Windhoek Second Learning Lab Report

Heja Lodge, Windhoek

31st October 2017

Compiled by

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FRACTAL

FUTURE RESILIENCE FOR AFRICAN CITIES AND LANDS

SUMMARY

Future Resilience for African CiTies and Lands (FRACTAL) is a four-year project that is funded by the Department for International development (DFID) and the Natural Environmental Research Council (NERC), within the multi-consortia programme: Future Climate For Africa (FCFA). FRACTAL's main overarching aim is to advance scientific knowledge about regional climate responses to anthropogenic forcings, to enhance the integration of this knowledge into decision-making at the codependent city-region scale, and thus to enable responsible development pathways.

The Windhoek Second Learning Lab took place on 31st October 2017 at Heja Lodge with 40 participants in attendance. This Learning Lab was focused on City of Windhoek Officials. It aimed to raise awareness about the proposed City of Windhoek's Climate Change Strategy and Action Plan, which is being led by the City's Division of Environmental Management.

Preliminary results were presented from the "Water Security in Windhoek: governance, water demand and supply, and livelihoods in the context of urbanization and climate change" research funded by START-GEC. This Project is led by researchers from UNAM and NamWater.

Key next steps towards the proposed City of Windhoek's Climate Change Strategy and Action Plans were identified, namely:

(1) Technical support into the climate change strategy on climate projections.

(2) Undertake a Climate vulnerability assessment.

(3) Focused training with councilors on governance and leadership to get climate buy in and ownership.

(4) Third Learning Lab an opportunity to consult external stakeholders on the City of Windhoek's Climate Change Strategy and Action Plan.

ACRONYMS AND ABBREVIATIONS

CoW	City of Windhoek
CSAG	Climate System Analysis Group
DFID	Department for International Development
FCFA	Future Climate For Africa
FRACTAL	Future Resilience for African Cities and Lands
GRN	Government of Namibia
IPCC	Intergovernmental Panel on Climate Change
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MoU	Memorandum of Understanding
NamWater	Namibia Water Corporation
NERC	Natural Environment Research Council
SOG	Small Opportunities Grant
START	Global Change System for Analysis, Research and Training
UCT	University of Cape Town
UNAM	University of Namibia
NDP	National Development Plan
UNFCCC	United Nations Framework Convention on Climate Change

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1. INTRODUCTION AND BACKGROUND TO THE WORKSHOP REPORT

Future Resilience for African Cities and Lands (FRACTAL) is a four-year project running from July 2015 to June, 2019. The FRACTAL Project is one of five consortia within the Future Climate for Africa (FCFA) Programme. FCFA aims to generate fundamentally new climate science focused on Africa, and to ensure that this science has an impact on human development across the continent.

The FRACTAL Project aims to:

1. Advance scientific knowledge on regional climate responses to global change.
2. Enhance knowledge on how to integrate this scientific knowledge on regional climate responses to global change into decision making at the city-regional scale.
3. Responsibly contribute to decisions for resilient development pathways through case studies.
4. Use iterative, trans-disciplinary, co-exploration / co-production processes to enhance the understanding of co-production of climate change knowledge.

The FRACTAL-related activities in Windhoek are based on the Memorandum of Understanding with the City of Windhoek (CoW), the University of Namibia (UNAM) and the Climate Systems Analysis Group (CSAG) at the University of Cape Town (UCT).

As part of the planned activities in the FRACTAL project for Windhoek, the First Learning Lab took place on 14th-15th March 2017 to discuss the burning issues within the City of Windhoek around the water, energy and climate change. The participants identified burning issues and questions. Two key burning issues identified were (i) Water insecurity; and (ii) Inadequate services in informal settlements (water, sanitation & energy).

The Windhoek Second Learning Lab took place on 31st October 2017 in Windhoek at Heja Lodge. The Second Learning Lab was predominantly City of Windhoek officials with a few external stakeholders in attendance to discuss the proposed City of Windhoek's Climate Change Strategy and Action Plan. The report covers learning lab activities, an overview of the workshop process along with outcomes and lessons learned from particular sessions.

2. WORKSHOP PROCESS AND OUTCOMES

In this section, the second learning lab activities are described based on the Programme (Annex 1: Windhoek Second Learning Lab Programme). Mr. Eddie Jjemba from the Red Cross Red Crescent Climate Centre facilitated the Learning Lab with support from the FRACTAL Team.

2.1. Welcome remarks

Mr. Hans-Christian Mahnke, British High Commission in Namibia

Mr. Hans-Christian Mahnke from the British High Commission in Namibia gave the welcome remarks. Mr Mahnke started by greeting all participants and briefly introduced himself as a Political and Press Officer and a Chevening Officer at the British High Commission in Windhoek, Namibia. He was also involved in the development of the OtjiToilet, a patented dry toilet system when working at the NGO 'Clayhouse'.

Figure 1: Mr. Hans-Christian Mahnke from the British High Commission in Namibia

He thanked all participants for coming together for the day today, and for your continued involvement in this ongoing process. He further elaborated that the FRACTAL research is funded by the Department for International Development (DFID) as part of the United Kingdom's international climate financing commitments and efforts on Sustainable Development Goal (SDG) 13 to "Take urgent action to tackle climate change and its impacts". He alluded to all knowing that the risks from climate change and extreme weather events are increasing, and that improvements in climate risk management are much needed to reduce the impacts, build resilience and enable sustainable development.

Thus, the Future Climate for Africa (FCFA) is a very exciting international research programme, unusual for its two-pronged approach. First, there is a significant investment in cutting-edge research to enhance the scientific understanding and prediction of extreme weather and climate in Africa. At the same time, processes like this one are going on across all four regional projects to work out how best that new understanding can be brought into use to inform current, real-world decisions. He noted that Namibia itself could not be funded by DFID because it is a middle-income country but it can collaborate in regional projects funded by DFID.

Mr. Mahnke was particularly interested to hear about the novel approach being taken by FRACTAL, bringing together so many relevant stakeholders to collaborate in an ongoing series of City Learning Labs. He was fascinated to see how this works in practice today and, as the project progresses, to see how FRACTAL will be able to support work on some of the longer-term policies that are most important for the City, like the Climate Change Strategy and Action Plan. The knowledge partnerships that FRACTAL is building - across many different types of stakeholders and regions of the world - are highly impressive. Through FRACTAL and the broader FCFA programme, north-south collaborations are being strengthened and perhaps more importantly, so are south-south collaborations. He noted that some of the Windhoek team have recently been to Lusaka to exchange ideas on climate-related pressures on the water sector, and he encourage the Windhoek FRACTAL Team to continue this kind of cross-city engagement to share the learning from FRACTAL as widely as possible. Mr. Mahnke was glad to be able to open this event today, and stated that he is looking forward to hearing how the project progresses.

