



REPORT ON LUSAKA LEARNING LAB 3:

EXPLORING WATER AND CLIMATE CHANGE FROM VARIOUS PERSPECTIVES

HELD AT CHITA LODGE IN KAFUE FROM 27TH TO 29TH NOVEMBER, 2017



Prepared by Brenda Mwalukanga and Audrey Daka

List of acronyms

DRR	Disaster Risk Reduction
FRACTAL	Future Resilience for African CiTies And Lands project
JICA	Japanese International Cooperation Agency
LCC	Lusaka City Council
LWSC	Lusaka Water and Sewerage Company
LuWSI	Lusaka Water Security Initiative
MCA	Millenium Challenge Account
MLG	Ministry of Local Government
MNDP/UNJP	Ministry of National Development Planning/ United Nations Joint Program
MOHC	Meteorological Office Hadley Centre
NGO	Non-governmental Organization
NWASCO	National Water and Sanitation Council
SHTC	Shibuyunji Town Council
SEI	Stockholm Environment Institute
UCT	University of Cape Town
UNZA	University of Zambia
WARMA	Water Resources Management Agency
WEAP	Water Energy and Analysis Planning
ZEMA	Zambian Environmental Management Agency
ZHPPF	Zambia Homeless and Poor Peoples Process Federation

REPORT ON THE 3RD LEARNING LAB EXPLORING CLIMATE AND WATER IN LUSAKA FROM VARIOUS PERSPECTIVES.

The 3rd learning lab was attended by a team from the FRACTAL project, led by the University of Cape Town (UCT) in partnership with the University of Zambia (UNZA) and Lusaka City Council (LCC) and various stakeholders drawn from the water sector in Lusaka.

The first day began with a field trip to Shaft 5 in Lilayi which is one of the largest boreholes that supplies water to the city. The borehole is 50 metres deep. Participants were informed that the borehole was drilled in 1957 and that the equipment is old. It was also explained that efforts to protect the borehole from encroachment are being made. It was also observed that there were armed security guards who were present guarding the borehole facilities, infrastructure and equipment.



The team then moved on to lolanda treatment plant in Kafue, about 45 minutes outside the city of Lusaka. The water abstraction and treatment plant gets its water from the Kafue River which provides approximately 40 % of the city's water. Mununga's colleague?, from Lusaka Water and Sewerage Company (LWSC), explained that the water treatment plant was established in 1954 and had 4 pumps that are running. He explained that the water abstraction and treatment plant is on land that previously belonged to an individual and the title deed was numbered 10 Landa Farm. But as time went on people began to refer to it as lolanda. He also explained that due to age, the abstraction and treatment plant is only operating at half its capacity. He explained that new infrastructure is being installed in order to increase the capacity of abstraction and treatment at the plant. The infrastructure include 4 new pumps and a pipeline that supplies the Lusaka population. The design capacity for the plant is 110,000 cubic

metres per day but currently it can only provide 96-98,000 cubic metres per day. With the new equipment (funded through MCA) it is expected that the plant will be able to reach full capacity again. Participants were also informed that despite the amount of works being undertaken, the plant will only be at full capacity in 2021. He explained that the river is tested at several points upstream in order to monitor water quality that may be compromised by users before it reaches the plant. He explained that in the event that the water quality is compromised, water abstraction is halted until the tests prove that the pollution has been eradicated. The water level is also monitored - the critical level is considered to be 972m above sea level. It was explained that the water level has never gone below the critical level.

Infrastructure projects (already funded)

Name	Abstraction m ³ /day (when complete)	Notes
Upgrading lolanda plant (MCA)	110,000	New equipment expected to bring lolanda plant back to full intended capacity
Kafue bulk water project (Chinese investment)	50-55,000	New water treatment plant and pipeline (next to lolanda)
JICA project	260,000	Feasibility studies completed. Due to start in 2019. Initially planned to be 600,000m ³ /day but revised down to 260,000.

Due to rainfall, the team were unable to go through the treatment plant. Arrangement were made to return when the weather had improved and when the FRACTAL team would have a gap in their program. The participants then proceeded to check in to their accommodation. In the evening, informal sessions on video editing and climate information were held. A demonstration of the water, evaluation and planning (WEAP)

model was held with the thresholds being demonstrated to planners and engineers from the city.

DAY TWO

The first day of the learning lab began at 9:00 hours. Bettina Koelle (Red Cross Climate Centre) welcomed everyone to the 3rd learning lab and asked Dr. Gilbert Siame from the University of Zambia, to give welcoming remarks to everyone who was in attendance.

