



**Baseline assessment for  
Lusaka – prepared for  
FRACTAL**

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## Glossary of terms

**Climate Resilience:** To adjust and develop in a proactive manner, reducing negative impacts of the changing climate conditions. Climate resilient development can be defined as: “Implement a holistic climate risk strategy that overcomes barriers and launches fully funded key adaptation initiatives 'How can we reach our development targets while accounting for current and future risks?’”<sup>1</sup>

**Informal settlements:** Areas where groups of housing have been constructed on land that the occupants have no legal claim to. They are also often unplanned settlements where housing is not in compliance with current planning and building regulations<sup>2</sup>.

**Peri-urban settlement:** A name given to the grey area which is neither entirely urban nor purely rural in the traditional sense; it is at most the partly urbanized rural area. Whatever definition may be given to it, it cannot eliminate some degree of arbitrariness.<sup>3</sup>

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<sup>1</sup> CDKN Glossary of Terms: Climate Resilient Development. Available at: <http://cdkn.org/glossary/item/?uri=http://reegle.info/glossary/1242>

<sup>2</sup> OECD Glossary of Statistical Terms. Available at: <https://stats.oecd.org/glossary/detail.asp?ID=1351>

<sup>3</sup> Defining the peri-urban: rural-urban linkages and institutional connections. N.d. Available at: <http://www.fao.org/docrep/003/x8050t/x8050t02.htm>

## 1. Background to the Future Climate for Africa Program

Future Climate for Africa (FCFA) is a five-year research program jointly funded by the UK's Department for International Development (DFID) and the Natural Environment Research Council (NERC). It aims to generate a 'decision-relevant' body of scientific evidence on climate change that can effectively support long-term planning and climate-resilient development on the African continent. It will also take steps to ensure that climate projections can be integrated into decision making and build the evidence base for delivering climate services in Africa.

FCFA projects will be delivered through collaborative partnerships of the world's best researchers. Four Regional Program Consortia (RPCs) have now been selected. Collectively they will cover issues in East, West, Central and Southern Africa. The Consortia are:

- **African Monsoon Multidisciplinary Analysis 2050 (AMMA-2050)**

AMMA- 2050 will improve understanding of how the West African monsoon will be affected by climate change in the coming decades – and help West African societies prepare and adapt.

- **Integrating Hydro-Climate Science into Policy Decisions for Climate-Resilient Infrastructure and Livelihoods in East Africa (HyCRISTAL)**

HyCRISTAL will develop new understanding of climate change and its impacts in East Africa, working with the region's decision-makers to manage water for a more climate-resilient future.

- **Uncertainty reduction in Models for Understanding Development Applications (UMFULA)**

The UMFULA project ('river' in Zulu) will provide new insights and more reliable information about climate processes and extremes in Central and Southern Africa. UMFULA will partner with agencies and universities in Tanzania and Malawi to link the information to development decisions with long-term consequences.

- **Future Resilience for African Cities and Lands (FRACTAL)**

FRACTAL will improve scientific knowledge of future climate trends in Southern Africa, deepen urban policy-makers' understanding of how climate change will affect water and energy services, and support them to explore climate-resilient development choices.

For more information on each Consortia and the institutions involved readers should refer to the FCFA Summary which can be found online @: <http://futureclimateafrica.org/wp-content/uploads/2015/09/Introducing-FCFA-Brochure-21-Sept-Double-Lores.pdf>



## The FCFA's approach to informing decision making in Africa

The FCFA recognises that bridging the gap between the disciplines of fundamental climate science and economic decision making is a challenge. It also recognises that economic development decisions being made today must be resilient to future climates, or risk creating maladaptation.

For these reasons, the FCFA has argued that, in designing their research programs, RPCs should focus on the key 'long-lived' economic decisions. The FCFA has asked researchers to approach the design of research from the 'development end' of the challenge. This creative challenge is at the heart of the FCFA program; it will ensure the integrity of climate science and that the science produced can help shape the outcomes Africa needs.

As part of the program, the FCFA has identified a critical need to understand institutional decision-making structures in Africa and ensure that scientific analysis developed through FCFA research is 'decision relevant'. This approach is particularly relevant where immediate development priorities result in limited institutional capacity to think over a longer 5-40 year time horizon.

In response, a project has been commissioned to help the FCFA identify and understand the **political economy of long-lived economic decision making in Africa**. This understanding will be complemented by support to help research consortia develop strategies for influencing institutional decision making.

As a result of this work, the FCFA expects to gain a clear understanding of the central institutions and processes that shape, and make, long-term economic decisions on the continent. It will also help to build understanding of how institutions access and reflect scientific insights. These insights will be used to support Consortia in the development of their research agendas and their approach to influencing major long-lived economic decisions. In the first phase of the project a Framework report was produced to provide a preliminary basis on which to conceptualise decision making processes relevant for climate change adaptation on the continent. As part of the second and current phase of work a series of country baseline studies are being developed. These aim to provide a basis for RPCs' country level engagements.

This report – the first in a series - focuses on supporting the **Future Resilience for African Cities and Lands (FRACTAL)** consortium by providing further background information on the decision making context relevant for one of their three urban City Labs – Lusaka in Zambia.



**Acknowledgments:** In developing this baseline the Pegasys team have been fortunate in being able to learn directly from the work delivered by the Red Cross/Red Crescent Climate Centre's report *Near-Term Climate Change in Zambia – what the research tells us produced* as well as *The Zambia Technical Report* produced by Bettina Koelle et al. in October 2014 as part of the FCFA scoping phase. It has also benefited from prior work delivered by the Pegasys team in 2011 as part of the Regional Climate Change Program's hotspot case study report.

Due to time and resource limitations this report has been delivered as a desk based exercise. It is recommended that, should FRACTAL or the FCFA see the value in extending the analysis begun in this report, a more in-depth study could be delivered through direct engagement with decision makers in Lusaka. This would allow for additional insight to be built into who makes key decisions and the extent to which they use/have appetite to use climate science in their decision making processes. This insight has inevitably been challenging to obtain remotely. Ground-truthing would be particularly valuable to ascertain situations where decision making plays out differently in-situ, or occurs through alternate and informal channels, in contrast to formal decision making architecture that is attested to in literature and official records.

## 2. Introduction to the report and outline of contents

This report has been produced to support the Future Resilience for African Cities and Lands (FRACTAL) consortia to initiate its City Learning Lab pilot in Lusaka. Lusaka is one of three cities (the others being Maputo and Windhoek<sup>4</sup>) that are at the centre of FRACTAL's approach to understanding how urban energy and water systems will function in a changing climate.

In accordance with FRACTAL's emphasis on co-exploration and its desire to collaboratively establish priorities with city stakeholders, this document does not attempt to define the key long-lived economic decisions that should be prioritised for investigation. These will be arrived at through discussion with city stakeholders as part of a proposed City Learning Lab process. Instead, this report attempts to provide a starting point for discussion. It provides:

1. **An overview of climate adaptation and resilience themes that may be relevant for Lusaka:** The report will explore the direct impacts that climate change is having on the city of Lusaka. It will identify a set of three core adaptation themes associated with water and sanitation, urban infrastructure and peri-urban settlements. These themes are not intended to be an exhaustive list of climate adaptation challenges, but rather to encapsulate a set of institutional dynamics and decision making areas that are acutely relevant for Lusaka and help stimulate further thinking about the focus of FRACTAL's city pilot.
2. **An exploration of Lusaka's climate challenges in the context of the broader city-region:** The report will explore how regional inter-dependencies, between Lusaka and surrounding regions, create important interfaces between food, water and energy. It will suggest that these dynamics or 'urban nexus' challenges exert a strong influence over Lusaka's ability to build resilience in the medium and long term.
3. **A provisional institutional analysis:** Through its analysis the report will aim to identify and discuss the relationship between the management of city scale challenges and regional decision making institutions.

The method followed in providing the above information was through a combination of sources and processes. The initial base of the analysis stems from previous work carried out by Pegasys in Zambia and Lusaka. The past work helped give context to a range of issues facing the water, energy and food nexus in Lusaka that includes the future impacts of climate change. In addition to using past project experience, a literature review was carried out to expand upon additional areas of interest for this project. Lastly, a selection of interviews took place with key informants. Noting the methods that were used to put together this report, further investigation into gaps or areas not covered in full may be necessary. Limitations of this document include the targeted focus on areas of Pegasys experience, and not necessarily the entire baseline of water, food and energy challenges in the region. It is hoped and assumed that these gaps will be dealt with during further scoping of the FRACTAL processes.

In the appendix of the document a **mapping of initiatives focussing on addressing water, energy and climate issues in Lusaka** has also been provided. This aims to help the FRACTAL team build an initial picture of the ecosystem of issues and players already operating in Lusaka. It is hoped that this can serve as a first step towards understanding how FRACTAL's work could complement ongoing activities, or add real value by focussing on crucial, but understudied climate decisions.

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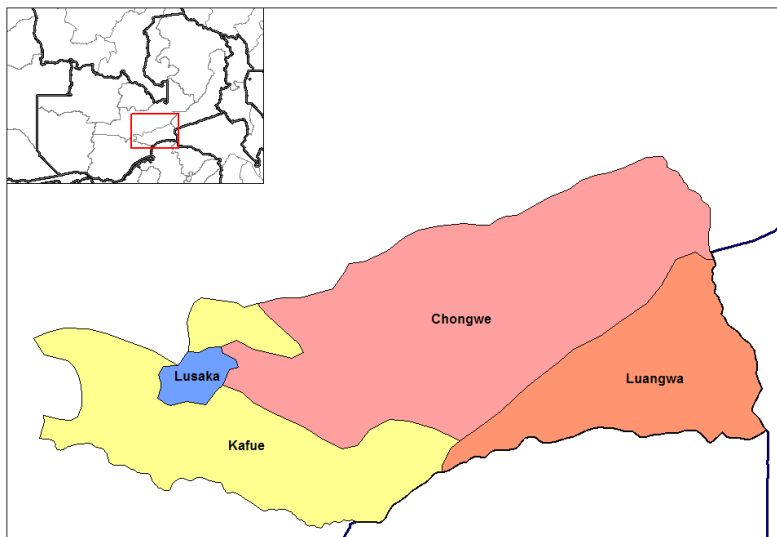
<sup>4</sup> FRACTAL will also collaborate with two additional self-funded South African cities, eThekweni Municipality and the City of Cape Town.

### 3. Lusaka and its vulnerability to climate change

Lusaka is the capital and largest city of Zambia, as well as its chief administrative, financial, and commercial centre. It is a sprawling city located in a productive farming area with a population of approximately 1.7 million people<sup>5</sup>. The city is also capital of Lusaka Province, the smallest and most populous of Zambia's ten provinces. Lusaka Province is made up of five districts: Chongwe, Kafue, Luangwa, Lusaka and Rufunsa. The city itself is bordered by four districts, Chongwe, Chilanga and Kafue (part of Lusaka Province) and Chibombo (part of Central Province)<sup>6</sup>.

Lusaka lies on a gently rolling plateau ~1300 m above sea level. The flat terrain and hard lithography make drainage a problem and accentuate susceptibility to flooding during the rainy season which runs from November to April. Hydrologically, the city can be divided into three drainage basins, the Chongwe, Chunga-Mwembeshi and Kafue Basins.

Figure 1: Lusaka Province showing Lusaka District (Lyons, n.d.)<sup>7</sup>



#### 3.1 Development challenges and climate vulnerabilities

As a result of its current development trajectory Lusaka has a number of characteristics that make it potentially vulnerable to climate change:

**A dense and rapidly expanding population:** Lusaka's population doubled in the post-1964 independence era (from 1963 to 1969),<sup>8</sup> driven by rural to urban migration<sup>9</sup>. This created urban management challenges for a city originally designed as a 'garden city' for 13,000 people by British planners in the 1930s<sup>10</sup>. The constraints encountered as a result of the city's original design have

<sup>5</sup> Lusaka City Council, 2014. Available at: <http://www.lcc.gov.zm/>

<sup>6</sup> There are 103 districts in Zambia and ten provinces. Provincial government is appointed by central government

<sup>7</sup> Lyons, A. n.d. Districts of Zambia. <http://nature.berkeley.edu/~ajlyons/zm/mapping.html>

<sup>8</sup> <http://www.newworldencyclopedia.org/entry/Lusaka>

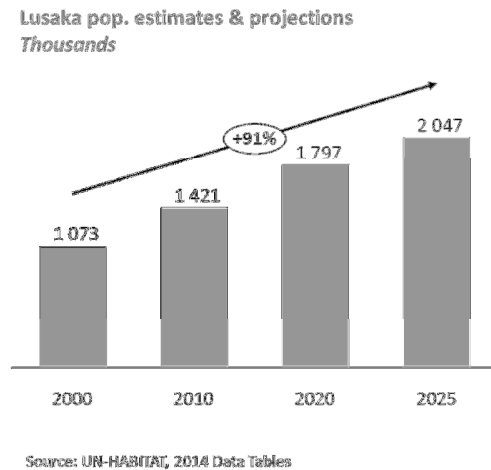
<sup>9</sup> Mulenga, C. n.d. The Case of Lusaka, Zambia. University of Zambia. [http://www.ucl.ac.uk/dpu-projects/Global\\_Report/pdfs/Lusaka.pdf](http://www.ucl.ac.uk/dpu-projects/Global_Report/pdfs/Lusaka.pdf)

<sup>10</sup> It wasn't until 1952 that Lusaka got its first sewerage treatment plant



had long-lived impacts, as Lusaka continued to grow rapidly through the 80s and 90s<sup>11</sup>. More recently, between 2000 and 2010 the city's population grew 4.9% per year<sup>12</sup> and, according to UN-Habitat, Lusaka is among the five cities in Africa that will grow fastest in the next 10 - 15 years<sup>13</sup>.