2.2. Interactive exercise to introduce participants

Mr. Eddie Jjemba, Red Cross Red Crescent Climate Centre

Participants were asked to find out information in five minutes from their partner so they could introduce their neighbors to the audience. The following information was reported back: the name, organization, position at organization and a fun fact about the individual.

2.3. Overview of FRACTAL Project in Windhoek

Prof John Mfune, Head of Department: Department of Biological Sciences, University of Namibia

Prof. Mfune started off with a quiz, the Figure 2 below was projected for a 2 minute were participants were asked to keep the answers to share them until the end of the presentation.

Figure 2: Quiz

Prof. Mfune gave an overview and an introduction to FRACTAL Project's history and objectives (http://www.fractal.org.za/). The aims of FRACTAL are to:

(a) Advance scientific knowledge on regional climate responses to global climate change;
(b) Enable knowledge on how to integrate this information into decision making at the city response scale;
(c) Responsibly contribute to decisions for resilient development pathways.

Prof. Mfune explained how Namibia will benefit from FRACTAL as the Project connects climate science to urban development in terms of integration of climate science knowledge in decision-making at city scale. Prof. Mfune stated that Windhoek is undergoing continuous development, some of which may not be climate proof. Prof. Mfune gave an example of the blocks of flats in Acacia area built in a riverbed is not climate proof development because it is prone to flooding events.

Figure 3: Prof. John Mfune from University of Namibia

Prof. Mfune highlighted key opportunities for FRACTAL collaboration in Windhoek:

- The Memorandum of Understanding (MoU) signed between City of Windhoek and University of Namibia.

- Integration of climate science knowledge in decision-making at city-region scale Contribute to resilient development.
- Learning Labs– Co-production: Identify burning issues & explore possible solutions. Multi-stakeholder collaborative platform for addressing a particular complex social challenge.
- The peer-to peer learning exchanges with other city partners such as the Windhoek-Lusaka Learning Exchange.
- Training workshops of new skills and knowledge related to climate information and decision making.
- Embedded researcher which is bridging research and practice. Ms. Kornelia Iipinge is the Windhoek Embedded Researcher for the FRACTAL Project.
- Research Grants e.g. Small Opportunity Grants; and the START GEC project on Water insecurity in Windhoek.

Activities undertaken in Windhoek so far:

1. The ***FRACTAL Windhoek: Inception and First Learning Lab*** took place on the 14th to 15th March 2017 with 37 participants and 33 participants respectively including Honorable Mrs. Sophia Swartz a member of the National Parliament. The participants identified burning issues and questions. Two key burning issues identified were (i) Water insecurity; and (ii) Inadequate services in informal settlements (water, sanitation and energy). Multi-stakeholder collaborative platform for addressing a particular complex social challenge.

Figure 4: Group photo from the Windhoek First Learning Lab

2. The ***Windhoek Climate Risk Narratives*** were development by climate scientists and further co-produced by participants at the First Learning Lab. The three climate risk narratives are: (1) Much hotter with a drier rainy season; (2) Hotter with more rainfall

later in the rainy season; and (3) Warmer with similar rainfall.

3. The ***Climate Change and Decision Making Awareness Workshop for Windhoek Councilors*** took place on 17th July 2017. The half day workshop was attended by the Mayor of Windhoek Mr. Muesee Kazapua, five City of Windhoek Councilors and two Windhoek Constituency Councilors. Joint facilitations from the City of Windhoek; University of Namibia; Ministry of Environment and Tourism; Namibia Meteorological Services; and ThinkNamibia Environmental Awareness and Climate Change Project. The Councilors recognized the need: (i) to revisit environmental related policies in order to make informed climate sensitive decisions; (ii) for their early involvement in policy development; and (iii) for climate scientists to prepare and share simplified versions of climate change related policy.

Figure 5: Group photo from the Windhoek Councilor's Climate Change and Decision Making Awareness Workshop

4. The ***Windhoek Urban Governance Research*** that took place from 14th August to 31st August 2017 with a total of 32 respondents. The research was aimed at understanding how decisions are made in the energy and water sectors. The preliminary results will be presented later in the sessions.

5. The ***Windhoek-Lusaka City Exchange Programme*** funded by FRACTAL's Small Opportunity Grant took place 16th -17th October 2017 in Lusaka and 02nd -03rd November 2017 in Windhoek. Participants for the exchange included representatives from City of Windhoek: Hon. Agatha Iiyambo a City of Windhoek Councilor; Ms. Zelda Scheepers a Section Engineer: Water and Wastewater; Ms. Charmaine Mwilima an Engineering Technician: Civil; and Ms. Grazy Tshipo an Environmental Management Officer. In addition, the FRACTAL Windhoek Principal Investigator (Prof. John Mfune) and Embedded Researcher (Ms. Kornelia Iipinge).

The site visits in Lusaka included the Kafue River, Shaft 5 abstraction borehole and Kalikiliki informal settlement. The Lusaka team is expected in Windhoek on 01-03 November 2017 with proposed site visits to New Goreangab Wastewater Reclamation Plant, Havana and artificial aquifer recharge borehole. In both Cities, the second days of the visits will entail discussions on regarding water and climate changes related issues that affect their Cities.

Figure 6: Participants in Lusaka, Zambia

Prof Mfune shared some of the Windhoek FRACTAL planned activities for 2017/2018 below:

- FRACTAL's assistance in the City of Windhoek's Climate Change Strategy and Action Plan;
- Conducting Content Analysis for City of Windhoek documents and National documents related to climate change, water, energy and environment;
- Honorable Councilors engagement: Summarize climate change related policies and co-produce Windhoek climate risk narrative and info-graphics;
- Baseline survey on climate information: source, type and usage.

After the presentation, participants were given an opportunity to ask questions or comments (see Table below).

Table 1: Questions or comments raised from the presentation

Question/Comment	**Response**
Mr. Hambunda: Why are other towns not included? Maybe we could invite them to learn from us (City of Windhoek).	
Mr. Hambunda: Stakeholder engagements are good platforms to engage Honorable Councilors, this empowers them development and consider resource management plans.	

