URAdapt

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

INTERIM TECHNICAL REPORT (2) - OVERVIEW

Project Name:	Managing Water at the Urban-Rural Interface: The key to climate change resilient cities (URAdapt)
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Research Institution:	International Water Management Institute (IWMI) Country partners: CSIR Water Research Institute, Ghana and Addis Abeba University, Ethiopia
Project Location:	Accra, Ghana and Addis Abeba, Ethiopia
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1. CHAPTER 1 - SYNTHESIS

This second interim technical report details the activities that have taken place between months 7 and 12 of the project (February – July 2010).

The second project period has been a period of setting up the information bases and cementing the stakeholder platforms. It has also been a period of identifying new partnerships necessary for the project and getting the project known to national authorities and key individuals involved in climate policy.

Some project dissemination has taken place via presentations at various Fora in the two project countries.

A new collaboration with the University of Arizona, has been initiated and it is hoped that some joint activities may emerge. Already there has been student exchange with a MSc doing some related research on urban farming with wastewater, in the project area.

The empirical research on climate downscaling, is a bit more advanced in Ethiopia than in Ghana, and this has to do with the fact that such downscaling work had already been initiated by our project partner there. In Ghana we had to start from scratch. Understanding of the institutions, and governance issues was more advanced than in Ethiopia, since IWMI had been involved in a Resources, Infrastructure, Demand and Access (RIDA) study on water resources and with a special focus on resource availability currently in Accra. Preliminary scenario analysis on the demand side without superimposing climate change have been analysed for both cities but these require further refinement.

Over the two project periods we have understood that the process of participatory planning at policy level, requires good data to make it useful. It is also clear that the platforms in both countries will have to be better initiated into concepts of vulnerability, complexity, and uncertainty and that tools like scenarios analysis will need to be clearly understood by them if they are to utilise it effectively. This can be seen as part of the PAR process and capacity building for policy makers, and we are now seeking the right kind of facilitator for this purpose.

2 CHAPTER 2 – RESEARCH PROBLEM

2.1 Project rationale and research problem

The original project rationale and research problem remain valid. The water resources sector will be among those most affected by changes in climatic conditions. Due to the interconnectivity between upstream and downstream areas, alterations in water quality and quantity in one will have implications for resource availability in the other. Access to basic water supplies is already constrained in much of sub-Saharan Africa, and the situation is expected to be exacerbated by future changes in the climate. Strategies to build climate change resilience in urban water sectors in Africa must adopt a broad perspective; one that recognises the dependence of urban centres on outlying rural areas, particularly where these supply water and food for cities. Simultaneously, resilience strategies must account for the relationships between multiple water-use sectors.

Research on climate change adaptation strategies has to date focused mostly on water resources management for rural agriculture. Simultaneously, urban infrastructure planning has so far ignored climate change and its related consequences for urban per capita water needs and wastewater disposal. The URAdapt project fills these gaps by examining the impacts of climatic and demographic changes on urban water resources management in Accra, Ghana and Addis Ababa, Ethiopia. These sites exemplify problems typical to developing cities in sub-Saharan Africa.

2.2 Project objectives

The project will provide decision support for authorities to manage the urban water cycle in the face of climate change and urbanization. The project has enrolled city authorities and representatives of vulnerable communities – including women's groups – in the respective cities into a science-based interactive dialogue. This will allow stakeholders to discuss the consequences of, and develop response strategies at various levels to, the changing circumstances.

URAdapt is structured as two mutually reinforcing work packages: a multi-stakeholder platform for learning, reflection, feedback, strategy development and evaluation (work package 1; WP1); and an analytical research process, which includes various types of studies and modelling (climate change, hydrological, socio-economic) (work package 2; WP2). The analytical research process will assist in identifying solutions for discussion at the platform. These will reflect various combinations of water supply and allocation options, demand management, water-saving sanitation solutions, as well as water reclamation and reuse for agriculture. The resultant adaptation strategies will take into account technical, socio-economic and environmental factors, and the platform will identify institutional roles and responsibilities for the process of adaptation.

The specific objectives of the project are to:

1. Develop a shared understanding amongst multiple stakeholders of climate change and its effects on water management at the urban-rural interface.

2. Using scenarios, to generate new knowledge on the upstream and downstream implications of urban water demand, and of resulting wastewater generation, as well as on water investment needs.

3. Prepare, in participation with city stakeholders and for the benefit of the most vulnerable groups, a strategic action plan for adapting to climate change based on improved water resource management

2.3 Evolution of project concept

At its core, the project concept remains unchanged. Since the last interim technical report, the project team has gained further insights into the types of stakeholder engagement that will support the overall project objectives. It has also progressed in setting up its analytical research activities, in the process identifying further avenues of inquiry that would yield relevant information for an eventual policy-oriented evidence-base.

In Accra, and Addis the project identity is crystallising towards 'participatory action research with policy- and decision-makers'. In particular, the project has fortified its interactions with the Accra Metropolitan Assembly and the Addis city authorities. The project envisions generating a decision-support tool for authorities at the city level. As such, it is imperative to gauge the needs – and incorporate the expertise – of city-level authorities from the outset.

The project has also made inroads into policy communities beyond the city level. In Ghana, URAdapt has contributed inputs into the draft National Urban Policy and the draft National Climate Change Policy Framework. Chapter 3 addresses engagement with policy-makers in more detail.

