Securing Sustainable Development Goal- 6 in Pakistan: A Framework for Clean Water and Sanitation

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Abstract: This paper aims to provide a comprehensive overview of the current state of Sustainable Development Goal 6 in Pakistan, along with a detailed study to address the issue. SDG 6 remains unfulfilled in Pakistan for several reasons, as millions lack access to clean drinking water, proper sanitation, and sufficient water for other essential uses. According to the research studies, Pakistan's water and sanitation facilities are plagued by improper water usage and inadequate financing, and the most significant factor is a lack of infrastructure. A qualitative research method is employed, and an analytical research design is applied to conduct this study. This research presents a robust framework that focuses on strengthening institutions, better government policies, promoting behavioral change and hygiene awareness, upgrading water and sanitary facilities, and improving financing policies for these services. The study also stresses the needs of the disadvantaged population, which comprises women, children and other susceptible groups. The study recommends the collaborative efforts of government institutions, international agencies, local communities, stakeholders, and civil society to achieve SDG 6. It is suggested to influence and encourage practice and policy and ensure that every citizen of Pakistan has access to cost-effective, hygienic water and sanitary facilities.

Key Words: Clean Water, Sanitation, Hygiene, Sustainable Development, Global Health, Human Rights

Introduction

The United Nations notes in the background of the development of this goal that over 40% of the world's population suffers from water scarcity, which is expected to worsen as global temperatures rise due to climate change. A significant issue affecting every continent is the depletion of supplies of safe drinking water, even though approximately 2.1 billion people have had access to better water and sanitation since 1990. The UN also predicts that at least one in four people worldwide will experience recurrent water shortages by 2050. Therefore, by 2030, Goal 6 aims to guarantee that everyone has access to safe and reasonably priced drinking water. Countries must make sufficient infrastructure investments, supply sanitary facilities, and promote cleanliness at all levels to meet the goal. Additionally, water-related habitats like rivers, marshes, mountains, and forests must be preserved and restored.

A group of Pakistani stakeholders has released a report detailing the nation's accomplishments and obstacles in implementing the Sustainable Development Goals (SDGs), even though Pakistan is expected to present a Voluntary National Review (VNR) at the 2019 session of the UN High-level Political Forum on Sustainable Development (HLPF). According to the 18 reports, the nation prioritizes SDGs 1 (no poverty), 3 (excellent health and well-being), 4 (quality education), 6 (clean water and sanitation), 8 (decent work and economic growth), and 16 (peace, justice, and strong institutions) and that a national SDG framework with national SDG targets and indicators has been adopted by the government. However, the report denotes dissatisfaction with the way policies of the SDGs are being implemented,

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characterizing institutional coordination at "every level" of government as well as among SDG task groups and units on the problems and progress of SDG implementation as "extremely weak." Pakistan has long struggled with a shortage of water and poor sanitation and clean drinking water infrastructure. Pakistan is among the 37 nations in the world with exceptionally high levels of water stress, which occurs when water availability is limited or demand for water exceeds supply. By 2025, it is predicted that there will be a complete water shortage (Kahlown & Majeed, 2003). Even if the nation's access to water and sanitation has somewhat improved over time, the dangers associated with inadequate sanitation have been made worse by water contamination and a lack of facilities for mixing untreated wastewater. Surprisingly high levels of E. coli contamination in both surface and subsurface water have been found in water tests conducted throughout Pakistan. Untreated wastewater is frequently combined with surface and groundwater for use in crop irrigation in addition to direct consumption. "Water Supply System (WSS) requires special attention as presently a large number of households do not have access to enough potable or shallow water and there is a lack of proper sanitation system," according to the Economic Survey of Pakistan, 2017-2018. In addition to having a detrimental effect on the ecosystem, poor sanitation causes illness.

