

Water in Islam

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Introduction

Life, food and water form one closely knit circular continuum. We could also visualize life to be poised/balanced on a tripod of 'air, water and food', for it is only in water or with water that life processes can go on or sustained. Hence, clean potable water forms an indispensable component simultaneously; there is the output of waste products which are flushed out of organisms through water medium. These complex phenomena have given rise to studies such as ecology and environment. In this study, we shall trace the historical developments by way of contextualizing sacred texts and delineating the developments relating to the utilization of water. Thus, this chapter aims at understanding what these sacred texts as well as auxiliary texts have to say on these issues on the one hand, as also tracing their historical evolution, on the other. Hence, the crux is to relate how the people in different epochs solved their problems of getting adequate water and its efficient utilization and safe disposal of waste.

Methodology

This chapter bases itself principally on three sources, viz., the Holy Quran, *Hadith* and *Sunnah*, besides two secondary sources, viz. *Fiqh* and Islamic History.

Quran is a divine scripture revealed to Prophet Muhammad over a period of 23 years in the cities of Makkah and Madinah, where he lived during his prophethood. The verses of the Quran were brought by archangel Jibraeel regularly during (610 AD and 632 AD) and were memorized by the Prophet before imparting to a

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host of his companions who also memorized it through frequent recitations. The Prophet put the verses in a sequence (which is not the same as a chronological order of revelation). During the era of the third Caliph Osman, various versions that had been written down by that time were brought together, and uniformity was given to it. Ever since the days of Prophet Muhammad, people have been memorizing the entire 6000 and odd verses. Since the Quran is in rhymed prose, it lends itself to an easy memorization (called *Hifz*), which developed as a skill among Muslims.

Hadith (pronounced as *Hadees*) are the sayings of Prophet Muhammad, which come next in the hierarchy of religious text. There were great many narrators of *Hadith*, and they began to be compiled only after 200 years of the Prophet's death. By then, a lot of political changes had taken place with Islam graduating from a faith to an empire, while narrators had developed a variety of leanings and political affiliations. Consequently, *Hadith* with the same or similar contents could be found in varied forms and wordings by a host of narrators. Although six of the *Hadith* collections are known to be most authentic, i.e. *Sahih Bukhari*, *Sahih Muslim*, *Nisai*, *Tirmizi*, *Abu Dawud* and *Ibne Majah*, there is no guarantee of the accuracy and health of the text being original. According to the own admission of the six compilers, they did a lot of sifting, sorting, sieving and scrutiny, yet could not ensure that the wordings they were committing to writing were entirely those of the Prophet's. Besides, a lot of repetitions also bring down the actual volume of content that can be extracted from them. Thus, *Hadith* comes a distant second after the Holy Quran when it comes to accessing the Islamic teachings.

The third source is the *Sunnah* or traditions of the Prophet. This also forms part of *Hadith*. These are actions and deeds of the Prophet which his companions witnessed and related the account to others before they came to be recorded by the compilers of *Hadith*. These are purely in the wordings of the Prophet's companions.

Fiqh or jurisprudence is the fourth source for extracting the practices prevailing in the early Islamic societies. A bewildering variety of Fiqh has been produced by a large number of scholars. This is mainly their legal and juristic opinions on various issues related to the life and development in various societies, in various eras under a variety of political dispensations. Although it could be a guide to the way they elicited legal guidance from the actual scriptural sources of the religion, they may be totally irrelevant to our times. What is important is that, their opinion and formulae can be totally irrelevant today, but their method of arriving at a formula for their own societies and challenges typical to their times may be of some value for us.

Islamic History or Muslim history can be a source to know the way various Islamic societies and administrations adopted for dealing with issues of water management. Islam became an imperial force after 30 years of the Prophet's demise. The Prophet was succeeded by Abu Bakar (for tenure of merely 2 years), Umar (for 10 years), Osman (for 17 years) and Ali (for 4 years during which the Islamic state split between Madinah and Damascus). Umayyad Empire with its seat in Damascus and Abbasids with their capital at Baghdad became the principal centre of political administration. Later, the conquests brought lands up to Spain and Sind under their tutelage. Still later, a variety of sultanates came to rule over these lands with

Ottomans (from Istanbul), Mughals (from Delhi), Ayyubid and Fatimid (from Cairo), Al-Movahid and Al-Moravid (from Maghreb), carving up new sultanates. The history of these lands and dispensations has been documented by historians.

