Iran Water management study

Hamid Kheyrodin
Assistant professor in Semnan University – Iran

ABSTRACT

Water resource management is a very important issue from several angles such as development of water bodies for future, protection of available water bodies from pollution and over exploitation and to prevent disputes. A paramount issue is water-its availability, quality and management. Water Management Importance. Water Management is important since it helps determine future Irrigation expectations. Water management is the management of water resources under set policies and regulations. Water, once an abundant natural resource, is becoming a more valuable commodity due to droughts and overuse Climate change is expected to intensify the existing risks, particularly in regions where water scarcity is already a concern, as well as create new opportunities in some areas. Efforts to develop adaptation strategies for agricultural water management can benefit from understanding the risks and adaptation strategies proposed to date. This understanding may assist in developing priorities for the adaptation of water resources for irrigation. The adaptation choices consider current technological perspectives and do not project future technological change; we are certain that technological change will shape some choices for adaptation in the coming decades. The greatest scope for action is in improving adaptive capacity and responding to changes in water demands, however the implementation requires revamping current water policy, adequate training to farmers and viable financial instruments.

Keywords: water, management, Iran
Introduction

Water management is the activity of planning, developing, distributing and optimum use of water resources under defined water polices and regulations. It includes: management of water treatment of drinking water, industrial water, sewage or wastewater, management of water resources, management of flood protection, management of irrigation, and management of the water table.

Water is a transparent, tasteless, odorless, and nearly colorless chemical substance, which is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms. It is vital for all known forms of life, even though it provides no calories or organic nutrients. Its chemical formula is H₂O, meaning that each of its molecules contains one oxygen and two hydrogen atoms, connected by covalent bonds. Water is the name of the liquid state of H₂O at standard ambient temperature and pressure. It forms precipitation in the form of rain and aerosols in the form of fog. Clouds are formed from suspended droplets of water and ice, its solid state. When finely divided, crystalline ice may precipitate in the form of snow. The gaseous state of water is steam or water vapor. Water moves continually through the water cycle of evaporation, transpiration (evapotranspiration), condensation, precipitation, and runoff, usually reaching the sea. Water covers 71% of the Earth's surface, mostly in seas and oceans. Small portions of water occur as groundwater (1.7%), in the glaciers and the ice caps of Antarctica and Greenland (1.7%), and in the air as vapor, clouds (formed of ice and liquid water suspended in air), and precipitation (0.001%).

Water plays an important role in the world economy. Approximately 70% of the freshwater used by humans goes to agriculture. Fishing in salt and fresh water bodies is a major source of food for many parts of the world. Much of long-distance trade of commodities (such as oil and natural gas) and manufactured products is transported by boats through seas, rivers, lakes, and canals. Large quantities of water, ice, and steam are used for cooling and heating, in industry and homes. Water is an excellent solvent for a wide variety of chemical substances; as such it is widely used in industrial processes, and in cooking and washing. Water is also central to many sports and other forms of entertainment, such as swimming, pleasure boating, boat racing, surfing, sport fishing, and diving.

Water is a liquid at the temperatures and pressures that are most adequate for life. Specifically, at a standard pressure of 1 atm, water is a liquid between 0 and 100 °C (32 and 212 °F). Increasing the pressure slightly lowers the melting point, which is about −5 °C (23 °F) at 600 atm and −22 °C (−8 °F) at 2100 atm. This effect is relevant, for example, to ice skating, to the buried lakes of Antarctica, and to the movement of glaciers. (At pressures higher than 2100 atm the melting point rapidly increases again, and ice takes several exotic forms that do not exist at lower pressures.) Increasing the pressure has a more dramatic effect on the boiling point, that is about 374 °C (705 °F) at 220 atm. This effect is important in, among other things, deep-sea hydrothermal vents and geysers, pressure cooking, and steam engine design. At the top of Mount Everest, where the atmospheric pressure is about 0.34 atm, water boils at 68 °C (154 °F).

At very low pressures (below about 0.006 atm), water cannot exist in the liquid state and passes directly from solid to gas by sublimation—a phenomenon exploited in the freeze drying of food. At very high pressures (above 221 atm), the liquid and gas states are no longer distinguishable, a state called supercritical steam.

