Addendum VII

Final Project Report for

FRACTAL Small Opportunity Grants

Project Title: Windhoek-Lusaka City Learning Exchange

I. Abstract

The *Windhoek-Lusaka Learning Exchange Programme* project entailed an exchange program between the City of Windhoek in Namibia and the City of Lusaka in Zambia. The project was funded by the FRACTAL Small Opportunity Grants (SOG). Exchange visits took place from 16th to 17th October 2017 in Lusaka and from 02nd to 03rd November 2017 in Windhoek. The aim of this Windhoek-Lusaka Learning Exchange Programme was to encourage inter-city learning by bringing key city actors together to share knowledge and experiences related to the on-going water and climate change work in both cities. The exchange visits to both cities included a diverse range of participants who were drawn from the political, city decision makers and technical city officials, as well as researchers from the respective National Universities (University of Namibia and University of Zambia) and the national water utility. For each of the two cities, the first day was devoted to site visits providing participants first hand experiences to the city's challenges and experimented solutions. The second day was dedicated to informative discussions focusing on crucial climate change related issues facing the cities. During the learning labs held in each city, water insecurity (inadequate availability and lack of access to water of good quality and quantity) and unregulated abstraction and flooding were identified as a burning issue in both cities. Furthermore, it was noted that water will be adversely affected by climate change if no mitigation and adaptive measures are put in place. During these exchange visits, sharing information and experiences and discussions focused on the extent to which the identified burning issues are affected by climate change. Furthermore, discussions revolved around identifying ways to improve current policies and plans via solicitation of better and timely climate change information and mapping out how such climate change information can be integrated into existing plans.

Key findings are that the City of Windhoek recharges groundwater artificially due to limited rainfall while in Lusaka the Lusaka City Council is challenged with residents drilling boreholes uncontrollably. The City of Windhoek has downscaled national documents and policies to better responds to water and climate change issues as opposed to Lusaka City Council. Both Cities are faced with high rates of urbanizations leading to high percentages of residents living in informal settlements. Differences were noted that Windhoek informal settlements are made up of temporal structures whilst in Lusaka the informal settlements structures are permanent. Windhoek mentioned that their municipalities manage distribution of water and electricity and that this is their source of revenue

Lusaka City Council is challenged with solid waste management whilst City of Windhoek has a Solid Water Management plan and it implements ward contractor systems in informal settlements where waste is picked up weekly at households and business whilst daily cleanup of open spaces. The consolidated outcomes of discussions and site visit will feed into the city dialogues and the next city learning labs as part of the on-going activities of Work Package 1, 2 and 3 of FRACTAL Project. These discussions and engagements at cross-city level will therefore contribute to deepening integrated learning process that is central to FRACTAL Strategic objectives. In addition, these discussions will yield information or raise more refined issues or questions about the identified burning issues that will inform and steer some research questions for FRACTAL Work Packages 2 and 3.

II. Project Information

Prof. John Mfune (the "Principal Investigator") and **University of Namibia** (the "Grantee")

The total grant awarded by the Grantor to the Grantee shall be no more than **$9983 *USD***, (***nine thousand nine hundred and eighty-three*** **U.S. Dollars**) for work outlined in the final grant proposal and budget (Addendum I).

The official Term of this Contract is from **31 August 2017** until **30 November 2017**.

1. Introduction

Climate change is adding a layer of complexity to cities that are already constrained and with many challenges. Navigating these complexities call for robust understanding of the climate system and its interaction with the human systems. Therefore, learning is essential for the adaptation of cities to current and future challenges. Through the City Learning labs and Dialogues the Future Resilience for African CiTies and Lands Project (FRACTAL) project has made good progress to kick-start conversations that led to identification of city-wide burning issues. However, there has been insufficient interaction among targeted cities to date.

Therefore, the Small Opportunity Grant (SOG) proposal was submitted in proposing a project that entailed an exchange program between the City of Windhoek in Namibia and the city of Lusaka in Zambia. The aim of this project was to encourage inter-city learning by bringing key city actors together to share knowledge and experiences related to the on-going water and climate change work in each of the cities. This provided an important learning platform for representatives from FRACTAL-affiliated institutions especially city council officials and academic institutions.

It was envisaged that conversations, discussions and planned site visits would generate insights that would sharpen the existing research questions and enhance inter-city collaboration. To this end, the SOG proposal was approved to further FRACTAL's research agenda by enhancing inter-city collaboration and learning through city exchange visits for Lusaka and Windhoek. This report contains activities and discussions carried out under the SOG which predominantly consisted of the Windhoek-Lusaka Learning Exchange Programme that took place on 16th -17th October 2017 in Lusaka and 02nd -03rd November 2017 in Windhoek.

2. Activities and Engagement

The Cities of Lusaka and Windhoek had similar burning issues identified by participants during their first learning labs that took place in September 2016 and March 2017, respectively. These included water security issues in terms of inadequacy, low quality, flooding and unregulated abstraction. The common physical location was that each of these burning issues was amplified in peri-urban settlements. The two day exchange visit was aimed at contributing to FRACTAL's learning objectives as well as building and strengthening inter-city relationships that can be leveraged in future. The Windhoek team visited Lusaka from 16th to 17th October 2017 while the Lusaka team was in Windhoek from 02nd to 03rd November 2017.

For each of the two cities, the first day was devoted to site visits providing participants with first hand experiences to the city's challenges and experimented solutions. The second day was dedicated to informative discussions focusing on crucial climate change related issues facing the cities. Both cities during the learning lab process have identified water insecurity in terms of quality and quantity. Furthermore, it is recognized that water will be adversely affected by climate change if no mitigative and adaptive measures are put in place. During these exchange visits, sharing information and experiences and discussions was focused on the extent to which

the identified burning issues are affected by climate change. Furthermore, discussions revolved around identifying ways to improve current policies and plans via solicitation of better and timely climate change information and mapping out how such climate change information can be integrated into existing plans.

The exchange visits to both cities included a diverse range of participants who were drawn from the political, city decision makers and technical city officials, as well as researchers from the respective National Universities (University of Namibia and University of Zambia) and the national water utility. The discussions were structured in participatory ways to encourage bonding and open discussion of the key issues identified. Windhoek is already implementing water abstraction in harsh and dry conditions as it is a desert and therefore it was imperative that they learn on how to reclaim water in harsh and dry conditions. Lusaka water surface and ground water resources have been identified as dwindling and therefore the exchange visit provided a learning opportunity to see what measures can and will have to be put in place in the event that the water resource capacity in the city is reduced.

During the exchange visit to the City of Windhoek, participants learnt that the city of Windhoek only has a population of approximately 400,000 people. In Lusaka one settlement has approximately the same number if people out of a city population of 2million. The learning opportunity for the city of Windhoek was on how services are being provided to a large population that has varying needs in water provision as well as capacities to access to water. The representatives will learned the diverse modes of service provision to both the planned and unplanned areas in Lusaka.

2.1. VISIT TO LUSAKA

The Windhoek team arrived in Lusaka on the 16th October, 2017. The Windhoek team included (1) Hon. Mrs. Agatha Iiyambo a City of Windhoek Councillor; (2) Ms. Zelda Scheepers a City of Windhoek Water & Wastewater Engineer; (3) Ms. Grazy Tshipo a City of Windhoek Environmental Officer; (4) Ms. Charmaine Mwilima a City of Windhoek Civil Engineer technician; (5) Prof. John Mfune the Windhoek Principal Investigator (PI) from University of Namibia (UNAM); and (6) Ms. Kornelia Iipinge the Windhoek Embedded Researcher. The Programme/Agenda for the Windhoek Team being hosted in Lusaka was followed for all proceedings (see Annex 1: Agenda on 16-18 October 2017).

