Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8999

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2023) *11*(4), 1-8

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Research Article

Water Management and Environmental Issues in Developing Countries

Faheem Sajjad Shah[1*], Sabir Aziz[2], Ahmar Riaz[3], Muddasar Saleem Chaudhary[4], Muhammad Noman Ur Rashid[5], Muammad Waqas[6]

[1]Department of Forestry and Range Management, Faculty of Agriculture Sciences & Technology,
[2]Department of Horticulture, Faculty of Agriculture Sciences& Technology,
Bahauddin Zakariya University, Multan, Pakistan
[3]Department of Earth and Environmental Sciences, Bahria University Islamabad
Construction Engineering and Management
[4]NUST H12 Islamabad
[5]National Rural Support Programme (NRSP) Islamabad
[6]Department of Agronomy, College of Agriculture, University of Sargodha
*Corresponding Author E-mail: basf18m040@gmail.com

Received: 19.03.2023 | Revised: 28.05.2023 | Accepted: 12.06.2023

ABSTRACT

Water is vital to both ecosystems and human cultures. Because of numerous worldwide developments, human activities' influence on land and water has grown more obvious. These are examples of climate change, urbanization, socioeconomic development, and population increase. While it is often assumed that ensuring water security is the cornerstone of sustainable development, research into its evolution and numerous environmental elements is still in its early phases. The purpose of this research is to offer an overview of the topic. This notion attempts to give clean water to all people. It attempts to provide healthy and productive lifestyles in addition to providing enough resources to everyone on the planet. Despite technical developments in the water resource management business, the lax attitude to resolving the numerous difficulties related to water security remains a serious concern internationally. This study will examine the many components of a water authentication scheme and its evolution in emerging nations as a result of environmental changes. It also looks at the many sustainable solutions that may be employed to address these issues.

Keywords: *Water, Climate change (Placeholder1), management, developing countries, sustainable development.*

INTRODUCTION

Water is necessary for everyone and the foundation of life. Global freshwater is under immense anthropogenic stress (Rockström et al., 2009), which is being pushed primarily by human population expansion and global warming).

Cite this article: Shah, F. S., Aziz, S., Riaz, A., Chaudhary, M. S., Rashid M.N., & Waqas, M. (2023). Water Management and Environmental Issues in Developing Countries, *Ind. J. Pure App. Biosci. 11*(4), 1-8. doi: http://dx.doi.org/10.18782/2582-2845.8999

Climate change is anticipated to alter freshwater availability and distribution, as well as the consequences of surface catastrophes such as flooding and famine, which would likely increase the need for river water (Tir et al., 2012) and have an impact on underground resources (Mitchell et al., 2012) Water management, a recurrent human issue, has thus emerged as an important policy area Due to human activity (Vörösmarty et al., 2010, & Cook et al., 2012). The idea of "water security," whether seen from a biophysical or social perspective, is nuanced, disputed, and changing. Diverse and complex thoughts, or adaptable thinking, are required to describe and execute them. For at least 30 years, adaptable water management and oversight strategies have already been recommended as a component of the shift from water regime to water governance (Pahl-Wostl, 2007).

Water concerns are widely mentioned in evaluations of economic development, ecosystem functions (Vörösmarty et al., 2010), and their relationship (Sullivan et al., 2005- & Esty et al., 2018). However, global evaluations of water resources (UN Water, 2009) usually employ scattered data reported as figures at the national level, with limited attempts to concentrate their safety significantly and restoration (Halpern et al., 2008). Despite a clear demand, high temporal and spatial analyses for freshwater resources have still been applied for proper assessment (UN Water, 2009). This is despite major advances in knowledge of human impact on the globe's oceans (Halpern et al., 2008, & Sanderson et al., 2002) and people's footprint on land (Espinoza, 2004). Obtaining a balance between the utilization of the human resource department and the conservation of landscapes is important for the success of effective water management strategies (UN Water, 2009; Vörösmarty et al., 2010; Koetz et al., 2012, & Dudgeon et al., 2006). Comprehensive auditing is required to establish how far this aim has progressed in the globe and how lucrative it may be in the future.

