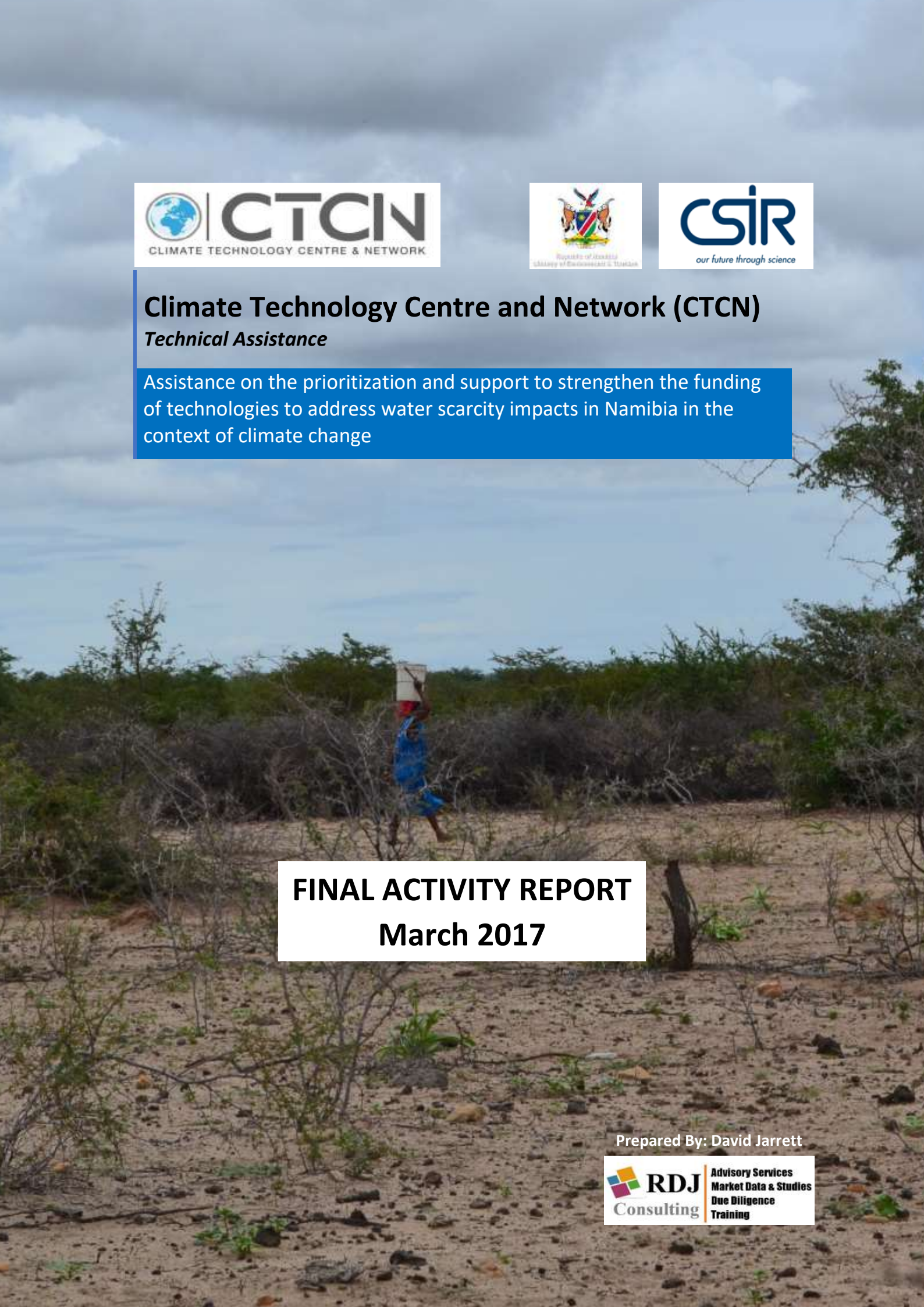

Climate Technology Centre and Network (CTCN)

Technical Assistance

Assistance on the prioritization and support to strengthen the funding of technologies to address water scarcity impacts in Namibia in the context of climate change

FINAL ACTIVITY REPORT
March 2017

Prepared By: David Jarrett

RDJ Consulting
Advisory Services
Market Data & Studies
Due Diligence
Training

Disclaimer

The **Government of the Republic of Namibia** (***GRN***) via the Ministry of Environment and Tourism, through its National Designated Entity (NDE), requested technical assistance from the **Climate Technology Centre & Network** (***CTCN***).

This report represents one of the deliverables of the *Assistance on the prioritization and support to strengthen the funding of technologies to address water scarcity impacts in Namibia in the context of climate change* Project (2011-017/NAM-01).

The Report has been prepared by the National Consultant (David Jarrett of **RDJ Consulting Services** (***RDJ***), Namibia) for the **Council for Scientific and Industrial Research** (***CSIR***) and CTCN to support the Client, i.e. the Government of the Republic of Namibia (GRN), in its specific readiness with respect to climate technology prioritisation finance. The report therefore contains opinions, conclusions and recommendations made by RDJ, using their professional judgment and reasonable care.

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Acknowledgement

It is only fitting that the people who made significant contributions in various forms to the project are acknowledged from the outset of the report. The progress made during the Project and the writing up of this Report could not have been achieved without the co-operation and assistance of many organisations.

The following are thus recognised;

- MET / Namibian NDE - Dr. Jonathan Kamwi, Mr Paulus Ashili and Mr. Petrus Muteyauli
- CSIR – Dr. Thando Ndarana, Dr. Oscar Mokotedi and Tshepiso Botomane
- UNEP – Dr. Jason Spensley and Dr. Sandra Bry
- Carbon Trust – Benjamin Curnier, Adriana Carvallo, Oliver Richards, David Aitken
- MAWF / DWA – Ms. Maria Amakali and Mr. Hendri Beukes
- NamWater – Mr. Johannes Sirunda

As with any acknowledgement listing, the listing will never be comprehensive and so our appreciation goes out also to all other stakeholders that supported the project through their contributions, comments and the provision of data.

Further, the works of previous colleagues is re-iterated in this Final Report to ensure completeness and avoid confusion. For this contribution that makes our work a continuity, we are extremely grateful and acknowledge the contribution here.

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Acronyms

BoN	Bank of Namibia
CSIR	Council for Scientific and Industrial Research
AR	Artificial Recharge
CAN	Central Area of Namibia
CBA	Cost Benefit Analysis
CC	Climate Change
CoW	City of Windhoek
CTCN	Climate Technology Centre and Network
DBN	Development Bank of Namibia
DTU	Technical University of Denmark
DEA	Directorate of Environmental Affairs
DWA	Department of Water Affairs
EIF	Environmental Investment Fund
EIA	Environmental Impact Assessment
GCF	Green Climate Fund
GROWAS	Ground Water Information System
INDC	Intended Nationally Determined Contribution
IBRD	International Bank for Reconstruction and Development
IDB	International Development Bank
IFC	International Finance Corporation
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resource Management
MAWF	Ministry of Agriculture, Water and Forestry
MCA	Multi-Criteria Analysis
MET	Ministry of Environment and Tourism - NAMIBIA
NAD	Namibian Dollar
MoF	Ministry of Finance
NPCC	National Policy on Climate Change
NDC	Namibia Development Corporation
NDE	National Designated Entity
RAND	South Africa – unit of currency (*equal to the NAD*)
RUWIS	Rural Water Information System
UDP	UNEP DTU Partnership
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollars
WDM	Water Demand Management

Units

cm	Centimetres	Length
Cu. M	Cubic Metre	Volume
kL	Kilolitre	Volume
kM	Kilometre	Length
L	Litre	Volume
M	Metre	Length
mm	millimetre	Length
m^3	Cubic Metre	Volume
Mm^3	Million Cubic Metre	Volume
Mm^3/a	Million Cubic Metre / annum	Volume

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1. List of Figures

2. Overview

2.1. Scope of the Report

The main purpose of this report is to provide insight into the actions and benefits carried out as a result of the CTCN Technical Assistance.

