

Water Security and Environmental Impact Assessment: A Study for Developing Economies [†]

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Abstract: Both ecosystems and human societies acknowledge the importance of water. The impact of human activities on both land and water have become more apparent due to various global changes. These include climate change, urbanization, socioeconomic development, and population growth. Although it is widely believed that securing water security is the key to sustainable development, studies on its evolution and various environmental factors are still in their early stages of development. This study aims to provide an overview of the concept. This concept aims to provide all people with safe water. It goes beyond merely providing adequate supplies to every person in the world, and it also aims to ensure healthy and productive lives. Despite the technological advancements being made in the water resource management industry, the lackadaisical approach to addressing the various challenges associated with water security continues to be a major issue globally. This study will help to overview of the various facets of the water security concept and its evolution in developing countries due to the environmental changes that have occurred. It also explores the multiple sustainable methods that can be used to address these issues.

Keywords: water security; water scarcity; climate change; socioeconomic changes; sustainable development

1. Introduction

Water is essential for everyone and the basis of life. Global freshwater is under tremendous anthropogenic strain [1], which is primarily caused by human population expansion and climate change. Freshwater availability and distribution, as well as the effects of water-related disasters like floods and droughts, are projected to change because of climate change, which will also likely increase demand for river water [2] and have an effect on groundwater availability [3]. Water security, a perennial human problem, has consequently emerged as a crucial area of policy for the Anthropogenic [4,5]. Whether originally seen from a biophysical or sociological standpoint, the concept of “water security” is complicated, contentious, and dynamic. To define and realize it, complex and dynamic thinking, or adaptive thinking, is required. As part of the transition from water government to water governance, adaptive approaches to water management and governance have been pushed for at least three decades [6].

Assessments of economic development, ecological services [4], and their interaction [7,8] prominently include water challenges. However, assessments of water resources on a global scale [9] frequently use data that is fragmented and expressed as statistics at the country level, which severely restricts attempts to prioritize their preservation and restoration [10]. Although there is a clear demand, high-resolution spatial analyses have not

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yet been used in the official assessment process for freshwater resources [9]. This is even though they have advanced understanding of the human impact on the world's oceans [11,12] and the human imprint on land [13]. Finding a balance between the use of human resources and the preservation of ecosystems is essential to the success of integrated water management strategies [9,14–16]. Systematic accounting is necessary to evaluate how far this target has come in the world and to determine how valuable it might be in the future.

Climate change, population growth, and economic development are all contributing factors to the increasing vulnerability of water resources to variable and extreme flows. These changes can also affect the availability and use of water. These have also had an impact on water-dependent ecosystems' ability to provide ecosystem services. Satisfying human demands is frequently achieved at the expense of the environment [14,17], with long-term consequences for socio-ecological systems as a whole. Water issues can often—but not always—be traced to governance shortcomings as opposed to the state of the resource base itself. Governmental failures range in scope from the local to the global, are numerous, and have diverse effects on industrialized and developing nations. Additionally, they are impacted by factors that operate concurrently at several levels of governance [18]. Poor governance, which includes a lack of efficiency and effectiveness of current resource-constrained governing systems, allegations of corruption, and the absence of civil society, pose challenges for all forms of development in many developing nations [7,19]. Lack of resources is a problem for emerging nations regardless of their institutional, economic, or physical conditions. In fact, some are regarded as failed states. Most of these nations have failed to provide for fundamental human needs as well as the demands of their own civilizations in terms of health and education. Many industrialized nations, however, struggle with excessive regulation brought on by stiff bureaucracy, industry fragmentation, unsustainable consumption patterns, and a general preference for economic over environmental concerns [21].

The complexity of water systems' interconnections is often accompanied by uncertainties and risks. For instance, with difficult hydrology, which is characterized by the combination of flood vulnerability, natural aridity, and significant intra- and inter-annual variability, they become more complex. The complexity of the water systems' interconnections increases the risk that they will not be able to meet their customers' needs. This is especially true in developing regions, where the lack of resources and infrastructure is the most common issue [22].

This study covers the water security issue and environmental impact assessment for developing continents. It explores the utilization of water and right to secure water reference with reference to continent wise population.

2. Materials and Methods

Water security is a critical issue that affects populations across the world. Different continents face different challenges when it comes to water security, and a significant factor in this regard is the population and water share of each continent. Developing continents, such as Africa and Asia, face significant water security challenges due to their high population growth rates and limited access to freshwater resources. The following analysis provides an overview of the water security issues facing these continents based on their population and water share. So, the analysis included comparative assessment of continents to evaluate share of each continent. This analysis is related based on population and freshwater availability in different continents. However, a framework can be utilized to analyze the water security issue as shown in Figure 1. Critical factors can be Population, density of population and available freshwater percentage. From all seven continents, Africa has a population of over 1.3 billion people, and the continent is home to some of the fastest-growing economies in the world. However, despite its vast water resources, Africa faces significant water security challenges due to its limited access to freshwater. Similarly, Asia is the most populous continent in the world, with a population of over 4.6 billion people. The region is home to some of the fastest-growing economies and is facing

significant water security challenges due to its high population growth rates and limited access to freshwater resources. The average water availability per capita in Asia is just 3920 cubic meters, well below the global average. So, these continents are critical for analysis and study.

