Windhoek Final Learning Lab Report

17-18 June 2019

Arebbusch Travel Lodge

Windhoek, Namibia

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Summary

The Future Resilience for African Cities and Lands (FRACTAL) project has been operating in Windhoek (and 8 other cities) since 2015 as a partnership between the University of Namibia, the City of Windhoek and over 20 international partners. The focus has been on engaging many diverse people to think through and co-generate knowledge on what decisions facing Windhoek are climate-sensitive, how the climate affecting Windhoek is changing, who has what power to act in reducing climate risks, and what is needed to put Windhoek on a more climate-resilient development pathway. The first phase of the FRACTAL project is currently wrapping up in June 2019.

Windhoek has run three Learning Labs and this report serves to provide the proceeding and outcomes of the fourth and final learning lab. The Final Windhoek Learning Lab was hosted in two days, and within these days the project's various milestones particularly in Windhoek was shared. It was important for the city of Windhoek to learn from the colleagues from Maputo and Durban, on how they are dealing with climate change issues within their cities. Decision making exercises, dialogues between decision makers and scientists were done and they were aimed to provoke constructive and learning ideas among all participants. Not forgetting the water insecurity in Windhoek, a discussion on the development of Windhoek's Water and Wastewater Master Plan was done and insights were given on how to better develop such a plan. This report also contains summaries of all the presentations given and outcome of the learning activities made over the two days. A brief summary of what happens to the planted seeds when FRACTAL will not be functioning fully is also given.

In summary, the workshop was a success. It brought together colleagues from Maputo, Durban, Cape Town and the UK, to share, engage and learn from each other's experiences and how they can take actionable efforts to cultivate the similar approaches. Thus far, great strides have been made by the FRACTAL project in Namibia in addressing burning issues within the city. It is up to the city and its citizens to take up actions to ensure that the city remains climate resilient and future decision making processes are informed by climate science information. FRACTAL as a project and the Namibian team hopes that the information, experiences, engagements and learning experiences has capacitated the city in enabling them to take on issues of climate change now and in the future. For Windhoek and Namibia this lab was an important tool as it allowed scientists, different stakeholders, academics and decision makers to explore the integration of climate change information into water planning processes? As such, FRACTAL team in Namibia appreciates all the opportunities from all its donors and associates for making the project a success.

Acronyms and abbreviations

AHP	Analytic Hierarchy Process
ALAN	Association for Local Authorities in Namibia
CaDD	Climate Capacity Diagnosis & Development
CoW	City of Windhoek
CSAG	Climate System Analysis Group
DAC	Durban Adaptation Charter
DFID	Department for International Development
DUREP	Durban Research Action Partnership
ER	Embedded Researchers
FCFA	Future Climate For Africa
FRACTAL	Future Resilience for African Cities and Lands
GCF	Green Climate Fund
ICCSAP	Integrated Climate Change Strategy and Action Plan
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
IUWM	Integrated Urban Water Management
IWWMP	Windhoek Integrated Water and Wastewater Master Plan
LIRA	Leading Integrated Research for Agenda 2030
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MoU	Memorandum of Understanding
NamWater	Namibia Water Corporation
NaYoRE	Namibian Youths on Renewable Energy
NCCC	National Climate Change Committee
NCCSAP	National Climate Change Strategy and Action Plan
NDP	National Development Plan
NERC	Natural Environment Research Council
NYCCC	Namibia Youth Coalition on Climate Change
SADC	Southern African Development Community
SOG	Small Opportunities Grant
UCT	University of Cape Town
UKZN	University of KwaZulu Natal
UNAM	University of Namibia
UNDP	United Nations Development Plan
WMARS	Windhoek Managed Aquifer Recharge Scheme

List of Figures

List of Tables

Table of Contents

Introduction and background to the workshop report

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). FRACTALs main overarching aim is to advance scientific knowledge about regional climate responses to anthropogenic forcing, enhance the integration of this knowledge into decision making at the co-dependent city-region scale, and thus enable responsible development pathways. The FRACTAL Project uses the "learning labs" process, which is transdisciplinary in nature. This process entails co-producing research questions that are relevant for all actors, including academics and practitioners, and knowledge that contributes to answering these questions.

In Windhoek, the University of Namibia in partnership with the City of Windhoek ran three Learning Labs accordingly: First Learning Lab on 14th -15th March 2017; Second Learning Lab on 31st October 2017; and Third Learning Lab on 14th -15th August 2018. The Final Windhoek Learning Lab was hosted on 17th -18th June 2019 at the Arebbusch Travel Lodge in Windhoek, Namibia. As part of city to city learning, the FRACTAL cities representatives from Durban and Maputo attended this Learning Lab. The purpose of the Final Windhoek Learning Lab was to bring together and leverage various threads of FRACTAL research that have been undertaken; to identify impacts from the project; and to reflect and discuss the way forward of the project as it comes to an end in June 2019. This report summaries of all the presentations given and outcome of the learning activities made over the two days.

Workshop process and outcomes

In this section, the Learning Lab proceedings are described based on the Programme (Annexure 1) and the participants list (Annexure 2).

Day One: 17 June 2019

Registration and Networking breakfast

The Final Windhoek Learning Lab availed time for all participants to network and have discussions with each other during the breakfast session. Conversation starter questions were displayed at the breakfast station for the participants to discuss as shown in the Figure below.

Figure 1: Networking breakfast station set up with versation questions starters

The questions were as follows:

a. How does development planning differ from climate adaptation?
b. Who all have a responsibility in getting water flowing out of your tap?
c. What do you think, are our chances of keeping global temperature increase to below 2 degrees Celsius?
d. How do you reduce water consumption in your home and work place?
e. What will a water secure Windhoek look like in 2040?
f. What is the difference between a weather forecast and a climate projection?
g. How can building climate resilience create jobs for the jobless?

Session 1: Official opening

Mr. Fillemon Hambuda, Department of Economic Development and Community Services, City of Windhoek

Mr. Fillemon Hambuda is the Strategic Executive for the Department of Economic Development and Community Services which has the Health and Environmental Services Division at City of Windhoek. Mr. Hambuda started off his welcoming remarks by extending a special welcome to guests from Maputo, Cape Town, Durban, and all the local guests that were present at the Learning Lab. He indicated that since the first Windhoek learning lab at Heja Lodge in 2017, great strides have been made by the FRACTAL project in Namibia in addressing burning issues within the city. Mr. Hambuda explained the milestones made by the project by using a Chinese proverb that says "small steps in the right direction spells success", with these words he noted that "it is important to know that, as a nation and a city we are not going slowly but we are headed in the right direction". Mr. Hambuda specified that burning issues are those issues that are hampering the city of Windhoek from attaining climate resilience and environmental sustainability. As such a lot of research activities, training workshops and policy development processes were undertaken as part a collective effort to address burning issues within the city.

Figure 2: Mr. Hambuda from City of Windhoek giving the opening and welcoming remarks

Mr. Hambuda further indicated that, because this is the project's final learning lab in Windhoek, the two days will reveal the projects various milestones and create a perfect platform for the city to learn from the colleagues from Maputo and Durban, on how they are dealing with climate change issues within their cities. He also noted that given the city's water scarcity issues, the final learning lab is an even more important tool as it will allow scientists, different stakeholders, academics and decision makers to explore the integration of climate change information into water planning processes. Mr. Hambuda then urged all participants to ensure that they are present for both days of the learning lab so that the project can be concluded on a high note.

Mr Hambuda expressed his expectation of the final learning lab by saying that "I expect to see noble discussions on how the city can take its climate response program to the next level and how the city would mainstream climate change information in their day-to-day activities while planning for a climate resilient city after the FRACTAL project". Moreover, Mr. Hambuda expressed his gratitude by noting that having learning labs such as this was a good initiative to promote co-explorative opportunities to finding solutions to climate change challenges in a collaborative manner. Furthermore, Mr. Hambuda thanked the local FRACTAL team, University of Cape Town and all the project partners for a job well done in the four years of the project duration.

Mr. Hambuda testified that when the project was in its infant stages the city was still in the process of formalising their integrated climate change and response programme, however today he can boast that the programme is on its feet and this is all due to the FRACTAL project. Mr. Hambuda humbly urged the donors that although the FRACTAL project was coming to an end, the city of Windhoek including all the SADC cites were still open to more opportunities that aim at reducing and strengthening cities resilience from challenges of climate change. He further hopes that cities do not become recipients of endless donations, but given support should rather seek to improve and strengthen local capacities in order to sustain the activities and initiatives that were started under the FRACTAL projects. He gave an example of Windhoek, where support would be needed to transition from the planning and development phase to the implementation phase of the climate change response program. Mr. Hambuda concluded his opening remarks by declaring the official opening of the Fourth (Final) Windhoek Learning Lab and wished all the participants good luck in all the deliberations that will be made within the two days.

Session 2A: Introduction of participants

Dr. Anna Taylor, University of Cape Town

FRACTAL as a project places value on introductory sessions, as this allows participants to know each other and feel more familiar with each other in a much comfortable environment. Dr. Taylor asked all participants to find a partner they have not spoken with before and introduce each other to the whole group. Dr. Taylor indicated that this way of introduction session allows to birth new relationship in a fun manner. All participants introduced the partners' name, position, institution and an expectation from the learning lab. The moral of the exercise was to create a comfortable environment, for everyone to feel at ease with each other. The session also allowed participants to talk to someone they have never spoken to which is part of what the FRACTAL project encourages.

Figure 3: Participants introducing each other in pairs

Session 2B: Objectives of Final Windhoek Learning Lab

Prof John Mfune, Associate Professor, University of Namibia

Prof. Mfune, the FRACTAL Project Investigator in Windhoek briefly stated the Final Windhoek Learning Lab objectives for the two days as:

1. Showcasing: Sharing results of research, training and activities
2. Identifying impact: Looking back and reflecting on what has been achieved in the lifetime of FRACTAL
3. What next: Next steps/processes to be taken forward post-FRACTAL

Prof. Mfune gave an opportunity to Her Excellency Ms. Kate Airey the British Commissioner in Namibia to give some remarks from the UK Government. H.E. Ms. Airey gave an address that reiterated the importance, the British government places on issues of climate change globally, including how to manage climate risks in Namibia. Recently, the United Kingdom signed a target of net-zero greenhouse gas emissions law towards eradicating its net contribution to climate change by 2050. The British High Commission is working to play their part in being water wise in Windhoek, to walk the talk. H.E. Ms Airey emphasized the importance for those involved in FRACTAL to clearly identify and describe the impacts of the project, to show that the resources were spent well and to justify more spending on these issues.

Figure 4: Her Excellency Ms. Kate Airey the British Commissioner to Namibia giving her remarks

Session 3: Showcasing FRACTAL research / activities and feedback from events

Prof. John Mfune, Associate Professor and Ms. Kornelia Iipinge, Windhoek Embedded Researcher, University of Namibia

Prof Mfune stated that the purpose of the session was to showcase the different activities and research that has been undertaken in Windhoek. According to Prof Mfune, on the basis of what we have experienced either within our local environment or nationally, people can accept and appreciate that climate change is a reality and Windhoek has not been spared because the city is undergoing a drought period. He noted that the FRACTAL project is predominantly interested in looking for climate specific information that is relevant for planning for the cities resilience and how they consider decision making in light of climate change challenges. As a project FRACTAL has used learning labs that invites different stakeholders to meet and discuss issues pertaining to climate change and how informed decision making can help the city in the long run. The project has also made use of contributions from various cities through city exchange visits, involvement of regional universities and other partner organization such as Stockholm Environment Institute, Aurecon and UK Met Office. He further indicated that other various partner organizations were also involved and they have provided extra funding, human resource capacities and some technical expertise in helping the FRACTAL project to achieve its goals. Prof. Mfune thus appreciates the UK government for setting aside a portion of their budget to contributing towards climate change and tackling issues of climate change.

Prof Mfune indicated that cities are centres where major activities contributing to climate change are happening, as such Windhoek as a city needed to have some discussion on information regarding climate change and how this will influence activities within the city's

boundaries. As part of Prof. Mfune's presentation, he gave various stakeholders that were involved in the activities shared their lessons. Below are some activities that the FRACTAL project conducted during its contracted years, including experiences from a few participants that were involved in those aspects:

1. In March 2017 FRACTAL hosted a consultative collaborative discussion (First Windhoek Learning Lab). This discussion was attended by multiple stakeholders to discuss and share issues of concern related to climate change and climate change information related issues. At this platform two critical issues were identified, which formed the basic backbone for the activities that FRACTAL has been involved in. The two burning issues were: Water insecurities within the city and Inadequate services to informal settlements (water, Sanitation and energy provision). At the same platform, it was also agreed that councillors were important decision makers as such a second workshop that invited them looked at climate change and decision making awareness.

2. Climate change and decision making awareness workshop was held to sensitize the climate change issue with the city councillors. The FRACTAL project recognised that, city councillors are within the upper part of decision making of the city and they are key players in decision making processes within the city. If the project was going to use climate change information as relevant to decision making, councillors are then required to know and familiarise themselves with climate change and the role they can play. At this platform councillors agreed, that they needed to learn and participate in issues related to climate change. Also at the workshop councillors were in agreement that they needed to study and understand environmental related policies so that they could make informed decisions. Councillors also felt that it was important for them to be involved in the conceptualization and development of environmental related policies. They also indicated that they needed simplified versions of climate related information for ease of understanding and involvement.

3. Additionally, because water security, water governance, water supply and demand including urbanization were identified as burning issues, a research was then carried out with extra funding from the START International Inc. The research was carried out to see the effects of drought in Windhoek and the central parts of Namibia and how this affects water supply to the city while exploring possibilities to prevent it. Another component was also carried out looking at the relationship between water supply and livelihoods. Another research component was conducted on water governance at Ujams Wastewater Treatment Plant (WWTP).

