# Integrating Disaster Management and Climate Resilience Strategies in Cities for Sustainability

**Kariuki Muigua**

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**Abstract**

*This paper critically examines the need to integrate disaster management and climate resilience in cities. The paper argues that cities are both victims and perpetrators of climate change while also being highly vulnerable to disasters. The paper explores the impacts of climate change and disasters on cities. It posits that climate change and disasters are major threats towards achieving sustainability in cities and fostering human progress. The paper proposes interventions towards integrating disaster management and climate resilience in cities for sustainability.*

## 1.0 Introduction

Cities have been identified as hubs for ideas, commerce, culture, science, productivity, social, human and economic development[1]. It has been noted that cities have enabled people to advance socially and economically through creation of jobs among other opportunities[2]. It is estimated that currently, nearly 56 percent of the global population – being approximately 4.4 billion inhabitants – live in cities[3]. Further, it has been noted that this trend is expected to continue, with the urban population more than doubling its current size by 2050, at which point nearly 7 of 10 people will live in cities[4]. Cities are therefore at the heart of human progress. They generate more than 80 percent of global Gross Domestic Product (GDP) and can contribute to sustainable growth through increased productivity and innovation if managed well[5].

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[1] United Nations., 'Sustainable Cities and Human Settlements' Available at https://sdgs.un.org/topics/sustainable-cities-and-human-settlements (Accessed on 20/11/2024)

[2] Ibid

[3] World Bank Group., 'Urban Development' Available at https://www.worldbank.org/en/topic/urbandevelopment/overview (Accessed on 20/11/2024)

[4] Ibid

[5] Ibid

Despite their key role in enhancing human progress, it has been noted that cities are highly vulnerable to climate change and disasters[6]. For instance, the location of many urban areas with large populations and critical economic assets in high-risk zones contributes to the increased attention given to impacts in urban areas of disasters induced or enhanced by climate change[7]. In addition, it has been observed that in most cities in developing countries, the size and vulnerability of informal settlements, generally built in unstable areas such as coastal zones, flood-prone planes and ravines, and geologically unstable slopes, greatly increases their vulnerability to climate change and natural disasters[8]. In light of these challenges, it is necessary to integrate disaster management and climate resilience in cities for sustainability.

This paper critically examines the need to integrate disaster management and climate resilience in cities. The paper argues that cities are both victims and perpetrators of climate change while also being highly vulnerable to disasters. The paper explores the impacts of climate change and disasters on cities. It posits that climate change and disasters are major threats towards achieving sustainability in cities and fostering human progress. The paper proposes interventions towards integrating disaster management and climate resilience in cities for sustainability.

## 2.0 Impacts of Climate Change and Disasters on Cities

It has been noted that due to their high concentration of people, infrastructures, housing and economic activities, cities are particularly vulnerable to the impacts of climate and natural disasters[9]. At the same time, it has been observed that cities are both victims of

[6] Bigio. A., 'Cities and Climate Change' Available at https://unfccc.int/sites/default/files/wbcitiescc.pdf (Accessed on 20/11/2024)
[7] Ibid
[8] Ibid
[9] United Nations Environment Programme., 'Goal 11: Sustainable Cities and Communities' Available at https://www.unep.org/topics/sustainable-development-goals/why-do-sustainable-development-goals-matter/goal-11#:~:text=Building%20urban%20resilience%20is%20crucial,disaster%20risk%20and%20climate%20change. (Accessed on 20/11/2024)

climate change and among its worst perpetrators[10]. For instance, not only are cities disproportionately exposed to the impacts of climate change, but they are also responsible for generating a large share of global emissions[11]. As centers for population, infrastructure and economic activities, cities are key contributors to global emissions of greenhouse gases as well as key hotspots of climate change impacts and vulnerabilities[12].

According to the United Nations Environment Programme (UNEP), cities are a key contributor to climate change since urban activities are major sources of greenhouse gas emissions[13]. It is estimated that cities and urban areas are responsible for nearly 70 percent of global carbon dioxide emissions, with transport and buildings being among the largest contributors[14]. The United Nations-Habitat further notes that urban areas and cities are expected to grow by 2.5 billion people raising the urban share of the global population to nearly 68 per cent[15]. As a result, rapid urbanization, population growth, economic development, and rising prosperity are factors that are expected to contribute to increased greenhouse gas emissions in cities[16]. Cities consume a huge amount of resources including energy, food and water[17]. Lack of sustainable practices in respect of these resources result in a significant amount of greenhouse gas emissions from cities[18]. For example, it has been noted that as the hubs of economic activity, cities drive the vast

