

MAINSTREAMING ADAPTATION INTO EXISTING URBAN DEVELOPMENT AND ENVIRONMENTAL MANAGEMENT PLANS WORKING PAPER May 2014

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Executive Summary

This working paper is developed to address issues on how adaptation of climate change induced impacts can be mainstreamed in the urban development and environmental management plans in Tanzania. It takes the case of Dar es Salaam whereby the project on adapting to Climate Change in Coastal Dar es Salaam (ACC Dar) funded by the European Commission has been implemented. The major aim of the project was to contribute to the implementation of the National Adaptation Programme of Action (NAPA) of the United Republic of Tanzania. As a part of the project implementation and as a way to assess how adaptation to climate change induced impacts may be incorporated in the planning process, different plans were used as case studies in assessing whether adaptation issues have been taken into consideration in these plans and identifying gaps that need to be addressed in order to ensure that climate change impact adaptation is mainstreamed and finally implemented. Plans that were used for analysis presented in this paper include (i)Temeke Municipal Council's Strategic Plan for Years 2010/2011 -2012/2013, (ii)Temeke Medium Term Expenditure Framework for years 2010/2011 -2012/2013, (iii)Strategic Water Supply Plan for Dar es Salaam and (iv) draft Dar es Salaam Master Plan2012 - 2032. Issues that are presented with regard to the analysed plans include various adaptation concerns (ACs) addressed in each of the analysed plan and why these adaptation concerns were selected as the issues for analysis, selected potentials for autonomous adaptation (PAAs), possible mitigation measures and adaptation needs. Results from the analysis form an important input to the process of mainstreaming climate change impact adaptation in local government plans. Furthermore, results are expected to set a scene for ensuring that adaptation strategies are included in future plans and budgets. A range of possible amendments to meet the identified adaptation needs are also presented. The recommendations for amendment have been based on technological, ecological and social aspects so that when they are implemented ecological health and improved well-being of the society in the municipality and the country as large will be ensured.

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ANNEX

List of acronyms

ACC Dar	Adapting to Climate Change in Coastal Dar es Salaam
ACs	adaptation concerns
AN	Adaptation Needs
CC	Climate Change
CCS	carbon capture and sequestration
EPWS	Equitable Payment for Watershed Services
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
LGA	Local Government Authorities
MTEF	Medium Term Expenditure Framework
NAPA	National Adaptation Programme of Action
PAAs	potentials for autonomous adaptation
UDEM	Urban Development and Environment Management

1. Introduction

1.1 Background

The ACC Dar project aims to improve the effectiveness of municipal council's initiatives in Dar es Salaam for supporting the efforts of coastal peri-urban dwellers, partially or totally dependent on natural resources, to adapt to Climate Change (CC) impacts. More specifically, the action will enhance the capacities of Dar's municipalities by increasing their understanding of adaptation practices and by providing them with enhanced methodologies for mainstreaming adaptation into their Urban Development and Environment Management (UDEM) strategies and plans. The achievement of these objectives will contribute to the overall goal of improving implementation of the National Adaptation Programme of Action (NAPA) of the United Republic of Tanzania.

This paper provides the final results of the project activities conducted to develop and test a methodology for the participatory design of LGAs' adaptation initiatives. In line with the project approach, these initiatives are meant to contribute to effective integration of CC concerns and related adaptation objectives into the plans and programs which currently shape the daily responsibilities at Dar es Salaam's local government departments. In particular, the designed initiatives take the form of amendments to the provisions made by four UDEM planning documents already in place and contribute to CC mainstreaming by introducing new procedures or adjusting the existing ones in order to feed CC related information into decision-making at local level.

The mainstreaming exercise is based on the results of previous project activities. The CC impacts of concern for the peri-urban population settled within the coastal plain were identified through household interviews under activity 1.1 (Ricci et al. 2012), while the participatory workshops conducted under activity 1.3 allowed for in-depth examination of community adaptation strategies (Loddoni 2013). Access to fresh water emerged as a top priority due to the increasing salinization of boreholes. As regards the strategies that people autonomously adopt to cope with changes in their living environment, the community indicated the following as the most common: water source diversification, change in economic activity, and change in settlement pattern or location (migration) (Ricci 2014). Accordingly, a series of study were carried out under activities 2.1 (Congedo et al. 2013) and 2.2 (Sappa et al. 2013) to assess the sensitivity to seawater intrusion of the coastal aquifer with regard to CC and growing physical expansion of peri-urban settlements (urban sprawl) within the coastal plain. Indeed, urban sprawl causes an additional human pressure over the coastal aquifer, due to increased groundwater withdrawal and soil sealing, and its effects are expected to combine with CC ones, i.e. reduced rainfall and increased temperature, in the next years. Those studies showed that the rate of water extraction from the coastal aquifer already exceeds the recharge flux, and seawater intrusion phenomenon will progress even faster under future condition of climate change and urban sprawl. Consequently, the need arises for LGAs to take action to ensure groundwater conservation while guaranteeing peri-urban population access to water. As indicated in Shemdoe (2013), climate change adaptation interventions should ensure that they do not undermine the autonomous adaptive capacity of households but rather promote and support sustainable adaptation strategies while preventing maladaptation.

The design methodology was developed in parallel to two other project activities that provided essential indications for formulating amendments to existing planning provisions. Firstly, from the capacity building carried out with LGAs officers under the work package 3, it emerged a clear indication to focus on those measures and actions already in place - or under development - that can be justified as necessary for adaptation with little change, in order to ensure immediate access to adaptation funding. Rainwater harvesting intervention is a good example in that aspect. Consequently, this was the major criterion used for choosing which among the existing planning measures should be taken into consideration for adaptation mainstreaming. Secondly, the project provided several opportunities to share work progress and products with academics from different fields and countries. One of the criticisms was that too great weight was placed on current adaptation strategies of people while their aspirations for change were overlooked. The risk was pointed out to implicitly define people's vulnerability as unchangeable and adaptation planning as a way to secure current conditions of life against climate change. As an antidote to such risk, an additional participatory phase was introduced, based on the backcasting scenario approach, to allow the community to play a role in the formulation of the adaptation objectives that informed the mainstreaming exercise (Faldi 2013). The core idea of participatory backcasting is to start by creating a desired vision of the future and then look backwards to the present situation in order to find out what will the challenges that might appear and present as well as potential for change. Through this process the community was enabled to provide indications of what kind of action should be taken to change current water supply management and decisionmaking in order to achieve the desired future.

1.2 Objectives

General Objective

The main objective of this working paper is to contribute in the advancement of methods for climate change mainstreaming into urban development environmental management plans at the local level

Specific Objectives

- To analyse various plans that are addressing climate change adaptation in the peri-urban coastal areas, and
- To formulate amendment options for a number of planning measure or provisions for better addressing adaptation needs in the identified plans.

1.3 Motivation and scope of the work

Climate change has had a lot of negative impacts in the coastal areas of Dar es Salaam. These are mainly the flood related impacts that have impacted people in various ways. Addressing climate change induced impacts need multifaceted approaches. Most of the approaches will only be applicable in a situation that there are policies, strategies, programs and plans that are supportive. Mainstreaming of such adaptation in the plans and budgeting systems requires identification of the existing gaps in these important documents. Identification of these gaps/needs is seen as an entry point to mainstream the adaptation as it has highlighted the negative effects if the adaptation are not included in these plans and also if the same are not budgeted for. This therefore calls for the need to contribute to the advancement of methods for climate change mainstreaming into the local environmental management plans to have supportive plans that could encourage investment and implementation of climate change adaptation in local areas and hence this study was deemed necessary.



Figure1. Dar es Salaam and its coastal plain (provided by Luca Congedo)

2. Approach and Methods

2.1 Overall Approach

The proposed mainstreaming methodology is based on the assumption that rather than preparing "new" plans for climate change adaptation, there is a need to integrate adaptation concern into the existing Urban Development and Environment Management (UDEM) strategies.

In order to develop a tailored and effective methodology for mainstreaming adaptation into UDEM plans in Dar es Salaam, literature review was conducted on approaches for adaptation mainstreaming into policies and planning and on experiences and good practices of mainstreaming environmental issues in Tanzania (Macchi and Ricci, 2014). The results from the literature review were discussed during a training course prepared for the LGAs officer as well as during the workshop with the ACCDar team. The feedbacks provided by the LGAs officers were essential for identifying priorities for change as well as weaknesses and strengths of the local government institutions. Departing from these findings, a step by step methodology was developed to identify specific amendments to the planned measure and provisions and implementing recommendation for the four selected plans.

In the context of this paper, mainstreaming is defined as the process of systematically integrating a selected value/idea/theme into policy domains, particularly the UDEM sectors. More specifically, in this context the selected value/idea/theme is the adverse effect of CC over Dar es Salaam's coastal plain (selected Adaptation Concerns) and the specific outcomes are the improvement of the capacity of Dar es Salaam LGAs for supporting the autonomous adaptation of peri-urban residents settled within the coastal plain (selected Potentials for Autonomous Adaptation).

When applied to climate change adaptation, the mainstreaming approach is considered to guarantee more sustainable, efficient, and effective use of financial and human resources (Persson and Klein 2008) than action-specific approach. Moreover, the mainstreaming approach, unlike stand-alone and sector specific measures and plans, has the potential for multisectoral action, and can facilitate the involvement of different levels of governance and stakeholders into decision-making. Mainstreaming is also considered to ensure consistency and avoid conflicts with other policy domains and long-term sustainability (ibid.), to find synergies with other programs (Adger et al. 2007), to contribute to vulnerability reduction in future projects and strategies by including priorities that are critical to successful adaptation (Lasco et al. 2009) and sensitivity of development outcomes to current and future climate change and variability (Huq et al. 2003; Agrawala 2005; Klein et al. 2005, 2007). It also contributes to prevent maladaptation (IPCC 2001), leverage a much larger financial flows in sectors affected by climate risks than the amounts available for financing adaptation separately (Agrawala 2005), and enhance the performance and development contribution of each sector and each government body at all levels.

