



Climate Change Adaptation in Urban Planning in African Cities

The CLUVA Project

Jørgensen, Gertrud; Herslund, Lise Byskov; Lund, Dorthe Hedensted; Workneh, Abraham ; Kombe, Wilbard; Gueye, Souleymane

Published in:
Resilience and Sustainability in Relation to Natural Disasters:

DOI:
[10.1007/978-3-319-04316-6_3](https://doi.org/10.1007/978-3-319-04316-6_3)

Publication date:
2014

Document version
Early version, also known as pre-print

Citation for published version (APA):
Jørgensen, G., Herslund, L. B., Lund, D. H., Workneh, A., Kombe, W., & Gueye, S. (2014). Climate Change Adaptation in Urban Planning in African Cities: The CLUVA Project. In P. Gasparini, G. Manfredi, & D. Asprone (Eds.), *Resilience and Sustainability in Relation to Natural Disasters: A Challenge for Future Cities* (pp. 25-37). Heidelberg: Springer. SpringerBriefs in Earth Sciences https://doi.org/10.1007/978-3-319-04316-6_3

SPRINGER BRIEFS IN EARTH SCIENCES

Paolo Gasparini
Gaetano Manfredi
Domenico Asprone *Editors*

Resilience and Sustainability in Relation to Natural Disasters: A Challenge for Future Cities



Springer

SpringerBriefs in Earth Sciences

For further volumes:
<http://www.springer.com/series/8897>

Paolo Gasparini · Gaetano Manfredi
Domenico Asprone
Editors

Resilience and Sustainability in Relation to Natural Disasters: A Challenge for Future Cities

 Springer

Editors

Paolo Gasparini
Gaetano Manfredi
AMRA Scarl
Naples
Italy

Domenico Asprone
Department of Structures for Engineering
and Architecture
University of Napoli “Federico II”
Naples
Italy

and

Department of Structures for Engineering
and Architecture
University of Napoli “Federico II”
Naples
Italy

ISSN 2191-5369

ISSN 2191-5377 (electronic)

ISBN 978-3-319-04315-9

ISBN 978-3-319-04316-6 (eBook)

DOI 10.1007/978-3-319-04316-6

Springer Cham Heidelberg New York Dordrecht London

Library of Congress Control Number: 2014930345

© The Author(s) 2014

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law. The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

The development of contemporary society is strongly dependent on its sustainability. The global sustainability is strongly dependent on the sustainability of the urban environment. Cities are quickly growing, and mankind is rapidly concentrating in urban areas. Since 2007, the world urban population had exceeded the rural population and the number of megacities is rapidly increasing. Cities are connected by a dense and complex web of relationships and represent the heart and the engine of the global development of contemporary society.

However, cities are also increasingly vulnerable and any adverse event can rapidly evolve into a catastrophe. Contemporary cities are becoming risk attractors because of the increasing technological complexity of urban systems, along with the increasing population density. A natural event of medium intensity occurring in any given area will threaten more human lives and produce much greater economic loss than a century ago, if proper mitigation actions have not been implemented. Some climate change-related natural hazards (floods, hurricanes, windstorms) are expected to increase with time almost everywhere. A city growing without an urban planning carefully considering such events will enhance its effects and will become a risk trap. In order to increase the resilience of cities against catastrophes the urban transformation processes must be also aware of the importance of extreme events and must be addressed to mitigate their effects on the vital functions of cities and communities. Redundancy and robustness of the components of the urban fabric are essential to restore the full efficiency of the city's vital functions after an extreme event has taken place. Hence, sustainability and resilience are the main keywords for future cities.

The present publication is the result of a Networking Event, held during the 6th UN-World Urban Forum, in September 2012, in Naples, Italy, and entitled "Resilience and Sustainability in Relation to Disasters: A Challenge for Future Cities." The Networking Event was arranged by the research center Analysis and Monitoring of the Environmental Risk (AMRA) and the Department of Structures for Engineering and Architecture of the University of Naples "Federico II." The Networking Event was aimed at presenting different approaches to the issues of resilience and sustainability of future cities. Scholars from different disciplines, including sociologists, economists, scientists involved on natural risks and physical vulnerability, and provided their own perspectives. This publication represents the final product of that event. Its objective is to share knowledge and experience

with the hope to offer a thoughtful interdisciplinary view to sustainable development of future safe cities.

Adam Rose, economist, professor at the University of South California and Coordinator for Economics of the Center for Risk and Economic Analysis of Terrorism Events, illustrates the role of economic resilience in the survival of cities. He highlighted how experience with disasters can be transformed into actions that promote sustainability.

Graham Tobin, professor of Geography, Environment and Planning at the University of South Florida, showed how social networks are related to vulnerability and sustainability, affecting community resilience in all the phases of a disaster, from the exposure to an incoming event, to evacuation, to resettlement.

Gertrud Jorgensen, professor of Architecture at the University of Copenhagen, presents the results of the FP7 CLUVA project (CLimate change and Urban Vulnerability in Africa), focusing on climate change adaptation in African urban areas.