The references to the Quran have been provided in the brackets at the end of all verses (such as 2:14, i.e. 2 referring to the chapter and 14 referring to verse number). Since there exist a great variety of translations into English, in some cases, the name of the translator has also been mentioned.¹

Water, a Natural and Precious Resource

Water is one of the most vital resources for man. Water is (along with food) an indispensable input for all living beings (animals or plants). Thus, water being such a vital resource, man should carefully and frugally use it, indeed conserve it. He should act as a conservator, caretaker and trustee of water.

Water, Its Uses and Disposal

There are numerous steps that have to be taken and they could be enumerated thus:

1. Getting or procuring water
2. Utilizing it as it is obtained
3. Water storage and its safekeeping
4. Augmentation of its usefulness (a) by frugal use; (b) cleaning so as to make it suitable for particular use; (c) a hierarchy of standards of cleanliness could be easily recognized, e.g. (i) water for injection should not only be distilled but also be pyrogen-free; (ii) water for drinking and cooking; (iii) water for washing and cleaning; (iv) for bathing and cleaning; (v) for gardening, animal husbandry, agriculture and aquaculture; (vi) for industrial processing and so on
5. Under item 4 above, another set of criteria needs consideration, (a) both optimal and minimal use; (b) conservation; (c) protection.

The above list is, of course, indicative of one of the tasks to be performed, desiderata to be kept in view and standards to be maintained. These are broadly the sub-heads under which we would like to proceed.

When we speak of the use of water, the question of a safe and benign disposal after use presents itself for tackling it concurrently.

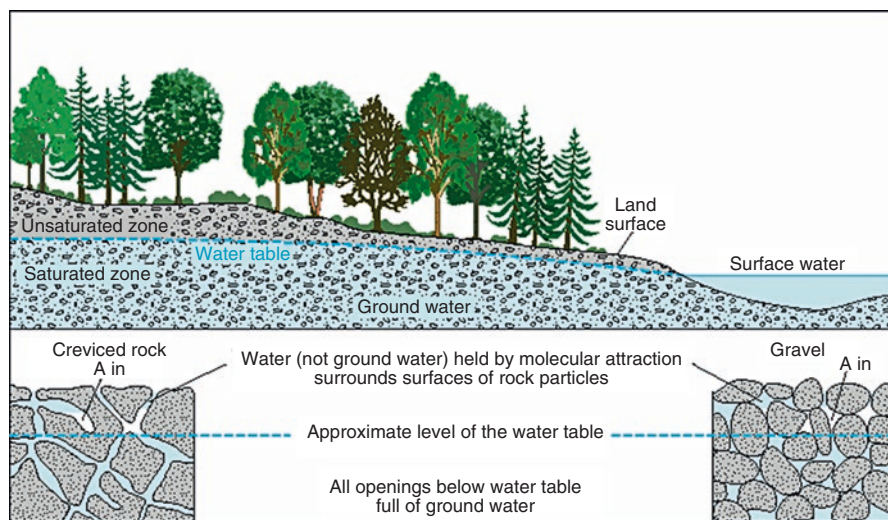
Hence, gradation and initial separation of out flowing stream and its recycling become imperative for dealing with such a polluted water stream. A grading system helps classify and segregate various streams and decision taken to recycle them. The aim is not to let a raw, untreated stream into public water bodies. These may be lakes,

¹The scheme of numbering verses of the Quran explained.

rivers or even the sea. A vigilant watch becomes imperative to prevent the polluter from escaping without paying towards the cost of reclaiming his waste stream. In a broader perspective, one can, of course, collect an element of cost towards this expense. In such a case, he does not have to bear this expenditure himself.

Rainfall, an Annually Renewable/Regenerative Process

Rainfall starts the cycle being the primary renewable source of freshwater. Rainfall varies according to the changing seasons during a given year. This annual cycle of rainfall helps replenish the supply of water to the parched earth. It is, of course, common knowledge that rainfall varies in intensity from place to place, season to season, etc. It is well known that a country like Malaysia or England receives rainfall for about 300 days in a year, whereas, at the other extreme, there are countries that receive rainfall for a limited number of days in a year, and what's more, even this may sometimes be copious or scanty. There are some areas hardly getting any rains during the year.