**Figure 2: Lusaka population estimates and projections 2000-2050**



Lusaka's population density is also high, at levels of up to 1,500 persons per hectare and an average population density of approximately 150 persons per hectare (Johannesburg's average population density by comparison is 20 persons per hectare and New York's is 93). Many densely populated, poorer areas have inadequate urban service provision such as water and wastewater supply. Government service provision is often unable to reach these areas, while private sector suppliers are fewer in low income areas. As a result, many of the services to poor and densely populated areas is led by the non-governmental organisations.

**A population living in poverty:** Approximately 34% of Lusaka's population lives below the national poverty line<sup>14</sup> and less than 20% of the population is in formal employment. The national poverty line is calculated by the Central Statistics Office (CSO) using the cost of basic needs approach. This includes the cost of a basic food basket in addition to an allowance of non-food needs. In 2010, the total poverty line was 146 009 kwacha<sup>15</sup>. (Associated with these high levels of poverty is housing insecurity, with studies from 2010 suggesting 94% of those living in rented accommodation lacked a formal written lease/rental agreement. This reflects a broader inadequacy with respect to land registration and ownership definitions in Zambia. As has been highlighted by numerous studies poor and marginalised citizens are likely to feel the impact of climate change most directly.<sup>16</sup>

**Groundwater stress:** Local aquifers including the Lusaka aquifer appear to be under stress due to sustained over-extraction (groundwater accounts for 57% of water used in the city<sup>17</sup>) as well as pollution from industry, leakages from latrines, septic tanks and unplanned quarrying of

<sup>11</sup> Growing at rates of 4.1% and 3.9% respectively in those decades. Central Statistics Office, 2014

<sup>12</sup> Wragg, 2010, Experiences of globalisation in Lusaka

<sup>13</sup> UN Habitat. 2014. State of Cities – Regional Reports. ISBN: 978-92-1-132598-0

<sup>14</sup> World Bank, 2014. Urban Average Poverty rates = 53% vs. 78% for rural average

<sup>15</sup> Republic of Zambia, Central Statistics Office, 2012. Living Conditions Monitoring and Survey Report. Zambia

<sup>16</sup> World Bank, 2011, Climate Change, Disaster Risk, and the Urban Poor, IHC, 2011 Adapting to Climate Change: Cities and the Urban Poor

<sup>17</sup> AfDB, 2015. Available at: <http://www.afdb.org/en/countries/southern-africa/zambia/zambia-economic-outlook/>

construction materials. There is also increased consumption of ground water recharge areas due to increased urbanisation and failure to enforce development control coupled with inadequate provisions in the 2009 Comprehensive Master Plan for the City. As is discussed further in the report, climate change - and the potential for reduced rainfall and infiltration - could have considerable impacts on the sustainability of groundwater resources, and slow the dilution of contaminated groundwater. This has the potential to endanger Lusaka's longer term viability as developmental pressures within the city increase water demand from groundwater, while alternative water supplies from the Kafue River face similar demands from expanding agricultural and industrial activity. For Kafue sources, there is also an issue of aging and poorly managed infrastructure resulting in high losses such as leakages.

**Weak infrastructure endowment and access to basic services:** Lusaka has a particularly weak infrastructure endowment compared to other major African cities;<sup>18</sup> ranking 14<sup>th</sup> out of 20 African cities recently assessed in a 2014 study by KPMG. This challenge is reflected in the limited coverage of basic hard infrastructure. Wastewater treatment is generally accepted as being inadequate<sup>19</sup> with the majority (60%) of water treatment infrastructure beyond its *reasonable useful life-time*<sup>20</sup> and the few existing water utilities unable to finance full operation and maintenance, let alone make investments needed in order to serve a growing population. Solid waste management is also a major problem and, in the context of increasing extreme weather events, poses a significant risk to human health. As a result Lusaka is suffering from a sanitation crisis that *claims lives through annual outbreaks of cholera, typhoid and dysentery*<sup>21</sup>.

**High dependence on hydropower for energy:** Lusaka is dependent on hydropower resources predominantly from the Kafue (Kafue Gorge) and Zambezi (Kariba Dam) rivers. Periodic exposure to droughts, low water levels or failures in the dams<sup>22</sup> can cause extensive blackouts in Lusaka. As recently as July 2015, the CEO of the Zambezi Water Authority announced that Lusaka should brace itself for a total power blackout by November 2015 if water levels at the Kariba Dam are not raised<sup>23</sup>. Perversely, blackouts are accentuating local water shortages as local pumping and water treatment stations require significant power.

### 3.2 The potential impact of climate change on Lusaka

Climate change projections indicate that southern African nations such as Zambia will experience temperature increases of between 1-2 degrees Celsius by 2050<sup>24</sup>. However, significant uncertainty persists with respect to future precipitation patterns, showing both the potential for a warmer-wetter and warmer-drier climate.<sup>25</sup>

Despite this uncertainty over the amount of precipitation that will fall, there does seem to be a consensus that extreme weather events more broadly, will increase in frequency.<sup>26</sup> In a 2010

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<sup>18</sup> Pricewaterhouse Coopers, 2015

<sup>19</sup> Including by Zambia's Sixth National Development Plan, 2011-2015 which identifies it as a key constraint to growth

<sup>20</sup> LWSC, At a Glance, 2013

<sup>21</sup> AfDB, 2015. <http://www.afdb.org/en/countries/southern-africa/zambia/zambia-economic-outlook/>

<sup>22</sup> There are critical concerns about the Kariba Dam where cracks have been identified and emergency donor funding has been mobilised

<sup>23</sup> The Zambian Economist, July 2015

<sup>24</sup> According to the UNDP 2003 Report Zambia has already experienced a 1.6 degree Celsius rise in mean average temperature since 1960

<sup>25</sup> Hachigonta S, Nelson G, Thomas TS, Majele Sibanda L, eds. 2013. Southern African agriculture and climate change: a comprehensive analysis. IFPRI Research Monograph. Washington, DC, USA: International Food Policy Research Institute (IFPRI).

<sup>26</sup> IPCC, 2012; IPCC 2014

analysis of the last four decades of climate, the Zambian Metrological Department (ZMD) established that frequency of extreme events has increased in Zambia<sup>27</sup>. They also recognised that there will be a change in the annual pattern of precipitation. It is expected that while rainfall events will tend to become less frequent, there will be more intense rainfall events, separated by a large number of dry days<sup>28</sup>. This variable precipitation is likely to have significant impacts in Zambia and on Lusaka in particular.

Drought is likely to become more intense, with significant implications for Lusaka. The 1991-2 drought is estimated to have cost Zambia in the region of US\$300 million<sup>29</sup>. In Lusaka, 70% of the workforce are engaged in agricultural activity<sup>30</sup> and urban agriculture is a major source of livelihoods; thus the country is particularly vulnerable to drought conditions.

Zambia also has a history of experiencing extreme flooding events. The 2006–7 rainy season saw nearly 1.5 million people affected<sup>31</sup> and over the last 30 years Zambia has lost an estimated USD 13.8bn or 0.4% of annual GDP growth to flooding and drought events<sup>32</sup>. As a result of high population densities, informal land ownership structures, and the confluence of intense seasonal rains and poor drainage, Lusaka is exposed to frequent flooding events<sup>33</sup>. Flooding in Lusaka is a yearly event and the townships of Misisi, Chawama Kanyama and Mandevu are regularly inundated. When combined with lack of solid waste disposal this can quickly lead to health epidemics.

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<sup>27</sup> ZMD, 2010. <http://www.mtwsc.gov.zm/>

<sup>28</sup> Kay and Washington, 2008; Shongwe et al., 2009, MTENR, 2010, Koelle, 2014

<sup>29</sup> Kandji, 2006. Climate Change Climate and Variability in Southern Africa: Impacts and Adaptation in the Agricultural Sector. Nairobi: UNEP/ICRAF.

<sup>30</sup> World Bank Data, 2014. Zambia Overview.

<sup>31</sup> GRZ-Government of Republic of Zambia. The National Adaptation Programme of Action (NAPA). Ministry of Tourism, Environment and Natural Resources (editor). Lusaka, Zambia, 2007

<sup>32</sup> Shishekanu M. 2013. Overview of the Zambian Climate Change Program, Presentation at the Stakeholder Meeting on Integrated Landscape Management in the Luangwa Valley in Zambia. Available at: <http://wbcarbonfinance.org/docs/biocf-Overview-of-the-Climate-Change-Programme-in-Zambia.pdf>

<sup>33</sup> Major flooding events occurring in 2009/10,

#### 4. A framework for thinking about Lusaka's climate change challenges and responses

As the chapters above have identified, Lusaka is already facing direct risks from climate change which are accentuating existing developmental challenges. In order to isolate the key economic decisions that will dictate Lusaka's future resilience to climate change, it is important both to understand how climate change risks manifest themselves and how they interact with institutional decision making frameworks at the city scale.

It's tempting to view cities as autonomous spatial, economic and decision making entities. It's also certainly true that 'cities and municipalities are central to fighting climate change'<sup>34</sup>. In Zambia where urbanization is relatively high (42%) and its primary city Lusaka accounts for close to 10% of the total population,<sup>35</sup> this view is compelling. However, as has been reinforced by a range of institutions including ICLEI<sup>36</sup> such an approach can be reductive if it results in a *failure to recognize opportunities based on the interconnected nature of cities and city-regions*<sup>37</sup>. This report argues that it's a mistake to think about Lusaka as an isolated entity when attempting to conceptualize both climate change risks and the policy and management responses available to it.

A failure to appreciate the multiple environmental and social interdependencies between cities and their surrounding regions will reduce understanding of systemic vulnerabilities, for instance those related to water access and quality. It can also reduce the ability of planners, policy makers and businesses to identify opportunities to deliver value through integrating multiple urban, peri-urban and rural objectives and activities. For instance, by introducing environmental conservation measures outside cities that deliver enhanced ecosystem services (water, air-quality, reduced humidity) in cities.

For Lusaka, a city that is dependant for a large proportion of its water, energy and food on the surrounding region, these 'urban nexus' issues are very real. For example:

- Lusaka is situated within the Kafue River Basin, a tributary of the Zambezi River. Approximately 46% of water used in Lusaka is piped 60 kms from the Kafue River. The remainder is sourced from groundwater, the recharge rate of which may also be affected by rainfall and surface water outside the cities boundary.
- National power production is dominated by a limited number of hydropower sites, the largest of which is the Kafue Gorge Dam, also found within the Kafue Flats on the Kafue river.<sup>38</sup>
- Although urban agriculture is significant in Lusaka, food staples such as maize, beef, fish, vegetables, milk and sugar are produced in neighbouring regions of which the Kafue Flats is a key source.

In light of these interconnections it is important – when thinking about Lusaka and the long-lived socio-economic decisions that influence its ability to adapt to climate change – to also think about the broader geo-region. The corollary of this is that - when trying to identify key decision makers

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<sup>34</sup> Bloomberg, 2015 Foreign Affairs, City Century

<sup>35</sup> Zambia's total population was estimated at 14.6m in 2014 according to the CIA Factbook, while Lusaka's population was

<sup>36</sup> ICLEI, 2014 Operationalizing the Urban NEXUS

<sup>37</sup> Brekke, 2014 Conference Paper on Operationalizing the Nexus in cities and city-regions for efficient, effective, customizable and resilient urban projects and investments

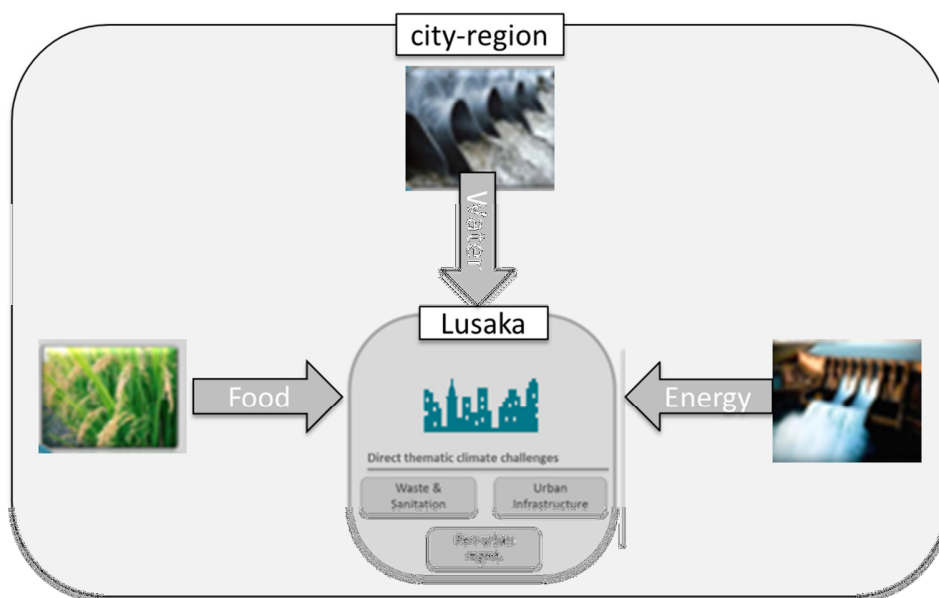
<sup>38</sup> The Flats also contain the smaller Itezhi-Tezhi Dam

and users of climate data – it’s important to think about institutions involved at a regional as well as purely city-scale.