Mr. Gerald Iiputa from UNAM was involved in the most recent developmental water project in the CoW. He indicated that Windhoek as a city has been involved in water reclamation since 1969. The Ujams WWTP has been around, but only had oxidation ponds, which were further upgraded to a modern plant with membrane filtration process in order to improve the quality of water and make it available for other uses. Mr. Iiputa indicated that he was interested in the project and the involvement of people in making such decisions, including the legislative tools used to make such decisions.

He also indicated that he was interested in the climate information that was involved in running the plant and how this was considered in their decision making processes. Mr. Iiputa gave his gratitude to FRACTAL as a project for making this possible and concluded that the plant is in a positive move with help from the city of Windhoek, and the plant is carrying out

its intended purpose as it was initially planned. As part of a local capacity development by FRACTAL a postgraduate study is being carried out at the plant assessing the impacts of hexagonal chromium on the terrestrial plants.

4. A city-to-city exchange between the city of Windhoek and the city of Lusaka was held. The Windhoek team visited several water related projects in Lusaka and how they are dealing with water issues within their city. Likewise, this was done with the Lusaka team when they visited Windhoek, a visit to the city's reclamation plant, boreholes and aquifer was done. The two cities held discussions, where commonalities and unique problems were identified including their possible solutions. Prof Mfune agreed that both cities learned a lot from this experience and hope that the exchange opportunities will continue for further exchange of lessons. He admitted that this exchange visit allowed both cities to identify common problems between them and how they could best tackle them using shared effort.

5. FRACTAL was also involved in simplifying models used for climate predictions. This was deemed necessary as councillors agreed that they needed simplified versions of climate information. As such councillors and the FRACTAL team sat together and simplified a few models using simple infographics and narratives. FRACTAL as a project helped in translating models into easy to understand, diagrammatically illustrative ways of showing how climate scenarios will change. Prof Mfune felt that as a project this is part of the little seed that the project has sown and hopes it will be taken up and moulded into something productive.

6. The Transformational Leadership on Climate Change Trainings were held for city councillors, constituency councillors, and city strategic executives. City executive were mainly involved in the city's decision making process, as such it was identified as important to sensitize climate change in their decision making processes. The Climate Capacity Diagnosis and Development (CaDD) and Analytic Hierarchy Process (AHP) decisions making tools were introduced to the strategic executives and other city officials. Prof Mfune believes that this was part of the seeds that the project has sown and hopes that they will yield positive results in the long run.

Ms. Liz Daniels (Research Fellow at Stockholm Environment Institute) indicated that a workshop was done with some of the representatives that were involved in the development of the climate change strategy and action plan. Different decision making processes were explored including different information and different practices that can be considered when making decisions, this then yielded different priorities and different preferences. The executives were then required to explore these options and how they would make decisions considering environmental factors, climate resilient factors, social factors cost and economic factors and how climate information can be integrated into these decision making plans. Executives were also required to question the information needs and how they make their decisions because there is a lot of actions that feeds into the ICCSAP and how they ensure that the plan is integrated considering different information and practices. Ms. Daniels indicated that a decision making tool (AHP) was used in order to explore what these different practices are when making decisions. Another tool the CaDD was done to help the city's strategic team and give them an indication of the strengths and weaknesses of different capacities and whether there are

gaps that need to be closed. These gaps could either be around leadership, skills and expertise. The exercise helped the executives to identify some of the institutional challenges and strengths that are present to deliver on the ICCSAP

7. FRACTAL also recognised that climate change cannot be complete without involvement of the youth. A city junior council's awareness workshop on climate change was held in April 2019 and this was co-facilitated by the Namibian Youth Coalition on Climate Change members.

Mr. Deon Shekuza (Environmental Youth Advocate) started off by appreciating the FRACTAL project and the City of Windhoek, for considering a youth session on climate change. He indicated that the workshop was useful as it targeted youth legislative bodies (junior councillors) in order to sensitize young law makers with the climate change agenda so that they can align their activities with the City's ICCSAP. He also indicated that by introducing climate change looking at its impacts, mitigation and adaptation strategies, the youth had a better understanding of climate change and its challenges which in this case was important for them to make contributions through group discussions at the workshop. As part of a pro-active measure Mr. Shekuza thanked the platform as the youth was involved in a discussion talking about tips revolving around energy and water conservation and how best they could take this up. Mr Shekuza also indicated that in order for the youth to take up some of the conservation measures the City of Windhoek had to show them, some of the activities, plans, response measures the city has in plan in dealing with climate change challenges. The presentation was given by Mr. Makuti from the CoW climate desk.

Figure 5: Mr. Deon Shekuza giving his contributions on the youth engagements

Mr Shekuza regrets that the Namibian youth mainly understand the science of climate change but they are not very well informed of the climate change agenda in terms of processes. He continued saying that it is important for the youth to understand how policies work, what kind of policies exist in the climate science environment and what do they say about youth involvement at a regional level as well as international level. Mr. Shekuza appreciates that the workshop was able to help the youth understand these policies including the historical narratives of climate change from the Rio-convention to the sustainable agenda and how available incentives could motivate them in promoting their involvement. Lastly, he indicated

that the youth were given a climate negotiation feel in order to understand how complicated the climate negotiations could be. As part of the reflections, the youth indicated their interest to get involved in the climate change response initiatives however, due to lack of structure and order within the junior council management and shorter target objectives they are mainly left out. Mr Shekuza alarms that junior councillor's plans should be aligned with the city's climate change response objectives in order to encourage full participation by the youth. Lastly, Mr. Shekuza also request that activities such as this be done with rural youth as they are mainly dis-enfranchised in terms of intellectual engagement.

8. A dialogue with academics was held by the FRACTAL project in order to address climate change issues and how they can promote climate science information within their respective work environments. The workshop fully engaged the academic team in discussions that were aimed to criticise the project's output and several other additions. The academic team also had a discussions on issues related to energy, water, agriculture and biodiversity and they listed different areas of research that they thought was needed to be done in Windhoek as a city, surrounding areas and Namibia at large. Prof Mfune noted that this practice was important as it forms the basis on which future funds can be sought.

9. As part of the burning issues in Windhoek and also revealed during the first learning lab. The Windhoek team applied for the FRACTAL Small Opportunity Grant (SOG) to conduct a study energy provision in three informal areas (Havana, Okuryangava and Goreangab) using questionnaires as a data collection tool. Prof Mfune understands that although some of this information is already available it is always good to validate the information that is available to make sure of what is happening on the ground. A focus group discussion was held and various community leaders from the three informal areas were present to discuss how they felt about the pressing matter and the way forward. Prof Mfune indicated that it was important to have a feedback session with local leaders in order to share with them the outcomes of the study.

Mr. Berthold Haingura (Hidino Hishongwa / Kahumba Kandola informal settlement Community Leader) agreed that the FRACTAL project was very insightful and it engaged community leaders in informal settlements which most projects omit to do. He also agreed that there is a challenge in the informal settlements where community members mainly harvest firewood from the surrounding forest areas to satisfy their energy demands, and this somehow contributes to climate change in the long run. He indicated that community leaders in the survey proposed that the city of Windhoek should meet them half way in meeting the energy demands within the informal settlements.

Currently, he noted that the manner in which power is sourced in the informal settlements through multiple connections from one source is not safe and it could create dangerous conditions for residents. Mr Haingura thanked the FRACTAL project for giving them the platform to provide their inputs and opinions on matters related to energy demand and supply in the informal settlements. Mr. Haingura further suggested that informal settlement residents be given permission by the City of Windhoek to set up transformers within their areas in order to have access to electricity.

Figure 6: Mr. Haingura giving his contributions on the research in the informal settlement

Prof Mfune concluded that there is a need for continuous dialogues and discussions between CoW and the informal settlements in order to try and meet local people's needs in terms of energy provision. He also urged the informal settlements to understand that the city is bound by laws and regulations and their requests may not be attended to promptly due to required channels that the city might need to follow. He further urged the city to abide to their policies and regulations by implementing them within the limits of what is actually possible. Prof. Mfune hopes to contribute to further discussions and dialogues between the city and the informal settlements in order to generate information that can be useful for decision making.

10. An awareness workshop on climate change for local authorities was held in June 2019. Only three local authorities' from the ten invited attended. Nevertheless, the workshop proceeded. Their deliberations, experiences and engagement at this workshop, probed further discussions which was beneficial in helping local authorities to craft climate sensitive decisions. As part of the learning experience the local authorities were taken for a tour around the health care risk waste facility.

Mrs Esther Kahiha-Ruzvidzo (Environmental Health officer at Mariental Municipality) – Mrs Kahiha-*Ruzvidzo shared her experience by saying that smaller local authorities such as her's learned a lot from the discussions and presentations that were shared during the workshop. She further stated that there are challenges facing local authorities such as funding and, technical expertise however, they have learned a lot from the City of Windhoek, how they deal with climate change issues and challenges. She indicated that the visit to the CoW Health Care and Risk Waste Facility encouraged her local authority to go a step further, to develop strategies and action plans aimed at dealing with climate change challenges. Finally, Mrs.* Kahiha-*Ruzvidzo agreed that the outcome of the workshop and experience shared will contribute positively towards the implementation of climate change strategies and action plans within their local authorities.*

11. Prof Mfune specified that climate information is important to the FRACTAL project as it feeds into decision making and planning. As such, another follow up training on accessing and interpreting climate information was held in June 2019. Various contents on climate science details were shared including available data.

Mr. Gotlieb Hamutwe (Consultant from REEWA) indicated that the training was useful particularly for him as a consultant in the renewable energy, environment, water and agriculture sectors. Mr Hamutwe agreed that the training was useful to understand various scenarios that have been predicted for Namibia and how to read climate models. In conclusion he admits that through FRACTAL his reporting was capacitated in terms of coming up with clear, better, improved and quality reporting that is mostly understood by major decision makers. FRACTAL has contributed to the national and international goals on climate change mitigation goals.

12. FRACTAL in its aim to ensure capacity building funded an academic to attend the Climate System analysis Group (CSAG)'s Winter School at University of Cape Town.

Ms. Mildred Johnson (Lecturer at UNAM in Biological Sciences Department at UNAM) admits that having granted the opportunity to attend the CSAG Winter School in Cape Town she was able to learn from the discussions, presentations and experiences shared during the training. She indicated that the opportunity has enabled her to broaden her knowledge in terms of climate change and the different aspects that were considered during the training. Ms. Johnson further appreciates the opportunity as she was exposed to different platforms, on how to access climate data and how to consider the social science aspects of climate change including the processes involved in decision making.

To conclude his presentation, Prof Mfune indicated that the presentation included all that the Windhoek-FRACTAL team has done and he expressed his gratitude in having the privilege to have received the funds from the UK government to run the project with the City of Windhoek. He also indicated that within the limits of what is practical the team tried its best to deliver project objectives as initially planned. Prof. Mfune thanked the City of Windhoek for committing to the project until the end and to the workshop participants for taking time to listen to the Windhoek-FRACTAL project's outcomes

Session 4: Tupopyeni oClimate Talk Show

Dr. Anna Taylor, Post-Doctoral Researcher, African Centre for Cities, University of Cape Town

The Tupopyeni oClimate Talk Show Session 3 had guests from Maputo Municipal Council, Eduardo Mondlane University and University of KwaZulu Natal (UKZN). The session was planned to focus on some of the emerging lessons from other FRACTAL cities that could be of interest to Windhoek and also to learn through exchange of ideas between the cities. Dr Taylor the Talk Show host indicated that the talk show is a more engaging format and it encourages fruitful discussions around climate change, rather than having PowerPoint presentations. The talk show guest were:

1. Prof. Genito Maure an Associate Professor in the Department of Physics at Eduardo Mondlane University and the Maputo-FRACTAL Principal Investigator; Maputo - Mozambique.
2. Mr. Hecrálito Mucavele, Senior technician in the Directory of Urban Planning and Environment at Conselho Municipal da Cidade de Maputo (Maputo Municipal Council) and the Maputo Embedded Researcher; Maputo - Mozambique.

3. Dr. Lulu van Rooyen is an Embedded Post-Doctoral Researcher at UKZN, Durban-South Africa.

Figure 7: Tupopyeni oClimate Talk Show guest from the left; Prof. Maure, Mr. Mucavele, Dr. van Rooyen and Dr. Taylor

The Table 1 below summarised the discussions during the Talk Show between the host and the panellists.