Surface and Groundwater Found in Nature

With the onset of rains, water starts flowing in small streams, rivulets, etc. They go dry when the rains are over. There are, of course, rivers big and small, seasonal or perennial. Apart from these sources, wells are also sunk which provide water either

throughout the year or they may also go dry in summer. Thus, water is available seasonally, i.e. periodically, and a very few places are blessed with adequate water throughout the year. However, man and his livestock need water throughout the year for they cannot manage to survive without water for more than a day or two. Hence, there is clearly a disjunction between daily requirements and seasonal unavailability. This necessitates perpetual efforts by people to store water from any or all sources that could be tapped. They must store the liquid either by harvesting the rainwater or collecting from seasonal flows in rivulets, streams and groundwater. This struggle is common to all cultures and civilizations of: ancient, middle or modern periods. The quest for locating/producing food and ensuring an adequate supply of water becomes the very basic and irreducible minimum requirement for the very survival of mankind. We shall try to trace the trajectory of this quest for food and water. While doing so, we shall see how religious beliefs, cultural norms of behaviour and social mores have all acted and interacted in terms of shaping and moulding the direction and intensity of this quest.

Mapping Water on the Planet

Even before we proceed to map the human quest for water, it will be useful to have an overview of form in which water exists and its quantity and accessibility in the nature. It is estimated that 71% of the surface of the earth is covered by oceans and seas. It does not come as a surprise that 97.5% of the available water is found in the oceans. The salinity gradient, the action of winds, tidal activity, etc. power the engine of seasonal (climate) variations of the planet. Hence, the vast oceans no doubt form an essential component of the planetary system.

It is not as if there is no water on this planet. There is enough and more water. Nevertheless, it comes as a sombre reminder that 97.5% of this water is in the oceans. The remaining 2.5% is available in the form of freshwater. Out of this, as much as 85% is locked up in the polar ice caps, tundra regions and in what the geographers call the third pole, viz., the Tibetan plateau with its snow covered high mountains and glaciers. The glaciers store rainwater and release some of the rainfall that is received, as ice melt to supplement the water supply of rivers during off seasons. Glaciers play a vital role in moderating climate.

Thus, a tiny slice of less than 1% of freshwater is there for all the creatures of the land. As much as 70% of this freshwater is used for irrigating crop lands. However, it is estimated that by efficiently using irrigation water, consumption could be cut by one-third.

- Total water on earth comes to 1.4 billion km³.
- Total renewable water falling on continents and islands/year is 41,000 km³.
- World population is over seven billion today.

That is why somebody has observed that the reality is that there is essentially no more freshwater available on the planet today than there was 2000 years ago. It is indeed the same water that the dragons drank aeons ago.²

Freshwater being scarce is also the most distributed item on earth. 'Of all the planet's renewable resources, freshwater may be the most unforgiving, difficult to purify, expensive to transport and impossible to substitute, water is essential to food production...'³

Common Sources of Water

Having quantified the freshwater resources of the earth, we shall now look at the sources that are commonly tapped to get the required supplies. There are surface water sources which could be tapped easily such as a river or a lake. You may only have to dip your vessel and take the water. However, to tap groundwater, e.g. you may have to sink a well from a shallow open well to a deep bore well. The shallow wells tap the near subsurface water which is recharged during the annual rainfall cycle; thus, these are renewable sources.

However, the depth of deep bore wells may vary from 100 to 1000 ft. Of course, there are areas where they go down to even 10,000 ft! Here, water accumulation is not a result of annual rainfall. Water has accumulated over a geological period—meaning over centuries. It means tapping water from such sources amounts to mining water. When once exhausted, recharge will be a matter of hundred centuries or so! This has already happened in some arid zones. It shows how very careful and circumspect we should be while harvesting groundwater. It may be seen that we are refraining from using the common expression—'exploitation of groundwater'. To our ears, it is an absolutely inapt expression!

Quality/Grade of Water

We can distinguish between various qualities of water, e.g. water with some dissolved gas such as oxygen. Only such aerated water is suitable for aquatic life—irrespective of whether the creatures inhabit lakes, rivers or seas. That is why if water is boiled or steam is condensed, all the dissolved gases would have evaporated. No fish could live in such water. It is dubbed as sterile water.

²Earth is estimated to have, 1.4 billion km³ of water. The three moons of the Jupiter have: Europa 2.9 times earth's (water), Callisto 27 times earth's, Gandymede 36 times earth's and among Saturn's moon, Titan has 29 times earth's water. Most of the above have it in the form of ice and some water underneath. [*National Geographic*, April 2010]

³C. P. Kumar: *Fresh water resources: A perspective*....Roorkee: International Year of fresh water 2003 www.angelfire.com/bc/mhhrrc/documents/fresh.html

Then, there is water with dissolved salt or sugar, for instance (or any other organic or inorganic substance). There is also saltish water, polluted water and so on.

