

## **Peri-Urban Livelihood and Adaptive Capacity: Urban Development in Dar Es Salaam**

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### **Abstract**

This research focuses the interactions between urban development and global environmental change processes as crucial for reducing the impacts of climate change. Together with the challenges of rapid urban growth, environmental change impacts will undermine efforts to achieve the sustainable development. Peri-urban refers to the area where urban and rural features and processes meet, intertwine and interact, usually located between city and countryside. Peri-urban growth patterns are shaping most of the urban development in sub-Saharan Africa, raising concerns regarding vulnerability to global environmental change in unplanned settlements. To date, there has been little exploration of the implications of peri-urban patterns for social vulnerability and adaptation options. The study discussed in this paper, conducted in Dar es Salaam, Tanzania, illustrates the livelihood strategies and environmental management practices used by peri-urban dwellers, while underlining challenges and opportunities for adaptive capacity. According to a few scholars, the acknowledgement of such hybridity leads to a reconsideration of the dominant strategies for addressing environmental issues in peri-urban areas. Assuming the transition to urban is the best solution, those strategies emphasize the role of infrastructure and services provisioning. Moreover, a criticism of dominant approaches arises through analysis of the recent trend toward ecological security in global cities' environmental management.

**Keywords:** Peri-Urban, Livelihood, Vulnerability, Sub-Saharan Africa, Adaptive Capacity

## Introduction

This paper analyzes the livelihoods, natural resource management and autonomous adaptation strategies in the peri-urban areas of Dar es Salaam, Tanzania. The purpose of this research is to illustrate how the interacting dynamics of livelihood, institutional activities, rural-urban relations, and environmental change offer both opportunities and challenges for enhancing peoples' adaptive capacity. The aim is to document how peri-urban communities experience and address environmental changes and the institutional actions and strategies they adopt for local adaptation or adaptive capacity improvement. Therefore, the investigation focused on natural resource systems upon which peri-urban households depend, looking at the vulnerability of human–environment systems.

The following section will provide background information, describing the existing literature. The next section will detail the location and method of the survey. In the last two sections, evidence of how different people living in peri-urban areas address environmental change is presented and the links to both urban and rural features and dynamics are explored. Finally, the relevance of the study with regards interpretive approaches and spatial planning for peri-urban areas is discussed.

### *Peri-urbanization*

According to UN Habitat, “for the first time, in 2009, Africa’s population exceeded one billion, of which 395 million, almost 40 per cent, lived in urban areas. This urban population will grow to one billion in 2040, and to 1.23 billion in 2050, by which time 60 per cent of all Africans will be living in cities.” (UN Habitat, 2010b). Rapid urban growth leads to the proliferation of unplanned settlements and, in fact, in the last several decades peri-urban informal areas have accommodated most of the demographic expansion in African cities. The processes of growth have shaped highly fragmented and dynamic rural-urban interfaces, characterized by constantly changing land uses, activities, social and institutional arrangements. These interfaces have been defined by Simon (2008) as “forms of hybridity” due to the coexistence of urban and rural features.

The term “peri-urban” has different interpretations and meanings. Although there is no consensus on the definition of the peri-urban areas there is growing recognition in the current debate, among development professionals and institutions, that rural and urban features coexist within cities and beyond their limits, and that solely urban or rural systems are inadequate for addressing processes of environmental and development change in the peri-urban context. Peri-urban<sup>1</sup> refers to the area where urban and rural features and processes meet, intertwine and interact, usually located between city and countryside. Peri-urban areas are characterized by mixed populations, important environmental services and natural resources consumed in

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<sup>1</sup> Commonly “desakota”, “peri-urban interface”, “urban-rural fringe”, “urban transition zone” and “semi-urbanised” area, have, to some extent, become interchangeable with ‘peri-urban’.

towns and cities. In this conceptualization peri-urban refer “not just to the fringe of the city but to a context where both rural and urban features tend to coexist, in environmental, socio-economic and institutional terms”. (Allen et al, 2006, pp. 20-21). Peri-urban areas are complex hybrid systems in which the urban and the rural are blended together.

