

THE IMPACT OF CLIMATE CHANGE ON WATER MANAGEMENT

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Contents

1. Introduction
 2. Global Climate Change
 3. Water as an Important Resource
 4. Coping with Global Climate Change in the Water Sector
 - 4.1. Education
 - 4.2. Appraisal Methodologies and Procedures
 - 4.3. Adaptation Methodologies and Procedures
 - 4.4. Prospective Research and Development Requirements: Vigorous and Viable Water Resource Management Systems
 - 4.5. Mitigation of the Greenhouse Effect through Water Resource Development
 5. Conclusion
- Glossary
Bibliography
Biographical Sketch

Summary

This chapter outlines the impact of global climate change on water resources and the management thereof if climate change on a global scale should occur. It is important to note that there is a great deal of uncertainty involved in the matter of climate change. The discussion first looks at water as an important resource to humans and other non-human organisms. Some of the qualities of water make it one of the most important resources in modern society. It is used in about every economic and personal sphere of life. Because of the importance of water humans need to mobilize water, in order to use in the different economic spheres in modern society. This is done with the involvement of a number of actors like the state and especially hydraulic engineers who are mostly employed by the state. The reason why the state is so involved in water resource management strategies is that it has sovereign control over the water resources in its territory. Because of the possible impacts of climate change on water resources a number of coping strategies should be devised in the near future. This will involve a holistic approach with the involvement of a great variety of individual actors and institutions on a global scale.

1. Introduction

Water is one of the most vital resources on which humans depend for a variety of purposes. These include not only biological survival, as water is needed to sustain the body, but also for a great variety of other objectives outside the human body. These purposes include water for religious or spiritual applications, for economic growth and economic sustainability, recreation, the production of electricity and the growing of food stuffs. With these different uses, although the list is not exhaustive, comes a great deal of organization to mobilize water from where it is abundant to demand centers. In earlier times people relied on rivers or streams for their daily water requirements. Yet, with economic growth and a ballooning world population it is unheard of to go down to the river or stream to fetch water in a container for use in our homes, especially in developed countries. In many developing countries this situation is still the order of the day, where people have to cover vast distances in some places to get water for household and personal use. In many instances the source from which the water is drawn is not suitable for personal utility and may be contaminated with the potential to cause waterborne diseases such as cholera.

Many of us living in developed countries sometimes take water from the tap for granted. Most of the time, we do not realize the infrastructural and institutional organization that lies behind the water flowing from the tap. This infrastructure and institutional capacity that enables us to have water from the tap is the nucleus of water management. The future of water management holds a number of challenges: growing populations, urbanization, increased food demand and a host of other problems and opportunities that will have a bearing on future water use. Population plays one of the most important roles regarding future water availability, use and the quality thereof. Another such challenge that is being discussed throughout the world is global climate change. It is propagated that global climate change will have severe impacts on ecosystems and human society. Yet, as the evidence of global climate change is presented, one wonders what the impact of such an event will be, if it should occur one day, on the management of water in different parts of the world and ultimately the entire globe. The main purpose of this chapter is to study the impact of global climate change on water management. It is not the intention to present the arguments for or against climate change on a world-wide scale but rather to look at the possible impacts, in the event of climate change, on what the future could hold for the management of water resources across the globe. The chapter will also propose a number of strategies that can be adopted to mitigate the impact of global climate change on water resources.

2. Global Climate Change

A number of variables can complicate the management of water resources in states and regions across the world. A growing population that places more pressure on available water resources on a daily basis is but one such variable. For instance, the population of the world has doubled in the last 40 years from about 2.5 billion in 1950 to over 5.3 billion in 1990 and 6 billion at the end of the 20th century. The increase in the earth's population from 1990 to 2000 marked an increase of 20 % in just one decade. By 2050 the population could stand at 10 billion. By 2100 the population could stabilize to just under 12 billion people.