Nevertheless, it may be appreciated that there is nothing like absolutely pure water for after all; water is well known as universal solvent.

Water, a Critical Resource

Water is a critically vital resource for sustaining life on earth; it behoves us to see what the Quran says about it. Moreover, even a cursory glance makes it clear that the Quran, the Bible and the Vedas, as do other scriptures and sacred books, all extol the role of water, while describing it extensively.

Quran Says All Life Created with and Dependent on Water

Quran is replete with references to the bounty bestowed on His Creation by sending rains...In the first instance, let's see two verses: 'God has created every animal from water....' (24:45). This verse is followed by another which adumbrates that 'It is He who has created man from water...' (25:54). This is followed by a third verse, which speaks about plants.

It is stated that 'It is He who sends down water from the skies; you drink thereof, and the plants also are satiated, on which you pasture your livestock, [and] by virtue of this, He causes crops to grow for you,...' (16:10 and 11).

Rainwater, a Bounty Showered by God

Further, about the quality and quantity of rains, 25:48 states that 'We cause pure water to descend from the skies...' and 15:22 adds that 'and we let loose the winds to fertilize [plants] and send down water from the skies and let you drink thereof...'

Sent as per Set Criteria

And in 23:18, it is stated that 'And we send down water from the skies in accordance with "set criterion" (measure) [set by us]...'

The above extracts from the verses make it clear that water is essential for life on earth and is of course, necessary for survival/growth of plants, animals and man. It is iterated that rainwater is pure water and that it is sent down according to set criterion (measure). In view of these verses, the adage that without water 'we are nothing' rings true.

Thus, it is clear that man, from the beginning of history, has had to struggle and tasked to (a) find water; (b) having found it, he had to store it; (c) he had to keep it clean and (d) dispose of the waste hygienically.

A Myth That Persists

The economists of yore were fond of saying that water, air and sunshine are ‘free goods’ that nature provides to man. (Marshall). Even as late as 1890s, this was not perhaps an entirely incorrect depiction of the situation then prevailing. But that’s not so now; freshwater (fw) is the most precious resource. It can no longer be considered a free good—indeed it’s a scarce resource. Against this background, we may also mention that even at the beginning of the twentieth century, we had not known that other celestial bodies in the solar system possessed water. New evidence shows that mostly moons of some of the planets have water. (cf. footnote 1 below)

The Crucial Need for Storage

It has been mentioned above that (a) often water is not available throughout the year, and that all areas are not equally endowed with adequate freshwater (fw) though water is required throughout the year by both men and livestock. This calls for storage of water and if the habitation is in a rain shadow area or an arid zone, then water has to be brought from a distant source.

Men at the dawn of settled agriculture started building barriers (dams) across small rivulets and jungle streams. But they could build a small cross wall to store some water. This cross wall/barrier could be of modest height such that it was submersible when the stream ran high. It is known by several names in diverse places. However, in south India, it goes under the name ‘Anaicut’. In ancient times, very rarely it could be of any great height. It was designed to be submersible. In the absence of any good impervious mortar, the wall would not be quite leak proof, and it was useful in storing limited quantity of water.

The next step was to use natural depressions in the topography for strengthening the sides of this excavation having a relatively big area as the foreshore of the tank/lake such that water could flow into this lake/tank-like structure. Later on, a surplus weir also came into vogue. For irrigating their lands, channels with a sluice/shutter were built.

It was in Mohenjo-Daro that the sharp-edged bricks began to be used in building water storage sumps. They were dry packed so precisely that there could be no water leakage. Over the millennia, similar bricks began to be moulded in most other civilizations.

Vessels made of burnt clay, hollowed out stone, (and in pottery) were widely produced that enabled people to store water at their homes. Skins also came handy

not only to carry but also to store water. Temples in Egypt used vessels made of hollowed out marble, polished and decorated to store and offer sacred water to their deities.

Irrigation: A Legacy Handed Down by Ancient Civilizations

The use of irrigation as an aid to agriculture is an ancient art. It is indeed the very foundation, on which a civilization gets built. The probabilities seem to point to Egypt as its place of origin of organized irrigation. Evidence shows that the peasantry bailed up water at least 4000 years ago and there is evidence of earlier irrigation there and in other parts of the ancient world which strengthen the belief that irrigation preceded and made possible the establishment and development of ancient civilizations. Along with labour-saving devices such as Shaduf, Sakia and Archimedes screws were invented.⁴

Shaduf or paecottah: A long pole supported on a horizontal cross beam (8–10 ft from ground) was hung with a rope with the shorter end counterbalanced. When the other end had a bucket generally of leather was dipped in the river and when full, pulled with a rope. The beam was turned towards the receptacle of the channel where it was emptied. In Egypt, it was called Shaduf, and in India, paecottah. Depending on the depth of water in the river, these devices could irrigate about two acres of land. Before the mass availability of electric or oil pumps, it was a common sight to see men toiling away bailing water.

