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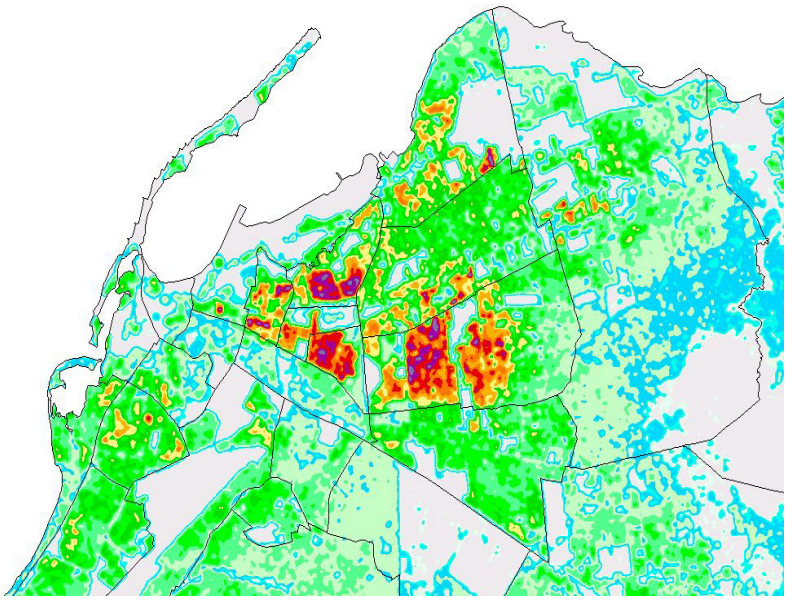
Final Report

Poverty and Environmental Vulnerability in Angola's Growing Slums:

Comparative Analysis of Luanda, Huambo and Cachiungo



prepared by:

Development Workshop Angola

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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 Cachiungo (the main town in the District of Cachiungo in Huambo Province). The urban areas of Luanda, Huambo, and Cachiungo 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, secondly, to explore in more depth the spatial aspects of poverty and urban environmental issues in Luanda. This report examines the differences among the three urban areas mentioned above. The report provides evidence that rising land prices has forced the urban poor out of inner-city informal *musseques* to occupy lower-valued environmentally risky sites such as river basins, dangerous slopes and areas susceptible to flooding on the margins of cities like Luanda.

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 of the population that often characterize rapidly-growing cities.

A typology of settlement types was developed for each urban area, based on the date of settlement, history, the distance from the city centre, service levels, street patterns and type of housing. In Luanda, the largest urban area, there is a greater diversity of settlement types, hence nine settlement types were identified. In Huambo, only three settlement types were identified: 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 Cachiungo, only two settlement types were identified (the formally-urbanised centre of the city and the informally-settled areas surrounding it) but in practice it was found that the characteristics of the two were similar.

A demographic analysis was carried out by first estimating the population in different settlement types using remote sensing and small sample surveys. These indicate that the population of the Province of Luanda (most of the population live in the city of Luanda) in 2008 was about 5.8 million. A comparison with previous population estimates indicates that the population of the city of Luanda is growing at just under 8% per annum. A 2010 update of the work carried out in 2008 indicates that the population was about 6.6 million in 2010. At present growth rates, Luanda may have a population of over 10 million by the year 2016. Even if population growth rates were to fall significantly in Luanda, the city would have a population of 10 million by about 2020. Luanda may therefore be among the five or six largest African cities. Using the same techniques, it was estimated that the population of the city of Huambo in 2008 was just less than 300,000 and Cachiungo about 10,000. There are less data available to estimate the growth rates of the latter two cities, but it is clear that Cachiungo's growth rate is little above zero and Huambo's, about 3%. There are thus significant differences in size between the capital city, a provincial capital and a district town, and the growth rates increase with the size of the city.

For Luanda, the population estimate from this research is higher than the estimate of the UN Population Division in World Population Prospects 2009, which estimates Luanda's

population in 2009 and 4.5 million. The population estimate from this research for Huambo is significantly lower than the UN estimate of 900,000 in 2009. Almost all the residents of Huambo and Cachiungo were born in those urban areas or the surrounding province. The residents of Luanda were born in a number of different provinces, notably Uige and Malange (both are roughly 350 kms distant from the capital). While a significant part of the growth of Luanda is due to natural growth, there is immigration from other areas particularly from the northern part of the country. Natural growth in Huambo and Cachiungo is probably balanced by out-migration.

In the 8 years since the end of civil conflict in Angola, the economy of the country has continued to depend on the oil industry. There has been a rapid growth in oil production in recent years, doubling between 2003 and 2008 and quadrupling between 1995 and 2008. Oil exploration and production is mainly offshore in the northern part of the country, close to the capital city. This has led to a rapid growth in the economy of the capital city, with an inflow of foreign workers and headquarters of companies linked to the oil industry. This reinforces the tendency for the economy of the capital city to develop more rapidly through the concentration there of government and private administrative functions. In Angola income from oil production (or loans backed by future oil production) is being used to finance post-war reconstruction. Although in the long-term the reconstruction strategy aims for balanced development throughout the country, the short-term effect of the rapid growth of the oil industry is to concentrate economic development in the capital city: the growth of the economy in other areas of the country will depend on agriculture and processing of agricultural products which, inevitably, will take longer. This presents Angola with a dilemma; in the short period in which Angola will have significant oil revenues available, it will need to provide for the needs of a rapidly growing population in the capital city while attempting to develop economically other areas of the country where the economy was seriously damaged by more than 20 years of civil conflict.

The United Nations Millennium Development Goals 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. A scoring system was developed for each of these characteristics (a score of 1 for good, 3 for unsatisfactory and 2 for intermediate level). From this, overall scores were calculated for each characteristic and a summary score was also calculated for each city. The overall score for Luanda and Huambo were similar (2.47 and 2.42, respectively) but for Cachiungo, it was 2.72. The overall score for Cachiungo was similar to the score for the informally-settled areas of Luanda and Huambo. The formal areas of Luanda and Huambo have high scores but the formal area of Cachiungo as a whole had a low score because it has seen little reconstruction and investment since the end of the war. In Luanda and Huambo there is a contrast between the formally settled and the other areas – the formally settled areas are usually close to the city centre, with more secure tenure and reasonable water and sanitation facilities. In Luanda and Huambo, there are also some transitional areas that are upgrading. However it should be noted that 70% of the population of Luanda still live in areas with inadequate access to safe water.

Overcrowding is the least important characteristic of slums in urban areas of Angola: only certain areas of Huambo and Luanda are overcrowded. There has been a tendency for the physical area of Luanda to expand in recent years and within its defined boundaries, Huambo has space to expand. Similarly housing quality is not the most important characteristic of slums in urban areas in Angola. In Luanda low scores for housing quality and sanitation are found mainly in newly-settled areas; residents of Luanda appear to manage to generate an income, through access to the informal economy, which permits them to upgrade the quality of their housing and to build latrines. In Huambo and Cachiungo the economy is less dynamic and even longer-term residents have houses with poorer quality building materials. In all urban areas the characteristics of slums with the poorest

scores are those depending on collectively supplied services: access to safe water, collection of solid waste and guarantee of secure tenure.

Flooding and erosion are important environmental issues in all three urban areas. Rainfall in Angola is highly variable from one year to another and rain falls in short and very heavy storms. These are conditions that create erosion risks, especially where control measures are inadequate (which is often the case in Angolan urban areas). Many urban areas in Angola have erosion gulleys. Flooding risk comes from the occupation of areas that are dry during the most part of the year, but become flooded after exceptionally heavy rainfalls. Cachiungo is a small town with unoccupied spaces and little population pressure; the built-up area has avoided areas of erosion and flooding risk, though serious erosion can be seen alongside dirt roads near the town. In Huambo there are significant areas, especially on the north side of the city, where the built-up area has encroached on slopes with a high erosion risk. Another important issue in Huambo is the extraction of sand and gravel from riverbeds in and close to the city, increasing the flow and erosion-potential of these rivers.

In Luanda where rainfall is extremely variable from one year to another, flooding and erosion has caused damage to housing built on slopes and in gulleys in high-rainfall years. These areas tend to surround the central city and are important areas in the informal economy: people are attracted to live in these areas because they are accessible to economic opportunities. In the outer areas of the city there is less overcrowding and less pressure to occupy risky areas. However flooding in Luanda disrupts transport, and this affects those living in outer areas of the city that are more likely to be cut-off from employment in the formal and informal economies near the centre. An environmental issue that affects only Luanda is the noise and pollution of a large city, which is cited as one of the factors leading residents to migrate to outer areas.

Individuals in Cachiungo are strongly linked to the surrounding rural areas, with most families being engaged in some way in agriculture or other rural activity. In Huambo, residents at the edge of the city are strongly engaged in rural activities while those living in informal housing areas closer to the city centre have livelihood strategies that embrace a number of activities, including some rural activities such as agriculture and trading in charcoal. Agriculture in Huambo and Cachiungo is constrained by the decline of soil fertility in the central belt of the Central Plateau of Angola, the lack of seeds and crops adapted to the area, and the high cost of inputs such as fertiliser. Individuals in Luanda have very weak links with the surrounding rural areas, which have sandy soils and low rainfall. The main economic activities are the formal and informal economies that are focused on the centre of the city. Thus, in Huambo and Cachiungo, economic activity in the surrounding rural areas counteracts the pull of the centre of the urban areas and the result is a lesser attractive pull of the centre of the city on population distribution. In Luanda the attractive pull of the economy in the centre of the city on population distribution is dominant though some other factors (discussed later) tend to work in the opposite direction.

The size of the city of Luanda and the concentration of economic activity in the central area make accessibility to the central area an important factor in the livelihood strategies of households. The lack of priority measures for public transport and two-wheeled vehicles has led to a high use of private vehicles in Luanda, which in turn has led to serious traffic congestion and long journey times. Roads in the centre of the city and along the main arteries now have a good surface but inside the *bairros,* road surfaces are made of dirt, they tend not to be maintained, and are impassable after rains. Thus accessibility to economic opportunities declines rapidly as one moves away from the city centre and as one moves away from the main roads into the interior of the *bairros*.

In Huambo there is no traffic congestion. The condition of the main roads is good but roads in the interior of the *bairros* are in poor condition. Accessibility is good along the main roads

and the main means of transport is motorcycles acting as taxis. Economic activities are more widely spread throughout the city than in Luanda. In Cachiungo accessibility is a less important issue, as the town is very 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 consider that their tenure is secure. Feelings of insecurity about tenure are highest in Cachiungo (where residents may have lost documents about their houses during the war) and in parts of Luanda, which are close to the city centre (where residents fear that they will be displaced by expansion of the city core).

Land values in the three urban areas reflect the importance of factors such as economic activity levels, accessibility, environmental risk factors and access to services. In Luanda, land values range from over 800 US$/$m^2$ in the city centre to less than 100 US$/$m^2$ in outer areas of the city (and less in the interior of *bairros* with poor accessibility and services). In Huambo the value of land is very much less: in well-serviced formal areas of the city, prices range between 100 and 150 US$/$m^2$; in less well-served formal areas it is between 30 and 70 US$/$m^2$. The average price of land in the more accessible parts of informal areas is 9 US$/$m^2$, with a range of 4 to 13 US$/$m^2$; while in less accessible parts of the informal areas of Huambo the value of land is about 5 US$/$m^2$. In Cachiungo, all lands are valued at less than 5 US$/$m^2$.

When choosing where to live, households can decide whether to live in a small town such as Cachiungo, with low housing costs but poor services, low levels of economic activity, and few choices for household livelihood strategies; a provincial city such as Huambo with higher housing costs but higher levels of economic activity; or the capital city with high housing costs but a more dynamic economy.

In Luanda land prices decline rapidly as one moves away from the core of the city where the formal economy is concentrated. Informal economic activities tend to cluster strongly around the central core, providing goods and services to the formal economy and to the higher-paid people who work in the formal economy. The informal economy is highly dependent on imported goods that come through the port and airport near the city core; centres of distribution of informal goods area on edge of city centre, such as the markets and warehouses in Hoji ya Henda and Cazenga. These are areas of high land values and overcrowding although the turnover of informal economic activities is higher. In Luanda, it is notable that land prices decline most rapidly in the north-easterly direction away from the city core – in this direction accessibility declines most rapidly because of environmental constraints on travel after the rains, such as the river valleys near Cacuaco and the areas of clay soils with risks of standing water in Hoji ya Henda and Cazenga.

Households make the same trade-off when choosing to locate themselves in different parts of the city of Luanda as they do between cities. If they choose to locate themselves in Cazenga, for example, conditions are overcrowded, there is noise and air pollution, the area is subject to flooding because of impervious clay soils, and land prices are high. Access to economic activities in the city core, and warehouses distributing goods for the informal economy, is however good. About 10 kms from the city centre, there is less pollution and overcrowding, no flooding, and land prices are lower but access to economic opportunities is poorer. There are areas of social housing 20 kms from the city centre, to which households have been forcibly removed from inner areas by the State: these have better services (as the State has provided water and solid waste removal services, and proof of tenure) but access to economic opportunities is much less.

In the city centre of Luanda, and adjoining areas to the south where new formal sector economic activities have developed, the price of land is high even when poor people occupy that land. There are more economic opportunities for poor people in these areas but the risk is that those able to pay the higher land prices will displace them. Displacement may occur by their being bought out or by administrative redevelopment. Gentrification (higher land values and a lowering of population density) is occurring. Those displaced are able to buy land relatively easily at the periphery of the city, though this land is marginal to economic opportunities, and is unserviced land. Land designated by the State as “housing reserves” are also on the periphery. The state and the poor are locked into developing marginal locations of low value, difficult-to-service, and inconvenient-to-access centres of employment.

Angola experienced strong economic growth from 2004 to 2008 with growth rates over 10% each year, though in 2009 and 2010 lower oil prices led to lower growth. The notable differences between the cities in this study, and the strong differences within them, show the difficulties of lifting people out of poverty even with strong national economic growth. High rates of economic activity in Luanda only slowly translate into economic development in the interior of the country. In an urban area with strong economic growth, poor people pay high prices to access land close to economic opportunities, and suffer overcrowding and difficult environmental conditions. Poor people are pushed outwards, either by the market or administratively, to areas of the city with limited economic opportunities. Compensation for administrative relocation should take into the account the loss of access to economic opportunities, as a plot of land in a remote location is not adequate compensation for a plot close to an economic hub. Providing better services in more remote locations would reduce the disadvantages of these locations, as would creation of employment close to new areas of housing.

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 spatial aspects of poverty and urban environmental issues in Angola cities (such as where the poor are located in relation to environmental risks, basic services and economic opportunities) and what are 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.

This is a report of a research project carried out in 2009 – 2011 by Development Workshop Angola in three urban areas of Angola. This report analyses the differences among the three urban areas of Luanda (the capital city of Angola), Huambo (the capital of Huambo Province), and Cachiungo, the main town in the District of Cachiungo in Huambo Province.

The research used field research and new mapping techniques to, firstly, supply baseline data on the five characteristics which the United Nations uses to define slums for the Millennium Development Goals (MDGs) and, secondly, to explore in more depth the spatial aspects of poverty and urban environmental issues in Luanda. The five characteristics that the United Nations uses to define slums are: a) poor security of tenure, b) difficulty of access to safe water, c) low levels of improved sanitation, c) low durability of housing structures, and e) overcrowding. 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 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 with different physical and socio-economic characteristics (based on 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.

The categories of settlement types identified can be more homogeneous than the administrative areas 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. The lower levels of *Comuna* and *bairro* lack data and are poorly defined.

Global Positioning System instruments allow the recording of the geographical coordinates of any position where an observation is made or an interview 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 MDGs indicators)

obtained from sample surveys can be mapped according to different categories in a settlement typology that can assist in targeting interventions. Maps can later be produced for individual administrative units overlaid on maps of different settlement types, in order to enable the visualise conditions according to municipalities, *comunas* and *bairros*. However 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.

The urban areas of Luanda, Huambo and Cachiungo were chosen for this study as they were considered to be representative of different types of urban area in Angola. Luanda (the capital of Angola) has a rapidly growing population and a growing economy. Huambo is the main city in Huambo Province and is sometimes considered as Angola's second city (though Benguela/Lobito and Lubango may now have larger populations). The growth of Huambo was never as rapid as that of Luanda and is an example of a second-tier city that shares the socio-economic characteristics of many Angolan and African urban areas. Cachiungo is a typical third-tier municipal city that was depopulated during the war, suffered serious damage and, like many Angolan municipal centres, is trying to rebuild itself as a regional market town.

2 TYPOLOGY OF URBAN SETTLEMENTS

The first phase of the research project carried out by Development Workshop Angola was the development of a typology of urban settlements areas with different physical and socio-economic characteristics in Luanda, Huambo and Cachiungo. The project classified settlement and housing areas according to this typology (rather than administrative boundaries) because administrative areas are heterogeneous and are difficult to use for pinpointing areas of particular social characteristics.

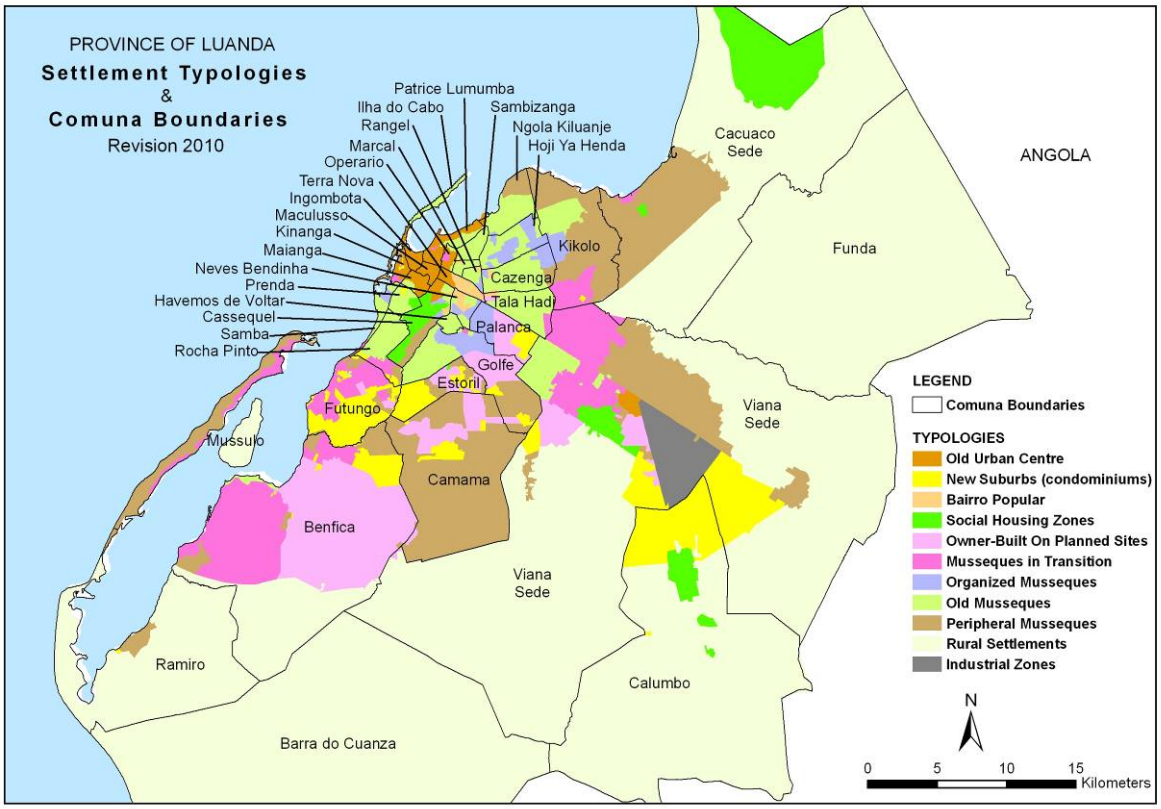
The area of study included the whole of the urban agglomeration as recommended and defined by UN Habitat.[1] This reduces discrepancies that may exist between different administrative units and enables international comparisons of the data with other cities.