2.1.1. LUSAKA DAY ONE: 16 OCTOBER 2017

2.1.1.1. Welcoming

On arrival the Windhoek team met at University of Zambia (UNZA) for the welcoming remarks. Dr. Gilbert Siame a Lecturer at UNZA and the Lusaka FRACTAL PI, welcomed everyone present (see Figure 1). He explained that the Lusaka team had Directors from Lusaka City Council's Engineering and City Planning and UNZA academic researchers (see Annex 2: Participants list on 16 October 2017).

Figure 1: Lusaka Team with the Windhoek Team group photo in Lusaka on 16 October 2017

Dr. Siame explained that the Department of Geography and Environmental Studies at UNZA wants to harness the collaboration in terms of exchange of experience and capacity building. He was happy that the approach was to move beyond the academics and into working with communities and municipalities. He stressed that the FRACTAL project aims to make a good start in this direction and has the support of both the former and current Head of Department of Geography and Environmental Studies, Dr. Wilma Nchito and Dr. Orleans Mfune respectively. Similar support has been expressed and provided by the Lusaka City Council (LCC) through Directors of City Planning, Engineering, and Waste Management among other departments.

Moreover, Dr. Siame appreciated the political representation that have been key in working with the Lusaka team on the FRACTAL project. Their engagement has added the flavour to what we do. He was happy to see the Councillor from City of Windhoek amongst the visiting delegation. He assured the Windhoek team that they would engage with the politicians and the community to the visit to the Kalikiliki informal settlement on Day two of the visit.

Dr. Wilma Nchito, a senior lecturer at UNZA, expressed her happiness that the Windhoek team had finally visited Lusaka. She thanked the acting Head of the Geography Department Dr. Nyanga for supporting the program and also thanked the Head of the Department of Geography and Environmental Studies who was not around Dr. Orleans Mfune. In addition, she thanked Brenda Mwalukanga the Lusaka Embedded Researcher.

Prof. John Mfune, the FRACTAL Windhoek PI from UNAM, was happy that the exchange has been a long time coming and was pleased to meet the Lusaka team. The two cities share problems that are both unique and others may be common between the two. He stated that urban problems can be complex and that both cities face water issues which are compounded by climate change. Prof. Mfune mentioned that he was keen to find out through these city-learning visits, the extent to which the experiences of the two cities (Windhoek and Lusaka) regarding water issues and climate change are the same or different. He stated that traveling and information sharing is very useful and was looking forward to the Lusaka team visiting the Windhoek. Cities need to address water quality and quantity and how climate information can be used by our city representatives for planning purposes. The exchange is meant to share lessons on how we have journeyed, based on the FRACTAL process.

2.1.1.2. Visit to Kafue River

It was agreed that the Windhoek delegation would be taken to the Kafue River to see the source of 40% of the Lusaka city's drinking water (see Figure 2). In Kafue it was explained to the team during the discussions that the year of 2015 saw the Kafue River almost reaching critical low levels. Had these levels been reached the Lusaka city's water source would have been threatened. After a good rainfall pattern the Kafue River has regained substantial water levels and abstraction has continued.

Figure 2: Kafue River

Figure 3: Participants discussing at the Kafue River

2.1.1.3. Visit to the groundwater abstraction point

The team was then taken to a groundwater abstraction point within the city of Lusaka called Linyali Shaft 5 (Figure 4). The borehole is under Lusaka Water and Sewerage Company and is one of the main ground water abstraction points. At this abstraction point it was noted that there was encroachment on the land where the abstraction point was. People had constructed houses near the borehole. This posed a risk to the quality of drinking water being abstracted.

Figure 4: Linyali Shaft 5 borehole abstraction point

2.2.1. LUSAKA DAY TWO: 17 OCTOBER 2017

2.2.1.1 Kalikiliki informal settlement

The Windhoek team was taken to the informal settlement of Kalikiliki in Lusaka (Figure 5). This settlement was selected on the basis of being a project study area for the Lusaka START-GEC Project on *Understanding the interaction of planning, flooding and solid waste in the City of Lusaka*. Kalikiliki settlement was mapped for flood prone areas with houses sampled to understand the intensity and frequency of flooding in the community. The purpose of the community engagement workshop was to present the research findings and have a feedback session with the community. A total of 36 community members participated inclusive of the Councillor Mr. Ernest Mtonga the Councillor the Kalikiliki settlement (Figure 6).

Figure 5: Kalikiliki members and the Windhoek team in Kalikiliki

Figure 6: Honourable Councillors Mr. Ernest Mtonga and Mrs. Agatha Iiyambo exchanging contacts

In this stakeholder workshop, a map of the most flood prone areas in Kalikiliki was presented i, Lusaka (Figure 7). It was revealed that the flooding occurs due to intensity in rainfall but also as a result of houses constructed along a stream in the Dambo area. It was noted that indiscriminate dumping of solid waste in drainage channels and the narrowing of the stream bed further contributed to flooding occurred in Kalikiliki.

Figure 7: Dr. Siame presenting the preliminary results in Kalikiliki

Members of the community were then allowed to ask question and most proposed that changes in the behaviour of the community was long overdue (Figure 8). On their part, residents of Kalikiliki felt that they were a forgotten community because many community services such as waste collection were not adequately addressed by the city authorities.

Figure 8: (A) Lusaka City Council official responding to questions raised. (B) Kalikiliki Community Chairperson giving closing remarks

2.2.1.2. Discussions by Lusaka City Council and University of Zambia

After Lunch, the team headed to the Lusaka City Council Committee Room where discussions were held. Below are questions and comments raised for the discussions below according to different themes:

A. Solid waste management:

1. Who takes the next decision for implementation after the research on Kalikiliki informal settlement? Who has the mandate to make decisions on what to do next? The next decisions?

Dr. Siame explained that researchers in Lusaka want to move away from the practice of collecting data from the community to rather engaging them in practical responsibility. Prof Mfune advised that the university can market their research to the media and other relevant stakeholders and propose to clean up the stream together with the community as part of the practical steps identified through this research and data collected.

2. During the discussion it was revealed that the local council of Lusaka outsources some Institutional services that the council is responsible. In cases where services are outsources the private sector only looks at efficiency profits, ignoring enforcement of some council laws and regulations. It was pointed out that solid waste management is a challenge in informal settlements. The Windhoek team echoed these sentiments that indeed waste management is a challenge but suggested that efforts are being make to involve local communities to manage and dispose of these waste.
3. One participant asked whether there are recycling companies in Lusaka. If present in Lusaka, the participant wanted to know whether these companies weigh the waste generated by local communities and if they are then billed at these waste management collection points? Such practice would foster dumping of waste at the dumpsite by these private collectors and hence contribute to better waste management in locations in the city.
4. During these discussions it was noted that the Lusaka local Council does not deal with liquid waste. Liquid waste is managed by another organization.

B. Water resources management:

1. In Lusaka, the key actors involved in in water resource management include the following :-

Lusaka Water and Sanitation Company (LWSC) is commercial water utility owned by 5 local authorities. It provides water to 5 districts namely Lusaka, Luangwa, Kafue, Chongwe and

Chilanga. Lusaka City Council (LCC) is the major shareholder with 60%. However, despite owning the utility, the national government through the Minister of local government directly supervises and directs the operations of LWSC. In this regard, decisions on water are not necessarily made at city level. Rather, these are national or corporate level decisions. The water sector has now been reformed under the new Act to include Water Resource Management Authority (WARMA) which is a regulatory authority of water users which previously did not exist. These changes imply different bodies that are now involved in decision making process. The water ministry provides policy and regulatory guidance in the water sector. LWSC staff plan the operation, maintenance and supply of water infrastructure and water with the approval being given by the board.