Table 1: Summary of the Tupopyeni oClimate Talk Show

Host Questions	**Response by Panellists**
FRACTAL has been designed to focus on climate sensitive issues that are most pressing in each city. Can we start with you telling us what has been the focus of FRACTAL activities in Maputo and in Durban?	**Durban:** The city was self-funded and had no funds for running learning labs. Initially the city had no idea how the activities would play out however, with the help from the Durban Research Action Partnership (DUREP) which is a long established partnership with the Durban Municipality (particularly the Environmental Planning and Climate Change Department) and with collaboration with UKZN the city was able to align already running activities with what FRACTAL was doing. Durban's focus was mainly biodiversity and climate change unlike water insecurity as a burning issue in other cities. **Maputo Municipal Council**: The Maputo Municipality focused on water and health as their burning issues. The municipality's the Directory of Urban Planning and Environment together with the Eduardo Mondlane University worked together in dealing with these issues. Although the Maputo Municipal Council has an Adaptation Plan in place it was important to re-visit the document and understand its content. The Maputo learning labs revealed that the document had climate projections and action plans however the recommendations made were too generic on addressing climate changes issues. Admittedly, although awareness on climate change in Maputo is high, policy makers and decisions

	makers still need to be sensitized on the issue of climate change. **Eduardo Mondlane University**: The activities in Maputo were driven from the outcome from the first Maputo learning lab which was attended by different stakeholders. Burning issues/ questions identified included: - Projections of heavy rainfall and drought for the next five to ten years and how the city could adapt to these changes. - Integration of climate variability and change into municipal action plans. - Institutional arrangements in place responsible for facilitating coordination between actors. - Simplifying and communicating climate change information to a range of actors. - Linking climate and health in terms of disease outbreaks. This was important to anticipate the likely outcome of health conditions and help decision makers to build and strengthen their predictive capacity and early warning tools to reduce climate impacts.
City exchanges have been a big part of enabling learning in the FRACTAL project. At the last Windhoek Lab we were joined by colleagues from Gaborone, who were very interested in learning about the ICCSAP process in Windhoek and have recently initiated a similar process in Gaborone. Maputo Team, I gather at the last Maputo Learning Lab in May you were at the receiving end of city exchanges from both Lusaka and Windhoek. Can you tell us about what that involved and what lessons emerged from that?	**Maputo –** The Final Maputo Learning Lab hosted in May 2019 was attended by colleagues from Lusaka (including its Deputy Major) and Windhoek. City exchange enabled the Maputo team to learn from the Windhoek team as they shared their development process of the CoW-ICCSAP including other activities that sparked discussions during the learning lab such as the reclamation of wastewater to drinking water standards. They also learned a lot about the transformation of sewage water into portable water as this is linked to health issues. The Maputo team was also able to learn from the Lusaka team through their involvement of climate information into their decision making processes. The team agreed that they have a lot to learn from the two cities. Some of the key learning points includes the involvement of decision making actors (city officials, executives, councillors and mayors) at the early stages of the project.
Dr. van Rooyen, if I am not mistaken Durban hosted colleagues from the City of Lusaka. Can you tell us a bit about what that entailed, including explaining a bit	**Durban** – In Durban, the Durban's Adaptation Charter (DAC) has created a platform to draw political actors into climate discussions which could have been technical for them. Local Municipalities sign the DAC and through this they are urged to take action through policies and strategy implementation towards climate change at their local level. By signing the

about the Durban Adaptation Charter that was signed on behalf of the Lusaka Mayor.	charter the local municipalities become hubs in providing needed resources and helping other surrounding cities to implement their climate change adaptation actions. Durban has taken on the responsibility to spread the DAC by giving training to different hubs in order for them to take responsibilities in forming their own compact. Developing capacity and environmental champions within various departments for fast integration between departments. This has enabled the city to strengthen its political commitment towards climate change, as such the city is seen as a one of the climate leaders globally.
Maputo Team, would you agree with me that FRACTAL has been pushing some boundaries in terms of trying to understand from many different perspectives how scientific climate information might be more and better integrated into city planning and management decisions? This has come with some considerable challenges. What would you say has been most challenging in doing FRACTAL work in Maputo and how have you dealt with that?	**Maputo** – One major challenge that the Maputo has experienced was the language barrier and translations where time consuming from Portuguese-English. There are other ongoing activities related to climate change in the city with different agendas in addressing a common problem. It would be wise if possible to integrate activities or join efforts in addressing similar problems in order to promote continuous engagement by the larger public. In terms of water there are various entities involved in the management of water and each of these have their various priorities. Also Maputo's water is sourced from trans-national water bodies, and this could create conflicting objectives in terms of use and management priorities. Decision makers only gave priorities to structured projects that brings in results such as sanitation. High staff turnover creating problems with continuity and maintaining the momentum.
Any last remarks?	Prof. Maure concluded that it is important to have departmental champions or driven youth representative within their Municipality in order to create awareness and promote engagement. Dr. van Rooyen indicated that southern Africa will become drier as a result of climate change and so she was interested to learn from the Windhoek reclamation project and the aquifer recharge process as an intervention towards adapting to climate change challenges.

In conclusion, Dr. Taylor agreed that city exchange programmes are a valuable mechanism in developing learning platforms and taking research findings beyond their city context in which they are developed. Dr. Taylor further indicated that due to long discussions between cities and understanding their respective burning issues, prior to the city exchange visits the FRACTAL project became a success. She also suggested that for continued success there is a need to encourage private and corporate involvement at national levels. Lastly, Dr. Taylor thanked the participants for sharing their experiences and addressing the questions.

Session 5: City of Windhoek Integrated Climate Change Strategy and Action Plan's process update and discussions

Mr. Olavi Makuti, Environmental Management Officer, Health and Environmental Services Division, City of Windhoek

Mr. Makuti started off his presentation by saying that climate change issues are serious particularly in southern Africa and the city of Windhoek is no exception. He indicated that the city Windhoek is more vulnerable to climate changes, as a result the city is involved in various activities that are aimed at ensuring the city's resilience in the long run. Mr. Makuti's presentation highlighted the activities that city of Windhoek is involved in. these activities are meant to tackle the issues of climate change including the progress, principles and what the city want to achieve on its developed CoW- Integrated Climate Change Strategy and Action Plan (ICCSAP).

Mr. Makuti indicated to the participants that global warming is a natural process, however over the years as the industrial revolution began the concentration of greenhouse gases in the atmosphere increased trapping more heat and increasing the earth's average temperature. He noted that in the older days industrial production was less compared to now, hence more emissions are now being emitted into the atmosphere than before. According to him advance technology and introduction of computers are some of the major contributing factors to increased atmospheric temperature as they allow for mass production while increasing energy consumption.

According to the latest Intergovernmental Panel on Climate Change (IPCC) report, Namibia will be mostly affected by climate change if the global temperature exceeds 1.5 degrees. It is against this background that the city of Windhoek and the FRACTAL project have been working hard to sensitize the issue of climate change to contribute to shared effort from other countries. Moreover, he indicated that although Africa contributes less to global emissions compared to other developing and developed countries the continent is most vulnerable to the impacts of climate change because of the continent's reduced adaptive capacity. He went on further to emphasise that African cities particularly in southern Africa are faced with challenging issues such as increasing urbanization, issues of water scarcity, sanitation problems and continuous high energy demands. As many people migrate to the city in search of employment and a better life, the conditions within the cities worsen due to a burden to maintain adequate services for all city residents. These conditions are especially worsened by a lack of sufficient investment in water and energy infrastructures coupled by challenging natural elements.

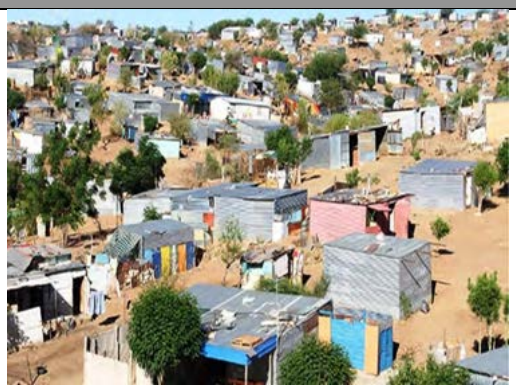
Mr Makuti admitted that globally there have been efforts (such as the UNFCCC, the Kyoto protocol, the Paris Agreement) to reduce global emissions and Namibia has been part of a few movements designed to combat climate change. Nationally the country has taken steps to combat climate change by developing the National Climate Change Policy in 2011 in order to guide the national response to climate change issues. Apart from this, the country also has a National Climate Change Strategy and Action Plan (NCCSAP) of 2013-2020 including other developmental documents such as the National Development Plan 5 (NDP5), Vision 2030 and the Harambee Prosperity Plan of Namibia.

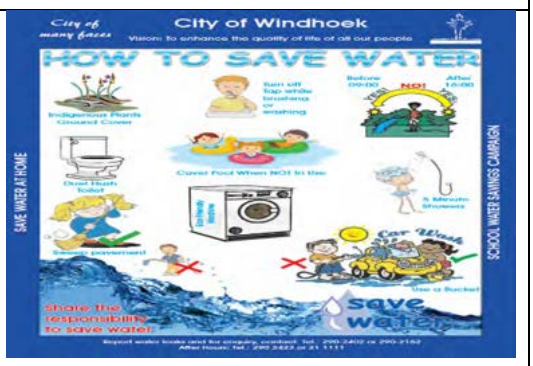
At the city level, city of Windhoek is involved in a number of activities aimed at addressing climate change these include the climate change desk which is responsible for the city's response to climate change, the development of the city's ICCSAP which is aimed at guiding the city on how to respond to climate change calamities and possible actions they could employ.

The city with assistance through the FRACTAL project also ran some models to see how the city will be impacted in the future. Mr. Makuti showed that according to the models the city will get drier as such narratives and infographics as a way to simplifying information were developed to help decision makers make informed decisions. Mr. Makuti understands that should business go on as usual the situation will worsen over time therefore it is important for cities including Windhoek to take actions upon themselves to combat climate change issues. Covering less than 2% of the global space and contributing more than 75% to global emissions, cities ought to take up actions to enhance their adaptation, preparedness and mitigation activities. However, this has always been a challenge due to limited adaptive capacities. Because of this the CoW-ICCSAP is only focusing on burning challenges around the city which are hampering the city from achieving its sustainability and climate resilient status.

Mr. Makuti admits that in order for the city to take issues of climate change seriously a formalized approach to climate change should be followed through the city's climate desk. Through this platform the city has participated on various activities aimed to sensitize climate change issues within the city including the FRACTAL project. The project allowed stakeholders including council members to identify burning issues hampering the city in becoming a climate resilient city which was a departure point for the FRACTAL project. The CoW-ICCSAP is framed around three pillars: adaptation, mitigation and cross cutting issues. The focal areas of the response plans are presented in the Table 2 below. Currently, the strategy has been reviewed by an external reviewer and comments have been given. The proposed CoW-ICCSAP is still to be submitted for the Council approval before it is launched, hopefully within 2019.

Table 2: Focal Areas of response plan for the proposed CoW-ICCSAP

Response factor	Action plan	
Human settlement	Formalization of informal settlements Controlling the increase in urban settlement Sanitation issues Environmental degradation	
Water Security and efficiency	Demand Management Augmentation of current supply Water reclamation Awareness raising and policies	

Renewable energy and energy efficiency	Promote the use of renewable energy CoW renewable energy policy	
Biodiversity and ecosystem goods and services	Develop biodiversity management strategies Develop policies that promote the protection of biodiversity Accord conservation status to biodiversity hot spots	
Awareness raising activities	Save water Save energy Waste reduction	
Sustainable transportation	Implementation of public transportation Integrated Transportation Master Plan	
Disaster preparedness	Disaster preparedness unit	

Healthy communities	City healthy profile Healthy city programme	
Public awareness and capacity building	Increase awareness within city residents	

Mr. Makuti concluded the presentation by saying that the document is a working document and all city department were involved in the development of the document. As such, shared effort from all departments is required including the city citizens to minimise further impacts on the environment while using climate information in all their decision making processes. He indicated that it is important for the city to have a localised ICCSAP and even if it is in its developmental stage, this shows the city's commitment in dealing with the impacts of climate change. The ICCSAP is to build the city's resilience to climate change by increasing the cities adaptive and mitigating capacity. The ICCSAP is also a tool to support national goals and it forms part of the institutional framework for mainstreaming climate change in all cities operational areas. Mr. Makuti indicated that ICCSAP is a dedicated approach and the idea is to have this provision in sectoral policies in order to ensure that climate change issues are strongly addressed and climate information is used to inform future decisions for the city. Lastly, Mr. Makuti noted that it is important to build and enhance capacity at all levels in order to sensitize climate change issues within the city.

Session 6: Co-producing the Windhoek impact story and closing remarks

Ms. Saima Haukelo, Environmental Management Intern, City of Windhoek and Dr. Anna Taylor, Post-Doctoral Researcher, African Centre of Cities, University of Cape Town

Ms. Haukelo as an observer on the Windhoek activities, she provided her opinions that the FRACTAL project provided an important space for a wide range of people to provide input. Moreover, FRACTAL also helped in sensitizing the councillors to the need for and importance of a climate strategy, building the political will to support the ICCSAP, in generating relevant information about changes in the climate over the Windhoek region and making it accessible. She also pointed out that opportunities were created to learn from the experiences of other cities in tackling climate challenges. Ms. Haukelo emphasized the importance of building relationships with stakeholders outside of the city who can help frame city policy to reflect a range of stakeholder needs and perspectives. In conclusion, Ms. Haukelo mentioned that the impact story suggests that other policy development processes might want to consider how to include co-production as a working principle.

Building on, Dr. Taylor asked participants to co-produce the Windhoek impact story. Participants were asked to draw and write on a piece of paper a SEED that represent the FRACTAL activity / output and the FRUIT that represent the impact in Windhoek by the FRACTAL project. The Table 3 below provides the summary of the co-produced impacts of FRACTAL in Windhoek.