There is a difference in the population growth rates between developed and developing

countries. In 1990 for instance 1.2 billion people, out of a total of 5.3 billion lived in developed states. In contrast, in developing states nearly 77 % of the 1990 world population resided in these countries. At present this situation is still prevalent. Population growth rates in developed countries are on average under 1 % per annum while in developing countries they exceed 2 % per year. In other parts of the south, especially Africa, Asia and the Middle East they are exceeding 3 % per year. In future more than 90 % of population growth will occur in the developing regions of the world. What this implies is that all new births will be in regions where access to safe water and sanitation facilities are lacking. Global climate change could compound this situation.

It is argued that human activities have since the mid 18th century led to an increase in greenhouse gasses in the atmosphere. These gasses have the ability to trap heat generated from the rays of sun in the atmosphere and could lead to a warming of the atmosphere. With an increase in these gasses the behavior of the earth's climate could be affected in a number of ways that are not fully understood. Yet, higher temperature, changes in the patterns of precipitation and sea-levels and the intensity and frequency of severe events, like floods and droughts, could be expected. All these variables could have an impact on the hydrological cycle and ultimately the fashion we use water. The causes of the increase of these greenhouse gasses are partly due to burning of fossil fuels in industry and motor vehicles and deforestation. Forests are important sinks in the carbon cycle that removes carbon dioxide, one of the most important greenhouse gasses, from the atmosphere. When forests are cleared an important component of the carbon cycle is removed and more carbon dioxide is released into the atmosphere through human activities such as agriculture and by mere breathing. Many mitigating strategies can be implemented to reduce carbon dioxide emissions into the atmosphere. However, a growing world population and increased energy use will make it more difficult to prevent climate change in the future. On top of this, political disagreements over who should take responsibility for these changes will further complicate international political responses to the problem at hand.

Global climate change could, in future, have a great variety of impacts on fresh water resources. Higher temperatures will increase evaporation from surface water storage facilities and rivers and lakes, snowfall and snowmelt patterns may change, which could lead to changes in the demand and supply of water in many regions of the world. Alterations in rainfall patterns could influence the availability of water in rivers and lakes - two of our most important sources of water at present - for hydroelectric generation, agricultural productivity and a host of other uses. The rise of sea-levels could contaminate coastal groundwater resources (like those in Israel and the Gaza Strip) on which humans in a number of localities around the globe are dependent for their daily water needs, especially those living on island states. Notwithstanding this, although there seems to be a lot of uncertainty contained within the climate change discourse and the impacts on water resources, this is however not the case. The uncertainty results from the inability of climate models to incorporate and reproduce vital elements of the hydrological cycle. Climate models are unable to model many hydrological processes such as cloud formation and storm generation, for these aspects occur on a scale larger than can be simulated by climate models. The climatic processes in the real world are also far more complex than those presented in climate models. We are therefore unable to know more than we would like about how the global water cycle

will change in future, and what the impacts will be on water resource management. Yet, this does not mean that we should sit back and take global climate change and its impact on water resources for granted, for water is a vital resource in every society.

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Biographical Sketch

Richard Meissner received his training as a political scientist at the Rand Afrikaans University (RAU) in Johannesburg. He obtained a Magister Artium (M.A.) degree in Political Studies from the same university in 1999 and is currently busy with a D.Phil. in International Relations at the University of Pretoria (UP). He was one of the first students in South Africa to complete a Master's thesis on water politics.

He was employed by the Political Studies department at the Rand Afrikaans University from 1996 to 1998 as a research assistant. He is currently employed as a research associate by the African Water Issues Research Unit (AWIRU) which he joined in 1999. He was involved in a number of studies regarding the management of national and international water resources in Southern Africa and the Middle East. He has also written a number of articles which were published in accredited journals. His scope of interest lies within the field of water politics and particularly the interaction of diverse actors within the domestic and international domains regarding water resource issues. Richard Meissner is a member of the South African Political Studies Association and the South African Institute of International Affairs.