There are clear complementarities between URAdapt, and its CCAA sister project in Accra, 'Climate Change and Human Health in Accra, Ghana'. URAdapt has built up networks with policy- and decision-makers, while its sister project has a firm base at the community-level. Stronger ties between the two could facilitate direct community-policy exchanges on climate change vulnerability and adaptation. The possible health impacts aggravated by climate change influencing the sources of these hazards, have to be identified with the sister project in order to formulate the right adaptation responses at policy level. As mentioned in the previous report members of the sister project team already participate on the Re-SAP platform.

In terms of WP1, the Research into Strategic Action Platform (Re-SAP) remains the main channel for engagement with stakeholders. It continues to bring together technical and socio-economic experts from key national- and local-level organisations. Its membership consists of individuals, who can contribute data, implement policy, and advise on policy change. In addition, a smaller Consultative Group has emerged from the Re-SAP. This advisory body is expected to steer the project towards strategic directions by deliberating broad evolutionary trends, such as the perspectives for urbanisation, orientation of climate change related policy, or the future of state devolution and the involvement of the private sector in previously public spheres of activity. These insights serve to ensure that the project's eventual strategic recommendations will be aligned with future political and institutional contexts.

In addition, the project has recently embarked upon targeted policy engagement as an additional means of ensuring that it develops timely recommendations, which meet the information needs of city-, regional- and national-level authorities. The project has participated in national-level policy consultations in two areas that are at the core of the URAdapt identity – urban development and climate change. The project will maintain its ties to national-level authorities in these, and other, sectors in order to introduce and sustain deliberations regarding water, cities and climate change on policy agendas. In addition the project recognised the need to establish regular contact with city-level authorities, and to this end has set up ties with the planning and project units of the Accra

Metropolitan Assembly, and in particular, closer ties with the Millenium Cities Project of the University of Columbia. This is with the intention of using this avenue as a means of influencing uptake of city-level adaptation recommendations. As a next step, the project envisions strengthening links between institutions dealing in isolation with urban and rural areas in order to bring to the forefront, the importance of the interdependencies and the need to manage the urban-rural interface.

Indeed, a recent participatory exercise with stakeholders in Accra revealed the extent of urban-rural and cross-sectoral interdependencies in terms of water resources [see section 2.2; see also annex 1 for the report of the second Re-SAP meeting in Accra]. Stakeholders identified a range of institutions that are expected to play a role in managing these interdependencies; however, they also noted a lack of coherent linkages between them. There is an evident need for an institutional continuum that will be able to address urban-rural and cross-sectoral interdependencies in water resources. The project team, together with stakeholders, will continue to deliberate various organisational mechanisms for a seamless flow of decision-making around common water resources.

In terms of WP2 in Accra, the research continues to be focused on climate change downscaling, hydrological modelling in the Densu Basin, and water allocation and flood modelling both in the Densu Basin and in Accra. The project team has flagged the potential influence of urbanisation and climate change on both water quality, and quantity; and it is exploring whether research into a potential association between sea-level rise and groundwater quality should be included into WP2, or at least flagged as a potential impact. Groundwater is not extensively used for water supply in Accra, and for this reason, the possible impacts on groundwater quality, are not high on the priority list in relation to adaptation responses to CC in view of climate mediated urban water impacts. In addition, the issue of mainstreaming gender and other socio-economic vulnerabilities, was raised at the 2nd Re-SAP meeting, and reflection is underway as to how this can be incorporated effectively within the project frame.

In Addis Ababa, during the reporting period, URAdapt held a platform inception meeting. At the inception meeting in April, members of the Addis Ababa platform were encouraged to reflect upon their roles, responsibilities and contributions *vis-a-vis* the project. Participants also identified existing mechanisms for managing urban-rural interdependencies in terms of water resources, and potential conflicts over those resources. In addition, they were asked to pinpoint synergistic research projects, channels for sustainable research-policy partnerships, along with the policy gaps that URAdapt could fill. An outcome of the Addis Ababa inception meeting was the decision to establish 'core' and 'main' platforms, which will meet at different intervals. The 'core platform' comprises strategic partners co-opted from the main platform, in order to reflect more closely on strategic aspects and also to involve them more closely with the data search. The set-up is similar to the Consultative Group and the Re-SAP platform in Accra, with, as mentioned, slightly differing compositions and objectives. In Addis the "Core Group" has strong representation of the city level authorities as these are key to both data access and policy decisions and the project team interacts accordingly with the group on an as needed basis. The term "core" here implies that these are partners who are essential for access to good city level data. In Accra, "Consultative Group" on the other hand comprises selected key SH representing the national level, as this is where the policy direction is given. The reason for this difference between the two cities, is partly that the boundary partners on the two platforms are not identical given the varied institutional environments for urban planning and management in the two countries/cities. Thus in Addis the city level decision making is strong on the platform, but access to data is more difficult requiring that more direct intereactions with the core group particularly is necessary.

