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Underground Water Crisis Management in Kabul

Ali Jan Rasikh

Abstract:- This paper analyzes the underground water crisis in Kabul, Afghanistan, exacerbated by climate change, urbanization, and inadequate water management infrastructure which has been intensified by the depletion of groundwater, unregulated urban growth, and reduced precipitation. The study applies the crisis management cycle—prevention, preparedness, response, and recovery to propose sustainable strategies for mitigating the crisis.

Prevention strategies include public awareness campaigns on water conservation and rainwater harvesting, along with sustainable water management practices such as efficient irrigation systems and surface water storage. Preparedness focuses on developing early warning systems and community training programs to enhance resilience. The response phase emphasizes immediate measures to provide clean water, protect existing sources, and improve water efficiency. Recovery efforts prioritize the development of a national-level framework for sustainable water resource management, pre-disaster planning, and post-disaster assessment processes to build resilience and "build back better."

By leveraging a combination of technical interventions, policy frameworks, and community engagement, this paper aims to provide a roadmap for addressing Kabul's water crisis while ensuring alignment with the United Nations Sustainable Development Goals (SDGs). The research draws on qualitative analysis of existing literature, seeking to foster academic and practical discourse on sustainable water management in crisis-affected regions.

Keywords:- *Underground Water Crisis, Prevention, Preparedness, Respond, Recovery.*

I. INTRODUCTION

Kabul faces a severe water shortage due to climate change, rapid population growth, and weak infrastructure. Climate change has been harsh on this region. The city has been experiencing a significant decline in annual snowfall and erratic rain patterns. This has reduced runoff into rivers and underground aquifers, critical for Kabul's water supply. [1] Over the past two decades, groundwater levels in Kabul have decreased by approximately one meter annually, with some areas experiencing drops of up to 30 meters.[2] According to the National Water Affairs Regulation Authority in July 2022, the groundwater level dropped 12 meters in a year.[3] In addition, Kabul is one of the fastest-growing cities in the world. In the early 2000s, the population was around 2.4 million[4], but it has now surpassed the 4.5 million mark.[5] According to estimates, the groundwater reserves in Kabul City are sufficient to meet the water requirements of approximately 2 million people. However, the current population of Kabul has exceeded 4.5 million. In a joint statement, UNAMA and UNICEF reported that, without immediate action, Kabul's groundwater could be depleted by 2030 due to rapid urbanization and climate change.[6]

This article will discuss how to manage the underground water crisis in Kabul. The underground water crisis in Kabul presents a complex challenge that requires a multifaceted approach encompassing prevention, preparedness, response, and recovery strategies. By investing in sustainable practices, enhancing infrastructure, promoting public awareness, and fostering community engagement, Kabul can work towards mitigating the impacts of its ongoing water crisis while building resilience against future challenges.

This essay employs a qualitative approach, drawing on existing literature to analyze water management solutions. By synthesizing diverse perspectives from academic studies, policy reports, and expert opinions, the study seeks to provide an in-depth understanding of the crisis and its potential

[1] Ehsan, K. (2023, July 12). Desperate and thirsty: Kabul's worsening water crisis. *Kabul Now.* Retrieved from file:///C:/Users/PREMIER%20COMPUTER/Downloads/Desperate%20and%20Thirsty_%20Kabul's%20Worsening%20Water%20Crisis%20_%20Special%20Report.html

[2] Kakar, F., Ahmad, F., & Stucki, V. (2013). Water resources management in Afghanistan: The issues and options. *Environment, Development and Sustainability, 15*(4), 927-950. https://doi.org/10.1007/s10669-013-9455-4

[3] SWN News. (2024, March). Groundwater level in Kabul drops 15 meters in past 5 years. Retrieved from https://swn.af/en/2024/03/groundwater-level-in-kabul-drops-15-meters-in-past-5-years/

[4] City Facts. (n.d.). *Kabul population.* Retrieved from https://www.city-facts.com/kabul/population

[5] World Population Review. (2024). *Kabul population 2024.* Retrieved from https://worldpopulationreview.com/cities/afghanistan/kabul

6 Amin, K. (2024, November 12). Kabul's water crisis: Uncertainty surrounds Taliban's agenda at UN climate conference. *Hasht-e Subh.* Retrieved from https://8am.media/eng/kabuls-water-crisis-uncertainty-surrounds-talibans-agenda-at-un-climate-conference/

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mitigation strategies. The author does not intend to come up with a final solution; however, to create a foundation for further discourse among scholars, policymakers, and practitioners.