Water also differs from most liquids in that it becomes less dense as it freezes. The maximum density of water in its liquid form (at 1 atm) is 1,000 kg/m³ (62.43 lb/cu ft); that occurs at 3.98 °C (39.16 °F). The density of ice is 917 kg/m³ (57.25 lb/cu ft). Thus, water expands 9% in volume as it freezes, which
accounts for the fact that ice floats on liquid water.
The details of the exact chemical nature of liquid water are not well understood; some theories suggest that the unusual behaviour of water is due to the existence of 2 liquid states.\[10\][13][14][15]

---

**Taste and odor**

Pure water is usually described as tasteless and odorless, although humans have specific sensors that can feel the presence of water in their mouths, and frogs are known to be able to smell it.\[17\] However, water from ordinary sources (including bottled mineral water) usually has many dissolved substances, that may give it varying tastes and odors. Humans and other animals have developed senses that enable them to evaluate the potability of water by avoiding water that is too salty or putrid.

**Color and appearance**

The apparent color of natural bodies of water (and swimming pools) is often determined more by dissolved and suspended solids, or by reflection of the sky, than by water itself.

Light in the visible electromagnetic spectrum can traverse a couple meters of pure water (or ice) without significant absorption, so that it looks transparent and colorless. Thus aquatic plants, algae, and other photosynthetic organisms can live in water up to hundreds of meters deep, because sunlight can reach them. Water vapour is essentially invisible as a gas.

Through a thickness of 10 meters (33 ft) or more, however, the intrinsic color of water (or ice) is visibly turquoise (greenish blue), as its absorption spectrum has a sharp minimum at the corresponding color of light (1/227 m\(^{-1}\) at 418 nm). The color becomes increasingly stronger and darker with increasing thickness. (Practically no sunlight reaches the parts of the oceans below 1,000 meters (3,300 ft) of depth.)

Infrared and ultraviolet light, on the other hand, is strongly absorbed by water.

The refraction index of liquid water (1.333 at 20 °C (68 °F)) is much higher than that of air (1.0), similar to those of alkanes and ethanol, but lower than those of glycerol (1.473), benzene (1.501), carbon disulfide (1.627), and common types of glass (1.4 to 1.6). The refraction index of ice (1.31) is lower than that of liquid water.

Polarity and hydrogen bonding

---

Fig 1: Iran water management
Since the water molecule is not linear and the oxygen atom has a higher electronegativity than hydrogen atoms, it is a polar molecule, with an electrical dipole moment: the oxygen atom carries a slight negative charge, whereas the hydrogen atoms are slightly positive. Water is a good polar solvent, that dissolves many salts and hydrophilic organic molecules such as sugars and simple alcohols such as ethanol. Water also dissolves many gases, such as oxygen and carbon dioxide—the latter giving the fizz of carbonated beverages, sparkling wines and beers. In addition, many substances in living organisms, such as proteins, DNA and polysaccharides, are dissolved in water. The interactions between water and the subunits of these biomacromolecules shape protein folding, DNA base pairing, and other phenomena crucial to life (hydrophobic effect). Many organic substances (such as fats and oils and alkanes) are hydrophobic, that is, insoluble in water. Many inorganic substances are insoluble too, including most metal oxides, sulfides, and silicates.

Because of its polarity, a molecule of water in the liquid or solid state can form up to four hydrogen bonds with neighboring molecules. These bonds are the cause of water's high surface tension and capillary forces. The capillary action refers to the tendency of water to move up a narrow tube against the force of gravity. This property is relied upon by all vascular plants, such as trees. The hydrogen bonds are also the reason why the melting and boiling points of water are much higher than those of other analogous compounds like hydrogen sulfide (H\(_2\)S). They also explain its exceptionally high specific heat capacity (about 4.2 J/g/K), heat of fusion (about 333 J/g), heat of vaporization (2257 J/g), and thermal conductivity (between 0.561 and 0.679 W/m/K). These properties make water more effective at moderating Earth's climate, by storing heat and transporting it between the oceans and the atmosphere. The hydrogen bonds of water are of moderate strength, around 23 kJ/mol (compared to a covalent O-H bond at 492 kJ/mol). Of this, it is estimated that 90% of the hydrogen bond is attributable to electrostatics, while the remaining 10% reflects partial covalent character.