The creation of water trusts which are a board of community representatives, a sub structure of the LWSC, is a key actor in water decision-making. These water trusts are responsible for running water supply in the settlements, representing the community in terms of planning to Lusaka water and sewerage, revenue collection as well as maintenance of infrastructure.

The decision making process from a community level is primarily through the water trusts, which then report to LWSC. LWSC subsequently seek final endorsement from the Ministry of Water, Sanitation and Environment. In the case where a decision for infrastructural development is made, consultation with national government structures such as the ministry and the relevant donor are held. Agreements are signed by national representatives as well as city representatives such as the Town Clerk. LWSC and other relevant government departments are responsible for contracting, implementation, monitoring and evaluation of the project.

Figure 9: Communal water point in Kalikiliki informal settlement

2. Key actors involved in water resource management in Windhoek, Namibia.

The City of Windhoek (CoW) is mandated by law to provide water and energy in the area under its jurisdiction. On both water and energy, the CoW buys bulk supplies from two government entities namely, Namibia Water Corporation Ltd (NamWater) and Namibia Power Corporation (NamPower) respectively and distribute to residents. This relationship means that CoW can only take decisions on the two services with regards to distribution, distribution infrastructure, tariffs and consumption. Therefore, decisions on bulk infrastructure and generation capacity are in the hands of NamWater and NamPower. Here, it therefore means that the governance of water and energy in the city is a shared responsibility between government entities and CoW unlike in the case of LCC.

3. The Windhoek team noted that groundwater in Lusaka is not appreciated or protected from pollution.

During the discussion it was also mentioned that the groundwater in the city of Lusaka is being threatened and thus will only be protected through zoning. Through the entire physical planning systems the protection of groundwater is not part of the institutional set up. The institution responsible has not included climate related issues. This is why the built environment is close to a recharge zone. Institutional and climate related decision making needs to begin. There is generalised climate information being disseminated beside agriculture. Water issues are not being targeted. The format of the dissemination of climate information and climate communication is not made easy whether daily or in the longer term. The Zambian Meteorological Department is not taking a lead in climate information, targeted policy, and institutional responses in the water sector. There is need to educate and review policy to include issues of climate change.

B. Climate information and decision making:

A discussion on the use of climate information for decision making was held. The Lusaka Team explained that various institutions use various levels of Meteorological data. For instance the water utility company uses hydrological data and have their own parameters. While academicians engage with Meta data from the Meteorological Department. It was also noted that some weather stations do not have automated data collection tools and equipment hence there are some data missing.

2.2.3. Reflections and Lessons Learned

Below are some of the reflections and lessons learned from all participants during the discussions (Figure 10):

a. Lusaka has a river that flows throughout the year.
b. The START GEC project showcased today deals with real problems that are faced by communities.
c. Data that has been collected through the study have revealed that inadequate waste management practices by local communities is the major source of flooding in Lusaka. In addition, settlements on or along the river channels, and add to the pressure on these flood prone areas.
d. There is good cooperation and participation of the community.
e. Communities contributed to some of the solutions. People suggested things that can be linked to government solutions. Felt the cooperation is useful.
f. In terms of climate change, the change in rainfall patterns, construction and encroachment on the river can all contribute to flooding.
g. Enjoyed the fact that information from different sources was used.
h. Liked the multi-disciplinary approach to the meeting. Council, researchers and community. Liked the fact that the council was not defensive but responded from the point of view of answering and acknowledging the problem and also providing solutions. Academics are usually theoretical. But the research shows that relevant data can be collected for policy development.
i. Seemed that Lusaka has only looked at flooding as the only potential threat of climate change. But perhaps they should consider drought. Should consider extending and protecting the ground water. Windhoek has had dry dams and aquifers that are hence

threatened. Lusaka may not be in immediate danger but needs to make sure that they think of the future.

j. Bringing the council and the people together is great. The fragile communication should not be shattered. Really doing a great job.
k. It was a good idea to begin the learning exchange with a tour and reflect and discuss much later.

A short questionnaire was circulated requesting all participants to detail the lessons learnt, challenges and opportunities identified during the exchange visit. The meeting was then concluded after the discussion and the Windhoek team travelled back to Windhoek on the 18th October 2017.

Figure 10: Lusaka and Windhoek team having a discussion in the Lusaka City Council committee room

2.2. VISIT TO WINDHOEK

The Lusaka team arrived in Windhoek on the 01 November 2017 evening. The team included (1) Mr. Maliwa Muchuu the Director of Engineering at Lusaka City Council; (2) Mr. Godwin Chinoya, the Director City Planning at Lusaka City Council; (3) Dr. Wilma Nchito, a Senior lecturer from the Department of Geography & Environmental Studies at UNZA; (4) Dr. Gilbert Siame, a lecturer from the Department of Geography & Environmental Studies at UNZA; and (5) Ms. Brenda Mwalukanga the Lusaka Embedded Researcher. The Programme/Agenda for the Lusaka team being hosted in Windhoek was followed for all proceedings (see Annex 3: Agenda in Windhoek: 01-03 November 2017).

2.2.1 WINDHOEK DAY ONE: 02 NOVEMBER 2017

2.2.1.1 Visit to Windhoek Wastewater Reclamation Plant

The Lusaka team together with Mr. Olavi Makuti and Mr. Mekondjo from the City of Windhoek's Environmental Management Division and Kornelia Iipinge visited the new Windhoek Goreangab Wastewater Reclamation Plant (Figure 11). They met with Dr. Thomas Honer the General Manager of the Windhoek Goreangab Operating Company (Pty) Ltd (WINGOC) who showed a video explaining the Plant's processes/stages which led to some discussions as highlighted below.

Figure 11: Group photo at New Goreangab Water Reclamation Plant

A. The history of WINGOC

Dr Honer explained that Namibia is the most arid country in Southern Africa. Windhoek, the capital of Namibia, has an average annual rainfall of around 370mm, while the average annual evaporation rate is 3400mm. The nearest perennial river, the Okavango, is 700km from the city on the north-eastern border of the country. Windhoek is therefore continuously facing serious water challenges. In 1968 the Windhoek Goreangab Water Reclamation plant was built by the City of Windhoek to reclaim water directly from domestic sewage effluent. Over the past 30 years the process was improved and the plant capacity extended to 2.9mm per annum.

Due to the fact that all naturally available water sources in and around Windhoek have been fully harnessed, the Windhoek New Goreangab Reclamation Plant was completed in 2002 and comprises the latest available proven water treatment technology. This was done in order to ensure the total utilization of available effluent from domestic wastewater to assure the security of water supply for the future. Dr Honer mentioned that the new plant has been based on extensive experience (30 years), research done locally, and on input from international experts to assure the compliance to the strictest water quality guidelines applied internationally.

B. Water sources

Dr Honer explained that Windhoek Goreangab Operating Company (WINGOC) has a partnership with the City of Windhoek that reclaims waste water to potable water for the City of Windhoek. The City then blends it with water from other surface water sources and groundwater before it is distributed to the residents of Windhoek. The City of Windhoek's Department of Infrastructure, Water & Technical Services is responsible for the supply, distribution and quality of potable water as well as the collection, reticulation and treatment of sewerage water. There are four main sources of water supply to the central area of Windhoek: surface water obtained from the Von Bach, Swakoppoort and Omatako dams owned by NamWater. In addition, groundwater abstracted from municipal production boreholes and the reclaimed water from WINGOC (see Figure 12).