Kalliopi Sapountzaki, professor of applied geography at the University of Athens, highlights the need for both “collective resilience” and “individual resilience for all the citizens.”

Edith Callaghan, professor at the School of Business at the Acadia University, contributes to the final chapter of this publication with his experience on how community engagement into decision-making processes can improve resilience and risk management of urban areas.

Gaetano Manfredi and Domenico Asprone, respectively, professor and assistant professor of Structural Engineering at the University of Naples “Federico II” link the concepts of urban resilience and sustainability and explain how urban resilience can be introduced as a fundamental aspect of social sustainability in future cities.

Paolo Gasparini, professor emeritus of geophysics at the University of Naples “Federico II,” and CEO of AMRA, together with Angela Di Ruocco and Raffaella Russo, respectively, Senior Researcher and Junior Researcher at AMRA, analyze natural hazards impacting on future cities. He indicated that the participation of citizens, along with advanced technologies, can play a fundamental role for effective real-time risk mitigation.

This publication collects all these contributions addressing different issues and scientific points of view to urban resilience in relation to natural disasters. The final chapter provides an integrated perspective to this issue along with a list of

recommendations for decision makers to promote and enhance urban resilience, emphasizing that resilience in the short term is necessary to ensure sustainability in the long term.

Naples, Italy, October 2013



Paolo Gasparini
Professor Emeritus University of Naples “Federico II”
Napoli, Italy - AMRA Scarl – Analysis
and Monitoring of Environmental Risk
Naples, Italy



Gaetano Manfredi
Full Professor, Department of Structures for Engineering
and Architecture
University of Naples “Federico II”
Naples, Italy



Domenico Asprone
Assistant Professor, Department of Structures
for Engineering and Architecture
University of Naples “Federico II”
Naples, Italy

Contents

1 Economic Resilience and Its Contribution to the Sustainability of Cities	1
Adam Rose	
2 Modeling Social Networks and Community Resilience in Chronic Disasters: Case Studies from Volcanic Areas in Ecuador and Mexico	13
Graham A. Tobin, Linda M. Whiteford, Arthur D. Murphy, Eric C. Jones and Christopher McCarty	
3 Climate Change Adaptation in Urban Planning in African Cities: The CLUVA Project	25
Gertrud Jørgensen, Lise Byskov Herslund, Dorthe Hedensted Lund, Abraham Workneh, Wilbard Kombe and Souleymane Gueye	
4 “Resilience for All” and “Collective Resilience”: Are These Planning Objectives Consistent with One Another?	39
Kalliopi Sapountzaki	
5 Linking Sustainability and Resilience of Future Cities	55
D. Asprone, A. Prota and G. Manfredi	
6 Natural Hazards Impacting on Future Cities	67
Paolo Gasparini, Angela Di Ruocco and Raffaella Russo	
7 Resilience and Sustainability in Relation to Disasters: A Challenge for Future Cities: Common Vision and Recommendations	77
Gaetano Manfredi, Adam Rose, Kalliopi Sapountzaki, Gertrud Jørgensen, Edith Callaghan, Graham Tobin, Paolo Gasparini and Domenico Asprone	

Chapter 3

Climate Change Adaptation in Urban Planning in African Cities: The CLUVA Project

Gertrud Jørgensen, Lise Byskov Herslund, Dorthe Hedensted Lund, Abraham Workneh, Wilbard Kombe and Souleymane Gueye

Abstract Resilience of urban structures towards impacts of a changing climate is one of the emerging tasks that cities all over the world are facing at present. Effects of climate change take many forms, depending on local climate, spatial patterns, and socioeconomic structures. Cities are only just beginning to be aware of the task, and some time will pass before it is integrated into mainstream urban governance. This chapter is based on work in progress. It covers urban governance and planning aspects of climate change adaptation as studied in the CLUVA project (CLimate change and Urban Vulnerability in Africa), as well as some experiences from Denmark. Focus is on the responses and capacities of urban authorities, strengths and weaknesses of the efforts, data needs and possible ways forward. The chapter concludes that many adaptation activities are taking place in the CLUVA case cities, but that they need integration at city level to form strategic adaptation plans. A combined rational and pragmatic approach is advisable as is involvement of stakeholders in the production of relevant knowledge.

Keywords Climate change adaptation · Urban planning · Urban governance · African cities

G. Jørgensen (✉) · L. B. Herslund · D. H. Lund
Department of Geosciences and Natural Resource Management, University of Copenhagen,
Rolighedsvej 23, 1958 Frederiksberg C, Denmark
e-mail: gej@ign.ku.dk
URL: <http://www.ign.ku.dk>

