	< 11
Nitrite	mg/litre	N	H	< 0.1	< 0.15
Potassium	mg/litre	K	H	< 25	< 100
Sodium	mg/litre	Na	H,I	< 100	< 300
Sulphate	mg/litre	SO_4	H,O	100	< 300
Asbestos (fibres longer than 10 µm)	Fibres/litre		H	<500 000	< 1000 000
INORGANIC MICRO DETERMINANTS					
Aluminium	µg/litre	Al	H	< 25	< 100
Antimony	µg/litre	Sb	H	< 5	< 50
Arsenic	µg/litre	As	H	<10	< 50
Beryllium	µg/litre	Be	H	< 2	< 5
Bismuth	µg/litre	Bi	H	< 250	< 500
Boron	µg/litre	B	H	< 300	< 500
Bromide	µg/litre	Br	H	< 500	< 1 000
Cadmium	µg/litre	Cd	H	< 5	< 10
Cerium	µg/litre	Ce	H	<1 000	<2 000
Cesium	µg/litre	Cs	H	< 1 000	< 2 000
Chromium Total	µg/litre	Cr	H	< 50	< 100
Cobalt	µg/litre	Co	H	< 250	< 500

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Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
Copper	µg/litre	Cu	H	< 500	< 2 000
Radon	Bq/L	Ra		< 200	< 1 000

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
INORGANIC MICRO DETERMINANTS					
Cyanide (free)	µg/litre	CN	H	< 20	< 50
Cyanide (recoverable)	µg/litre	CN	H	< 70	< 200
Iron	µg/litre	Fe	H,E	< 200	< 300
Lead	µg/litre	Pb	H	<10	< 50
Manganese	µg/litre	Mn	H	< 50	< 100
Mercury	µg/litre	Hg	H	< 1	<2
Nickel	µg/litre	Ni	H	< 50	< 150
Selenium	µg/litre	Se	H	< 10	< 50
Thallium	µg/litre	Ti	H	< 5	< 10
Tin	µg/litre	Sn	H	<100	<200
Titanium	µg/litre	Ti	H	< 100	< 300
Uranium	µg/litre	U	H	< 3	< 15
Vanadium	µg/litre	V	H	< 100	< 500
Zinc	µg/litre	Zn	H	< 1 000	< 5 000
Organo-metallic compounds: (as organo or industrial chemicals or others)	µg/litre	Polymer	H	below detection limit (in accordance with WHO and EPA requirements)	below detection limit (in accordance with WHO and EPA requirements)
ORGANIC DETERMINANTS					
Dissolved Organic Carbon	mg/litre	DOC-C	H	< 5	<10
Phenol compounds	µg/litre	phenol	H	< 5	< 10
DISINFECTION AND DISINFECTION BY-PRODUCTS					
Bromodichloromethane (Part of THM)	µg/litre		H	< 20	< 50
Bromoform (Part of THM)	µg/litre		H	< 40	< 40
Chloroform (Part of THM)	µg/litre		H	< 20	< 100
Dibromomonochloro-methane (Part of THM)	µg/litre		H	< 20	< 100
Trihalomethanes (Total)	µg/litre	THM	H	< 100	< 150
Bromate	µg/litre		H	< 5	< 10
Chloramines	mg/litre	Cl_2	H	< 2	< 4
Chlorine dioxide after 30 min. GENERAL	µg/litre		H	200 - 500	< 800
Chlorine dioxide after 30 min. SPECIFIC	µg/litre		Turbidity > 0.3 NTU	200	200 - 400
Chlorine dioxide after 60 min. SPECIFIC	µg/litre		Turbidity > 1.0 NTU	< 200	200 - 500
Chlorite	µg/litre		H	< 400	< 800
Chlorate	µg/litre		H	< 200	< 700
Haloacetic acids	µg/litre		H	not detected	< 60
Chlorine, free, after 30 min; GENERAL	mg/litre	Cl_2	H,I	0.3 – 0.5	0.1 – 1.5
Chlorine, free, after 30 min; SPECIFIC	mg/litre	Cl_2	Turbidity: < 0.3 NTU	0.3	0.1 – 1.5

