

## Water Conservation and Sustainability: An Utmost Importance

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Water is one of the core essential and basic necessity; 1) for the life forms-living things on the biosphere, 2) for the natural processes, 3) for the communities, 4) for the society, 5) for the economy of the country and 6) for on-coming generations. Although total earth's water (>71%) is constant, it goes through continuous hydrological cycle such as transpiring by vegetation, evaporation, precipitation, runoff, infiltration and other natural processes. Consequently, the rainfall in any locations may not be same and therefore water shortage is the final outcome. Despite earth's majority of the cover is filled by water (97% by oceans), only freshwater (about 3% in which 85% is available as a glacier) is suitable for living organisms including humans. In recent years water table is facing serious threat due to rapid population increase, industrial and urban development, over usage, climate change, global warming, shrinkage in glaciers in Arctic and Antarctic, natural calamities (shifting of precipitation and reduced snow pack) and negligence of people to use the water in proper way and slow replenishment of natural waters [1]. Besides, drastic economic expansion, energy demand and shrinkage of replenished waters are point of major concern. Water withdrawals across all sectors including public use (municipal), rural or domestic use, livestock use, irrigation, thermoelectric power generation increased dramatically between 1950 and 2005 in the USA [2]. When compare with few decades during the past, the draught condition in all over the world have been doubled. The rainfall has been changed during the current years and catchment of rainwater is decreasing in several countries. Very recently, with increasing demand of water requirement, preservation of water resources has been increased. It is anticipated that water level may go further down and their necessity may increase more in future. It is utmost necessity for the humans to take care of the water resources, usage pattern and sustainable management/conservation at great importance. Consequently, water conservation can be achieved 1) through logical policy, 2) from existing resources, 3) by mechanical auditing, 4) by rain water harvesting, 5) increase de-salination projects (to get additional sustainable water from ocean), 6) water re-use and 7) stringent regulations to adopt safe and conservative water adaptation policy by individuals in order to save the earth and improve the quality and quantity of the sustainable water.

Majority of water bodies on the earth contain cocktails of toxic chemicals. In some countries along with toxic chemicals, bad sanitary quality makes water to carry biological pathogens and replenishment of these contaminated water take several years. Moreover, chemical and biological contamination tend to increase more in future if there is no strict water conservation/management policy is maintained in and around developing countries, industries, in house, commercial sector, municipalities, metropolitan cities and in agriculture [1]. Peoples living in big cities are exposed to cocktails of toxic contaminants due to elevated aquifer/ground water contamination, decrease in the water table, less waste water treatment facilities in developing countries in which industrial development is sky rocketing and therefore replenishment of available freshwater is decreasing. In addition, as it indicated earlier the loss of freshwater by 1) by precipitation (evaporation), 2) during incorporation in to the products (e.g., building materials), 3) in the vegetation transpiration 4) runoff, 5) evaporation cannot be ignored. Increasing water demands in order to support

population and economic growth, environmental natural ecosystems (e.g., wetlands, rivers, lakes and groundwater systems), energy growth and supply shifts expected with climate change [3].

Wastage of potable water occurs in several ways especially from domestic kitchen (unnecessary running of tap in the sink), bathroom (continuous running of tap during tooth brush/shaving and long shower [also leaky faucet and toilet contributes 20-100 gallons/day]), several flushing of toilets with more than expected water to wash, laundry (less loaded laundry), home garden/lawn and car washing. In the U.S., the water consumption per home is almost 50-70 gallons/day/person in which almost 15% of water wasted. In India, the approximate usage of water/home/day is 900 liters (approximately 240 gallons/home/day if the home has 4 persons it would be a 60 gallons/person/day) without any conservative method. However with conservative method 20 gallons/home/day is good enough therefore 92% of water can be saved. Further defective plumbing in municipal, domesticated, industrial areas to reduce leaking is necessary. For example, in Delhi, India estimated losses of drinking water is from 30% to 40%.