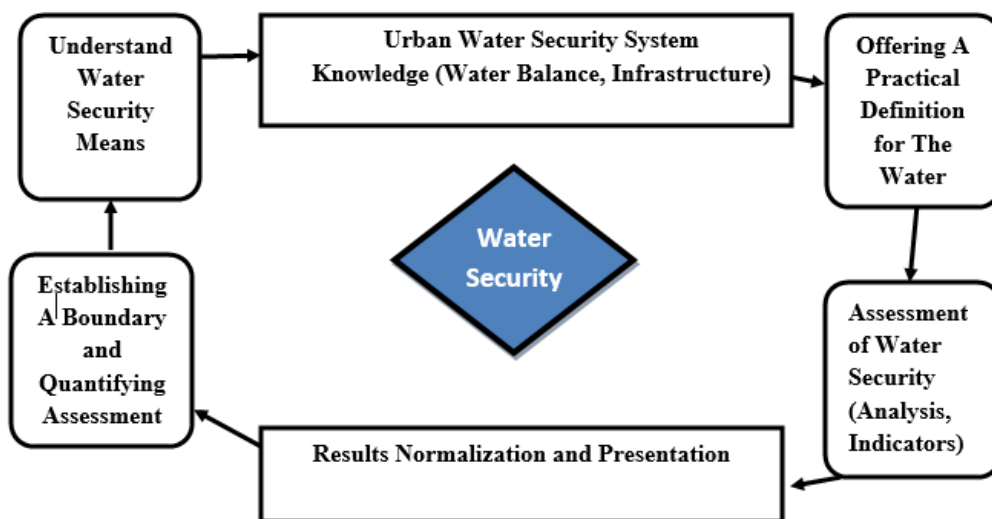


Figure 1. Methodology framework.

3. Results and Analysis

The increasing economic growth and standards for water-secure continents have changed the societal measures of risk associated with water-related issues. This has resulted in the emergence of competing environmental and social trade-offs that are becoming more challenging to manage.

Water consumption is different in different continent. Freshwater availability according to their population. Asia is a major portion of land consisting more freshwater density than others. it is understanding that is more than the whole of our calculation in Africa, Australia, Europe, and America respectively consisting of 8%, 7%, 13% and 26% + 11% of total as shown in Figure 2.

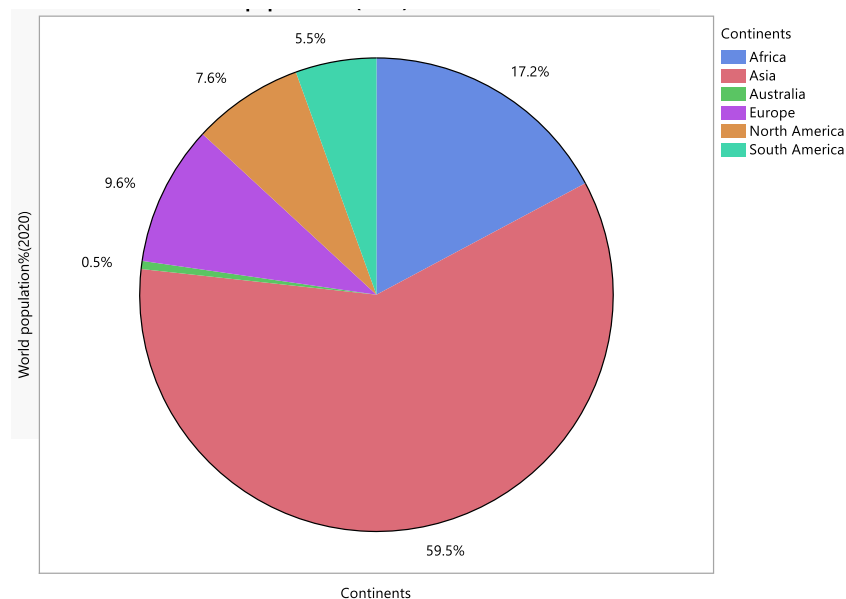


Figure 2. World population in different continents.

In developing countries, as they often face challenges in managing their limited water resources and balancing economic development with environmental protection.

In developing countries, access to clean and reliable water can be limited due to a lack of infrastructure and investment. This can lead to water scarcity and increased competition for resources, which can exacerbate existing social and economic inequalities. Stats shown in Table 1 explain that fresh water availability is a major issue in Africa, which covers majority of under developed countries.