A. Definition

The crisis management cycle refers to the systematic process organizations follow to prepare for, respond to, recover from, and learn from crises. This cycle emphasizes the importance of not just reacting to crises as they occur, but also incorporating lessons learned into future strategies, ensuring continuous improvement and resilience. By understanding each phase of the cycle, organizations can better manage potential crises and enhance their overall preparedness for future incidents.[7]

B. Prevention

According to the UNDRR, prevention is activities and measures to avoid existing and new disaster risks. Prevention (i.e., disaster prevention) expresses the concept and intention to avoid potential adverse impacts of hazardous events completely. While certain disaster risks cannot be eliminated, prevention aims at reducing vulnerability and exposure in such contexts where, as a result, the risk of disaster is removed.[8]

Kabul is now facing an underground water crisis that needs to be managed wisely. According to a study released in May 2020 by the Afghanistan Research and Evaluation Unit (AREU), the groundwater levels in Kabul have experienced a steady decline of approximately 1 meter per year over the last 20 years. The study also found that certain areas in central Kabul have experienced even more significant losses, with drops of up to 30 meters over 14 years. [9] In addition, in a joint statement, UNAMA and UNICEF reported that, without immediate action, Kabul's groundwater could be depleted by 2030 due to rapid urbanization and climate change.[10]

To manage this situation, we need to take some measures in the prevention phase of the crisis management cycle.

➢ *Public Awareness Campaigns about Water Harvesting*

Educating citizens about the importance of conserving water can lead to behavioral changes that support sustainability. Campaigns should target both urban and rural populations to promote responsible water use. It is particularly useful in Rainwater harvesting (RWH). It is collecting and storing rain, rather than allowing it to run off. Rainwater is collected from a roof-like surface and redirected to a tank, cistern, deep pit (well, shaft, or borehole), aquifer, or reservoir with percolation so that it seeps down and restores the groundwater. Rainwater harvesting differs from stormwater as the runoff is typically collected from roofs and other area surfaces for storage and subsequent reuse. Its uses include watering gardens, livestock, irrigation, domestic use with proper treatment, and domestic heating. The harvested water can also be used for long-term storage or groundwater recharge.

Rainwater harvesting is one of the simplest and oldest methods of self-supply of water for households, having been used in South Asia and other countries for many thousands of years. Installations can be designed for different scales, including households, neighborhoods, and communities, and can also serve institutions such as schools, hospitals, and other public facilities.[11]

➢ *Sustainable Water Management Practices*

Establishing sustainable practices is essential for preserving groundwater resources. This includes promoting water conservation techniques and implementing efficient irrigation practices in agriculture.

- *Water Conservation via Managing Water Surface*

Kabul city is traversed by three main rivers: the Kabul River, Paghman River, and Logar River. The Paghman River replenishes the Qargha reservoir. These rivers primarily flow during periods of snowmelt and rainfall, providing surface water resources that are crucial for the region. The Kabul River's average monthly runoff (measured in Mm^3) is monitored at the Tang-E-Sayedan, Sang-i-Naweshta, and Qala-E-Malik hydrological stations. Analysis of the hydrographs indicates that significant volumes of water flow into Kabul city annually from the Paghman, Maidan, and Logar rivers, the city's primary surface water sources.

Effective management of these surface water flows is vital for reducing unnecessary water usage in Kabul and optimizing storage in small basins. This stored water can then be used for groundwater recharge, helping to maintain a sustainable supply of groundwater for the city. By capturing excess river flow during peak periods and directing it into storage basins or reservoirs, this water can infiltrate the ground, replenishing underground aquifers and providing a reliable future water source. This method ensures efficient use of surface water resources while supporting Kabul city's long-term water sustainability.

[7] Fiveable. (n.d.). Crisis management cycle. *Fiveable Library*. Retrieved from https://library.fiveable.me/key-terms/crisis-management/crisis-management-cycle

[8] United Nations Office for Disaster Risk Reduction. (n.d.). Prevention. *UNDRR Terminology*. Retrieved from https://www.undrr.org/terminology/prevention

[9] Ehsan, K. (2023). Desperate and thirsty: Kabul's worsening water crisis. *Special Report.* Retrieved from file:///C:/Users/PREMIER%20COMPUTER/Downloads/Desperate%20and%20Thirsty_%20Kabul's%20Worsening%20Water%20Crisis%20_%20Special%20Report.html

[10] Amin, K. (2024, November 12). Kabul's water crisis: Uncertainty surrounds Taliban's agenda at UN climate conference. *Hasht-e Subh.* Retrieved from https://8am.media/eng/kabuls-water-crisis-uncertainty-surrounds-talibans-agenda-at-un-climate-conference/

[11] Wikipedia contributors. (n.d.). Rainwater harvesting: Agriculture. In *Wikipedia*. Retrieved November 14, 2024, from https://en.wikipedia.org/wiki/Rainwater_harvesting#Agriculture

