



## Management of Water Resources

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### Abstract

The planet Earth is comprised of water to about 75% and due to this reason it is also termed as the 'blue planet'. Water is regarded to be an essential resource that is vital for the existence of not only human beings, but also animals, birds and plants. There have been numerous water bodies such as oceans, seas, rivers, lakes and ponds; people residing close to water bodies particularly in rural areas make use of water for number of tasks such as preparing the meals, bathing, washing, drinking, cleaning their houses and so forth. Agriculture is regarded to be the major user of water; farmers will be vested with this task to make use of water in an efficient manner and improve water management. The scope of sustainable management of water resources in agriculture concerns the responsibility of water managers and to make sure that water resources are allocated in an efficient and an equitable manner and to benefit the environment in social, economic and environmental concerns. Management of water resources includes activities and functions such as irrigation, availability of water in an effortless way across the production seasons, water management in rain-fed agriculture, management of floods, draughts and drainage and the conservation of ecosystems and connected cultural and recreational values. The management of water resources operates in a highly varied set of political, enlightening, lawful and institutional frameworks. The main purpose of this research paper is to highlight the information that communicates the significance and the effective management of water resources. Aspects such as economic, industrial, agricultural, environment, flora and fauna, energy, transport, tourism, infrastructure, social, regional, financial, economic, and political can be well administered through the effective management of water resources. In order to implement effective management of water resources, it is vital to strengthen the institutions, rights and the functions of planning, organizing, managing and administrating.

**Keywords:** Pretreatment; Enzymatic Hydrolysis; Fermentation; Bioethanol

### Introduction

Water issues are of concern to all the sections of the society and all economic sectors. Population expansion, rapid urbanization and industrialization, the growth of agriculture and tourism, and climatic changes all put water resources under increasing pressure. Specified these increasing demands it is vital that this essential resource is appropriately handled and managed; the demands of the people on water resources underscores the hydrological, social, economic and ecological inter-dependencies upon the rivers, lakes, seas and other water bodies. These interdependencies require more incorporated programs to increasing and administrating water and land resources. There is an energetic relationship between basin stakeholders and central governments, who have to work in collaboration to make sure the practicality of their deci-

sions in meeting the sustainable development goals. To deal with the comprehensive nature of water management, many countries are now introducing an integrated approach to water resources management at the national and regional level. This includes enhancement of the institutional understandings and procedures that are put into operation for effective management of water resources [1].

There has to be formulation of appropriate decisions relating to water management. Together, they have to put in place management systems that will alleviate the influences of natural hazards, supply water for productive purposes such as agriculture, industry, energy, transport, tourism, fishing, etc., availability of water for social purposes such as health and domestic services and protec-

tion of the environment. One must learn to adequately manage the conflicts with regards to water resource management that may occur between many different users. The integrated water resources management approach assists to handle and build up water resources in a sustainable and a balanced manner, taking into consideration the social, economic and environmental interests. It distinguishes the numerous various kinds of groups that normally compete with each other for acquisition of water; research has indicated that in the slum areas of cities such as Delhi, Mumbai, people wait in queues for obtaining one or two buckets of water depending upon the number of family members within their household. Water management accentuates the involvement in national policy and law making procedures, maintenance of good governance and formulating efficient institutional and regulatory arrangements as routes to more reasonable and sustainable decisions. A range of instruments, such as social and environmental assessments, economic instruments, and information and monitoring systems, adequately assist this process [1].

#### Different usages of water

Water is regarded to be a basic requirement for the survival of all living things; there have been multiple uses of water which have been identified as follows: [2].

Water for Basic Human Needs and Reducing of the Conditions of Poverty – Water is a basic human requirement; human beings make use of water for numerous purposes such as drinking, washing, bathing, sanitation, hygiene, cleanliness and in preparation of food. In the agricultural and the industrial development of the country also water is regarded to be an essential source. When an individual is residing in the conditions of poverty, then water is considered to be vital for mitigating their destitute conditions, for example, if they just have a handful of grains and they have water available, then too they will be able to feed themselves; it is vital for the maintenance of good health and prevalence of diseases and illnesses.

Water for Social and Economic Development – In this case, there is a strong correlation between the utilization of water and bringing about social and economic development of the society and the country. The focus has been laid upon three aspects, equity, economics and environment. Water management is essential for bringing about developments in the systems of education, employment opportunities, medical and health care facilities, because

with the provision of clean drinking water, achievements would be made. Water is of primary importance for economic development through energy and industrial creation. It is required for numerous forms of energy production that is hydro power and the water for cooling of thermal and nuclear power stations. And energy in turn is required for pumping, including extraction of water from underground aquifers. Water is required for most of the industries and those industries in turn have effect, through pollution and abstraction, on water quality that has an influence upon both downstream users and natural ecosystems. A major water usage is within the sector of non-food agriculture, in particular recent movements towards increasing bio fuels. This has significant inferences for water resources management.