Mr. Mahnke: - There is a need to address pressing issues such as poverty and inequality etc. - We need to develop policies that talk to development plans. - Developing countries such as Namibia are mostly affected by the impacts of climate change, there is a need to develop adaptive strategies instead of addressing the symptoms.	
Mr. Mahnke: City of Windhoek need to lead by example, this will get people involved in the issues of climate change and sensitize them on environmental issues.	Mr. Hambuda: The City of Windhoek has different policies/plans in place: such as solid waste management, wastewater treatment, environmental management plan, artificial aquifer recharge. Eventually the City will entirely lead by example as political leaderships are slowly starting to show interest and they are taking leadership.
Mr. Mahnke: Money should be raised to allow communities to clean up their areas this gets them involved in the issues of environmental clean-up.	Mr. Hambuda: Communities must be consulted on how they want to clean up their environments, this helps them to get involved and own initiatives.

2.4. City of Windhoek Climate Change Strategy and Action Plan

Mr. Olavi Makuti, Environment Management Division in the Department of Economic Development and Environment, City of Windhoek

Mr. Makuti introduced the City's Climate Change Strategy and Action Plan as essential for the City of Windhoek, with the aim of getting together all departments and divisions in the City to action plans in becoming resilient to climate change. Mr. Makuti defined resilience as the ability to withstand effects of climate change. In addition, he stated that resources are required to adapt to climate change.

Mr. Makuti stated that urbanisation is moving at a very fast rate which the latest estimates at 9% growth rate and 4% city rate. Informal settlements are growing at a fast pace. This communities harvest firewood for cooking. It is ultimate that alternative renewable energies options are available to reduce deforestation. Trees are carbon sinks for carbon dioxide.

Mr. Makuti stated that the **Climate Change Strategy Objectives** sets out Windhoek's climate change programme over the period 2018-2025, providing a clear framework of action for the council, all affected stakeholders and Windhoek residents at large. The **Context of the Strategy** is linked to a lot of international, national and local

conventions, strategies, policies and plans such as:

a. United Nations Framework Convention on Climate Change (UNFCCC).
b. National Policy on Climate Change
c. National Climate Change Strategy and Action Plan 2013-2020
d. Vision 2030
e. Namibia's 5th National Development Plan (NDP5).
f. Harambee Prosperity Plan
g. City of Windhoek based policies: Water Demand Management Strategy, Transportation Master Plan, Waste Management Strategy and Policy, Renewable Energy Policy, Healthy Cities Program, Spatial Development Framework and many others.

The **Strategy development process** is outlined below:

1. Detailed literature review
   - •To assess the current state of adaptation and mitigation in Windhoek. This will include a comprehensive review of existing and newly developed legislation that supports climate change adaptation and mitigation.
   - •All available sector master plans, management plans, will be assessed for alignment opportunities, project ideas, current risks and funding sources.
2. Comprehensive risk assessment
   - •Likely future climate scenario for Windhoek based on regionally downscaled climate change projections contained in national documents.
   - •Climate Change Vulnerability Assessment
3. Stakeholder engagement
   - •Will be conducted to identify priority projects, extreme events hotspots, critical policies and plans, and potential adaptation and mitigation opportunities and barriers.
   - •Workshops and meetings will be organized.
4. Compilation of strategy

The themes listed below represent the **core/focal target areas of the Strategy** for activity to tackle climate change and enhance sustainability within the City of Windhoek:

1. Water Security and Efficiency
2. Energy Efficiency and Renewable Energy
3. Biodiversity and Ecosystem Goods and Services
4. Healthy Communities
5. The Built Environment
   A. Critical Infrastructure
   B. Waste Minimization and Management
   C. Human Settlements (eradication of informal settlements)

The **Proposed Layout of the Strategy** is outlined below:

1. Introduction
   Problem Framing-Climate Change
2. Climate change in the city of Windhoek

    a. Overview
    b. Climate Change Projections
3. The National Strategic Climate Change Context
4. Windhoek Climate Change Response Approach
    a. Climate Change Adaptation
    b. Climate Change Mitigation
5. Climate change focus areas
6. Windhoek's Climate Change Action Plan Framework
    a. Agenda A: Adaptation
    b. Agenda B: Mitigation
7. Implementation Framework
8. Monitoring and Evaluation

Mr. Makuti stated that **additional knowledge and expertise** will be required as below:

- Conducting of baseline climate vulnerability and risk assessment – upon which most adaptation and mitigation actions will be based.
- Facilitate the process of identifying and assessing adaptation and mitigation options (through stakeholder workshop).
- Editing of the final document.

After the presentation, participants were given an opportunity to ask questions or comments (see Table 2 below).

Table 2: Responses to the questions raised from the presentation

Questions/Comments	**Response**
Mr. Kambuli: Did we identify vulnerable factors in the plan and how do we deal with it?	Mr. Makuti: It is important to put environmental sensitive or climate change issues on the City's Balance Scorecard. The Scorecard is a management tool that comprehensively measures the performance of an organisation. These issues need to be popularized and people must be made aware of them within the City of Windhoek departments and divisions.
Mr. Makuti: -The City of Windhoek need to speak to national government more and provide more technical support to smaller towns in order to solve bigger problems in the long run. -There is a need for the climate change strategy to address the issues of integration between CoW's departments, this will address the issues of silo mentality. - Financial sustainability and resource mobilization are important factors that need to be addressed for the plan. -It is important for every single CoW department to adopt the climate change	

strategy.
-Addressing the issues of climate change is leadership driven, therefore leadership support is needed in order to address the issues of climate change.

2.5. Tupopyeni oClimate Talk Show

The host Dr. Anna Taylor introduced the talk Show with the panelist of climate expert Dr. Laura Burgin, Town planner Ms. Kornelia Iipinge and Engineer Dr. James Cullis.

Figure 7: The Tupopyeni oClimate Talk show

The **Climate risk narratives** main features are:

1. A number of narratives are written as a result of uncertainty in future projections of climate.
2. Each individual narrative is written in the present tense without language of uncertainty.
3. They capture multiple lines of evidence and shift the burden of interpreting the data to the climate scientist.
4. Impacts of a change in climate are other non-climate factors can be explored to add context.