Nevertheless, there are many difficulties in applying the mainstreaming approach, for which its actual effectiveness is often questioned. For instance, LGAs officers may not embrace changes that threaten their value systems and interests, including power hierarchies. Secondly, LGAs may be concerned about a reduction of funds dedicated to adaptation due to the adoption of the mainstreaming approach and use of mainstreaming tools (e.g. monitoring actions) as a means of the central government and donors to control and impose top-down conditions to LGAs. To address these issues, the mainstreaming methodology has been conceived to involve the LGAs officers in the whole process of mainstreaming.

At operational level, a mainstreaming strategy involves four types of change: procedural, organizational, normative, and policy reframing. Consistently with the approach adopted by the ACCDAR project (Macchi, 2014), in the context of this paper the specific aim of those changes is the improvement of local capacity to adapt rather than the mere climate proofing of development decision. Therefore, a contextual vulnerability perspective is assumed, which addresses the issue of human security in a multidimensional manner. Vulnerability is considered to be the result of a process in which the system of social interactions and power relations influence people's access to resources, and therefore contribute in a determinative manner to defining the kind of vulnerability of a given social group in a given time and place. As a result, the adaptation options defined through such an approach also address the structural inequalities of the context in order to change vulnerability circumstances (O'Brien et al. 2007; Simon 2010).

The methodology for mainstreaming of adaptation into the four selected plans has taken this perspective and focuses on procedural and organizational changes, as it aims to support decision-making at LGAs level. Indeed, the normative and policy reframing changes rather involve decision-making at regional, national, and global level. Procedural changes consists of introducing new or modifying existing decision-making procedures while feeding information related to the issue to be mainstreamed into decision processes.

Procedural tools commonly used include ex-ante assessments, dedicated budgeting and checklists, sectorial reporting and audits, consultation with experts, and participation of stakeholders. The purpose of these changes is to contribute to creating a favorable context for adaptation, which is strictly connected to creating an enabling context for accessing fresh water, improving local capacity to adapt and ensuring water source conservation. Organizational changes involve changes in formal responsibilities and mandates, networking and cooperation among diverse departments of LGAs and stakeholders (public and private), and structural changes of budgets. It contributes to foster collaboration and reduce conflicts between different level of organization and actors, to induce ownership, appropriation, understanding, and enhanced capabilities on adaptation within the relevant sectors as well as to introduce new responsibilities and various accountability mechanisms (Peters 1998 cited in Persson and Klein 2008). However several risks such as institutional inertia, sectoral compartmentalization, self-interest, and related budget should be considered for the implementation of the proposed changes.

The developed methodology is structured in two phases. The first phase is the assessment of the plan for identification of the adaptation needs. The second phase focuses on changes to the plan, identifying amendment options for the measures and provisions and formulating recommendations for design and implementation of the proposed changes.

In the first phase, in the light of the studies conducted within the ACC DAR project ,the following adaptation concerns and potentials, as well as climate change mitigation implications are identified:

- Two Adaptation Concerns (ACs): the first Adaptation Concern is the water resource conservation (AC1) and focuses on the conservation of water quality and quantity from natural sources; the second is to improve access to fresh water (AC2) and focuses on the accessibility in terms of cost, location and other aspects (enabling context).
- Three Potentials for Autonomous Adaptation (PAAs): water source diversification (PAA1) to
 understand whether a planning measure or provision increases or reduces the variety of water
 sources upon which residents can rely; changes in income generating activities (PAA2), to assess
 whether the measure facilitates changes in income generating activities that are required for people
 to cope with environmental changes; and relocation or changes in actual settlement patterns (PAA3),
 to assess whether the measure provides support to households who are required to make structural
 changes in their living place or relocate elsewhere.
- Two mitigation related issues: the plan's contribution to greenhouse gas emissions (GHG) and the plan's contribution to carbon capture and sequestration (CCS)

The assessment of the plan consists of a process to identify possible negative and positive impacts of the selected measures and provisions on ACs PAAs, GHG and CCS. When a negative impact is detected, a correspondent Adaptation Needs (AN) is formulated as an input for the second phase of the mainstreaming process, which includes the identification of possible amendments to plan measure or provision, their scrutiny and the formulation of the recommendations for changing the plan.

According to the nature of impacts of the measure or provision is expected to induce on ACs, PAAs, GHG and CCS, three types of Adaptation Needs are proposed:

- need to completely revise the measure as it has only negative implications for ACs and PAAs (AN1);
- need to strengthen or adjust the measure for better addressing the threats related to ACs and PAAs (AN2);
- no change is needed as the measure is consistent with the requirements of ACs and PAAs (AN3)

In the second phase, to address each identified Adaptation Need, a series of amendments to the measure are identified, including technological, ecological and social options.

In order to select a set of feasible and suitable amendments to the plan, a list of scrutiny criteria has been identified as follows:

- Effectiveness: includes sustainability and flexibility
- Efficiency: includes cost and benefits, low-regret, no regret and win-win-win scrutiny sub-criteria
- Feasibility: includes technical, social and institutional barriers to the implementation
- Knowledge-based: includes knowledge gaps limiting the implementation of the amendment and possible contribution of the amendment to use the existing data and knowledge to bridge the gap between knowledge and action
- Equity and legitimacy.

A scrutiny process, based on these criteria, leads to the selection of one or more amendments to the measure that will improve its contribution to adaptation while meeting mitigation requirements. Through a

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scoreboard, the most feasible and suitable amendment options are identified and a set of options are selected among those with the highest score, also considering potential synergies.

Final recommendations provide indications on how to amend the measure, and how to implement the chosen amendments. The former includes a description of the chosen amendments, their contribution to adaptation and the possible synergies between two or more of them. The indications for effective implementation of the chosen amendment focus on who are the relevant actors and stakeholders to be involved in the implementation process as well as on what are the opportunities/threats (technical; social, institutional, etc.) and the cost implications to be considered.

2.2 Data Collection and Analysis Methodology

Analysis of the selected plans for identifying gaps as an approach to develop recommendations for amendments and on how adaptation of climate change induced impacts can be mainstreamed in the urban development and environmental management plans in Tanzania was done using sequential steps. These involved identification of plans to be analysed. In this step, four urban development and management plans were identified. The identification and selection of plans were based mostly on their close link to issues related to climate change adaptation in Dar es Salaam. What follows is an extract

A variety of document types were considered, ranging over different scales of time (3 to 20 years), space (municipal to regional) and scope (one policy sector to multi-sectoral).

Consistently with scope of the project, the selection of planning documents was made with a focus on water resources, including both conservation and access issues, and on peri-urban areas facing the problem of groundwater salinization. Accordingly, it was also decided to conduct the mainstreaming exercise with Temeke Municipal Council as a study case. The reasons for this are that the majority of Temeke territory lays within the coastal plain and is made by peri-urban and rural areas, with the latter expected to change into peri-urban in the next years.

Plans that were identified and selected are:

At the municipal level

(i)Temeke Medium Term Expenditure Framework for years 2010/2011 - 2012/2013, and

(ii) Temeke Municipal Council's Strategic Plan for Years 2010/2011 - 2012/2013.

At the city level:

(iii)Strategic Water Supply Plan for Dar es Salaam, and

(iv) the new Dar es Salaam Master Plan.



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These four selected urban development and management plans were scanned through to identify and select issues that the study focused on for analysis. In each of the plans, one strategic issue was selected for further analysis. This was then followed by the selection of two measures in each of the strategic issue selected from the plan to be assessed.

Two measures selected under the Temeke Medium Term Expenditure Framework for years 2010/2011 - 2012/2013 are (i) Forest conservation increased from 2100 ha to 25,000 ha by 2013 and (ii) construction of demonstration toilets and sanitation facilities in 11 wards by June 2013.

Under the Temeke Municipal Council's Strategic Plan for Years 2010/2011 - 2012/2013, the selected strategies are (i) protection of environment and reserve areas in 4 wards enhanced by 2013, and (ii) Total of 1,500,000 trees in 175 mitaa planted by 2013.

Under the improvement of surface water sources from 276,000m3/d to 576,000m3/d ultimate capacity by 2032 the selected measures are (i) Improving surface water sources from 276,000m3/d to 576,000m3/d ultimate capacity by 2032 and (ii) Installation of 20 deep wells with a minimum depth of 600 m in Kimbiji and Mpera.

Under the New Dar es Salaam Master Plan, building provisions under Article 6 - Consolidation process zoneand Article 18 – Peri-urban areas and urban agriculture zone were selected for analysis.

All these measures were assessed against ACs, PAAs, GHG and CS followed by the identification of the adaptation needs for each of the measures. Then the amendment options were identified for each AN2, i.e. need to strengthen or adjust the measure for better addressing the threats related to ACs and PAAs, because only measures that could be justified as necessary for adaptation with little change were included in the assessment. Finally recommendations were formulated based on a comparative assessment of the potential amendment options. The process is schematically presented in Figure 3.