More than 650 million people in almost 40 countries suffer from water scarcity. Among them particularly, 36 countries face extremely high water stress, including several countries in the Sub-Saharan region, Middle East, Indian deserts contributes to the looming crisis from African and Asian continents. Due to water shortage, the energy production and economic development in India and China has been affected seriously. Water scarcity is very severe in fast developing country like India, along with decreased energy production, the water quality with respect to chemical and biological contamination [1]. The water shortage in India, China, Nepal, Bangladesh, is very common as the tropical monsoon fail to pour a rain on the seasonal basis. In the USA water shortage is very common (e.g., western parts of arid desert zone) especially from the past 10 years [4]. Water supplies decreased due to the drying up of streams, decline in the ground water levels due to the excess pumping, chemical contamination and increased drought conditions. Among European Union, the water scarcity hits several countries among them Spain, France, Cyprus, Bulgaria, Romania, Germany, Czech and some others are affected while Croatia is least water stressed country. The aquifers in Belgium, France have been over exploited and contaminated by chemicals. Due to climate change and decrease in groundwater level related water stress makes Australian economy hit during the past 2-5 years. For the regional, humans welfare and the development, the reliable sources and supply of drinking water

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is utmost important. Considering those facts, water conservation/management policies should be implemented immediately. For this particular context, in this editorial most efficient water conservation plans for two large democratic nations in the world such as USA (developed temperate country) and the India (fast developing tropical country) were further highlighted.

The ultimate goal of water conservation effort can be focused to reduce unnecessary water intake and to alter the flow to the places where physical and chemical properties of the water are encouraging to reuse. In addition, water conservation plans can be implemented by new planning, management, technology, regulatory and enforcement in water supplying systems and re-habilitate in water usage habit to individuals. The key point in water conservation plans is monitoring the water sources and reservoirs of stream flows, surface water resources and ground water levels. First, securing the drinking water from the water scarcity, over consumption, degradation, natural damage (e.g. drought, flood damage, waste of rainwater), prolonged unsustainable management and pollution sources should be delineated and avoided. During drought watch and drought warning emergency situations, water supply should be reduced by 5 to 15%, respectively to the individuals. During emergency situations prohibition should be implied for watering for a landscape, golf course, lawns, gardens, nurseries, driveways, garage, parking areas, streets, sidewalks, crematories and paved ways. Besides, ban or restriction should impose to artificial waterfalls, fountains, filling of swimming pools, washing vehicles and large water usage areas such as hotels and restaurants. Water pricing and metering, water efficiency, integrated and general water supply and land use planning programs, water use regulation, assured supply law, water utility measures (e.g. water pressure management, water use audits, water accounting and loss control, information and teaching to public, replacement and promotions, recycling municipal effluent) water market, are additional source of water conservation plans.

In the US, most of peoples have awareness on importance of water in the life. However, they should understand exactly what all the responsibilities to conserve water are. Therefore, water conservation should begin from the household use by providing information and assistance with how they can reduce the amount of the water they use every day. There are several water saving tips can be followed. For example, a water faucet left running can use 20 gallons of water while you shave, 10 gallons while you brush your teeth, 2 gallons while you wash your hands, >4 gallons while you flush (one time) toilet. A continuous shower requires up to 12 gallons per minute, and a full bathtub uses 36 gallons. Wetting down, soaping up, and rinsing off rapidly uses only 4 gallons. Water at a minimum level in a bath uses only 10 to 12 gallons. Toilets used the most water on a daily basis (20.1 gallons per person per day), clothes washers were the second largest water users (15 gallons per person per day) and showers were third (13.3 gallons per person day) followed by faucets (11.1 gallons per capita/day for a family) and leaks (10 per capita/day for a family) [5-8]. Automatic dishwashers use up to 16 gallons of water; washing dishes by hand in a sink or dishpan requires only 5 gallons. Further several conservative methods can be adopted during watering to lawn, gardening, car wash, washing walkways and garage. With improved method water conservation per family would be 72.5 per capita/day to 49.6 per capita/day with almost 40% of the water can be saved/family. In addition, Installing water saving devices in old equipment, acquisition of new water-saving equipment, acquisition of water-saving household appliances, other measures, device or equipment designed to save water (repairing leaks, recycling of household liquid waste, rainwater collection, etc.) [7-8].