Economic expansion, population increase, climate change, and other global to local reasons all have an influence on the accessibility and utilization of waterways, increasing the risk of severe low and large outflows, altering flows, and water distribution exceeding sustainable supply. They also have impacted the capabilities of water-dependent communities to provide ecological integrity. People's needs are frequently met at the expense of the environment (Zeggini et al., 2008, & Vörösmarty et al., 2010), with lengthy ramifications for overall political and social systems. Water concerns are frequently—but not always—attributed to administration flaws instead of the natural resource state itself. Administration failures range in breadth from local to global, are numerous, and have varying consequences on developed and developing countries.

Furthermore, they are influenced by forces that deliver effective at many levels of authority (Gupta et al., 2013). In many underdeveloped nations, poor governance, which includes a lack of productivity and effectiveness of present asset governing systems, allegations of fraud and the disappearance of civilized society constitute a threat hurdles to all types of development (Pahl-Wostl et al., 2012; & Pahl-Wostl 2011). In spite of their organizational, financial, or physical characteristics, rising nations face a resource shortage. In reality, several are considered failed nations. Most of these countries have failed to fulfil basic human requirements along with the aspirations of their local cultures regarding health and education. Furthermore, many industrialized countries face unnecessary regulations as a result of strong bureaucracy, industry fragmentation, unsustainable consumption habits, and a generalized preference for economic concerns above environmental concerns (Orlowsky et al., 2014).

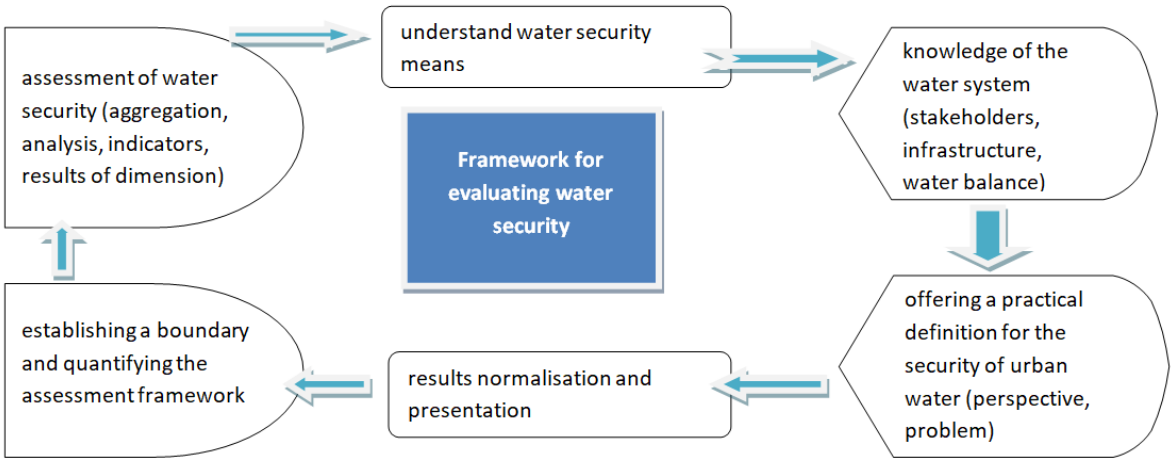
The water system's extensive linkages of physiological, ecological, economic, and political components contain hazards or implications. They get any more problematic by "tough hydrological," described as a combination of drought conditions, storm susceptibility, and large inter- and intra-annual precipitation patterns, while the latter is the most problematic. The expenditure necessary

to ensure water security (in knowledge, institutions, and infrastructure) grows with complications. Such hydrologic hazards are prevalent in several of the globe's impoverished parts, which are also the least able to bear the comparably large costs of coping building and organizational innovation (Grey et al., 2007).

