



Covenant of Mayors in Sub-Saharan Africa



RISK AND VULNERABILITY ASSESSMENT (RVA)

Lusaka City Council

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Abbreviations

CIP	Climate Information Platform
CoM SSA	Covenant of Mayors in Sub-Saharan Africa
CSAG	Climate Systems Analysis Group
DRM	Disaster Risk Management
EC	European Commission
EIZ	Engineering Institution of Zambia
EU	European Union
GCF	Green Climate Fund
GCoM	Global Covenant of Mayors for Climate & Energy
GDP	Gross Domestic Product
GHG	Greenhouse gases
HDI	Human Development Index
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre of the European Union
LAMU	Lusaka Apex Medical University
LCC	Lusaka City Council
LISWMC	Lusaka Integrated Solid Waste Management Company
LUDC	Lusaka Urban District Council
LWSC	Lusaka Water and Sewerage Company
MPL	Minimum Proficiency Level
MTENR	Ministry of Tourism, Environment and Natural Resources
NAP	National Adaptation Plan
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NMESP	National Malaria Elimination Strategic Plan
NWASCO	National Water Supply and Sanitation Council
RVA	Risk and Vulnerability Assessment
SDGs	Sustainable Development Goals
SEACAP	Sustainable Energy Access and Climate Action Plan
STEM	Science, Technology, Engineering and Mathematics
UNILUS	University of Lusaka
UNZA	University of Zambia
UTH	University Teaching Hospital
WARMA	Water Resources Management Authority
WASH	Water, Sanitation and Hygiene
WDC	Ward Development Committee

ZAOU	Zambian Open University
ZESCO	Zambia Electricity Supply Corporation Limited
ZMD	Zambia Meteorological Department

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1. Local government overview for Lusaka, Zambia

1.1. Country context

Zambia is located in south-central Africa, sharing borders with the Democratic Republic of Congo, Botswana, Namibia, Tanzania, Malawi, and Mozambique (Figure 1). The population is racially and ethnically diverse, with 73 distinct ethnic groups and is concentrated around the economic hubs of the capital city, Lusaka, in the south-central part of Zambia and the Copperbelt Province to the north (Figure 2). The country spans 752,617 km², with 9,220 km² of surface water coverage (1%). The climate is tropical with a rainy season (November to April) in summer and dry season (May to October) in winter. Over recent decades Zambia's climate has been highly variable with a series of climatic extremes (e.g. droughts, seasonal floods and flash floods, extreme temperatures and dry spells) which have occurred with increased frequency, intensity and magnitude. The impacts of these extremes on the country increasingly exert considerable stress on the country's vulnerable sectors, especially agriculture.

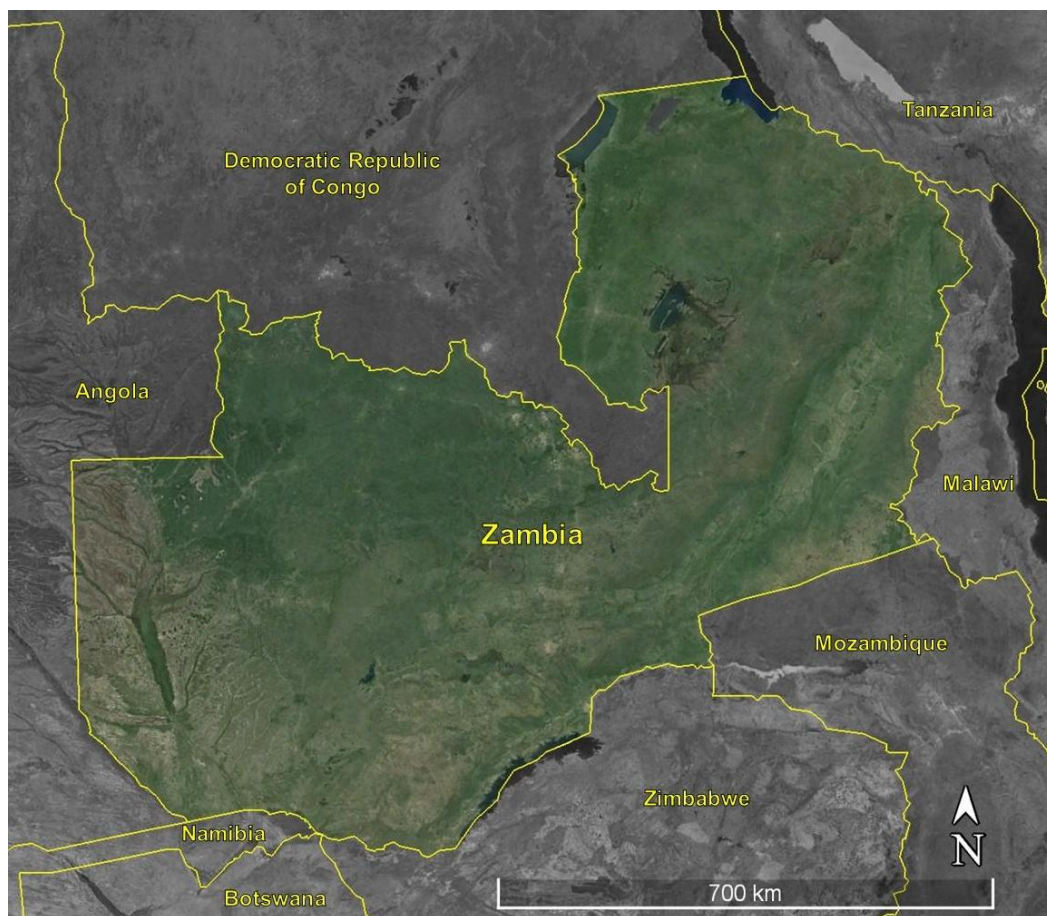


Figure 1. Map of Zambia (Google Earth; Data SIO, NOAA, U.S. Navy, NGA, GEBOO; Image Landsat/Copernicus).

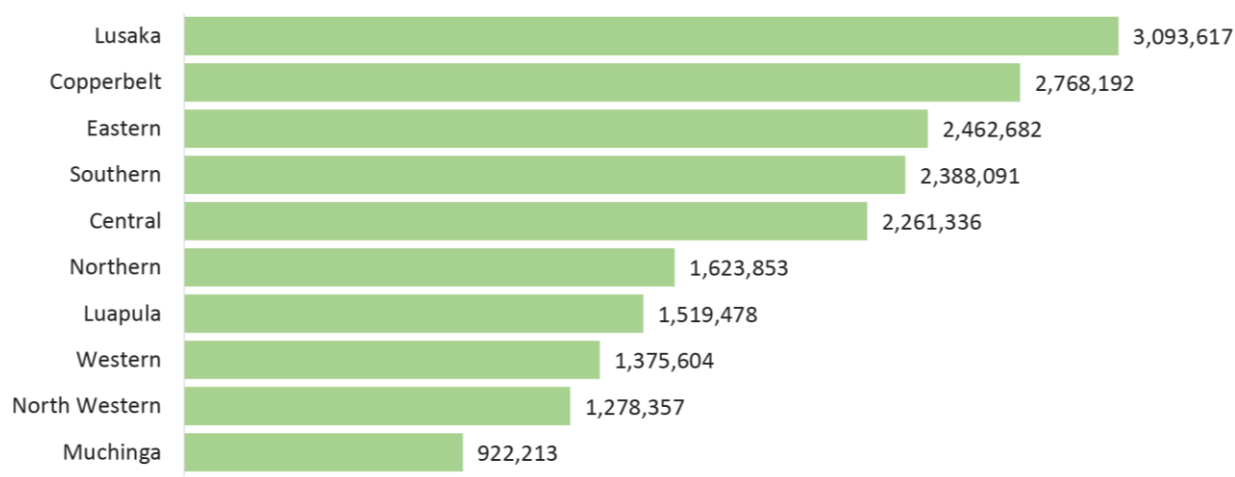


Figure 2. Zambia's population size by province (ZamStats, 2022).

Zambia has a GDP of \$83.687 billion and was classified by the World Bank as a low-income nation in 2022 due to persistently weak economic growth that worsened during the COVID-19 pandemic. In addition to the financial toll of the pandemic, recent droughts and floods have resulted in significant losses to the agriculture sector (Braithwaite *et al.*, 2018). Climate change is estimated to have lost Zambia's annual GDP growth of 0.4 percent, or US\$13.8 billion, between 2007 and 2016. According to the World Bank (2018), flooded fields, water scarcity, crop damage, and an increase in crop and livestock illnesses would be the main causes of the US\$2.2-3.1 billion in agricultural losses attributable to climate change over the next 10 to 20 years.

Population

Zambia's population of over 19.6 million people (ZamStats, 2022) is almost evenly divided into males (49%) and females (51%) and displayed a growth rate of 3.5% over the last decade with an HDI of 0.569. Roughly 56% of Zambia's population resides in rural regions, compared to 44% who live in cities or other metropolitan areas. Zambia's yearly rate of urbanization is around 4%. In Zambia, there are 34 cities with a population between 10,000 and 100,000, 7 cities with a population between 100,000 and 1 million, and 1 city with more than a million residents. Only 25% of the existing population has access to better sanitation, and it is predicted that 70% of people live in informal settlements (IWA, 2022). Despite Zambia's 98.10 males for every 100 girls sex ratio in 2021, the nation was placed in Group 3 on the Gender Development Index by the United Nations Development Programme in 2017 and was rated 125th out of 160 nations in the Gender Inequality Index in 2017.

1.2. City Context

Administration

The city of Lusaka, which is in the province of Lusaka (Figure 3), serves as both the provincial seat and the main administrative, financial, and commercial hub of the province. Lusaka is also the biggest city in Zambia, and the Lusaka district is home to over 2 million people (ZamStats, 2022), with the population of the metropolitan area estimated at over 3.5 million. Administration is undertaken through the Lusaka City Council (LCC) which has a political wing headed by the mayor and an administrative wing led by the Town Clerk and eight directors representing eight departments:

1. Department of Human Resource and Administration
2. Department of Legal Services
3. Department of Engineering Services
4. Department of City Planning
5. Department of Public Health
6. Department of Housing and Social Services
7. Department of Finance
8. Department of Valuation and Real Estate Management

With elected local leaders (councillors) serving as the Council's community representatives, LCC functions as a local authority and practices a form of representative local government. The LCC, a municipal body established under the municipal Government Act chapter 281 of the Laws of Zambia, elects the mayor. The delivery of public services is one of the main mandates and the councillors serve as a bridge between the community and the local government.

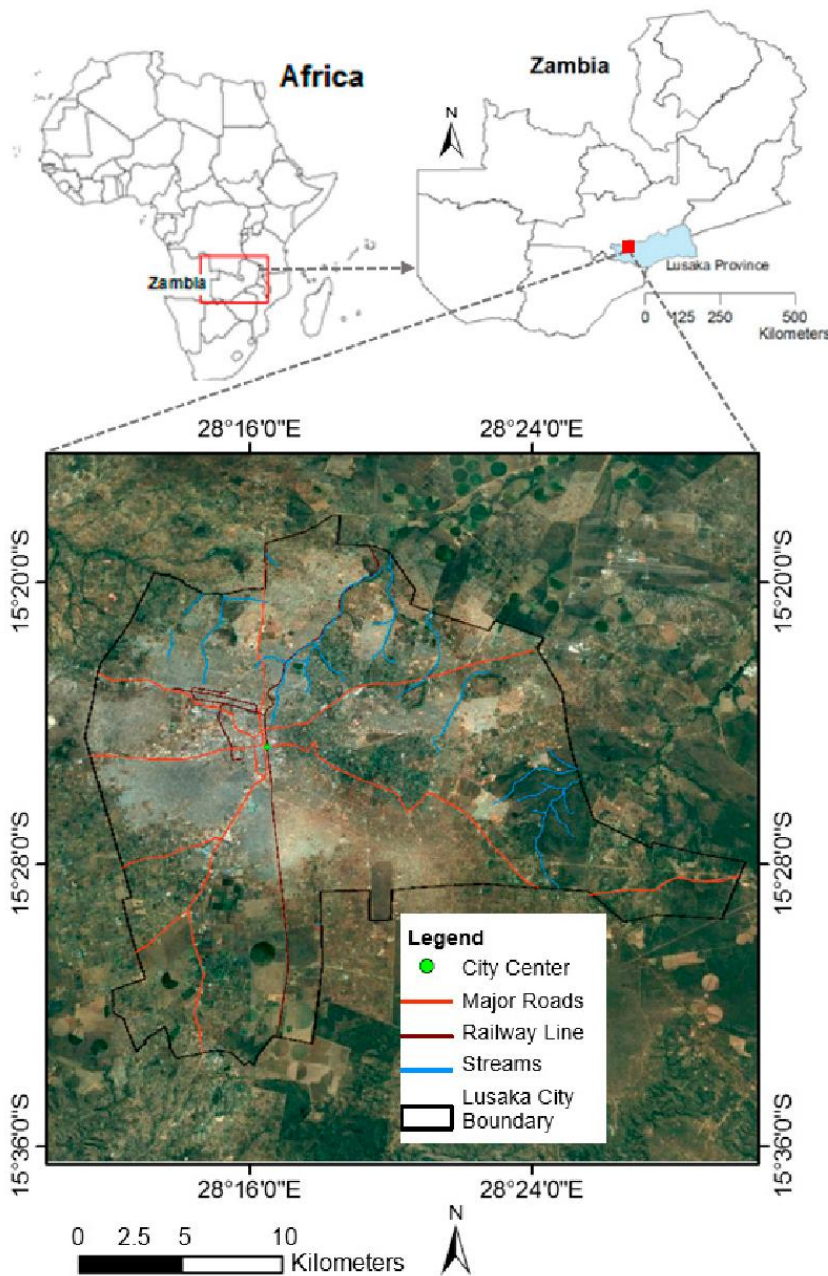


Figure 3. Lusaka Province and the city of Lusaka location and boundaries (Simwanda and Murayama, 2017).