The Windhoek Climate Risk Narratives were developed and further co-produced in the Windhoek First Learning Lab. The three Windhoek climate risk narratives developed are: (1) Much hotter with a drier rainy season; (2) Hotter with more rainfall later in the rainy season; and (3) Warmer with similar rainfall. A short description of the three climate narratives are described below:

(1) *Much hotter with a drier rainy season*

In the middle of the 21st century, Windhoek and the surrounding region of Khomas experience temperatures which are much hotter than they used to be. The hottest years which were experienced by the region at the start of the century are now normal. The number of extremely hot days (above 35°C) has doubled on average, although some years are cooler and some are even hotter. The summer time lasts much longer than it used to with many more extremely hot days being felt at the start and end of the rainy season. In central and northern Namibia, rainfall totals have also reduced since the start of the century. On average, Khomas Region receives about a third less rainfall than it did previously in the rainy season but this varies greatly year-to-year due to the influence of El Nino and its interactions with local scale processes such as the availability of soil moisture to drive convective rain systems….

(2) *Hotter with more rainfall later in the rainy season*

The climate of Windhoek in the middle of the 21st century is hotter than it was previously. Temperatures are about 1.5°C to 2°C warmer on average in all months than they were at the start of the century. Extremely hot days are more frequent, particularly in the rainfall season. Days where temperatures rise above 35°C have increased by about 50% compared to the start of the century. Intense convective downpours, triggered by the hot weather and the high moisture content of the atmosphere, occur frequently towards the end of the rainfall season. However the rains are not reliable and some years are still as dry as the dry years at the start of the century…..

(3) *Warmer with similar rainfall*

In Windhoek and the surrounding region of Khomas, cycles of warmer and wetter conditions followed by drier and cooler conditions persist in the middle of the 21st century. Conditions continue to be quite variable from one year to another but on the whole temperatures are about 1-1.5°C warmer than they used to be. Average annual rainfall totals are much the same as they were in previous decades. The influences of El Nino and La Nina continue to be experienced by the region resulting in some years undergoing a prolonged dry season and others being wetter than normal. When rain storms occur in the rainfall season they are typically more intense than they used to be as a result of the warmer atmosphere….

Table 3: Responses to the questions raised from the Tupopyeni oClimate Talk show

Question	**Response**
How do you deal with the level of uncertainty in future climate with the models?	Dr. Burgin: Global climate models (GCMs) are used to analyse what the future climate might be like but these often produce a range of results. We need to then have discussions with people that need this information to help them understand this uncertainty and make better decisions.

Which one of the predicted scenarios as per the three Windhoek climate risk narratives is likely to happen?	Dr. Burgin: Each of the scenarios is a possible future and we cannot say which is most likely at the moment. We currently don't know which climate model is best at capturing current trends, as the observations of climate for Africa are quite sparse. As satellite data is providing more observations, and the time period they cover is building up we are starting to use these in combination with ground observations to assess how good the models are for the present. We can then use this understanding to say which models will perform best in the future.
When developing a model, do you consider global efforts put into changing climate change situation? Example, how will the predicted scenario change for countries?	Dr. Burgin: Yes, in a general sense. Concentration of greenhouse gases in the atmosphere is usually studied with different emission scenarios, this is then passed on to climate scientist to model the outcomes. However, it is quite unclear what will happen to future greenhouse gas emissions, hence the scenarios.
If city of Windhoek want to start modeling, what information should we start gathering in order to tackle this?	Dr. Burgin: Usually a powerful computer is needed, and expert climate scientists and software engineers to develop the codes. Satellite and land-based observations are needed. But it is possible to run some models which only cover a smaller regional models, as these can be run on a PC and are more therefore more cost effective. The FRACTAL project is using international expertise to run climate models and impact models. The FRACTAL project allows us to use expertise e.g. at Climate System Analysis Group (CSAG) at University of Cape Town and in the UK to model the likelihood in the future.
Global Climate Models are expensive, what is it that we as a nation are doing and how close is it to the climate data?	Dr. Burgin: This project is one example of how Namibia as a nation can work with climate scientists to improve the information we produce to aid decision making, starting with the city of Windhoek. The Namibian Meteorological Services works on a weekly and seasonal forecast but they do not do much of climate modeling. The Meteorological office do communicate with the general public.
What type of data feeds into these models or should we just expect	Climate models are quite complex, it is easier to make narratives so people can understand the basic knowledge of climate change. When there is more

final models?	observations fed into the models and understanding of the physical processes, prediction scenarios can be more accurate.

2.6. Windhoek governance arrangements: Preliminary results

Prof. Dianne Scott, African Centre for Cities, University of Cape Town

Prof. Scott introduced the session on the preliminary findings from the Windhoek urban governance research that was conducted during 14th-31st August 2017 by Dr. Davison Muchadenyika and Ms. Kornelia Iipinge. The aim of Governance work package was to understand the governance arrangements in the city of Windhoek with special reference to water and climate change in order to discover entry points and receptivity to climate information. Climate change is predicted to exacerbate water issues of extreme events, greater evapotranspiration, less water. The Governance configuration: elements in relation to each other produce an outcome, i.e. water shortage.

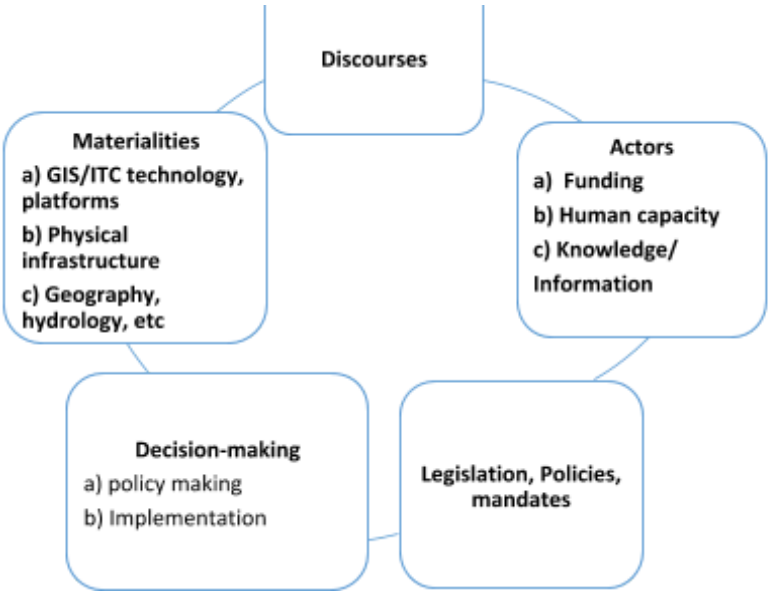

Figure 8: The Governance configuration diagram

The Developmental context of the urban governance in Namibia are:

- Development: 2030 Vision; Harambee Prosperity Plan; and 5th National Development Plan.
- Water: Water Act 1954 (inherited from SA) and Reform – late 1990s (National Water Policy White Paper 2000; Water Supply and Sanitation Policy 2008; and Water Resources Management Act 2013)
- National Climate Change Policy: National Climate Change Strategy & Action Plan.