In the sections below we attempt to build an integrated picture of climate-development challenges. In section 5 we identify three major climate change management themes being encountered in Lusaka - **Water and Sanitation**, **Urban infrastructure** and **Urban informal Settlements**. These are not intended as an exhaustive list of challenges facing the city but useful lenses through which to understand key long-lived economic decisions and the institutional dynamics associated with them.

In section 6 we aim to identify how these issues are tied to a number of broader geo-regional ‘stories’ about the integration between Lusaka and one of its key surrounding regions – the Kafue Flats. Through this narrative we will aim to highlight institutional decision making issues and illustrate the relevance of thinking at this expanded city-region scale.

**Figure 3: A framework illustrating the relationship between Lusaka and the broader city-region where resources such as food, water and energy are drawn from further afield including Kafue, Chibombo, Chisamba and Chongwe.**



### **The role of the private sector also needs to be taken into account when considering the impacts of climate change in Lusaka**

Although many institutions within the realm of government are critical in decision-making around climate change, this cannot be carried out within a vacuum. The private sector has a major role to play in implementing many of the climate-related decisions by government. For instance, in May 2015 the Lusaka Times published the following headline, “Government calls on private sector to help build more housing units in the country.”<sup>39</sup> The private sector has also been involved in water supply and sanitation in some areas, and has been praised by the Lusaka Water and Sewerage Company (LWSC) for their

<sup>39</sup> Lusaka Times, 2015. Government calls on private sector to help build more housing units in the country. Available at: <https://www.lusakatimes.com/2015/03/27/government-calls-on-private-sector-to-help-build-more-housing-units-in-the-country/>

efforts in providing access to clean drinking water and good sanitation to Zambians<sup>40</sup>. Another novel initiative to include private sector engagement in solving social problems is the Innovation Grant Program funded through the \$355 million MCC compact. “The promise and potential of the Innovation Grant Program will serve the most vulnerable members of society, ensuring that women, children, the poor, and other disadvantaged groups are able to benefit from access to clean water and sanitation services.”<sup>41</sup>

The private sector is also an important stakeholder considering the resources used by Lusaka from the city-region. Water, energy and food have major linkages with the private sector in ensuring delivery of products to the city. From a food perspective, major commercial farms provide food to the growing capital. From an energy perspective, private independent producers are slowly gaining more traction as electricity supply in the country is unable to meet current demand. Major commercial water users within Lusaka and the Kafue may also have a role to play in supporting water management within the region.

## 5. City scale management challenges

An exhaustive review of the urban management challenges created by climate change – and the implications for decision making in Lusaka - is beyond the scope of this report. As an alternative, we have grouped climate change issues into three thematic areas which arguably are broadly representative of the major challenges facing the city and have used this as a lens to think about institutional responses and decision making interfaces.

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<sup>40</sup> Lusaka Voice, 2014. Available at: <http://lusakavoice.com/2014/10/01/govt-private-sector-praised-for-improving-water-supply/>

<sup>41</sup> Millennium Challenge Corporation, 2014. Transforming water access in Lusaka. Available at: <https://www.mcc.gov/blog/entry/transforming-water-access-in-lusaka>

The diagram illustrates the relationship between various urban infrastructure and service sectors, categorized into three main groups: Green (top left), Blue (bottom center), and Red (top right). A grey node labeled "Out of scope of this research" is also present.

**Green Group (Top Left):**

- Land use planning
- Basic service delivery
- Informal settlements
- Land ownership and access
- Food

**Blue Group (Bottom Center):**

- Solid waste management
- Storm water management
- Water and sanitation
- Wastewater management
- Catchment management
- Water supply and reticulation

**Red Group (Top Right):**

- Transport
- Built environment
- Urban Economic Infra.
- Energy
- Communications and digital

**Out of scope of this research (Grey):**

- Out of scope of this research

The diagram uses solid lines to connect nodes within the same group and dashed lines to connect nodes across groups. A large dashed oval encloses the Green and Blue groups, and another dashed oval encloses the Red group. A third dashed oval encloses the "Out of scope of this research" node.

## 5.1 Water & Sanitation

Water demand currently exceeds Lusaka's average yield of approximately 260,000 m<sup>3</sup>/day. No major water supply development has occurred in the past 30 years despite increasing demands, with old and poorly maintained infrastructure and poor administrative and management systems leading to 47% of water supply being unaccounted for<sup>42</sup>. Future supply should be resolvable through improved

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maintenance, further development of groundwater sources, and/ or through additional transfers from the Kafue River. However, undermining future groundwater supply options is contamination from pit latrines in informal settlement areas, failure of sanitation infrastructure with spills and leaks, and the approval of septic tanks, soak-aways, and other developments near groundwater sources<sup>43</sup>. Additional transfers from the Kafue River are possible, but require expensive infrastructure developments and compete with other demands for use of the Kafue. Thus, water supply challenges exist primarily because of development pressures and aging infrastructure. Climate change may place additional strain on water supply if droughts decrease the availability of groundwater from already developed sources, and/ or decrease flows from the Kafue River and thus increase competition for its allocable withdrawals. Private boreholes are also drying up as a result of damage caused to aquifers in the Lusaka-city region and over extraction of the resource.

With respect to sanitation, inadequate and poorly maintained infrastructure leads to contamination of groundwater sources and significant health risks. Only 35% of the population in Lusaka had access to a flushing toilet in 2010 and the sewer system serviced only 65% of the population in 2012. The city, via the Lusaka Water and Sewerage Company (LWSC) operates two conventional treatment plants at Manchinci and Chunga, both are near to capacity.

The lack of sanitation infrastructure is particularly important in the informal settlement areas where contamination of ground and surface water results in serious disease outbreaks including cholera. Increased flooding events from climate change would exacerbate contamination and health concerns stemming from inadequate sanitation infrastructure, and strong storm or flooding events could further damage existing infrastructure. Drainage is a significant problem during the wet season in Lusaka as many parts of the city are flat and prone to pooling water.

The health consequences of poor drainage are exacerbated by inadequate solid waste pickup and management systems. Historically only a small fraction of generated waste is reported to have found its way to landfill<sup>44</sup>. In 2004 it was published that only 10% of solid waste generated in Lusaka was reaching the landfill<sup>45</sup>. The Lusaka City Council has attracted criticism due to poor performance in this area. In 2003 the Waste Management Unit (WMU) was established as part of the City Council to help manage this issue and tackle the growing quantity of waste being produced in the city. Waste management challenges are especially problematic in informal settlements in Lusaka, where service provision is relatively poorer.

**Key Institutions:** Underlying the water and sanitation story is the need to plan future development based on growing - and in some instances competing - water needs, and to build and maintain adequate infrastructure. Alongside the water supply of future growth, existing infrastructure in Lusaka requires improvement in terms of water supply and sanitation. With this in mind the following institutions become critical to consider.

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<sup>43</sup> Mayerhofer C., Shamboko-Mbale B and Mweene R. 2010. Survey on Commercial Farming and Major Industries. Information and Management Program for the Lusaka Groundwater Systems. Zambia – German Cooperation.

<sup>44</sup> The Report of the Auditor General suggested 14% of Solid Waste in Zambia made it to landfill in 2007

<sup>45</sup> Waele J. et al., 2004. Urban waste landfill planning and karstic groundwater resources in developing countries: the example of Lusaka (Zambia). Journal of African Earth Sciences.



- **Ministry of Energy and Water Development (MEWD)** – The Department of Water Affairs (DWA) within MEWD is mandated to develop and manage water resources, with the objective of doing so sustainably for social and economic development<sup>46</sup>. This includes planning and mobilisation of resources for the development of further water supply sources. The Department of Planning and Information within MEWD also assists through the coordination of funding. However, as large scale developments have not taken place recently, MEWD has not played a significant role in building Lusaka’s water supply resilience.
- **Ministry of Local Government and Housing (MLGH)** – The MLGH has the national mandate to provide adequate and safe water supply and sanitation, as distinguished from MEWD’s mandate to develop and manage water resources. The Department of Housing and Infrastructure Development within MLGH fulfils this role. In 2007 MLGH established the national urban water supply programme (NUWSSP), which provides a plan to provide urban water supply and sanitation<sup>47</sup>. Implementation of water supply and sanitation improvements however, takes place through the entities discussed below, which are overseen by the MLGH.
- **Lusaka City Council (LCC)** – The LCC is one of four city councils in Zambia established by MLGH. The LCC consists of elected Councillors who make policy decisions, and the Management team which is responsible for implementing policy. The 2010 – 2015 strategic plan the core pillars for the LCC include: strengthening institutional governance, enhancing institutional capacity, infrastructure development (especially the CBD), effective management of solid waste and environmental conservation, maintenance of health standards through health programs, enhancement of revenue base and efficient utilisation of finance and enhancement of community participation in civic matter within the City of Lusaka. The LCC is involved with providing clean water and establishing water works and water mains (although the core mandate for this is with the Lusaka Water and Sewage Company); establishing and maintaining sanitation and drainage systems; and controlling the use of land and erection of buildings in the interest of public health, safety and orderly development for the city of Lusaka<sup>48</sup>. Thus, the LCC’s mandate makes it a central institution for the planning and development aspects of building resilience in water supply and sanitation.

However, the LCC faces significant challenges in fulfilling its mandate, introducing a discrepancy between the LCC’s role and its autonomy and capacity. Challenges include:

- Actual financial autonomy does not meet the National Decentralisation Policy level, and is not sufficient to support the LCC’s mandate. The LCC should have financial autonomy to raise taxes and collect service fees, as well as receive external funding and thus contribute financially to fulfilling its service responsibilities. In reality, however, the MLGH controls whether the LCC receives external grants or loans, the LCC may not raise fees without the MLGH’s review and approval, and the LCC depends on the national government to raise taxes. Thus, the LCC’s financial operations are closely controlled by the MLGH, creating a disconnect between its financial authority and service mandate.

<sup>46</sup> Ministry of Energy, Water and Development. Available at: <http://www.mewd.gov.zm/>

<sup>47</sup> Ministry of Local Government and Housing. Available at: <http://www.mlgh.gov.zm/>

<sup>48</sup> Lusaka City Council, n.d. Available at: <http://www.lcc.gov.zm/>

- Unauthorised land allocation and development disrupt planned development and result in unplanned settlements. This unplanned development leads to contamination of groundwater, and settlement in places that may be difficult to service with sanitation infrastructure. There is a lot of illegal land allocations and developments by LCC members, political cadres and councillors who usually do it outside the law. There is high perception that land administration is very corrupt in Zambia.
- **National Water and Sanitation Council (NWASCO)** – NWASCO is the national institution responsible for regulating water providers to support efficient and sustainable water supply and sanitation services. It was established in 2000, under the Water Supply and Sanitation Act of 1997, and its mandate includes balancing of social and commercial interests, protecting consumers from exploitation, and protecting providers from undue political interference. NWASCO's functions include licensing service providers, developing sector guidelines, establishing and enforcing standards, advising government and local authorities, and disseminating information<sup>49</sup>. NWASCO exhibits strong capacity in its role as regulator, for example by facilitating finance and strategy-focussed discussions among service providers, publishing performance indicators of and by establishing consumer-driven Water Watch Groups, thereby encouraging information flow, transparency and accountability. Thus, NWASCO is effective with regard to its mandate, but its mandate does not make it directly responsible for supplying water and sanitation.
- **Water Resources Management Authority (WARMA)** - set up by the Zambian Government following the water sector reforms process that led to the enactment of the Water Resources Management Act of 2011, WARMA is an authority whose main function is "to promote and adopt a dynamic, gender-sensitive, integrated, interactive, participatory and multi-sectoral approach to water resources management and development that includes human, land, environmental and socio-economic considerations, especially poverty reduction and the elimination of water borne diseases, including malaria". WARMA is responsible for managing and regulating the use of Zambia's water resources in an integrated, participatory and sustainable manner based on human, land, environmental and socio-economic considerations.
- **Lusaka Water & Sewerage Company (LWSC)** – LWSC, established in 1988, is the commercial utility company responsible for facilitating the provision of potable water and adequate sanitation to the urban and informal areas of Lusaka. LWSC is overseen by NWASCO, and manages the current water supply and sanitation infrastructure, and planning and financing for further developments<sup>50</sup>. The LWSC received significant support from four development partners including the World Bank who provided a loan in 2014 of \$65million to develop and implement the Lusaka Sanitation Master Plan that aims for 100 percent sanitation coverage for Lusaka Province by 2035.
- **NGOs and donors to LWSC** – NGOs and donors have provided Lusaka with significant funding to address water and sanitation challenges in the past,<sup>51</sup> including through direct assistance to LWSC for developing its water and sanitation infrastructure and systems. Although Zambia's

<sup>49</sup> National Water Supply and Sanitation Council. Available at: <http://www.nwasco.org.zm/>

<sup>50</sup> Lusaka Water and Sewerage Council. Available at: <http://www.lwsc.com.zm/>

<sup>51</sup> Including Irish Aid, AfDB, JICA, DFID and others

overall aid dependence has reduced dramatically in recent years, evidence suggests (albeit outdated, from 2001) that the water and sanitation sector may still be heavily reliant on donor support (donor funds accounted for 41% of spending in the sector in 2001 and close to 100% of capital spending)<sup>52</sup>. Traditionally large players in the sector include the World Bank, African Development Bank, GIZ, and JICA. Funding will tend to flow either directly to the Ministry of Finance, to NGOs or to local government entities via the District Water and Sanitation Health Education Committees. The US Millennium Challenge Corporation is also active, under its local counterpart MCC-Zambia and is actively supporting upgrading of LWSC's infrastructure<sup>53</sup>. There is also a significant funding going to LWSC from the Millennium Challenge Account, money from the USA Government. Other NGOs such as Care International and Water Aid are key players in the water and sanitation sector, especially in informal sectors.