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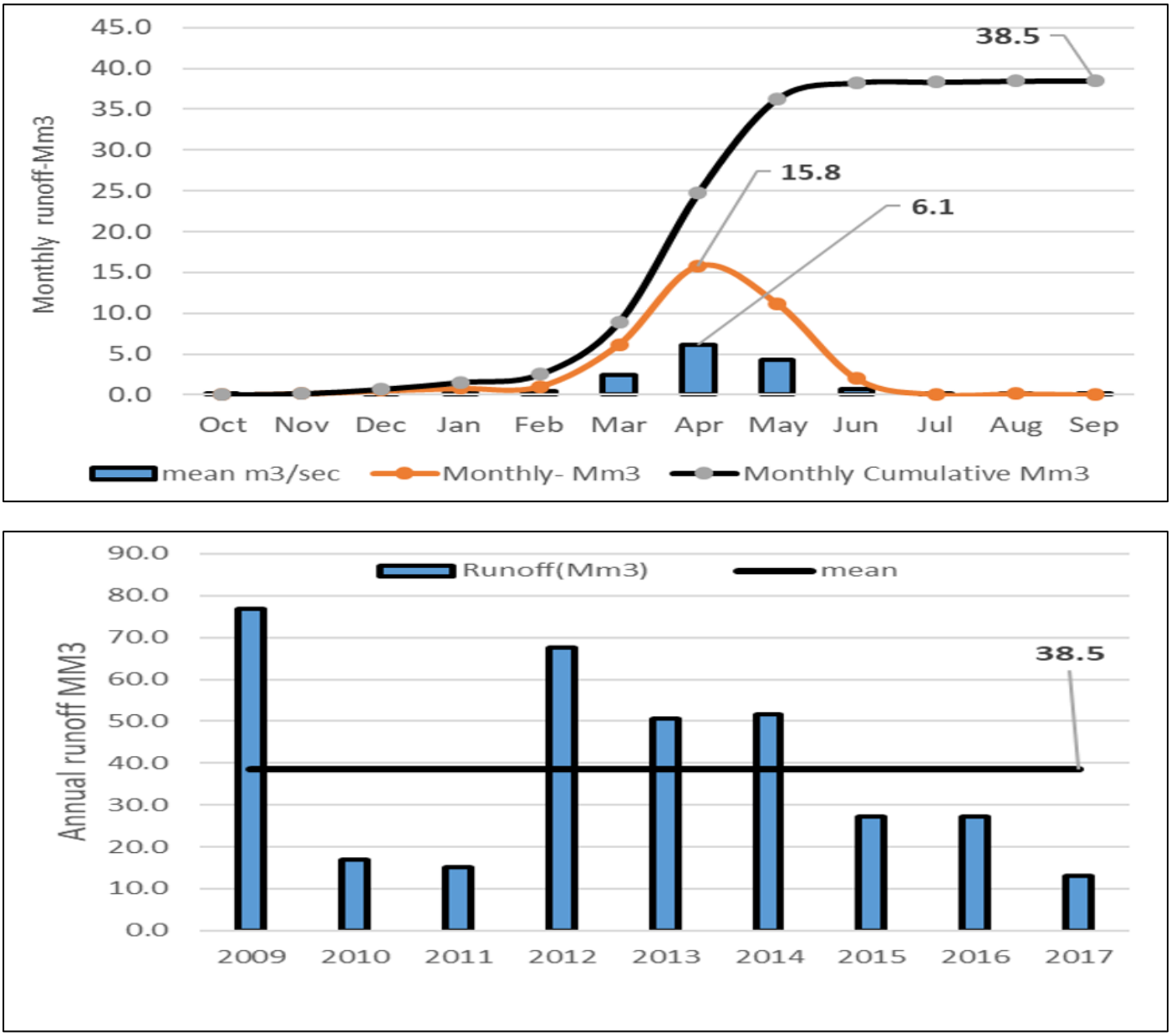
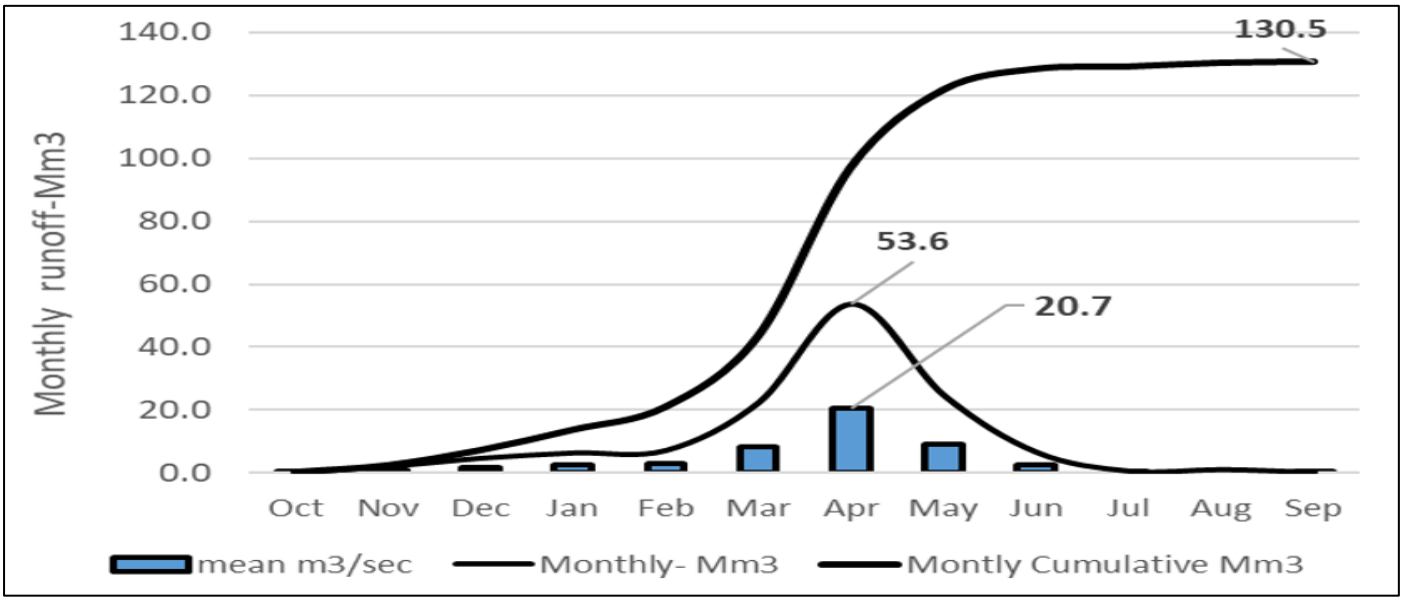