Prof. Scott gave the preliminary findings on the governance arrangements below:

1. **Discourses**

- Neoliberal economic discourse – 'water as a commodity' – Water demand management.
- Social development discourse – 'water as a right', poverty alleviation, provision of services - standpipes.
- Environmental: 'Water as a scarce resource', Water security and Integrated Water Resource Management – protection of northern aquifer.
- Co-operation and risk sharing – Ministry, NamWater and CoW
- Climate change vulnerable – emerging discourse

2. **Actors**

- Multi-scalar:
  - International
  - National: Ministry of Agriculture, Water and Forestry; NamWater
  - Regional: Khomas Regional Council
  - City of Windhoek:
    - Political actors: Mayor, Management Committee (everyday functions) and Full Council (takes decisions).
    - Administrative actors (Bureaucracy) (No decision-making authority)
      - Chief Executive Officer
      - 9 departments with Strategic Executives as heads
      - Strategic Executive Forum (make recommendations)
  - Other: NGOs, Social movements, researchers, donors, consultants

3. **Policy & Legislation**

3.1. Policy & Legislation: National

- **Development:** 2030 Vision, Harambee Prosperity Plan and 5th National Development Plan.
- **Water & Climate Change**
  - Water Act 1954 (inherited from SA)
  - Reform – late 1990s (National Water Policy White Paper 2000, Water Supply and Sanitation Policy 2008, and Water Resources Management Act 2013)
- National Climate Change Policy: National Climate Change Strategy & Action Plan.

3.2. Policy & Legislation: Windhoek

- Policy reform since 2011
- Transformational Strategic Plan 2017-2020
- Drought Response Plan of 2017
- Windhoek Climate Change Strategy and Action Plan – being developed
- As a Municipality of Windhoek takes its decisions independently.

4. **Materialities are:** Climate, Climate change, and Water and sanitation infrastructure.
5. **Platforms:**

- Platforms for public participation exist at national, regional and local levels.
- National Climate Change Committees. National Emergency Water Committee

6. **Decision-making (Policy making & implementation)**

- **National**:
  - There has been relatively low level of devolution. Most influential actor.
- **NamWater** makes decisions regarding large dams/ water planning
- **Local: Windhoek** however does have independence of water and energy distribution and accounting for the city.

Prof Scott noted the outcome as:

- Acute shortage of water in the face of increasing intensity of droughts in Windhoek
- Where are the gaps? Needs? Hotspots?

2.7. Understanding decision-making related to burning issues and entry points for climate information

Ms. Liz Daniels, Stockholm Environment Institute

Ms. Daniels gave a short presentation on decision-making related to burning issues and entry points for climate information. Objectives for the day were to identify how (and which) decision support methods could be useful for city stakeholders in developing the Windhoek Climate Change Strategy and Action Plan and to identify a relevant case study of a climate sensitive decision already taken which could be explored.

Ms Daniels explained the aims are (1) To better understand decision making processes: When, how, and why have climate sensitive decisions been taken in Windhoek?; and (2) To better support and strengthen future decisions: What methods and tools could be useful to integrate climate information into decision-making processes?

Research has been undertaken by FRACTAL team members reviewing a variety of different decision methods and approaches from different disciplines which could be applied.

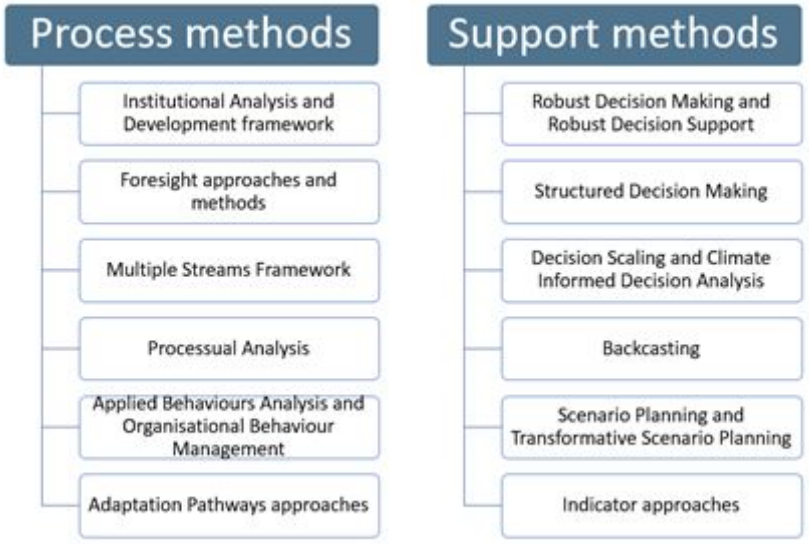

Figure 9: Decision-making process and support methods

Process methods can be applied to understand how climate sensitive decisions have been made. Analysing past decisions can help to understand what processes and actors aligned to achieve an outcome and what climate information was used, in what format, through which institutions and at what point in the decision-making process. This can also help to identify entry points for climate information to be integrated into decision-making going forwards.

Having identified water insecurity as a 'burning issue' in Windhoek at the First Learning Lab, one case that could be explored, which relates to water supply augmentation is the artificial recharge of the Windhoek Aquifer, referred to as water banking. The Windhoek Managed Aquifer Recharge System (WMARS) may be a useful pilot case for decision analysis due to:

- Water insecurity is a burning issue
- Water banking decisions date back over a long period (roughly 15 years)
- It is a climate adaptation strategy proposed in other cities
- It is a climate sensitive medium- to long-term decision affecting biophysical and infrastructural systems at the city regional scale.

It was explained that this is a proposed idea for decision analysis which could produce lessons learned about water banking decisions in Windhoek.

Support methods and tools can help to strengthen decision-making and integrate climate information. It was explained that there are a range of methods and approaches and that there is no one method/approach/tool that suits all circumstances of adaptation decision-making. The decision context and the available 'inputs' to the

decision process should inform the choice of method. Ms Daniels suggested that it was important to understand from the Learning Lab participants if, and how, different methods or approaches could be useful for decision-making e.g. in the Climate Change Strategy and Action Plan. It was explained that Decision Scaling is one approach that is already being applied in Lusaka using the Water Evaluation and Planning (WEAP) model which Dr Cullis would give more detail about. Other methods and tools include those designed to support in identifying and addressing institutional capacity gaps and challenges.