Geography and Development

Lusaka is located on the plateau that forms most of Zambia's terrain, at an altitude of 1,280 m. The flat landscape and hard rock under Lusaka lead to flooding during the rainy season, and the dominance of non-clay soils result in reduced filtration of groundwater before entering aquifers. Though several rivers flow around Lusaka and a few streams flow through the city, surface water is limited, and no large water bodies are present in Lusaka. The Kafue River flows about 50km south of Lusaka, outside the city boundaries. Water is obtained from the Kafue River at an extraction rate of 10,500m³ /day, accounting for 50% of the city's water supply, the city obtains the remainder of its water supply from underground water and the pumping rate is 110,000 m³/day. The Kafue (Kafue Gorge) and Zambezi (Kariba Dam) rivers also generate most of the electricity for the city.

The city spans a 360 km² area, of which 84% is covered in urban development, with only 14% urban green space and less than 1% bare land (Nyimbili *et al.*, 2024). Lusaka city has experienced rapid unplanned and uncontrolled urbanisation resulting in poor urban land use distribution, unplanned settlements, overcrowding and congestion, urban poverty, poor living conditions as well as land degradation and environmental pollution (Simwanda *et al.*, 2020). Approximately 38.3% of Lusaka’s land that is in residential use is informal (Figure 4) and an estimated 70% of the population in Lusaka reside in the city’s 37 unplanned settlements (Ono and Muya, 2024). Lusaka’s informal settlements have a high population density of 148 people per ha (or 1.48 per km²), with the city having a built-up density of 95 people per ha (Chiwele *et al.*, 2022).

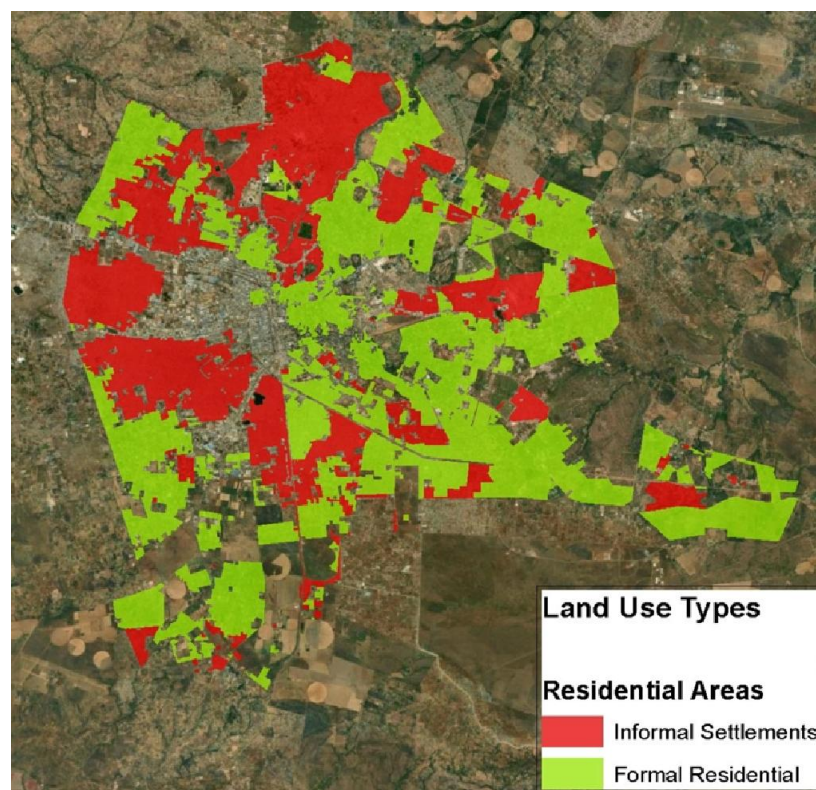


Figure 4. Informal and formal settlements in Lusaka (Chiwele *et al.*, 2022).

Economy and Employment

As the economic and financial hub of Zambia, Lusaka serves as the country's main gateway to the rest of the world and largest business centre. The economy of Lusaka province accounts for approximately 35% of national GDP (ZamStats, 2022). The city’s economy is dominated by the service sector, as well as wholesale and retail trade. The finance, insurance, real estate, transport, communications, energy, construction and manufacturing sectors form the predominant areas of employment in Lusaka. Urban agriculture, consisting of crop cultivation and animal husbandry, is also a key sector in Lusaka, though agriculturally productive land is being lost to urbanisation.

National budgeting in 2024 allocated the majority of expenditure to General Public Services and Economic Affairs (Table 1). Health and Education were allocated 11.8% and 15.4% respectively, and 0.8% was allocated to Environmental Protection. At the city level, the LCC approved a budget of 732 million Zambian Kwacha (~US\$28 million) for 2024, 14% larger than the 2023 budget.

Table 1. Zambia's 2024 National Budget allocations (PMRC, 2023).

Functions	2024 Budget	
	Amount (K)	% of Budget
General Public Services	58.93 billion	33.1
Defence	9.92 billion	5.6
Public Order and Safety	6.76 billion	3.8
Economic Affairs	39.76 billion	22.3

Environmental Protection	1.45 billion	0.8
Housing and Community Amenities	2.65 billion	1.5
Health	20.91 billion	11.8
Recreation, Culture and Religion	493 million	0.3
Education	27.35 billion	15.4
Social Protection	9.67 billion	5.4
Total	177.89 billion	100.0

Zambia's unemployment rate was 12.6% in 2022, with a youth unemployment rate of 18.8% (ZamStats and MLSS, 2022). Lusaka province holds the highest share of the working-age population at 23.1% and the province also holds both the highest share of the employed persons at 33.2% and employed youths at 32.6%. It is important to consider the dynamics of employment in Zambia's urban areas, with 66.5% of people in precarious employment¹ residing in the country's urban areas.

Healthcare

The city of Lusaka hosts two of Zambia's five national tertiary hospitals. The University Teaching Hospital (UTH) has 1655 beds and 250 baby cots and serves as the highest-level hospital in the area, also taking referrals from other health institutions around the country. The second tertiary hospital in Lusaka is Chainama Hills Mental Hospital, which has 210 beds and 167 unofficial "floor beds", and is Zambia's only psychiatric hospital. Significant progress has been made in the delivery of maternal and newborn health services over the last decade, with focused efforts to deliver better healthcare in the city's unplanned settlements (Jacobs *et al.*, 2024).

Outbreaks of cholera represent one of the most significant healthcare challenges in Zambia, with more than 30 outbreaks since 1977 (Mutale *et al.*, 2020). With its significant population size and density, the city of Lusaka is often a site for rapid progression of these outbreaks, with Lusaka city and the surrounding Lusaka district being identified as the most significant cholera hotspot in Zambia (Figure 5). Most recently, the 2023 cholera outbreak which occurred across southern Africa, spread to Lusaka in October 2023 where cases surged by 71.2% within a week along with a 175% increase in fatalities (UNICEF, 2024). The cholera outbreaks are often made more severe by climate impacts such as droughts and flooding (Libanda *et al.*, 2024). The impacts of the 2023 outbreak were initially compounded by the ongoing drought which led to water rationing in September 2023, with the inconsistent water supply resulting in people becoming more reliant on untreated shallow wells and boreholes, leading to continued exposure to contaminated water sources (Kateule *et al.*, 2024). In early January 2024, heavy rainfall resulted in flooding which hindered the delivery of healthcare and preventative interventions during outbreaks as road access was restricted. The flooding also exacerbated the outbreak as drinking water sources became contaminated as sanitation systems overflowed, and pit latrines were washed out (Kateule *et al.*, 2024).

¹ Precarious employment is where the verbal or written contract of employment is of a relatively short duration (less than three months) or a contract that can be terminated at short notice.

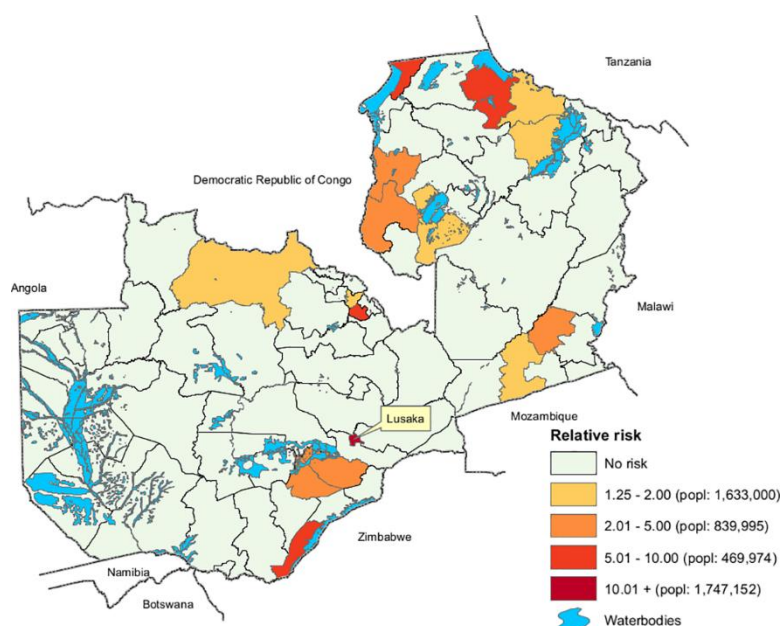


Figure 5. Spatiotemporal hotspots of cholera in Zambia, 2008–2017 (Mwaba et al., 2020).

In addition to the direct impact to human wellbeing, cholera outbreaks have significant socio-economic impacts, as service delivery and schooling are interrupted, and government financing is diverted to emergency interventions. The 2023 outbreak led to temporary prohibition of street vending and public gatherings and school closures of several weeks.

Zambia also faces healthcare challenges from malaria, which is endemic across the country and the country has faced a 27% increase in malaria cases due to extreme heat, harming maternal and newborn health (Lubinda *et al.*, 2021). Lusaka province has exhibited consistently low incidence of malaria (Shimaponda-Mataa *et al.*, 2017), but the impacts of the disease are still felt in the population, particularly women and the youth (Mwaba *et al.*, 2023). Zambia’s National Malaria Elimination Centre is in Lusaka and is implementing the National Malaria Elimination Strategic Plan 2022-2026 (NMESP) which has set ambitious targets to reduce malaria related morbidity and mortality nationally while pursuing subnational malaria elimination. The implementation NMESP has however been impacted by a shortfall of funding, securing only 18% of the US\$ 384,167,400.47 required for the 2022-2024 implementation period, requiring significant and rapid resource mobilisation efforts (MOH, 2022).

Education

Zambia has achieved near universal primary school completion levels national statistics indicate a completion rate of 91.8% at Grade 7, though the district of Lusaka had a lower average of 78.6% (UNICEF, 2021). Ensuring coverage of care, learning and education services remains persistently low for children in early years. Girls also continue to be at a disadvantage, with many dropping out of school in the upper primary and secondary grades, and poorer levels of transition to junior secondary and senior secondary levels. In 2022 schooling in Zambia was made free, but this has not been met with adequate resources, with some schools in Lusaka only having enough desks for 17% of their students (GPJ, 2024). Learning outcomes remain low, with only 10% of seventh grade students reaching minimum proficiency level (MPL) in reading and mathematics (UNESCO, 2024). Schooling is also negatively impacted during outbreaks of cholera as schools are closed to reduce exposure risk for the children. However, this often results in significant losses of schooling days which hinders the quality of education delivered, for example the 2023 outbreak saw school closures for over 5 weeks (ZOA-UK, 2024). Given the frequency of cholera outbreaks, these impacts can extend across a most of a child’s schooling period.

Several higher education institutions are present in Lusaka, including the University of Zambia (UNZA), University Teaching Hospital (UTH), University of Lusaka (UNILUS), Lusaka Apex Medical University (LAMU), and the Zambian

Open University (ZAOU) among others. The presence of several tertiary institutions in Lusaka results to significant proportion of the tertiary student population being concentrated in the city, with UNZA, UNILUS, LAMU and ZAOU accounting for 31% of the tertiary student base in 2022 (HEA, 2022). Tertiary education must still address the challenges of gender equality and promotion of the Science, Technology, Engineering and Mathematics (STEM) fields to ensure critical skills and knowledge are present. Across Zambia, there were 156,044 tertiary students in 2022 (HEA, 2022), of which 46% were female. STEM fields held the lowest number of students at 20% of all students and had a significantly low proportion of female students at only 14%.

1.3. Adaptation policy and commitments

The Government of Zambia is a party to the Sendai Framework as of 2015 and signed and ratified the Paris Agreement in 2016. The Government submitted its First National Communication (NC) on climate change to the UNFCCC in 2002, and its third NC in 2020. This was followed by the submission of an undated Nationally Determined Contribution in 2021 and a national adaptation plan for Zambia in 2023. Other national and local plans and policies integrate climate change, including the Constitution of Zambia (Table 2).