This report is limited in accuracy to the time at which Activity 4 was activated and executed. *The full final report however incorporates actions carried out prior to activity 4 so as to allow for completeness*.

- Activities 1 – 3 are completed and the works of previous colleagues is re-iterated in this Final Report to ensure completeness and avoid confusion.
- Activity 4 is explained in detail with clear task correlations re the project pipeline, concept note development and technology priorities provided.

2.2. Country / Project relevance

Namibia lies on the descending branch of the Hadley Cell[1] in the Southern Hemisphere subtropical belt. It is therefore a semi-arid country that suffers from water scarcity problems, thus rendering the country extremely prone and vulnerable to climate change impacts as both the temperatures and rainfall variability are both increasing as a result.

Namibia's climate is governed by its location on the south-western side of the African continent in the Subtropical High Pressure Zone between the Inter-Tropical Convergence Zone to the north and the

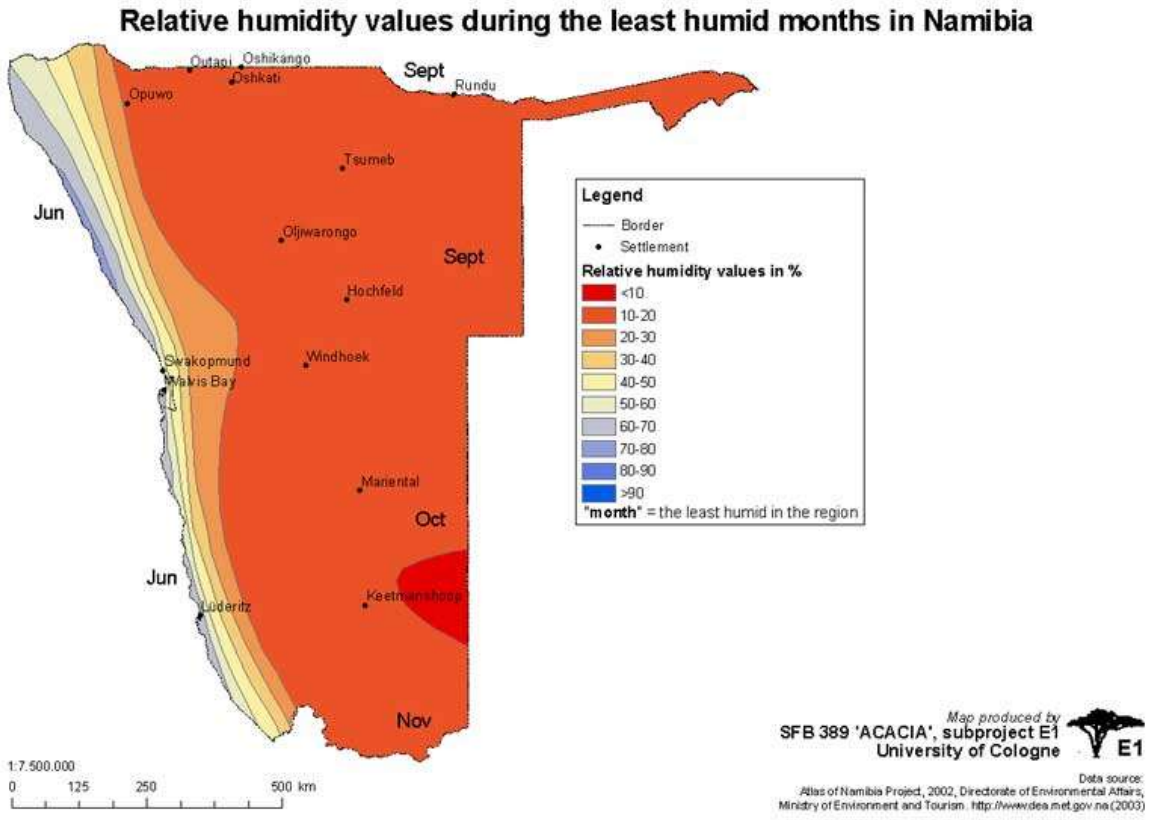


Figure 1 Relative Humidity (Namibia)

[1] https://www.seas.harvard.edu/climate/eli/research/equable/hadley.html

Temperate Zone to the south (Mendelsohn, Jarvis, & Robertson, 2013). The different seasons experienced in Namibia are driven by the northward and southward movement of these zones, in response to the apparent movements of the sun. The movement of the Inter-Tropical Convergence Zone south during the Namibian summer results in the rainfall season, normally starting in October and ending in April. In the far south, the Temperate Zone moves northwards during the Namibian winter, resulting in the winter rains which occur in the far southwest of the country. Small variations in the timing of these movements result in the considerable differences in the weather experienced in Namibia from one year to the next.

Countries in the region face natural constraints such as a high degree of spatial and temporal variability in the rainfall. Namibia due to its extreme arid nature suffers these constraints even more. These constraints are particularly apparent in the case of groundwater resources.

The two most predominant features of Namibia's climate are (IWRM Task Force, 2000) the scarcity and unpredictability of its rainfall. Namibia's climate is second in aridity only to the Sahara Desert within Africa (Barnard, 1998).

With a per capita GDP of USD 5,693 (2013), Namibia is ranked among the Upper Middle Income countries in the World Bank´s categorization and among the Emerging Market Economies by the International Monetary Fund (IMF). However, wealth and income distribution inequality is among the three highest worldwide, illustrated by a Gini coefficient of 63.9 for the 2003-2012 period (UNDP, 2014). According to UNDP's latest Human Development Report, 32% of Namibia´s population lived below the national poverty line, 29% below the international poverty line and 16% in severe poverty in 2013.

Water is a scarce resource and one of the major primary limiting factors to development in Namibia. The effects of climate change, rapid population growth, and rural exodus pose additional challenges and threaten people's livelihoods as well as the balance of the ecosystems.

Namibia's water resources are unevenly distributed throughout the country and there are no perennial rivers within the country's borders. Namibia's international boundaries, both northern and southern are marked by the Kunene River in the northwest, the Okavango River in the central north and the Zambezi and Kwando Rivers in the northeast. The Orange River marks Namibia's southern border. It is only in these rivers that perennial surface water resources are found (Namibia, 2010). These rivers are all shared with neighbouring riparian states with an obligation for them to be managed and used in terms of the relevant rules of International Water Law.

Namibia's ephemeral rivers are "effluent" systems. This means that the groundwater tables are fed by the river, rather than a high-water table acting as a source for the river, as is the case with "influent" rivers. Only a small proportion of the rain that falls on a particular basin ends up as flow in the river (IWRM Task Force, 2000, p. 8).

Namibia's groundwater occurs in a wide range of rock types making groundwater management a complex process. It has to deal not only with highly variable hydraulic properties of the rocks but also very partial knowledge of flow systems and the impacts of human activity – both in terms of abstraction and pollution. The essential feature of Namibia's groundwater is that it continues to provide a buffer against drought in many regions of the country, but it does remain inherently vulnerable to over-abstraction and pollution (IWRM Task Force, 2000, p. 9).

As a result of water scarcity and increasing demand from all sectors, Integrated Water Resources Management (IWRM) has also been identified as essential for the management of the Water Sector in Namibia (Namibia, 2010). IWRM was recognised as an important link that was missing in the management of the Namibian water sector.