Dr. Siame welcomed everyone to the 3rd learning lab, gave an overview of what FRACTAL had been doing since the second learning lab and asked everyone to feel free and participate. He then called upon Mr. Mununga Mungalu from Lusaka Water and Sewerage Company (LWSC) who also welcomed everyone to the third learning lab. He said there was need to have quality water in the city. He explained that the learning labs created great learning opportunities and sharpened participants' minds.

Dr. Nchito then gave an update on the high level breakfast that was held to engage policy makers and decision makers in the water sector prior to the second learning lab. She explained that the Minister of Water, Environment and Sanitation arrived early and before other invited guests had arrived. The FRACTAL team then had to wait for the other participants to arrive. She informed the participants that besides the minister, the deputy mayor, district commissioner, town clerk's representative and other key directors were present during the breakfast. Climate narratives were presented to the minister by Dr. Chris Jack and the other delegates and a good discussion was held. The decision makers accepted that climate change would have an impact on development in the city in future, but sometimes there were other more immediate pressing matters that needed addressing first.

She then also explained that there is an initiative called the Lusaka Water Security Initiative (LuWSI) that has 21 stakeholders from public, private and civil society organizations. This initiative is aimed at protecting the water resources for the city of Lusaka and ensuring that there is sustainable use of the same. She explained that the initiative was started by GIZ and after its infancy has now been handed over to National

Water and Sanitation Council (NWASCO). Dr. Nchito explained that Lilayi shaft 5 is the main water source that they want to protect through establishing recreational facilities. There is also the Manja Pamodzi project being spearheaded by Zambia Breweries, LuWSI and FRACTAL. She stated that it is important for other stakeholders to come on board to avoid duplication and to better coordinate the development and protection of water resources.

CITY EXCHANGE

Participants were then given an update on the city exchange that occurred between the FRACTAL cities. Lusaka was visited by the cities of Harare and Windhoek. They were part of a learning exchange program for city researchers to understand the issues in the water sector in Lusaka as well as the similarities to their cities. They were taken on a tour to water source sites in peri-urban areas, fed by the Kafue River and discussed how their cities would be impacted by climate change.

The Lusaka team also visited Windhoek with city representatives from Lusaka City Council and the University of Zambia attending. They were taken on a tour of the city's water reclamation plant and an artificially recharged borehole. The learning between the cities focused on the similarities between Windhoek and Lusaka and learning from the extreme case of Namibia. Reclamation of water from the sewer system is quite expensive and it supplies about 20% of water to the city of Windhoek.

Rebecca Ilunga (Aurecon) then gave a presentation on the case of Cape Town which is going through a serious drought. In Cape Town, each person is allocated 87 liters a day. From this allocation, one flush of the toilet is equivalent to 9 liters. Residents and guests are encouraged to flush the toilet only 3 times in a day. This is equal to 27 liters. The remaining 60 liters is divided into a 3 minute shower which takes approximately 37 liters. Cold water (from the shower) is supposed to be captured and used for flushing, gardening or pets. Dishes are only washed once a day to avoid overuse of water.

This was followed by a short verbal presentation from Brenda Mwalukanga, the embedded researcher in Lusaka. She explained how the first day of the learning lab would unfold. Participants were informed that a small team of the Lusaka FRACTAL team developed draft policy briefs on each of the four burning issues identified in the first learning lab and explored in the second learning lab. These are inadequate water supply, groundwater pollution, flooding and unregulated groundwater abstraction. This activity was requested by FRACTAL participants at the end of the second learning lab. First drafts of the policy briefs were co-produced between a researcher and a practitioner before this learning lab. The drafts would be co-explored by the wider FRACTAL team which would break into groups to further refine the draft policy briefs. She requested participants to dispute information that was inaccurate or not represented well as well as to include any important information that the smaller working group authors may have missed..

The participants were then taken through a reflective process and requested to state what their reflection of the first day (field trip) and informal sessions were. Below are the reflections.

