

# URAdapt

Managing Water at the Urban-Rural Interface: The key to climate  
change resilient cities

## MEETING REPORT

URAdapt Addis Ababa Fourth  
Re-SAP Meeting.

Thursday, August 23<sup>rd</sup>, 2011



**URAdapt Addis Ababa Fourth Re-SAP Meeting.**  
**Tuesday, August 23<sup>rd</sup>, 2011**  
**ILRI-Small Auditorium, Addis Ababa, Ethiopia**

**1. Opening Remarks**

The meeting started at 9:30 am with an opening and welcome speech by Dr. Liqa Raschid-Sally to the 4<sup>th</sup> Research into Strategic Action Platform (Re-SAP) meeting participants.

Dr Raschid-Sally began by giving a brief update on the project so far. She mentioned results of climate change downscaling, baseline study of water supply, sanitation and wastewater management and institutional framework, and the city water balance modeling work, as the findings of the last three meetings. Dr. Raschid-Sally introduced the meeting agenda to members present. She mentioned that, on top of demographic, economic and migration issues in the Addis Ababa; climate change has had additional effect on water demand problems. Dr. Raschid-Sally also reflected on the need to account for the impact of climate change on urban-rural-water interactions which were of particular importance given the surrounding special zone of Addis Ababa. She also hoped that, all the findings of the projects will be consolidated using the findings from the institutional study, to identify the policy and planning implications. Furthermore, she explained that this meeting would focus on translating the findings to recommendations and hoped that the outcome of the meeting would contribute to identifying the challenges and help to provide concrete recommendations.

After her remarks, Dr. Raschid-Sally invited Dr. Simon Langan, the new Head of IWMI-East Africa, to introduce himself and also give an opening remark. Dr. Raschid-Sally concluded her remarks and asked participants to quickly introduce themselves.

**2. Agenda for the day**

Agenda for the day was presented by Dr. Raschid-Sally. She hoped that the meeting would be a fruitful one, and enquired whether the participants had any other questions, comments or inputs regarding the agenda for the meeting. There was a general consensus to maintain the current agenda.

**3. Presentations**

***3.1 Findings from climate change and hydrological modeling implications for policy and planning***

Dr. Semu began his presentation by stating that there have been many findings from his research, however the main emphasis of the presentation would focus on results on climate

change and hydrological modeling and its implications for policy and planning of Addis Ababa City. Dr. Semu detailed the presentation as follows: impacts of climate change on urban flooding, impacts of climate change on reservoir inflow, impact of climate change on water supply and demand, impact of expansion of urban settlement/built environment and conclusion.

Dr. Semu, summarizing the findings said that there is an increase in urban flooding with extreme hydrological events in Addis Ababa City. He underlined that the effect of climate change will be to greatly contribute to an increase in urban flooding. Regional downscaled data combined with statistical downscaling was used to analyse the different IDF design curves, where flood analysis is based on 50 year return periods. Calculations show that the 10 year return flow for the 2030-2040 period is higher than what the design curves predict. He remarked that many drainage culverts in Addis Ababa are being designed without considering the change in flows due to climate change. He added that there has been a change in intensity, duration and frequency curve over the past years and recommended that there is a need to change the design guidelines of drainage culverts in Addis Ababa city to incorporate the change of flow magnitude due to climate change. The existing structures will deteriorate, making communities more vulnerable.

With regard to inflow to reservoirs (situated in Addis Ababa city), reverse modeling was done since inflow data is not available. Dr. Semu remarked that this is a data gap for analysis. He concluded that climate change impacts will cause an increase in rainfall, thereby an increase in inflow to the three reservoirs serving Addis Ababa. The various inflows to the reservoirs were summarized as follows: Legedadi 90 MCM, Dire 30 MCM and Gefersa 25MCM. He anticipated that there would be a small increase in inflows to the three reservoirs due to climate change. He noted again that an increase in inflow to the reservoirs could undermine the safety of reservoirs.

According to Dr. Semu, there is a global temperature increase. As a result, he said that he anticipated an increase in water demand in Addis Ababa similar to other cities in the world, which in turn causes an increase wastewater generation. He emphasized that the water demand increase will be a great issue in the face of population and economic growth. After he had mentioned the water resources potential of Addis Ababa city (both from well fields and reservoirs), he stated that currently the water supply is not satisfying the water demand as well as disparity in the spatial distribution. He projected the future water demand based on average population growth rates obtained from different documents. Accordingly, there will not be sufficient water to satisfy even the base line projected population scenarios' water requirements. He also added that the water potential of Addis Ababa is very limited citing the Gerbi dam and ground water as additional sources. The plans for Sibilu dam may not materialize. Hence, there might be a need to seek water sources from basins further away, with such as the Nile and Awash Rivers.

