

INVESTIGATING THE LIVELIHOODS OF THE POPULATION DEPENDENT ON NATURAL RESOURCES AND THEIR CONCERNS REGARDING CLIMATE CHANGE

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Glossary*

Adaptation

Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation:

Anticipatory Adaptation – Adaptation that takes place before impacts of climate change are observed. Also referred to as proactive adaptation.

Autonomous Adaptation – Adaptation that does not constitute a conscious response to climatic stimuli, but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. Also referred to as spontaneous adaptation.

Planned Adaptation – Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change, and that action is required to return to, maintain, or achieve a desired state.

Adaptation Assessment

The practice of identifying options for adapting to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency and feasibility.

Adaptation Benefits

The avoided damage costs or the accrued benefits following the adoption and implementation of adaptation measures.

Adaptive Capacity (in relation to climate change impacts)

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Climate Sensitivity

The equilibrium temperature rise that would occur as a result of a doubling of CO₂ concentration above pre-industrial levels.

Resilience

The ability of a social or ecological system to absorb disturbances while retaining the same basic structure, ways of functioning, capacity for self-organisation, and capacity to adapt to stress and change.

Sensitivity

The degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea-level rise).

Vulnerability

The degree to which a system is susceptible to, and unable to cope with adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

*Source: Glossary WG II IPCC 2001 (<http://www.ipcc.ch/pdf/glossary/ar4wg2>).

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1 Introduction, Scope and Motivation



1.1 Background

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

In order to build a better understanding of adaptation, two extensive surveys have been conducted. First, a questionnaire was administered to almost 6000 households in Dar's coastal plain to investigate livelihoods and identify issues of concern related to CC. Second, officials from the Dar City Council and its three municipalities were interviewed to gather information on any current activities related to UDEM and to CC adaptation. Third, an ongoing series of public events using the Forum Theatre technique are exploring future options for autonomous adaptation and raising awareness on CC among inhabitants of the target area.

This report presents the analysis of data from the household questionnaires, and proposes a framework for assessment of the adaptive capacity of people living in the peri-urban areas of coastal Dar es Salaam.

1.2 Goals and Scope

The overall objective of this study is to provide an assessment of climate related concerns and the adaptive capacity of the population living in coastal Dar's unplanned and underserved neighbourhoods, where the dependence of livelihoods on locally available natural resources is usually quite high.

Those people are already experiencing a number of environmental changes (decreasing availability of water, loss of land along the seashore, etc.). In response to these changes, they autonomously carry out adaptation activities (e.g. changing water sources, crops or livestock, land use, differentiating household activities, etc.), which in turn impact their living environment and entail changes to social relations, values and livelihood priorities.

Analysis of the data collected by interviewing a sample of approximately 6000 households is expected to provide valuable information on Dar's municipal services, which will facilitate a better understanding of the relationship between climate change and livelihood strategies in peri-urban Dar.

More specifically, the study focuses on what natural resources peri-urban households have access to, how they use the natural resources at their disposal, what changes in climate they have observed, what strategies they have adopted to cope with those changes, and gender differences in the degree of dependence on natural resources.

Besides knowledge enhancement, the study also aims to build a basis for the development of a survey procedure. This procedure is tailored to the capacity of Dar's municipal services and can be used to monitor the above-mentioned topics. It is hoped that this will allow for evaluation of institutional adaptation initiatives that support peri-urban households in their effort to cope with climate change.

1.3 Motivation

According to the URT National Adaptation Plan of Action (2007), predictions show an increase in temperature and important changes in rainfall patterns throughout the country. There is major concern over the increased frequency of extreme weather events, particularly flooding, droughts, cyclones, and tropical storms, which are expected to become more intense, frequent and unpredictable. In fact, the downscaling of global climate scenarios to local contexts leads to many uncertainties. Nevertheless, data from the Tanzania Meteorological Agency provides evidence of significant trends of change in Dar es Salaam: rainfall has decreased from about 1200mm/year in the 1960s to about 1000mm/year in 2009 and the temperature has been increasing steadily, with the highest temperature increase recorded in the last decade (1999-2008). Both of these developments have contributed to the impoverishment of local freshwater resources.

The impacts of climate change on key sectors of the Tanzanian economy and on people's well being prompted preparation of the NAPA. The situation in Dar es Salaam raises major concerns, as the city is the largest in Tanzania (3.2 million in 2009, with an expected growth trend of around 5% according to the projections of the World Population Prospects 2011) and the main engine of the national economy. In recent decades, the city has expanded tremendously due to both natural growth and immigration, and today the coastal plain is largely urbanized. Residential neighbourhoods lie beside tourism infrastructures and other economic activities along the coast.

Most of these neighbourhoods are unplanned and underserved (from 70 to 80% are informal settlements, according to Kombe 2005; A. Lupala 2002; Kironde, 2006; Hill and Linder, 2010), and their inhabitants are largely dependent on natural resources for their livelihoods. Along with fishing, urban agriculture plays a major role. It ranks as Dar's second largest employer and provides the City with a large quantity of food (354,657 tons in 2004, according to the City Council). Climate change represents a further threat for people who are already faced with coastal erosion, watershed salinization, periodic inundations, as well as sea and land pollution.

In addition, urban development and changes in socioeconomic conditions in peri-urban areas are altering exposure and sensitivity to environmental changes. Between 2002 and 2011, continuous and discontinuous urban land grew by more than 10% per year (see figure 1), while residential uses are put at risk of displacement by more economically valuable activities. These factors are likely to exacerbate the effects of climate change, impacting the probability of climate events and stresses and orienting the positive or negative impacts thereof.

In the face of evident environmental changes, peri-urban dwellers are undertaking diverse adaptation practises. This shows that the Peri-urban has some capacity to adapt, which represents a valuable resource for coping with future impacts of climate change. Meanwhile, autonomous adaptation practices might affect development in several ways.

Local institutions are expected to identify viable options for supporting the adaptation effort of Dar's population while ensuring proper accounting for potential maladaptation. Also, due to the cumulative effects of urban growth and changes in local climate, the need arise to prioritize the mainstreaming of adaptation in UDEM strategies and plans.

In order to do so, better knowledge on climate related concerns and adaptive capacity of the Peri-urban is crucial.

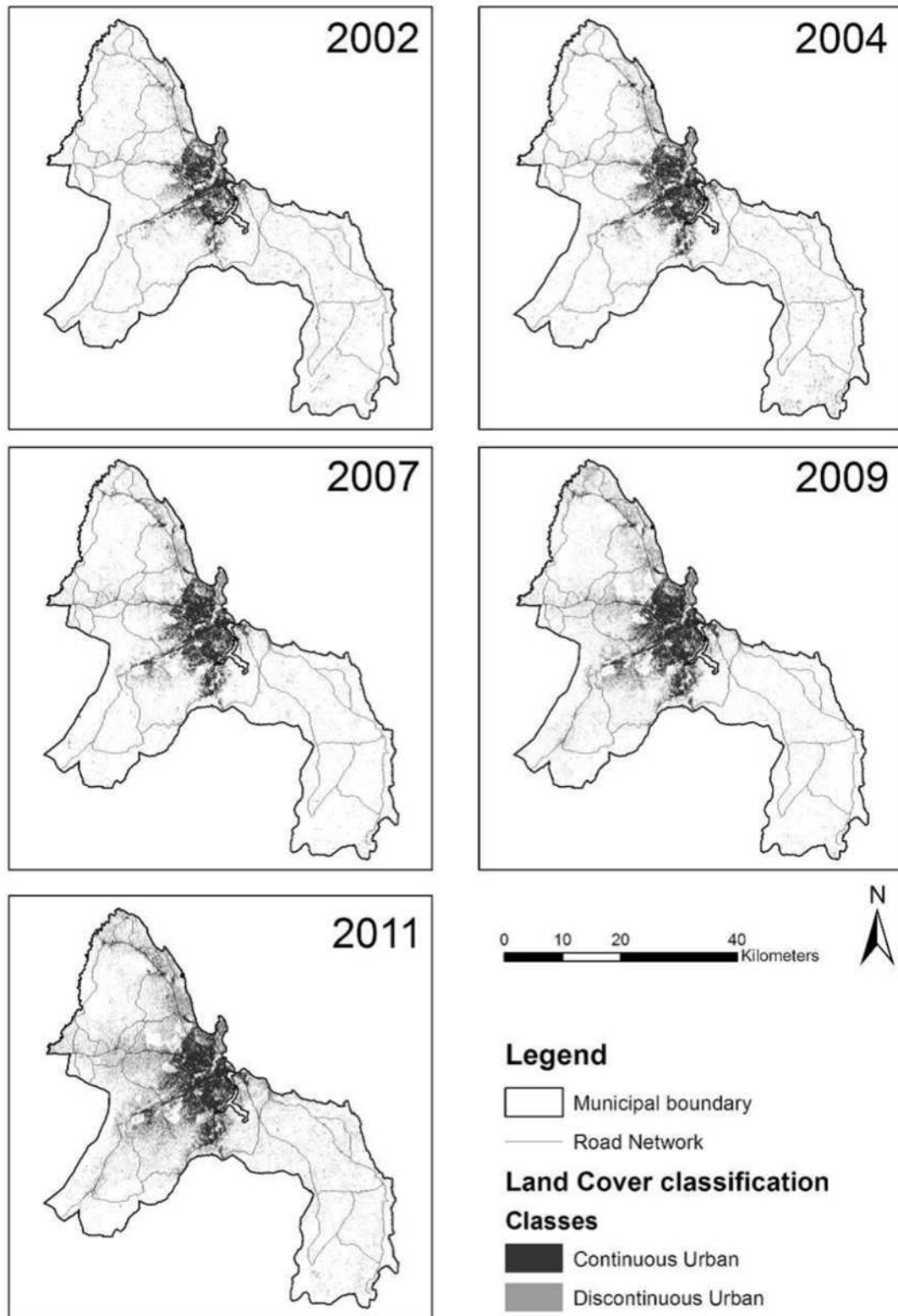


Figure 1 - Land Cover Change Over the Past Ten Years (Congedo, 2012)

2 Approach and Methods



Although different definitions of the peri-urban areas exist among academics and practitioners, in the current debate there is growing recognition that rural and urban features coexist within cities and beyond their limits (Allen, 2001; Simon, 2008), and that rural-urban dichotomies are inadequate to deal with processes of environmental and developmental change in the peri-urban context (Allen, 2003). In this study Peri-urban¹ refers to the areas where urban and rural features and processes meet, intertwine and interact. They are characterized by mixed populations and are the location of important environmental services and natural resources consumed in towns and cities (Allen et al, 2006). Being complex hybrid systems in which the urban and the rural are blended together, peri-urban areas are both resourceful and vulnerable.

The degree to which urban and peri-urban populations depend on natural resource-based activities plays a significant role in determining their vulnerability to environmental changes (Adger, 1999) and poses institutional challenges for socio-ecological planning and vulnerability assessment (Eakin et al, 2010). The IPCC's Fourth Assessment Report defines vulnerability as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, the sensitivity and adaptive capacity of that system" (IPCC, 2007).

$$\text{Vulnerability} = f(\text{Exposure, Sensitivity, Adaptive Capacity})$$

The interpretations of this function differ according to the emphasis given to one or other of the three components, ranging from those more concerned with assessing the impact of climate hazards to those who highlight the need for strengthening adaptive capacity in order to improve the system's ability to cope with uncertain threats.

This study focuses on adaptive capacity as the component of vulnerability most amenable to influence by Dar's local government. Several considerations have led to this conclusion. First, the local climate scenario is uncertain, due partly to the fact that little meteorological data is available over a long enough period of time to allow for climate change forecasting. Second, it is impossible for local government to control urban development during the current growth trend. Third, the financial resources available are inadequate to effectively reduce the exposure of people and activities to expected climate hazards. Diverse definitions have been proposed for adaptive capacity. In this study we will refer to the following two:

"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" (Gallopin, 2006: 296) and

"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: 400).

Finally, it should be highlighted that the ability of a system to ensure equitable access and entitlement to key resources and assets is a fundamental characteristic of adaptive capacity. Unfortunately, there is still limited knowledge about peri-urban residents' methods of accessing and managing natural resources, or their autonomous practices for coping with environmental change. Even if local people are often involved in planning process and in vulnerability assessments, those dimensions are mostly neglected (Dodman and Mitlin, 2011).

¹Commonly "desakota", "peri-urban interface", "urban-rural fringe", "urban transition zone" and "semi urbanised" area, have, to some extent, become interchangeable with 'peri-urban'.

Drawing on these premises and in order to better understand the components of the adaptive capacity of Dar's Peri-urban, four major areas of investigation have been identified:

Rural-urban interaction (including economic flows, the flow of resources, socio-cultural relations and the movement of people) - Relationships between the Peri-urban and the city centre as well as between the Peri-urban and rural districts should both be explored;

People's access to resources (land, water, energy, shorelines, sea, raw materials, etc.) - Here the question is how and under what conditions people access basic resources;

Environmental management (water, waste, etc.) - A better understanding of how people access available natural resources and the related management regimes might help in identifying obstacles and opportunities for autonomous adaptation to environmental change;

Environmental changes (soil fertility, humidity, etc.) - The changes observed by residents of peri-urban areas and their perception of the causes of these changes provide valuable information on their degree of awareness of climate change related impacts. Exploring the strategies they have implemented to address those impacts in both the short and medium-term is also crucial to outlining a few adaptation profiles.

The following paragraphs contain the different phases of the survey (Figure 2).

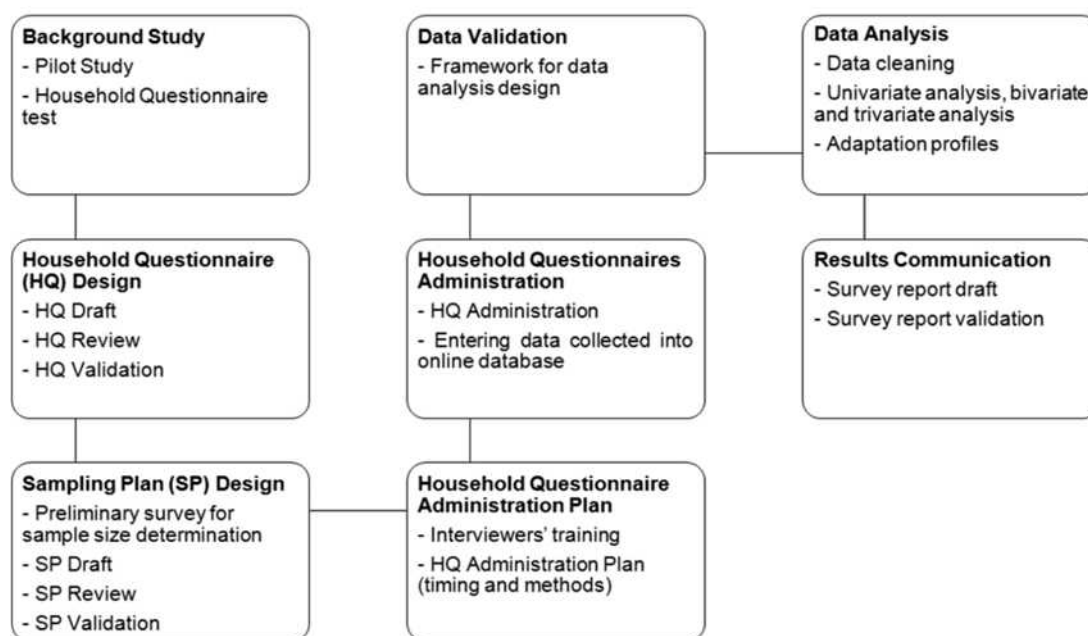


Figure 2 - Activity Workflow

2.1 Preliminary Activities

2.1.1 Pilot Study

The study started with the review of relevant documents/literature on urban and peri-urban areas in Dar es Salaam, surveys on livelihood and natural resource dependence carried by various scholars, and reports on environmental conditions and changes in Dar es Salaam.

A pilot study was conducted to identify key areas of inquiry in unplanned and un-serviced settlements in peri-urban Dar es Salaam.

The purpose of the preliminary study was to familiarize with the study area, to identify a sample area for in-depth study and test the developed data collection tools (household questionnaire). It also helped to focus the research through the identification of key issues to concentrate on during the main study.

The pilot study included administration of forty household questionnaires in the Kinondoni municipality. The household questionnaires were administered in four different wards (ten in each ward) located in the Kinondoni District: Bunju, Kunduchi, Kawe and Msasani. The wards were selected on the basis of a series of field visits, a review of the literature on Dar es Salaam's peri-urban areas and preliminary information collected through interviews with the Kinondoni Municipality, the Dar es Salaam City Council and officers from the Ministry of Lands and Human Settlements Development.

Within each of the four wards, two sub-wards were identified, one in a coastal area and the other in an inland area, (to obtain a better distribution of cases). Sub-wards Bunju A and Boco were selected in the Bunju ward; sub-wards Madale and Mtongani were selected in the Kunduchi ward; sub-wards Makongo and Changanikeni were selected in Kawe ward. The fourth ward is urban rather than peri-urban (recently urbanized). It was selected as a control in order to verify the responses from the other three peri-urban wards.

Departing from the results of the pilot study, strategic variables were identified and a new questionnaire, tailored to Dar's peri-urban areas, was designed. The questionnaire structure is displayed in Figure 3.

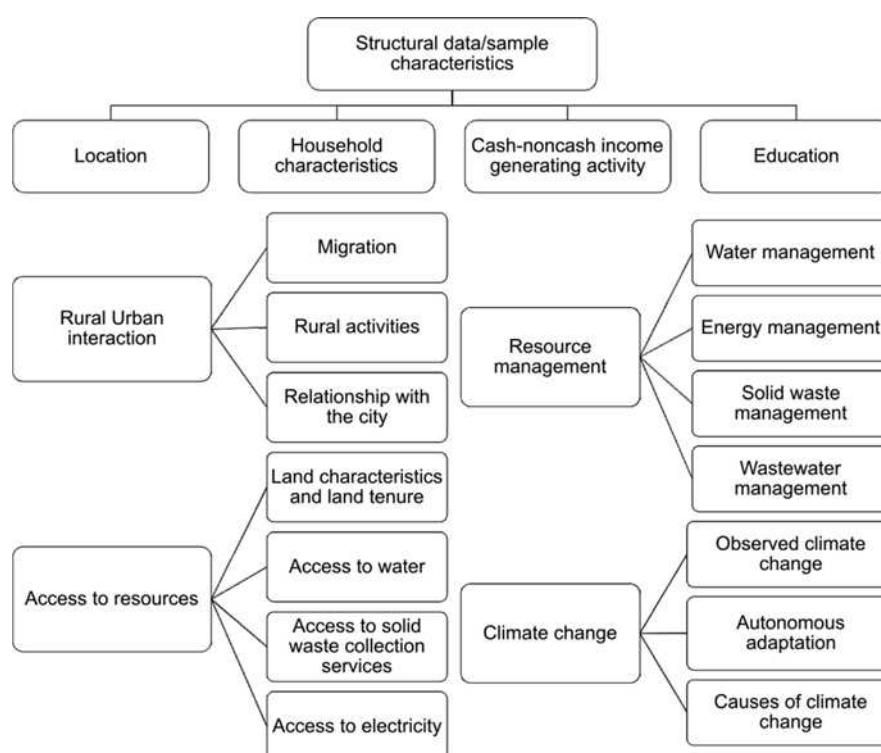


Figure 3 - Household Questionnaire Structure

2.1.2 Preliminary Survey

In order to design the Sampling Plan (define population, choose sampling method) for questionnaire administration, a Pre-questionnaire Survey was carried out by ARU staff in Dar es Salaam's coastal wards, which estimated the number of households and total population in the target area.

The last population census, conducted by the National Bureau of Statistics (NBS) in 2002, was considered too outdated for sample size determination. For this reason, the updated data was collected from local government at the ward level, and at the sub-ward level when the ward level offices had not been provided with the latest data. Where available, data on total population, household size, and number of households was collected from each sub-ward. Where household size data was available, it was used directly. Where unavailable, the number of households was calculated using population and applicable household size (6 people per household).

The pre-questionnaire survey resulted in a slightly higher total population: 133,920 households, as opposed to the 120,000 households identified in the census data.

2.2 Methodology for Data Collection and Analysis

2.2.1 Sampling Plan

Following the pilot study and the preliminary survey, the areas to be surveyed were selected according to settlements' characteristics and location.

The target areas for the questionnaire were the peri-urban settlements located in the coastal plain² of Dar es Salaam (figure 4). They were identified on both the ground and the map based on the demarcation previously defined for the ACC Dar project. Within the survey areas sixteen wards were identified for questionnaire administration, and the basic sampling unit was the household.

Due to the lack of updated population data and households' location data, a non-probabilistic sampling technique with judgmental sampling type was designed. Interviewers were trained to select households with socio-economic heterogeneity (different education and income), located in different environmental contexts (close to shoreline, river, lowland or swamp, etc.), that were stably settled (at least 5 years) with livelihoods dependent on urban and rural activities as well as direct access to natural resources (following the above-mentioned definition of peri-urban areas - § 2.1), and located in low-medium density settlements.

Sample Size

The sample size (5%) was derived from non-updated data provided by the local government (120.000 households) and the number of households selected for questionnaire administration was increased from 500 (as foreseen in the application form of the project) to 6000.

Originally, administration of questionnaires to a 10% sample of the households was planned (10% of all the eligible/target households) but ultimately the sample size was halved (from 10% down to 5%) due to time and human resources restrictions. The figure 120,000 for the total number of households in the study area, which was the basis for the selection of 6000 households as the sample size (5%), was derived from the non-updated data provided by the local government. The breakdown of the data for the total number of households and the number of households in the 5% sample for the three municipalities is shown in Table 1.

Table 1 - Total Population and Selected Sample Size for Questionnaire

Municipality	Total Number of Households	5% of Households
Kinondoni	52,060	2,603
Temeke	27,260	1,365
Ilala	54,600	2,730
Total	133,920	6,698

Although, according to the Table 1, the total number of questionnaires to be administered ought to be 6,698 (in order for the sample size to remain 5%), the originally selected sample size of 6,000 was maintained for practical reasons. Therefore, the actual sample size was 4.48% instead of 5%. After questionnaire administration, this figure went down further, because not all the 6,000 questionnaires were administered, and not all the administered questionnaires were included in the final statistical analysis.

²Coastal Plain "spans the central area of Dar es Salaam from the coast towards the west, rising from 0 m to 60 m above sea level with a gradient varying from 0% to 5%" (Faldi 2011) and it includes three geological features: alluvial and river terraces, white-buff sands and gravels and raised coral reef limestone.

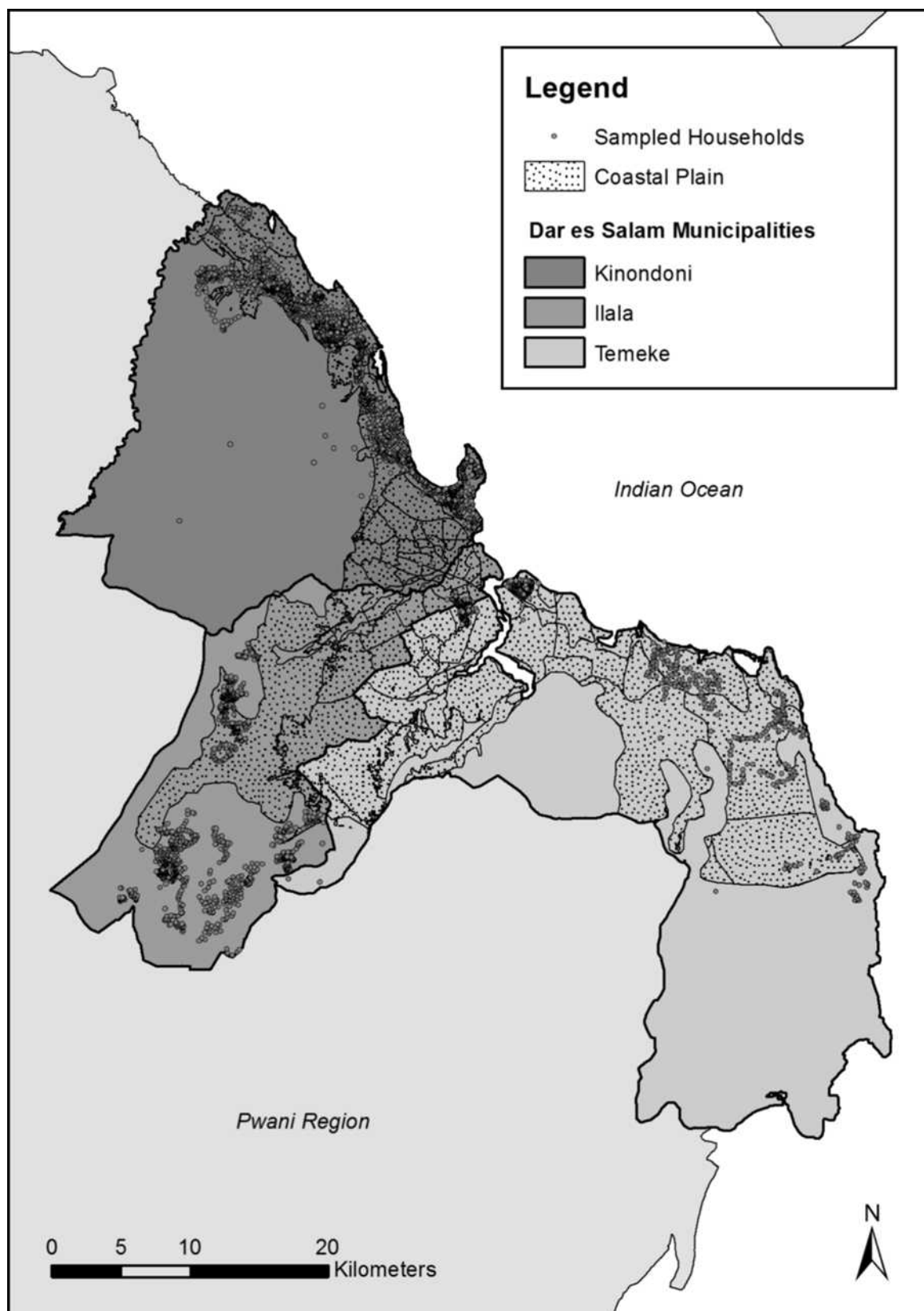


Figure 4 - Household Questionnaire Distribution

Data Collection Techniques

Data was collected between September and November 2011 by four interviewers. They were trained by ARU on the sampling plan and the thematic sections of the questionnaire. Interviewers were taught to identify and classify their survey sub-areas into three socio-economic brackets, ensuring that each of the socio-economic brackets was represented in the survey, except where members of a particular bracket were absent in a particular survey area.

The household questionnaires were administered face-to-face using a hard copy version that was entered into the database only after the data collection.

All the data from the questionnaire have been georeferenced, entered online using the open source statistical survey software LimeSurvey, and published on the reserved area of the project web site. The use of this software facilitated the input of data collected by ARU interviewers and remote access to the database. The use of Internet based software enabled pinpointing of data in different places, avoiding the problems with mismatching that can occur using a stand-alone database. The database was also accessible anytime by project staff, which facilitated an analysis of the data collected using simple statistics, and the possibility of identifying and correcting any mistakes made during the field survey.

2.2.2 Data Analysis Techniques

After the data entry, the data matrix was reviewed and 5860 questionnaires were validated and included in the data analysis. The data analysis was conducted in January and February of 2012 by DICEA and ARU by using the following techniques: univariate (frequencies), bivariate (two-way), and trivariate analysis (three-way cross-tabulation).

All the questionnaire sections were analysed using the variables' frequencies while two-way cross-tabulation was used to analyse the covariation among variables from different questionnaire sections. Three-way cross-tabulation was used to specify, interpret and explain relations already investigated between two variables. Those analyses were then combined in order to design households' adaptation profiles.

2.2.3 Limitation of the Study

The study gives basic information on peri-urban households' characteristics and on autonomous adaptation strategies, but the role of local institutions in autonomous adaptation strategies and in modalities of accessing resources were not addressed in the survey. These aspects should complement the outputs of the household survey in order to orient capacity building and the design of the adaptation initiatives foreseen by the ACC Dar project. Gender issues and power relations dynamics are also poorly explored in the analysis of the household questionnaire data, and therefore need to be addressed through further investigation to identify the vulnerabilities of Dar's peri-urban residents in these respects.

3 Findings

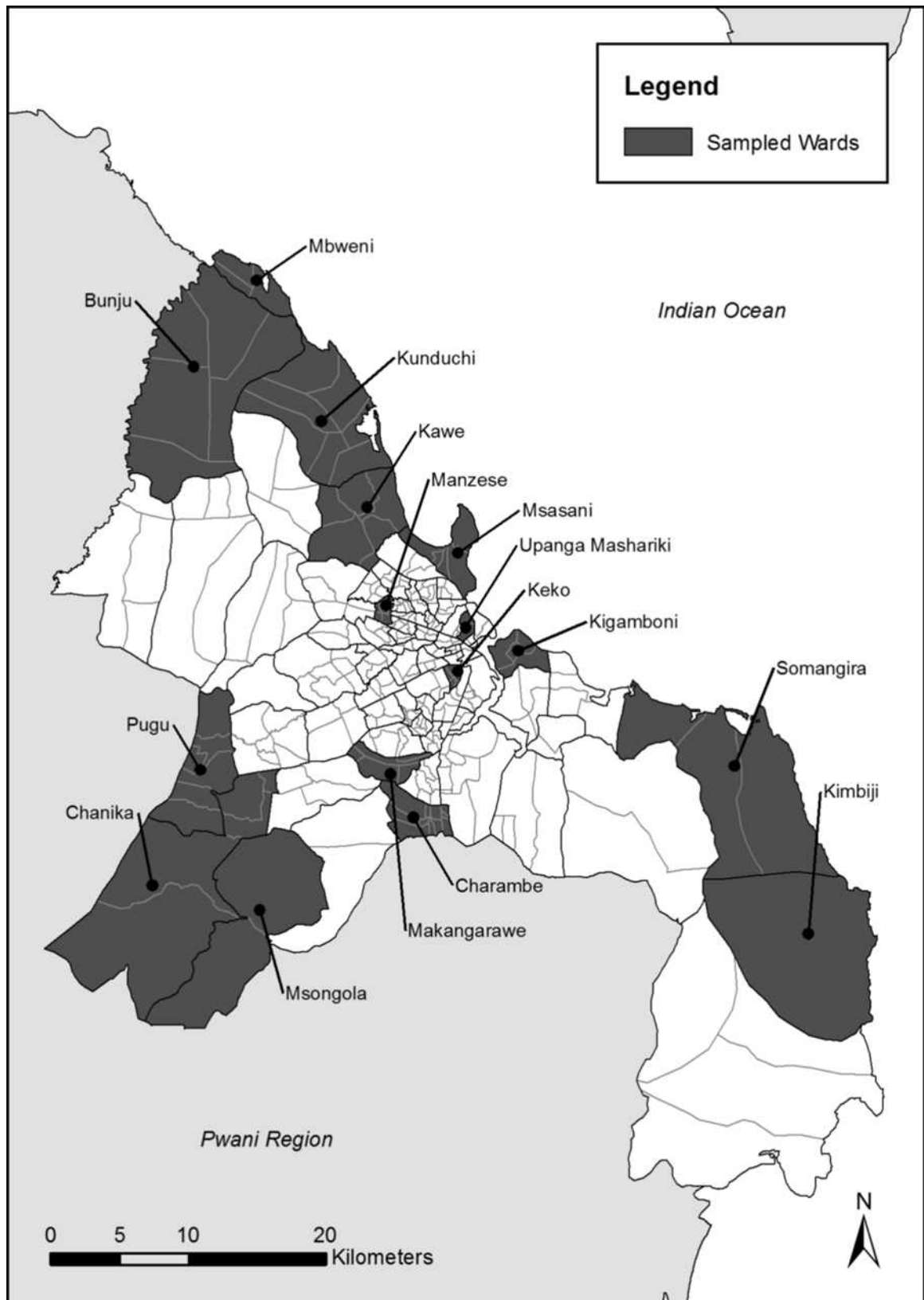


Figure 5 - Sampled Wards

3.1 Profile of the Study Population

This section includes the structural data of the sample, including the main socio-economic characteristics of the households involved in the survey and of the questionnaire respondents.

