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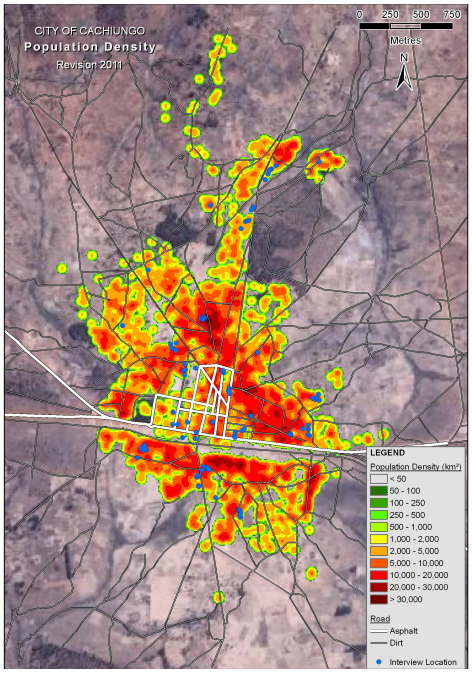
Final Report

Poverty and Environmental Vulnerability in Angola's Growing Slums:

City Report for Katchiungo



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EXECUTIVE SUMMARY

Development Workshop Angola carried out a research project in 2009 - 2011 in three urban areas of Angola, namely Luanda (the capital city of Angola), Huambo (the capital of Huambo Province), and Katchiungo (the main town in the District of Katchiungo in Huambo Province). The urban areas of Luanda, Huambo, and Katchiungo were chosen for this study, as they are dissimilar and were considered to be representative of different types of urban areas in Angola. The study used field research and new mapping techniques to supply baseline data on the five indicators which the United Nations uses to define slums for the Millennium Development Goals (MDGs) and, to explore in more depth the spatial aspects of poverty and urban environmental issues. This volume focuses on the city of Katchiungo.

New techniques including the use of satellite images for remote sensing put within reach of NGOs and local university departments in Africa the capacity to map social conditions and analyse their spatial aspects. Remote sensing, coupled with small sample surveys, can provide population estimates, show the spatial extent of urban areas, and identify areas of similar physical and socio-economic characteristics. This information can be updated as urban areas develop and change, and they permit the tracking of rapid changes in demographics and socio-economic situations that often characterize rapidly-growing cities.

A typology of settlements was developed, based on the date of settlement, history, the distance from the city centre, service levels, street patterns and type of housing. In Katchiungo, only two settlement types were identified – the formally-urbanised centre of the city and the informally-settled areas surrounding it. Due to the small size of this city, it was found that there are more similarities, rather than differences that define these two settlement types.

Using remote sensing and small sample surveys, an estimate of the population showed that there were about 10,000 residents in Katchiungo. Less data were available to make population growth projections; however, the population growth rate was estimated at just a little above zero.

Almost all the residents of Katchiungo were born in either Katchiungo or in Huambo province. A very small minority were born in the adjacent province of Bie, located to the east. Natural population growth in Katchiungo is probably balanced by out-migration, hence the very low overall population growth rate.

This study used five indicators of poverty, adapted from the definition of slums used by the United Nations Millennium Development Goals: a) poor security of tenure, b) difficult access to safe water, c) low levels of improved sanitation, d) low durability of housing structures and e) overcrowding. A scoring system was developed (i.e., a score of 1 for good, 3 for unsatisfactory and 2 for intermediate level) and applied to each indicator. From this, overall scores were calculated for each indicator, and a summary score was also calculated for the city. The overall score for Katchiungo was 2.45, suggesting that the inhabitants of Katchiungo were living in relatively poor conditions. This is perhaps partly due to the fact that in Katchiungo, there has been little reconstruction and investment since the end of the civil war in 2002.

With its relatively small population, overcrowding was found to be the least important indicator of community well-being in Katchiungo (score of 1). Similarly, housing quality does not seem to be an important characteristic since the residents seem to have reasonably good quality houses (average score of 1.8 for both settlement types). Those living in the

informal housing areas generally have lower quality houses than those in the formal housing areas, but the quality is still adequate. The indicators with the poorest scores are those that relate to collectively supplied services: access to safe water, collection of solid waste and guarantee of secure tenure. Access to safe water was rated lowest in both informal and formal housing areas (score of 3 for each) and access to improved sanitation was rated just slightly better at 2.5 for each settlement type. Security of tenure was rated highest in the formal housing areas (score of 1) while in the informal housing areas, the score was in the other extreme (score of 3). The results suggest that it may be worthwhile for city administrators and other stakeholders to pay attention to these latter three indicators and take steps to address these issues.

Flooding is not an important environmental issue in Katchiungo – due to its high elevation, rainwater can readily drain into catchment areas in the lower elevations. Katchiungo is a small town with unoccupied spaces and little population pressure; the built-up area has generally avoided areas of erosion and flooding risk. However, the risk of erosion remains an important issue. The annual rainfall rates in Katchiungo are among the highest in the country, and rain can fall in short and very heavy storms. With the rapid growth of the charcoal industry and the shifting cultivation practiced by many farmers, the loss of vegetation cover has increased – these are conditions that create erosion risks, especially where control measures are inadequate. Already, serious erosion can be seen alongside dirt roads near the town. Clearly, erosion is another issue that the city administrators should pay attention to.

In the bigger cities, access to the urban core is very important because this is where most of the economic opportunities exist. The existence and condition of roads and the available modes of transportation are therefore critical for the livelihood strategies of households. However, accessibility is a less important issue in Katchiungo, as the town is very small and distances between opposite ends of the city are small.

In all three urban areas there is a land market in which private transactions take place, even though legally, all land in Angola belongs to the state. Buying land (or a house) is the usual way in which a house is obtained, and simply squatting or occupying land is very rare. Only a small minority of residents hold the documents that, by law, are required to show their right to occupy the land. Considerable numbers of people have no documents at all. Despite this, most residents in the formal housing areas consider that their tenure is secure. Feelings of insecurity about tenure are highest in the informal housing areas of Katchiungo where residents may have lost documents about their houses during the war.

Land values normally reflect the importance of factors such as economic activity levels, accessibility, environmental risk factors and access to services. At the time of the study, however, all lands in Katchiungo were valued at less than US$5 /$m^2$.

Individuals in Katchiungo are strongly linked to the surrounding rural areas, with most families being engaged in some way in agriculture or other rural activity. Thus, while Cachiiungo is considered an urban center, it has retained its mainly rural character. Furthermore, the economic activity in the surrounding rural areas appear to counteract the pull of the urban centre, resulting in a more even population distribution between the urban and rural areas.

1 INTRODUCTION

There is a lack of reliable data about social conditions in urban areas in Angola as there has not been a full census since 1971, and only a partial census was carried out (in Luanda and Malange) in 1983. Continuous civil conflict from the time of independence from Portugal in 1975 until 2002 prevented the development of institutional capacity for data collection, analysis and planning. There are no accurate data on the population of cities, despite their rapid growth during the civil conflict when the rural economy collapsed and many areas of the country were unsafe. There has been no overall view of the spatial aspects of poverty and urban environmental issues in Angolan cities (such as where the poor are located in relation to environmental risks, basic services and economic opportunities), and the geographical implications of policies such as upgrading. This, despite it being known that urban poverty has a strong spatial component, and that urban planning requires geographical information on social and environmental issues. There is, in particular, a paucity of data and information on Angola's second- and third-tier cities, despite the fact that they account for half of the country's urban population and a third of its total population.

This volume focuses on the findings for the city of Katchiungo – it is part of a report of a research project carried out in 2009 - 2011 by Development Workshop Angola in three urban areas of Angola, i.e., Luanda (the capital city of Angola), Huambo (the capital of Huambo Province), and Katchiungo, the main town in the District of Katchiungo in Huambo Province.

1.1 Objectives of the Study

The objectives of this project were:

1) to use action research to provide baseline data on poverty and environmental vulnerability in a first, second- and third-tier city in Angola, and to analyze poverty and vulnerability through five specific indicators:
   a) land tenure and land markets
   b) environmental burdens
   c) access to basic services (water and sanitation)
   d) settlement density and overcrowding
   e) housing quality and location

2) to apply a comparative analytical approach to examine first, how interactions among factors in these five areas produce specific vulnerability profiles in each city, and second, how vulnerability profiles differ between the different cities given their specific demographic, geographic and environmental settings

3) to make research results accessible to the wider public in general, and urban managers and technicians in particular, with the aim of influencing urban policy and practice at the national level, and

4) to enhance DW's own capacity for implementing urban planning projects and to capacitate Angolan policy-makers, urban managers and civil society, as well as regional policy-makers and policy researchers in other African contexts that confront rapid and complex urbanization challenges.

2 METHODOLOGY

2.1 Research Framework

The Millennium Development Goals (MDGs) standards were used to study urban poverty. The MDG 11, developed by UN Habitat, has been accepted by the Angolan Government as a basis for monitoring their performance on their stated policy for post-conflict reconstruction and shelter provision. Similarly, the government's programme of providing "Water for All" essentially aims at attaining the MDG standard for equitable access to water. The purpose of incorporating the MDG-compatible indicators into the study is to make the research results a useful tool to influence government policy, and to greatly facilitate the collection of data that the government needs for their own planning.

The research used five MDG indicators:

a) Land tenure and land markets
b) Environmental burdens
c) Access to basic services (water and sanitation)
d) Settlement density and overcrowding
e) Housing quality and location

Two levels of comparative analysis were done: first, the different 'layers' of information (one 'layer' for each indicator) were mapped and overlaid in order to create poverty/vulnerability maps of the sample areas. Second, the findings for each city were compared with the others to identify similarities and differences (see the analytical framework, Figure 1 below).

2.2 The Study Areas: Luanda, Huambo and Katchiungo

Even on a continent that as a whole is grappling with unusually explosive urban growth, Angola stands out for its particularly rapid rates and levels of urbanization and the daunting urban poverty and planning challenges it consequently confronts in the post-conflict period. Reliable urban poverty information is particularly scarce for the half of the urban population that resides in second- and third-tier cities. In these urban areas, land tenure, livelihood subsistence strategies, service demands, and relationships to environment and environmental change, differ significantly from Luanda. To date, most urban research and programme implementation has focused on Luanda, and it has primarily been the data on the capital city that has informed the development of new and important urban policy planning and poverty reduction frameworks. Recent demographic analysis through GIS remote sensing based on high-resolution satellite imagery showed that in cities such as Luanda and Huambo, between 70-80% of the population are living in the large peri-urban slum areas. The analysis further showed that population densities are highest in the peri-urban areas.

Most of Angola's urban growth has involved unregulated expansion at the periphery of its cities, often onto steep slopes or flood-plains. Large slums expanded around an older urban core. Housing has invaded environmentally sensitive areas and there are problems of erosion and flooding. There are few preparations for these and other extreme events. There is little information about local manifestations of climate change and what it might imply.

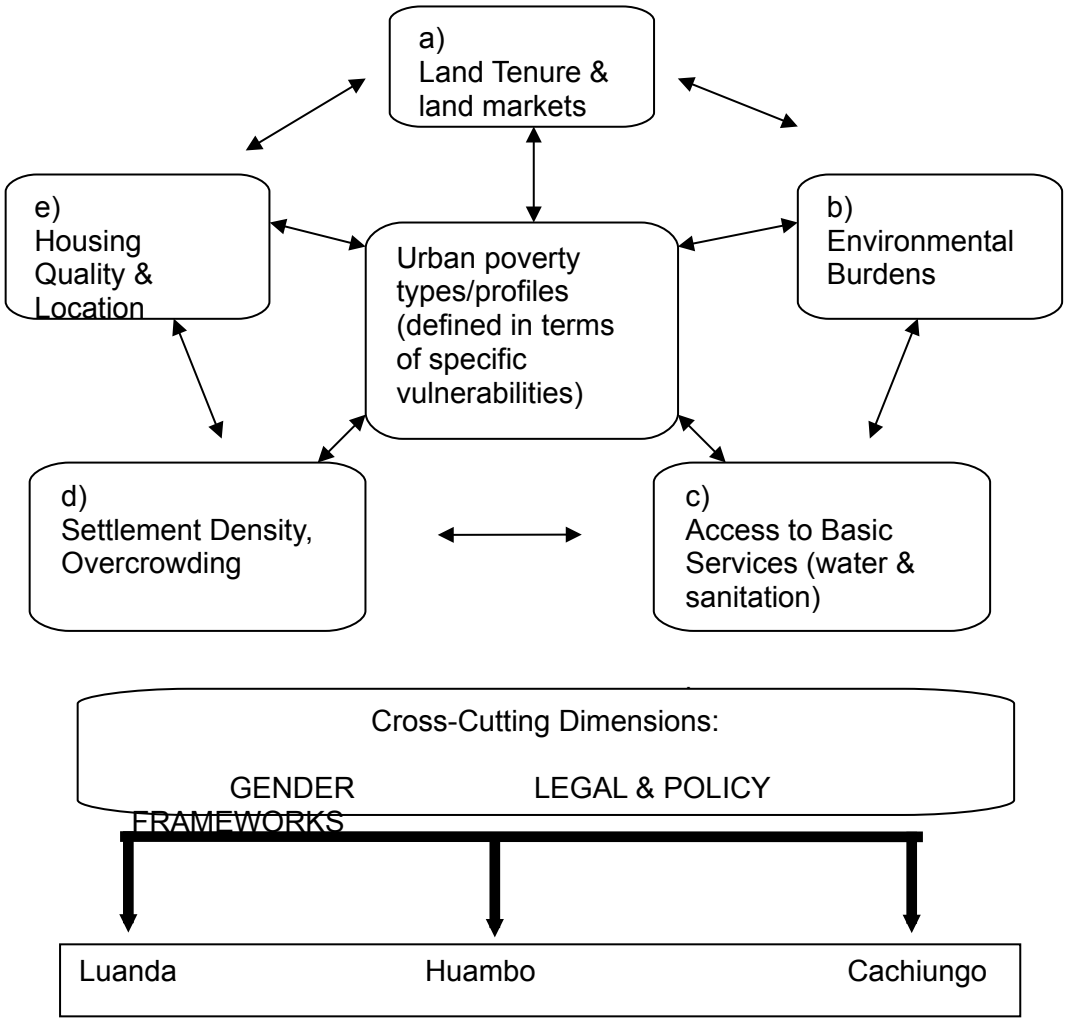


Figure 1. Analytical framework: urban poverty indicators

The cities of Luanda (the capital of Angola), Huambo (Angola's second largest city and the capital of the province of Huambo), and Katchiungo (a municipal town in the eastern part of the province of Huambo), were chosen for this study because they are considered to include a vast variety of urban settlement types and are representative of most Angolan urban areas and even of cities throughout sub-Saharan Africa.

