



POLICY BRIEF

Decision-making and climate resilience in the water sector of Harare

Mzime Regina Ndebele-Murisa and Chipo Plaxedes Mubaya

Summary

This policy brief is based on discussions and recommendations from studies funded by the IDRC-African Climate Leadership Program (AfriCLP) and the Natural Environment Research Council (NERC) and START's Africa Global Environmental Change (GEC) project administered under the Future Resilience for African CiTies and Lands (FRACTAL) program which focused on decision-making and climate resilience in Harare. These studies were conducted between 2016 and 2018. The common issues that both projects addressed include:

- ◆ Examining the nature of climate change risks and vulnerabilities in relation to water service delivery
- ◆ Understanding processes and outcomes of decision-making to mainstream climate change adaptation in cities across southern Africa
- ◆ Potential adaptation options in this context

The brief summarizes the context of climate change, variability and water in Harare to contribute to the existing knowledge base on the city's vulnerability and risks as well as to inform future, sustainable policy, planning and governance of the city in these sectors. The brief suggests a suite of recommendations for the development of the city in the water sector as provision of relevant climate information by the research fraternity; continuous undertaking of risk and vulnerability assessments; setting up of a climate change department/unit within and by the City of Harare which should also ensure optimal resource mobilization for infrastructural development; institutionalization and enforcement of regulations to prevent infrastructural development in areas not serviced with potable water and sewerage while at the same time working on provision of equitable potable water for all citizens. Then both the City of Harare and Government should facilitate an integrated/holistic approach in water resources management in order to avoid overlaps.

Introduction

The resilience of many cities may be compromised by a combination of climate changes affecting the frequency and intensity of extreme events. These extreme events include flooding and droughts, coupled with other global change drivers such as land use change, pollution, fragmentation of natural systems and overexploitation of resources. Non-climatic factors include population growth and consequently urban sprawl, high water distributional losses, low billing collection, overstaffing, and under recovery of costs, among others. The institutional frameworks for building resilience in many cities are yet to be effectively implemented as there is vast political interference in service provision and regulation, as well as obstacles to effectively undertake public private partnerships to meet increasing demand for energy and water in the cities (Dominguez Torres, 2012; Niang et al., 2014;

Satterthwaite et al., 2016; Elmqvist et al., 2018). Most parts of southern Africa are already experiencing warming and high variability in rainfall and changes to the geographical distribution of water resources, with the arid to semi-arid areas becoming drier, while other areas are becoming wetter (Kundzewicz et al, 2010; Pinto et al., 2015; Maure et al., 2018). Areas in which runoff is projected to decline are likely to face a reduction in the value of the services provided by water resources (Arnell, 2004; Niang et al., 2014). This is a cause for concern, particularly as communities in the region are heavily reliant on river ecosystems and potable water for their livelihoods and economic development.

These challenges are compounded by a subsequent propensity towards improper planning, inadequate infrastructural development, pollution and

unsustainable exploitation of natural resources in African cities. Water demand in most southern African cities is already outstripping supply, with water withdrawals in the region being estimated to have increased six-fold during the 20th century (Rockstrom and Gordon, 2002; Molden, 2007). Zimbabwe, for instance is projected to become water-stressed by 2025 (Arnell, 2004; Brown et al., 2012). In addition, increases in frequency and intensity of extreme weather events such as droughts and floods are complicating water resources management in the southern African region in particular, which is located along a semi-arid belt (Chigwada, 2005; Darwall, 2009; Mwendera, 2010; Niang et al., 2014). In this regard, this research focused on the context of climate change and water in Harare to contribute to the existing knowledge base on the city's vulnerability and risks as well as to inform future, sustainable policy, planning and governance of the city in this sector. Based on the 2012 census, the city of Harare had a population of 2.1 million, which is currently estimated to have more than doubled to 4.5 while projections at a 2% growth rate give estimates of 3.2 million by 2032 (Zimstats, 2012). Ideally, the water treatment should produce 1.2 million cubic ML per day to meet the potable water demand. However, only 58% of this demand is currently being met at a production rate of 670,000 cubic ML per day with only the Central Business District (CBD) Area receives water every day while the majority of Harare's suburbs are under water rationing. This rationing involves receiving water 3-4 times a week at most, with some suburbs having no water at all for a number of years now.