A. Workneh
Ardhi University, Dar es Salaam, Tanzania

W. Kombe
Ethiopian Institute of Architecture, Building and City Planning (EiABC), Addis Ababa,
Ethiopia

S. Gueye
Université Gaston Berger, St. Louis du Senegal, Senegal

3.1 Introduction

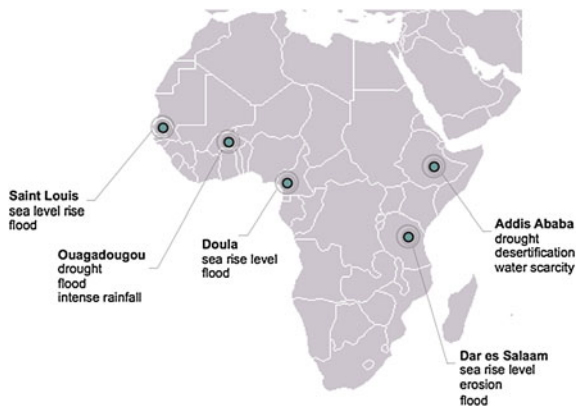
During the last 10–15 years, cities worldwide have been confronted with the problem of adapting to local impacts of climate change. A general list of effects include rising sea levels, rising temperatures, and an intensification of the hydrological cycle, entailing hazards such as more frequent and intense rainfall as well as longer drier periods causing droughts (Loftus et al. 2011). The specific hazards and impacts differ widely between cities due to local topography, spatial development pattern, and socio-economic characteristics (Davoudi and Crawford 2009; OECD 2010), but in the case cities of this chapter, flooding is widely recognized as a hazard connected to climate change and already effective. Therefore this specific hazard is in focus in the work presented here.

Cities have been highlighted as being more vulnerable to the impacts of climate change than rural areas due to their dependence on complicated and extensive infrastructure, the high density of buildings, and the concentration of population (OECD 2010). Most of the cities facing the highest risks from climate change are found in low-income countries, among them many cities in Sub-Saharan Africa, and most of them have serious constraints on their capacity to adapt to these effects (Bicknell et al. 2009). In this chapter the CLUVA case cities form the background cases (St. Louis, Ougadougou, Addis Ababa, Douala and Dar es Salaam, see Fig. 3.1).

African cities clearly need to become more resilient towards climate change. But even in developed countries, adaptation to climate change is a new task for the cities, and although both administration and the political level is increasingly aware of the need, no routine or commonly agreed practises have been developed yet. Two studies of practise in Danish municipalities (Helleesen et al. 2011; Lund et al. 2012) supplement the African cases seen from a developed-world perspective.

Climate change adaptation, including disaster risk management, covers a variety of different sub-tasks: e.g. plans for relief in crisis situations, establishment

Fig. 3.1 Case cities of the CLUVA project



of warning systems, and preventive measures connected to well-functioning infrastructures, social networks, and integration of adaptation measures into land use planning (UNISdR 2005). Adaptation needs policies which are both integrated into existing policy fields and across sectors, levels, and administrative functions, and which include civil society. When we add that knowledge and methods are still sought for, this makes climate change adaptation a difficult challenge for cities, not least in Sub-Saharan Africa.

3.2 The African Urban Context and the Cluva Project

Developing countries, especially those in Sub-Saharan Africa, are highly vulnerable to impacts of climate change, both because of their reliance on climate-sensitive sectors for development such as agriculture and because they lack adequate economic and institutional capacities to adapt to the impacts of climate change (Boko 2007).

The CLUVA project¹ investigates local impacts of climate change in five African case cities as well as the possibilities to increase resilience (see Fig. 3.1). Six African and six European universities and research institutes participate in the project, which includes downscaling of IPCC scenarios, studying vulnerability, and investigating land use based urban strategies as an element of creating resilience, which is the basis for this chapter. The work is now halfway, and includes baseline reports for two selected cities (Jørgensen et al. 2012) an analysis of the governance structure in two selected cities (Vedeld and Kombe 2012) an exemplary of adaptation measures at city level based on four cities (Herslund et al. 2012), and a system of geographical indicators of vulnerability to climate change (Nyed and Herslund 2012). The empirical basis for these products includes study visits, interviews, document studies, expert evaluations and meetings with key stakeholders.

The urban context as found in Sub-Saharan Africa is decisive for the options of adaptation to climate change: Rapid urbanisation coupled with economic stagnation leads to poverty, informality and spatial fragmentation (Roy 2005; Watson 2009; Cheru 2005; Kyessi 2005), making the task of providing infrastructure, service, planning and management to the marginalised majority of the urban population very difficult (Watson 2009). Climate change related hazards pose a further complicating factor. They threaten economic development; increase the stress and vulnerability of already impoverished the households, and probably will place even more pressure on an already compromised infrastructure. However, the same urban characteristics may provide an opportunity to adopt adaptation measures, which are uniquely innovative, such as community-level coping strategies and the use of low-technology infrastructure, and thus developing African cities in a more context-appropriate, innovative and possibly more democratic way as more

¹ SEVENTH FRAMEWORK PROGRAMME, Grant agreement no. 265137: “CLimate change and Urban Vulnerability in Africa”, 2010–2013, www.cluva.eu.

stakeholders at various levels and within different sectors as well as inhabitants in vulnerable areas will need to participate (Bicknell et al. 2009).