3.1.1 Location

Table 2 lists the sample size by ward for each municipality in the Dar es Salaam. The total number of households sampled for this study was 5860. This sample was drawn from 16 of the 86 wards (kata) of the city and from 73 of their 447 subwards (mitaa). A total of 1184 (20.2%) households were sampled from Ilala, 3064 (52.3%) from Kinondoni and 1612 (27.5%) from Temeke, out of a total of 4 wards from Ilala, 6 wards from Kinondoni and 7 wards from Temeke.

Following the selected data collection techniques, more questionnaires were administered in the more populous subwards. The highest number of questionnaires was administered in Kunduchi ward, while the fewest questionnaires were administered in Charambe ward.

Table 2 - Questionnaire Distribution by Location

Municipality	Ward	Administered Questionnaire (n.)	% of Municipality	% of Total
Ilala (n. 1184)	Pugu	434	36.7%	7.4%
	Upanga Mashariki	55	4.6%	0.9%
	Chanika	485	41.0%	8.3%
	Msongola	210	17.7%	3.6%
Kinondoni (n. 3064)	Bunju	411	13.4%	7.0%
	Kawe	334	10.9%	5.7%
	Kunduchi	1399	45.7%	23.9%
	Manzese	54	1.8%	0.9%
	Mbweni	79	2.6%	1.3%
	Msasani	787	25.7%	13.4%
Temeke (n. 1612)	Charambe	35	2.2%	0.6%
	Keko	599	37.2%	10.2%
	Kigamboni	512	31.8%	8.7%
	Kimbiji	70	4.3%	1.2%
	Makangarawe	156	9.7%	2.7%
	Somangira	240	14.9%	4.1%
Total		5860		100.0%

3.1.2. Household Characteristics

Age and Gender

Figure 6 shows that most of the respondents (22%) fall within the 36-40 age group, 16% of respondents were under 30 or between 31-35 years, 14% were between 41-45, 12% were between 46-51% were between 51-55, and 11% are 56 and over.

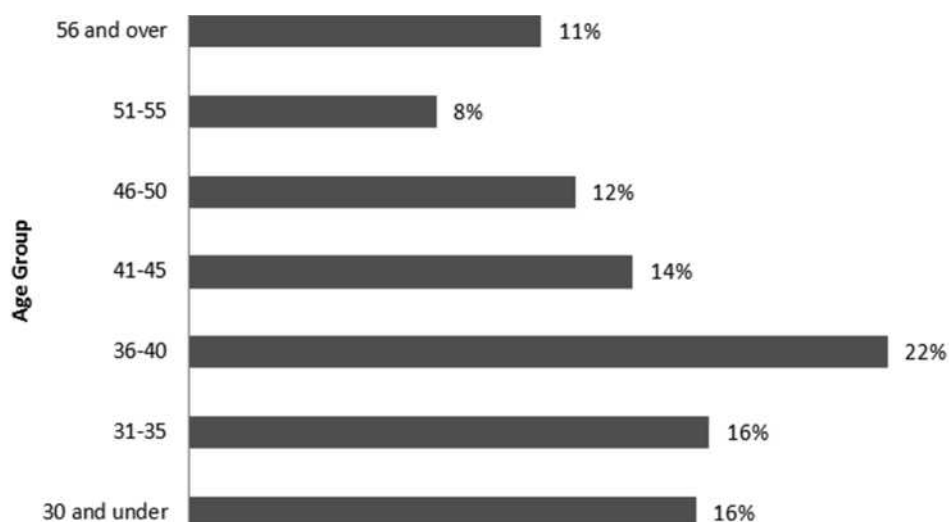


Figure 6 - Age Distribution

Respondents are almost equally distributed between male (49.8%) and female (50.2%). The analysis of their age shows that women under 40 are overrepresented. Conversely, men are more represented than the women in the age groups over 40 (Figure 7).

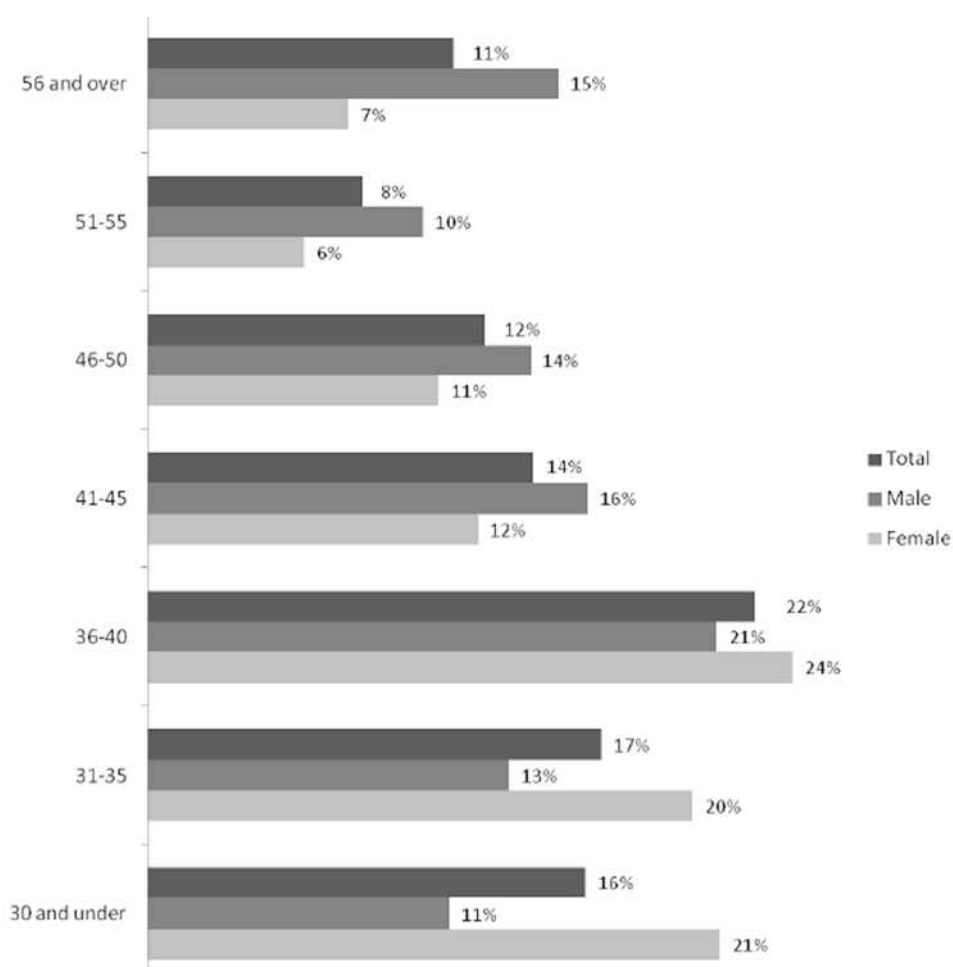


Figure 7 - Percentage of Each Age Group by Gender

Education

As shown in Figure 8, there are considerable variations with respect to the education level of respondents. While 9% and 2% of the respondents have Bachelors and Masters degrees, 59% have only a primary education, 20% have an ordinary level secondary education, 2% have an advanced level³ secondary education, and 8% have other certificates or diplomas not included in the previous categories.

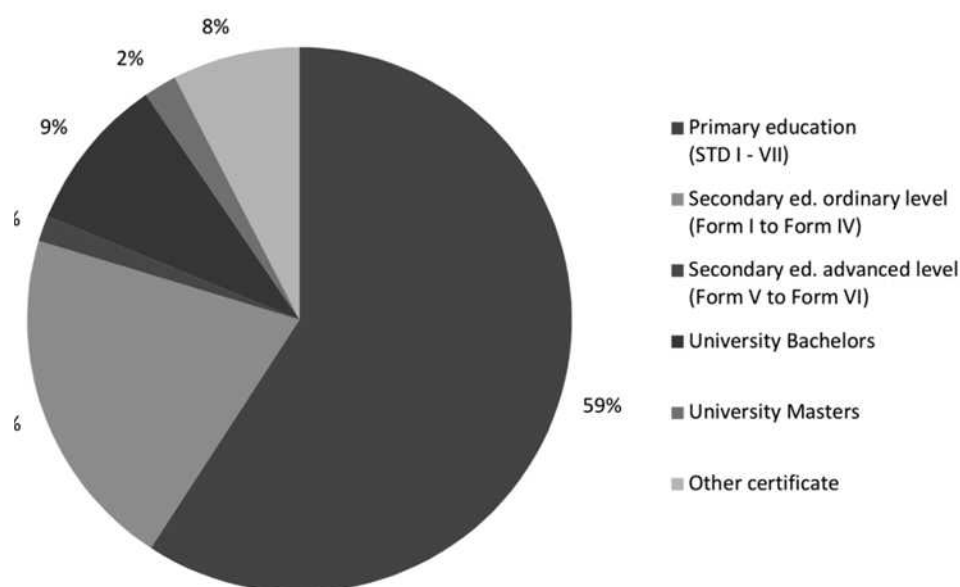


Figure 8 - Education Level

There is an evident difference between men and women in terms of education level. Women are overrepresented among those with only a primary education, while the percentage of men is higher among those who have a university degree (Table 3).

Table 3 - Education by Gender

		Female	Male	Total
Education Level	Primary education	64.5%	54.2%	59.3%
	Secondary education	22.0%	21.7%	21.9%
	University education	7.4%	15.1%	11.3%
	Other certificate	6.1%	9.0%	7.6%
Total		100.0%	100.0%	100.0%

³This education level is preparatory for accessing the University

Household Size

According to the findings in Figure 9, the majority (42%) of sampled households had a family size of 3 or 4 people, 29% had a family size of 5 or 6 people, 13% had 7 or more members, while 16% had less than 3 members. The distribution of household size is very similar for each of the three municipalities.

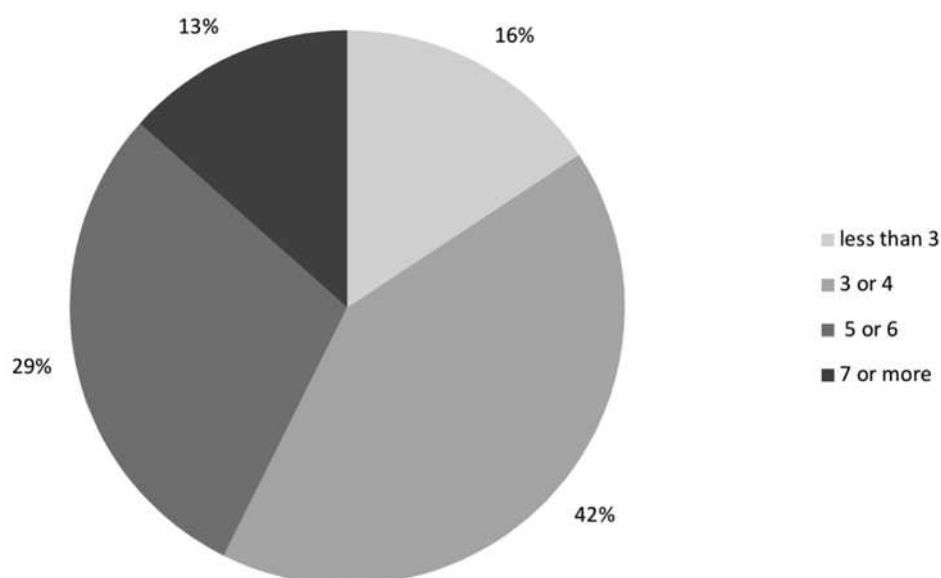


Figure 9 - Number of Household Members

3.1.3 Cash/Noncash Income Generating Activities

The surveys also collected information on household income, which was used to calculate the average income of the households sampled as well as income distribution by ward.

The monthly income levels of the respondents in the surveyed areas are displayed in Figure 10, which shows the ranges for the values of monthly household income.

The range of income variation is quite wide: most respondents (44%) have a monthly income between 150,000 and 300,000 Tanzanian Shillings⁴ (TZS). A significant proportion of respondents (21%) earn between TZS 50,000 and 150,000, while 16% earn between 300,000 and 500,000 TZS and 10% between 500,000 and 900,000.

Only 5% of the total respondents reported to be earning over TZS 900,000 per month, while 4% appear to earn a very low income of less than 50,000 TZS per month.

⁴1000 Tanzanian Shilling correspond to 0.48 Euro

(source: http://ec.europa.eu/budget/contracts_grants/info_contracts/infoeuro/infoeuro_en.cfm accessed march 2012)

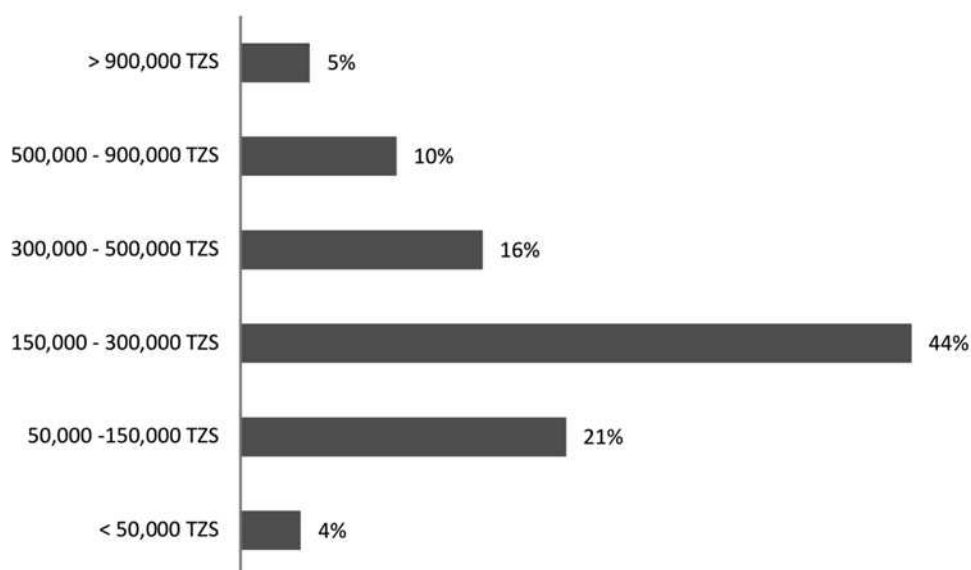


Figure 10 - Percentage Distribution of Monthly Household Income

Income level is unequally distributed among the different wards. The wards with the highest income levels are Msasani and Kunduchi (Figure 12), where the average monthly household income was above the mean for all sampled households (Figure 11). All other wards were below that mean, and the ward with the lowest average income was Upanga Mashariki.

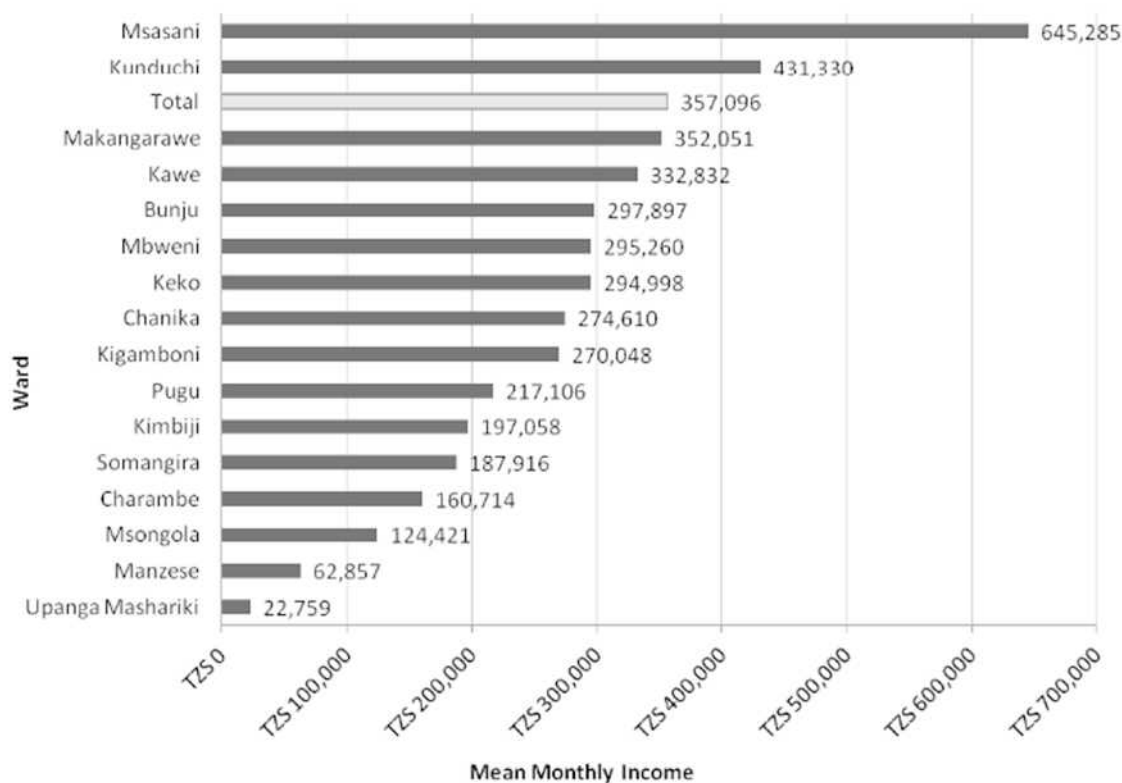


Figure 11 - Monthly Income Mean by Ward

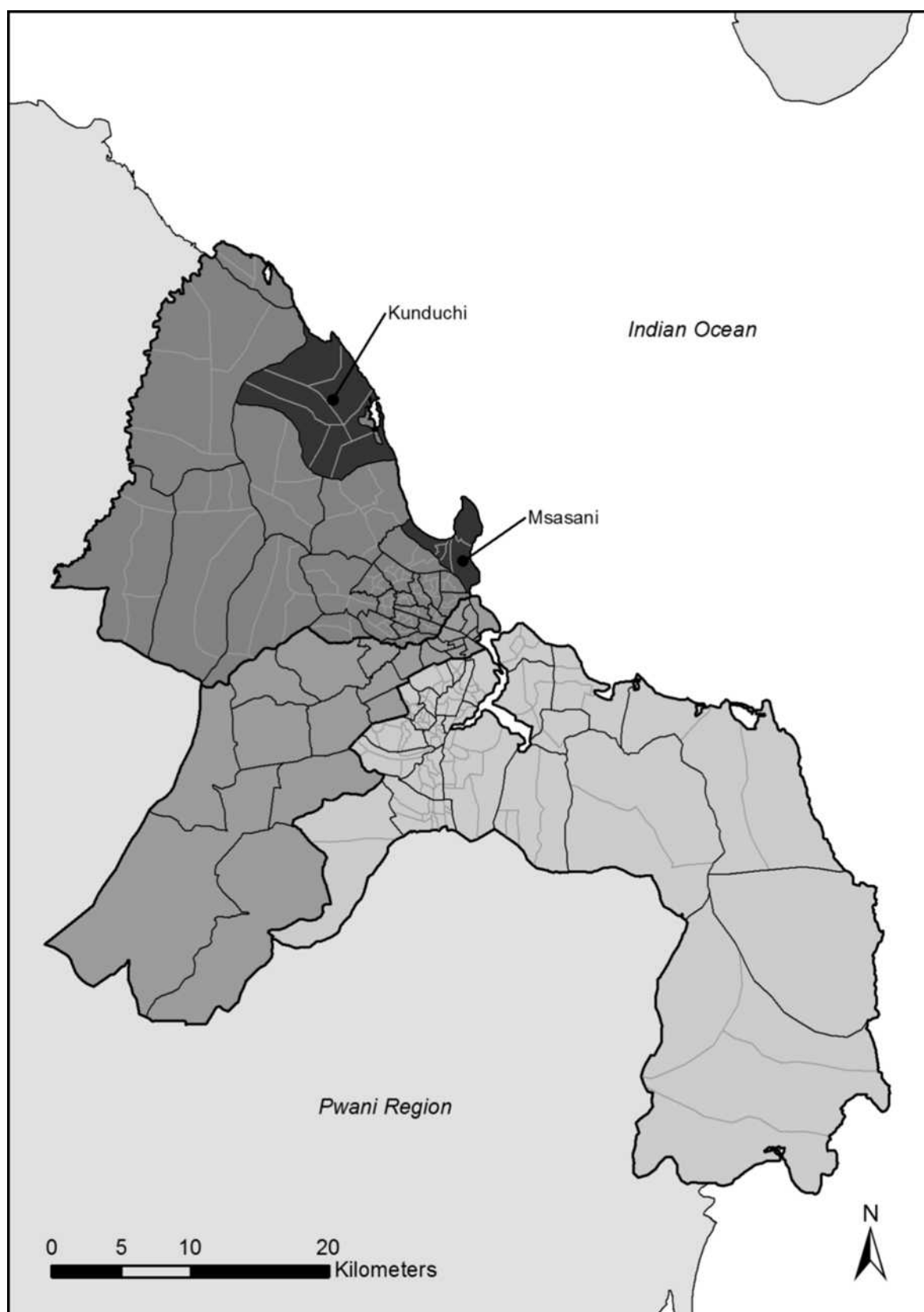


Figure 12 - Wards with Mean Income Levels above the Total Sample Mean

Sources of Household Income and Livelihood

Households are engaged in a wide variety of cash and non-cash income generating activities, and most of the households sampled practice several activities.

The aim of the study was to investigate the interdependence between peri-urban households, urban income generating activities and activities related to natural resource management (e.g. agriculture, fishing, etc.). Six main sources of income were identified: agriculture, livestock, charcoal making, fishing, shop/small business, and employment in urban areas (institutions, shops, etc.). These also included self-employment, where individuals received payment in kind, salary/wage employment and informal jobs. A list of other income generating activities has also been compiled, and shows that many of the households sampled also engaged in other activities as their main source of income, like brick making, tailoring, plumbing, security services, building and construction (mason), and others. Figure 13 shows the main sources of income for all the sampled households. About 27% of respondents were employed in urban areas, while 19% were engaged in agriculture as their main source of income. Only 8% worked with livestock, 2% in fishing and 1% in charcoal making.

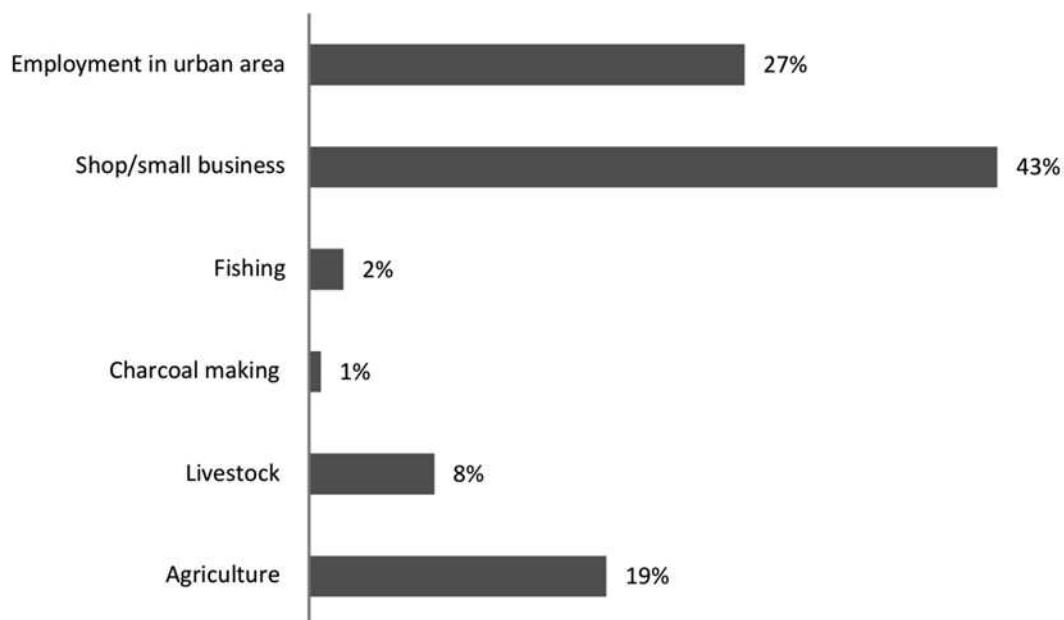


Figure 13 - Main Source of Household Income

Figure 14 displays the percentages of men and women engaged in various activities as their main source of income. There are differences in main source of income between the men and women interviewed. While men are overrepresented among those employed in urban areas (37% compared to 26% of women), women are overrepresented among those employed in shops/small businesses (57% compared to 42% of men)



Figure 14 – Main Source of Income by Gender

Income generating activities are distributed differently among the sampled wards, as shown in Table 4. Charambe, Msongola, Kimbiji and Somangira are the wards where sample households are mainly engaged in rural activities (agriculture) as their main source of income. These are located in south Temeke and in southwest Ilala (Figure 16). Contrarily, Bunju, Keko, Kigamboni and Pugu have a high percent of commercial activities, while in Msasani and Kawe most of households work in urban areas. Choice of activity seems to be linked to the distance from the city centre. Indeed, Msasani and Kawe are close to the city centre, while Bunju, Kigambini and Pugu are further away, but still located near main roads, facilitating transportation of goods and trade. On the other hand, the wards where the main source of income is agriculture are located in low-density areas and are quite far from the main transport routes.

Table 4 - Main Source of Income by Ward

Municipality	Ward	Main Source of Income						Total
		Agriculture	Livestock	Charcoal making	Fishing	Shop/small business	Employment in urban area	
Ilala	Pugu	22%	4%	0%	1%	58%	15%	100%
	Upanga Mashariki	44%	33%	0%	0%	23%	0%	100%
	Chanika	45%	4%	3%	0%	25%	23%	100%
	Msongola	57%	25%	1%	0%	16%	1%	100%
	Total Ilala	41%	12%	2%	1%	33%	13%	100%
Kinondoni	Bunju	5%	5%	1%	3%	70%	17%	100%
	Kawe	7%	3%	0%	3%	44%	42%	100%
	Kunduchi	5%	3%	0%	4%	49%	38%	100%
	Manzese	44%	36%	0%	0%	21%	0%	100%
	Mbweni	21%	7%	1%	3%	32%	35%	100%
	Msasani	1%	1%	0%	0%	42%	55%	100%
	Total Kinondoni	6%	4%	0%	3%	47%	39%	100%
Temeke	Charambe	74%	11%	6%	0%	9%	0%	100%
	Keko	5%	14%	0%	0%	55%	26%	100%
	Kigamboni	6%	3%	1%	6%	67%	18%	100%
	Kimbiji	82%	7%	0%	7%	1%	1%	100%
	Makangarawe	29%	21%	3%	0%	34%	13%	100%
	Somangira	73%	12%	1%	5%	7%	2%	100%
	Total Temeke	23%	11%	1%	3%	45%	17%	100%

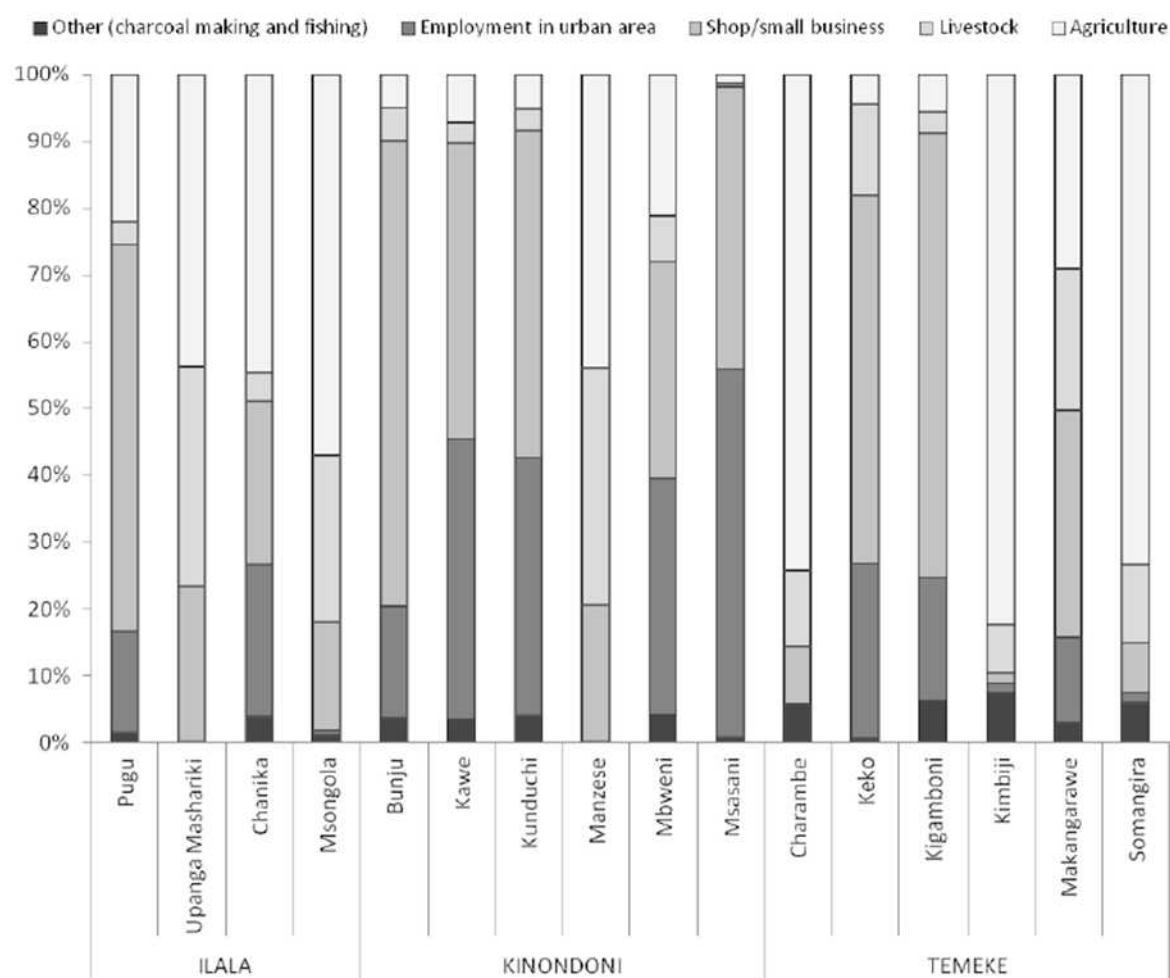


Figure 15 - Main Source of Income by Ward

Figure 15 displays the distribution of income source by ward, reflecting spatial differentiations for income production.