The research also states that "wastewater treatment is essential for the continuous and affluent supply of water for agriculture in the future due to the country's water scarcity." Even if our sector has the ability and aptitude to develop and build wastewater/sewage treatment plants locally, only a small percentage of industrial effluent is being cleaned up and put back into use. The demands on sanitation and the availability of clean water have grown throughout time as a result of population growth. Among the top ten nations with the least access to clean water is Pakistan. Although Pakistan has risen in the rankings and is now ranked fifth out of ten nations with the greatest improved access to water since 2000, with over 44 million people, it still lags behind China, India, Indonesia, and Nigeria. According to estimates, 98% of the 21 wealthiest people in Pakistan have access to clean water, 88.5% of people have access to clean water nearby, and 79.2% of the poorest people have it. According to the World Resources Institute, if the current situation continues and no investments are made in water availability and efficient, all-encompassing water conservation measures, Pakistan will be classified as having Extremely high water stress by 2040. According to this scenario, by 2040, Pakistan will be ranked 23rd out of 33 nations experiencing water stress (Ahmad, 2023). Pakistan must ensure equitable access to safe, pocket-friendly and clean drinking water, as well as improved sanitation facilities to attain SDG 6. The country faces many problems, such as rapid population growth, urbanization of areas, and overuse of groundwater for agricultural purposes, which makes it difficult to provide basic rights of clean drinking and sanitation water for everyday use to its citizens. This lack of proper clean and hygienic water leads to negative social, economic and environmental consequences. This study aims to have a comprehensive look at the current state of water provision and snags and to provide a solution to overcome such problems.

Figure 1

Sustainable Development Goal #6: Clean Water and Sanitation

https://unstats.un.org/sdgs/report/2021/

Research Objectives

- To examine the current state of clean water and sanitation facilities.
- To determine the problems that are hindering the achievement of SDG 6.
- To analyze the impact of the water crisis on public health, economic prosperity and environmental sustainability.
- To identify the areas which require improvements and policy change to attain SDG

Research Questions

- What is the current state of potable drinking water and sanitary facilities in Pakistan?
- Which problems and obstacles hinder the achievement of SDG 6?
- How do unhygienic drinking water and sanitation facilities impact other spheres of public life?
- Which policy reforms are necessary, and what can be done to improve the current SDG 6 condition?

Research Methodology

The difficulty in attaining Sustainable Development Goal (SDG 6) in Pakistan is examined in this study by using an analytical research approach followed by a qualitative research methodology that relies on secondary sources such as newspapers, research papers, government reports, and policy papers. Further information regarding Pakistan's current water and sanitation facilities has also been added through an online survey. The theory of sustainable development encompasses a holistic approach to social justice, environmental sustainability, and economic feasibility to guarantee sustainable growth. This theory is based on the principles of justice, equity and sustainability.

Problem Statement

Ensuring access to water and sanitation for all is Sustainable Development Goal 6. Access to safe water, sanitation and hygiene is the most basic human need for health and well-being. Immediate action and plan are needed to combat Pakistan's crucial water and sanitation crisis, marked by inadequate access and ineffective management which is posing a serious threat to public health, economic prosperity, and environmental sustainability hindering the achievement of SDG 6 and providing a secure water future.

Pakistan's Commitment to Attain Sustainable Development Goals

Pakistan was a pioneer in committing to the Sustainable Development Goals (SDGs) and Millenium Development Goals (MDGs). Like many other countries, Pakistan's socio-economic progress and other developments are heavily reliant on its water resources. However, the country faces various challenges related to water scarcity and its quality. The worsened impacts of climate change and demands have amplified the issues. Achieving SDG 6 would benefit Pakistan. In 2022, Pakistan ranked 125th out of 163 countries, with a score of 59.30, in the global SDG ranking. (Umar et al., 2024). To attain the SDGs, particularly in the water field investment in infrastructure, making better policies, ensuring their implementation, creating awareness among the public, holding stakeholders and the private sector accountable for their actions, capacity building, and adoption of modern technology is important and necessary. Guaranteeing access to clean water and hygienic sanitation facilities depends on water management, allocation, control of rising water treatment and management costs.