The second Research into Strategic Action Platform (Re-SAP) meeting took place in Addis Ababa in early August and is included in this reporting period for convenience. The project team presented preliminary findings from climate change downscaling and hydrological modelling. The platform provided advice on future research activities on the basis of stakeholders' information needs vis-a vis responding to climate change. Among others, platform members emphasised the importance of investigating the water-use practices of upstream agriculture and industry, and their implications for the quantity and quality of water that reaches Addis Ababa and its downstream areas. They also asked that the project team deliberate methodologies for investigating the impacts of climate change on groundwater - a potentially important source of water for the city in the future. The project team agreed to develop concept notes around these - and other - research areas, and to share them with platform members for feedback. The next platform meeting was tentatively set for December. The project teams have consultations with members on an as needed basis, particularly with the Core group. The Re-SAP meeting was followed by a half-day training workshop on the VENSIM urban water balance model for students of the Addis Ababa University (AAU), staff of the Addis Ababa Water and Sanitation Agency (AWSA) and others.

The project team sensed eagerness among platform members to participate in the project and appreciation that the project tries to bring evidence based research into the decision matrix. A representative of the Ministry of Water Resources in Ethiopia offered to make available laboratory facilities for water quality analyses. Platform members expect to be regularly informed of project activities, and anticipate significant outputs from the project.

Addis Ababa Re-SAP shows that platforms can act as diagnostic tools if they have the right mix of members and the right participation, and the discussions are well structured around defined problems and facilitated to produce the desired result.

The second platform meeting in Addis Ababa was an opportunity for project team members from the two study sites to interact with each other. This stimulated critical thinking around comparative studies that could be undertaken during the project period around climate change downscaling, hydrological modelling, urban water allocation modelling and the institutional and policy contexts of Accra and Addis Ababa. In terms of the latter, the project team identified the need to update and deepen existing hydro-institutional studies (analyses that have mapped water flows and their related institutional relationships), and to 'superimpose' these on the institutional arrangements that are emerging to govern climate change action. Importantly, the institutional contexts of the two sites are expected to be vastly different, given the degree of autonomy accorded to Addis Ababa. The city has the same status as federal states. This is in contrast to Accra, which exists as a metropolitan administration within the Greater Accra Region.

In terms of WP2 activities, project team members at the two study sites are following the same broad conceptual framework for modelling ie climate change downscaling – hydrological modelling – urban water allocation modelling. However, the types of studies undertaken at the two cities differ according to the distinct physical features of the sites. The city of Addis Ababa, is located at the head end of the Akaki Basin, whereas Accra is located at the tail end of the Odaw-Korle basin. Whereas in Accra the downstream water use is not significant, in Addis there is a thriving agricultural economy partly fed by wastewater from the city.

Similarly if we analyse the supply sources to the two cities, the Densu basin which is one of the basins feeding the city of Accra, is tapped at its tail end via the Weija dam, which implies that other water uses in the upstream areas will affect the city both in terms of quality and quantity. In the case of Addis, much of the current water supply to Addis Ababa comes from the Gafersa Dam and the

Legedadi Dam (connected to the Dire dam). The latter is connected to the Dire Dam, both of which are situated upstream in their respective basins. Thus multiple uses of the basin might affect the supply more in terms of quality than quantity. The analytical frames for the 2 cities are therefore distinctly different. Whereas in the Densu basin it has been decided to apply a water allocation model (WEAP) to model different water use scenarios and their implications for the city, in the Akaki basin, the multiple use and development of new water sources (the dams are said to have reached their potential and there have been proposals to carry out inter-basin transfers from the Blue Nile Basin. However, there is also newly found groundwater potential in the city, and current investigations are focusing on means of developing it), to serve the city and surrounding towns will be investigated. Additionally, in Addis there are many important water use activities downstream of the city that will be affected by city water use and climate change.

Indeed, the project team discussed the need to include water quality as one of the parameters affected by climate change, and the possibility of carrying out water quality studies at both sites. The team felt that such research could be done in Addis Ababa on the basis of time series data. However, there is insufficient data to support modelling of water quality alterations under different climate change scenarios. In principle, we suggest that climate change may aggravate water quality, by causing reductions in volumetric flows which could affect the dilution capacities of the rivers. Again it is more likely when comparing the existing water qualities in the Densu river (Accra) and the Akaki river (Addis) that this impact will be felt more in the latter.. Extreme examples exist elsewhere, when the river is seasonal and receiving wastewater, there is no dilution during some periods. Reductions in water flow due to extreme events may have the same effect. Given the lack of reliable water quality data it is difficult to model such water quality impacts and relate them directly to climate change, so the project teams agree that it is perhaps sufficient to flag this possibility for the future.

2.4 Vulnerability analyses

The importance of understanding and framing the concept of city vulnerability is recognised by the project team. In as much as representatives have been included on the platform in both cities, to take on board the perspectives of vulnerable groups (described as urban poor), and our sister project in Accra, which is researching issues of vulnerability at community level, is also on the platform; the project team felt that a more in-depth understanding of context of vulnerability was required. With this in view the team brainstormed and has produced a preliminary outline of context definition and possible studies to be undertaken. An intern is further researching the methodology in order to identify potential field study requirements. In this regard we will work in collaboration with our sister project as much as possible. This research will feed into the reflection.

In Addis some preliminary work has already been undertaken with farmers downstream of the city who are using water from the river that is polluted by city discharges; on how they are adapting to changes within their water environment. This will give pointers on how to handle vulnerabilities induced by climate change.