Fig 1 Monthly Runoff (Mm^3) at Qala-E-Malik Hydrological Station



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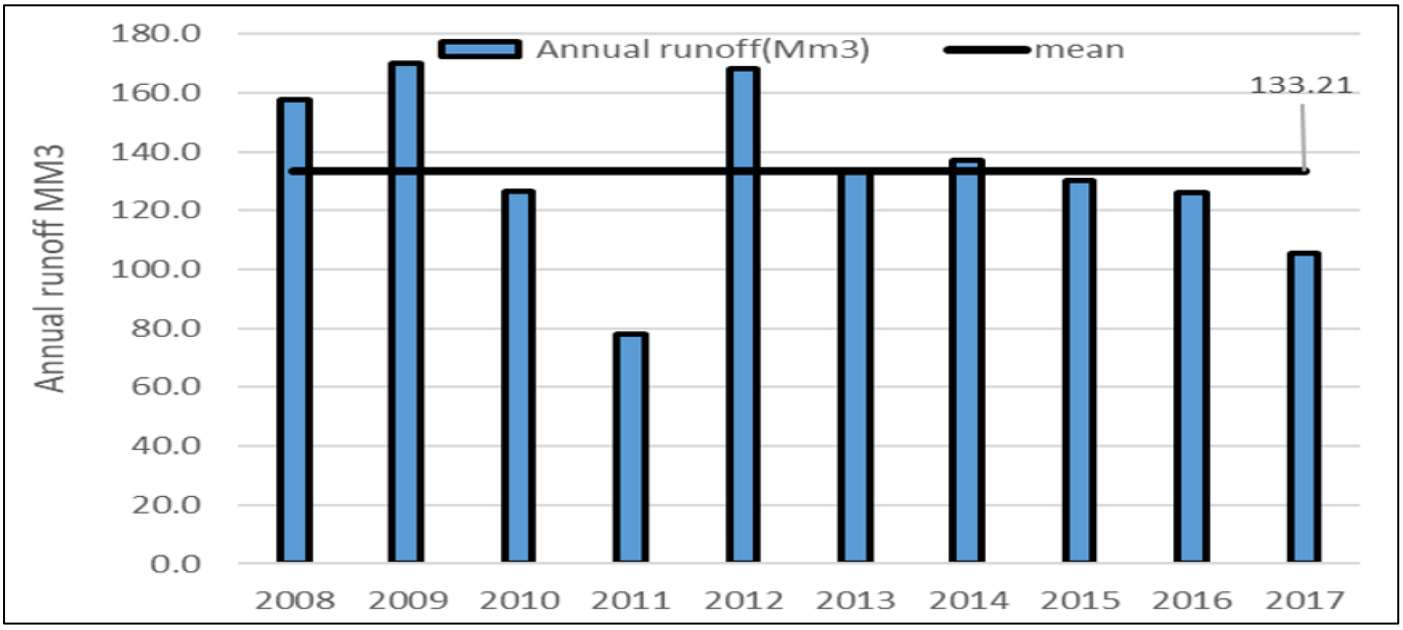

Fig 2 Monthly Runoff (Mm3) at Tangi-E-Sayedan Hydrological Station

On average, the Paghman Sub-River contributes 38.5 Mm^3 of water to the Qargha Dam, while the Maidan and Logar Rivers contribute 130 Mm^3 and 226 Mm^3, respectively, to the Kabul city area. The Paghman and Maidan Rivers flow from the upper parts of the city, whereas the Logar River merges with the Kabul River in the lower city. Properly managing these flows can significantly address Kabul's water needs and support groundwater replenishment. By implementing practices such as water storage and groundwater recharge, the overall water resources and potential of Kabul city can be effectively enhanced.[12]