- **Private Sector actors:** There are a large number of industries and companies within Lusaka that have a vested interest in ensuring water supply is stable and of good quality in Lusaka. These companies include breweries or other food processing industries including grain processing, dairy factories or abattoirs. 70% of all industries in Lusaka are located within the industrial area, where a large proportion also use boreholes to source groundwater. Through the German-Zambia cooperation a study was undertaken on an information and management program for the Lusaka groundwater systems<sup>54</sup>. From a Lusaka perspective, major private sector water users and therefore potential partners include Zambia Breweries (based within Lusaka drawing groundwater) or Illovo Sugar (based within the Kafue).

#### **Key long-lived economic decisions that may need to be interrogated in light of climate change**

- **New water treatment systems:** Lusaka has been the recipient of significant funding in the past few years from the Millennium Challenge Corporation, GIZ and the World Bank. Funding has been focussed on improving the city's water and wastewater treatment. In May 2015 the World Bank made a further \$65m to the government for improvement of sanitation in Lusaka.
- **New water supply systems and inter-basin transfers:** According to the Lusaka Water Master Plan Investment Strategy<sup>55</sup> (2014), there are an additional 25+ boreholes planned for delivery around Lusaka in 2015. 55% of the water supply in Lusaka is groundwater, highlighting the importance of the resources for the city. Therefore it is important that the effects of climate change alongside major economic development on the aquifer availability and quality are well understood.
- **New water storage infrastructure and rehabilitation of existing storage:** New water storage infrastructure has been identified for development in high growth regions in Lusaka, Kafue, Chongwe and Luangwa. At present, due to lack of sufficient water and damage to existing reservoirs, some are not in use while some are abandoned due to their state of disrepair.

<sup>52</sup> MLGH, 2004, Water Supply and Sanitation Sector Finance and Resource Flow Assessment

<sup>53</sup> Funding of \$355m with the project due to be completed in 2018

<sup>54</sup> Mayerhofer C., Shamboko-Mbale B and Mweene R. 2010. Survey on Commercial Farming and Major Industries. Information and Management Program for the Lusaka Groundwater Systems. Zambia – German Cooperation.

<sup>55</sup> Lusaka Water Master Investment Strategy, 2014. Lusaka Water and Sewerage Company. Available at: <http://www.lwsc.com.zm/wp-content/uploads/2015/06/Lusaka-Water-Master-Plan-investment-strategy-report-for-printing-V2.pdf>

- Upstream/catchment conservation is under the mandate of Water Resources Management Authority (WARMA), who are newly established as an agency. WWF Zambia have also done some work in this area.
- **Upstream/catchment development and E-flows:** WWF Zambia are currently undertaking an extensive project on the Kafue River in terms of e-flows<sup>56</sup>. The broader issue of how upstream/catchment areas are being managed and natural infrastructure is maintained may also be a relevant issue for FRACTAL to consider.
- Upstream water resource planning, water allocation and master plans: i.e. plans for expanding irrigated agriculture in the Kafue: The German BMZ within the Energy and Climate Fund (ECF) are currently supporting WARMA in establishing a water management plan which includes allocation through their “Integrating climate change in water resources modelling” project<sup>57</sup>.

## 5.2 Urban Economic Infrastructure

At present Lusaka’s urban infrastructure is unable to support its growing population and is typically poorly maintained. For the purposes of this paper we define urban economic infrastructure as transportation, power systems, and the built urban environment<sup>58</sup>.

In 2009 the World Economic Forum ranked Zambia’s infrastructure against 134 other countries. It came 118<sup>th</sup> in terms of overall infrastructure quality, 107<sup>th</sup> in terms of road quality and 112<sup>th</sup> in terms of electricity quality<sup>59</sup>.

Type of infrastructure	Rating out of 134 countries
Overall infrastructure	118
Quality of roads	107
Quality of electricity	112
Quality of railroads	92

These national experiences are to some extent representative of Lusaka which is experiencing frequent blackouts and whose radial road network and generally poor road quality continue to exert a major drag on the city’s economic performance. The majority of water infrastructure was built in the 1960s and 1970s when the population of Lusaka was closer to 400,000<sup>60</sup>. Similarly, besides the Kariba North extension project in 1977 there have been few major investments in power generation infrastructure, although new solar power projects are now being discussed actively.

<sup>56</sup> [http://wwf.panda.org/what\\_we\\_do/where\\_we\\_work/project/projects/index.cfm?uProjectID=9F0838](http://wwf.panda.org/what_we_do/where_we_work/project/projects/index.cfm?uProjectID=9F0838)

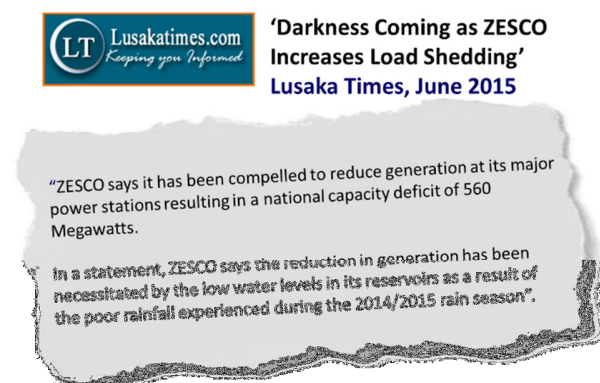
<sup>57</sup> <http://www.giz.de/en/worldwide/27707.html>

<sup>58</sup> While communication technology is considered to be a key element of urban infrastructure it has been excluded from this study due to limited information as well as time and resource constraints

<sup>59</sup> World Economic Forum, 2007. Zambia. Available at: <http://www.weforum.org/pdf/GCR08/Zambia.pdf>

<sup>60</sup> Adam et al, Zambia: Building Prosperity from Resource Wealth, 2014

Figure 5: Media snapshot reporting impact of load shedding



The fragility of the current infrastructure endowment is already a challenge – but is one that will arguably be accentuated by climate change. Extreme weather events have the potential to both create catastrophic failure in systems built within historically determined design thresholds, as well as accelerating depreciation of already under-maintained infrastructure<sup>61</sup>.

Within the transportation sector roads are a key issue as damage prevents effective access to markets and hinders the penetration of services. Currently, roads are poorly maintained and repaired. Overloaded vehicles and increasing congestion cause additional damage, and congestion makes refurbishment of roads more difficult. Increased instances of flooding and storm events, or a prolonged rainy season resulting from climate change would lead to increased water on the roads, exacerbating existing damage.

Finally, the built environment, including industry, commercial, and government buildings and offices, is also often poorly maintained and may be further damaged by storm or flood events. Additionally, heat damage may lead to material stress or decrease staff productivity. There is strong evidence to suggest, for example, that rising temperatures will have a substantial, and as yet under-researched, impact on labour force productivity with daily productivity in the manufacturing sector estimated to drop by 2%, for each degree of warming<sup>62</sup>. Important consideration in this respect include whether or not the master plan for the City is guiding the development of the City or whether limitation in the implementation of the plan give light to the challenges faces in the build environment of the City.

**Key Institutions:** The institutional arrangements centre on those participants responsible for planning and building strong infrastructure, and those responsible for minimising risks. The institutions are mostly government, though they receive funding from external sources.

- **Ministry of Works and Supply**– The WS is the key national institution responsible for facilitating provision of socio-economic infrastructure and other services aimed at stimulating economic growth and development. Infrastructure includes roads, bridges, dams, and communications. The functions of MWS include policy for buildings and the construction industry, construction and maintenance of roads, and control of government transport and offices. Most climate resilience activities, however, occur through the Roads Development Agency.

<sup>61</sup> Watkiss, FCFA, 2014

<sup>62</sup> Sudarshan, The Economic Impacts of Temperature on Industrial Productivity, 2013, p.1

- **Roads Development Agency (RDA)** – The RDA is semi-autonomous from the WS and was established in 2002 by an act of parliament. It is responsible for the care, maintenance and construction of public roads and bridges in Zambia. This includes constructing new roads and bridges, and refurbishing existing infrastructure to make them more resilient to extreme weather events. The RDA receives funding from the Zambian government, fuel levies, and from donors. The RDA is effective but faces financial constraints (running a deficit of ZMK 65 billion in 2013<sup>63</sup>), and notes a shortage of capable contractors in Zambia to carry out projects. The RDA is attempting to integrate building climate resilience into its operations, and has done so in the updated Sixth National Development Plan (SNDP<sup>64</sup>), but cites that a lack of financial resources will make implementation of resilience measures difficult. Several projects have been completed in Lusaka including the transport masterplan and the upgrading of 400km of road.<sup>65</sup>
- **National Road Fund Agency (NRFA) and ROADSIP** – The NRFA was established in 2002 by statute to manage and administer the Road Fund. Additionally, the NRFA coordinates the ten-year Road Sector Investment Program (ROADSIP), which is a 15 year program aimed at building a core road network and improving maintenance, safety, and building management capacity. The program's costs are estimated at \$1.6 billion USD, with funds originating from fuel levies; lenders and donors include the World Bank, the European Union, DANIDA, NORAD, and the governments of Japan and Germany. ROADSIP, the NRFA and the RDA thus represent a strong trio of institutions building climate resilience for roads and transportation which includes consideration of the future climate projections in the design, construction and maintenance of infrastructure.
- **Ministry of Local Government and Housing (MLGH)** – The MLGH plays a role through the Department of Housing and Infrastructure Development, which is responsible for facilitating urban infrastructure development and management through local authorities.<sup>66</sup> The MLGH also has a role in supporting commercial water sanitation services. It is also expected to support the development of public-private-partnerships in collaboration with the Zambian Development Agency<sup>67</sup>. MLGH is also mandated to guide urban development by ensuring that each and every city or town has an Integrated Development Plan (IDP). The IDP is supposed to be a framework for all infrastructure development in the towns and cities.
- **Lusaka City Council (LCC)** – The LCC again has a mandate regarding development and maintenance of Lusaka's urban economic infrastructure, particularly regarding roads and the built environment. The LCC is responsible for the construction and maintenance of public roads and bridges, to control the use of land and to ensure buildings are erected in a safe manner, and to take measures regarding the movement, markets and storage of agricultural and manufactured products (LCC 2011). The same challenges as described above, including financial and human resource capacity constraints, prevent the LCC from fulfilling its broad mandate.

<sup>63</sup> RDA, Annual Report, 2013

<sup>64</sup> Sixth National Development Plan, 2011 – 2015. Government of Zambia. Available at: [http://siteresources.worldbank.org/INTZAMBIA/Resources/SNDP\\_Final\\_Draft\\_20\\_01\\_2011.pdf](http://siteresources.worldbank.org/INTZAMBIA/Resources/SNDP_Final_Draft_20_01_2011.pdf)

<sup>65</sup> RDA, Annual Report, 2013

<sup>66</sup> Ministry of Local Government and Housing. Available at: <http://www.mlgh.gov.zm/>

<sup>67</sup> Since 2008 there has been only one PPP in Zambia, the Redevelopment of the Long Acres Lodge by the Thuthuka Group International of South Africa a \$200m project that has yet to reach financial closure.