1.1 The need for urban governance research in Harare

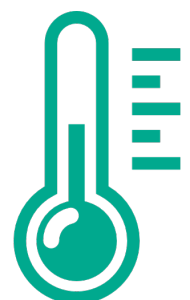
This study is timely given that efforts by southern African cities to embark on structural and policy reforms to foster inclusive decision making have not dealt with challenges in providing adequate services to urban populations, especially in the water sector. What makes the picture gloomier is that climate change is and will likely continue to exacerbate existing challenges that Harare faces and yet opportunities exist to redress this situation. In addition, water resources risks and vulnerabilities have not been adequately addressed in climate change and variability analysis in Harare, including a dearth of information on adaptation in the city, hence the need for our understanding of the issues involved. Despite studies carried out elsewhere on

the importance of water and climate, studies of this nature are still incipient in Harare as most study foci have been largely rural and peripheral to the city. As a first step, improved incorporation of information about current climate variability into water-related management and the risk assessments of the city would assist adaptation for longer-term climate change and vulnerability and more efficient decision-making. It is important to understand urban governance for building a resilient city given that the city is already faced by other governance challenges independent of climate change. A recent study highlights that it may not actually be a case of water crises in African cities but rather, a water governance crisis that exacerbates inequalities in water security (Milan, 2016). This water security challenge is further attributed to imbalance between demand and supply, unplanned settlements, financial mismanagement and poor planning.

1.2 Stakeholder engagement

The two projects (AfriCLP and FRACTAL-START-GEC) upon which this brief is based employed trans-disciplinary research through the incorporation of social and natural sciences in the research, including a city to city learning approach through city exchange visits to Windhoek and Lusaka where there was sharing of experiences on best practices. In addition, the study engaged in knowledge co-production through engagement of stakeholders from the inception of the projects, attachment of Embedded Researchers and a culmination meeting where results were validated, and action points co-produced by city stakeholders. The initial engagement of project partners from the inception of the projects was a platform which assisted project leads from the research institute to identify stakeholders in the water sector. It was also during these engagements that discussions on the city's needs assessment as well as burning issues were raised and isolated to include specific issues to be addressed for the duration of the projects.

“ There is a change in the temperature and rainfall patterns around Harare ”



2.0 Critical issues

2.1 Climatic risks in relation to water service delivery in Harare

Results indicate that there is a change in the temperature and rainfall patterns around Harare with warming being increasingly experienced in the past decade (see Figure 1).



Figure 1: Annual average minimum and maximum temperatures for the city of Harare between 1984 and 2014 (Source: Belvedere, Chibero and Kutsaga weather stations- Zimbabwe Meteorological Services)

Harare residents correctly recalled historical climate trends and reported that there have been increases in temperature and decreases in rainfall over the years coupled with delays in the onset of rains. The study highlights that perceptions on historical temperature and rainfall trends were similar regardless of residents' location with more than 50 percent of the respondents across all the six sampled locations reporting that they have noted significant changes in temperature and rainfall over the past 30 years (see Figure 2). In addition, we found that water flows of the Upper Manyame along tributaries and in reservoirs where Harare draws its water from are strongly associated with rainfall ($R^2 = 0.87$, Pearson's Correlation Coefficient) hence potentially and likely influenced by rainfall (see Figure 3), among other factors in the city of Harare.