Table 2. Main national and local undertakings on adaptation.

Plan/strategy	Description
National	
Constitution of Zambia (2016)	The Constitution of Zambia was promulgated in 1991 and amended in 1996, 2009 and 2016. In article 257, the Constitution sets an obligation for the State to establish mechanisms that address climate change: “The State shall, in the utilisation of natural resources and management of the environment [...] establish and implement mechanisms that address climate change”.
Zambia’s Vision 2030 (2016)	Zambia Vision 2030 is a long-term perspective plan aims at attaining prosperous middle-income nation status by 2030 by creating an enabling environment for sustainable socio-economic development.
Zambia’s Nationally Determined Contribution (NDC) (2021)	Zambia’s NDC was first published in 2015, updated in 2021, will be updated in 2026 as part of the Paris Agreement. Adaptation actions in this NDC are focused on strategic productive systems (agriculture, wildlife and water), strategic infrastructure and health systems and enhanced capacity building, research, technology transfer and finance for adaptation. The country requires substantial resources to meet the means of implementation of these interventions.
Zambia’s National Adaptation Plan (2023)	Zambia’s National Adaptation Plan includes: <ul style="list-style-type: none"> - an overview of existing adaptation policies and programs - historical and projected climate change in the country -adaptation actions for droughts, floods, high temperatures and windstorms - synergies between adaptation options and DRR - integration of CC adaptation and gender in annual budgeting - strategy for implementing and monitoring the Zambia’s NAP <p>Adaptation options were evaluated across 10 criteria including institutional governance, social, environmental, gender, technical, cost effectiveness, and inclusiveness among others.</p>
National Policy on Climate Change (2016)	The Zambia National Policy on Climate Change is a cross-sectoral policy enacted in 2016, whose overall objective is to provide a framework for coordinating climate change programmes in order to ensure climate resilient and low carbon development pathways for sustainable development towards the attainment of Zambia's Vision 2030.
Climate Change gender action plan of	The objective of the plan is to ensure that Zambia’s climate change processes mainstream gender considerations to guarantee that women and men can have access

the Republic of Zambia (2018)	to, participate in, and benefit equally from climate change initiatives. It focuses in priority on sustainable agriculture and food security; Health; Forests, biodiversity and wildlife; Water security, Disaster risk reduction, preparedness and resilience; Infrastructure; Energy; and Tourism. It promotes policy reform and synergy; education and awareness-raising; academic research, sex-disaggregated data, and information dissemination—both for public awareness and to inform policy; and capacity building and training.
National Climate Change Learning Strategy of Zambia (2020)	<p>This document systematically examines the country's learning and skills development needs to respond to the impacts of climate change. It aims to strengthen individual and institutional systemic capacities of the energy, health, forestry, agriculture and education sectors to enable them deliver climate change learning and contribute to the implementation of the NDC and NAPs.</p> <p>The strategy covers the period up to 2030. Priority actions are phrased as short term (1-2 years); medium term (3-5 years); and long term (6-10 years). Each of the five sectors will deal with the three national priority actions: 1) awareness raising and knowledge strengthening; 2) individual and institutional capacity building and 3) mainstreaming climate change learning into the priority sector policies and systems in the short-, medium- and long-terms.</p>
Zambia's National Strategy to Reduce Emissions from Deforestation and Forest Degradation (REDD+) (2016)	REDD+ is a global mechanism established under the UNFCCC to reduce emissions from tropical deforestation and degradation in developing countries. Zambia identified REDD+ as a mechanism to reduce the country's high rate of deforestation, while simultaneously promoting local conservation, forest resources management, sustainable community development and poverty reduction.
National Climate Change Response Strategy (NCCRS) (2010)	The National Climate Change Response Strategy aims to make the country climate resilient and help fulfil the development priorities as listed under the National Long Term Vision 2030. Zambia's NCCRS identifies agriculture, food security, fisheries, water, forestry, wildlife, health, mining, tourism, human settlements, and physical infrastructure as priority sectors for adaptation based on their economic vulnerability and national development priorities.
The Water Resources Management Act, 2011	This Act establishes the Water Resources Management Authority and defines its functions and powers, provides for the management, development, conservation, protection and preservation of the water resource and its ecosystems, and details rules organising commercial and private consumption. It seeks to adapt water systems management to a changing climate and charges the government and other state actors to take specific action accordingly.
Disaster Management Act no 13/2010 (2010)	<p>The Disaster Management act establishes a framework for the management of natural disasters. Several measures of prevention, preparedness, coordination and mitigation are defined to deal with natural emergencies (flood, erosion, wildfires, etc) at national and provincial levels. These include disaster management plans, declarations of disasters and recovery plans.</p> <p>The act further establishes the National Disaster Management and Mitigation Unit and the National Disaster Relief Trust Fund. It sets these institutions' respective missions and prerogatives.</p>
The National Disaster Management Policy (2015)	The main goals of the policy are to: 1)develop and implement Disaster Risk Management (DRM) plans, 2) strengthen horizontal and vertical coordination mechanisms, 3) develop an integrated disaster risk management information and communication system in order to enhance timely decision making, 4) establish monitoring and evaluation mechanisms to ensure prudent utilization of resources, 5) coordinate research and activities relevant to DRM in order to advise the Disaster Management structures at different levels, 6) provide administrative, logistical and management support services, and 7) put in place appropriate measures to respond to

	climatic changes such as implementing public educational and information programmes.
Second National Biodiversity Strategy and Action Plan 2015-2025 (2015)	This document sets the government's strategy and implementation actions for biodiversity conservation over the period 2015-2025. It incorporates climate resilient principles to improve conservation efforts. It further aims to protect forests, recognising their water and climate regulation functions.
Local	
Comprehensive Urban Development Plan	In progress
Lusaka Sanitation Master Plan (2011-2030)	The Master Plan provides a strategy for 100% coverage of Lusaka Province—in both off-site (sewers) and on-site sanitation—by 2035. The Lusaka Sanitation Program is one of the first steps towards implementing the Lusaka Sanitation Master Plan with the aim of providing adequate sanitation facilities to all urban citizens of Lusaka Province, starting with investments in Lusaka City.
Proposed Land Use Plan 2030 for Greater Lusaka	The land use plan for Greater Lusaka is formulated to target population and employment towards 2030. It is anticipated that gradual dense residential development and effective foundation for economic development, led by industrial zones and competitive urban centre development, are fundamental elements for the land use plan, while vulnerable water system with greenery network will be protected and formulated.

1.4. Key stakeholders, their roles and responsibilities

The Department of Environment and Natural Resources, under the Ministry of Tourism, Environment and Natural Resources (MTENR), is the climate change focal point under the United Nations Framework Convention on Climate Change. The Climate Change Facilitation Unit, established by the MTENR, serves to strengthen national coordination of all efforts related to climate change, including integrating climate change into national strategic planning.

The ministry of Green Economy and Environment is the National Designated Authority in Zambia for the Green Climate Fund (GCF) and is responsible for overseeing all GCF-related activities in the country. The Development Bank of Zambia and the Zambia National Commercial Bank PLC are the fund's Direct Access Accredited Entities. The Disaster Mitigation and Management Unit, housed by the Office of the Vice President, focuses on strengthening national capacity for effective disaster preparation, response, mitigation, and rehabilitation.

The Zambia Meteorological Department (ZMD) is the country's primary provider of meteorological services. The department is charged with monitoring, predicting, analysing, and providing weather and climate change-related data and information, as well as providing advice and assessments for related policy formulation. At the Lusaka City Council, a climate change focal point is in charge of climate projects development and implementation.

2. The Covenant of Mayors Sub-Saharan Africa and Sustainable Energy Access and Climate Action Plans

2.1. The Covenant of Mayors in Sub-Saharan Africa (CoM SSA)

The Covenant of Mayors in Sub-Saharan Africa (CoM SSA) is an initiative launched by the European Union (EU) to support local authorities in sub-Saharan Africa in the climate challenge and in their efforts to ensure access to clean

energy. It is the “regional covenant” or chapter of the Global Covenant of Mayors for Climate & Energy. CoM SSA is delivered through a partnership of global and local city networks as well as initiatives funded by the European Commission (EC). It is a bottom-up and voluntary initiative that invites cities to define and meet ambitious and realistic energy access and climate targets set by themselves, in line with GCoM requirements. This means that targets are at least as ambitious as cities’ respective government’s Nationally Determined Contribution (NDC) under the Paris Agreement. Furthermore, targets need to be in line with National Adaptation Plans (where these exist) and be consistent with the principles around energy access and urban sustainability embodied in the Sustainable Development Goals (SDGs). Local authorities are encouraged to voluntarily commit to the implementation of a climate and energy action plan in their area of influence. They are also encouraged to define long-term vision actions towards a sustainable future based on the pillars of climate change mitigation and adaptation, and sustainable, affordable, and secure access to energy. CoM SSA is open to any city in sub-Saharan Africa, regardless of the size. In order to translate the political commitment into practical measures, CoM SSA signatories commit to producing and implementing a strategic and operational document called the Sustainable Energy Access and Climate Action Plan (SEACAP).

2.2. The Sustainable Energy Access and Climate Action Plans (SEACAPs)

The Sustainable Energy Access and Climate Action Plan (SEACAP) is the key document that sets the strategies, plans, and actions for a sustainable and low greenhouse gas (GHG) emission development pathway, while including climate adaptation actions and ensuring access to secure, affordable and sustainable energy, in response to the current and future impacts of climate change in the region. The SEACAP is both a strategic and an operational document. It uses the results of the Baseline Emissions Inventory (BEI) to identify the best fields of action and opportunities for reaching the local authority’s greenhouse gas (GHG) emission reduction targets. It is based on the climate change Risk and Vulnerability Assessment (RVA), which identifies the most relevant city climate hazards and vulnerabilities. It also includes an Access to Energy Assessment, which articulates a plan to improve the access to secure, sustainable, affordable and reliable energy. The SEACAP defines concrete measures for climate mitigation, adaptation and access to sustainable energy, with timeframes and assigned responsibilities, translating the long-term strategy into action.

2.3. Development phases of the SEACAP with respect to the Adaptation pillar

The Adaptation pillar of the SEACAP development involves four phases:

- i. **Initiation phase** – Activities in this phase include the identification of national action plans on adaptation, mobilising and engaging stakeholders, and affirming political commitment to the SEACAP development from the heads of the municipality and the national government.
- ii. **Planning phase** – This phase includes pre-assessment and development stages. Thus, it involves developing a Risk and Vulnerability Assessment (RVA) (this document) which highlights the climate hazards that affect a local government and indicates the sectors and population groups within the city most heavily impacted by climate hazards. The RVA offers an opportunity for local government authorities to obtain data specific to the local government, thus increasing awareness of the current status and providing a premise for further action to improve the status quo. After the development of the RVA, targets are set for each sector particularly vulnerable to climate change, and thereafter actions are set to achieve these targets.
- iii. **Implementation phase** – This phase involves delivering practical actions, starting with the ones identified as priority in the planning phase. All the information necessary to implement these actions is collected, funding is secured (either internally or from external sources) and a project management approach is adopted – including deadline control, financial control, planning and risk management.
- iv. **Monitoring and Reporting phase** – This phase involves reviewing progress and re-adjusting priorities. The proposed actions are monitored to ensure that the targets are achieved in this phase. Specific procedures and processes for each of the actions are confirmed, while maintaining constant communication with the stakeholders throughout. On a regular basis, progress is assessed, and priorities are adjusted as needed to fit

the current situation. A progress report is submitted every second year after the SEACAP was developed, for monitoring and evaluation.

This document constitutes the Risk and Vulnerability Assessment, the baseline assessment for the Adaptation pillar. It will be used to set climate change adaptation targets as well as guide the development of actions to reduce vulnerability to the impacts of climate change and enhance resilience in Lusaka, Zambia.

2.4. The purpose of the Risk and Vulnerability Assessment

The RVA examines the nature and extent of a risk by analysing potential hazards that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend and assesses their vulnerability (IPCC, 2014). This can take the form of a single assessment or various assessments undertaken per sector. RVAs are the most commonly used tools for identifying, quantifying and prioritising key risks of a system to climate change.

3. RVA methodology

The Lusaka RVA was developed according to the recommendations of the Guide How to develop a Sustainable Energy Access and Climate Action Plan (SEACAP) in sub-Saharan Africa (Palermo, V. et al., 2018), which sets out the methodology and reporting framework for developing a SEACAP. The Lusaka RVA is part of the preliminary studies required in the SEACAP development framework.

Data collection for the Lusaka RVA was carried out using a mixed qualitative and quantitative approach combining: (i) scientific data obtained from the meteorological station located in Lusaka; (ii) a literature review incorporating the various existing national and local plans and strategies; and (iii) a participatory workshop with relevant local stakeholders. All the RVA data is the result of triangulation between documentary data and the results of the participatory workshops, as illustrated below.

3.1. Scientific data

The scientific data for the RVA are compiled primarily from two sources: (i) records from the Lusaka meteorological station through the Climate Information Platform (CSAG, 2022), and (ii) the Nationally Determined Contribution of the Government of Lusaka (2021). The scientific data was used to map the current climate of Lusaka and anticipate its evolution, as well as to confirm the participatory assessment of climate hazards affecting the city now and in the future.