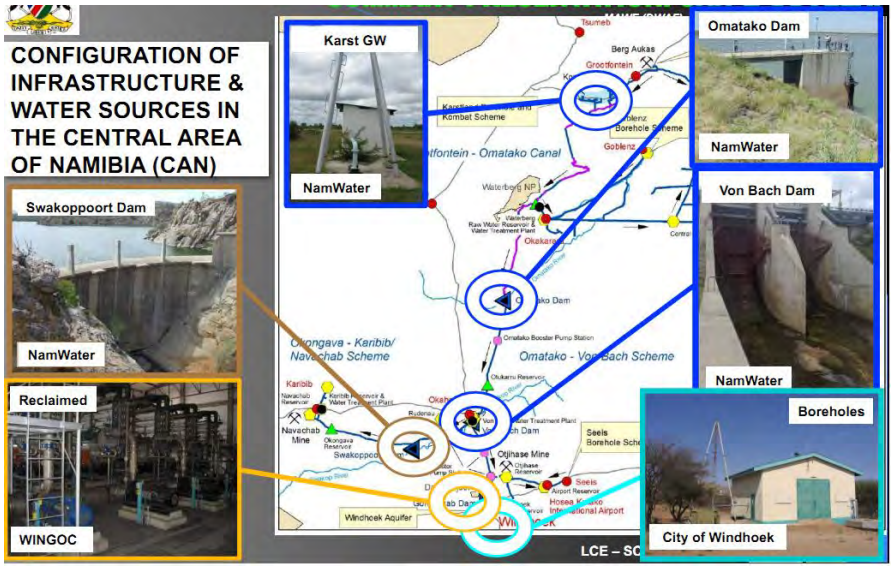

Figure 12: Water sources and infrastructure in the central area of Namibia
Source: Hugh, 2015

C. Process of the water reclamation plant

Dr. Honer took the team on a tour around the plant and explained on the various steps and operations. He explained that WINGOC only receives treated domestic wastewater from Gammas Wastewater Treatment Plant. The Ujams Wastewater Treatment Plant receives and treats Windhoek's industrial wastewater. The treatment steps at WINGOC uses a multiple-barrier treatment sequence as a safeguard against pathogens and other potentially harmful and unwanted contaminants. Intensive bio-monitoring programs and other tests are carried out on reclaimed water, and no negative health effects have been detected as a result of the use of reclaimed water thus far.

Figure 13: The different process/ steps of water treatment at WINGOC plant

Figure 14: Dr. Honer explaining the processes at WINGOC to the visitors

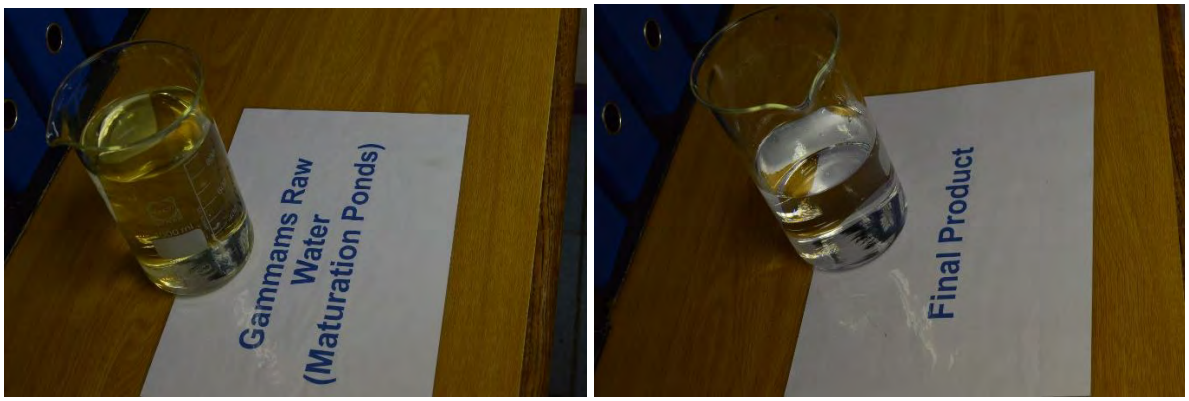

Figure 15: A comparison of the Gammas raw water and the final (reclaimed) product from WINGOC

2.2.1.2. Windhoek START GEC Project preliminary results

During this learning exchange, members of the Windhoek-Lusaka SOG had a session at the University of Namibia at which the Windhoek START GEC project team share some of the preliminary results. The Windhoek START GEC Project is conducting study on *Water Security in Windhoek: governance, water demand and supply, and livelihoods in the context of urbanization and climate change*. Some of the primary results presented to the Lusaka Team are summarized below.

Dr. Ndeyapo Nickanor who is also the Dean of the Faculty of Science at the University of Namibia presented results on water and livelihoods which has the following 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.

A. Water and livelihood component

This component of 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.

Figure 16: Dr. Nickanor presenting the preliminary results from the Windhoek START GEC Project

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. The targeted sample size was 900 households but only 863 households in nine constituencies participated in the survey giving a 95% response rate. The majority of the 5% that did not participate were from the high income constituencies. They refused to take part in the survey.

The results showed that the highest percentage of respondents were 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 settlements are from communal taps; mostly communal prepaid water metered taps. Another source includes water that is piped into houses in formal households in Windhoek West and John Pandeni Constituency. Results further revealed that many households in John Pandeni Constituency experienced frequent water shortage on daily basis, whilst it was on weekly basis in Katutura central Constituency. Water-related challenges included rainfall flooding, water logging, drainage congestion and disposal of wastewater, all mostly in the informal settlement areas.

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

Figure 17: Mr. Sirunda presenting the preliminary results from the Windhoek START GEC Project

Mr. Johannes Sirunda, the Head of Research & Development at NamWater, presented the preliminary results from the component on water demand and supply in the Windhoek START GEC Project. Mr. Sirunda explained how NamWater supplies water to the public and municipalities. He noted that with the increasing population increase there are increasing demands and the challenge is how to supply water to the people in an arid country of Namibia. Namibia's perennial rivers are shared with other SADC states such as Zambezi River. Thus most of the country depends on groundwater supplies and the about 10 dams in the country.

The objectives of the Water Demand and Quality component of the START GEC project were summarized to include: (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. It was noted that to achieve these objectives, current and historical data will be obtained from NamWater, Ministry of Agriculture, Water and Forestry- Department of Water Affairs and Namibian Meteorological Services. The data to be collected will include but not be limited to Streamflow, Dam levels, Rainfall and Groundwater table levels.

Mr. Sirunda mentioned that three different Drought Indices will be used namely: Standardized Precipitation Index (SPI), Effective Drought Index (EDI), and Streamflow Drought Index (SDI).

The Water Evaluation and Planning (WEAP), a software tool for integrated water resources planning, will be used for the running model. Simulations of the Current situation and different scenarios (population growth, urbanization, and drought) will be run. He concluded with the 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 stream flow data.