- **Disaster Management and Mitigation Unit (DMMU)** – The DMMU was established by a special act of parliament in 2010 mandated with coordinating disaster response and risk mitigation, with an emphasis in the past five years on risk mitigation including mechanisms to protect against climate variability. The DMMU is located within the Office of the Vice President, giving it authority to direct the actions of line ministries for disaster response and risk mitigation purposes. The DMMU is heavily involved in responding to physical infrastructure disasters and minimising risks to physical infrastructure in Lusaka from climate related disasters such as floods. The DMMU works with other institutions, including the RDA, the MLGH, and the LCC, to increase climate resilience through proactive planning for changes in weather extremes and improving the response to extreme events. The provincial, district & sub-district levels of the DMMU provided for in the 2010 Act are still being established.
  - **Zambia Vulnerability Assessment Committee (ZVAC)** – One of the functions under the DMMU is the coordination of the ZVAC. Monthly ZVAC meetings bring together government ministries, NGOs and other stakeholder representatives to communicate, identify, and address vulnerabilities. This provides a forum to discuss urban infrastructure resilience among key participants on a regular basis.
- **Ministry of Finance (MoF)** – The MoF is responsible for the mobilisation, planning and distribution of government resources. Because infrastructure development projects require significant resources, MoF must play a role in building infrastructural resilience. The ministry has taken on an increasingly central position in relation to promoting the mainstreaming of climate change across ministries in recent years. This has been through the establishment of the National Climate Change Secretariat (ZNCCS). The secretariat is made up of a number of technical experts in addition to a national coordinator. “The National Coordinator oversees and ensures that there is effective programme coordination and mobilization of resources and technical assistance for implementing ministries/institutions in order to manage the impacts of climate change.”<sup>68</sup>
- **Ministry of Energy and Water Development (MEWD)** – MEWD is responsible for promoting sustainable development and management of energy and water resources to enhance national socio-economic development. Zambia’s updated Sixth National Development Plan 2013-16 (SNDP)<sup>69</sup> includes the building of climate resilient energy and water infrastructure, illustrating that MEWD is integrating building of climate resilience at a strategic planning level.
- **National Council for Construction (NCC)** – The NCC is intended to support national development in Zambia, particularly planning and construction of physical infrastructure, by facilitating active participation of representatives from all trade and professional bodies in the Zambian construction industry. It is thus a forum through which construction practices that build climate change resilience could be communicated.
- **Zambia Electricity Supply Corporation Limited (ZESCO)**: ZESCO is the vertically integrated state utility that engages in generation, transmission and distribution of electricity. It accounts for around 80% of national power production. Managed as a parastatal company, ZESCO maintains an ‘arm’s

<sup>68</sup> National Climate Change Secretariat, n.d. Available at: <http://www.znccs.org.zm/>

<sup>69</sup> Sixth National Development Plan, 2011 – 2015, Government of Zambia. Available at: [http://siteresources.worldbank.org/INTZAMBIA/Resources/SNDP\\_Final\\_Draft\\_20\\_01\\_2011.pdf](http://siteresources.worldbank.org/INTZAMBIA/Resources/SNDP_Final_Draft_20_01_2011.pdf)



length' relationship with government: being overseen by a government appointed board of directors and managed by an executive board.

- **Copperbelt Energy Corporation (CEC):** The CEC is a privately owned utility that supplies energy purchased from ZESCO to Zambia's mines in the Copperbelt. In 2014 CEC supplied energy equivalent to 28% of the country's total consumption.<sup>70</sup>
- **Private Sector Contractors** – Private sector contractors and service providers will play an important role regarding the construction of climate change resilient infrastructure, including roads, buildings, and communication and energy networks. The NCC above represents one avenue through which to engage with private sector contractors. The capacity and reliability of construction service providers is low according to employers such as the RDA, so building infrastructural resilience will likely necessitate capacity building within the private sector.

### **Key long-lived economic decisions that may need to be interrogated in light of climate change**

Lusaka is likely to be affected by a series of plans to deliver major road infrastructure upgrades, expansions or new developments in the coming years. The location, design and tolerances of these may all need to be interrogated as a result of climate change. Examples of specific developments include:

- **The Zambia Road Rehabilitation and Maintenance Project:** This World Bank supported program, which involves disbursement of over \$75million to upgrade roads is now ending its first phase. In the second phase support will be provided to upgrade the Lusaka-Chirundu road. The road connects Lusaka to Zimbabwe, South Africa and Tanzania and is a major heavy goods route, as well as being notoriously treacherous. The World Bank is supporting the rehabilitation of about 100 km of the 135 km of this international trunk road.<sup>71</sup>
- **Regional transport corridors:** Lusaka is a central node. It adjoins five major regional transport corridors each of which has been tagged as a priority under the SADC protocol. The management of these corridors will inevitably have impacts for urban development, agricultural productivity, water demands, immigration and resilience in Lusaka.

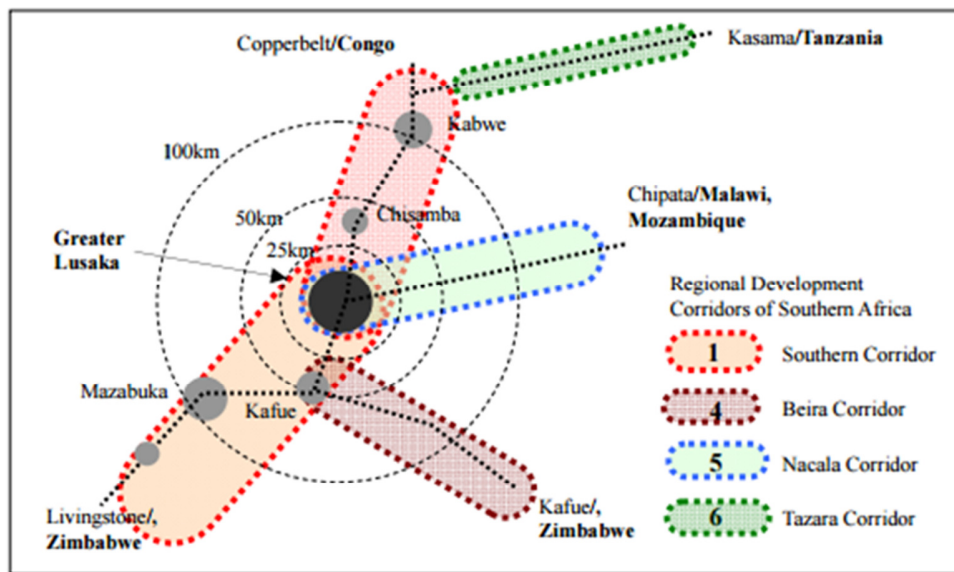
**Figure 6: Regional economic corridors with the potential to impact Lusaka (JICA, 2011)**

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<sup>70</sup> Energy Regulation Board, Zambia, 2015

<sup>71</sup> World Bank, 2014 Lusaka-Chirundu Road: From 'Vehicle Graveyard' to a Modern Thoroughfare





- **Location and design of new energy infrastructure:** ZESCO's electricity generation is 99% hydro, and 1% thermal<sup>72</sup>. The total installed capacity stands at 2,202MW. This is below the demand for electricity in the country. Major new projects include: Itezhi-Tezhi Hydro Power Plant (completion 2015), Kariba North Bank Extension, Shiwangandi Mini-hydro Power Station Project and the Lower Kafue Gorge Hydro Power Station<sup>73,74</sup>. The efficacy, location and design of these major infrastructure projects should be aligned with projected climate change scenarios given their extensive long-lived impacts.

### 5.3 Informal settlements

Today 65% of Lusaka's population lives in informal settlements<sup>75</sup>. Citizens in these areas are particularly vulnerable to climate change as a result of a confluence of factors that include population density, poor infrastructure, limited service provision and insecurity of land ownership. Climate change has the potential to undermine an already weak water and sanitation system, with associated health risks.

Informal settlements have inadequate access to essential water supply and sanitation infrastructure services, the livelihood and health consequences of which may be exacerbated by climate change. Some of these settlements originally emerged largely on privately owned agricultural land, and were permitted by the landowners in exchange for rent. Because settlements were unplanned, unauthorised, and viewed as temporary, essential infrastructure was not introduced and settlements did not develop on grid patterns, so implementation of infrastructure often requires relocating residents. Exacerbating this, settlement occurred near employment opportunities on the western, southern and northern outskirts of Lusaka which are generally flat, shallow and rocky, making introduction of sanitation infrastructure particularly expensive and difficult. As a result of the difficulty and expense of introducing water and sanitation infrastructure, residents rely on shallow water wells for water supply and pit

<sup>72</sup> This comes from diesel powered generators located in districts in the North Western Province

<sup>73</sup> <http://www.zesco.co.zm/projects/generation>

<sup>74</sup> <http://invest-tripartite.org/wp-content/uploads/2013/06/12-Kafue-Gorge-Lower-Hydropower-Project-Brief-26-05-2013.pdf>

<sup>75</sup> PATH, 2015

latrines for sanitation, leading to health consequences such as diarrhoea and cholera outbreaks in the wet season when there is substantial standing water. These concerns exist as a result of development, but will be exacerbated by climate change, as increased occurrence of drought will make access to clean water even more difficult, and increased occurrence of floods will lead to more problems with sanitation and water-borne diseases. The exact nature of the informal settlements needs to be investigated so that water development committees and other necessary parties are part of the decision making processes in the City to reduce climate change impacts.

As a related issue, drainage is a particular problem in Lusaka's informal settlements. The flat and shallow rock terrain, informal housing patterns, close proximity of homes, and inadequate solid waste management systems lead to ponding and malaria during the wet season. In addition to the geography of the region, the quality and efficiency of drainage infrastructure is lacking in many informal settlements. As a result of these challenges, public health related problems are significant in these areas.

An additional concern is regarding the built environment in informal settlements, which is even more susceptible to damage than other structures in Lusaka. Houses are built from unconventional materials and do not meet building standards. They are therefore more vulnerable to flood damage and residents lack financial resources to repair damage. Additionally, access to roads and transportation is already inadequate and will become even more inaccessible if existing infrastructure is damaged by flooding, making access to employment even more difficult. The added impact of climate change needs to be taken into account for these challenges.

### **Key Institutions**

The institutions involved in building climate change resilience for informal settlements overlap with those involved in water and sanitation and economic infrastructure, but many institutions have a specific focus or mandate related to informal settlements.

- **Ministry of Local Government and Housing (MLGH)** – MLGH contributes to building climate resilience through actions under the Urban and Regional Planning Act of 2015, which authorises MLGH to declare settlements as improvement areas. Once declared, whether originally authorised or unauthorised, an upgrading process can take place which includes provision of water and sanitation infrastructure, roads, and school and health facilities. This ability to recognise and improve unauthorised settlements allows for building of climate resilience in otherwise disregarded areas.
- **Lusaka City Council (LCC)**– In addition to being responsible for the provision of infrastructure and social services to informal settlements, the LCC's planning role is particularly important as it relates to informal settlements because so many challenges have resulted from unplanned development. As indicated above, unauthorised individuals from outside and potentially from within the LCC allocate and develop land. The LCC lacks the financial and human resource capacity to stop unauthorised development, introducing additional climate vulnerabilities rather than building resilience. The LCC is laying the groundwork to build resilience in additional informal areas through the expansion of Lusaka's city limits through rezoning of previous

agricultural land. This brings additional settlement areas into the city's boundaries allowing them to receive city services and improvements in the future. However, in many cases the expansion of the City limits is happening without regulation. Settlements are consuming farm land and water recharge areas without planning. A new law has provided for joint physical planning between Lusaka and the surrounding towns. However the challenge of urban expansion remains.

- **Ward Development Committees (WDC) and Residents Development Committees (RDC)** – In order to respond to the challenge of water supply and infrastructure development in comparatively unplanned and under-serviced areas the LCC supported the establishment of WDCs. The idea was that these would be established in each settlement as a mechanism for community participation in planning and development<sup>76</sup>. In 1994 these were replaced by Residents Development Committees with a similar intention, that they would serve as an entry point to directly engage with informal communities regarding a number of topics including the development of climate change resilience. Significant flooding problems in some informal areas have resulted in awareness and engagement with climate change at the RDC level. As highly political, overarching government committees, these institutions may play a significant role in creating climate resilient communities.
- **National Water and Sanitation Council (NWASCO)** – NWASCO focuses specifically on informal water supply and sanitation through its Devolution Trust Fund (DTF). The DTF was established in 2001 and serves as a basket financing instrument aiming to assist commercial water and sewerage utilities (CUs) to extend their services to the urban poor (NWASCO 2011).
- **Lusaka Water & Sewerage Company (LWSC)** – LWSC is a quasi-government institution operating as a private utility<sup>77</sup>. It has a specific informal department under its Commercial Services Directorate. Its responsibility is to deliver services to low income areas or informal settlements in Lusaka. As part of a \$65 million improvement project funded by the World Bank, the LWSC is undertaking studies to identify the best water supply and sanitation systems for informal settlements and to expand and rehabilitate the water supply distribution network<sup>78</sup>. Additionally, the LWSC is working with NWASCO on specific projects, including the drilling of three boreholes and metering of an additional 1,100 connections (LWSC 2013).
- **DMMU** – The Disaster Management and Mitigation Unit (DMMU) contributes to resilience in informal areas particularly during the wet season by providing clean drinking water to minimise the spread of disease. The DMMU also coordinates nine different government departments, including health, agriculture, education, social protection, and infrastructure, to mitigate risks from extreme events in informal areas and to respond in the case of extreme events. As part of its risk mitigation focus, the DMMU has recommended that several informal settlements be relocated as they are prone to floods. This is because the building of long term resilience is extremely difficult in areas where homes are constantly at risk of flooding for example.<sup>79</sup>

<sup>76</sup> World Bank, 2004, Issue Paper; Zambia: Issues of Scaling Up in Peri-Urban Areas

<sup>77</sup> The councils of Lusaka city, Kafue, Chongwe and Luangwa are the LWSC's shareholders

<sup>78</sup> World Bank, 2015, Project Appraisal Document on a proposed credit to the Republic of Zambia

<sup>79</sup> BMZ, GIZ, ODI, African Climate Finance Hub, 2013. Understanding climate finance readiness needs in Zambia. Available at: <https://www.giz.de/expertise/downloads/giz2013-en-climate-finance-readiness-zambia.pdf>