“In these peri-urban or “rur-urban” landscapes, common assumptions about the values, activities, land use and social organization of “rural” or “urban” populations may not be valid, and policies for addressing the vulnerability and adaptive capacity of these populations to environmental change may be ineffective” ((Reardon et al., 2007; Eakin et al, 2010, p. 14). Because of residents’ relationships to environmental changes and their heavy dependence on natural resources, and because the “rural” and the “urban” are so intertwined, these spaces pose “new” institutional challenges for socio-ecological planning and vulnerability assessment (Eakin et al, 2010). It is broadly assumed across academic disciplines that the degree to which urban and peri-urban populations depend on natural resource-based economic activities plays a significant role in determining their vulnerability to environmental risk:

Resource dependency in this context can be characterized as dependent on the structure and diversity of income, social stability and resilience. Dependency and its implications can be observed through a combination of reliance on climate dependent resources; variability in such income sources; and migration and other social variables associated with stability and resilience [...] The diversity of income sources, and the variability of those income sources across time, can be used as an indicator of vulnerability at the household level, where it is hypothesized that the greater diversity of income the greater resilience of livelihood to disruption of particular sources.” (Adger, 1999 p. 254).

However, in peri-urban areas, vulnerability is equally likely to be associated with a heterogeneous flow of materials and resources involving a variety of economic activities, actors, institutions, power relations, global-local processes, and drivers of change (Eakin et al, 2010). The residents’ close relation to environmental changes, their heavy dependence on natural resources, and the intertwining of rural and urban characteristics cause these spaces to pose “new” institutional challenges for socio-ecological planning and vulnerability assessment. How do peri-urban livelihoods and the rural-urban interplay shape autonomous adaptation strategies to environmental change? And in what ways is institutional environmental planning and management evolving to support the capacity of peri-urban communities to respond to environmental change? Are the “informal” autonomous and “formal” institutional strategies and practices acting synergistically? In a context of lack of resources and “poor” fiscal systems, this synergy may be an essential element of, if not a precondition for, the effectiveness of planning actions. In order to address the effects of environmental change, the presumed distinction between urban and rural, even if it is already becoming increasingly less relevant for planning (Allen, 2003), needs to be overcome completely.

In sub-Saharan African cities, functional decentralization and infrastructure provisioning are often advocated as sustainable “solutions” for improving unplanned and underserved settlements. It is widely argued that improved urban planning and provision of public services and infrastructure are crucial for the development and promotion of resilient cities (Stern, 2007) and for addressing environmental threats. There is a broad consensus that betterment of housing conditions and provision of modern infrastructures are the best ways to reduce environmental risk and vulnerability to climate change in unplanned settlements (UN Habitat, 2003). The majority of studies agree that “in most cities, planning for adaptation must first overcome an inadequate infrastructure base” (Satterthwaite, 2008) in order to enhance adaptation and reduce urban vulnerability. Governments play a key role in enhancing adaptation (Adger and Agrawala et al. 2007) and monitoring land-use management systems and sources of urban vulnerability. They should ensure that all urban dwellers have access to infrastructure and services, should guide where settlements develop, regulate hazardous human activities that can produce disasters, design land use regulations and zoning to influence land availability and encourage and foster better quality housing and safer sites (Satterthwaite et al 2007).

These positions are linked to the broader discussions of environmental sustainability. There is increasing concern over urban ecological security (UES), which generates strategies to reconfigure cities and their infrastructures in order to secure their ecological and material reproduction. In addition to other contemporary sustainability challenges, UES is expected to respond to the opportunities and constraints of resource constraints and climate change (Hodson and Marvin, 2009). Hodson and Marvin stress the new dominant ‘logic’ of infrastructure provisioning which is characterized as Secure Urbanism and Resilient Infrastructure (SURI), and express their concern about “how the pressures of UES and SURI as a strategic response are designed to secure the divisible securitization of resources at the metropolitan scale[...], rather than actively contributing to wider collective solutions for the implications of climate change and resource constraints (Hodson and Marvin 2009 p. 212). Their primary criticism is that the predominant focus is on economic aspects in urban governance, while ecological aspects are neglected.

The same article also questions the applicability of the urban ecological security approaches and solutions in contexts that are different from world cities:

World cities are using their capability, resources and networks to develop a style of transcendent urbanism that is claimed can overcome the potential limits of climate change and resource constraints to guarantee future economic and territorial growth. Critically, we need to ask what this means for the by-passed places, the new peripheries constructed by ‘enclosure’ and the ordinary cities of the North and global cities of the South. The implication is that such cities simply ‘make-do’ or ‘improvise’ with their restricted resources and constrained capacity as world cities establish themselves as ecologically secure spaces. Alternatively, ‘ordinary’ cities and cities of the south are configured as potential new markets that ‘consume’ the

architectural and engineered eco-city fixes produced in the exemplary world cities (Hodson and Marvin, 2009, p. 210).

There are, however, alternative approaches to SURI (e.g. transition towns) than may help in developing alternative or hybrid solutions. These alternative approaches aim to construct responses based on other principles, such as fair shares, mutual interdependences, social justice and the styles of socio-technical solutions these would imply (Hodson and Marvin, 2009).