Luanda was founded in 1576 and is one of the oldest cities in Africa south of the Sahara. As the capital city, Luanda represents, to an extent, the classic 'mega-city', of which the hyper-urbanized setting has been the focus of most urban poverty and planning research in Angola and more broadly throughout Africa. Since the country achieved independence from Portugal in 1975, the population of the city of Luanda had grown between eight- and ten-fold, and is estimated to be over 5 million people today. With an average urban growth rate of between 6.5 and 7% per year, Luanda has been growing at twice the rate of an average Southern African city (the population growth of other coastal cities such as Benguela-Lobito, Namibe and Lubango has been almost as fast). Luanda's urbanisation has been accelerated by the flight of war-affected populations and internally displaced people because of its relative safety during the war. Thus, the city has expanded to peri-urban areas where a large

proportion of the population lives in self-built slums (*musseques*) without any kind of infrastructure.

Huambo city is the capital of the province of Huambo and was the centre of major conflict during the recent war. The city of Huambo was designated in 1912 to become the capital of Angola, even though at the time no buildings existed within the proposed city limits. A large area was reserved for the city, within which the construction of huts or other informal construction type was banned. Informal housing grew up around these wide limits so the division between the urbanized city and peri-urban areas is much clearer than in Luanda. The growth of the city was never as rapid as in Luanda and rarely led to contact between these two spaces. Huambo is an example of a second-tier city that has hitherto been largely neglected, but shares the socio-economic characteristics of many Angolan and African urban areas (for the relative locations of the provinces of Luanda and Huambo, see Figure 2).

Figure 2. Map of Angola: relative locations of the provinces of Luanda and Huambo

Katchiungo is a typical third-tier municipal city that has been left out of most researches up until now. Katchiungo was largely depopulated during the war, and suffered serious damage. Like many Angolan municipal centres, Katchiungo is rebuilding itself as a regional market town in the last post-conflict years. Figure 3 shows the relative locations of the cities of Huambo and Katchiungo, while Figure 4 shows the local administrations/population centres in the District of Katchiungo.

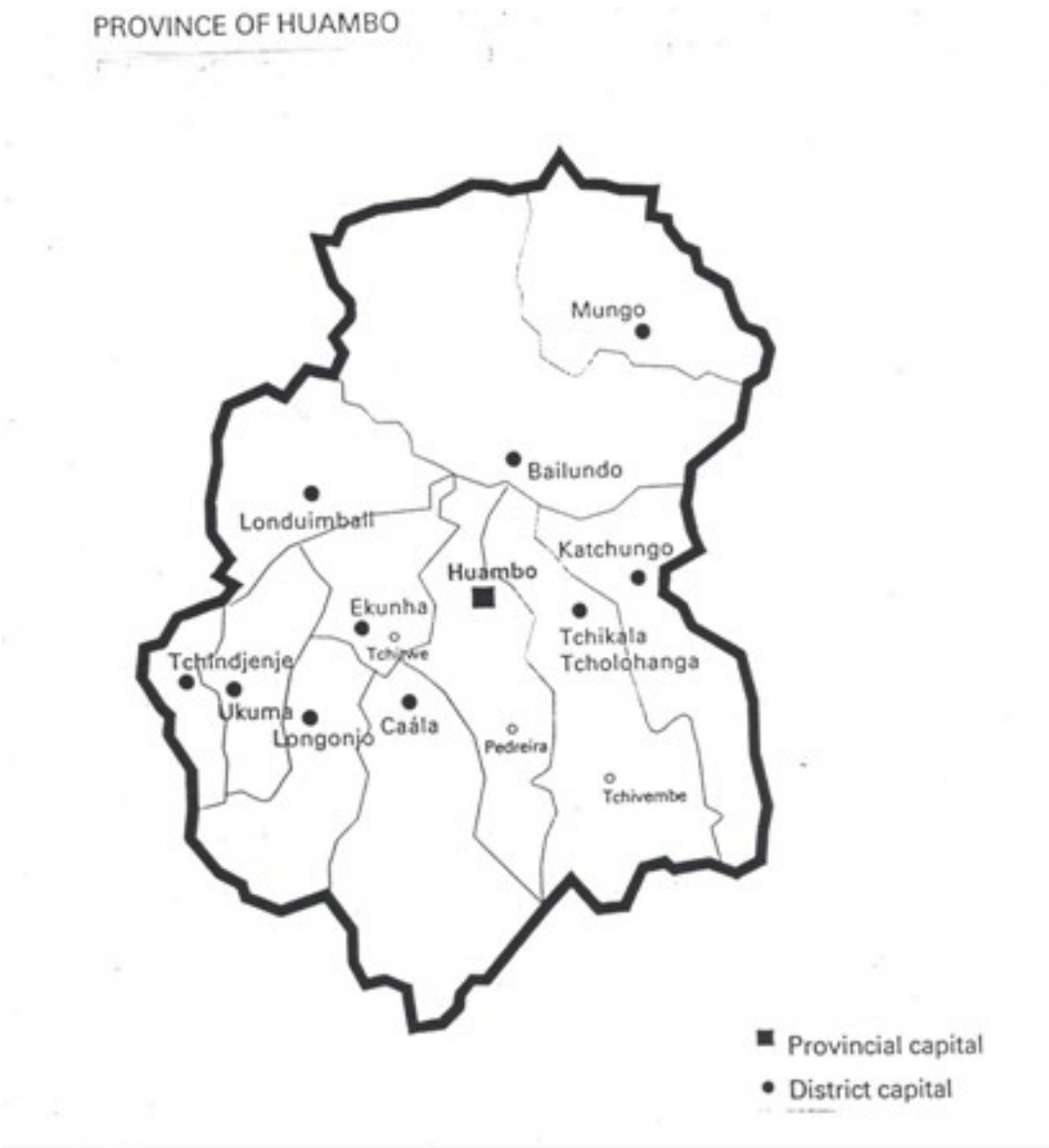


Figure 3. Relative locations of the City of Huambo and District of Katchiungo

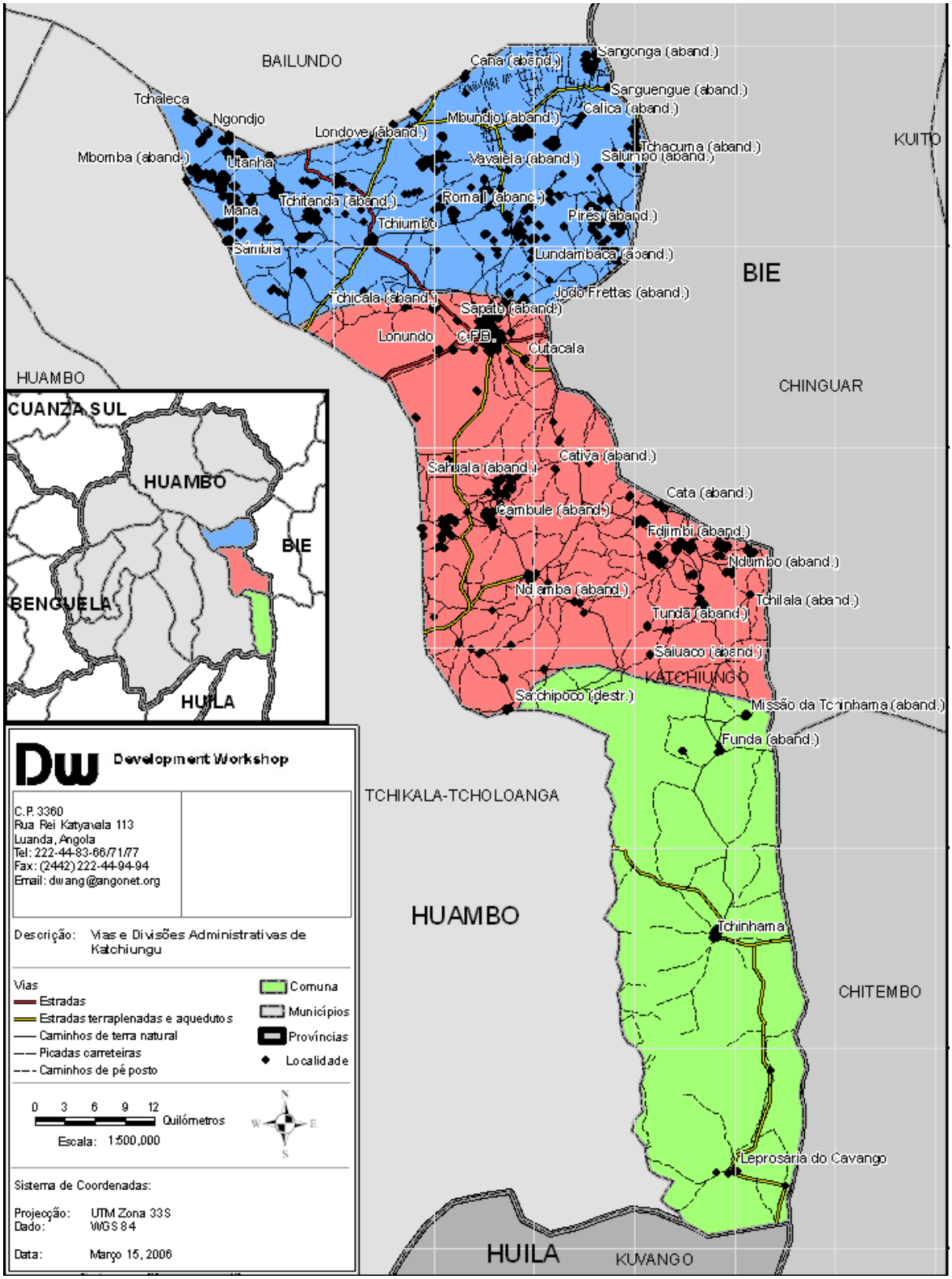


Figure 4. Local administrations in Katchiungo District, circa 2006

2.3 Typology of Urban Settlements: Katchiungo

The first phase of the research project entailed the development of a typology of urban settlements areas that are homogenous with respect to physical and socio-economic characteristics. The project classified settlement and housing areas according to these typologies (rather than administrative boundaries) because areas designated by administrative boundaries are made up of heterogenous communities and are difficult to use for pinpointing areas of particular social characteristics. This was in recognition of the fact that principal settlement patterns and land-occupation regimes in a city do not always follow the municipal administrative boundaries. A settlement typology can identify areas that are more homogeneous than the administrative areas that are often used to delineate urban areas, and provide better information on the location of specific social issues and risks. In Angolan urban areas the municipal administrative level is too heterogeneous to be useful in identifying issues. On the other hand, the lower levels of *Comuna* and *bairro* lack data and are poorly defined. Hence it was felt that for purposes of urban planning, delineating areas with similar characteristics, regardless of administrative boundaries, would be a more useful way of viewing the city.

The areas of study included “the whole of the urban agglomeration” as recommended and defined by UN Habitat. This reduces discrepancies that may exist between different administrative units and enables international comparisons of the data with other cities.

A different typology of urban settlements had to be developed for each city that was studied, and each typology is specific for that city at the time of the research. It should be noted that the typology would probably change with time, as new urban areas are developed or upgraded, or as their residents make changes, or move to other areas. Such changes, for example, have been evident in Luanda – it was therefore necessary to modify and update the typology used in a previous study since some parts of previously poor areas have been upgraded and have become significantly different from other areas in that category. This will probably need to be done in future research in Huambo as new types of areas appear with the creation of sites-and-services projects in that city.

All areas of each city were mapped into different zones based on satellite images; key informants who are familiar with the city were then requested to identify and categorize each type of development. The typology is based on urban forms and types of housing, which reflect different socio-economic conditions as well as the levels of access to basic services. Zones with similar physical structure that were built during the same period generally have a similar level of population density, tenure security, housing quality, and access to urban infrastructure and public services such as piped water and sewage system. As noted above, the development of the typology and categories of urban areas need to be sensitive to changes such as upgrading, and the movement of different groups of people into and out of the areas.

In Luanda, the largest urban area, there is a greater diversity of types of settlement and the typology included nine settlement types. In Huambo the typology involved only three settlement types: the formally-urbanised centre of the city, the informally-settled areas surrounding it, and semi-formal settlements which have some, but not all, of the services associated with formal housing areas. In Katchiungo, only two settlement types were identified – the formally-urbanised centre of the city and the informally-settled areas surrounding it.

2.4 Poverty Indicators

2.4.1 Poverty Indicators Defined

The United Nations Millennium Development Goals (MDGs) uses five characteristics to define slums: a) poor security of tenure, b) difficult access to safe water, c) low levels of improved sanitation, d) low durability of housing structures and e) overcrowding. The MDG 11 (developed by UN Habitat) aims to achieve a significant improvement in the lives of 100 million slum-dwellers worldwide. It has been accepted by the Angolan Government as a basis for monitoring their performance on their stated policy for post-conflict reconstruction and shelter provision. Similarly, the government's programme of providing "Water for All" (*Agua para Todos*) essentially aims at attaining the MDG standard of equitable access to water. MDG-compatible indicators are a useful tool for Government policy development and planning.

The MDG 11 defines a slum as a contiguous settlement where the inhabitants are characterized as having inadequate housing and basic services. A slum household is a group of individuals living under the same roof, and lack two or more of the five conditions named above.

Indicators were developed for this research to measure these characteristics in each of the urban settlements types. This was also partly a response to the request from the Angolan Ministry of Urbanism to develop a tool for monitoring progress towards the Millennium Goals. A three-point rating scale was used to evaluate each settlement type on each slum indicator. A score of 1 was used to indicate "best conditions", a score of 3 was used to indicate "worst conditions", while a score of 2 was used to indicate "intermediate conditions". This scoring or ranking system was used to rate the indicators in all three cities.

Household surveys using a simple interview schedule, focus group discussions with local people and government representatives, and field observations were carried out to obtain data for each of the five indicators, for each settlement type. Information on access to water and basic services, housing quality and location and the number of people per household was collected through a household survey of 74 households in Katchiungo. The sampling units were obtained from areas that were considered representative of each settlement type. While the data are not considered robust enough to support statistical tests of significance, they provide a good indication of the situation in each settlement type.