SHARING EXPERIENCES

Participants' reflections of the field trip to Lilayi Shaft 5 and Iolanda Water Treatment Works

1. It was surprising to see shaft 5 and the condition it is in (including age) as well as the fact that it looks very vulnerable
2. At face value the concerns regarding the vulnerability are valid but steps have been taken to improve the facilities
3. Surprising that we've been abstracting from the same water source and it is amazing to consider the (size of?) underground water source available at shaft 5
4. The history of water supply in Lusaka is often forgotten
5. There is an enormous amount of knowledge and experience within the management teams

6. The new projects that we have are impressive
7. The capacity of lolanda is impressive. The fact that the Kafue river levels have not dropped below the city's necessary supply level
8. Good to see that Lusaka Water and Sewerage Company are being proactive in their plans
9. I was struck by the number of individual boreholes
10. It was surprising to learn about how many processes are already happening for the city's water supply
11. Interesting to learn about lolanda's history
12. It's surprising to compare how far down local users drill to access groundwater (up to 80m) in comparison to the drilling depth for shaft 5 (40m)
13. Surprising to hear about the level of contamination in the shallow wells and that people are still drinking the water
14. Interesting to hear about the Cape Town crisis (day zero) and it gave perspective of how we waste water and thinking of water saving measures
15. The realisation that we will have adequate water but the major issue will be distribution and not the resource
16. The workshop, specifically the policy brief evaluation, has been logical
17. Encouraging how much thinking has already been done for water supply
18. Interesting to see the rain patterns for Lusaka and the Kafue and how we sometimes misinterpret drought patterns
19. Water security versus the physical security of water infrastructure
20. Would like to know how planning was carried out by engineers who make water supply decisions
21. Seeing the opportunity available from all the investments being made
22. Interesting to do the issue mapping and to see what it means for the application - not one person or institution can fix the problem; that issues are messy and complex
23. Interesting to hear the issue of flying toilets

24. Should remember that problems in one area can be an opportunity in another

THEMATIC GROUPS AND POLICY BRIEFS

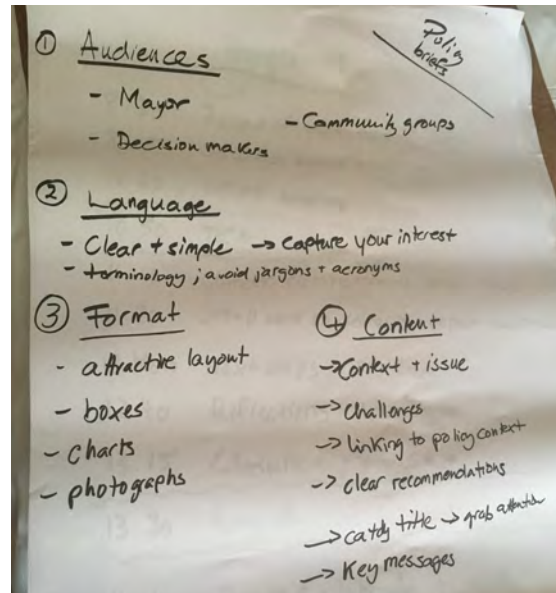
Participants then chose which of the four thematic working groups they would like to join to work on the policy briefs. Participants were requested to place their photo on the flip chart that represented the policy brief that they wished to contribute to.



They were informed that the target audiences are civic leaders, key decision makers in the water sector and influencers of policy. They were also advised that the format, language and content of the policy briefs is important.

Some recommendations for a strong policy brief were made:

- Graphical representation such as charts and photos and an attractive layout.
- Linking policies to clear recommendations that will improve the issues.
- The key messages should also be highlighted, perhaps in a box



Participants were also informed that they would be included as co-authors of the policy brief that they worked on. The thematic areas are;