The increase in demand due to temperature rise has not been modeled due to lack of local information on increased water use which would have to be studied in the future. Hydrological modeling has shown that the biggest contributor to increase in water demand is however population expansion implying that non-climatic drivers may have a higher impact than the climate drivers. He also showed that the projected baseline scenarios of population growth and projected water demand of Addis Ababa is expected to increase waste water generation. Finally he pointed out that data from AAWSA analysed for consumer patterns has shown that 101 consumers currently take 17% of the water produced.

Dr. Semu highlighted the impact of land use change on runoff. On the basis of the land use change master plans for 3 years (1984, 1986 and 2002), and using a boundary of 517 sq km, he said that there is great change in land use in Addis Ababa from 1984 to 2002. He believed that the high level of land use change means an increase in impervious areas, which in turn allows an increase runoff generation and consequent flooding. The present situation of urban expansion of impervious surfaces can be expected to worsen the impact. He also pointed out that the runoff coefficient has increased, and it is possible to calculate which sub-catchments in the city are most susceptible to flooding. Example in sub-catchment 10 of the city the comparative figures for runoff between 1986 and 2002 shows an increase of 15%. Water harvesting structures that reduce the load going into storm drainage at peak time, retarding the flow is one possibility to manage the flows.

In conclusion, Dr. Semu pointed out that an expansion of built environment is producing greater risk of flooding in Addis Ababa, while climate change is likely to put additional pressure on the city in the long run. Furthermore, he indicated that despite additional water supply development, by 2030, Addis Ababa will still have insufficient water supply due to increased temperature and expansion of population and wellbeing. Water saving technology may need to be introduced to reduce the water usage. Rainwater harvesting is also a likelu option that is worth further study.

#### **Questions and Discussion: Climate change and hydrological modeling implications for policy and planning.**

Dr. Liqa Raschid-Sally thanked Dr. Semu for his presentation and invited participants for any questions, comments and discussions on his presentation. The first point was raised by Dr Alebel Bayru, who suggested that rainwater harvesting has to be recommended for water supply for Addis Ababa city in order to solve water demand deficit. Dr. Geremew and Dr. Semu, who agreed with this, responded that a recommendation for rainwater harvesting is possible but further quantification is needed. Furthermore, they added that tapping into the available springs of the city will also need to be considered as a possible option when assessing the city water resources.

A participant wanted to know the source of the population growth rate of Addis Ababa city as used by the research? Dr. Semu answered by stating that the finding of population growth rate is based on averaging growth rates from different documents. He added that some of the figures are not official because he has collected from academic area. Furthermore, Dr. Semu explained that there are many uncertainties that emanates from the effect of climate change that are not included in the projected demand figures. More discussions ensued with others contributing, on the projected demand figures.

Dr Alebel queried whether the elasticity of demand had been analysed? He stated that it was necessary to analyse the assumptions behind both the high population growth scenarios used by the reports and the high water consumption. Was elasticity factored in eg: increasing water price will reduce demand, so if this is the future policy then it will influence the outcomes. Similarly the future growth and development policies must be analysed for us to be able to make realistic projections.

Mr. Fekadu Lebecha of the Oromia Regional State Water Resource Bureau queried on the possibility of the use of water restriction policy? Upon discussion it was agreed that the objective of the meeting was to identify some of these challenges and to provide recommendations that will help in institutional setup and policy making.

A participant also indicated that many of the water sources for Addis Ababa city is from ground table, and therefore, there is the need to consider recharging underground sources of water to solve the problem of water demand deficit. Subsequently, Dr. Semu said that there are documents that confirm that the majority of recharge to ground water in Addis Ababa is from Nile catchment. The issue was retained as a research gap requiring further investigations.

Dr Solomon gave a suggestion on how to make the presentations clearer to policy makers. He explained that the non – climate change drivers should be analysed through various scenarios and then the CC drivers must be superimposed on this.

Dr. Liqa Raschid-Sally thanked all the participants and adjourned the first session for tea break.