2.4.1.1 Security of Tenure

Secure Tenure is the right of all individuals and groups to effective protection by the state against forced evictions from their homes. Women should have full and equal access and rights to inheritance and to ownership of land and other property. Individuals who have secure tenure have:

1. Documentation that can be used as proof of secure tenure status, such as:
    - formal title deeds to either one or both of land or residence
    - enforceable agreements or any document as a proof of a tenure arrangement
    - formal rental contracts (tenant households)
    - customary tenure
    - tax payment documents (property tax, municipality tax, etc.)
    - customary tenure and possession of utility bills as additional proof of tenure

2. Evidence of *de facto* or perceived protection from forced evictions – this is defined as the proportion of household-heads who believe that they will not be evicted from their present residence within the next five years.

Angolan regulations specify that urban land tenure can only be conceded on the basis of the existence of urban physical plans. Current state policy indicates that settlements that are not urbanized should be upgraded and tenure is unlikely to be granted before this process of urbanization takes place. Master plans do not exist for all urban areas in Angola at the time of writing. For the purpose of measuring this indicator therefore, housing that are in already existing urbanized zones may be considered to have secure tenure, and settlements that can easily be upgraded or can be "urbanized" without evicting existing residents may be considered to have an intermediate level of tenure security. Informal settlements that do not demonstrate patterns that can be easily urbanized can be considered to have insecure tenure. Table 1 below shows the definitions of the three scores for this indicator.

Table 1. Definition of scores for Security of Tenure indicator

Score	Settlement Type	Description
1	Organized/planned settlements	Planned settlements that generally have access or allowances for public infrastructure and where the majority of the population already has secure or provisional tenure (for example, Central Urban Areas, newly planned subdivisions, condominiums and existing Bairro Populars). People living in these areas also have more tenure security than residents of zones which are at risk of being demolished "for public use" such as the construction of major streets or because they are located in environmentally hazardous areas.
2	Upgradable settlements	Organized musseques with an aligned street pattern where public infrastructure, such as sewers, water pipes and electricity, can easily be installed. Residents in these areas can be considered to have more secure tenure, as these zones are generally well organized, and can be upgraded and urbanised without demolition of housing.
3	Unorganized settlements	Settlements with an unorganised urban layout and built without an aligned street pattern are difficult to upgrade with urban services. These settlements often need reorganization before the instalment of service infrastructure and have a higher risk of demolition therefore tenure is not secure. If such zones are located in environmentally-hazardous locations their tenure is highly insecure.

2.4.1.2 Access to Improved Water Supply

According to the UN Habitat, a household is considered to have access to improved water supply if it has sufficient amount of water for family use, at an affordable price, available to household members without being subject to extreme effort, especially to women and children. “Affordability” means that water should not consume an undue proportion of the household income, i.e., a maximum of 10%. “A sufficient quantity” means that at least 20 litres of water should be available, per person per day. Water should be accessible without exerting excessive efforts and should not take an undue proportion of the household’s time (i.e., households should spend less than one hour a day to obtain the minimum sufficient quantity of at least 20 litres per person per day).

The proportion of households with access to improved water supply includes households with:

- direct connection (piped water) to the dwelling or plot
- access to a public stand pipe within 100 meters of the household
- access to non-piped water from:
    - protected bore-hole or dug well with pump
    - protected spring

Water supply is considered “Not improved” if it is: water from an unprotected well or unprotected spring, vendor-provided water, bottled water (based on concerns about the quantity of supplied water, not concerns over the water quality), and tanker truck-provided water.

Thus, neither households who are connected to public water pipes that only function occasionally, nor households who have access to water in abundant quantities from an unprotected well, nor people who have the financial means to regularly fill their private tank with water from a cistern truck, are considered to have a sustainable access to an improved water source. The score for this indicator is based on the main water source, although existing detailed information gathered by DW on water price and location of water sources were also examined. Table 2 below shows the definition of the three scores for this indicator.

2.4.1.3 Adequate Sanitation

A household is considered to have adequate access to sanitation, if an excreta disposal system, either in the form of a private toilet or a public toilet shared with a reasonable number of people, is available to household members.

Adequate sanitation facilities include the proportion of households with:

- a direct private/public sewer connection (to the dwelling or plot) or a septic system (with sufficient capacity in order not to be clogged)
- a pour-flush latrine, private or shared between a maximum of two families (i.e., not public)
- an improved pit latrine, private or shared (i.e., not public)

Inadequate sanitation includes service or bucket latrines (where excreta are manually removed), public latrines, and latrines with an open pit. It also includes a sewage system or septic tank that does not have sufficient capacity, or a sanitation facility that is used by more than two households. Sanitation facilities were divided into three hierarchically-ranked categories (Table 3).

Table 2. Definition of scores for Improved Water Supply indicator

Score	Water source	Description
1	Connection to public water pipes	Households in Luanda, located close to the centre of the city, obtain water through their own piped connections to the formal water supply network. These households often pay very low or flat rate fees to the water company even though they have better access than people who have to buy water through the informal sector. The public water company EPAL (*Empresa Pública da Água, Luanda*) does not actively enforce payment because it recognizes that the service is poor and water meter reading and billing is expensive. Therefore, income for the maintenance and expansion of the system is limited. Illegal connections to the public water pipes are quite common in areas located close to the city centres. While illegal connections can not be considered sustainable a larger proportion of the population gains access to clean water through these connections than the 8% of households that have formal contracts with EPAL.
2	Public water taps (*chafariz*) or Improved water pipes with manual pumps	Public water taps or standpipes in Luanda and manual pumps in Huambo are built by the public water company EPAL, EPHAS or NGOs within neighbourhoods that have an available connection to the water pipeline. Access to standpipes tends to be in pockets as standpipe projects usually cover only very limited geographical areas and serve about 1,000 people each within 100-meter radius. Sometimes people walk relatively long distances with heavy loads of water in order to get water from a standpipe. The water from these pipes is normally paid for through the committee that manages and maintains the manual pump and collects a contribution from the consumers to maintain and sustain the system.
3	No access to safe water (i.e., water is obtained from the informal water market or traditional wells)	According to UN Habitat the informal water market, which sells water from cistern trucks or private water taps or tanks for market price, and unprotected wells with low quality water, can not be considered sustainable or improved sources of safe water. The informal peri-urban water market in Luanda is estimated to turn over almost US$250 million per year. It provides almost 20 litres or water per person per day to almost 4 million people at a price of about US$0.01 per litre. The water for the informal water supply system comes from girafas (supply points where cistern trucks fill up), from illegal connections to the pipeline and from the re-sale of water by households with domestic connections. Cistern trucks supply water to private tanks and sometimes to public water taps in Luanda. Prices vary greatly between areas depending on distance and access from the pumping stations. Due to fluctuating prices and supply of water provided by cistern trucks, this cannot be considered a sustainable water source. Traditional wells are the main source of water for the overwhelming majority of households in Huambo. This is an easily accessible source of water that supplies sufficient water for most of the year. However, the wells are unprotected and the water cannot be considered safe.

Table 3. Definition of scores for Improved Sanitation Facilities indicator

Score	Sanitation Facilities	Description
1	Connection to the sewage system	The Luanda sewage system covers a very limited part of the city close to the city centre and is in need of repair. In some areas the system does not work due to lack of maintenance. A sewage system which works properly without getting clogged is considered the most hygienic type of sanitation facilities. There is no sewage system in Huambo or Katchiungo
2	Septic tanks (*fossa septica*)	Septic tanks which are considered to be improved sanitation facilities are very common in Angolan urban areas
	Improved dry pit latrines (*latrina seca*)	Improved pit latrines such as pour-flush latrines and ventilated improved pit latrines are considered to be adequate sanitation facilities.
3	Inadequate or No facilities	Uncovered pit latrines and public latrines are considered inadequate. In some areas people do not have access to any kind of sanitation facilities and are therefore forced to use facilities such as a bucket or an open pit in the ground (*poço roto*), or sometimes use rubbish deposits, vacant lots, or grassy fields, which poses ser public health risks to the neighbourhood.

UN Habitat also recommends using the regularity of solid waste collection as an indicator – this is defined as the "proportion of households enjoying weekly solid waste collection. "Solid waste poses considerable threat to human sanitary conditions by blocking drains and serving as breeding ground for flies and other pests that spread diseases such as malaria and dengue". Furthermore, UN Habitat states that "regular solid waste collection is a clear indicator of the effectiveness of a municipal administration." Stagnant water and ponds due to non-existent or deficient sewage and rainwater drainage systems also add to sanitation problems in many *bairros*.

For this study, solid waste removal was divided into three categories:

- regular/door-to-door collection,
- irregular waste collection from containers or local garbage dumps (provided in some *musseques*) which are easily accessible by waste-removal trucks,
- no services.

Table 4 shows the definition of scores for Solid Waste Collection. An overall sanitation score was calculated by getting the mean of the Solid Waste Collection and Sanitation Facilities scores.

Table 4. Definition of scores for Solid Waste Collection indicator

Score	Solid Waste Collection	Description

1	Regular	Regular waste removal services at least once a week are only available for populations located in planned urbanised areas of the two cities.
2	Irregular	Communal rubbish deposits in the form of neighbourhood level containers and ”irregular” waste removal services are offered in some aligned musseques that are easily accessible by waste removal trucks. However, these are usually not door-to-door services and people normally have to carry their rubbish some distance to a designated deposit area located along main streets where the garbage trucks pass by.
3	No services	In most of the unaligned musseques there is no solid-waste collection service and rubbish piles up and serve as breeding places for insects that pose sanitation risks to the population. In these areas people have to take care of disposing of their garbage themselves, either by burying it, burning it or by simply leaving it out on the street in informal rubbish deposits (*lixeiras salvagems*).

2.4.1.4 Overcrowding

A house is considered by UN Habitat to provide a sufficient living area for the household members if not more than three people share the same room. This is a key indicator measuring the adequacy of the basic human need for shelter. Reduced space per person is often associated with certain categories of health risks and therefore considered as the key criterion that defines the slum.

Overcrowding is associated with a low number of square meters of space per person and high occupancy rates, with large numbers of persons sharing one room used for cooking, sleeping, and other household activities. A room is defined as a space in a housing unit or other living quarters that is at least four square meters, enclosed by walls reaching from the floor to the ceiling (or roof covering), or to a height of at least two meters, of an area large enough to hold a bed for an adult. The total number of types of rooms therefore includes bedrooms, dining rooms, living rooms, studies, habitable attics, servants’ rooms, kitchens and other separate spaces intended for dwelling purposes.

Population data was scored on a three-point scale, from low to high density. In order to accurately measure population density for each settlement type, obvious open spaces, vacant lots and commercial or industrial areas were removed. Specific areas with a density of over 500 people per hectare were defined as overcrowded. The results of the study show that no settlement type in the three cities has been identified as overcrowded in its entirety.

It should be emphasized that low density is not necessarily the most desirable form of settlement, since residents of such areas often need to travel long distances in order to reach services such as water, health, and schools facilities. However, when settlements reach population densities that can be considered as overcrowded, the advantages linked to high density are diminished by factors such as competition for scarce resources and health risks due to a lack of sanitation facilities and services. Table 5 below shows the definition of scores for Overcrowding.

Table 5. Definition of scores for the Overcrowding indicator

Score	Population Density	Density (pop/ha)	Description
1	Low density	< 100	Peri-Rural, New Peripheral Settlements, Sub-Urban & Condominiums, Social Housing, Self-Built Planned Settlements
2	Medium density	100 – 300	Very high density areas located close to the city centre: Organized & Transitional *Musseques*
3	High density	300 >	Some Old Inner-city *Musseques* which include areas with a population density of more than 500 people per hectare

2.4.1.5 Housing Quality

According to the UN Habitat definition of durable structures, “a house is considered ‘durable’ if it is built in a non-hazardous location and has a structure permanent and adequate enough to protect its inhabitants from the extremes of climatic conditions such as rain, heat, cold and humidity.” According to the UN, the right to adequate housing is an important factor in order for people to have an acceptable standard of living as promoted by the Universal Declaration of Human Rights (1948) and the International Covenant on Economic, Social and Cultural Rights (1966). Non-durable structures, which do not provide adequate protection from the elements, and thus expose residents to high morbidity and mortality risks, are one of the components that define a slum.

The following durability factors should be considered when categorizing housing units:

- Quality of construction (e.g. materials used for wall, floor and roof);
- Compliance with local building codes, standards and by-laws.

This study focused on the first of these two components since the majority of housing in urban areas in Angola is located in unplanned areas and does not comply with any kind of building codes or by-laws. It is not easy to define durable structures, since this indicator depends on many different factors such as building material, maintenance and climate. A building that may be durable in one area might not be durable in another area that is prone to geological or climate-related hazards such as earthquakes or floods. Further, some of these factors, such as construction quality and maintenance are not easily measurable.

Thus, this study used housing building material, roof material and floor material as the main indicators to determine the status of durable structures. Manufactured cement blocks, which are the most common building material in Angola, are considered quite durable. Other materials that are used are: ceramic bricks (*tijolos*), adobe bricks, wood, corrugated iron and traditional cement (*pau-a-pique*). Error! Reference source not found. shows the definition of scores for building materials.

Table 6. Definition of scores for Quality of Building Material indicator

Score	Building material	Description
1	*Tijolos* (ceramic bricks)	The most expensive building material, traditionally used in high-rise buildings in the city centre
	Cement blocks	The most common building material in Luanda which

		provides adequate protection from wind and rain
2	Adobe (un-burnt clay bricks)	A common building material in the provinces outside of Luanda, which, if used in the right way, provides sufficient protection from wind and rain
	Wood	An uncommon building material, except in Old *musseque* houses; varies in quality depending on timber resistance to termites.
3	*Pau-a-pique*	A traditional mixture of wood and clay, which, if properly maintained, provides sufficient protection from wind and rain, but rarely used in recent construction due to the lack of resistant wood.
	Corrugated iron	Low quality building material that is not durable and does not provide sufficient protection from wind and rain.