Traditionally, all these strategies and policies categorize specific economic activities, land use, infrastructures and resources as either rural or urban and adopt a sector-based approach. To overcome this urban/rural dichotomy, Mattingly (2009) has proposed a way to address planning in peri-urban areas. He reviewed the results of past research on the peri-urban interfaces (PUI)<sup>2</sup> and proposed policies and actions to “improve the passage from rural to urban living”. These policies and actions should reinforce other policies, such as land planning and land-related policies, “aiming at better environmental management, and [...] strengthen[ing] local and family food security through support for small farmers with market knowledge, better access to seeds and fertiliser, micro-credit and so on” (Mattingly, 2009 p. 50). He argues in favor of conducting “[...] land planning that is sensitive to peri-urban social and economic factors or help[s] farmers obtain more of the value of their land rights [...]” (Mattingly, 2009 p.50). To implement this planning the coexistence of different institutions in peri-urban areas and the overlap of their competences and functions must be managed. This implicates the resolution of conflicts between urban governments, which are oriented to develop “not natural resource-based” activities, and rural governments focused mainly on agricultural uses.

Both urban and rural government can contribute to the creation of sustainable peri-urban systems. Mattingly asserts that rural governments give more support to peri-urban agriculture. “They could take the lead in providing technical advice on peri-urban farming and soil fertility maintenance; improving access to credit, [...] strengthening security of tenure; [and defending] the land needs and land rights of farmers, including [...] against more powerful and aggressive urban governments” (Mattingly, 2009 pp. 50-51). On the other hand, urban governments should take responsibility for the impacts of their actions, such as new land demands and waste management, through planning “the expansion of the city to give more time to the most vulnerable farmers,” using sensitivity in design and timing, transparency in decision making, supporting initiatives, and compensation (Mattingly, 2009 p. 51).

In our case study, Dar es Salaam, local government addressed the problem of rural-urban integrated planning by designing a Strategic Urban Development Plan in 1999 (SUDP, 1999)<sup>3</sup>. However, plans for land use zoning and building regulation are

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<sup>2</sup> He mainly refers to the Development Planning Unit research groups on PUI at the University College of London, where he is an associate professor.

<sup>3</sup> Strategic Urban Development Plan (SUDP) designed to replace the Dar es Salaam Master Plan was one of the key objectives of the Sustainable Dar es Salaam Project (SDP). The Sustainable Cities Programme is a UN-HABITAT/UNEP programme started in the early 1990's, Its aim is to assist

still designed along relatively rigid urban/rural divides. While detailed urban plans regulating building activity exist within pre-defined “urban” boundaries, development and land use plans in the remaining extra-urban domain, which are regulated by numerous Land Acts at the national level, are still inconsistent and waiting for “the city” to come. The same problem occurs in vulnerability assessment and adaptation planning at the local level; in fact the entire region of Dar es Salaam is considered to be a future “urban region” requiring infrastructure provisioning.

*Linking peri-urban dynamics and adaptive capacity*

The rural–urban interface is particularly challenging when addressing adaptive capacity concerns. While the environmental change in African cities (and in Least Developed Countries in general) is broadly studied, these issues have received little attention in peri-urban areas, despite the fact that they constitute the most at-risk part of African cities.

Peri-urban areas should be treated as integral elements of urban systems in spatial, social, economic, “functional and planning terms, because they and their environments are integral to the growth and operation of growing cities” (Simon 2008). Those same peri-urban areas include features and are relevant to rural development and livelihood policies. Furthermore, the focus on peri-urban areas is crucial because the urban-rural interface is also the place with the most potential for positive change, due to the many “forces” that come together in this space (Erling, 2007, cited in Simon 2008). While explaining the nature of this potential, Erling gives the example of multifunctional urban agriculture as a source of “creative and ingenious new approaches to producing food amid competition for land use”. Others (Davila, 2002; Allen, 2003; ...) argue that there are other opportunities for positive changes that could be useful for adaptation to environmental change, such as livelihood diversification, access to services, reuse of waste in agriculture, and waste recycling for re-sale in the city (though this might be associated with health problems and pollution), and greater access to information and decision-making.

According to the common conceptualizations emerging across climate change literature (Smit and Wandel, 2006), vulnerability is a function of the exposure and sensitivity of a system to hazardous conditions and the ability of the system to cope with, adapt to, or recover from the effects of those conditions. Exposure and sensitivity are linked to the properties of a community or group and are dependent on the interaction between the group’s characteristics and the environment, as well as the characteristics of the climate impulse (change).