### ***3.1 Vulnerability to climate change impact in Addis Ababa***

Dr. Alebel commenced by explaining the general and specific objectives of his research. Accordingly, the general objective is to assess the vulnerability and adaptation capacity of Addis Ababa to water mediated climate change impacts. The specific objective of his study is to assess the extent of vulnerability of the city; to identify the most vulnerable areas/community in Addis Ababa; to assess the adaptation capacity of the city; and to propose policy and institutional options to build the adaptation capacity of the city to WMCCI. He indicated that urban vulnerability to climate change impact is mainly due to urbanization, low quality of lives, strong

rural-urban linkage. He cautioned that climate change is a distant problem for many, and therefore affects measures for adaptation.

Dr. Alebel presented the detailed conceptual framework and data acquisition methodology used. Data were gathered from review of reports, previous studies, etc and qualitatively from Focus Group Discussions (FGD's), key informant interview and physical observation. Accordingly, he took into account 20 years' residency to cover flood experiences of respondents over this period, gender issue, socio and economic status for the selection of FGD participants. Furthermore, he used a weighting criteria for selection of most vulnerable community/area were as follows: flood is counted for 40%, water supply and sanitation are counted for 50%, and economic status is counted for 10%.

Dr. Alebel also used the projected changes in annual precipitation and seasonal variation in temperature of Addis Ababa from the other studies to show the impacts in Addis Ababa both at the city and household levels. Accordingly, climate change increases riverine flood volume (e.g. street flood), water demand (water shortage) and also increased wastewater generation and pollution of rivers were some of the consequences studied

Dr. Alebel identified that the most vulnerable areas in the terms of flood, water supply and sanitation for different sub cities of Addis Ababa. He said Akaki, Arada, Cherkos, Lideta and Kolfe are the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> most vulnerable sub cities respectively.

Finally, Dr. Alebel explained the vulnerability of Addis Ababa by categorizing into socio economic and physical infrastructure vulnerabilities. Accordingly, he categorized urbanization, housing sanitation, economic status and urban and peri-urban agriculture under socio economic vulnerability; and road and drainage, water supply and sanitation, wastewater management under the physical infrastructure vulnerability. He also described both vulnerabilities in detail.

#### **Questions and Discussion: Vulnerability to climate change impact in Addis Ababa.**

A participant suggested that, the topic has to comprise the vulnerability to climate change and variability impact in Addis Ababa. Consequently, the remark was accepted by Dr. Alebel as his presentation also comprised "climate variability".

The second point raised by a participant was with regard to the criteria for selection of most vulnerable community/area. He indicated that, even though the assessment was showing beyond climate change, the study only linked the criteria to climate change (remark unclear).

AAWSA indicated that only a small part of domestic wastewater is collected, but that the intention is to treat 20% of flows and that due attention is being paid to design gravity flow sewers.

A participant raised an issue on treatment of water and indicated that sludge coming from different part of Addis Ababa city water treatment plants are being discharged in Oromia, and disturbing Oromia's area communities. He further explained the experience they have in Oromia Region with regards to treating sludge from water treatment. The comment was accepted by the participants and agreed to be considered in future findings.

A point was raised that the Kality wastewater treatment plant was working over the design capacity. An interesting discussion ensued about providing the treated water to the farmers as a compensation measure. AAWSA is contemplating sinking some boreholes for the farmers instead.

Dr Langan inquired about the impact on health of water quality and suggested analysing health records for influencing policy. Tadesse confirmed that he has prepared an MSc report quantifying the pollution impacts. Dr Alebel also explained that he had prepared a journal paper with some quantification of health impacts.

The last point raised by Dr Solomon, and was agreed by all was the fact that Addis Ababa's sub-cities are so huge that it will be useful to spatially disaggregate the areas in order to pinpoint the hot spot vulnerable areas in the city.

Dr. Liqa Raschid-Sally thanked all the participants and adjourned the second session for lunch break.

#### **4. Result Uptake Exercise (Working Group Discussion)**

Mr. Geremew Sahilu guided participants through the working group discussions. He begun by presenting the objectives of the group discussion and the details of the research outcome analytical framework. He said the objectives of the exercise was to get feedback on soundness of research results; and to brainstorm on how to engage policy and decision makers to adopt/act upon on recommended strategic and policy directions based on the research results. He added that the research outcome analytical framework contains climatic and non-climatic driven results identified through URAdapt research; possible immediate concerns and long term impacts of these findings; strategic recommendations for decision makers (DM) to mitigate the impacts; and suggestion on the role of policy makers (PM).