2.8. The use of climate information in infrastructure planning; the application of decision scaling in Lusaka and its potential use in Windhoek

Dr. James Cullis, AURECON

Figure 10: Dr. James Cullis from AURECON

Table 4: Responses to the questions raised from the Prof Scott, Ms. Daniels and Dr. Cullis presentation

Question	Response
How do I sell the idea of climate change to the decision makers, if models are long term?	Large efforts goes into developing seasonal models. There is therefore a gap that we are trying to fill. However decision makers can be informed through meetings/workshop in order to sensitize them to the issue.
What is the chances of South Africa having a hurricane? These cyclones are not so far	We admit that Namibia is not far from South Africa, these two countries are closer together and they share the same ocean. If a cyclone hit down south Namibia can also be affected, however there are so many

from Namibia. Did the people not know about the Durban cyclone? What is happening to the models, are they not working?	variables involved.
I want to know a link between climate change and disaster risk management?	Connections are there, there are opportunities to bring those together so we do not reinvent the wheel. People are moving into proactive management response as opposed to emergency response. We still need to understand the connection between climate change and disaster risk management.
There is a need for systems to be flexible in order to address new variables and climate change issues. We must harness the benefits of climate change too, we should not only concentrate on bad effects.	
Policy makers must appreciate technical inputs, certain areas are reserved however decision makers sometimes override this and cause problems in the long run. We need to sensitize politicians to issues of the environment so they are not left behind. Policies and frameworks need to include politicians. We need to move with decision makers.	

2.9. Water Security in Windhoek: Water Security and Livelihoods in Windhoek

Dr. Ndeyapo Nickanor, UNAM and Dr. Earl Lewis, Multidisciplinary Research Center-UNAM

The Windhoek SysTem for Analysis, Research and Training through Global Environmental Change (START GEC) Project title is Water Security in Windhoek: governance, water demand and supply, and livelihoods in the context of urbanization and climate change. The Project has three research components namely:

1. Water Governance: a case study of processes, actors and timelines at the city of Windhoek industrial Effluent Water Reclamation Plant.
2. The impact of drought on water resources used for supply to the City of Windhoek.
3. Water Security and Livelihoods in Windhoek: modeling synergies and hotspots of water demand and supply in the context of climate change and urbanization.

Below are some preliminary results presented into two sections: (1) Water and livelihood component by Dr. Ndeyapo Nickanor and (2) Water demand and supply component by Dr. Earl Lewis.

A. Water and livelihood component

The Water and livelihood component is led by Dr. Ndeyapo Nickanor is the Dean of the Faculty of Science at UNAM and Prof. Lawrence Kazembe from the Department of Statistics and Population Studies at University of Namibia. Dr. Nickanor indicated that she will focus on the component on water and livelihood, the study will address the following specific objectives:

A. Assess the synergetic links between livelihoods and water security, and subsequent food security amongst different social groups in the City of Windhoek.
B. Investigate the spatial distribution of hotspots accumulating from water supply and demand in Windhoek and how this changes in context of urbanization and climate change.

The study focuses on investigating water inequalities and interdependencies on livelihoods. It will determine the extent to which water security of different social groups in the City of Windhoek is affected by these dependencies. Data from this study will contribute to prioritizing water security based on what will be revealed from possible conflicts-of-use arising from inadequate availability and/or inaccessibility of water resources. Ultimately, the results of the study will contribute to highlighting the importance of policies addressing challenges of water availability, access and conflicts-of-use. In addition, the study will add knowledge to our understanding of barriers and challenges to development of water infrastructure that is more resilient to impacts of climate change hence informing design and development of climate proof water supply infrastructure for the City of Windhoek and regional areas.

Dr. Nickanor indicated that for the study design and sampling A two-stage cluster cross-section sample was used accordingly: At first stage: Random selection of 35 Enumeration Areas with probability proportional to size (PPS), in all 10 Constituencies in Windhoek. The Second stage: Systematic selection of households. Bringing the targeted sample size at 900 households. The Total enumerated was 863 households in nine constituencies with 95% response rate. One of the Constituency was where the high income people live and it was a challenge to administer in that area.

Figure 11: Dr. Nickanor presenting the preliminary results from the Windhoek START Project

The results showed that the highest percentage of respondents are from Constituencies where informal settlements are found i.e. Tobias Hainyeko 19.1%, Samora Machel 15.2% and Moses ǁGaroëb 21.4%. The sources of water in those informal settlement is from communal taps mostly communal prepaid water metered taps. Another source of water is piped into house more for formal households in Windhoek West and John Pandeni Constituency. As for the frequency of water shortage it was common in daily in the John Pandeni Constituency, whilst weekly in Katutura Central Constituency. As for Water-related challenges: with high percentages were rainfall flooding, water logging, drainage congestion and disposal of wastewater all mostly in the informal settlements areas.

The study also looked at the link water security and the food security nexus. The results between food insecurity and lack of water showed the following Constituencies that rarely (one or twice): Windhoek Rural, Tobias Hainyeko, Samora Machel, Moses ǁGaroëb, Khomasdal and John Pandeni Constituencies. Dr. Nickanor concluded with the way forward for the study below:

1. Assess the reliability of the indicators for generating water security index: using Alpha Cronbach.
2. Generate a water security index using the Asian Water Development Outlook Index that uses five dimensions namely: Household security index, Economic security index, Urban water security index, Environmental water security, and Resilience to water insecurity.
3. Examine the linkages between water security and livelihoods: using Structural Equation Models;

4. Examine the relationship between water security and well-being: using Structural Equation Models
5. Examine the relationship between water security and food security: using Structural Equation Models
6. Spatial regression of water demand and consumption deficit.

B. Water demand and supply component

This component is led by Dr. Earl Lewis from Multidisciplinary Research Center (MRC) at UNAM and Mr. Johannes Sirunda the Head of Research & Development at NamWater. Dr. Lewis presented the component on water demand and supply in the Windhoek START GEC Project. The stated that the components objectives were to: (1) Quantify the severity and duration of drought in Windhoek; and (2) Determine if water supply sources and assumptions in Windhoek is sufficient and appropriate to meet the growing water demand and how climate change and urbanization affect this process. The approach and methods to be used is the current and historical data will be obtained from NamWater, MAWF- Department of Water Affairs and the Namibian Meteorological Services. The data will entail Streamflow, Dam levels, Rainfall and Groundwater table levels.