It should be noted that different typologies of urban settlements need to be developed for each city that is studied, using these techniques. It should also 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. The typology developed for each city is specific for that city at the time of the research. It has adapted the typology used in Luanda as some parts of poor areas have been upgraded and have become significantly different from other areas in that category. This will probably 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, and informants who are familiar with the city were then requested to identify and categorize each type of development. The typology is based on urban form 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 which 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 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 Cachiungo, only two settlement types were identified (the formally-urbanised centre of the city and the informally-settled areas surrounding it) but in practice, it was found that the characteristics of the two were similar.

[1] "The urban agglomeration is defined as the built-up or densely populated area containing the city proper; suburbs, and continuously settled commuter areas. This may be smaller or larger than the metropolitan area." UN Habitat, Urban Indicators Guidelines, August 2004.


PROVINCE OF LUANDA
Settlement Typologies
&
Comuna Boundaries
Revision 2010
Patrice Lumumba
Ilha do Cabo
Sambizanga
Rangel
Ngola Kiluanje
Marcal
Hoji Ya Henda
Operario
Terra Nova
Ingombota
Maculusso
Kinanga
Maianga
Neves Bendinha
Prenda
Havemos de Voltar
Cassequel
Samba
Rocha Pinto
Cacuaco
Sede
ANGOLA
Kikolo
Funda
Cazenga
Tala Hadi
Palanca
Golfe
Estoril
Futungo
Mussulo
Viana
Sede
Camama
Benfica
Viana
Sede
Ramiro
Calumbo
Barra do Cuanza
LEGEND
Comuna Boundaries
TYPOLOGIES
Old Urban Centre
New Suburbs (condominiums)
Bairro Popular
Social Housing Zones
Owner-Built On Planned Sites
Musseques in Transition
Organized Musseques
Old Musseques
Peripheral Musseques
Rural Settlements
Industrial Zones
N
0
5
10
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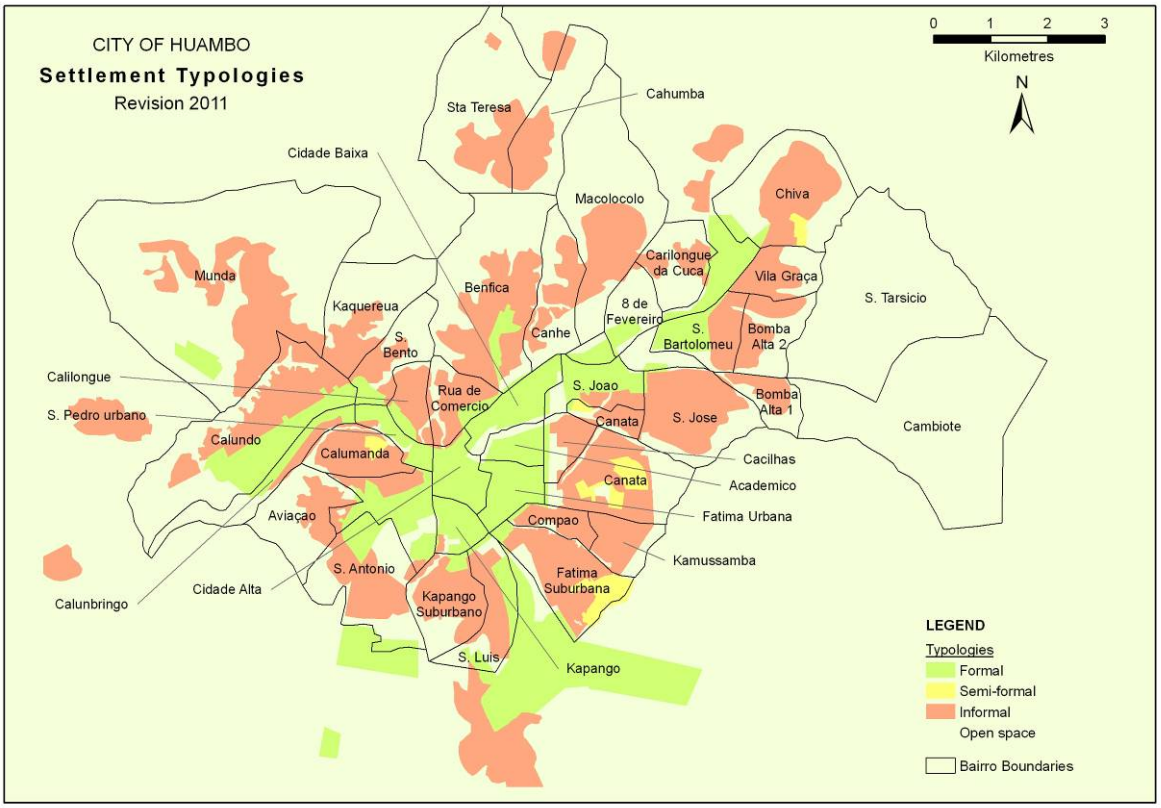
Kilometers


CITY OF HUAMBO
Settlement Typologies
Revision 2011
0
1
2
3
Kilometres
N
Sta Teresa
Cahumba
Cidade Baixa
Macolocolo
Chiva
Munda
Carilongue da Cuca
Vila Graça
Benfica
S. Tarsicio
Kaquereua
8 de Fevereiro
Canhe
S. Bartolomeu
Bomba Alta 2
S. Bento
Calilongue
Rua de Comercio
S. Joao
Bomba Alta 1
S. Pedro urbano
Canata
S. Jose
Cambiote
Calundo
Calumanda
Cacilhas
Canata
Academico
Aviaçao
Compao
Fatima Urbana
S. Antonio
Kamussamba
Fatima Suburbana
Calunbringo
Cidade Alta
Kapango Suburbano
S. Luis
Kapango
LEGEND
Typologies
Formal
Semi-formal
Informal
Open space
Bairro Boundaries

3 DEMOGRAPHY

There has been no census of the population of Luanda since 1983 and for the other two cities since before Independence in 1975. Considerable uncertainties exist about the number of people living in these urban areas and in the various subdivisions. Using remote sensing technology, a demographic analysis was therefore carried out by calculating the population in different settlement types and different administrative areas. Recent QuickBird high-resolution (0.80m) images for 2008 were procured and geo-referenced. For 12 months, teams of 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.

In addition to this, field teams were recruited involving municipal administrations, students and local civil society organisations to collect household and demographic information in all of the residential typology areas.

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, which were than measured in square metres. This method was adopted because it is usually impossible to identify individual houses – the edges of the roof on one house often being right next to the edges of the roofs of its neighbours. 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 with 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.

The results show that the population of the Province of Luanda (most of the population of which live in the city of Luanda) in 2008, was about 5.8 million. A comparison with previous population estimates indicates that the population of the city of Luanda is growing at just under 8% per annum, and it was estimated that in 2010, the population was about 6.6 million. Using the same techniques, it was estimated that the population of the city of Huambo in 2008 was just under 300,000 and for Cachiungo, it was about 10,000 (see Figure 1).

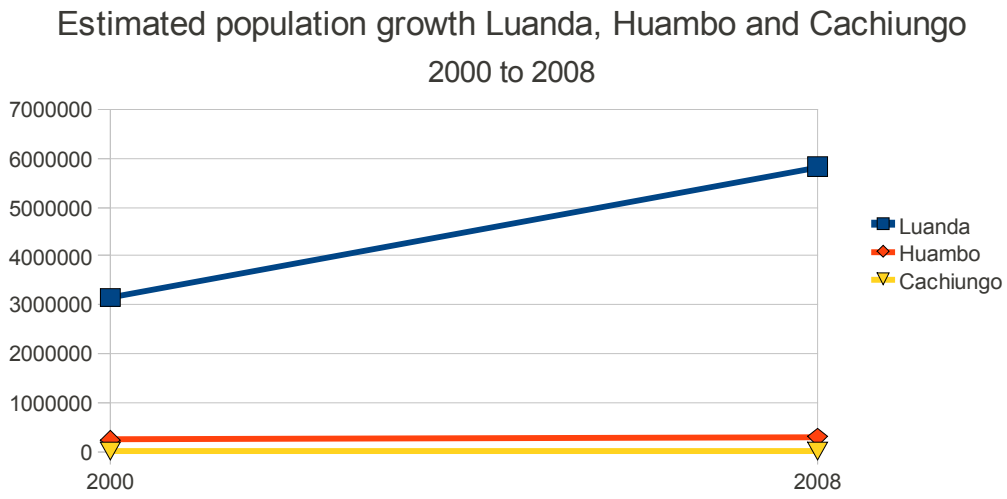


Figure 1. Population estimates: Luanda, Huambo, Cachiungo

Rooftop mapping was made of all residential units and built structures in Luanda

There are less data available to estimate the growth rates of the latter two cities, but it is clear that Cachiungo's growth rate is little above zero and Huambo's about 3%.

The estimated population growth rates per year are as follows.

Luanda	7 to 8 %
Huambo	2 to 3%
Cachiungo	zero

There are thus significant differences in size between the capital city, a provincial capital and a district town, and the growth rates increase with the size of the city. The largest city is growing more rapidly.

At present growth rates of just under 8% per year, the city of Luanda may have a population of over 10 million by 2016. Even if population growth rates were to fall significantly to 4% per year, Luanda would have a population of 10 million by about 2020. Luanda may therefore be among the six largest African cities. Cairo, Lagos and Kinshasa have comparably larger populations, as does Johannesburg, when the population of surrounding areas is taken into account. Luanda probably has a population similar to that of Khartoum, Alexandria or Abidjan: this has probably not been recognised internationally due to the lack of data on Luanda's population (see Figure 2). The population estimate from this research for Luanda is higher than the estimate of the UN Population Division in World Population Prospects 2009, which estimates Luanda's population in 2009 at 4.5 million. The population estimate from this research for Huambo is significantly lower than the UN estimate of 900,000 in 2009.

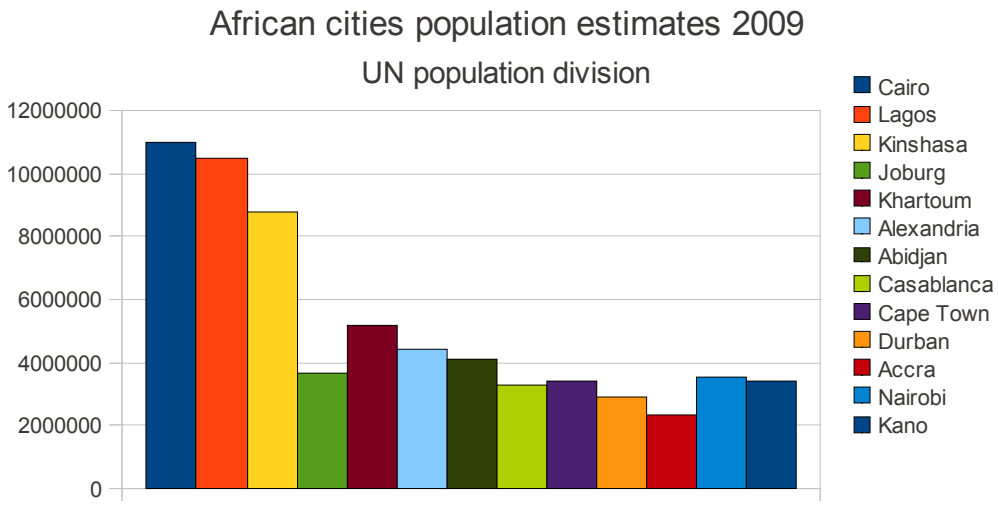
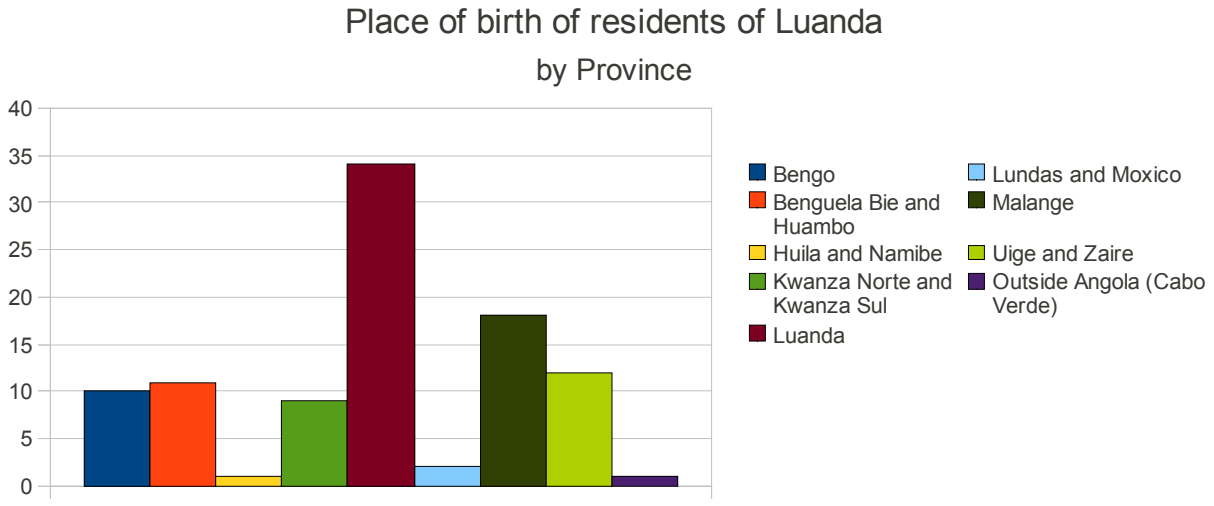


Figure 2. Population estimates of some African cities

The residents of Luanda were born in a number of different Provinces, notably Uige and Malange that are 350 kms distant from the capital. While a significant part of the growth of Luanda is due to natural growth, there is immigration from other areas particularly in the northern part of the country (see Figure 3).

Figure 3. Origin of residents of Luanda



Almost all the residents of Huambo and Cachiungo were born in those urban areas or the surrounding province. Natural growth in Huambo and Cachiungo is probably balanced by out-migration to Benguela/Lobito, Lubango and Luanda. Figure 4 and Figure 5 below, show the origins of residents in formally-settled areas, informally-settled areas, and semi-formally settled areas, respectively.