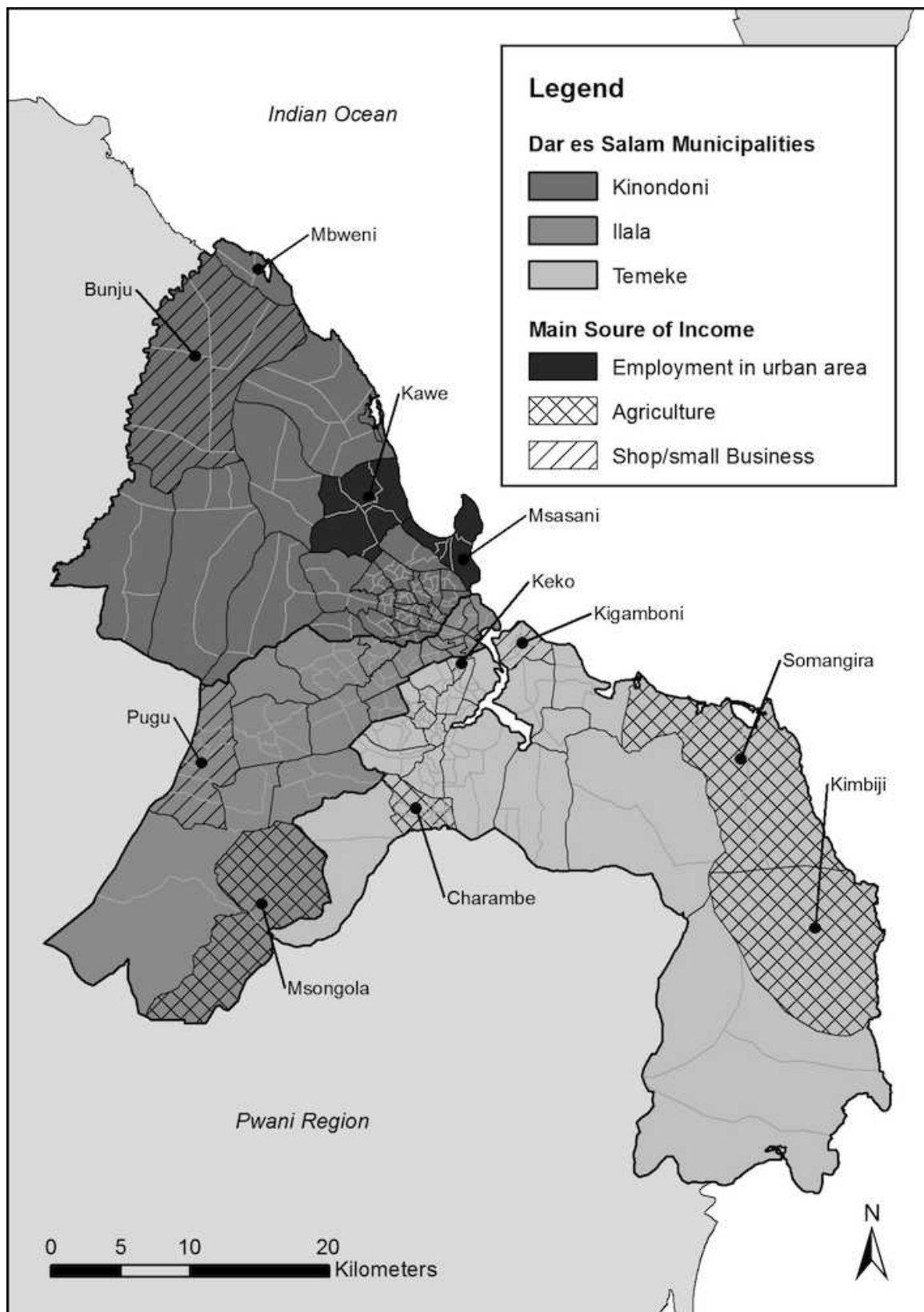


Figure 16 - Main Source of Income by Ward - Map

Secondary activities were also explored through the questionnaire. Figure 17 shows the percentage of households who work in exchange for food and goods or in agriculture as secondary sources of income. Among the sampled households, about 20% work in farming as a secondary job, often in exchange for food and goods. Households whose main source of income comes from employment in urban areas or charcoal making are mainly engaged in farming as a secondary activity, while those working in livestock and agriculture as their main source of income mainly work in exchange for food and goods as secondary activities (Figure 17).

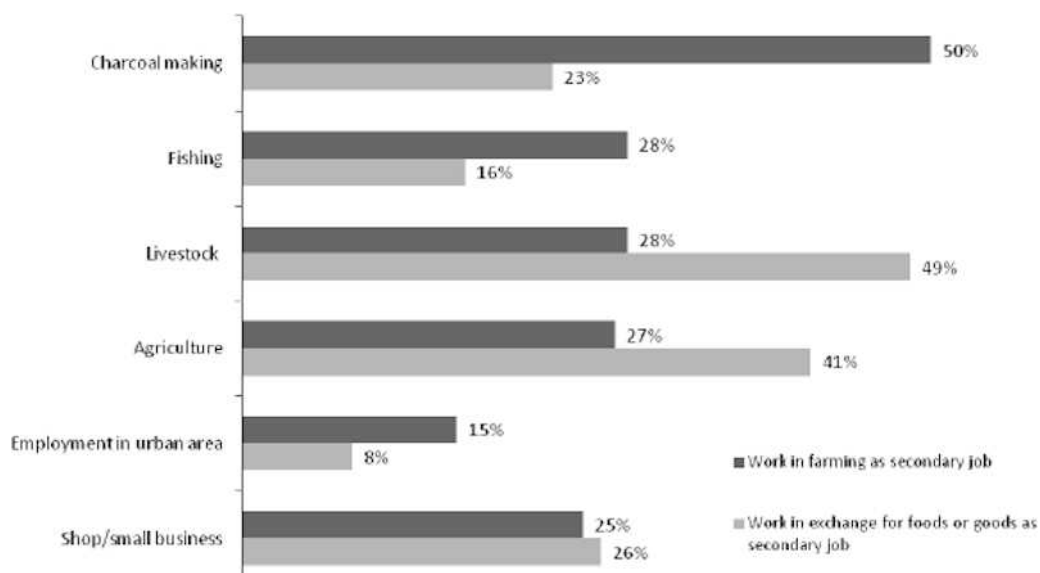


Figure 17 - Main Source of Income by Secondary Activity

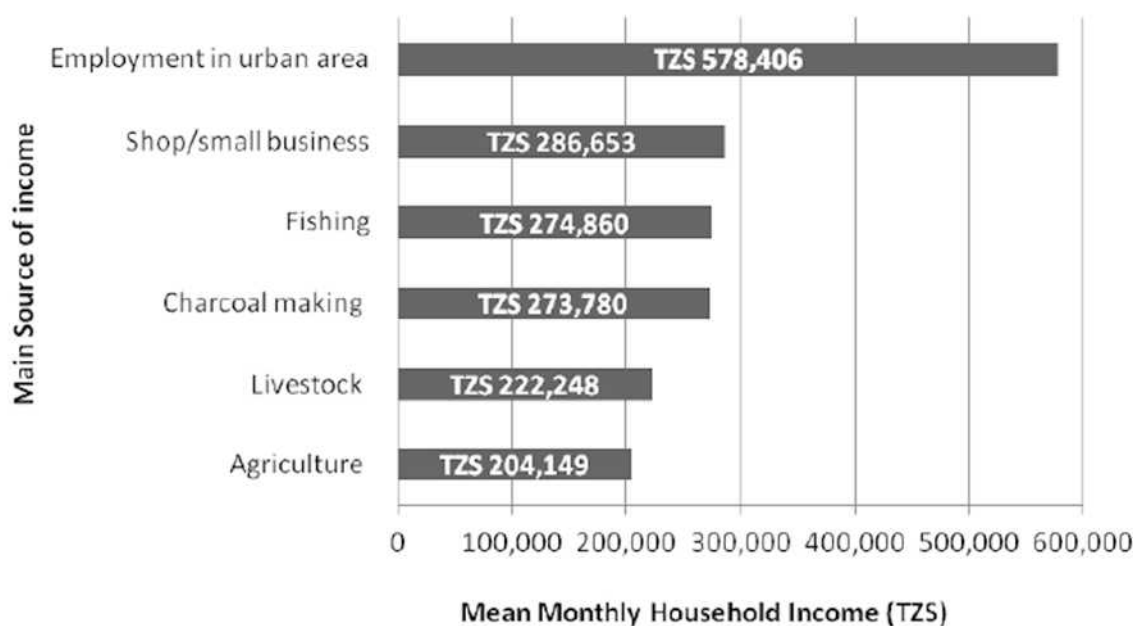


Figure 18 - Mean Monthly Household Income by Main Source

The implications of activity type as regards income level have been examined according to the mean household income by source. Figure 18 presents the mean of monthly household income across all the households engaged in different activities. The highest mean value is for employment in urban areas, while the others sources of income have quite similar mean values of, approximately 200,000 TZS.

3.2 Rural-Urban Interaction

In Dar es Salaam, local government addressed the problem of rural-urban integrated planning by designing a Strategic Urban Development Plan in 1999 (SUDP, 1999). However, plans for land use, zoning and building regulation are still designed along relatively rigid urban/rural divides. While detailed urban plans exist that regulate building activity within pre-defined “urban” boundaries, development and land use plans in the remaining extra-urban domain, even if regulated by numerous Land Acts at the national level, are still inconsistent. 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.

The analysis of the empirical data, collected in the 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.

3.2.1 Migration

This section seeks to understand if the households in the sampled areas are stably settled, or if they recently migrated from other areas. It also aims to clarify trends in and reasons for migration, in order to understand if migration is mainly unidirectional, i.e. from other rural regions of Tanzania to Dar es Salaam, or if it is multidirectional, i.e. from outside and within Dar es Salaam or within the same municipality.

The sampled areas are very dynamic and relatively young settlements. Figure 19 shows that most of households settled between 2001 and 2005 (40%), while the percentage of households settled before 1991 was 18%, 11% between 1990 and 1995, 16% between 1996 and 2000 and 14% after 2006, all of which are quite close. This trend could be linked to the acceleration of structural and institutional reforms, and to the financial and administrative decentralization undertaken at the end of 1990s. These processes, together with debt reduction initiatives (Heavily Indebted Poor Countries (HIPC) Initiative in April, 2000), led to improvement in national and foreign investments and increased investments flows, allowing the government to increase budgetary expenditures in social and other sectors, such roads and infrastructure (Muganda, 2004).

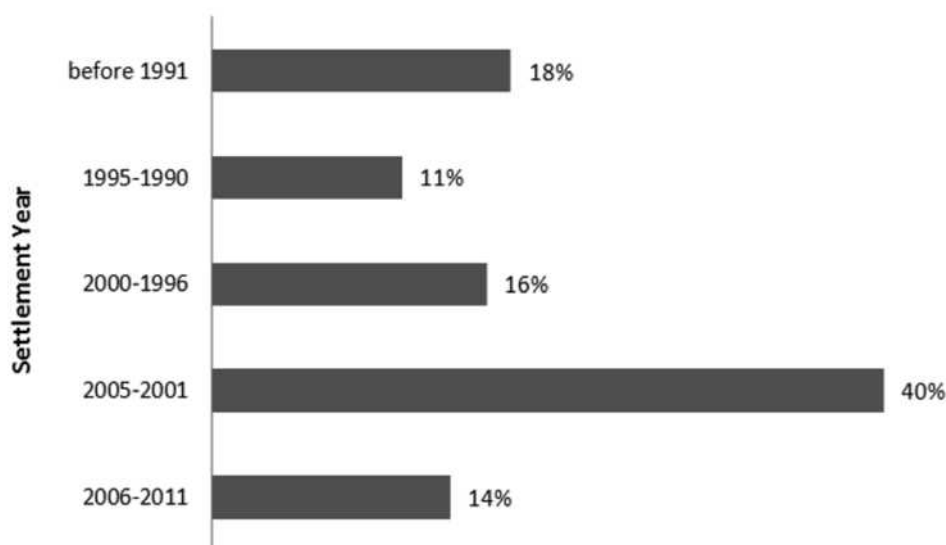


Figure 19 - Household Settlement Year

Places of origin, intended as the place of settlement immediately prior to the current one, appear almost equally distributed. In the 16 sampled wards, the majority of households surveyed came from other Tanzanian regions (36%), but similar percentages of households came from the same region of Dar es Salaam (34%) and moved within the same municipality (30%) (Figure 20).

According to these results, the development of peri-urban areas is almost equally due to rural-to-urban migration flows and to internal migration (from the city centre to peri-urban areas and the opposite). An urban to peri-urban household movement also exists, often induced by the upgrading programmes undertaken in those areas closer to the city centre, from which several interviewees had come.



Figure 20 - Household Location Immediately Prior to Current Site

Internal migration is evident in Ilala and Temeke municipalities, where the percentages of households coming from the same municipality (39% and 44% respectively) are higher than in others. In Ilala there is also a consistent portion of households coming from the same region (42%). By contrast, in Kinondoni the percentage of households coming from other regions is higher (45%) than households coming from the same municipality (18%) (Figure 21). Considering that Ilala is the oldest and densest part of the city and the Temeke is the least urbanized municipality, the percentages in Figure 18 demonstrate that movements within the same municipality or to another municipality of Dar es Salaam are undertaken within more densely built-up areas, into peri-urban areas (Ilala), and in less dense peri-urban areas (Temeke).

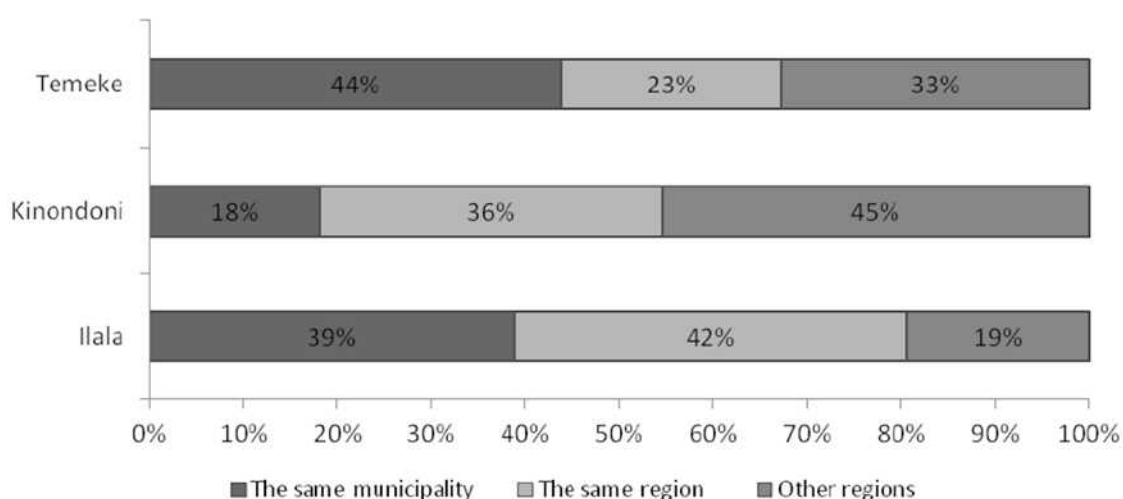


Figure 21 - Households' Previous Place of Settlement

Investigation of the contribution of the different wards to households' movements within the three municipalities reveals that each municipality has wards where the trend of movement is more evident. The cross-tab illustrating the previous place of settlement by ward (Table 5) shows that in the Ilala wards of Chanika and in Pugu, households coming from the same municipality or the same region are overrepresented. Among the Kinondoni wards, households from other regions are overrepresented in the Msasani wards, while in the Temeke ward Keko households from the same municipality are overrepresented.

Table 5 - Previous Place of Settlement by Ward

Municipality	Ward	Previous Place of Settlement			Total
		The same district	The same region	Other regions	
Ilala	Pugu	16%	69%	15%	100%
	Upanga Mashariki	76%	2%	22%	100%
	Chanika	51%	33%	16%	100%
	Msongola	50%	16%	34%	100%
	Total Ilala	39%	42%	19%	100%
Kinondoni	Bunju	26%	42%	32%	100%
	Kawe	14%	43%	43%	100%
	Kunduchi	19%	37%	43%	100%
	Manzese	72%	2%	26%	100%
	Mbweni	19%	19%	61%	100%
	Msasani	9%	33%	58%	100%
	Total Kinondoni	18%	36%	45%	100%
Temeke	Charambe	23%	31%	46%	100%
	Keko	61%	19%	20%	100%
	Kigamboni	38%	19%	43%	100%
	Kimbiji	32%	21%	47%	100%
	Makangarawe	25%	52%	23%	100%
	Somangira	32%	23%	45%	100%
	Total Temeke	44%	23%	33%	100%

Furthermore, Figure 22 shows that most of the respondents (35%) have indicated the purchasing of a piece of land as their reason for moving to the area where they currently live. Among them, people coming from the same municipality are overrepresented (Table 6).

Many households also moved in order to look for a job (21%) or for self-employment (15%), and these people came mainly from other Tanzanian regions. Others moved to be closer to or visit family members (12%) and then settled stably. These respondents come mainly from the same municipality, but there is also a considerable portion coming from other regions. Others moved for business purposes (9%) or to find an area with more space for living and working (e.g. to have the possibility of practicing agriculture or free husbandry). Peri-urban areas attract many people seeking a place that enables them to undertake or continue rural activities simultaneously and to be close to urban dynamics, benefits and facilities. Few people were required to move for reasons beyond their control, like job transfer (8%) and government decision (1%), and these two reasons occurred for people from remote areas that the government designated for cultivation, deforestation and wild animal control.

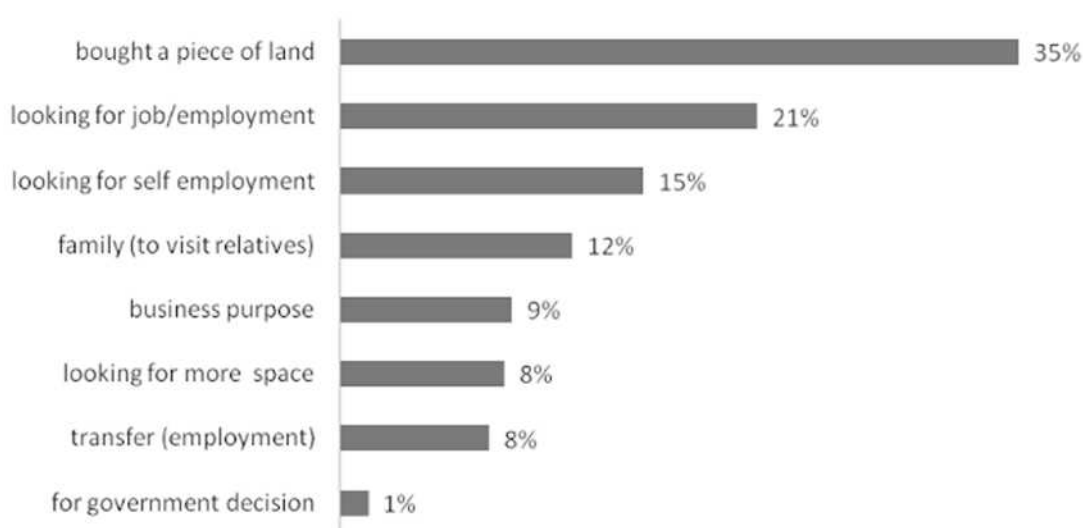


Figure 22 - Reasons for Households' Transfer to Current Location

It has also come to light that, among those who moved to purchase a piece of land, almost all did indeed do so, but not all of them have a title deed. More specifically, 94% of the respondents who moved to purchase land bought the plot where they currently reside, but only 65% have a title deed (fig.23).

This implies that a considerable portion of households own land without a "formal" certificate.

Table 6 - Cross-tabulation of Reason for Movement and Previous Place of Settlement

		Previous Place of Settlement			Total
		The same municipality	The same region (DSM)	Other regions	
Reason of movement	Looking for more space for animal husbandry and/or agriculture	10%	9%	7%	8%
	Bought a piece of land	42%	45%	20%	35%
	Looking for job/employment	16%	17%	29%	21%
	Transfer (employment)	4%	4%	14%	8%
	Looking for self-employment	14%	17%	15%	15%
	Government decision	1%	2%	1%	1%
	Business purpose	7%	7%	11%	9%
	Family (to visit relatives)	17%	9%	11%	12%
Total		100%	100%	100%	100%

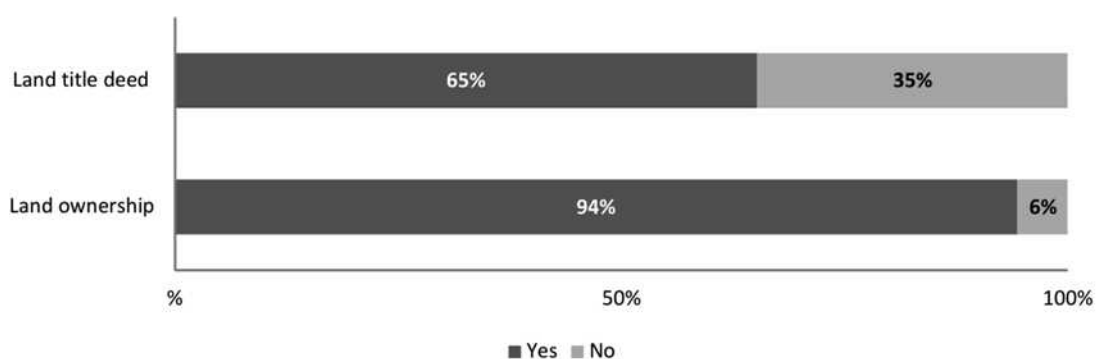


Figure 23 - Households who Moved to Buy Land by Current Ownership and by Title Deed

As for the individual variables, the analysis also shows the relation between education level and the reason for movement. People with a basic education (primary school) are overrepresented among those who moved looking for more space for animal husbandry, agriculture, and self-employment. Among those who moved due to a job transfer, on the other hand, people with a university education are overrepresented; those moved looking for employment have mainly a secondary or a university education.

3.2.2. Rural Activities

This section aims to understand how and to what extent peri-urban households are engaged in rural activities, and if those activities take place close to home or in other locations.

Figure 24 shows that shop/small business is the main income activity most practiced close to home (49%). Livestock keeping (fig. 26) and agriculture also take place near people's residences, as well as many other activities (20%) like brick making, tailoring, carpentry, mat making, and water selling.

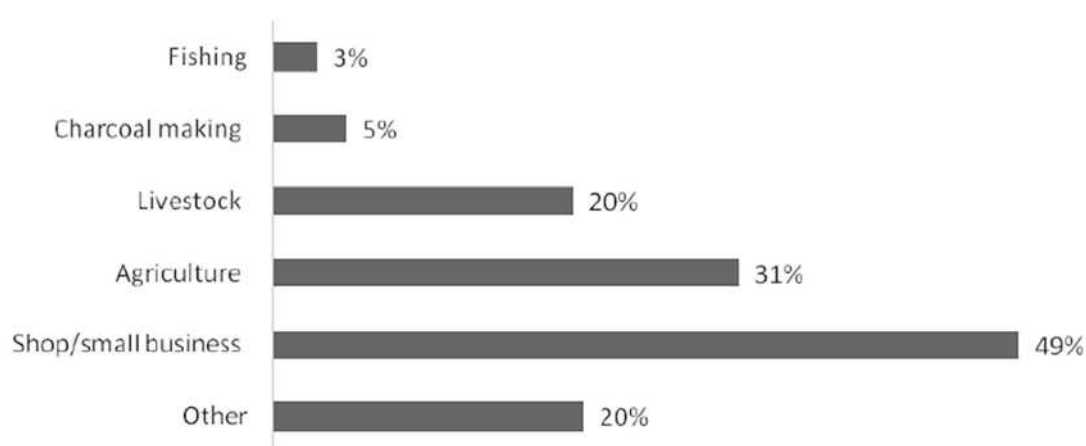


Figure 24 - Main Activities Undertaken Close to the Home

As shown in the analysis of cash-noncash income generating activities, a considerable portion of respondents practice agriculture as their main source of income. The types of crops being grown have been assessed for their varying sensitivities to environmental change, and it has emerged that the type of crop affects both perception of environmental changes and adaptation strategies. The most common crops are cassava and maize, while fruits, with the exception of coconut and banana, are less common (Figure 25).

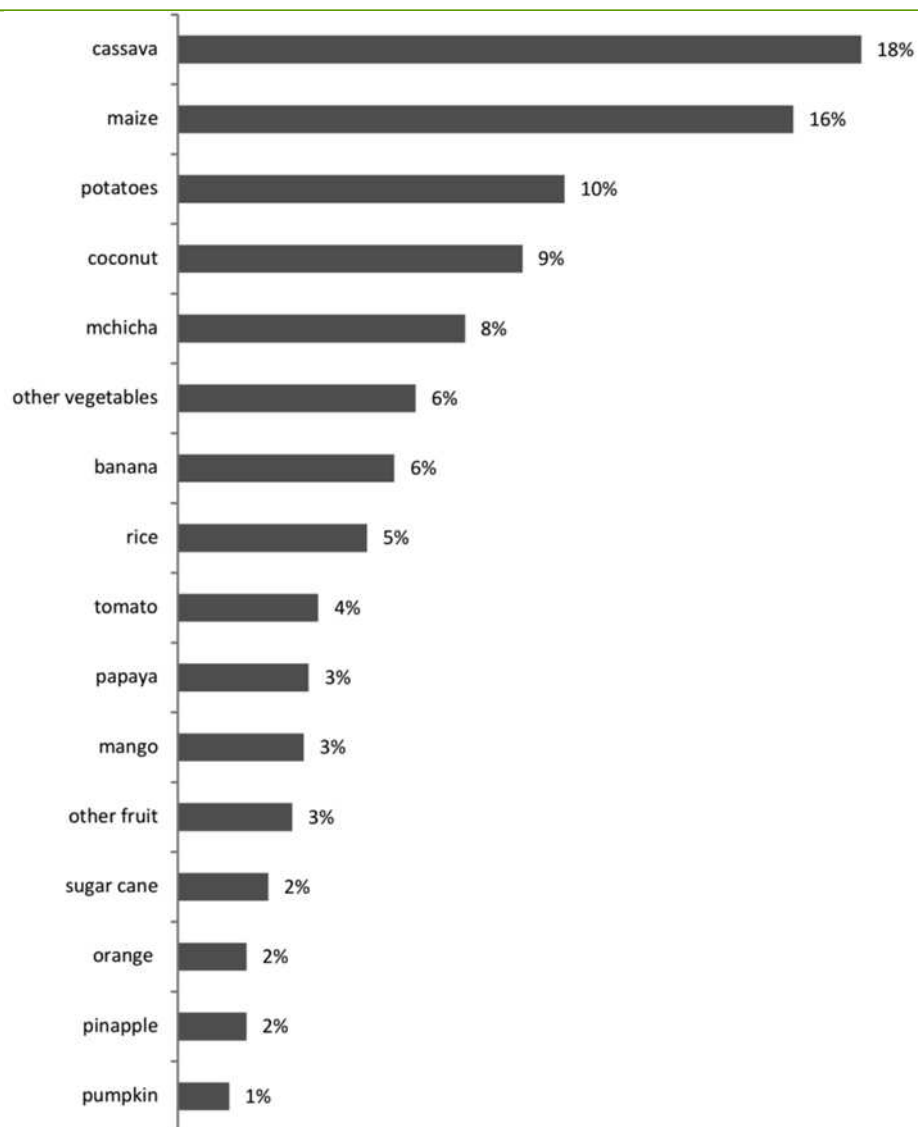


Figure 25 - Types of Crop

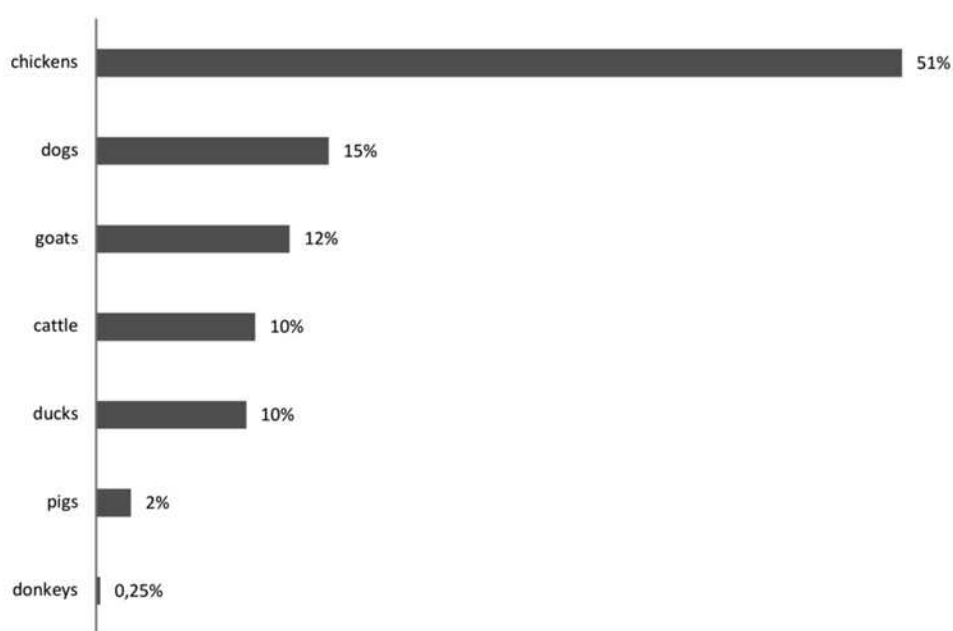


Figure 26 - Types of Livestock

3.2.3 Relationship with the City Centre

Movement of people 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 implicates that a plurality of activities and physical patterns exist which are based on urban and peri-urban interdependencies. There is not much difference between the numbers of those who travel to the city centre almost every day (31%), on a weekly basis (29%), about twice a month (18%) and rarely (22%) (Figure 27).

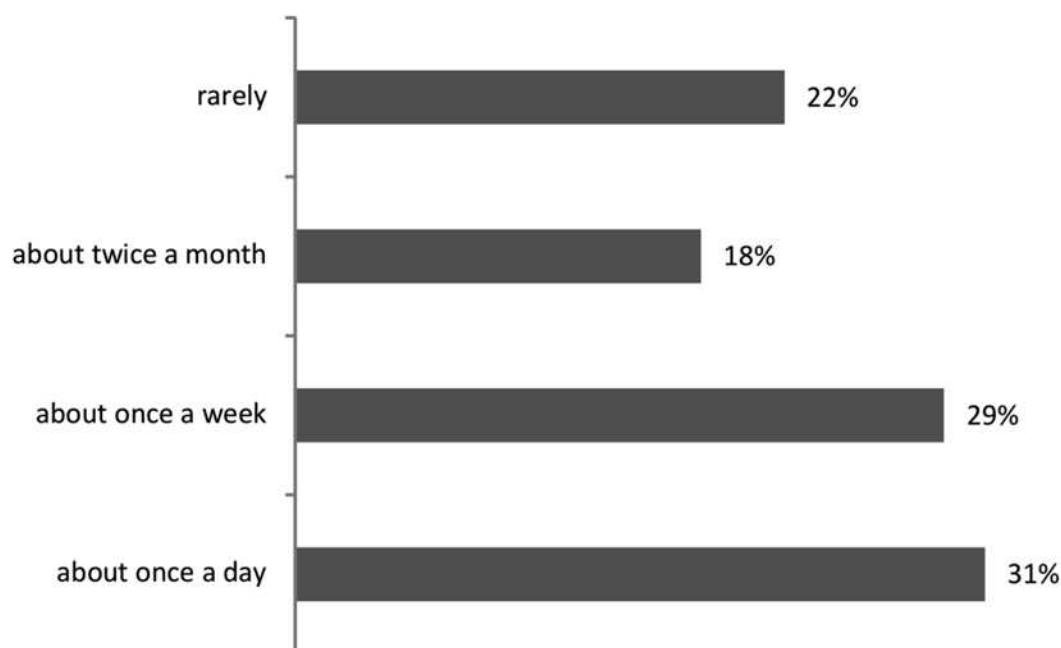


Figure 27 - Frequency of Travel to the City Centre

Nevertheless, the research has found that there is a strong dependence on the city centre, and almost all respondents have to travel there at least once a month. They do so mainly for the purpose of shopping (68%), and less so for work reasons (30%), selling purposes (16%), health services (16%), or to access education services (2%) (Figure 28).