Table 3: Summary of the co-produced impact of FRACTAL in Windhoek

SEED – FRACTAL activity / output	**FRUIT** – impact
Learning from Durban activities during the talk show / panel discussion in the final Learning Lab e.g. hub and compact, Leading Integrated Research for Agenda 2030 in Africa (LIRA) activities, thinking of informal settlements as part of the city.	Possibly linking mitigation and adaptation activities in the same way e.g. community base ecosystem based adaptation work.
Recognizing the setbacks to furthering climate agenda and action when individuals being replaced by high turnover of staff, identified through the CaDD work.	Possible further implementation of institutional capacity strengthening work e.g. CaDD.
Research exchange – having other city representatives at the Lab.	Use other city's examples to tailor make it to our own examples, like Durban's community based adaptation, and implementation of Durban's CCSAP.
Acacia pod containing several seeds: consideration of migration and informal settlements in relation to climate issues; adapting to water shortages; sustainable energy solutions for all.	Engagements in FRACTAL activities has shown that, though the issue of climate change may seem like an impossible task, everyone is working together to find solutions. [So the impact could be growing a sense of empowerment and a network to act on climate change].
Discovery of different burning issues that the city faces.	Bringing different actors and sectors to solve those issues through co-production.
Consideration of climate change issues in master plan development.	Windhoek renewable energy development projects.
Climate change learning lab.	Stakeholders establishing the inter-linkages between adaptation and mitigation.
Ujams wastewater treatment plant case study	Policy development
Planting seed in several CoW departments	Part of a journey of building a city that is more climate resilient for future generations.
Spreading the climate message.	To be all inclusive, including everybody from the grassroots level.
Informal settlers who are involved in such discussions.	Future more informed society who will contribute by coming up with measures that

	will curb climate change impacts.
Awareness of climate risk is very strong within the cities, particularly related to youth.	Through continued engagement we can improve the flow of information to those who need it most.
City exchange funding provided and facilitated by FRACTAL.	Evidence today showed that people are keen to enlarge and learn more. There are key learnings coming from these exchanges and it appears that people are eager for more such opportunities.
Inviting community members to join in the Learning Lab and creating opportunities to participate fully and equally.	"I learn a lot of many things today and get more information"
Political training	Development of CoW-ICCSAP; CoW renewable energy policy.
Community engagement	Awareness of climate change by community; awareness of CoW with other stakeholders
Climate change desk	Development of CoW-ICCSAP.
The concept of mainstream versus dedicated climate change responses (presented at transformative leadership workshop).	The idea is embedded in the ICCSAP where lead departments have to mainstream climate change into their mandates.
Collaborative engagements	Sharing and learning with other cities and planning to visit other cities (e.g. Ms. Kahitu planning to visit Durban).
Hearing about the Durban Adaptation Charter from city exchange colleague at the Lab.	Develop a hub; Windhoek to build capacity with other Namibian cities.
Climate information mainstreaming.	Strategies and action plans that take climate into account.
The networking that the Labs enabled.	People can exchange contacts, coordinate and collaborate beyond the FRACTAL Lab.
By training councillors there is now more understanding of climate by decision makers.	A more resilient city to climate change adverse impacts, especially to water sector decisions.
Many seeds: commitment, collaborations, engagements, funds, workshops, trainings, learning labs.	Empowerment, increased individual involvement / awareness, improved ICCSAP for city, exchange learning platforms.
Creation of CoW Climate Change Desk.	Engage all stakeholders within CoW that can contribute from their departments towards addressing climate change.
Sharing of experiences from other cities.	Improving the CoW-ICCSAP.
Exchange of ideas and lessons around city level CC action and strategy planning e.g. Gaborone visiting Windhoek and learning	Gaborone now pressing ahead with their own city level plan; visit to Durban and partnerships / future collaboration to share

about ICCSAP process & learning from the Durban case from Lulu on lessons from their planning about political commitment, etc.	learning on implementation.
Analytic Hierarchy Process and other tools used as part of decision-making process	Allows for climate change and climate resilience to be included as an important factor when planning infrastructure.
Youth Councillors Training	Finding new champions to grasp, promote and advocate for climate-related issues, thereby holding authorities to account and driving change.
Lab and energy project with informal settlements.	We have learn a lot from FRACTAL but policies in the City is a challenge to the informal residents, most of their services does not include them. We encourage the Council to develop platforms with residents from informal settlements.
FRACTAL research and Labs highlight need to support communities to build their capacity to implement climate adaptation and mitigation measures.	Support for community-based interventions, specifically on: promoting voluntary movement from flood lines / river beds; management of natural resources through empowerment of and incentives for communities to move away from using natural resources like wood for making fires to making use of solar energy; incentives for the replacement of electrical geysers with solar geysers for all households in Windhoek.

Some participants shared their "Seeds & Fruits" with all participants. In closing, Dr. Taylor thanked all participants for attending the lab session and invited them all to return for Day Two. Then after the Final Windhoek Learning Lab day one was adjourned.

Day Two

Session 7: Introduction of participants and Day One recap

Prof John Mfune, University of Namibia

Prof. Mfune welcomed all participants to the second day of the Final Windhoek Learning Lab. The participants that had just joined for Day Two were asked to introduce themselves. Prof Mfune did a quick recap of Day One, and then after asked participants three questions.

1. What activities of FRACTAL do you remember and struck your attention?
2. What do you remember about the Windhoek impact story?
3. What do you remember about the CoW-ICCSAP?

The three questions were asked to encourage engagement and conversation between participants before the activities of day two began. Prof Mfune also wanted to remind participants of the main points discussed the previous day.

Session 8: Windhoek's water resource planning under climate change

Dr. Anna Taylor, African Centre for Cities

Dr. Taylor stated off the session on distilling climate information for increasing Windhoek water security as a key component of urban climate resilience (focusing on managed aquifer recharge). The aim of the series of sessions were: (1) To understand the decision process of the Windhoek Managed Aquifer Recharge Scheme (WMARS), within the wider Namibia Central Areas regional water planning, management and governance context; (2) To figure out what climate (change) information might be relevant to, and actionable by, various actors; (3) To begin the process of distilling the necessary climate (change) information, in collaboration with those who will use it in the decision process(es); and (4) Tentatively chart some next steps (with associated resourcing). In the table below Dr. Taylor listed what is known about the WMARS decision process and what are pending / upcoming WMARS decisions.

Table 4: WMARS process timeline and upcoming decisions

What we know about the WMARS decision process
• 1997: Concept first considered during severe drought period as alternative to piping water from Okavango River (three dams running dry) • 1997-1999: Aquifer studied to establish flow characteristics and boundaries, technical feasibility study tested first recharge points • 2002: Results of WMARS technical feasibility study published • 2002: New reclamation plant commissioned • 2003: WMARS economic feasibility study undertaken • ??: Agreement between NamWater and CoW on payment model for water (cost price paid during recharge, mark up paid during extraction, i.e. point of sale to consumers) • 2004: Feasibility phase completed, 4 boreholes equipped for recharge • 2005: Implementation plan & water quality requirements established • 2006 - 2012: First production phase, 2.83 Mm^3 injected via 6 boreholes • 2013 - 2016: Expansion phase to drill additional 10 recharge boreholes and 10 deep abstraction boreholes; low rainfall, increasing abstraction rates • 2014: CoW capital investment to date 57.8 million • 2015: CoW announces water restrictions due to low dam levels • 2016: President declares national state of emergency due to drought • 2016: Drilling more abstraction boreholes, abstracting 11 million m3/annum • 2016: Draft WMARS proposal to Green Climate Fund (GCF) • 2017: Good rains, motivate to get back on track with WMARS • 2017: Full proposal (funded by United Nations Development Plan (UNDP) submitted to GCF but unsuccessful • 2018: 8 Recharge points but 2 defunct, capacity to recharge 2 Mm^3/a • May 2019: President declares national state of emergency due to drought & CoW declares water crisis.

What are pending / upcoming WMARS decisions
• How many, where and when to drill additional injection boreholes? And more abstraction boreholes? And install necessary pumps and pipes? • Where to source water for recharge? How much? What quality? At what cost? • Who will pay: How to finance the next stage(s)? • What scale can WMARS be taken to? (How many boreholes, how much water, what injection rate); Over what stages and timescales? • What are the thresholds for initiating each stage? (Potential for application of the adaptation pathways approach as a next step?).

Dr. Taylor stated that, what is known about the wider water planning, management and governance context of WMARS, the inputs from following presentations by Eng. Alice Chang and from Prof. Dianne Scott - drawing in material from Eng. Nick Walker *et al.* 2017 work.

Dr. Taylor listed the different institutions / organizations that have a stake in figuring out climate info needs for the water planning:

- CoW Department of Infrastructure, Water and Technical Services - Windhoek water distributor
- NamWater - Windhoek bulk water supplier
- Namibia Meteorological Service- national weather and climate service provider
- National Climate Change Unit - facilitating climate change action
- Windhoek residents & business reps - water users and taxpayers
- CoW Councillors - decision making body
- CoW Department of Finance - decide budget allocations; leverage loans and grants
- UNAM - national knowledge producers
- CSAG - regional climate information producers & providers
- UK Met Office - international climate information producers & providers
- Banks, UNDP, GCF, DfID - financiers & funders

Lastly, Dr. Taylor noted the climate information needs: Rainfall patterns (including long-term trends) influencing dam levels and natural aquifer recharge rates; and temperature and evaporation patterns influencing dam levels, water demand levels, water quality parameters. Consideration of the time scale either temporal scale (daily, weekly, seasonal, decadal, 30 years) or spatial scale (catchment, city, country). Nevertheless, non-climate info needs: population growth, economic growth, water demand, supply costs, water pricing and revenue, technological developments for alternative supplies and water efficiencies.

Eng. Alice Chang, Aurecon

Undoubtedly, Windhoek is a dry city and currently the city is faced with water crises after it has been plagued by a drought since 2017. The water scarcity in Windhoek is real, as such the city has gone a step further to plan for water resources in light of climate change. Aurecon South Africa Office was contracted by the City of Windhoek to develop the Windhoek Integrated Water and Wastewater Master Plan (IWWWMP). Engineer Chang from Aurecon illustrated what the process is likely to involve, what Aurecon thinks could be the approach and methodology in response to what the city has requested. The session was also a platform to provide initial feedback into the master plan process from the participants.

To start of her presentation Eng. Alice emphasised that the Windhoek IWWWMP project has not yet kicked off as such her presentation only showed how Aurecon will intend to meet the city's terms of reference and how climate change can influence the deliverable. She also indicated that the master plan was tied to questions posed at First Windhoek Learning Lab relating to the availability of climate information and its ability to ensure climate resilient water infrastructures in Windhoek. The plan was also developed following possible reduction in water supply from NamWater and lack of mediate term water alternatives for the central areas of Namibia. While NamWater responsibility is to get water to central areas of Windhoek, Eng. Chang indicate that their project will mainly focus on infrastructural water distribution systems, water treatment plants, wastewater treatment plant and sewer plants. She admitted that these two different factors although they do not overlap they need to speak to each other to ensure water supply to the city.

Eng. Chang indicated that the city's water demand in 2013 was $36Mm^{3,}$ as compared to ~$34Mm^3$ available from all water sources such as semi-purified waste water, reclaimed wastewater, ground water supply and surface water. This means Windhoek has not been behaving like a dry city and by 2050 there will be a $50Mm^3$ deficit with current water resources. This estimate is likely to increase due to climate change impacts decreasing annual rainfall by 10 – 30% during the next 100 years. It is against this background that an IWWWMP is being developed. Eng. Chang also added that the city realised that due to occurrences of pollution, eutrophication and algal bloom in the Swakoppoort and Goreangab reservoirs, plans to go ahead with the master plan were approved. These factors were understood to reduce water availability to the city and generating possible health issues related to waterborne diseases. A strategic master plan was then planned to assist the CoW in mobilising the necessary resources for ensuring sustainable and affordable water supply and sanitation services for a period of 20 years.

Eng. Chang clarified that in order to achieve a successful IWWWMP an Integrated Urban Water management (IUWM) approach will be used by looking at the city's water cycle through optimising the linkages between wastewater, portable water and energy. Secondly, the plan will aim at improving the city's resilience to climate change by optimising and expanding current recycling systems. Thirdly, engagement of stakeholders from the technical, institutional, financial and environmental spheres. Fourthly, a strategic and operational document will be developed aiming at determining the required works, costs, impacts and sequence investments. Lastly, a thorough economic and financial analysis will be done detailing the financial approach and strategy to develop the plan. According to Eng. Chang the development of the master plan will be done in three phases as described in the Table 5 below.

Table 5: Proposed developmental phases for the Windhoek Integrated Water and Wastewater Master Plan

Phase 1	**Integrated Diagnosis**
	✓ Confirmation of Windhoek Proper ✓ Water balance reconciliation ✓ **Climate change risk assessment** o Quantifying probable effects of climate change on water demand, water resources and water balance. Based on existing studies' results. o Assess the vulnerability of existing facilities to extreme

	climatic events, mainly floods. ✓ Water supply facilities ✓ Wastewater facilities ✓ The case of informal settlements ✓ Institutional and regulatory assessment ✓ Environmental and public health impacts ✓ Financial sustainability ✓ **Proposition of scenarios** o Three comprehensive scenarios describing a sustainable future o Objective: To help CoW screen the possible options before developing the Master Plan. o Each scenario should: ▪ Reconcile water demand and water resources over the next 20 years ▪ Propose a coherent bulk development strategy ▪ Propose a recycling strategy regarding wastewater and sludge, and a sludge value chain strategy for the informal settlements and rural areas ▪ Propose an institutional set-up for the management of the facilities.
Phase 2	**Comparison of Scenarios**
	✓ Detailed water balance reconciliation ✓ **Climate change resilience and water security of the scenario – propose an indicator to qualify the level of resilience to climate change of the scenario** ✓ Service level strategy per type of area (Windhoek Proper, informal settlements, rural areas) ✓ High level mapping of the bulk infrastructure ✓ CAPEX and OPEX estimate ✓ Tariff structure ✓ High level costs benefits analysis ✓ Institutional set-up for the implementation, operation and maintenance.
	✓ Multi-criteria analysis: o Weighted technical, environmental, social, climate change resilience, financial and economic criteria (to be discussed with CoW prior to developing the analysis) o How heavily should **climate change resilience** be weighted compared to other criteria? ✓ Scenario to be developed will be selected by the Steering Committee
Phase 3	**Development of the Integrated Master Plan**
	Optimise selected scenarios or merge various scenarios and develop the Master Plan ✓ Concept design of new bulk infrastructures, rehabilitation and improvement of existing infrastructures ✓ Ensure adequate level of service ✓ Include accompanying measures

	✓ Phasing of developments ✓ Identify priority projects

To encourage engagement between the participants, Eng. Chang asked the participants to group themselves in five groups and to picture Windhoek in 2039. She asked the participants "*If you were a CoW official, and you were responsible for drafting the request for Proposal for the selection of consulting services for the Windhoek IWWWMP, how would you allow the inclusion of climate change?*" Some response from the participants includes:

1. Conducting a vulnerability assessment in order to offset the impacts.
2. By diversifying water supply sources to ensure resilience.
3. Have participants from the city's climate desk or the national climate change unit sit in on the selection committee.
4. Consider the city's geo-sciences and lack of surface water supply.
5. Consider the projection of the reduction of rainfall in the next 100 years.
6. Have a technical task force including academics, climate scientists, and environmentalists etc. to look at the proposal and fill in the gaps.
7. Look at how you can better the current infrastructures in place.
8. Look at baseline studies in terms of what information is available related to climate change in the city.
9. Use indigenous knowledge to inform decision making.
10. Avoid management by crisis norm of doing things.
11. Look at the sensitivity of the water supply sources in Windhoek to climate change.
12. Account for the range in the scenarios as opposed to optimization output from each scenario.