MATERIALS AND METHODS

Water scarcity has been one of the most significant problems in recent years, which is required for a variety of uses by a rapidly growing population. It is a critical issue since utilizing the same water resources will be required to enhance crop yields in meeting the demands of the expanding economy. Population growth and climate change exacerbate the world's water problems. Over 40 % of the population globally does not have proper access to safe water, and over 600 million do not have even the most basic sewage system (Leckie et al., 2021, & Chellaney, 2011). Another major worry in global warming research is an increase in surface tragedies (Masago et al., 2018). Population increase, economic growth, urban growth, alterations in land use, migratory routes, energy concerns, and modifications in food production may exacerbate more ambiguous threats (Wheate & Evans, 2009).

Water security problems must be handled on several stages, usually at the same time and in accordance with varied definitions of water security. To accomplish WASH objectives, an extensive understanding of regional issues impacting household water security is required. Actual occurrences may be muddled by the typical statistical surveys used to measure MDG compliance. Furthermore, national legislation and the worldwide main objective processes have been critical. Ringler et al. explore global scenarios in Chapter 11, which are useful for conveying the larger picture. They may also mask important geographical trends, such as water scarcity (Zeggini et al., 2008).



The framework cycle to operationalize water security.

The water availability is critical for achieving long-term, all-encompassing development. Water security utilizes water's positive forces but reduces its negative impacts. Everybody has access to effective, affordable, drinkable water, allowing them to live healthy, full lives. Civilizations do not have water-borne illnesses, earthquakes, storms, and famine. Water security promotes ecological and sustainability justice by addressing the consequences of inadequate water administration. Water security has been characterized in several forms, indicating the ambition to have control over water supplies. Water security is described as "the capacity of a population to secure sustainable accessibility to enough amounts of water of appropriate quality essential for rising living standards, people's health, and economic development", social progress, making sure shelter against

water-related disaster events, and conserving ecological systems in an atmosphere of unity and social stability," in accordance with the UN agency on water. (ESCAP, 2013) " The following are the keys to improving water security:

- Ensuring that there are sufficient, consistent and acceptable water resources available
- Reducing the dangers associated with water, such as pollution, droughts and floods;
- Resolving any difficulties that may result from disagreements regarding shared waters

The very first category of water security problems would be management and competing needs, while severe events will be the next main emphasis. It is critical to provide diverse appropriate services that support various water challenges. Because of growing concerns regarding the proper usage of scarce water resources, policymakers, institutions, donor agencies, and people have frequently employed the phrase "water security" to convey various perspectives on the problem's critical surface challenges over the years. Moreover, there is a dispute regarding how to formulate water security concepts to deal with lengthy water challenges. Utilizing many professions, water security is offered as a preliminary step for decision-making varied surface concerns. (Schultz & Uhlenbrook, 2008).

RESULTS

Economic expansion, as well as shifting ethics and norms, have transformed societal estimates of tolerated water-related risk in water-secure locations across the world. Simultaneously, because of the environmental externalities, 20th century basic solutions to drought in many nations (e.g., massive reservoirs and flood protection methods) are being more disputed. Furthermore, The 'Evolution of humans' epoch is distinguished by the creation of fresh ecosystems.

We have the outcome of different continents' fresh water supplies based on population. Asia has a higher freshwater density than the rest of the world. Notably, it is greater than the total of our calculations in Africa, Australia, Europe, and America, which are 8%, 7%, 13%, and 26%+11% of the total.

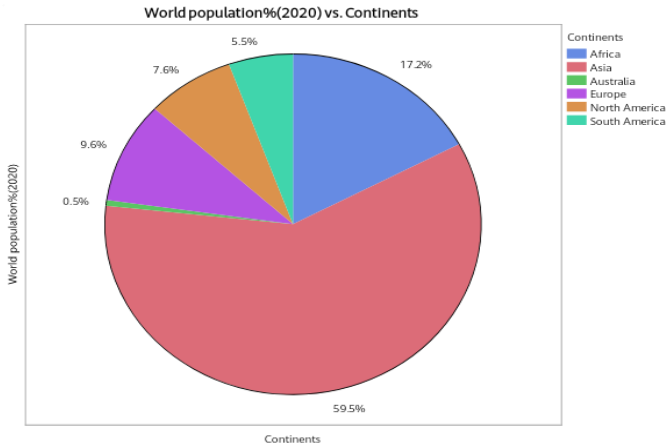


Figure1. Global population distribution across continents

Continent	World population %	Density(p/km2)	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