- Water quality
- Water supply
- Unregulated groundwater abstraction
- Flooding

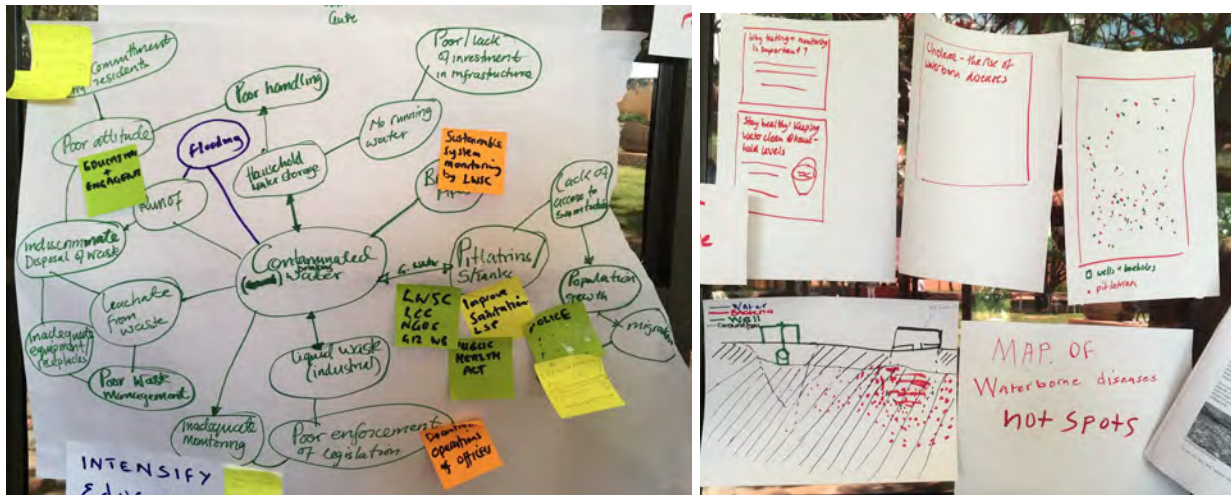
WATER QUALITY

Presentations by each group were then given. In the presentation on water quality, the causes of water contamination included broken pipes, blocked drains, industrial contamination, septic tanks being built near water sources, lack of monitoring of both the drilling of boreholes and the aquifers of groundwater. Others included the construction of pit latrines, poor hygiene practices, throwing of fecal matter into streams as well as indiscriminate disposal of garbage. By having contaminated water there is a huge risk of the spread of communicable diseases such as cholera, dysentery and typhoid which will cause low productivity of the people.

Recommendations in order to improve water quality include:

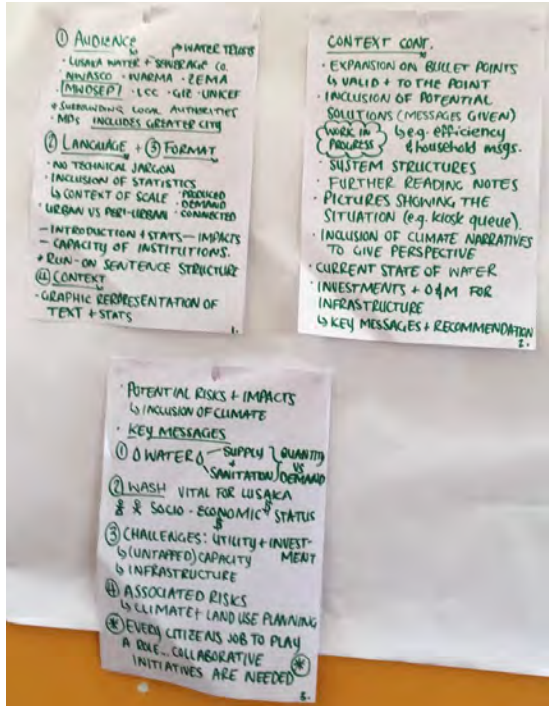
- Provide appropriate sanitation to people in the communities
- Sensitize on the use of water treatment chemicals such as chlorine

- Intensify the sensitization on health education and practices of personal hygiene including washing of hands every time with soap
- Storing of water in small mouth containers
- Distribution of mobile toilets even though it was recognized that these toilets are expensive
- Adherence to building regulations of constructing septic tanks and latrines 65 meters away from sources of water.