Roof material, which is also considered an important indicator of the durability of dwellings and the financial means of its inhabitants, was scored separately. Corrugated iron is by far the most common roof material in Luanda. However, the state of these roofs varies greatly – some are well maintained and have weatherproof insulation while others have started to rust and have holes in them. Corrugated iron can make dwellings very hot during the warmest season unless it is well insulated. Therefore, it is difficult to estimate the durability of a structure based on roof material only. It mainly helps to identify the most durable dwellings (i.e., having roofs made of ceramic tiles or cement) and the poorest dwellings (with grass roofs) from the rest. Error! Reference source not found. shows the definition of scores for quality of roof materials

Table 7. Definition of scores for Quality of Roof Materials indicator

Score	Roof material	Description
1	Ceramic tiles (*telhas*)	The most expensive roof material, traditionally used in high-rise buildings in the city centre
2	Corrugated iron (*chapas de zinco ou de lausalite*)	The most common roof material in Luanda, which, if well maintained, provides moderate protection from wind and rain. Asbestos cement sheets are known to be a health risk.
3	Thatch roofs (*capim*)	Low quality roof material that is not durable and does not provide sufficient protection from wind and rain unless it is maintained very regularly. Thatch roofs are a clear indicator of limited financial means and are rarely used in Luanda

People normally put a lot of effort in improving the floor material of their homes because it improves the quality of the house, hence this indicator was scored separately. Table 8 shows the definition of scores for flooring materials.

Table 8. Definition of scores for Quality of Flooring Materials indicator

Score	Floor material	Description
1	Covered floors (mosaic,	Paved floors are a good sign of well-being. The most common floor material is mosaic.

	wood or taco)	
2	Cement floors	Most people try to put together enough money to cover their floors with cement in order to provide some insulation from the weather and to keep insects and other pests from entering the house.
3	Dirt floors (*terra batida*)	Dirt floors are common in corrugated iron shacks and houses made of cement blocks or adobe on the periphery of the city. Dirt floors do not provide any kind of insulation from rain and cold and can therefore cause health risks for household members.

2.4.2 Data Gathering: Poverty Indicators

A total of 74 households (16 from Formal housing areas and 58 from Informal housing areas) were surveyed in Katchiungo to obtain information on the indicators of poverty. A team of three researchers gathered the data from June 1 to July 1, 2010.

Focus group discussions with the municipal administration staff and local community representatives were held to confirm the data collected and to obtain more qualitative data.

2.5 Environmental Burdens

A variety of methods were used to assess environmental risks in the three urban areas. Focus group discussions were used to identify the most important environmental issues in the three urban areas, remote sensing was used to locate the areas affected by these issues, and filed visits were used to assess their impact.

Flooding and erosion were identified as important environmental issues in all urban areas except for Cahiungo which has minimal risk of flooding. Other important issues considered were inadequate solid waste disposal, extraction of sand and stone as building materials, and quality and quantity of groundwater.

Rainfall in Angola is highly variable from one year to another and rains fall in short and very heavy storms. These are conditions that create erosion risks. Large amounts of rain within a short period of time are conducive to erosion: the size of the raindrop is large and the impact of the raindrops closes the pores on the soil surface and moves particles of soil down a slope. A large amount of rain at one time means that rainfall rapidly exceeds the absorption capacity of the soil and the loss of water from evaporation and transpiration. Surface run-off is thus common. Water from such storms flow as sheets and then begin to concentrate in rills and gullies. The quantity and velocity of water has a significant erosive power that scours the earth and deepens the gullies into ravines.

It is often the case in Angola that there is little knowledge of mitigation measures against erosion and the control measures that are implemented are inadequate. Many urban areas in Angola have erosion gullies.

A diagnostic of environmental burdens in Luanda was carried out, using a methodology first developed by Development Workshop in 2007 after severe flooding in Luanda. Aerial photos and satellite images were used to locate areas at risk from flooding and erosion, by identifying areas with standing water, stream courses and unprotected slopes. Newspaper reports from the last five years and information from community groups also helped to identify such locations. The same methods were used to identify where there are large accumulations of solid waste, either active garbage dumping sites or former dumping sites that were originally outside the built-up area but have now become surrounded by housing. A sample of points were visited to verify the information and to understand more about the processes involved in creating these risks (for example how flooding occurs and why at-risk areas are occupied).

Risk areas were mapped and estimates made of the number of people at risk. It is difficult to obtain systematic information about the hazards presented by former waste disposal sites, but information were collected from the press, key informants and local residents about incidences of hazards. Discussions were held with people in risk areas, and data about land access and prices were collected so as to have a better understanding of the motivations of people to live in risk areas.

2.6 Accessibility

Accessibility from the homes to the main centres of economic activity was evaluated for each research area. It was felt that this was an important variable that determines the choice of residential locations because it significantly impacts on the survival strategies of the households. Data such as location and condition of roads, and means of transportation were obtained.

2.7 Land Markets

For the poor, their home and the land on which it is built are often the only way they can build up and incrementally accumulate assets and wealth. Thus, improvements to and the quality of the homes are often taken as good indicators of the economic well-being of the household. Land values or the cost to purchase or rent residential land is assumed to be an important determinant of where the poor choose to reside or build their homes. This study therefore obtained data on the land markets in the research areas, with a focus on rents, land occupation, and how land and housing were accessed.

In all three urban areas there is a land and housing market in which private transactions take place, even though legally, all land in Angola belongs to the state. Nowadays, buying land (or a house) is the usual way in which a house is obtained. Those who built a house on land that they had occupied without purchase, or who occupied an empty house, did so more than 25 years ago; simply squatting or occupying land or a house now does not happen.

The land markets and land tenure component of this study focused on three main aspects: i) the rural link of peri-urban residents, ii) peri-urban residents' involvement in land markets, and iii) occupancy rights. Observation and existing evidence strongly suggests that a large

percentage of peri-urban residents in second- and third-tier cities are engaged in agricultural activities within and outside the city perimeter. Agriculture therefore does seem to provide an important contribution to the livelihoods of peri-urban residents. To date, no research has been undertaken in Angola on this specific aspect of urban livelihoods.

At the periphery of expanding cities, local actors are part of a dynamic informal land market. Residents of peri-urban areas that own still unoccupied land beyond the city limits are negotiating their parcels with those urban residents that are pursuing land for housing. While not having done any specific research on this issue, DW has been involved as an actor in this land market through its layout planning projects in Huambo. Here, individuals who own parcels of land were enjoined to give up their ownership rights and to place the parcels of land in a pool. In return, they were compensated with smaller, but higher value, urbanized parcels of land in the same area. Compensated occupants were free to sell all or some of their urbanized parcels to an interested third party, thus generating capital that can boost their household economy (e.g., investing in a home-based informal business). It was observed that indeed, many of those who were compensated with urbanized parcels cashed these to improve their household economy. This has led DW towards a basic understanding of the important relationship between land markets and poverty reduction.

DW's land research program implemented together with CEHS from 2002 to 2005 showed how few residents (i.e., less than 1% of those interviewed) of peri-urban settlements are in the possession of official occupancy rights documents. More research and policy influencing on this topic is an absolute priority, because based on the current land legislation in Angola, all urban and rural residents that will not have initiated their land regularization process by July 2010 will lose any occupancy right.

2.7.1 Data Gathering: Land Markets

For this component of the study, Urban LandMark of South Africa provided assistance with the design of the interview schedule, sampling procedure, and data analysis. The interview schedule was partly based on DW's 2003 study on land tenure; revisions were made on the basis of consultations with a number of partner organisations. Urban LandMark (a regional partner based in South Africa) contributed to the design of the research instrument, based on their previous studies on urban land markets. Other partner organisations that contributed were: Universidade Eduardo Mondlane (Maputo), UCT (Cape Town) and City Alliance. A desktop review of the media and of Angola's Land and Housing Laws, as well as input from key informants in the public and private sectors, were also used to improve the interview schedule. After the first draft of the research instrument was developed by DW staff members, the Director of Urban LandMark travelled to Luanda to exchange experiences with DW on the topic and help finalise the draft of the research instrument. This was then sent to the national and provincial government officials for comments. During the training workshop for survey enumerators, the participants were also given the opportunity to comment on the first draft of the interview schedule. These steps were taken to ensure that questions were adapted to the context of the city, and can elicit information that can influence public policies and decision-making.

An interval random sampling technique (with a random start) was used to select the respondents. The sampling and data gathering procedures used in Luanda were followed – using satellite imagery, the number of households in Katchiungo was calculated so as to define the sampling interval.

The training of the survey enumerators consisted of a two-day indoor workshop and two days of fieldwork to pre-test the research instrument and evaluate the performance of the field team. During the indoor workshop, the participants were given an overview of the

project including the research methodology; the sessions covered topics such as research ethics, techniques for collecting quantitative and qualitative data, how to geo-reference research areas, and techniques on how to measure land. Participants were also given the opportunity to role-play (simulating a variety of do's and don'ts that they are likely to encounter during the field research). Data gathering was done by a team of three from June 1 to July 1, 2010.

2.8 Population Estimates

There has been no census of the population of Luanda since 1983, and for the other two cities, since before Independence from Portugal in 1975. Considerable uncertainties exist about the number of people living in these urban areas and in the various subdivisions. The research team therefore had to obtain an estimate of the population in each research area. Remote sensing technology was used – recent QuickBird high-resolution (0.80m) images for 2008 were procured and geo-referenced. GIS technicians (from Development Workshop and from the government department responsible for territorial administration) carried out a detailed rooftop mapping of all residential units and built structures. An estimate of the total population for the area was obtained by multiplying the number of rooftops by the average number of people in the households.

Three approaches were generally used to map houses:
1) In areas of very high-density single-level houses, roofs that were visible in satellite images were mapped in polygon shape-files (see Error! Reference source not found. below), which were then measured in square metres. An estimate was obtained of the number of square metres of roofing per person from data collected at homes where both the number of residents and roof area (in square metres) was reported.

2) In areas where individual houses can be identified more clearly, each house was mapped as a dot, and so the resulting data sets consist of point shape-files

3) The boundaries of apartment blocks were mapped as polygons, and the number of apartments in each block was estimated by multiplying the number of levels or floors by the number of apartments on each level. Enumerators who visited each apartment block counted the number of levels and apartments.

For houses mapped as points and for apartments, the following estimates of the number of people per household (based on previous DW research) were used: 5 people per apartment, 6 people per house in urban housing types, and 7 people per house in all other housing types.

Figure 5. Satellite image of rooftops mapped in polygon shape-files

The study used field research and new mapping techniques to, firstly, supply baseline data on the five characteristics (security of tenure, access to safe water, improved sanitation, quality of housing structures, and overcrowding) which the United Nations uses to define slums for the Millennium Development Goals (MDGs). Secondly, the study sought to explore in more depth the spatial aspects of poverty and urban environmental issues. The spatial aspects of poverty and urban environmental issues that were studied were land markets and prices, housing location and transport, and flooding and erosion risk.

New techniques have put within reach of NGOs, NGO coalitions, and local university departments the capacity to map social conditions and to analyse their spatial aspects. Remote sensing images of urban areas can identify individual buildings – counting the buildings, coupled with sample surveys, can give population estimates for whole urban areas and parts of those areas. Remote sensing can also show growth in the spatial extent of urban areas. Coupled with local knowledge, remote sensing can provide the information to make a typology of sub-areas based on different physical and socio-economic characteristics (e.g., the date of settlement, history, the distance from the city centre, service levels, street patterns and type of housing). The location of sub-areas can be identified from urban images and mapped. They can be updated as urban areas develop and change, and they permit tracking of the rapid changes in demographics and the socio-economic situation of the population that often occur in rapidly growing cities.

Global Positioning System instruments allow the recording of the geographical coordinates of any position where an observation is made, or where an interview is carried out. This means that it is possible to accurately plot observations or survey results on a map and

relate these to other geographical features. Indicators of social conditions (such as the MDGs indicators) obtained from sample surveys can be mapped according to different categories in a settlement typology that can be used to assist in targeting interventions. Maps can later be produced for individual administrative units overlaid on maps of different settlement types, in order to visualise conditions according to municipalities, *comunas* and *bairros*. In addition, the ability to map the exact location of geo-referenced data from survey results or observations also provides the opportunity to explore more deeply the spatial aspects of poverty, such as how people's location with respect to services, economic opportunities or environmental risks affect their overall opportunities or vulnerability.

3 THE FINDINGS

3.1 Population Growth Estimates

In 2009, it was estimated that there were 152, 800 people in the District of Katchiungo. This study found that there were only about 10,000 people in the city of Katchiungo itself (see Figure 6 below). Although there is less data available for projecting population growth rates, it was estimated that the population growth rate per year in Katchiungo is just a little above zero.

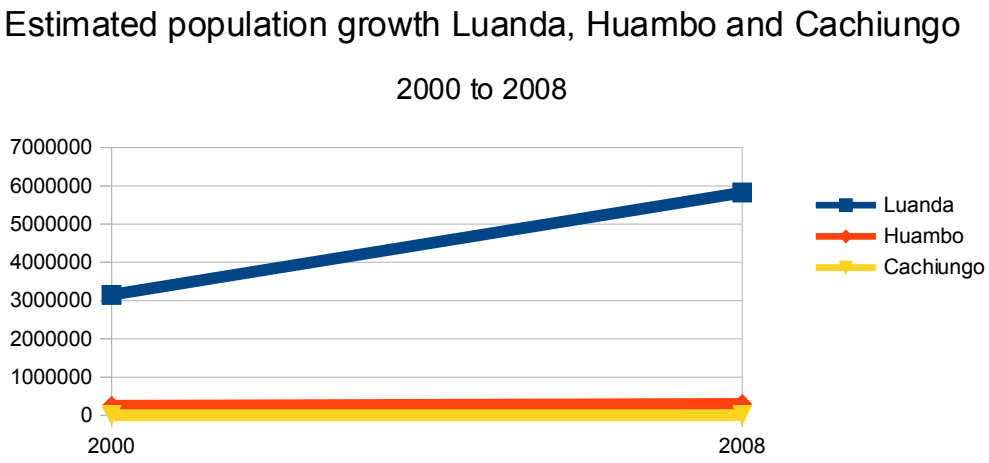
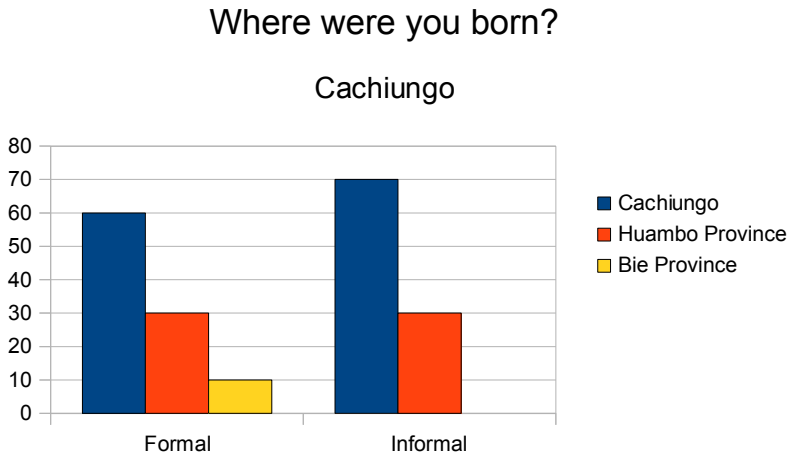


Figure 6. Population estimates: Luanda, Huambo and Katchiungo



Natural population growth in Katchiungo is probably balanced by out-migration to Benguela/Lobito, Lubango and Luanda. Overall, the majority of the residents of Katchiungo were born in Katchiungo itself. This is also true in both the formal and informal settlement areas (about 60% and 70% of the respondents, respectively – see Figure 7). About one-third (30%) of the residents in each settlement type were born outside of Katchiungo, but within Huambo province. It is interesting to note that in the informal settlements, the residents were born only in either of Katchiungo or outside of Katchiungo but still within the province of Huambo. On the other hand, 10% of the residents in the formal settlements were born in the adjacent province of Bie (one merely needs to cross the eastern border of Katchiungo to get into the province of Bie).