In case of India the method adopted so far can be modified which would able to conserve about 90% of the water. The examples are follows; for brushing, washing hands, shaving by running tap for 9 min require 81 liters of water while using mug and tumbler require meager 3 liters. Similarly, shower (shower flower open all the time during shower), flushing traditional toilet consumes 104 liter, while with modified adaptation of wet down, tap off, soap up, rinse off method and using modern dual flush system in toilet needed 25 liters of water. Besides, watering plants, washing floor, and washing car by running hose for 20 min may exhaust 720 liter water, while water can, mop or bucket and two buckets car washing method may require 41 liters of water [9]. Similar to USA, in India promoting a water-saving consciousness should be educated to support changes that will achieve a reduction in water use. Peoples and industries are ignorant about the water usage and misusing available water sources are large [1]. Therefore, Government should implement a stringent rules on peoples and industries along with 1) surface water storage, 2) conservation of rain water, 3) ground water conservation such as artificial recharge and percolation tank method, 4) catchment area protection (CAP), 5) inter-basin transfer of water, 6) adoption of drip sprinkler irrigation, 7) management of growing pattern of crops such as selection of crop varieties, nutritional management, and role of antitranspirants, 8) reducing evapotranspiration, 9) reducing evaporation from various water bodies, 10) recycling of water and conservation of water in domestic use, 11) reduce the loss of water and 12) reuse of wastewater and artificial recharge to groundwater [9].

Rainwater harvesting becoming an attractive in domestic as well as agriculture sector and it should be encouraged by Government of India by providing subsidies for rain water harvesting resources purchasing (catching ducts, filtration unit, pump and over head rainwater storing roof with appropriate plumbing). Particularly, rainwater harvesting in tropical countries should be implemented to domesticated areas. The filtered and stored rainwater can be used to irrigate the home garden, lawn, taking shower (filtered and dis-infected), toilets and also in small scale agriculture. Harvesting rainwater by digging ponds, lakes, canals, channels, expand the size of existing water reservoir in rural areas would help to cultivate short time economical yielding plants.

Urban water conservation is typically achieved through prescriptive regulations, including the rationing of water for particular uses and requirements for the installation of particular technologies. A significant shift has occurred in pollution control regulations toward market-based policies in recent decades [10]. Recycling or re-use of reclaimed water (wastewater treatment effluent) to industrial, agriculture, golf course, parks, cemeteries, road medians, paper mills and carpet dyers, toilet flushing, dust control, construction activities, concrete mixing, and artificial lakes. Reused water can also be used in landscape irrigation, agricultural irrigation, aesthetic uses such as fountains, and fire protection. In the industries, water is mainly used for washing, heating, cooling purpose. Further industrial water also used as a carrier of coatings, chemical dyes and natural or artificial pigments. In order to reduce the cost and waste the industrial processed water, reusing in another area with less stringent water quality requirements such as cooling water at power plants and oil refineries or industrial process can be an alternate option. Because the most water-intensive cooling method used in industrial applications is once-through cooling, in which water contacts and lowers the temperature of a heat source and then is discharged. Recycling water with a re-circulating cooling system can greatly reduce water use by using the same water to perform several cooling operations. Three cooling water conservation approaches that can be used to reduce water use are evaporative cooling, ozonation, and

air heat exchange. On the whole, water management and conservation is very important on the global basis, teaching to the public about importance of water conservation is utmost important in order to save this earth and to maintain quality of human life in good safe.

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