C. **Questions and answers session**

1. How does city of Windhoek handle the balance between payment for water vs. human rights to water? Dr. Nickanor explained that the community understands that water is a scarce commodity and the supply of water comes with a cost. In the informal settlements community members use communal prepaid water meters that need to be loaded with water units. One cannot get water if there is no water units on the token/card. It was stated that Lusaka faces political interferences in the provision of water but there has not been such cases in Windhoek reported.
2. Dr. Nchito asked what the rate of consumption of water by the different social groups? Dr. Nickanor indicated that more details analysis will still needs to be done but from the presented results they would see that Windhoek West which is considered as a middle income suburb.
3. Mr Sirunda explained that in Namibia one needs to have a permit from Department of Water Affairs at MAWF in order to drill and abstractions water from borehole. The Department of Water Affairs monitors boreholes and considers re-applications of permits. Mr. Sirunda said NamWater is also regulated by MAWF. Mr. Muchuu said unlike in Lusaka, citizens in Lusaka drill boreholes for domestic use without applications of permits.
4. Mr. Muchuu asked how non-revenue water is dealt with in Windhoek as Lusaka's non-revenue water is at 40%. Mr. Sirunda stated that non-revenue water is a challenge in Windhoek as well as in other towns in Namibia. Water leakage detection is still a challenge in Windhoek and contributes to non-revenue water.

2.2.1.3. Visit to Havana Informal settlement

The team were taken to the Havana informal settlement in Katutura. In this informal settlement, Lusaka participants noticed that unlike in Lusaka the housing was temporal and made from corrugated iron shacks. However, in Lusaka the housing or shelters are made from concrete or burnt bricks. The Havana community have access to water and sanitation services from the local authorities through communal water points and public toilets (Figure 18 and Figure 19). Unlike in Lusaka, the local authority in Windhoek bought water from the main water utility company and resell at a small profit to the consumers. It is one of the streams of revenue for the city. This is not the case in Lusaka. The team was also shown a biofuel toilet / dry or ecosan toilet that is constructed at low cost (Figure 20).

Figure 18: A child withdrawing water from the communal prepaid water metered standpipe

Figure 19: Communal toilets and water standpipes in Havana informal settlement

Figure 20: Dry toilet for an individual house in Havana

2.2.2. WINDHOEK DAY TWO: 03 NOVEMBER 2017

The meeting was chaired by Hon. Agatha Iiyambo the Councilor of City of Windhoek. She welcomed the Lusaka Team to Namibia and all other participants. All participants were given an opportunity to introduce themselves (

Annex 5: Participants list on 03 November 2017). The City of Windhoek included Mr. Fillemon Hambuda, the Strategic Executive of the Economic development and Community Services who previously serves as the acting Chief Executive Officer (CEO) of the City of Windhoek for over a year and a half. Ms. Mary-Anne Kahitu the Manager of the Environmental Management Division was also present among others.

Figure 21: Lusaka and Windhoek team having a discussion in the City of Windhoek committee room

2.2.2.1. City of Windhoek's water and climate change issues

Mr. Olavi Makuti the Environmental Officer at the City of Windhoek gave a presentation on the City of Windhoek's water and climate change issues.

Figure 22: City of Windhoek's water and climate change issues presentation by Mr. Olavi Makuti

A. History and City structure of the City of Windhoek

Mr. Olavi indicated that Windhoek is the capital city of the Republic of Namibia. Most government operations are still centralized. The country is divided into 14 Regions, each headed by a governor appointed by the President. Regions are further sub-divided into constituencies. The City of Windhoek has a population of about 400,000 people. The City was developed at the site of the permanent spring around 1840 where the name Windhoek stands for "hot springs". He

further described an informal settlement called Katutura that is located in the northwestern part of the City.

The City of Windhoek council is governed by Local Authorities Act. Councils vary from region to region. Windhoek has 15 councilors of the City of Windhoek. The Mayor and Deputy Mayor are elected among the councilors by the councilors. Execution of duties is undertaken by a management committee. Council meets once a month. All councilors operate on part time basis. The Mayor cannot make unilateral decisions. Decision making is by consensus. The executive management of the city includes the Chief Executive Officer (CEO) assisted by 9 departmental Strategic Executives (SE) namely: Department of City Police; Department of Economic Development and Community Services; Department of Electricity; Department of Infrastructure, Water & Technical Services; Department of Human Capital and Corporate Services; Department of Housing, Property Management & Human Settlement; Department of Finance & Customer Service; Department of Urban Planning and Transport Planning; and Department of Information & Communication Technology.

In his presentation, My Olavi alluded to the fact that Zambia and Namibia's relations began as early as the 1960. Some freedom fighters were accommodated in Zambia and Angola. One of the longest streets in Windhoek is named after Dr. Kenneth Kaunda and a flat has been bought for the former Zambian president.

B. Windhoek's Climate

Windhoek receives between 300-350 mm of rainfall per year. Highest rainfall is recorded in the north eastern regions, Okavango and then Ohangwena region. Rains come sporadically and at time with high intensity. Rain is not properly spread. The rainfall season starts between October and April. Evaporation is high and exceeds precipitation by 90%. The dams mostly reach 40% full dam's capacities. If it does not rain the next rainy season in any year, this creates water crisis and the city reverts to using recharge water in the aquafers in the city as an emergency measure.

C. Sustainability challenges

- High urbanization rate. Global projections indicate that more than half the population will be in cities.
- Over-exploitation of natural resources to meet basic needs especially in informal settlements.
- Limited water resources due to high aridity. Goreangab dam water is not utilized due to high pollution.
- Protection of urban natural spaces and biodiversity such as pubic parks.
- The city buys water from Nam Water in bulk and distributes to the consumers in the city. The city is a big consumer of NamWater. The city is worried about the future supply. Water comes from a three dam system (Swakoppoort, Von Bach and Omatako Dam).
- NamWater is undertaking studies on long-term water supply options such as desalinization.
- Sand mining an issues and the city has developed a City of Windhoek Sand Mining Policy mid-2017. Need to regulate this sand mining to avoid harming the environment.

- Have a biodiversity inventory and have looked at the threats.

D. The City of Windhoek's response

- Have established a climate change desk.
- Integrated climate change strategy and action plan being developed.
- Awareness –envisioned Windhoek Green News via online.
- Various Projects such as the compact of Mayors, produced a preliminary greenhouse inventory, FRACTAL, Windhoek Bremen Climate Partnership, Various Infrastructure projects in the pipeline, various ongoing projects to mitigate effects of climate change.
- In the process of developing an environmental education center (learning and excursion for children).
- Contribute to National and international efforts such as the
  - National climate change committee
  - National greenhouse gas inventory working group
  - National communications to the UNFCCC
  - Future plans and studies at national scale: Desalination of water, Greening of the desert and Underground storage.

E. Demonstration of City of Windhoek's efforts

- Approved the integrated transportation master plan
- Artificial recharge of aquifers in Windhoek.
- Solid waste recycling at household level.
- Water demand management programme.
- Water reclamation at Windhoek Goreangab reclamation plant.
- Methane gas extraction from the Kupferberg landfill site in Windhoek (waste to energy project). Biogas from Gammas reclamation plant.
- Biodiversity inventory and management framework.
- Proposed City of Windhoek's Climate Change Strategy And Action Plan
- City of Windhoek Renewable Energy Policy just approved by Council.
- City's boundaries has been expanded.
- Strategic Environmental Assessment (SEA) and Spatial Development Framework (SDF). Have been approved by Council.
- Awareness raising activities, Water Campaign to promote reduction in water use at household and industrial levels punitive measures attached.

2.2.2.2. Discussions by City of Windhoek and University of Namibia

After the presentation Hon. Iiyambo opened up the questions and answer session focused on discussions of water and climate change issues.