Figure 3: Diagram for the analysis of UDEM selected plans

2.3 Limitation of the study

Although the Temeke municipality has various plans that need to be assessed based on their gaps and the need to include climate change adaptation, in this working paper, the assessment has been limited to only four UDEM plans and to only two measures or provisions for each plan. These plans are:(i)Temeke Medium Term Expenditure Framework for years 2010/2011 - 2012/2013; (ii) Temeke Municipal Council's Strategic Plan for Years 2010/2011 - 2012/2013; (iii)Strategic Water Supply Plan for Dar es Salaam; and (iv) the new Dar es Salaam Master Plan. Other limitation that this assessment has encountered is that the future of the draft Dar es Salaam Master plan 2014 -2032 is uncertain. It was not clear during the mainstreaming exercise whether the master plan will be approved by the government or not.

SHEMDOE R., KASSENGA G., RICCI L., NORERO C., MACCHI S., SAPPA G. 6 Mainstreaming Adaptation Into Existing Urban Development And Environmental Management Plans Moreover, although the working group could count on a variety of background inputs from other project activities, the whole exercise was based on the experience and intuition of persons involved. This resulted in bias especially for the identification of amendment options, where it would be advisable to involve a broader panel of participants, including experts from different disciplines, stakeholders and policy makers.

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3. Findings

The assessment conducted based on the criteria mentioned in chapter two shows that the measure under consideration may have negative impacts on livelihood of residents, mainly due to restrictions in the use of natural resources within the reserve areas. Furthermore, these measures may also have negative impacts to the environment and the whole ecosystem. In the following sections, innings that have been gathered on the analysis of the four different UDEM are presented.

3.1 Temeke Medium Term Expenditure Framework for years 2010/2011 - 2012/2013

Under the Temeke Medium Term Expenditure Framework for years 2010/2011 - 2012/2013, two measures were analyzed. The measures are (i) ensuring forest conservation is increased from 2100 ha to 25,000 ha by 2013 (through tree and flower planting, and drilling and drilling of one water well) and (ii) Construction of demonstration toilets and sanitation facilities in 11 wards by June 2013(by constructing toilets and sanitation facilities, conducting sanitation marketing and sensitization on personal hygiene).

3.1.1 Forest conservation increased from 2100 ha to 25,000 ha by 2013

Enhancing forest conservation by increasing from 2100 ha to 25,000 ha by 2013 through tree and flower planting, and drilling water well as an adaptation measure, has several positive impacts such as reduction of Urban Heat Island, increased access and providing an alternative source to water to the communities in the respective area. If the measure is not implemented strategically, it may have negative impact on water resources conservation especially when considering the aspect of drilling and setting up water wells. If the drilling of water well is not done in a strategic way it may result into over pumping of groundwater hence the possibility of salt water intrusion is increased. It is therefore important to capitalize on proper rainwater harvesting in the coastal areas to reduce the dependence of the ground water as amount of water withdrawn from the coastal aquifer is already exceeding the recharge potential.

Other associated negative impact that may be felt in the area is the increased rate of migration to the area where water is more available. As it is known that not everywhere in Dar es Salaam, community have access to water resources and other associated ecosystem services that are provided by green structure, introduction of more green structure, may improve the quality of the environment and hence attract more people to more towards the green structure and water associated ecosystem services hence increase the population and negatively impact the livability of such areas.

In order for the measure not to impact the ecological systems and also take on board the welfare of the communities in the area, the following amendments are proposed. Firstly, for water conservation, the adjustment needed to be done is to address the threat of over pumping of water by monitoring of groundwater table levels. Secondly, on the economic aspect, awareness raising for the community to tape benefits from conservation measures as part of income generating activities (e.g., Selling tree seedlings could be one of the income generation activities while benefitting conservation of the environment). Thirdly, in order to reduce the possibility of increasing migration rate, there is a need for formalization of the informal properties, whereby communities in those areas will be the owners of the land and its associated resources and hence capacitate them with the decision making tools in selecting who should come to the areas hence reduce the impact of influx of people to these areas.

3.1.2 Construction of demonstration toilets and sanitation facilities in 11 wards by June 2013

Constructing toilets and sanitation facilities, conducting sanitation marketing and sensitization on personal hygiene are the interventions included in the plan as activities related to construction of demonstration toilets and sanitation facilities in 11 wards. The negative effects associated with this measure include increased salinization levels due to contamination of groundwater. Amendments needed for this measure is therefore to ensure that there is a clear strategy for ensuring that contents from the pit latrines are well treated to reduce the salinization of the ground water.

3.2 Temeke Municipal Council's Strategic Plan for Years 2010/2011 - 2012/2013

According to the national devolution policy, Temeke Municipal Council (TMC) shall contribute to National Strategies and Policy specific outcomes for growth, improved quality of live, good governance and equity. To this purpose, a Strategic Plan shall be prepared and reviewed every three years that provides for objectives, strategies, targets and performance indicators that will guide TMC interventions.

The Strategic Plan for years 2010/2011 - 2012/2013 was prepared according to the above provisions. The two measures selected for assessment fall under Objective E: "Management of natural resources and environment improved". They are: (i) Protection of environment and reserved areas in 4 wards enhanced by 2013; and (ii) 1,500,000 trees in 175 mitaa planted by 2013.

3.2.1 Protection of environment and reserve areas in 4 wards enhanced by 2013

Protection rules are likely to prevent residents to continue using streams and springs within the reserve areas as a free source for water, which could result in increasing costs for households to access water. Therefore, the need arises to provide amendment options for ensuring that the measure will not impose additional water costs to residents A couple of amendments are proposed as the most suitable and feasible to this aim. Firstly, the set-up of a water monitoring system for natural sources located within the reserved areas shall be introduced to collect data required for an adaptive management of streams and springs, i.e. giving residents the right to withdraw water within limits dictated by common principles for conservation of water bodies, such as minimum water table level or minimum river flow. Secondly, a local water committee shall be delegated to guarantee equitable access to and distribution from natural water sources based on the monitoring results, and to enable the community to participate in the monitoring activities in order to gain self-reliance in adaptive management of natural resources upon which most households depend.

When natural water sources within the reserve areas are currently used by residents as the main source for water or as a complementary source to adapt to water shortages, the risk exists that new protection rules will affect the capability of households to access water at all, or at times. The measure required to be amended so as to provide for enabling residents to access a variety of water sources at least equal to the current one after the intervention. It is then suggested to complement this measure with initiatives to support and encourage rainwater harvesting at household level as a supplementary source of water, while introducing adaptive management (see paragraph above) every when it will be impossible to provide an alternative to households completely dependent on water sources within the reserve areas.

Residents whose income generating activities rely on natural resources from the reserve areas may be forced to change their livelihood strategies as a consequence of use restrictions imposed by the measure under consideration. As some households may be unable to cope with the new situation, there is the need to support them in changes towards more sustainable income activity within and in environs of the reserve areas in order to gain a broader acceptance of the new regulations amongst the community. To this aim, it is proposed to amend the measure by provision of special initiatives including the promotion of low water demanding crops and organic (i.e. chemical free) farming methods in the environs of the reserved areas and the creation of opportunities for income generation through sustainable use of the natural resources from the reserved areas.

Lastly, through restricting both the use of natural resources and possibility to settle within the reserved areas, the measure may cause the residents most affected by those restrictions to migrate elsewhere, with serious consequences in terms of increased urban sprawl and household impoverishment. In order to prevent such an effect, amendments mentioned in the above paragraphs shall be complemented by additional ones especially addressed to support residents in a transition towards more sustainable settlement patterns and/or to provide them with adequate resettlement opportunities. To do so, it would be recommended to introduce provisions for ensuring that a participatory approach will be adopted in residents' relocation and livelihood reconstruction as well as for raising awareness among residents about the environmental impact of different settlement patterns.

3.2.2 Total of 1,500,000 trees in 175 mitaa planted by 2013

Although the measure under consideration appears to be environmentally and ecologically sound, a few negative impacts have been assessed on the basis of the criteria mentioned in Chapter Two.

Firstly, indigenous species and natural habitats may be affected by inappropriate selection of the species of trees to be planted and choice of planting locations. Therefore the need arises to ensure that decisions to plant trees result in the right trees in the right place, and exotic plant species will be appropriately monitored and managed to protect sprouts and favour their growth. To adjust the measure accordingly, a combination of three amendment options is suggested as follows: tree species most suitable to present and future groundwater availability shall be identified as a priority for tree nurseries providing sprouts to new and/or replacement planting; a monitoring system for existing trees and planted seedlings shall be developed, drawing on both local and scientific knowledge; a buffer zone surrounding planted seeds and sprouts shall be established and protected.

Secondly, the measure may result in propping up timber harvesting especially in areas where local economy depends on natural resources. Indeed, residents may look to new trees as an opportunity for income

generation. There is a need to provide guidance for sustainable exploitation of planted trees, while supporting changes towards alternative economic activities. To meet this need, it is proposed to complement the measure with provisions for awareness raising among residents of the multiple value of trees (including groundwater and soil conservation, improved microclimate and city beautification) and disseminating knowledge of sustainable use of timber.

As regards unsustainable uses of timber, there is special concern that a greater availability gives impetus to further charcoal production and thus making other options for income generation less attractive. Therefore, the need arises to promote among residents the use of low GHG emission fuel for cooking as an alternative to charcoal. To this aim, an amendment is recommended to also provide for enhancing resident's understanding of benefits associated with the use of low-carbon energy sources.