3.2. Literature review

A literature review was conducted to collect information from various existing documentary sources. For instance, previous projects reports, sectoral reports and public policy documents at international, regional, national and local levels were studied. The main documentary sources used for this report are the:

- Zambia's National Adaptation Plan (2023)
- Technical reports from FRACTAL, FRACTAL-Plus and LuWSI projects in Lusaka

The study of these documents supplemented the climate data and helped to refine the participatory assessment of vulnerable sectors and populations.

3.3. Participatory RVA workshops

The participatory RVA workshop was held on 10 April 2024 in Lusaka. The event had 39 attendees, of whom 26 were city officials and 16 were women. The Lusaka City Council was well represented, with the mayor as well as several councillors participating in the event, along with representatives from the Legal, Development, and Environmental departments. Other organisations represented were:

- Ministry of Finance
- Lusaka Province Planning Authority
- Ward Development Committee (WDC)
- Lusaka Integrated Solid Waste Management Company (LISWMC)
- Water Resources Management Authority (WARMA)
- National Water Supply and Sanitation Council (NWASCO)
- Zambia Electricity Supply Corporation Limited (ZESCO)
- Engineering Institution of Zambia (EIZ)
- Zambia National Women's Lobby
- Zambia Statistics Agency
- University of Zambia (UNZA)
- University of Lusaka

The participants were introduced to critical climate change concepts before carrying out the RVA activities to ensure a shared technical understanding of all stakeholders. Gathering the RVA data was carried out in a participatory process, with all stakeholders engaged to identify the climate risks as well as vulnerable sectors and population groups in their city. They were guided to critically assess the impacts of climate hazards in their city, with consideration of both primary and secondary impacts. This participatory assessment of climate risk and vulnerabilities was designed to support the SEACAP development process.

4. Climate history and projected climate change

4.1. Climate history

Zambia experiences a predominantly sub-tropical climate characterized by three distinct seasons: a hot and dry season (mid-August to mid-November), a wet rainy season (mid-November to April) and a cool dry season (May to mid-August). Average mean temperatures range from 18°C in July to 25°C in September and is highly variable and moderated by elevation. Rainfall is strongly influenced by the movement of the Inter-Tropical Convergence Zone (ITCZ) as well as the El Niño/Southern Oscillation (ENSO) phenomenon and varies from an annual average of 600 mm in the lower south up to 1,300 mm in the upper north of the country. El Niño conditions (warm phase) bring drier than average conditions in the wet summer months (December-February) in the southern half of the country, whilst the north of the country simultaneously experiences significantly wetter than average conditions. The opposite happens with La Niña conditions (cold phase) (World Bank, 2024).

Historical data show that the mean annual temperatures in the country have increased on average by 0.29°C since the 1960s, or a total of 1.6°C. Between 1971 and 2005, annual rainfall declined by 6% (or 58mm) compared to the prior 30-year baseline period (Government of the Republic of Zambia, 2020).

Lusaka has a dry climate for most of the year and a rainy season that lasts for four months. The average temperature in Lusaka has been increasing over the period 1979-2023 (Figure 6) and currently ranges between 19.60°C July and 28.90°C in September.

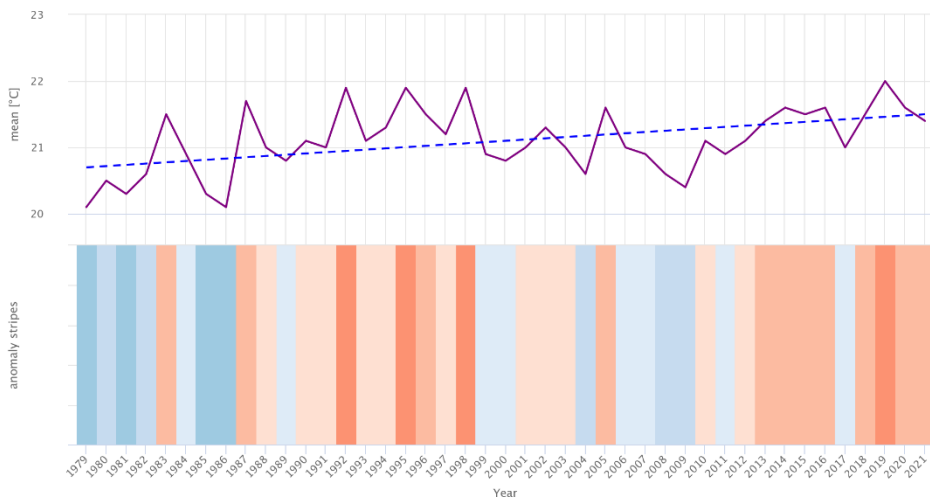


Figure 6. Mean yearly temperature, trend and anomaly for 1979 to 2023 in Lusaka (CIP, 2024).

The average rainfall for Lusaka is 650mm per year, with the highest rainfall during January an average of 220mm. The summer is characterised with periods of thunderstorm activity that often lasts for more than a week. Humidity rises to about 84% during January and averages a monthly 62.8% during the remainder of the year. The annual average evapotranspiration is 2218mm.

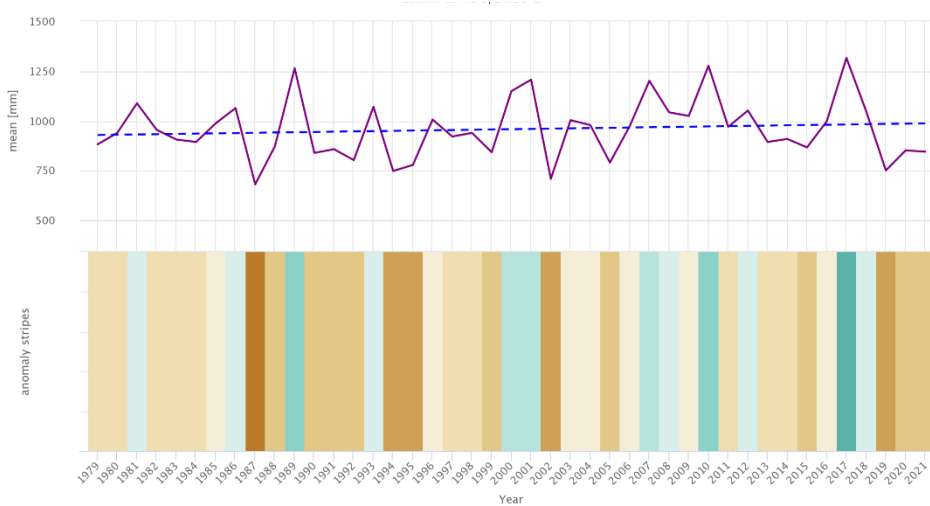


Figure 7. Mean yearly precipitation, trend and anomaly for 1979 to 2023 in Lusaka (CIP, 2024).

4.2. Projected climate change

According to Zambia’s National Adaptation Plan (2023), if the current national carbon dioxide emissions continue to increase at the same rate, the average temperature in the Lusaka Province is expected to increase by 2 to 3°C by 2050, and rainfall is expected to decrease by up to 35% by 2100.

At the local level, the RegCM AMMA-Ensemble model² also predicts a significant increase in temperature in Lusaka by 2060 under RCP 8.5³, as shown in the graph below. The red blocks represent projected increases in mean monthly temperature, showing that each month of the year will likely be 1 to 2.5°C warmer on average during the period 2040-2060 compared to the period 1979-2000 (Figure 8).

² Each black curve indicates the output of a different climate model (11 climate models in total) based on the Maputo meteorological station data.

³ RCP 8.5 is an IPCC scenario in which emissions continue to rise throughout the twenty-first century.

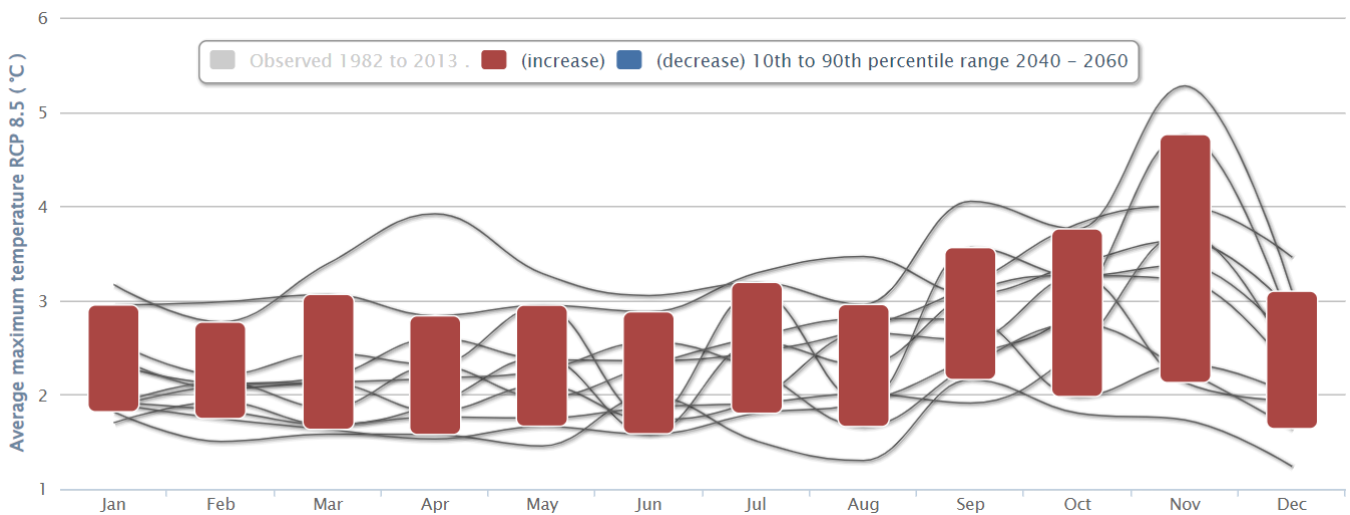


Figure 8. Average maximum temperature (°C) in Lusaka for the period 2040-2060 under RCP 8.5 scenario (CIP, 2024).

Over the year for Lusaka, data show a likely sharp drop in rainfall for the months of March, April and November (around -30 mm of rain) in the period 2040–2060 compared to the period 1979–2000 (Figure 9). The projections also indicate a shift in the rainy season towards the beginning and end of the year, with more rainfall likely falling in the city in January. The red blocks represent projected decreases in mean monthly rainfall (up to 40 mm in November) while the blue blocks represent projected increases in mean monthly rainfall (up to 45 mm in January) for the period 2040-2060 compared to the period 1979-2000.

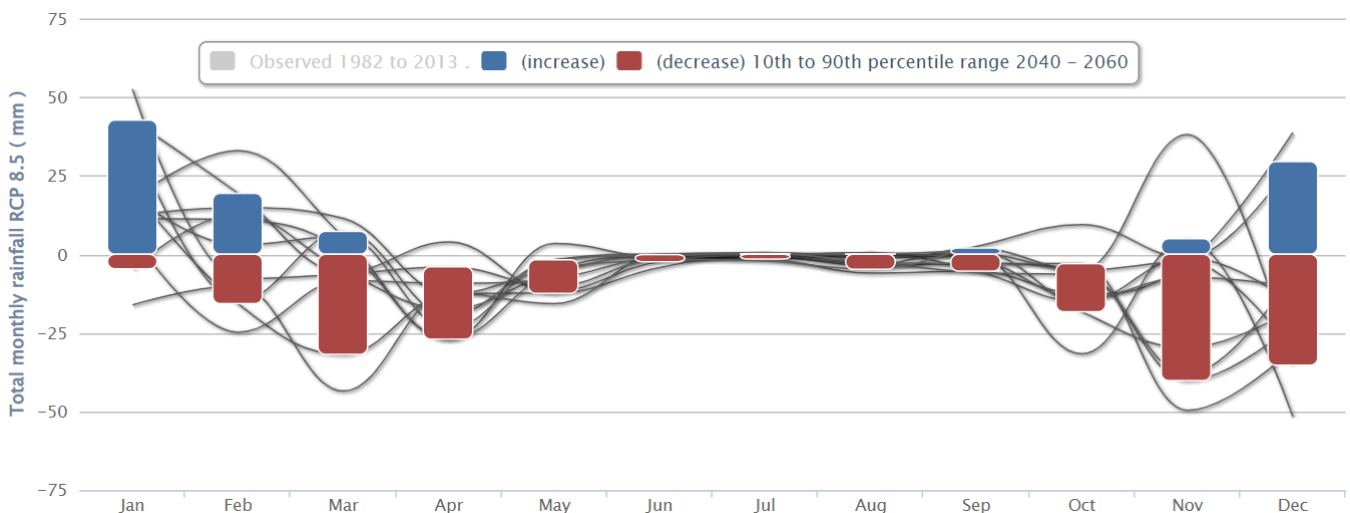


Figure 9. Total monthly rainfall (mm) in Lusaka for the period 2040-2060 under RCP 8.5 scenario (CIP, 2024).

5. Climate hazards and their impact

5.1. Current climate hazards

Zambia is predominantly affected by the impacts of floods and the linked secondary impacts such as cholera epidemics, as well as droughts (Figure 10). Floods and droughts have increased in frequency over the past three decades, costing the nation an estimated 0.4% in annual economic growth. Flooding generally occurs in the rainy season, particularly from December to February when high intensity precipitation events are most prominent.

Zambia’s National Adaptation Plan (NAP, 2023) identifies droughts, floods, high temperatures and windstorms as the primary hazards for which adaptation actions are needed.