[10] United Nations-Habitat., 'Cities and Climate Action' Available at https://unhabitat.org/wcr/ (Accessed on 20/11/2024)
[11] Ibid
[12] Intergovernmental Panel on Climate Change., 'Climate Change 2023: Synthesis Report' Available at https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf (Accessed on 20/11/2024)
[13] United Nations Environment Programme., 'Cities and Climate Change' Available at https://www.unep.org/explore-topics/resource-efficiency/what-we-do/cities-and-climate-change#:~:text=At%20the%20same%20time%2C%20cities,contributors%20(IPCC%2C%202022). (Accessed on 20/11/2024)
[14] Ibid
[15] United Nations- Habitat., 'Cities and Climate Change' Available at https://unhabitat.org/cities-and-climate-change (Accessed on 20/11/2024)
[16] Ibid
[17] United Nations Development Programme., 'Cities Have a Key Role to Play in Tackling Climate Change – Here's Why' Available at https://climatepromise.undp.org/news-and-stories/cities-have-key-role-play-tackling-climate-change-heres-why (Accessed on 20/11/2024)
[18] Ibid

majority of the world's energy use and are major contributors to global greenhouse gas emissions[19]. In addition, cities also serve as key transportation hubs, emitting substantial amounts of carbon through extensive road networks, public transit systems and airports[20]. Cities are therefore major contributors to the climate change crisis generating huge amount of greenhouse gases from activities and sectors such as energy, buildings, transport, and infrastructure.

In addition to their contribution to climate change, cities are also among its major victims. Since they are home to major infrastructure and highly concentrated populations, cities are also vulnerable to the impacts of climate change including rising sea levels, warmer temperatures and severe storms[21]. Climate change is a global phenomenon whose impacts affect urban life[22]. For instance, rising global temperatures due to climate change cause sea levels to rise, increases the number of extreme weather events such as floods, droughts and storms, and increases the spread of tropical diseases with adverse impacts on cities' basic services, infrastructure, housing, human livelihoods and health[23].

Climate change is causing adverse impacts on human health, livelihoods and key infrastructure in cities[24]. It has been noted that urban infrastructure, including transportation, water, sanitation and energy systems are being compromised by extreme and slow-onset events[25]. This results in economic losses, disruptions of basic services and negative impacts to human health and well-being in cities[26]. Climate change is worsening

[19] Organisation for Economic Co-operation and Development., 'Cities and Climate Change' Available at https://www.oecd-ilibrary.org/governance/cities-and-climate-change_9789264091375-en (Accessed on 20/11/2024)
[20] United Nations Development Programme., 'Cities Have a Key Role to Play in Tackling Climate Change – Here's Why' Op Cit
[21] Organisation for Economic Co-operation and Development., 'Cities and Climate Change' Op Cit
[22] United Nations Environment Programme., 'Cities and Climate Change' Op Cit
[23] Ibid
[24] Intergovernmental Panel on Climate Change., 'Climate Change 2023: Synthesis Report' Op Cit
[25] Ibid
[26] Ibid

existing vulnerabilities in urban areas, placing pressure on the ability of cities to manage its impacts[27]. Rapid urbanization and the advancement of urban centers and cities is also fueling adverse environmental and socioeconomic repercussions[28]. These include increased instances of natural disasters, depletion of biodiversity, and degradation of ecosystems[29]. It has been noted that the expansion of cities heavily relies on consumption of natural resources including water and land with knock-on effects on biodiversity and ecosystem services[30]. This constrains the protection of biodiversity and management of ecosystem services[31]. These challenges contribute to a heightened vulnerability of cities to disasters and climate change, primarily due to population density, housing shortages, limited access to essential services, and energy constraints[32].