Water and Natural Ecosystems – Water and natural ecosystems contribute in the living and promotion of welfare of the communities particularly residing in rural areas and tribal communities; people depend upon water bodies for fishing and obtaining many of the products provided by them such as salt, and other sea products; people in rural areas, who are poverty stricken employ fishing as their job and sell it in the market in order to carry out their daily living activities. Social and economic development and development of the human beings, reduction in the conditions of poverty take place simultaneously along with the preservation of the natural environmental conditions.

Water Security – It is vital to manage the security of the water resources, because the water bodies are getting polluted due to waste materials from the industries, as a result of draughts, floods etc. People residing in rural areas normally wash and bathe at the water bodies, thus leading to their pollution; hence, it is important to keep the water bodies clean and not throw any kinds of waste materials into them. There is a close linkage between water security and food security, because normally people who reside nearby the water bodies, obtain water to prepare their food, they may even make use of water for drinking purposes, they keep cattle and livestock which also need water and if the water bodies are polluted then the health of the people as well as their livestock will get severely affected; therefore, it is vital to maintain water security.

#### Recognition of the complexity and diversity of managing water resources in agriculture

The recognition of the complexity and diversity of managing water resources in agriculture has been stated as follows: [3].

Hydrology – The features of the water such as flowing, evaporating and having the opportunity to get reutilized makes it very distinguishing; agriculture can contribute positively towards the hydrological cycle through the groundwater recharge and the water purification tasks. There has also been contribution of the agricultural methods to surface water and groundwater pollution and there has also been diversion of water from the supporting ecosystems.

Sources – There have been number of sources from which water can be obtained for agricultural purposes such as rivers, lakes, and groundwater which includes shallow and deep aquifers. The growth of crops requires water and it is considered to be an essential resource. There is even growing usage of recycled water and these sources of water make provision of water on small scale basis in some of the regions within the country.

Uses – In the agricultural methods, there has been heterogeneity of water utilization in terms of space, quality and variability; the production of crops is done on seasonal basis, there would be variations in the demand and supply factors, thus, there have been different uses of water in the agricultural methods through, dams, reservoirs and irrigation infrastructure. The management of these systems can have varying consequences upon the environmental conditions.

Economics – When water is made use on the farm or in the production of goods then it is termed as a private good; when it is being used from a lake or a river then it does public good. The utilization of water resources is usually done in the private sector such as farms, households and industries, but the ownership and delivery of the water is normally in the public sphere, for example, the water used in the households in rural and tribal areas may be obtained from the lakes or the rivers that are located nearby.

Institutions - Water resources are normally administered through multifaceted and profound institutional and governance regulations, often the management is implemented through national institutions and governance and, in some cases, cross over the national border structures. Water institutions are also entrenched in sub-national regional and local governments and water user organizations, while the control of surface water and groundwater are generally regarded to be separate areas.

### Management of water resources in India

1. It is vital to look into management of water resources in India and the prevailing situation regarding the usage of water in different parts of the country: [4].
2. Agriculture – This sector accounts for 28% of GDP and 67% of employment.
3. Irrigation – This leads to higher incomes, more safe sources of revenues and livelihoods, and reduction in the conditions of poverty.
4. Irrigated area totals to 90 million - Surface water accounts for 39%, groundwater for 47%, and other sources for 14%
5. Domestic and Industrial Water Supply - There has been an increasing demand for domestic and industrial water supply; it is the main requirement for survival.
6. Increasing water scarcity – There has been an increase in the scarcity of water which is accounted as nine out of 20 river basins deemed to be water scarce that is less than 1000 m<sup>3</sup> per capita per year.
7. Groundwater - Groundwater table has been decreasing in most of the states in the country.
8. Continuous Investment - There has not been any development in the gross irrigated area despite making continuous investment.
9. Developed Area and Actual Area - Actual area that has been irrigated is not in equivalence with the developed area.
10. I and D Schemes - Inadequate performance on the part of I and D schemes.
11. Condition of I and D Schemes - Condition of I and D schemes have been weakening and there has been a reduction in the areas.
12. Conflicting Situations - There has been an increase in the conflicts and disputes over water resources management and adequate utilization.
13. WUAs - WUAs have been formulated but have not rendered sufficient and satisfactory performance.

### Accomplishing the Realization of Integrated Water Resource Management

There has been identification of ways through which the implementation and realization of integrated water resource management can be effectively achieved: [5].

Planning – This is a function which is regarded to be the most important in the case of management of water resources; in order to implement the task effectively it is required to perform adequate planning of the operations, it should not be done in isolation from carrying out practical action and learning. Development and financing of water basins and watershed demonstrations projects is vital, work should be done in an adaptive manner to gain efficient results and improve the policies and procedures.