Most recently, a national state of emergency was declared in February 2024 due to severe drought, with the country experiencing the driest agricultural season in more than forty years. In the last thirty years, Zambia suffered from droughts on average once every two years. Droughts are particularly problematic for the country’s hydro-power sector, as hydropower constitutes 85% of the overall electricity generation in Zambia. Most hydro- power is generated in the southwest of the country along the Zambezi River and its tributaries, most notably at Kariba dam and Kafue Gorge. During the 2019/2020 southern Africa droughts, the Kariba hydropower output was cut as the Zambezi River was near its lowest level in half a century, causing elevated electricity prices, blackouts for seventeen million people and impeding national economic growth (Trace, 2019).

Attributed to the effects of the 2023/2024 El Nino event, the rainfall season was characterized by late onset, prolonged dry spells, and high temperatures (WFP, 2024). In the previous year, the country experienced the most severe flooding in over 50 years following heavy rainfall and thunderstorms. The country also experiences frequent cholera outbreaks, often linked to or exacerbated by the impacts of climate hazards, such shortages of clean water during droughts and contamination clean water and dispersion of the disease during floods.

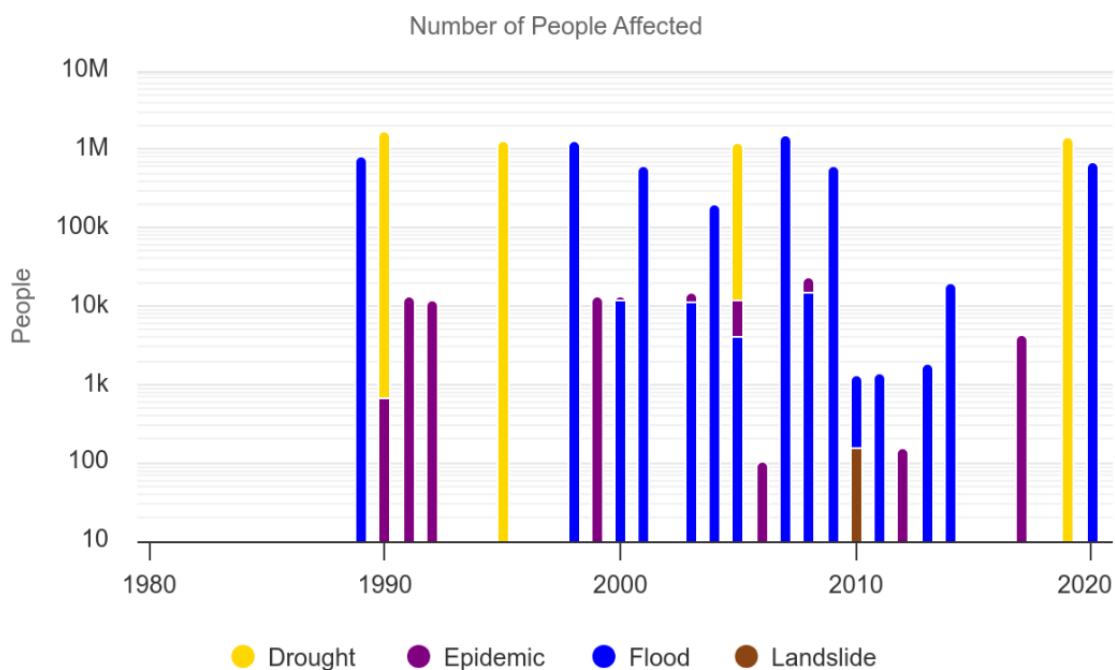


Figure 10. Zambia's key natural hazard statistics from 1980-2020 (World Bank, 2024).

The city of Lusaka experiences climate hazards in alignment with national trends. Participants at the RVA workshop identified drought, floods and heatwaves as the primary hazards observed in the city, with several associated secondary hazards also noted (Table 3). The city was exposed to the impacts of the 2022/2023 floods, requiring relocation of flood victims in the city. The 2023/2024 drought impacted the city in the form of restricted water supply and loss of urban agriculture as well as disrupted energy supply and a severe cholera outbreak that was worsened by localised flooding.

Table 3. Current climate hazards observed in Lusaka.

Hazards	Observed in Lusaka [Yes or No]
Extreme heat	
Drought	Yes
Heatwave	Yes
Extreme precipitation	
Rainstorm	Yes
Fog	No
Hail	No
Storm and Winds	
Severe Wind	Yes
Tornado	No
Cyclone (Hurricane/Typhoon)	No
Lightning/Thunderstorm	Yes
Floods	
Flash flood/surface flood	Yes
River flood	No
Groundwater flood	Yes
Permanent inundation ⁴	No
Other	
Landslide	Yes
Forest/Land fire	No
Vector-borne diseases	Yes
Saltwater intrusion	No
Cold waves	Yes

5.2. Impact of current climate hazards

In the RVA workshop, the participants assessed the impact of drought, floods and heatwaves on the city of Lusaka (Table 4). Floods and droughts were considered most critical through their respective frequency and intensity, and all hazards were noted to have long-term impacts on the city’s people and sectors.

Table 4. Extent of the impact of climate hazards affecting Lusaka.

Climate hazard	Frequency	Intensity	Timeframe
Heatwaves	1	3	Short-, medium- and long-term
Floods	3	2	Long-term
Droughts	2	3	Short-, medium- and long-term

Droughts have resulted in crop failure which has contributed to rising food insecurity. The reduced availability of water during droughts has impacted energy production through hydropower and resulted in limited energy access. As open land within and around the city has dried out during droughts, dust became a prevalent challenge, with implications for air quality and subsequently respiratory health of people in Lusaka. Water rationing during droughts has also impacted industrial productivity in the city which contributes to job losses and growing poverty.

⁴ Due to sea-level rise

The industrial processes that have continued to function during droughts have often done so with increased costs resulting in rising process of food and other products.

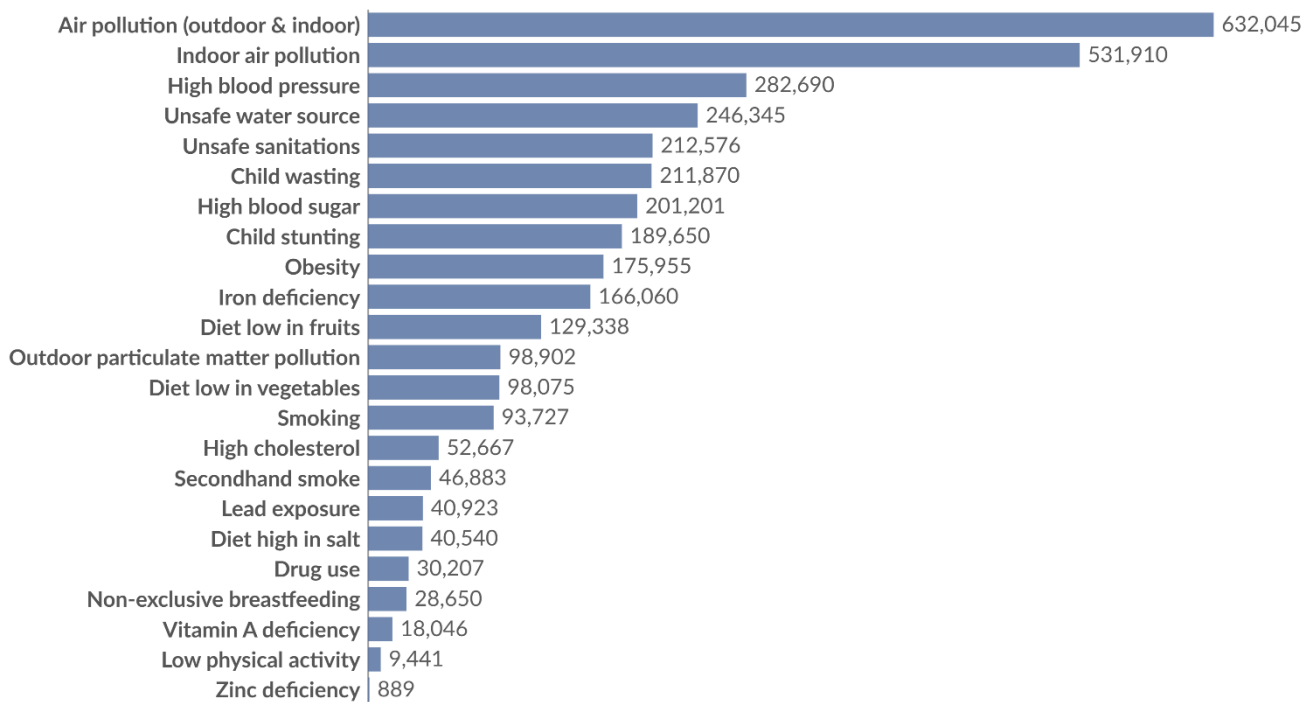
In Lusaka, floods have resulted in overflowing of on-site sanitation systems such as septic tanks and pit latrines, spreading waste and contaminating fresh water sources and contributing to the spread of waterborne diseases. Submerged roads and bridges during floods prevented delivery of emergency response and hindering schooling, service delivery and other socio-economic activities in the city. Houses have been flooded leading to damaged personal property across the city. In intense cases, floods have also resulted in direct loss of life in Lusaka. The participants noted that flooding has become an annual occurrence, requiring intervention to address these impacts each year and contributing to significant increase in government expenditure.

Heatwaves have contributed to numerous challenges in Lusaka with impacts often connected to drought effects (Irudukunda *et al.*, 2023). Human health has been impacted as heatwaves have intensified the severity of cardiovascular and respiratory diseases and conditions, as well as diabetes. Pregnant women and overweight individuals have also struggled with health impacts during heatwaves in Lusaka. Heatwaves have impacted water security in the city, as water rationing has resulted in erratic piped water supply and ground and surface water sources have dried out. Erratic water supply has resulted in increased risk of cholera and typhoid in the city. Food security has also been significantly impacted through crop failure, water rationing and increased need for refrigeration. Limited water availability and rationing during heatwaves also impacts the city's economic functioning by hampering hydropower production.

Lusaka experiences extensive impacts from climate hazards that often result in compounding effects through the sequence of their occurrence. The city often oscillates between the extremes of drought and flood in a pattern of increasing frequency. The long-term water insecurity through periods of drought and contamination during floods, which often occur in sequence, has had far-reaching health and socio-economic impacts in Lusaka.

The city carries a significant burden of disease as a result of the impact of the climate hazards, through a variety of direct and indirect impacts on health. Water and food insecurity impact nutrition and development, while high temperatures can lead to heat stroke and aggravation of existing cardiorespiratory conditions and can also impact the wellbeing of people with diabetes and the pregnant population. Secondary impacts of floods such as cholera outbreaks add to the burden of disease and contribute to the spread of vector-borne diseases such as malaria by increased availability of stagnant water for mosquitoes. This reflects trends of burden of disease at the national level (Figure 11), with significant impacts from air pollution, unsafe water and sanitation, as well as conditions that are impacted by heat such as high blood pressure, and conditions associated with malnutrition.

Disease burden is measured as Disability-Adjusted Life Years (DALYs). One DALY is the equivalent of losing one year in good health because of either premature mortality or disability. One DALY represents one lost year of healthy life.



Data source: IHME, Global Burden of Disease (2024)

OurWorldinData.org/burden-of-disease | CC BY

Figure 11. Disease burden by risk factor, Zambia 2021 (Roser *et al.*, 2021).

5.3. Future climate hazards

The participants' assessment of predicted changes in frequency and intensity of drought, floods and heatwave hazards is predominantly aligned with national data (Table 5). As described in Section 4.2, trends of rising temperatures and decreased annual rainfall support the assessment of the participants that drought events will likely become more severe while remaining confined to the early summer months (Sep–Dec). The rising temperatures are expected to increase severity and frequency of heatwaves, aligned with findings of the participants. Heat risk is projected to increase severely across the Lusaka province, with marked increase in severity from 2040 onwards (Figure 12). Projections described in section 4.2 show rainfall decreasing in the early months of the rainy season Flooding (Oct–Dec) but increasing in the later months (Jan and Feb).

Despite an overall decrease in annual rainfall, the narrowing and intensification of the rainfall window is expected to drive an increase in flooding, with more heavy rainfall occurring over a shorter period. Flooding becomes more likely and severe as these high volumes of precipitation cannot infiltrate quickly, exacerbated by drying of ground and dieback of greenery under hotter and drier conditions in early summer. Land use change and insufficient urban drainage systems in the city will also likely continue to drive increased flood impacts without intervention.

Table 5. Predicted future trends in the frequency, intensity and timescale of climate hazards in Lusaka.

Climate hazard	Expected change of intensity	Expected change of frequency	Timescale	Description of the expected impacts by the participants	Alignment with national/local data
Drought	Increase	No change	Long-term	Droughts will have gradually greater impacts in the long-term, driving increased water and food insecurity. Health impacts will also increase and socio-economic function in the city will be further hindered.	Average temperature is projected to increase by 2–3°C by 2050s but changes will be most evident in next decades (NAP, 2023). Projections show annual rainfall to remain at current levels to decreasing, ranging from no change to a clear decrease of up to 35% by 2100. Changes may become evident from the 2040s (NAP, 2023).
Floods	No change	No change	Medium-term	Floods are expected to continue along current trends for the medium-term. Their almost annual occurrence and impacts on health are expected to persist.	Projections for the number of heavy rainfall days per year show no consistent signal. The number of rainy days per year is projected to remain at current levels or decrease, ranging from no change to decreasing by 2050, and generally decreasing by up to 35% by 2100 (NAP, 2023).
Heatwaves	Increase	Increase	Short term	It is expected that heatwave impacts will increase, contributing to water and food insecurity. Health impacts will increase, and livelihoods will be threatened as costs of goods and services rise with rising need for air conditioning and refrigeration.	As with drought, average temperature is projected to increase by 2–3°C by the 2050s but changes will be most evident in next decades (NAP, 2023).