Cities are therefore highly vulnerable to the impacts of climate change and disasters. It is estimated that millions of people living in cities are likely to be affected by the consequences of climate change and disasters including rising sea levels, increased precipitation, inland floods, more frequent and stronger cyclones and storms, and periods of more extreme heat and cold[33]. Climate change and disasters can also negatively impact infrastructure and worsen access to basic urban services including water, sanitation, shelter, education, energy, and health services therefore undermining the quality of life in cities[34]. It has been noted that the most affected populations are the urban poor especially slum dwellers in developing countries who tend to live along river banks, on hillsides and slopes prone to landslides, near polluted grounds, on decertified

[27] De Genaro Chiroli et al., 'Integrating Resilience and Sustainability: A systematic Analysis of Resilient Cities Using ISO 37123' Available at https://www.sciencedirect.com/science/article/abs/pii/S2212420923004405 (Accessed on 21/11/2024)
[28] Ibid
[29] Ibid
[30] Secretariat of the Convention on Biological Diversity., 'Cities and Biodiversity Outlook' Available at https://www.cbd.int/authorities/doc/cbo-1/cbd-cbo1-summary-en-f-web.pdf (Accessed on 21/11/2024)
[31] Ibid
[32] De Genaro Chiroli et al., 'Integrating Resilience and Sustainability: A systematic Analysis of Resilient Cities Using ISO 37123' Op Cit
[33] United Nations-Habitat., 'Climate Change' Available at https://unhabitat.org/topic/climate-change (Accessed on 21/11/2024)
[34] Ibid

land, in unstable structures vulnerable to earthquakes, and along waterfronts in coastal areas[35]. The urban poor in cities including those who live in slums and informal settlements are highly vulnerable to disasters and climate change[36]. Further, it has been noted that the impacts of climate change including droughts and rising sea level and more frequent and intense natural disasters in rural areas will likely generate an additional influx of people to cities who often become permanent dwellers therefore increasing the vulnerability of cities to climate change and natural disasters[37]. In light of these challenges, it is necessary to integrate disaster management and climate resilience strategies in cities for sustainability.

## 3.0 Integrating Disaster Management and Climate Resilience Strategies in Cities

Due to their vulnerability to disasters and the impacts of climate change, it is imperative to integrate disaster management and climate resilience strategies in cities for sustainability. Effective disaster management is often achieved through Disaster Risk Reduction (DRR[38]). It has been pointed out that disasters are not natural (even if the associated hazard is) and that it is only through reducing and managing conditions of hazard, exposure and vulnerability that it becomes possible to prevent losses and alleviate the impacts of disasters[39]. Since it is not possible to reduce the severity of natural hazards, the main opportunity for effective disaster management lies in reducing vulnerability and exposure[40]. DRR refers to the concept and practice of reducing disaster risks through systematic efforts to analyse and reduce the causal factors of disasters[41]. DRR is aimed towards preventing new and reducing existing disaster risk and managing

[35] Ibid
[36] Ibid
[37] Bigio. A., 'Cities and Climate Change' Op Cit
[38] Disaster Risk Reduction and Disaster Risk Management., Available at https://www.preventionweb.net/understanding-disaster-risk/key-concepts/disaster-risk-reduction-disaster-risk-management#:~:text=Mitigation,use%20and%20building%20construction%20codes. (Accessed on 21/11/2024)
[39] Ibid
[40] Ibid
[41] United Nations Educational, Scientific, and Cultural Organization., 'Disaster Risk Reduction' Available at https://www.unesco.org/en/disaster-risk-reduction#:~:text=Disaster%20risk%20reduction%20is%20the,the%20causal%20factors%20of%20disasters (Accessed on 21/11/2024)

residual risk, all of which contribute to strengthening resilience fostering Sustainable Development[42]. DRR has been identified as an integral part of social and economic development, and is vital if development is to be sustainable[43].

Climate resilience refers to the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate change[44]. Climate resilience has also been defined as the capacity or ability to anticipate and cope with climate shocks, and to recover from their impacts in a timely and efficient manner[45]. It can also be described as the ability of an ecosystem, society or business to anticipate, prepare for and respond to the impacts of climate change[46]. Climate resilience is built on understanding climate-related risks and vulnerabilities and implementing relevant measures to manage these risks effectively[47]. Climate-resilient communities, businesses and ecosystems are able to maintain essential functions while adapting to current and future climate-induced conditions[48]. The ideal of climate resilience can be realised through ensuring resilient people and livelihoods, resilient businesses and economies, and resilient environmental systems[49].