➢ *SDG and Water Harvesting*

Practicing the prevention stage directly affects the SDGs goals. It is worth mentioning that rainwater harvesting in conjunction with urban agriculture would be a viable way to help meet the United Nations Sustainable Development Goals for cleaner and sustainable cities, health and well-being, and food and water security (Sustainable Development Goal 6). The technology is available, however, it needs to be remodeled to use water more efficiently, especially in an urban setting.[13]

C. Preparedness

Preparedness action is carried out within the context of disaster risk management. It aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery. A preparedness plan establishes arrangements in advance to enable timely, effective, and appropriate responses to specific potential hazardous events or emerging disaster situations that might threaten society or the environment.[14] Enhancing Preparedness for Water Crises Preparedness involves creating systems that enable effective management during a crisis.

➢ *Early Warning Systems*

Implementing hydro-meteorological monitoring systems could be helpful. Storms, floods, droughts, and landslides are just a few examples of hydrometeorological hazards that can be caused by climate change or extreme meteorological events. With these hazards accounting for most of the natural disasters that occur worldwide, robust hydrometeorological monitoring systems are needed to improve preparedness and mitigation measures.[15]

In recent years, international collaborations have invested more to enhance Afghanistan's hydro-meteorological monitoring infrastructure. For example, the International Centre for Integrated Mountain Development (ICIMOD) and the Commonwealth Scientific and Industrial Research Organization (CSIRO) have helped the installation of automatic weather stations and other monitoring equipment in the Kabul River Basin. These initiatives aim to establish a sustainable, long-term cryosphere monitoring program, focusing on areas with significant snow and glacier presence. [16]

[12] Reshteen, S., Rahmatzai, A., & Safi, A. G. (2024). Urban water crisis in Kabul city: Key challenges and solutions. *Journal of Natural Science Review, 2*(3), 138–150. Retrieved from https://kujnsr.com

[13] Wikipedia contributors. (n.d.). Rainwater harvesting: Agriculture. In *Wikipedia*. Retrieved November 25, 2024, from https://en.wikipedia.org/wiki/Rainwater_harvesting#Agriculture

[14] United Nations Office for Disaster Risk Reduction. (n.d.). Preparedness. *UNDRR Terminology*. Retrieved from https://www.undrr.org/terminology/preparedness

[15] AZoCleantech. (n.d.). Water resource challenges in Afghanistan: A growing concern. Retrieved from https://www.azocleantech.com/article.aspx?ArticleID=1479

[16] International Centre for Integrated Mountain Development (ICIMOD). (n.d.). Urban resilience in Afghanistan: A focus

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In addition, the Climate Risk and Early Warning Systems (CREWS) Initiative was launched at UNFCCC COP21 in Paris, in 2015. It provides access to sustainable early warning systems to safeguard the population of those Least Developed Countries (LDCs) and Small Island Developing States (SIDS) that face significant threats against natural hazards. Afghanistan is highly impacted by frequent floods, landslides, earthquakes, storms, and droughts. For this reason, CREWS started working here to make the country more resilient and improve its hydro-met, early warning, and climate services. Unfortunately, this has been stagnant since August 2021 ever since the interim Taliban Administration came into power. [17]

A country already undergoing a deadly humanitarian crisis needs its leaders to have plans of action instead of providing temporary relief after the mishap. Because if we are to understand the meaning of Governance in the words of Francis Fukuyama, it indicates, "a government's ability to make and enforce rules, and to deliver services, regardless of whether that government is democratic or not." Climate and governance are thus closely linked to one another and need to be in sync to tackle the country's climate hazards, especially in a country like Afghanistan.[18]

➢ *Community Training Program*

According to the joint statement, UNAMA and UNICEF reported that, without immediate action, Kabul's groundwater could be depleted by 2030 due to rapid urbanization and climate change.[19] People in Dashtee-Barchi, Kabul go far distances and wait long queues and hours to secure limited water for their families. They show that Kabul is in the middle of a crisis.[20] In this case, the government and involved NGOs should educate communities on how to be more prepared to prevent the exacerbation of the situation.

Community training programs play a key role in building a resilient community. This ensures that communities and individuals are informed, equipped, and active in mitigating the impacts of the potential crisis. Without an informed and aware population, even the best plan will not mitigate the effect of the crisis. One of the most effective ways to do this is using mass media. Since many parts of Kabul are already in crisis, the government and NGOs should work harder to educate people to understand the impact of this crisis. This encourages people to take precautionary actions. For example, people should be encouraged to take measures to reservoir water during rainy and snowy seasons like water harvesting.

D. Response

Actions taken directly before, during, or immediately after a disaster to save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected. Disaster response is predominantly focused on immediate and short-term needs and is sometimes called disaster relief. Effective, efficient, and timely response relies on disaster risk-informed preparedness measures, including the development of the response capacities of individuals, communities, organizations, countries, and the international community.[21]

Addressing Kabul's groundwater crisis, particularly in areas like Dashte Barchi, requires immediate and coordinated actions to ensure access to safe drinking water and mitigate the impacts of water scarcity. According to the Concern Worldwide article, there are nine ways that we can approach water scarcity and I am going to discuss three of them.