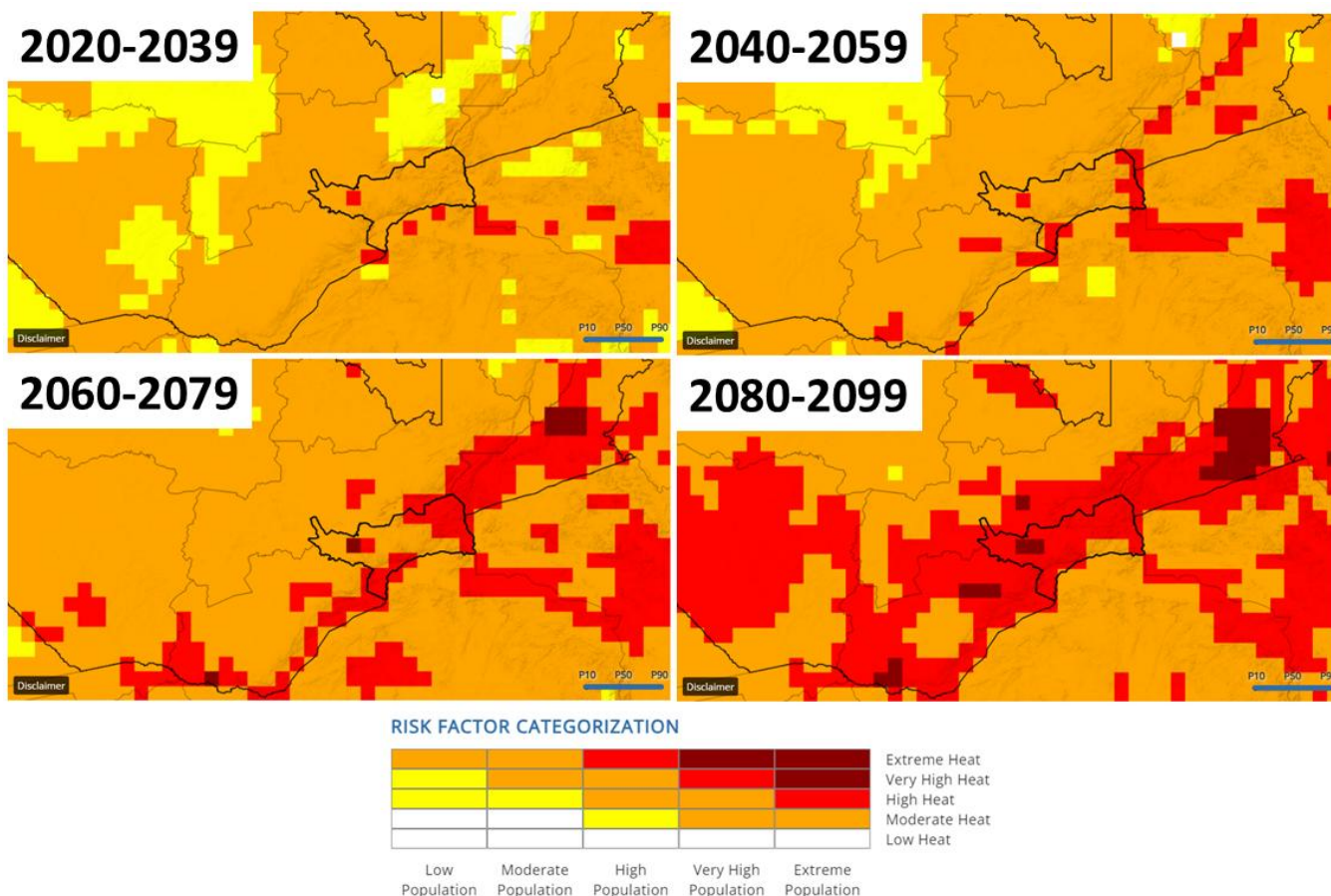


Figure 12. Categorization of Temperature-Based Heat + Population Risk Categorization for Lusaka Province, Zambia for the next century; (Ref. Period: 1995-2014), SSP5-8.5, 50th percentile (World Bank, 2024).

6. Impact of climate hazards on sectors and population groups

6.1. Impact of climate hazards on sectors

The participants assessed the magnitude of the key climate hazards on different sectors in Lusaka (Table 6) and described how each sector is impacted. The highest impacts were attributed to the energy, water, waste, health, civil protection and emergency, and agriculture and forestry sectors. The buildings, transport, and land use planning sectors were attributed the lowest impacts by the participants.

Table 6. Magnitude of the impact of climate hazards on sectors in Lusaka, rated high (3), moderate (2) or low (1).

Climate hazard	Building	Transport	Energy	Water	Waste	Land use planning	Agriculture and forestry	Environment and biodiversity	Health	Civil protection and emergency
Droughts	0	0	3	3	2	0	3	3	3	1
Floods	1	2	2	3	3	3	1	2	3	3
Heatwaves	0	0	3	3	3	0	3	0	3	3
TOTAL	1	3	8	9	8	3	7	5	9	7

The participants highlighted how drought would have widespread and severe impacts across various sectors in Lusaka. Droughts threaten the energy sector given the significant reliance on hydropower in Zambia, jeopardising energy security and driving greater use of coal for energy generation during times of water scarcity. This assessment is aligned with estimations of drought disasters leading to annual economic loss of US\$45 million through decreases in hydropower production (CIMA and UNDRR, 2019). The energy sector impacts cascade into the agriculture and forestry sector in the form of rising deforestation as people seek out alternative fuel sources during times of energy insecurity. Water scarcity also results in crop failure, impacting food security in Lusaka as a city with a notable level of urban agriculture. The impacts of water scarcity extend beyond agricultural flora, impacting the environmental and biodiversity sector as local flora and fauna are threatened during droughts. Dry environments are susceptible to erosion and result in increased dust, reducing air quality in the city which has consequences for the health sector as people with respiratory conditions are affected. Dehydration and malnutrition are also significant challenges during droughts due to water and food insecurity. Currently, the Lusaka Water and Sewerage Company (LWSC) is only able to supply roughly 52% of the water needed for Lusaka's rapidly growing population and industry, with the remaining 48% drawn directly from groundwater by private individuals and companies (FRACTAL, 2017), presenting an increasingly precarious status of the water sector in the city.

Flooding was attributed widespread impacts, most notably in the water, waste, and health sectors due to contamination of surface and ground water by sewage and other waste that results in outbreaks of waterborne diseases. The relationship between flooding and outbreaks of cholera and other waterborne diseases in Lusaka has been well documented and is projected to worsen as flooding impacts water, sanitation and hygiene (WASH) in the city, being compounded by scarcity of safe water during droughts (Libanda *et al.*, 2024). As Lusaka is significantly dependent on groundwater resources, with 60% of water used in the city extracted from groundwater sources (Simukonda *et al.*, 2018), contamination during flood events poses significant WASH risks. These risks manifest with greater severity in the city's unplanned settlements and areas where sanitation infrastructure is not adequate to handle growing population size and density (Habanyama *et al.*, 2024). Urban waste also blocks drainage systems, preventing optimal functioning and worsening the impacts of floods in the city. High impacts were also noted for the land use planning and the civil protection and emergency sectors, as physical access to deliver emergency services is impacted by flooding and many people need to be relocated following flood events. Moderate impacts were attributed to the transport and energy sector, as floods limit road access and can result in power outages.

The environmental and biodiversity sector also experiences moderate impacts through contamination of groundwater by water and soil erosion during floods. The buildings sector was attributed low impacts, noting the need for temporary relocation of affected people during floods, and the agriculture and forestry sector was noted as having low impacts too. The participants assessed the impact of heatwaves in Lusaka as high across all the affected sectors. The water sector is impacted through water scarcity and subsequent rationing, which has consequences for the energy sector as hydropower generation is hampered and energy supply is disrupted.

The health sector is also impacted through risk of dehydration and people consuming unsafe water out of desperation, leading to the spread of waterborne diseases. The high temperatures also have direct health impacts for those with cardiovascular and respiratory conditions as well as those with diabetes (Cheng *et al.*, 2019; McCutcheon *et al.*, 2022; Nyambe, 2024; Vallianou *et al.*, 2021). The agriculture and forestry sector is impacted as high temperatures and water insecurity result in crop failure and soils dry out, becoming susceptible to erosion. Impacts are also present in the waste sector, as harmful gases are emitted from waste dumps under the hotter conditions.

6.2. Impact of climate hazards on population groups

The magnitude of climate hazard impacts on different population groups in Lusaka was assessed by the participants (

Table 7). High impacts were attributed to the majority of groups for all three hazards, with only a few receiving moderate or low ratings. The prevalence of high ratings highlights the widespread social impacts of drought, floods and heatwaves in Lusaka across most people in the city.

Table 7. Magnitude of the impact of climate hazards on population groups in Lusaka, rated high (3), moderate (2) or low (1).

Climate Hazard	Women and girls	Children	Youth	Elderly	Marginalised groups	Persons living with disabilities	Persons with chronic diseases	Low-income households
Droughts	3	3	3	2	1	2	3	3
Flooding	3	3	2	3		3	3	3
Heatwaves	2	2	3	3		3	2	3
TOTAL	8	8	8	8	1	8	8	9

Droughts have severe impacts on women and girls, as they are often responsible for securing water resources for their households. Drought-induced water scarcity results in women and girls needing to find alternative water sources and often travel greater distances to access water. As droughts drive food insecurity and so children face developmental challenges, with stunted growth and compromised immunity as a result of malnutrition during droughts (Rosen *et al.*, 2021). The challenges of food insecurity and malnutrition were also noted for those in low-income households, with droughts often leading to spikes in food prices, as well as for persons with chronic diseases as their access to nutritious food is hindered. The youth face socio-economic impacts as a result of drought, as the impacts on energy generation in Lusaka result in job losses in the industrial sector, increasing youth unemployment.

In Lusaka, floods impact women and girls through their gender roles, as they are exposed to flood impacts in their pursuit of water resources. Children also face significant flood impacts, with vulnerable children losing their lives during severe flooding. Additionally, they are highly at risk from the waterborne disease outbreaks that typically ensue from floods and have disrupted schooling during flood events. Youth access to tertiary education is also hindered by flooding, as well as their participation in business and trade, contributing to poverty among this group. The elderly as well as persons with disabilities also face challenges in accessing local trading or business areas during floods, and their access to health services is also often impeded, a challenge that extends to persons with chronic diseases. Lusaka’s low-income households are concentrated in unplanned settlements that are predominantly in flood-prone areas (Chiwele *et al.*, 2022), and so these people are frequently and severely affected by floods, with loss of property and exposure to waterborne diseases being key impacts. Finally, as men are often household breadwinners in Lusaka, their hampered ability to access places of work and subsequently support their households was noted as a key impact during floods.

The impacts of heatwaves were directly attributed to health impacts across all relevant population groups in Lusaka. Pregnant women face health risks during heatwaves (Hicks *et al.*, 2023), and exposure to heat stress during pregnancy has been shown to have severe impacts on foetal development and wellbeing (Andriano, 2023; Chersich *et al.*, 2020). Children also suffer greater likelihood and severity of cardiorespiratory conditions under severe heat stress (Green *et al.*, 2019), while the youth, elderly and persons with disabilities are at risk of disease exposure due to the WASH impacts of heatwaves. Persons with chronic diseases are at heightened risk during heatwaves, with participants noting cardiorespiratory conditions, diabetes and hyper-/hypotension as being of key concern (Cheng *et al.*, 2019; McCutcheon *et al.*, 2022; Nyambe, 2024; Vallianou *et al.*, 2021). Persons with albinism are more susceptible to all forms of skin cancer and are thus placed at greater risk during heatwaves as UV exposure increases (Wright and Norval, 2023). People in low-income households face socio-economic impacts as heatwaves often result in energy supply interruptions which impact small businesses like barbershops and household mechanics. Those in low-income households often work labour-intensive jobs that become dangerously taxing during heatwaves, placing them at risk of health complications (Nyambe, 2024).

7. RVA Conclusion

The city of Lusaka has been exposed to significant impacts from climate hazards, predominantly drought and floods, over recent decades. The impacts of these hazards have been exacerbated by the rapidly growing urban population which results in overburdened infrastructure and expansion of unplanned settlements in high-risk areas. As the severity and frequency of these climate hazards are set to worsen in the future due to climate change, so the magnitude and extent of risk will increase for the population of Lusaka.

The impacts of the climate hazards on water security in the city was highlighted as a primary concern, with droughts and heatwaves leading to water scarcity and floods leading to contamination of surface and groundwater sources. Droughts are the most significant driver of water insecurity, which impacts all people in Lusaka, with women and girls, children, the elderly, and persons with disabilities and chronic diseases being most severely affected. The secondary impacts of water insecurity cascade through all sectors of the city, primarily through energy insecurity which has widespread negative socio-economic effects, including increased food prices and disrupted economic function. This impacts all population groups in the city, but those in low-income households are most vulnerable.