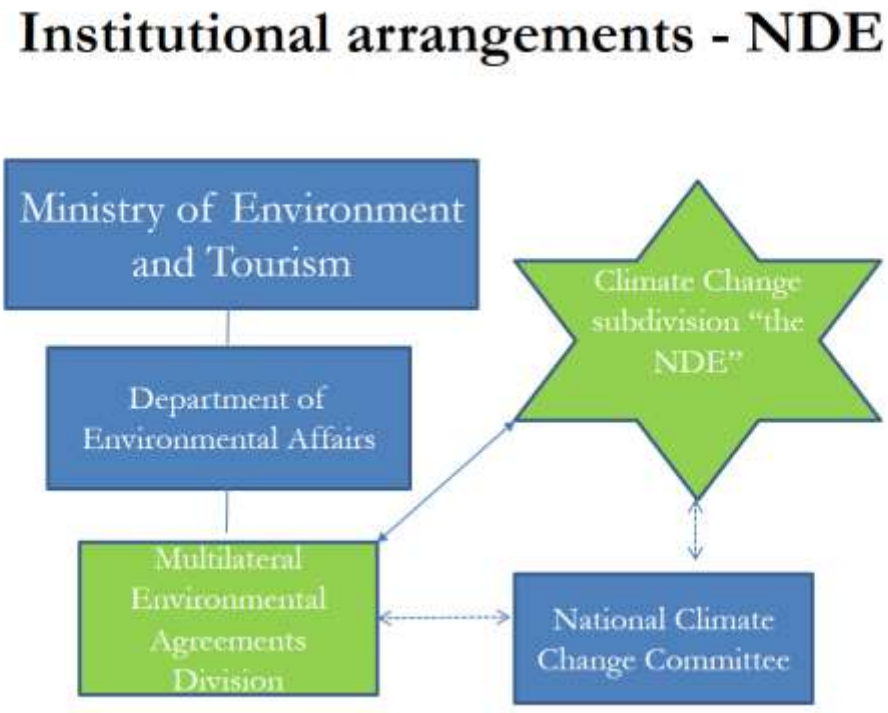


Figure 2 Institutional Arrangements related to the NDE

Through the Ministry of Environment and Tourism, its National Designated Entity (NDE), the Namibian government requested technical assistance from the CTCN that will assist with accelerating the transfer and implementation of water scarcity technologies into the country.

The objective[2] of the CTCN technical assistance is to identify and prioritize climate change adaptation technologies for addressing water scarcity Namibia, as well as to identify and create opportunities to finance their implementation. This is conducted through a consultative and transparent process that will involve as much as possible, all the relevant stakeholders. The prioritized technologies will form a basis for enabling the deployment of water scarcity technology and implementation of related projects. The technical assistance will then link these projects with financing mechanisms and investment possibilities.

This technical assistance has two main components to it, namely;

(**a**) the identification and prioritization of water scarcity technologies, and
(**b**) the development of project concepts from some of these that will be used to solicit climate finance for projects.

As a consortium partner of the CTCN, the CSIR was afforded the honour of developing the response plan and to lead aspects of its implementation in collaboration with the UDP (another consortium

[2] CTCN Response Plan 2014-017/NAM-01

partner of the CTCN) and the Carbon Trust. The latter is a member of the growing global network of the CTCN.

The technical assistance was envisaged to have four activities namely;

- Activity 1: Contextualization of the technology transfer;
- Activity 2: Stakeholder identification and consultation;
- Activity 3: Technology prioritization;
- Activity 4: Investment aspects: Provide support to identify and create opportunities for financial investment to deploy and scale up ranked technology solutions.

Activity 1: Contextualization of the technology transfer;

The contextualization of the technology transfer forms a key pillar to the project and was carried out focussing on;

- A Policy review
- The development of a "long list" of technology actions.

The policy review focussed on encompassing the strategic outlook of the government and other supporting policies and laws. The key policy areas were water and climate change actions, along with other supporting areas such as energy, health and welfare.

Policy Review

As required by the CTCN and as outlined in the NDE operational manual, every technical assistance request and the response thereto should align with national development priorities.

In the context of this technical assistance request, a policy review was conducted to develop the context within which the required technology prioritization was conducted.

As identified by the Namibian National Development Plan (NDP), the country's development plans are

- Poverty reduction;
- Employment creation;
- Promotion of employment creation;
- Stimulation of economic growth and the sustainability thereof;
- Narrowing the disparity in income;
- Reduction of regional development inequalities;
- Promotion of gender equality and equity;
- Environmental and ecological sustainability enhance; and
- Combat the spread of HIV/AIDS

These development priorities played an important role in informing the technology prioritization that was discussed further, so as to align the technology transfer to address water scarcity in Namibia with other issues of national significance and importance.

In addition to the NDP, a number of policies were reviewed. The focus of this review was on water and climate change policies, strategies and plans in Namibia. As noted in local studies, even without the impacts of climate change taken into consideration, the country is likely to face water scarcity in the short to medium term. Climate change exacerbates the problem. The Integrated Water Resources Management (IWRM) Plan, which is the main water related plan in Namibia, stresses the need for the use of unconventional water resources to alleviate water supply deficiencies.

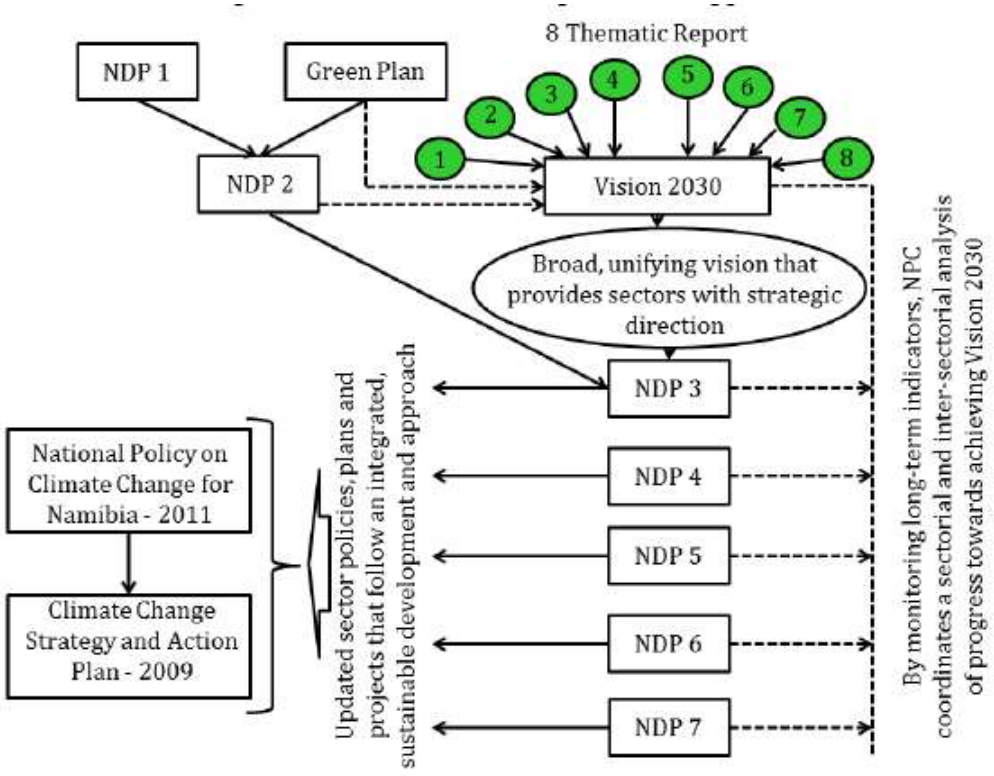


Figure 1: a schematic diagram showing Namibia's Vision 2030, which is a broad unifying vision that provides sectors with strategic direction that must each operationalize through the development of strategies, and monitor through indicators. The sector strategies link with climate change policy, strategy and action plan through specific climate change actions. (Adapted from Vision 2030[1])

Figure 3 Policy Interaction

The Namibian Water Resources Management Act of 2013 and Water National Water Policy White Paper are both in harmony with the IWRM plan and provide the required broader framework within which the former is implemented. Among other issues addressed in the act and the white paper, the importance of using diverse technologies to address water scarcity is highlighted. This in complete agreement with the national development goals as highlighted above.