Figure 7. Origin of the residents of Katchiungo

The most densely populated areas in the city of Katchiungo seem to show a relatively even outward spread from the city centre, with the north, northeast and southeast quadrants being more densely populated. The population seems to be generally concentrated in well-defined areas and seem to be tightly clustered around the city centre (see Error: Reference source not found).

The city centre is almost made up of the formal housing areas, and the more densely populated areas make up the informal housing areas. It was estimated that only 10% of all homes in the city were located in the formal housing areas while the great majority (90%) were in the informal housing zones.

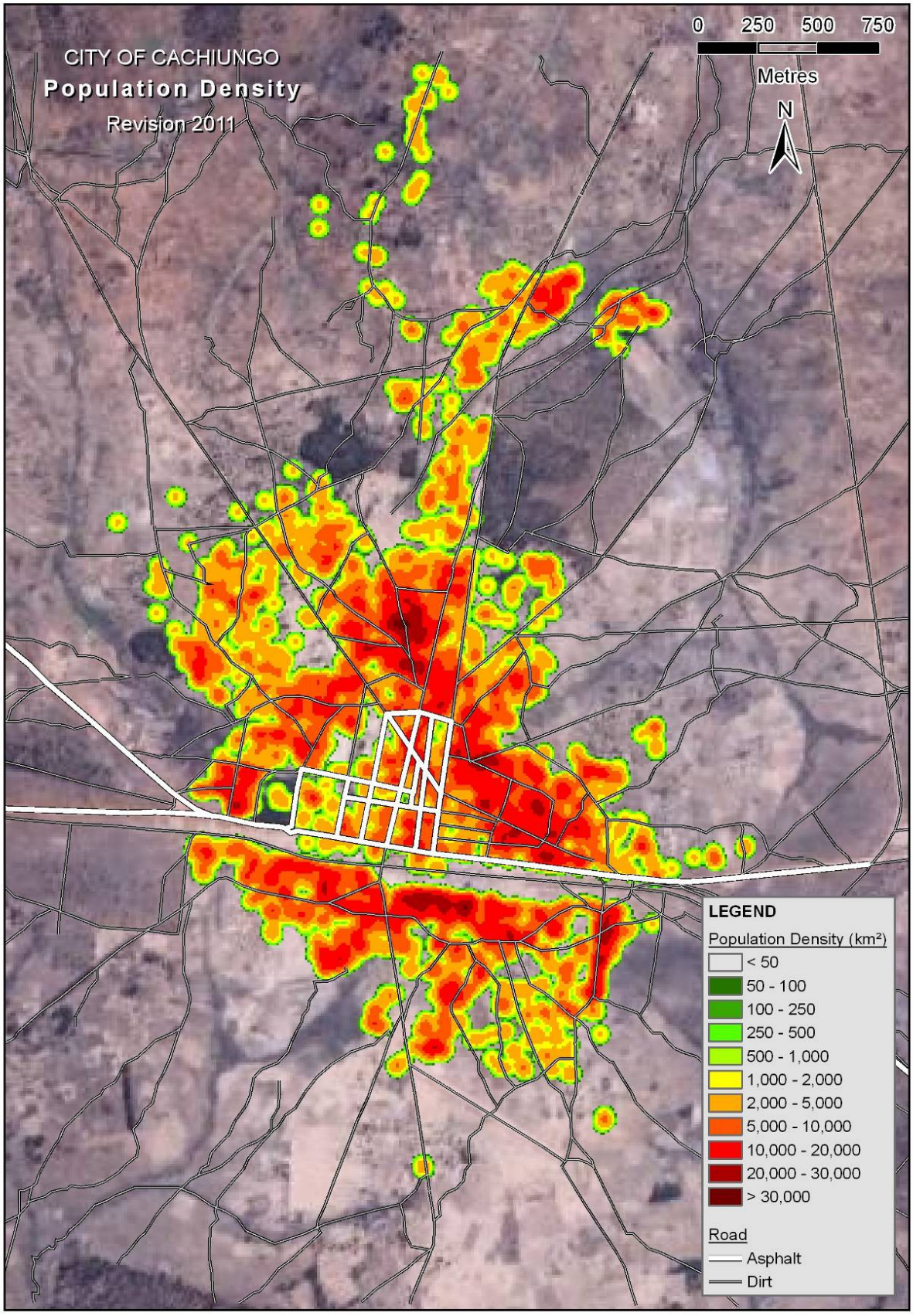


Figure 8. Population concentrations in the city of Katchiungo

3.2 Poverty Indicators: Katchiungo

3.2.1 Security of Tenure

In the sample of Katchiungo residents, the formal housing areas were represented by about 22% of the respondents, and the rest (about 78%) were from the informal housing areas.

A little over two-thirds (67.6%) of all the homes in Katchiungo were owner-occupied while a little over one-fourth (25.7%) were rented. There were sharply contrasting differences in home ownership patterns between the two settlement types – an overwhelming majority of the homes (81% of respondents) in the informal housing areas were owner-occupied, while only less than one-fifth (18.8%) of the homes in the formal housing areas were owner-occupied. The reverse is true when it comes to rented accommodations – the study found that the overwhelming majority of the residents in the formal housing areas (81.3%) were renting their homes whereas only about one out of ten residents (10.3%) in the informal housing areas were renting (see Table 9). Perhaps this is a function of the value of land and the cost of home ownership – there are more home owners in the informal housing areas because home ownership is more affordable.

Table 9. Home ownership patterns in Katchiungo

Settlement Type	Housing Property Type								Total	
	Owner-occupied		Rented		Owned by relatives		No response			
	No.	%	No.	%	No.	%	No.	%	No.	%
Formal Housing	3	18.8%	13	81.3%	0		0		16	100.0%
Informal Housing	47	81.0%	6	10.3%	4	6.9%	1	1.7%	58	100.0%
Total	50	67.6%	19	25.7%	4	5.4%	1	1.4%	74	100.0%

The study also found that those living in the informal housing areas have highly insecure tenure (score of 3) but in sharp contrast, those living in the formal housing areas had very secure tenure (score of 1). This is because the formal housing areas coincide with the planned/organized sections of the city (see the area bounded by the blue lines in Figure 9). As mentioned earlier, Angolan regulations specify that urban land tenure can only be conceded on the basis of the existence of urban physical plans, and that tenure is unlikely to be granted before this process of urbanization takes place. Therefore, housing that are in already existing urbanized zones may be considered to have secure tenure, but informal settlements that do not demonstrate patterns that can be easily urbanized are considered to have insecure tenure. It is interesting to note that this is the only indicator where the scores for the two types of settlements are at completely opposite ends of the scale; the other scores for both settlement types are much closer to each other.

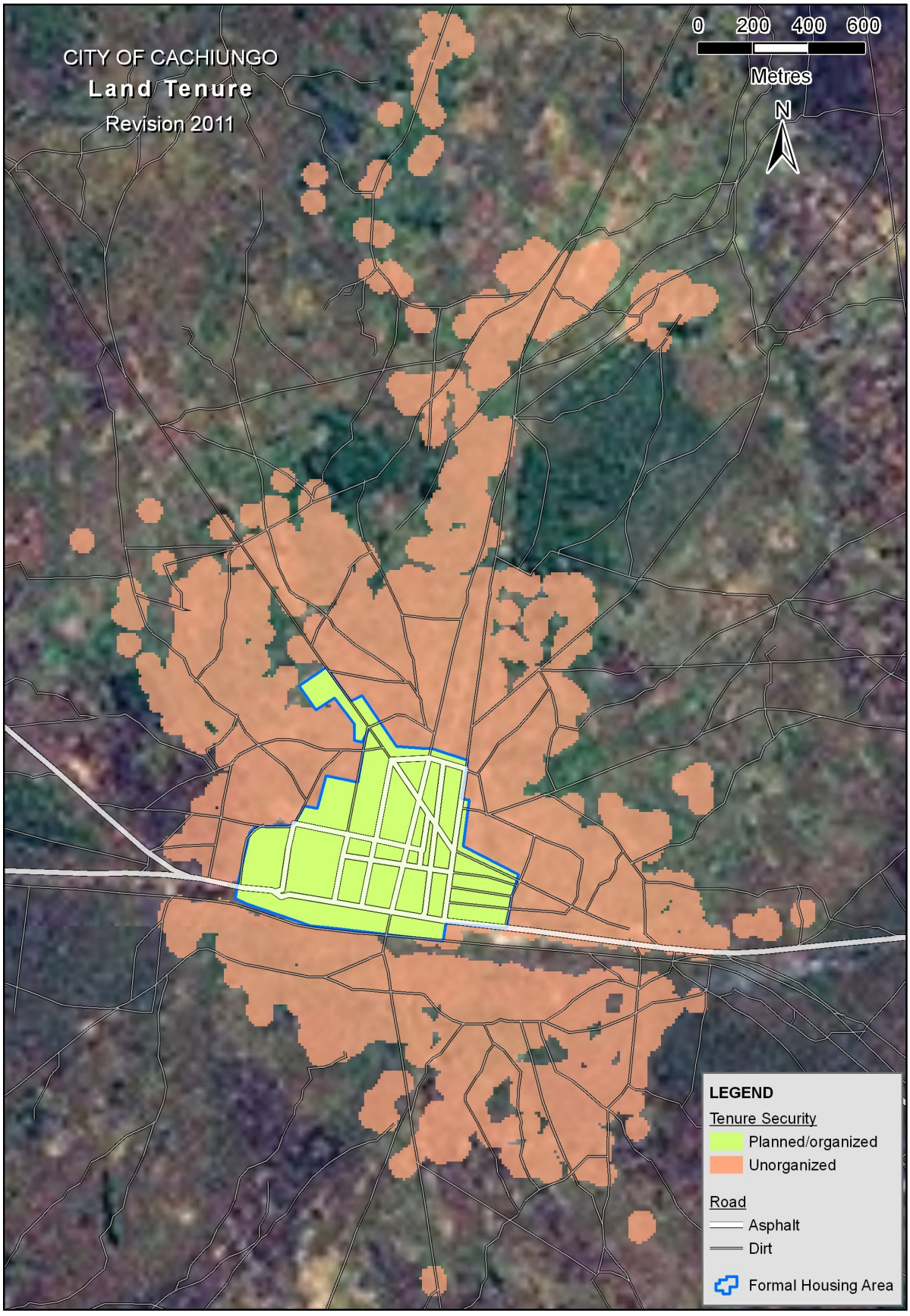


Figure 9. Formal and informal housing areas in Katchiungo

3.2.2 Access to Improved Water Supply

When asked about their main sources of drinking water, almost three-fourths (74%) of the responses indicated that these were unprotected wells and only a little over one-fourth of the responses (26%) indicated protected wells as their source (Figure 10).

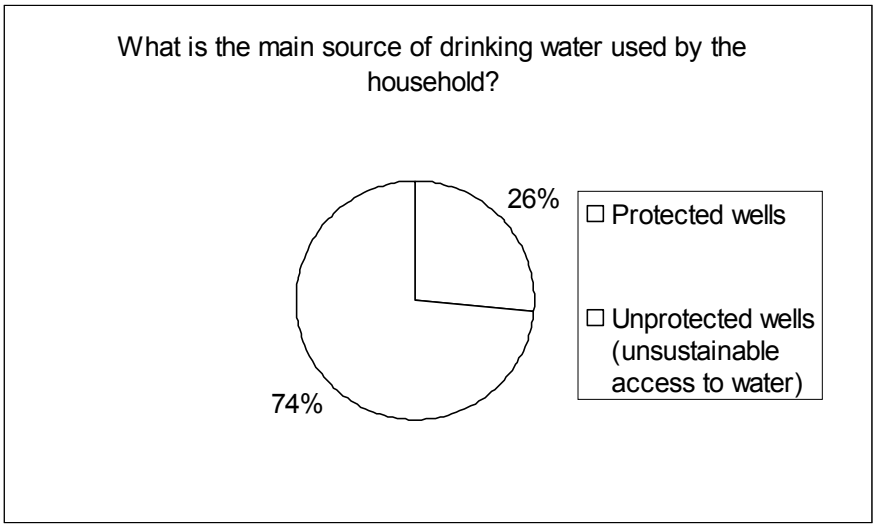


Figure 10. Main source of drinking water in Katchiungo

A closer look at the data shows that those living in the informal housing areas were at greater risk than those living in the formal housing areas. A little more than eight out of ten responses (82%) in the informal housing areas indicated that they obtain their water from unprotected water sources, while only less than one-fifth (18%) obtained water from protected sources (Table 10). In the formal housing areas, on the other hand, the responses indicate that a little more than one half (56.3%) of the residents obtained their water from protected wells or the public water taps, and only a little more than one-third of the responses (37.5%) indicated an unsustainable source of drinking water. For this question, the responses from the residents in the formal and informal housing areas made up 21% and 79% of the responses, respectively.