➢ *Provide Clean, Safe Water to those who Need it Most*

The most straightforward approach to addressing water scarcity is to provide people with water. Water trucking serves as a rapid, short-term response to shortages, whether supplying refugee camps while infrastructure is upgraded or delivering water to communities during a drought. Though effective in emergencies, it is costly and unsustainable as a long-term solution. However, it can serve as a critical temporary measure to save lives.

While water trucking is helpful, constructing and repairing water sources in communities offers a more sustainable solution, akin to teaching someone to fish instead of merely giving them one. This may involve drilling new wells, which requires analyzing groundwater distribution and the geological structure of the area. In some cases, existing wells can be enhanced with hand pumps that seal and protect them, making water collection easier and safer.

For areas with unreliable or nonexistent grid power, solar-powered water pumps provide an economical and eco-friendly solution, utilizing one of the most consistent resources: sunlight. [22]

on water security. Retrieved from https://lib.icimod.org/record/34820?utm_source

[17] MEIG. (2024). Highlight #28/2024: The role of governance underlined during climate crisis challenges unfolding in Afghanistan. Retrieved from https://www.meig.ch/highlight-28-2024-the-role-of-governance-underlined-during-climate-crisis-challenges-unfolding-in-afghanistan/?utm

[18] MEIG. (2024). Highlight #28/2024: The role of governance underlined during climate crisis challenges unfolding in Afghanistan. Retrieved from https://www.meig.ch/highlight-28-2024-the-role-of-governance-underlined-during-climate-crisis-challenges-unfolding-in-afghanistan/?utm

[19] Amin, K. (2024, November 12). Kabul's water crisis: Uncertainty surrounds Taliban's agenda at UN climate conference. *Hasht-e Subh.* Retrieved from https://8am.media/eng/kabuls-water-crisis-uncertainty-surrounds-talibans-agenda-at-un-climate-conference/

[20] Ehsan, K. (2023, July 12). Desperate and thirsty: Kabul's worsening water crisis. *Kabul Now.* Retrieved from file:///C:/Users/PREMIER%20COMPUTER/Downloads/Desperate%20and%20Thirsty_%20Kabul's%20Worsening%20Water%20Crisis%20_%20Special%20Report.html

[21] United Nations Office for Disaster Risk Reduction. (n.d.). Response. *UNDRR Terminology.* Retrieved from https://www.undrr.org/terminology/response

[22] Concern Worldwide. (n.d.). Water scarcity: Solutions that work. Retrieved from https://www.concern.net/news/water-scarcity-solutions-that-work

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- *Protect (or Improve) the Quality of available Water in an Area*

In the best-case scenario, a community has access to a natural spring. When this is the case, efforts are focused on protecting the spring to ensure it remains a reliable source of clean water. This involves working with the community to construct protective structures around the spring, safeguarding the surrounding land from contamination by humans or animals.

If the available water source is non-potable, there are still ways to enhance its quality. For example, seawater can be desalinated using large-scale systems or portable devices. Additionally, methods such as water purification tablets and other treatment options can be employed to eliminate microorganisms and pathogens responsible for illnesses like typhoid, cholera, and other waterborne diseases.[23]

- *Collect and Store Rainwater to use Later on*

A rainwater catchment system, like the one installed by Concern Worldwide on a community latrine in eastern Freetown, Sierra Leone, offers a practical, low-tech, and cost-effective solution to water scarcity in areas with sufficient rainfall. Rainwater Harvesting Systems work by using a specially designated catchment surface to collect rainwater, which is then stored for future use.

For regions with adequate and reliable rainfall, this method has several advantages. It requires minimal technological investment, making it simple for communities to maintain and manage. When collected properly, rainwater typically requires less processing to be safe for use. While it may not always meet the demand for drinking water, it serves as an excellent supplemental resource, particularly for agricultural purposes, which consume a significant portion of water in water-stressed regions. Additionally, rainwater harvesting can support other critical needs, such as watering livestock or providing water for schools and hospitals.

This approach can be a valuable addition to a community's water management strategy, alleviating pressure on other sources and improving resilience to water shortages.[24]

E. Recovery

The restoring or improving livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems, and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and "build back better", to avoid or reduce future disaster risk.[25]

Disaster-impacted countries and communities are oftentimes much better equipped to Build Back Better during the extended period of recovery, rehabilitation, and reconstruction when they have taken actions to strengthen recovery capacity and decision-making effectiveness prior to the onset of disaster. As such, implementation of Priority 4b focuses on building this capacity through the creation and strengthening of recovery-focused relationships, the establishment of planning and coordination mechanisms, and the introduction of methods and procedures to ensure recovery activities are adequately informed and supported. National-level disaster recovery frameworks provide the structure and context required by stakeholders active in recovery planning and operations. Stakeholders in Priority 4b, which include national and local governments, the private sector, and civil society organizations, can undertake several tasks to implement Priority 4b. This guide recommends the following four tasks:

- *Develop an All-Stakeholder, National-Level Recovery Framework*

Task 4b.1 emphasizes creating a comprehensive disaster recovery framework that unites stakeholders at all levels. To manage Kabul's underground water crisis, all stakeholders, including government agencies, local communities, private entities, and international organizations, must collaborate in outlining roles, responsibilities, and goals. A national recovery framework prioritizes sustainable water extraction policies, aquifer restoration, and the regulation of groundwater use. It would also provide a structured approach for transitioning from immediate relief to long-term recovery, ensuring all actions align with the principles of sustainable development and resilience.