In the same groups, the participants were also asked to picture Windhoek under three scenarios and how it would be like. Discussions were made in groups were presented to all participants. The below Figures illustrate the outcome of the scenarios from all the group discussions.

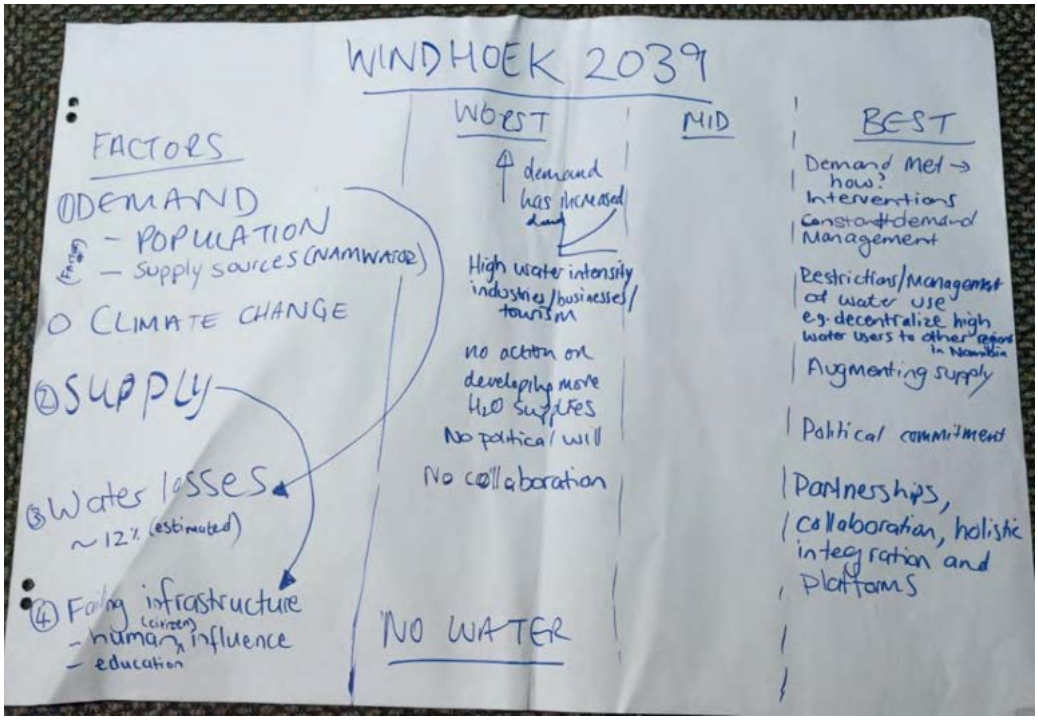


Figure 8: Group 1 discussions on the Windhoek IWWWMP scenarios

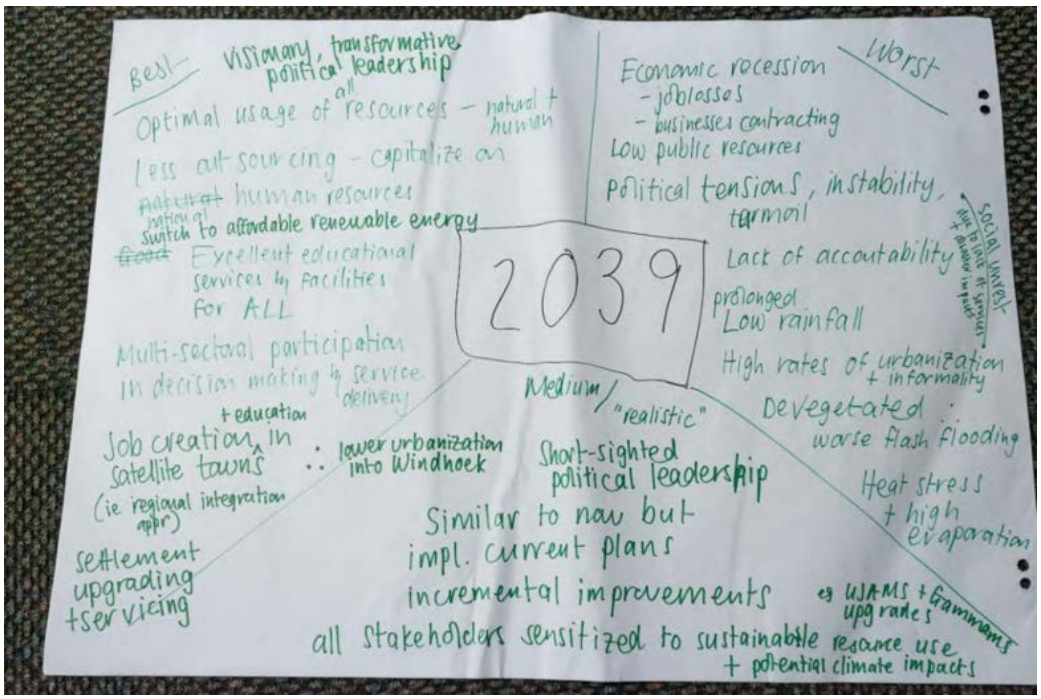


Figure 9: Group 2 discussions on the Windhoek IWWWMP scenarios

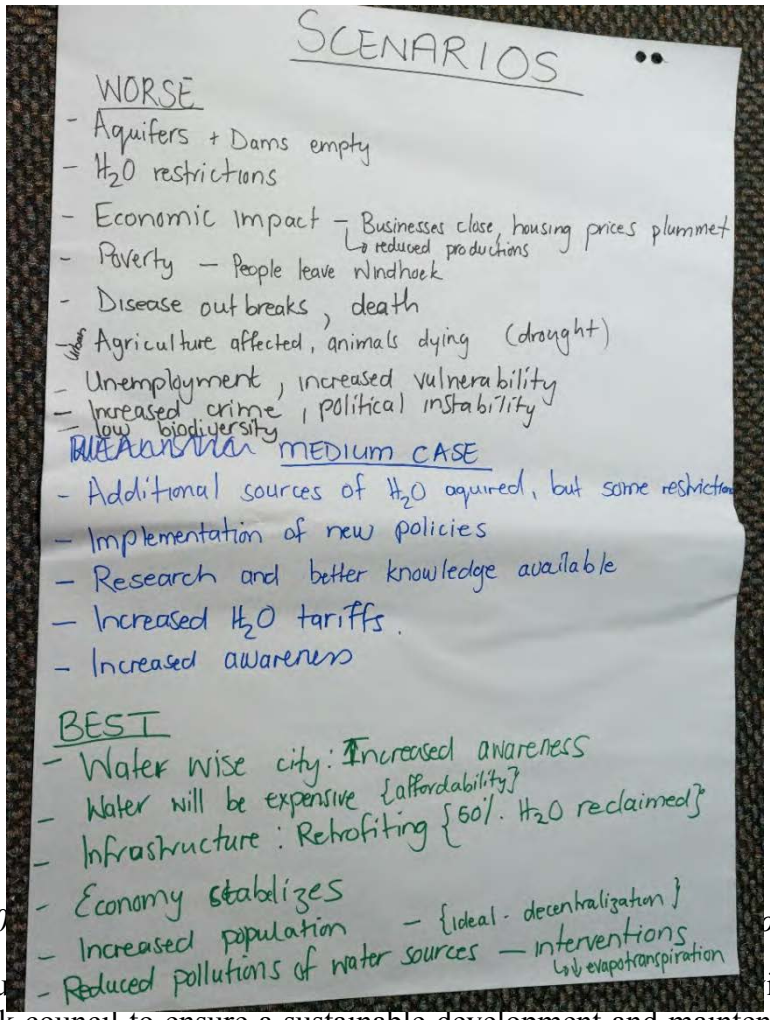


Figure 10 [illegible] *os*

In conclu [illegible] ide a vision to City of Windhoek council to ensure a sustainable development and maintenance of facilities and an operational plan to the municipality departments for the development of the infrastructure. Participants also agreed that multiple institutional involvement is important to ensure that the master plan speaks to both social, environmental and economic factors. In the meantime strong water demand management measures is required, coupled by measures to reduce water losses and mechanisms to increase wastewater reclamation and management of the aquifer recharge.

Session 9: Climate information distillation

Ms. Tamara Janes, Science Manager of Climate Information for International Development, UK Met Office and Dr. Izidine Pinto, Post-Doctoral Researcher, University of Cape Town

The aim of Ms. Janes' presentation was to explain what distillation meant and practically allow participants to do some distillations with pieces of climate evidence for the city of Windhoek. In order to put things into perspective, Ms. Janes agreed that climate science is a very wide ranging field and complex in nature and as climate scientists they have a wealth of information sources that they can use in order to inform decision making. These mainly range from complex models on both regional and global scale that they use to do specific analysis on various regions. Climate scientist do analysis on observational data, historic trends of what might be happening in different regions which could be somehow complex if one does not have an idea of what the current vulnerabilities could be in the region of interest. Ms. Janes further noted that climate scientist can also take it a step further by looking at the risk of extremes in the future. This is important to see how extreme weather events or extreme conditions might change under various future climate scenarios. Admittedly, climate scientists have not been good at translating the science into useful and relevant information

historically. Ms. Janes noted that this is where distillation comes in because science cannot be left hanging for no one to make use of because useful information can be extracted from it.

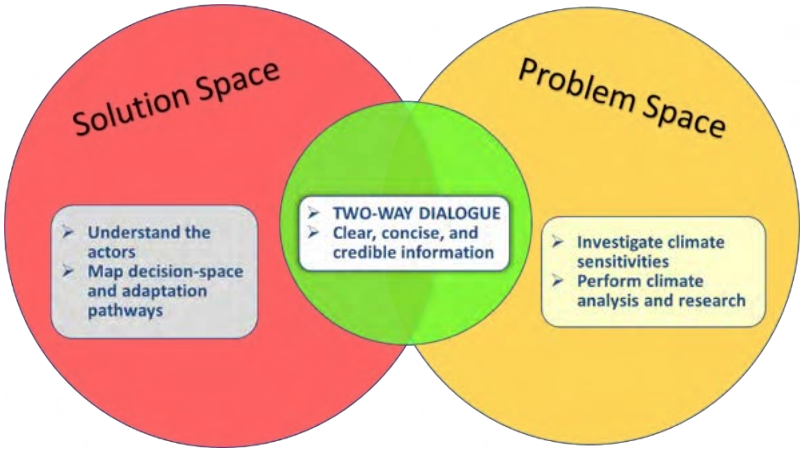


Figure 11: A depiction of the solution space and problem space in defining distillation

In FRACTAL distillation is defined as the process by which one takes complex climate science, and tailor it by making it more relevant to a specific decision making context (see Figure 11). Ms. Janes admits that distillation is a crucial part, and the climate science that climate scientist offer must be tailored to various specific decision making contexts. In order for participants to visualize what distillation meant they had to consider a specific problem, one which scientists are usually comfortable with such as considering the climate sensitivities (processes at play within the atmosphere and ocean and how would these processes change in the future in case of a warmer climate). Ms. Janes noted that although climate scientists are mostly comfortable with the science side of things they are mainly challenged within the solution space where decisions are made on the ground. In order to better understand this space and the key actors involved in the region of interest a mapping of the decision space is crucial in order to identify adaptation pathways. This is one of the key outcomes of what FRACTAL has done to map the decision space before thinking about what climate science information is available.

Ms. Janes view distillation happens at the convergence of climate science and decision space. She believes that climate scientists cannot do distillation on their own, the process requires a two-way dialogue between climate scientists and users or decision makers on the ground. She gave an example: When a person visits a Doctor, a good General Practioner (GP) would ask you questions about your illness and help diagnose the problem you are facing. What one will not appreciate is have the GP write you a note and send you out. She explained that distillation is similar in a way that instead of climate scientists dumping climate science information on decision makers, there is a need for a two-way dialogue in order to identify which information is relevant. Within the process of distillation and the steps taken in order to decide which information is relevant for a particular decision, there are often assumptions made along the way which are usually associated with risks. According to her it is important to know that every decision made by climate scientists and decision makers in terms of identifying what information is relevant has an assumption and a level of risk associated with it. What is key is to have an amount of acceptable risk within the climate information of interest which will be dependent on the decision making context.

Figure 12: Climate Evidence Box

In order for participants to have a feel of being a climate scientist a box of evidence (Figure 12) was unpacked from the previous training on climate and background to climate science. In groups, participants had to (1) Identify the key messages from each of the following plots; (2) What questions/clarifications would you want to ask of a climate scientist?; and (3) What's missing? The figure below is an example of the climate information provided for interpretation (Figure 13).