3.3 Climate Change Adaptation and Urban Planning

Adaptation to climate change may appear to be an overwhelming task to city managers who already struggle to address other urban challenges. However, instead of seeing adaptation to climate change as a “stand alone” task, integration into existing urban policies seems to be a more feasible way. Urban planning and management is a key policy area, and adaptation based on urban planning has the potential to adapt (over time) the building stock, the infrastructure, the industrial and economic base, and the spatial patterns of urban development to the risks that may be brought on by climate change (Bicknell et al. 2009).

Satterthwaite et al. (2009) highlight four important measures to be taken in planning for urban adaptation to climate change; (1) channel new growth away from high risk areas, (2) implement land use restrictions in high risk areas, (3) improve drainage, and (4) introduce higher building and infrastructure standards. Such measures may sound simple, but they require knowledge, adequate planning and implementation instruments, and economic power. The highly informal urban development in African cities clearly raises challenges in relation to such measures.

Incorporation of climate change adaptation into policy-making across governance levels poses another challenge (Bicknell et al. 2009). Many African countries have been engaged in making National Adaptation Programmes of Action (NAPA's) as recommended by the UNFCCC. Such programmes are largely concerned with climate change impacts on agriculture, forestry and water management. Few governments have managed to downscale the national programmes to the city level despite the fact that there is an urgent need to develop city-level adaptation frameworks (Bicknell et al. 2009). City governments should form a nexus, linking community-based adaptation to the funds and skill of the national level, with strategic adaptation plans at city level in a key role, linking also climate change adaptation to the general economic and urban development agendas of cities (see Fig. 3.3) (UN-Habitat 2011).

3.4 Planning Approaches to Climate Change Adaptation

As planning for climate change adaptation at city level is a new field cf. e.g. (Katich 2009), there is no generally accepted tool-kit for how to develop a climate change adaptation plan or incorporate adaptation into relevant sector planning. But experiences do exist from the cities which have made adaptation strategies and plans, and planning theory offers different approaches to city-level adaptation.

Urban planning throughout the last century was generally dominated by *the rational planning approach*, characterized—in its pure form—by logic and progressive stages, clear goals and comprehensive assessments giving exact and reliable knowledge of present conditions and projections of the future, followed by plans and implementation carried out by professionals. Scientific and expert knowledge is seen as the most reliable and legitimate type of knowledge (Allmendinger 2009). While this approach has obvious strengths in relation to climate change adaptation (not least in the focus on a reliable knowledge base for action), the model is also problematic as a sole approach, because (1) it is difficult to predict the exact consequences of climate change and adaptation measures, (2) immediate action is needed, and (3) the issue involves several sectors and many different stakeholders.

Elements of the rational approach relevant to climate change adaptation planning are (1) Becoming aware of problems, (2) Intention and commitment to act, (3) Conducting local climate change and impact assessments, (4) Listing impacts and options, (5) Prioritizing adaptation actions, (6) Incorporation of adaptation into other relevant plans, (7) Implementation and (8) Evaluation (derived from UN-Habitat (2011) and Bicknell et al. (2009)). From a strictly rational perspective the elements should progress from (1) to (8), so that actions are based on knowledge and overall prioritisation. From this perspective, as stated by Danish municipal planners in a recent study, uncertain knowledge of local effects of climate change impacts is a major barrier to the development of adaptation strategies, because it blocks the progressive stages and lessens the legitimacy of policies (Helleesen et al. 2011; Lund et al. 2012).

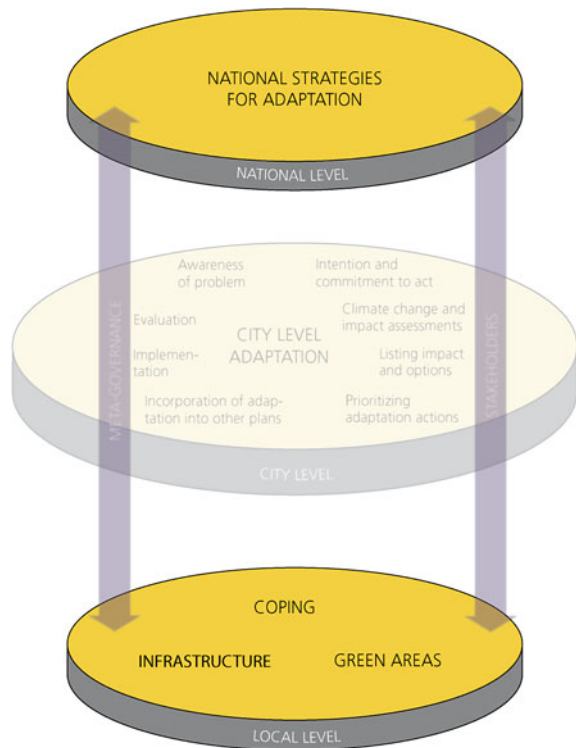
So, while the rational approach has strengths, it also has limitations as an approach to cope with a complex task, with many actors involved, and where immediate action is needed. In the Danish study, planners accepted the uncertainty related to climate change impacts, and simply went ahead with the creation of action plans using whatever knowledge available in an incremental manner working towards an overall strategy (Helleesen et al. 2011). This is an example of *the pragmatic approach* to planning, which stresses planning as an incremental process, based on collaboration and multiple knowledge perspectives (Allmendinger 2009). The Fig. 3.2 sums up the characteristics of respectively the rational and pragmatic approach according to the planning process, types of knowledge used, goals, and the kinds of participants taking part.