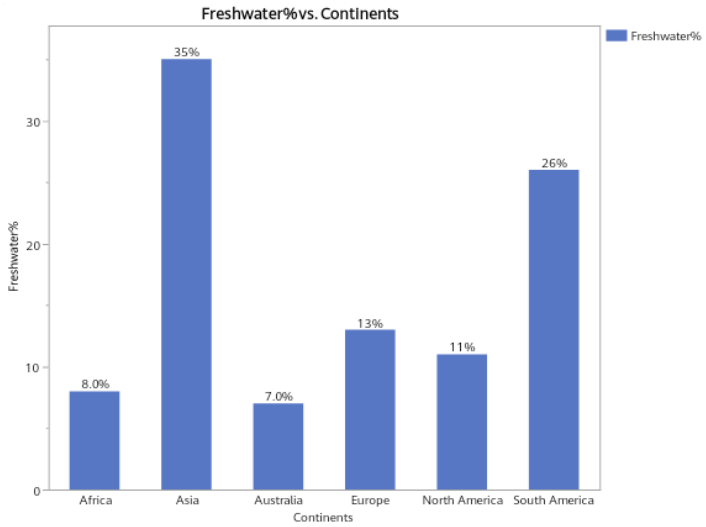


Figure 2. Population and freshwater distribution in the globe by continent.

More research, the utilization of new science-based strategies, and the implementation of incorporated water resource planning concepts are all needed to tackle these obstacles and solve diverse water-related problems in the long run. Monitoring and controlling water quality is critical around the world, especially in poor countries.

DISCUSSION

Water is often recognized as the greatest important of all environmental assets (Meybeck, 2003 & Vörösmarty et al., 2005), and our research reveals that human operations significantly influence groundwater methods and could also be altered by environmental issues. Due to the paucity of freshwater, several nations worldwide suffer water scarcity as water demand grows. To address the rising water shortage, several nations have devised national and regional water management strategies (Wang et al., 2018). We discovered that roughly 80 per cent of the global total is illiterate (4.8 billion) and resides in places where at least one event of human water security danger surpasses the 75th percentile (for 2000). America, nearly all of Europe, and large swaths of East Asia, the Middle East, the Indian subcontinent, and eastern China face a high event risk due to intensive agriculture and dense population. Smaller continuous zones with high recurrence hazards exist in Central Mexicans, Castro, Northern Africa, Niger, South Africa, Korea, and Japan (Vörösmarty et al., 2010). The biggest cause of polluted water is the world's rising population. A significant amount of fresh water is consumed in agricultural practices, causing a reduction in the groundwater table. The "world" goal is a relatively new element to the water security debate. The World Water Management Association (and the Global Water Convention are both strongly advocating for a global and local water security strategy that emphasizes change in activity and Interoperable Water Resources Management (Gawel et al., 2011, & Gupta et al., 2013).

CONCLUSION

Additional research, innovative scientifically based methodologies, and support for integrated water resource management concepts are required for these challenges to be successfully solved. Understanding and controlling water supply and quality is critical around the world, especially in poor countries. Fulfilling the United Nations Sustainable Development Goal 2030 will be impossible without first attaining a water-secure world.

Acknowledgement:

This creative scientific literature, an acknowledgement, is an expression of gratitude for assistance in creating an original work.

Funding: No Funding for this paper

Conflict of Interest:

There is no conflict of interest between authors.

Author's Contribution:

All authors are contributed equally, and all authors' responses are observed.

REFERENCES

Abell, R., Thieme, M. L., Revenga, C., Bryer, M., Kottelat, M., Bogutskaya, N., & Petry, P. (2008). Freshwater ecoregions of the world: a new map of biogeographic units for freshwater biodiversity conservation. *BioScience*, *58*(5), 403-414.