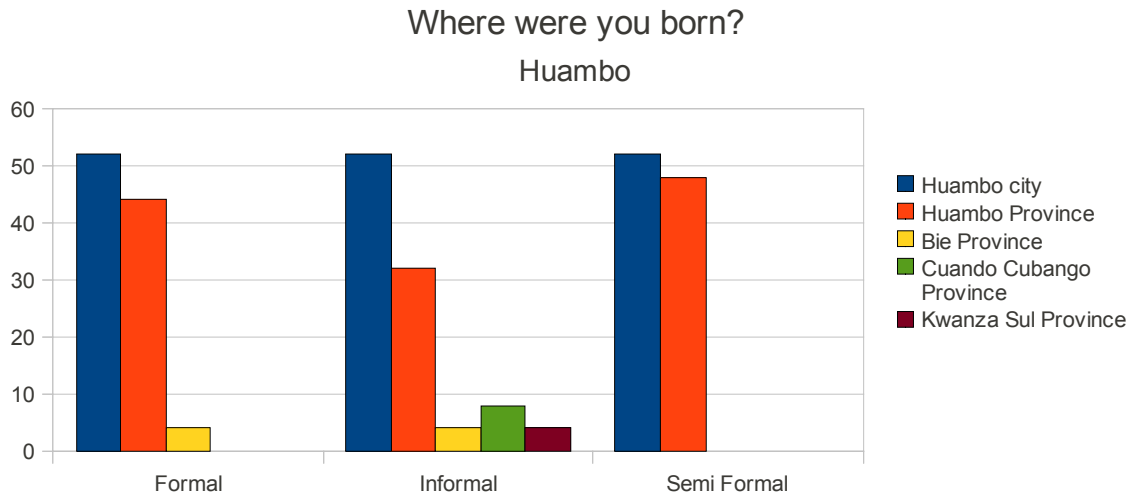


Figure 4. Origin of residents of Huambo

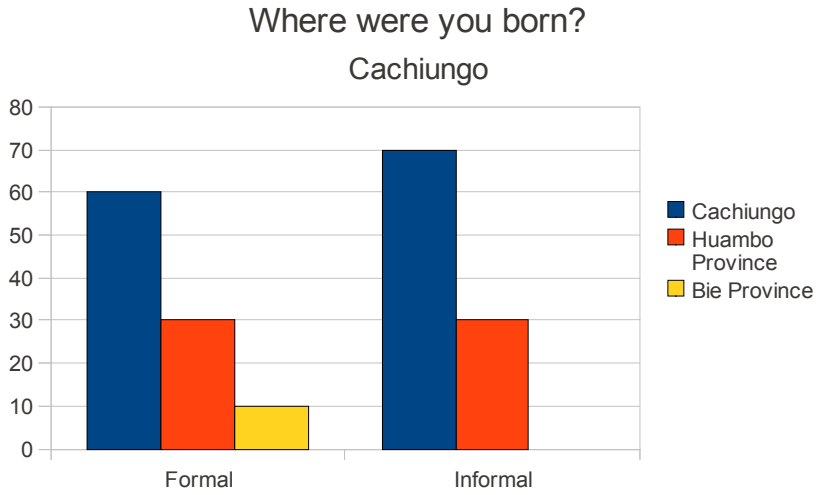
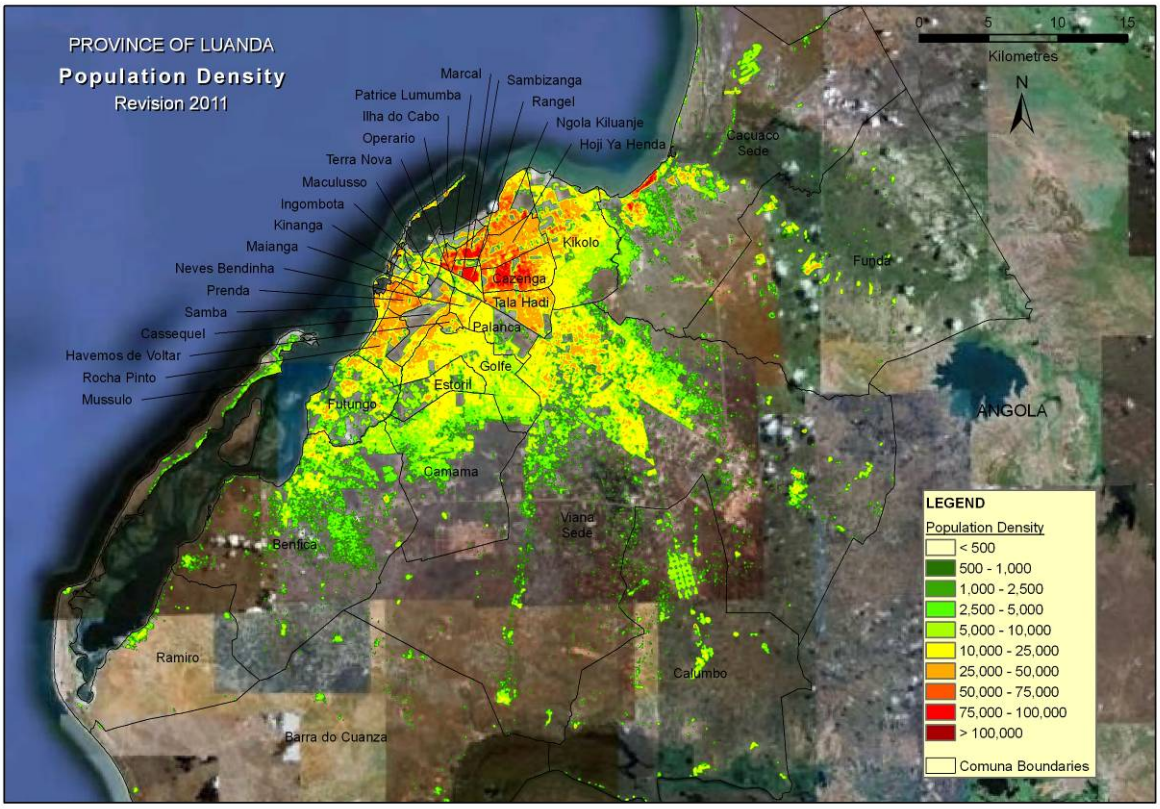
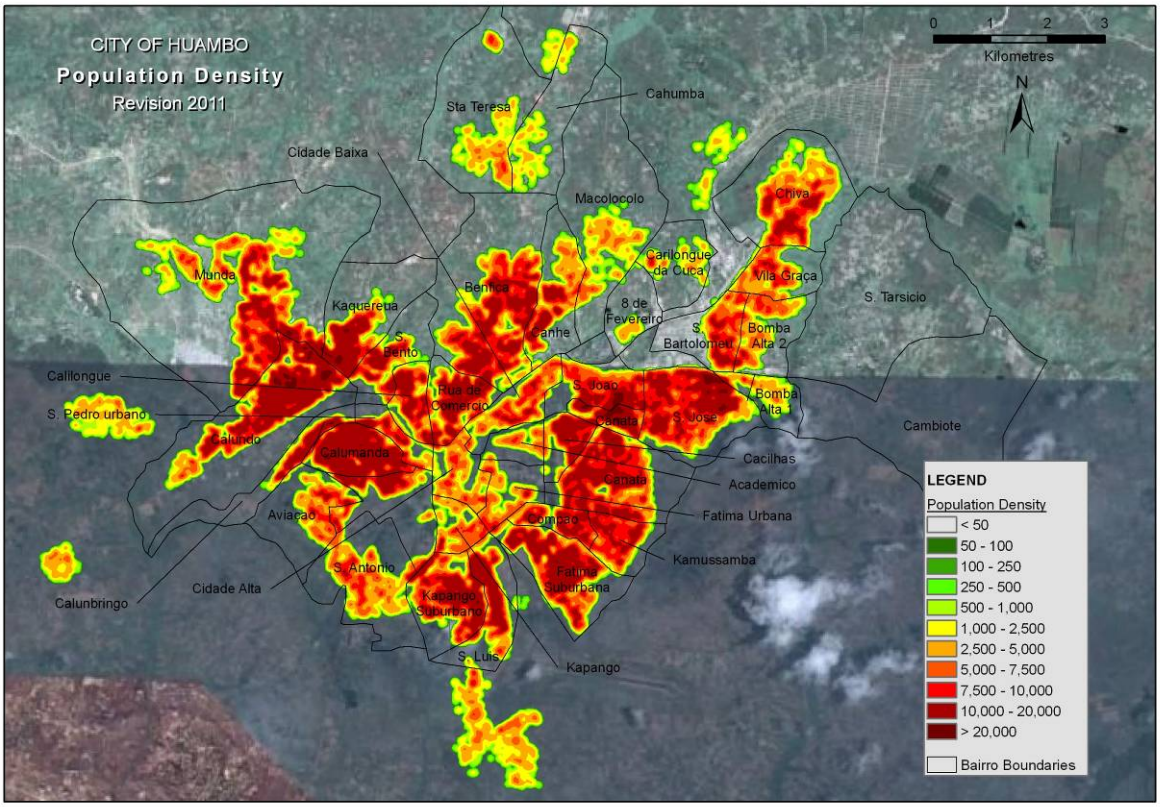
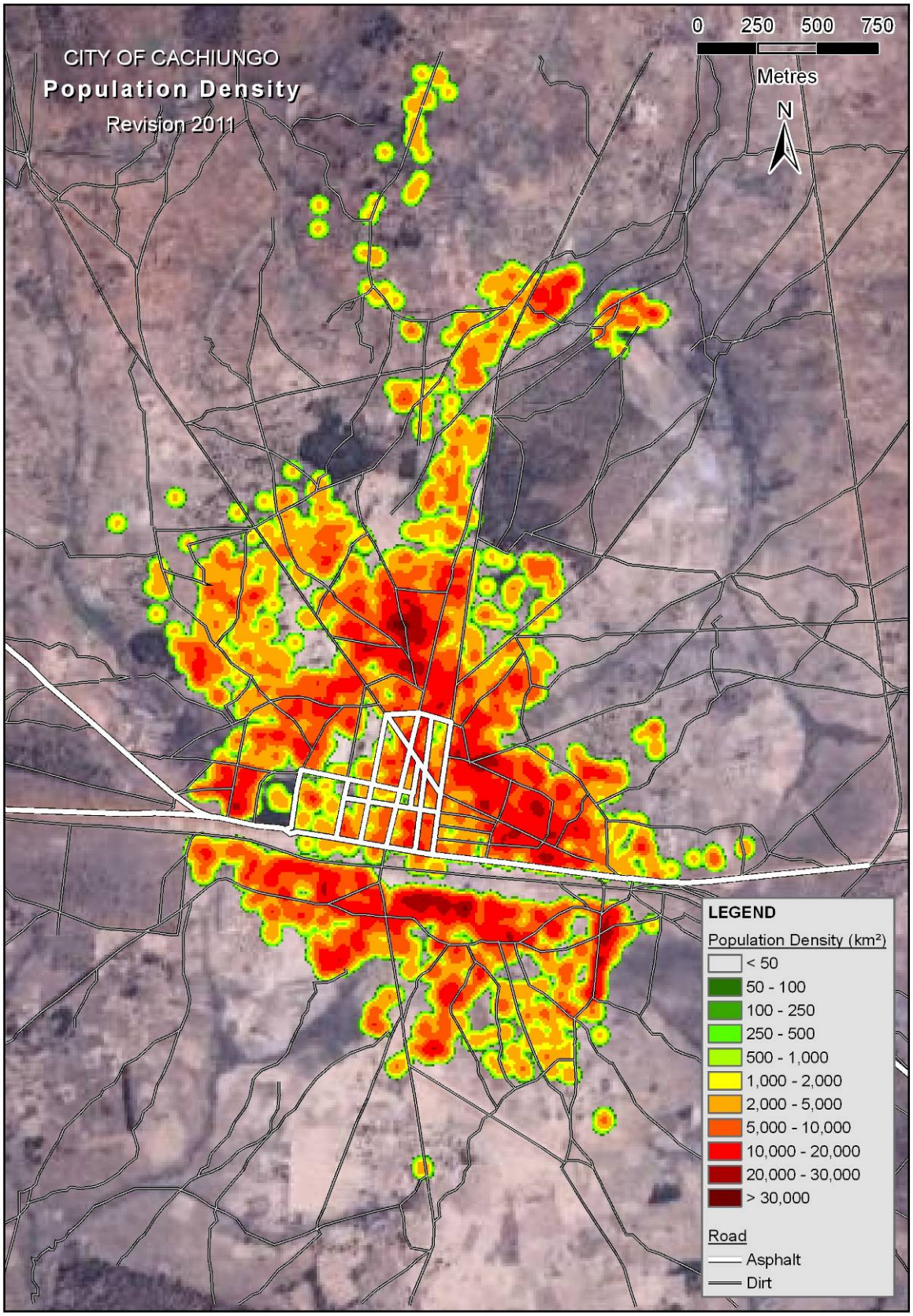


Figure 5. Origin of residents of Cachiungo


PROVINCE OF LUANDA
Population Density
Revision 2011
0 5 10 15
Kilometres
N
Marcal
Sambizanga
Patrice Lumumba
Rangel
Ilha do Cabo
Ngola Kiluanje
Operario
Hoji Ya Henda
Terra Nova
Cacuaco Sede
Maculusso
Ingombota
Kinanga
Kikolo
Maianga
Funda
Neves Bendinha
Cazenga
Prenda
Tala Hadi
Samba
Palanca
Cassequel
Golfe
Havemos de Voltar
Estoril
Rocha Pinto
Futungo
Mussulo
ANGOLA
Camama
Viana Sede
Benfica
Ramiro
Calumbo
Barra do Cuanza
LEGEND
Population Density
< 500
500 - 1,000
1,000 - 2,500
2,500 - 5,000
5,000 - 10,000
10,000 - 25,000
25,000 - 50,000
50,000 - 75,000
75,000 - 100,000
> 100,000
Comuna Boundaries


CITY OF HUAMBO
Population Density
Revision 2011
0 1 2 3
Kilometres
N
Sta Teresa
Cahumba
Cidade Baixa
Macolocolo
Chiva
Carilongue da Cuca
Vila Graça
Munde
Benfica
S. Tarsicio
Kaquereua
8 de Fevereiro
Canhe
S. Bartolomeu
Bomba Alta 2
S. Bento
Callongue
Rua de Comercio
S. Joao
Bomba Alta
S. Pedro urbano
Camita
S. Jose
Cambiote
Calundo
Calumanda
Cacilhas
Camata
Academico
Aviacao
Compao
Fatima Urbana
S. Antonio
Kamussamba
Cidade Alta
Fatima Suburbana
Calunbringo
Kapango Suburbano
S. Luis
Kapango
LEGEND
Population Density
< 50
50 - 100
100 - 250
250 - 500
500 - 1,000
1,000 - 2,500
2,500 - 5,000
5,000 - 7,500
7,500 - 10,000
10,000 - 20,000
> 20,000
Bairro Boundaries



In the 8 years since the end of the war the economy of Angola continued to depend on the oil industry. There has been a rapid growth in oil production in recent years, doubling between 2003 and 2008 and quadrupling between 1995 and 2008 (Figure 6).

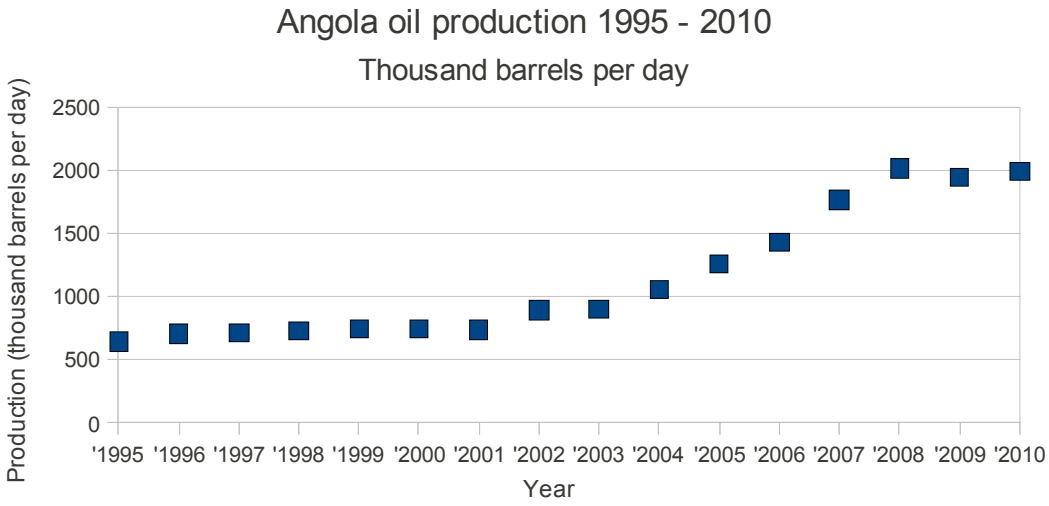


Figure 6. Oil production - driver of the Angolan economy

The oil industry is offshore in the northern part of the country, close to the capital city. This has led to a rapid growth in the economy of the capital city, with an inflow of foreign workers and headquarters of companies linked to the oil industry. This reinforces the tendency for the economy of the capital city to develop more rapidly because of the concentration there of government departments, educational establishments, and headquarters of large companies. Where the capital city is a port, there is also the tendency for economic development to cluster around the import and export trade.

Income from oil production (or loans backed by future oil production) is being used to finance post-war reconstruction. Thus although in the long-term the reconstruction strategy aims for balanced development throughout the country, the short-term effect is perverse. Long-term reconstruction in the interior of the country is slowed by the need to rebuild transport links, such as the Benguela Railway that will reopen in Huambo and Cachiungo almost 10 years after the end of the war. Redevelopment in the interior will be largely based on agriculture and agricultural processing, and will require the redevelopment of agricultural research, markets, and incentives. Meanwhile, in Luanda economic activity associated with oil (with an international labour force and the relatively highly paid local staff) creates incentives for migration to Luanda and further associated economic growth.

This presents Angola with a dilemma. In the short period of about 20 years in which Angola will have significant oil revenues available, it will need to provide for the needs of a rapidly growing population in the capital city and improve transport and basic services, while at the same time attempt to develop other areas of the country where the economy was seriously damaged by more than 20 years of civil conflict.

4 UN MDG CHARACTERISTICS OF SLUMS

4.1 Millennium Development Goals

The United Nations uses five characteristics to define slums for the 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. 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" 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 that 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 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".

A simple questionnaire was used to collect data for each settlement type and this was supplemented with group discussions and actual observations to validate the results. Field research in the form of household surveys, focus group discussions with local people and government representatives, and field observations were carried out to obtain data for each of the five indicators. Information on access to water and basic services, housing quality and location and the number of people per household was collected by carrying out a household survey of more than 700 households in Luanda. Household surveys were carried out in each of the nine settlement types and the sample took into account the number of households in each of these settlement types. A minimum of 60 household surveys were conducted per settlement type, and considerably more households were interviewed in the most populous settlement types (old *musseques* and peripheral *musseques*). Sample areas were identified which are considered representative of each settlement type in six different municipalities. The data are not considered robust enough to support statistical tests of significance, but they provide a good indication of the situation in each settlement type.

4.2 Secure Tenure

Secure Tenure is the right of all individuals and groups to effective protection by the State against forced evictions. 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 is 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 Secure 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.

4.3 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. less than 10%. A sufficient quantity means that water should be

available at a quantity of at least 20 litres per person per day. Water should be accessible without exerting excessive efforts and should not take an undue proportion of the household's time (less than one hour a day for 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 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: an unprotected well, 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 will also be examined.

shows the definitions of the three scores for this indicator.

Table 2. Definitions 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.[2] 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 (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. [3] 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.

[2] Development Workshop, *The Informal Peri-Urban Water Sector in Luanda*, June 2009.
[3] Development Workshop, *The Informal Peri-Urban Water Sector in Luanda*, June 2009.

4.4 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 (not public);
- an improved pit latrine, private or shared (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 3. Definition of scores for 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 exists no sewage system in Huambo or Cachiungo
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.[4]

[4] Information obtained from sample inquiries on the access to water and basic sanitation conditions for a baseline study of the urban observatory (*Estudo de base do observatorio urbano*)

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 serve as breeding ground for flies and other pests that spread diseases such as malaria and dengue. Further, according to UN Habitat "regular solid waste collection is a clear indicator of the effectiveness of a municipal administration." [5] Stagnant water ponds due to non-existent or deficient sewage and rainwater drainage systems also add to sanitation problems in many *bairros*.

For this project solid waste removal was divided into three categories:

- regular/door-to-door collection,
- irregular waste collection from containers or local garbage dumps which is 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 derived 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*).

[5] United Nations Human Settlements Programme (2004) *Urban Indicators Guidelines – Monitoring the Habitat Agenda and the Millennium Development Goals.* http://ww2.unhabitat.org/programmes/guo/documents/urban_indicators_guidelines.pdf

4.5 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 key criteria to define the slum.