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Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
Chlorine, free, after 30 min; SPECIFIC	mg/litre	Cl_2	Turbidity: > 0.3 NTU	0.5	0.1 – 1.5
Chlorine, free, after 60 min; SPECIFIC	mg/litre	Cl_2	Turbidity: >1.0 NTU	1.0	0.1 – 1.5

Specifications for water quality intended for human consumption from the source and piped water supply					
Status				Ranges and upper limits	
Interpretation				(Ideal guideline)	(Acceptable Standard)
DETERMINANTS	Unit	Format	Concern	95 Percentile Requirement	
BIOLOGICAL REQUIREMENTS					
Algae					
Chlorophyll α	µg/litre		E,O	< 1	< 2
Total algae cell count		/ml	H,O	< 200	<5 000
Blue-green algae	cells	/ml	H,O	< 200	<2 000
Mycrocystin	µg/litre		H	< 0.1	< 1
Geosmin	ng/litre		E, H	< 15	< 30
2-Methyl Iso Borneol (2 MIB)	ng/litre		E, H	< 15	< 30
OTHER DETERMINANTS					
Agricultural chemical compounds			H	Any organic compound recognized as an agro-chemical shall be in accordance with the WHO and EPA requirements.	
Industrial chemical compounds			H	Any organic compound recognized as an industrial chemical shall be in accordance with the WHO and EPA requirements.	
Endocrine disruptive chemicals			H	Any chemical compound that is suspected of having endocrine disruptive effects shall be in accordance with the WHO and EPA requirements.	
RADIOACTIVITY				95 Percentile Requirement	
Gross alpha activity	Bq/litre		H	< 0.2	< 0.5
Gross beta activity	Bq/litre		H	< 0.4	< 1.0
If Gross alpha and beta is above specification calculate Dose based on individual radionuclide concentrations	mSv/a		H	≤ 0.04	≤ 0.1

"Concern" refers to impact if the limit is transgressed: H = health concern; O = organoleptic effect;
I = effect on infrastructure, structural; E = aesthetic effect
* Based on a viral cell culture-dependent method and not on cell culture-independent methods (e.g. PCR)
** Indicative of faecal pollution having occurred, even when the residual disinfectant levels are safe.
*** Comply with SANAS Guidelines

Table 2: Standards for Microbiological and Biological Requirements

MICROBIOLOGICAL REQUIREMENTS APPLICABLE TO ALL POTABLE WATER					
Microbiology	**cfu**			**95 percentile**	**1 of samples maximum**
Heterotrophic bacteria HPC or TCC	counts	/ml		100	1 000
Total Coliform	counts	/100 ml	H	0	5
E.Coli	counts	/100 ml	H	0	1
Entrerococci	counts	/100 ml	H	0	1
Somatic Coliphage	counts	/100 ml	H	0	1
Clostridium perfrigens inclusive spores	counts	/100 ml	H	0	1
Enteric viruses	viral count*	/10 L	H	0	1
Parasites (Protozoa) applicable to all potable water				95 percentile	99 percentile
Giardia lamblia	cysts	/100 litre	H	0	1
Cryptosporidium	oocysts	/100 litre	H	0	1
Giardia lamblia and Giardia lamblia (Grab sample)	cysts or oocysts	/10 L	H	0	0

Table 3: Special Requirements for the Protection of Infrastructure

Specifications for water quality intended for human consumption from the source and piped water supply for the protection of infrastructure against corrosion					
Status				**Ranges and upper limits**	
Interpretation				**(Ideal guideline)**	**(Acceptable Standard)**
DETERMINANTS	**Unit**	**Format**	**Concern**	**95 Percentile requirement**	
CORROSIVE AND SCALING PROPERTIES (treated surface water)					
Calcium Carbonate Precipitation Potential	mg/litre	CCPP	I	4 - 5	1 - 6
Alkalinity/Sulphate/ Chloride Ratio	Equi-valents	Corrosivety Ratio	I	With SO_4 and Cl above 50 mg/litre Ratio=(Alk/50)/(SO_4/48+Cl/35.5) > 5.0 Water is Stable Ratio= (SO_4/48+Cl/35.5)/(Alk/50) > 0.2 is Corrosive	
Total Hardness (Ca & Mg)	mg/litre	$CaCO_3$	I	<200	< 400
CORROSIVE AND SCALING PROPERTIES (ground water)					
Calcium Carbonate Precipitation Potential	mg/litre	CCPP	I	4 - 5	3 - 15
Alkalinity/Sulphate/ Chloride Ratio	Equi-valents	Corrosivety Ratio	I	With SO_4 and Cl above 50 mg/litre Ratio=(Alk/50)/(SO_4/48+Cl/35.5) > 5.0 Water is Stable Ratio= (SO_4/48+Cl/35.5)/(Alk/50) > 0.2 Water is Corrosive	
Total Hardness (Ca & Mg)	mg/litre	$CaCO_3$	I	<400	< 1000