Adaptation in African cities is a very complex task where a pragmatic approach is necessary. Involving a wider set of participants, such as people living in the extensive informal settlements, and including their knowledge is crucial both for the process and the results. Adaptation in Africa must acknowledge informal settlements' right to planning and influence (Myers 2011) in order to facilitate communication and involve local knowledge and private resources in solutions, thus increasing the efficiency and quality of decisions. But this also poses challenges of how to integrate actions in a strategic planning at city level, in order to co-ordinate local initiatives and national policies (and funding) and to integrate crucial sectors (infrastructure, green areas, health, waste management, water supply etc.).

	Rational approach	Pragmatic (collaborative) approach
Planning process	Defined progressive stages	Incremental
Type of knowledge	Expert knowledge	Expert and local, experiential knowledge
Goals	Clear and pre-defined	May change as new knowledge is gained
Participants	Politicians and professional planners	Multiple stakeholders

Fig. 3.2 Ideal typologies of rational and pragmatic approach to planning based on Lund et al. (2012), Allmendinger (2009), Healey (2007), Myers (2011)

Fig. 3.3 The city level is relatively weak in climate change adaptation in the CLUVA cities as illustrated by Herslund et al. (2012)



3.5 Adaptation Measures: Findings from Cluva Cities

In the case cities, climate change adaptation is not yet specifically addressed at city level in coherent adaptation strategies, but a wide range of adaptation activities are nevertheless taking place. Here we only give an overview, for more detail see Jørgensen et al. (2012) and Herslund et al. (2012).

3.5.1 Rising Awareness and National Framework

The national level contributes to raising awareness leading to an emerging framework for local and city level action. In Tanzania and Ethiopia national policies have been launched which require local authorities to work on climate change adaptation. Both have involved stakeholders from various sectors in the preparations. This gives the local authorities a framework for action and gives climate change adaptation an ‘owner’, at least at national level (Jørgensen et al. 2012).

The city of St. Louis started a process of its own in 2010, utilising networks with a partner city, UNESCO (St. Louis is classified as world heritage), and UN Habitat to identify and develop projects in collaboration between French and Senegalese planners, resource persons and local actors. The projects both contained ideas for the overall development and functionality of the city and specific ideas for how to build and plan local areas in a more climate proof and sustainable manner.

3.5.2 City Level Plans

In the CLUVA cities, climate change adaptation has not yet been specifically addressed at city level in an adopted climate change adaptation strategy. Neither is climate change adaptation mentioned explicitly in master—or structural plans for the cities (Jørgensen et al. 2012; Kombe and Kweka 2012; Institutional Assessment of CLUVA cities 2012). However, some climate change elements are addressed, such as localisation of new city areas (St. Louis) and expansion of green structures in Addis Ababa (Institutional Assessment of CLUVA cities 2012) and Ouagadougou (Ouedraogo and Jean-Baptiste 2012).

But the cities also face challenges in order to include adaptation in their plans. As acknowledged by experts working in the Addis Ababa Environment Protection Authority; except data coming out of the national meteorological service agency, no detailed research has so far been undertaken on the city or any other city in Ethiopia for that matter showing the impact of climate change (Jørgensen et al. 2012). Also in Ouagadougou, the impacts and vulnerability risks caused by climate change have not yet been sufficiently evaluated yet, but national and international co-operation between practice and research is to remedy this and strengthen expertise through training (Ouedraogo and Jean-Baptiste 2012). This illustrates the problems of basing adaptation on a strictly ‘rational approach’ to planning as expressed also in the frustrations of Danish planners mentioned above.

In the CLUVA institutional assessment report (Institutional Assessment of CLUVA cities 2012), a common conclusion among the five cities identifies lack of coordination as a serious problem. Especially in the field of environment, coordination between actors and between the different levels of government, city, municipalities and local councils is totally lacking. Lack of awareness, expertise,

institutional responsibility and capacity also raised as problems in Tanzania (Kombe and Kweka 2012) as well as in St. Louis and Addis Ababa (Jørgensen et al. 2012), hindering a more coherent response. In St. Louis, however, setting up district councils has proven to be very important in the adaptation to climate change, especially in relation to flooding (Herslund et al. 2012). The lack of a broader framework means that the direction and coordination of the activities going on in all the cities become fragmented. The CLUVA ‘institutional assessment’ proposes a solution to the lack of coordination in the form of ‘steering committees, climate change forums, or working groups’ that can coordinate and also ensure multi-sectorial and multi-level involvement, thus advising a ‘pragmatic approach’ (Institutional Assessment of CLUVA cities 2012).