Table 10. Main source of drinking water, Katchiungo

Settlement Type	Main Source of Drinking Water						Total	
	Protected well or public water tap		Unsustainable access to water		No response			
	No. of responses	%	No. of responses	%	No. of responses	%	No. of responses	%
Formal Housing	9	56.3%	6	37.5%	1	6%	16	100.0%
Informal Housing	11	18.0%	50	82.0%	0		61	100.0%
Total	20	26.0%	56	72.7%	1	1%	77	100.0%

**Three households provided two responses*

If the source of drinking water is unsafe, the water can be treated to make it safer to drink. However, only a little more than two-thirds (about 68%) of all respondents said they treat their drinking water to make it safer to drink, leaving almost one-third of the Katchiungo population at risk of contracting water-borne diseases (Figure 11)

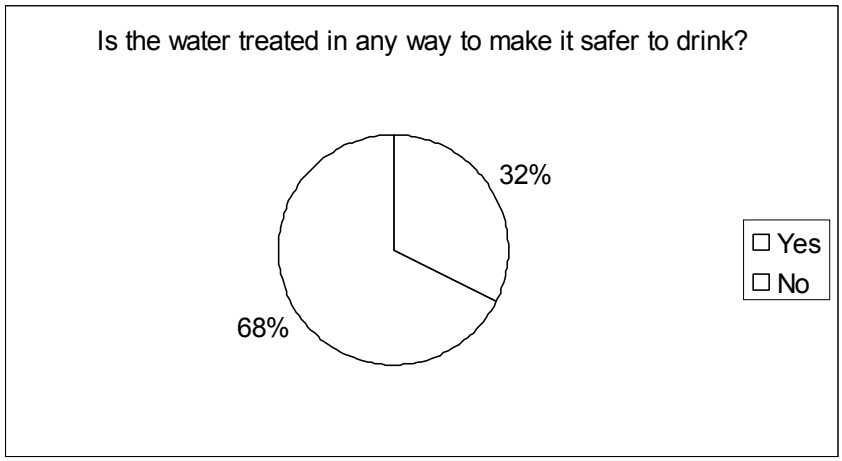


Figure 11. Incidence of treatment of drinking water

The data show that the great majority (81.3%) of those from the formal housing areas treat their drinking water and an almost identical proportion (81%) of those in the informal housing areas do not (see Table 11). This indicates that the majority of the residents in the informal housing areas, and by extension, most of the residents in Katchiungo, are at risk of contracting water-borne diseases

Table 11. Treatment of drinking water in Katchiungo

Settlement Type	Is the Drinking Water Treated				Total	
	Yes		No			
	No.	%	No.	%	No.	%
Formal Housing	13	81.3%	3	18.8%	16	100.0%
Informal Housing	11	19.0%	47	81.0%	58	100.0%
Total	24	32.4%	50	67.6%	74	100.0%

Consistent with the above data, the researchers had rated this indicator very poorly (score of 3) for both formal and informal housing areas, again suggesting that the population of Katchiungo is highly at risk of water-borne diseases. It must be noted that in Katchiungo, there are no domestic connections to public water pipes.

Figure 12 shows the map of Katchiungo indicating the city centre, and locations of the main sources of drinking water (both protected and unprotected) overlaid on top of the map indicating population density. The map also shows the formal housing area (bounded by the blue lines) as occupying most of the downtown core, but having a lower population density compared to the areas just outside of the boundary of the formal housing areas.

While this map shows that there are proportionately more sources of drinking water in the formal compared to the informal housing areas, the data also show that in general, drinking water seems to be reasonably accessible to Katchiungo residents – only about one out of ten households spend 15-30 minutes to get water for home consumption while the rest take less time than that (Figure 13).

Figure 12. Population density, main sources of drinking water, and settlement type

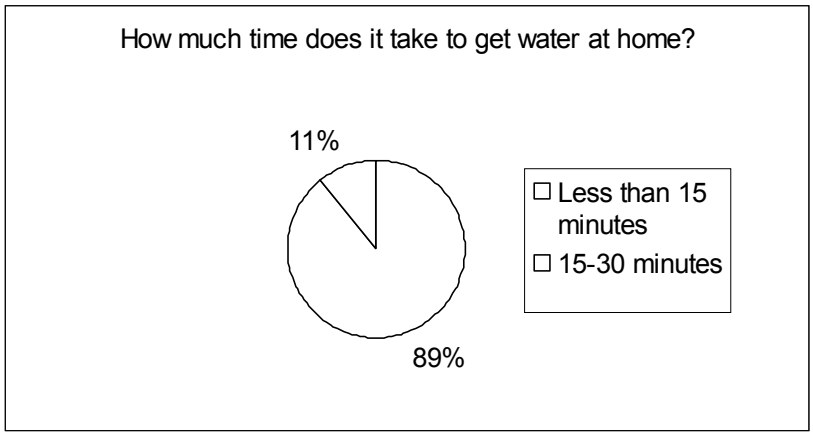


Figure 13. Average time it takes to fetch drinking water

A closer look at the data confirms the above observation that in both informal and formal housing areas, the great majority of the residents spend less than 15 minutes to get drinking water, with those in the informal housing areas spending just slightly more time fetching water.

Table 12. Average time spent in fetching water, by settlement type

Settlement Type	Time it Takes to Get Water				Total	
	Less than 15 minutes		15-30 minutes			
	No.	%	No.	%	No.	%
Formal Housing	15	93.8%	1	6.3%	16	100.0%
Informal Housing	51	87.9%	7	12.1%	58	100.0%
Total	66	89.2%	8	10.8%	74	100.0%

3.2.3 Adequate Sanitation

All the respondents in both types of settlement areas said they use toilets that had either a septic tank or were of the improved dry pit latrine type. According to the definition of scores for this indicator, the indicator should be given a score of 2

When asked where their toilets were located, a little more than two-thirds (67.6%) of all the respondents said they were in the backyard of their homes (Figure 14). This is true for the

majority of residents in both settlement types – almost three-fourths (70.7%) of the respondents in the informal housing areas gave this response while a smaller proportion (56%) of those in the formal housing areas said their toilets were in their backyard (Table 13). Just slightly more than one-fifth (23%) of the respondents said they were in the community; however, the respondents who used the community latrines were all from the informal housing areas. In the few cases where the toilets were located inside the house, the data show that all of these were found in the formal housing areas. Similarly, all those who had toilets inside the house and in the backyard were only in the formal housing areas.

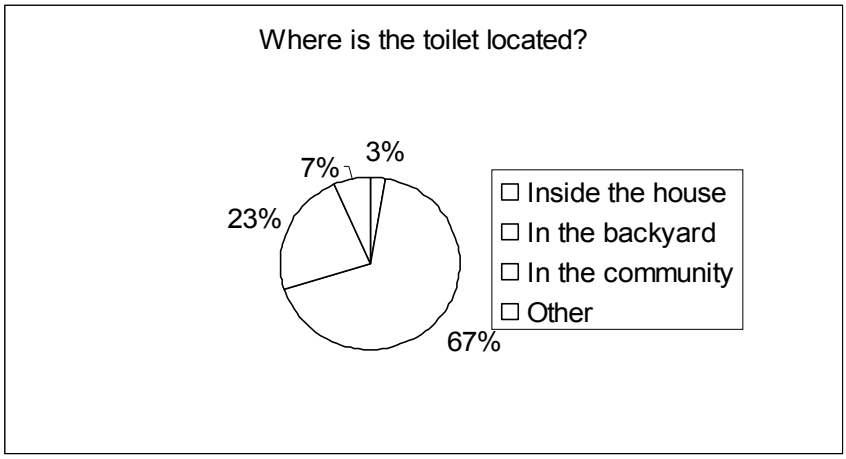


Figure 14. Location of toilets in all of Katchiungo

Table 13. Location of toilet, by settlement type

Settlement Type	Location of Toilet								Total	
	Inside the house		In the backyard		In the community		Inside the house and in the backyard			
	No.	%	No.	%	No.	%	No.	%	No.	%
Formal Housing	2	12.5%	9	56.3%	0	0	5	31.3%	16	100.0%
Informal Housing	0	0.0%	41	70.7%	17	29.3%	0		58	100.0%
Total	2	2.7%	50	67.6%	17	23.0%	5	6.8%	74	100.0%

In Katchiungo, there are no public waste removal services to remove household garbage. Because of this, the researchers gave identical overall scores of 2.5 for each of the formal and informal housing areas for the indicator Access to improved sanitation and solid waste collection.

3.2.4 Overcrowding

In Katchiungo, the average occupancy rate was only 2.2 persons per room. Both informal and formal housing areas had very similar room occupancy rates, with the informal housing areas only slightly more dense than those in the formal housing areas (2.3 persons vs. 2.1 persons, respectively). These suggest that overcrowding is not a problem in all areas of Katchiungo, and the researchers thus gave this indicator a score of 1 for both settlement types. This suggests that overcrowding may not be an important indicator of poverty in Katchiungo, and possibly in other third-tier cities.

3.2.5 Housing Quality

3.2.5.1 Building Materials

The data show that the building materials used in the houses in Katchiungo were of reasonably durable quality. About 80% of all the responses indicated that their homes were made of adobes (unburnt clay bricks) while about one fifth were made of either ceramic bricks or cement blocks (Figure 15).

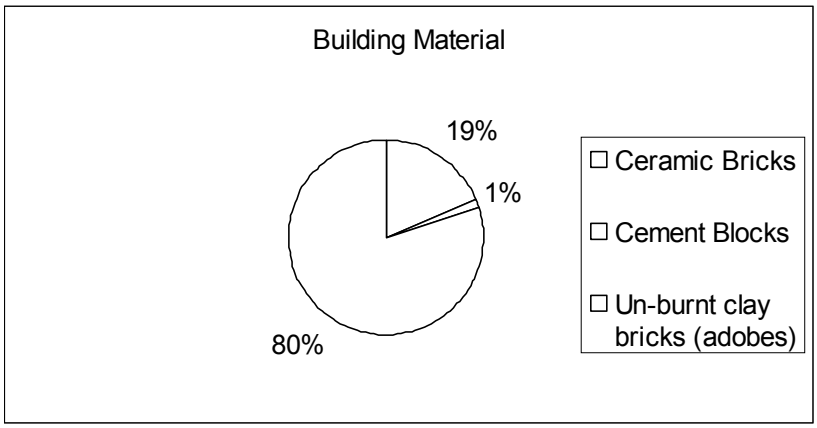


Figure 15. Common building materials for houses, all of Katchiungo

A closer look at the data shows that all of the houses in the informal housing areas were made of adobes while those in the formal housing areas were mostly built using the more durable ceramic bricks (82.4%) and cement blocks (5.9%), with the remaining 11.8% being built with adobes (Table 14).

Table 14. Type of building material for houses in Katchiungo, by settlement type

Settlement Type	Type of Building Material						Total	
	Ceramic Bricks		Cement Blocks		Adobes			
	No. of responses	%	No. of responses	%	No. of responses	%	No. of responses	%
Formal Housing	14	82.4%	1	5.9%	2	11.8%	17	100.0%
Informal Housing	0	0.0%	0	0.0%	58	100.0%	58	100.0%
Total	14	18.7%	1	1.3%	60	80.0%	75	100.0%

One respondent from the informal housing area replied both ceramic bricks and adobes

3.2.5.2 Roofing Materials

Almost three-fourths (74.4%) of all the responses indicated that their roofs were made of corrugated iron while a little more than one-fifth (23.1%) indicated that their roofs were made of ceramic tiles, the best quality roofing material available. A very small percentage (2.6%) indicated that they had thatch roofs (Figure 16). Again, these indicate that the houses in Katchiungo are made of reasonably good quality materials.

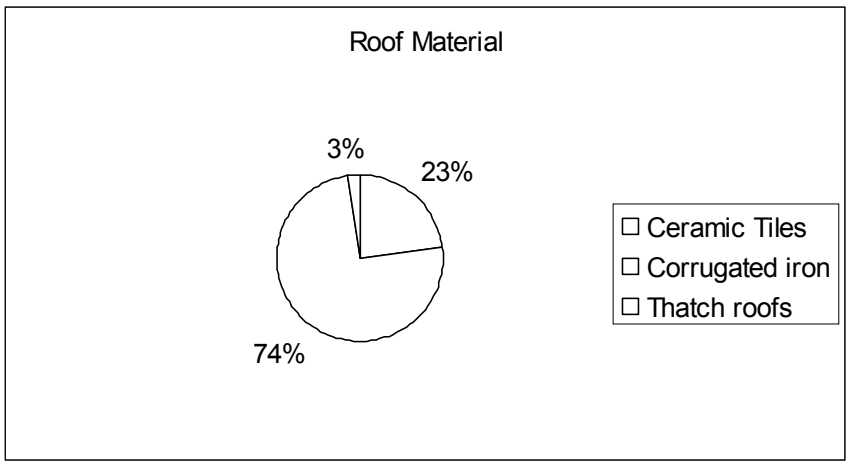


Figure 16. Common roofing materials, all of Katchiungo

The data show that a much greater proportion of the roofs of the houses in the formal housing areas were made of ceramic tiles (good quality roof) compared to those in the informal housing areas (61.1% and 11.7%, respectively – see Table 15). On the other hand, the proportion of houses that had corrugated iron roofs in the informal housing areas was more than double that in the formal housing areas (85% vs. 38.9%, respectively). Those in

the formal housing area did not report any roof made of thatch, suggesting that the roofs of houses in the formal housing areas were of much better quality.

Table 15. Roofing material of houses, by settlement type

Settlement Type	Type of Roofing Material						Total	
	Ceramic Tiles		Corrugated iron		Thatch roofs			
	No. of respon-ses	%	No. of respon-ses	%	No. of respon-ses	%	No. of respon-ses	%
Formal Housing	11	61.1 %	7	38.9 %	0	0.0%	18	100%
Informal Housing	7	11.7 %	51	85.0 %	2	3.3%	60	100%
Total	18	23.1 %	58	74.4 %	2	2.6%	78	100%

Four respondents provided two responses each

3.2.5.3 Floor Materials

The data show that overall, the houses in Katchiungo did not have good quality floor materials. Almost two-thirds (64.1%) of the houses had unburnt clay or dirt floors while only one-third (33.3%) had the more durable cement floor (Figure 17). The type of floors can possibly contribute to potential health risks because the unburnt clay or dirt floors are more difficult to keep clean than cement or mosaic or wood

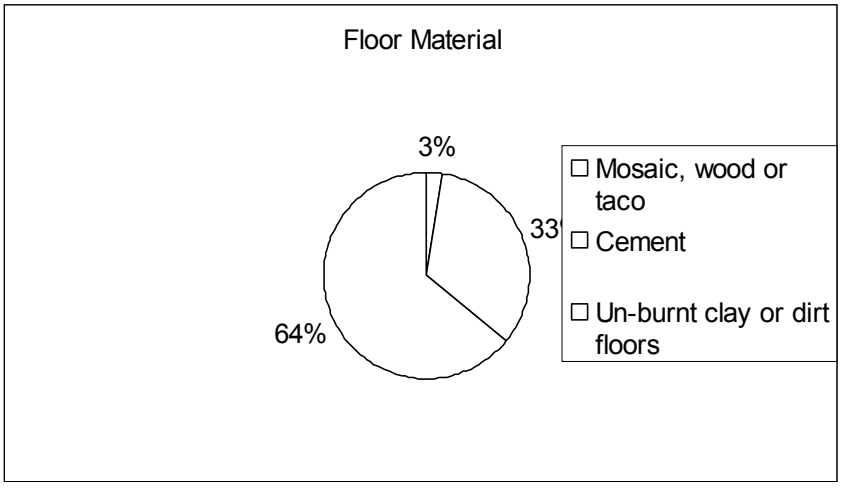


Figure 17. Common materials of floors, all of Katchiungo

Again, the data show that the more durable, better quality floors can be found in the formal housing area homes, while the homes in the informal housing areas were predominantly of unburnt clay or dirt (Table 16). About 94.4% of the homes in the formal housing areas either had cement floors (83.3%) or floors made of mosaic, wood or taco (11.1%) while those in the informal housing areas had either cement (18.3%) or unburnt clay or dirt floors (81.7%).