3 CHAPTER 3 – SUMMARY OF RESEARCH FINDINGS

3.1 Summary of research findings

This chapter details the progress that has been made on the individual project activities during the reporting period. As planned for WP1, the project has held platform meetings in both Accra and Addis Ababa. These are opportunities for stakeholders to review progress and to input into research activities. Capacity building of both the project team, as well as project stakeholders, has occurred through the team's participation in conferences and seminars, and the platform meetings.

With WP 2 preliminary climate downscaling results are available for Addis and have fed discussions at platform level. In Accra, progress is slower because of difficulty in setting up the program for analysis and downloading the data. Initial analysis with development scenarios have been done under different urban and economic growth parameters, for both the cities, without including climate change into the equation. This is part of the PhD output. Despite slower progress in Accra, this is not slowing down the overall process as we are in the process of setting the baselines which are necessary for the follow up activities.

3.2 Progress towards objectives – Work Package 1

The Gantt chart below indicates the overall workplan for WP1. The percentages in the boxes indicate the extent to which individual activities have been finalised (with all activities expected to be 100% complete by the end of the project). During the current reporting period, the project was expected to hold platform meetings in both Accra and Addis Ababa to review progress, and to build the capacities of staff from partner institutions and the research-policy platform.

Time	Project Year	Year One				Year Two				Year Three		Status
	Project Quarter	1	2	3	4	5	6	7	8	9	10	
	Calendar Month	Aug-Oct	Nov-Jan	Feb-Apr	May-Jul	Aug-Oct	Nov-Jan	Feb-Apr	May-Jul	Aug-Oct	Nov-Jan	
	Calendar Year	2009	2009-10	2010	2010	2010	10-11	2011	2011	2011	2011-12	
Work Package One: Research-Policy Platform												
1.1	Institutional analysis, stakeholder identification, project partner meeting	50%	50%									100%
1.2	Initial stakeholder consultations & setting up of platform and/or expanding existing one	50%	50%									100%
1.3	1st platform meeting, analysis and agreement on impact pathway and M&E system		50%	50%								100%
1.4	Platform meetings to review progress				25%							25%
1.5	Present scenario results to nat. policy and decision makers & develop recommendations											

1.6	Capacity building of staff from partner institutions & research-policy platform		5% in both cities	5% in both cities	10% in both cities	20% in both cities						
1.7	Developing strategies for urban resilience											

Activity 1.4 Platform meetings to review progress

Accra: URAdapt held its second Re-SAP meeting in Accra on July 20th. The meeting was again well-attended by stakeholders (a total of 37 participants were present). In response to recommendations from stakeholders – both during the platform inception meeting and during one-to-one discussions – the project team made concerted efforts to enroll representatives of the National Disaster Management Organisation (responsible for disaster risk and response management), the Association of Ghana Industries (the advocacy body for industry, a major water-use sector), Aqua Vitens Rand Limited (the 'management arm' of the Ghana Water Company Limited), the Institute for Statistical Social and Economic Research (a centre for social scientific and economics expertise in Ghana) and the Greater Accra Regional Coordinating Council (among the entities that can facilitate interactions between Accra and its surrounding municipalities and districts) to the platform. All sent representatives to the meeting. In addition, a sizable delegation from the Accra Metropolitan Assembly – a key stakeholder group, given the project's focus on cities – participated in the event.

Among others, the project team updated the platform on the climate change downscaling and hydrological modelling. Since the previous platform gathering, the team had evaluated potential models for regional climate downscaling, and selected RegCM3 for both Accra and Addis Ababa. This is expected to provide data on the future climate according to a 20 km^2 grid. The project team will carry out statistical downscaling in efforts to secure a higher resolution (of up to 1 km^2). This is expected to provide, among others, signals of possible flood events at the city-level. Basin-level hydrology will be modelled under different downscaled climate scenarios with HEC-HMS. This will yield an indication of water availability at the level of the Densu Basin. The allocation of basin waters – including the amounts expected to reach Accra – will be modelled using WEAP. Accra's water demand scenarios would be analysed using the VENSIM urban water balance model.

In addition, the project team had invited a researcher from the Institute for Statistical Social and Economic Research to give a presentation on urban development trends in Ghana, and the upcoming Urban Development Policy, at the platform meeting. The discussion that followed highlighted the care that the project would have to take in its demarcation of city boundaries, and the data that it would use to make urban growth projections. The Ghana Statistical Service is expected to begin a new population census exercise in 2010. However, the data from this census may not be available within the timeframe of URAdapt.

The project team also carried out a participatory exercise with stakeholders to characterise the urban-rural and cross-sectoral interdependencies in terms of water resources [see annex 1 for the meeting report]. Stakeholders identified a range of institutions that are expected to play a role in managing these interdependencies; however, they also noted a lack of coherent linkages between them. There is an evident need for an institutional continuum that will be able to address urban-rural and cross-sectoral interdependencies in water resources. The project will continue to deliberate with stakeholders means of ensuring a seamless flow of decision-making around common water resources.