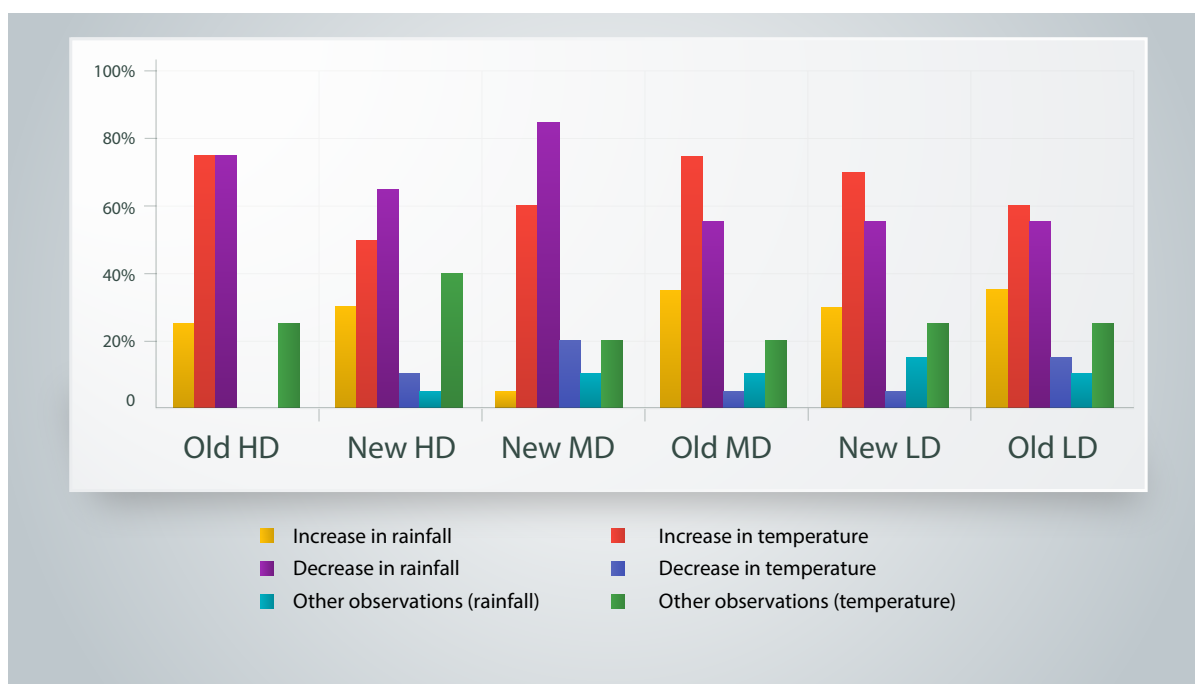


Figure 2: Responses on historical climate trends across six suburbs in Harare

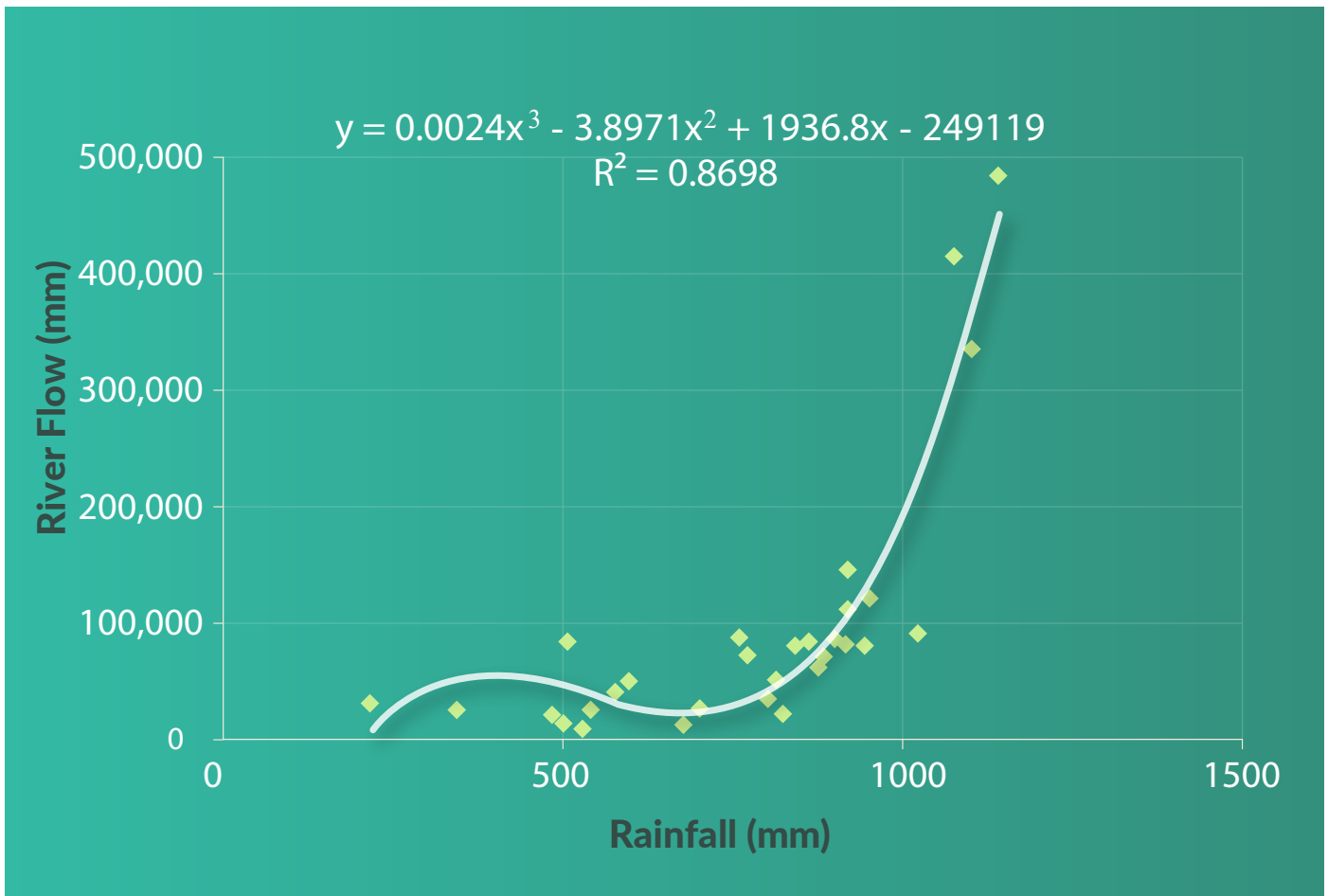


Figure 3: Polynomial (order 3) regression of seasonal rainfall totals around Harare and river flows of Upper Manyame for the period 1984 to 2014 (Source: Zimbabwe Meteorological Services Department and ZINWA)



Figure 4: Mabvuku residents (women and children) collecting water from a communal borehole

2.2 Non-climatic risks

The study found that there has been rapid population expansion in Harare which has put pressure on water resources. Although the population has continued to grow, the infrastructure which was recently upgraded in 2014 to a 58% production capacity of 670 000 cubic ML of treated water per day is still inadequate to service the growing population of close to 4.5 million people in Greater with a water demand of

1,2 million cubic ML per day for all households and industries. As a result, some areas, especially new suburbs do not have potable water connection. Rapid population growth also poses a risk in that it has led to destruction of wetlands as some people end up building their houses on wetlands. Wetlands were reported to be one of the natural water purification systems in the city that have in the past helped to

naturally purify and recharge water before it reaches water bodies. Poor maintenance of water equipment and treatment facilities has resulted in poor water quality. Failure of the City Council to supply water to all the residents and increased sewer burst pipes pose a risk of disease outbreaks such as cholera and typhoid; this being an everyday challenge leading to pollution of the environment once the sewer is spilt into the environment.

2.3 Decision making for water service delivery in the city of Harare

The study highlights that decision-making processes within the national government are based on 5-year phases after each election period, making decision making dependant on these phases. As a result, there appears not to have been sufficiently long-term planning for water resources beyond the five-year period in the city as was found by Muchadema and Williams (2017). The study found that among the major challenges that the city faces in the context of decision-making are lack of financial capacity and low budgeting, limited home grown and harmonised policies and multiple players with undefined roles in the water sector. The study indicates that limited budgets cripple local authorities who are responsible for water supply in urban areas. The relevant ministry is responsible for the provision of water, yet the entities involved are housed under different ministries, for example, the council which is under the ministry of local government. In addition, the study finds that there is lack of equitable distribution of water due in some cases to decisions made to allocate land and funds inappropriately, including the council having to continue to embrace out-dated infrastructure in a context of a growing population in the city, as well as the prioritization of the refurbishment of the Morton Jaffray water works, which lose 60% of treated water due to leaks. The situation is therefore compounded by poor planning and budgeting, where for instance the 2016 budget does not reflect water as a priority nor developments required for water service delivery.