Communication – The authorities that are vested with the responsibilities to implement effective management of water resources should communicate with each other regarding the various kinds of innovative plans and procedures. It is vital to work with stakeholders in order to get used to the principles and institutional realities through the demonstration projects that are flexible and they get easily adjusted and regulated as they advance in their functioning. It is vital to communicate and share the lessons, viewpoints and ideas in the ways that catalyze action at the local, national and the regional levels.

Implementation – The process of implementation takes into consideration water governance that is coordinated and facilitated across the levels and promotes consensus building. It is crucial to identify the rights and responsibilities of the people regarding the effective usage of water resources. In order to carry out effectiveness in the implementation process, it is required that individuals irrespective of the category that they belong to should possess adequate knowledge and information regarding the effective management of water resources; the main viewpoints should comprise of possessing information regarding the security and cleanliness of water resources.

Costs and Benefits – Financing of the water management projects and programs must be sustainable; the costs and benefits of water resources contribute in enhancing the livelihoods of the people, socio-economic development of the community and the nation and all kinds of direct and indirect benefits from the ecosystem services to justify and mobilize the investments. Therefore, it is necessary to develop the incentives that recompense the management of watersheds sustainability.

### Addressing the challenges that are experienced in the management of water resources

There have been many challenges that are experienced in the management of water resources and these differ from one region to another: [6].

1. With the expansion of industrialization, there has been immense usage of water resources; in rural areas there has been establishment of small scale industries and people who were not completely aware of the management of water resources used to throw waste materials from the industries in the nearby water bodies such as rivers and lakes, thus causing their pollution.
2. Urban expansion and tourism have been the major aspects that have led to challenges that have been experienced in the management of water resources. More and more people are migrating to urban areas from the rural areas in order to improve their living conditions and with the decentralization, regions are granted with more power and authority and they claim a wider role in the planning and administration of water resources.
3. It is important to identify the negative and the positive aspects of water; water is essential to human, animal and plant life, water supports all the productive activities such as agriculture, generation of hydropower, industries, fishing, tourism and transport. On the other hand, the negative aspects of water have been identified in the spread of diseases which occur due to contaminated and polluted water, flooding of vast areas, and scarcity of water resources can result in prolonged conditions of draught and decline in the economic conditions. Water has also been a source of conflict between the communities in a local or national basin, or in trans boundary basins that are shared by more than one nation.
4. Water issues and problems cater to all kinds of sections within the society; problems such as population expansion, economic growth, rapid urbanization, industrialization, the increase in agriculture, tourism, natural calamities such as earthquakes, floods, draughts etc and changes in climatic conditions put the water resources in the strained position. Since it is of immense significance for survival, it is necessary to implement effective management of water resources.

### Discussion

It is vital to understand the integrated approach that render a contribution in the organization of water resources management across the sectors and interest groups, and at various ranges, from local to international. It put emphasis on the participation in national policy and law making procedures, instituting good governance and formulating effectual institutional and authoritarian understandings as directions to more reasonable and sustainable decisions. A variety of instruments, such as community and envi-

ronmental appraisals, financially viable devices, and information and supervising organizations, sustain this process.

Ecosystems and other water bodies which, separately structure their fundamental significance, make provision of the vital natural services of great value to human wellbeing and existence. In many developing countries there is a continuing deprivation of freshwater sources in terms of both quantity and quality and of aquatic ecosystems. This means smaller quantity of advantages, less life sustenance and more water-related difficulties and risks. The aspects such as population expansion, demographic transformations, economic development and climate change have a vital influence on water resources. Regularly, water resources have a noteworthy influence on the production and economic growth, on health, medical, physical conditions, livelihoods, and on national security. As the pressures, stress and conflicts on water resources increase, it is fundamental that one should manage renewable freshwaters in an appropriate manner. But, management of water resources is becoming progressively more multifaceted and controversial.

### Conclusion

In most of the regions, management of water resources has always been the most important predicament because of the natural variability and uncertainty in the weather conditions. With the transformations in the climatic conditions, this problem is expected to get poorer. In some regions, changes in climate will mean little rainfall and lower river flows, while in other regions climatic change will mean having more floods. These changes will be aggravated because of other variations such as population and economic growth, urbanization, industrialization and increasing demands for food, which leads to an augmentation in the demand for water, and degrade water sources and aquifers in basins where the water availability is scarce. Aspects such as industrialization, agriculture, urbanization, transportation, infrastructural development, social, economic and regional development and for the purpose of existence of the human beings, animals and plants, it is vital to make effective management of water resources. Planning, communication, implementation and costs and benefits are considered to be vital functions of integrated water resource management. Water resource management has also been an area of conflict and controversies; therefore, it is vital to take into account the utilization and the distribution concerns of water, keeping the water resources pollution free and always making efficient use of water for the fulfillment of all the needs and requirements.

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