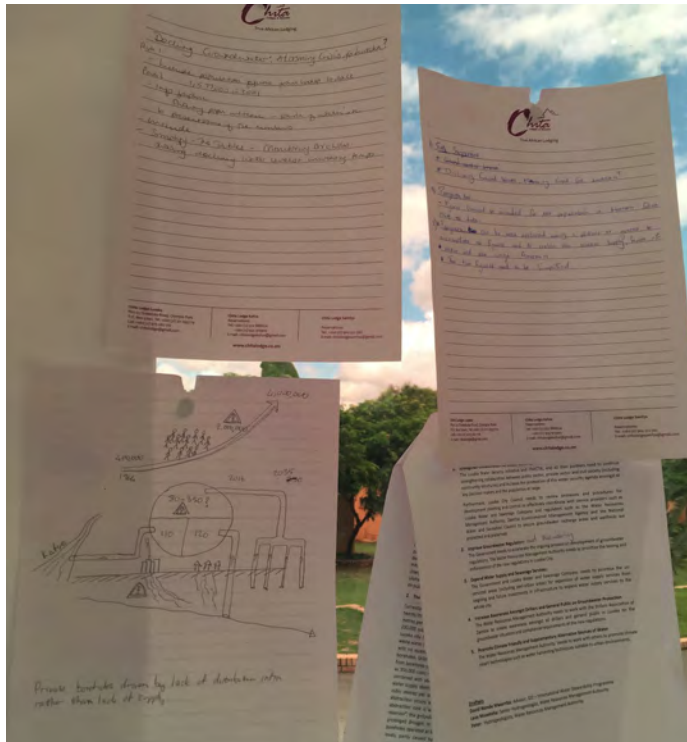
WATER SUPPLY

The participants working on the policy brief on water supply reported that they focused on the audience and questioned who they wanted to disseminate the policy brief to. The key institutions identified included Lusaka Water and Sewerage Company (LWSC), Water Resources Management Authority (WARMA), Zambia Environmental Management Agency (ZEMA), Ministry of Water, Environment and Sanitation, Lusaka City Council and GIZ. The group also recommended distributing the policy to the surrounding local authorities and Members of Parliament. They reported adding a few statistics to the policy. A picture depicting the gender bias in water collection was inserted. (Women queuing up at a tap stand). They stated that the draft policy brief had minimum jargon and highlighted the capacity of the relevant institutions. It recognized the dual supply system in the city where there is one model for planned areas and another for peri-urban areas. The brief required the climate narratives, current state of water affairs, investment for future infrastructure development and key messages and recommendations to be included.



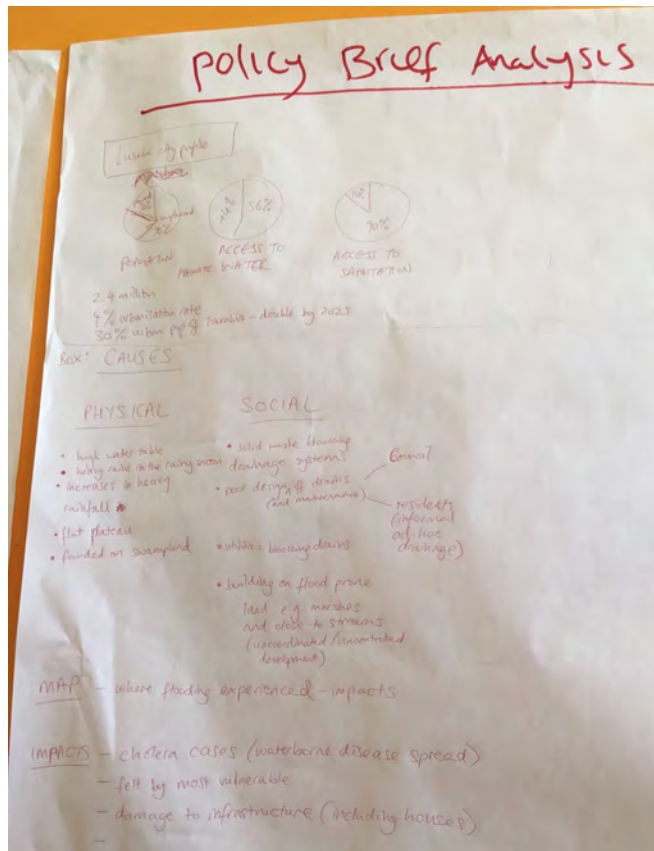
UNREGULATED GROUNDWATER OVER ABSTRACTION

The group thought that figures and graphs should be added and that there should be more explanation. Recommendations are that groundwater should be regulated and monitored. It was stated that the Kafue River has adequate water; what is lacking is the infrastructure to abstract and meet the demand of the city. Participants were also informed that WARMA does not have a statutory instrument on how to abstract water. The challenge recognized under this theme is a significant number of households have not been connected to the water supply.



FLOODING

Lusaka city has a population of approximately 2.4 million, with an urbanization rate of 4.9%. There are different causes or drivers of flooding which include both geographical/physical and social aspects. The geographical reasons include a high water table, heavy rainfall, a flat plateau and swampy areas. On the social aspect, there is the failure to subscribe for waste collection and disposal and the dumping of waste in drainages, solid waste blocking drainage systems, poor/inadequate design of drains and lack of maintenance of drains by the local authority. Other social aspects include building on flood prone land e.g. marshes and close to streams, uncoordinated/uncontrolled development. Impacts of flooding include waterborne and communicable diseases such as cholera, typhoid and dysentery as well as damage to infrastructure (including houses), predominantly affecting the urban poor.



ISSUE MAPPING THE THEMATIC AREAS

The final session of the day was a systems analysis mapping exercise of each of the thematic areas. Dr. Dianne Scott led the session and requested participants to break away into their same thematic groups and map out the causes of each burning issue. She gave an example and also explained that this was part of the nexus work under FRACTAL. The nexus cluster is designed to be the point of integration where the city learning, decision-making and climate information can converge and collaborate in better understanding city systems and climate information needs.