Figure 2

https://www.ice.org.uk/eventarchive/achieving-sdg-6-the-water-goal

Harmonizing National Goals with Global Targets for Water and Sanitation

Pakistan is ranked as the world's eighth most vulnerable to climate change, and this condition of water scarcity poses a very serious threat to its economic and social development (Mujtaba et al., 2024). Moreover, the Sustainable Development Goals concerning water usage efficiency, integrated water resources management, and global access to water and sanitation facilities management will help in achieving SDG 6. Along these lines, Vision 2025 of Pakistan tackles water security issues, including increased water storage capacity, increased agricultural productivity with 20% more output, and ensuring clean drinking water for all citizens. According to PCRWR's recent warning, Pakistan will be drained out of all its existing water by 2025 unless the government takes effective measures. Now, the economy and public health of a nation are suffering maliciously from water scarcity. Water scarcity and water-borne diseases have been estimated to account for a loss of GDP to the tune of 1.44 per cent, with more than 80 per cent of the water supplied reported to be unfit for consumption. To alleviate the problem, several stand-alone projects are underway; however, now, a national water policy needs to be enacted.

Approximately 60 per cent of Pakistan's population is employed in agriculture and livestock, while these sectors organize approximately 80 per cent of the country's exports. Approximately 95% of their total water consumption goes to agriculture. Pakistan is among the 36 countries most highlighted for water in the world, even having the world's biggest glaciers (Qureshi & Ashraf, 2019). A critical water demand-supply gap is anticipated due to an ever-increasing population growth. Water problems and high tensions with neighbouring countries over transboundary water sources threaten the future security, stability, and sustainability of the country; thus, immediate coordinated preparation and execution are needed to avoid an impending disaster (The Asia Foundation, 2017).

Current State of Water and Infrastructure in Pakistan

Due to its vast population, Pakistan has been identified as one of the countries facing a severe water crisis. The per capita annual capacity of water availability has drastically declined from 5140 m3 to 1000 m3 since 1950. The primary source is rivers, which serve 70% of the total surface water supply; groundwater comprises 15%, while rainfall and other sources contribute 8% (Mansuri et al., 2018). Pakistan, like other South Asian countries, contains resources from water of different types, including surface water resources such as basins, rivers, coats, lakes, big and small internal reservoirs, and subsurface water resources. The primary sources would be precipitation and then, firstly, the build-up of some frozen water, eventually adding to the formation and advancement of glaciers. Pakistan has 143 water storage facilities with different types and capacities. Among these are the Chashma, Mangla and Tarbela reservoirs, which can be categorized as large entities, as their collective storage capacity is 18.92 million Acre Feet. Water resource diversity is essential to the ecological, economic, and societal sustainability of Pakistan. Water supplies are unpredictable due to factors such as ice and snowmelt in the upper Indus Basin, variability in monsoon rainfall, and complicated patterns of groundwater circulation in the lower regions. The west rivers are dependable for 75% of the surface water contribution, and all other east rivers add 1.5% to the surface water contribution. The rest comes from rainfall and river flows in Pakistan. A drop in the mean annual precipitation has further stressed water resources because it reduces their recharge, and with the increase in temperature through the annual increase in temperature, global warming has affected Pakistan. Global warming has also led to the rapid melting of glaciers due to higher temperatures. Almost half of downstream surface water needs are met by ice reserves in its glaciers. More than 60% of surface flows in Pakistan are now used for commercial, residential, and agricultural purposes. It has now become one of Pakistan's most important resources because of seasonal irregularity and poor surface water management. After China, India, and the USA, Pakistan is already one of the fourth largest groundwater consumers in the world, and it uses almost ten times more irrigation water than any other use (Murtaza & Zia 2012).

Water Resource Management

Water resource management encircles the allocation and management of water resources across sectors and regions through a combination of laws, management practices, and allocation systems. Pakistan has established a comprehensive policy framework for water management, but it is not as effective as it should be in achieving SDG 6. The National

Water Policy 2018 provides a roadmap for sustainable water management. It encourages cooperation and collaboration among federal, provincial, and local levels of government and stakeholders.