Addis: The Re-SAP inception meeting in Addis Ababa was held in April 2010. This was an opportunity for the project team to introduce URAdapt to stakeholders, and to obtain their input on institutional problems, research ideas, climate change related projects, and the optimal mode of engagement between the project team and the stakeholder platform. During the meeting, participants validated the membership of the larger platform, and agreed on the establishment of a smaller core group that would provide more frequent input into the project. The core group includes representatives of the Addis Ababa (city) and Oromiya (regional) administrations, the Addis Ababa Water and Sanitation Authority, both the federal and regional Environmental Protection Agency, the Ministry of Water Resources and the Oromiya Water Development Bureau. Institutional arrangements and linkages were recognised as being of great importance specially the relationship between the federal and regional authorities. The potential water use conflicts that were highlighted provided the basis for possible research studies. Mapping of the existing situations provided insights on current projects on climate change. It was recommended that research related to climate impacts on urban water cycle, should be demand driven, and focus on the hotspots, and conducted in close collaboration between the research bodies and the implementing bodies. Finally it was agreed that whilst there was a good water management policy in place, the gap was in relation to mainstreaming climate change. It was also suggested that the platform meetings should be convened based on progress in relation to data collection and analysis and that good communication was essential. In fact this was re-iterated at the second Re-SAP meeting and the project team took good not of this.

The second Re-SAP meeting in Addis Ababa was held in August 2010. The project team had developed the initial research ideas proposed by the platform into more comprehensive research themes. These, along with a framework and checklist for baseline data collection, were presented to the platform for validation. Platform members gave priority to socio-economic studies of the up- and downstream settlements surrounding Addis Ababa, as well as policy and institutional issues. The second Re-SAP meeting was also an opportunity for the project team to present preliminary results from climate change downscaling and its expected consequences on urban water management. The project team had invited a guest speaker from the University of Arizona to share experiences of climate change and water reuse in south-western United States. Platform members expressed their commitment to and interest in the project, and requested means of interacting with the project team in the periods between platform meetings. The types of analysis relevant to Addis as explained in the section on evolution of the project, also emerged as a result of this meeting.

The request for more contact with the stakeholders is retained, but it must be understood that in reality overly frequent meetings would only result in lower attendance as these are the same people who attend various other meetings as well. However it is understood that as data outputs accelerate we would have more frequent interactions to keep stakeholders abreast of developments.

Activity 1.6 Capacity building of staff from partner institutions & research-policy platform

During the platform meetings in Accra and Addis Ababa, stakeholders were sensitised to the climate downscaling, hydrological and water allocation models that the project will use. In Accra, stakeholders were also exposed to the latest thinking on urban development dynamics in Ghana, and had the opportunity to discuss the implications for URAdapt research.

In Addis Ababa, in turn, project team members organised a one-day training workshop on the use of the VENSIM model for urban water balance, for representatives of industry and students from Addis Ababa University. See chapter 5 for a description of the workshop, and the project's other capacity building activities during the reporting period.

3.3 Progress towards objectives – Work Package 2

The Gantt chart below indicates the overall workplan for WP2. The percentages in the boxes indicate the extent to which individual activities have been finalised (with all activities expected to be 100% complete by the end of the project). During the current reporting period, the project was expected to complete the inventory of available climatic and hydrological models, and to decide on model use; to define the main scenario types; begin climate change downscaling; begin the collection of demographic and urban water systems data; develop the VENSIM model; and begin data analysis and modelling of scenarios.

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	Calendar Month	Aug-Oct	Nov-Jan	Feb-Apr	May-Jul	Aug-Oct	Nov-Jan	Feb-Apr	May-Jul	Aug-Oct	Nov-Jan	
	Calendar Year	2009	2009-10	2010	2010	2010	10-11	2011	2011	2011	2011-12	
Work Package Two: Analytical Research												
2.1	Inventory of available climatic and hydrologic models (properties and usefulness). Decide on model use.		50%	50%								100%
2.2	Define main scenario types.			30% (in both Accra and Addis)								30%
2.3	Data collection: climatic data generated from downscaled climate scenario results			20% (Addis) 10% (Accra)	30%(Addis) 20% (Accra)							50% (Addis) 30% (Accra)
2.4	Data collection: demographic data and urban water system			30% (Addis) 20% (Accra)	30% (Addis) 20% (Accra)							60% (Addis) 40% (Accra)
2.5	VENSIM model development			30% (Addis + Accra)	30% (Addis)+ Accra)							60% (Addis) 60% (Accra)
2.6	Data analysis and modelling of scenarios				10% (Accra and Addis)							10% (Accra and Addis)
2.7	Generating and incorporating feedback from platform											
2.8	Finalize scenarios in collaboration with stakeholders											

Activity 2.1 Inventory of available climate and hydrological models; decide on model use

REGCM3 has been selected as the regional climate model for climate downscaling in both Accra and Addis Ababa. There is widespread consensus that the model is able to simulate the climatology of Africa fairly well. HEC-HMS has been selected as the hydrological model as it is very versatile being applicable in a very wide range of problems. This includes large river basin water supply and flood hydrology, and small urban or natural watershed runoff. Hydrographs produced by the program are used directly or in conjunction with other software for studies of water availability, urban drainage, flow forecasting, future urbanization impact, flood damage reduction, floodplain regulation, etc.

For Accra, the Densu River Basin (the basin that provides parts of the city with water for potable use) has been selected as the study site for water availability and allocation modelling, whilst flood modelling will be undertaken in the Odaw Catchment (the catchment that contributes to much of the flooding in the city of Accra). Both the climate change and hydrologic models are currently being setup. The project team envisions climate change downscaling, and the calibration and validation of the HEC-HMS model for the selected river and urban catchments, to take place between August and December 2010.