Along with the more general policy framework, climate change related policies and strategies were also considered. The National Policy on Climate Change for Namibia recognizes that climate change impacts are expected to adversely impact water availability as climate change studies in the region have shown that there will be increased variability in rainfall, increases temperatures, more severe and prolonged droughts, declining soil moisture and as well as increased evapotranspiration

in-line with the general water act and policy and integrated water resource management practices, the climate change policy puts further emphasis on diversifying the water supply in the country as a measure to address water scarcity that will be exacerbated by the changing climate. It goes further to deal with trans-boundary issues that are a common feature in water resources.

As a direct response to the National Policy on Climate Change for Namibia, a National Climate Change Strategy and Action Plan was developed in 2013. Therein, various technology options were highlighted. This informed the technology options that were proposed for prioritization in this

technical assistance plan. Briefly, the technology options that were identified from the climate change strategy were;

- Desalination;
- Efficient irrigation practices;
- Tubewell/Borehole as a drought interventions for domestic water supply;
- Water harvesting; and
- Water reclamation and reuse.

Many of the proposals in the Namibian Climate Change Policy and strategy contributed to the country's Intended Nationally Determined Contribution (INDC). As INDCs will involve reporting to the UNFCCC on progress made towards achieving adaptation goals every five years, this is an important consideration because the impact of this CTCN technical assistance will be measurable.

In summary, the policy review outlined above demonstrated that there is consistency in national development planning and climate change endeavours in Namibia. In particular, adaptation measures outlined in the latter, which are technology focused, suggest that the transfer of the relevant technologies can be directly linked to development goals of the country.

A number of technology options were proffered towards the initial development of a "long list" being;

- Desalination;
- Efficient irrigation practices;
- Tubewell / Borehole as a drought interventions for domestic water supply;
- Water harvesting; and
- Water reclamation and reuse.

As such, whilst the criteria for prioritizing technologies were adjusted during the workshop (see below) by the stakeholders, a direct link to the envisaged water scarcity technology transfer to these development goals was established because the technology prioritization criteria were initially informed by these.

Activity 2: Stakeholder identification and consultation;

This Activity incorporated the preparatory and implementation of;

- Stakeholder Identification
- Workshop Preparation
- Technology Prioritization Workshop

The outcome of the workshop provided a number of potential technology options such as;

I. Pilot desalination plant with renewable power and membrane technology
II. Rainwater Harvesting in Central-Northern Namibia
III. Subsurface Storage of Oshana-Floodwater – Flood water harvesting
IV. Reverse Osmosis (RO) options
V. Aquifer Storage Transfer & Recovery (ASTR)
VI. Drilling and rehabilitation of boreholes
VII. Efficient irrigation systems (sprinkler and drip), incl. irrigation scheduling
VIII. Multi-Stage Flash (MSF) Distillation

Activity 3: Technology prioritization;

The key actions of Activity 2 and Activity 3 led to the identification of technology options, identification of criteria, ranking of the technologies, assign weights to each of the criteria, combine weights and scores, and conduct a sensitivity analysis thus resulting in a prioritization report.

Following the policy analysis, which provided the context within which the technology transfer is going to take place in the technical assistance, and from which options of water scarce technologies were gleaned, technology factsheets were developed. Attempts to factor in the most up to date information in the factsheets were made. These factsheets are provided in Annex II below.

The topics covered in the factsheets are as follows:

- Technology description;
- Contribution to climate change;
- Contributions to development and potential benefits;
- Knowledge/capacity building requirements;
- Institutional arrangements;
- Cost of implication;
- Current status of diffusion of the technology in Namibia and potential private sector involvement; and
- Opportunities and barriers.

The main purpose of these technology factsheets served as input into the technology prioritization workshop. The factsheets were shared with the workshop participants about a week before the workshop took place in order to give the participants enough time to familiarize themselves with their contents.

The Project has carried out a number of steps to arrive at a long list of projects that can benefit from the technology options. As a result, in the initial stage after policy analysis (0 Policy Review), factsheets were prepared to act as a baseline to share and discuss with stakeholders at the national workshop.

At the national workshop, the following sector groups were formed.

- GROUP 1: DESALINATION
- GROUP 2: AGRICULTURAL WATER SUPPLY AND EFFICIENT
- GROUP 3: GROUND WATER RESOURCE MANAGEMENT
- GROUP 4: WATER REUSE AND RECLAMATION

As shown, the long list of potential technologies presented a wish listing that was further examined to create a prioritized “short – list”.

The methodology used was founded on the carrying out of a sensitivity analysis.

This long list was prioritised[3] as follows;

Technology Priority	Group 1: Desalination technologies	Group 2: Agricultural water supply and efficiency	Group 3: Ground Water Resource Management	Group 4: Water reuse and reclamation
Priority 1	Multi-Stage Flash (MSF) Distillation	Efficient irrigation systems (sprinkler and drip), incl. irrigation scheduling	Drilling and rehabilitation of boreholes	Aquifer Storage and Recovery (ASR)

The proposed project accepted from the outset that there would be a number of challenges such as high evaporative rates, cultural expectations of communities (resistance to change), water use behaviour (Water management) and geographic complexity due to wide spread / low density communities.

[3] Full listing in Annex

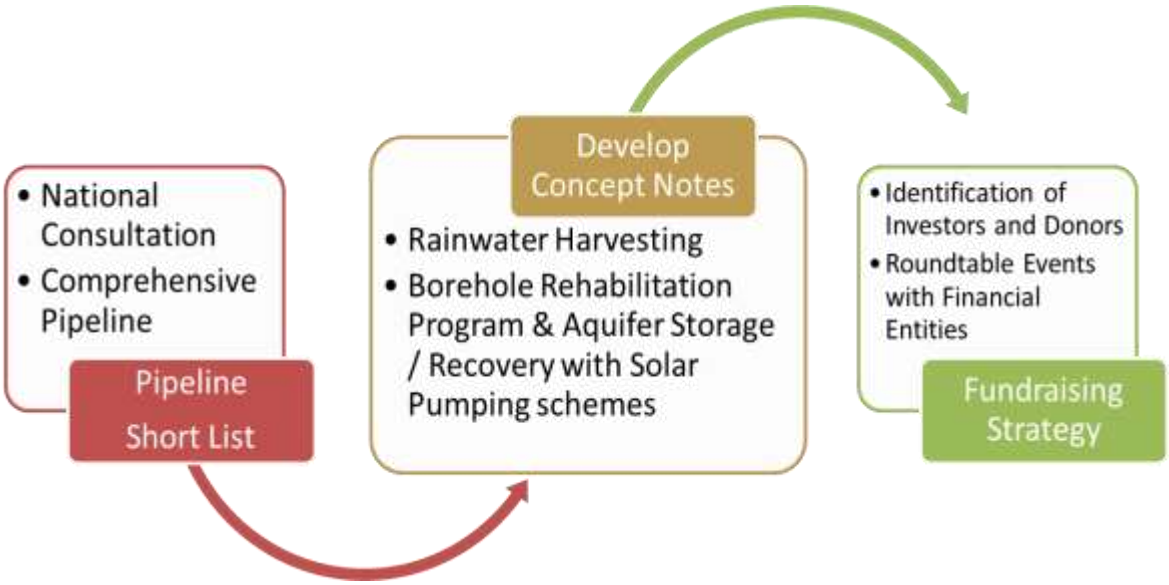
3. Understanding Activity 4

Activity 4 has thus a clear focus on outcome and Investment aspects. This culminates in the provision of support to identify and create opportunities for financial investment to deploy and scale up the prioritized technology solutions.