DAY 3

SOLUTIONS MAPPING

The third day began with recapping the previous day's progress and building on the issue maps developed in the final session from the day before. The aim was to reframe

thinking in terms of 'solution spaces' and consider which actors and capacities would be needed to deliver these solutions. Sukaina Bharwani and Liz Daniels explained that the steps to follow in the systems mapping were to seek solution spaces by identifying potential opportunities to address some of the issues and drivers identified in the previous mapping exercise. For each of these solutions, participants were asked to also identify actors who have a role to play in the solution and what kind of interaction this would be e.g. particular institutional capacities, processes or mechanisms that would be needed to achieve the solution..

Each group then reported back on the solution mapping process that they undertook for the thematic issue that they represented as well as the actors, institutions and processes that were required for implementation.

1. WATER QUALITY: PRESENTATION ON SOLUTIONS TO CONTAMINATED DRINKING WATER

Participants were informed that there were efforts to bury shallow wells and pit latrines. The solution was to have (and enforce) planning regulations that require septic tanks to be built at least 60 meters from the source of water. There is also need for the sewer network to be broadened and developed in all the areas of Lusaka. There is also need to intensify awareness raising on personal hygiene and increase health education. The actors identified were the waste management, public health, engineers, planners, communities, Lusaka City Council police, LWSC, GIZ, LuWSI, Non-Governmental Organisations (NGOs) and different stakeholders.

2. INADEQUATE WATER SUPPLY: SOLUTIONS TO INCREASE WATER SUPPLY

The group mapping inadequate water supply recognized that there was need to increase infrastructure that will ensure that the city's water demand is met and the

general population has adequate access to water. They recognized that there were projects being implemented that would increase supply to the city.

Actors identified included Lusaka Water and Sewerage Company.