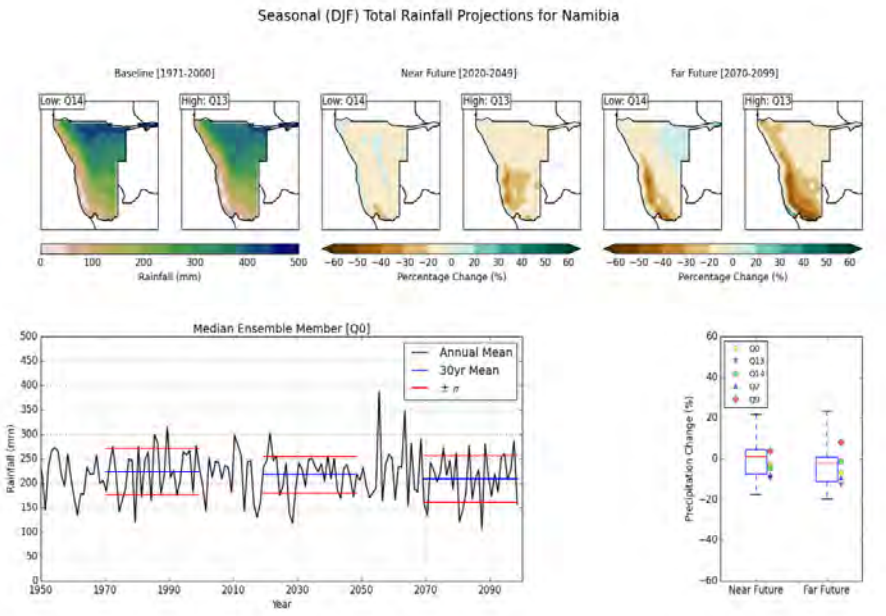


Figure 13: Season total rainfall projection for Namibia

This exercise gave participants the opportunity to experience what it is like being a climate scientist in terms of interpreting plots and graphs. This exercise also allowed participants to have the opportunity to ask climate scientists questions and enable dialogue between them in a way resulting in informed decision through the distillation process. While unpacking the box she indicated that the content was complex and some graphs were in black and white which is not ideal when working with scientific information (Figure 14). Ms. Janes then identified some plots that the participants can use in order to do some analysis.

Figure 14: Participants taking a picture of the climate information plots

In groups participants identified what they felt were the key messages within the plots, the type of questions and clarifications they would ask a climate scientist and what pieces of information was missing? If they had issues they would call the climate scientist to help guide their discussions. After this discussion the groups presented their outcome. Finally, Ms. Janes hopes that using this exercise distillation has become clearer through dialogues between the climate scientists and decision makers. She also indicated that plots are essential tools for scientists to display the information contained within climate models or observation data in a way that makes sense to them. However, the key was that, these tools could make sense to them but not everyone and that is where the dialogue needs to happen in order to ensure an informed decision making process.

Figure 15: Participants discussing and interpreting the climate information plots

Session 10A: Capacity mapping and development to enhance climate governance

Prof Dianne Scott, Associate Professor, African Centre for Cities

Prof Scott began by noting that the purpose of the presentation was to give a bigger picture in terms of mainstream climate change information into decision making, governance and policies in the city. She mentioned that it is important to have an understanding of the bigger picture including the governance configurations within which we operate in when making decisions. To better explain, Prof Scott indicated that in order to understand the governance configurations within the city of Windhoek one needs to understand the actors involved, who mainly have the power to make decisions and to create legislations and policies. In many cases these actors have the knowledge about climate change and they often time have access to systematic funding for upgrading human capacity which is important for decision making. Apart from having the knowledge on climate change, actors also have the ability to act upon the policies and regulations, and rule out the needed information they need order to ensure an effective decision making process. After understanding the policies and regulations including all relevant information in place, there is a need to further understand the materialities in place. These include the geographic aspects, hydrology, physical infrastructures in place and a further deep understanding of the water situation.

Furthermore, Prof. Scott stated that there is a need to consider the discourses involved, this involves ideas around social development, co-operations and risk sharing, vulnerability to climate change and neoliberal economic. Considering all these factors (Figure 16), decision makers are able to mainstream climate change into their decision making. Prof Di also indicated that the ICCSAP for the city is already a step towards implementing the mainstreaming of climate change information into decision making because decision makers are now required to go an extra step in thinking about climate change.

Figure 16: Water and climate change governance configuration for Windhoek

Prof Scott emphasised that the Namibian water governance is being managed by three actors: The Ministry of Agriculture, Water and Forestry, NamWater and various departments within CoW. Other non-stakeholders, NGO, civil societies, donors and private companies are also involved. The discourses around the water issues in Windhoek include water as a public good where everybody needs water as basic means of survival. Water in Windhoek is also considered as a commodity as it is not free, as such people need to pay for it.

Additionally, due to the drought situation in Windhoek water is mainly considered as a scarce resource. Due to the discourse around water and its relationship with climate change either positive or negative there has been some degree of dedications towards climate governance. One of this includes the climate change unit which is running under the Ministry of Environment and Tourism. The unit has three staff and they use the states legislation and national policies to ensure that the national climate change strategy and action plan implements the climate change policy. Prof. Scott concluded that actors and institutions should be dedicated both at national and local levels to mainstream climate change into their decision making. She also applauds the CoW for localising the national strategy and hope that this will encourage other local municipalities to take up climate change issues seriously and get involved in developing strategies that speaks to their respective environments.

Session 10B: Organisational capacities needed to deliver climate resilient decision making and action (+ General Discussions)

Ms. Liz Daniels, Research Fellow and Dr Sukaina Bharwani, Senior Research Fellow, Stockholm Environment Institute

Ms Daniels's presentation looked at what all institutions involved in decision making need to look like for climate resilient action. To allow for dialogue among participants Ms. Daniels posed a question to the room by asking what institutional capacity and capabilities are needed to deliver a resilient decision making and action. By looking at the best scenario in 2039 from the previous exercise, how can we get there as a city and what sorts of things need to be in place at an institutional level to reach that scenario. Some of the suggestions from the floor included:

Table 6: Suggested institutional capacities needed to deliver climate resilient decision making and action in Windhoek

	Suggestions
Institutional Capacities	Transparency
	Awareness within institutions
	Diligence to implement respective mandates by different actors
	Traceability to enable adjustment and changes
	Continuous learning by institutions e.g. being able to retain staff
	Network of champions
	Capacity to organise platforms between departments to have integrated approach to problems
	Policy coherence
	Building political buy ins by political leaders
	Departmental champions
	Leaderships

Ms. Daniels said that the Climate Capacity Diagnosis and Development (CaDD) tool gives a structured way through some questions enable to understand what level of capacity or which capacities organizations are particularly strong in or the opposite which could be useful for development. Ms. Daniels mentioned that the CaDD tool, although used in European cities, was used in Windhoek and Lusaka which is a different context in order to provoke engagements and to explore which capacities are strong and which are not in order to accelerate action.

The participants were grouped into two groups to discuss the following questions. 1. What are some of the capacity challenges you face within your institutions or departments and what could be the ways to overcome them? 2. Which ones are the most pertinent and pressing challenges you face in your decision making action and what are the ways to overcome those? Who needs to take action? The discussions were presented back to all the participants.

Session 11: Last learning lab, what is next?

Ms. Alice McClure, FRACTAL Coordinator, University of Cape Town and Prof. John Mfune, University of Namibia

Ms McClure started off by appreciating the efforts that the Windhoek Embedded Researcher (Kornelia Iipinge) has invested in enabling these processes, organising events and making sure that all the activities within FRACTAL were planned and organised timely. She regrets that due to reduced budgets the next phase of FRACTAL will not have embedded researchers thus it could be difficult to convene platforms such as these. As Ms McClure has learned from the reflections that the learning labs have generated interesting lessons that created the power of engagement and the contribution it has made in ensuring transparency and dialogues among partners. Ms. McClure hopes that although the last phase of the project has come to an end she looks forward to suggestions on how FRACTAL including its partners can assist in initiating processes and strongly laying foundations to activities such as these.

On the way forward Prof Mfune wants residents of Windhoek and surrounding towns to remember that we have a water issue and other associated climate related challenges. He indicated that Kigali - Rwanda gives us a good example of taking an issue, owning it and making change that is impactful. He urges that the city will recognise current problems and take actionable effort in solving the problem. He further urges all residents to play a role in creating a resilient city. Prof. Mfune indicated that FRACTAL has helped the city to realise that they can tackle the issues of climate change and they are able to develop the capacity to ensure a climate resilient city. However, in order for this to happen the city needs to own the process and take it up within own different official mandates a difference can be made. He hopes that what FRACTAL has done in Windhoek will be taken up seriously and continued by all respective stakeholders. Lastly, Prof. Mfune thanked all the colleagues especially the city of Windhoek for opening their doors to the FRACTAL project and funders of the FRACTAL project. To close off Prof Mfune said “This is our city, this is where we exist, and we should therefore make our city better for ourselves and not wait for people to come to our rescue”.

As part for the learning lab reflections, participants were asked to note down responses on sticky notes on the following: major learning; how to take these forward; and who is responsible, as shown in Table 7.

Table 7: Participants reflections on the Final Windhoek Learning Lab

Question	Participants Responses
Major learnings	• Capacity of FRACTAL to join various actors together on a safe space with equality – no hierarchy. • FRACTAL process key learning, "awareness" establishing enough proof about the negative impacts/issues concerning climate change. • Simplification of climate information into infographics and narratives. • Co-production. • Courage to share ideas • Research/case studies. • Coordinated exchange of information on climate change. • Taking climate change information and incorporating that into the day-to-day work environment. • Simplifying of climate change information. • Mental planning (conceptualising?). • It is important for CoW to be resilient in the future. • Everything about climate change. • System is complex. Not everything is what you expect. Challenges with institutions "complexity". • Complexity of decision-making process. • How decisions are made, the complexities and who's involved. • Being climate resilient. • The type of engagements of the FRACTAL project create an environment whereby different stakeholders shared their experiences. • Energy challenges, water and sanitation. Climate challenges are here to stay and we must adapt. • Decision-making: Is not that simple, Climate information is not the only factor compared to other social problems.
How to take these learnings forward	• Training partners and technicians to involve decision-makers in there events and to run the events e.g. learning lab training. • FRACTAL should not only end here in today's discussions but further outside to a larger organisational body and communities. • Encourage environmentalists/climate scientists to simplify info in all their awareness activities/workshops/training.

	• Continue the relationships that exist. • Online platform: Climate change desk, raise awareness. • Transparency: Media, within CoW itself. • Challenges must be taken seriously: Idea to action. • Use the findings to contribute towards decision-making in the city of Windhoek. • Co-production process increases receptivity which increases mainstreaming. • Involve more towns. • All policies developed moving forward should include climate change information. • There is a need for a continued dialogue involving stakeholders on how to address climate change impacts… Climate change information should be central to all development. • There is a need to create formal platforms constituted by representatives from all stakeholders. • We need information. We need to work with universities so that everything that we do going forward is based on good science. Continuous engagements which outputs must be included in policies and decision-making. • All potential jobs going forward should include climate change. • Individual responsibility/education. Decision making on climate change. Policy making. Awareness across all spheres of community. • Decision-making that leads to policy and awareness. • Decisions leading to policy making. A climate lens for everything. • We must find an easy way to share climate information and all should know who champions are – a climate change division who… • Through continuous engagements with current and new stakeholders. • Communication links must be quick and direct for all. • Find an easy way of sharing climate change information. • Action must be taken by politicians and municipal government, communities, media, academia. • Good platform as it helps enlighten City fathers on the challenges of climate change and to take action against it. Need to be ongoing. • Need continuous and updating on the parameters and effects

	that are required in cities climate resilience assessments.
Responsibility	• Task team of each city • Environmental practitioners, environmental champions – climate change units • Make use of the embedded researchers and stakeholders involved. • CoW is responsible: Show public that their ideas are welcome and that CoW is accessible. • City of Windhoek. • CoW and UNAM to take action and implement the learning. • Cities that benefited must be involved to pass on the climate change information to other towns through ALAN (Association of Local Authorities of Namibia). • All stakeholders- individuals who took part in the workshops • Ms. Kahitu the Manager of Health and Environmental Services Division and the City of Windhoek. • Everyone, we need a champion • Champion should be the climate desk at City of Windhoek • We the individual • Individual and issue politicians, not party politicians – can be issue champions. • All that were involved in FRACTAL process should become agents of change. • Those who has been running the project (UNAM, CoW). • Maybe a climate change division who communicate to all stakeholders. Open, transparent and accessible. • All must know who the champions are. Communication is the responsibility of all the stakeholders. • Grassroots citizen's involvement- FRACTAL labs etc. has created inspiration and ownership of all city actors.

Furthermore, as part of the FRACTAL Process reflection, Ms. McClure handed out reflection forms that were also distributed at both the Lusaka and Maputo Final Learning Labs. Below in
Table 8 are the responses from Windhoek on the Learning Lab journey.

Table 8: Reflections on the Windhoek Learning Lab journey by participants

What have you liked about FRACTAL and Why?