- **Zambia Vulnerability Assessment Committee** – As above, the Zambia Vulnerability Assessment Committee provides a valuable forum for engaging with government ministries, NGOs and other stakeholder representatives regarding vulnerabilities and building of resilience in informal settlements.
- **Ministry of Health (MoH)** – The MoH aims to provide Zambians with equal access to cost effective and quality health care. The MoH is working to develop and improve health care facilities, access to facilities, and to build capacity among health care providers in Zambia. Although not directly focused on building climate change resilience, the ministry's activities do contribute to resilience by supporting the development of healthy populations with greater physiological capacity to cope with, and recover from external shocks.
- **Department for International Development (DFID)** – In Zambia DFID's priorities include supporting the government to deliver better services and make better investment decisions, tackling malaria and maternal mortality, and increasing opportunities for rural wealth creation. DFID has made efforts to support informal development through its £2.9 million Peri-Urban Lusaka Small Enterprise Project (PULSE), though difficulties with effective fiduciary management and marketing were encountered. Increasing the financial resources of the urban poor, lifting them out of poverty, will mean that they have better access to services and resources, which is likely to decrease their vulnerability to changes (including climate change).
- **CARE International** - CARE has supported the Peri-Urban Lusaka Small Enterprise Project and provided direct budget support to the LCC to assist with capacity building. CARE International also provide water kiosks for thousands of the people in the slums of Lusaka.
- **Water and Sanitation for the Urban Poor (WSUP)** – WSUP is a partnership between the private sector, civil society and academia focused on increasing access to water and sanitation for the urban poor. It emphasises serving as a partner to the local service provider. WSUP is developing a program targeted toward the peri-urban areas of Kayama and Chaisa to increase provision of water supply, sanitation, solid waste management and drainage. It has also conducted research to determine the impacts of climate change on informal settlements in Lusaka.
- **Delegation of the European Union** – As indicated above, the EU Delegation to Zambia is contributing € 358,000 to assist LWSC to build water supply and sanitation capacity in the peri-urban areas of Kanyama and Chazanga.
- **UN Habitat and UNDP** – have supported the National Urban and Peri-Urban Settlement Management Program as a phase of the Sustainable Lusaka Program, working alongside the MLGH. This program sought to build the capacity of local institutions and communities, to improve effective delivery of housing, infrastructure and services, and to support environmentally sustainable development. The project has since ended, but some learning from the process may be of relevance.
- **Millennium Challenge Account (MCA)** – The MCA is the implementing agent of the Lusaka Water Supply, Sanitation and Drainage Project. The Millennium Challenge Corporation (MCC), funding by the USA has funded the MCA since 2012.
- **Other Development NGOs** – Several more NGOs contribute to building climate resilience in other areas. World Vision works in all provinces in Zambia, supporting emergency relief projects

and helping communities build resilience to natural disasters. Irish AID supports the national development planning process, education, governance, and health and sanitation in Zambia. It has also contributed to the Sustainable Lusaka Program described above.

### **Potential long-lived economic decisions**

As Lusaka expands, urban land use planning needs to take into account future climate impacts as well as deliver basic developmental needs.

- **Private real-estate development plans:** While the City Council and various organs of government are mandated to play a role in city planning, no single institution is in complete control as development continues in an ad-hoc manner throughout the city. The strength of existing legal frameworks and monitoring systems for controlling conversion of existing land use is also contestable. In this context private real estate developers, businesses and domestic land owners play a direct role in directing further expansion within the city, making them a potentially key point of influence.
- **Housing:** The relatively unchecked rate of land use change has led to an expansion in commercial property within Lusaka at the expense of domestic areas. As a result both formal and informal housing is expected to continue to experience an increase in demand. The planning and management as well as the physical location and tolerances of these new domestic homes presents a major set of economic decisions that could and arguably should be influenced by climate considerations.

## 6. Lusaka & linkages to the broader geo-region: water, energy and food nexus issues

The following section of the report aims to explore the relevance of ‘urban nexus’ issues for Lusaka. It will explore how decisions made in nearby regions create vulnerabilities and opportunities to build climate resilience. While there are a number of regions which supply important goods and services to Lusaka, in this report we explore just one example – that of the Kafue Flats.

### 6.1 Introduction to the Kafue Flats

The Kafue River is the largest tributary to the Zambezi River (Figure 1<sup>80</sup>), contributing 9% of the rivers flow<sup>81,82</sup>.

Figure 7: Map of the Kafue Region



<sup>80</sup> <http://www.grida.no/publications/zambezi/ebook.aspx>

<sup>81</sup> Figure source: [http://webworld.unesco.org/water/wwap/wwdr/wwdr3/case\\_studies/pdf/Zambia\\_National\\_Water\\_Resources\\_Report.pdf](http://webworld.unesco.org/water/wwap/wwdr/wwdr3/case_studies/pdf/Zambia_National_Water_Resources_Report.pdf)

<sup>82</sup> [http://siteresources.worldbank.org/INTAFRICA/Resources/Zambezi\\_MSIOA\\_-\\_Vol\\_3\\_-\\_State\\_of\\_the\\_Basin.pdf](http://siteresources.worldbank.org/INTAFRICA/Resources/Zambezi_MSIOA_-_Vol_3_-_State_of_the_Basin.pdf)

The abundance of water in the Kafue has supported significant economic activity and the Kafue River basin is the economic hub of Zambia. The Upper Kafue Sub-Basin is home to the Copperbelt mining region. The Lower Kafue Sub-Basin includes the Kafue Flats as well as the Kafue Gorge. The area is the source of 50% of all hydropower produced in the country, 7% of the national fisheries, 20% of the national cattle herd and it accounts for 46% of Lusaka's water supply. It attracts a significant number of tourists, is an accredited Ramsar Wetland and is home to an abundance of diverse wildlife.

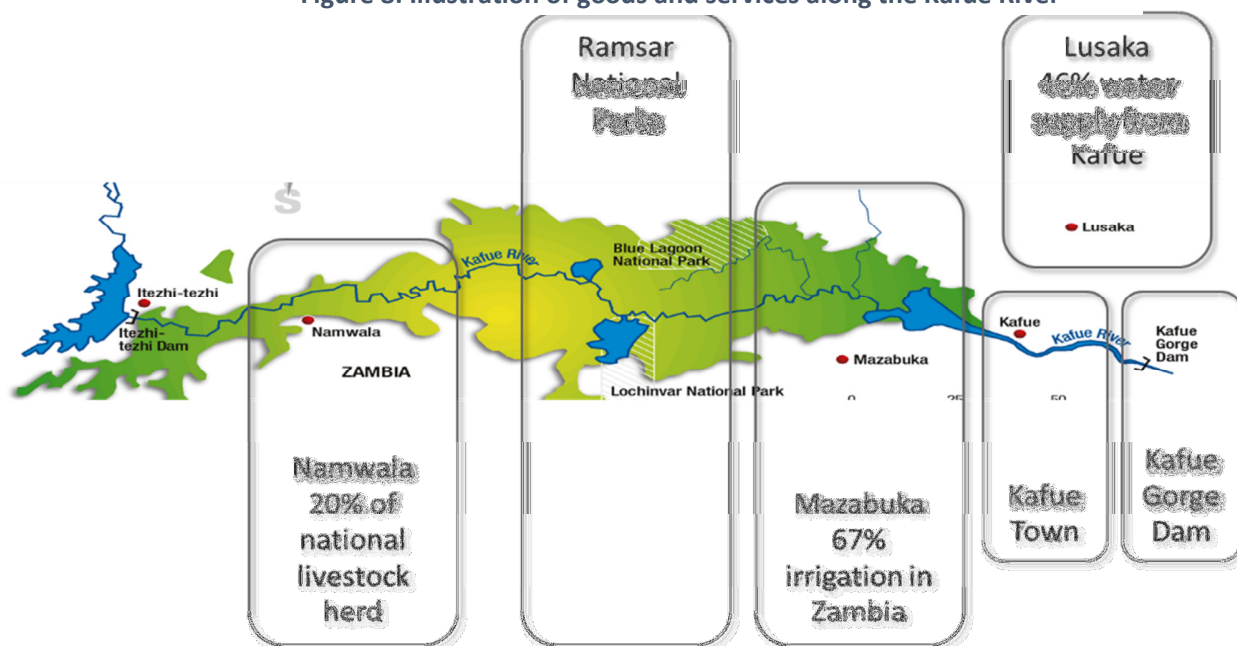
Lusaka makes significant demands on the Kafue Flats to supply it with energy, water and food. In the following sections we look at each of these issues and the linkages between the Kafue flats and the city of Lusaka in more detail.

## 6.2 Water

### Lusaka receives a large proportion of its water from the Kafue River

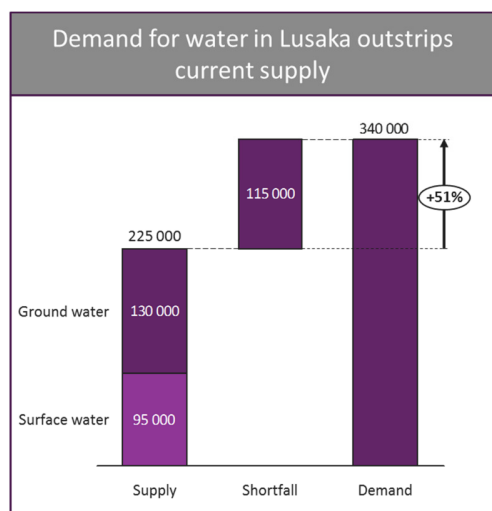
Lusaka gets its water from two primary sources. Firstly it's supplied by groundwater (about 130,000 m<sup>3</sup>/day) and secondly it takes water from the Kafue River (about 95,000 - 96,000 m<sup>3</sup>/day) through the Iolanda Treatment Works. Cumulatively this provides Lusaka with approximately 225 000 m<sup>3</sup>/day. However, the demand for water in the city is 51% higher than supply at 340 000m<sup>3</sup>/day, leaving a supply gap of 115 000 m<sup>3</sup>/day<sup>83</sup>.

Figure 8: Illustration of goods and services along the Kafue River



<sup>83</sup> Lusaka Water and Sewerage Company Water Master Plan Investment Strategy, 2014

**Figure 9: Lusaka's water balance<sup>84</sup>**

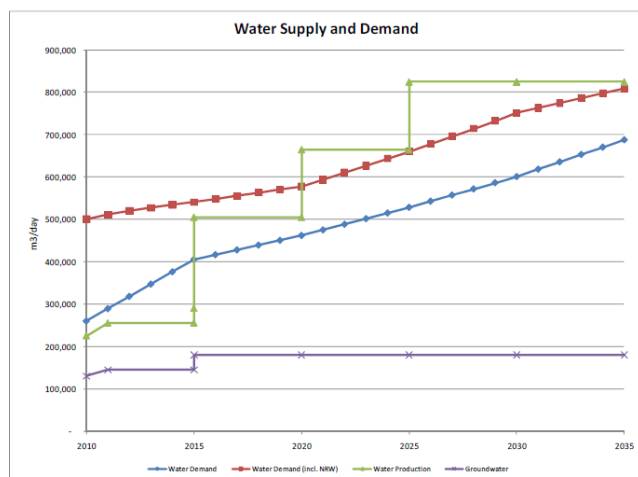


In the process of transporting water to the city a large amount is lost and wasted with 50% of water supplied to the city being classified as non-revenue water/water loss. The majority of these losses occur through leakage in pipelines. It is assumed that the majority of the losses stem from the substantial pipeline transporting water from the Kafue River to Lusaka but illegal/unrecorded abstraction is also likely to be significant.

#### **Lusaka expects to meet an increasing proportion of its own water needs from the Kafue**

Lusaka's future demand for water is indicated in the following figure from Lusaka's Water Master Plan Investment Strategy (2014). It suggests that because the current supply from groundwater is unable to increase, future water demands are likely to be sourced directly from the Kafue River Basin.

**Figure 10: Lusaka total water demand and supply (m<sup>3</sup>/day)**



<sup>84</sup> Charts developed using data from the Lusaka Water and Sewerage Company Water Master Plan Investment Strategy, 2014



However, water availability in the Kafue is likely to come under significant pressure.

Domestic water demand in the Kafue River Catchment is projected to grow to 258 MCM/year by 2020. A large proportion of this growth is due to the expansion of water supply to the Lusaka Water Sewerage Company from the Kafue (which tallies with the expectations for supplying Lusaka – discussed above). As a result it is estimated that abstractions from the Kafue River at Iolanda Water Works for Lusaka will increase to seven times the current abstraction of 40 MCM/year.