The key task detailed were;

I. Identify opportunities for financial investment and/or technical assistance to deploy and scale up the highest ranked technology solutions.
II. Catalogue/list of prioritized technologies for the highest ranked technology solutions.
III. Present the technology options to potential investors based within and outside of Namibia.

Deliverables to be aligned to the key tasks outcome.



Output Indicator

- Catalogue of technologies
- Number of potential donor agreements
- Number of concept notes
-

4. ACTIVITY 4 – Investment Aspects

Activity 4 is the final activity for this CTCN technical assistance program. An initial action of Activity 4 was to re-affirm the priority projects and the likelihood for stakeholder support and general ownership of project implementation. 11 Projects (*Project Pipeline (August 2016) 7.3)* were potentially identified and discussed with the key stakeholders (MAWF and NamWater) to give commitment on technology choice and application.

4.1. ACTIVITY 4.1

The technology options chosen at this stage will inform the choice of project concepts to be considered and it was put forward that a total of four to eight projects will be developed based on initial discussions with the key stakeholders.

Two to four of these projects will be based on existing technology transfer projects that did not succeed as a result of a lack of funding, the other two to four will be new concepts developed from scratch to be identified by this TA.

STATUS:

This activity (4.1) is now fully completed.

Although more technology options are indicated from Activity 3, two technology options are now highlighted. This is attributed in part to the key stakeholders (MAWF / NamWater) agreeing on a narrower focus of action.

4.2. ACTIVITY 4.2

The purpose of Activity is to include practical indicators on what projects have used these technologies, how successful they were, and their cost, where to find them (local or international), who produce them and who sell them. The project pipeline once confirmed and updated will attract the projects most likely to succeed and garner solid support from stakeholders and project implementers.

STATUS:

This activity (4.2) is now completed.

Meetings ultimately with stakeholders at MAWF (M. Amakali) and NamWater (J. Sirunda) took place between Sept. 2016 and October 2016, resulting in an agreed ownership of the technologies highlighted.

The purpose of the meeting was to clearly identify;

- Agreed Projects
- Agreed sites / target parameters
- Ministerial/Implementer approval
- Dedicated contact persons

The projects discussed and narrowed for conclusion were;

Project Number	Project Title	Proposal Ownership (Executing Entity)	Implementation Partners
Nam 01	Pilot desalination plant with renewable power and membrane technology	NamWater	DRFN
Nam 02	Rainwater Harvesting in Central-Northern Namibia	MAWF	NFU / NAU / GIZ / MET
Nam 03	Subsurface Storage of Oshana-Floodwater – Flood water harvesting	NamWater	GIZ / MET

At the meeting, the following was discussed and shared[4];

Project NAM 01 has already been submitted to the Adaptation Fund and as such no further assistance is required at this time.

Projects NAM 02 / 03 could be highlighted but they by their natural disposition presented challenges such as saline /fluoride issues and need further examination before being taken forward.

Other Projects (Nam 04 – Nam 11) were also introduced and discussed but also resulted in the discussions pointing to the need for further examination beyond this programme. Ultimately, the projects overall were presented at a strategic level requiring more details to overcome their generic

[4] See section 7.3 Project Pipeline (August 2016)

nature going forward. It was also agreed that a further project proposal was to be put forward by MAWF/NamWater to be identified and communicated in due course under this programme.

The stakeholders were introduced to a draft Concept Note Frame and Project Plan for comments.

4.3. Current Priority Projects

Based on the above, there was a refocusing of efforts to arrive at technologies that would still give tangible action points in line with stakeholder consultation and desire. Desalination was accepted as one of the technologies with wide application and promise for Namibia. The stakeholders therefore would provide further feedback on this and another project technology for the team, to be pursued for investment which resulted in rehabilitation of existing borehole infrastructure being put forward.

The identified and agreed technologies after looking into wider actions and benefits resulted in;

- Desalination
- Rehabilitation of boreholes and pumping technologies

The rehabilitation of boreholes in particular will focus on possible schedules, any reticulation linkages / plans and tariff impacts or general outlooks.

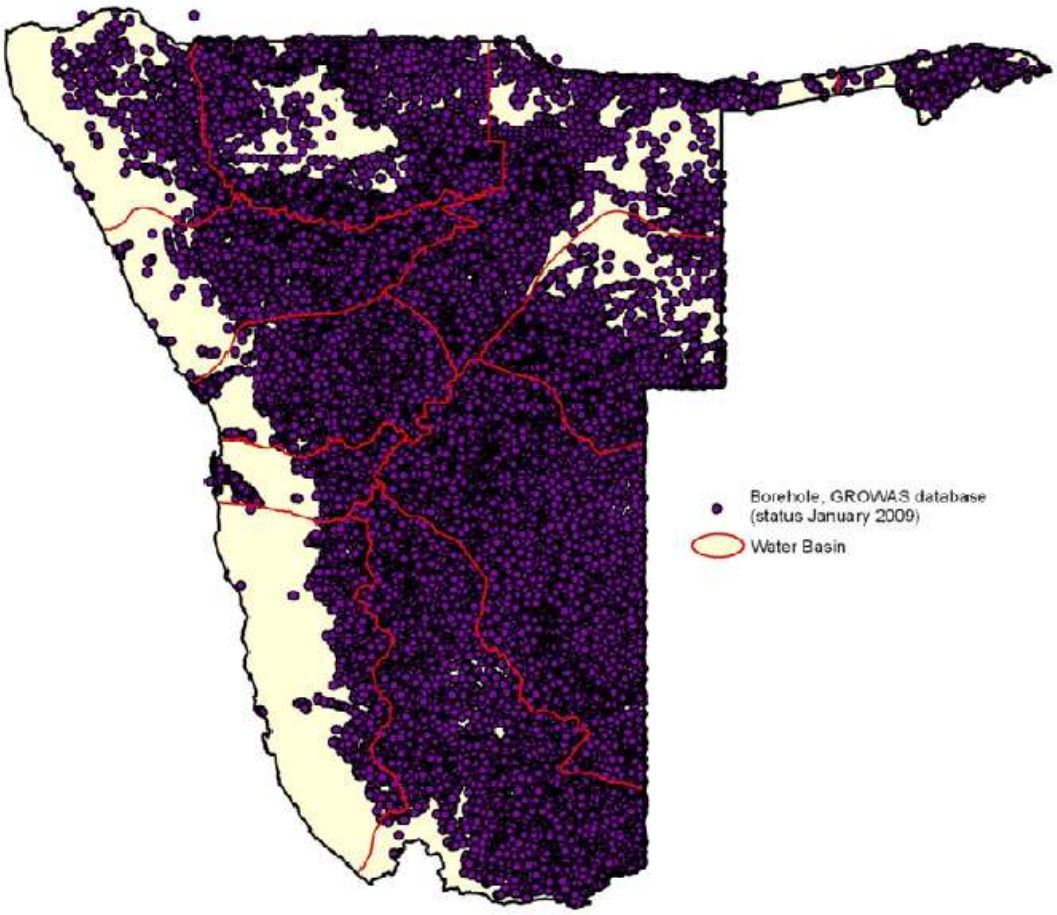


Figure 4 Distribution of Boreholes in Namibia (page 2, IWRM Plan 2010)

5. Concept Note development

5.1. ACTIVITY 4.3

The purpose of this Activity was to provide detailed business plans for the project concepts being developed and have them ready for submission to the financiers. Due however to complications in fully identifying stakeholder driven active projects, concept notes were developed looking at upstream analysis of market conditions and sizing for two technology types (for boreholes and desalinisation).