3.3 Strategic Water Supply Plan for Dar es Salaam

Under the Strategic Water Supply Plan for Dar es Salaam, two measures were selected and analysed. These were drawn from the strategy for ensuring that water supply for Dar es Salaam is improved and community members in Dar es Salaam can access water with limited problems. The measures are: (i) Improve surface water sources from the current 276,000m3/d to 576,000m3/d ultimate capacity by 2032 through the existing Upper Ruvu and Lower Ruvu water treatments on the Ruvu River and Mtoni water treatment plant on Kizinga River; and (ii) Installation of 20 deep wells with a minimum depth of 600 m in Kimbiji and Mpera for producing 260,000 m³ and 130,000 m³ per day, respectively.

3.3.1 Improve surface water sources from 276,000m3/d to 576,000m3/d ultimate capacity by 2032

The Strategic Water Supply Plan for Dar es Salaam has set a goal of improving surface water sources from the current 276,000m3/d to 576,000m3/d ultimate capacity by 2032 by implementing various actions. Actions that are planned to attain the goal include, improving the existing Upper Ruvu and Lower Ruvu water treatments on the Ruvu River and Mtoni water treatment plant on Kizinga River. Implementation of this action has positive impact including the contribution to the decrease of groundwater exploitation demand and reduction in seawater intrusion among others. Negative impacts associated with the measure include reducing groundwater recharge the river basin. This activity may result in reduction of the level of ground water and hence result into saltwater intrusion. Reduction in the river discharge as a result of excessive abstraction may negatively affect ecology integrity downstream. Other negative impacts that are associated with the implementation of this measure include: increased cost of access to water by residents particularly to those who depend on free water sources; and also disruption of the livelihood activities to some households and business community in the city by demolishing some of the business premises to allow installation of the main water pipeline and also to secure areas for constructing water reservoirs. To reduce the negative impacts that have been identified under this measure, there is a need to take into account the conservation of water catchment upstream by ensuring that revenue collected through the sales of water to various consumers downstream are used to invest in the conservation of upper catchment and hence the plan could include aspects of Equitable Payment for Watershed Services (EPWS). There is a need to establish environmental flow of the river for ensuring that abstraction for water supply does not affect aquatic systems downstream. As some community segments will be affected by not accessing free surface water, an adjustment is needed as the measure should take into account issues related to running cost of water treatment and supply network, subsided water tariff as some of the community segments could not be able to pay high tariffs and also consider minimum disruption of livelihood of the communities that will be affected by water supply systems construction activities. Regarding the community segments whose properties and businesses have been demolished, the adjustment is needed to ensure that those who are relocated are compensated properly and timely.

3.3.2 Installation of 20 deep wells with a minimum depth of 600 m in Kimbiji and Mpera

Installation of 20 deep wells with a minimum depth of 600 m in Kimbiji and Mpera for producing 260,000 m³ and 130,000 m³ per day, respectively is likely to have both positive and negative impacts to the communities and the ground water ecosystems. The identified positive impacts of the measure include improved access and diversity sources of water, reduction in costs for treating waterborne diseases and improving communities' livelihoods in the areas. The main negative impact that is envisaged is that the measure will lead into over pumping of ground water to attain the required capacity per day, with potential consequences of salinization and local land subsidence. Other negative impacts by the measure include increased costs of ground water treatment due to salinization. For the communities, the measure will cause some disruption of

the livelihood activities of some households and business community in the city by demolishing some of the business premises to allow construction of the water wells and associated amenities in the area.

Amendments that are proposed to the plan to ensure that negative impacts are reduced when the measure is implemented include ensuring that there is a limited inflow/immigration of people to this area to reduce environmental degradation and pollution. This can be done though the inclusion of formalization of the informal properties including land in all areas of the city. Other proposed amendment is to address the threat of over pumping of water by improving the monitoring of groundwater.

3.4 New Dar es Salaam Master Plan

The new Master Plan sets out the objectives and policies aimed at achieving a shared vision of the metropolitan city for the next twenty years. It defines the direction of the territorial development and provides for a system of rules and procedures for its implementation.

This assessment focuses on Section 2 of Design Guidelines "Proposed Land Use Zones" and the related parts of Section 3 "Town Planning and Building Standards", as these planning provisions will influence future urban and peri-urban development patterns in Dar es Salaam region. Moreover, a special attention is paid to the Southern part of Dar es Salaam region as recommendations are likely to be more productive in an area that it is still mainly undeveloped and therefore provides a more favorable context for transition to sustainable settlement patterns.

Among the Design Guidelines' articles of greatest interest for this area, which falls under the authority of Temeke Municipal Council, the following two were considered: (i) Article 6 – Consolidation process zone; and (ii) Article 18 – Peri-urban areas / urban agriculture zone. More in details, the Master Plan's provisions for these two zones are the followings:

Article 6 – Areas in the Consolidation process

6.1 – These are the parts of the city, predominantly residential, characterized by a consolidated urban structure, with low quality settlements and a low building density.

6.2 – In the areas that belong to this category all operations of accommodation and transformation of buildings are permitted, including demolition and reconstruction, provided that new buildings do not exceed the height of five floors above ground. All developments should meet the planning and building standards as defined in Section 3.

6.3 – In these parts of the city all measures are planned to provide them with adequate roads, other necessary infrastructure networks (water, sewerage system, and electricity), adequate space for community facilities and green areas.

Article 18 – Peri-urban areas / urban agriculture

18.1 – These are the parts of the territory outside the urban perimeter, characterized by a strong prevalence of agricultural or potentially agricultural areas and low residential density.

18.2 – In these areas, all possible transformations of agricultural nature are allowed, including the construction of residential and / or service buildings, related to the agricultural activity.

In the case of dispersed settlements, the new residential buildings may not exceed the density of one new dwelling per hectare.

18.3 – The Municipalities may decide to establish a perimeter around existing settlements at the date of approval of the Plan, to which the prescriptions of Article 7 of the present Rules will apply.

3.4.1 Article 6 – Consolidation process zone

Based on the criteria outlined in Chapter Two, quite a large number of potential negative impacts were identified which made the task to formulate amendments for the measure under consideration rather challenging. Major concerns arise from the provisions for redevelopment and densification as they entail significant change in the living environment of the existing communities and require important infrastructure development to meet the future demand.

In areas where building expansion and densification will not be accompanied with development of adequate water supply and sanitation systems and solid waste management, the risk exists of further deterioration of the shallow aquifer. Lack of water supply infrastructure induces the drilling of additional boreholes to satisfy the new demand which increases groundwater exploitation. Within the coastal plain, an augmented withdrawal of water from the shallow aquifer combined with reduced recharge capacity due to soil sealing expansion may cause an acceleration of seawater intrusion, a phenomenon already present in most of the areas interested by the measure under consideration. In addition, water and soil pollution associated to lack of sanitation infrastructure and improper solid waste management will worsen the level of groundwater contamination. Therefore, within the coastal plain and especially in areas where the shallow aquifer is Adapting to Climate Change in Coastal Dar es Salaam - Project Ref. EC Grant Contract No 2010/254-773

already brackish and/or polluted, there is the need to provide for initiatives that guarantee the mitigation of the above impacts. To adjust the measure accordingly, a combination of three amendment options is suggested. Firstly the installation of a monitoring system for groundwater contamination and level is required to inform decision-making about new development or densification. In principle, within the coastal plain, no building permit should be issued without a prior assessment of its impact on the shallow aquifer and the use of boreholes should be as limited as possible. Secondly, it shall be prescribed that land use plans secure the conservation of vegetated spaces between (and within) the plots as a way to limit soil sealing, and provide for the protection of river banks which is crucial for controlling pollution caused by runoff. Lastly, the effectiveness of the above amendments may be increased by setting up a local committee which will be held responsible of ensuring the conservation of green spaces, the protection and maintenance of water supply and sanitation infrastructure, and the prevention of direct discharge into natural watercourse as well as water withdrawal from the shallow aquifer.

On the other hand, the supply of water from other sources than boreholes is likely to lead to an increase in water costs for the population living in areas under consolidation process. The need arises to secure access to fresh water for low income households. So, the above local committee should also be given the responsibility to ensure equitable and affordable access to fresh water for all residents in the consolidation areas after upgrading of water supply.

However, even in case of increased investment in the water sector, problems of intermittent service are unlikely to be solved in the short term. So, there is the need to ensure households' access to a complementary water source alternative to boreholes since, as noticed above, conservation of the aquifer is to be considered a priority in coastal areas under consolidation process. It is then suggested to complement the planning measure under consideration with initiatives aimed to raise awareness among residents about groundwater degradation, problems and solutions and to support the development of rainwater harvesting systems for non-drinking uses in redevelopment operations.

The consolidation process may also put at risk some of the economic activities on which households currently depend, thus leading to reduced opportunities for livelihood diversification. For instance, less land will be available for urban agriculture but also non-agricultural activities may be affected by the enforcement of new regulations. To prevent such a risk, it would be necessary to ensure the residents involvement in decision-making relevant to their livelihood. Accordingly, an amendment is recommended to adopt a participatory approach in redevelopment plan preparation process.

The above amendment is equally crucial to mitigate some negative impacts that the consolidation process could cause on the housing conditions of present dwellers. Firstly, building densification may result in unsustainable living conditions if the new settlement regulations and design will be not properly enforced by local government. The adoption of a participatory approach in plan preparation could help to gain residents' acceptance. In addition, it is suggested to complement the measure under consideration with initiatives aimed to deliver technical assistance to households in order to facilitate their compliance with the new building provisions. Secondly, a rise in land price should be expected after redevelopment. This may persuade residents to sell their property and migrate to peri-urban areas but also raises the risk of eviction for tenants and poor leaseholders. In this case, too, the involvement of residents in planning decision-making is probably the only way to find adequate solution to both problems, including the identification of ways for preventing migration from areas under consolidation to limit urban sprawl in peri-urban areas.