- *Enable Pre-Disaster Recovery Planning Among All Stakeholders*

Task 4b.2 focuses on proactive planning before crises occur, enhancing the capacity to respond and recover effectively. For Kabul, pre-disaster recovery planning could include mapping groundwater resources, identifying high-risk zones, and implementing recharge projects such as rainwater harvesting. This task would also involve training communities and officials on sustainable water use and emergency water distribution systems. By planning, stakeholders can ensure that recovery measures, such as infrastructure repair and equitable water access, are ready to be deployed swiftly when a crisis arises.

- *Formalize Processes to Assess Post-Disaster Damages and Needs*

Task 4b.3 highlights the importance of formalizing systems to assess the extent of damages and recovery requirements accurately. In Kabul's case, post-crisis assessments would include evaluating groundwater depletion levels, contamination risks, and infrastructure damages. Using tools like Post-Disaster Needs Assessments (PDNAs),

[23] Concern Worldwide. (n.d.). Water scarcity: Solutions that work. Retrieved from https://www.concern.net/news/water-scarcity-solutions-that-work

[24] Concern Worldwide. (n.d.). Water scarcity: Solutions that work. Retrieved from https://www.concern.net/news/water-scarcity-solutions-that-work

[25] United Nations Office for Disaster Risk Reduction. (n.d.). Recovery. *UNDRR Terminology*. Retrieved from https://www.undrr.org/terminology/recovery

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stakeholders can quantify the economic, social, and environmental impacts of the water crisis. This data-driven approach would enable authorities to prioritize recovery investments, such as repairing damaged wells, improving water supply infrastructure, and restoring natural recharge areas.

- *Strengthen Policies, Laws, and Programs to Build Back Better*

Task 4b.4 advocates for robust policy frameworks and supportive mechanisms to ensure recovery aligns with "Build Back Better" principles. For Kabul's water crisis, this would involve enacting strict groundwater extraction laws, incentivizing sustainable water use, and incorporating disaster risk reduction measures into urban planning. Policies could mandate the use of efficient irrigation and water recycling technologies, while public awareness campaigns promote conservation practices. Strengthened governance and regulatory mechanisms would ensure that recovery efforts not only address the current crisis but also enhance resilience to future challenges.[26]

II. RECOMMENDATION

Integrating water harvesting with effective surface water management is essential to address Kabul's ongoing water crisis. Rainwater harvesting can significantly reduce reliance on depleting underground water reserves by capturing and storing rainwater for domestic, agricultural, and industrial use. Policies mandating rooftop rainwater harvesting systems and community-based storage facilities should be introduced to promote widespread adoption. Public awareness campaigns can also educate citizens on the importance of conserving water through harvesting techniques, ensuring long-term behavioral change.

Surface water management plays a crucial role in sustaining water availability in Kabul. The city's rivers, including the Paghman, Maidan, and Logar Rivers, currently experience substantial runoff losses during periods of peak flow. Building small reservoirs and infiltration basins can capture this excess water, storing it for future use or directing it into aquifers for groundwater recharge. Urban planning must incorporate features like permeable pavements, natural drainage systems, and green infrastructure to enhance the efficiency of surface water management while reducing urban flooding.

A collaborative approach involving government agencies, local communities, and international partners is necessary to implement these solutions effectively. Financial incentives such as subsidies for rainwater harvesting systems and investments in modern irrigation technologies for agriculture can accelerate adoption. Monitoring and evaluation systems should be established to assess the impact of these measures and ensure their continuous improvement. Together, these strategies can provide a sustainable pathway to mitigate Kabul's water crisis and build resilience for the future.

III. CONCLUSION

The underground water crisis in Kabul is a multifaceted challenge that threatens the city's sustainability and the well-being of its inhabitants. Climate change, rapid urbanization, and insufficient water management have led to the depletion of groundwater resources at an alarming rate. This crisis demands immediate, comprehensive, and coordinated efforts at the local, national, and international levels.

The crisis management cycle—comprising prevention, preparedness, response, and recovery—offers a structured framework for addressing this challenge. Prevention measures, such as public awareness campaigns and the promotion of rainwater harvesting, can reduce dependence on dwindling groundwater resources. Preparedness actions, including the establishment of early warning systems and community training programs, enhance resilience and readiness for future challenges. Immediate response efforts must focus on ensuring access to safe and clean water while protecting existing water sources. Finally, recovery strategies should prioritize the development of sustainable frameworks, policies, and infrastructure to "build back better" and reduce vulnerability to future crises.