Overcrowding is associated with a low number of square meters 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 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, that is at least four square meters. 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 overcrowding. No settlement type 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 overcrowding, 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

4.6 Housing Quality

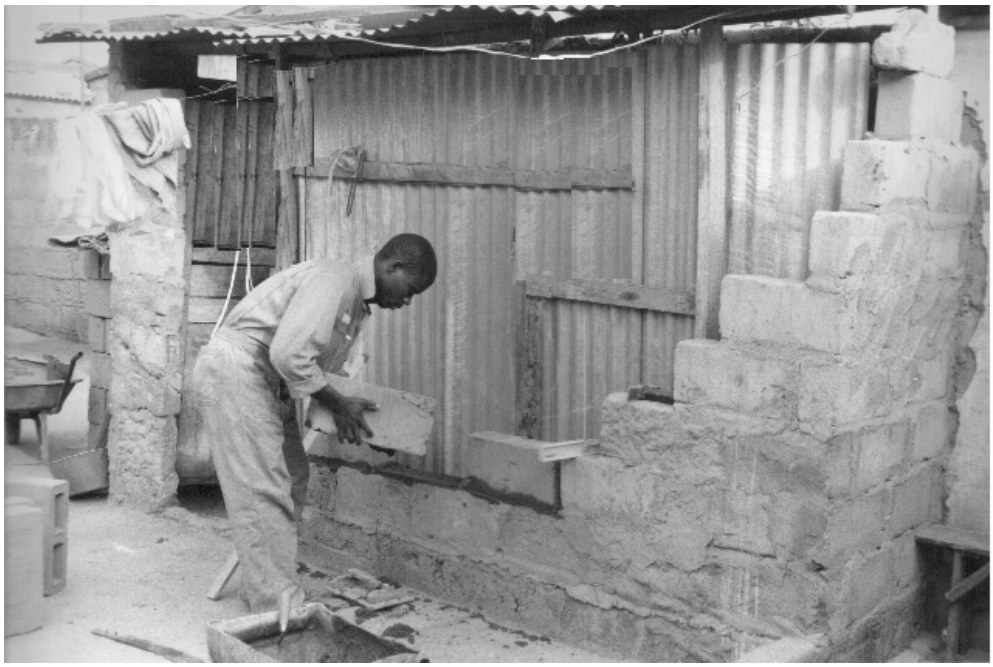
According to the UN Habitat definition of durable structures, “a house is considered ‘durable’ if it is built in a non-hazardous location and has a structure permanent and adequate enough to protect its inhabitants from the extremes of climatic conditions such as rain, heat, cold and humidity.” According 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 expose residents to high morbidity and mortality risks, are one of the components that define a slum. [6]

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 research has 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*). Table 4.6 shows the definition of scores for building materials.



[6] United Nations Human Settlements Programme (2004) *Urban Indicators Guidelines – Monitoring the Habitat Agenda and the Millennium Development Goals.* http://ww2.unhabitat.org/programmes/guo/documents/urban_indicators_guidelines.pdf

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, that 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.

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

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. Table 7 shows the definition of scoring 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

Flooring material, which people put a lot of effort into improving because it improves the quality of housing, was scored separately. Table 8 shows the definition of scoring for flooring materials.

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

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

4.7 Overall MDG Indicator Score

The score for all five Millennium Development Goals indicators was combined so as to create an overall characterisation for each settlement type and to assess the contribution of each factor to poor living conditions. Each factor was weighted on the basis of the importance given to it by residents in focus groups discussions.

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

The overall score for Luanda and Huambo were almost similar (2.47 and 2.42, respectively) but for Cachiungo, it was 2.72 (see Table 9). The overall scores in Luanda and Huambo were close to the mid-point between inadequate (3) and average (2) while the scores in Cachiungo were closer to inadequate (3). Huambo scored highest in terms of access to safe water, with Luanda placing a distant second.

Cachiungo, as expected, had the highest and best score in terms of overcrowding with Huambo and Luanda almost having identical scores of slightly above intermediate conditions. Scoring on overcrowding is relatively good in all three urban areas so this score is the least important characteristic of slums in urban areas of Angola. Overcrowding was observed only in certain areas of Huambo and Luanda. There has been a tendency for the physical area of Luanda to expand in recent years, especially since 2002 when security

concerns disappeared. Huambo has space within its defined boundaries to expand: the definition of the formal area of the city 100 years ago left space for the eventual development of Huambo as the capital city of Angola (Nova Lisboa) so there is space around the existing formal housing areas for expansion as well as at the edge of the city.

Similarly, housing quality does not seem to be the most important characteristic of slums in urban areas in Angola, with Luanda and Huambo having almost identical scores (2.16 and 2.18, respectively). In Luanda, low scores of housing quality are found mainly in newly-settled areas; residents of Luanda appear to manage to generate an income, through access to the informal economy, which permits them to upgrade the quality of their housing. In Huambo and Cachiungo, on the other hand, the economy is less dynamic and even longer-term residents have houses with poorer quality building materials.

A service for collection of solid waste has not been developed in many areas of Luanda and Huambo. In Huambo the service is restricted to places adjacent to the tarred roads while in Luanda, it is restricted to some areas near the city centre. There is no service in Cachiungo.

In all urban areas the characteristics of slums with the poorest scores are those depending on collectively-supplied services: access to safe water, collection of solid waste and guarantee of secure tenure. There are programmes to improve access to safe water in Luanda and Huambo though these have been slow and, in the case of Luanda, may not be keeping pace with population growth. Residents of these areas in Luanda depend on water that is transported by tanker-lorry and sold from private tanks at a high price; there is therefore an active water market in Luanda. In Huambo and Cachiungo the rainfall is higher and water is available generally from shallow wells or protected boreholes; a water market has not developed in these urban areas, though there is some concern about the quality of water from wells as the growing population may be polluting the water table through latrines. Cachiungo had the worst scores (3) in terms of security of tenure and access to safe water, but scored better than Huambo in terms of access to improved sanitation.

As will be seen later, guarantees of secure tenure scored poorly in most areas as it is difficult to obtain the documents that are legally necessary to show occupation rights. Thus in Luanda and Huambo the overall score for the MDG urban slums indicators is good in the central, formally-settled, urban areas that are dominated by a rapidly growing economy (Luanda) or where there has been determined efforts at rebuilding since 2002 (Huambo) and deteriorates away from the centre. In Cachiungo all areas of the town scored poorly except for the overcrowding indicator as mentioned earlier.

Table 9. Comparison of scores for indicators that define the characteristics of slums among the three urban areas

Urban area	Score					Overall weighted score
	Security of tenure	Access to safe water	Access to improved sanitation	Overcrowding	Housing quality	
Luanda	2.49	2.72	2.41	1.99	2.16	2.47
Huambo	2.81	1.89	2.81	1.89	2.18	2.42
Cachiungo	3	3	2.5	1	2.67	2.72

Scores: 1 = best conditions 2 = intermediate conditions 3 = worst conditions

As can be expected, there are differences that are bound to arise between settlement types within each city. The formal areas of Luanda and Huambo have high scores and are considered good (1) on almost all indicators (see Table 10 and Table 11 below). However the formal area of Cachiungo as a whole has seen little reconstruction and investment since the end of the war in which it suffered damage so it scored poorly; the score for Cachiungo is similar to the score for the informally-settled areas of Luanda and Huambo.

In Luanda and Huambo there is a contrast between the formally settled areas, usually close to the centre, with more secure tenure and reasonable water and sanitation, and other areas. The conditions are better in the formally-settled areas, and conditions seem to become poorer as one moves from Semi-formal to Informal types of settlements. It is surprising to note that the semi-formal settlement areas in Huambo scored lowest (score of 3) in terms of access to safe water.

There are also in Luanda and Huambo, some transitional areas which are upgrading: in some of these there has been State provision of services such as water and solid waste removal and provision of better security of tenure through demarcated plots and some documentation. However it should be noted that 70% of the population of Luanda still live in areas with inadequate access to safe water, poor tenure security and poor solid waste removal services. Similarly the sanitation score is low in newly-settled areas but relatively high in other areas, as residents build latrines when they have made enough income in the informal economy to afford to do so.

Table 10. Scores for indicators for Huambo and Cachiungo, by settlement type

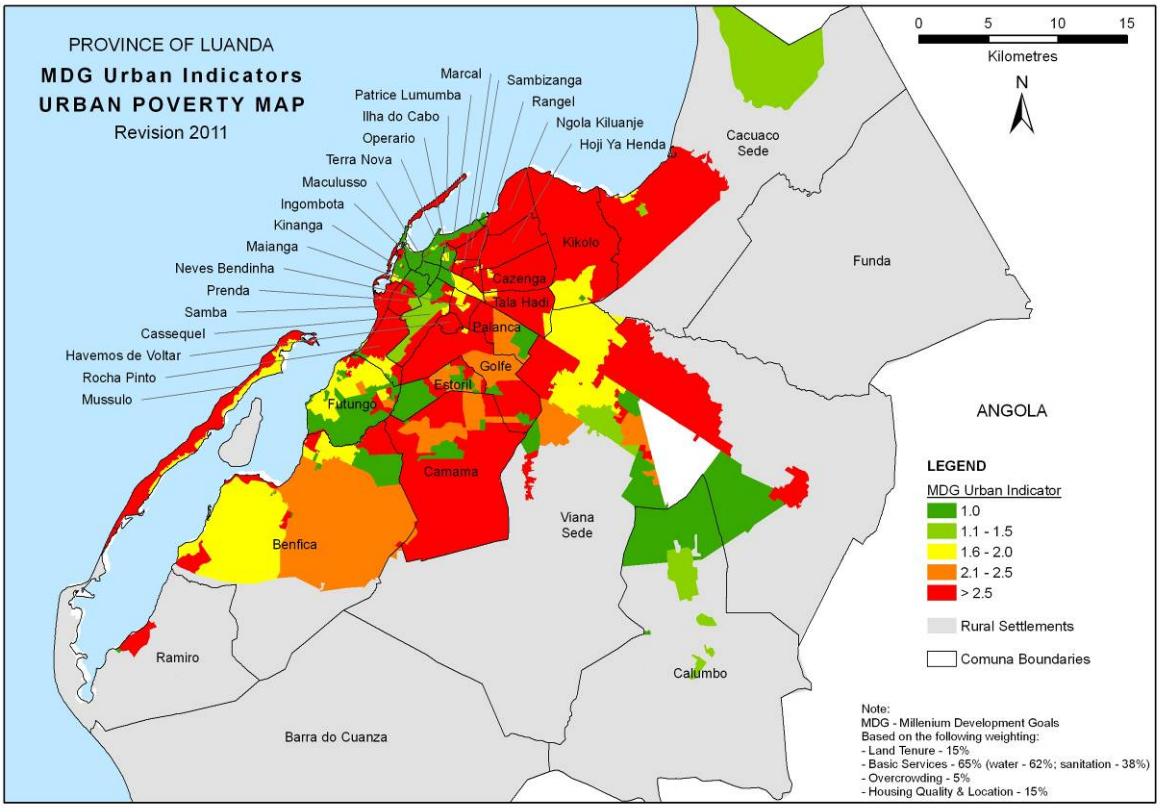
Settlement Type	Score					Overall Score
	Security of tenure	Access to safe water	Access to improved sanitation & solid waste collection	Over-crowding	Durable structures	
Huambo						
Formal	1	1	1	1	1	1
Semi-formal	2	3	2	1	2	2.35
Informal	3	2	3	2	3	2.55
Weighted Average	2.81	1.89	2.81	1.89	2.18	2.42
Cachiungo						
Formal and informal	3	3	2.5	1	2.67	2.72

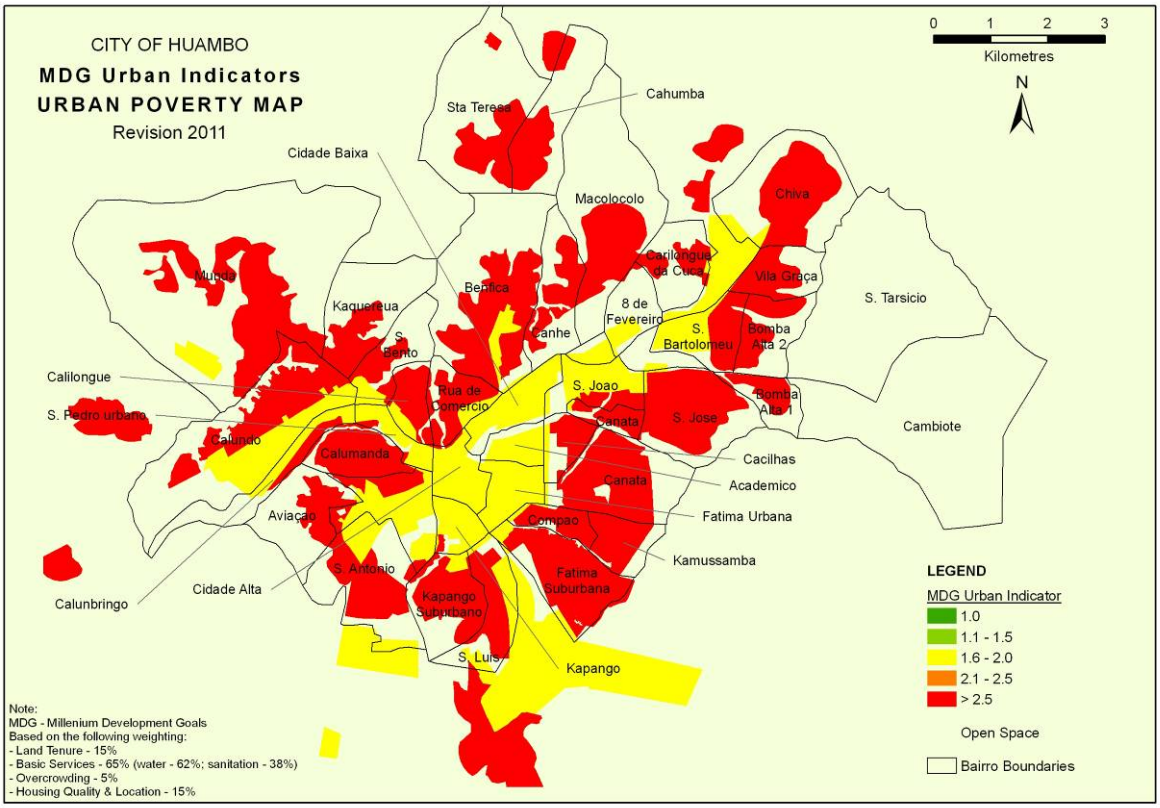
Scores: 1 = best conditions 2 = intermediate conditions 3 = worst conditions

Table 11. Scores for indicators for Luanda, by settlement type

Settlement Type		Percent of overall pop.	Score					Overall weighted score
			Security of tenure	Access to safe water	Access to improved sanitation	Over-crowding	Housing quality	
A	Old Urban Centre	3	1	1	1	1	1	1
B	New Suburbs & Condo-miniums	3	1	1	1	1	1	1
C	*Bairro Popular*	1	1	2	2	1	1.67	1.5
D	Social Housing Zones	2	1	1	1.5	1	1.67	1.23
E	Owner-built on Planned Sites	7	1	3	2	1	2.33	2.37
F	Transitional *musseques*	11	2	2	2	2	2	1.85
G	Organized *musseques*	8	2	3	3	2	2.3	2.45
H	Old *musseques*	40	3	3	2	3	2	2.72
I	Peripheral *musseques*	21	3	3	3	1	2.67	2.85
J	Rural Settle-ments	4	3	3	3	1	3	2.9
Weights for overall ranking (%)			15	40	25	5	15	
Weighted Average			2.49	2.72	2.41	1.99	2.16	2.47

Scores: 1 = best conditions 2 = intermediate conditions 3 = worst conditions


PROVINCE OF LUANDA
MDG Urban Indicators
URBAN POVERTY MAP
Revision 2011
0 5 10 15
Kilometres
N
Marcal
Sambizanga
Patrice Lumumba
Rangel
Ilha do Cabo
Ngola Kiluanje
Operario
Hoji Ya Henda
Terra Nova
Maculusso
Ingombota
Kinanga
Maianga
Neves Bendinha
Prenda
Samba
Cassequel
Havemos de Voltar
Rocha Pinto
Mussulo
Cacuaco Sede
Funda
Kikolo
Cazenga
Tala Hadi
Palanca
Golfe
Estoril
Futungo
Camama
Benfica
Viana Sede
Ramiro
Calumbo
Barra do Cuanza
ANGOLA
LEGEND
MDG Urban Indicator
1.0
1.1 - 1.5
1.6 - 2.0
2.1 - 2.5
> 2.5
Rural Settlements
Comuna Boundaries
Note:
MDG - Millenium Development Goals
Based on the following weighting:
- Land Tenure - 15%
- Basic Services - 65% (water - 62%; sanitation - 38%)
- Overcrowding - 5%
- Housing Quality & Location - 15%


CITY OF HUAMBO
MDG Urban Indicators
URBAN POVERTY MAP
Revision 2011
0 1 2 3
Kilometres
N
Sta Teresa
Cahumba
Cidade Baixa
Macolocolo
Chiva
Mundo
Benfica
Kaquenua
Calilongua da Cuca
Vila Graça
S. Tarsicio
8 de Fevereiro
S. Bartolomeu
Bomba Alta 2
Vanhe
S. Bento
Calilongue
S. Pedro urbano
Rua de Comercio
S. Joao
Bomba Alta 1
S. Jose
Canata
Cambiote
Calumbo
Calumanda
Cacilhas
Academico
Canata
Aviação
Fatima Urbana
Compao
Kamussamba
S. Antonio
Fatima Suburbana
Cidade Alta
Calunbringo
Kapango Subpbano
S. Luis
Kapango
LEGEND
MDG Urban Indicator
1.0
1.1 - 1.5
1.6 - 2.0
2.1 - 2.5
> 2.5
Open Space
Bairro Boundaries
Note:
MDG - Millenium Development Goals
Based on the following weighting:
- Land Tenure - 15%
- Basic Services - 65% (water - 62%; sanitation - 38%)
- Overcrowding - 5%
- Housing Quality & Location - 15%

5 ENVIRONMENTAL RISKS

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 three urban areas.

Rainfall in Angola is highly variable from one year to another and rain falls 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.

An environmental issue that affects only Luanda is the noise and pollution of a large city, which is cited as one of the factors leading residents to migrate to outer areas.