**Electrical conductivity and electrolysis**

Pure water has a low electrical conductivity, which increases with the dissolution of a small amount of ionic material such as common salt. Liquid water can be split into the elements hydrogen and oxygen by passing an electric current through it—a process called electrolysis. The decomposition requires more energy input
than the heat released by the inverse process (285.8 kJ/mol, or 15.9 MJ/kg). Liquid water can be assumed to be incompressible for most purposes: its compressibility ranges from 4.4 to $5.1 \times 10^{-10}$ Pa$^{-1}$ in ordinary conditions. Even in oceans at 4 km depth, where the pressure is 400 atm, water suffers only a 1.8% decrease in volume.

![Image of water management in central Iran](image)

**Fig 3: Water management in central Iran**

The viscosity of water is about $10^{-3}$ Pa·s or 0.01 poise at 20 °C (68 °F), and the speed of sound in liquid water ranges between 1,400 and 1,540 meters per second (4,600 and 5,100 ft/s) depending on temperature. Sound travels long distances in water with little attenuation, especially at low frequencies (roughly 0.03 dB/km for 1 kHz), a property that is exploited by cetaceans and humans for communication and environment sensing (sonar).

**Reactivity**

Metallic elements which are more electropositive than hydrogen such as lithium, sodium, calcium, potassium and caesium displace hydrogen from water, forming hydroxides and releasing hydrogen. At high temperatures, carbon reacts with steam to form carbon monoxide. Main articles: Hydrology and Water distribution on Earth Water covers 71% of the Earth's surface; the oceans contain 96.5% of the Earth's water. The Antarctic ice sheet, which contains 61% of all fresh water on Earth, is visible at the bottom. Condensed atmospheric water can be seen as clouds, contributing to the Earth's albedo.

Hydrology is the study of the movement, distribution, and quality of water throughout the Earth. The study of the distribution of water is hydrography. The study of the distribution and movement of groundwater is hydrogeology, of glaciers is glaciology, of inland waters is limnology and distribution of oceans is oceanography. Ecological processes with hydrology are in focus of ecohydrology. The collective mass of water found on, under, and...
over the surface of a planet is called the hydrosphere. Earth's approximate water volume (the total water supply of the world) is 1.338 billion cubic kilometers ($321 \times 10^6 \text{ cu mi}$).[2]

Liquid water is found in bodies of water, such as an ocean, sea, lake, river, stream, canal, pond, or puddle. The majority of water on Earth is sea water. Water is also present in the atmosphere in solid, liquid, and vapor states. It also exists as groundwater in aquifers. Water is important in many geological processes. Groundwater is present in most rocks, and the pressure of this groundwater affects patterns of faulting. Water in the mantle is responsible for the melt that produces volcanoes at subduction zones. On the surface of the Earth, water is important in both chemical and physical weathering processes. Water, and to a lesser but still significant extent, ice, are also responsible for a large amount of sediment transport that occurs on the surface of the earth. Deposition of transported sediment forms many types of sedimentary rocks, which make up the geologic record of Earth history.

**Water cycle**

**Main article: Water cycle**

The water cycle (known scientifically as the hydrologic cycle) refers to the continuous exchange of water within the hydrosphere, between the atmosphere, soil water, surface water, groundwater, and plants.

Water moves perpetually through each of these regions in the water cycle consisting of the following transfer processes:

- evaporation from oceans and other water bodies into the air and transpiration from land plants and animals into the air.
- precipitation, from water vapor condensing from the air and falling to the earth or ocean.
- runoff from the land usually reaching the sea.
Most water vapor over the oceans returns to the oceans, but winds carry water vapor over land at the same rate as runoff into the sea, about 47 Tt per year. Over land, evaporation and transpiration contribute another 72 Tt per year. Precipitation, at a rate of 119 Tt per year over land, has several forms: most commonly rain, snow, and hail, with some contribution from fog and dew.\[^{[1]}\] Dew is small drops of water that are condensed when a high density of water vapor meets a cool surface. Dew usually forms in the morning when the temperature is the lowest, just before sunrise and when the temperature of the earth's surface starts to increase.\[^{[2]}\] Condensed water in the air may also refract sunlight to produce rainbows.