The primary source of Pakistan's water supply is heavily reliant on the Indus River and its tributaries, which are at risk because of climate change (Ahmed et al., 2023). Water resource management in Pakistan consists of a complex network of agencies, institutions, and stakeholders. Key players include The Ministry of Water Resources, which is responsible for formulating national water policies and strategic plans for water resource infrastructure development. The Indus River System Authority is responsible for managing water allocation within the Indus Basin Irrigation System, with the objective of equal water distribution of water resources among provinces and stakeholders. The water management system in the provinces is unheeded by the irrigation and agriculture departments. It integrates irrigation systems, water distribution, and agricultural services. Cities are served by water and agencies responsible for sanitation services. Pakistan has various strategic approaches to water management and regulations.

The above-mentioned characteristics of the governance process are as follows: The 1960 Indus Waters Treaty specifies the distribution of water from the Indus River and its tributaries between India and Pakistan. The authority for distribution and allocation of water resources among provinces and consumers, using water usage regulations, is exercised by the Irrigation and Regulation Services Authority, otherwise known as IRSA. The objective is to promote fair water pricing. The current pricing model may encourage inefficient water use and underinvestment in infrastructure. To promote collaborative water management, farmers are united under local water management structures. These institutions coordinate water management, irrigation infrastructure, and maintenance operations. Various institutions collect, examine, and share information on hydrological statistics to track water resources. Pakistan Meteorological Department and Pakistan Council of Research in Water Resources carry out monitoring of river flows, rainfall, and water quality in the country (Rasheed et al., 2021).

Challenges, Weaknesses, And Gaps in Pakistan's Effort Towards SDG-6

Insufficient Cooperation and Coordination

Although Pakistan has established many frameworks for better regulations for water resources, Pakistan is still facing major problems that are unfit such as the agriculture system, adoption of modern technologies for irrigation, water scarcity and clean water issues, enforcing administrative policies for water regulation, and ignorance of the public towards water scarcity issues which leads to their limited participation in decision making (Mumtaz, et al., 2020). Effective frameworks from the government and their implementation, finance for infrastructure, sustainable practices, and public awareness and participation in WRM are required to rout these hindrances. There is a need to improve water management and preservation by improving administration strategies and proposing innovative solutions.

Water Contamination and Inefficiency

The water resources in Pakistan are fumbling because of many critical reasons. Foremost, specific businesses and industries are major reasons for environmental harm by ejecting untreated garbage in rivers, which is a violation of laws. Secondly, the research and statistical data regarding water resources management in Pakistan are not enough. It is challenging for researchers and academics to consider the water availability, water consumption, and pollutant concentration in water. Assessment of the groundwater depletion rate is also difficult. Moreover, there is an imbalance in water management regulation in Pakistan, which is the reason for the unequal distribution of water resources and, in many regions, intensifying water scarcity. Due to a lack of supervision and enforcement, many areas and ecosystems are impacted by unchecked illegal agriculture water draining. Pakistan has also failed to cooperate with industries, urban growth, or with the agricultural community. Due to this, a notable gap is created in water management that harms Water Resource Management WRM. Because policies for agricultural practices are not properly implemented to develop a better irrigation infrastructure, the water consumption is high, which is a big challenge for WRM (Gany et al., 2019)

Climate Change

Climate change is further exacerbating water problems in Pakistan. Government initiatives do not regularly assess water resources in response to climate change. For example, in Pakistan, there are no appropriate plans for developing climate-resilient infrastructure, and technology to promote water efficiency is unavailable. Climate change will increase Pakistan's temperature by 2050, and the predicted increment in temperature will be 0.6 to 1.5 degrees, which will ultimately lead to an increase in heat waves, floods, and water shortage. Due to heatwaves, the process of desertification and decrease in the flow rate of rivers will be rapid. There has been a significant impact on Pakistan's water resources in the last few years. Due to this, water scarcity is increasing, and agriculture is being affected. Groundwater management and conservation are essential to protect water resources and prevent flooding (Sajjad & Ghaffar, 2019).

Urbanization and Population Growth

Pakistan's water resources are under great threat. Water scarcity in Pakistan increases by 0.7% every year, while water supply has remained the same from 1977 to 2017. Due to this, there is fear of a decrease in water supply per person from 3478 cubic meters to 1117 cubic meters only (FAO 2021; WORLD 2021). We will need more water in the coming decades, but we don't have effective plans to implement to solve this problem. According to the predictions, Pakistan's population will reach 338 million by 2050(UN,2021), which is why it is facing the threat of seawater scarcity. Since water is essential for survival, it is very important to use water resources efficiently as people are moving towards urban areas.