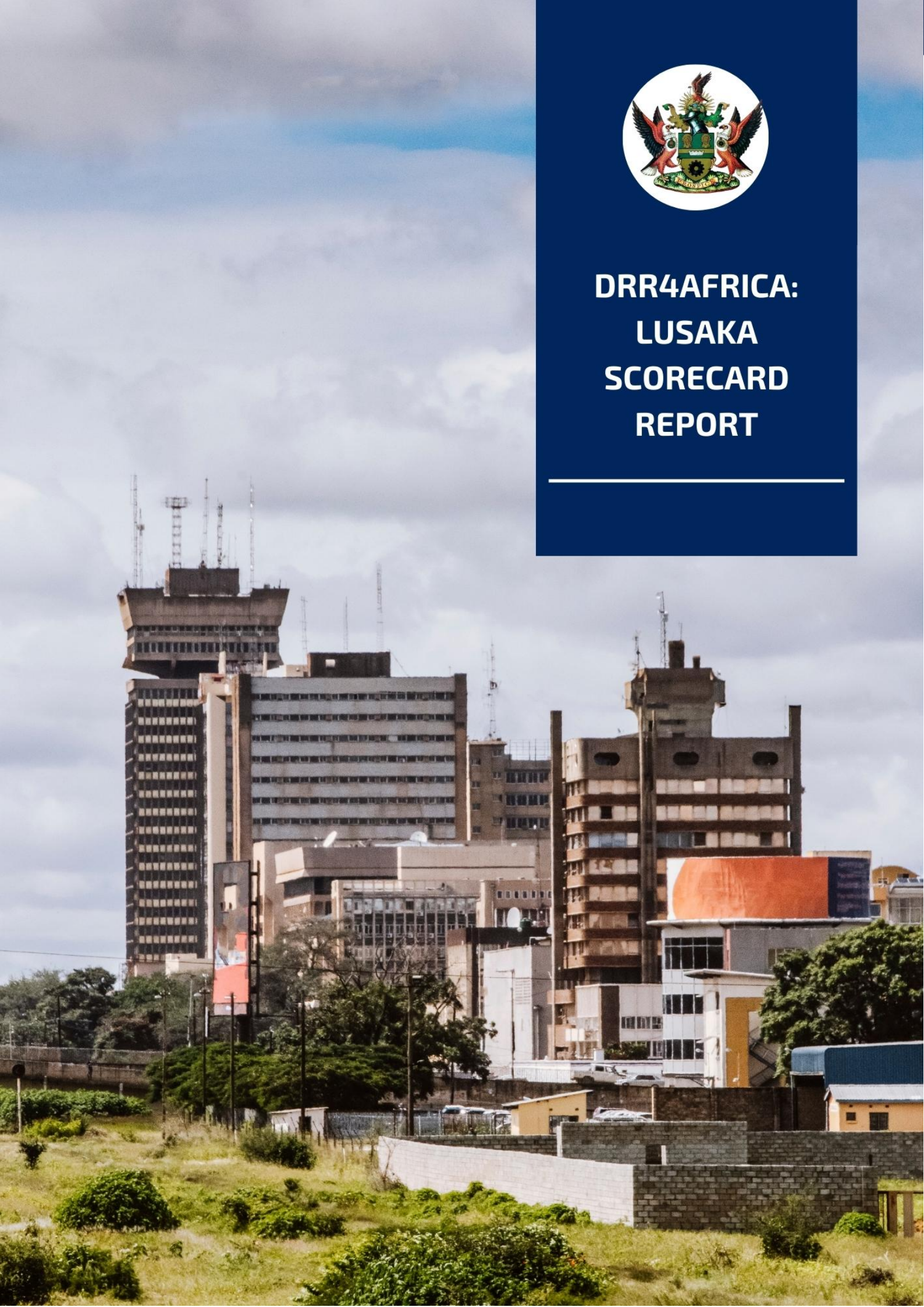
Flooding drives significant health risks for the population of Lusaka, with severe cholera outbreaks becoming more frequent. The significant shortfall of piped water supply and resultant dependence on groundwater in the city, also with prevalence of pit latrines and shallow wells, create conditions that result in rapid contamination of water sources and subsequent spread of diseases during floods. Children are particularly vulnerable to the resultant health risks, and they also suffer substantial disruptions to schooling during floods and disease outbreaks. People living in the city's unplanned settlements also face significant risk as most are located in flood-prone areas with poor drainage and limited access for emergency response and relief services.

Heatwaves also present widespread health risks for the city of Lusaka. Heat stress aggravates existing chronic conditions and drives water insecurity, placing many at risk of dehydration. The increased energy demand for refrigeration and air conditioning drives greater energy insecurity, and prices of food and other basic goods spike during heatwaves. The consequences for foetal development and pregnant women are significant under heat stress, and children and the elderly are also susceptible to the dangers associated with heatwaves.

While the impacts of droughts and flooding are substantial when considered in isolation, they can compound to create a dire situation in Lusaka if they occur in sequence, as observed during the 2023/2024 drought and subsequent floods and cholera outbreak in early 2024. As these hazards are expected to become more intense and frequent under future climate conditions, these impacts could pose significant risk to the city of Lusaka. Interventions to address water security and other WASH needs are a priority to mitigate against these risks, and targeted interventions for the city's unplanned settlements are needed as they are vulnerability hotspots. While drought-induced energy insecurity severely impacts the city of Lusaka, energy generation predominantly occurs outside of the city, and so local interventions should seek to reduce dependence on the national grid through diverse renewable energy sources and other energy security interventions.



**DRR4AFRICA:
LUSAKA
SCORECARD
REPORT**



8. Scorecard introduction

The [UNDRR Disaster Resilience Scorecard for Cities](#) allows local governments to assess their disaster resilience, structuring the assessment around UNDRR’s Ten Essentials for Making Cities Resilient (Figure 13). The Scorecard can also be used to help monitor and review progress, and challenges, in the implementation of The Sendai Framework for Disaster Risk Reduction (2015-2030) and supports the baseline analysis for preparation of the disaster risk reduction and resilience strategies.

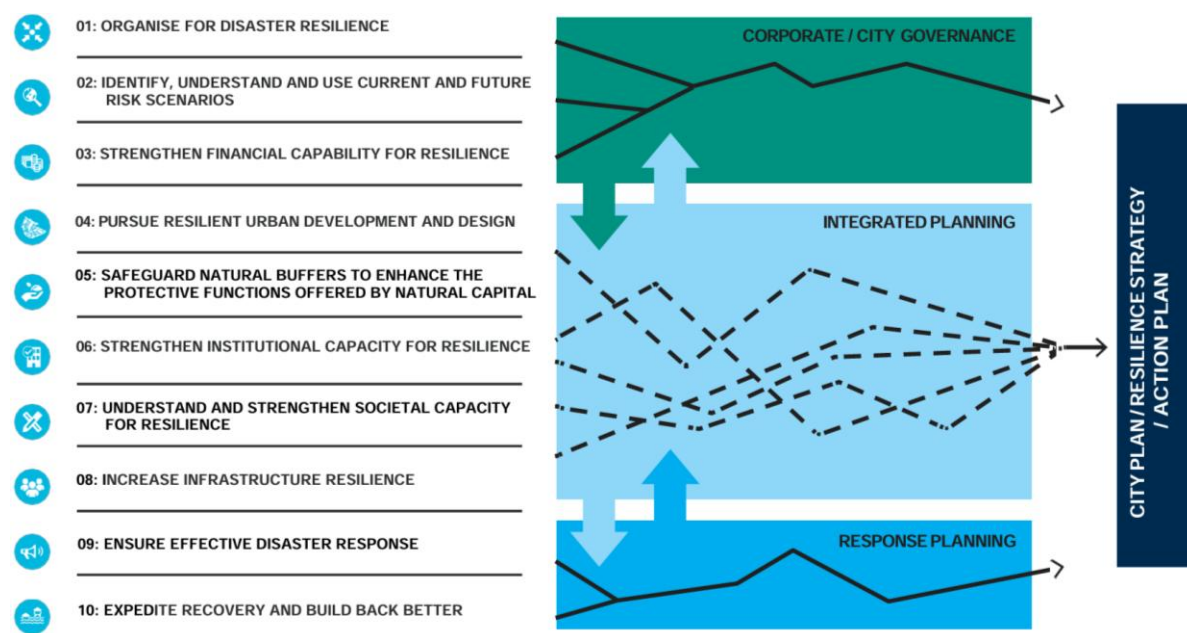


Figure 13. Using the UNDRR Disaster Resilience Scorecard for Cities and its basis on the Ten Essentials for Making Cities Resilient to inform effective DRR action planning (UNDRR, 2017).

The City of Lusaka undertook the completion of their Preliminary Level Scorecard as part of the DRR4Africa project, through a participatory multi-stakeholder workshop held on 11 April 2024 in Lusaka. The event had 39 attendees, of whom 26 were city officials and 16 were women. The Lusaka City Council was well represented, with the Lord mayor as well as several councillors participating in the event, along with representatives from the Legal, Development, and Environmental departments. Other organisations represented were:

- Ministry of Finance
- Lusaka Province Planning Authority
- Ward Development Committee (WDC)
- Lusaka Integrated Solid Waste Management Company (LISWMC)
- Water Resources Management Authority (WARMA)
- National Water Supply and Sanitation Council (NWASCO)
- Zambia Electricity Supply Corporation Limited (ZESCO)
- Engineering Institution of Zambia (EIZ)
- Zambia National Women’s Lobby
- Zambia Statistics Agency
- University of Zambia (UNZA)
- University of Lusaka

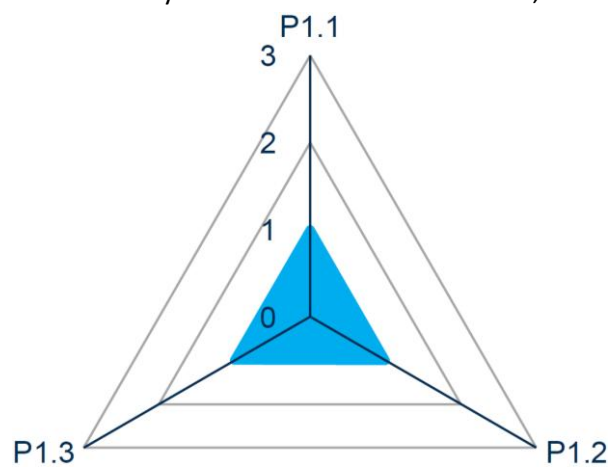
The participants were introduced to key disaster resilience concepts before completing the scorecard to ensure a shared understanding of all stakeholders. Gathering the scorecard information was carried out in a participatory process, with all stakeholders engaged to determine results for their city. Completing the Preliminary Level Scorecard opened dialogues with the various departments and stakeholders on the issues related to disaster risk reduction and resilience in the city of Lusaka. The exercise also represented the first step in establishing a community of practice for DRR in the city, bringing the various stakeholders together for collaborate efforts to address DRR challenges. The cross-cutting nature of DRR requires that this community of practice includes all relevant stakeholders so that the city’s resilience needs can be addressed holistically.

9. Scorecard results

9.1. City governance

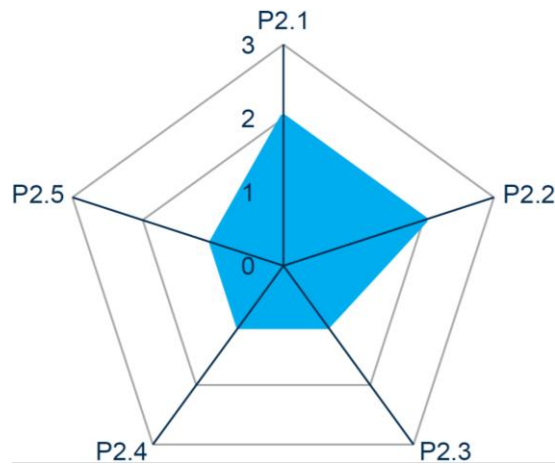
Essential 1: Organize for Resilience

The actions taken in Lusaka to develop an organisational structure and processes for DRR are at the primary stage and need to be expanded. Much of this constraint is the result of the national-level management of DRR efforts by the DMMU, but there are additional steps that can be taken locally to allow the city to reduce disaster risks. An Integrated Development Plan is currently being developed and presents an opportunity for critical DRR mainstreaming utilising the Sendai Framework. Local level funding is also needed for these actions, and so engagement with partners and national stakeholders, such as the Ministry of Green Economy and Environment and DMMU, to mobilise these funds is key.



Essential 2: Identify, Understand and Use Current and Future Risk Scenarios

The city shows strong capacity to identify hazards and risks, but understanding of vulnerability and cascading impacts could be improved. It is critical to develop different risk scenarios for future decision-making and plan for the potential impacts of hazard interaction. Establishing the sharing risk information between the city authorities and utility providers is a key step given the cross-cutting nature of the disaster impacts in Lusaka. Greater effort is needed to develop disaster scenarios, map vulnerability and exposure, and sensitise both government and public stakeholders to the findings of these.