3.5.3 Adaptation by Individual Projects and Sectors

While coordinated city-level efforts are sparse, quite a lot of activity is taking place locally and in specific sectors. Addressing the challenges of climate change adaptation may not be the explicit or main purpose of these activities, but in practice they can assist in the process of adaptation. Furthermore, many communities and individual urban households are already involved in activities that will enhance the resilience of households and communities. Such coping strategies or autonomous adaptation activities—which local communities pursue without any sponsor or authority involved—also form an important part of adaptation to climate change.

These efforts include projects related to urban infrastructure, green area development, upgrading informal areas, resettlement of affected people, and enhancing local coping capacities. Two examples are given below.

Green area development may be used as an example of such activities. Urban green spaces have become recognised as important contributors to the quality of urban life and urban environments as they provide a number of essential ecosystem services such as biodiversity, recreational activities, reducing air pollution and heat islands, and preventing urban flooding through water infiltration, storage and evaporation within the local catchment areas (Andrade and Vieira 2007; Godefroid and Koedam 2003; Fryd et al. 2010). Urban green spaces in developing countries, however, are often under threat. Example in the CLUVA case cities of Dar es Salaam (Mng’ong’o 2005) and Addis Ababa (Belete 2011) green spaces are jeopardized by overuse, waste dumping, and urban construction. However, greening projects are also under way. In Addis Ababa, more than 40 % of the city area has been allocated for green development, including extending the number of public parks and urban forests, improving conditions for urban agriculture, public tree plantings and buffer zones along the 75 rivers in the city. It has been important to combine the protection of green areas with projects also aiming at improving the livelihoods of urban inhabitants, especially through urban agriculture (Herslund et al. 2012). In Ouagadougou, a project to improve the infrastructure of the urban

forest and national park “Bangr-weogo” put focus on the importance of green areas. This urban forest form, together with the green belt around the urban area of Ouagadougou and some sacred woods and green spaces, a green structure in Ouagadougou which helps adaptation to increasing risks of drought, desertification and flooding (Herslund et al. 2012).

Informal area rehabilitation is likewise a very important jigsaw piece in climate change adaptation. In Addis Ababa the only strong intervention related to climate change adaptation undertaken by the city government is the legalization of informal settlements built before 1996. Estimates by planners working in the city government put the current share of informal housing in Addis between 80,000 and 100,000 units. A considerable proportion of this amount is in the process of legalization. Due to this process, inhabitants in the informal sector have been able to improve their housing situation to withstand the direct impacts of climate change (intensive rainfall and flooding) (Jørgensen et al. 2012). In St. Louis, large areas suffer from lack of sanitation and drainage. Some of these areas are being upgraded with drainage and raised roads based on sponsoring from the EU or other development agencies (Information from study visit St. Louis April 2011). In Dar es Salaam, upgrading programs has been ongoing for the last decades. NGOs have been important in this work and now a ‘Citywide Strategy for Upgrading Unplanned and Unserviced Settlements in Dar es Salaam’ is in the process of being developed, including provision of new building plots, increased density, access to safe drinking water; access to adequate sanitation; roads, drainage, and solid waste collection (Dodman et al. 2011). In Ouagadougou, more than 60 % of the population live on undeveloped land. The City Council did not have means and methods to control the situation, but a way to legalise the informal areas has been to start to build houses. The completion by the state of a moderately priced housing area for the middle social strata has taken place outside the city (Ouedraogo and Jean-Baptiste 2012).

Sector—and local projects are very important in adaptation to climate change impacts, but they also have limitations if not integrated in a city-wide strategy. Example green area development has several benefits and is a low-cost solution. However, green areas are being encroached, so green efforts must be coordinated with overall spatial and social strategies.

3.6 Perspectives and Conclusions: Adaptation at City Level

No doubt, African cities—as exemplified in the CLUVA case cities—face a very difficult task in rising awareness, initiating, integrating, funding and implementing climate change adaptation plans. Even in developed countries, the task is new and overwhelming. Knowledge, methods and data are lacking, and the task comes on top of other important tasks for city politicians and planners (Helleesen et al. 2011).

3.6.1 Governance Deficiencies

A study within the CLUVA project on the governance framework for climate change adaptation lists a number of challenges based on Dar es Salaam: An unclear organisation at national level with overlapping authorities and lack of ownership to the task; lack of mechanisms to support vertical and horizontal coordination; lack of operational capacity; lack of knowledge among urban planners; and lack of public participation (Vedeld and Kombe 2012). Such deficiencies can probably not be remedied in the short term, but they can be seen as “systemic weaknesses” which must be taken into consideration in designing climate change adaptation at city level.

3.6.2 Much Activity: Weak City Level

When looking into specific initiatives which can be defined as relevant for climate change adaption (Jørgensen et al. 2012; Herslund et al. 2012) also positive aspects come to light. Many initiatives are taking place within various sectors, and although they lack coordination at city level, experiences are gathered. However, vertical coordination between state, city and local levels is missing, as well as horizontal coordination and integration of sector and local initiatives into a city-wide integrated and coordinated strategy. The city level seems to be weak; instead valuable, but uncoordinated, efforts take place at the local level. Herslund et al. (Herslund et al. 2012) illustrated this in Fig. 3.3.