[42] United Nations Office for Disaster Risk Reduction., 'Disaster Risk Prevention' Available at https://www.undrr.org/terminology/disaster-risk-reduction (Accessed on 21/11/2024)

[43] United Nations., 'Disaster Risk Reduction' Available at https://sustainabledevelopment.un.org/topics/disasterriskreduction#:~:text=For%20example%2C%20by%20reducing%20exposure,risk%20reduction%20is%20not%20explicit. (Accessed on 21/11/2024)

[44] Center for Climate and Energy Solutions., 'Climate Resilience Portal' Available at https://www.c2es.org/content/climate-resilience-overview/#:~:text=For%20example%2C%20a%20combination%20of,impacts%20can%20exacerbate%20existing%20inequalities (Accessed on 21/11/2024)

[45] The London School of Economics and Political Science., 'What is the Difference between Climate Change Adaptation and Resilience?' Available at https://www.lse.ac.uk/granthaminstitute/explainers/what-is-the-difference-between-climate-change-adaptation-and-resilience/ (Accessed on 21/11/2024)

[46] Jonker. A., & McGrath. A., 'What is Climate Resilience?' Available at https://www.ibm.com/think/topics/climate-resilience (Accessed on 21/11/2024)

[47] Ibid

[48] Ibid

[49] United Nations Climate Change., 'Climate Resilience' Available at https://unfccc.int/sites/default/files/resource/ExecSumm_Resilience_0.pdf (Accessed on 21/11/2024)

The United Nations *2030 Agenda for Sustainable Development*[50] recognizes the need to integrate disaster management and climate resilience strategies in cities for sustainability. Sustainable Development Goal 11 seeks to make cities and human settlements inclusive, safe, resilient, and sustainable[51]. It sets out several targets towards building resilience in cities against the impacts of disasters and climate change including through ensuring access to adequate, safe, and affordable housing and basic services in cities; providing safe, accessible, affordable and sustainable transport systems for all; protecting the poor and people in vulnerable situations; and ensuring access to inclusive, safe, and accessible green and public spaces[52].

Integrating disaster management and climate resilience strategies in cities for sustainability is also a key theme under the *Sendai Framework for Disaster Risk Reduction*[53]. Under the Sendai Framework, states commit to address DRR and the building of resilience to disasters with a renewed sense of urgency within the context of Sustainable Development and poverty eradication, and to integrate, as appropriate, both DRR and the building of resilience into policies, plans, programmes and budgets at all levels and to consider both within relevant frameworks[54]. The Sendai Framework identifies four priority actions for effective disaster prevention and management[55]. These are understanding disaster risk; strengthening disaster risk governance to manage disaster risk; investing in disaster risk reduction for resilience; and enhancing disaster preparedness for effective response, recovery, rehabilitation and reconstruction[56]. It is therefore vital to implement the Sendai Framework

[50] Ibid
[50] United Nations General Assembly., 'Transforming Our World: the 2030 Agenda for Sustainable Development.' 21 October 2015, A/RES/70/1., Available at https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainabl e%20Development%20web.pdf (Accessed on 21/11/2024)
[51] Ibid
[52] Ibid
[53] Sendai Framework for Disaster Risk Reduction 2015-2030., Available at https://www.undrr.org/media/16176/download?startDownload=20240430 (Accessed on 21/11/2024)
[54] Ibid
[55] Ibid
[56] Ibid

in order to effectively integrate disaster management and climate resilience strategies in cities for sustainability.

According to UNEP, building urban resilience is crucial to avoid human, social and economic losses while improving the sustainability of urbanization processes, protecting the environment and mitigating disaster risk and climate change[57]. It is thus necessary to integrate disaster management and climate resilience strategies in cities for sustainability. In order to achieve this goal, it is necessary to make cities an integral part of the solution in fighting climate change[58]. It has been noted that cities have a crucial role to play in anticipating and coping with the impacts of climate change[59]. By prioritizing increased and resilient climate investments, ambitious urban planning and robust policies, cities can play a pivotal role in translating global climate targets into locally achievable solutions[60].

Despite their significant contribution to climate change due to rapid population growth and high greenhouse gas emissions, cities also serve as hubs for innovation which is an opportunity that can be harnessed to achieve sustainable and climate resilient solutions[61]. These solutions include renewable energy sources, cleaner production techniques and regulations or incentives to limit industrial emissions in cities[62]. It is imperative for cities to prioritise investments in green and climate-resilient infrastructure including through enhancing energy efficiency, expanding access to clean energy and promoting low-carbon transportation[63]. It has been noted that building green/ natural and blue infrastructure in cities can support carbon uptake and storage, reduce energy use and risk from the impacts of climate change and disasters including heatwaves, flooding, heavy precipitation and

[57] United Nations Environment Programme., 'Goal 11: Sustainable Cities and Communities' Op Cit
[58] United Nations Environment Programme., 'Cities and Climate Change' Op Cit
[59] United Nations Development Programme., 'Cities Have a Key Role to Play in Tackling Climate Change – Here's Why' Op Cit
[60] Ibid
[61] Ibid
[62] United Nations Environment Programme., 'Cities and Climate Change' Op Cit
[63] United Nations Development Programme., 'Cities Have a Key Role to Play in Tackling Climate Change – Here's Why' Op Cit

droughts while also generating co-benefits for health, well-being and livelihoods in cities[64]. Fostering sustainable waste management, local food production, and enhancing urban green spaces including gardens, urban forests, and parks are also vital strategies in strengthening the role of cities in the fight against climate change[65].