In Addis Ababa, in turn, a first round of climate modelling has been completed using REGCM3. The project will run a second round with more detailed parameters. The team has made a start with testing the impacts of climate change on water availability and extreme flows. Between August and December, the team will complete the baseline survey, re-calibrate the hydrological model, and continue to test the impacts of climate change on water availability.

Activity 2.2 Define main scenario types

The project team envisions applying the outputs of selected IPCC scenarios, to various combinations of scenarios of urban development in the cities of interest, agricultural development in corresponding catchments, which would in turn account for different scenarios of urban and rural water demands, wastewater generation, urban runoff and water allocations At both sites, baseline information is being gathered and validated during platform meetings. The project team will complement this with document reviews, and screen eventual data ahead of scenario generation. In terms of academic research contributions to these scenarios, in the case of the IPCC scenarios, we just utilise two scenarios and do not in any way contribute to generating them. With the other scenarios mentioned, the contribution of academic research is to be able to define the parametric values we should be using for these possible scenarios.

Activity 2.3 Data collection: climatic data generated from downscaling

In Accra, the project team has completed the collection of historical climate data. The REGCM3 profiles are being arranged. About 40% of the work is completed and Model outputs are expected by early 2011. Feedback is provided to the SH on data needs, analytical methods to be used etc and those SH with relevant technical expertise provide feedback to project team.

In Addis Ababa, a preliminary round of climate change downscaling has been completed. This yielded data on a 50 km^2 grid. A second round is planned to be completed by the end of the year. This is expected to generate data on a 10 km^2 grid.

Activity 2.4 Data collection: demographic data and urban water system

Accra: As part of the PhD study financed by the project, demographic and urban water system data have been collected. Additionally a completed study for Accra on a Resources, Infrastructure,

Demand and Access (RIDA) is available that has been prepared in collaboration with the SWITCH ongoing project in the city of Accra. This information base has to be updated and expanded where necessary for more up to date information that can be used in the city water balance models.

In **Addis** Ababa, the project team prepared a baseline framework and check list for data collection. This was validated at the second platform meeting. Students from the Addis Ababa University have been trained to collect necessary data. The baseline is expected to be complete by September 2010.

Activity 2.5 VENSIM model development

In Accra: preliminary model development for Accra is complete and has been tested. The next step is to refine the model and the parameters.

In Addis Ababa, preliminary model set-up is complete and some urban development scenarios have been studied as part of the PhD thesis. Additionally students from the Addis Ababa University have completed initial training in the use of the VENSIM model. They will contribute towards the further development of the model through data collection and other activities.

Activity 2.6 Data analysis and modelling of scenarios

This activity will evolve out of the outputs of activity 2.5, as well as discussions with stakeholders.

4 CHAPTER 4 – PROJECT IMPLEMENTATION AND MANAGEMENT ISSUES

4.1 Project implementation

Chapter 3 described the activities that have occurred during the project period. In terms of project design and implementation, the first interim technical report considered the disciplinary orientation of the project; research partnerships; the involvement of research users, ultimate beneficiaries or their representatives in further defining and/ or implementing the project; as well as gender issues. During this reporting period, engagement with stakeholders – in particular, various types of policy- and decision-makers – has emerged as a significant aspect of project implementation. This section outlines key encounters with stakeholders, and chronicles the project monitoring visit made by the IDRC project officer to Accra in July 2010.

As mentioned in section 2.3, the project period coincides with the drafting of national policies on climate change and urban development. The project team has provided input into these policies, and the draft urban development policy was presented to stakeholders at the last platform meeting. In addition, URAdapt has established interactions with the Ministry of Environment, Science and Technology (MEST), which is in the process of setting up a Ghana Environmental Conventions Coordinating Authority (GECCA). GECCA will house the National Climate Change Coordinating Committee (NCCCC), which is tasked with coordinating the various climate change related initiatives that are being implemented in Ghana. The secretary of the NCCCC delivered the opening address at the inception meeting of the Re-SAP. In addition, the Environmental Protection Agency (EPA) – an authority under the MEST, which implements environmental sector policies – is represented on the Re-SAP.

At the level of Accra, the project team has found a metropolitan administration that is committed to improving the management of its water sector and allied sectors, primarily under the auspices of the Accra Millennium City Initiative. Indeed, the project team has since May met on a monthly basis with members of the AMA to establish a strong contact, URAdapt considers the AMA a prime-mover in any action that would have to be taken to build the resilience of Accra to climate change through water management, and will continue to interact closely with this stakeholder.

In Ethiopia, as in Ghana, the Environmental Protection Agency (EPA) plays a central role in drafting climate change related initiatives at the federal level. The extent to which individual sector Ministries, Departments and Agencies (MDAs) have drafted their own strategies to address climate change, needs to be investigated in both countries/cities.

There is a difference in the status of the EPAs in Ghana and Ethiopia. In Ghana, EPA is represented in Cabinet through the MEST. In Ethiopia, the EPA does not have Cabinet-level presence. They are however represented in the Basin High Council, which also has 7 Federal Ministries, and civil society organisations and the water bureaus as observers.