Allan, C., Xia, J., & Pahl-Wostl, C. (2013). Climate change and water security: challenges for adaptive water management. *Current Opinion in Environmental Sustainability*, *5*(6), 625-632.

Chellaney, B. (2011). *Water: Asia's new battleground*. Georgetown University Press.

Cook, C., & Bakker, K. (2012). Water security: Debating an emerging paradigm. *Global environmental change*, *22*(1), 94-102.

Cooley, H., Ajami, N., Ha, M. L., Srinivasan, V., Morrison, J., Donnelly, K., & Christian-Smith, J. (2014). Global water governance in the twenty-first century. *The World's Water: The Biennial Report on Freshwater Resources*, 1–18.

Dudgeon, D., Arthington, A. H., Gessner, M. O., Kawabata, Z. I., Knowler, D. J., Lévêque, C., & Sullivan, C. A. (2006). Freshwater biodiversity: importance, threats, status and conservation challenges. *Biological Reviews*, *81*(2), 163–182.

Esty, D. C., & Emerson, J. W. (2018). From crises and gurus to science and metrics: Yale's Environmental Performance Index and the rise of data-driven policymaking. In *Routledge handbook of sustainability indicators* (pp. 93–102). Routledge.

ESCAP, U. (2013). *Water security & the global water agenda: A UN-water analytical brief*. United Nations University (UNU).

Espinoza, M. S. (2004). Developments in Biodiversity. *Colo. J. Int'l Envtl. L. & Pol'y*, *15*, 29.

Gawel, E., & Bernsen, K. (2011). Globalization of Water: the case for global water governance? *Nature and Culture*, *6*(3), 205-217.

Grey, D., & Sadoff, C. W. (2007). Sink or swim? Water security for growth and development. *Water policy*, *9*(6), 545–571.

Grey, D., Garrick, D., Blackmore, D., Kelman, J., Muller, M., & Sadoff, C. (2013). Water security in one blue planet: twenty-first-century policy challenges for science. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *371*(2002), 20120406.

Gupta, J., & Pahl-Wostl, C. (2013). Global water governance in the context of global and multilevel governance: its need, form, and challenges. *Ecology and Society*, *18*(4).

Gupta, G. (2013). Tarique (2013) Prevalence of musculoskeletal disorders in farmers of Kanpur-Rural. *India. J Community Med Health Educ*, *3*(249), 2161–0711.

Halpern, B. S., Walbridge, S., Selkoe, K. A., Kappel, C. V., Micheli, F., d'Agrosa, C., & Watson, R. (2008). A global map of human impact on marine ecosystems. *science*, *319*(5865), 948-952.

Halpern, B. S., Ebert, C. M., Kappel, C. V., Madin, E. M., Micheli, F., Perry, M., & Walbridge, S. (2009). Global priority areas for incorporating land–sea connections in marine

conservation. *Conservation Letters*, *2*(4), 189-196.

Koetz, T., Farrell, K. N., & Bridgewater, P. (2012). Building better science-policy interfaces for international environmental governance: assessing potential within the Intergovernmental Platform for Biodiversity and Ecosystem Services. *International environmental agreements: politics, law and economics*, *pp. 12*, 1–21.

Leckie, H., Smythe, H., & Leflaive, X. (2021). Financing water security for sustainable growth in Asia and the Pacific.

Majumder, M. (2015). *Impact of urbanization on water shortage in the face of climatic aberrations*. Springer.

Masago, Y., Mishra, B. K., Jalilov, S. M., Kefi, M., Kumar, P., Dilley, M., & Fukushi, K. (2018). Future outlook of urban water environment in Asian cities.

Meybeck, M. (2003). Global analysis of river systems: from Earth system controls to Anthropocene syndromes. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, *358*(1440), 1935-1955.

Mishra, B. K., Kumar, P., Saraswat, C., Chakraborty, S., & Gautam, A. (2021). Water security in a changing environment: Concept, challenges and solutions. *Water*, *13*(4), 490.