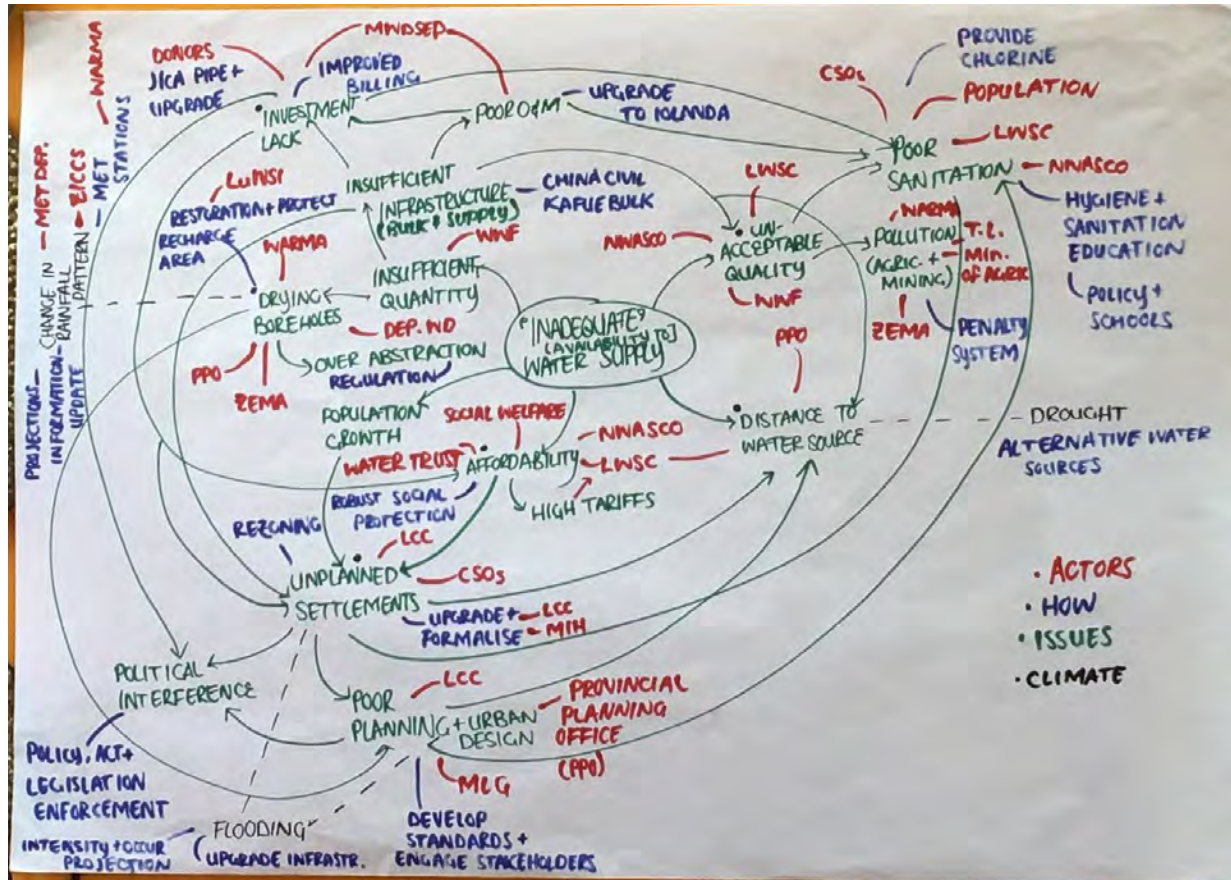


Photo: Mapping issues around inadequate water supply

3. FLOODING: SOLUTIONS TO ADDRESS INCREASED FLOOD INCIDENCES

Actions to address flood incidences are already included within the city-wide Disaster Risk Reduction (DRR) strategy and slum upgrading strategy; implementation of these strategies is needed. There is also a comprehensive urban development plan developed by the Japanese International Cooperation Agency (JICA) which has not yet been implemented. Included within the Lusaka Drainage Investment Plan under the Millennium Challenge Account (MCA) there are a range of drainage standards outlined.

The highest standard of drain should be applied (i.e. to withstand larger flood events and higher surface runoff in future) and these standards should be reviewed by climate scientists. (The formulation and implementation of the solid waste management policy should be expedited. There is also a need to sensitize the community about proper waste disposal and relevant by-laws (which are then enforced) to reduce the improper disposal of waste in drains and to improve the rates of recycling of waste.

Actors identified include the Ministry of Local Government, LCC, NGO's, MCA, LWSC, climate scientists and communities.

The mode of implementation would be through policy implementation, ensuring adherence to design standards and by-laws, and enforcement of these by-laws so that community members comply.

4. UNREGULATED GROUNDWATER ABSTRACTION: SOLUTIONS TO REGULATE GROUNDWATER ABSTRACTION

There are unknown levels of abstraction of groundwater. The growing population and increased economic activities has led to growing demand for water. The slow connection rate has also resulted in people resorting to alternative sources other than LWSC connections such as individual boreholes to boost supply in homes.

The solution map showed the need to regulate abstraction through WARMA for both domestic and commercial use, intensify sensitization (on what?) by Lusaka Water and Sewerage Company and WARMA through the media. The group also stated that there is a need to strengthen (and enforce?) building planning regulations which require septic tanks to be separate (from boreholes?) . This can be done by both LWSC and LCC. Another recommendation is to encourage the use of communal septic tanks and boreholes; this can be possible through the help of the Lusaka City Council and

Millennium Challenge Account. This would require constant monitoring and inspections to ensure compliance. LWSC and LCC need to revisit the cost sharing modalities of some of these solutions.

The solutions would be implemented through regulating abstraction that is supported by a statutory instrument that gives WARMA this mandate and function. The issuing of regulations to support implementation of the new urban and regional planning act is needed, as is increasing the capacity of Lusaka City Council and WARMA and a review of cost sharing between these institutions.

CLIMATE RISK NARRATIVES

The session was followed by an update of the climate risk narratives. Chris gave a presentation on Lusaka's rainfall and temperature data. He stated that, based on this data, three climate scenarios were developed for Lusaka. He also stressed that climate scientists cannot speak in absolute figures because there is uncertainty when dealing with climate data. The models used to analyze climate data may have errors which then create uncertainty. Therefore providing information to decision makers in absolute terms would not be professional. In order to deal with the possibility of mathematical and model errors, FRACTAL climate scientists developed the climate risk narratives which look at three possible scenarios that could arise given the context of the climate information and the model being used. He also showed that the historical data showed that there was a drought in the 1990s and that based on the assessment of previous climate data, the possibility of a drought occurring in the future was once in 50 years.

Brenda then explained that in the co-produced climate risk narratives, three scenarios of each city's climate were given. As there is a considerable level of uncertainty when dealing with climate science, it is important to plan with consideration of what potential

different future climates may look like, given historical climate data and future climate projections.

Below are the three scenarios developed for Lusaka based on the historical climate data and information and future climate projections. Areas of impact, societal consequences and responses were updated and added to by the Learning Lab participants in small groups, each working on a different scenario. Each scenario group consisted of at least one representative from each thematic area.