Although this finding is specific for the CLUVA project, similar types of conclusions can also be drawn in developed countries. The Danish studies found that incorporation of climate change adaptation in the urban/municipal planning system is an obvious advantage, but that no best practice has been developed yet; municipal co-ordination (between sectors) is crucial, but difficult (Helleesen et al. 2011). Local politicians feel that adaptation is challenged first and foremost by lack of economic means because adaptation measures (which are expensive responses to uncertain long term impacts) will ‘loose’ to more immediate needs such as social services and schools. Also the lack of an adequate legal framework is a problem. Good contact between politicians and administration as well as public participation will help both awareness and implementation (Lund et al. 2012).

Despite the challenges, it could be safely said that in the Danish context the city level—or the municipalities—are the most important and strongest level both for initiating activities and for coordination cross sector as well as vertically. Mguni et al. compares responses to urban flooding in Copenhagen and Dar es Salaam. Copenhagen follows a top down approach, developing an overall strategy, making assessments, specifying action, and implementing the most urgent tasks first. Opposite in Dar es Salaam, there is no overall strategy or systematized assessment, but adaptation is going on in local, often informal settlements, e.g. where local

communities take measures to combat flooding. Such efforts form important elements to be included in a possible adaptation plan (Mguni and Herslund 2012). To make a difference, adaptation needs participation of the inhabitants in vulnerable areas.

In the context of African cities, it will probably be important to strengthen the city level in climate change adaptation, in order to coordinate, finance and prioritize efforts.

3.6.3 Combined Approaches

Although at stronger city level is needed, it might be a dangerous path to put all the marbles on a city level based rational planning approach. A pragmatic approach would rather take a starting point in existing activities. The planning elements of rational planning should be a part of adaptation planning, but they need not necessarily all be present and finished before any planning can occur. The listing of elements (in Fig. 3.2) can be used as a checklist to get an overview of activities that could form elements in a more comprehensive and coordinated strategy and plan for adaptation

In other words: to be effective, city-level adaptation plans need not to be all-encompassing holistic plans. They can also be put together by *coordinating* a variety of local community plans, projects and activities as well as sector plans and strategies using a pragmatic approach. While such a plan may not capture all conceivable contingencies which may result from climate variability in the long term, it is more likely to foster action faster than a rational planning approach. This in turn will generate experiences and learning that can be applied in other similar areas or sectors.

3.6.4 Need for Relevant Knowledge

Both in Africa and in Denmark, planners find that lack of knowledge is an important issue. Specific data and knowledge about future local impacts (downscaling) is severely needed both in order to raise awareness and put adaptation on the agenda, but also in order to launch effective policies and measures. An important question is how to use expert knowledge together with local knowledge in the processes and how to ensure that expert knowledge produced is relevant for the local stakeholders. The CLUVA project produces much data and knowledge to be used by the case cities. As part of the process of making data useful, an indicator system is prepared and discussed with stakeholders in the cities. Indicators encompass physical, institutional, and attitudinal indicators as well as indicators covering local assets, and have been developed in a qualitative (Jean-Baptiste et al. 2011) as well as a quantitative (GIS-based) (Nyed and Herslund 2012) set up. Such efforts may form an important link between research and practise.