Adaptive capacity refers to a “system’s ability to adjust to a disturbance, moderate potential damage, take advantage of opportunities and cope with the consequences of a transformation that occurs” (Gallopín, 2006, p. 296). For other

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cities in achieving more environmentally sustainable growth and development. It is founded on a participatory urban decision making process, and promotes sustainability through environmental planning and management (EPM) approach. Although a draft document was ready in 1999; even today, the SUDP has not legally superseded the 1979 Master Plan.

authors this means “the capacity to modify exposure to risks associated with climate change, absorb and recover from losses stemming from climate impacts, and exploit new opportunities that arise in the process of adaptation” (Adger and Vincent 2005, p. 400).

According to these definitions, while exposure and sensitivity orient the potential impact of climate change, adaptive capacity can be a major influence on the eventual impacts of those changes. Adaptive capacity is therefore an obvious focus for adaptation planning because it is the component of vulnerability most amenable to influence social systems in coping with climate changes (Marshall et al, 2010). Adaptive capacity is closely related to many other concepts, such as resilience, coping ability, adaptability, management capacity, flexibility, robustness and stability (Smit and Wandel, 2006). In this paper resilience is conceived as a perspective for adaptation planning, rather than a clear and well-defined concept to address vulnerability reduction. We apply these principles to address peri-urban development in Dar es Salaam.

### **Case Study: Dar es Salaam**

Dar es Salaam is the largest city in Tanzania and the third fastest growing urban center in Africa. In 2000 it accommodated 33.7% of the mainland urban population and Kinondoni was the most populous municipality in the city (UN Habitat, 2010c). While Tanzania’s urban growth rate is expected to be 4.5% between 2015 and 2020, in Dar es Salaam it is projected to be higher (UN 2010). As in most rapidly growing cities of sub-Saharan Africa, informal growth represents the predominant “mode of urbanisation” (Roy 2005). Several studies estimate that about 70% of Dar es Salaam’s population lives in informal settlements (Kombe 2005; A. Lupala 2002). Other scholars, like Kironde (2006), argue that more than 80% of the buildings in Dar es Salaam are located in unplanned areas (Hill and Linder, 2010).

This urban growth will occur in an environment that is particularly at risk to the negative impacts of climate change. According to data collected by UNDP (2009) and IPCC (2007), the main effects of climate change in Dar es Salaam are flooding, sea level rise, drought and changes in rain patterns. Furthermore, global climate change scenarios show that the temperature will continue to rise and rainfall will continue to increase in the years to come (IPCCb, 2007). In addition, urban development and changes in socioeconomic conditions in peri-urban areas are altering exposure and sensitivity to environmental changes. These factors are likely to exacerbate the physical drivers of the changes mentioned above, thereby affecting the probability of climate events and stresses and orienting their positive or negative impacts. Facing environmental change, peri-urban dwellers are already beginning to diversify their livelihoods, in some cases moving towards lower dependence on the natural resource base and an increased reliance on urban employment and services. This diversification entails changes in social relations, values and livelihood priorities.

### **Methods**

The research seeks to build the knowledge base for the identification and development of adaptive measures tailored to the needs of peri-urban communities in sub-Saharan Africa. The aim is neither to measure current adaptive capacities and vulnerabilities, nor to quantify impacts or effects of adaptation practices. Rather, the focus is to document the ways in which peri-urban communities experience and address changing environmental conditions and the strategies institutions are implementing to improve adaptation or adaptive capacity. This paper looks at human–environment systems vulnerability, including communities, households and groups located in peri-urban areas, with a focus on the natural resource systems upon which people depend.

### *Scale of Analysis*

Adaptive capacity can be investigated on a range of levels (individual, household, institutional, national, etc); this paper focuses on community adaptive capacity and is based on investigations conducted at the household level. This investigation is centered on rural-urban processes and community assets, analyzing household livelihoods, adaptation strategies and environmental management as the main factors that determine adaptive capacity. The analysis also considers that asset-oriented approaches may mask the role of processes and functions in supporting adaptive capacity. An understanding of adaptive capacity needs to give relevance to the different intangible processes such as decision-making and governance, fostering of innovation, experimentation and opportunity exploitation. Adaptive capacity must also address both formal and informal institutions and entitlements systems. This implies a shift “from simply looking at what a system has that enables it to adapt, to recognising what a system does to enable it to adapt (WRI, 2009)” (Jones et al 2010: 1). The household focus enables a better understanding of how and why people organize their activities and of collective and individual processes of decision-making within families (Preston, 1994). Thus, household livelihood strategies give relevant information regarding both collective and individual processes of environmental management and adaptation strategies.