Quality of Surface Water

The water of the Indus River and the other major rivers is somewhat pure, but the water downstream, like small rivers and lakes, is heavily contaminated. The reason for this is that a dangerous amount of waste containing toxic chemicals is being disposed of in rivers without any proper planning and is not supervised by any policies (Ahmed et al.,2023).

Groundwater Depletion

Groundwater in Pakistan is depleted very rapidly, and water scarcity is increasing due to a lack of research and proper planning. Groundwater levels are also decreasing because as much water is stored in groundwater, it is being extracted for various reasons. If this condition of water usage continues, then the water level will drop to a menacing level. According to research, in Karachi and Balochistan, the water level has dropped to a very hazardous level in the last 30 years. The concerns fall in groundwater levels in the areas of the Kuchlag-sub basin of the Pishin Lora basin in Balochistan in the last 30 years (Nazli et al., 2024). The water shortage in Pakistan is very critical, and the government cannot provide clean water to everyone due to its poor management. Violation of rules and regulations is one of the main problems. Rules may look good on paper, but they have not been implemented. There are also weaknesses in the current regulations and policies governed under Pakistan's water management. All these factors affect water conditions in Pakistan, including public health, economic development, and environmental sustainability.

Effects on Human Health

Despite being a fundamental right, just 20% of Pakistanis have an approach to clean drinking water. The remaining population is exposed to contaminated water, which leads to diseases and other effects. Studies have shown that water samples from Sindh, Punjab, Khyber Pakhtunkhwa, and Balochistan are contaminated with nitrates, iron, arsenic, and pathogens.

The primary causes of the preponderance of tainted water are littering, population growth, and the release of household trash into water bodies. Water contamination from the disposal of industrial and agricultural waste is hazardous to both human health and the environment.

Agriculture runoff and the use of fertilizer have caused contaminants like fluoride levels to rise noticeably. Due to Pakistan's rapid population increase and lack of freshwater resources, people are forced to drink untreated and contaminated water, which is primarily saline and does not meet World Health Organization WHO standards, as their

primary source of water. The amount of water available per person fell by 3900 cubic meters between 1951 and 2009 (Qamar et al., 2022)

Due to a significant shortage of current water reservoirs and inadequate drainage, sanitization, and storage projects, Pakistan's water deficit is predicted to reach 32% by 2025. Pakistan's water management is under strain, and the recent flooding has made water management even more difficult. The 33 percent of deaths and 80 percent of all diseases in Pakistan are caused by waterborne diseases. A significant amount of Pakistani rupees (PKR) 112 billion is spent annually on diseases linked to poor hygiene, including those brought on by contaminated water and inadequate sanitation (Noureen et al., 2022). Numerous sources of contamination pose a threat to Pakistan's water resources. Industrial trash releases metals like copper and iron into water bodies, and cotton fields in Punjab and Multan pollute groundwater with pesticides. Animal and human faces can contaminate water sources due to inadequate drainage and sanitation systems; studies have shown that contamination levels are significant in Islamabad and Rawalpindi. In addition, open defecation is still a major problem in Punjab's rural areas, which exacerbates the nation's water pollution problems. In Pakistan, waterborne illnesses are common, especially in rural regions and urban centres like Hyderabad and Karachi. Cholera, dysentery, hepatitis, typhoid, and gastroenteritis are common illnesses that are frequently brought on by bacteria such as Salmonella, Giardia lamblia, and E. coli. Hepatitis E is predominant in Islamabad as a result of improper water consumption, and Naegleria flue infections are prevalent in Karachi, where 96 cases were verified in 2019. Despite the serious consequences of these diseases, many individuals are still ignorant of the dangers of using contaminated water for household use (Qamar et al., 2022).