Figure 12: Dr. Lewis presenting the preliminary results from the Windhoek START GEC Project

Dr. Lewis mentioned that three different Drought Indices will be used namely: Standardized Precipitation Index (SPI), Effective Drought Index (EDI), and Streamflow Drought Index (SDI). As for the running the model, the Water Evaluation and Planning (WEAP) a software tool for integrated water resources planning will be used. Simulations of the Current situation and different Scenarios (population growth, urbanization, and drought) will be run.

Current progress on data collected from 1962 to 2017 on the following parameters:

Dam level data, Average Monthly Maximum Temperature, Average Monthly Maximum Temperature, Monthly Total Rainfall, Groundwater table level, and Omatako-Okavango catchment area. On the way forward for the team is to finish up on the Swakop-Omaruru catchment area and collect streamflow data.

2.10. Next steps towards City of Windhoek's Climate Change Strategy and Action Plan

Dr. Anna Taylor from University of Cape Town and Mr. Eddie Jjemba from Red Cross Climate Centre

Moving forward, a group activity of the next steps towards the City of Windhoek's Climate Change Strategy and Action Plan. The action plan outlined the next steps, responsibilities, timelines to further the knowledge partnership with particular focus on City's Climate Change Strategy and Action Plan. The participants were divided into four groups and given some time to discuss what should be the next steps in producing the City of Windhoek's Climate Change Strategy and Action Plan. Below are the next steps as per the group discussion points.

1. Group One discussion

No.	**Group 1**
1	Gain an understanding of climate information.
a)	Understanding climate information (data analysis).
b)	Understand climate change impacts - through analysis or model.
2	-Establish a communication platform (Decision makers, communities, City of Windhoek, academia) which would provide safe space. - Locate this activity between stage 2 and 3 of the process). -The process is not to provide consensus but rather provide a set of options
3	Engage with University students on possible research projects.

Figure 13: Group 1 discussion and feedback

2. Group Two discussion

No.	Group 2
1	Technical support into the climate change strategy on: -Climate projections (data) -Specific data for sectoral disciplines.
2	Capacity building at all levels.
3	Apply the climate change capacity diagnostic tool.
4	Undertake a Climate vulnerability assessment.


Figure 14: Group Two discussion and feedback

3. Group Three discussion

No.	Group 3

1	Develop project plan for FRACTAL support to the CCSAP with regular review mechanism (manage expectations).
2	Focused training with councilors on governance and leadership to get climate buy in and ownership. Proposed workshop name: "***Transformational leadership on climate change***".
3	Third Learning Lab an opportunity to consult external stakeholders on the CCSAP.
4	Targeted technical workshop on climate modeling (how it works and how results can be used) For experts from CoW departments, Ministries, UNAM.

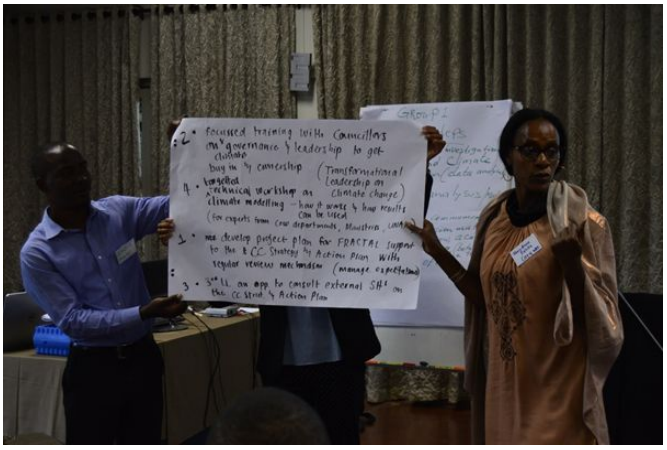

Figure 15 : Group three group feedback

4. Group Four discussion

No.	**Group 4**
1	Governance: -Reform processes -Facilitate cooperation between divisions
2	Key area informal settlement: -Assist with implementation -Advocacy to get buy in from higher levels -Needs an overall re-think (perhaps from a national level, get the bigger picture on why informal settlements are growing)

3	Need to look at livelihood strategies: -Must be sustainable -Look at this as part four overhaul -Links to UNAM's research
4	Think about external impacts and influences e.g. desalination plant.

Figure 16: Group four group discussion and feedback

5. Group Five discussion

No.	Group 5
1	Information sharing: -Need to show the benefit to society, -Awareness raising of city planning.
2	Access information on funding.
3	Review design (infrastructures) standards.
4	Develop long term relationship with UNAM.
5	Get City's CCSAP on CEO's level.
6	Technical & policy makers: -all sectors together -to get buy in to the plan.
7	Workshop: -Co-exploration -Presentation of purpose to National Climate Change Committee.

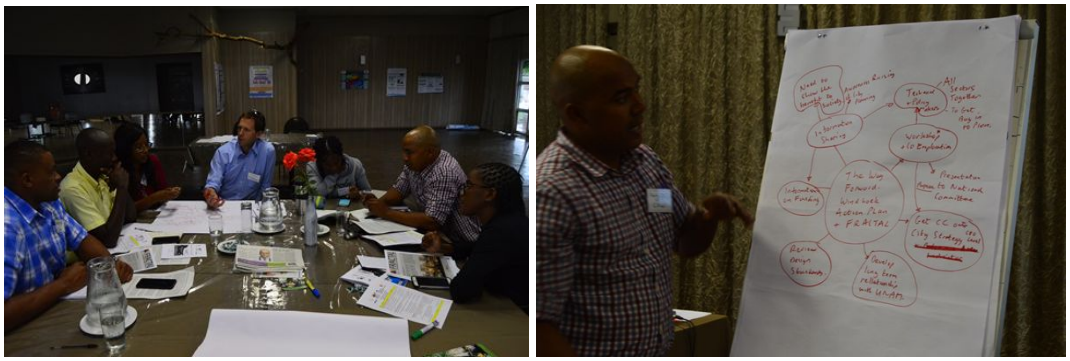

Figure 17: Group five discussion and feedback

3. CLOSING REMARKS

Ms. Mary-Anne, Kahitu, Manager: Environmental Division, City of Windhoek

Giving closing remarks to the FRACTAL Second learning lab Ms. Kahitu indicated her gratitude for being part of the learning platform. She thanked all participants especially Mr. Hambunda who is the new Strategic Executive for Economic Development and Community Services for being part of the deliberations and information sharing experience. Ms. Kahitu further appreciated the presence of the British High Commission in Namibia for supporting FRACTAL and the British effort in supporting scholarship opportunities for young Namibians. Ms. Kahitu also appreciated the effort by the FRACTAL team, particularly in Namibia under the spearhead of Prof. Mfune for the work and commitment they have shown to the project. On behalf of the City of Windhoek Ms. Kahitu thanked the University of Cape Town's team and the other FRACTAL team for making it to Namibia plus their informative presentations. According to Ms. Kahitu, this shows a level of commitment and she looks forward to learning more from these kinds of platforms.