The Egyptian *Sakia* (called *harat* and Persian wheel in India) consisted of two parallel endless ropes passing over a wheel. Small buckets were attached and when the wheel was turned, one half of the small buckets got filled up, while the other half got empty. The main wheel was rotated by men or animals depending upon the head. This could irrigate more than double of previous device.

Archimedes screw: Then, there was ‘Archimedes screw’ invented circa 200 BC in Greece, in which a cork-screw rotated in a tube (wooden). When rotated, it bailed out water. ‘Knowledge of these mechanical aids spread from one to other ancient empire. All these devices are still in use in various areas.’⁵ Trade and commerce greatly helped in such a dissemination.

Flooding or Basin Irrigation

Over a period of centuries, Egyptians studied—when the Nile starts having freshens, when floods come and when they subside and so on. With careful records having been maintained, they learnt to estimate the periodicity of these events.

⁴Encyclopedia Britannica, 1963 ed. P. 684.

⁵Ibid.

They would flood the fields when the river was in spate and let the water remain for the duration of the flood in the river. Then, the fields would be drained out and crop taken with the moisture retained being generally sufficient till the crop ripened. Up to nineteenth century, this method of flood or basin irrigation was in vogue in the Nile area. There are still one million acres under the old Pharaonic system of basin irrigation, while the remaining five million acres of Egyptian farmland being served by perennial irrigation, thanks to the dams built in the last century.

Whereas, the inflows in the Nile were more predictable and occurred more or less on schedule as compared to rivers in Mesopotamia where the Euphrates and the Tigris, originating in two different mountain ranges, behaved more unpredictably with floods being more severe. Even so, there also flood irrigation was in vogue by around 2000 BC. Hammurabi had ordered some canals to be cleared in 1700 BC.⁶

Mohenjo Daro civilization was based on and more attuned towards trade and commerce and was not a predominantly agricultural one. Hence, these irrigation methods were not adopted by them. Later on, in the Gangetic plain, all the above devices and systems gradually came to be used.

At the birth of Islam—in the Arabian Desert, water was, of course, one of the scarcest of resources. From ancient times, they had to be frugal and careful in using water. They depended on occasional oases with some scrub shrubbery around; sometimes, wells were also sunk in such spots. When Islam spread outside the Arabian Peninsula, they came in contact with areas such as Egypt, the fertile crescent and became familiar with irrigation practised in these countries. From the above, it could be seen that all these areas, Arab Peninsula, Egypt, Iraq and India where Islam spread, had had hoary traditions and practices well tried and tested, agricultural practices, and ways of irrigating their fields and husbanding their livestock and water.

Excerpts from the Quran

The Quran describes water as the basis and origin of life. Quranic verses point out (cf. p. 4 above) that life originated from water as the following verses amply show:

He sends down saving rain for them when they have lost all hope and spreads abroad His mercy (Quran 25:48).

Perceived Benefits of Water

Water's role in farming and producing the sustenance of life of men and animals is described in the following verse:

⁶Ibid.

He Who has, made for you the earth like a carpet spread out; has enabled you to go about therein by roads (and channels); and has sent down water from the sky. With it have we produced diverse pairs of plants each separate from the others. (20:63)

Yet another verse mentions the rejuvenating properties of rainwater hinting at the resurrection being a necessary stage in the cycle of life's ultimate destiny in the following verse:

And He who sends down (from time to time) water from the sky in due measure, and we raise to life therewith a land that is dead. Even so will you be raised (from the dead) (43:11)

A third verse hints at the purity of rainwater and we know for sure that the water pouring down from clouds is pure. This essentially points to the property of water which, even while dissolving the impurities into it carries them forward to seas and leaving them behind, rises into vapour to form clouds, before coming down to the earth again in pristine pure form.

Navigation over Water

Sea as Highway

In the previous paragraph, we have seen how water is crucial for the very survival of life on earth.

We now look at the use of large bodies of water as bases for navigation—whether it is seas or large rivers. Arabs, especially from the coastal areas were engaged in trade and commerce besides being intrepid seafarers. They built vessels for undertaking trade. In the Quran, there is a frequent mention of this facility. Here are some verses in this regard.