Addressing Kabul's water crisis requires a collaborative approach that involves government agencies, local communities, private sector actors, and international organizations. By leveraging technical innovations, strengthening governance, and fostering public participation, Kabul can work toward achieving long-term water sustainability. Integrating these strategies with global commitments such as the United Nations Sustainable Development Goals (SDGs) can further enhance their effectiveness, ensuring that the solutions not only address the current crisis but also build resilience for future generations.

This paper emphasizes the importance of sustainable water management practices and proactive governance as key pillars for tackling the water crisis in Kabul. By adopting these recommendations, policymakers and stakeholders can pave the way for a resilient and water-secure future for Afghanistan's capital.

REFERENCES

- *Articles*

[1]. Amin, K. (2024, November 12). Kabul's water crisis: Uncertainty surrounds Taliban's agenda at UN climate conference. *Hasht-e Subh.* Retrieved from https://8am.media/eng/kabuls-water-crisis-uncertainty-surrounds-talibans-agenda-at-un-climate-conference/

[26] United Nations Office for Disaster Risk Reduction. (n.d.). *Global Assessment Report on Disaster Risk Reduction.* Retrieved from https://www.undrr.org/media/83543/download?startDownload=20241124

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14576701

[2]. Ehsan, K. (2023, July 12). Desperate and thirsty: Kabul's worsening water crisis. *Kabul Now*. Retrieved from file:///C:/Users/PREMIER%20COMPUTER/Downloads/Desperate%20and%20Thirsty_%20Kabul's%20Worsening%20Water%20Crisis%20_%20Special%20Report.html

[3]. Kakar, F., Ahmad, F., & Stucki, V. (2013). Water resources management in Afghanistan: The issues and options. *Environment, Development and Sustainability, 15*(4), 927-950. https://doi.org/10.1007/s10669-013-9455-4

[4]. Reshteen, S., Rahmatzai, A., & Safi, A. G. (2024). Urban water crisis in Kabul city: Key challenges and solutions. *Journal of Natural Science Review, 2*(3), 138–150. Retrieved from https://kujnsr.com

[5]. SWN News. (2024, March). Groundwater level in Kabul drops 15 meters in past 5 years. Retrieved from https://swn.af/en/2024/03/groundwater-level-in-kabul-drops-15-meters-in-past-5-years/

➢ *Websites*

[6]. AZoCleantech. (n.d.). Water resource challenges in Afghanistan: A growing concern. Retrieved from https://www.azocleantech.com/article.aspx?ArticleID=1479

[7]. City Facts. (n.d.). Kabul population. Retrieved from https://www.city-facts.com/kabul/population

[8]. Concern Worldwide. (n.d.). Water scarcity: Solutions that work. Retrieved from https://www.concern.net/news/water-scarcity-solutions-that-work

[9]. Fiveable. (n.d.). Crisis management cycle. *Fiveable Library*. Retrieved from https://library.fiveable.me/key-terms/crisis-management/crisis-management-cycle

[10]. International Centre for Integrated Mountain Development (ICIMOD). (n.d.). Urban resilience in Afghanistan: A focus on water security. Retrieved from https://lib.icimod.org/record/34820?utm_source

[11]. MEIG. (2024). Highlight #28/2024: The role of governance underlined during climate crisis challenges unfolding in Afghanistan. Retrieved from https://www.meig.ch/highlight-28-2024-the-role-of-governance-underlined-during-climate-crisis-challenges-unfolding-in-afghanistan/?utm

[12]. United Nations Office for Disaster Risk Reduction. (n.d.). *Global Assessment Report on Disaster Risk Reduction.* Retrieved from https://www.undrr.org/media/83543/download?startDownload=20241124

[13]. United Nations Office for Disaster Risk Reduction. (n.d.). *Prevention*. UNDRR Terminology. Retrieved from https://www.undrr.org/terminology/prevention

[14]. United Nations Office for Disaster Risk Reduction. (n.d.). *Preparedness.* UNDRR Terminology. Retrieved from https://www.undrr.org/terminology/preparedness

[15]. United Nations Office for Disaster Risk Reduction. (n.d.). *Response*. UNDRR Terminology. Retrieved from https://www.undrr.org/terminology/response

[16]. United Nations Office for Disaster Risk Reduction. (n.d.). *Recovery*. UNDRR Terminology. Retrieved from https://www.undrr.org/terminology/recovery

[17]. Wikipedia contributors. (n.d.). Rainwater harvesting: Agriculture. In *Wikipedia.* Retrieved November 25, 2024, from https://en.wikipedia.org/wiki/Rainwater_harvesting#Agriculture

[18]. World Population Review. (2024). *Kabul population 2024.* Retrieved from https://worldpopulationreview.com/cities/afghanistan/kabul