Given the crucial role of peri-urban areas in settlement processes, the activities undertaken in these areas must be included as a fundamental resource in the adaptation action plans<sup>4</sup>. It is hypothesized that adaptive capacity in peri-urban areas depends on four main factors: type and magnitude of the local environmental impacts of climate change, rural-urban dynamics, land-use patterns and urban fabric, local capacity to cope with climate change effects, and institutional capacity in environmental management and urban development planning.

Based on this interpretative framework<sup>5</sup>, a household questionnaire was developed and administrated in 2009. The questionnaire was structured around four

<sup>4</sup> Refers to *action planning* or “*a multi-dimensional and on-going process that takes place in real time*” (Friedmann, 2005) as a viable solution for addressing the uncertainty, fast-changing environment and lack of financial resources which characterize contexts like sub-Saharan African cities.

<sup>5</sup> The survey presented here is part of a broader research study in which several types of investigation have been performed: a) household questionnaires; b) ward and district questionnaires (to understand

main areas of investigation (see Appendix I), identified through a review of the literature on peri-urban areas and through discussion at the ARDHI University of Dar es Salaam. These four areas are as follows: rural-urban interaction, access to resources (land, water, energy, etc.), environmental management (water, waste, soil, etc.), and environmental transformations and autonomous adaptation strategies due to climate change.

Rural-urban interaction, economic flows, the flow of resources and socio-cultural relations are fundamental to understanding urban and regional development dynamics. The rural-urban divide has been addressed in key documents that constitute the core of the UN Habitat mandate. As underlined in the Istanbul Declaration and the Habitat Agenda (§ 613 and 169), rural and urban areas are interdependent from an economic, environmental and social point of view. As such, integrated planning approaches are needed. Successful approaches should combine advantages of urban, peri-urban and rural processes to promote a more balanced use of natural resources, and support mutually reinforcing social and economic development initiatives, encourage and sustainable environmental management (Allen and You, 2002).

The survey featured questions regarding resource access aim to identify resource use and the management regime as well as obstacles and opportunities in adaptation to climate change in peri-urban areas. Access to water, land, shorelines, sea and raw materials are factors in communities' adaptive capacities. Similarly, resource management modalities have a considerable effect on the vulnerability of communities. Finally, the questionnaire was designed to collect information on local autonomous practices and strategies for adapting to environmental changes, which, as established by COP 7 (Decision 28/CP.7), must be considered in identifying adaptation priority actions. Overall, the research aims to help in understanding the environmental changes observed by residents of peri-urban areas, their perceptions of the causes of these changes and the strategies implemented to address them in both short and medium-term.

### *Sampling Location*

The questionnaires were completed by forty households selected in four different wards (ten in each ward) (Fig.1) in the Kinondoni District<sup>6</sup>: Bunju, Kunduchi, Kawe and Msasani. The wards were selected on the basis of a series of field visits, a

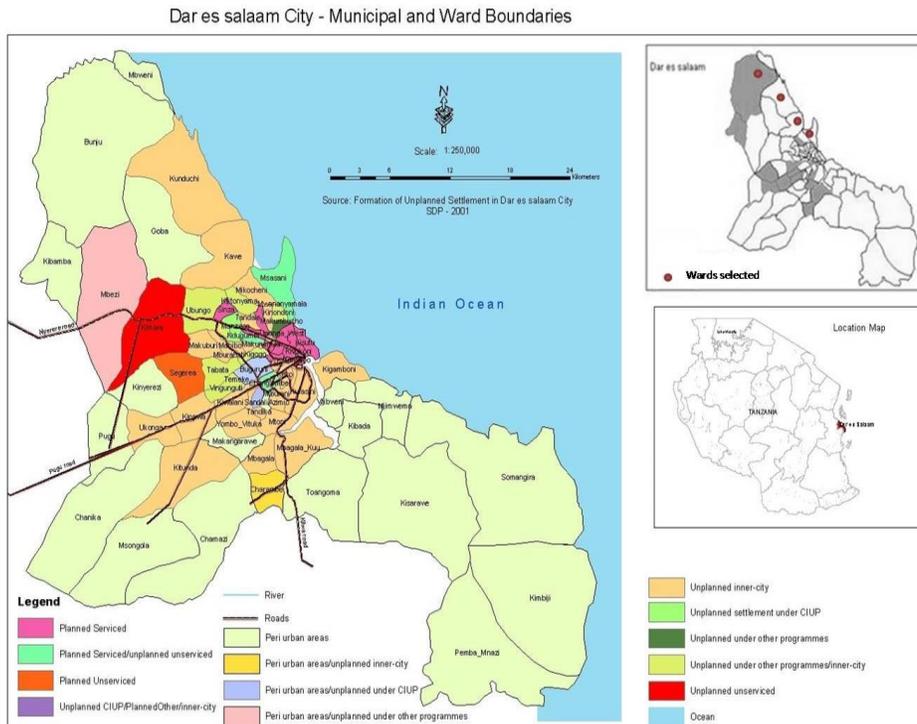
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policies and instruments for urban planning and environmental management in Kinondoni district); c) surveys and data collection (to gather data and information on the current status of natural resources, infrastructure and services, land use, informal activities, pressures and environmental concern in peri-urban areas); d) interviews with research development centres, government institutions and NGOs (to acquire broader knowledge on policies, programs and tools for natural resource management, for adaptation to climate change and for urban and regional development at the national and local levels).