1. **What punitive measures are in place to ensure that water is used sparingly and not wasted?**

In Windhoek, there is a block traffic pricing, the more you use the more you pay. Those that exceed a certain set amount pay according to that block tariffs. This was set in order to compel citizens to monitor their water usage. Water rules are also set, e.g. Swimming pools must have a

cover to avoid the high evaporation rates. Stringent measures for car wash businesses that had to reapply and rearrange, advised on water saving measures and precautions.

2. **How are you impacted by energy deficits in Namibia?**

Namibia generates some of its energy sources from the Ruacana hydropower station at the Kunene River shared with Angola. The production is affected by low water levels as turbines cannot generate at full force during dry seasons. Other SADC countries such as Zambia, Zimbabwe, South Africa and Mozambique provide the other share of energy to Namibia. The City of Windhoek is proposing to put up solar energy of 10 megawatts to put back into the grid especially for Windhoek. The Ministry of Mines and Energy has a Solar Revolving Fund available for the public to apply for loans. Such policies are also encouraging business to run on solar energy. There is a net metering to enable business to put energy back into the grid and these businesses are compensated for this energy recharge to the grid.

3. **To what extent do you work with stakeholders on climate change?**

Studies on climate change have been reliant on IPCC Reports. Recognize that running climate models is not a cheap exercise, only knowing Climate System Analysis Group (CSAG) at University of Cape Town is running the continental and regional models. The Namibian Meteorological Services collect long-term data on basic parameters such as temperatures and rainfall. The Metrological Services run simple models for weather forecasting and seasonal variations which is used for broadcasting national predictions.

On studies for climate variability, the Ministry of Environment and Tourism (MET) have been doing the studies. The MET is the custodian of the National Climate Change Policy and has a climate change unit. The MET is also in charge of the National Climate Change Committee (NCCC) which the City of Windhoek also sits on. Their role on the NCCC is not well entrenched in the city of Windhoek structure. However, the city has made positive moves by establishing a climate desk that will participate mote on the NCCC since the discussion of global warming is intensifying. The city through FRACTAL has done local base studies on climate risk and variability.

4. **How is solid waste managed even in informal settlements?**

Ward contractor systems for open waste management in informal settlements is implemented in Windhoek. Waste is picked up weekly at households and business whilst daily cleanup of open spaces. It is a continuous effort that the City of Windhoek is implementing with the Mayor and Councillors involved on raising awareness and education the public such as organized cleanup campaigns with the Mayor and Councillors.

5. **How many committees do you have? Lusaka has 10 committees and each director reports to several committees.**

The City of Windhoek council consists of 15 Councillors. Management committee is responsible for day to day running of the council issues. Councillors have committees such as land, sport, economic, cleanliness, HIV/AIDS, healthy cities, youth committees.

There are four levels in the city's decision-making process namely departments, Strategic Executive Forum (SEF), management committee and full council. Thus, people critical in the city's decision making process are Divisional managers, Strategic Executives (department heads),

management committee councillors and Councillors. SEF recommends and Full Council takes decisions. It is important to highlight that the Management Committee is bestowed functions that deal with the day to day operations of the COW. The CEO and city officials (Strategic Executives) have no decision-making authority, rather, they only recommend.

2.2.2.3. Action Items

Mr. Hambuda requested for the reviving of the twinning agreement between the city of Windhoek and Lusaka so that we work together on water, solid waste management and climate change related issues. FRACTAL Project has limited resources and a time frame but the relationship should not end. It was noted that there already exists an MOU between the two cities. What we need to do id revive and operationalize and make it active by carrying out activities of mutual benefit.

2.2.2.4. Closing remarks

Councilor Mrs. Iiyambo asked Prof. Mfune to give the closing remarks. Prof. Mfune, firstly, thanked highly Mr. Hambuda and the City of Windhoek team. Thanked them for setting time aside, infact the whole morning to participate in this exchange discussion on day 3 of the visit of our counterparts from Lusaka. He reiterated the anticipation of more such engagements in future. Prof Mfune said it was a privileged to have colleagues from the city of Lusaka who came for the exchange visit. Thanked them for leaving their work and coming to visit Windhoek and learning about how we deal with water issues and problems in informal settlements. Finally, Prof. Mfune thanked Kornelia Iipinge, the Windhoek embedded researcher, for the great work that she does on FRACTAL Project.

A short questionnaire was circulated requesting all participants to detail the lessons learnt, challenges and opportunities identified during the exchange visit. The meeting was then concluded after the discussion and the Lusaka team travelled back to Lusaka on the 03 November 2017 straight after the meeting.

Figure 23: Group photo of participants at the City of Windhoek's committee room

3. Outcomes and Outputs

3.1. Questionnaire responses in Lusaka

On the last day of the visit in Lusaka, participants from both cities completed questionnaire and responses are listed below.

A. Main lessons learnt

No.	Lesson
1.	Water security is vital for survival of the communities of Lusaka. Waste management should be a key topic especially for the communities of Kalikiliki and Kanyama compounds. Erect proper drainage systems and also ensure that there is adequate planning for most settlements.
2.	Flooding is caused or enhanced by illegal dumping of solid waste in Kalikiliki and Kanyama settlements due to housing on water channels.
3.	Some formal settlements are not serviced with roads and drainage infrastructure.
4.	There is a willingness of locals in the settlements to address their waste disposal issues and infrastructure development.
5.	Co-production of climate knowledge should actively involve communities.
6.	Language and concepts need clear clarification for all stakeholders.
7.	Research must point to action points.
8.	The absence forward development committees has created a serious disconnect between the community and Lusaka City Council.
9.	The community is very willing to help themselves.
10.	There are inadequate resources to carry out projects.
11.	Cadres in local communities sometimes cause confusion.
12.	The stakeholder meeting was well done. People in the informal settlement want to be heard. The research done by the university is very valuable to bring the understanding gap to the foreground.
13.	Community buy-in is essential.
14.	Namibia's population size is close to the human population of Lusaka and their level of informality may not be as intense as ours (Namibia).
15.	The borehole at the Lilayi Shaft 5 used a horizontal method of drilling rather than the common vertical method.
16.	Solid waste, water supply, floods and climate change.
17.	Noted that there are institutional arrangements in Windhoek where the provision of key services e.g. water and electricity, are outsourced.
18.	Research can help understand development issues from the perspective of the concerned or affected individuals properly.

19.	Exchange visits open up an array of different perspectives of looking at things.

B. Challenges identified

No.	Challenges identified
1.	Water quality could be compromised especially at Lilayi Shaft 5 and also in the Kafue River. This may be due to flooding in the informal settlements which is a result of waste disposal and inadequate drainages.
2.	Poor planning in the informal settlements by the Lusaka City Council.
3.	Inadequate infrastructure to facilitate solid waste removal and lack of drainages to enhance flood water flow.
4.	Inadequate funds to address the solid waste disposal management.
5.	Had to get very broad stakeholder participation.
6.	Co-production processes are very expensive.
7.	Insufficient maintenance that occurred in the past can create serious difficulties in the future. Lusaka has lots of catchup to do, without sufficient funds.
8.	Lack of community inducement.
9.	Flooding can be reduced –they are man- made.
10.	The bus and the driver could not operate on 18th October2017 which was a holiday, the day that the Windhoek team was returning.
11.	The community of Kalikiliki feel like they have been forgotten by the government.
12.	Poor planning.
13.	Solid waste management in the City of Lusaka.
14.	Poor infrastructure and capacity.
15.	Solid waste management challenges in informal settlements.
16.	Limited time for the exchange visit.