As concerns GHG emissions and CCS, the consolidation process will have negative impacts on both. Firstly, besides the building process itself, the population rise associated with redevelopment and densification will generate greater mobility for people and goods and an expansion of energy demand, both leading to increased GHG emissions. In order to contain these emissions, the measure should be so amended as to include the development of a monitoring system for emissions from transport and energy production, in order to provide essential information to decision-making about new development or densification. Secondly, the consolidation process will result in a reduction of vegetated land cover, which entails a loss of current potential for carbon capture and sequestration. In order to preserve such potential but also to contribute to city beautification, it is recommended to amend the planning measure under consideration by providing for a minimum tree planting requirement per dwelling unit in new development.

3.4.2 Article 18 – Peri-urban areas / urban agriculture zone

To the purpose of mainstreaming CC adaptation into the Master Plan, this planning measure is of particular importance as it will impact over large areas in Dar es Salaam region where people livelihoods are expected to remain highly dependent on natural resources. Climate change will particularly hit them and the need arises to make a special effort to maintain and develop their adaptive capacity while preventing mal-adaptation. To do so, quite a large number of amendments to the measure are required.

The measure especially provides for areas where the predominant land use will be agriculture. This may put at risk groundwater resources for a series of reasons. Firstly, increased use of fertilizers and pesticides will result in water source contamination and soil pollution. Secondly, a growing demand of water for farming uses, i.e. irrigation and livestock breeding, will raise the rate of water withdrawal from the shallow aquifer. In order to avoid these impacts, there is the need to promote the adoption of sustainable cultivation techniques by farmers while preventing the use of chemical fertilizers. Consequently, it is suggested to amend the measure so as to include the development of pilot projects on sustainable cultivation techniques, including organic (chemical free) farming and water saving techniques (i.e. micro-irrigation and net-houses). To complement this action, an additional amendment can be introduced to provide for the development of initiatives aimed at facilitate learning and sharing of experiences from pilot projects, thus contributing to raise awareness on benefits from sustainable cultivation techniques among peri-urban communities.

The expansion of built-up areas in the peri-urban zone may contribute to worsen the above impacts on water source conservation This is especially true when the redevelopment of existing settlements will occur without simultaneous provision of adequate water supply and sanitation systems and waste management. To prevent increased water source contamination, soil pollution and groundwater overexploitation, the measure should be as amended so to require the existence of adequate water supply and sanitation infrastructure and solid waste management as a condition for issuing any new building permit in existing settlements. Meanwhile, at least two additional amendments should be considered to lay the foundation for the design of locally tailored, sustainable infrastructure. Firstly, a monitoring system for underground water level and quality shall be created. Secondly, a local committee to ensure the community participation in the design, construction and stewardship of new infrastructure shall be set up.

Proper provision of water supply, although highly desirable for water conservation, may entail a rise in water costs for households. The same may also occur in areas of increasing competition for water due to the combination of inadequate water service and growing water demand. The need arises to ensure no additional costs for residents in accessing freshwater as a consequence of water supply upgrading and population growth. In order to keep freshwater affordable for all residents after redevelopment, it would be crucial to amend the measure so as to provide for the protection of the cheapest source of drinkable water (i.e. community water storage facilities) from contamination and vandalism. To the same aim, the measure shall be amended to include the set-up of local committees in charge to guarantee equitable and affordable access to fresh water for residents. Such committees may also initiate steps towards establishing economic agreements with high water consuming companies (e.g. intensive stock-breeders) to keep domestic water bill low.

In peri-urban areas the competition for water between domestic and agricultural uses is likely to become very high, which may reduce into the variety of water sources accessible to households for domestic uses. To prevent the risk of reduction in water source diversification options for households, there is the need to provide for conflict-resolving institutions and tools. Then, it is highly recommended to complement the measure with the set-up of local committees to manage conflicts arising between households and farmers for access to freshwater sources. Such committees could also be held responsible to bring the voice of peri-urban communities into negotiation with high water consuming companies, where an ecological compensation for damage they caused may be established and a contribution for the development of new sources of water through run-off harvesting and water reuse may be requested.

As concerns negative impacts on income generating activities, it has to be noticed that the implementation of the planning measure under consideration may affect agricultural practices of both residents of existing settlements and those living in rural houses dispersed throughout the landscape.

Firstly, the redevelopment of existing settlements may lead to the exclusion of agricultural uses from residential areas and, more in general, to a disconnection between agricultural and urban activities. Then, the need arises to preserve agricultural uses within the urban areas while ensuring connection between agriculture production and food markets. To this aim, it is suggested to amend the measure so as to require the preparation of a special plan for the protection and development of agricultural and agriculture-related uses near and within the urban boundaries. Such a plan will consider water availability as a limiting factor and secure adequate space for future provision of marketing facilities. In addition, as an incentive towards more sound agricultural practices, an amendment may be introduced to provide for issuing land titles to residents who will adopt sustainable farming and water management techniques.

Secondly, in case of poor or inconsiderate management of wastewater and solid waste within the dispersed settlements, food-producing farmers may experience an income reduction due to a fall in the quality of their product. In order to prevent crops contamination, it is highly recommended to provide for the development of awareness raising initiatives on health and economic risks associated with uncontrolled discharge or

improper reuse of wastewater and solid waste risks over agricultural lands. In addition, the set-up of a local committee to control and promote quality and safety of food production may be introduced.

A further problem is that the regulations for new settlements defined under the measure may be rejected by residents, thus resulting completely ineffective and/or leading residents to migrate elsewhere. It should be also noticed that these regulations pay little attention to environmental impacts from new settlements. Therefore, there is the need to ensure residents' involvement in planning decision-making relevant to their settlement needs while enhancing the environmental performances of decisions made according to the measure. To meet this need, it is suggested to provide for the set-up of a local committee held responsible to manage possible conflicts arising during implementation. In addition, the provided regulations for new settlements shall be so amended as to include the preservation of natural areas with high ecological value (e.g. wood- and wetlands) as well as land very productive for farming from residential encroachment.

Lastly, the measure does not consider that future growth in both farming activities and settled population within the peri-urban areas will lead to an increased demand of mobility and energy, thus causing a negative impact on the environment in terms of GHG emissions. There is the need to contain GHG emissions associated with the new demand through the promotion of low carbon and energy efficient techniques and systems in the sectors of transportation, agriculture and energy production. To meet this need, some amendments should be introduced as follows. Firstly, increased emissions could be compensated by innovating farming practices with techniques. Secondly, the development of awareness raising initiatives on the environmental impacts of private car transport and fossil based energy production is highly recommended to create a more favourable context to the diffusion of low carbon transport and energy production options as well as more energy efficient engines.

4. Conclusions and Recommendations

4.1 Conclusions

Based on the objectives and the scope of the analysis, it is concluded that UDEM plans and strategies especially those were assessed and reported in this paper have addressed various climate change adaptation issues to a certain extent. Adaptation measures included in the plans and strategies analysed range from enhancing forest conservation by increasing the hectares of the vegetation cover through tree planting, constructing toilets and sanitation facilities, improving water sources through water treatments and installation of deep wells, and regulating building activities to reduce urban sprawl into natural areas.

Based on the analysis, it has been observed that the implementation of these measures have both positive and negative impacts. As the main aim is to implement the adaptation measures with negative impacts to the environment and the community, various amendments have been proposed and if implemented will reduce negative impacts and hence adapt to the impacts of climate change in the coastal areas.

The methodology proposed is definitely valid although it would require some revision in order to simplify the assessment process. The in depth examination of a few planning measures or provisions provided sufficient insights for the identification of key mainstreaming initiatives whose reach goes far beyond the improvement of a single measure or provision. In other words, what emerges from the examination of a specific measure has potential to be generalized and provide clear directions for how to proceed in order to mainstreaming adaptation into the whole plan, which is the ultimate scope of this work.

As regards possible improvements, the number of criteria considered could be reduced and one should ensure that they are commonly agreed, shared and understood by all participants.

Moreover, the formulation of amendment options is largely based on the experience and intuition of persons involved. The results would be more balanced if developed through a focus groups gathering experts from different disciplines, stakeholders and policy makers.

4.2 Recommendations

Analysis of the four UDEM plans and strategies has identified a number of adaptation needs. When the plans are considered for review, the adaptation need for the measures selected should be included.

For the enhancement of the forest conservation the following amendment to the existing measures are recommended:

- Tree species most suitable to present and future groundwater availability shall be identified as a
 priority for tree nurseries providing sprouts to new and/or replacement planting; a monitoring system
 for existing trees and planted seedlings shall be developed, drawing on both local and scientific
 knowledge; a buffer zone surrounding planted seeds and sprouts shall be established and protected;
- Awareness raising among residents of the multiple value of trees (including groundwater and soil conservation, improved microclimate and city beautification) and disseminating knowledge of sustainable use of timber should be carried out;
- Promote among residents the use of low GHG emission fuel for cooking as an alternative to charcoal;
- Proper conservation of water catchment upstream by ensuring that revenue collected through the sales of water to various consumers downstream are used to invest in the conservation of upper catchment and hence the plan could include aspects of Equitable Payment for Watershed Services (EPWS).