Accordingly, five main discussion points were given to the participants who were divided into two groups. The points include:

1. Are the results sound?
2. Are the recommendations relevant?
3. What further recommendations/actions can you suggest?
4. Which stakeholders need to be involved?

5. How do we present these results to DM/PM so that they are convinced to act?

The above questions were answered based on the assessment results attached herewith. at the Annex-1. Each group presented the results in plenary, which were discussed. Some interesting perceptions of stakeholders from the different organizations of importance to the project are captured below.

#### **DISCUSSION RESULT OF GROUP ONE:**

##### ***Result 1: Consequence of increased flood peak and volume consequences?***

1. Yes
2. Yes
3. Climate change and other non-climate change drivers should be included at the local, regions and national level.
4. Ministry of Water Resource and Energy, National Metrological Agency (NMA), Ministry of Works and Urban Development, Addis Ababa City Administration, Addis Ababa Road Authority and Flood Protection Agency.
5. Yes

##### ***Result 2: Consequence of increased water demand?***

1. Yes
2. Yes
3. Harvesting rain water during rainy season.
4. Addis Ababa City Administration and Addis Ababa City Water Supply and Sanitation Authority.
5. Yes

##### ***Result 3: Consequences of increased wastewater generation***

1. Yes
2. Yes
3. Wastewater reuse (for agriculture, for street cleaning, watering parks and green areas)
4. Solid Waste Management and Street Cleaning.
5. Yes

##### ***Result 4: Consequences of increased built up area and change in urban land use pattern***

1. Yes
2. Yes
3. Check dam, water and soil conservation
4. Ministry Of Water Resource and Energy, Ministry of Agriculture.
5. Yes



## **DISCUSSION RESULT OF GROUP TWO**

### **Result 1: Consequence of increased flood peak and volume consequences?**

1. Sound but needs further analysis on seasonal pattern.
2. Yes
3. Regular maintenance and monitoring; improving the early warning system; inventorying of the structures (evidence based approach); refer to the documents at hand; integration among the main actors; and to incorporate non-climatic drivers.
4. Ethiopian Road Authority, Addis Ababa City Municipality, National Metrological Agency (NMA), relevant consultants.
5. Evidence based approach

### **Result 2: Consequence of increased water demand?**

1. Yes
2. Relevant but the priority should be on reducing un-accounted loses.
3. Revision of the master plan; protecting potential water source areas.
4. Addis Ababa City Administration, Ministry of Water Resource and Energy, Addis Ababa City Water Supply and Sanitation Authority and Oromia Government (health, water and environment).
5. Through evidence approach.

### **Result 3: Consequences of increased wastewater generation**

1. Yes
2. Yes
3. Releasing treated waste water to the farmers (with proper supervision and monitoring).
4. Federal and Addis Ababa Environmental Pollution Agency, Industries and Ministry of Water Resource and Energy.
5. Show examples (like the tannery industry) and evidences.

### **Result 4: Consequences of increased built up area and change in urban land use pattern**

1. Yes
2. Yes
3. Integration and policy; multiple use of green spaces (ponds, etc); proper utilization of master plan; and buffer zones along the river banks
4. Green and Clear Addis Ababa Agency, Addis Ababa Municipality.
5. Using demonstration site

## **Wrap Up and Closing Remarks**

Dr. Liqa Raschid-Sally made the closing remarks in which she presented a wrap-up of the discussions made for the whole day. She hoped that the meeting had allowed participants to

reflect on key issues and she is hopeful it will empower the project to move forward. She informed participants on the scheduled Policy Round Table meeting in October. She finally thanked all the participants for the participation.

The meeting came to an end at 4:00pm.

## Annex-1: Group discussion points on overall result assessment and recommendation for policy makers (pm) and decision makers (dm)