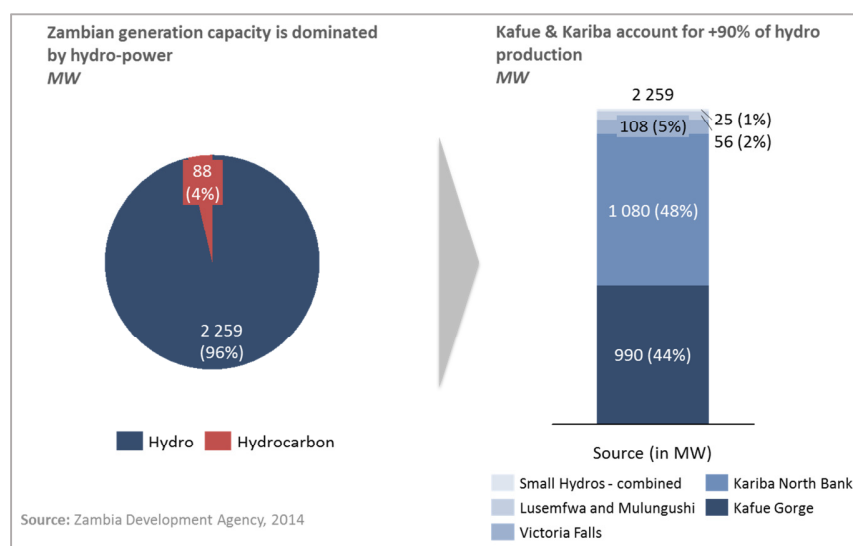
However, there are a number of other significant water demand increases that can be expected from the upper, middle and lower Kafue Catchment. These include significant expansion in irrigated agriculture, mining and industrial development within the greater Lusaka and Kafue Town areas. Agriculture and mining are important sectors for the country's national development and both are heavy water users. As a result it's highly likely that trade-offs in water demand will increasingly be encountered in what is believed to be an already over-allocated basin.

As a result of these dynamics it's clear that Lusaka will need to engage with broader regional attempts to plan for and manage water availability, if it wants to secure supply into the future. Understanding this threat to its longevity and developing suitable frameworks and platforms for discussing trade-offs amongst different users – particularly in the context of climate change - will arguably be key for the city. In particular, due to the importance of groundwater supply for the City of Lusaka, the recharge areas need to be mapped for their quality, quantity and threats.

### 6.3 Energy

In terms of total primary energy Zambia, and Lusaka to a lesser extent, continues to be dependent on wood and biomass (90% of national total primary energy). However, with respect to electricity, hydropower plays a key role in Zambia, accounting for 96% of generation capacity<sup>85</sup>.

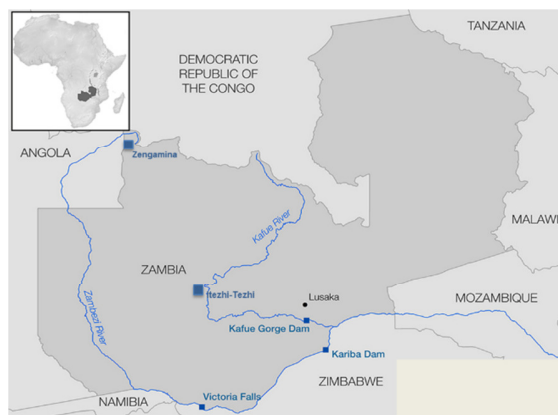
**Figure 11: Zambian electricity generation by source**



<sup>85</sup> Zesco, 2015. Available at: <http://www.zesco.co.zm/>

The Kafue Gorge Dam is home to a 990MW hydropower station which provides 50% of the total electricity production of Zambia. 431 MW are exported from the Kafue Gorge Power Station to Zimbabwe and South Africa. In addition, a large proportion of the energy consumed within Lusaka is used in the Copperbelt region of Zambia, and is not used in the Kafue Flats where it is generated. The 102 MW Itezhi-Tezhi hydro-power station built in 1977 also operates at the foot of the Kafue Flats as a joint venture between ZESCO and Tata.

**Figure 12: Map showing the location of key hydropower sites**



Consistently high economic growth in Zambia, fuelled by copper prices and exports, has over the last ten years supported an annual growth in energy demand of close to 3% per annum. In the medium term, growth is projected to increase to 7.1% in 2014 and 7.4% in 2015<sup>86</sup> and while the global collapse in copper prices may lower the rate of Zambia's growth, other sources of economic development have been steadily growing<sup>87</sup>.

Alongside the growing demand, energy production is under pressure in Zambia, with demand for imported petroleum rising at 40% per annum, and charcoal and biomass resources which make up the majority of primary energy become increasingly stressed<sup>88</sup>.

Within Lusaka, 54% of households use charcoal, 44% electricity, and the remainder kerosene and firewood. Electricity demand growth within Lusaka has consistently exceeded the national average by 100% p.a over the last ten years<sup>89</sup>. Lusaka consumes ~37% of Zambia's total electricity production<sup>90</sup> and the associated water consumption needed in order to produce the electricity is equivalent to 329 MCM per annum<sup>91</sup>.

Clearly Lusaka is dependent on national infrastructure for its electricity supply and for large quantities of its primary energy supply via charcoal produced in the surrounding region. While this is unsurprising, the high dependence on just two dams (one of which is located on the Kafue) for electricity makes Lusaka particularly vulnerable to supply shortages. This is additionally concerning given the well observed

<sup>86</sup> Zambia Africa Economic Outlook, 2014. <http://www.afdb.org/en/countries/southern-africa/zambia/zambia-economic-outlook/>

<sup>87</sup> <http://www.zda.org.zm/sites/default/files/Zambia%20Energy%20Sector%20Profile%20-%20June%202013.pdf>

<sup>88</sup> Oil imports in particular are expected to grow by 40% p.a, Zambian Development Agency, 2014

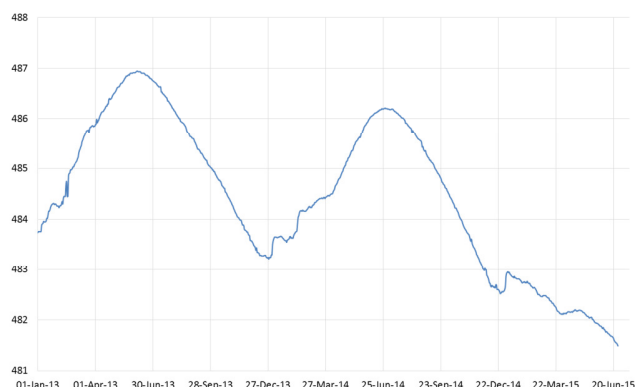
<sup>89</sup> African Trader, 2014 <http://www.africantrader.co/index.php/business-news/powering-growth-in-lusaka-3301>

<sup>90</sup> Electricity regulation Board, 2013-14 statistical bulletin

<sup>91</sup> Assuming the consumption of hydropower generation is 183 m3/mwh as quoted in the IHA Report on Hydropower in SADC.

challenges with declining water levels and the associated impacts on power production on the Kariba Lake.

#### Kariba Lake levels Jan 2013-2014<sup>92</sup>



The nature of hydro-power production and its close interlinkages with upstream water use and consumption levels means that – again – in order for Lusaka to control and manage the risks associated with its power supply it needs to act outside its direct physical and administrative boundaries.

In addition to the source of hydropower, other energy sources need to be investigated. Many of the urban poor in Lusaka do not have access to electricity, using charcoal instead. Charcoal is sourced from areas further afield where trees and shrubs suitable for making charcoal can still be found. The sustainability of this wood fuel source is also sensitive to climate change impacts.

## 6.4 Food

Research has shown that up to 93% of households in informal settlements, which house 70-75% of the city's population, are food insecure. Most households do not only have poor access to food, but also consume foods from a very narrow range of food types.<sup>93</sup>

Locally grown fresh produce is an important component of the diets of many urban households in Zambia who in most instances do not produce their own. According to the CSO/MACO/FSRP Urban Food Consumption Survey (UCS) of 2007/8, fresh produce accounts for 21% of the food budget of urban households in Lusaka, coming second only to cereals and staples at 24%. The share of household total consumption of fresh produce from own produce is only 7% which means that over 90% of the value passes through formal retail channels.

Although not all of this food is sourced from the Kafue Flats themselves, since it is the largest productive region in close proximity to Lusaka, it can plausibly be concluded that the region plays an important role in supplying food to the capital city<sup>94</sup>. Food grown in the Kafue is certainly consumed in large quantities in Lusaka. As one of the closest sources of water for agriculture, a large proportion of food grown in the basin is transported to the city for consumption. Vegetable farms on the outskirts of Lusaka towards the Kafue are also part of the catchment, although they draw mostly groundwater for irrigation (if irrigated).

<sup>92</sup> Zesco, 2015, Presentation to the ZNFU

<sup>93</sup> Mulenga, 2013. The State of Food Insecurity in Lusaka, Zambia. African Food Security Urban Network. Urban Food Security Series No. 19.

<sup>94</sup> Zambia Agriculture Sector Profile, 2011. [www.zda.org.zm/?q=download/file/fid/49](http://www.zda.org.zm/?q=download/file/fid/49)

Ensuring adequate food production in the Kafue means addressing a number of potential challenges. Firstly local food demand within the Kafue is also growing as population expands, potentially leaving less available for regional export.

Other important areas surrounding Lusaka in terms of food include Chongwe which is a leading area for poultry supplies, Chibombo and Chisamaba districts which are a good source of fresh vegetables and animal products. These areas are now also increasingly under pressure from uncoordinated urbanization emanating from the City of Lusaka. There is also a substantial amount of fresh vegetables coming from Mkushi farming area in Central Province.

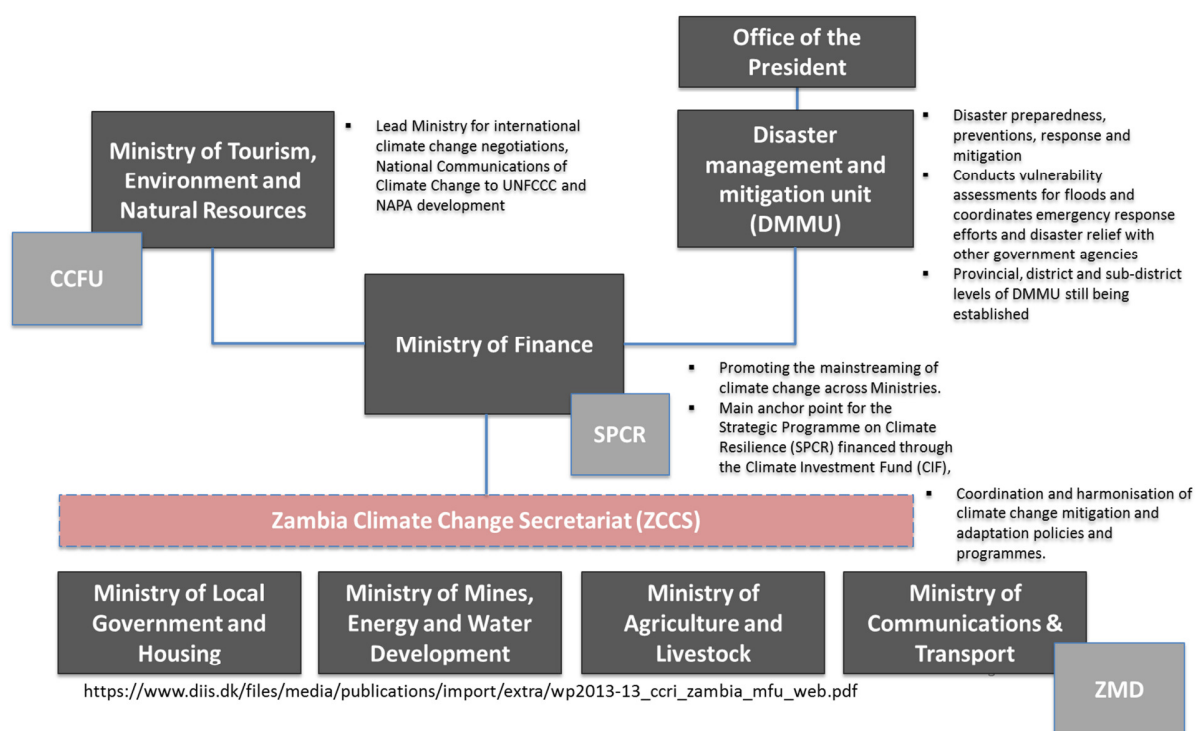
In addition, the majority of small-scale farming in Zambia including that within the Kafue is rain-fed, with only 5% of the cultivated land in Kafue being irrigated. This creates vulnerability to short term fluctuations in weather. Even in instances where large irrigated producers are operating, water resources are likely to become constrained as small-holders' and communities' demand for water grows.

## 7. Mapping of institutional stakeholders governing climate change responses

The following is a narrative of the different ministries and their respective responsibilities regarding water, energy, food or climate. Particular focus is given to those institutions that play a central role in Lusaka specifically.

In the figure below we begin by summarizing the institutions and ministries that are most directly relevant when considering who owns the management of climate change issues in Zambia.

**Figure 13: Government institutional map indicating the relationship between different Zambian ministries involved in climate-related activities**



From desk based research it appears that both the Ministry of Tourism, Environment and Natural Resources and the Disaster Management and Mitigation Unit play central roles, although with a differentiation in respect to their focus. In such cases, the context defines which institution is key. For example, for long term issues, the Ministry of Finance, MLGH, Energy, Water and Environmental Development are key.

- **Disaster Management and Mitigation Unit (DMMU):** the unit was established in 1994 and operates under the Office of the Vice-President. It is responsible for disaster preparedness, prevention, response and mitigation. The DMMU also conducts vulnerability assessments and contingency plans for flooding alongside coordination of emergency response efforts with other government agencies and international organisations.