Further, in order to effective cope with the impacts of disasters and climate change, it is necessary for cities to strengthen governance and institutional capabilities for effective responses to climate and disaster risks[66]. It is also necessary for cities to embrace nature-based solutions which can provide cost-effective ways of reducing risks while also providing additional ecologic, social and economic benefits[67]. It has been noted that nature offers many solutions to reduce the impacts of disasters and climate change[68]. For instance, forests help stabilize slopes, sand dunes help protect coastlines, and wetlands help to buffer excess rainwater[69]. Nature-based solutions are effective in building the resilience of households, communities and cities in light of increasing number and frequency of disasters all over the world[70]. It has been noted that urban nature-based solutions address multiple challenges, including climate change, biodiversity loss, disaster risk, water and food security, human health and socio-economic development[71]. It is therefore vital to utilise nature-based solutions in cities including urban parks, urban trees, green roofs, and green walls for enhanced disaster

[64] Intergovernmental Panel on Climate Change., 'Climate Change 2023: Synthesis Report' Op Cit
[65] United Nations Development Programme., 'Cities Have a Key Role to Play in Tackling Climate Change – Here's Why' Op Cit
[66] United Nations Economic Commission for Europe., 'Integrating Disaster Risk Reduction and Climate Change Adaptation for Risk-informed and Climate-smart Development' Available at https://unece.org/sites/default/files/2021-10/IBC%20environment%20and%20climate%20change_Integrating%20Disaster%20Risk%20Reduction%20and%20Climate%20Change%20Adaptation_2021.pdf (Accessed on 21/11/2024)
[67] Ibid
[68] European Union., 'Nature-Based Solutions for Disaster and Climate Resilience' Available at https://www.unsdglearn.org/courses/nature-based-solutions-for-disaster-and-climate-resilience/ (Accessed on 21/11/2024)
[69] Ibid
[70] Ibid
[71] Urban-Nature Based Solutions., Available at https://wwf.panda.org/projects/one_planet_cities/what_we_do/urban_naturebased_solutions/ (Accessed on 21/11/2024)

management and climate resilience[72]. Coastal cities can also embrace nature-based solutions towards strengthening flood protection through levees, dikes and seawalls, and planting mangrove ecosystems as buffers[73]. These solutions have the potential to strengthen disaster management and climate resilience in cities including through significant emissions reductions, while also delivering economic benefits to urban populations and local economies[74].

## 4.0 Conclusion

Cities are highly vulnerable to the impacts of climate change and disasters while also playing a huge role in the climate crisis due to huge amounts of greenhouse gas emissions[75]. The effects of climate change and disasters including extreme heat, flooding, storms, and earthquakes are causing adverse impacts on human health, livelihoods and key infrastructure in cities[76]. Due to their vulnerability to disasters and the impacts of climate change, it is imperative to integrate disaster management and climate resilience strategies in cities for sustainability. Achieving this ideal requires cities to harness opportunities including renewable energy, cleaner production techniques, green and climate-resilient infrastructure, sustainable waste management, and nature-based solutions including urban green spaces[77]. Integrating disaster management and climate resilience in cities for sustainability is therefore possible and achievable.

[72] United Nations Environment Programme., 'Nature-Based Solutions for Urban Challenges' Available at https://unepdhi.org/nature-based-solutions-for-urban-challenges/ (Accessed on 21/11/2024)
[73] United Nations Development Programme., 'Cities Have a Key Role to Play in Tackling Climate Change – Here's Why' Op Cit
[74] Ibid
[75] Bigio. A., 'Cities and Climate Change' Op Cit
[76] Intergovernmental Panel on Climate Change., 'Climate Change 2023: Synthesis Report' Op Cit
[77] United Nations Development Programme., 'Cities Have a Key Role to Play in Tackling Climate Change – Here's Why' Op Cit

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