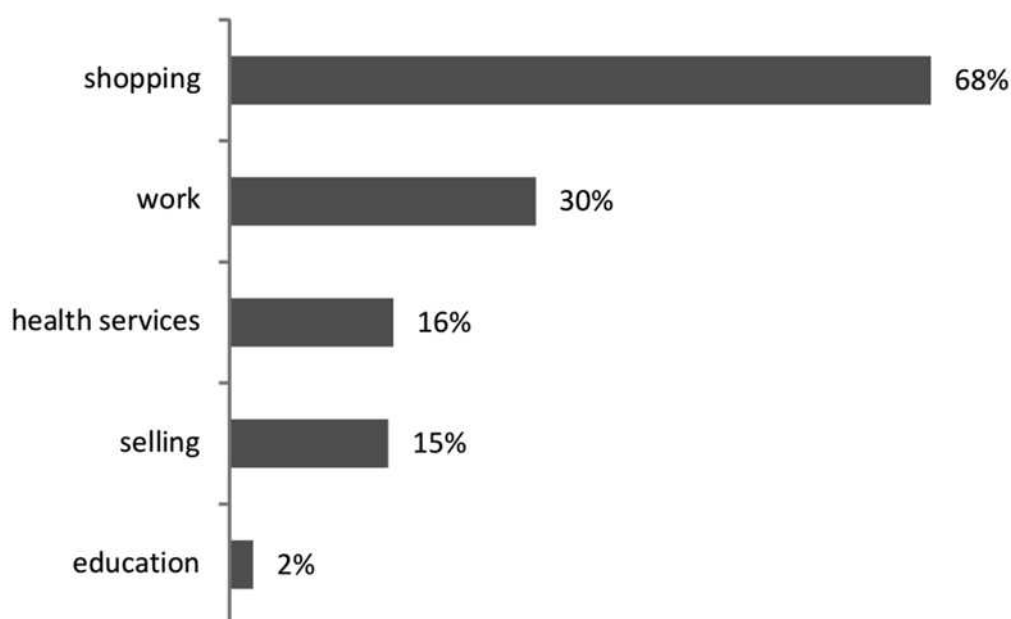


Figure 28 - Main Reasons for Journeys to the City Centre

FINDINGS

Journeys to the city centre are possible thanks to the local bus system (daladala) which serves almost every area of the region and is used by 81% of the respondents, while only 16% use a private car. Furthermore, in remote areas not reachable with daladala, the mode of transport is supplemented by motorcycles and small vehicles (Bajaj and pikipiki) (Figure 29).

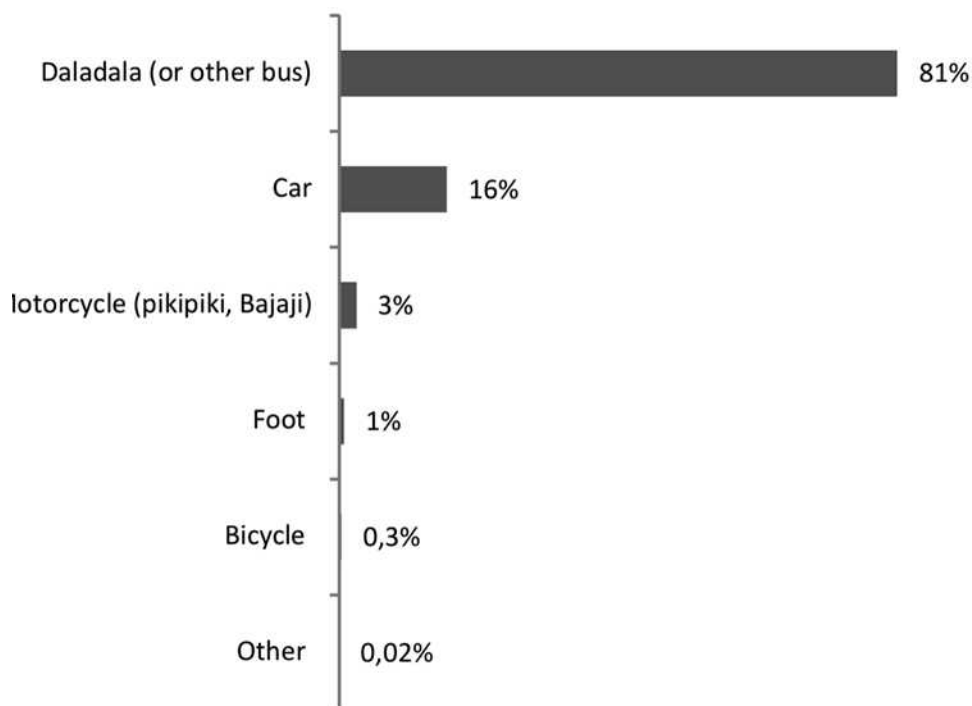


Figure 29 - Main Means of Transportation to the City Centre

To understand whether peri-urban areas are considered temporary settlements, the desire of respondents to move to the city centre or close by in the future has been also investigated. The majority of respondents (71%) want to stay in the peri-urban area and to live in environments with "free" spaces, while only 29% wish to move to the city centre, or a more urbanized area with better infrastructure and facilities (Figure 30).

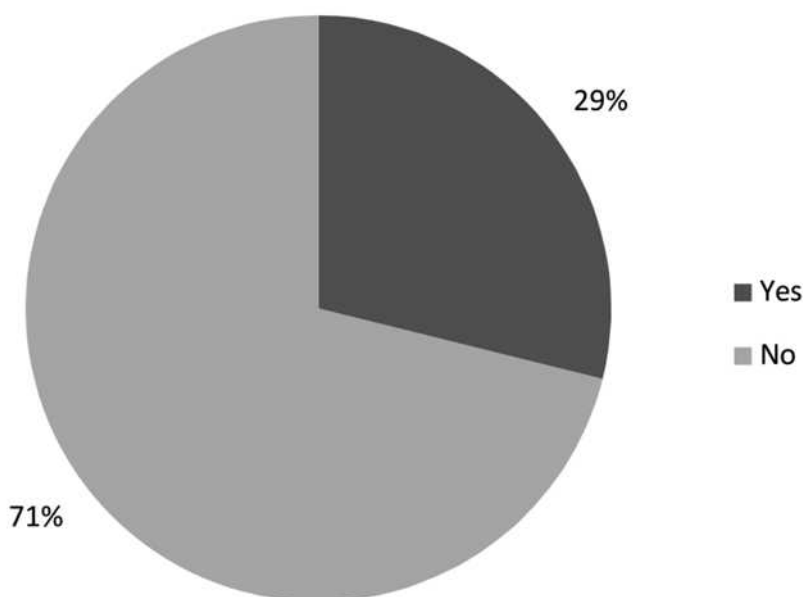


Figure 30 - Willingness to Move to City Centre

By comparing these answers with the reasons why individuals usually travel to the city centre, the study has revealed that those who travel for work- or study-related reasons are more likely to move to the city centre. Conversely, those who travel for shopping purposes prefer to stay in peri-urban areas (Table 7).

Willingness to move to the city centre is obviously linked to income source: if the main source of income is dependent on natural resources (agriculture, fishing, etc.), a higher percentage of respondents want to remain in peri-urban areas, while the opposite is true for those employed in urban areas and in shops or small businesses.

Even among respondents employed in urban areas and in shops or small businesses as their main source of income, those who also practice farming as secondary activity prefer to stay in peri-urban areas (Table 8).

Table 7 - Crosstab of Willingness to Move to City Centre and Reason for Journeys to City Centre

		Willingness to move to the city centre		Total
		Yes	No	
Reason for travelling to the city centre	Work	41%	59%	100%
	Selling	28%	72%	100%
	Shopping	26%	74%	100%
	Health services	36%	64%	100%
	Education	80%	20%	100%
Total		28%	72%	100%

Table 8 - Relation between Main Income Source, Secondary Activity and Willingness to Move to City Centre

		Willingness to move to the city centre		Total
		Yes	No	
Employment in urban area as main income source and farming as a secondary job	Yes	25%	75%	100%
	No	36%	64%	100%
Total		35%	65%	100%
Shop/small business as main income source and farming as a secondary job	Yes	14%	86%	100%
	No	38%	62%	100%
Total		32%	68%	100%

FINDINGS

Analysis of individual variables demonstrates that willingness to move to the city centre is also linked to age. While those who want to move to the city centre are overrepresented in age groups under 45 (especially under 35), those who prefer to stay in peri-urban areas are overrepresented in age group over 46 years (Table 9).

Table 9 - Willingness to Move to City Centre by Age

		Age group			
		35 and under	36 to 45	46 and over	Total
Willingness to move to city centre	Yes	32%	31%	23%	29%
	No	68%	69%	77%	71%
Total		100%	100%	100%	100%

Even education level seems to influence the desire to move to the city centre. While those who want to move to the city are overrepresented in higher education groups, those who want to stay in the same place have mainly a primary education level (Table 10).

Table 10 - Willingness to Move to the City Centre by Education Level

		Education level				
		Primary education	Secondary education	University education	Other certificate	Total
Willingness to move to city centre	Yes	26%	31%	37%	38%	29%
	No	74%	70%	63%	62%	71%
Total		100%	100%	100%	100%	100%

3.3 Access to Resources

The section of the questionnaire regarding access to resources aimed, on the one hand, to investigate the modalities of accessing resources such as water, land and energy, and the presence or absence of related facilities, including solid and liquid waste collection. On the other hand, it also sought to identify obstacles and opportunities in adaptation to climate change in peri-urban areas. Access to water, land, shorelines, sea and raw materials constitute determining factors in adaptive capacity. Access to land, water, energy and service such as waste management is often an “informal” process, based on social networks and direct relation with the environment. The payment of taxes might be an indicator of a household’s use of “formal” services, even if the multiple and indirect existing methods of accessing services and paying taxes/fees prevent a direct relation. Nevertheless, the information on taxes/fees is useful for understanding the level of expenses incurred by families. While most households pay for electricity and access to water (64% and 78% respectively) only a few households pay for wastewater collection (10%) (Figure 31).

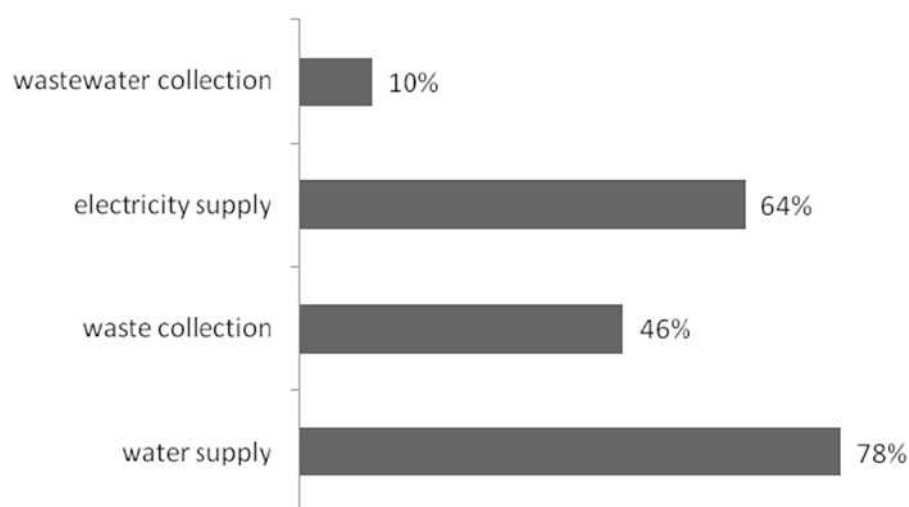


Figure 31 - Percentage of Households Paying Taxes/Fees to Access Resources and Services

3.3.1 Land Characteristics and Land Tenure

The land tenure regime arises as an important issue linked to income source and food production. Most respondents (67%) own the land where they live and almost all of them (97%) bought the same land and have a title deed (97%). Furthermore, 64% pay taxes for their land and/or house, 60% bought the land and 47% hold a title deed (Figure 32).

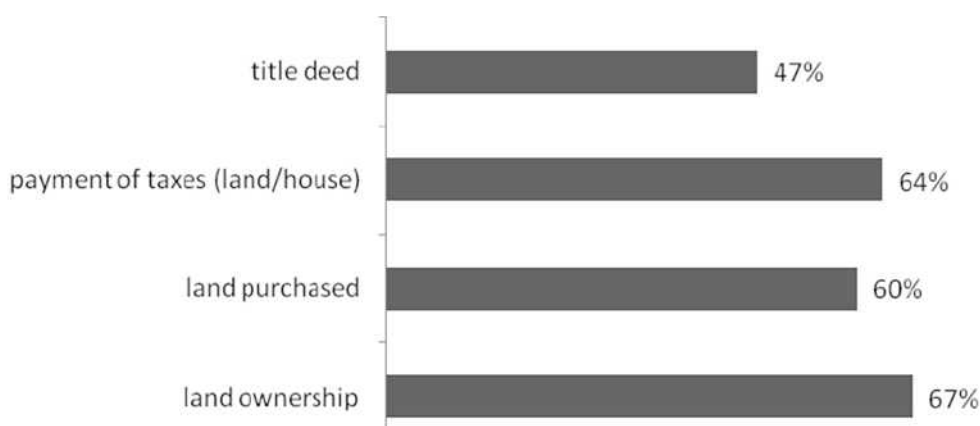


Figure 32 - Characteristics of Land Title, Ownership, Transaction and Tax Payment

FINDINGS

It has been determined that there is no relation among land ownership, titling and payment of taxes. In fact, among households without land ownership or title deeds, those who pay taxes on their land and house are overrepresented.

This means that there are “indirect” and informal fiscal systems. For example, people who don’t have a title deed and rent their land or their house from other landowners may also pay taxes to the owner for services or land use.

It is also evident that there is a wide range in tax payment, from 1000 TZS to more than 25.000 TZS per month, and while the percentage of people paying less than 1000 TZS is the highest (32%), distribution across the other tax brackets is fairly consistent (Figure 33).



Figure 33 - Monthly Taxes on Land and House (TZS)

Figure 34 shows that the tax expenses for land and/or house and fees are higher in Kinondoni municipality, particularly in Msasani and Kawe wards, which have a high income level

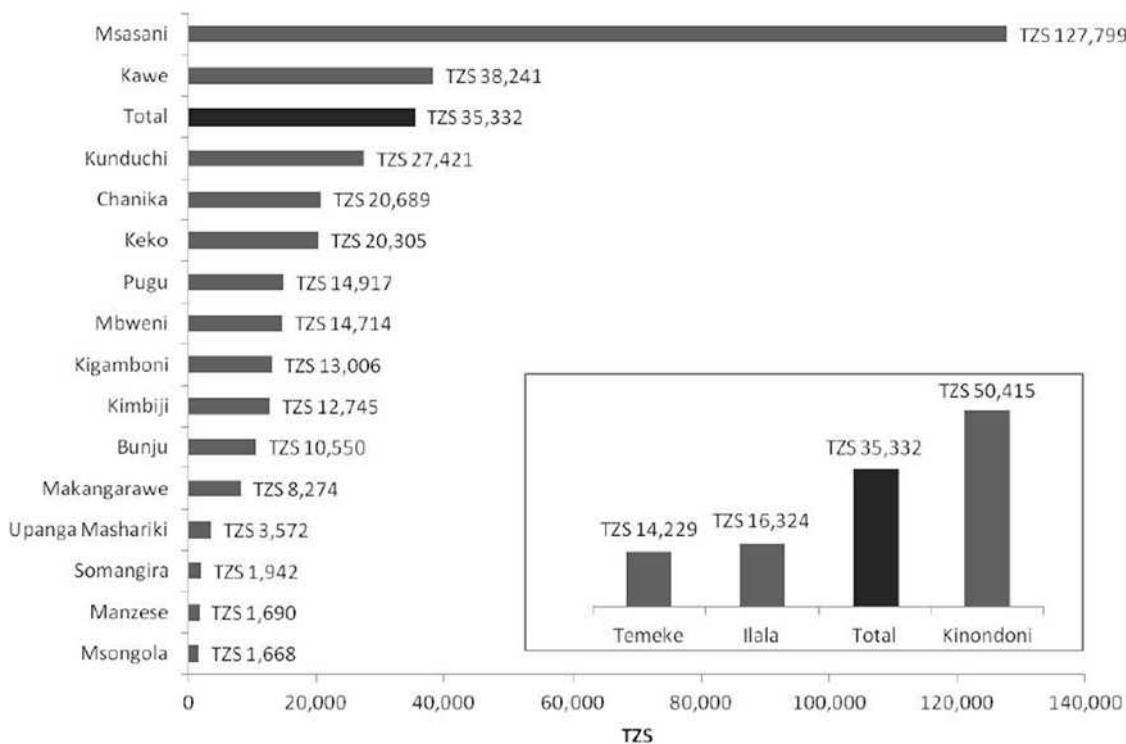


Figure 34 - Monthly Tax Expenses for Land and/or House by Ward and Municipality

3.2.2 Access to Other Resources and Services

Monthly expenses for water, waste, electricity and wastewater vary among households. Expenses have been divided into classes for each service, reflecting a wide range of expenses, as shown in Figure 35.

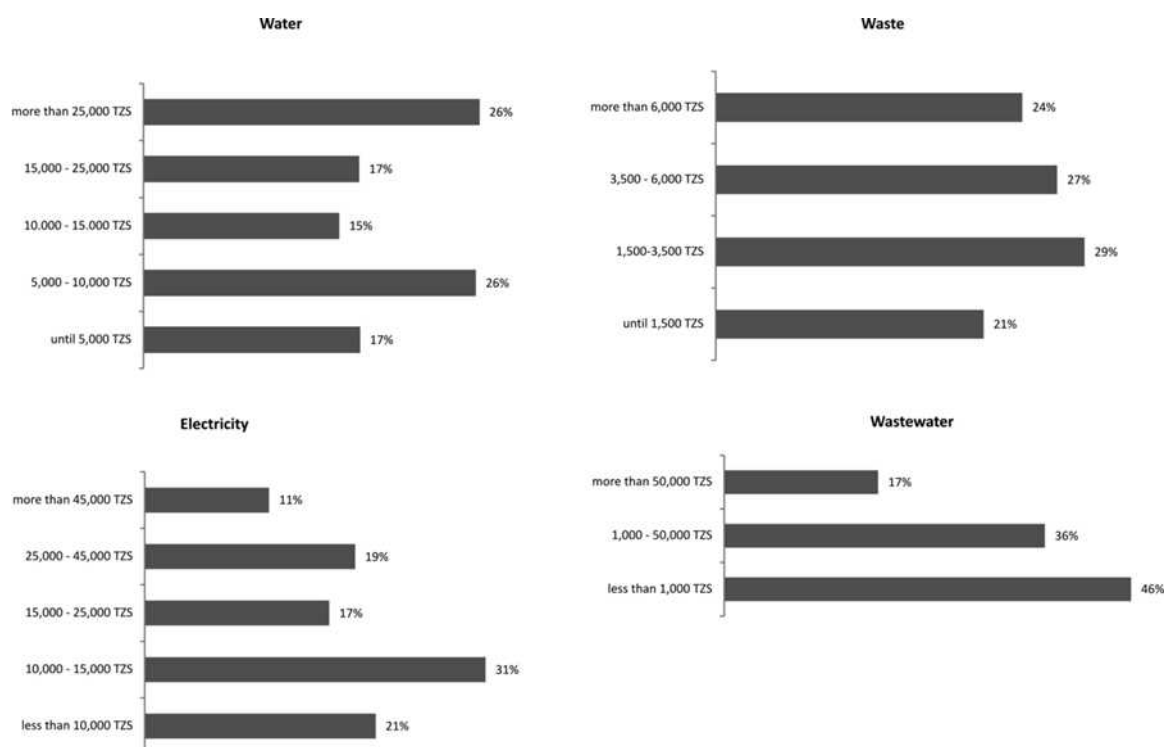


Figure 35 - Distribution of Monthly Expenses by Service

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Furthermore, expenses are not homogeneous among the different wards according to the presence of infrastructure or other modalities of supply. The mean monthly water expense is about 20,000 TZS but in Mbweni ward, that expense is almost doubled. In Temeke, expenses are lower than Ilala and Kinondoni, especially in remote areas of southern Temeke, like Somangira, (far from the shoreline and the city centre) (Figure 36).

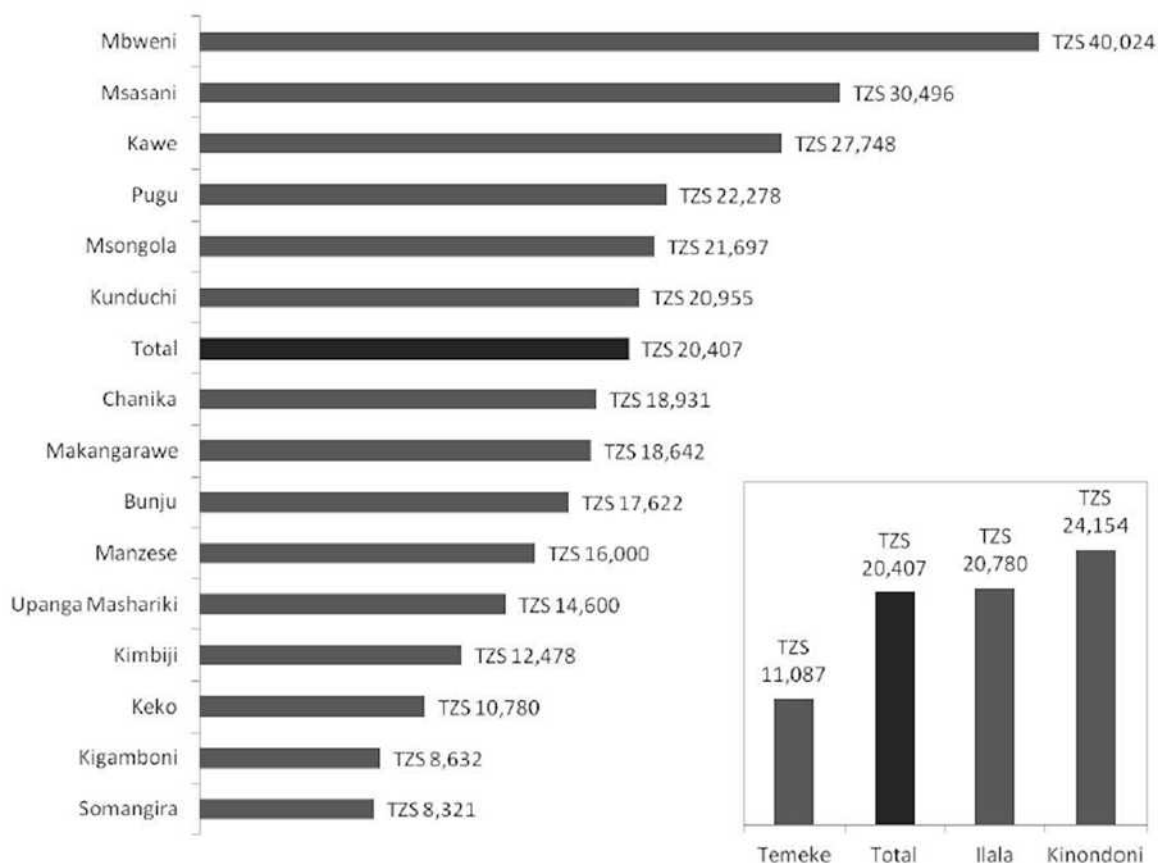


Figure 36 - Mean Monthly Water Expense by Ward and Municipality

The mean monthly electricity expense is about 24,000 TZS, and in Msasani ward, where expenses are highest, that expense is almost doubled. In Temeke and Ilala expenses are lower than Kinondoni and are also below the mean monthly household expenses of all three municipalities (Figure 37). The wards not included in the figure below have a mean equal to zero.

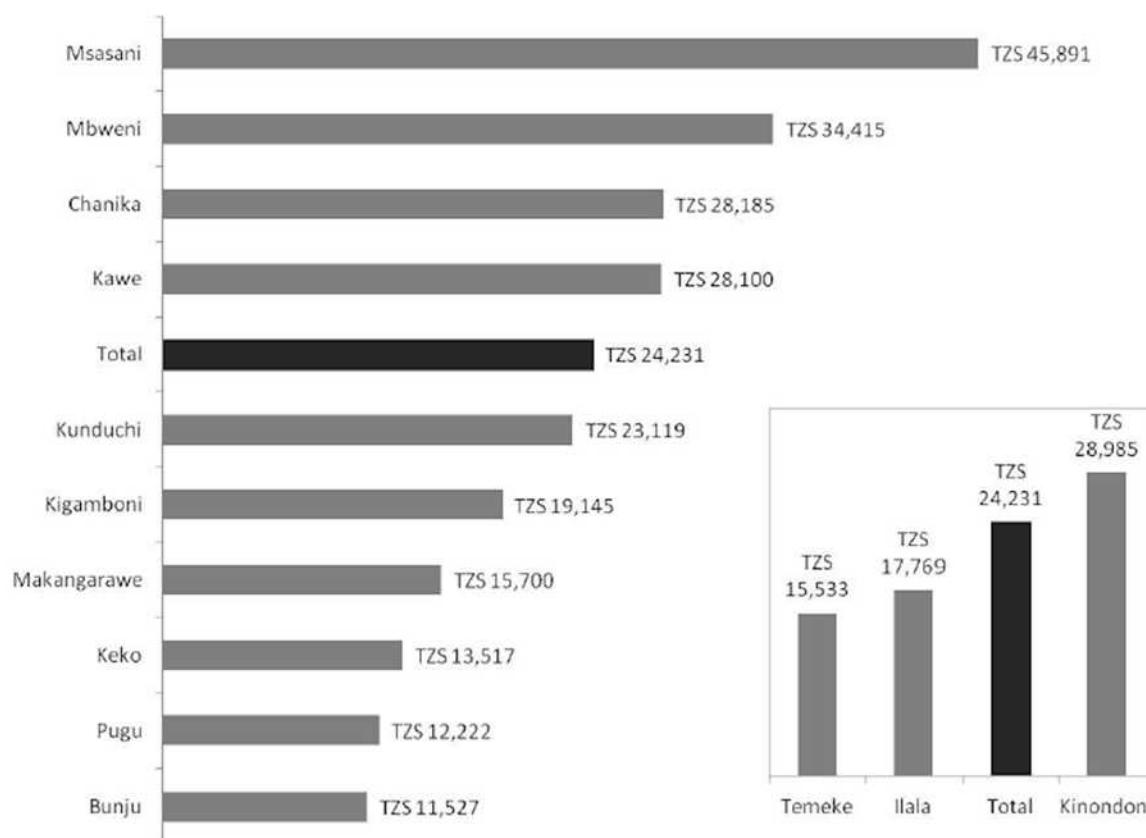


Figure 37 - Mean Monthly Electricity Expense by Ward and Municipality

The mean of monthly waste collection expense is approximately 5000 TZS, and in Kawe ward that expense is more than double. In Temeke, expenses are lower than Ilala and Kinondoni, where households spend almost three times the amount spent in Temeke (2438 TZS) (Figure 38).

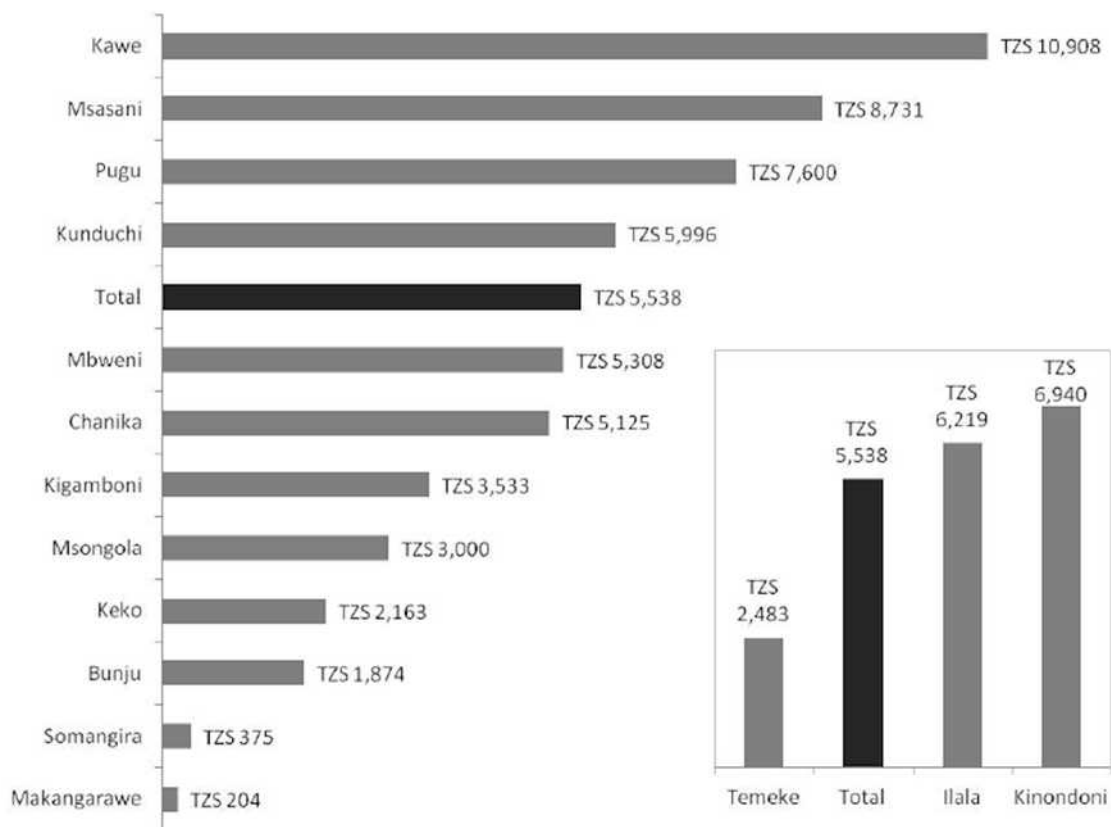


Figure 38 - Mean Monthly Waste Collection Expense by Ward and Municipality

The mean monthly wastewater collection expense is approximately 29,000 TZS, and the ward with the highest expenses is Kawe. In Temeke, expenses are lower than Ilala and Kinondoni, but while Ilala mean is close to the total mean, Kinondoni's is highest (38,657 TZS) (Figure 39).

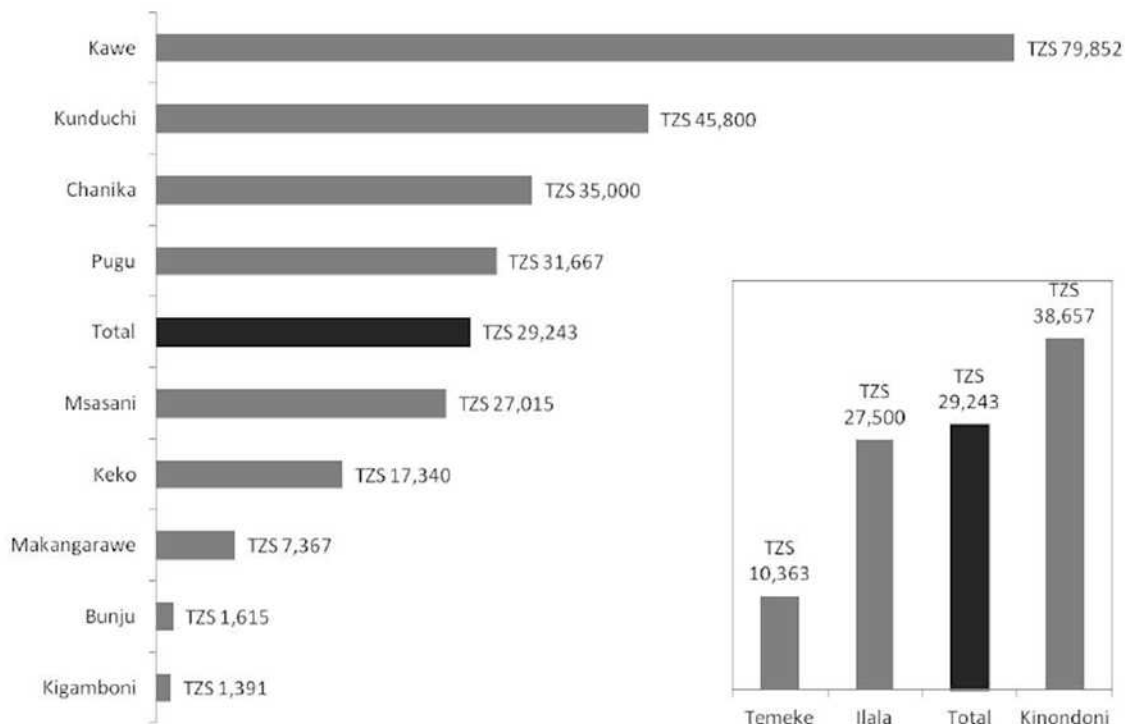


Figure 39 - Mean Monthly Wastewater Collection Expense by Ward and Municipality

3.4 Resource Management

Resource management modalities have a considerable effect on the vulnerability of residents. The identification of resource use and the management regime is crucial to understanding households' capacity to interact with the environment, substitute or integrate facilities with their practices and cope with a lack water supply, waste management, or other services.