Table 1. Water Consumption w.r.t Population of continents.

Continent	World Population%	Density(p/km ²)	Fresh water%
Asia	59.54%	150	35
Africa	17.2%	45	8
Australia	0.55%	5	7
South America	5.53%	25	26
North America	7.6%	28	11
Europe	9.59%	34	13

Water security is a significant issue in Africa, as many countries on the continent face challenges in managing their limited water resources and providing access to clean and reliable water for human and environmental needs.

One of the main challenges facing Africa is the high level of water scarcity on the continent a shown in Figure 3. Many countries have limited water resources, and as populations grow and economies develop, competition for water resources is increasing. Climate change is also exacerbating this problem, as it leads to changes in precipitation patterns, increased evaporation, and more extreme weather events, all of which can impact water availability.

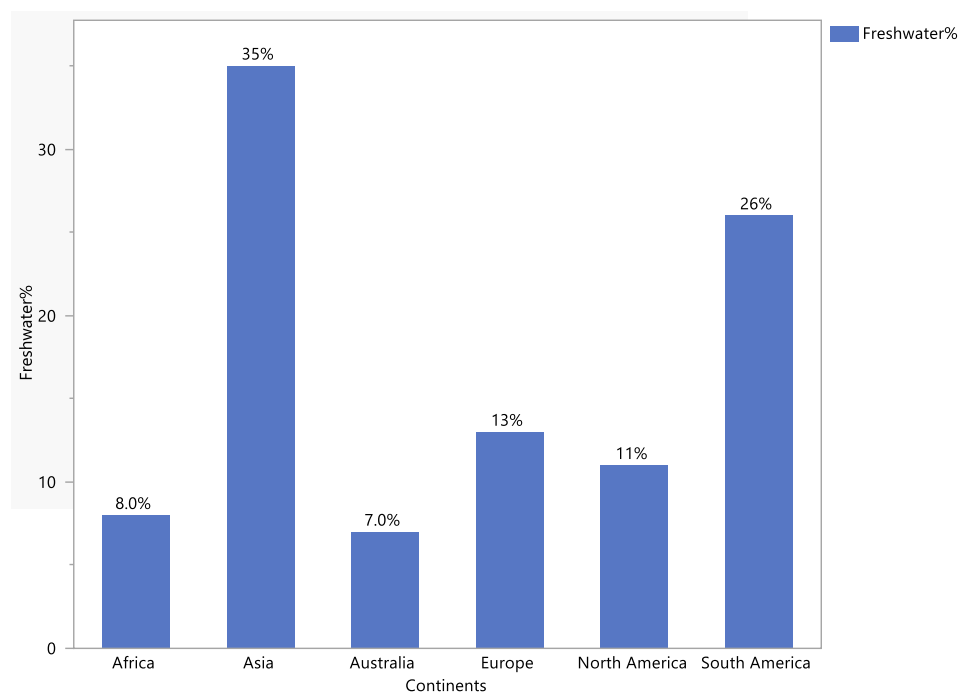


Figure 3. Division of population and fresh water in world continent wise.

Further study, the application of fresh science-based approaches, and the adoption of integrated water resources management concepts are all necessary to meet these chal-

allenges and sustainably resolve diverse water-related problems. Understanding and managing water availability and quality is crucial everywhere, but especially in developing nations.

4. Discussion

This study demonstrates that freshwater systems are directly endangered by human activities and could be further impacted by anthropogenic climate change; water is often regarded as the most important of all natural resources. Because freshwater is a limited resource, many countries around the world are experiencing water scarcity as water demand rises. Many countries have developed national and regional water management plans to address the growing water crisis. We discover that nearly 80% of the world's population (4.8 billion) lives in areas where either incident human water security threat exceeds the 75th percentile (for 2000). Due to intense agricultural and dense population, the United States, almost all of Europe, and significant sections of central Asia, the Middle East, the Indian subcontinent, and eastern China pose a high incident hazard. Central Mexico, Cuba, North Africa, Nigeria, South Africa, Korea, and Japan all have smaller contiguous zones with high occurrence threat. The world's growing population is the primary cause of contaminated water. A large portion of fresh water is used in agricultural practices, which also causes a drop in ground water level. The 'global' imperative is a recent addition to the discourse of water security. Both the International Water Resources Association (IWRA) and the World Water Congress (WWC) are currently promoting a water strategy for global and continental water security that promotes adaptive approaches and Integrated Water Resources Management.

5. Conclusions

For these problems to be successfully solved, it is necessary to do additional research, implement new scientifically based approaches, and support the principles of integrated water resources management. Especially for African and Asian continent, it is necessary to review the water security policy. Understanding and managing water availability and quality is crucial everywhere, but especially in developing nations. Without first achieving a water secure world, it will not be possible to achieve the United Nations Sustainable Development Goal 2030.

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