2.4 Response options for the city

The study found that at household level, the greater proportion of residents reported lack of climatic adaptation/ coping mechanisms. The fact that they dig wells and drill boreholes to have a constant water supply where the council supply has faltered appears not to be a response strategy for them but rather, a norm especially in the new high-density

areas of the city. In addition, Harare residents relate more with direct water service delivery than climatic challenges, which to these residents appear peripheral and distant. However, the study indicates that residents do acknowledge recycling of water and using water from buckets instead of showering as some of the ways in which they deal with water shortages.

At national level, the study builds an understanding on how the then Ministry of Environment, Water and Climate dedicated a climate change management department that is responsible for all climate change related programs in Zimbabwe. Zimbabwe also developed a climate policy and the National Climate Change Response Strategy with the aim of developing adaptation strategies that can reduce and mitigate the impacts of climate change. The strategy has adaptation options for different sectors including the water sector. It ensures mainstreaming of climate change adaptation in different sectors. For the water sector, the strategy specifically seeks to strengthen stakeholder institutions in water resource management; promote more efficient water practices; promote catchment promotion and adopt analysis and tools that incorporate climate change (climate change response strategy). The study also notes that there are plans on the ground to construct more dams for example the Kunzwi dam, which is expected to augment water supply from Lake Chivero, the main reservoir source of raw water for Harare. There is an indication that these efforts are complemented by civil society through advocacy work for the conservation of wetlands in a bid to tackle the root cause for some of the water challenges in the city, such as poor water quality, which is linked to degradation of wetlands as well as some corporate social responsibility (CSR) to build communal boreholes in response to the water scarcity and associated health epidemics. The CSOs now educate communities on the importance of wetlands, health and sanitation among other issues.

3.0 Policy recommendations

The following recommendations are made to encourage climate resilience and contextualized decision-making in that:

- ◆ Researchers must periodically provide relevant climate information through stakeholder engagements to address issues of climate risks and vulnerability and water scarcity timeously and decisively
- ◆ City of Harare must initiate a continuous process of risk assessment to ensure that interventions and priorities are appropriately targeted
- ◆ City of Harare must work towards providing equitable potable water for all including the city poor
- ◆ City of Harare must institute regulations that forbid settlement on non- or subserviced land with no water connection
- ◆ City of Harare must set up a climate change department/unit to focus on climatic issues in an urgent manner
- ◆ Government and City of Harare must ensure the existence of optimal domestic resource mobilization for infrastructural development
- ◆ Government and the City of Harare must facilitate for an integrated/holistic approach in managing water resources in the city to avoid overlaps.

Acknowledgements

The authors are grateful for funding from the IDRC’s AfriCLP program as well as NERC and DFID’s FRACTAL and FCFA programs in collaboration with START granted to Chinhoyi University of Technology working in partnership with Harare City Council and Zimbabwe National Water Authority (ZINWA).