This section highlights the high level of diversification in resource management and in modalities of accessing resources, especially water.

3.4.1 Water Management

The main sources of water are pipeline (39%) and well (30%), but a considerable portion of households also access water through a neighbour's source (22%).

Street vendors and natural sources of water (stream, spring and ground pit) are the main choice in only a few cases (5% and 3% respectively) (Figure 40). Nevertheless, these main sources are integrated with many other options (Faldi, 2011) due to the poor reliability and quality of the water supply system and the variability in water availability. Analysis of the relation between water source and main income source demonstrates that most farmers (61%) draw water from the well, while for livestock keepers the main sources are well (48%) and pipeline (36%). Traders (small/shop business) have access to water via pipelines (40%), a neighbour's source (28%) and wells (26%), while those employed in urban areas mainly use pipelines (66%) (Figure 41).

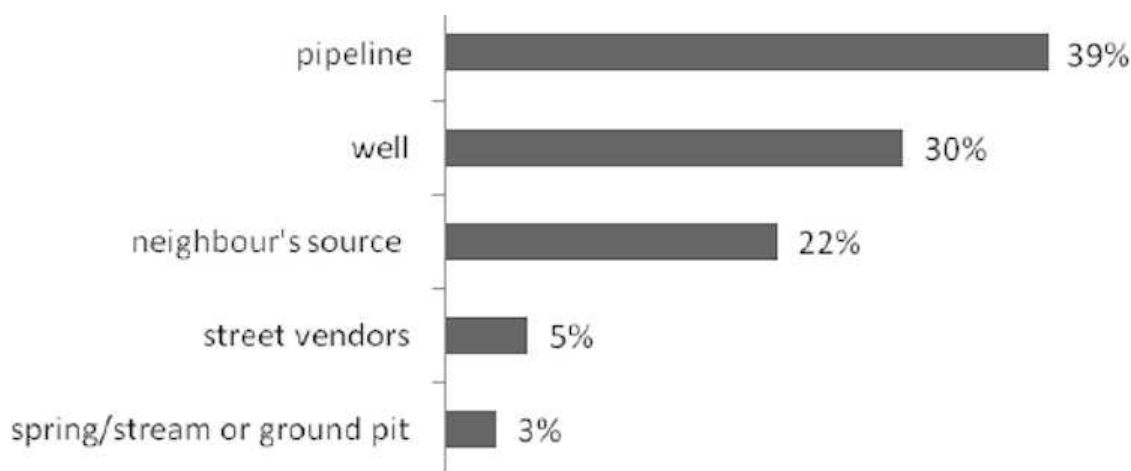


Figure 40 - Water Sources

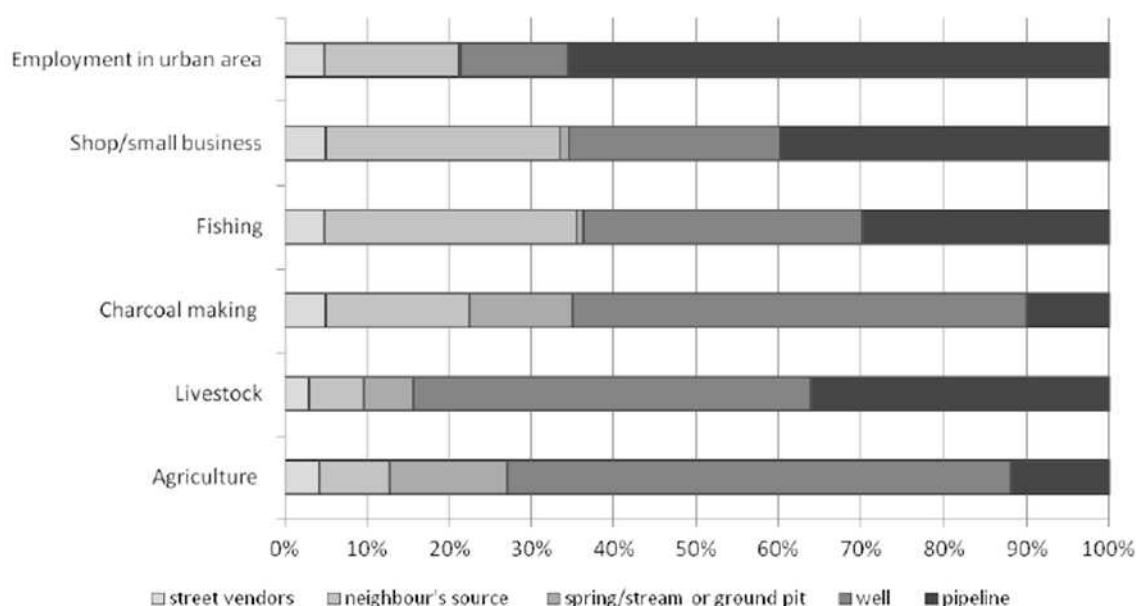


Figure 41 - Distribution of Water Source According to Income Source

Also, the water storage systems are manifold and have different capacities. Figure 42 shows that water is stored mainly in 20L buckets (62%) and storage system capacity ranges mainly between 150 and 300 litres (figure 43). Only those employed in urban areas store their water mainly in tanks (55%), which also have a greater water storage capacity (Figure 44).

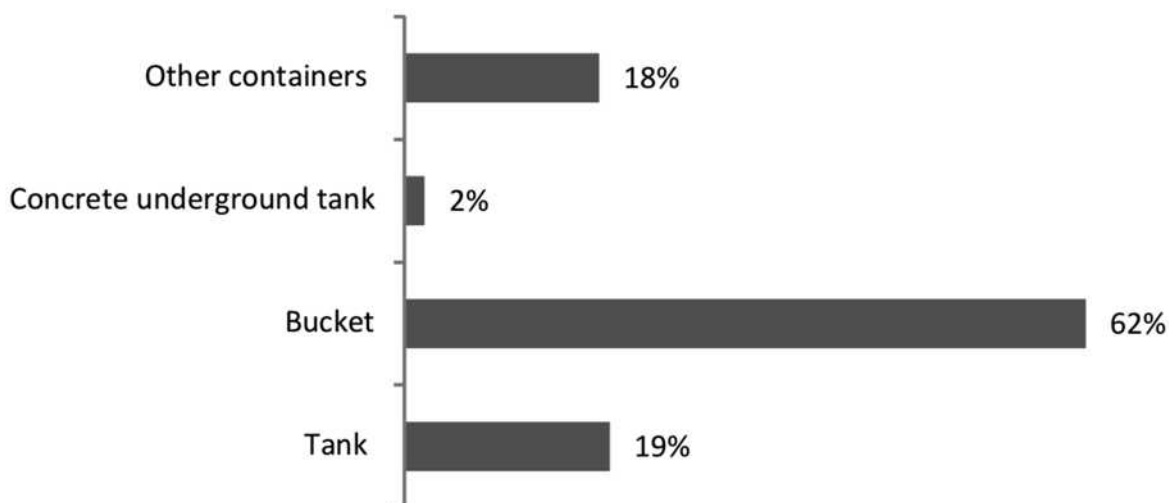


Figure 42 - Type of Water Storage System

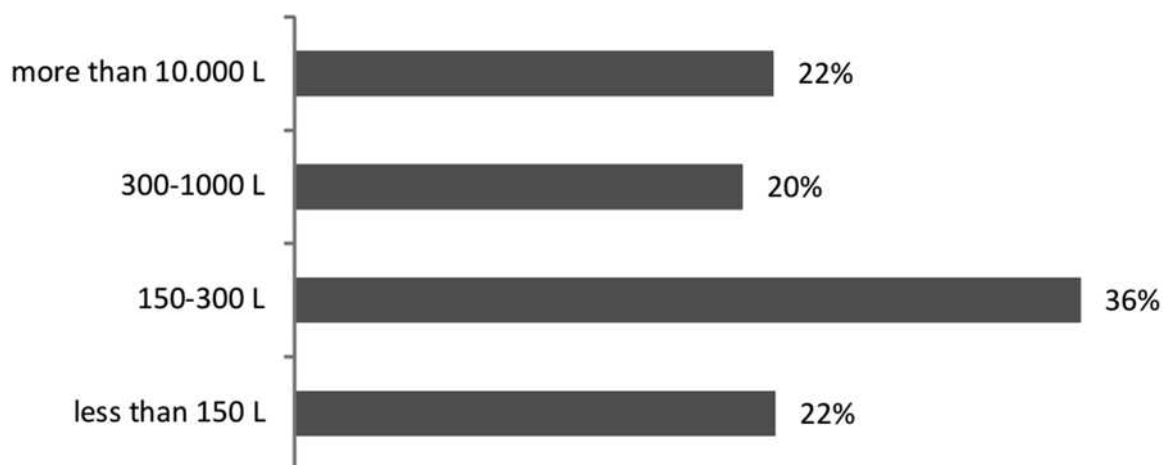


Figure 43 - Capacity of Water Storage Systems

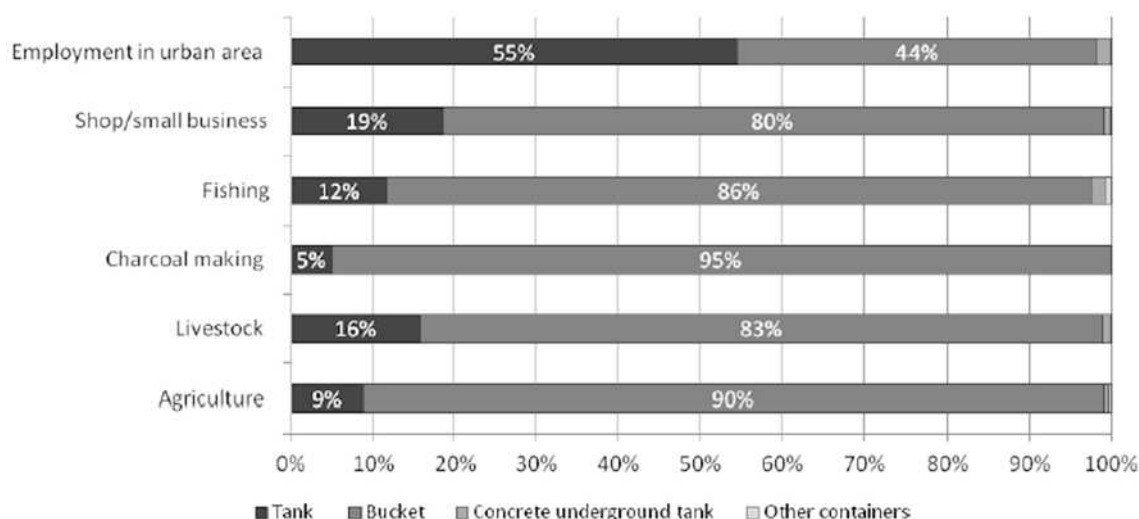


Figure 44 - Water Storage Systems by Main Source of Income

3.4.2 Energy management

Most sampled households have an electricity supply (68%) (Figure 45). However, one must consider that, due to the frequent shortages in electricity supply, households have to rely on alternative sources for light, cooking and other activities.

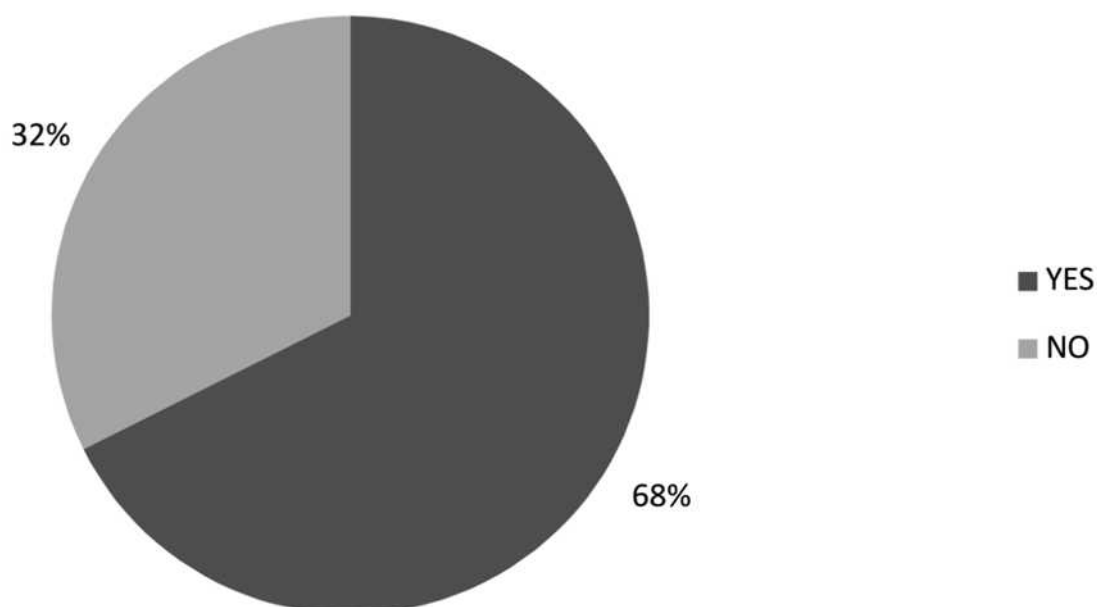


Figure 45 - Electricity Supply

The most commonly used energy source for cooking is charcoal (73%) while other sources (kerosene, electricity, gas, etc.) are all used by between 4 and 11% of the respondents (Figure 46).

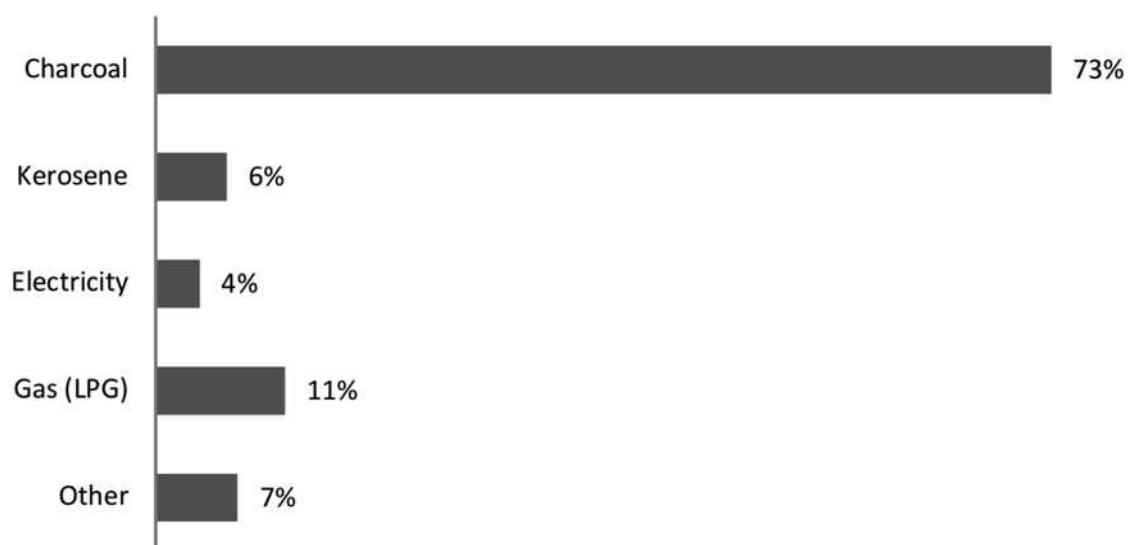


Figure 46 - Source of Energy for Domestic Use

The main source of energy for cooking is charcoal. Nevertheless, those employed in urban areas also use gas and electricity. For the households with other primary sources of electricity, the secondary energy source for cooking is kerosene (Figure 47).

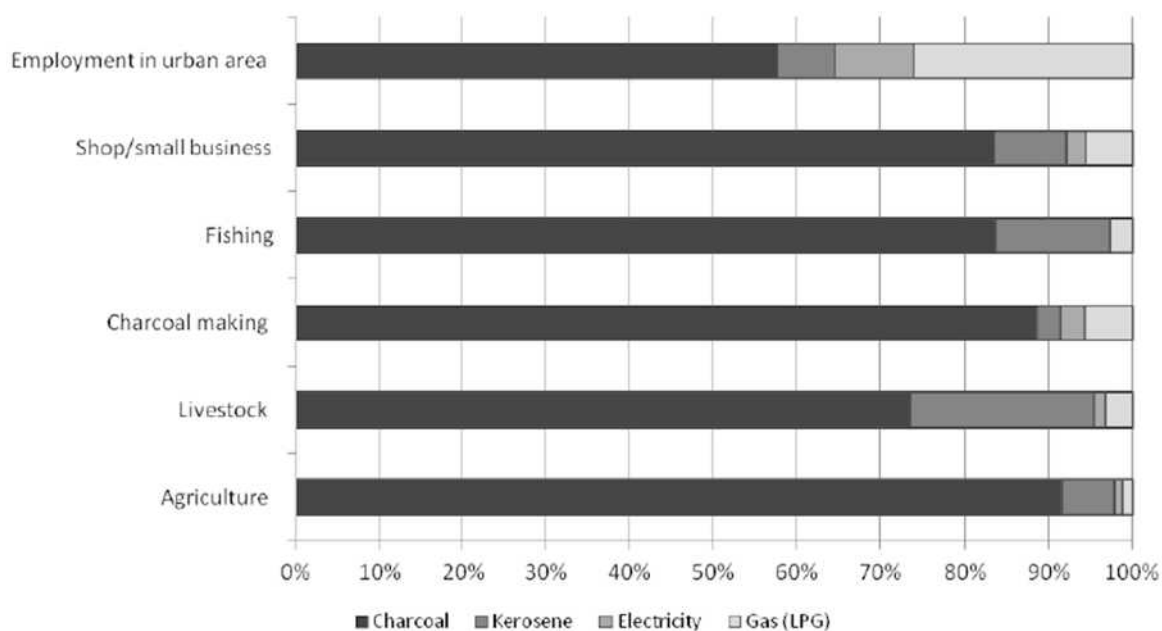


Figure 47 - Distribution of Energy Source for Cooking by Main Income Source

Figure 48 shows that the majority of farmers, livestock keepers and charcoal makers use kerosene lamps, while the traders and those employed in urban areas use electricity. A small portion of farmers also use other sources (Figure 46).

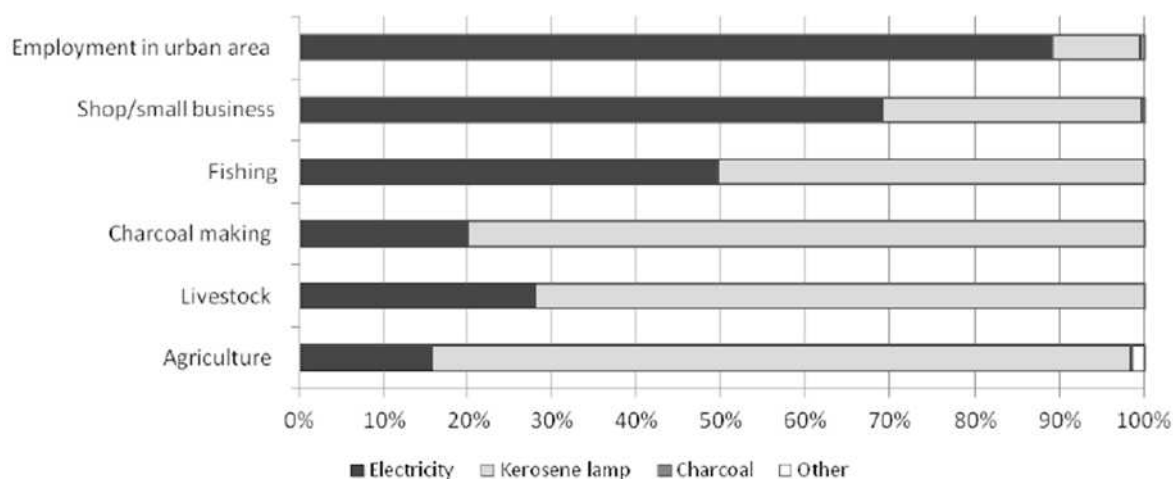


Figure 48 - Distribution of Energy Source for Light by Main Source of Income

3.4.3 Solid Waste Management

Half of the respondents practice individual solid waste collection, while the other households rely on informal street collectors or waste collection companies (Figure 49).

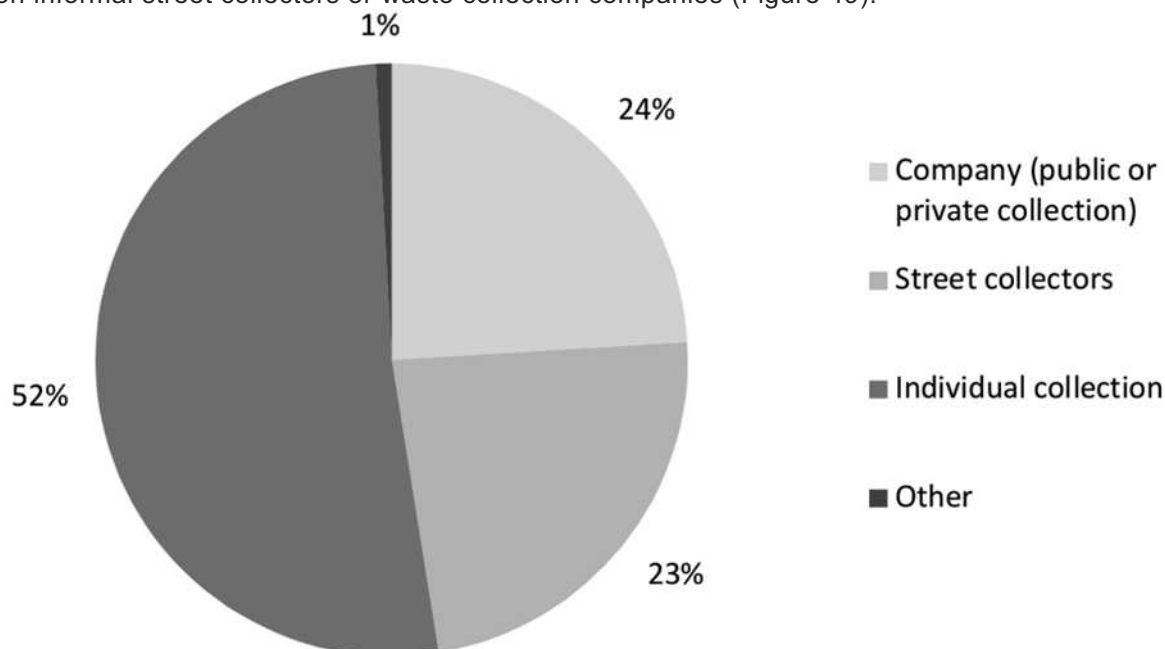


Figure 49 - Type of Waste Collection System

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As most solid waste is collected autonomously, waste disposal modalities and sites have been also investigated. Only 4% of respondents affirmed that they recycle their waste, while most of them dispose of waste either in landfills or by burning it (Figure 50).

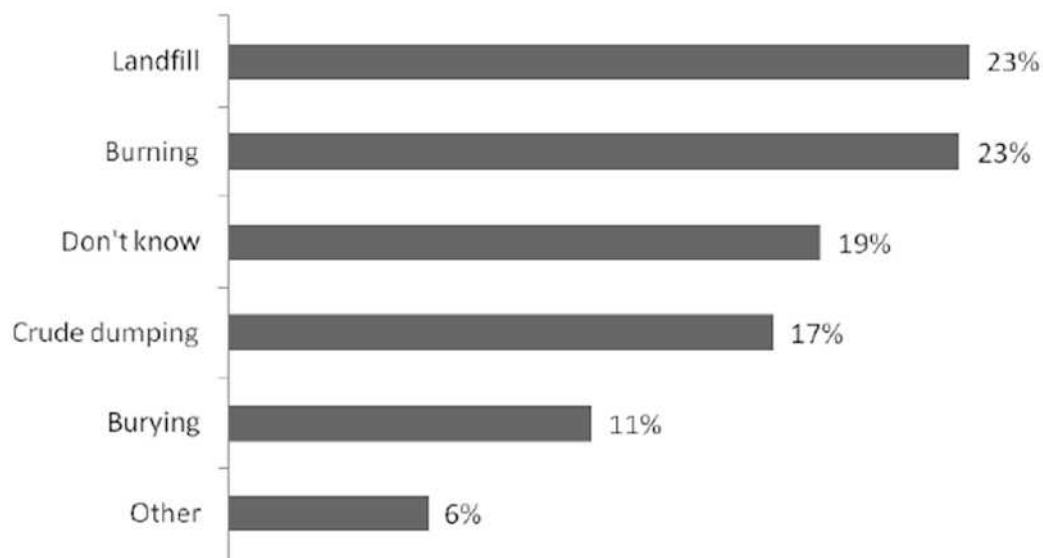


Figure 50 - Site and Modality of Solid Waste Disposal

Due to autonomous disposal and the multiple modalities of waste management (even within the same household) waste production per day is low, as shown in Figure 51.

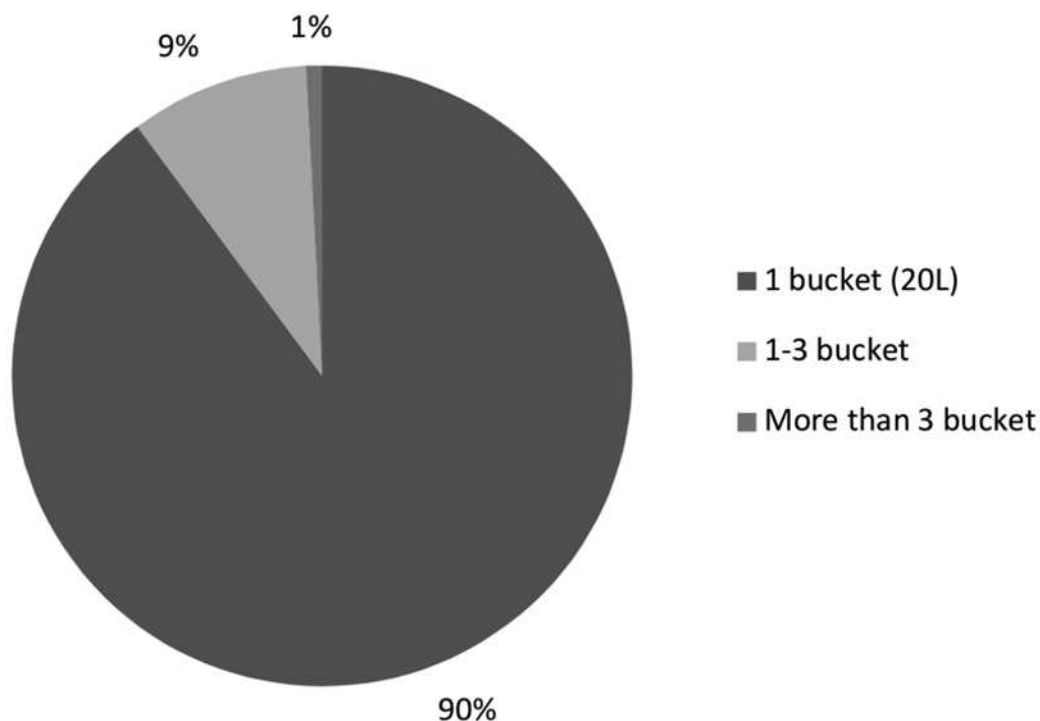


Figure 51 - Households' Daily Waste Production

3.4.4 Wastewater Management

Like solid waste, wastewater is mainly managed autonomously. Only 4% of the sampled households use a collection and disposal system, while wastewater is usually deposited in pits until saturation (pit latrine); 25% use a septic tank and only 12% a VIP latrine (Figure 52). Most of these systems are autonomously built and managed by the households, as reflected in Figure 53.

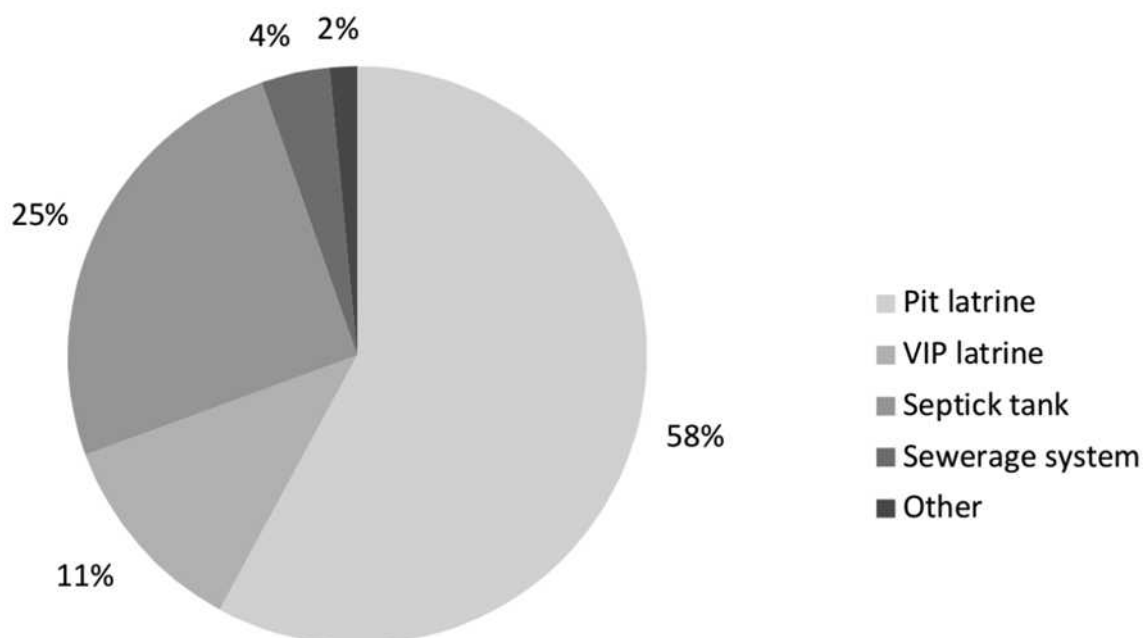


Figure 52 - Wastewater Management (collection and disposal) Systems

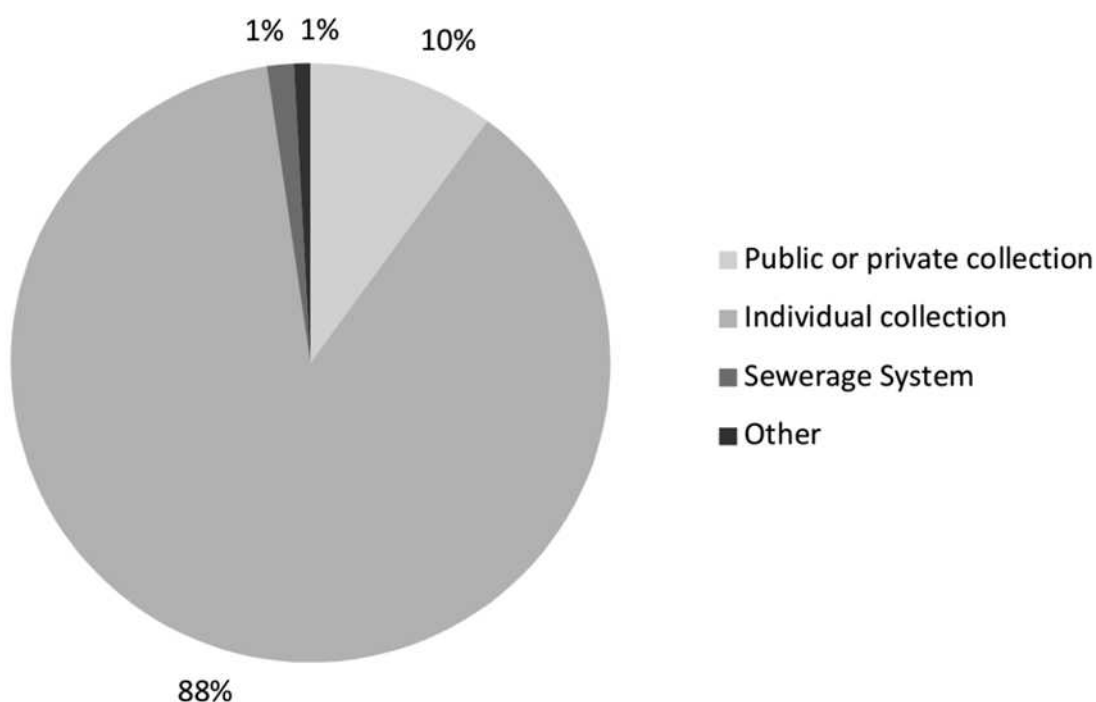


Figure 53 - Wastewater Collection Systems

3.5 Climate Change Adaptation

The last section of the questionnaire collected information on autonomous local strategies for adapting to environmental changes, which, as established by COP 7 (Decision 28/CP.7), must be considered when identifying adaptation priority actions. More specifically, this section seeks to understand the environmental changes observed by residents of peri-urban areas, their perception of the causes of these changes and the strategies implemented to address them in both the short- and medium-term. The frequency and relation with characteristics of peri-urban households described above have been analysed for each of these themes.