For a sustainable exploitation of water sources the following are recommended as amendments to the existing measures:

- Setting-up of a water level monitoring system for natural sources located within the reserved areas shall be introduced to collect data required for an adaptive management of streams and springs, i.e. giving residents the right to withdraw water within limits dictated by common principles for water bodies conservation, such as minimum water table level or minimum river flow.
- Establishment of water user associations shall be delegated to guarantee equitable access to and distribution from natural water sources based on the monitoring results, and to enable to community to participate in the monitoring activities in order to gain self-reliance in adaptive management of natural resources upon which most households depend;

- Water user associations are also expected to initiate steps towards establishing economic agreements with high water consuming companies to keep domestic water bill low, as well as requiring ecological compensation for damage they causes and their commitment to develop new sources of water through run-off harvesting and water reuse;
- Awareness raising among residents about groundwater degradation, problems and solutions and to support the development of rainwater harvesting systems for non-drinking uses in redevelopment operations.

Under the consolidation process proposed in the New Dar es Salaam Master plan the following are recommended:

- In principle, within the coastal plain, no building permit should be issued without a prior assessment of its impact on the shallow aquifer and the use of boreholes should be as limited as possible
- Ensure the existence of prescribed that land use plans secure the conservation of vegetated spaces between (and within) the plots as a way to limit soil sealing, and provide for the protection of river banks which is crucial for controlling pollution caused by runoff;
- Involvement of residents in planning decision-making is probably the best option to find adequate solution to the identification of ways for preventing migration from areas under consolidation to limit urban sprawl in peri-urban areas.

For a transition towards sustainable farming in urban and peri-urban areas

- Pilot projects shall be developed for innovating farming practices with more environmentally sound techniques, including organic (chemical free) farming, water saving techniques (i.e. micro-irrigation and net-houses) and techniques which minimize losses in soil carbon, (i.e. minimum tillage techniques)
- Special plans for the protection and development of agricultural and agriculture-related uses near and within the urban boundaries shall be prepared. Such plans will consider water availability as a limiting factor and secure adequate space for marketing facilities.
- Awareness raising among residents on health and economic risks associated with uncontrolled discharge or improper reuse of wastewater and solid waste risks over agricultural lands, as a way to secure quality and safety of food production together with the achievement of water conservation goals.

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ANNEX

Guidelines for mainstreaming climate change adaptation into existing UDEM plans

Liana Ricci Silvia Macchi Carlo Norero

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INTRODUCTION

Overall objective

These guidelines provide ACC DAR project team with basic instructions to formulate recommendations to Dar es Salaam's local government authorities (LGAs) for mainstreaming climate change adaptation concerns into the following four plans:

- 1) Dar es Salaam Master Plan 2012 2032 (with a focus on Temeke Municipality area) Sapienza responsibility;
- 2) Temeke Municipal Council's Strategic Plan 2010/2011 2012/2013) Sapienza responsibility;
- 3) Water Supply Improvement Plan for Dar es Salaam (with a special focus on Temeke Municipality area)) Ardhi responsibility;
- 4) Temeke Municipal Council's Expenditure Framework for Financial Years for years 2010/2011 2012/2013 Ardhi responsibility.

<u>N.B.</u> We tested the guidelines on the Temeke Municipal Council's Strategic Plan 2010/2011 - 2012/2013. All examples provided in the guidelines refer to this Plan.

DEFINITIONS

Mitigation

With respect to Climate Change (CC), mitigation means implementing policies to reduce greenhouse gas emissions (GHG) and enhance sinks.

Adaptation

Adaptation means anticipating the adverse effects of climate change by adopting appropriate actions to prevent or minimize the damages, without forgetting to seize the positive opportunities that may also arise. <u>Mainstreaming</u>

In general mainstreaming could be defined as the process of systematically integrating a selected value/idea/theme into all domains and levels of policy to promote specific outcomes.

More specifically, in this project:

- the selected value/idea/theme is the adverse effect of CC over Dar es Salaam's coastal plain (see Selected Adaptation Concerns) ;
- the specific outcomes are the improvement of the capacity of Dar es Salaam LGAs for supporting the autonomous adaptation of peri-urban population settled within the coastal plain (see Selected Potentials for Autonomous Adaptation).

Selected Adaptation Concerns (ACs)

Consistently with the studies conducted within the ACC DAR project, two adaptation concerns have been selected to be mainstreamed into the four plans:

- AC1: water resource conservation;
- AC2: improve access to fresh water.

Selected Potentials for Autonomous Adaptation (PAAs)

Consistently with the studies conducted within the ACC DAR project, three autonomous adaptation strategies have been selected as relevant to the adaptation mainstreaming of the four plans: water source diversification, change in economic activity, and change in settlement pattern or location (migration). Consequently, favorable conditions for autonomous adaptation are identified as follows:

- PAA1:potential for diversification of water sources (will the measure increase or reduce the variey of water source upon which residents can rely?);
- PAA2:potential for changes in income generating activities (will the measure facilitate changes in income generating activities that are required for people to cope with environmental changes?);
- PAA3:potential for relocation or changes in actual settlement patterns (will the measure provide support to households that should make structural changes in their living place or relocate elsewhere?)

Mitigation related Issues

In order to integrate mitigation concern into the process leading to formulate recommendations for CC mainstreaming, the following mitigation related issues will be considered for assessment:

GHG: the plan's contribution to greenhouse gas emissions

CCS: the plan's contribution to carbon capture and sequestration

Selected Adaptation Needs (ANs)

A set of measures provided by the plan is assessed and possible adaptation needs are identified for each of them as follows:

- AN1: there is a need to change the measure as it has negative implications for Adaptation Concerns (ACs) and Potentials for Autonomous Adaptation (PAAs);
- AN2: there is a need to strengthen or adjust the measure for better address the threats related to ACs and PAAs;
- AN3: no change is needed as the measure is consistent with the requirements of ACs and PAAs.

PROCESS PHASING

The process to formulate recommendations for adaptation mainstreaming process is structured as follows:

Table 1. Process phasing

	Timeframe							
PHASE 1	10 DAYS							
Step 1.1	Step 1.1 Scan the plan							
Step 1.2	Select a strategic issue as a focus for the assessment	- 3 days						
Step 1.3	Identify 2 among the measures related to the selected strategic							
	issue							
Step 1.4	Assess the 2 measures against ACs and PAAs	7 days						
Step 1.5	Assess the 2 measures against GHG and CS							
Step 1.6	Step 1.6 Identify adaptation needs for the 2 measures							
	Deadline for the assessment of the 4 Plans (8 measu	res): December 15, 2013						
PHASE 2	CHANGE THE PLAN	15 DAYS						
Step 2.1	Identify amendment options for each chosen measure	5 days						
Step 2.2	Select the most "suitable/feasible" amendment options to each	5 days						
	measure							
Step 2.3	5 days							
Dea	Deadline for formulating recommendations on the 4 Plans (8 measures): February 2, 2014							



GUIDELINES FOR PHASE 1: ASSESS THE PLAN

Step 1.1. Scan the Plan

Provide a short description of the plan, including the followings (if applicable):

- Title, delivering authority, scope (time and area)
- Why is it delivered? According to which national regulation, if any? Is it compulsory or not? is it delivered periodically or not?...
- If it is part of a wider planning process: what stands before (policy or plan)? what stands after (detailed plan, budgeting, ..)
- Plan's structure and contents

Step 1.2. Select the strategic issue for plan assessment.

Specify reasons for selection: why is it relevant to CC adaptation?

Provide a short description of the issue, according to the plan.

Example. The objective "Management of natural resources and environment improved" was selected as a strategic issue for adaptation mainstreaming (pp. 34-35) because it might interfere with both water conservation and access to fresh water (see step 1.4) and contribute to both adaptation and mitigation.

Step 1.3. Identify two measures, under the chosen strategic issue, that have negative or positive implications for ACs and PAAs.

Specify reasons for selection: is the measure more feasible than others?

Example. All measures under the strategic issue "Management of natural resources and environment improved" have implication for ACs and PAAs. The measure "Protection of environment and reserved areas in 4 wards enhanced by 2013" (p. 60) was selected because it seems more feasible than measures that aim at creating new reserved areas. In fact the process of establishing new reserved areas could exceed the duration of the plan.

Step 1.4. Assess how the identified measures impact, positively or negatively, on ACs and PAAs.

Scrutinize the measures against the two adaptation concerns (ACs) and the three potentials for autonomous adaptation (PAAs) selected for the assessment

Example. The measure "Protection of environment and reserved areas in 4 wards enhanced by 2013":

- positively impacts AC1 because it prevents building construction and deforestation thus ensuring the conditions for adequate recharge of shallow aquifer;
- negatively impacts AC2 because it might prevent the free access to natural freshwater sources;
- negatively impacts PAA1 because it might reduce the variety of water sources upon which the residents can rely;
- positively impacts PAA2 because it provides restrictions for unsustainable income activity within the reserved areas;
- positively impacts PAA3 because it prevents unsustainable residential development within the reserves areas.

Step 1.5. Assess whether measures identified in step 1.2 impact positively or negatively on GHG and CCS.

Scrutinize the measures against greenhouse gas emissions (GHG) and carbon capture and sequestration (CCS).

Example. The measure "Protection of environment and reserved areas in 4 wards enhanced by 2013" might reduce the risk of deforestation and consequently reduce the net GHG emissions, while increasing CCS potential through additional tree planting.

Step 1.6. Identify the adaptation needs (ANs).

Drawing on the assessment results, identify the adaptation needs for each of the assessment criterion.

Example. The measure "Protection of environment and reserved areas in 4 wards enhanced by 2013" needs an adjustment in order to eliminate or reduces negative impact related to PAA1 (water source diversification).