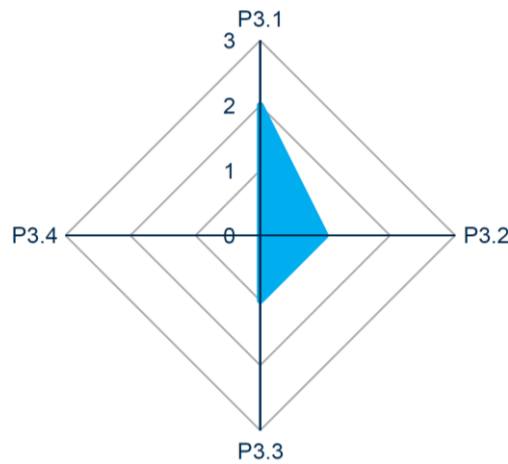
CASCADING HAZARD IMPACTS IN LUSAKA

Lusaka experiences extensive impacts from climate hazards that often result in compounding effects through the sequence of their occurrence. The city often oscillates between the extremes of drought and flood in a pattern of increasing frequency. The long-term water insecurity through periods of drought and contamination during floods, which often occur in sequence, has had far-reaching health and socio-economic impacts in Lusaka.

While the impacts of droughts and flooding are substantial when considered in isolation, they can compound to create a dire situation in Lusaka if they occur in sequence, as observed during the 2023/2024 drought and subsequent floods and cholera outbreak in early 2024. As these hazards are expected to become more intense and frequent under future climate conditions, these impacts could pose significant risk to the city of Lusaka. Interventions to address water security and other WASH needs are a priority to mitigate against these risks, and targeted interventions for the city's unplanned settlements are needed as they are vulnerability hotspots. While drought-induced energy insecurity severely impacts the city of Lusaka, energy generation predominantly occurs outside of the city, and so local interventions should seek to reduce dependence on the national grid through diverse renewable energy sources and other energy security interventions.

Essential 3: Strengthen Financial Capacity for Resilience

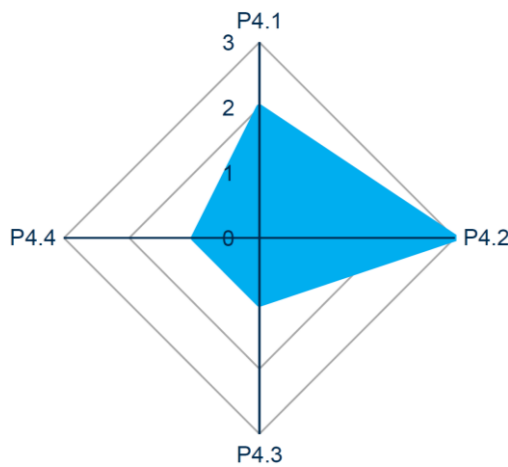
Understanding of the economic impact of disasters and the need for investment in resilience is strong in Lusaka, and the city has engaged in various partnerships to seek support in accessing funding for DRR efforts. These partnerships are nascent, and the city does not yet have well-established financial mechanisms that can support resilience activities. Incentives for the private sector to support resilience also need to be established, as this pathway is not well engaged currently.



9.2. Integrated planning

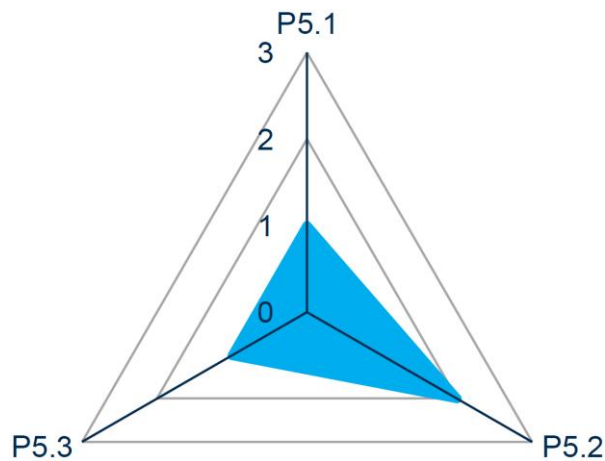
Essential 4: Pursue Resilient Urban Development

The city is zoned and there is a strong policy basis for resilience, but enforcement/application and updating remains challenging. In order for the built environment to be assessed and made resilient, these shortfalls will need to be addressed. Challenges arise around the extensive informal settlements in the city, making enforcement challenging, and driving a need for resettlement processes that are time consuming and costly. Updating of policy and standards will also be contingent on robust and reliable disaster scenarios.



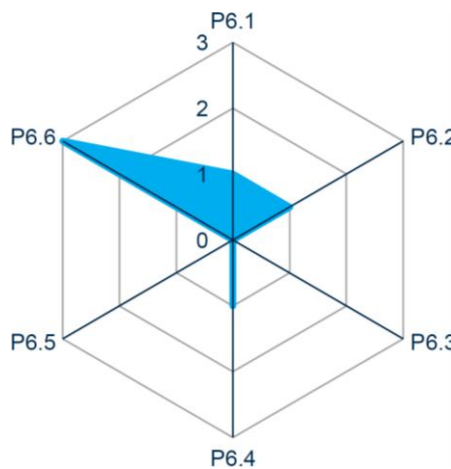
Essential 5: Safeguard Natural Buffers to Enhance the Protective Functions Offered by Natural Ecosystems

The city is actively promoting green infrastructure but establishing baseline understanding of existing natural assets and their functions, within the city and at the ecosystem level, remains lacking. The city will need to fully assess its natural assets in order to effectively safeguard its natural buffers and their protective functions. This baseline understanding must then be expanded into effective continuous monitoring critical ecosystems services for integration into DRM actions.



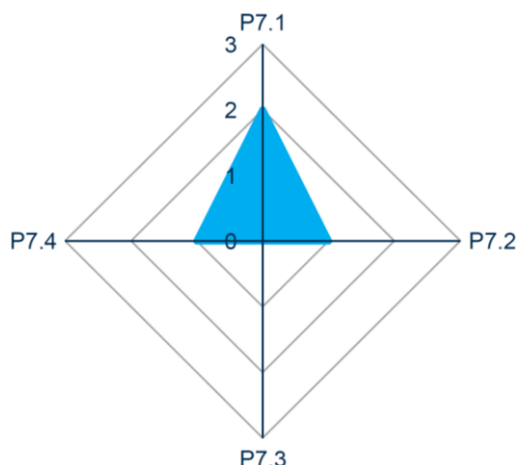
Essential 6: Strengthen Institutional Capacity for Resilience

Lusaka’s institutional DRR capacity is lacking, though there are growing efforts to address this through partnerships and engagement with stakeholders. Data gathering and sharing, training and awareness raising all require greater capacity that is not currently sufficient. As most DRR efforts are not embedded at the local level, most capacity building could be driven and funded via the city. The city’s efforts to leverage partnerships to address these shortcomings are promising, but there needs to be greater engagement with national government stakeholders as well as the private sector and civil society in the city.



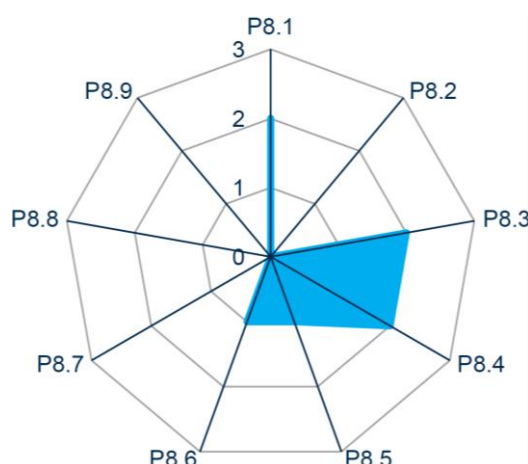
Essential 7: Understand and Strengthen Societal Capacity for Resilience

There is a strong presence of community organisations in DRR in the city but operating mostly in isolation from the local government. The collaboration between these organisations and the city through training and other communication needs to be improved. This will allow the city to fully understand and strengthen its societal capacity for resilience.



Essential 8: Increase Infrastructure Resilience

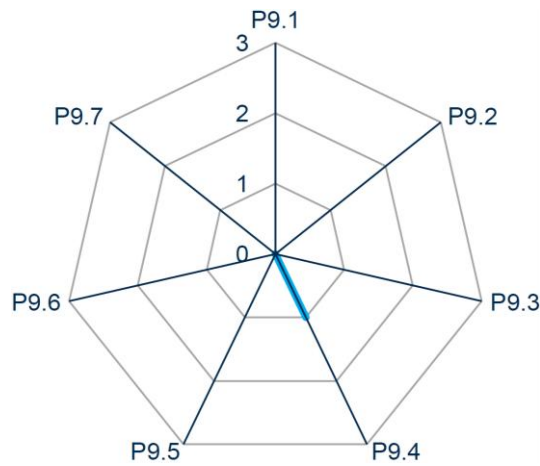
Lusaka’s critical infrastructure presents a mixed level of resilience. While the Integrated Development Plan promotes resilient infrastructure, and essential service provision is relatively well supported, a stronger evidence base is needed to inform resilient development. Water and energy infrastructure are relatively resilient, while transport and communications infrastructure less so. Healthcare and education infrastructure are highly vulnerable to disaster impacts and first responder assets are not currently sufficient for the rapidly growing population of Lusaka.



9.3. Response planning

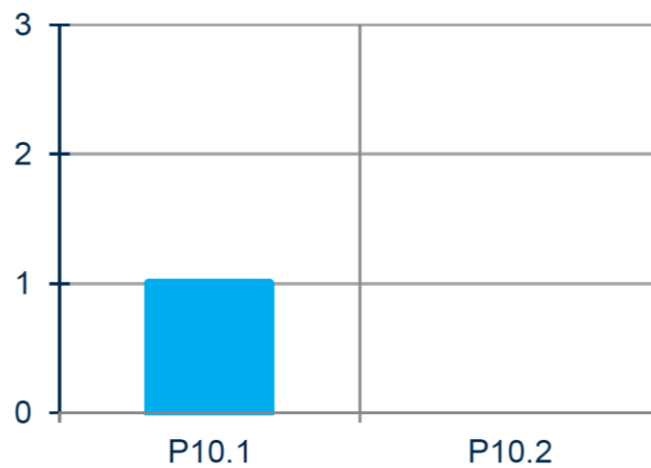
Essential 9: Ensure Effective Disaster Response

Disaster response in Lusaka was found to be severely lacking. Most response to past disasters has been ad-hoc with temporary operations centres. While this does result from a lack of local-level DMMU structures, the city can develop plans, capacity and resources for more effective disaster response that supports nationally coordinated interventions. Conducting training, establishing emergency supply and equipment stores and establishing operating procedures can reduce the impact of future disasters and reduce dependency on intervention from higher levels of government that can delay critical response efforts.



Essential 10: Expedite Recovery and Build Back Better

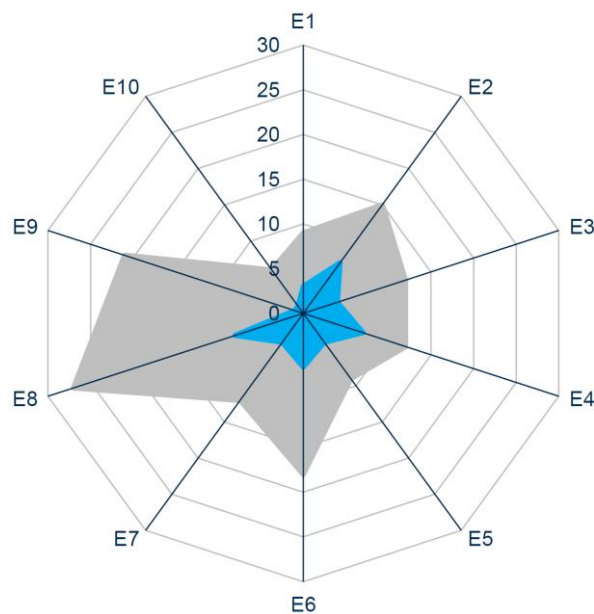
Post-disaster recovery could be strengthened in Lusaka through improved recovery planning and assessments for lesson-learning. Currently planning efforts are conducted by DMMU and thus not at the local level, and so different departments and city stakeholders are not aware of the plans during emergencies. Assessing disaster impacts is not a mainstreamed process and results in current loss of critical lessons and data.



10. Scorecard Conclusion

DRR in the city of Lusaka requires significant development, but there are some strong pillars of efforts that have been made that can support this process. As the mandate for DRR efforts, and thus the funding for these activities, is held by the national entity DMMU, efforts at the city level are contingent on acquisition of additional funding from external sources or re-allocation of existing funds. The city is actively leveraging partnerships to address this, but these efforts are nascent, and it is critical that the mainstreaming of DRR through city process unlock local-level DRR funding within government budgets. Engagement with national entities and ministries to advocate for this will be integral to strengthening local-level DRR efforts in Lusaka.

The results of the Scorecard highlight a lack of capacity and resources across all ten Essentials. There is also a general lack of baseline assessments and understanding to inform DRR actions. Policy and proactiveness on the part of the city are present, but the lack of baseline information and capacity needs prevent the municipality from being effective at disaster risk management. Essential 9 highlighted a severe shortfall in disaster response in Lusaka, though this is also the result of most of the identified actions falling outside of city’s mandate and instead being held by DMMU. It is critical that steps are taken to address these resilience needs in Lusaka, given the increasing severity and frequency of disasters driven by climate change, and the rapidly growing population of the city resulting at a rising number of people exposed to these impacts.



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