Table 16. Common floor materials, by settlement type

Settlement Type	Type of Floor Material						Total	
	Mosaic, wood or taco		Cement		Unburnt clay or dirt floors			
	No. of respon-ses	%	No. of respon-ses	%	No. of respon-ses	%	No. of respon-ses	%
Formal Housing	2	11.1%	15	83.3%	1	5.6%	18	100.0%
Informal Housing	0	0.0%	11	18.3%	49	81.7%	60	100.0%
Total	2	2.6%	26	33.3%	50	64.1%	78	100.0%

Four respondents provided two responses each

Because the houses in the formal housing areas were made of better quality building, roofing, and floor materials, the researchers gave overall scores of 1.3 and 2.3 to the formal and informal housing settlement types, respectively. Figure 18 below shows the map of Katchiungo overlaid with population density and housing quality data. The data points show that the houses were predominantly built of intermediate quality materials.

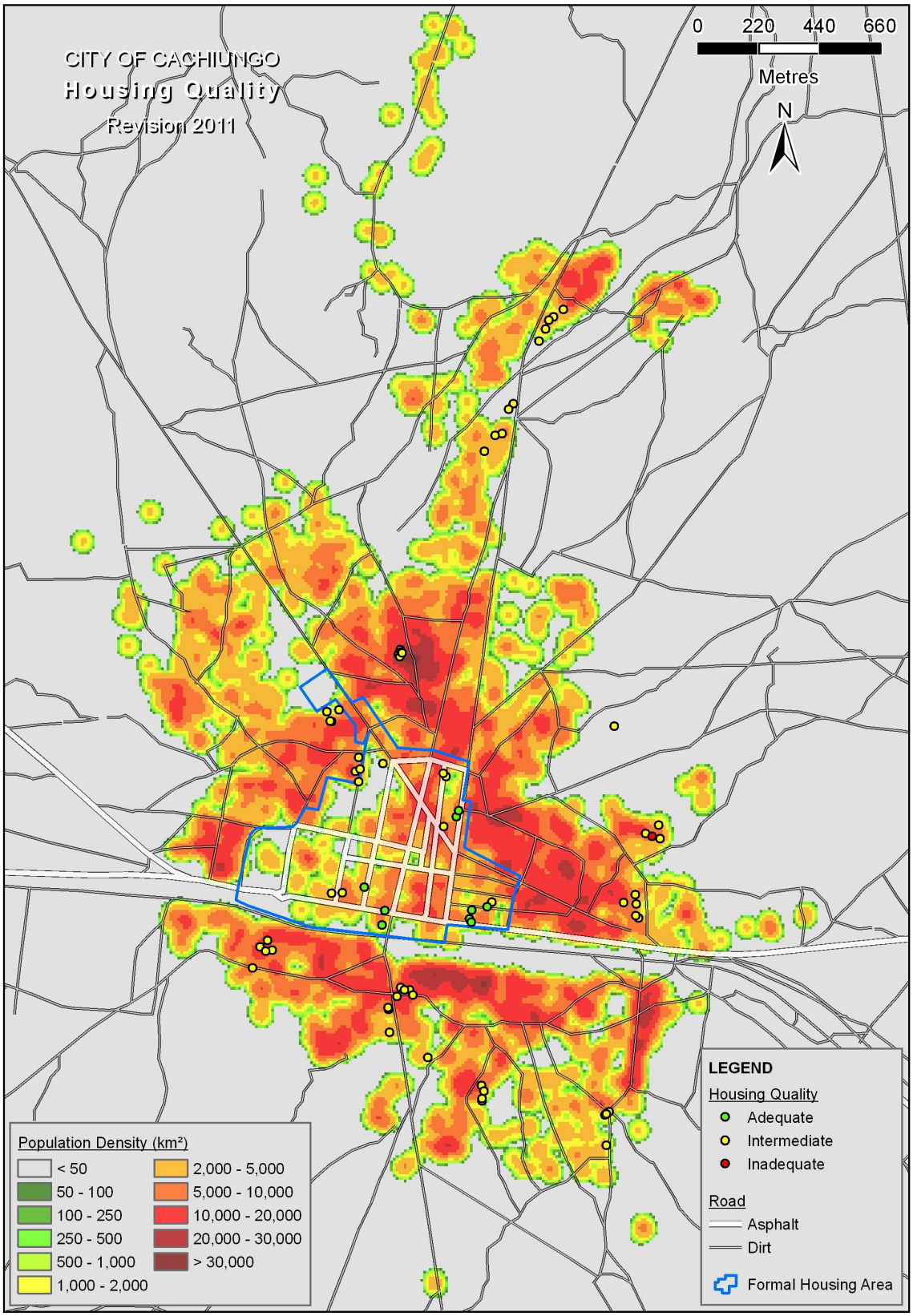


Figure 18. Population density, and housing quality by settlement type

3.2.6 Overall Indicator Scores

For each indicator that had sub-indicators, an average score was computed to provide an overall picture for that particular indicator (Table 17). These average scores show that Katchiungo rated highest in terms of overcrowding (average score of 1) and lowest in terms of access to safe water (average score of 3). Housing quality and security of tenure were rated favourably (average scores of 1.8 and 2, respectively).

The table below also shows that overall, the indicator scores for the two settlement types were relatively close to each other. The only exception was the security of tenure indicator where the scores were at the extreme, opposite ends of the scale. Identical scores were computed for both settlement types in terms of access to safe water, improved sanitation, and overcrowding, whereas the scores given to each settlement type for the housing quality indicator were markedly different.

The score for all five indicators was combined so as to create an overall descriptor for each settlement type. Each factor was weighted on the basis of the importance given to it by residents, as they indicated in focus group discussions. The weights applied to each indicator were:

The overall weighted score for Katchiungo was 2.45, which is near the lowest score possible. This indicates that overall, the living conditions in Katchiungo were inadequate. Indeed, the indicators for Security of tenure and Access to safe water were given the lowest possible score of 3, while just a slightly higher score of 2.5 was given to Access to improved sanitation.

Secure tenure	15%
Access to Improved Water Supply	40%
Adequate Sanitation	25%
Overcrowding	5%
Housing Quality	15%

Being a third-tier city, it was expected that the local administration's capacity to provide collectively-supplied services would be low. This assumption was supported by the low scores obtained for the indicators for access to safe water, and collection of solid waste (the study noted that there is no solid waste collection service in Katchiungo). While there is a national program to improve access to safe water (*Agua Para Todos*) this has been slow in being deployed in Katchiungo, perhaps partly due to the fact that this is not a "really urgent need", given that there is abundant rainfall and water is generally available from shallow wells or protected boreholes. Thus, a water market has not developed in this city, though there is some concern about the quality of water from wells as the growing population may be polluting the water table through latrines. The data also provided support for the expected result that the score for security of tenure would be low – the majority of the population live in the informal housing areas where security of tenure is most precarious. This is also because generally, in all areas of the country, it is difficult to obtain the documents that are legally necessary to show occupation rights.

Katchiungo, as expected, had the highest and best score in terms of overcrowding (score of 1). However, it must be noted that the key informants in the focus group discussions did not consider this as an important indicator and suggested that this should be given the least weight (i.e., 5 out of 100 possible points).

Table 17. Overall poverty indicator scores, by settlement type

Settlement Type	Score					Overall weighted score
	Security of tenure	Access to safe water	Access to improved sanitation & solid waste collection	Over-crowding	Housing quality	
Formal	1	3	2.5	1	1.3	2.2
Informal	3	3	2.5	1	2.3	2.7
Weights for overall ranking (%)	15	40	25	5	15	
Average	2	3	2.5	1	1.8	
Weighted Average						2.45
Scores: 1 = best conditions 2 = intermediate conditions 3 = worst conditions						

3.3 Urban-rural Linkages

Individuals in Katchiungo, even those who live in the formal area of the town, have strong links to the surrounding rural areas. Most families are engaged in some way in agriculture or other rural activity, such a honey or charcoal production. The most common fuel used for cooking is wood, which is gathered as dead wood from surrounding areas, on the way back from the fields. It has been noted that as of late, there has been a growing charcoal industry, with consumers in Luanda and other urban centres as the main market. Other employment

opportunities are limited. However being located in a town such as Katchiungo, (rather than being in an outlying village), does permit one to engage in other economic activities (even if returns are low) such as trading in the small informal market or by the roadside. Those engaged in agriculture in Katchiungo face many constraints. Soil fertility (and therefore, crop yields) has declined in the farming belt along the main road and railway on the Central Plateau because of overuse of the soils and overuse of inorganic fertilisers during the colonial era. Crops provide low yields if inorganic fertilisers are not applied, and these are very expensive and not always available. Crop varieties adapted to local conditions are unavailable. Farmers save their own seed from previous crops even though these may no longer provide good yields.

3.4 Environmental Burdens

There are no rainfall records for recent years for Katchiungo, but the agricultural research station at Chianga, located just outside the city of Huambo, has maintained rainfall records in the past 70 years. Since Huambo city is only about 60 kms to the west of Katchiungo, the researchers have assumed that the rainfall data collected by the Chianga weather station would be applicable to Katchiungo as well. The rainfall data show that on the whole, the amount of rainfall in the province is higher than in most areas of the country – the average annual rainfall is up to 1,400 mm of rain. More than 95% of the rain falls between the months of October to April, but the highest amounts of rain fall in the months of December and March (i.e., the amount of precipitation is about 230-240 mm for each of these two months). Because of its high elevation, the temperatures in the province are also much lower than the rest of the country – the average daily temperatures are from 18-23 Celsius and the average minimum temperatures are from 11-13 Celsius.

3.4.1 Erosion and Flooding in Katchiungo

Katchiungo is a small town with unoccupied spaces and little population pressure; the built-up area has avoided slopes and flood plains, i.e., areas of erosion and flooding risk. Due to its high elevation, erosion, rather than flooding, seems to be the most serious risk – rainwater will flow down the steep slopes at higher velocities and will carry soil along with it. Figure 19 below shows that relatively few houses in Katchiungo are built on steep slopes, hence the risk of damage to houses due to erosion is minimal.

Other factors contribute to the high risk of erosion: a) the high amounts of rainfall, b) the high amounts of precipitation that come down as heavy storms, c) a charcoal industry that has grown in recent years, contributing to deforestation and decreased ground cover (trees are cut and processed into charcoal but no replanting is done), d) the relatively poor capacity of the soil to sustain agriculture (soils in the area have low nutrient content and low water-holding capacity) – hence farmers practice shifting cultivation (when the soil nutrients are exhausted, farmers can no longer obtain good crop yields, so they move on and clear the land in new areas without replanting trees in the areas they are leaving).

Katchiungo is on the watershed, with streams flowing northwards or southwards away from the watershed along which runs the main east-west tarred road and the Benguela Railway. Dirt roads running north-south therefore tend to accumulate run-off. Serious erosion can be seen alongside dirt roads near the town, especially those that run in a north-south direction, away from the town. It was observed that inadequate mitigation measures have been made to control erosion, hence deep gullies have developed alongside dirt roads that have been re-opened since 2002.

