

Water resource, climate change and integrated water resource management: Review study

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Abstract: Climate change is a global threat in the modern and contemporary world. These changes have a lot of undesired effects on the environment water resource are high on the agenda. This paper summarizes the impact of climate change on water resources and how adapting to these continuous changes can bring about solutions. This paper was prepared by reviewing relevant articles using a meta-analysis. Data used was entirely of secondary origin. Adaptive Capacity is a term used to describe the ability of a system to adapt to changes in its environment. The ability and aptitude to adjust to ever-changing circumstances has always been at the heart of water management. What has changed is our understanding and application of a comprehensive set of water management strategies that adhere to modern concepts and rules. Climate change is a global focus in environmental management and water resource management, with strategies such as culturally focused but environmentally coerced, actor-focused but context-aware, process-focused but action/outcome-oriented, and iterative and messy but linear for convenience being developed. Adaptation to climatic effects includes drought and flood resistance, changes that could lead decrease in water quality and quantity. Since certain climate change impacts are irreversible, the best approach is through adaptation.

Keywords: climate change, adaptation, water, integrated, resources.

1.0 Introduction

The rapid rate of changes in modern global climate change is having serious effects on many plants and animal diversity and, at least in some scenarios, is pushing for changes, especially when changes in conditions alter patterns of selection. Climate change thus paves opportunity for the study of the genetic aspect of adaptation. [1]. Changes in hydrological properties and morphological processes have been seen in the hydrology of significant waterbodies such as river all over the globe. Despite the fact that these observable shifts and variations have been commonly attributed to climate change. Climate change is best defined as a shift in the weather on a regular basis [2]. Climate change may affect both long-term availability and short-term unpredictability of water supplies in many places. Rainfall, temperature, humidity, wind intensity, duration of accumulated snowpack, nature and extent of vegetation, soil moisture, and runoff have all contributed to increased magnitude and frequency of water shortages, as well as lengthy changes in mean renewable water supplies are all possible regional impacts of climate change [3]. To deal with these complex problems, which are typically characterized by high unpredictability, interdependences, and competing goals of numerous stakeholders, as well as a multiplicity of compartments, such as river, land, or coastal ecosystems, or varied socioeconomic areas, water management concerns should typically recognize multiple decision-making metrics and a large number of possible options [4]. Our climate is changing, and this is having an impact on people's lives and livelihoods. Climate change causes a water crisis in our daily lives because water supply is becoming more variable, water quality is deteriorating, and competition for depleting water resources is intensifying. Water crisis was ranked first in the The World Economic Forum's 2015 evaluation of global dangers, which have the potential to wreak havoc on the world's poor and vulnerable people [5].

Climate change is adversely affecting the environment and which water resource management is at the heart of this problem. So, it is necessary to find ways to adapt to the effects, hence the need for this research.

The specific aim the paper is to summaries the measures taken in climate change adaptation through water resources management.

Objectively this paper focuses on

- To have the general understanding of the effect of climate change
- To know its implication on integrated water resource management efforts
- Provide necessary recommendations

The scope the study covers the effects of climate change adaptation on integrated water resources management.

2.0 MATERIALS AND METHODS

This work is a review paper. Journals, articles and previous project works relevant to the above-mentioned topic were carefully studied and sampled purposefully. Different works were studied and summarized to come up the information required for the preparation of the paper.

2.1 Type of data

Data used in this in this research is of secondary origin. Through review of papers, journal etc. This research was conducted using a meta-analysis

3.0 LITERATURE REVIEW

3.1 Understanding Water security

Water security is defined as "adequate protection from water-related disasters and diseases, as well as affordable access to sufficient quantity and quality of water to meet basic food, energy, and other needs essential for leading a healthy and productive life without jeopardizing the sustainability of vital ecosystems." [6].

3.2 Impact of Climate Change and Adaptation Strategies

The intensity of climate change, geological circumstances, geographical location, sociopolitical, and economic considerations all influence the effects of climate change in a given area. Changes in climate have implications on every area of human existence and the natural world. As a result, integrated approaches are required for coping and adaptation techniques to climate change, both within and between the natural environment and the socioeconomic system. [7].

One of the most serious concerns facing society is climate change. Climate change affects the Earth's ecological systems and, as a result, people's livelihoods and well-being, mostly through the medium of water. Climate change-related changes in the hydrological cycle can have a variety of effects and dangers. Climate change is expected to diminish the availability of renewable surface water and groundwater in most dry subtropical regions. Water scarcity and riverine floods are expected to affect a larger proportion of the worldwide population as the century progresses [4]. Climate change might potentially affect water availability and quality which will have knock on effect on every sector of the economy, such as health, agriculture, industry, transport, energy supply, fisheries, forestry, and recreation. Additionally, some water sources effects will prevail as a result of alterations in the number and intensity of disasters in the water supply distribution most notably flood and drought. [4].

According to the introductory remarks of the Intergovernmental Panel on Climate Change's most latest report on climate and water, observation - based archives and global climate models provide ample evidence that water sources are highly susceptible and have the potential to be severely impacted by climate change, with far-reaching implications for people communities and ecological systems. [8].

4.0 RESULTS AND DISCUSSIONS

Adaptive Capacity is a term used to describe the ability of a system to adapt to changes in its environment. Defining adaptable capacity in the context of integrated water resource management is difficult due to the concept's use in many research traditions. One such tradition exists in hazard-risk research and climate change adaptation, and the IPCC incorporated it in its 3rd Assessment Report. Adaptive capacity is described as a natural and social system's

ability to successfully respond to climate variability and change, and it is mostly measured as part of assessments of certain populations' sensitivity to climate change consequences [9].