C. Opportunities identified

No	Opportunities identified
1.	Need for more research in solid waste management in the city of Lusaka.
2.	Need to understand how the water at Lilayi Shaft 5 is treated and how communities use the research outcomes to enable them take community based solutions to deal with solid waste and flood interactions and whether the quality is not compromised.
3.	Cooperation and willingness of local community members to address their problems.
4.	Cooperation between locals, UNZA and Lusaka City Council to work together. Research provided this platform.
5.	There are opportunities for continued dialogue with the community.
6.	The communities know the problems they face and they have some ideas for possible solutions.
7.	Greater community involvement could lead to job creation opportunities without placing additional strain on the city. The city should not let this opportunity slip.
8.	All relevant stakeholders need to actively commit to solid waste reduction and better management.
9.	A comparative analysis can be done by the team on both cities with regard to water security through developing a paper
10.	Opportunities for blogging from two different city perspectives.
11.	All stakeholders to work together.
12.	Cleaning campaign and education by means of fliers and meetings.
13.	Underground water needs to be improved and new pipes installed and have backups.
14.	Sanitation in informal settlements.
15.	Solid waste management in general.
16.	Collaboration for further engagements with Windhoek.

D. Questions Respondents Had

These are here presented as written by respondents

No	Questions identified
1.	Who will be responsible for taking the first decision /step based on the research findings as presented?

2.	How to get political will in as afar as managing waste in Lusaka is concerned?
3.	How to adequately sensitize communities so that they can start separating waste and also pay for waste to be collected?
4.	Pollution is a huge problem, however if the council does not address other sources of flooding e.g. nutrients and needs the problem will not be addressed properly and could sour the established good understanding. This should perhaps be indicated in the Lusaka START GEC report.
5.	Quality of borehole in informal areas?
6.	Treatment opportunities to ensure and maintain quality of water?
7.	There is a serious need or education in the community with regard to the effect of waste management and how it affects them personally.
8.	Are the issues manmade or because due to climate change?
9.	Windhoek mentioned that their municipalities manage distribution of water and electricity and that this is their source of revenue. How is the council in Windhoek operationalizing these 2 services?
10.	Who should initiate this and where to start?
11.	Are the communities willing to change their life styles?
12.	How is liquid waste managed in both Cities?
13.	How can the water resources be sustained taking into consideration the climate change?
14.	Pollution of the aquifer?
15.	Formalization of informal settlements and management if boreholes including their water quality and quantity issues.
16.	Solid waste management is in open spaces especially the electricity reserved areas which are an eyesore.
17.	How can we help the community to appreciate the danger that climate change poses, especially looking at the way waste is managed as well as the aspect of building along the natural water channel?

3.2. Questionnaire response in Windhoek

Below are the questionnaire responses from all participants at the city of Windhoek on day 3 of the visit during the last discussion.

A. Main lessons learnt

No.	Lesson
1.	The importance of using information or evidence for decision making.
2.	The importance of partnerships in solving issues-urban issues-multi-disciplinary approach.
3.	Windhoek informal settlements are made up of temporal structures
4.	The city of Windhoek (CoW) has downscaled national documents and policies to better respond to issues
5.	The city of Windhoek recharges groundwater artificially due to limited rainfall
6.	The standard of reclaimed water at WINGOC is set higher for quality purposes than ordinary water pumped at treated.
7.	Co-learning key to enhancing understanding of climate issues
8.	The seriousness with which water issues are dealt with in Windhoek
9.	Awareness is a major factor
10.	Water reclamation process and the importance of safeguarding each drop of water
11.	Recharge of aquifer
12.	Initiatives made in the face of scarcity of water
13.	Keeping the city clean without street vendors.
14.	Very rich discussions on governance, water resources management and climate change.
15.	There is an opportunity to increase the level of knowledge (well researched) in the city decision making
16.	Mainly key points are climate change challenges that are facing the two cities such as water and climate change related issues
17.	Lusaka city council is challenged with solid waste management and the uncontrolled drilling of boreholes
18.	Partnerships are key for effective climate response-the water and energy sectors.
19.	Knowledge on climate change continue to be sourced from international platforms e.g. IPPCC. Local efforts are needed.
20.	Lusaka and Windhoek have similar problems regarding urbanization and its effects in city life.
21.	Informative research before decision making
22.	Strengthen collaboration between cities
23.	Learn from each other

24.	Similarities in problems of accessible to water and energy in both cities
25.	High densities of humans make solid waste management a problem in Lusaka
26.	The challenges faced by the two cities are similar in nature and we can create some synergies and learn from each other.
27.	Learning institution can play a pivotal role in generating information and knowledge that can be used by decision makers to tackle some of these issues.
28.	Resilience for African cities can only be achieved through governance policies that has buy in of all stakeholders.
29.	The two cities have common areas of interest and issues and these are dealt with differently but some solutions can be replicated.

B. Challenges identified

No	Challenges identified
1.	Availability of strategic information generation particularly on climate change as a new/emerging issue.
2.	The temporal structure and rapid urbanization pose a risk and challenge to CoW.
3.	The CoW has a water challenge but are not utilizing certain trans-boundary water resources in the region such as the Zambezi River
4.	The city is in a water scares region
5.	Water resources challenges
6.	Management of slums
7.	Population growth
8.	Water abstraction and drought the growth of the informal settlements
9.	Resilience of African cities calls for many actors to come together both within the city structure (across sector) and between cities (including small but growing cities)
10.	Water and sanitation
11.	Solid waste management in Lusaka
12.	Sanitation in Windhoek with the prepaid water system
13.	The major challenge that both cities have is to take care of the urban poor and help them to adapt to the anticipated effects of climate change.
14.	Lack of proper research
15.	No collaborations
16.	Lack of consultations

17.	Rapid urbanization
18.	Water insecurity
19.	Energy insecurity
20.	Stakeholder coordination
21.	Information accessibility- locally generated
22.	What can be done to address the issues of urban migration in the rural areas
23.	How to provide access to resources such as water and energy in informal settlement.
24.	The time for the visit is too brief
25.	Availability of stakeholders
26.	Silo working of different arms
27.	Energy can become a threat in the future in Namibia as it does not generate more locally

C. Opportunities identified

No	Opportunities identified
1.	FRACTAL can assist in generation of information on a number of issues relevant for urban development.
2.	Research and networking across disciples and sectors.
3.	Joint paper on informal settlements and access to services such as water, sanitation and electricity. A comparison between on informal settlement in both Lusaka and Windhoek.
4.	A comparison on water security risks in Lusaka and Windhoek.
5.	Room for collaboration of various commonly experienced challenges in both cities other than those associated with climate
6.	Buy in from government
7.	Money is spent on problems like waste
8.	Actions are problem based
9.	Need to venture into alternative sources of renewable energy
10.	Room to upgrade the slums
11.	Use of solar energy
12.	Housing for the poor
13.	Re-activating the Lusaka-Windhoek sister city

14.	Form partnership within knowledge centers (city-universities)
15.	Collaboration with the two city to renew their signing cooperation. The two cities to meet more often to discuss the way forwards.
16.	Lusaka city to learn about how Windhoek manages its solid waste
17.	There is an opportunity to revive the relationship between the city of Windhoek and Lusaka City Council to cooperate or many more areas.
18.	More opportunities for collaboration, training, visits (benchmark)
19.	More involvement by all stakeholders
20.	More dialogue and sharing of information
21.	Good opportunity for building partnerships, co-creation/ co-productions of information for decision making.
22.	The city has many new initiatives such as setting up the climate change unit-FRACTAL can contribute to this.
23.	Climate change affects us all and only collectively can real change happen.
24.	Future collaborations between cities to build capacity and to learn from each other.