Mitchell, M., Curtis, A., Sharp, E., & Mendham, E. (2012). Directions for social research to underpin improved groundwater management. *Journal of Hydrology*, *448*, 223–231.

Orlowsky, B., Hoekstra, A. Y., Gudmundsson, L., & Seneviratne, S. I. (2014). Today, virtual water consumption and trade under future water scarcity. *Environmental research letters*, *9*(7), 074007.

Pahl-Wostl, C., Lebel, L., Knieper, C., & Nikitina, E. (2012). From applying panaceas to mastering complexity: toward adaptive water governance in river basins. *Environmental Science & Policy*, *23*, 24-34.

Pahl-Wostl, C., Gupta, J., & Bhaduri, A. (2016). Water security: a popular but contested concept. In *Handbook on water security* (pp. 1-16). Edward Elgar Publishing.

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., & Foley, J. A. (2009). A safe operating space for humanity. *nature*, *461*(7263), 472-475.

Pahl-Wostl, C. (2007). Transitions towards adaptive management of water facing climate and global change. *Water resources management*, *21*, 49-62.

Pahl-Wostl, C., Jeffrey, P., Isendahl, N., & Brugnach, M. (2011). Maturing the new water management paradigm: progressing from aspiration to practice. *Water resources management*, *25*, 837-856.

Ringler, C., Biswas, A. K., & Cline, S. A. (Eds.). (2010). *Global change: impacts on water and food security*. Berlin: Springer.

Sanderson, E. W., Jaiteh, M., Levy, M. A., Redford, K. H., Wannebo, A. V., & Woolmer, G. (2002). The human footprint and the last of the wild: the human footprint is a global map of human influence on the land surface, which suggests that human beings are stewards of nature, whether we like it or not. *BioScience*, *52*(10), 891-904.

Schultz, B., & Uhlenbrook, S. (2008). Water security: What does it mean, and what may it imply? In *Water for a Changing World-Developing Local Knowledge and Capacity* (pp. 53-68). CRC Press.

Sullivan, C., & Meigh, J. (2005). Targeting attention on local vulnerabilities using an integrated index approach: the example of the climate vulnerability index. *Water Science and Technology*, *51*(5), 69-78.

Tir, J., & Stinnett, D. M. (2012). Weathering climate change: Can institutions mitigate international water conflict? *Journal of Peace Research*, *49*(1), 211-225.

Vidal, F., Sedan, D., D'Agostino, D., Cavalieri, M. L., Mullen, E., Parot Varela, M. M., & Andrinolo, D. (2017). Recreational exposure during algal bloom in Carrasco Beach, Uruguay: A liver failure case report. *Toxins*, *9*(9), 267.

Vörösmarty, C. J., McIntyre, P. B., Gessner, M. O., Dudgeon, D., Prusevich, A., Green, P., & Davies, P. M. (2010). Global threats to human water security and river biodiversity. *nature*, *467*(7315), 555-561.

Vörösmarty, C. J., Léveque, C., Revenga, C., Bos, R., Caudill, C., Chilton, J., & Reidy, C. A. (2005). Freshwater. *Millennium ecosystem assessment*, *1*, 165-207.

Wang, X. J., Zhang, J. Y., Gao, J., Shahid, S., Xia, X. H., Geng, Z., & Tang, L. (2018). The new concept of water resources management in China: ensuring water security in changing environment. *Environment, Development and Sustainability*, *20*, 897–909.

Wheater, H., & Evans, E. (2009). Land use, water management and future flood risk. *Land use policy*, *26*, S251-S264.

World Water Assessment Programme (United Nations), & UN-Water. (2009). Water in a changing world.

Zeggini, E., Scott, L. J., Saxena, R., Voight, B. F., Marchini, J. L., Hu, T., & Altshuler, D. (2008). Meta-analysis of genome-wide association data and large-scale replication identifies additional susceptibility loci for type 2 diabetes. *Nature Genetics*, *40*(5), 638-645.