Water Management and Sustainable Development

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Abstract: Water is the basis of life on earth; it is the main component of the environment and an essential element for human life. Water is also fundamental for sustaining a high quality of life and for economic and social development. Human health greatly has been affected by water. But water resources has been threaten by pollution, miss using, and industrialization.
In this paper loads on water resources and water availability depending on factors are analyzed; regions of water scarcity and water resources deficit are discussed. Possible ways of water supply improvement and elimination of water resources deficit in different conditions were argued.

Keywords: Water management; Freshwater; Sustainable development

Introduction

Water is very important resources for sustainable development in human life. Uses of water include agricultural, industrial, household, recreational and environmental activities. The demand of water amount increased six times in 20th century when comparing with 19th century, but during this time the population of word increased only three fold. To know reliable assessment of water storage on the earth is essential but there is complicated problem because water is very dynamic. It is in permanent motion, converting among liquid, solid, and gaseous phases. In addition to the quantitative estimation of water storage, it is necessary to determine the form salt or freshwater and the other formation on our planet.

It is estimated that the earths hydrosphere contains of water, 1,386 million cubic kilometers (km^3). However 97.5 percent of this amount is salt water and only 2.5 percent is fresh water. Most of the fresh water

(68.7 percent) is in the form of ice and permanent snow cover in the Antarctic, the Arctic, and mountainous regions. Fresh groundwater comprises 29.9 percent of fresh water resources. Only 0.26 percent of the total amount of fresh water on the earth is concentrated in lakes, reservoirs, and river systems (Korzoun 1978).

Water storage in the hydrosphere permanently exchange among the ocean, land, and the atmosphere. This exchange is usually called the turnover of water on the earth, or the global hydrological cycle. This cycle is fully replenished according to hydrospheric water, for example 2500 year for oceanic water, 10000 years permafrost and polar ice, 1500 years deep groundwater and mountainous glaciers. On the other hand, water storage in lakes is fully replenished 17 years and in rivers only 17 days. So, river water is of great importance in the global hydrological cycle and in supplying humankind with freshwater. In hydrology and water management, two concepts are very important that are used freshwater storage and renewable water resources.

Renewable water resources include the water yearly replenished in the process of water turnover on the earth. In the process of turnover, both the quantity of river runoff is replenished and its quality is restored. If we could stop the contamination of rivers, then, with time, water could return to its natural purity. It is the river runoff that is most widely distributed over the land and provides a major part of water use in the world. A discovery of the anthropogenic factors that effect change of the quantitative and qualitative parameters of river water, are very important aspects of the water resources appraisal and assessment. Reliable assessment and appraisal of water resources is very important for each country or region and serves as an important prerequisite for all other aspects of the utilization and operation of water resources, and development of measures to protect against depletion and pollution. So each country is responsible water use and assessment their water sources.

There are many research and document about renewable freshwater resources published since the turn of the past century in the different countries of the world. During the last years, the results of global estimations have been published with varying degrees of comprehensiveness (Baumgartner & Reichel 1975; Berner & Berner 1987, World Resources Institute 1996; Gleick 1993 and 1998).

For assess renewable water resources at the global scale it must be;

5. The availability of the long-term observation series;
6. Location of sites on large and medium rivers, uniformly spread across the region,
7. Observations should reflect the river runoff regime, natural, or close to natural.

Also using water was primarily estimated for the countries of the world. Then the values obtained were generalized for large natural-economic regions and continents.

Household Water

The amount of public water use in their home depends on climatic conditions. In many well-equipped cities of the world, water withdrawals equal 300-600 liters per day per person (lcd). By the end of the 20th century, in industrially developed countries of Europe and North America, the per capita urban water withdrawal was expected to increase up to 500-800 l/day. On the other hand, in developing agricultural countries of Asia, Africa, and Latin America, public water withdrawal is 50 to 100 lcd; in individual regions with insufficient water resources, it is not more than 10 to 40 lcd of freshwater per person (Shiklomanov & Markova 1987; Gleick 1993 and 1998).

When calculated the specific water withdrawal is 400 to 600 lcd, and consumption does not usually exceed 5 to 10 percent of total water intake. Water use by populations in cities and rural areas was estimated using population dynamics data (urban and rural) and per capita water withdrawal.

Industrial Water Uses

Generally water in industry is used for cooling, transportation, as a solvent, and as an ingredient of finished products. Mostly water user is thermal and nuclear power generation. They use water mostly for cooling system.
Used water in industry withdrawal is quite different not only for individual branches of industry, but also within each kind of production, depending on the technology of manufacturing process. As a rule, in the northern regions, industrial water withdrawals seem to be considerably less than in southern regions with higher air temperatures. Some water is use in recirculation system after used. But new freshwater add to system. The amount of new freshwater intake water supply is insignificant. Extra water intake in most industries it is 5 to 20

percent, reaching 30 to 40 percent in some industries (Shiklomanov & Markova 1987; Margat 1994; Shiklomanov 1997

In the future, most countries will need to continuously increase the transition to circulating water supply systems. Many industries will convert to water-free, or dry, technologies. In some countries and regions of the world, there is a tendency to increase the use of marine waters for industrial purposes.

Agricultural Water Uses

For all the countries and regions in the world, irrigation is the principal water user. At the beginning of the 20 th almost all developed and developing countries initiated intensive irrigation development. This intensive irrigation could provide for the growth of irrigated areas and increased crop production. But this increase in irrigated areas slowed considerably (Postel 1992; Shiklomanov 1997).

The reason of this situation was the very high cost of irrigation system construction, soil salinization, the depletion of irrigation water-supplying sources, and the problems of environmental protection. Also some developed countries, the amount of irrigated lands has stabilized or even decreased.

At the present time, about 15 percent of all cultivated lands are being irrigated. However, the food produced in irrigated areas amounts to almost half the total crop production. Irrigated areas would expand mainly in countries with an extremely rapid population growth and sufficient water and land resources. Water required for irrigation is determined water intake in cubic meters per hectare per year (m^3/ha/year), and returnable waters in percentage of water intake. They depend on general physiographic conditions, serviceable condition of irrigation systems, watering techniques and crop composition. In the irrigation area the returnable water amount is change according to the area and climatic condition. This amount changes between 20-60% percent of total water intake. Therefore, the values of annual water withdrawal vary greatly, from 5,000-6,000 m^3/ha to 15000-17000 m^3/ha, and in individual regions of Africa to 20000 or 25000 m^3/ha. (Shiklomanov & Markova 1987; Shiklomanov 1997; FAO 1995 and 1999).

A considerable water economy can be attained through use of the most efficient modern engineering methods and means of watering (sprinkling, drip irrigation, etc.) that increase crop productivity and decrease irrigation water volume.

The largest water use in agriculture is irrigation. However, quantitatively, the total water contribution to other agricultural uses is insignificant when compared to those for irrigation (approximately, 5 to 8 percent). In estimating future water withdrawals for irrigation, the trend of irrigation to decrease due to improving technological procedures and engineering efficiency was considered.

Solutions to the Water Crisis

* Develop more water sources, while ensuring that environmental and community concerns are addressed;

* Improve water infrastructure, including the installation of low-flow toilets and efficient drip-irrigation systems;

* Improve water-use efficiency

* Update the Clean Water Act and the Safe Drinking Water Act to include new contaminants, and actively enforce the standards already in place

* Price water more accurately, with the understanding that water is a human right and should be subsidized for basic human needs

* Improve and expand public participation in environmental decision-making; and Strengthen water institutions and improve communication between them.

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