D. Questions Respondents Have

These are here presented as written by respondents

No	Questions
1.	Solutions/tried & tested solutions for our water problems in Windhoek?
2.	Ways to ensure climate change is mainstreamed into all policies and programmes with in CoW?
3.	What was the process undertaken to establish the climate change desk and the city's climate change policy.
4.	SADC approach to climate change intervention. Recently adopted doctrines that could inform future exchanges.
5.	Will inequality be dealt with as the poor do not seem to have many work opportunities in the city?
6.	Does what we collect (revenue) match up to the needs of our city (Lusaka) council?
7.	Do we meet most of our budgetary requirements?
8.	The food security aspects of Windhoek still need a clear plan of action
9.	Do parliamentarians seat in Council meeting in Windhoek as they do in Lusaka?

10.	What is the unit cost of water in Windhoek?
11.	How can FRACTAL assist in ongoing research beyond the project period?
12.	Can the city mobilize funds and engage with UNAM to do the research in the sectors that need baselines, near information etc.? Provide coproduction efforts.
13.	How can we broaden the collaborations between Lusaka and Windhoek- beyond FRACTAL?
14.	How best can we obtain evidence based information for climate change to inform city decisions when they plan?
15.	How governance process can facilitate decisions made based on relevant information for urban planning?

4. Conclusions

The aim of the two exchange visits to Lusaka and Windhoek respectively were to contribute to FRACTAL's learning objectives and to build and strengthen inter-city relationships that can be leveraged in future. The Windhoek team visited Lusaka from 16th to 17th October 2017 while the Lusaka team was in Windhoek from 02nd to 3rd November 2017.

4.1. Key lessons learnt:

1. Lusaka City Council is challenged with solid waste management and the uncontrolled drilling of boreholes which are prone to pollution. Water security is vital for survival of the communities of Lusaka. Waste management should be a key topic especially for the communities of Kalikiliki and Kanyama compounds. There is need for adequate planning including proper drainage systems for most settlements. There is also a serious need for education in the community with regard to the effect of waste management and how it affects them personally.
1. The city of Windhoek has downscaled national documents and policies to better responds to issues. Windhoek informal settlements are made up of temporal structures whilst in Lusaka the structures are permanent. The city of Windhoek recharges groundwater artificially due to limited rainfall while in Lusaka they rely abstraction of water from Kafue River and from a well. The standard of reclaimed water at WINGOC is set higher for quality purposes than ordinary water that is pumped and treated.
2. Learning institutions can play a pivotal role in generating information and knowledge that can be used by decision makers to tackle some of these issues. The importance of using information or evidence for decision making was also highlighted. Knowledge on climate change continues to be sourced from international platforms e.g. Intergovernmental Panel on Climate Change (IPPCC) instead of local organizations. This needs to be addressed. Resilience for African cities can only be achieved through governance policies that has buy-in of all stakeholders.
3. The two cities have common areas of interest regarding water and waste management. These issues are dealt with differently although some solutions can be replicated in the other city.

4.2. Key questions identified:

- How best can we obtain evidence based information for climate change to inform city decisions when they plan?
- How governance process can facilitate decisions made based on relevant information for urban planning?
- How can we help the community to appreciate the danger that climate change poses, especially looking at the way waste is managed as well as the aspect of building along the natural water channel?
- How can the water resources be sustained taking into consideration of climate change?
- How can we broaden the collaborations between Lusaka and Windhoek- beyond FRACTAL?
- What was the process undertaken to establish the City of Windhoek's climate change desk and the city's climate change policy.
- Who will be responsible for taking the first decision /step based on the research findings as presented for the both the START GEC Projects?

4.3. Blog:

The Windhoek-Lusaka Learning Exchange Programme reflection blog has been published on the FRACTAL website on the 27th November 2017. The link to the blog: http://www.fractal.org.za/2017/11/27/reflections-from-lusaka-windhoek-exchange-the-case-of-abundance-of-water-resources-against-deficit-water/

5. Appendix

Annex 1: Agenda on 16-18 October 2017

Future Resilience for African CiTies and Lands Project
Windhoek Team hosted by Lusaka City Council and University of Zambia (UNZA)
16-18 October 2017; Lusaka, Zambia

Time	Activity	Facilitator	Venue
Day 1: 16 October 2017			
Arrival of Windhoek team in Lusaka at 11am			
12:00-12:30	Introductions and welcome remarks	Dr. Nyanga	UNZA Geography departmental library
12:30-13:30	Lunch	All	Mulungushi
14:00-17:00	Trip to Kafue River and Shaft 5 Borehole	Dr. Siame, Dr. Nchito Ms. Mwalukanga Mr. Namutoka	Kafue River
DAY 2 : 17 October 2017			
08:30-12:00	Trip to Kalikiliki	All	Kalikiliki informal settlement
13:00-14:00	Lunch	All	TBD
15:00-16:00	Reflection of the day	Dr. Siame	UNZA Geography departmental library
DAY 3: 18 October 2017 **Windhoek team departs Lusaka at 11am**			

Annex 2: Participants list on 16 October 2017

Participants name	Institution	Email address	Telephone
1. Prof. John Mfune	University of Namibia	jmfune@unam.na	+264 61 206 3743
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3. Hon. Agatha Iiyambo	City of Windhoek	agatha.iiyambo@gmail.com	+264811260332
4. Ms. Grazy Tshipo	City of Windhoek	Grazy.Tshipo@windhoekcc.org.na	+264 61 290 2373
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Annex 3: Agenda in Windhoek: 01-03 November 2017

Future Resilience for African CiTies and Lands Project
Lusaka Team hosted by City of Windhoek and University of Namibia
01-03 November 2017; Windhoek, Namibia

Time	Activity	Facilitator	Venue
Day 1: 01 November 2017			
Arrival of Lusaka team at Hosea Kutako International Airport at 20:40 Shuttle takes team to Arebbusch Travel Lodge (Windhoek)			
DAY 2 : 02 November 2017			
08.00-08.15	Introductions and welcome remarks	Prof J Mfune, UNAM	Arebbusch Travel Lodge
09:00-11:00	Trip to Goreangab Wastewater Reclamation Plant	Dr. T Honer, WINGOC	Goreangab, Katutura
11:30-13:00	Site visit to Artificial aquifer recharge borehole	Ms. Z Scheepers, City of Windhoek	Intersection of the B2 and Frankie Fredericks drive, Olympia
13:00-14:00	Lunch	All	Arebbusch Travel Lodge
14:00-15:00	Water security in Windhoek START GEC Project	UNAM & NamWater	University of Namibia Science Building W100
15:30-17:00	Trip to Havana Big Bend	Ms. C Mwilima, City of Windhoek	Havana, Katutura
Day 3 : 03 November 2017			
08:30-10:30	Discussions by City of Windhoek on water and climate change related issues	Mr. O Makuti, City of Windhoek	Head Office, City of Windhoek
10.30-10:45	Closing remarks	Mr. F Hambuda, Strategic Executive, City of Windhoek	Head Office, City of Windhoek
10:45-11.15	Lunch	All	
11:30 Departure of Lusaka team at Hosea Kutako International Airport			

Annex 4: Participants list on 02 November 2017

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Annex 5: Participants list on 03 November 2017

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