5.1 Erosion and Flooding in Luanda

Luanda Observatory is the only station in Angola that has a long continuous record of rainfall reading, beginning in 1901. It is one of the few stations that existed before the large-scale expansion of meteorological stations in Angola in the early 1940s; it continued to take measurements after the collapse of the network of stations in 1975. Unlike other stations with a long record of measurements (such as Namibe and Lubango) there has never been a gap in data collection and readings appear to be reliable. An extensive network in Angola for collecting weather data was only available between about 1945 and 1975, represented by the map for 1972 (see Figure 7). *There is one rainy season in Angola, from about October to April, but there are significant differences between the south-west (where the rainy season lasts only four months and rainfall is low) and the north-east (where rainfall can reach 1700 mm and the rainy season lasts for 8 months).* The average length of the dry season in Angola is shown in Figure 8.

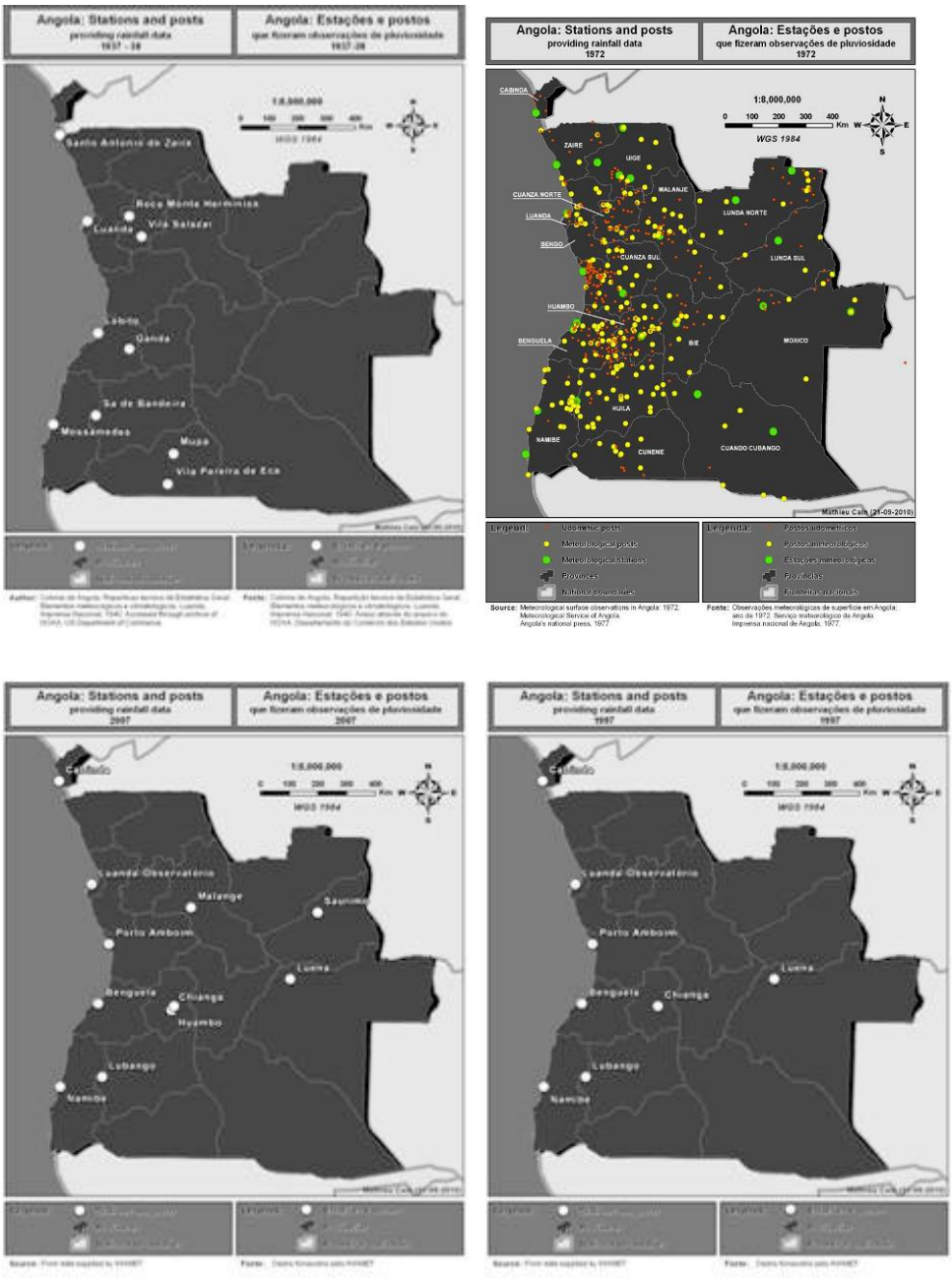


Figure 7. Stations and posts providing rainfall data in 1937/38, 1972,1997, 2007

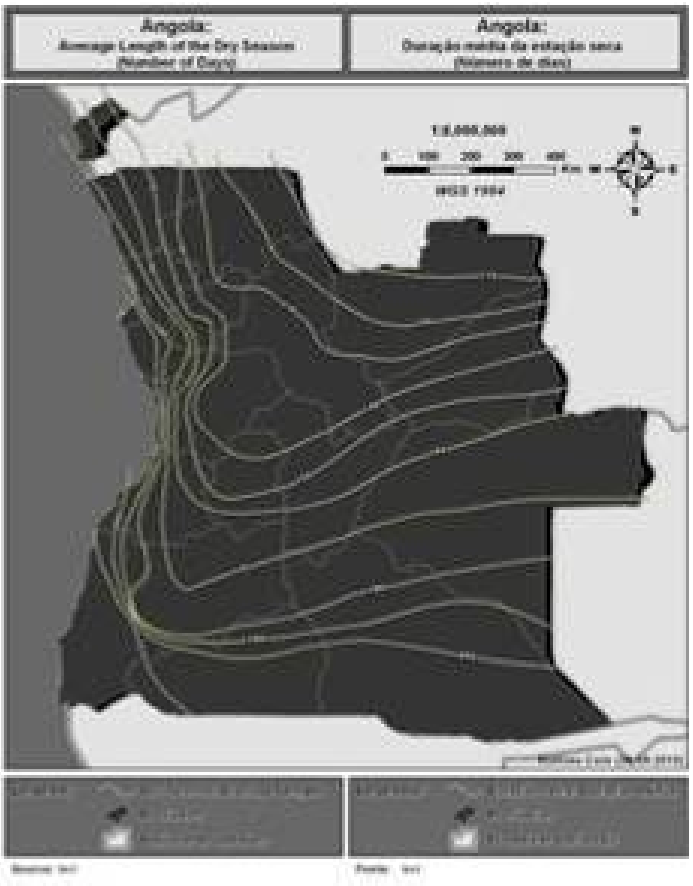


Figure 8. Average length of the dry season in Angola

Luanda is part of the relatively dry coastal belt of Angola, with a longer dry season than areas further from the coast. The mean annual rainfall is 340 mm per year. The wet season runs from November to April, and in an average year more than half of the annual precipitation falls in March and April (see Figure 9).

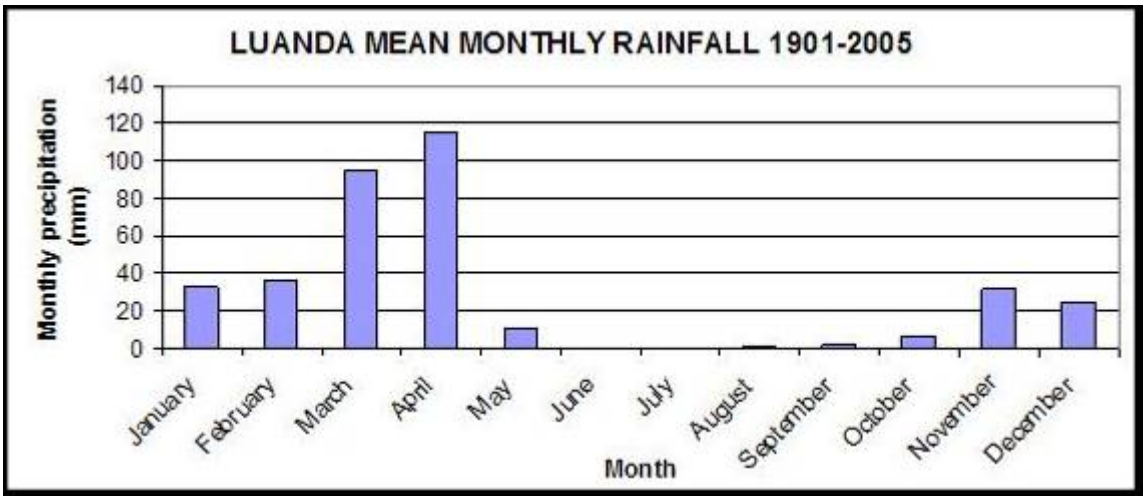


Figure 9. Average annual rainfall pattern in Luanda

Rainfall in Luanda is, however, highly variable from one year to the next, as it is in many places in Angola (see Figure 10). The annual total rainfall per calendar year has been as low as 52 mm (1982) and as high as 860 mm (1984). Most rainfall is in short, heavy storms, particularly in March and April – when these storms do not develop, rainfall is low.

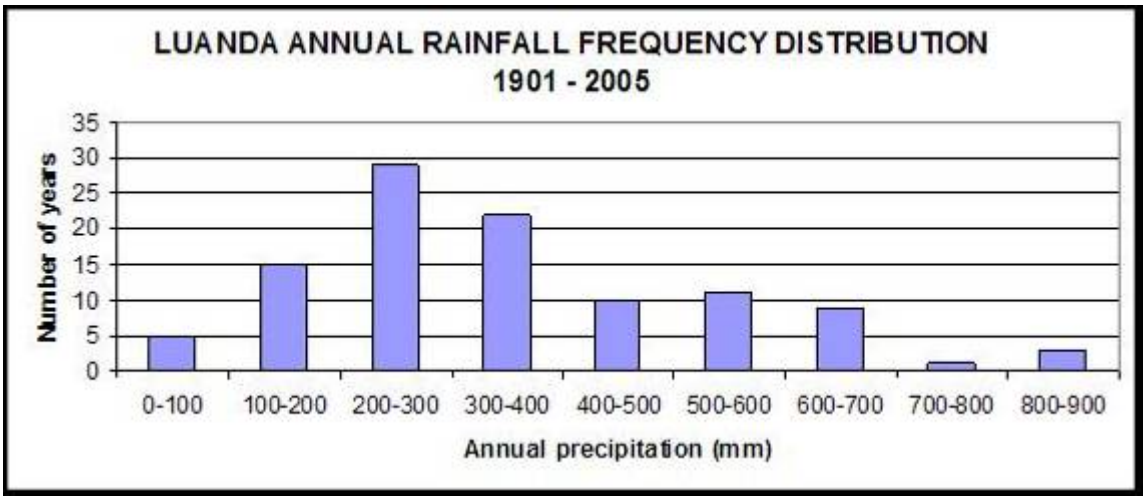


Figure 10. The variability of amount of annual rainfall in Luanda

Information on the maximum rainfall in a 24-hour period is available for the years 1943 to 1972 (Figure 11). The data indicate that in 50% of years there is a day on which more than 70 mm of rainfall occurs, and in 20% of years there is a day on which more than 120 mm of rain falls. These days almost always occur in March and April.

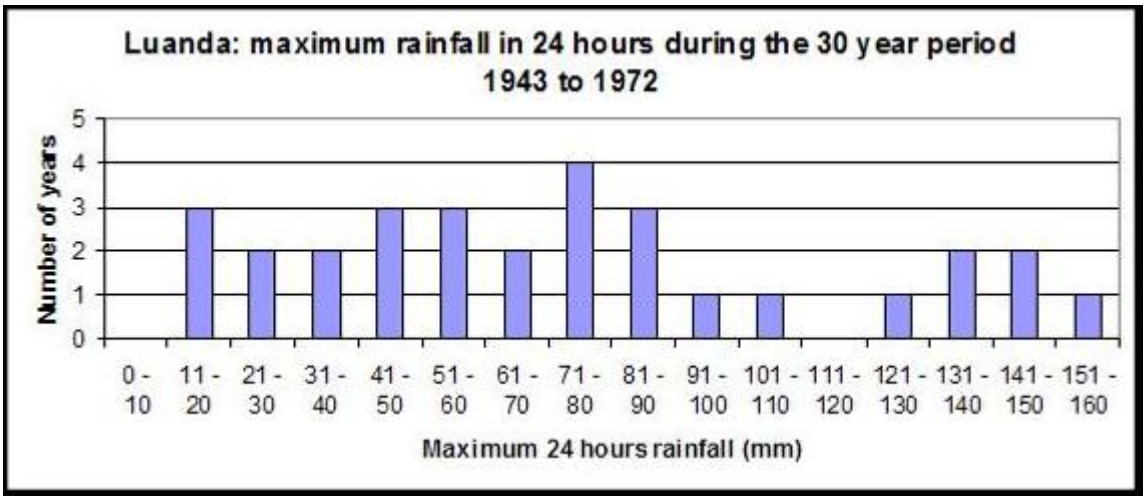


Figure 11. Maximum rainfall in 24 hours, Luanda

There have been seven months in the 105-year period in which more than 300 mm of rain fell in one month (see Table 12). Thus while Luanda is in a relatively dry region, there is a lot of variability and it is not unknown for that amount of rain to fall in one month – this has

occurred six times in the last 100 years, one of which (1969) had 680 mm in two months. It is also fairly common for large amounts of rain to fall in one day.

Table 12. Maximum monthly total rainfall, 1901 to 2005, Luanda

Year	Month	Monthly total
1916	April	341 mm
1935	April	302 mm
1955	April	404 mm
1969	March	361 mm
1969	April	319 mm
1970	March	398 mm
1996	April	321 mm

In Luanda, rubbish has often been dumped in gullies, and there is often sediment from previous erosion: these can create dams in gullies or blockages in culverts under roads. When sufficient water has built up behind these blockages, they may give way rapidly, causing a very high and rapid flow of water with considerable erosive power that can damage bridges, as well as causing the collapse of the sides of the gullies and damage to buildings near their edge.

Erosion risk areas were mapped from satellite images by identifying stream floodplains and slopes of more than 3%. The map indicates areas where housing areas have encroached onto erosion risk areas. All streams and rivers and their adjacent floodplains were digitized to identify areas that are potentially inundated after heavy rains. The mapping was done from Quickbird satellite images taken in 2007 and 2008. Other areas susceptible to flooding were mapped from the same images and classified as isolated pools, borrow pits or lakes and marshes. The identification of pools was aided by a previous aerial survey conducted over part of Luanda in 2007, following very heavy rains: observers in a helicopter identified flooding from the air and ground teams then plotted their exact position. Isolated pools were mapped as points, and were categorised into small, medium and large sizes. Buffer areas were then produced to reflect their relative expanses: 15 metre radii around small pools, 30 metres for medium ones and 60 metre radii around large pools. The borrow pits, lakes and marshes were mapped out as polygons.

A final set of the data were produced by combining all the streams and rivers, pools, borrow pits and lakes and marshes, into one set of polygons around which a buffer area of 300 metres was mapped. This broad surrounding zone was used to as an approximate area in which malaria may be most prevalent since these areas are relatively close to the breeding sites of *Anopheles gambiae,*[7] the major vector of malaria in Luanda.

Areas of steeper slope, potential inundation and standing water were then analysed in relation to a set of data on population density. These density data allow estimates to be

[7] Areas of high mosquito abundance and mosquito distribution in urban areas have been shown to correlate with breeding sites; this strongly affects the risk of malaria infection (Gimnig J.E., Hightower A.W., Hawley W.A., 2006. Application of geographic information systems to the study of the ecology of mosquitos and mosquito-borne diseases. *Wageningen UR Frontis Series, 9,* 27-39.

made of the number of people living within risk areas. Estimates were also produced of the number of people within various risk areas living in different types of housing.

In the heavy rains that occurred in Luanda in early 2007, structural damage mainly occurred in places of steep relief near the coast, for example in Sambizanga Municipality, or where homes had been built close to rivers or man-made drainage canals. As would be expected, most homes that were physically damaged were ones with rudimentary foundations and flimsy walls.

Home construction have also occurred in borrow pits – old excavations from which building sand was removed previously. These have pools of water at the bottom after heavy rains. Some also have steep walls, immediately above or below where homes have been built and these walls are at risk of collapse after heavy rains.

After heavy rains, ponds of standing, stagnant water occur in some flatter areas more distant from the coast, such as in the municipalities of Cazenga, Viana and Kilamba Kiaxi. Clay soils predominate in these flat areas, whereas sandy soils through which water drains more rapidly occur closer to the coast. In the colonial era, housing was built in Cazenga in areas subject to this type of flooding and, although a few houses have been abandoned, housing subject to this form of flooding continues to be occupied. Some roads are badly flooded after rains and completely impassable after heavy rains. In Viana and Kilamba Kiaxi (areas that have mainly been occupied in the last 10 years), the pressure on land is not as yet so great, so housing has not yet occupied most of these patches of land subject to flooding. However informal housing does appear to be gradually moving into these areas.

As the occupied area of the city has grown eastwards and southwards in the last 10 years, it has begun to encroach onto the floodplain of streams that flow into the sea at Cacuaco, and a network of streams that reach the sea southwest of Luanda. The variability of rainfall leads to significant and rapid changes in the level of streams in certain years, amplified by rubbish and sediment that block drainage channels and culverts. This leads to flooding of properties built closer to streams, particularly where construction has not taken account of the possibility of high rainfall. This flooding may not lead to damage to the houses but does damage the contents.

Households say flooding leads to higher incidence of sickness, especially where there is stagnant water. The most commonly reported disease is malaria. The consequences of flooding are aggravated by the volume of garbage close to residential areas, and by poor sanitation. Stagnant pools tend also to have refuse around them. Refuse may include faecal material, as some households report defecating in plastic bags which are discarded with other domestic waste (on the street, in drainage lines or around permanent pools).