References

- Allmendinger P (2009) *Planning Theory*. Palgrave Macmillan/Houndsmills, Basingstoke
- Andrade H, Vieira R (2007) A climatic study of an urban green space: the Gulbenkian park in Lisbon (Portugal). *Finisterra* 42(84):27–46
- Belete D (2011) Road and urban storm water drainage network integration in Addis Ababa: Addis Ketema Sub-city. *J Eng Technol Res* 3(7):217–225
- Bicknell J, Dodman D, Satterthwaite D (eds) (2009) *Adapting Cities to Climate Change: Understanding and Addressing the Development Challenges*. Earthscan, London
- Boko MI, Niang A, Nyong C, Vogel A, Githeko M, Medany B, Osman-Elasha R, Tabo and P, Yanda (2007) Africa. Climate change 2007: impacts, adaptation and vulnerability. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE (eds) *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge UK, pp 433–467
- Cheru F (2005) Globalization and uneven urbanization in Africa: the limits to effective Urban governance in the provision of basic services <http://printfu.org/read/globalization-and-uneven-urbanization-in-africa-the-limits-to-3ba9.html?f=IqeYpurpn6Wih-SUPOGunKunh7Pb5cfV1M7q093X49SVztPQj->
- Davoudi S, Crawford J, Mehmood A (eds) (2009) *Planning for climate change: strategies for mitigation and adaptation for spatial planners*. Earthscan, London
- Dodman D, Kibona E, Kiluma L (2011) *Tomorrow is too late: Responding to Social and Climate Vulnerability in Dar es Salaam*. Tanzania, Case study prepared for the Global Report on Human Settlements 2011
- Fryd O, Jensen MB, Ingvertsen ST, Jeppesen J, Magid J (2010) Doing the first loop of planning for sustainable urban drainage system retrofits: a case study from Odense, Denmark
- Godefroid S, Koedam N (2003) How important are large versus small forest remnants for the conservation of the woodland flora in an urban context? *Glob Ecol Biogeogr* 12:287–298
- Healey P (2007) *Urban Complexities and Spatial Strategies: Towards a Relational Planning for Our Times*. Routledge, London
- Hellesen T, Lund DH, Nellemann V, Sehested K (2011) *Klimatilpasning i de danske kommuner—et overblik*. Frederiksberg, Skov & Landskab, Københavns Universitet, Arbejdsrapport, p 121
- Herslund L, Mguni P, Lund DH (2012) Exemplary of policies, strategies and measures related to climate change adaptation. CLUVA deliverable 3.6 http://www.cluva.eu/index.php?option=com_content&view=section&layout=blog&id=9&Itemid=100
- Information from study visit St. Louis, April 2011
- Institutional Assessment of CLUVA cities (2012) The common report. CLUVA deliverable 5:3
- Jean-Baptiste N, Kuhlicke, Kunath A, Kabisch S (2011) Review and evaluation of existing vulnerability indicators in order to obtain an appropriate set of indicators for assessing climate related vulnerability. CLUVA deliverable 2.11. http://www.cluva.eu/deliverables/CLUVA_D2.11.pdf
- Jørgensen G, Herslund L, Workneh A, Workkalemahu L, Bekele E (2012) Baseline scenario for Addis Ababa, CLUVA deliverable 3.5. http://www.cluva.eu/index.php?option=com_content&view=section&layout=blog&id=9&Itemid=100
- Katich K (2009) *Urban Climate Resilience: A Global Assessment of City Adaptation Plans*. Master thesis in city planning, Massachusetts Institute of technology
- Kombe W, Kweka C (2012) Institutional analysis for climate change in Dar es Salaam city. Draft CLUVA deliverable 5:3
- Kyessi G (2005) Community-based urban water management in fringe neighbourhoods: the case of Dar es Salaam, Tanzania. *Habitat International* 29 (2005):1–25 http://vT2d7K3pLe4NbH49bfzePf1OKIzt6SqtTmz9jOn4zj3sqU1M7d293hlNrkjZOan-Zig56KXqpTd4pah6KeWnamYz-nb2d3iub7Z0tqPoN-pp5-Wzoer5aOjppqCX1dng37-CUo9_c56DS3OjL59vG4NjI09XUk-XV1c-iy9nilNnU2s7V18vZ3s7ho5usm9XQ1Zig8Q

- Loftus A-C, Howe C, Anton B, Philip R, Morchain D (2011) Adapting Urban water systems to climate change: a handbook for decision makers at the local level. ICLEI European secretariat
- Lund, Dorthe Hedensted & Nellemann, Vibeke Wainø (2012) Klimatilpasning i de danske kommuner—det siger politikerne./ Skov & Landskab. 49 s
- Mguni P, Herslund L, Jensen MJ (2012) Soft infrastructures for flood risk management in Dar es Salaam and Copenhagen. Conference paper for IWA World Water Congress and Exhibition, Busan, South Korea, 16–21 Sept 2012
- Mng'ong'o O (2005) A Browning process: the case of Dar es Salaam city. PhD thesis. KTH, Skolan för arkitektur och samhällsbyggnad. ISBN:91-7323-086-3
- Myers G (2011) African cities: Alternative visions of urban theory and practice. Zed Books Ltd, London and New York
- Nyed P.K, Herslund L. (2012): System of land use indicators for vulnerability to climate change. CLUVA deliverable 3.3 http://www.cluva.eu/index.php?option=com_content&view=section&layout=blog&id=9&Itemid=100
- OECD (2010) Cities and climate change. OECD Publishing <http://dx.doi.org/10.1787/9789264091375-en>
- Ouedraogo, Jean-Baptiste, 2012. Brief on The Urban development Plan in Burkina Faso. Unpublished
- Roy A (2005) Urban informality: toward an epistemology of planning. J Am Plann Assoc Spring 71(2):147
- Satterthwaite et al (2009) Adapting to climate change in Urban areas: the possibilities and constraints in low- and middle-Income nations. In: Bicknell J, Dodman D, Satterthwaite D (eds) Adapting cities to climate change: understanding and addressing the development challenges. Earthscan, London
- UN-Habitat (2011) Cities and climate change. Global report on human settlements 2011. United Nations Human Settlements Programme. Earthscan, London
- UNISDR (United Nations International Strategy for Disaster Reduction Secretariat) (2005) Hyogo framework for action 2005–2015: building the resilience of nations and communities to disasters—summary
- Vedeld T, Hellevik S, Kombe W (2012) Draft mid-term report on the planning system and government structure in Dar es Salaam Related to urban disaster risk management and climate change adaptation. Deliverable draft, CLUVA, not published
- Watson V (2009) Seeing from the South: refocusing urban planning on the globe's central urban issues. Urban Stud J 46:2259