The developed concept notes will describe recommended aspects of potential for financing and the clear deployment potential pathway for the technologies, as well as a description of the technology, a description of the demand drivers, an estimation of the market size. Included, will also be some financial modelling to understand the potential revenues and costs of deployment of both of these technologies. This market based exercise is informed by stakeholder supported and publicly available data, and will therefore provide general information for the consideration of potential investors.

Proceeding, this Activity is to be further executed through either;

- A short training course on how to strengthen project concepts relevant to these technologies and/or;
- A set of 'investor engagement' meetings with potential investors, in Namibia and internationally. In Namibia, an investor engagement meeting will be held with domestic and international funders. Complementary bilateral meetings and presentations in international forums will be held which will involve travel and accommodation of Namibian government and/or private sector representatives and in some cases the CTCN consortium and/or network partner representative, therefore the activity will be characterized by a set of meetings that will be held at the relevant offices, and corresponding preparatory and follow-up activities.

To assist particularly with the rehabilitation of boreholes concept note development, field data was requested via the Hydrology Section of MAWF.

The type of borehole information requested included;

- Quantity of Boreholes in need of rehabilitation (plus site info)
- Average cost of rehabilitation / borehole
- Rainwater collection areas and collection systems
- Number of public water supply systems
- Desalination systems for rehabilitation (sites)
- Potential new desalination systems (sites / volumes)

However, direct intervention from the project team was required to prevent a purely desktop exercise. As a result, field data was collected from the Rural Water Information System (RUWIS) database in the regions of //Karas, Omusati, Oshana and Kunene. The Chief hydrologist (Mr. Beukes) at MAWF provided further correlating data from its Ground Water Information System (GROWAS) database.

Some idea of borehole rehabilitation costs was also shared by MAWF with the team such as for example;

The estimated prices for cleaning of boreholes are:

Hardap and //Karas:	N$ 25 200.00 per borehole
Kunene and Erongo:	N$ 30 000.00 per borehole

Omusati, Oshana, Ohangwena and Oshikoto:	N$ 30 000.00 per borehole
Omaheke and Otjozondjupa:	N$ 28 000.00 per borehole
Zambezi, Kavango East and Kavango West:	N$ 31 000.00 per borehole

In relation to the desalination concept note, an additional benefit accrued was the visit to Namibia's only two desalination plants for public water supply of communities. Desalination was considered a priority one project for Namibia and so these projects offered valuable first-hand experience and data.

As per the technology fact sheets provided by CuveWaters[5], Desalination is most widely used in arid regions; more than half of the world's current desalination capacity (volume) is located in the Middle East and North Africa. Seawater as a source, accounts for over 50% of desalination sourced water worldwide. However, as of 2005 in the United States, only 7% of desalination plants used seawater. Brackish waters made up the majority of source waters for desalination, with most of the remainder consisting of river waters and wastewaters.

The sites visited were;

Figure 5 Amarika Desalination Plant - Namibia

Amarika in Omusati Region;

- Provide 6.4 m^3 of fresh water per day
- Pull water from a depth of 50 m away
- Handle brine water for purification up to 44 000 µS/cm
- An evaporative pond of 3 364 m^2

Figure 6 Akutsima Desalination Plant - Namibia

Akutsima in Omusati Region;

- Provide 2.7 m^3 of fresh water per day
- Pull water from a depth of 50 m based 5km away from the plant
- Handle brine water for purification up to 44 000 µS/cm
- An evaporative pond of 2 704 m^2

Carbon Trust is now utilising and analysing the data.

[5] *www.cuvewaters.net*

STATUS:

This activity (4.3) is still active.

The project faced a number of setbacks but these have now in general been mitigated and overcome.

A number of issues were clarified with Stakeholders during Activity 4 such as;

- We need Namwater and MAWF input (e.g. regarding project ideas, data to develop the concept notes, etc.)
- The idea is that the Namibian government will use these concept notes to engage with finance providers to get finance for their projects.
- CTCN will not finance these projects directly.

Concept Notes are being developed by Carbon Trust along with suggested business models and/or approaches where possible for utilisation at the potential investor round-tables.

6. Outstanding actions

The project team has pushed forward and made strides. Sadly, there are a few outstanding matters which have a status as follows;

Namibian Water Master Plan (*issued October 2016*)
http://www.namibiansun.com/news/water-master-plan-revealed
Request made to MAWF / Namwater but no response.

Namibian Water Master Plan (*is desalination a part of the plan*?)
Request made to MAWF / Namwater but no response.

Concept Notes
Carbon Trust now developing Concept Notes along with suggested business models and/or approaches.

Investor listing
Carbon Trust is interviewing prospective investors.

Investor Funding Agreements
Carbon Trust is interviewing prospective investors.

7. Annexures

7.1. Key Project Contacts

Organisation	Person	Contact email
Carbon Trust	Adriana Carvallo	Adriana.Carvallo@CarbonTrust.com
Carbon Trust	Benjamin Curnier	Benjamin.Curnier@CarbonTrust.com
Carbon Trust	Oliver Richards	Oliver.Richards@carbontrust.com
Carbon Trust	David Aitken	David.Aitken@carbontrust.com
CTCN	Jason Spensley	Jason.Spensley@unep.org
CTCN	Sandra Bry	Sandra.Bry.Affiliate@unep.org
CTCN	Abdel Karim TRAORE	A.TRAORE@unido.org
CSIR	Oscar Mokotedi	OMokotedi@csir.co.za
NDE / MET	Jonathan Kamwi	mutauk@yahoo.co.uk
MET	Paulus Ashili	paulusashili80@gmail.com
MET	Petrus Muteyauli	pmuteyauli@yahoo.co.uk
MAWF / DWA	Maria Amakali	amakalim@mawf.gov.na
MAWF / DWA	Henry Beukes	HenryB@mawf.gov.na
NamWater	Johannes Sirunda	SirundaJ@namwater.com.na
RDJ Consulting	David Jarrett	consultant@rdjconsulting.co.za
RDJ Consulting	Olga Priscila	olga.priscila@ymail.com

7.2. Project Plan Summary

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Meet with Main Partners, introduce project plan theory	1	1	2	10	**100%**
Project listing confirmation with Main Partners	1	2	4	8	**100%**
Prioritization of Key Projects for investment and concept note development	2	2	12	7	**100%**
Develop Concept Notes	3	4	12	0	**55%**[6]
Present draft Concept Notes to Main Partners	7	1	0	0	**0%**
Arrange meetings with potential investors	8	2	0	0	**0%**
Hold roundtable meetings with potential investors	10	7	0	0	**0%**
Develop draft report on roundtable outcomes	17	2	0	0	**0%**
Incorporate Main Partner comments into draft report	19	1	0	0	**0%**
Final Report	20	1	0	0	**0%**
Presentation of Final Report	20	1	0	0	**0%**

[6] Carbon Trust to advise.