1. Bringing together different stakeholders from a range of organizations and scales to share and learn from each other in a creative space allowing for ideas, collaboration and new relationships to be built outside of the day to day growing recognition of the importance of different research, practice and types of knowledge and how these needs to be brought together for holistic solutions. The friendships and warmth and strong relationships developed between all the stakeholders.
2. FRACTAL created a platform for me to learn about climate modelling, projections and how to read complex maps and also simply this for others to understand the information better. I was also able to network with other experts in climate science and learn from them. FRACTAL dealt with issues that we are faced with and provided possible solutions/suggestions how to tackle climate change issue.
3. The methodology of having learning labs was very inclusive and educative. The facilitators were engaging and interactive with the participants.
4. It gave insight on a concept not widely discussed on a 'one-on-one' basis. The media is full of this, but it still needs this type of intervention to spread the message. Why? If it does not affect you now, it will at least make you think twice.
5. It has been so interesting to see the co-production of knowledge that has come about as a result of FRACTAL. It's very difficult to sometimes bring people together and get them to talk across disciplines, and that is what FRACAL has done.
6. Innovative and participatory approaches; thinking out of the box; being accommodating to the expertise, status, knowledge and background of all the participants; and lastly, despite the above, still achieving real and impactful outcomes.
7. LABS – FRACTAL has provided a platform for co-learning, co-producing and for different stakeholders to sit together and talk about the common issues of climate on an equal footing. Distillation of climate change information- for the first time a lot of people like decision-makers can appreciate climate information because through distillation, information can be very simple and tailored to specific decision contexts.
8. The interactive sessions. The clap by Eddie Jjemba. The time given for group discussions. The city digests newsletters.
9. I enjoyed the discourse. It was valuable to go through a theory or topic and then have practical discussions or exercises on it. The greatest value came from the different participants expressing their views and experiences.
10. I did learn a lot of things which I never heard before and I did also meet new people in life. So it's a great Programme or workshops so that its update same is mind.
11. Bringing of various stakeholders together, leading to enhanced planning.
12. The academic way of removing emotion and getting to the facts without stepping on toes and having fun.
13. I liked the format of engagement; the manner and diversity of presentations; the ideas, topics and activities were so inspiring. I learned more than I would in school. FRACTAL is for me, transformative.
14. The activities roll-out structuring methodology was so effective in consequence and

knowledge building on the targeted goals of the project objective.

15. To my city, why? It is the tool for future resilience in terms of human and natural resource utilization and to not harm the environment/nature, for it still to be sustainable.
16. The diversity and variety of people involved. It is because of that diversity that we able to learn so much together. I enjoyed grappling with the decisions being faced in cities and the climate information that is available or can be (co) produced.
17. I liked the engaging of different stakeholders and share expertise, inclusion of informal settlement is an amazing approach we have a clear message to deliver on challenges to our climate change, to the communities. They promised to give feedback on their sessions and they are very much committed.
18. What I like about FRACTAL is the team work and work ethics that are put in the planning of conferences, climate training, co-production frameworks and platforms of different stakeholders.
19. The introduction of the science into decision making processes. Taking climate change issues and ensure that they are addressed/ at least get a chance to be considered at the management and government table.
20. Bring experts together to achieve a common goal – climate resilience. Because it is necessary ingredient for overcoming current challenges and becoming a resilient - WHK
21. Group discussion, presenters really know there topics, exchanging programmes/info between researchers/cities in other countries, open my eyes where to get climate data and how to disseminate the climate information in a laymen language.
22. The information dissemination was overwhelming. I learned a lot in a space of 2 weeks. So much needs to be shared with others at work also. Well-presented and well planned.
23. The project was designed in a flexible format that it was able to adapt to the issues of the city of Windhoek as they are presented. It provides an invaluable platform for stakeholders from various backgrounds to interact and share experiences that mapped the way forward on drafting the City Climate Change Strategy and Action Plan.
24. Direct contact with local authority leaders and political leaders, because it helped me understand how they think and operate. Networking opportunities with city leaders and hardcore researchers/academics.
25. I like FRACTAL because this project is contributing to cities in the SADC region to become resilient to the negative impacts of climate change.
26. The methodology and the form how FRACTAL organize the activities are different from other workshops.
27. I like the open collaborative ethos of FRACTAL. I like meeting new colleagues who become friends. I like the humor and fun we have shared. I like the way everyone is respected for who they are and what knowledge they hold. I like the creativity and the flexibility in the planning process. In short I like the TD process and well it has been implemented with passion. I liked field trips (essential). I liked the way that ER's have had a great capacity building journey that was well managed.
28. The people, safe space to explore ideas, recognition that we are all uncomfortable in the transdisciplinary space and we start always knowing what is coming next and so have to be flexible and carry a team and partners who recognize that this is important. Local

teams have been engaging partners.

29. The views and opinions of the different stakeholders and their future plans to compact ideal with issues of climate change at their various scope of duties.
30. The type of engagements we had throughout the years. Its informality helped breaking the ice commonly found when a mixture of hierarchies is meeting. It also helped in opening space for all to contribute with questions, comments and suggestions to the project implementation in several cities.
31. They bring together the management of city of WHPC with the local leaders to see and discuss how to overcome this climate changes in the city and the mediators. Because we have learned more how and what should be done to overcome this.
32. What I liked about FRACTAL was the platform made to engagement different organizations and institutes into one of the main issues we have within our country and communities and discussions on how we could come up with better solutions and have a better approach to climate change.
33. I liked the fact that delegates from all institutions come together and have the possibility to exchange doubts, issues, ideas, expertise and solutions. Talking face to face is, in my opinion, the most effective way to bring a message across. All the information I received in one day I could never have gained anyway else. I am happy to be part of the experience and to have gotten the chance to communicate my doubts, issues and ideas on a personal level.
34. I like the acquaintance I establish was great. The people I spoke to reinforce my commitment to continue the journey. As for the formal sessions, I like the breakaway group sessions. It allowed dialogue, thus is an inspiration as well.
35. Diversity of presenters from different disciplines. Interactive sessions. Sessions linked to infrastructure planning were useful/interesting. Networking opportunities with various stakeholders. Introduction of attendees was good to know who the role players are.
36. Interactions between different stakeholders especially those that are connected to the CoW. The networking these FRACTAL learning labs had provided. Not mentioning the learning opportunities it had provided. I am also very impressed with the co-production and embedded researcher ideas that the FRACTAL project had planted not only in CoW but also in Namibia and SADC region. Bringing in expertise from the city/Sweden/RSA was also an excellent idea.
37. FRACTAL's focus on climate change information in city planning and decision-making. This is central to climate change mainstreaming and making city climate smart and resilient.

Has the FRACTAL process changed the way you approach issues of climate change in your city (or cities in general)? If so, can you provide an example?

1. Yes, far greater understanding than a top-down approach of 'inserting' climate information into a decision-making process but an effective approach. Decision-making is complex and messy and is an ongoing process where climate considerations may be needed at different points alongside other information. This is not simple and requires ongoing engagement and dialogue to build confidence in exploring and

considering climate change.

2. Yes it has, now I am more climate change conscious possible decisions that I would take will consider climate information. FRACTAL has taught me to simplify climate information into a much simplified manner and I am able to share this freely with colleagues now. Now I understand that climate change is a cross-cutting issue and collaboration between various departments is needed to ensure a climate resilient city/environment.
3. Yes! Being a public health practitioner, I came to appreciate the effects of climate change on the health of the people. Whatever happens in the environment effects the people's health? In case temperature rises with no water, the public will be prone to drought related disease outbreaks.
4. Yes most definitely. In planning cities are the need to consider more than just the ordinary tools, not only what…..
5. Yes, by attending this workshop and reading previous reports, I have learned much about co-production.
6. Yes, it has laid the foundation of knowledge about climate change and how cities, despite being part of the problem, can also be part of the solution.
7. Through the FRACTAL project the City of Windhoek is approaching the climate change issue in an organized and participatory manner.
8. I now consider all perspectives of economic, climate change, social, political and environmental.
9. Yes, the processes reinforced my views of making science accessible in terms of communication with the general public. Engagements with the different stakeholders has brought the concept of framing climate change to the forefront, thus sensitizing me to consider the needs of the audience.
10. Yes, because some things which some was not new about it like how some other country did their doing research.
11. Yes, I learned that even scientific information can be interpreted in a way that ordinary citizens can understand.
12. We tackle problems alone and suffer the consequences alone and sometimes all suffer as a result. I have learned that I don't have to. Awareness should be taken to the next step perhaps that is the best way to become a champion.
13. Surely, I am now more cognizant of distilling climate science. I am also more aware of different dynamics involved in climate activism and public mobilization. I am now able to discern different roles and how we bring them all together.
14. Yes, using more structured methods in assessing, analyzing and collecting climate related data aspects of city.
15. Yes, the conservation of resources is highly spared. We started to give licenses to wood collectors. It's only the miprososis trees that are cut and no other indigenous trees. Through this process climate change is care for by planting trees and conservation of nature.
16. Yes, I am much more conscious of the balancing act between theoretically informed research and practice based experience and how to better pitch the work we do

between them to draw together peoples strengths, interests and mandates.

17. Yes, we have communities that have no idea on what is happening in the globe but with this project one could make a difference on educating or have many awareness on formalizing informal settlements and saving water.
18. FRACTAL has given me an opportunity to learn more about climate change and has expanded my capacity in climate change issues. It has opened my mind on future career choices. I want to make in regards to climate change and also work toward adaptation in my city.
19. Yes, attending the learning labs have open up my daily thinking on my professional work. As an environmental engineer work cannot only be about reduction of pollution by why we need to curb pollution and how what I do can impact on the climate.
20. Yes, FRACTAL has developed climate capacity and thinking and has influenced CoW leadership thinking. More so, it has influenced the development of the WHK CECAP about to be approved by council as our blue print and road map.
21. Yes, distilled of information to the consumers and in a way it can easily be understood.
22. Yes, I know solid waste can contribute majorly to climate change adaptation and mitigation.
23. Yes, by far. The projected made me understand better the climate science information and appreciate different roles played by other stakeholders. It also made me realize that issues of climate change need to be tackled holistically. It also helped to shape the involvement and understanding of politicians.
24. Yes, now I have more awareness and I can discuss and act on climate change issues with knowledge.
25. No
26. Yes, because different institutions and sectors that participated in the FRACTAL events are looking to issues regarded to climate change are very important even to in their life. Before majority of them doesn't take it into their mind.
27. Not being a climate specialist FRACTAL has provided me with a critical lens with which to understand cities and development planning and what happens when climate change is not taken into consideration in development planning e.g. The Maputo thing was planned with no climate change considerations and with sea level rise now sits 2-3 metres from the high water mark.
28. Yes definitely, it has make me to start thinking/being creative as an individual and minding the activity which might have negative impacts on the environment. To realize the seriousness of the issue of climate change in Namibia and also to be able to share with others.
29. Yes, climate change has to be explained using existing examples in each city. It also requires that knowledge is co-produced and shared among stakeholders e.g. the way we implemented SOG helped us frame our approach in the type of message to be delivered in the project results.
30. Yes, by giving them the ways how to implement new scenarios, the procedures and regulations. The positive impacts that city representatives give in activities and how

they understand it.

31. Yes, the FRACTAL influenced me for the better today to go back home and create awareness amongst my very own people, in order to tackle issues of climate change we'd need more people at hand awareness of the necessities of working together.
32. Yes, I learned how to communicate my ideas and fears to people and not to be afraid to speak up. Sometimes all we need is to be in a medium/community that wants to hear what we have to say. This gives us a feeling of being important and the courage is growing. I will, in future, speak up more and share ideas because it might be important. This is related to climate change obviously.
33. Not to take climate conservation too seriously. Although it's a daunting challenge that require great response, it's very important that its brought to a human level where there is a good understanding to have fun during such sessions.
34. I would have appreciated it from a conventional, technical perspective in the master plan study. But FRACTAL has given me some food for thought on some other considerations.
35. Yes it has. It emphasizes the idea that what climate science do and what the end users especially the communities need. And also highlighted the different views each stakeholder/affected entity has it climate change. It also brought CoW out as an example of how climate change issues can be addressed in cities/towns in Namibia/SADC. The interactive research produced during FRACTAL are for future research efforts, especially to build more research networks.
36. Yes, I have appreciated the focus placed on stakeholder engagement and attempts to meet climate change needs/ contributions for different ideas at CoW, universities, youth, other local authorities, and residents in informal settlements.

Is there anything that you really would really have liked to have done/seen/heard/learned during FRACTAL that wasn't part of the process? Please describe

1. Reached a point where, for a particular decision case, further co-exploration and distillation could have led to the development of usable climate information for team/group/project-written up and shared as an example to other stakeholders i.e. a concrete example that is taken up by a city project. Heard more news from those under-represented in processes e.g. from the informal settlements. Created a stronger platform for engagement between city and informal settlements.
2. Give a climate change talk to high schools. Learners are future champs on climate change and if they are left out our future could be impacted. Alternatively follow up on junior councils on whether they've communicated the message onto the larger group, which is their schools. Create incentives for local/community leaders to encourage participation of both them and the larger community.
3. More sharing of information between countries like the videos, leaflets and articles that would showcase the best practices in terms of being climate resilient in different countries.
4. A breakdown into more understandable language and concept with more visual sometimes only won't….

5. I think no matter how much we try to avoid it, jargon comes into play, so maybe next time sessions like climate evidence box can be simplified even further. The community leaders were struggling to understand.
6. Ways in which to cement and further build on the partnerships and collaboration that has been created?
7. In the next phase there is a need to look at the issue of climate financing. The raising of funding for climate change project especially international donor agencies can be a daunting task and complex. National resources alone would not take us to where we want to go.
8. Exchange visits that included other city officials within the City of Windhoek, other departments. Engaging other universities in the country.
9. Some of the slides were a bit congested or very small sometimes making it difficult to read/follow.
10. Indigenous knowledge should be emphasized. More workshops with communities.
11. It is interesting how such a huge amount of data can be condensed into useful information that stretches such a large area – from top to bottom. The outcome and buy-in will be the proof that it was worth it. Thanks and all the best!
12. Not really, but I think it will be great if we can have a FRACTAL 2 to offer "advanced" activities to where this FRACTAL has reached.
13. To my comprehension I have heard enough: what is what it has done is more awareness and capacity building.
14. I would have liked hear more from political representatives to be able to understand better what drives them, what their perspectives are on climate matters and how research processes can support in feeding into their decision-making better.
15. I would like to see FRACTAL management to assign voluntary members to push or facilitate platforms between residents and municipality on energy and sanitation in informal settlements.
16. I have joined FRACTAL late. So I am not too sure what I have missed. I would have liked to see more collaboration with our Namibian met office because I think they need capacity building and they are at good level of giving advice to ministries and institutions, such as city of Windhoek, in terms of climate change.
17. Perhaps not now, but in the future to see more strategic plans that incorporate climate change issues, as the case with the current development of the water master plan, other strategic plans should follow.
18. More scientific evidence speaking to real issues in WHK. Ownership by the cities involved in FRACTAL. More work done by universities – research papers to produce data for planning and decision-making.
19. Yes, I missed the land aspects of FRACTAL. I missed the land part, can be that it was not identified as a priority. I liked the aspect of biodiversity and GHG emissions is linked.
20. I wanted to see the national leaders' commitment even at ministers' level.
21. I would say although, perhaps not with FRACTAL mandate, the issue of accessing climate information after the project lapsed more particularly the modelling information.