'And among His signs are the ships, smooth running through the ocean, (tall as hills)...' (42:32).

'It is God who has subjected the sea to you, that ships may sail upon it by His command, that you may seek His Bounty, that you may be grateful'. (45:12)

'Nor are the two bodies of flowing water alike—one palatable, sweet, and pleasant to drink, and the other salty and bitter. Yet from each (kind of water) do you eat flesh fresh and tender, and you extract ornaments to wear (e.g. pearls and coral), and you see ships therein that plough the waves, that you may seek (thus) of the Bounty of God that you may be grateful.' (35:12).

Prayer on Water

No Islamic prayer is prescribed in respect of water. But Muslims are recommended that they pray for rains whenever they face an acute scarcity of water and drought. This prayer is called Namaz e Istisqaa. This congregational prayer is held in an open

ground with long supplication after the namaz (prayer) is over. The believers are supposed to beseech forgiveness for their sins and to invoke God's blessings for the inhabitants of the earth.

The Quran also narrates Prophet Moses' prayer for water which led to gushing forth of 12 springs from stones upon hitting them with his staff:

And (recall) when Moses prayed for water for his people, so we said, 'strike with your staff the stone'. And there gushed forth from it 12 springs, and every people knew its watering place. 'Eat and drink from the provision of Allah, and do not commit any mischief on the earth, spreading corruption'. (2:60).

Qualities of Water

Fertilizing quality of water: The Quran talks of water's quality of rendering the soil fecund and thereby paving the way for agriculture:

'And we let loose the winds to fertilize [plants] and send down water from the skies and let you drink thereof...' (15:22).

Mythological Anecdotes

Water is held as a precious resource to be made accessible to every individual. However, the water which carries high sanctity among Muslims is the water of Zamzam. It springs from a well in Makkah, 20 m east of the Kaaba, the holiest place in Islam. According to an allegorical description, it was a miraculously generated source of water from God, which began thousands of years ago when Ibrahim's infant son Ismail was thirsty and kept crying for water and was kicking at the ground when water gushed out. Millions of pilgrims visit the well each year while performing the Hajj or Umrah pilgrimages, where they reverentially drink its water. Most of them carry a few litres of Zamzam water while returning from their pilgrimage.

It is also seen that some of the pilgrims dip their *Ihram* (sacramental two-sheet cloth wrapped around the body) in Zamzam water. This is brought back after drying and kept safely to be used as a burial shroud upon death, while laying them to rest in the grave.

The fervent faith of pilgrims, from early Islamic times to this day, has not ceased to lend curative properties to the water of the Well of *Zamzam*, which is perceived as a bearer of *baraka* (blessings) as well as cure. It is stressed that Holy Prophet, peace be upon him, drank this water and used it regularly for various purposes.

Promoting Conservation and Protection

Sustainable Practices: Guiding Principles of Water Use, Preservation and Management

A host of laws, regulations, principles, practices and norms have either been laid down or deduced from the scriptural sources or evolved over centuries in Islamic lands regarding use, storage, preservation, distribution and management of water and water resources.

There are three basic principles that inspire and inform these regulations and practices:

1. *Tawheed* (unity of God and his creations)
2. *Mizan* (It is the principle that every aspect of creation holds together because there is a balance. Maintaining natural systems, therefore, can be interpreted as *mizan*.)
3. *Khalifa*: Human beings have been created in the role of vicegerent of God on the earth and have been entrusted to use, manage, preserve, promote, conserve and distribute the resources. These resources are *amanah* (trust) with the man appointed a custodian.

Islam forbids its followers from wastefulness, overconsumption and hoarding of resources. Water is regarded as a common property. Traditions of the Prophet Muhammad describe a common share for all people in respect of three things: (1) grass (pasturelands), (2) water and (3) fire or fuel.

In view of the crucial nature of water in sustaining life, God has made its use the common right of all living beings. All are entitled to its use without establishing any monopoly over its resources. Similarly, its usurpation, despoilment, wastage and abuse have been strictly forbidden. Regardless of the use being private or public or in circumstances when it is scarce or the supplies are abundant, believers have been forbidden from extravagance. Once the Prophet saw his companion Saad washing before his prayers, he admonished him against wastage of water, telling him that even if he were to be washing on the banks of a river, he should not waste water.