7.3. Project Pipeline (August 2016)

Project Number	Project Title	Proposal Ownership (Executing Entity)	Implementation Partners	Brief description / background	Project site(s)	Region	Technology Focus	Mitigation / Adaptation	Project Duration (Months)	Project Development Status	Additional Remarks
Nam 01	Pilot desalination plant with renewable power and membrane technology	NamWater	GIZ / Cuve Waters	The 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.	Uis / Bethanie	Karas	Desalination / Renewable Energy	Mitigation		Concept	Concept note now developed and submitted again to the Adaptation Fund. (AFB.PPRC_.18.6). Component 1 - Desalination Plant / water Distribution, Component 2 - Hybrid solar/wind power plant, Component 6 - Replication (Bethanie)

Project Number	Project Title	Proposal Ownership (Executing Entity)	Implementation Partners	Brief description / background	Project site(s)	Region	Technology Focus	Mitigation / Adaptation	Project Duration (Months)	Project Development Status	Additional Remarks
Nam 02	Rainwater Harvesting in Central-Northern Namibia	MAWF	NFU / NAU / GIZ / MET	Different types of rainwater harvesting tanks were piloted in the village of Epyeshona, near Oshakati, in central-northern Namibia. Vegetable gardens with water-saving drip irrigation systems were established next to the tanks	Epyeshona, near Oshakati	Oshana	Water harvesting / Drip irrigation	Adaptation		Pilot completed	

Nam 03	Subsurface Storage of Oshana-Floodwater – Flood water harvesting	NamWater	GIZ / MAWF	Subsurface water storage technology is part of the German-Namibian research project, which was aimed at establishing an Integrated Water Resources Management (IWRM) in the Cuvelai-Etosha Basin. The central-northern region of Namibia is characterized by a system of oshanas, very shallow river streams that drain North-central Namibia from north to south during the rainy season.	Epyeshona, near Oshakati	Oshana	Flood Water harvesting	Adaptation		Pilot completed	Cuve Waters executed pilot (http://www.cuvewaters.net) and so no Concept Note. Follow up with GIZ required to then develop Concept Note for replication. GIZ contacts now working in Botsawana on a replication project. Need to find out from MAWF / NamWater, level of local involvement.
Nam 04	Flood water harvesting										Technology prioritised during the workshop.
Nam 05	Construction of pipelines										Technology prioritised during the workshop.

Project Number	Project Title	Proposal Ownership (Executing Entity)	Implementation Partners	Brief description / background	Project site(s)	Region	Technology Focus	Mitigation / Adaptation	Project Duration (Months)	Project Development Status	Additional Remarks
Nam 06	Reverse Osmosis (RO)										Technology prioritised during the workshop.
Nam 07	Aquifer Storage Transfer & Recovery (ASTR)	NamWater	MAWF / Rural water	Utilisation of natural aquifers to store water during rainy season and draw down during droughts etc.	Various (3 sites discussed)	Various	Deep Borehole pumping and recharge systems	Adaptation		Concept	Technology prioritised during the workshop. Concept Note development required.
Nam 08	Aquifer Storage and Recovery (ASR										Technology prioritised during the workshop.
Nam 09	Drilling and rehabilitation of boreholes	NamWater	MWAF / Rural Water	rehabilitation of old boreholes and solarisation of pumping replacing diesel pumps	Various (to be determined)	Various	Borehole pumping and solar water pumps	Mitigation / Cross - cutting		Concept	Technology prioritised during the workshop. Concept Note development required. Discuss with Mr Nepale (NamWater)
Nam 10	Efficient irrigation systems (sprinkler and drip), incl. irrigation scheduling	MAWF	Rural Water / AgriBusiness Development / Famers Union	Sustainable water usage for livelihood development and agri-business	Various (to be determined)	Various	Efficient water delivery systems - Drip / Solar water pumps	Cross-cutting		Concept	Technology prioritised during the workshop. Concept Note development required. Discuss further with Ms Maria Amakali (MAWF)

Project Number	Project Title	Proposal Ownership (Executing Entity)	Implementation Partners	Brief description / background	Project site(s)	Region	Technology Focus	Mitigation / Adaptation	Project Duration (Months)	Project Development Status	Additional Remarks
Nam 11	Multi-Stage Flash (MSF) Distillation		MWAF / NAMWATER								Technology prioritised during the workshop.
Nam 12											

7.4. List of Participants (*National technology prioritisation workshop*)

National technology prioritisation workshop Participants	Designation	Institutions
1. Mr Frank Wittneben		AGRA
2. Mr. Gilbert Mulonda	Manager: Market Promotion and Research	Agro-marketing and trade agency
3. Mr Luther Rukira	Managing Director	Aqua Services and Engineering
4. Pierre van Rensburg	Strategic Executive Infrastructure, Water & Scientific Services	City of Windhoek
6. Mrs Esther Heita		Electricity Control Board
7. Mr. Mathias Moyo		Electricity Control Board
8. Ms. Johanna Kweedi		Environmental Investment Fund
9. Ms. A.M. Iteta		Environmental Investment Fund
10. Hon. E. Wambo	Chairperson HRC	Hardap Region
11. Mr. G. Hochobeb	Deputy Director HRC	Hardap Region
12. Dr. Samuel Mbambo	Governor	Kavango East Region
13. Rev. Heikki Ausiku	Advisor to the Hon. Governor	Kavango West Region
14. Adreas Ngalangi		
15. Mr.Lucas Tumweneni Shekwaanyena	Personal Assistant To The Governor	Kharas Region
16. Hon. Katuutire Kaura	Advisor to the Hon. Governor	Kunene Region
17. Mr. Henry Beukes		MAWF
18. Ms. Asteria Salomo		
19. Mr. Simon Andre Dirkse	Chief Meteorological Technician	Metrological services
20. Ms. Isabella Kapolo	Meteorological Technician	Metrological services
21. Mr.Norwel Sinvula Mwananawa		Ministry of Mines and Energy
22. Dr. Michael Humavindu	Deputy Permanent Secretary	Ministry of Trade and Industry

National technology prioritisation workshop Participants	Designation	Institutions
23. Mr. Vetuundja kazapua		Namibia National Farmers Union
24. Mr. Hiwanaame		NamPower
25. Mr Jaco Hanekom		Namibia Agricultural Union
26. Mrs. Lovisa H Kambonde		National Commission on Research Science and Technology
27.Mrs Alushe Nditya		National Commission on Research Science and Technology
28. Mr A. Middleton	Executive Director	
29. Ms. Martha Shikomba		National Planning Commission
30. Ms. Mirjam Asino		Oshana region
31. Hon. Samuel Shivute		Oshikoto Region
32.Mr. Frans Enkali		Oshikoto Region
33. Mrs Christella W. Mwenyo		Oshikoto Region
34. Mr. Moses !Omeb	Special Advisor to the Governor	Otjozondjupa Region
35. Dr. Elsabe Julies	Biological Sciences	University of Namibia
36. Ms. Saara Shikomba		UNDP
37. Mr.Nelson Zaakapi		UNDP
38. Mrs. Mubyiana		Zambezi Region
39. Mr. Matengu		Zambezi Region
40. Mr. Mbarandongo		Zambezi Region
41. Mr. Franklin Chilinda	Deputy Director: Planning & Development	Khomas Region
42. Mr. Apollos Hamulungu	Chief Development Planner: Planning & Development	Khomas Region
43. Mr. John Siruda	Head: Research & Development	Namwater
44. MR. R .Likando	Project manager	Namwater
45. MR L Kahuva	Geohydrologist	Namwater