The Ministry of Tourism, Environment and Natural Resources leads international climate change negotiations, provides the National Communications on Climate Change to the UNFCCC, and has been instrumental in developing the National Adaptation Programme of Action (NAPA). A number of these tasks have been conducted through a Climate Change Facilitation Unit (CCFU) housed in the Ministry. Alongside these two key entities the Ministry of Finance (MoF) has taken a central position in promoting the mainstreaming of climate change across Ministries through a Climate Change Secretariat. As the provider of funding it inevitably has a significant ability to encourage co-ordination and exert influence over other ministries. The MoF is also the anchor for the Strategic Programme on Climate Resilience (SPCR) financed through the World Bank's Climate Investment Fund (CIF)<sup>95</sup>. The second phase of the project has been underway since 2013. The project will be complete 2019 with a total project cost at 36 million USD. The objective of the second phase of Strengthening Climate Resilience Project in Zambia is to strengthen Zambia's institutional framework for climate resilience and improve the adaptive capacity of vulnerable communities. The first component of the project is strategic national support. The second component is to support participatory adaptation. The third component is to pilot participatory adaptation.

It should also be noted that – within the National Climate Change Response Strategy (NCCRS), which is currently in preparation – a new body has been suggested. The National Climate Change and Development Council (NCCDC) is expected to ensure overall coordination and harmonization of climate change mitigation and adaptation efforts. This will include representation from relevant Ministries, as well as from the House of Chiefs, civil society, the private sector and academia. It remains to be seen how influential this new body will be.

In addition to the abovementioned coordinating bodies, the following Ministries are also involved in climate change.

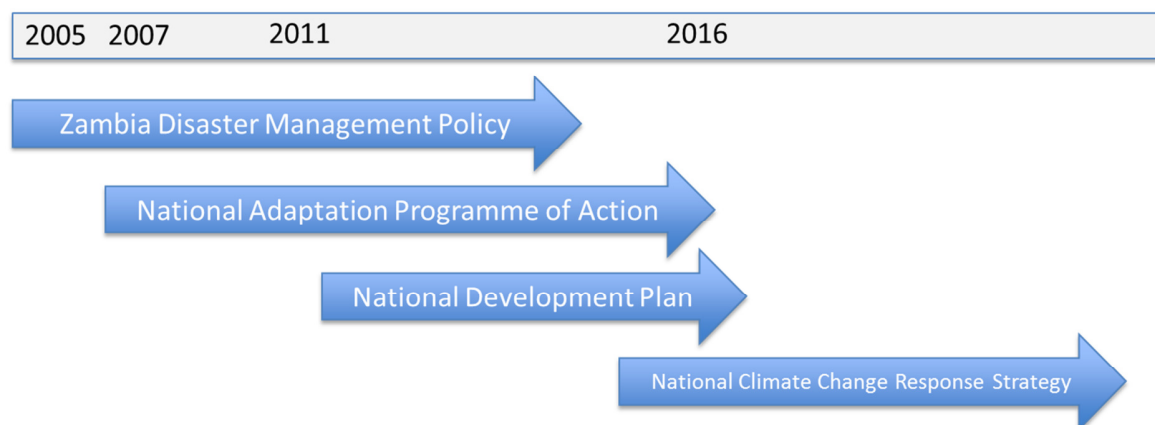
- Ministry of Agriculture and Livestock (MAL) is mainstreaming agricultural policies on climate change. These include the support of new variants and conservation agriculture measures. These are however implemented largely on a donor-funded basis, and therefore there is arguably limited consistency and coherence in the overall selection and delivery of the programs.
- Ministry of Mines, Energy and Water Development (MMEWD) have begun to mainstream climate change mainly through the Department of Water Affairs. This includes securing infrastructure against floods and droughts. Studies have also been supported that consider the impact of climate change on hydropower generation. In principle, the climate screening of water use plans is done, however this is a challenge due to lack of data and information availability
- Ministry of Local Government and Housing (MLGH) is responsible for supporting the development of local integrated development plans. Some funding has been received from the Constituency Development Fund in water and sanitation projects. Climate change adaptation has not been explicit in this regard. The MLGH is a coordinating Ministry and it is very key in decision making and programme implementation.
- The Ministry of Communications and Transport (MCT) is responsible for early warning and climate change assessments. These include crop yield predictions together with DMMU.

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<sup>95</sup> <http://www.worldbank.org/projects/P127254/zambia-strengthening-climate-resilience-ppcr-phase-ii?lang=en>

The following figure gives a quick overview of some major climate-relevant acts, policies and strategies in Zambia.

**Figure 14: Climate-related policies in Zambia**



- Zambia's *Disaster Management Policy* was developed in 2005. The policy focuses on developing capacity at all levels to prepare for and respond to disasters. Natural hazards such as drought and floods are a key element in the policy. The policy does not link these hazards to climate change, which is only sporadically mentioned.
- Zambia's *National Adaptation Programme of Action* (NAPA) was developed in 2007 and identifies priority sectors for action, namely agriculture, natural resources, water, health and energy. According to observers the NAPA is to some extent an isolated plan and is not broadly considered in individual sector planning.
- The 2011 – 2015 Sixth National Development Plan (SNDP) includes climate change in the 2030 vision. 1-2 overall programs within key sectors (agriculture, natural resources, transport, energy, mining, local government etc.) are aimed at adaptation, mitigation and/or disaster risk management. It is implicitly expected that these programs will be funded through donor support and not through the limited government budget put aside.
- The National Climate Change Response Strategy drafting is currently underway. The strategy will provide a cross-cutting policy and institutional framework in response to the fragmentation and lack of clear roles in climate change and disaster management to date. As a result, there has been a strong focus on institutional arrangements including the National Climate Change and Development Council.

## 8. Conclusion

The objectives of this report were to provide an overview of climate adaptation and resilience themes that may be relevant for Lusaka. In particular challenges associated with water and sanitation, urban infrastructure and informal settlements were focused on with greater detail. The second objective for this study was to explore the climate-related challenges in the context of Lusaka within a broader city-region. In this case, the Kafue Flats were of particular focus. However, there are a number of neighbouring regions that also play an important role in terms of food supply. Finally, a high-level institutional analysis was carried out to identify relationships between the city level and regional decision-making institutions. This analysis requires further development and expansion once the linkages have been made within the City of Lusaka to best highlight and identify where decision-making is taking place. Further research is also required to identify and understand the role of provincial government in terms of climate change and building resilience thereof.



## Appendix

**Table 1: List of current initiatives on climate or water, energy and food in and around Lusaka and Zambia.**

<b>Sector</b>	<b>Title of initiative</b>	<b>Description</b>	<b>Core Institution</b>	<b>Contact</b>
<b>Water</b>	Groundwater Resources Management Support Program	Groundwater Resources Management Support Program (GReSP) funded by the Federal Ministry for Economic Cooperation and Development (BMZ: Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung).	Water Resources Management Authority (WARMA)	Warma communications: Lemmy Namayanga
	Integrating Climate Change in Water Resources Monitoring	GIZ are pursuing a project to look at integrating Climate Change in Water Resources Monitoring in Zambia (Aurecon implementing, GIZ funding)	GIZ Zambia	Conrad Thombansen Water Stewardship Program Diana Caceres
	Lusaka Sanitation Program	AfDB are supporting this initiative to increase access to sustainable sanitation services to Lusaka's residents especially the urban poor and strengthen Lusaka Water and Sewerage Company's (LWSC) capacity to manage sanitation services	Lusaka Water and Sewerage Company	Andrew Mutuna
	Lusaka Water and Supply, Sanitation and drainage Project	The Millennium Challenge Corporation through the Millennium Challenge Account – Zambia on behalf of Lusaka Water and Sewerage is implementing the Lusaka Water and Supply, Sanitation and drainage Project. This project will increase incomes through improved health and employability of project beneficiaries through the provision of clean	Millennium Challenge Corporation	n/a

		and safe water supply and adequate sanitation and drainage in targeted areas of Lusaka city. The estimated cost of the project is at \$355 million and the completion date is 2018		
	Integrated Water Management Unit	University of Zambia Integrated Water Management Unit <sup>96</sup> . The UNZA IWRM Centre was established as part of the Water Sector Support program developed by Ministry of Energy and Water Development (MEWD) in collaboration with Royal Danish Embassy (RDE)	University of Zambia	Professor Imasiku Nyambe: Imasiku Nyambe
	WWF Zambia Freshwater Unit <sup>97</sup>	WWF are running a number of initiatives to look at climate change related impacts on water and ecological functioning	WWF Zambia	Dr. Nyambe
<b>Energy</b>	Hydropower related risks of climate change	ZESCO are pursuing a project on the hydropower related risks of climate change (IFC) <sup>98</sup> . Major components of the study include development of downscaled temperature and precipitation projections for the basin, modelling of hydrologic flows in the Kafue River, modelling of corresponding reservoir and energy outputs, analyses of financial implications, and considerations of natural hazards and other uses of water in the study area.	ZESCO	Chief Engineer Hydrology: George Sikasote
	Lower Kafue Gorge Hydropower Prefeasibility	ZESCO have carried out a prefeasibility study for the investments needed for the development of the Lower Kafue Gorge hydropower station. This study has taken into	ZESCO	As above

<sup>96</sup> <http://mines.unza.zm/index.php/2013-02-27-10-00-54/under-graduate>

<sup>97</sup> [http://wwf.panda.org/who\\_we\\_are/wwf\\_offices/wwf\\_zambia\\_nature\\_conservation/focal\\_thematic\\_areas/freshwater/](http://wwf.panda.org/who_we_are/wwf_offices/wwf_zambia_nature_conservation/focal_thematic_areas/freshwater/)

<sup>98</sup> [http://www.ifc.org/wps/wcm/connect/topics\\_ext\\_content/ifc\\_external\\_corporate\\_site/cb\\_home/publications/climaterisk\\_hydro\\_zambia](http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/cb_home/publications/climaterisk_hydro_zambia)

	Study	account potential climate change impacts.		
<b>Food</b>	Climate change and food security	Climate change and food security in Zambia Scenarios (FAO) <sup>99</sup>	FAO	No direct contact
	Climate change mitigation and adaptation initiative	Zambia National Farmers Union Climate Change Mitigation and Adaptation Initiative <sup>100</sup>	ZNFU	Coillard Hamusimbi
	Climate change and vulnerability in regions I and II	Adaptation to climate change and vulnerability in agro-ecological regions I and II Project in Zambia (UNDP) <sup>101, 102</sup>	UNDP Department of Agriculture	Acting Deputy Director: Stanslaus Chisakuta
<b>Climate Change</b>	Pilot Program for Climate Resilience (PPCR)	Pilot Program for Climate Resilience (PPCR) (AfDB, World Bank, UNDP, IFC, DfID)	Climate Change Secretariat	National Coordinator: David Kaluba
	SCRIKa	Ministry of Finance Climate Change Secretariat: Strengthening climate resilience in the Kafue Basin, Zambia (African Development Bank) <sup>103</sup>	Climate Change Secretariat	National Coordinator: David Kaluba
		Private sector support to climate resilience in Zambia: Consulting services on Agricultural Weather Index-Based Insurance (World Bank) <sup>104</sup>		
		Sigtuna Climate Change Education Research Initiative – part of a broader Southern Africa – Sweden partnership		
		A range of climate-related projects in Zambia	The Nature	Dr. Victor M. Siamudaala; Country

<sup>99</sup> <http://www.fao.org/fsnforum/forum/discussions/epic-zambia>

<sup>100</sup> <http://www.wfo-oma.com/climate-change/case-studies/zambia-national-farmers-union-znfu-climate-change-mitigation-and-adaptation-initiative.html>

<sup>101</sup> <https://www.devex.com/projects/tenders/consultancy-services-under-adaptation-to-climate-change-and-variability-in-agroecological-regions-i-and-ii-project-in-zambia/164446>

<sup>102</sup> [http://www.undp.org/content/dam/undp/documents/projects/ZMB/00058205\\_Adaptation%20ProDoc\\_FINAL\\_.pdf](http://www.undp.org/content/dam/undp/documents/projects/ZMB/00058205_Adaptation%20ProDoc_FINAL_.pdf)

<sup>103</sup> <https://www.devex.com/projects/pipelines/strengthening-climate-resilience-in-the-kafue-basin-zambia/24520>

<sup>104</sup> <https://www.devex.com/projects/tenders/private-sector-support-to-climate-resilience-in-zambia-consulting-services-on-agricultural-weather-index-based-insurance/80507>

		underway	Conservancy	Director
<b>Waste</b>	Resource – Cities initiative	A partnership between Lusaka and Dayton USA to look at opportunities for more effective solid waste management	ICMA	See ICMA.org for more information
<b>Flooding</b>	Sustainable Urban Resilient Water for Africa	Lusaka City Council in partnership with ICLEI - Local Governments for Sustainability - Africa recently held a workshop under the auspices of the Sustainable Urban Resilient Water for Africa: Developing Local Climate Solutions (SURE Water 4 Africa: Developing LOCs) project.	ICLEI	<a href="http://africa.iclei.org/news-events/news-details/article/lusaka-city-council-prioritises-local-action-for-flooding.html">http://africa.iclei.org/news-events/news-details/article/lusaka-city-council-prioritises-local-action-for-flooding.html</a>

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