These relations have been hypothesized according to the overall approach and the scope of the survey. The hypotheses (on which the crosstabs have been built) are mainly focused on the households' dependence on natural resources and on the modalities of accessing resources (formal – informal, direct or indirect), as they orient the autonomous adaptation opportunities on which households rely and determine their sensitivity to environmental changes. The results show that the households involved in the survey have developed multiple adaptation strategies and environmental management practices to cope with environmental threats, and that those strategies are linked to modalities of accessing resources, household activities and dependence on natural resources.

3.5.1 Observed Environmental Changes

Almost all respondents noted changes in water availability, soil fertility, soil aridity, air humidity, and rain patterns as well as other changes such as sea level rise, biodiversity, extreme events, and shifting ocean currents (Figure 54).

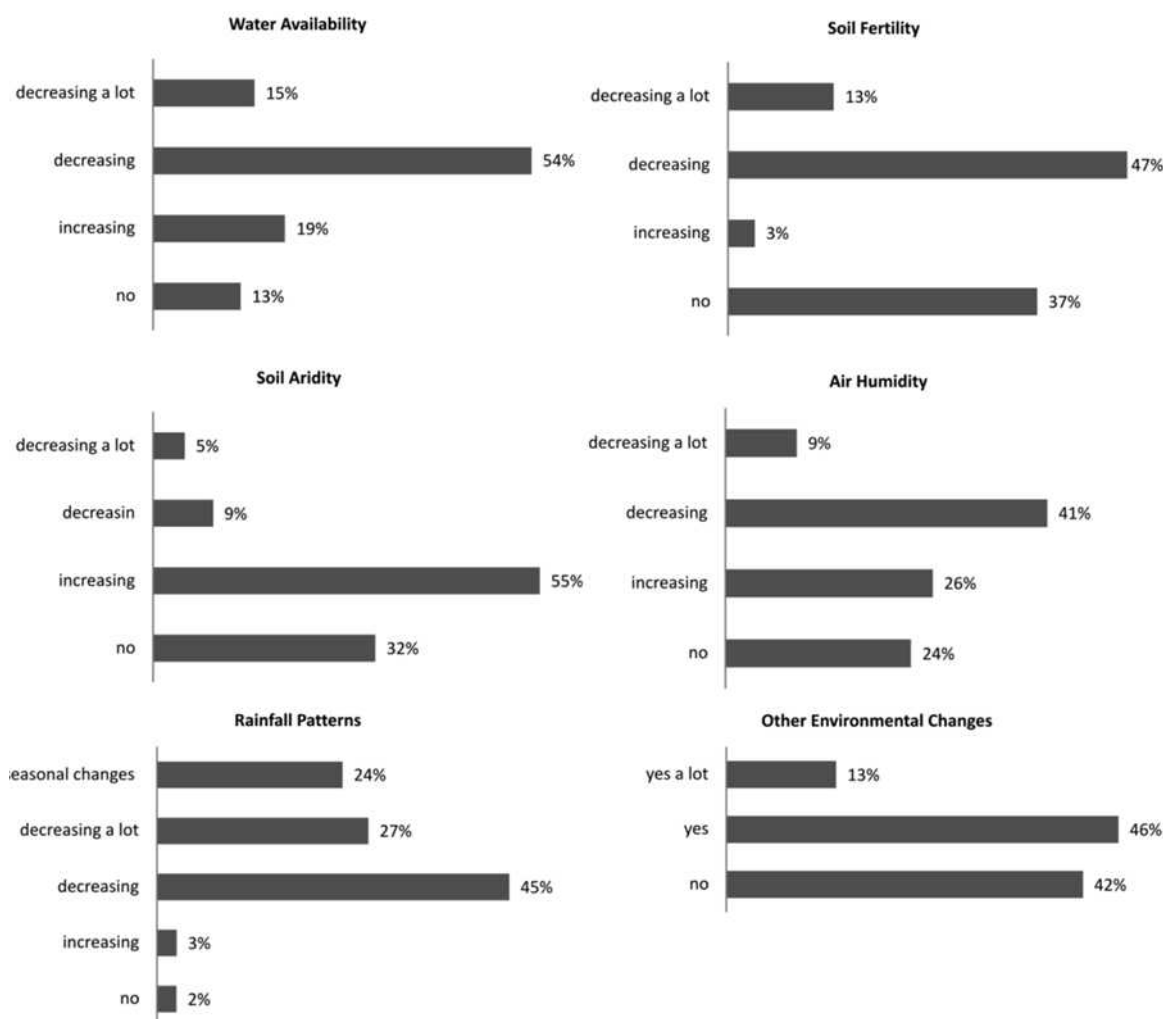


Figure 54 - Environmental Changes Observed by Respondents

The results showed that availability of water has been declining significantly in recent years. According to interviews conducted during the pilot study, rivers which normally flow year round have become seasonal, and the water previously obtained 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. These and other environmental changes are the result of a complex set of factors linked to global warming, anthropogenic pressures and inadequate local environmental management.

The decrease in water availability has been observed by about 68% of the sampled households, among which 14% observed that the decrease was significant. Other changes that have been observed include decreasing soil fertility (60%), increasing soil aridity (55%) and decreasing air humidity (50%). However, about half of respondents in these cases observed no changes and opposite changes, while only 12% of respondents did not notice changes in water availability and 18% noticed water availability increasing. Most respondents also observed changes in rainfall, in term of both an overall decrease (72%) and in seasonal patterns (24%).

All the observed changes have been cross-referenced with the location of the questionnaires, and no relevant differences have been found between the different wards and subwards in terms of the changes observed (Figures 56 to 61). Nevertheless, it has emerged that in Upanga Mashariki, Manzese, Kimbiji and Msongola wards there is an overrepresentation of households who noticed decreases in water availability, in soil fertility and in air humidity, increases in soil aridity (except Msongola), changes in rain patterns and other changes (Figure 55).

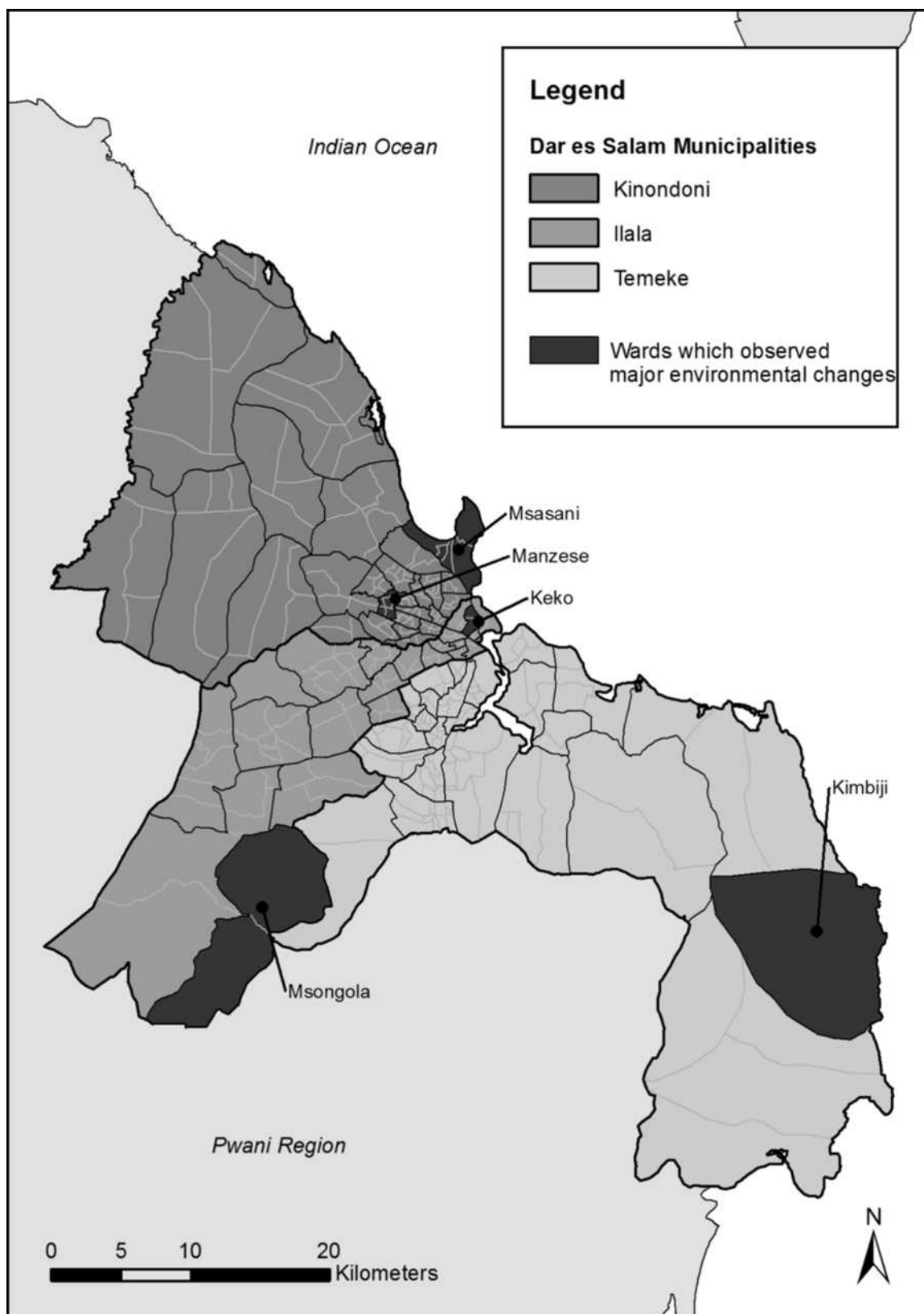


Figure 55 - Observed Environmental Changes by Ward

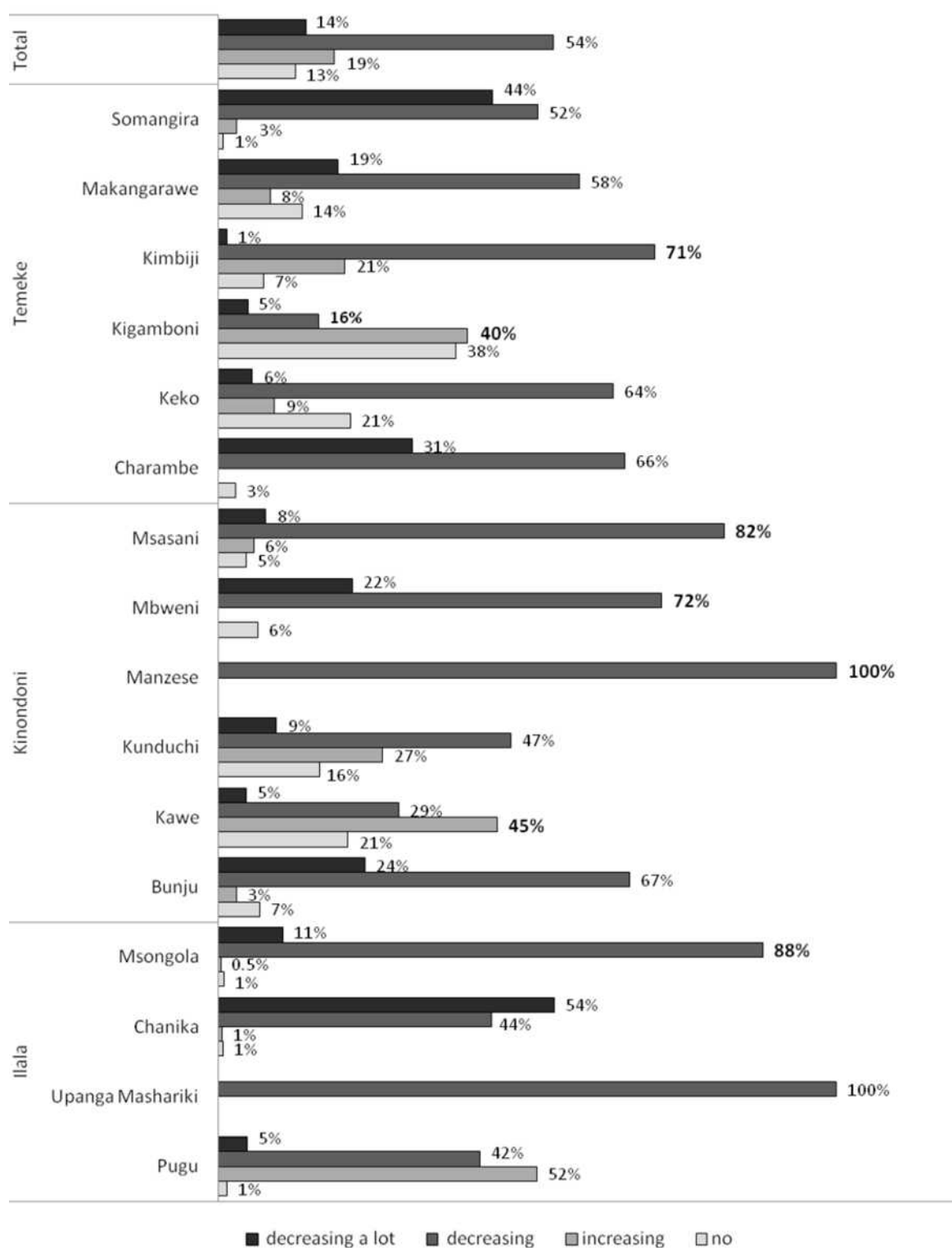


Figure 56 - Observed Changes in Water Availability by Wards

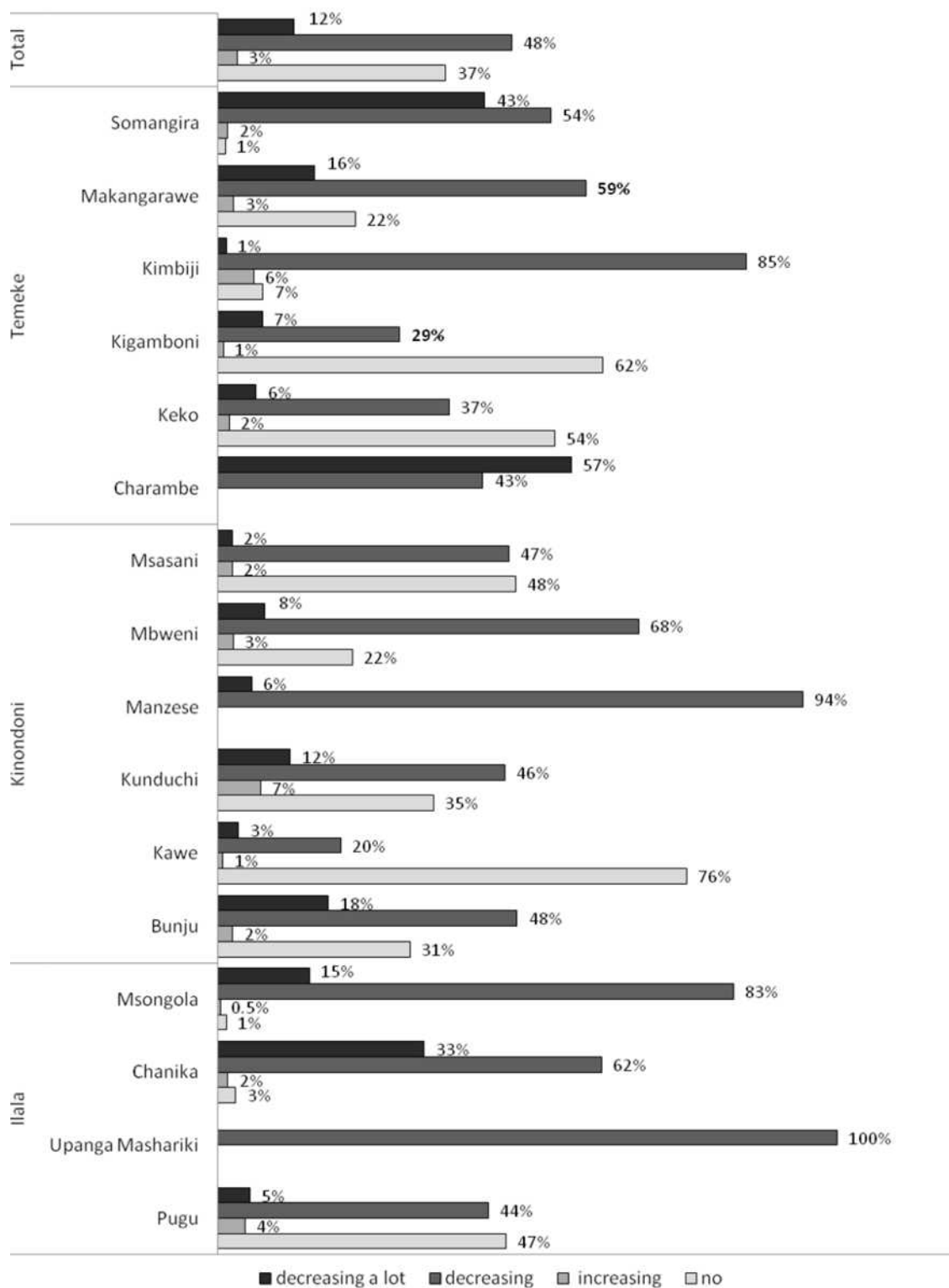


Figure 57 - Observed Changes in Soil Fertility by Ward

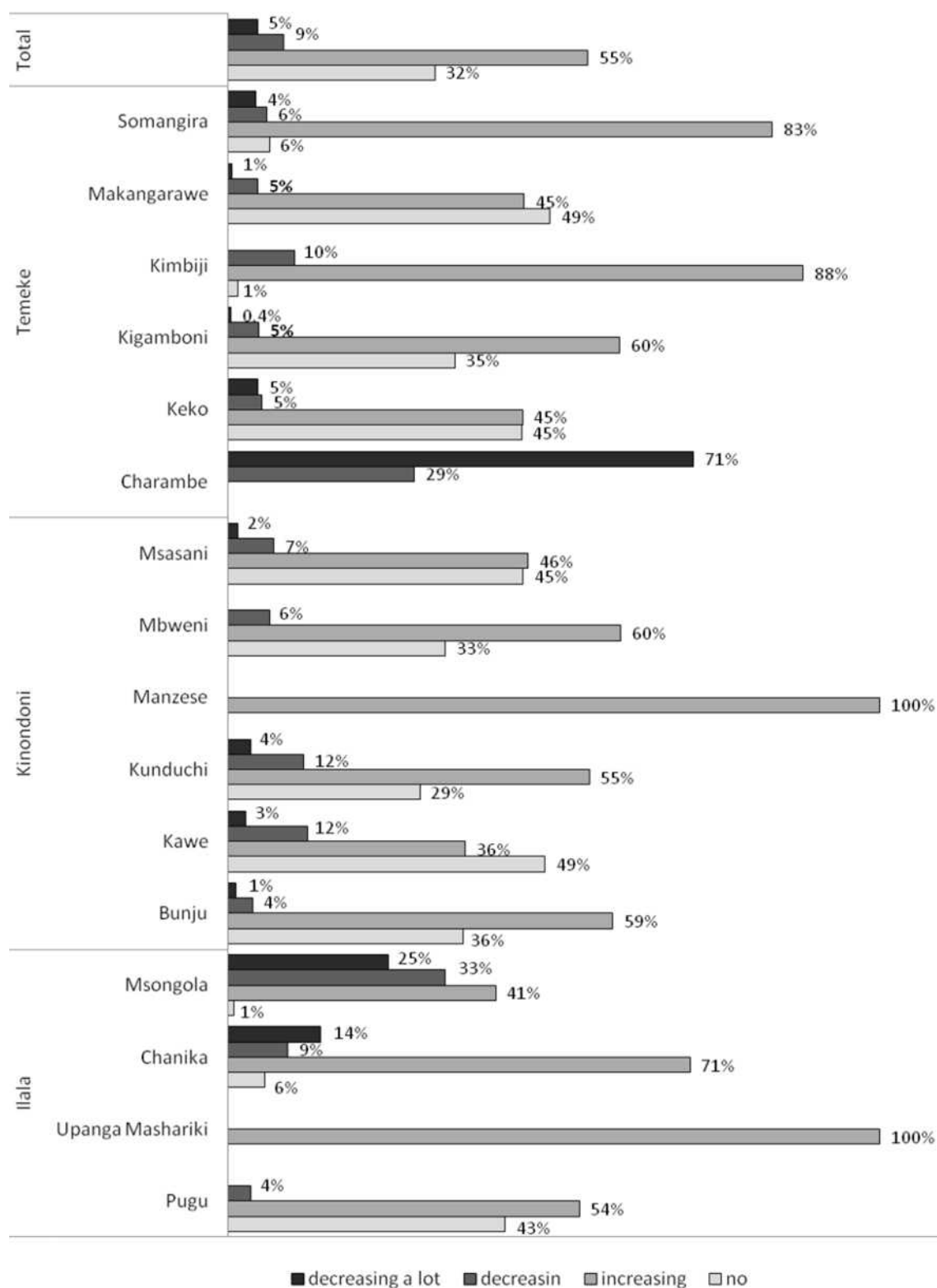


Figure 58 - Observed Changes in Soil Aridity by W

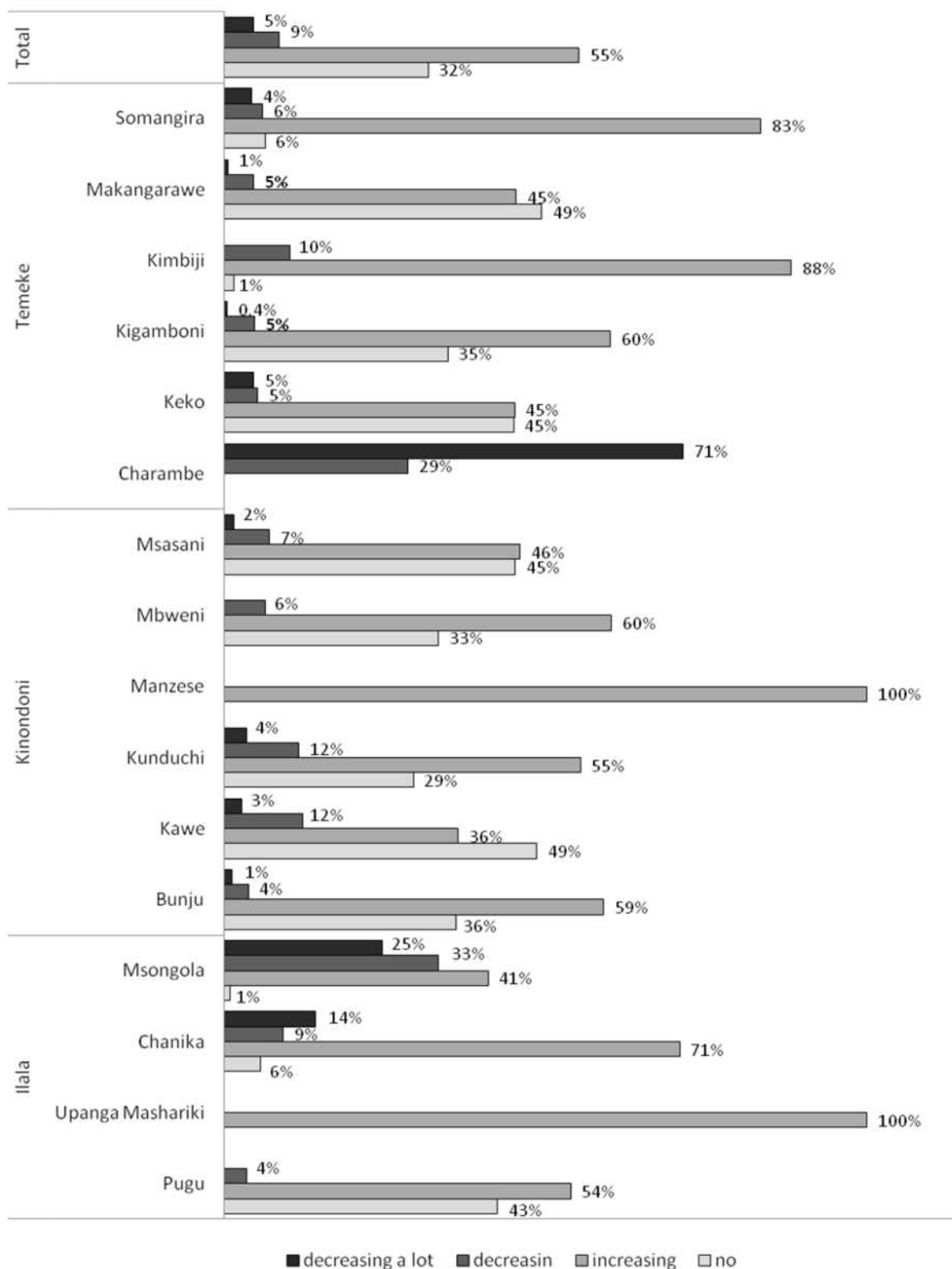


Figure 59 - Observed Changes in Air Humidity by Wards

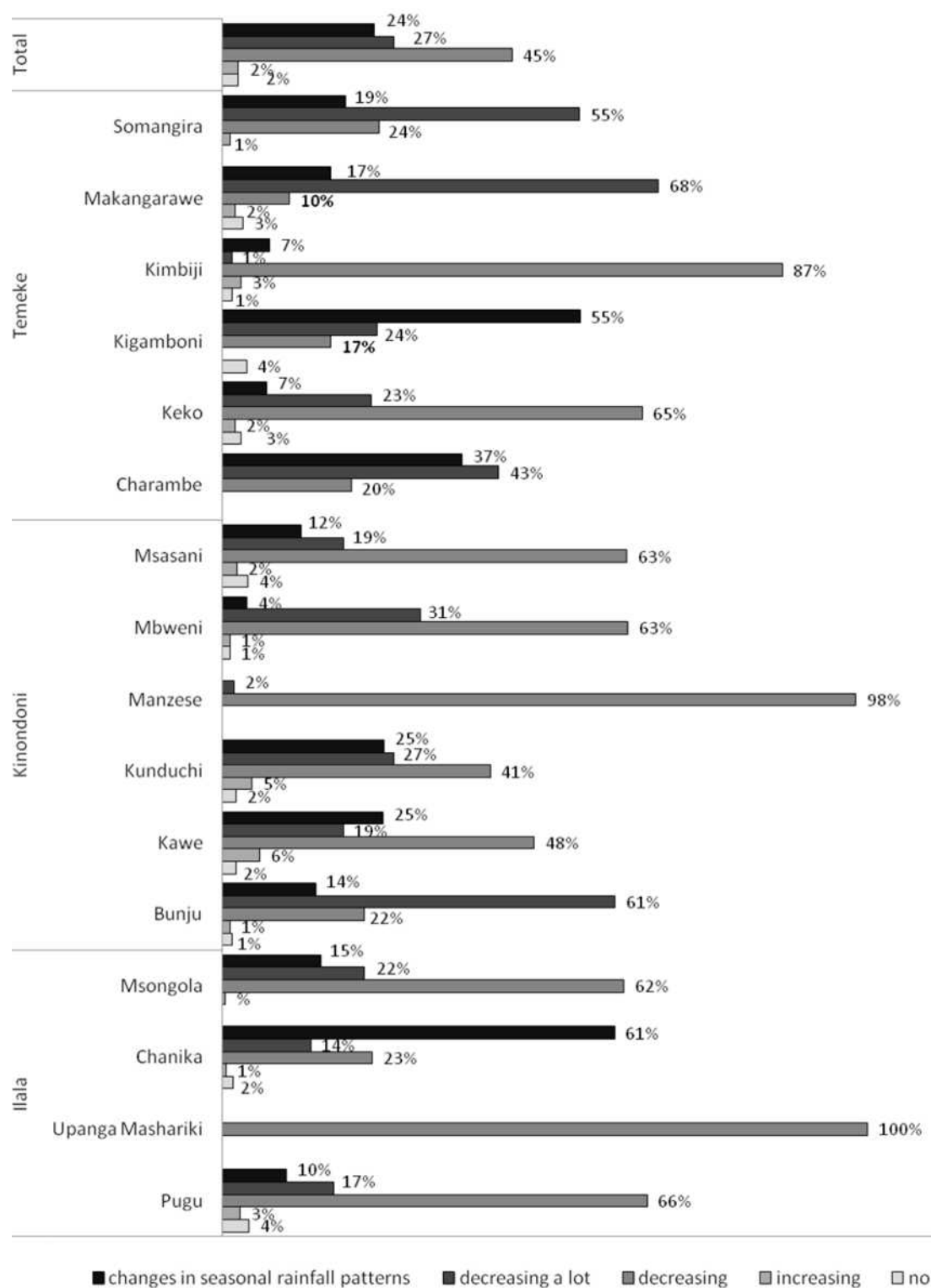
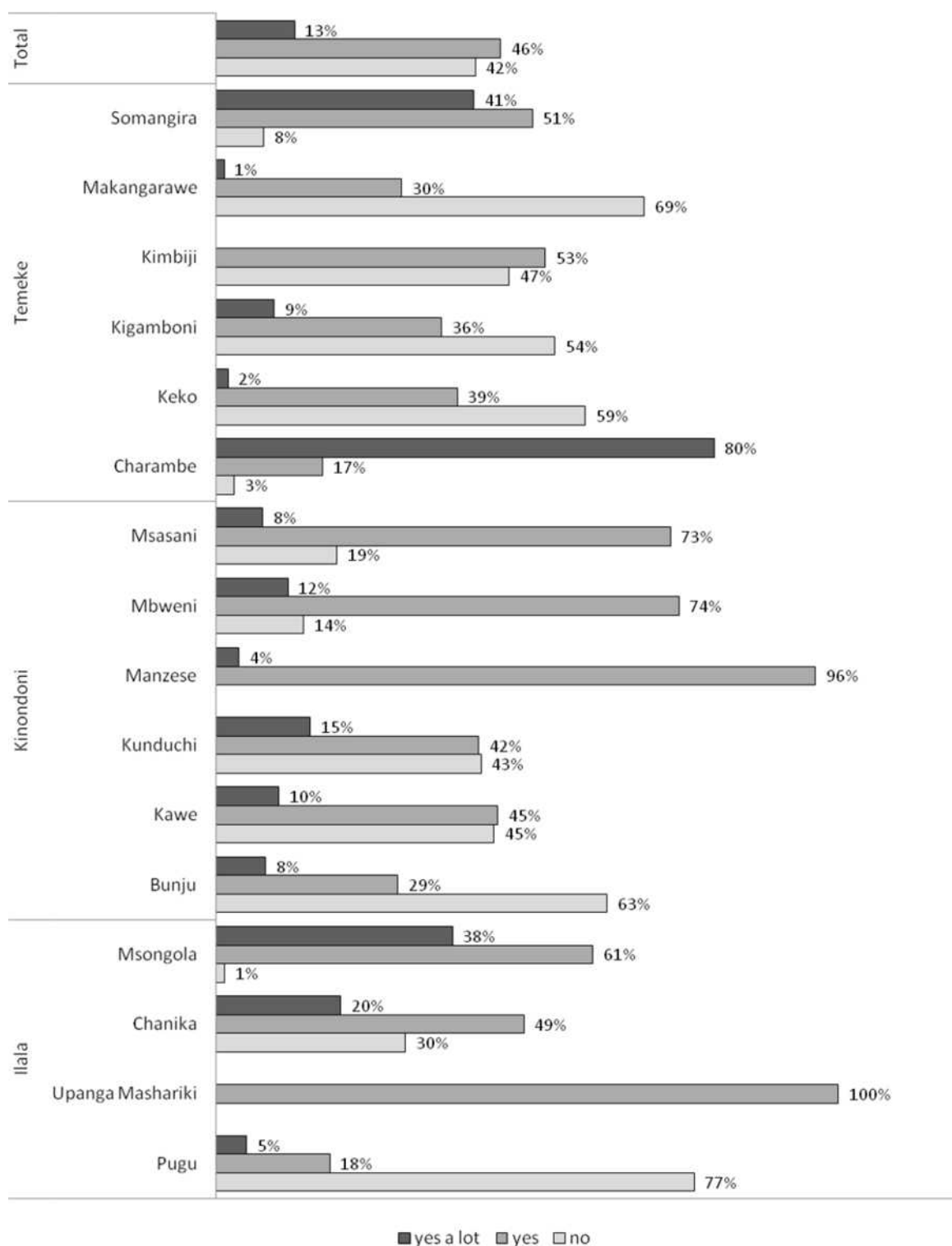


Figure 60 - Observed Changes in Rainfall Patterns by Wards



61 - Other Observed Environmental Changes by Wards

The changes observed are also linked to households' activities. Households engaged in agriculture and livestock keeping as their main activities observed more changes in air humidity (decreasing), rain patterns (decreasing) and other environmental changes, than those engaged in shop/small business activities or working in urban areas.