National technology prioritisation workshop Participants	Designation	Institutions
44. Dr. Jonathan Kamwi		MET
45. Mr. Sion Shifa		MET
46. Ms. Uazamo Kaura		MET
47. Mr. Reagan Chunga		MET
48. Mr. Paulus Ashili		MET
49. Mr. Kanime Abraham		MET
50 Mr. Panduleni Hamukwaya		MET
51. Mr. Moritz von Hase		Namibian Permaculture
52. David Jarrett		RDJ Consulting Services
53. Mr. Nicco Masule		MET
54. Ms. Greater Mukumbira		
55. Dr Thando Ndarana		CSIR (South Africa)
56. Dr. Sara Lærke Meltofte Trærup		UNEP DTU Partnership
57. Ms. Birga Ndombo	Water Scarcity Technology Coordinator	Ministry of Environment and Tourism
58. Ms. M. Amakali	Director: Water Resource Management	Ministry of Agriculture Water and Forestry
59. Dr. John Mfune	Senior Lecturer	University of Namibia
60. Prof. Mapani		University of Namibia
61.Ndina Nashipili		Ministry of Agriculture Water and Forestry
62.Sarafia Ashipala		Ministry of Agriculture Water and Forestry
63. Ben Van der Merwe		City of Windhoek / ENVES
64. Wimpie kruger		NDC
65.Mariya Newaya		Office of the Prime Minister
66.Alisa Shidhika		
67.Michael Mwamutit		NamWater

National technology prioritisation workshop Participants	Designation	Institutions
68.Victoria T. Shifindi		Ministry of Agriculture Water and Forestry
69. Erginius Endjala	Governor	Omusati Region

8. Workshop Programme: 21 -22 Jan. 2016

Day One – Technology Prioritization 21 January 2016		
Time	Task	Resource
09:00 – 09:05	Introduction and welcome	Facilitator
09:05 – 09:25	Official opening speech	Honourable Minister of Environment and Tourism: Mr Pohamba Shifeta
09:25 – 09:45	Introduction to the Climate Technology Centre and Network (CTCN)	CTCN Climate Technology Manager: Jason Spensley
	Introduction to the Climate Technology Centre and Network (CTCN)	Thando Ndarana (CSIR)
09:45 – 09:55	National Designated Entity (NDE) processes and the water scarcity technology response plan	Jonathan Kamwi (NDE)
09:55 – 10:00	Questions and discussion	Facilitator / All
10:00 – 10:20	Tea break	
10:20 – 10:40	The policy context	Maria Amakali (MAWF)
10:40 – 11:00	Technology options	John Sirunda (NAMWATER)
11:00 – 11:20	Presentation on technology prioritization methodology	Sara Traerup (UNEP DTU Partnership)
11:20 – 11:35	Questions and discussion	Facilitator / All
11:35 – 11:45	Division of participants into groups and definition of group functions, nomination of group leaders	Facilitator
11:45 – 12:30	Technology prioritization: Refine information of the technology options that were identified by the project team (presentation above)	Break away groups
12:30 – 13:00	Discussion and refinement of proposed criteria	Breakaway groups
13:00 – 14:00	Lunch break	
14:00 – 14:30	Groups report back to the participants	Group leaders
14:30 – 15:45	Technology prioritization: Application of the MCA method to the technology options	Breakaway groups

15:45 – 16:00	Tea break	
16:00 – 16:30	Group report back	Group leaders
16:30 – 17:00	Wrap up of day one	National coordinator: Birga Ndombo

Day Two – Technology Prioritization **22 January 2016**		
Time	Task	Resource
09:00 – 09:10	Recap of day one: Presentation of prioritized technologies	Birga Ndombo (National Coordinator)
09:10 – 09:20	Presentation of the development of project concepts	Benjamin Curnier (Carbon Trust)
09:20 – 10:00	Task 1: Describe the concept	Breakaway groups
10:00 – 10:20	Tea break	
10:20 – 10:40	Task 2: Describe the setting	Breakaway groups
10:40 – 11:00	Task 3: Describe the team	Breakaway groups
11:00 – 11:45	Task 4: Explain the plan	Breakaway groups
11:45 – 12:15	Task 5: Describe the benefits and impacts	Breakaway groups
12:15 – 12:35	Task 6: Describe the considerations for implementation factors	Breakaway groups
12:35 – 12:55	Presentation of project concepts	Group leaders
12:55 – 13:00	CLOSURE	
13:00 – 14:00	Lunch break	

9. Activity 3 – Technology Prioritization Listing

Technology Priority	Group 1: Desalination technologies	Group 2: Agricultural water supply and efficiency	Group 3: Ground Water Resource Management	Group 4: Water reuse and reclamation
Priority 1	Multi-Stage Flash (MSF) Distillation	Efficient irrigation systems (sprinkler and drip), incl. irrigation scheduling	Drilling and rehabilitation of boreholes	Aquifer Storage and Recovery (ASR)
Priority 2	Reverse Osmosis (RO)	Flood water harvesting	Construction of pipelines	Aquifer Storage Transfer & Recovery (ASTR)

10.Summary of interviewees for Namibia water concept notes[7]

No.	Name	Organisation, Role	Interview Status
1	Janeke Hoffman	Grundfos, Business Development Head SSA	Completed
2	Uwe Stoll	KfW, Director	Completed
3	Dietrich Remmert	IPPR, Policy Analyst	Completed
4	George Butler	IFC, Water & Sanitation Specialist	Completed
5	Martin Quinger	MAWF / BGW, CEB Groundwater Project Lead	Completed
6	Jez Richardson	CRIDF, Director	Completed
7	Sean Furey	Skat / RWSN, Rural water specialist	Completed
8	Tim Foster	University of Technology Sydney, Sustainable water specialist	Completed
9	Franziske Wende	CuveWaters / GIZ, Water specialist	Completed
10	Hugh Bruce	LUND Engineering Consultants, Water supply and financial modelling expert	Completed
11	Alison Wedgwood	eWaterPay, CEO	Completed
12	Benedict Libanda	Environmental Investment Fund, CEO	Completed
13	Martin Inkumbi	Development Bank of Namibia, CEO	Scheduled
14	David Schaub-Jones	SeeSaw, Founder (eWater specialist in SSA)	Scheduled
15	Ilana Cohen	GSMA, Head of Mobile for Development Utilities	Awaiting reply
16	Barbara Omoregi	Bank of Namibia, Director: Payment and Settlement Systems	Awaiting reply
17	Johannes Sirunda	NamWater, Head of R&D	Awaiting reply

[7] Correct as of 21 March 2017

11.Potential Financing Sources

11.1. Namibia

- Kongalend
- Nedbank Namibia
- Standard Bank Namibia
- The Environmental Investment Fund
- The Development Bank of Namibia

11.2. Regional

- African Development Bank
- Southern Africa Development Bank

11.3. International

- World Bank
- Adaptation Fund
- The Green Climate Fund
- GIZ / KfW
- EU
- GEF

12.Relevant Policies

a) National Development plans (Vision 2030, NDP 4, NDP 5 – Draft)

b) National Water Policy White Paper 2000

c) The Namibian Water Resources Management Act of 2013

d) National Drought Policy and Strategy

e) Water Supply and Sanitation Policy 2008

f) The National Policy on Climate Change for Namibia

g) National Climate Change Strategy and Action Plan 2013 - 2020

h) Intended Nationally Determined Contribution (INDC)

i) Environmental Management Act 2007 (EMA)

13.References

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IWRM Task Force. (2000). *STRATEGIC WATER RESOURCES ASSESSMENT IN NAMIBIA.* Windhoek: MAWRD (MAWF). Retrieved 2017, from http://www.iwrm-namibia.info.na/downloads/theme-report-strategic-water-resources-assessm.pdf

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Namibia, I. P. (2010). *Integrated Water Resources Management Plan for Namibia.* Windhoek: Ministry of Agriculture, Water and Forestry.

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