Water runoff often collects over watersheds flowing into rivers. A mathematical model used to simulate river or stream flow and calculate water quality parameters is a hydrological transport model. Some water is diverted to irrigation for agriculture. Rivers and seas offer opportunity for travel and commerce. Through erosion, runoff shapes the environment creating river valleys and deltas which provide rich soil and level ground for the establishment of population centers. A flood occurs when an area of land, usually low-lying, is covered with water. It is when a river overflows its banks or flood comes from the sea. A drought is an extended period of months or years when a region notes a deficiency in its water supply. This occurs when a region receives consistently below average precipitation.

**Water industry**

A water-carrier in India, 1882. In many places where running water is not available, water has to be transported by people.
The water industry provides drinking water and wastewater services (including sewage treatment) to households and industry. Water supply facilities include water wells, cisterns for rainwater harvesting, water supply networks, and water purification facilities, water tanks, water towers, water pipes including old aqueducts. Atmospheric water generators are in development.

Drinking water is often collected at springs, extracted from artificial borings (wells) in the ground, or pumped from lakes and rivers. Building more wells in adequate places is thus a possible way to produce more water, assuming the aquifers can supply an adequate flow. Other water sources include rainwater collection. Water may require purification for human consumption. This may involve removal of undissolved substances, dissolved substances and harmful microbes. Popular methods are filtering with sand which only removes undissolved material, while chlorination and boiling kill harmful microbes. Distillation does all three functions. More advanced techniques exist, such as reverse osmosis. Desalination of abundant seawater is a more expensive solution used in coastal arid climates.

The distribution of drinking water is done through municipal water systems, tanker delivery or as bottled water. Governments in many countries have programs to distribute water to the needy at no charge. Reducing usage by using drinking (potable) water only for human consumption is another option. In some cities such as Hong
Kong, sea water is extensively used for flushing toilets citywide in order to conserve fresh water resources. Polluting water may be the biggest single misuse of water; to the extent that a pollutant limits other uses of the water, it becomes a waste of the resource, regardless of benefits to the polluter. Like other types of pollution, this does not enter standard accounting of market costs, being conceived as externalities for which the market cannot account. Thus other people pay the price of water pollution, while the private firms’ profits are not redistributed to the local population, victims of this pollution. Pharmaceuticals consumed by humans often end up in the waterways and can have detrimental effects on aquatic life if they bioaccumulate and if they are not biodegradable. Municipal and industrial wastewater are typically treated at wastewater treatment plants. Mitigation of polluted surface runoff is addressed through a variety of prevention and treatment techniques. (See Surface runoff#Mitigation and treatment.)

Industrial applications

Many industrial processes rely on reactions using chemicals dissolved in water, suspension of solids in water slurries or using water to dissolve and extract substances, or to wash products or process equipment. Processes such as mining, chemical pulping, pulp bleaching, paper manufacturing, textile production, dyeing, printing, and cooling of power plants use large amounts of water, requiring a dedicated water source, and often cause significant water pollution. Water is used in power generation. Hydroelectricity is electricity obtained from hydropower. Hydroelectric power comes from water driving a water turbine connected to a generator. Hydroelectricity is a low-cost, non-polluting, renewable energy source. The energy is supplied by the motion of water. Typically a dam is constructed on a river, creating an artificial lake behind it. Water flowing out of the lake is forced through turbines that turn generators fig 6.

Conclusion

The use of agricultural water makes it possible to grow fruits and vegetables and raise livestock, which is a main part of our diet. Agricultural water is used for irrigation, pesticide and fertilizer applications, crop cooling (for example, light irrigation), and frost control. Farm water, also known as agricultural water, is water committed for use in the production of food and fiber. On average, 80 percent of the fresh water withdrawn from rivers and groundwater is used to produce food and other agricultural products.

Acknowledgement: I thank from semnan university caus grant and laboratory analysis water.

References

1. "Science in Your Watershed - Locate Your Watershed". USGS. Retrieved 2016-10-12. This article incorporates text from this source, which is in the public domain.
2. "Hydrologic Unit Maps". USGS. Retrieved 2016-10-12. This article incorporates text from this source, which is in the public domain.
3. "Boundary Descriptions and Names of Regions, Subregions, Accounting Units and Cataloging Units". water.usgs.gov. USGS. Retrieved 2016-10-12. This article incorporates text from this source, which is in the public domain.