Figure 18: Ms. Kahitu from City of Windhoek giving the closing remarks

Ms. Kahitu further thanked the City of Windhoek team for showing interest and making time out of their busy schedule to be part of the climate change discussions, which is affecting the city. She urged City of Windhoek officials to show their support and make meaningful engagements as they support issues of climate change in the City of Windhoek. FRACTAL Learning Labs are a great platform where stakeholders can share their views, opinions and reflections of stakeholders as they bring about adaptive change while developing resilience strategies to climate change. Finally, she urged everyone to continue the effort of combating and developing strategies to adapt to the changes of climate change in the city. “This session is a great testimony that we are reaping the benefits of FRACTAL in Namibia” said Ms. Kahitu.

ANNEX 1: Windhoek Second Learning Lab Programme

Second Windhoek City Learning Lab
31 October 2017, 09:00-16:00
Heja Lodge, Windhoek, Namibia

Time	Session	Facilitator
08:30-09:00	Registration and Tea/Coffee	
09:00-09:10	Welcome remarks by Mr. Hans-Christian Mahnke, British High Commission	
09:10-09:30	Interactive exercise to introduce participants	Mr. Eddie Jjemba, FRACTAL
09:30-09:45	Overview of FRACTAL Project in Windhoek	Prof. John Mfune, UNAM
09:45-10:30	City of Windhoek Climate Change Strategy and Action Plan	Mr. Olavi Makuti, City of Windhoek
10:30-10:50	Tea Break (and Group photo)	
10:50-11:30	Climate risk narratives	Dr. Laura Burgin, FRACTAL
11:30-13:00	Windhoek governance arrangements: Preliminary results	Prof. Dianne Scott, FRACTAL
	Understanding decision making related to burning issues and entry points for climate information	Ms. Liz Daniels, FRACTAL
	The use of climate information in infrastructure planning; the application of decision scaling in Lusaka and its potential use in Windhoek	Dr. James Cullis, AURECON
13:00-14:00	Lunch	
14:00-14:40	Water Security in Windhoek: Water demand and supply, and livelihoods in the context of urbanization and climate change	Prof. Lawrence Kazembe, Dr. Ndeyapo Nickanor, Dr. Earl Lewis, UNAM; Mr. John Sirunda, NamWater;

14:40-15:50	Visioning exercise and Action planning: next steps, responsibilities, timelines to further the knowledge partnership (with particular focus on City's Climate Change Strategy and Action Plan)	Dr. Anna Taylor, FRACTAL
15:50-16:00	Closing remarks	City of Windhoek
TEA & COFFEE		

ANNEX 2: Attendance list and participants' details

No.	Name	Organization	Email Address
1	Indileni Daniel	City of Windhoek	Indileni.Daniel@windhoekcc.org.na
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6	Moses Ashipala	City of Windhoek	Moses.Ashipala@windhoekcc.org.na
7	Justina Haihambo	City of Windhoek	Justina.Haihambo@windhoekcc.org.na
8	Dirk Coetzee	University of Namibia	engdirkjones@gmail.com
9	Samuel Haraseb	City of Windhoek	Samuel.Haraseb@windhoekcc.org.na
10	James Cullis	AURECON	james.cullis@aurecongroup.com
11	Hans Gerd Lueesse	Ministry of Agriculture, Water and Forestry	hans.lueesse@mwaf.gov.na
12	Anna Taylor	University of Cape Town	annataylor@gmail.com
13	Liz Daniels	Stockholm Environment Institute	liz.daniels@sei-international.org
14	Uaka Kazombiaze	City of Windhoek	Uaka.Kazombiaze@windhoekcc.org.na
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21	Besty Mwanamwali	City of Windhoek	Besty.Mwanamwali@windhoekcc.org.na
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23	Fillemon Hambuda	City of Windhoek	Fillemon.Hambuda@windhoekcc.org.na
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26	Mekondjo Shanyenganye	City of Windhoek	Mekondjo.Shanyenganye@windhoekcc.org.na
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28	Martin Shikongo	City of Windhoek	Martin.Shikongo@windhoekcc.org.na

29	Zelda Scheepers	City of Windhoek	Zelda.Scheepers@windhoekcc.org.na
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31	Charmaine Mwilima	City of Windhoek	Charmaine.Mwilima@windhoekcc.org.na
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ANNEX 3: Climate Risk Narratives for Windhoek

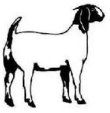
Much hotter with drier rainy season

Natural system
Much hotter
Summer lasts much longer
Extremely hot days have doubled
Khomas receives a third less rainfall

Socio-economic
Larger informal settlements
Fewer tourists

Health
Heat-stress
Poor air quality and respiratory illnesses

Farming
Small-stock instead of European cattle breeds
Price of beef increased



Ecosystems
Water sources polluted with algae
Fewer species of wildlife

Hotter with later rainy season

Natural system
1.5 – 2°C warmer year-round
50% more extremely hot days
Rainfall not reliable
Increased rainfall at end of rainy season

Socio-economic
Strong integrated water demand management policy needed

High electricity demand for air conditioning

More flooding occurs
High tourism levels

Health
Heat-stress
Vector-borne disease

Farming
Irrigation in Northern Namibia – larger harvests

Farmers struggle with variable rainfall
Disparities between commercial and communal

Warmer with similar rainfall

Natural system
1 – 1.5 °C warmer
Variable from year-to-year
Average annual rainfall similar
More intense storms

Socio-economic
High migration and growth of informal settlements

Vulnerability to flooding increased
Transport problems during flooding

High water demand in dry years

Health
Water-borne disease
Vector-borne disease