<sup>6</sup> Dar es Salaam has a regional administration with three Municipal Councils, namely Ilala, Kinondoni and Temeke. The three Municipalities are the three districts of the Region and are divided into Divisions, which are in turn divided into Wards. Wards are divided into villages in the case of rural areas and Streets in the case of urban areas. At times the villages are divided into hamlets which are the smallest units.

review of the literature on Dar es Salaam's peri-urban areas and discussion with academics from the Ardhi University. To obtain a better distribution of cases, two subwards were identified within each of the four wards: one in a coastal area and the other in an inland area. Subwards *Bunju A* and *Boco* were selected in the Bunju ward; subwards *Madale* and *Mtongani* were selected in the Kunduchi ward; subwards *Makongo* and *Changanikeni* were selected in Kawe ward. The fourth ward is an urban rather than a peri-urban ward (recently urbanized). It has been selected as a control in order to verify the responses from the other three peri-urban wards.

Figure. 1. Dar es Salaam— Municipal Boundaries



Source: Socio-Economic Survey city of Dar es Salaam, 2007

All selected wards are characterized by the coexistence of urban and rural activities (agriculture, livestock, businesses, schools, transport), informal settlements and activities, and low-medium density settlement areas (each lot must be between 0.08 and 6 ha). The neighborhoods chosen to receive the questionnaire are located in areas with different environmental characteristics (coastal and inland areas with different morphologies) and are close to major natural resources (rivers, ocean, wetlands, forests). Households were identified according to criteria of socio-economic and cultural heterogeneity in order to obtain a sample as representative as possible of the different dynamics of peri-urban areas. Furthermore, stable settled households, which have extensive knowledge of resources and local development dynamics and which are dependent on both urban and rural activities and resources, were selected.

## Results and Discussion

This survey consisted of a limited number of interviews and could only observe some aspects of households' behavior and peri-urban dynamics. Although it is not possible to obtain generalized conclusions, the information collected is an important starting point for structuring a more comprehensive and targeted survey, with more tailored questionnaires. Involving a larger sample of households in the survey could be useful in assessing the potential impacts of climate change and adaptive capacity and in developing methodologies for supporting the design of appropriate local adaptation actions.

There were a number of constraints on survey methodology and its application. Local authorities lack adequate knowledge and capacity regarding planning processes and implementation, which are mainly based on "western principles" and there is limited knowledge of climate issues at the local level. Other obstacles include limited financial resources and other more important things that must be addressed, such as natural disasters, health, and environmental emergencies, which force medium and long term planning to be pushed aside. As a result, projects that are not included in short-term policy are rarely implemented.

The analysis of the empirical data, collected in the four targeted wards in Dar es Salaam, shows that rural-urban interactions are crucial for livelihood maintenance in a changing environment, due to their economic, social and environmental relevance. Furthermore, households have developed multiple adaptation strategies and environmental management practices to cope with environmental threats, but these activities are still neglected in vulnerability assessment and adaptation planning. As a result, there is a need for better understanding of the autonomous practices taking place in peri-urban areas and for strategies to integrate those practices in to adaptation planning at the local level.

### *Rural-urban interaction*

The analysis of the responses concerning *rural-urban interaction* showed that in the three wards the majority of households surveyed came from the same district. Only a few families were from other regions or other districts of Dar es Salaam. This shows that the development of peri-urban areas is not solely due to rural-to-urban migration flows; an urban to peri-urban migrations also exists, often induced by the upgrading programs undertaken in those areas closer to the city centre from where several interviewees came.