As for sharing of water, the Prophet is said to have decreed that no more than ankle depth of water be taken for irrigation. In later ages, in Muslim lands, penalties came to be levied on misuse, pollution and degradation of water.

During his time, the Holy Prophet demarcated two types of zones (1) *Harim* for the sake of protection and (2) *Hima* for preservation.

Hima were zones where water wells, springs or streams or watersheds were located. These were to be reserved for the collective use. Everyone would have access to them but no one would use them for bathing or washing or any other kind of activity that would pollute or harm it in any way.

Harims were inviolable sanctuaries and were larger areas reserved for growing of trees and woodlands. The animals would be allowed to browse and graze. No trees would be cut nor wildlife disturbed.

Hima and *Harims*, present till very recently in many of the Islamic lands, are no longer used as water has come to be a civic responsibility of the city administration.

A Hima in Sanaa, Yemen Still in Use

Purity and cleanliness of water received a great deal of attention in the Prophet's teachings. He forbade people from passing urine in or near a water source as also taking bath in stagnant water. The Prophet is quoted to have said: Guard yourself from three kinds of practices: No one should evacuate his bowels near water sources, on roadsides and in the shade.



Awareness Through Belief Systems

Conserve, Do Not Splurge

Islam would like its adherents to be circumspect in the use of earth's resources. There prevailed a strong awareness and common concern among people with respect to taking care of water sources and surroundings at the time of Islam's

advent. However, the development of concern regarding ecological degradation is a development of the second half of the twentieth century. But the very rise of Islam in desert lands amid scarcity of water and fodder had in itself engendered an attitude of extreme caution towards the use of water. Islamic teaching as a general rule, urges its followers to be prudent consumers of resources. It enjoins austere lives, charity instead of conspicuous consumption. The Quran says: Eat and drink out of what God has provided, but do not indulge in waste. For those who indulge in wasting resources are indeed brothers of Satan. The Quran says:

And render to the kindred their due rights, as (also) to those in want, and to the wayfarer:
But squander not (your wealth) in the manner of a spendthrift. (17:26)

In keeping with these specific instructions, household utensils were patterned for economic use of water. For instance, the ewers (see picture), jars and *badhna* from Muslim lands came to have nozzles in order to pinpoint delivery of water. This is distinctly different from *Lota* in households in India. Similarly, Leather skin bags (*Mushk*) that could preserve water from evaporation were in common use in Islamic lands. Moreover, since most of the lands where Islam won adherents in the early period were basically desert lands, water had to be carried on the back of horses, mules or donkeys. The leather skins filled with water seemed a more practical mode of transportation for they could be laid on horsebacks with men striding on them.

Water Purification Practices (Past and Present)

1. Rainwater is of the highest purity. So people were always given to collecting it as it was free from contamination. But the storage capacities being limited, the availability of collected rainwater for drinking and cooking was limited as it could last for a couple of days at the most.
2. Well water was normally quite potable provided the particular well was not surrounded by organic waste and other debris.
3. Water from rivulets, streams, rivers and tanks was the next source.
4. Keeping water from the above sources (2 and 3 above) in a vessel and letting it stand for some time helped the particulate matter settle down. This process was hastened by adding alum. Some locally available plants and herbs such as Velliver or Khas also came in handy which were put in the vessel to clean water. All these steps helped remove gross particulate matter, as also coagulate some organic matter. But when water was exposed to organic waste including human and animal waste, it became problematic. The density of population, adequate availability and scarcity of water were also crucial determinants of the extent of such contamination in a particular habitation. In fact, dense population in a particular habitation in itself proved to be a major cause for a high degree of pollution of water.



However, sand filtering by way of putting sand into a vessel and keeping another vessel below to collect the slowly descending water was a common practice handed down from antiquity. A more elaborate method was to use four vessels one over the other with the bottoms of three upper vessels having some small holes in them. The first vessel contained small pebbles, the next one charcoal and the third vessel half to two-third of coarse sand. After sometime, a thin organic film would form helped entrap organic matter in the water. Thus, in the bottom vessel, clean filtered water got collected.

During the last century, boiling of water came into vogue. However, it may be noted that these methods were mostly practised by the well-off persons, while the poor could hardly practice it on a continuing basis.

At present, various methods are being practised especially by the municipal authorities for cleaning/purifying water. All these are cultural practices adopted in diverse climes and regions.

Recent developments have shown that a bottle full of water kept exposed to sun for a day or two effectively kills off all germs and viruses in water and makes it safe for drinking purpose (as also for cooking). Thus, getting potable and safe drinking water is a constant struggle.