The impact of flooding in Luanda is manifested in terms of:

- Flooding of homes and commercial premises

- Structural damage to buildings. This is localized near faster-flowing drainage lines and near borrow pits

- Severe disruption to traffic, both locally and to the broader flow of traffic in the city

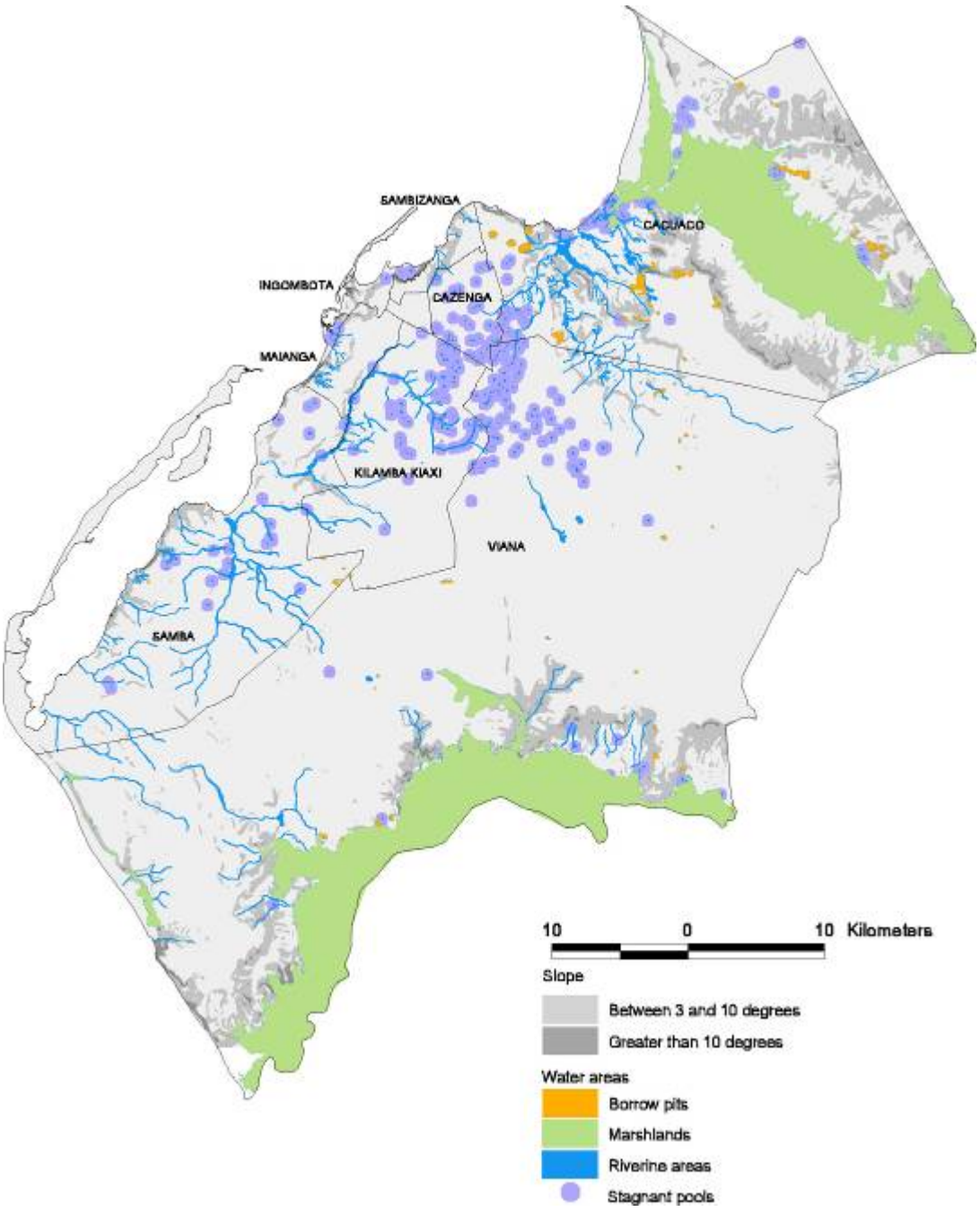
- Increased incidence of diseases

Many of the areas affected by flooding and erosion are close to the city centre and are important areas in the informal economy: people are attracted to live in these areas because they are accessible to economic opportunities. In the outer areas of the city there is less overcrowding and less pressure to occupy risky areas. However flooding in Luanda disrupts transport, and this affects those living in outer areas of the city that are more likely to be cut-

off from employment in the formal and informal economies near the centre.

Better maintenance of drainage lines would enable some storm water to flow away rapidly. Improvements to sanitation and refuse collection could reduce the health impact of flooding, and could reduce the blocking of drainage lines, which contributes to flooding and to water surges when the blockages give way. Some stagnant pools could be filled in.

Areas affected by environmental hazards, Province of Luanda



5.2 Erosion and Flooding in Huambo

There are many gaps in the rainfall record for the city of Huambo. There is a better series of rainfall data from the Chianga Agricultural Station (about 15 kms from Huambo City), and these data were used for analysis of the situation in both Huambo and Cachiungo.

The mean annual rainfall at Chianga over the years 1943 to 2009 is 1389 mm. The variability is less than for many other places in Angola. Only 1 year (1.5% of years) in this period had a total rainfall of less than 972 mm (30% below the mean)[8]. Only 3 years (4.5% of years) had a total rainfall of more than 1805 mm (30% above the mean). However rainfall is high compared to the western coastal areas of Angola (see Figure 12).

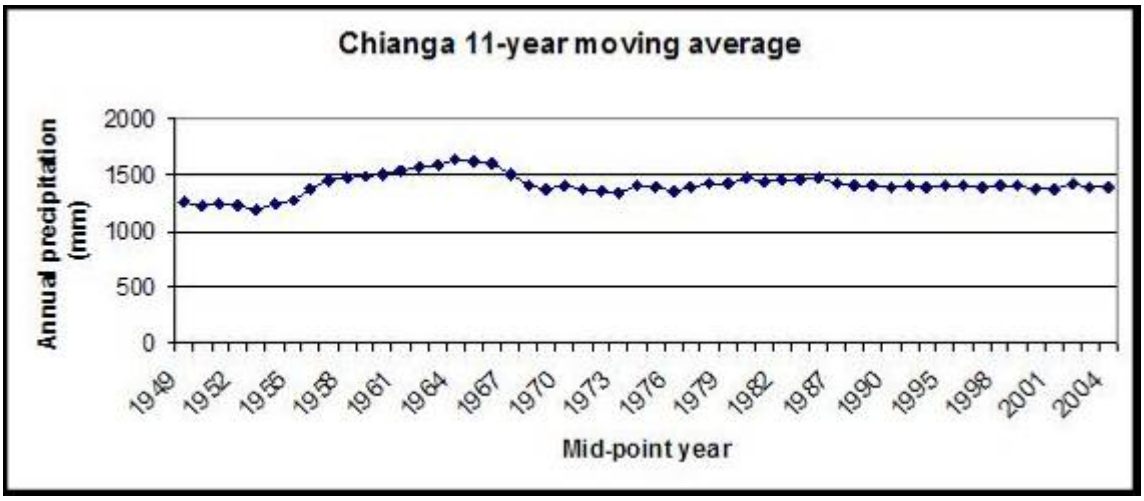


Figure 12. Annual rainfall pattern, Chianga

The rainy season runs from October to April. The rainiest months are December and March (Figure 13). In some years there is a period of some days in January or February with almost no rain: if this lasts for 20 days or more, there is a risk of loss of the main crop, maize, which is usually planted in November and harvested in April but which suffers a steep reduction in production if there is no soil moisture available at the time of flowering in January and February.

[8] This was 1989, an exceptional drought year. There was a dry period in early 1989 and then the 1989/90 rainy seasons started very late.

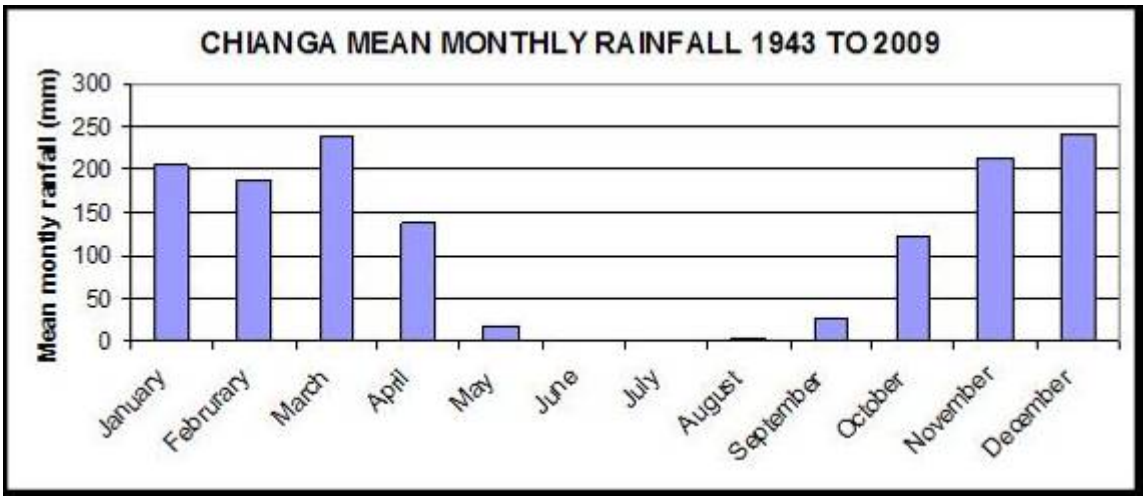


Figure 13. Monthly rainfall pattern, Chianga, Huambo

There is no sign of a change in the overall amount of rainfall over the last 40 years. Before that there was a period of 10 years with slightly above average rainfall. Before that there was a period of 10 years with slightly below average rainfall.

Data on maximum 24-hour rainfall is not available for Chianga but is available for Huambo City in the period 1943 to 1972 (Figure 14). In all years in this 30-year period there was a day when more than 40 mm of rain fell, and in almost two-thirds of years there was a day when 51 to 70 mm of rain fell.

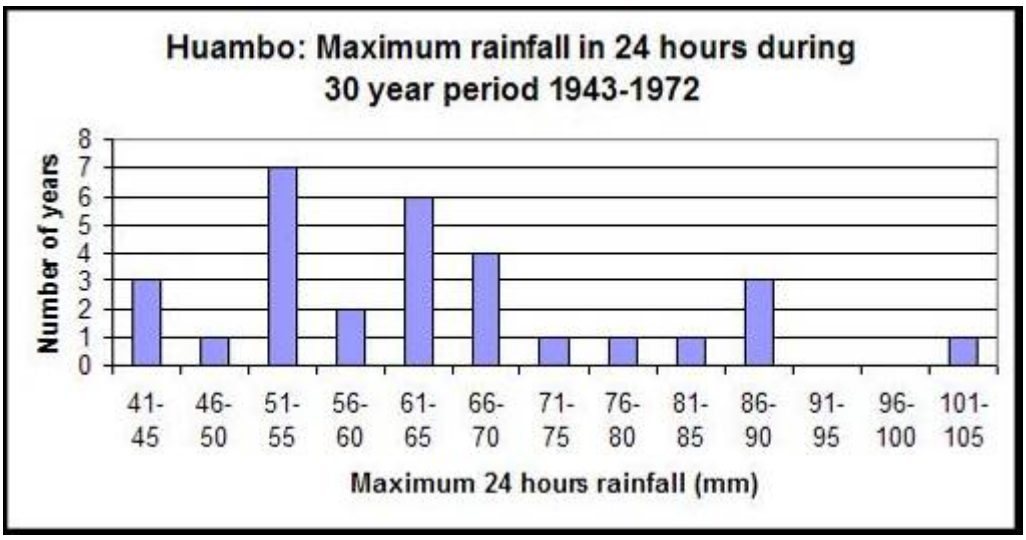


Figure 14. Maximum rainfall in 24 hours, Huambo

The very high rainfall almost every year, and the occasional days of very heavy rainfall in

almost every year, contributes to the erosion risk in the city of Huambo. As mentioned earlier, large amounts of rain in a very short period of time are conducive to erosion.

The central plateau of Angola is at the headwaters of a number of important rivers. The city of Huambo was built on the watershed, serving the Benguela Railway that follows the watershed across the central plateau. The city of Huambo lies between the Queve River running northwards and the Cunene River running southwards, with slopes around the city leading down into the streams at the headwaters of these rivers. The course of the Queve River to the Atlantic Ocean is shorter than the course of the Cunene River, so the Queve River is more steeply incised in the plateau – the slopes on the north side of the city are steeper than those on the south side.

Flooding is not a risk in Huambo City, as rainwater drains away rapidly and there are no areas where water collects. On the other hand, erosion risk is high due to sloping ground and high rainfall, some of it occurring in short, heavy storms. The growth of the city has brought the occupied area close to the steep slopes. Some of this is informal housing, but some official areas of self-built housing are also located close to, and on, sloping ground. The removal of vegetation leaves bare soil surfaces, on which erosion can occur. Earth roads and paths that run down slopes allow sheets of water to gain momentum on a bare surface and erosion often occurs where roads approach the edge of an existing gully or streambed. The lack of regular water in most informal housing areas means that there is usually a significant movement of people going down to the valleys to collect water, and the paths formed in this way become erosion areas.

Deforestation, another risk factor, occurred around Huambo city, particularly during the war when access to the city was cut off and wood was used as fuel. Risk has also been increased by the recent extraction of sand from streambeds close to the town. The constant movement, up and down the slopes beside the stream, of the people involved in digging sand increases the risk of erosion. The removal of material from the streambed increases the speed of stream flow and thus increases erosion risk upstream and sedimentation downstream. *Onaka* (vegetable gardens) that were found along the stream have been damaged and removed both directly by digging and indirectly by stream flow – this increases further the velocity of stream flow and the erosive power of the streams.

The extraction of sand and gravel from riverbeds in and close to the city, increases the flow and erosion potential of these rivers. The increased demand for sand and gravel is due to the building boom in Huambo that started in 2002, with new houses being built and older ones being upgraded from adobe to cement. The people who extract sand and gravel receive very low pay but have very few options for livelihood strategies. The Municipal Administration has a low capacity to control this kind of extraction. Local people are aware that these short-term livelihood strategies have a negative effect on longer-term livelihood strategies (for example destroying vegetable gardens) but they also understand that extreme poverty drives some families to these strategies.

The management of erosion risks in the city of Huambo is variable. In some communities in informal housing areas, sandbags are placed across pathways during heavy rains to slow down the flow of water; drainage channels have been built from pathways to lead water into basins from which water drains away slowly or overflows with a lower velocity. Elephant grass is sometimes planted at the head of gullies. In many communities, on the other hand, such precautions are not taken and erosion control techniques appear to be unknown.

The roadways in areas of formal housing mainly have hard surfaces so they pose less of an erosion risk. However, some main roads near the city run down slopes to cross valleys, and the drainage works on these slopes appear to be incomplete. During storms, water tends to

run from the city down such slopes and then concentrate in the ditch at the side of the road, causing a gully to cut back beside the road from the stream at the foot of the slope. These ditches should have baffles to reduce the speed of the flow of water, but often these have not been completed. The railway crosses the central plateau watershed by curving to avoid most of the river valleys while the main roads tend to cross the river valleys by descending to a low-level bridge then rising again to the plateau surface level hence the design and construction of the roads increase the risk of erosion.

Erosion risk areas have been mapped from satellite images by identifying stream flood plains, and slopes of more than 3%. The map indicates areas where informal housing areas have encroached onto erosion risk areas. Steeper slopes occur close to *bairros* on the north side of the city where the River Queve has cut more deeply into the plateau surface than the streams to the south of the city. The areas in which erosion was observed coincide closely with areas of risk identified from satellite images.

5.3 Erosion and Flooding in Cachiungo

There are no rainfall records for recent years for Cachiungo. It is assumed that the rainfall is similar to that at Chianga and Huambo, about 60 kms to the west.

Cachiungo is a small town with unoccupied spaces and little population pressure; the built-up area has avoided slopes and flood plains, areas of erosion and flooding risk. Serious erosion can be seen alongside dirt roads near the town, especially those that run in a north-south direction, away from the town. Cachiungo 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, and inadequate mitigation measures have been made to control erosion, hence deep ditches have developed alongside dirt roads that have been re-opened since 2002.

5.4 Urban-rural Linkages

Individuals in Cachiungo, 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 usual cooking fuel is wood, which is gathered as dead wood from surrounding areas on the way back from the fields. Other employment opportunities are limited. However being located in a town such as Cachiungo, rather than in an outlying village, does permit 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 Cachiungo face many constraints. Soil fertility has declined in the 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. Soils are no longer productive if inorganic fertilisers are not applied, but 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.

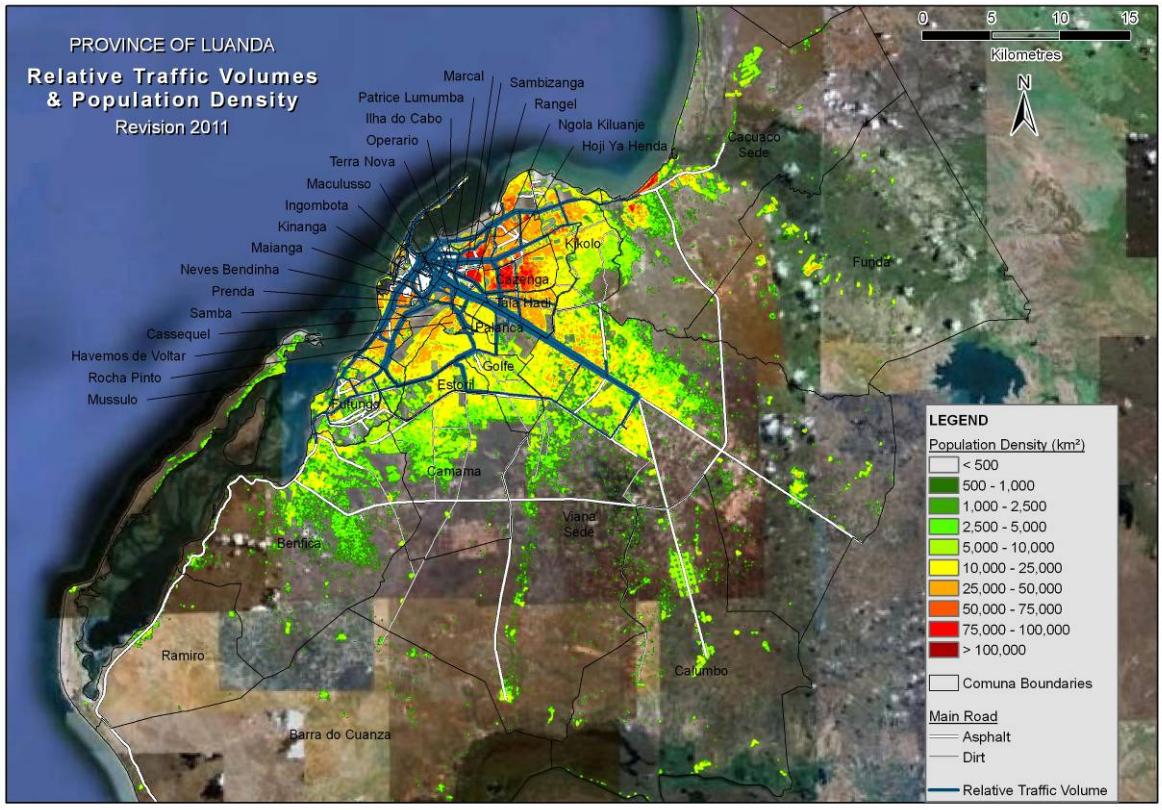
In Huambo, residents at the edge of the city are strongly engaged in rural activities while those living in informal housing areas closer to the city centre have livelihood strategies that embrace a number of activities, including some rural activities such as agriculture and trading in charcoal. Those engaged in agriculture in the city of Huambo face similar constraints to those in Cachiungo.