Fifty percent of the respondents have indicated labor or family as their reason for moving to peri-urban areas. Indeed peri-urban areas attract many people seeking a place that allows them simultaneously to undertake or continue rural activities and be close to urban dynamics, benefits and facilities. Migration between peri-urban areas and the inner-city, and vice versa, occur frequently and necessarily imply flows of people, resources, information, commodities, production inputs and decision-making power (Tacoli, 1998). It implies that a plurality of activities and physical patterns are

based on urban and peri-urban interdependencies. Most respondents said they travelled to the city centre on a weekly basis (67%) while only 10% travelled either on a daily basis or only rarely. These movements are possible thanks to the local bus system, *daladala*, which serves almost every area of the region and is used by 90% of the respondents. In remote areas, this mode of transport is supplemented with private transport services that use motorcycles and small vehicles (*Bajaj* and *pikipiki*).

The main sources of livelihood identified are agriculture and livestock (97%), along with other local informal activities, such as petty trade. For this and other reasons, the majority of respondents (83%) wish to live in environments with "free" spaces, while only 17% of respondents wish to move to a more urbanized area with better infrastructure and facilities.

#### *Access to resources*

The second section of the survey highlighted access to resources such as water, land and energy and the presence or absence of related facilities in populated areas, including solid and liquid waste collection. In this section land tenure arises as an important issue linked to the urban planning process and actions implementation. Among respondents, over 60% do not have land title (for house and land), more than 30% have a title deed for rent (leasehold title), and the remaining 7% own a customary title (right of occupancy derived from ancient communities). This title is becoming ever less popular and, although legally recognized, is not protected if other interests arise in urban development (Kironde, 2005). Even if only 30% have a title deed, almost all respondents claim they pay taxes for land and housing. This means that in some case there are "indirect" and informal fiscal systems. For example, those who lack a title deed and rent their land or their house from other land "owners" may also pay taxes to the owner for services or land uses. In addition, 26% pay fees for water and electricity and only 9% have to pay for waste collection services, which are often provided illegally by private parties, particularly in denser areas.

#### *Environmental management*

The responses concerning environmental management (which includes waste management) indicate that only 6% of households use a collection system provided by private parties while the remaining 94% manage waste independently. Of that 94%, some manage waste by burning, abandoning and burying it (46%), or by recycling useful materials and composting organic waste to be reused as fertilizer (46%). The remaining 8% of autonomous waste managers practice other activities like collecting materials, such as plastics or metals, for sale to companies or people that can treat or reuse them. None of the respondents uses a sewage collection and disposal system; waste is usually abandoned in pits until saturation (pit latrine). Only in very rare cases is a septic tank used. Most households surveyed also undertake practices for water management, such as rainwater harvesting, and rely on a variety of water sources. There are also informal groups and community-based organizations for maintenance of roads, canals, and common spaces.

*Climate change: observed changes and adaptation practices*

In the survey section on climate change, almost all respondents noted changes in water availability, soil fertility, soil aridity, air humidity and rain patterns. Results show that water availability has been declining significantly in recent years. Rivers that normally flow year round have become seasonal, and the amount of water drawn from shallow pits in the wetlands or near rivers has decreased, requiring deeper digging. Other significant changes were observed both in the amount of rain and in normal seasonal rainfall patterns. Furthermore, coastline—up to 100 meters in the last 30 years in some places—has eroded significantly, changing village morphology and fishermen's activities. These and other environmental changes result from a complex set of factors, including global warming as well as anthropogenic pressures and inadequate local environmental and urban policies.

Different strategies for coping with environmental changes are being implemented. Because of the decrease in water availability, many people change crop systems (e.g. moving from rice to cassava, which requires less water) or decide to stop farming and start breeding livestock. Most respondents, who have been observing rapid and significant environmental changes in recent years, are contemplating plans for coping with further deterioration of environmental conditions that go beyond immediate reactive solutions. They are considering strategies such as change of employment, transition from subsistence activities dependent on natural resources to activities only partially or indirectly dependent on them, such as trade or small business. In some cases, respondents have even thought of moving to another area or returning to their rural native region.

These strategies are being considered not only in response to exacerbation of environmental problems but also in the event of higher population pressure and new urban developments, which would interfere with ordinary practices, such as agriculture and the cultivation of livestock. This response is partly linked to the effects of environmental change. These environmental changes are equally attributed to changes in land use, local anthropogenic actions (mainly urban development) and global environmental change, which is more or less human-induced. In addition, only a few people attribute the ongoing changes to weak institutions and mismanagement of resources.

**Conclusions**

The results described in the previous paragraph demonstrate that the blend of “rural” and “urban” features is crucial to people’s livelihoods and is thus strictly linked to their adaptive capacity. Ignoring the importance of the availability of land for farming and other activities, the possibility of reusing waste materials, the variety of water sources, and the different “informal” dynamics (and opportunities) could damage people’s livelihoods and compromise their assets.