Because of the widespread impact of climate change and the numerous climate-sensitive processes and policies that will be undertaken around the globe in reaction to it, a template that can be used to various adaption strategies must be found but not unduly burdensome. These four concepts guide the overall design. Its goals are to be:

1. Socially oriented but environmentally restrained
2. Actor-centric but context-aware.
3. Action/outcome-oriented but process-focused; and
4. Iterative and untidy but linear for convenience [10].

Ambiguity ideas are crucial in worldwide ecological change assessments, such as global warming investigations and impact science, and especially in water resources studies. To varying degrees, there is uncertainty about everything in the future, as well as much of the past and current situation.

This research examines the application of the ambiguity concept to change detection results, system process insight and simulation, and, most importantly, future global warming consequences on water management forecasts. A method for evaluating and minimizing uncertainty [11].

4.1 Climate change's impact on water resources

Climate change's difficulties to address the issues posed by climate change in the water sector, it is necessary to first assess its possible impacts on various aspects of water resources and management.

4.1.1 Quantity - less rain and more sunshine in some locations, rainfall will increase, while in others, it will drop. Based on the findings of numerous modeling studies, there is already widespread agreement in certain bigger regions about what changes are probable. There is still dispute in some areas. In many cases, changes in average rainfall of up to 20% – both increases and declines – are expected.

4.1.2 Floods and droughts are examples of extreme weather.

Extreme water events such as floods and droughts have a size that is tied to this issue. There are good reasons to believe that storms and floods will become stronger and more intense, and droughts will last longer and be more destructive [12].

Additional effects of climate change include higher evaporation rates, a higher proportion of precipitation falling as rain rather than snow, earlier and shorter runoff seasons, increased water temperatures, and decreased water quality in both inland areas, all of which have significant influence on water resources. [13]

It is vital to remember that climate change affects more than just the water industry. Water's relevance in reacting to climate changes has been more obvious during the last years. Water, on the other hand, still has a lot of issues when it comes to global warming preparedness. Fundamental challenges that must be addressed at the global, regional, and local levels include the inherent uncertainty associated with climate change, rigidity of infrastructure and organizations that deal with water, and the lack of a coordinated strategy for water resource management [5]. Despite the fact that they were not envisaged when the program began, a number of climate change mitigation and adaptation outcomes have been accomplished. Over-dependence on water to sustain livelihoods has been significantly diminished due to societies engaging in fewer water demanding economic activities. [14].

Global warming is a serious phenomenon with more visible implications in recent years. It has a negative impact on the city and agricultural water resources, as well as plant, animals, and marine habitats, raising the risk of flooding and complicating the monitoring of these events and water resources, as well as offering timely protection against these unpredictable phenomena. Coordination between many key parties; (ii) regular conversations, discourse, and enhanced interconnections between many different water resource managers and consumers; (iii) effective, prudent, fair and equal use and management of stormwater, groundwater, aquifers, and on-farm water supplies, taking into consideration allocation, accessibility, adoptability, and requirement; and (iv) multiple uses of water to improve

water productivity .In order to increase water production, Integrated Water Resources Management should comprise an integrated strategy to overcome physical, technological, social, economic, environmental, hydrologic, institutional, administrative, political, legal, and financial concerns. [15].

Both supply and demand for water supply services may be affected by climate change. The nature of these possible ramifications is uncertain. Some potential impacts will be direct and obvious (e.g., increased frequency of extreme floods causing damage to Water Sanitation and Hygiene infrastructure), while others will be indirect, subtle, and of a more uncertain nature and severity (e.g., increased frequency of extreme floods causing damage to Water Sanitary infrastructure) (e.g., sea-level rise leading to migration away from coastal areas). Impacts can either cancel each other out or amplify each other [8].

The ability and aptitude to adapt to changing conditions has always been at the heart of water management. What has changed is our understanding and application of a comprehensive set of water management strategies that adhere to modern concepts and rules. We don't start with the assumption that particular technological solutions (dams, levees) are the best. Rather, we should begin our planning by determining the goals of our water plans and initiatives. Not only "management objectives" but also "social and community well-being," "water quality," "ecosystem sustainability," and "environmental restoration" are now commonly included. Adaptive management in the face of uncertainty [16].

5.0 CONCLUSION

Climate change is seriously affecting the world and its environs, its affecting living organisms, plants and animals. Some of the most serious effects are felt in the water resource sector as a lots of water sources are being affected by the unpredictability of climate, hydraulic infrastructures such as dams are collapsing due to climate effects. The amount of rainfall recharging existing water bodies and water features is diminish as result harsh weather episodes in certain parts of the globe. As a result of this adaptation strategies need to be put in place to ensure sustainable management of these resources and infrastructures.

Adaptation has been key to human survival on earth even in the early stages of His existence. The resilience to navigate through adverse and unprecedented environmental changes has shaped the history of man. This phase of adaptation is nothing like the other as the threat to food security as result of effects of climate change are prevailing, certain unknown diseases emerging, the ever-increasing shift in weather patterns are among reasons for concern. Water resource threatened due climate change is a major global concern as its well documented the economic and environmental relevance to human existence on earth. There is a need for an integrated and holistic approach to water resource management in order to avoid future water extremes and scarcities through sustainable inclusive and effective water storage, infrastructures, governance and water allocation policy.

6.0 RECOMMENDATIONS

1. Policy implementation
2. Drawing up a long-term inclusive climate change action plan
3. Enlightening agriculturist on the potential effects of climate change and climate on crop yield.

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