This relation has been explored by identifying three classes of resource dependency:

- 1 Dependent, which includes households engaged in farming, livestock, fishing, or charcoal making as their main source of income, who possibly practice agriculture as secondary activity.
- 2 Partially Dependent, which includes households engaged in shop/small businesses or employed in urban areas but practice agriculture as secondary activity.
- 3 Not Dependent, which includes households engaged in shop/small businesses or employed in urban without secondary activities.

These analyses show that the households dependent on natural resources note more and significant changes while those who are independent of natural resources do not. It must be emphasized that changes in air humidity and in rain patterns are also observed by households that are independent and partially dependent on natural resources, though these changes are clearly linked to rural activities. In general, households observing more environmental changes also have a lower mean income level. Finally, more changes are observed by farmers growing specific type of crops, particularly rice, pineapple, mango, orange and potatoes.

The possibility of an interdependence between the changes observed and households' land size has been also explored, revealing that respondents who observed significant changes have a big plot, while the opposite is true for those who had not observed changes.

Obviously, households accessing water mainly through natural sources observed more and consistent environmental changes, especially in water availability. Furthermore, if the households have a less stable and capacious storage system (e.g. bucket) they have a heightened perception of environmental changes linked to water resources, compared with the perceptions of households who use stable and capacious storage systems (e.g. underground concrete tank).

This sequence of characterizations is synthesized in the following chart (Figure 62).

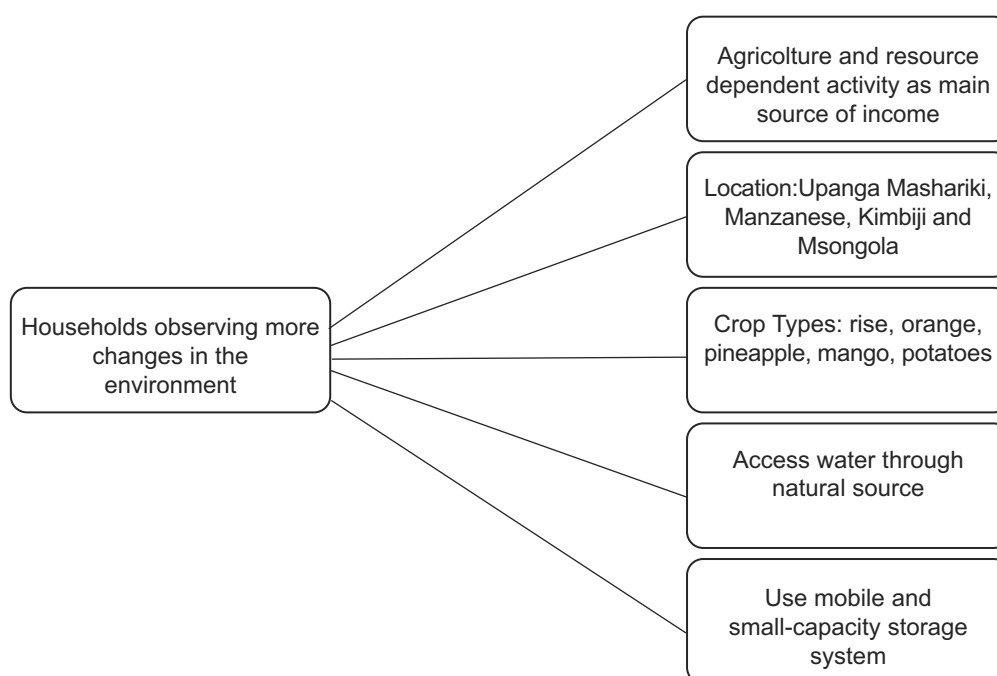


Figure 62 - Characteristics of Households Observing More Environmental Changes

3.5.2 Autonomous Adaptation Strategies

Even if it is widely recognized that the residents of sub-Saharan cities (not exclusively) have developed multiple adaptation strategies and environmental management practices to cope with environmental threats (UN Habitat, 2010), these activities are still neglected in vulnerability assessment and adaptation planning. This sub-section aims to contribute to a better understanding of the autonomous practices taking place in the peri-urban areas of coastal Dar es Salaam, in order to provide knowledge on how to integrate those practices into local institutional activities and into the design of adaptation initiatives.

Different strategies for coping with environmental changes are being implemented in Dar es Salaam. 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.

Furthermore, 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 (e.g. trade or small business). In some cases respondents have even thought of moving to another area or returning to their rural native region.

According to the pilot study, these strategies are being considered not only in response to exasperation of environmental problems, but also in the event of higher population pressure and new urban developments, which would interfere with ordinary practices and activities (e.g. agriculture, livestock keeping, etc.). This response is partly linked to the causes to which respondents attribute environmental change.

Implemented Adaptation Strategies

Though the majority of respondents are not engaged in adaptation practices, many different strategies are currently being undertaken (Figure 63). The most common of these is changes to the structure of land and housing (32%), which includes the excavation of trenches, adjustments to roofs, floors or other structural and not structural components of the house. Improvements or changes in type of activity are two other adaptation options found among the sampled households (24%). Few households changed their type of crop or the type of livestock they raise. Cross referencing adaptation strategies with main source of income, it emerges that most households engaged in livestock keeping and small/shops businesses as their main source of income, changed their type of activity, while the others mainly made changes in the structure of their land and house or modified their current livelihood activities (Figure 64).

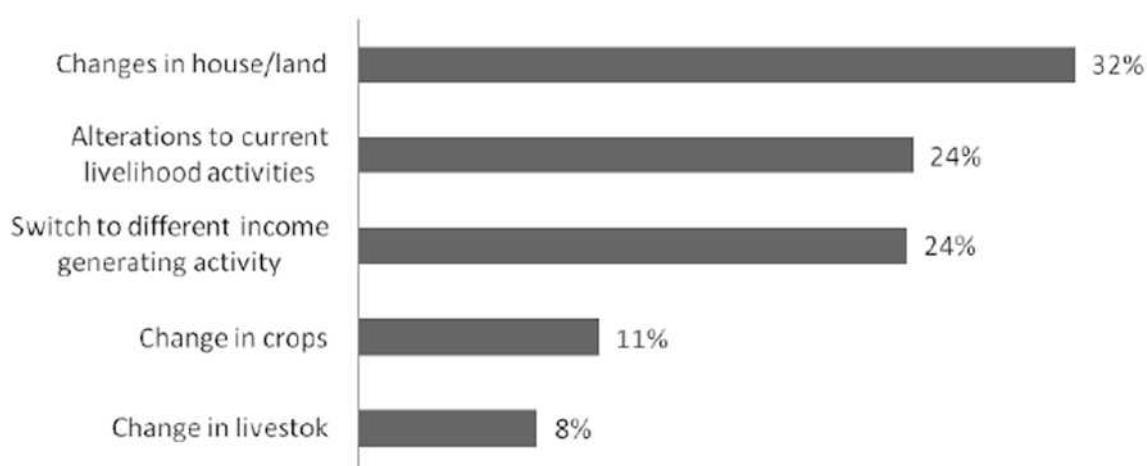


Figure 63 - Households' Autonomous Adaptation Strategies

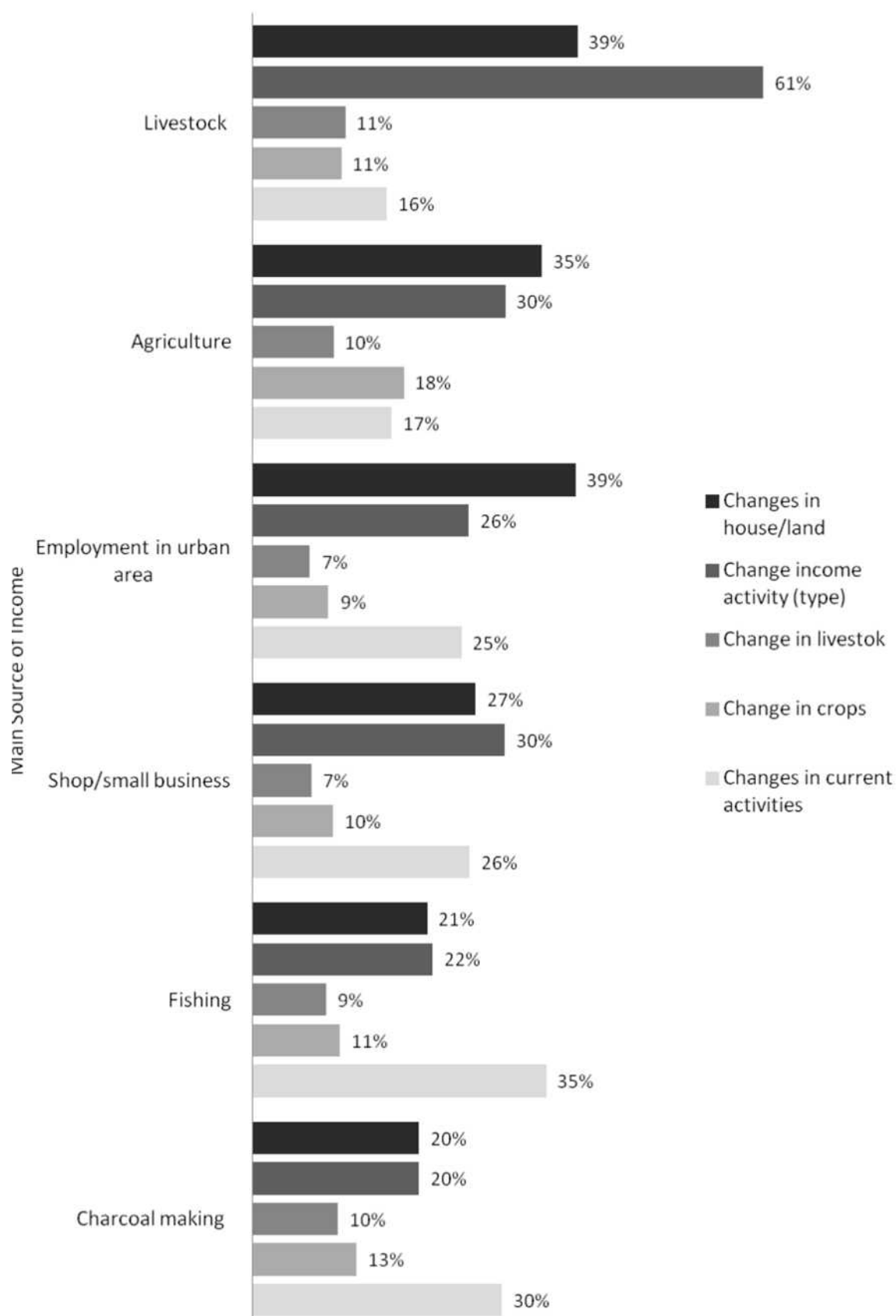


Figure 64 - Distribution of Current Autonomous Adaptation Strategies by Income Source

Future Adaptation Strategies

Among respondents, 43% have thought of adopting adaptation strategies in the future if environmental conditions worsen. These respondents would choose to start a new business (30%), move to another area (26%) or undertake other changes, as shown in Figure 65.

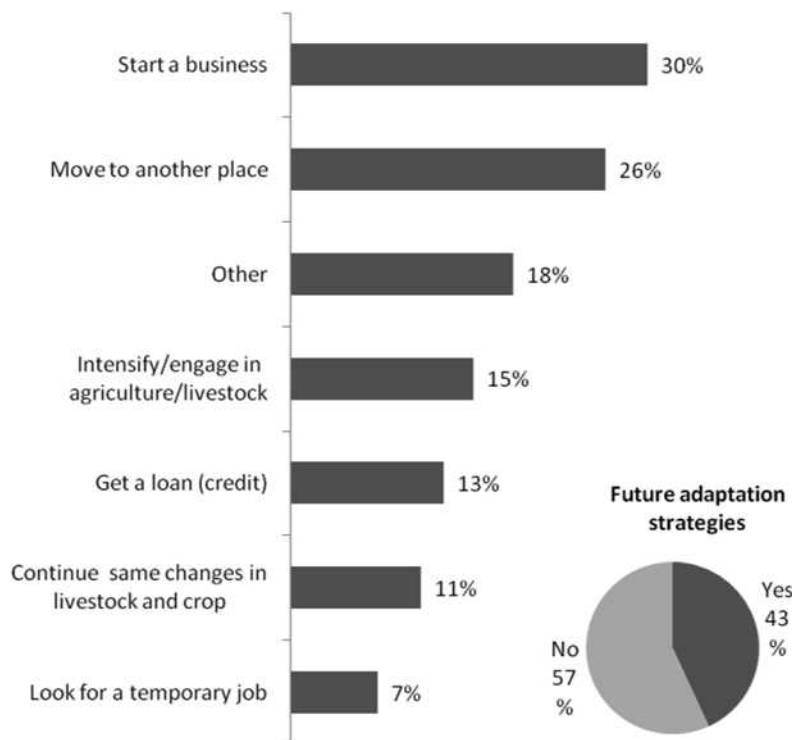


Figure 65 - Type of Future Adaptation Strategies

The relation and interdependence between household characteristics and adaptation strategies, including autonomous ones, has also been investigated.

As regards the possible connection between adaptation strategies and main sources of income, it has emerged that households practicing rural activities (agriculture, livestock keeping) and other activities that are dependent on natural resource (fishing) prefer to continue with the same changes they are currently making as regards livestock and crops, or to intensify the activity that they are already practicing. On the other hand, those who work in charcoal making would prefer to start a new business (Figure 66). A similar trend arises if we consider the activities practiced close to the home. Thus, in order to have a better understanding of this relation, three household groups have been analysed: dependent, partially dependent and not dependent on natural resources. It seems that those who are dependent on natural resources want to continue with the same changes they are already undertaking or intensify their activities. Those who are partially dependent on natural resources choose more flexible strategies, such as taking out a loan or getting a temporary job. It has to be considered that households partially dependent on natural resources are engaged in rural activities as secondary sources of income, and it could be the case that those activities are already part of their adaptation strategy. Households not dependent on natural resources prefer to migrate.

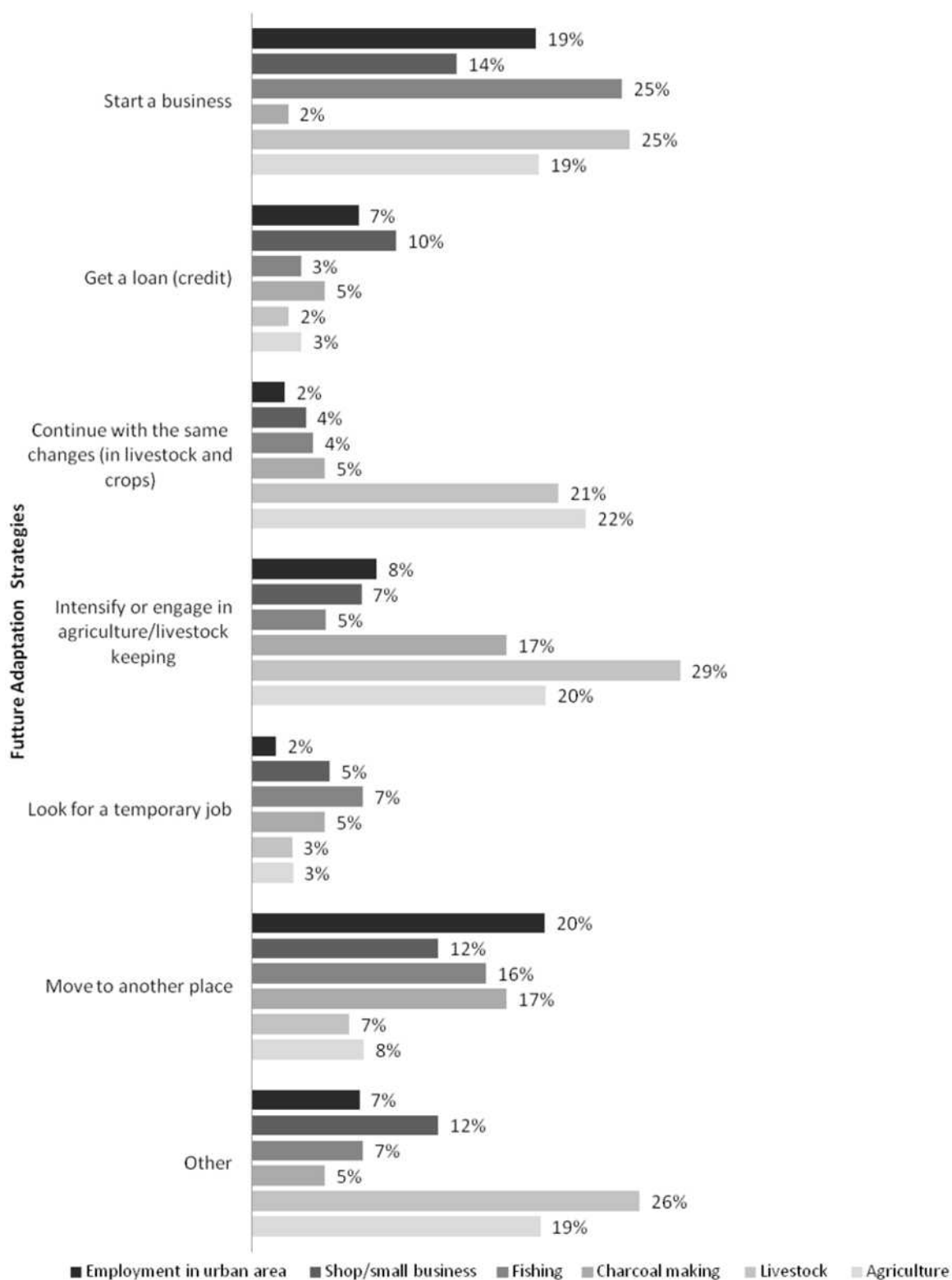


Figure 66 - Future Adaptation Strategies by Main Source of Income

According to these results, dependence on natural resources does not seem to be a driver of migration for peri-urban dwellers, but is a possible choice for people who are more connected to and dependent on the city centre. The connection between dependence on natural resources and future adaptation strategies is also described in the Figure 67 below.

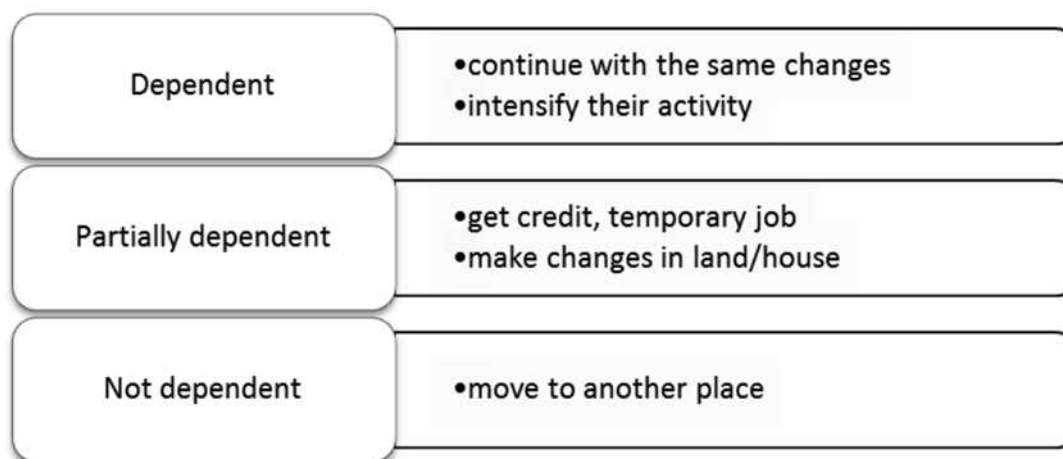


Figure 67 - Relation Between Dependence on Natural Resources and Adaptation Strategies

Examination of the connection between adaptation strategies and rural-urban relation revealed that people who travel to the city centre more frequently usually do not have adaptation strategies, particularly as regards the options “changes in their current activity”, “changes in type or income generating activity” and “changes in land/house structure”. Those households are less dependent on rural activities, less sensitive to environmental stress and have no options as regards future adaptation strategies.

The possible relationship between adaptation and land tenure regime was also explored in order to better understand whether adaptation strategies are influenced by land titling and formal or informal modalities of accessing land. There is no evident interdependence between adaptation strategies, land tenure and access to land. Nevertheless, the following tables show that those who have land ownership, who purchased their land and have a title deed, seem to opt primarily for the adaptation strategy of changes to the structure of their land or house (Tables 11-16).

Table 11

		Change in House/Land		Total
		Yes	No	
Land Ownership	Yes	38%	62%	100%
	No	19%	82%	100%
Total		32%	69%	100%

table 12

		Change in House/Land		Total
		Yes	No	
Bought the Land	Yes	40%	60%	100%
	No	19%	81%	100%
Total		32%	68%	100%

table 13

		Change in House/Land		Total
		Yes	No	
Hold a Land Title Deed	Yes	40%	60%	100%
	No	25%	76%	100%
Total		32%	68%	100%

table 14

		Bought the Land		Total
		Yes	No	
Future Adaptation Strategies	Start a business	30%	30%	30%
	Get a loan (credit)	14%	12%	13%
	Continue same changes in livestock and crop	14%	7%	11%
	Intensify/engage in agriculture/livestock	18%	11%	15%
	Look for a temporary job	7%	8%	7%
	Move to another place	21%	31%	25%
	Other	21%	16%	19%
				100%

table 15

		Land Ownership		Total
		Yes	No	
Future Adaptation Strategies	Start a business	29%	30%	30%
	Get a loan (credit)	13%	13%	13%
	Continue same changes in livestock and crop	15%	3%	11%
	Intensify/engage in agriculture/livestock	19%	8%	15%
	Look for a temporary job	7%	8%	7%
	Move to another place	20%	36%	26%
	Other	21%	14%	18%
Total				100%

table 16

		Future Adaptation Strategies		Total
		Yes	No	
Land Size (hectares)	Up to 1 ha	41%	59%	100,0%
	More than 1 ha	56%	44%	100,0%
Total		48%	53%	100,0%

The relationship between *adaptation strategies and modalities of accessing water* has also been investigated. The results indicate that those who draw water from a spring/stream or ground pit and observed a decrease in water availability, made changes mainly in livestock keeping and in the structure of their land or house.

There is also a connection between *observed changes and adaptation strategies*. As mentioned above, the households engaged in agriculture and livestock keeping observed more changes in water availability ("decreasing" or "decreasing a lot"). Both groups implemented adaptation strategies that include changes and improvements in the activity that they are already practicing. Nevertheless, the farmers who observed decreasing water availability mainly made changes in their type of crop, while the livestock keepers who observed water increasing mainly made changes in their type of livestock.

The future strategies of farmers and livestock keepers are to get a loan, look for a temporary job, move to another place and continue with the same changes in type of livestock and crops (Figure 68). However, those among them who observed decreases in water availability prefer to continue with the same changes (in livestock and crop) or intensify the livestock or agriculture activities they already practiced.

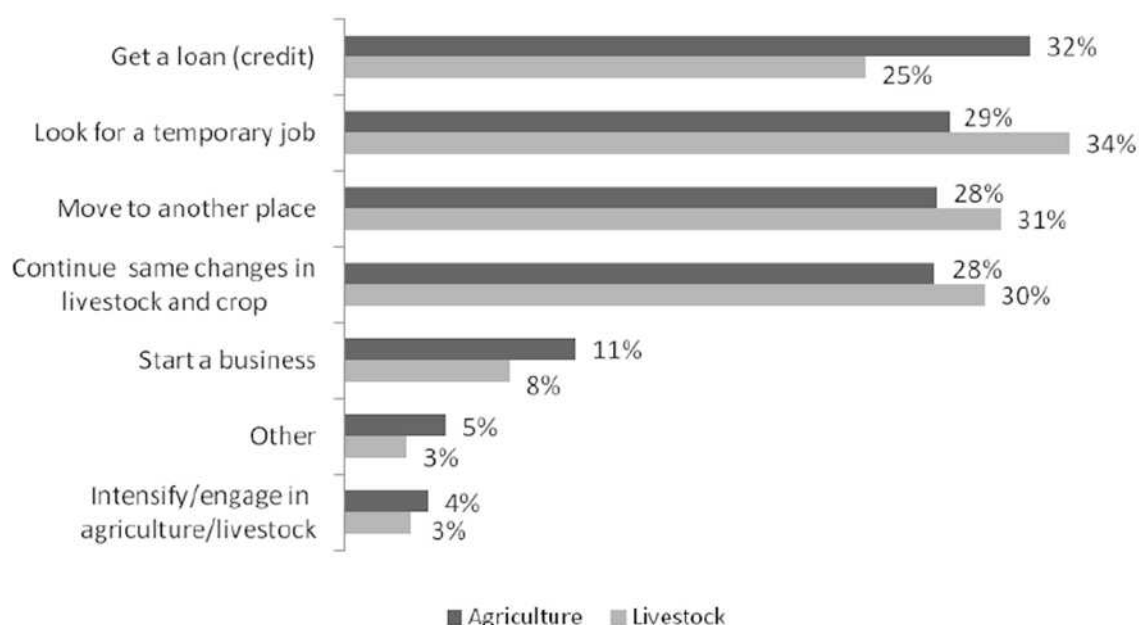


Figure 68 - Future Adaptation Strategies of Households Engaged in Agriculture and Livestock Keeping as Main Source of Income

Respondents observing a consistent decrease in soil fertility are more likely to make changes in livestock and crops, while other adaptation strategies are not influenced by this issue. As for future adaptation strategies, those who observed the worst changes in soil fertility intend to continue with the same activity or intensify it; on the other hand, starting a business is a strategy that does not seem to be related to the changes observed.

Those who observed changes in air humidity demonstrated the same attitudes, but only when a consistent decrease in air humidity is observed. On the other hand, the adaptation strategies do not seem to be dependent on the changes observed in rain patterns. Indeed, observation of changes in rainfall does not appear to be linked to households' dependence on natural resources or their adaptation strategies.

The relationship between income level and future adaptation strategies has also been analysed. Those who chose more "flexible" strategies, such as moving to another place, getting a loan or starting a business, have a higher income, while the opposite is true for those who would adopt "resistance" strategies in the future (Figure 69).

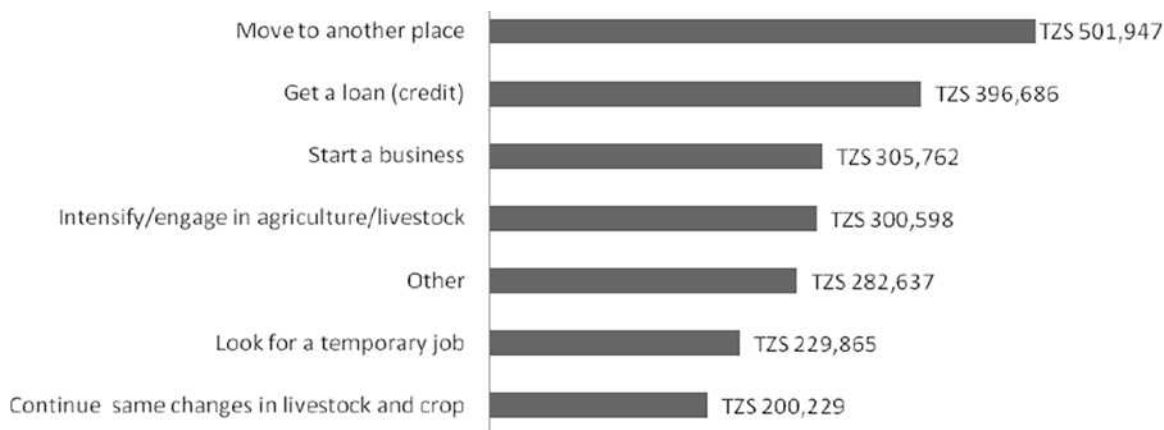


Figure 69 - Mean Income for Each Future Adaptation Strategy

3.5.3 Causes of Environmental Changes

The observed environmental changes are mainly attributed to global environmental change (92%) and human-related activities (87%), such as changes in land use and other local anthropogenic activities related mainly to urban development. A considerable portion of respondents also attributed the changes observed to inadequate institutional environmental management (65%), while a small portion believed it was due to other causes (33%), like el Nino, Tsunami, and other events (Figure 70). Furthermore, even if perception of environmental changes differs according to main source of income, this difference is not evident in cause attribution (Figure 71).