References

- Arnell, N.W. 2004. Climate change and global water resources: SRES emissions and socio-economic scenarios. *Global environmental change*, 14, 31-52.
- Bates, B.C., Kundzewicz, S. W., and Palutikof, J.P. 2008. Climate change and water. Technical paper of the Intergovernmental Panel on Climate Change. Geneva: IPCC Secretariat
- Bates, B. C., Kundzewicz, S.W. and Palutikof, J.P. 2008. Climate change and water. Technical paper of the Intergovernmental Panel on Climate Change. Geneva: IPCC Secretariat.
- Brown, D., Chanakira, R.R., Chatiza, R., Dhliwayo, M., Dodman, D., Masiwa, M., Muchadenyika, D., Mugabe, P. and Zvigadza, S. 2012. Climate change impacts, vulnerability and adaptation in Zimbabwe. IIED Climate Change Working Paper 3, UK. <http://pubs.iied.org/pdfs/10034IIED.pdf>.
- Dominguez Torres, C. 2012. The Future of Water in African Cities: Why Waste Water? Urban Access to Water Supply and Sanitation in Sub-Saharan Africa, Background Report. Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/12276> License: CC BY 3.0 IGO.
- Elmqvist, T., Siri, J., Andersson, E., Anderson, P., Bai, X., Das, P.K., Gatere, T., Gonzalez, A., Goodness, J., Handel, S.N. and Török, E.H. 2018. Urban tinkering. *Sustainability Science*, pp.1-16.
- Kundzewicz, Z. W. and Krysanova, V. 2010. Climate change and stream water quality in the multi-factor context. *Climatic Change*, 103, 353-362.
- Maure, G.A., Pinto, I., Ndebele-Murisa, M.R., Muthige, M., Lennard, C., Nikulin, G., Dosio, A. and Meque, A.O. 2018. The southern African climate under 1.5° and 2°C of global warming as simulated by CORDEX models, *Environmental Research Letters*, <https://doi:10.1088/1748-9326/aab190>.
- Milan, B.F. 2016. Water security in an urbanized world: an equity perspective. Habitat International, Technische Universität Berlin. <http://dx.doi.org/10.14279/depositonce-5767>.
- Muchademba D. and Williams J.J. 2017. Politics and the practice of planning: The case of Zimbabwean cities. *Cities* 63, 33-40.
- Niang, I., Ruppel, O., Abdrabo, M., Essel, A., Lennard, C., Padgham, J. and Urquhart, P. 2014. Africa. In: Barros, V., Field, C., Dokken, D., Mastrandrea, M., Mach, K., Bilir, T., Chatterjee, M., Ebi, K., Estrada, Y., Genova, R., Girma, B., Kissel, E., Levy, A., Maccracken, S., Mastrandrea, P. and White, L. (eds.) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge. Cambridge University Press, United Kingdom and New York, NY, USA.
- O'Neill, B.C., Kriegler, E., Ebi, K.L., Kemp-Benedict, E., Riahi, K., Rothman, D.S., van Ruijven, B.J., van Vuuren, D.P., Birkmann, J., Kok, K. and Levy, M. 2017. The roads ahead: narratives for shared socioeconomic pathways describing world futures in the 21st century. *Global Environmental Change*, 42, 169-180.
- Pinto, I., Lennard, C., Tadross, M., Hewitson, B., Dosio, A., Nikulin, G. and Shongwe, M. E. 2015. Evaluation and projections of extreme precipitation over southern Africa from two CORDEX models. *Climatic Change*, 135, 655-668.
- Satterthwaite, D. 2016. Successful, safe and sustainable cities: towards a New Urban Agenda. *Commonwealth Journal of Local Governance*, 19, <http://dx.doi.org/10.5130/cjlg.v0i19.5446>.
- Chigwada, J. 2005. Climate proofing infrastructure and diversifying livelihoods in Zimbabwe. *IDS Bulletin Vol. 36, No. 4*.
- Darwall, W.R.T., Smith, K.G., Tweddle, D. and Skelton P. 2009. The Status and Distribution of Freshwater Biodiversity in Southern Africa. IUCN Gland, Switzerland and Grahamstown, South Africa, 120 pp.
- Molden D. 2007 (ed). *Water for food, water for life: A comprehensive assessment of water management in Agriculture*. London: Earthscan and Colombo: International Water Management Institute.
- Mwendera, M. 2010: Situation Analysis for Water and Wetlands Sector in Eastern and Southern Africa. International Union for Conservation of Nature (IUCN), Nairobi, Kenya, 50-51 pp.
- Rockstrom, J. & Gordon, L. 2002. The role of water in sustaining ecological functions- a global assessment. *Water Ecology* 11(4), 267-272.
- Vörösmarty C.J., Green P., Salisbury J. and Lammers R.B. (2000). Global water resources: vulnerability from climate change and population growth. *Science* 289, 284-208.
- Zimstats 2012. Census 2012. Provincial report, Harare. <http://www.zimstat.co.zw/sites/default/files/img/publications/Population/Harare.pdf>