Effects On Economic Development

Limited accessibility to sanitary facilities and clean water severely affected Pakistan's economic development. Ensuring universal access to clean water and sanitation facilities is essential for fostering economic growth, lowering poverty, and raising living standards, as stated in SDG 6. The notable financial burden of waterborne illnesses is one of the reasons that has become a hindrance to Pakistan's economic development. A study published in the Journal of Water and Health estimates that lack of clean water and sanitation causing diarrheal illnesses cost Pakistan roughly PKR 69 billion, or USD 40 million (Toor & Butt, 2023). The nation's resources are drained by this, and they can be used to support productive industries. Lack of clean water and sanitation facilities also affects the agrarian sector. Pakistan's 20% of GDP comes from agriculture, making it an important economic sector (Economic Survey of Pakistan, 2019-2020).

Despite this, inadequate water management strategies and water scarcity are causing huge losses to agricultural output. The report published in the Journal of Agriculture and Research states that water scarcity alone costs the agricultural economy over PKR 150 billion (about USD 950 million) per year (AHMAD, 2003).

The overall productivity of the nation's workforce is impacted by a lack of clean water and sanitation facilities further exacerbated by financial loss caused by waterborne diseases and resulting in agricultural loss as well. The lack of such facilities causes productivity losses which are estimated to be between 10 to 15 percent of Pakistan's GDP, as stated by a study published in the Journal of Water and Health (Hussain et al., 2025).

Effects On Environmental Sustainability

The environmental sustainability of Pakistan is often compromised as the country struggles with the achievement of Sustainable Development Goal 6, which consists of clean water and sanitation. Inadequate sanitation facilities, mismanagement of polluted water treatment infrastructure, and untreated domestic and industrial wastewater are dumped into waterways, causing extreme water pollution. This not only affects groundwater by contaminating it, making it harmful for human use, but it is also harmful to marine life. Pakistan's biodiversity has dropped due to habitat destruction and water quality degradation, moreover triggered by pollution and infrastructural development. Many species, including dolphins and snow leopards, are endangered and threatened to go extinct in the future. Climate change is further exacerbating the situation as Pakistan is vulnerable to rainfall patterns and a surge in disastrous occurrences such as droughts and floods.

In Pakistan, the usage of untreated wastewater for irrigation purposes is polluting the soil, declining its fertility rate, and affecting agricultural output. Moreover, it adds to the rising greenhouse emissions and also raises concerns about food security. Pakistan's failure to meet SDG-6 further worsens the situation. Significant public health issues that can be seen in Pakistan include cholera, typhoid, and diarrhoea, which are spread by lack of clean water and sanitation facilities. Other notable economic consequences are present, in addition to the environmental effects of Pakistan's failure to achieve the goal of SDG-6. Higher healthcare expenditures, less tourism revenue and a decreased rate of agricultural output are the results of soil degradation, loss of biodiversity and the effects of climate change. In order to mitigate the adverse effects and ensure a sustainable future for Pakistan, the Pakistani government must provide clean water and sanitation facilities as top priorities. All these factors contribute to the drainage of the nation's resources. In short, Pakistan's progress is hindered by many variables discussed above. Thus, to amplify Pakistan's development, including economic growth, reduction of poverty, and raising living standards, the government must prioritize making investments in clean water and sanitation infrastructures.

A Roadmap to Achieve SDG 6 in Pakistan

Pakistan, as one of the water-stressed nations, should overcome fearsome hurdles in order to achieve Sustainable Development Goal 6 (SDG-6), which demands universal access to clean water and sanitation facilities. Pakistan is among the top 10 nations which are experiencing water scarcity, with per capita water availability declining from 5,260 cubic meters since the 1950s to just 1,000 cubic meters in 2023. This roadmap will describe Pakistan's progress, hurdles and suggestions for attaining SDG-6 through government initiatives, stakeholder involvement, and community-based progress. This strategy must be adopted to its full potential to ensure sustainable water management in Pakistan and international support for the Sustainable Development Goals of the UN (Mujtaba et al., 2024).