Individuals in Luanda have very weak links with the surrounding rural areas, which have sandy soils and low rainfall. The main economic activities are the formal and informal economies that are focused on the centre of the city. Thus, in Huambo and Cachiungo, economic activity in the surrounding rural areas counteracts the pull of the centre of the urban areas, hence there is less attraction to migrate to the centre of the city. In Luanda, the attractive pull of the economy in the centre of the city is dominant though some other factors tend to work in the opposite direction (see later discussion).

6 ACCESSIBILITY

6.1 Accessibility in Luanda

The size of the city of Luanda and the concentration of economic activity in the central area make accessibility to the central area an important factor in households' livelihood strategies. The lack of priority measures for public transport and two-wheeled vehicles has led to a high use of private vehicles in Luanda, which in turn has led to serious traffic congestion and long journey times. Roads in the centre of the city and along the main arteries now have a good surface but inside the *bairros,* road surfaces are made of dirt, they tend to be maintained poorly, and are impassable after rains. Thus accessibility to economic opportunities rapidly declines as one moves away from the city centre and away from main roads into the interior of *bairros*.



While the main roads in Luanda are now tarred and generally in good condition, the road outside of people's houses are rarely tarred – tarred residential roads are only found close to the centre of the city (see Figure 15). Only 19% of roads are in good condition after it rains and 30% are impassable (Figure 16).

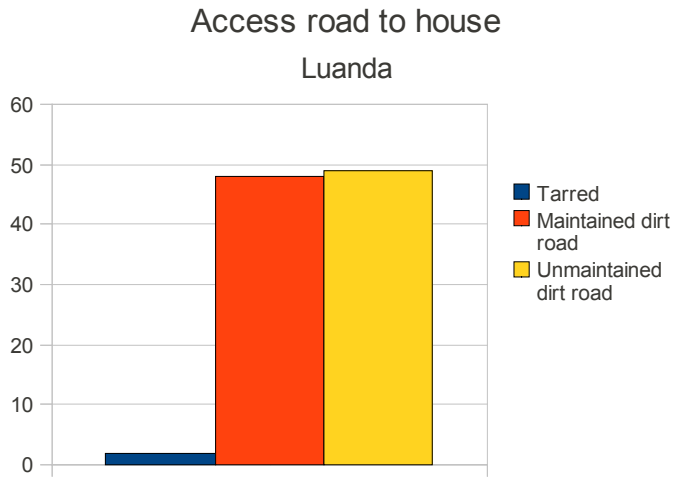


Figure 15. Types of road surface in Luanda

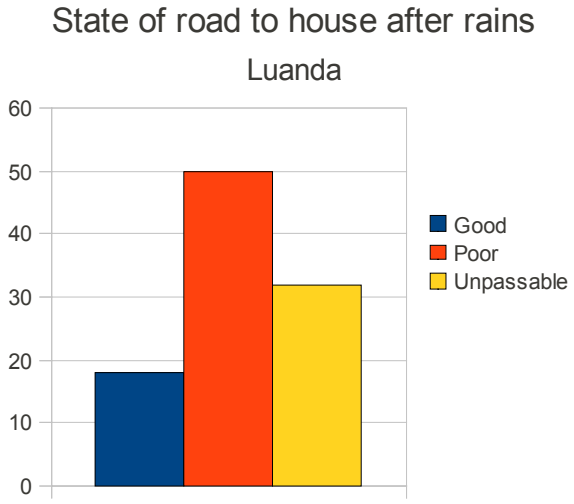


Figure 16. Condition of the roads after it rains, Luanda

Two-thirds of journeys to work are made by taxi-minibus (Figure 17). Taxi-minibuses are the most important means of transport in all areas of the city (Figure 18), but closer to the city centre (i.e., in transitional musseques), families are more likely to use their own car or to walk.

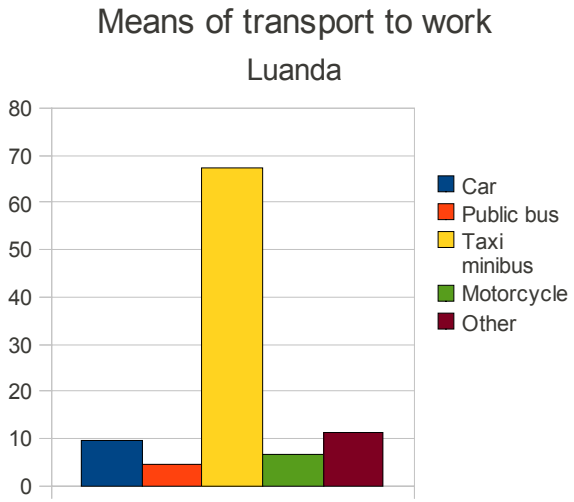


Figure 17. Normal mode of transportation in Luanda

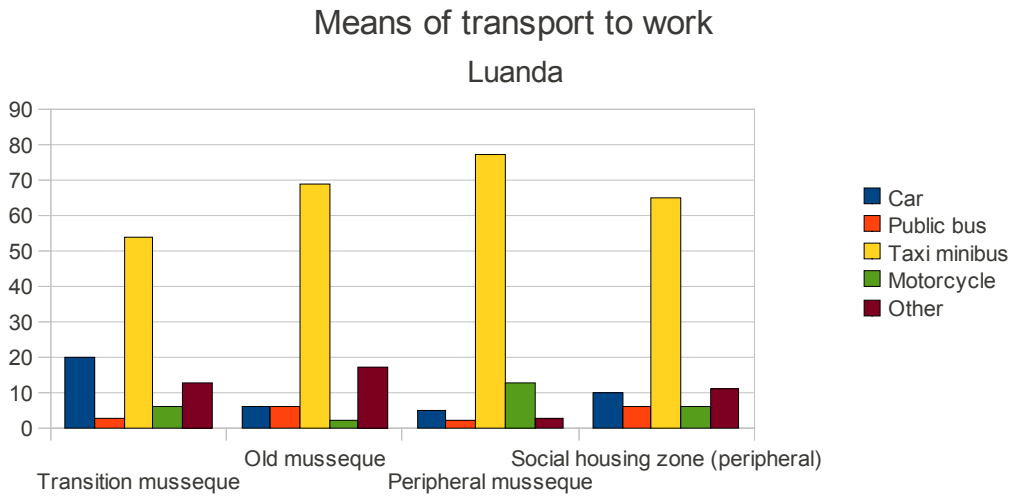


Figure 18. The taxi-minibus – the most important mode of transportation in Luanda

Journey times to work are long, with a significant proportion of journeys taking more than one hour and even more than two hours (Figure 19). Journey times are lowest in the transitional *musseques* that are located closest to the city centre (Figure 20).

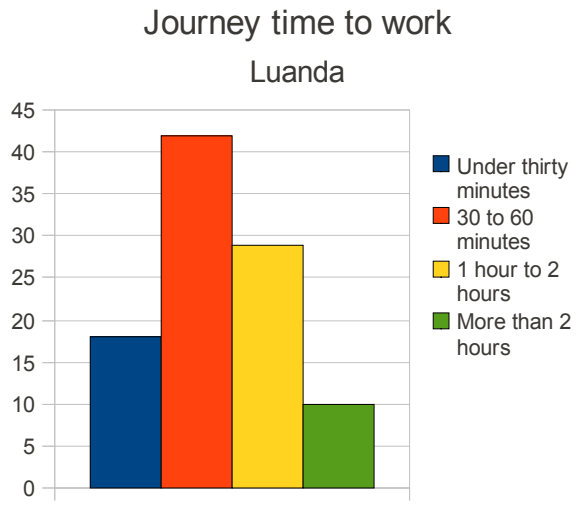


Figure 19. Residents of Luanda spend a significant amount of time travelling to work

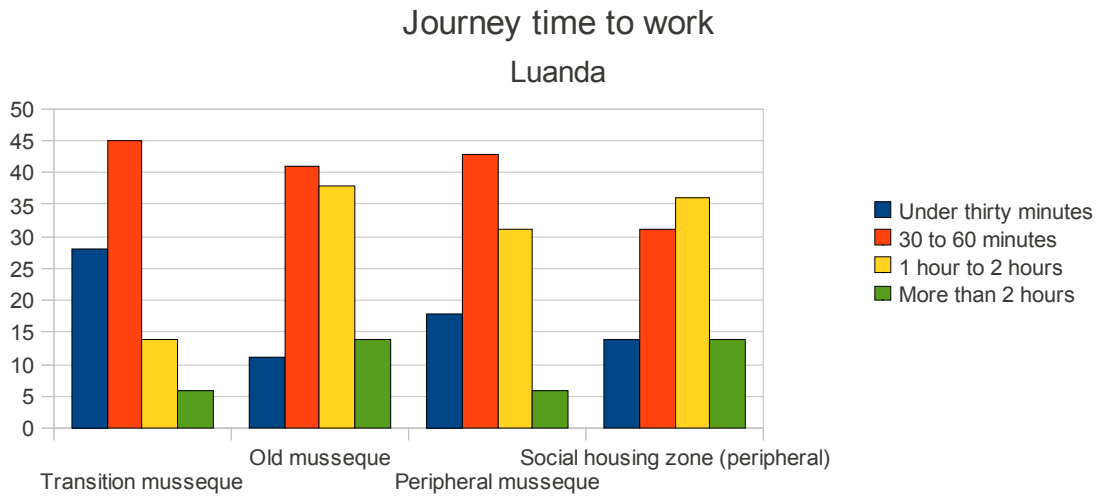


Figure 20. Journey time to work in Luanda, by settlement type

6.2 Accessibility in Huambo

The city of Huambo is very much smaller in size, and economic activities are more widely spread throughout the city than in Luanda. These factors make accessibility to the central core a less important factor in households' livelihood strategies. In Huambo there is little traffic congestion. The condition of the main roads and roads in the central area is good so accessibility is good along the main roads. Again, the quality of the roads becomes poorer as one moves from the formally-settled areas to the informally-settled areas (Figure 21).

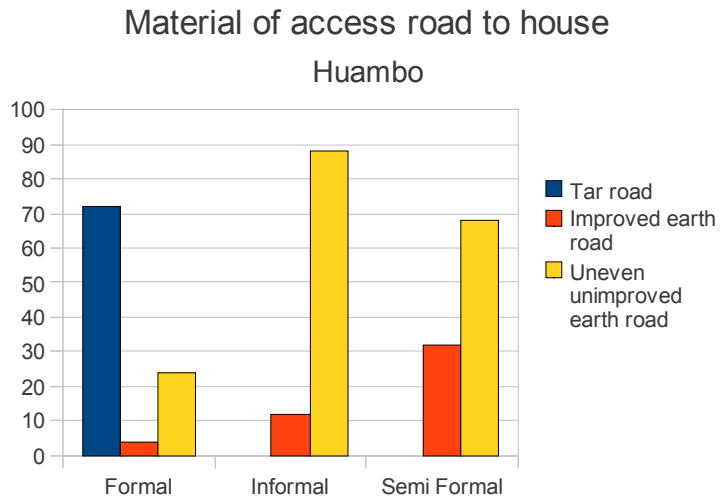


Figure 21. Quality of roads in Huambo, by settlement type

The condition of the roads after the rains mirrors that of the quality of the road surface. Thus, roads are more accessible in formally-settled areas compared to the semi-formal and informally settled areas. The data show that after the rains, there is only a very slight difference in the condition of the roads between the two latter settlement types in Huambo (Figure 22),

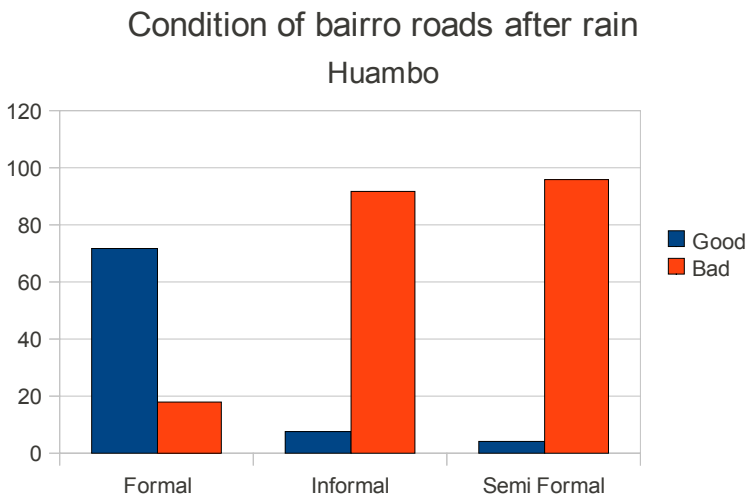


Figure 22. Condition of the roads in Huambo after the rains, by settlement type

Travel by the most common means of transport (minibus-taxis, public bus, and motorcycle) is fairly rapid from one part of the city to another . The minibus-taxi is the most common means of transport for those living in semi-formal settlement types but the least used form of transport among residents in formal settlement types – private cars and the public bus are their more popular modes of transport.

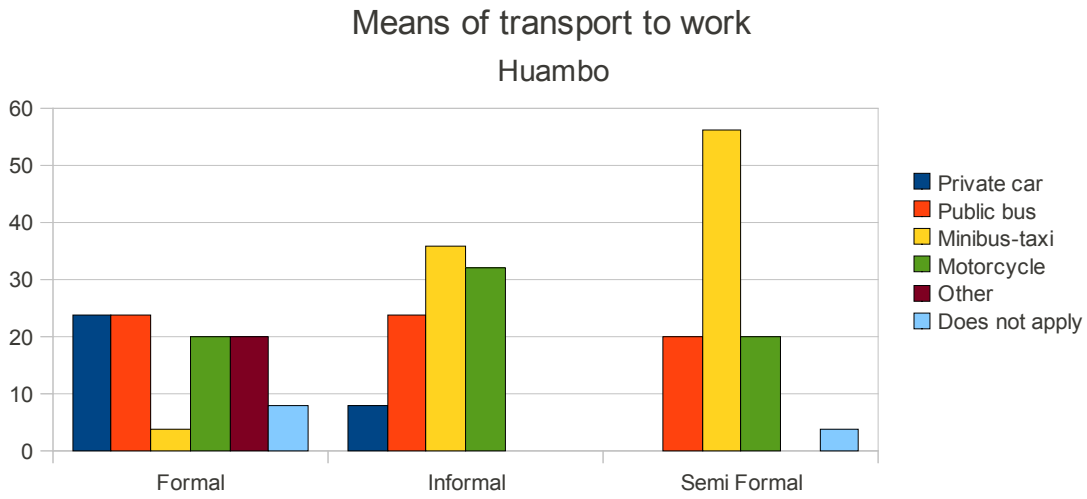


Figure 23. The most common means of transport in Huambo, by settlement type

Roads in the interior of *the bairros* are generally in poor condition and are often impassable in the rainy season. However, the time taken to reach work is less in Huambo than in Luanda, with no residents taking more than an hour (compared to 40% in Luanda) and just under half of residents having a journey time to work of less than 30 minutes (compared to under 20% in Luanda). Nevertheless those living in the formal housing areas have much shorter journey times than those in other areas, because they live closer to the main employment areas in the centre of the city, have better quality roads, and are more likely to use a private car (Figure 24). In informal and semi-formal housing areas, the journey time to work is closely associated with distance from the nearest main road and distance from the centre of the city.

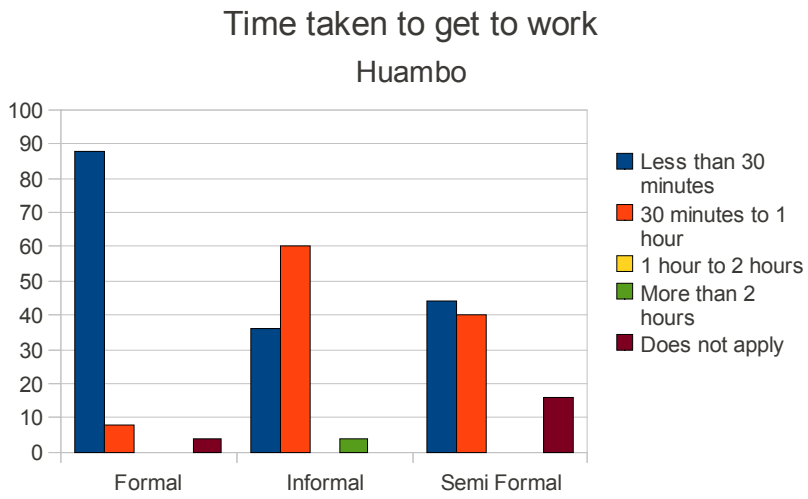


Figure 24. Journey time to work in Huambo, by settlement type

6.3 Accessibility in Cachiungo

In Cachiungo accessibility is a far less important issue, as the town is very small. Roads in the formal areas of the town are now tarred and are in good condition after the rains. Roads in the informal areas of the town are unmaintained dirt and are in poor condition after the rains.

6.4 Conclusions on Accessibility

Accessibility is an important issue in Luanda due to the size of the city and traffic congestion. Few journeys are made by motorcycle or motorcycle-taxi due to the dangers of this mode of transport in the roads of Luanda. Journeys to work can be long. In Huambo, journeys are shorter and cheaper, more journeys are made by motorcycle-taxi and motorcycle, and this is cheaper than taxi-minibuses.

7 LAND MARKETS

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.

In Huambo and Cachiungo almost all residents of formal housing areas purchased their house. In informal and semi-formal areas, most residents purchased the land and built their own house, although there is a market for both land and houses in these areas.

In Luanda, it was the State that built houses in social housing zones, so fewer residents have built their present houses. Since the peripheral *musseques* are some of the most "newly-settled" areas, the residents are likely to have built their own homes. This is supported by the data from the study, which shows that about 95% of the households have built the homes they presently occupy (Figure 25). A little more than 60% of residents in the old *musseques* have also built their own homes. In other settlement types, most of the houses were probably originally built by the residents but some have subsequently sold their houses, so the proportion of residents who have built their own home partly depends on the age of the settlement.