Migration, information, money and commodities intensify rural-urban linkages and increase livelihood diversification. Temporary or permanent migration to or from the city, motivated by the search for housing and employment, is a helpful mechanism for increasing earnings, expanding social networks and reducing vulnerability. Mobility and migration may also give rise to a growing phenomenon of ‘multi-spatial’ households and enterprises (Adell, 1999). Peri-urban development and migrations may generate a local market for street vendors and hawkers and facilitate the arrival of high-middle income dwellers in search of more space or cheaper housing. This, in turn, may constitute job opportunities for domestic help workers. Easy access to a variety of transport options enables high levels of commuting between peri-urban-areas and the city center, providing commuters with access to services such as health and education as well as work opportunities.

Intense rural-urban interplay also creates the possibility of access to solid and liquid waste facilities. The growing flows of liquid and solid waste out of the city into surroundings areas and between peri-urban neighborhoods, although associated with health problems, represents opportunities for reducing the use of commercial fertilizers in agriculture, or for recycling solid waste for sale in the city. This contributes to an increase and diversification of sources of income. Rural-urban interplay could also facilitate access to information and decision-making processes and structures, which are usually better represented in urban areas. In a rapidly changing environment, access to environmental information and warning systems are vital for risk and vulnerability reduction. Peri-urban dwellers have access to resources, but this access is oriented by “urban biased” development. There are already many options for obtaining water, using land, and gaining access to housing or other activities in peri-urban areas, but urban-oriented development plans could undermine these opportunities by pushing for full urbanization, ignoring the positive effects of the existing array of opportunities.

Providing infrastructure and services to accelerate the transition to the “urban” may reduce vulnerability, but it could also modify or damage the livelihoods system and its flexibility. The focus on infrastructure “protection” and economic competitiveness as basic requirements for addressing environmental threats leads to the expulsion of hybrid practices and land uses in peri-urban areas. Conversion from peri-urban to urban uses (or pressure to convert) increases commercialization of land, thereby changing peri-urban areas into investment zones where customary practices of land allocation are no longer possible or allowed. This also implies a land regularization process and the imposition of certain fees, which may force poorer people to migrate, further marginalizing them, and making them more vulnerable to environmental changes and heavily impacting their livelihoods. Peri-urban dwellers have a high capacity to change and adapt the ways in which they access and manage resources but at the same time are exposed to considerable uncertainty.

The presence of multiple autonomous adaptation strategies and environmental management practices could be a crucial resource in the absence of financial revenues. Institutions responsible for implementing adaptation strategies at the local level are required to better understand how urban development and planned interventions

affect the community's adaptive capacity, both positively and negatively, and how existing approaches could be improved in order to contribute to communities' adaptive capacity.

The increasing concern over urban ecological security (UES) misses the ecological aspects, focusing on economic aspects of urban governance. The dominant strategic responses aspire to construct enhanced ecological security for "world cities" through the creation of secure urbanism and resilient infrastructure (Hodson and Marvin, 2009). The characteristics and extension on peri-urban features and dynamics in African cities call for alternative approaches, such as tailored rural-urban hybrid solutions. After investigating adaptive capacity in peri-urban areas, one can highlight specific aspects on rural-urban relations, resources access, environmental management and autonomous adaptation practices. These aspects are strictly linked to mutual interdependence, social justice, human agency and socio-technical solutions, which could inform the aforementioned alternative approaches.

This document has highlighted the dynamics and resources of the peri-urban interface, and paid particular attention to areas, processes, and functions that can be influential in both the development of adaptation strategies and actions implementation. The information obtained through the field survey is essential to identifying sustainable and viable adaptation options. Not only does this information provide data on environmental management and autonomous adaptation strategies, but it also reveals a neglected part of urban and rural-urban development processes, emphasizing the conflicts and contradictions between urban development, under the dominant logic of ecological security, and peri-urban dynamics. Further studies focused on the peri-urban context and on rural-urban dynamics may contribute to a reduction in the uncertainty surrounding climate change projection. The experiences, strategies, and actions of people at a local level require even more exploration. Ultimately, if environmental change is tied to rapidly evolving social and economic landscapes—as it is in peri-urban areas—it is even more of a challenge to define appropriate measures for minimizing vulnerability. Enhancing adaptive capacity requires a conception of populations and communities as an integrated system, free of the urban bias, where urban and rural features, cultures, economies, natural cycles, and livelihoods are interdependent and mutually reinforcing.

As Adell (1999) states, those who stressed the importance of the urban bias, relying on the socially reductionist assumptions "that the main difference between rural and urban consists in their social 'classes'" do not consider "the conflation of people and space." People, not places and physical infrastructure, are responsible for creating the flows, practices and relations between rural and urban areas and environmental management processes.

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