Scenario 1.	A HOTTER AND DRIER CLIMATE		
NATURAL SYSTEM	AREAS OF IMPACT	SOCIETAL CONSEQUENCES	RESPONSES
Extreme hot days and heat waves becoming more frequent	Water shortages	Political instability	Adapt agricultural system
More severe and more frequent drought	Highly impacted agriculture	Health crisis	Develop adequate building design standards
	Insecure food supply	Conflict	Use alternative energy sources
	Hydropower shortages		Alternative water technology

Scenario 2	Warmer and more erratic and extreme rainfall		
Less predictable rainfall and more contrast between wet and dry season	Agriculture impacted and more irrigation needed	Humanitarian crisis	Adapt agricultural system
Wetter wet seasons and drier dry? season	Crop failure and possible erratic rainfall	Health impact	Develop adequate building design standards
	More flooding		Use alternative energy sources
	Health impact: more heat stress		Alternative water technology
Scenario 3	Warmer and more extreme rainfall		
Stable water sources	Agriculture impacted: more irrigation needed	Humanitarian crisis	Adapt agricultural systems
Increased evaporation	Crop failures possible due to extreme rainfall	Health impact	Develop adequate building design standards
	More flooding		Alternative water technology

The day ended with a reflective and action planning process. Below are the reflections on what participants liked and what could be improved. See tabulation below.

No.	WHAT I LIKED
1.	The spirit
2.	The mess mapping
3.	Small group work sessions
4.	Participation
5.	Great conversations
6.	Interactions
7.	Short games
8.	Unusualness of the room
9.	Working on the policy briefs
10.	Visit to the river
11.	Short informal chats
12.	Stories of water in Cape Town
13.	Generosity to share experiences
14.	Commitment
15.	Everyone's honesty
16.	Climate sessions
17.	Interactions
18.	Presentations
19.	Factual work
20.	Grounded learning in the reality of things
21.	People were very present
22.	WEAP model
23.	Venue
24.	More time for field trips, dinner and conversation
25.	Copies of the climate change policy that were provided by Ministry of Lands representative and circulated to participants
26.	Socializing

27.	Informal learning sessions
28.	Bettina's facilitation, "it was live."
	WHAT WAS NOT SO GOOD & COULD BE IMPROVED
1.	Inadequate time for the learning lab
2.	Had to bath cold water as there was no hot water in the room
3.	Internet was not so good
4.	There was no session on governance and would have loved one. Should be included in the next learning lab.
5.	Didn't discuss climate narratives enough
6.	Didn't have enough feedback from LuWSI
7.	Didn't make a long term plan
8.	Didn't have a mini cocktails
9.	Include a short video making session in the next learning lab on the issues

The end of the reflections on the last day of the learning lab also had an action planning exercise. This was a process where participants suggested the work that needed to be undertaken by the FRACTAL team. See action plan below.

No.	ACTION	WHO	WHEN
1.	Send out Group photo	Bettina	ASAP
2.	Re-organize the WEAP training for Lusaka	Brenda	ASAP
3.	Compilation of workshop report	Brenda , Di, Gilbert (FRACTAL team)	15 th December 2017
4.	Compilation of video	Bettina	16 th December,2017

5.	Input into the national adaptation plan as a stakeholder during the process development	Peter /ER	1 ST Quarter 2018
6.	Consolidate the policy briefs with climate information being embedded	All, ER	
7.	Dissemination of the policy briefs at a high level event and publication	Lusaka FRACTAL team	FEB 2018
8.	Researchers to look at the actions from the issue maps, solution maps	FRACTAL team	Feb 2018
9.	Combining the systems map with themes	Nexus cluster (Di)	Feb 2018
10	Engaging with decision making tools	FRACTAL	Feb 2018
11	Validation, publication and presentation at a conference (Water day and IPCC Cities conference)	FRACTAL	March 2018
12	Plan to hold learning lab 4 (solutions based)	Brenda ER	First quarter 2018
13	Further develop the WEAP model on Lusaka	Rebecca	May 2018

Closing remarks from Dr Siame

Dr Siame noted that he was happy that everyone was on time. He reiterated that it is important to keep the energy and fire alive and ensure that meetings we have continue

to be relevant to each other. He encouraged everyone to follow the work plan that has been suggested and thanked Brenda for her hard work in organising the workshop and ensuring that there was good attendance and participation.

The participants then proceeded to Iolanda water abstraction and treatment plant for a tour to make up for the first day when the weather was uncondusive.

**ATTENDANCE LIST FOR THE LUSAKA LEARNING LAB 3 ON THE 27TH
NOVEMBER 2017**

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SECOND DAY OF THE 3RD LEARNING LAB 28TH NOVEMBER, 2017

ATTENDANCE LIST FOR THE LUSAKA LEARNING LAB 3 ON THE 28TH NOVEMBER, 2017

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4	Mando Chitondo	GIZ/LUWSI	Mando.chitondo@giz.de	0961866866
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