Table 1 below provides a summary of the assessment results and related adaptation needs. In particular, the first column shows the 2 measures selected in step 1.3. The third column shows the impacts identified in steps 1.4 and 1.5 according to the various criteria selected for assessment (ACs, PAAs, GHG and CCS – see the second column). The fourth column shows the adaptation needs identified for each measure.

MEASURES	ASSESSMENT	CRITERIA	ADAPTATION NEEDS
	AC1	Positive impact: it ensure the conditions for adequate recharge of the shallow aquifer	Adaptation need
	AC2	Negative impact: it might prevent the free access to natural freshwater sources	Adaptation need
Protection of environment	PAA1	Negative impact: it might reduce the variety of water sources accessible by residents	Adaptation need
and reserved areas in 4	PAA2	Positive impact: it prevents unsustainable income activity within the reserved areas	Adaptation need
wards enhanced by 2013	PAA3	Positive impact: it prevents unsustainable residential development within the reserved areas	Adaptation need
	GHG	Positive impact: it reduces the net GHG emissions	Adaptation need
	CCS	Positive impact: it preserves and increases the CCS potential	Adaptation need
	Interaction with	AC1	Adaptation need
	Interaction with		
	Interaction with		
Measure 2	Interaction with		
	Interaction with	PAA3	
	Interaction with	GHG	
	Interaction with	CCS	

Table 2. (Table 1 of Phase 1) Adaptation needs by plan measure

GUIDELINES FOR PHASE 2: AMEND THE PLAN

In the second phase a list of recommendations is developed to adjust or improve the planning measures according to the adaptation needs identified in the first phase.

Step 2.1 Identify amendment options for each chosen measure

Based on the implications of the selected plan measures on the Adaptation Concerns (ACs), Potentials for Autonomous Adaptation (PAAs) and Mitigation related issues (GHG and CCS), a series of Adaptation Needs have been identified (Step 1.6). *Example*

MEASURES	ASSESS	ADAPTATION NEEDS		
		Positive impact: preserved capacity for shallow aquifer recharge		
		Positive impact: reduced groundwater extraction		
	AC1	Positive impact: reduced groundwater pollution	AN3: the measure is consistent with the requirements of AC1	
		Positive impact: reduced alteration of natural surface water bodies		
		Positive impact: reduced soil erosion		
		Positive impact: improved soil fertility		
	AC2	Negative impact: might increase cost for access to water	AN2: provide options for ensuring no additional costs for an access to freshwater	
Measure 1. "Protection of	PAA1	Negative impact: might reduce variety of water sources available to residents	AN2: provide options for ensuring that residents will be able to access a variety of water sources at least equal to the current one after the intervention	
environment and reserved areas in		Positive impact: provided restrictions for unsustainable human activity		
4 wards enhanced by		Positive impact: might improve incomes related with wildlife reproduction (fishery)	ANO, august regidente in	
2013	PAA2	Positive impact: improved soil fertility might push residents to change their crops or income activity	ANZ: support residents in changes towards more sustainable income activity within and in environs of the	
		Positive impact: increased job opportunities for the management of reserved areas	reserved area	
		Negative impact: provided restriction for income activity might be rejected		
		Positive impact: provided restrictions for unsustainable residential development	AN2: support residents in changes towards more	
	PAA3	Negative impact: increased pressure to migrate might results in increased urban sprawl and household impoverishment	sustainable settlement patterns and/or provide adequate resettlement opportunities	
	GHG	Positive impact: reduced net GHG emissions	AN3: the measure is consistent with the requirements of GHG	
	CCS	Positive impact: increased protection of the CCS potential	AN3: the measure is consistent with the requirements of CCS	

The step 2.1 aims to formulate a range of possible amendments to meet the identified adaptation needs. Those amendments are meant to change/modify the plan measure in order to:

- mitigate its negative implications for ACs and PAAs as well as for GHG and CCS (meet the AN1);
- strengthen or adjust the measure for better address the threats related to ACs and PAAs as well as to GHG and CCS (meet the AN2) or
- to strengthen and ensure the measure implementation and its positive contribution to ACs and PAAs as well as to GHG and CCS (meet the AN3).

Type of changes

From the literature three different approaches for tackling adaptation can be discerned:

- a) applied technological and infrastructure-based approaches (e.g. provide new water infrastructure);
- b) investing in natural capital and ecosystem-based adaptation (e.g. preserve, maintain and expand natural habitat).
- c) human development and vulnerability reduction (e.g. improve regulation on access to water);

Technological, social and ecological options can be combined since they are often interdependent and synergetic.

For each adaptation need different changes to the measure can be identified. A change can be identified for each of the type of changes listed above (a, b and c), for one only and/or a combination of them. The zero-option (no change) should also be included in the list of changes identified for each adaptation need.

Example. The measure 1 has a negative impact on AC2 because it might increase the cost for accessing water when natural water sources, which currently provide free water to residents, are located in reserved areas. What amendments would be required to the measure to ensure that residents will not have to bear additional costs for access to freshwater as a result of intervention? There are several options to consider for answering to this question:

- Technological option: review the reserved area boundary in a way that will not undermine access to natural water sources for residents OR provide a new infrastructure for pumping freshwater from within the reserved area to a free water point outside the reserved area;
- Ecological option: allow residents to access water sources located in the reserved area according to adaptive management principles (e.g. minimum water table level or river flow);
- Social option: set up a local water committee to control access to and distribution from natural water sources OR identify an alternative source OR provide a certain amount of freshwater for free to poor households (change in water service tariff).

The business as usual (no change) option should be also considered together with the different changes to the measure

The table below provides a summary of the amendment options for each adaptation need

Adaptation needs	Amendment options				
No change	Copy here the original version of the measure under consideration				
	If needed, insert here a statement of the conditions under which the changes proposed below are required				
Copy here the description of the adaptation need	Technological option	Insert here a short description of one or more proposed changes			
under consideration	Ecological option	Insert here a short description of one or more proposed changes			
	Social option	Insert here a short description of one or more proposed changes			

Table 3. (Table 1 of Phase 2) Amendment options by adaptation need

Example						
Adaptation needs	Amendment options					
No change	Protection of environment and reserved areas in 4 wards enhanced by 2013					
	When natural water sources within the reserved areas currently provide free water to residents, the following options are proposed:					
	Technological options	 Review the reserved area boundary in a way that will not undermine access to natural water sources for residents Provide a new infrastructure for pumping freshwater from within the reserved areas to a free water point outside the reserved areas 				
Provide options for ensuring no additional costs for an access to freshwater	Ecological options	3. Set up a monitoring system of water bodies to collect data needed for determining the quantity of water that residents can extract while respecting conservation goals (e.g. minimum water table level or minimum river flow)				
	Social options	 Set up a local water committee to guarantee equitable access to and distribution from natural water sources (including participatory monitoring of groundwater and surface water bodies) Identify alternative free water sources outside the reserved areas Provide a certain amount of freshwater for free to poor households (change in water service tariff) 				
	When natural water sources within the reserved areas are currently used by residents as main source of water or as complementary source to adapt to water shortages, the following options are proposed:					
Provide options for ensuring that residents will	Technological options	AS ABOVE PLUS 7. Improve water supply to underserviced residents (e.g. building new wells and pipelines)				
of water sources at least equal to the current one	Ecological options	AS ABOVE PLUS 8. Support and encourage rainwater harvesting as a supplementary source of water				
	Social options	AS ABOVE PLUS 9. Promote community-based water supply systems for water source diversification, sustainable water storage and water management				
	When residents' income	activity relies upon natural resources of the				
Support residents in	Teserved area, the follov Technological options	 10. Support and encourage water and land efficient agricultural practices (i.e. micro- irrigation and net-houses) while controlling chemical inputs on the best agricultural land of the Municipality 				
changes towards more sustainable income activity within and in environs of the reserved area	Ecological options	 Promote low water demanding crops and organic (chemical free) farming methods especially in the environs of the reserved areas Create opportunities for income generation through sustainable use of the natural resources from reserved areas 				
	Social options	13. Set up local committees for natural resources management according to shared conservation goals				

		14. Support and encourage community shared facilities/projects for alternative income generation
	If living within the reserve following options are pro-	ved areas will be restricted or forbidden, the poposed:
Support residents in	Technological options	 15. Develop guidance for sustainable settlement patterns within and in the environs of the reserved areas 16. Provide resettlement opportunities that shall ensure adequate livelihood reconstruction to resettled people
changing towards more sustainable settlement patterns and/or provide adequate resettlement	Ecological options	17. Support residents to upgrade their physical assets for improved compatibility with water resource conservation and access to freshwater goals
opportunities	Social options	 Adopt a participatory approach to residents relocation and livelihood reconstruction Provide assistance to resettled people to reconstruct their livelihood and receive adequate compensation Raise awareness among residents about the environmental impact of different settlement patterns

Step 2.2 Select the most "suitable/feasible" amendment options to each measure

In order to ensure their feasibility, further to the aim of meeting the identified Adaptation Needs the different amendment options will be scrutinized using the following criteria:

Effectiveness

- **Sustainability:** assess whether the amendment is free from contributing to climate change (e.g. increasing GHG emission) or limiting the ability of ecosystems and other group of residents to adapt.
- *Flexibility:* assess whether adjustments can be made to the amendment at a later stage to meet challenges additional or different than those considered to date.