Government Initiatives

a. Clean Green Pakistan Movement: The Pakistani government, in 2018, started The Clean Green Movement (CGPM), which aims to improve environmental sustainability that includes afforestation, sanitation and water conservation. The planting of trees, solid and liquid waste management, clean drinking water, and overall sanitation facilities are the five pillars of this movement. To fight the desertification of land and to improve soil water retention, "The 10 Billion Tree Tsunami "initiative was introduced, under which 1 billion trees are planted (Asif et al., 2023).In both urban and rural areas, more than 10 Million individuals were reached by creating awareness efforts about cleanliness and water conservation. Thanks to the installation of 500 water filtration units in both urban and rural areas, millions of people have access to safe and clean drinking water. Meanwhile, there are some drawbacks, such as inadequate funds and resources for widespread adoption and a lack of awareness about water pollution in the industry and agriculture sectors (Nasir et al., 2022).

b. National Water Policy: To reduce water scarcity, enhance water management and ensure the equal and just distribution of water resources, The National Water Policy (NWP) was introduced in 2018. The NWP focuses on climate change adaptation, impactful irrigation techniques, and water conservation. A major component of NWP is the construction of water reservoirs and dams, such as the Diamer-Bhasha Dam, which, when completed, is anticipated to store 8.1 million acre-feet of water. Another significant project is the promotion of drip irrigation, which can save up to 50% of water waste in agriculture when compared to typical flood irrigation. However, there are significant limitations, including a lack of cooperation between the federal and provincial governments and a sluggish implementation caused by bureaucratic obstacles and interprovincial disagreements (Hamdy et al., 2003).

Engaging Stakeholders

a. Role of NGOs: NGOs are actively engaged in water conservation, sanitation, and awareness initiatives, including WaterAid, WWF-Pakistan, and Indus Earth Trust. 1.5 million people benefited from WaterAid's installation of more than 10,000 hand pumps and water filtration systems in rural regions. By building 500 rainwater harvesting systems in Thar, WWF-Pakistan encouraged rainwater harvesting in dry areas. However, the fact that only 10% of funding comes from domestic sources and that there is a reliance on foreign contributors are significant obstacles.

b. Private and Public Sector: In Pakistan, industrial waste is a key factor in water contamination. 60% of industrial wastewater is left untreated, according to the Pakistan Council of Research in Water Resources (PCRWR). Two million people downstream are impacted by harmful chemicals released into the Ravi River by Kasur tanneries. Groundwater in Faisalabad is contaminated by chemicals and colours from the textile industry, making it unfit for human consumption. This problem can be lessened by enforcing the laws governing the treatment of industrial effluent and offering incentives to businesses that implement environmentally friendly procedures (Hamdy et al., 2003)

Community-Based Progress

a. Engaging Media: Media outlets have the power to increase public awareness of sanitation and water conservation. Twenty million people watched TV ads like "Pani Bachao, Zindagi Bachao" (Save Water, Save Life), and youth awareness was raised through social media efforts.

b. Address Climate Change Issues: Pakistan's water supplies are being impacted by climate change. Water supply is declining due to melting glaciers and unpredictable rainfall patterns. The International Panel on Climate Change (IPCC) estimates that the glaciers in Pakistan are receding by 1.5 meters per year. Another worry is the increased frequency of droughts and floods; the 2022 floods damaged $30 billion and affected 33 million people. These effects can be lessened by creating climate-resilient water infrastructure and encouraging groundwater recharging and rainwater collection.

c. Promote Water Conservation: Water can be saved by promoting the adoption of water-efficient devices in homes and farms. In Punjab, drip irrigation conserved 30% of water, while low-flow taps in cities cut water use by 20%.

Impact On Pakistan's Image and Cooperation

Pakistan's international image is damaged by water scarcity and inadequate sanitation, which has an impact on foreign investment and tourism. The World Bank estimates that Pakistan loses $5.7 billion a year as a result of inadequate water and sanitation management. Pakistan partners with China under the China-Pakistan Economic Corridor (CPEC) framework for water infrastructure projects. Initiatives for water management are funded by the World Bank and Asian Development Bank; in 2023, $1.2 billion will be set aside for water projects (Winston, 2013).