Table 4: Frequency of Microbiological Monitoring (including Turbidity values) for Water Supply and Distribution

Size of population served	Turbidity 95%**	Frequency of sampling
> 250 000	< 0,5 NTU	Thrice weekly ***
100 001 – 250 000	< 1,0 NTU	Twice weekly
50 001 – 100 000	< 1,0 NTU	Once weekly

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10 001 – 50 000	< 1,0 NTU	**Three times every month**
< 10 000 reticulated	< 1,0 NTU	**Once every 1 month***
< 10 000 non-reticulated	**1 – 2 NTU**	**Once every 1 month***

* Upon complaints by the consumers or of medical practitioners and after incidents such as pipe breaks, the frequency should be increased until the situation has returned to original counts and been declared safe;

** Average or 95 percentile turbidity of the water supplied

*** The frequency should be stepped up by one extra sampling per week for every 100 000 residents (including the estimated number of visitors residing within the area at any time) in the area served, over and above 250 000.

General Information

1. The area being monitored shall be defined by the Minister in consultation with the Minister responsible for health and, where applicable, relevant officials from the Regional and Local Authorities;
2. At the time of sampling the operator shall also take a "free chlorine" reading of the same water under examination but prior to sampling for microbiological sampling, whilst using a portable device designed for that purpose and accepted by the Minister; this 'reading' is to be recorded and reported together with the results from the microbiological analyses;
3. As for field 'screening' of water supplies for microbiological contamination there exist portable devices designed for that purpose and accepted by the Minister; these 'readings' are to be recorded and reported together with the results from the microbiological analyses;
4. The results of the microbiological monitoring together with the free chlorine readings is to be reported as per mutual agreement to the ultimate supplier (bulk water supplier, Local Authority, or any other supplier) for remedial action where required, and to the Minister for record and monitoring purposes and follow up actions;
5. The costs of routine monitoring shall be borne by the authority commissioning the monitoring;
6. The US-EPA 2012 (update) Drinking Water Standards and Health Advisories shall be used to prescribe the maximum disinfection dosages when deemed necessary by the Minister.
7. Biological monitoring of invertebrates shall be conducted using the NASS method as prescribed in the guidelines by the Minister.

Methodology for Sampling and Analyses

The methodologies followed for sampling and during transit and storage of samples prior to analysis shall be as prescribed.

1. Preferably samples are to be taken in borosilicate glass bottles with a glass or polypropylene screw-cap lid;
2. Where this is not feasible or practical polyethylene bottles with internal seal and with screw-lid can be used;
3. Samples shall, as far as practical, be analysed within 24 hours of sampling;
4. Where there are special requirements for the period between sampling and analysis to be less than 24 hours, such requirement should be attended to as far as is practical;
5. Samples are to be kept and stored, even during transit, at as low a temperature as is practically manageable, whilst preventing the risk of the sample freezing;
6. The sample shall be kept away from light and shielded from sunlight, to reduce chances of micro-/biological growth to a mininum;
7. The use of preservation chemicals should be considered, planned and executed with extreme care;
8. Where sample preservation is appropriate or required an extra smaller volume sample should be taken so as to not upset any other analyses that are affected by the preservation chemical(s);
9. Certain determinants may be monitored 'in the field' at the time of sampling; such field-data are to be measured in a receptacle or container different from the sample container; data so obtained shall be recorded as "field measurement" and cannot replace laboratory analysis for the parameters concerned;
10. The methodologies followed for physical, chemical and microbiological analysis shall be in agreement with the specifications listed in the latest edition of the SANS 241, Drinking Water Standards, published by the SABS.
11. The cost of routine, regulatory inspections and monitoring, for the purpose of fulfilling the provisions of this regulation shall borne by the service provider.

APPENDIX D

REFERENCES

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