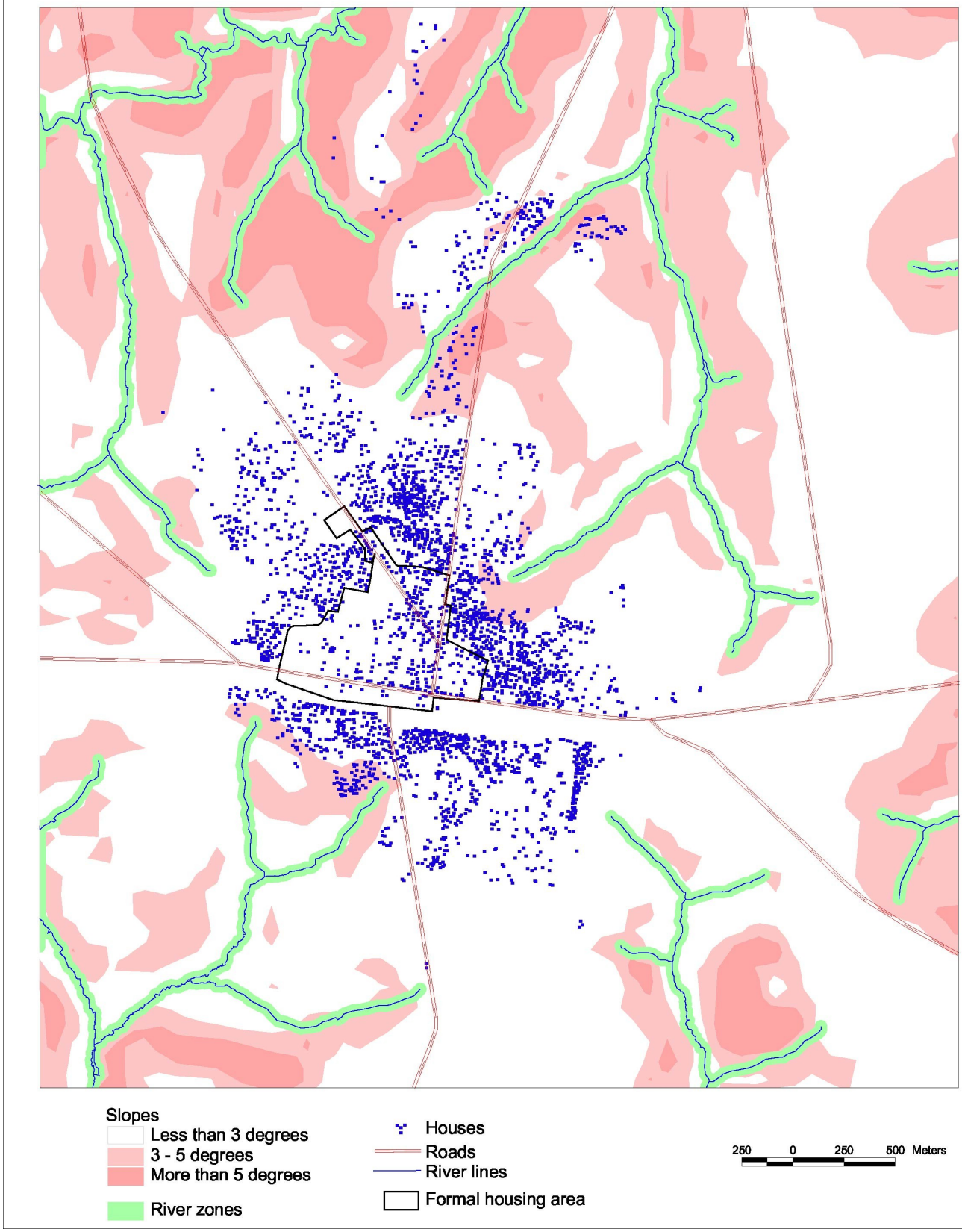


Figure 19. Location of houses and erosion risk, Katchiungo

Figure 20. Charcoal production, a growing industry in Katchiungo

Figure 21. Large areas of land being cleared for crop production

Figure 22. Gully formation along a dirt road

3.5 Accessibility

In Katchiungo, accessibility is a far less important issue, as the town is very small. About 75% of the roads in the formal areas of the town are now tarred and are in good condition even after the rains, so access to the houses are generally not a problem. On the other hand, 63.4% of the informal areas of the town have unmaintained dirt roads that are in poor condition after the rains (Figure 23, Figure 24 and Figure 25). A little more than 20% of the roads in the informal housing areas are difficult to navigate, if not impassable, after the rains and this constrains the movement of a significant proportion of the population of Katchiungo. It has been observed that the quality of the roads becomes poorer as one goes from the formally-settled areas to the informally-settled ones).

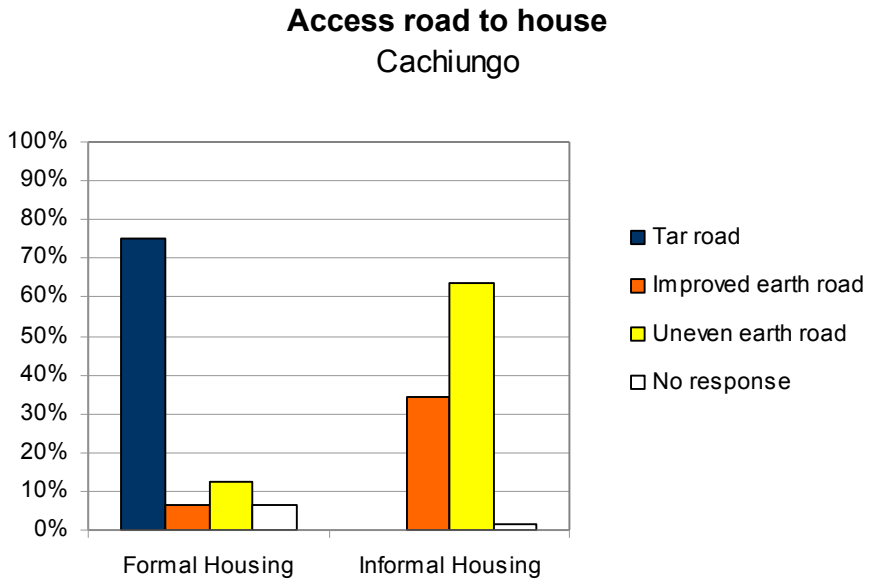


Figure 23. Quality of roads in Katchiungo, by settlement type

Figure 24. Typical dirt road in Katchiungo

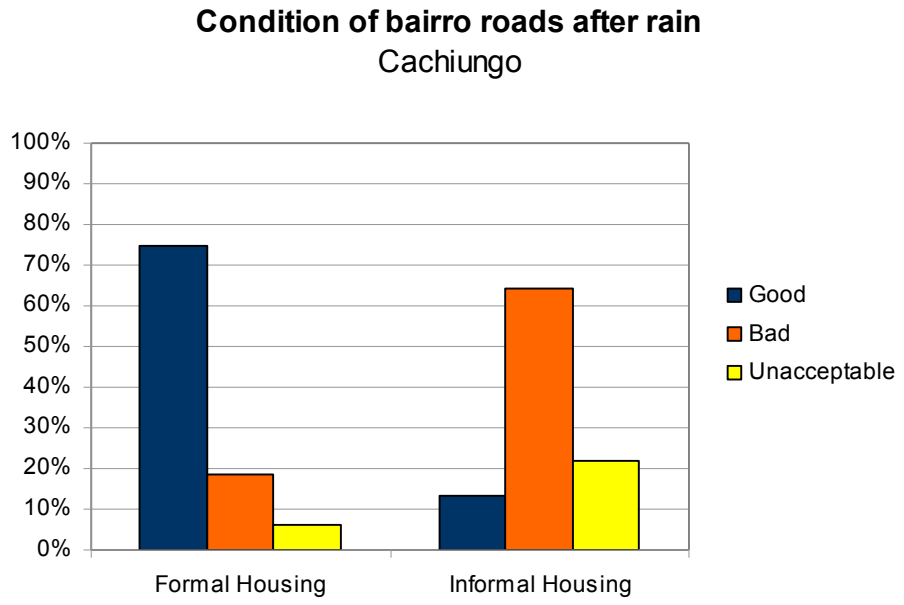


Figure 25. Condition of the roads after the rains, by settlement type

Katchiungo is a very small city and one needs to negotiate only short distances to reach any destination. Therefore, it is not surprising that the majority of the people (about 70% each in both the formal and informal housing areas), choose to walk to work or to wherever they need to go (Figure 26). The motorcycle comes in as a distant second as the most common means of transportation in both settlement types. Its popularity is perhaps due to the fact that they better suited to the terrain in Katchiungo (i.e., motorcycles can easily navigate narrow informal trails) and they are less expensive to own and operate than a car.

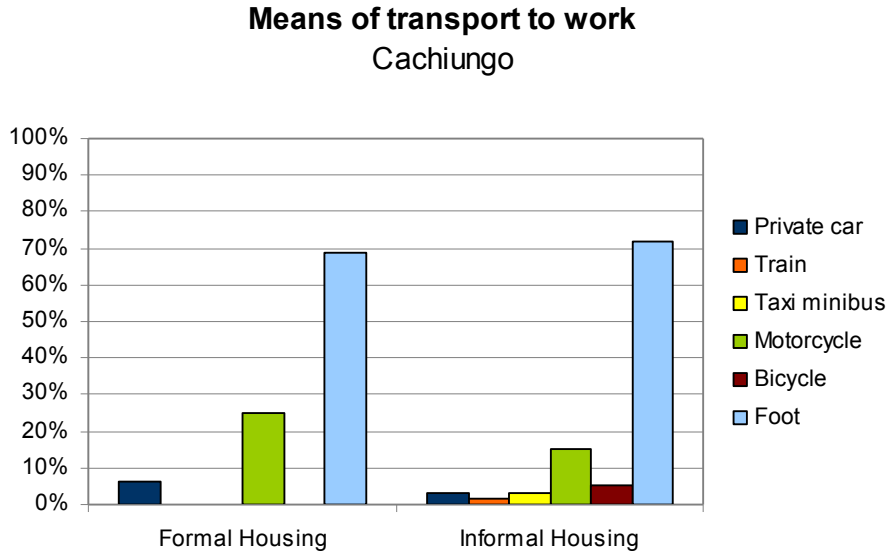


Figure 26. The most common means of transportation in Katchiungo, by settlement type

Even though distances are short within the town, most residents in Katchiungo work in agricultural areas outside of town and therefore need to travel relatively longer distances to work. Since most of the population travel by foot, the time required to reach one's destination can be an important consideration. Those who live in the formal housing areas take less time to travel to work (less than 30 minutes, or one hour maximum) than those living in informal areas – they are more likely to work in the town proper where travel distances are shorter, and are more likely to have access to a vehicle (Figure 27).

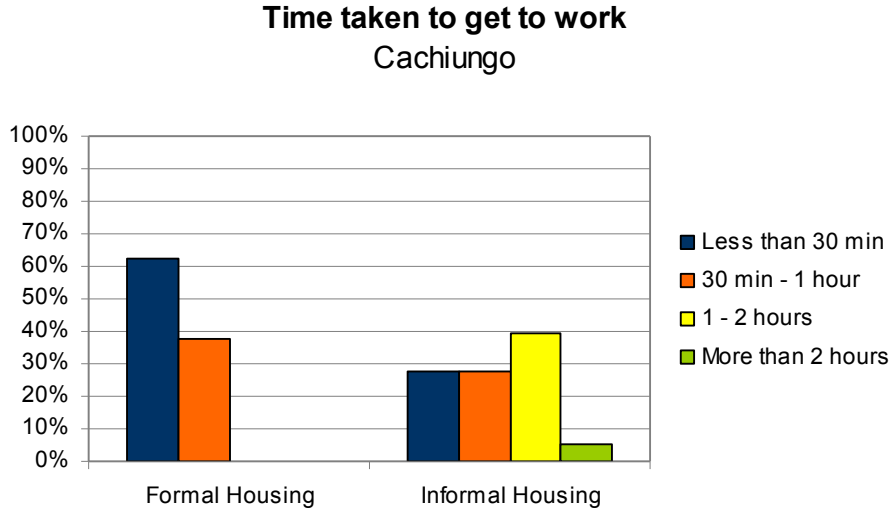


Figure 27. Time spent travelling to work, by settlement type

3.6 Land Markets

In Katchiungo, there is a land and housing market in which private transactions take place, even though legally, all land in Angola belongs to the state. Nowadays, buying land (or a house) is the usual way in which a house is obtained. Those who built a house on land that they had occupied without purchase, or who occupied an empty house, did so more than 25 years ago; simply squatting or occupying land or a house now does not happen.

Contrary to expectations, the great majority of residents (81.3%) in the formal housing areas In Katchiungo are renting the houses they currently live in. On the other hand, an almost identical proportion of respondents (81%) who live in informal housing areas purchased and now own their house, with only about one out of ten households renting. In informal housing areas, most residents purchased the land and built their own house, although there is a market for both land and houses in these areas.

Only a small minority of residents hold the documents that by law, are required to show their right to occupy the land. A considerable number of people have no documents at all. Despite this, most residents in the formal housing areas consider that their tenure is secure. Feelings of insecurity about tenure are highest in the informal housing areas of Katchiungo, where residents may have lost documents about their houses and land during the war.

Land values normally reflect the importance of factors such as economic activity levels, accessibility, environmental risk factors and access to services. It is also commonly observed that land value decreases as one moves away from the city centre,and as one moves towards the interior of any *bairro* that has poor accessibility and services. However, this study found that in Katchiungo, all land has a value of less than US$5 /$m^2$.

4 CONCLUSIONS

This research project is part of a larger study about three different types of urban areas in Angola. Luanda is a rapidly growing capital city with a growing economy, with oil exploration and production industries as the drivers of growth. Huambo is a provincial city that is growing slowly compared to Luanda, and without a strong motor for the economy. Katchiungo is a small town with very low economic growth and a stagnant economy.

The use of field research and new mapping techniques in this study has shown that new techniques have put within reach of local organisations the capacity to map social conditions and analyse their spatial aspects. Remote sensing images of urban areas can identify individual buildings – counting the buildings, together with sample surveys, can give population estimates for whole urban areas and parts of those areas. Remote sensing can also show the growth of the spatial extent of the urban areas. Coupled with local knowledge, remote sensing can provide the information to construct a typology of sub-areas being made up of homogenous physical and socio-economic characteristics (e.g., based on the date of settlement, history, the distance from the city centre, service levels, street patterns and type of housing, etc.). The location of sub-areas can be identified from urban images and mapped. These maps can be updated as urban areas develop and change, hence they permit the tracking of the rapid changes in demographics and the socio-economic situation of the population that often occur in rapidly-growing cities.

This research has generated population data for the three cities and their sub-areas. It has shown that the city of Katchiungo has a population of 10,000 and an almost negligible population growth rate.

Land prices, and thus rents and property prices, are very low in Katchiungo, with all land being valued at less than US$5 /$m^2$.

The choice facing poor people is whether to pay low rents or property prices that will allow them to live in a city with a less dynamic economy or to pay higher rents or property prices that will allow them to live in the capital city with a dynamic economy where opportunities for household income-generating strategies are better. Within a large urban area, poor people can face similar choices – they can a) pay high rents or property prices to live in an area close to the economic opportunities near the old urban core, or b) they can pay lower rents or property prices to live in an area with good access to informal sector economic opportunities but very high population densities and difficult environmental conditions, or c) they can pay low rents and property prices to live in an area remote from economic opportunities in the formal or informal economy. However, in a very much smaller urban area such as Katchiungo, these differentials in terms of economic opportunities as a function of distance from the centers of economic activity do not exist. The small land area occupied by the city makes everything accessible (travel-wise), to virtually every one.

The evidence is that in general, the Katchiungo urban area has not spread into areas of environmental risk. The data show that the urban core itself is located in a very low risk area and that in the outlying or peripheral areas, there are relatively few houses that have been built on steep slopes that may be at risk of erosion. Perhaps this is an issue that the city administrators should keep an eye on, to make sure that this trend does not continue to grow. The study has shown that there are adequate areas for the future physical expansion for the city, and similarly, areas for housing in non-risk areas are available. With an almost negligible population and economic growth rates, there will be little pressure for the city and the people of Katchiungo to occupy at risk areas.

Another plus factor that Katchiungo can count on is that being located in high elevations, there is almost no risk of flooding since rain water will readily drain to lower catchment areas. However, for the city administrators and the people in general, this highlights the importance and urgency of implementing effective erosion mitigation measures. High annual rainfall rates and possible concentrated periods of heavy rain brought about by climate change phenomena will dramatically increase the risk of erosion. The inevitable physical expansion of the urban area and the human settlements, albeit at a very slow rate, will contribute to the amount of runoff that must be managed and planned for.