1.	<p><b>Please read the results and provide us your feedback</b></p> <ol style="list-style-type: none"> <li>1. Are the results sound?</li> <li>2. Are the recommendations relevant?</li> <li>3. What further recommendations/actions can you suggest?</li> <li>4. Which stakeholders need to be involved?</li> <li>5. How do we present these results to DM/PM so that they are convinced to act?</li> </ol>
2.1	<p><b>Result 1: Consequence of increased Flood peak and Volume consequences?</b></p> <p><b>Scenario:</b> Increase in city flooding due to CC and non-CC drivers requires adjusted higher design flood considerations</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>1. This requires developing new design guidelines e.g. the IDF curve should be changed. What other actions are needed to develop new IDF curve and incorporate it to the design guideline?</li> <li>2. How do we convince a PM? Cost-Benefit analysis is one way - if we show the cost difference between the wider sizes of UD structure (e.g. culvert) and the cost due to collapse or damage of this structure + additional costs of traffic and reduced super-market sales, then they might consider mainstreaming the changes to their policy or guideline documents. What other ideas?</li> </ol>
2.2	<p><b>Result 2: Consequence of Increased Water Demand?</b></p> <p><b>Scenario:</b> Increase in water demand due to CC (temperature increase) and non-CC drivers, will tremendously increase the water demand situation of the city even beyond the planned water development master plan</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>1. This requires multi-faceted measures to be introduced. Immediate measures involve policy action on water saving and management by city government. What are the other mechanisms? Who else has to be involved?</li> <li>2. How do we convince the PM/DM to act on this policy. One way is to show how much water we can save by implementing the water saving facilities and relating it to the additional number of people who can be served. Any other ideas?</li> </ol>
2.3	<p><b>Result 3: Consequences of Increased Wastewater generation</b></p> <p><b>Scenario:</b> Due to CC and non-CC drivers, increase in city water demand obviously increases the waste water generation (80 % of supplied water becomes waste water), posing difficulties in handling large volumes of wastewater.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>1. Proper disposal of wastewater requires a multi-faceted approach and solution. One mechanism to reduce wastewater generation is through water saving. Another mechanism is to encourage decentralized wastewater disposal systems so smaller volumes are handled. What are the other possibilities?</li> <li>2. How do we convince PM/DM?</li> </ol>
2.4	<p><b>Result 4: Consequences of Increased Built up area and change in urban land use pattern</b></p> <p><b>Scenario:</b> Rapid increase in built up area and change in land use pattern reduces infiltration to groundwater, contributing high flood production and reduced ground water recharge. Furthermore, it decreases wellbeing due to absence of open/green space, encourage worsening of environmental pollution.</p> <p><b>Recommendation:</b></p> <ol style="list-style-type: none"> <li>1. Develop guideline for open/green space to built up area ratio during expansion of the built up environment, including orientation of green space to maximize infiltration and retard surface runoff.</li> <li>2. Enact a zoning policy that provides for buffer zones, green spaces, urban agriculture etc</li> <li>3. What other mechanisms are possible?</li> <li>4. How do we convince PM/DM</li> </ol>

## Annex-2: Lists of the participants

S.NO	NAME	POSITION	ORGANIZATION
1	Abebe Angasa	Lecturer	Addis Ababa University
2	Abiti Getaneh (Ato )	Director, Research & Development	Ministry of Water and Energy
3	Alebel Bayrau, PhD		EDRI
4	Alemu Mekonnen (Dr.)	Coordinator	AAU/ Environmental Economics Policy Forum for Ethiopia
5	Ayana Kelbesa		Oromiya Water, Mines and Energy Bureau
6	Behailu Shimeles	Head, Catchment mgt. & water quality service	Addis Ababa Water & Sewerage Authority
7	Biruk Kebede	Hydrology Expert	Ministry of Water and Energy
8	Engida Mengistu	Internal Audit Support process leader	Addis Ababa Women, Children and yout's Affair bureau
9	Fekadu Lebecha	Head, Water Resource Management	Oromiya Water , Mine and Energy Bureau
10	Gebru Jember	Programme Officer	Climate Change Forum Ethiopia
11	Geremew Sahlu	Lecturer/Researcher	Addis Ababa University/ AAIT
12	Gosaye Fanta Abebe		Ministry of Water and Energy
13	Mesikir Tesfaye	Urban Environment & Energy Coordinator	Forum for Environment
14	Semu Moges (Dr.)		Addis Ababa University Department of Civil Engineering
15	Simon Langan	Head, IWMI NBEA	International Water Management Institute (IWMI)
16	Solomon Seyoum Demissie (Dr.)	Researcher	IWMI
17	Tamiru Gedefa Wami	Urban Water Supply & Sanitation P. Coordinator	Ministry of Water and Energy
18	Yohannes Zerihun (Ato)	Eco hydrologist	Ministry of Water and Energy
19	Edmund K. Akoto-Danso	Environmental Scientist	IWMI
20	Liga Raschid-Sally (Dr.)	Environmental Engineering	IWMI