Are the cities going to be allowed to access such information after the project has lapsed/ended?

22. Involve ministers of environment and minister of urban and rural development so that they can take this issue to Cabinet for deliberation and action.
23. Yes, climate change will need us to allocate money to address it. I would have like what cities are doing to mobilize funding to address climate change as their own resources may not be enough in the long run.
24. I would have liked to have seen a session designed to gain insight into participants' receptivity to climate resilient development. I would very much like to have had a serious third space workshop at the outset of the project to explore "home spaces" and participants paradigmatic approaches to knowledge; and also their views of working together in a third space to co-produce – (coming from different paradigms)
25. More focus on social voices including more of the more vulnerable groups throughout the labs. More cross city learning and exchange. Longer labs sometimes.
26. The involvement of other municipalities (LA) in the projects was not really there and I believe all region are run by LA's and this information/learning lab could have raised awareness in the respective town. The ALAN as an association running the LA was not really visible in my opinion.
27. I'd really have loved if a mayor himself/herself could have attended the municipal training in climate change. I'd also have liked to have secondary and primary school students from Maputo to have the opportunity to 'play with' climate data.
28. No all the infections that facing us (city) and communities is and I like the way FRACTAL bring people together to work and found out how they can fight against challenges.
29. I would have loved to see the FRACTAL involving a couple of people that have experienced certain issues/negative impacts with regards to climate change that are rather not into the industry or have got no educational background about climate change, to involve them to share their heart-felt stories.
30. I would like to see that the ideas that are shared and the transfer of information is taken serious by the decision-making institutions. What is the process of taking the information to the authorities? Is the message taken further? How do we see if the changes or ideas that came up are implemented? Will there be actions and can we see them?
31. Maybe just invite more stakeholders. There is lot of people with the background on climate change. Maybe if it can be scale up to have more stakeholders involve?
32. A better integration of trainers since most of the experts were from the UK/Sweden/RSA. These trainers' coordinators should have conducted more one-to-one sessions with locals and incorporate them more into the whole FRACTAL project. Stakeholders such as universities, private organizations, water and electrical utilities (NAMWATER/NAMPOWER) should have had trainers that had benefited from how the whole FRACTAL management were executed and conducted.
33. In recognition of those climate information, more training on modelling and CC relevant short-course (certificate) to incentivize capacity development.

If you had to give advice on how FRACTAL could be improved, what would this be? How might the process be implemented in a different, better way?

1. Involvement of the met services at the outset- brought them on the FRACTAL journey shadowing the climate scientists in the team and building their capacity/engagement. Bringing in the community voice more to the learning lab process. Earlier engagement of senior decision-makers and councilors at the outset. Greater focus on capacity development and strengthening of the city team to increasingly take on more leadership of the processes (this has happened but has emerged rather than being planned in)
2. Encourage more collaboration between different stakeholders by holding more workshops, pull in local authorities as well because climate change is a common problem and simply involving city of WHK/ other cities is not enough. Consider having regional talks with local authorities to encourage pro-climate change solutions.
3. The process was good could not have suggested otherwise.
4. The social media can be applied most efficiently, pop-up links. FRACTAL may even have its own website as well as part of the Windhoek website……FRACTAL should in itself be promoted in the media.
5. There are several Namibian researchers who can be given the chance to speak, it felt a bit overwhelmingly driven by people outside the country sometimes. However, maybe it's necessary at the start, it can be handed over more in future.
6. FRACTAL was well organized but the issue of sharing experiences by the participating cities can be strengthened. More resources for capacity building should also be made available.
7. Consider easier engagement with the local meteorological services as they deal with weather and climate information. Engaging stakeholders from other sectors e.g. health, urban government. That did not deal with the burning issue identified.
8. Thus far the team is doing a good job.
9. I only want FRACTAL to push our City of Windhoek members to do their job and implement their promises to the nation of Windhoek.
10. Efforts should be employed to publicize each workshop in the main stream media to create awareness of the subject matter. An advertorial in local newspapers could help. Also securing the platform with television stations for experts to create awareness and ignite community thinking /positive action.
11. It should be more regular and institutionalized. I would like more technology applied in teaching so we use algorithms, holograms and sliced in short I really like it and have nothing against it.
12. I think the implementation methodology was excellent.
13. FRACTAL did its part it is now for all different institutions to cascade the message as we have learned distillation of information.
14. 2 ER's per city- maybe 1 with climate expertise and other with urban governance /DM expertise. Having a buddy system can bring out the best and provide cover in support when needed.
15. To have some mechanism on brining informal residents in board in order for the message to reach the most vulnerable people which is informal residents. Creating

temporal employment to community leaders that are not working, especially those who are committed which is a tool to encourage the deliverance of the project approaches and achievements.

16. Perhaps have sector based workshops on climate change e.g. water sector alone learning lab, air pollution learning lab etc. learning labs that are tailor made per sector.
17. Small cities also to be included in all the learning labs. This can be organized through the main cities since climate change is all over.
18. FRACTAL can involve other towns and cities in Namibia for them to respond and get capacitated too. FRACTAL has the capacity to run a national climate change drive.
19. I would have loved to see the political leadership executives, officials, stakeholders and presidents of Windhoek (representatives) at one learning lab. I would have loved to see perhaps one or two community/residents also attached to the project (maybe as assistant embedded researcher).
20. Involve youth leader and junior parliamentarians and junior city councilors as they are future city leaders.
21. I have no advice on this.
22. Continue the way that are using but trying to bring something tan – Gible. Continue to involve decision-makers and if possible expand to other strategical cities.
23. More consistency with participants attending – respect how participants joining late in the processes. See comment 2 on previous page – essential (I would very much like to have had a serious third space workshop at the outset of the project to explore "home spaces" and participants paradigmatic approaches to knowledge; and also their views of working together in a third space to co-produce – (coming from different paradigms). A workshop on how to co-write.
24. I would like to see even more integration of social voices into the distillation process. More research on values, ethics and different problems that inform decision-making.
25. Involvement of the politicians more, community based organizations involvement also. It should have been further had approached or reach the regions whereby the regional councils are involved in the project.
26. FRACTAL should extend the concept of tier 1 or tier 2 cities to multiple cities in the same country, if possible. This would allow current tier 2 cities to upgrade to tier 1 and thus, serve as example to newcomer cities on how to implement engagements etc.
27. FRACTAL is doing well and I only empower you to do and not leave them (city) to fund of did the put this process in program? Or they just take it from you and put in the file. I thank you so much to the management of FRACTAL.
28. I think FRACTAL did a very good job on passing on the message/information and giving comparisons and solutions. Hopefully there will be changes because one can only do so much. Improvements: making sure information reaches those with greater powers of implementing changes within the community.
29. I feel like more stakeholders should be involved, especially from the water industries, the consulting engineering consulting companies and the public. There are people out there that are not part of any institution, but have amazing solutions to problems. So maybe FRACTAL could advertise such learning labs and try to reach every corner of the public. There are a lot of people out there that are need of platforms where they

can communicate their ideas for them to be realized on a larger scale. However, this is a great start!

30. Same response as per the prior question. - (Maybe just invite more stakeholders. There is lot of people with the background on climate change. Maybe if it can be scale up to have more stakeholders involve?)
31. Probably spread out the interactive sessions a bit more over the two days.
32. Involve more local stakeholders into the contributions and management of knowledge and networks within Namibia and SADC. Market FRACTAL better and highlight how it can contribute towards building capacity in CoW and other local authorities as well as at different research institutions. Publications from FRACTAL should be distributed more widely and be simplified more.
33. Greater involvement of CoW and UNAM in drawing roadmap for project. Fine tune the role and engagement of the embedded researchers (ER). ER concept contributed to great success for FRACTAL. Upscaling project to other local authorities.

Session 12: Closing remarks

Ms Mary-Anne Kahitu, Manager: Health and Environmental Services, City of Windhoek

Ms Kahitu started of her closing remarks by quoting that "climate change impacts have the potential to reverse our hearts and efforts in sustaining our environment and development if left unaddressed. She emphasized that if the impacts are not addressed adequately this could create problems in sustaining our environment. On behalf of the city of Windhoek, Ms. Kahitu thanked the FRACTAL project for giving them the opportunity to go hard on climate related issues.

Furthermore, Ms Kahitu carried on thanking FRACTAL project for bring the participants together as this enabled the city to engage adequately with some of its stakeholders. Ms Kahitu emphasised that from the First Windhoek Learning Lab, the city has learned that in order for the city to address climate change sufficiently and adequately, the city needs to engage all stakeholders and FRACTAL was able to bring everyone on board to encourage discussions and deliberations around the issues of climate change. Through sharing ideas everyone will be able to contribute towards a climate resilient Windhoek. She hopes platforms such as these will be encouraged in order to allow for continuous engagements and sharing of ideas while benefiting the city and its residents. Ms. Kahitu further hopes that city residents will continue campaigning for a resilient city through all their engagements either at a city, regional or national level.

Moreover, Ms. Kahitu thanked the team from Maputo, Cape Town, Durban, and the UK for making time to attend the Final Windhoek Learning Lab. She indicated that platforms such as these are very important to promote engagement especially within top management, which is important for their decision making processes. Ms Kahitu hopes that this final learning lab will not be the last of its kind because platforms of this nature are important for discussions such as climate change which is a cross-cutting issue. She admits that it is important to always involve institution of high learning in order to tap into their knowledge while planting an understanding within the city leaders.

Lastly, Ms. Kahitu reiterates the commitment of City of Windhoek's commitment towards ensuring that the CoW-ICCSAP is fully implemented after approval and that every

department will contribute to the effort of having a climate resilient city. She thanked the FRACTAL project for allowing them an opportunity to have climate distillation sessions which is important for simplifying climate science information for decision making processes within the city. With a special thanks to the University of Namibia as their partners in implementing the FRACTAL project in Windhoek-Namibia. In closing, Ms. Kahitu urges the experts and stakeholders to continue supporting the city of Windhoek including local municipalities in their attempt to develop pro-climate change initiatives.

Annex 1: Windhoek Final Learning Lab Agenda

Agenda: Windhoek Fourth (Final) Learning Lab
FRACTAL Project
17-18 June 2019
Arebbusch Travel Lodge, Windhoek - Namibia

Time	Session #	Session	Facilitator
17 JUNE 2019: MONDAY			
08:00-09:30	Arrival, Registration and Networking breakfast		
09:30-09:45	1	Official Opening by Mr. Fillemon Hambuda, Strategic Executive: Economic Development and Community Services, City of Windhoek	
09:45-10:30	2	Introductions of participants	Dr. Anna Taylor, University of Cape Town
		Plenary session: Objectives of Fourth (Final) Windhoek Learning Lab	Prof. John Mfune, University of Namibia
10:30-10:45	Tea break (and group photo)		
10:45 – 12:00	3	Showcasing FRACTAL research / activities and feedback from youth, Councilor, other local authorities, CC Unit and other stakeholders on preceding events	Prof. John Mfune and Ms. Kornelia Iipinge
12:00-13:00	4	Tupopyeni oClimate Season 3: with Maputo City Council, Eduardo Mondlane University and University of KwaZulu-Natal representatives	Dr. Anna Taylor, UCT
13:00-14:00	Lunch		
14:00-15:30	5	City of Windhoek Integrated Climate Change Strategy and Action Plan: process update and discussions	Mr. Olavi Makuti, City of Windhoek
15:30-16:00	Tea break		
16:00-16:30	6	Co-producing the Windhoek impact story, Reflections of Day 1 and Closing remarks	Ms. Saima Haukelo and Dr. Anna Taylor
18 JUNE 2019: TUESDAY			
08:30–09:00	7	Welcome, introduction of participants and Day 1 recap	Prof. John Mfune, UNAM

09:00 - 10:30	8	Windhoek water resource planning under climate change	Eng. Alice Chang, Aurecon and Dr. Anna Taylor
10:30 – 11:00	Tea break		
11:00-12:30	9	Climate information distillation	Ms. Tamara Janes, UK Met Office and Dr. Izidine Pinto, UCT
12:30-13:30	Lunch		
13:30 – 14:30	10	Capacity mapping and development to enhance climate governance	Prof. Dianne Scott, African Centre for Cities, Dr. Bharwani, and Ms. Liz Daniels, SEI
14:30 -15:10	11	General Discussions	Mr. Olavi Makuti, CoW
15:10-15:30	Tea break		
15:30-16:15	12	Last Learning Lab: What next? Reflection / evaluation	Ms. Alice McClure, UCT
16:00-16:30	13	Closing remarks	City of Windhoek

Annex 2: Windhoek Final Learning Lab Attendance List

#	Name	Institution	Email address
1	Mr. Abel Hamutenya	City of Windhoek – Disaster Risk Management	Abel.Hamutenya@windhoekcc.org
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