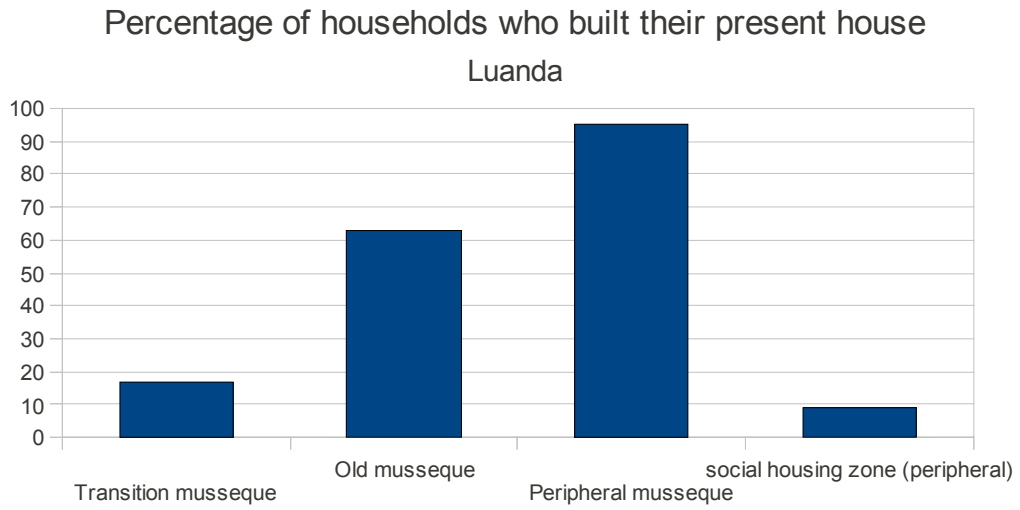
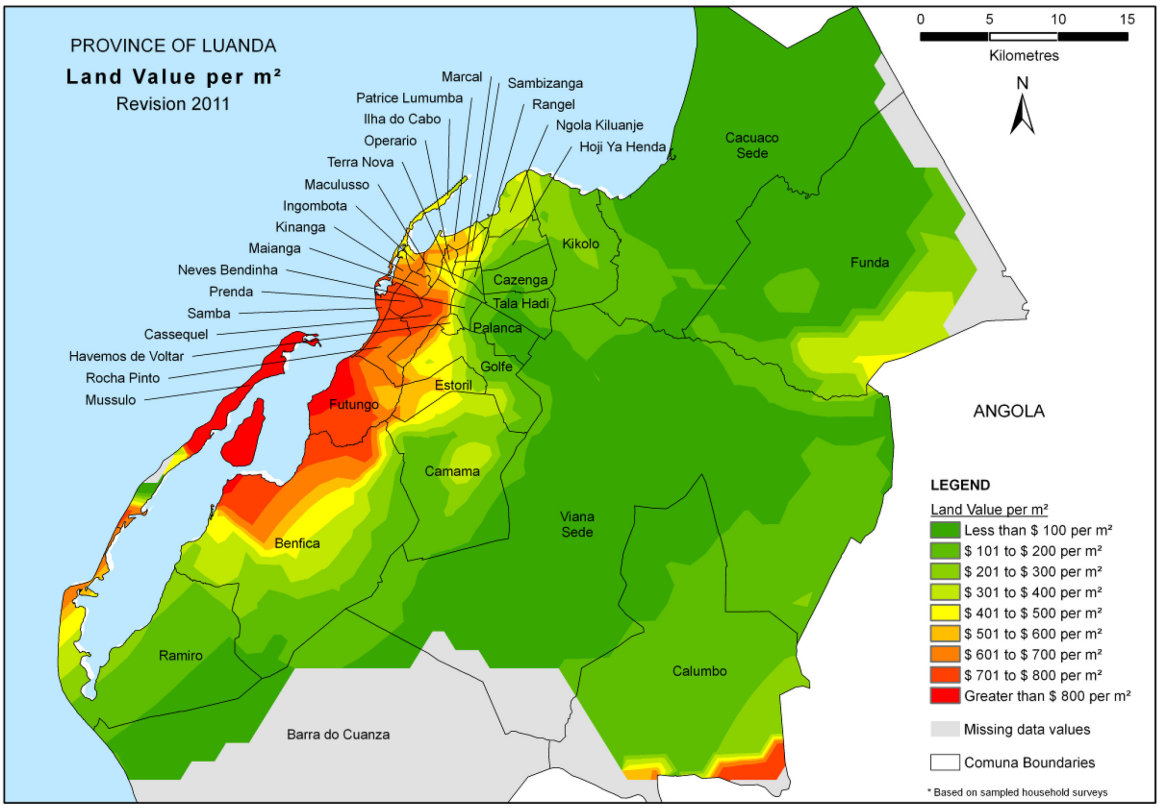


Figure 25. Households in Luanda who built their own house, by settlement type

Only a small minority of residents in all urban areas 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 consider that their tenure is secure. Feelings of insecurity about tenure are highest in Cachiungo (where residents may have lost documents about their houses during the war) and in parts of Luanda that are close to the city centre (where residents fear that they will be displaced by expansion of the city core).



Land values in the three urban areas reflect the importance of factors such as economic activity levels, accessibility, environmental risk factors and access to services.

In Luanda, land values vary significantly between settlement types and within settlement types (Figure 26). The values range from over US$800 /m^2 in the city centre to less than US$100 /m^2 in the outer areas of the city (and less in the interior of *bairros* with poor accessibility and services).

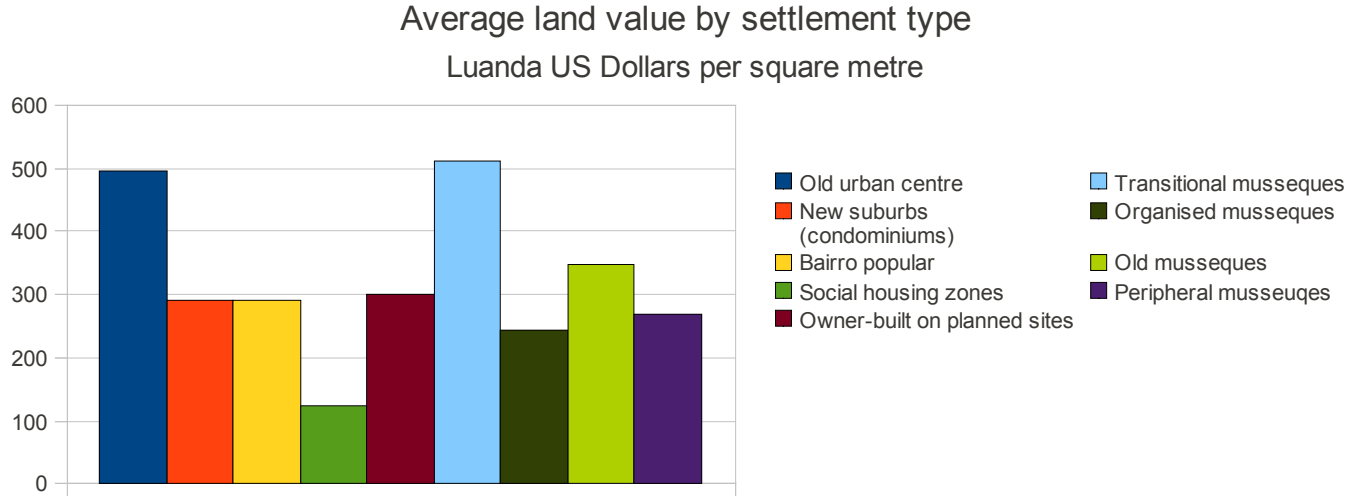


Figure 26. Average land values in Luanda, by settlement type

As expected, the land values in Luanda are very much higher than those in Huambo and Cachiungo. In Huambo the value of land is very much less: in well-serviced formal areas of the city, the price of land is between 100 and 150 US$/m^2; in less well-served formal areas it is between 30 and 70 US$/m^2 (Figure 27). The average price of land in the more accessible parts of informal areas is 9 US$/m^2, and ranges between 4 and 13 US$/m^2, while in less accessible parts of informal areas of Huambo the value of land is about 5 US$/m^2. In Cachiungo, all land has a value of less than 5 US$/m^2.

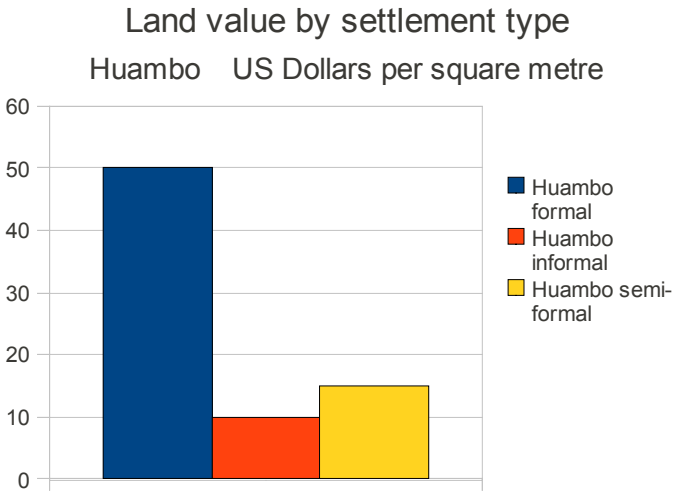


Figure 27. Land values in Huambo, by settlement type

When choosing where to live, households can decide whether to live in a small town such as Cachiungo (with low housing costs but poor services, low levels of economic activity and few choices for household livelihood strategies); a provincial city such as Huambo (with higher housing costs but higher levels of economic activity); or the capital city (with high housing costs but a more dynamic economy).

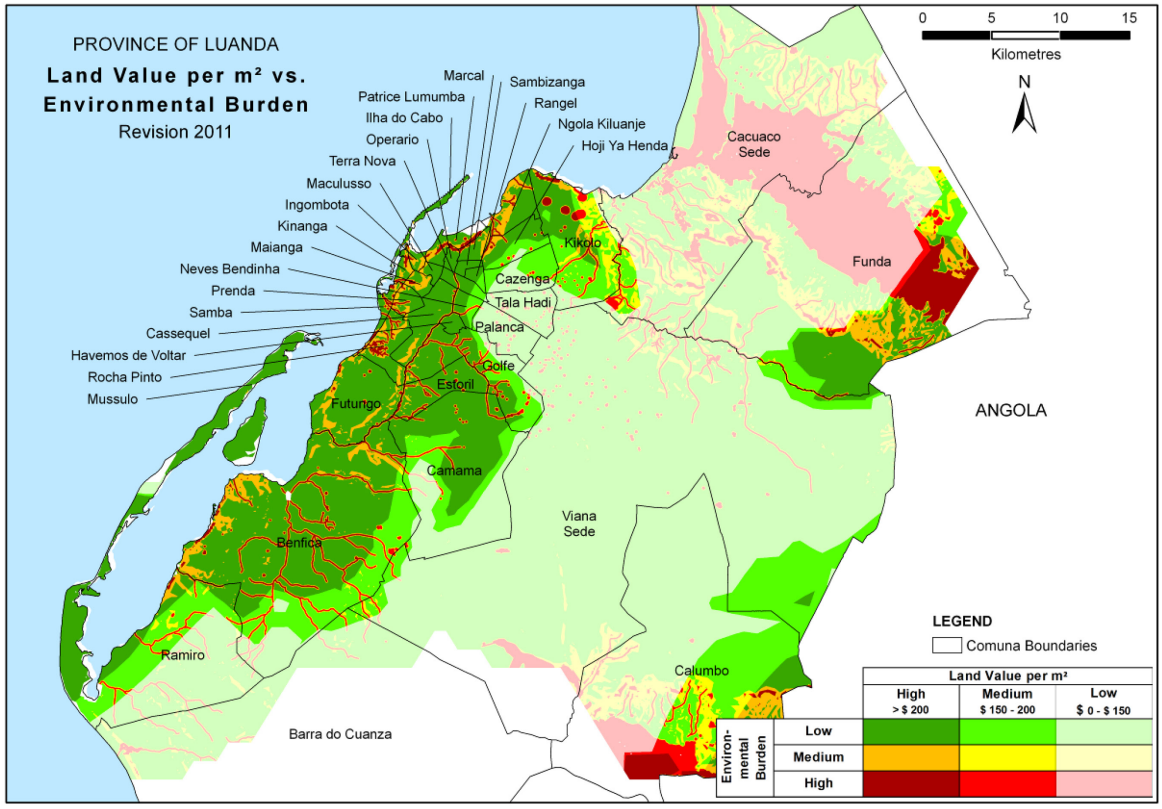
In Luanda land prices decline rapidly as one moves away from the core of the city where the formal economy is concentrated. Informal economic activities tend to cluster strongly around the central core, providing goods and services to the formal economy and to the higher-paid people who work in the formal economy. The informal economy is highly dependent on imported goods that come through the port and airport near the city core; and the centres of distribution of informal goods located at the edge of city centre, such as the markets and warehouses in Hoji ya Henda and Cazenga. These are areas of high land values and overcrowding although turnover of informal economic activities is higher. In Luanda it is notable that land prices decline most rapidly in the north-easterly direction away from the city core; in this direction, accessibility also declines most rapidly because of environmental constraints on travel after the rains, such as the river valleys near Cacuaco and the areas of clay soils with risks of standing water in Hoji ya Henda and Cazenga.

Households make the same trade-off between choosing to locate themselves in different parts of the city of Luanda as they do between cities. If they choose to locate themselves in Cazenga, for example, conditions are overcrowded, there is noise and air pollution, the area is subject to flooding because of impervious clay soils, and land prices are high. Access to economic activities in the city core, and warehouses distributing goods for the informal economy, is however good. About 10 kms from the city centre, there is less pollution and overcrowding, no flooding, land prices are lower, but access to economic opportunities is poorer. There are areas of social housing 20 kms from the city centre, to which households have been forcibly removed from inner areas by the State – these have better services (as the State has provided water and solid waste removal services, and proof of tenure) but

access to economic opportunities is much less.

In the city centre of Luanda, and adjoining areas to the south where new formal sector economic activities have developed, the price of land is high even when it is occupied by poor people. There are more economic opportunities for poor people in these areas but the risk is that they will be displaced by those who are able to pay the higher land prices. Displacement may occur by their being bought out or by administrative redevelopment. Gentrification (higher land values and a lowering of population density) is occurring. Those displaced are able to buy land relatively easily at the periphery of the city, though this land is marginal to economic opportunities and involves unserviced land. Land designated by the State as “housing reserves” are also on the periphery. The state and the poor are locked into developing marginal locations of low value, difficult-to-service, and inconvenient-to-access centres of employment.

The following map of Luanda shows a cross tabulation of land values vs environmental burdens and demonstrates the reason that the poor have increasingly resettled in peripheral areas of the city and in areas that are characterised by a higher level of environmental risk.



8 CONCLUSIONS

Luanda, Huambo and Cachiungo represent very 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 a motor. Huambo is a provincial city that is growing slowly compared to Luanda, and without a strong motor for the economy. Cachiungo 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 of buildings, coupled 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 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 (based on 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 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 Luanda has a population of just under 6 million and a growth rate of just under 8% per year. It is significantly bigger than other cities in Angola and is growing at a faster rate. It is probably one of the six biggest cities in Africa, though it does not appear on the list of such cities as yet because an official census has not been conducted. It will be a mega-city within 10 years even if population growth rates decline significantly. Huambo has a population of just under 300,000, which is less than that shown in some internationally available sources. The growth rate is between 2 and 3% per year.

Angola experienced strong economic growth from 2004 to 2008 with growth rates of over 10% each year, though in 2009 and 2010 lower oil prices led to lower growth. The notable differences between the cities in this study, and the strong differences within them, show the difficulties of lifting people out of poverty even with strong economic growth rates. High rates of economic activity in Luanda only slowly translate into economic development in the interior of the country. The use of oil revenues to generate income to rebuild the infrastructure of the economy has led to a concentration of economic activity and population in the capital city. This creates a dilemma for Angola – within the short period that revenues from oil will be available, a significant amount of resources will be required to provide services for the growing population as well as to rebuild the economy in the rest of the country.

Land prices, and thus rents and property prices, are high in all areas of Luanda. Prices are less in Huambo and very much less in Cachiungo. 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 an urban area, poor people face similar choices. In Luanda 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 such as Cazenga, 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.

The evidence is that urban areas have not spread into areas of environmental risk, but that areas of environmental risk are close to the urban cores and are occupied because the demand for land is high in these areas with more economic opportunities. In outlying areas to which the urban areas have spread, housing densities are lower and housing has avoided areas of environmental risk.

Poorer people occupy areas of environmental risks (such as the steeper slopes in Sambizanga in Luanda) so as to be closer to economic opportunities. Land values are lower on slopes and streambeds than on surrounding areas. For poorer people, the strong friction of distance puts a premium on proximity to economic opportunities. This is especially true in Luanda where traffic congestion is serious, travel speeds are low, and consequently, travel times are longer and more expensive. This friction of distance however also encourages higher-income people and high-value activities to also cluster (for example in the centres of Luanda and Huambo). With an expanding economy, there is a tendency for poorer people to be pushed outwards by higher land values and gentrification.

Land values in these cities do not correspond directly to population density. The main driver of land values is not the number of people seeking to live in a particular area but the small number of people with high incomes and high-value economic activities. Population densities are actually tending to decline as land values increase around the old urban core of Luanda, a process similar to gentrification. The very large disparities in land values within Luanda mirror the large disparities in wealth within the city. Within Luanda the highest population densities occur in areas such as Cazenga where land values are relatively low but the distance to the economic opportunities to be found in the old urban core, is short. Land values are lower because it is an area of environmental risk, subject to stagnant water (which can invade residences, seriously disrupt transport and create a health risk). The economic base of these areas (i.e., industries that were developed in the 1960s, and were established along the main arterial roads) has collapsed and has been replaced by centres of the informal economy (such as import companies housed in former factories and warehouses, and informal markets on located on waste ground). This suggests that the informal economy does not generate significant surpluses compared to the formal economy found in Luanda, even at the scale of informal wholesaling.

Although there are significant differences in the physical settings of the three cities, the most significant differences between the cities are due to their physical size and their economy. Luanda is on a coastal plain with a lower, though variable, rainfall. Huambo and Cachiungo have an incised topography and a high rainfall with low variability. It is however the physical size of the cities, the difficulties of access that this causes, and the differences in land values due to the significantly different values of the economy, that differentiate the three cities.