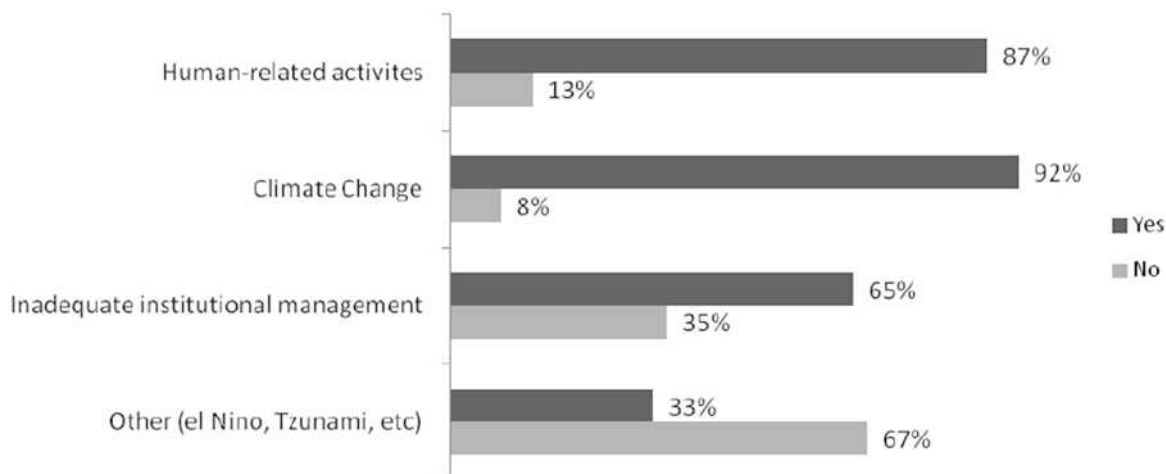


Figure 70 - Causes of Environmental Change

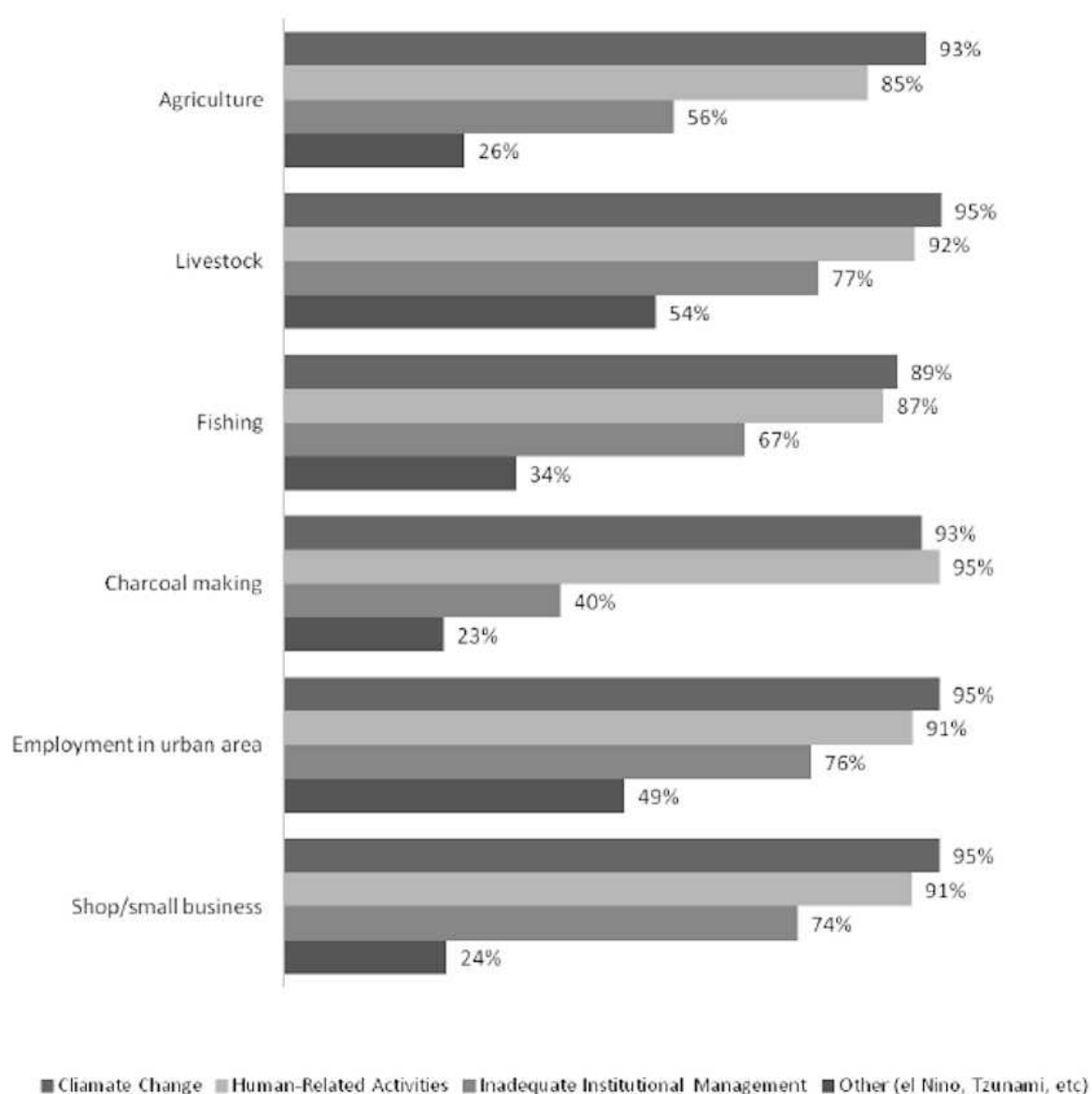


Figure 71 - Causes of Environmental Change by Main Income source

3.6 Adaptation Profiles

According to the previous analysis, two types of adaptation profiles can be discerned, and are displayed in Figure 72. The first profile type describes families engaged in adaptation strategies that are more oriented to “resistance”, to staying in the same place, improving or intensifying the activities they are already practicing, and changing the characteristics of their land and house according to on environmental changes. Those households usually practice rural activities as their main source of income or as secondary activities, and typically have ownership or a title deed for their land. They are totally or partially dependent on natural resources and have a low mean income. Furthermore, being engaged in agriculture and livestock, they observe considerable changes in water availability and soil fertility. The second profile type describes households adopting “flexible” adaptation strategies. Those households are likely to move to other places, to change their income activities and to modify their livelihoods arrangements. They are engaged mainly in urban activities, have a strong dependence on the city centre and a high mean income as compared with the other profile type. The environmental changes they observe are mainly variations in rain patterns.

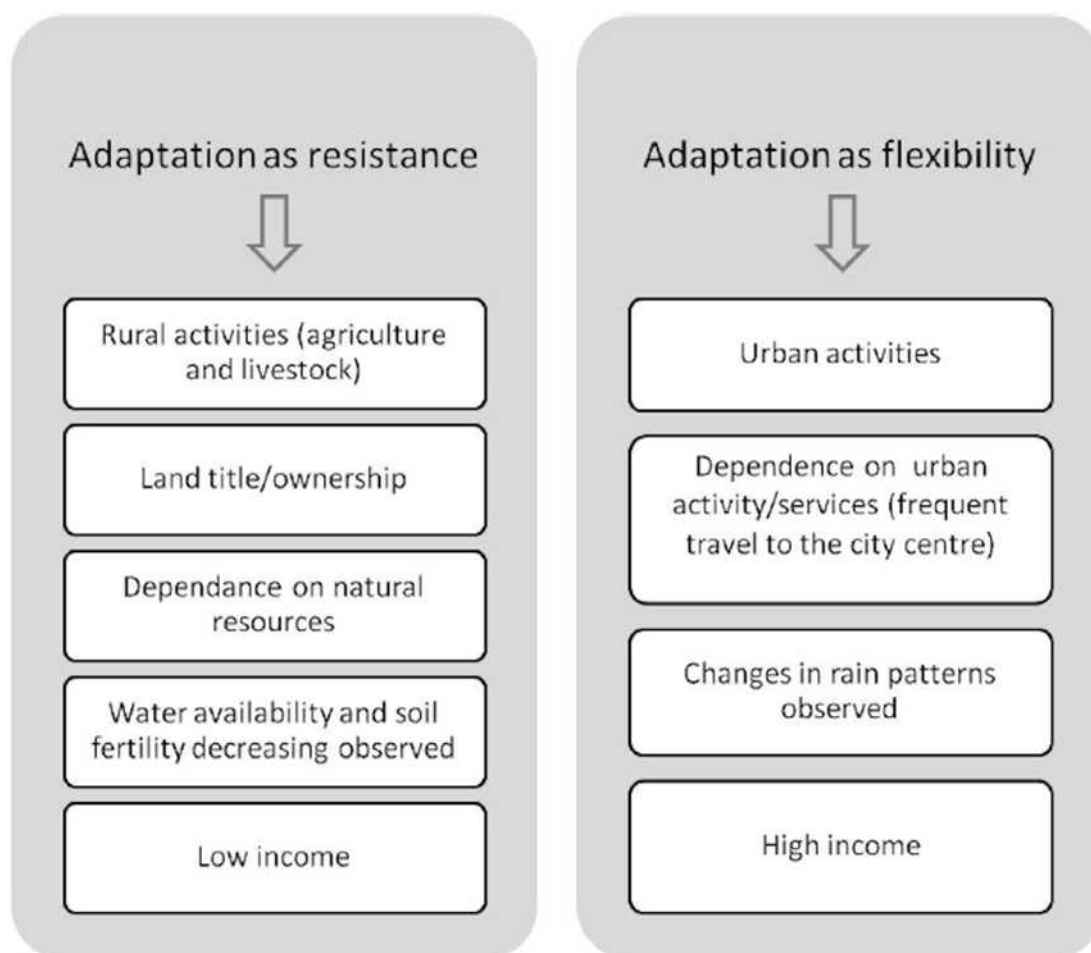


Figure 72 - Characteristics of Households Oriented to Flexible or Resistant Adaptation Strategies

4 Conclusions and Recommendations



4.1 Conclusions

In the light of the definition of adaptive capacity given in paragraph 2.1, analysis of data from the household survey provides relevant knowledge on the nature and components of adaptive capacity in coastal Dar's peri-urban areas.

A better understanding of the relationship between the characteristics of peri-urban households' and their autonomous adaptation strategies is the primary contribution of this study. There is a twofold interaction between the two sets of information. First, autonomous adaptation practices impact the characteristic features of the peri-urban, either in a positive or negative way. Second, those features function as both opportunities and constraints for the diverse adaptation practices that peri-urban dwellers undertake to cope with changes in their living environment. A visual representation of this relationship is as follows:

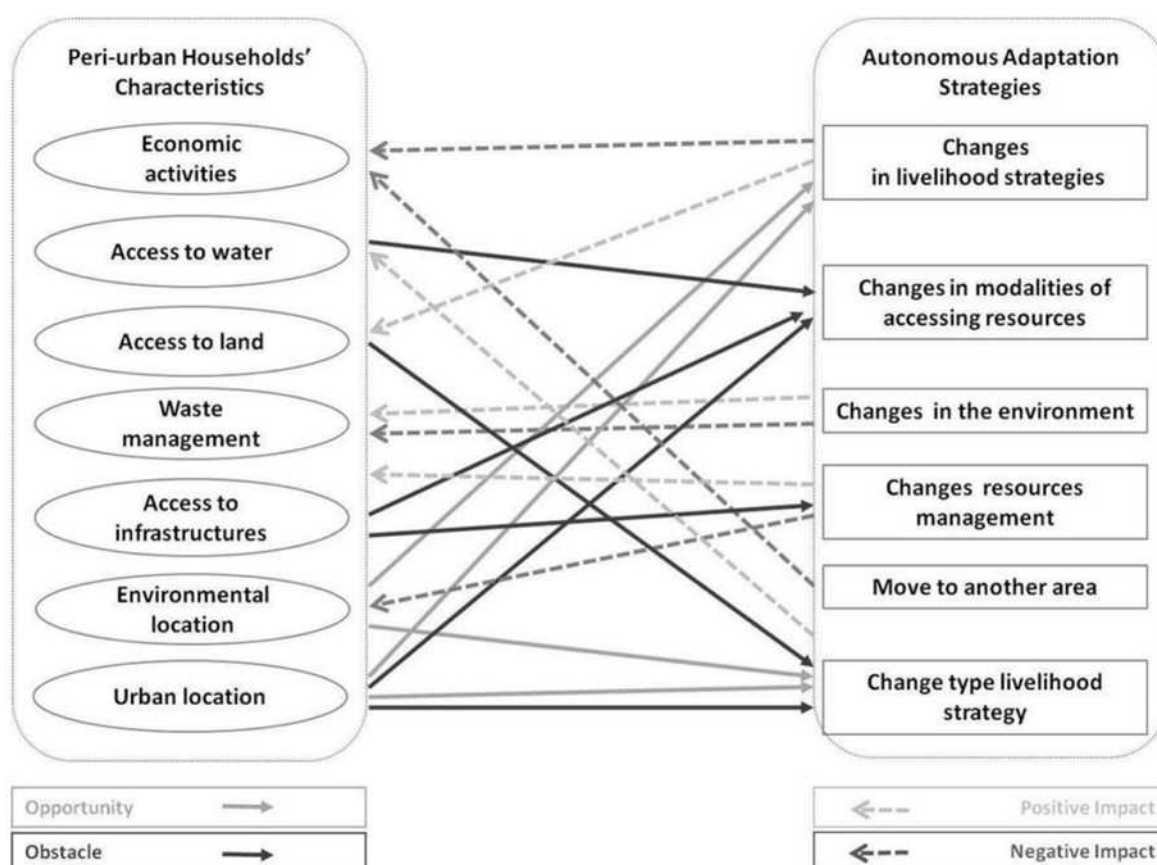


Figure 73 - Reciprocal Interactions Between Peri-Urban Households' Characteristics and Autonomous Adaptation Strategies

The analysis in the previous paragraphs shows that peri-urban households' adaptive capacity is linked to the possibility of diversifying sources of income and modalities of accessing water, land and other resources. Furthermore, most of autonomous adaptation strategies identified depend on the presence of both urban and rural features in peri-urban areas. This rural-urban mix allows individuals to develop hybrid livelihood strategies in which rural-urban and formal-informal practices complement, subsidise or support each other.

For this reason, investigation of the mutual interaction (Figure 64) between autonomous adaption practices and the characteristics of peri-urban households is essential to understanding households' vulnerability to environmental change.

On the one hand, investigating opportunities and obstacles arising from the households' characteristics can contribute to understanding how different modalities of accessing resources and resource management, spatial location, facilities and economic activities might promote or limit specific autonomous adaptation practice.

If a household is located close to a big market or to major transport routes, a small shop or business is a viable adaptation strategy of livelihood diversification (or change). Households located close to rivers (or others natural sources of water) can easily get water from shallow pits in order to diversify and multiply water sources in order to cope with water shortage periods.

There are also characteristics of peri-urban households that constitute obstacles and prevent specific autonomous adaptation practices. For instance, households located close to main infrastructures (pipelines, roads, etc.) that have access to pipelines but not to natural source of water, are not able to diversify their water sources, and when there is a shortage or infrastructure malfunction they are subject to street water vendors' speculation. Furthermore, accessing to new land can be difficult due to high prices and competition from investors.

Adaptation practices can produce negative or positive impacts on the social environmental and economic condition of households. For example, using organic fertilizers in urban agriculture or increasing the cultivated acreage to cope with soil aridity or decreasing soil fertility can improve waste management through organic waste recycling.

On the other hand, negative impacts can also be generated by adaptation practices that create risks and pressure on the environment. The construction of small embankments across drying rivers to preserve water for agriculture and domestic purposes could damage the river ecosystem and exacerbate the effects of changing climate on people (restricted access to water) and natural resources. Nevertheless, there are some limitations of the study. Indeed, it has yielded limited information on the role of local institutions in autonomous adaptation strategies. This information is essential to orienting the capacity building of municipal services and the design of adaptation initiatives. A better understanding of this role may be reached by combining the results of this study with new information gathered through interviews with municipal officials. Also, the diverse modalities of accessing resources that have been identified here require further investigation in order to provide valuable information on key factors of the peri-urban adaptive capacity.

Furthermore, gender issues and power relations within the household and in peri-urban society in general have not been addressed through the present survey as this was beyond the scope of this study, and not suited to the questionnaire method of data collection. Instead, gender issues and power relations will be explored through the Forum Theatre technique during the participatory activities performed in the second year of this project.

4.2 Recommendations

The study results help to identify two key issues on which participatory activities might focus: access to water and access to land. The data analysis indicates that these issues play a crucial role in shaping adaptation practices of peri-urban households. The Forum Theatre technique has already been tested in the context of Dar's peri-urban areas, and it has proven to be a suitable method for investigating gender roles and power relations as they related to modalities of resource access and environmental management.

The development of Forum Theatre plays on these key issues will complement the information gathered through the household questionnaire by providing an outline of the impacts that diverse adaptation strategies might have on the peri-urban social fabric and on the role that cultural aspects play in households' choices and behaviour. Knowledge of these impacts will be crucial to ensuring that future adaptation initiatives will not aggravate gender, age and class imbalances in social

relationships. The assessment of actual adaptive capacity should highlight the constraints imposed by actual gender roles, power relations and the cultural context as potential hot spots for initiatives and measures oriented to enhancing the adaptive capacity of Dar's peri-urban areas.

The knowledge developed and lessons learned through the present study should be transferred to local institutions in order to inform their capacity building. The information on land use, environmental management, access to resources and adaptation practices is essential to increasing municipal institutions' awareness of the efforts that peri-urban households are already undertaking to cope with environmental change. In addition, improved knowledge on informal practices is crucial to understanding how local institutions can investigate critical situations (constraints to adaptive capacity and negative impacts of autonomous adaptation) and identify possible initiatives for supporting and orienting the autonomous adaptation practices already in progress.

The outcomes of the household survey are also expected to complement further spatial and land cover analyses of Dar's peri-urban settlements (e.g. remote sensing and digital mapping). Integrating socio-economic and environmental data from the questionnaires with environmental information obtained through monitoring of land cover changes will be crucial to identifying adaptive capacity distribution across Dar's coastal areas. This will be essential for identifying major problems and spatial priorities for adaptation initiative design and environmental vulnerability reduction.

Methodologies for exploring Dar's vulnerability should consider both the physical and socio-economic factors that combine to determine community vulnerability to environmental changes. Thus, both the household survey and spatial analysis of Dar are strictly linked to the monitoring of residents' dependence on specific natural resources (such as groundwater) through indicators and scenario development. Those scenarios and indicators are the main inputs in the design of adaptation initiatives that can be performed by local institutions. Indeed, this knowledge should be included in capacity building for local institutions in order to improve their ability to assess new climate change vulnerability scenarios and to design effective adaptation initiatives for Dar's inhabitants.



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Appendix 1 Questionnaire Form Sample

ADAPTING TO CLIMATE CHANGE IN COASTAL DAR ES SALAAM HOUSEHOLD QUESTIONNAIRE

AIM

The aim of the questionnaire is to gather information on the livelihood strategies and environmental management practices used by peri-urban dwellers, and their autonomous adaptation strategies to environmental changes.

The questionnaire is structured around four main areas of investigation:

Rural-urban interaction (economic flows, the flow of resources and socio-cultural relations, movement of people); interdependencies and relationships between peri-urban areas and the city centre and between peri-urban areas and rural areas (regions);

Access to resources (land, water, energy, shorelines, sea, raw materials etc.);

Environmental management: The aim, on the one hand, is to identify resource use and the management regime, and on the other hand, to identify obstacles and opportunities in autonomous adaptation to environmental change in peri-urban areas;

Climate change: environmental transformations and autonomous adaptation strategies. The aim is to improve understanding of the environmental changes observed by residents of peri-urban areas, their perception of the causes of these changes and the strategies they have implemented to address them in both the short and medium-term.

WHO AND WHERE

The targeted households are those in the coastal plain, with socio-economic and cultural heterogeneity (different education, income, etc.), who are stably settled (at least 5 years), and whose livelihoods are dependent on both urban and rural activities and resources. The households are selected randomly throughout the coastal plain.

*PERI-URBAN (PU) areas are areas with prevalence of low-medium density settlements and where people livelihood is partly or totally dependent on direct access to natural resources. In PU areas urban and rural activities are juxtaposed, and rural and the urban landscape features are highly intertwined.

**AUTONOMOUS ADAPTATION: Individual or collective actions, initiatives or strategies spontaneously and independently undertaken to adjust to actual or expected environmental changes. It includes all the initiatives not planned or promoted by institutions.

QUESTIONS

STRUCTURAL DATA/SAMPLE CHARACTERISTICS

LOCATION

Q1. IN WHICH SUB WARD (MTAA) DO YOU LIVE?

HOUSEHOLD DETERMINATION

Q2. WHAT IS YOUR GENDER?

1. Female
2. Male

Q3. HOW MANY PEOPLE ARE IN YOUR FAMILY?

(no. of people, including the interviewee)

Q4. HOW OLD ARE YOU?

(in years as of the date of the questionnaire survey)

CASH-NONCASH INCOME GENERATING ACTIVITIES

Q5. HOW MUCH IS YOUR INCOME OR MONTHLY CASH FLOW? (OR EXPENDITURE) (TZS*)

Q6. WHAT IS YOUR MAIN SOURCE OF INCOME?

1. Agriculture (specify crop)
2. Livestock (specify livestock)
3. Charcoal making
4. Fishing
5. Shop/small business
6. Employment in an urban area
7. Other

Q7. (a). DO YOU WORK IN FARMING AS A SECONDARY JOB?

1. Yes
2. No

Q7(b). DO YOU WORK IN EXCHANGE FOR FOOD OR GOODS?

1. Yes
2. No

EDUCATION

Q8. WHAT IS YOUR EDUCATION LEVEL?

1. Form IV
2. STD I
3. STD IV
4. STD VII
5. Bachelor's
6. Master's
7. Other certificate

RURAL-URBAN INTERACTIONS

MIGRATION

Q9. HOW LONG HAVE YOU LIVED HERE?
(years)

Q10. WHERE DID YOU LIVE BEFORE?

1. The same district
2. The same region (Dar Es Salaam)
3. Other regions
4. Other

Q11. WHICH REGION OF TANZANIA DO YOU COME FROM?

Q12. WHY DID YOU MOVE HERE?

1. Looking for more space for animal husbandry and/or agriculture
2. Bought a piece of land
3. Looking for job/employment
4. Transfer (employment)
5. Looking for self-employment
6. Because of government decisions
7. Business purposes
8. Family (to visit relatives)
9. Other

Q13. DID YOU MOVE HERE ALONE OR WITH YOUR FAMILY?

1. Alone
2. With family

RURAL ACTIVITIES

Q14. WHAT ACTIVITY DO YOU UNDERTAKE THE MOST IN YOUR PLACE?

1. Agriculture (specify crop)
2. Livestock (specify animal)
3. Charcoal making
4. Fishing
5. Shop/small business
6. Other

Q15. WHAT OTHER ACTIVITIES DO YOU REGULARLY DO IN YOUR PLACE?

1. Agriculture (specify crop)
2. Livestock (specify animal)
3. Charcoal making (
4. Fishing
5. Shop/small business
6. Employment in urban area (institution; shop, etc.)
7. Other

Q16. WHAT CROP DO YOU GROW?

1. Cassava
2. Maize
3. Potato
4. Orange
5. Mango
6. Banana
7. Coconut
8. Pawpaw
9. Mchicha
10. Sugar cane
11. Tomato
12. Pumpkin
13. Rice
14. Pineapple
15. Other vegetable(s)
16. Other fruit(s)

Q17. WHAT LIVESTOCK/ANIMALS DO YOU RAISE?

1. Cattle
2. Goat
3. Pig
4. Chickens
5. Donkey
7. Dog
8. Duck
9. Others

RELATIONSHIP WITH THE CITY

Q18. HOW OFTEN DO YOU GO TO THE CITY CENTER?

1. About once a day
2. About once a week
3. About twice a month
4. Rarely

Q19. FOR WHAT REASON DO YOU GO TO THE CITY CENTER?

1. Work
2. Selling
3. Shopping
4. Health services
5. Education
6. Other

Q20. WHAT MEANS OF TRANSPORTION DO YOU USE MOST TO GO TO THE CITY CENTRE?

1. Daladala (or other bus/minibus)
2. Motorcycle
3. Personal Car
4. Bicycle
5. On foot
6. Other

Q21. WHAT OTHER MEANS OF TRANSPORTION DO YOU USE?

1. Daladala (or other bus/minibus)
2. Motorcycle
3. Car
4. Bicycle
5. Foot
6. Other

Q22. WOULD YOU LIKE TO MOVE TO THE CITY CENTRE?

1. Yes
2. No

ACCESS TO RESOURCES

LAND CHARACTERISTICS AND LAND TENURE

Q23. DO YOU OWN LAND?

1. Yes
2. No

Q24. DID YOU BUY THE PIECE OF LAND YOU LIVE ON?

1. Yes
2. No

Q25. DO YOU HOLD A TITLE DEED FOR YOUR LAND?

1. Yes
2. No

Q26. HOW LARGE IS THE PIECE OF LAND ON WHICH YOU LIVE?
(hectares)

Q27. DO YOU PAY ANY TAXES/FEES ON YOUR LAND/HOUSE?

1. Yes
2. No

Q28. HOW MUCH DO YOU SPEND IN LAND/HOUSE TAXES A MONTH?
(TZS)

ACCESS TO WATER RESOURCES

Q29. DO YOU PAY ANY TAXES/FEES FOR WATER?

1. Yes
2. No

Q30. HOW MUCH DO YOU SPEND ON WATER A MONTH?
(TZS)

ACCESS TO SOLID WASTE COLLECTION

Q31. DO YOU PAY ANY TAXES/FEES FOR WASTE COLLECTION?

1. Yes
2. No

Q32. HOW MUCH DO YOU SPEND FOR WASTE COLLECTION A MONTH?
(TZS)

ACCESS TO ELECTRICITY

Q33. DO YOU PAY ANY TAXES/FEES FOR ELECTRICITY?

1. Yes
2. No

Q34. HOW MUCH DO YOU SPEND FOR ELECTRICITY A MONTH?
(TZS)

Q35. DO YOU PAY ANY TAXES/FEES FOR WASTEWATER COLLECTION?

1. Yes
2. No

Q36. HOW MUCH DO YOU SPEND FOR WASTEWATER COLLECTION A MONTH?
(TZS)

RESOURCE MANAGEMENT

WATER MANAGEMENT

Q37. WHAT IS YOUR MAIN WATER SOURCE?

1. Street vendors
2. Neighbour's source (e.g. pipeline)
3. Spring/stream or ground pit
4. Well
5. Pipeline
6. Other

Q38. WHERE DO YOU STORE WATER?

1. Tank
2. Bucket (20L)
3. Concrete (underground tank)
4. Other containers

Q39. HAVE YOU ANOTHER WATER STORAGE SYSTEM, IF YES WHICH ONE?

1. Tank
2. Bucket (20L)
3. Concrete (underground tank)
4. Other containers

Q40. WHAT IS YOUR WATER STORAGE CAPACITY IN LITRES?
(litres)

ENERGY MANAGEMENT

Q41. IS YOUR HOUSE CONNECTED TO THE ELECTRICITY SUPPLY NETWORK?

1. Yes
2. No

Q42(a). WHAT SOURCE OF ENERGY DO YOU USE FOR COOKING?

1. Charcoal
2. Gasoline
3. Power line
4. Other

Q42(b). DO YOU USE ANY OTHER SOURCE OF ENERGY, SUCH AS FUEL, WOOD ETC?

1. Yes
2. No

Q42(c). WHAT SOURCE OF ENERGY DO YOU USE FOR LIGHTING?

1. Charcoal
2. Gasoline
3. Power line
4. Other

SOLID WASTE MANAGEMENT

Q43. WHO COLLECTS YOUR GARBAGE (SOLID WASTE)?

1. Company (public or private collection)
2. Street collectors
3. Individual collection
4. Other

Q44. WHERE DOES YOUR GARBAGE GO?

1. Crude dumping
2. Burning
3. Burying
4. Landfill
5. Don't know
6. Other (nyinginezo)

Q45. HOW MUCH GARBAGE DO YOU PRODUCE A DAY?

1. 1 bucket [up to one]
2. 1-3 buckets [from 1 to 3]
3. More than 3 buckets

Q46. DO YOU RECYCLE/REUSE/SELL YOUR GARBAGE IN WHOLE OR IN PART?

1. Yes
2. No

RESOURCE MANAGEMENT (WASTEWATER)

Q47. WHO COLLECTS YOUR WASTEWATER?

1. Public or private collection
2. Individual collection (pit latrine)
3. Central sewerage system
4. Other

Q48. WHERE DOES YOUR WASTEWATER GO?

1. Pit latrine
2. VIP latrine
3. Septic tank
4. Other

Q49. DO YOU RECYCLE/REUSE/SELL YOUR WASTEWATER IN WHOLE OR IN PART?

1. Yes
2. No

CLIMATE CHANGE ADAPTATION

OBSERVED CLIMATE CHANGES

Q50. HAVE YOU NOTICED ANY CHANGE IN WATER AVAILABILITY IN THE LAST YEAR?

1. No
2. Yes, increasing
3. Yes, decreasing
4. Yes, decreasing a lot

Q51. HAVE YOU NOTICED ANY CHANGE IN SOIL FERTILITY IN THE LAST YEAR?

1. No
2. Yes, increasing
3. Yes, decreasing
4. Yes, decreasing a lot

Q52. HAVE YOU NOTICED ANY CHANGE IN SOIL ARIDITY IN THE LAST YEAR?

1. No
2. Yes, increasing
3. Yes, decreasing
4. Yes, decreasing a lot

Q53. HAVE YOU NOTICED ANY CHANGE IN AIR HUMIDITY IN THE LAST YEAR?

1. No
2. Yes, increasing
3. Yes, decreasing
4. Yes, decreasing a lot

Q54. HAVE YOU NOTICED ANY CHANGE IN RAINFALL PATTERNS IN THE LAST YEAR?

1. No
2. Yes, increasing
3. Yes, decreasing
4. Yes, decreasing a lot
5. Yes, changes in seasonal rainfall patterns

Q55. HAVE YOU NOTICED ANY OTHER ENVIRONMENTAL CHANGES (SEA LEVEL RISE, BIO-DIVERSITY, ETC) IN THE LAST YEAR?

1. No
2. Yes
3. Yes, a lot

AUTONOMOUS ADAPTATION STRATEGIES

Q56. HAVE YOU MADE ANY CHANGE IN THE KIND OF ACTIVITY THAT YOU USUALLY DO IN YOUR PLACE AND/OR IN THE TIME THAT YOU DEDICATE TO IT?

1. Yes
2. No

Q57. HAVE YOU MADE ANY CHANGES IN THE CROP(S) YOU GROW?

1. Yes
2. No

Q58. HAVE YOU MADE ANY CHANGES IN THE LIVESTOCK YOU RAISE?

1. Yes
2. No

Q59. HAVE YOU SWITCHED TO OTHER INCOME GENERATING ACTIVITIES?

1. Yes
2. No

Q60. HAVE YOU MADE ANY CHANGES TO YOUR HOUSE/LAND?

1. Yes
2. No

Q61. DO YOU HAVE A STRATEGY TO COPE WITH FUTURE ENVIRONMENTAL CHANGES THAT COULD THREATEN YOUR LIVELIHOOD/PLACE (DROUGHT, FLOODING, ETC.)

1. Yes
2. No

Q62. WHAT SORT OF STRATEGY DO YOU HAVE?

1. Start business
2. Loan credit
3. Continue as climate changes impacts unfold (in livestock and crop)
4. Intensify or introduce agriculture/livestock
5. Look for temporary job
6. Move to another place
7. Other

CLIMATE CHANGE CAUSES

Q63. IN YOUR OPINION, ARE THE CHANGES YOU NOTICED MAINLY RELATED TO CLIMATE CHANGE?

1. Yes
2. No

Q64. IN YOUR OPINION, ARE THE CHANGES YOU NOTICED MAINLY HUMAN-RELATED?

1. Yes
2. No

Q65. IN YOUR OPINION, ARE THE CHANGES YOU NOTICED MAINLY RELATED TO INADEQUATE ENVIRONMENTAL MANAGEMENT BY LOCAL INSTITUTIONS?

1. Yes
2. No

Q66. IN YOUR OPINION, ARE THE CHANGES YOU NOTICED MAINLY RELATED TO OTHER CAUSES (LIKE EL NINO, TSUNAMI, ETC)?

1. Yes
2. No



Project title:

Adapting to Climate Change in Coastal Dar es Salaam

Project acronym:	ACC Dar
Contract number:	2010/254-773
Project duration:	01/02/2011 – 31/01/2014
Grant Contract Beneficiary:	DICEA Sapienza University of Rome
Contact Person:	Silvia Macchi
Partner in the Action:	Ardhi University Dar es Salaam
Associate in the Action:	Dar es Salaam City Council