Efficiency

- Costs and benefits: identify what are the costs (economic, environmental and social) associated to the different amendments and prioritize the *low regret*¹ option (i.e. the amendment will bring relative high benefits compared to the costs, e.g. moderate levels of investment increase the capacity to cope with future climate risks).
- **No regret**²: assess whether the amendment would be justified under all plausible future scenarios, including the absence of manmade climate change (e.g. the amendment to the measure contributes to more sustainable water management and bring benefits also alleviating already existing problems such as groundwater contamination).
- *Win-win-win:* assess whether the amendment entails side-benefits for other social, environmental or economic objectives (e.g. the amendment contributes to closing the gap between water demand and supply or create synergies with mitigation objectives)

Feasibility

• **Barriers to the implementation:** Assess whether the amendment is free from facing barriers to implementation. They can be technical; social (conflict between stakeholders involved), institutional

¹ According to the World Bank, low-regret options are those adaptation measures where moderate levels of investment increase the capacity to cope with future climate risks

² According to the World Bank, no-regret options are those adaptation measures that would be justified under all plausible future scenarios, including the absence of manmade climate change (Eales et al., 2006), whereas a solution that would only make sense under very few climate scenario would be a high regret option. The EU defines those options as low-regret.

(conflicts between regulations or with other measures included in the plan, obstacles in current administrative arrangements).

Knowledge-based

- **Knowledge gaps**: assess whether the knowledge and data needed for the design, implementation and monitoring of the amendment options are already available as well as easy to access and to use, or whether the amendment contributes to improve their availability, accessibility, and usability.
- **Knowledge use:** assess whether the amendment contributes to bridge the gap between knowledge and action, i.e. whether it improves the communication flow between the knowledge sources (including both research and practice) and the decision-makers. Examples of it are creating platforms, tools, or events to communicate and translate the existing knowledge so that it can orient decision-makers to integrate adaptation concerns, e.g. identifying a suitable location for water supply infrastructure location.

Equity and legitimacy

• **Beneficiaries:** assess whether the costs and benefits associated with the amendment are equally shared by all the population groups

This process will lead to selecting one or more amendments to the measure that will improve its contribution to adaptation (and mitigation).

The table below provides a summary of the assessment results.

- Each amendment is assessed against each criterion according to the following rules:
- a three level scoring system is used to rate the amended measure for all the assessment criteria: high, medium, low
- the assessment concern the amended measure, not the amendment only
- a green cell signal that the ranking of the amended measure is higher than the original measure, while a red cell signals that the ranking of the amended measure is lower than the original measure.

	Criteria								Score		
	Effecti	veness		Effici	ency		Feasibility	Know bas	ledge- sed	Equity and legitimacy	
Amendment to the measure	Sustainability	Flexibility	Costs	Low regret (*)	No regret	Win-win		gaps gaps	Knowledge use		
No obongo	High Medium Low	High Medium Low	- High - Medium - Low	High Medium Low							
No change	1 2 3	1 2 3	- 1 - 2 - 3	1 2 3	SUM						
1	High Medium Low	High Medium Low	- High - Medium - Low	High Medium Low							
	1 2 3	1 2 3	- 1 - 2 - 3	1 2 3	SUM						
2	High Medium Low	High Medium Low	- High - Medium - Low	High Medium Low							
	1 2 3	1 2 3	- 1 - 2 - 3	1 2 3	SUM						

Table 4. (Table 2 of Phase 2) Assessment of the amendment options by measure

(*) Low regret criterion is assessed according to the ratio sustainability/costs: HIGH when the ratio > 1; MEDIUM when the ratio = 1; LOW when the ratio < 1

Example

	Criteria										
	Effective	eness		Effici	ency		Feasibility	Knowled	ge-based	Equity and legitimacy	Score
Amendment to the measure	Sustainability	Flexibility	Costs	Low regret (*)	No regret	Win-win- win		Knowledge gaps	Knowledge use		
No change	Medium (social impacts)	High	Medium	Medium	High	Medium (no social win)	Medium (social barrier)	Medium	Low	Medium	
	2	3	-2	2	3	2	2	2	1	2	17
1. Review the reserved area boundary in a way that will not undermine access to natural water	Medium (environm impacts)	High	Medium	Medium	High	Medium (no envir. win)	Medium (institutional barrier)	Medium	Low	High	
sources for residents	2	3	-2	2	3	2	2	2	1	3	18
 Provide a new infrastructure for pumping freshwater from within the reserved areas to a free water point outside the reserved areas 	Medium (environm impacts)	Low	High	Low	High	Medium (no envir. win)	Medium (technical barrier)	Medium	Low	High	
	2	1	-3	1	3	2	2	2	1	3	14
 Set up a monitoring system of water bodies to collect data needed for determining the quantity of water that residents can extract while respecting conservation goals (e.g. minimum 	High	High	High	Medium	High	High	Low (technical & Institutional barriers)	High	High	High	
water table level or minimum river now)	3	3	-3	2	3	3	1	3	3	3	21
 Set up a local water committee to guarantee equitable access to and distribution from natural water sources (including participatory monitoring of groundwater and surface water bodies) 	High	High	Medium	High	High	High	High	Medium	High	High	
	3	3	-2	3	3	3	3	2	3	3	24
5. Identify alternative free water sources outside the reserved areas	Medium (environm impacts)	High	Medium	High	High	Medium (no envir. win)	Medium (depending on context)	Medium	Low	High	
	2	3	-2	3	3	2	2	2	1	3	19
 Provide a certain amount of freshwater for free to poor households (change in water service tariff) 	High	High	High	Medium	High	High	Medium (institutional barrier)	Medium	Low	High	
	3	3	-3	2	3	3	2	2	1	3	19

Step 2.3 Formulate recommendations

In this step recommendations will be formulated on the following key aspects:

- 1. how to amend the selected measure, and
- 2. how to implement the amended measure.

2.3.1 How to amend the selected measure

As concerns the first aspect, a series of amendments will be proposed, based on the results of the assessment conducted in the step 2.2. An effort should be made to capitalize on possible synergies between two or more of the amendment options scrutinized in 2.2.

Example. When natural water sources within the reserved areas currently provide free water to residents, the measure could be amended by combining Option 7. "Identify alternative free water sources outside the reserved areas" and 5. "Set up a monitoring system of water bodies to collect data needed for determining the quantity of water that residents can extract while respecting conservation goals". The alternative free sources, if available, will substitute the water sources located in the reserved area as main source, while the water sources within the reserve area will be used to meet unexpected peaks in water demand under the condition of compatibility with conservation goals. In addition, the set-up of a local water committee (Option 6) is recommended to improve the performance of the amended measure under a number of criteria.

2.3.2 How to implement the selected measure

Recommendations related to the second aspect will focus on what are the requirements to ensure the effective implementation of the amended measure. Special attention will be paid to (a) who are the relevant actors and stakeholders involved in the implementation as well as what are (b) the opportunities/threats and (c) the cost implications to be considered for the implementation process. Example of relevant information related to those three dimensions are reported below. As regards (b) and (c) it will be helpful to use the information produced for the evaluation of the amendments (step 2.2).

a. Relevant actors and stakeholders

Recommendations should be complemented by an analysis of what action needs to be taken by whom in order to ensure its implementation.

This includes the identification of the main actors and stakeholders that need to be involved in order to effectively amend the measure and implement the proposed recommendation. For each of the key actors and stakeholders identified, the role to be played should also be indicated.

Example. Monitoring of water quantity and quality: Wami-Ruvu basin Authority is responsible for data collection within basin, pollution control and drafting of Water Utilization Plans, while Village Councils and Community Representative Boards are responsible for collecting data from the users. Besides them, a number of other institutional actors have background knowledge, competences and instruments for water monitoring (e.g. Drilling and Dam Construction Agency, DAWASA, Universities). An organizational framework could be defined to ensure the implementation of measure as amended in 2.3.1.

b. Opportunities and threats associated to recommendations

Based on the feasibility assessment undertaken in the step 2.2, external threats and opportunities associated to the implementation of the amended measure will be identified. Threats as well as opportunities are technical; social, institutional, etc.

Example. The measure as amended in 2.3.1 includes monitoring of water quality and quantity as well as accessibility by residents. Technical obstacles, such as the characteristics of boreholes to be monitored, have to be considered in the design of the monitoring network. Social obstacles, such as interests of private water providers and water street vendors, may conflict with water monitoring activities (particularly with the dissemination of water quality data); thus an effective way to manage sensitive data shall be identified. The existence of previous data collection initiatives or observation wells already onsite shall be indicated as an opportunity.

c. Cost implications of the recommendations

Finally, recommendations should include an estimation of the costs associated to the implementation of the amended measure, to highlight whether extra financial resources are needed or planned budget allocation should be modified.

Example

The measure as amended in 2.3.1 entails extra financial resources. A recommendation could be made that it shall not generate additional costs for Temeke Municipality or what of the already budgeted resources could be re-allocated on the new activities.

	Proposed Amendments	Recommendations for the implementation					
		Actors and stakeholders	Threats & Opportunities	Cost implications			
Measure	From 2.3.1	From 2.3.2 (a)	From 2.3.2 (b)	From 2.3.2 (c)			

Table 5. (Table 3 of Phase 2) Recommendations



Project title: Adapting to Climate Change in Coastal Dar es Salaam

Project acronym: Contract number: Project duration: Contact Person: Partner in the Action: Associate in the Action:

ACC Dar 2010/254-773 01/02/2011 - 31/01/2014 Grant Contract Beneficiary: **DICEA Sapienza University of Rome** Silvia Macchi Ardhi University Dar es Salaam Dar es Salaam City Council