Recommendations

- Effective indicators can help policymakers with clear directions on sustainable paths to implement SMART and adhesive policies to obtain effective results.
- The frequency of water-related catastrophes highlights the importance of immediate incorporation of disaster resilience programs such as The Sendai Framework for Disaster Risk Reduction (2015-2030), to which Pakistan is also a signatory which was endorsed at the Third UN World Conference, Japan replacing the Hyogo Framework (UNDRR 2015) so Pakistan should take collective measures with the collaboration of the international community.
- Another main issue that Pakistan needs to overcome is to bring corruption to an end and implement transparency among its institutions so development in all the departments including the achievement of the SDG-6 goal should be made possible.
- One of the most important factors is the connection between SDGs if it is observed closely SDG-6 is not only linked to SDG-1(which is based on ending poverty) but also to SDG-3(which aims to improve health), but it is also connected to SDG-13 (which targets environmental sustainability). So, policymakers must understand this complex dynamics and work towards it to improve the deteriorating condition of Pakistan.
- There is a dire need to focus not only on making policies and trying to implement them but to implement them along with the cooperation of stakeholders, governing bodies, national and international organizations, and institutions, and also by creating an awareness among the public so the process towards achieving SDG-6 can be paced up.

- Continuous supply of funds is extremely important right now keeping in mind Pakistan's water condition and water infrastructure. Without the proper flow of funds and financial assistance, it becomes hard to overcome the related problems. So, a formal mechanism is required to meet the concerns of this ambitious agenda of 2030.
- All the stakeholders should learn from their past mistakes which include technological faults, management capabilities, capacity building, lack of cooperation, insufficient data availability, inadequate conduct of research, and informal mechanisms to implement policies, rules and regulations.
- A regulatory commission should be established which will be responsible for governing all water distribution bodies, governing all water bodies, focusing on increasing the water storage capacity and infrastructure, and keeping checks and balances on industrial, agricultural, and urban areas so no injustice would be conducted.

Conclusion

The Pakistan water crisis is no longer a hidden problem, and it poses a significant threat to achieving the Sustainable Development Goal (SDG-6). Water resources are under great threat because of many factors like population increment, urbanization, industrialization and climate change. Not only are human health and economic growth affected by the lack of availability of pure water and sanitation, but ecological viability is also affected. To tackle these obstacles, Pakistan needs to adopt a multi-faceted and practical approach that comprises administrative projects involving interest investors and regional programs that generate collective understanding and worldwide collaboration. Efficient policies and a resilient system are essential for directing legislators and managing institutions for eco-friendly routes regarding SDG-6. By admitting and accepting these tactics pertaining to productive administration, water preservation projects, and environment-adaptable initiatives, Pakistan will be able to alleviate the consequences of the water shortage. It can also secure an eco-friendly posterity for its residents. Several hurdles exist in Pakistan's route to achieving eco-friendly growth regarding SDG6. Amidst these primary obstacles exist insufficient structure concerning the administrating water assets, absence of public awareness and participation in resolution procedures, additionally absence of public awareness and participation in resolution procedures, additionally lack of management and collaboration with interest investors for appendage of country's water challenges, which are becoming more severe through increment, monopolization, climate changes, water spoilage and ineffectiveness. These challenges possess extensive consequences amidst the utmost critical concerns, which are underground draining, water shortage, and reduced hydration standards. Over-exploitation of underground holds causes hazardous reduction of water calibres, resulting from inadequate preparation, investigation, and framework, as well as similarly inefficient laws.

Along with increasing heat, greater recurring thermal waves and altered rainfall configurations influence water accessibility and standard environment alteration, which is creating more complex issues. Pakistan should adopt multi-dimensional tactics to surmount these barriers, comprising encouraging eco-friendly water administration techniques, improving water control, and strengthening interest investors' collaboration and partnership. This can be achieved by generating and implementing effective laws, creating expenditures in the water framework, and enlightening public opinion about the worth of preservation. Pakistan should also provide study analysis and growth of water administration's highest precedence, highlighting innovative solutions for the country's specific issues in termination of attaining SDG-6 demands for collaboration with all interest investors, including and encompassing the public and private fields. Pakistan can ensure a water-reliable posterity for its citizens and can obtain more proximate achievements regarding SDGs by working on and implementing a preventative strategy for water administration.

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