In Ethiopia, IWRM policy and basin master plans based on this, are prepared by Ministry of Water Resources but are expected to be implemented by the basin authorities where they exist. The Ministry reserves the management function, except in basins where there is no authority, where the Ministry issues permits for water use etc. Basin authorities have been established in 2 of the 12

basins. Only the Nile Basin Authority is functional. Basin authorities have a dual reporting system, reporting to both the ministry and the Basin council.

According to platform members from the EPA in Ethiopia, the country has published a NAPA in 2007. Efforts are currently under way to develop a 'climate change mitigation and adaptation framework', which will serve as an implementation strategy. In addition, there are various donor-funded initiatives, which encourage learning between climate change related initiatives, and collate lessons for policy-makers. URAdapt project team members have participated in such efforts. Team members are often called to provide expertise based on knowledge gained from the project activities. For the team members too there is a learning element from these meetings. The contributions could simply take the form of recommendations or we may be asked to write something or provide some information.

The complexity of the institutional context in which URAdapt works in both Ghana and Ethiopia has made the project team aware of the need for deeper and more comprehensive 'climate change and hydro-institutional mapping'. The intention of such an exercise is to superimpose onto a map of water transfers and flows a chart of the institutions that govern them. This will be augmented by a third map, which depicts the institutions that govern climate change action, and the connections between them. The project will use case analogies of past 'trigger events' to understand the ways in which institutional channels that manage the urban-rural interface, for instance, have formed and operated.

Equally, at the city-level, Accra and Addis Ababa have distinct systems of administration. Addis Ababa has comparatively more authority than Accra. This, along with the national-level policy environment, will have repercussions on the stakeholder engagement and uptake strategies that URAdapt will pursue.

Stakeholder engagement was a central theme during the IDRC project officer's three-day monitoring visit to Accra in July 2010. The visit entailed meetings with the Director for Water at the Ministry of Water Resources, Works and Housing, as well as the Executive Director of the Water Resources Commission. Both individuals provided insights into the current status of the water sector, and water resources more generally, in Ghana. In addition, the project team arranged a meeting with a group of city-level authorities in Accra to discuss water- and climate change-related issues and the ways in which the metropolitan administration addresses them. The monitoring visit also included a day-long field trip to the Densu Basin (the major source of water for the city), as well as a city tour of flood-prone areas in Accra (led by a representative of the government authority responsible for maintaining sewerage and drainage networks) and otherwise vulnerable settlements (led by a representative of a non-governmental organisation that works for the benefit of informal urban communities).

4.2 Project management

Project Administration by the host organisation (IWMI) is functioning smoothly with support given for financial management from the centre's headquarters.

Because of internal financial management practices and good software, resource availability and keeping track of expenses is not an issue. There is sometimes some delay in processing contracts to consultants because of internal procedures but this is not frequent. In one of the project locations (Ghana) the climate change downscaling activity has been slowed down, due to the initial lack of

expertise in the local project team and the need to locate a consultant who has access to data and is familiar with relevant software. Apart from this the project is on schedule.

On stakeholder engagement, two meetings are expected to take place in Accra, and one in Addis before the end of the year. Addis and Accra are overall on par in terms of progress, albeit in different project activities. In some Addis is in advance in others, Accra. For isntance Addis has progressed a bit more with CC modelling. Some additional visits by PL to provide backstopping is planned.

In this quarter staffing has been stable, but some changes are expected next quarter with staff movement. These will however be replaced. Additional staff is also expected to come on board as and when needed.

Project management and administration support from IDRC has been very good, and the project officer and his administrative assistant provide support in a timely manner.

Expenditure is still low (see FR) as project leader was very careful with the expenses. It is expected that it will pick up in the next periods. As such, more project travel to the sites and more inter-action between the teams can be envisaged. This is partly because some of the more expensive activities have not got off the ground. We are also thinking of facilitation for the PAR policy process, so the intention is to use some of the funds for this, as it was not programmed in the original budget.

5 CHAPTER 5 – PROJECT OUTPUTS AND DISSEMINATION

5.1 Information sharing and dissemination

March 2010 – URAdapt project team member in Ethiopia participated in an Oxfam-organised consultation on climate change research projects in Ethiopia.

The URAdapt project officer attended the Association of American Geographers annual meeting in Washington D.C. between April 14th and 18th. Her participation led to contact with a group of researchers from the George Washington University, working on flooding in Accra, and an exchange of data.

Members of the URAdapt project team met with members of the Accra Metropolitan Assembly in June 2010. This followed earlier discussions in May with the Metropolitan Chief Executive on how the project could assist Accra in achieving its goals under the Millennium City Initiative. The URAdapt team had the opportunity to present the project to representatives of the development planning, physical planning, waste, drainage, sewerage, works and public health departments. In turn, URAdapt learned of some of the existing mechanisms through which the metropolitan administration manages water - both within its own boundaries as well as together with authorities in surrounding areas - and some of the challenges that it faces on these fronts. These insights will allow URAdapt to carry out research that meets the demands of its key stakeholders. As a follow-up to this, the planning department was prepared to work with the project and share information from their GIS database for some specific neighbourhoods within the city. This can provide useful information for re-confirming some of the parameters used and assumptions made in the urban water balance model.

Also in June, the URAdapt project leader took part in a panel discussion on Ghana's preparedness to respond to climate change. The discussion was organised as a side-event at the annual Accra Environmental Film Festival.

The Advisory Board of the CCAA programme visited Accra in early June. URAdapt, along with other CCAA-sponsored projects, presented its approach and activities to the Board.

As mentioned earlier, the National Climate Change Coordinating Committee (NCCCC) in Ghana organised a series of roundtable discussions in June on a future climate change policy framework for Ghana. The URAdapt project was present at the discussions, and together with other stakeholders, deliberated means of building climate resilience and promoting low carbon development in a socially equitable manner.

In July 2010, the URAdapt project team participated in a meeting on Accra's Millennium City Initiative. The meeting was convened by the Accra Metropolitan Assembly, and brought together partners in the project.

Also in July, URAdapt held its second platform meeting in Accra. See section 3.2 and annex 1 for further information.

In July, URAdapt was also invited to present at the Mole Conference in Accra. This is the main annual water and sanitation event in Ghana. This year's theme was climate change.

5.2 Knowledge creation

See chapter 3 for a description of progress to date.

5.3 Training

See chapter 6

5.4 Research outputs

See the annexes for reports of the platform meetings in Accra and Addis Ababa. These, along with the presentations that were given at the meetings, are also available on the project website (http://uradapt.iwmi.org).

The project team is in the process of developing a publication strategy for the research outputs of the project. Potential paper topics include: what are the impacts of climate change and land use change on water availability for Accra? How will urbanisation in the upper Odaw river catchment impact on flood incidence and levels in the city of Accra? What institutional and stakeholder arrangements would enhance the urban-rural synergies between Accra and its rural communities and increase the resilience of Accra to climate change?

6 CHAPTER 6 – CAPACITY BUILDING

6.1 Short-term training

In Addis Ababa, in turn, project team members organised a one-day training workshop for representatives of industry and students from Addis Ababa University. A total of ten participants took part in the training. They were introduced to the urban water system of Addis Ababa, as well as the VENSIM model (with a particular emphasis on its properties and its practical application as an urban water balance modelling tool for the city of Addis Ababa). Workshop participants also had the opportunity to practice using the VENSIM model. The training contributed towards building local capacities for urban water management under different climate change scenarios. It also served as initial training for postgraduate students from Addis Ababa University, who will contribute towards data collection and analysis. The results of the workshop evaluation indicated that participants found the training extremely useful, and would have wished for a longer training workshop.

The core Training budget is for MSc and PhD students. But we will look into other possible useful training sessions for the platform members which covers climate change and adaptation. In fact one possibility which will be tested is to combine one training type presentation into each of the Re-SAP workshops. At the end of workshops we have verbal feedback from participants that new knowledge is being presented and we see this as part of capacity building.

6.2 Fellowships

[N/A]

6.3 Student supervision

The team leader was a co-supervisor on a MSc thesis[1] on Pollution in the Densu basin which was partly supported by the project.

The team leader also co supervised one MSc. Student Tabitha Spence from the University of Arizona for her on-going research on Urban Food Security, Health, and Adaptation in the Developing World: The Case of Wastewater Irrigators in Addis Ababa, Ethiopia"

In the reporting period, One PhD student Daan Van Rooijen submitted his thesis and presented himself for the viva. The thesis title is "Implications of urban development for water demand, wastewater generation and re-use in water stressed cities". This work established the baseline and worked with some development, water supply and sanitation scenarios. If there is remaining funding it is envisaged that another student would commence research work that could contribute to a PhD but there will be insufficient time to complete a second PhD.

[1]Akoto-Danso, E.K., 2010. Assessing pollution and river recovery processes in the middle catchment of the Densu River Basin in Ghana in partial fulfilment of MPhil degree in the Environmental Science Program of the University of Legon.

6.4 Capacity building of stakeholders

Section 3.2 described the capacity building that took place during the platform meetings in Accra and Addis Ababa.

CHAPTER 7 – OUTCOMES AND IMPACT

Please look at 'Outcome Mapping' diagram in proposal – we are following this and hope to re-introduce the outcome mapping approach at a later stage. However we have observed the following:

Outcome 1: Stakeholders are becoming better able to evaluate the factors that make them more vulnerable to, and that help them cope with, climate change. Please see section 3.2 and section 5.4.

Outcome 2: Active exchange and learning between researchers, vulnerable groups and policy advisors at the inception workshop. The gathering also allowed representatives of at-risk groups to input into the design of empirical research activities. At subsequent Re-SAP workshops, stakeholders have verbally indicated their satisfaction on the knowledge sharing and learning that is taking place. Representatives of vulnerable groups, who are participating on the different platform groupings are gradually able to better articulate the needs of such groups for the purposes of policy level responses to adaptation.

Outcome 3: policy making processes within the two countries are much better aware of the project intentions and types of evidence that will be generated. In Accra the team leader and other members have been invited to participate in such processes. In Addis such participation is not certain for all types of input, though technical inputs on climate modelling are requested from our key partner. The project will review this aspect

Later on in the project it is intended to capture outcome and impact stories.

7. CHAPTER 8 – RECOMMENDATIONS

No specific recommendations can be made at this juncture. However, as project spending is lower than expected, partly due to delay in start of certain activities, but also due to careful fund management! The project leader requests time to review how best to utilise any left-over funds.