Use of Water in Social and Religious Traditions

Dogmas and Practices

Islam does not allow/encourage worship of any tangible object. Since Islam is a strictly monotheistic faith and images of God are prohibited—be they drawn, painted or sculpted—Islamic mode of worship does not involve any tangible object or material. This rules out the scope for any kind of prayer or supplication being

fashioned around water. However, ritual cleansing with water is a mandatory component of Islamic prayers regardless of their being said at home, at mosque, etc. This ritual cleansing is termed *wudu* or ablution. Next comes a bath.

Need for ablution led to mosques reserving an area for ablution with provision of cisterns, series of taps and overhead tanks. Mosques constructed in olden days in Iran and the subcontinent had *hauz* or open cisterns with seating arrangements around them. Usually, the cisterns would be raised a feet above the ground in order that the user could scoop out water from cupped hands and wash the face, hands and legs over a spillway that would carry the outwash away from the ablution area. Some older mosques had Hammam or bathrooms attached for travellers. These were mostly copied from Turkish inns and mosques and came to the subcontinent via Iran.

Prophet Mohammed established a religious institution (declared as collective property) known as ‘waqf’. In this context, some of the water sources and wells were declared as ‘waqf’ and public had the right to use them. Generally, Islamic principles concerning water laws were based on two norms. These were (1) the right of thirst where all people had the right to quench their thirst or to give water to animals and (2) the right of irrigation where water can be used to water land and plants.

In the Shi’i school of Islam, the concept of serving of water to wayfarers or processionists is considered an act of piety. This led to the establishing of ‘watering stations’ or Saqqa Khana for free serving of water for drinking, and it came to be recognized as a religious duty. The Shi’ites endeavour to honour and commemorate the tragic event of Karbala and the martyrdom of Imam Husain and that of his loyal companions, who were martyred after remaining thirsty for 3 days. These Saqqa Khanas could be seen adjacent to Imambaras in Lucknow, Murshidabad and Jaunpur, cities with sizeable Shia population in India. One such modern Saqqa Khana was constructed at the famous Imambara at Jaunpur in 1990 where water is dispensed electronically.

Resources Enough for Man’s Need

In verse 41:10, it is stated that.

‘[He has]... Blessed it [i.e. the world] with plenty and growth, and ingrained the means of growing its food within it, sufficient for all seekers...’ (Translation by Ahmed Ali). We discuss this issue further in paragraphs below.

Respect to Rivers in Scriptures and Mythological Descriptions

As stated above, certain norms were laid down to ensure that rivers were kept clean. In certain places, any infringement attracted penal provisions under the law.

Water Festivals of the World

Islam does not prescribe any festivals related to water, rivers or rainy season. However, in Mughal period, *Phoolwalon ki sair* got evolved as a syncretic practice. *Phoolwalon ki sair* has its origin to the reign of penultimate Mughal King in Delhi, Akbar Shah II (1808–1837). It was started by his wife Mumtaz Mahal Begum who took a vow to offer a chador of flowers at the dargah (mausoleum) of Khaja Bakhtiyar Kaaki at Mehrauli if her son Mirza Jehangir was released by the British from internment. When this happened, the entire Mughal darbar shifted to Mehrauli for a week and a floral chador was offered at the dargah and a floral *pankha* (fan) was offered at the temple of Yogmayaji. Seeing the enthusiasm of the people, the Mughal King decided to make it an annual affair immediately after the rainy season. It continued up to Quit India Movement in 1942. The British discontinued it under their ‘Divide and Rule policy’. Independent India’s first Prime Minister, Jawaharlal Nehru, revived it in 1961 and attended it at Mehrauli till he lived. Now, it has grown into a huge affair with pankhas being taken out in procession and dance troupes putting up performances. Chief Minister of Delhi attends it regularly and occasionally. Prime Ministers too have been putting in an appearance. All states of India offer floral pankhas for the purpose to both the dargah and the temple. It is organized by Anjuman Sair e Gulfaroshan (Society of Festival of Florists), a registered society. The message of secularism is embedded into it, and the fact that it is held after rainy season is considered a festival of thanksgiving for God’s bounty.⁷

Technologies in Water Management

Awareness Regarding Water Cycle and Hydrology

Water being a very crucial element in sustaining life, the Quran amplifies the idea of the primacy of water. It also delineates how water is replenished in the nature. Some of the verses of the Quran shed light on how winds, clouds and rain complete the water cycle. Here, we quote two of them:

Allah is the One Who sends forth the winds which rise up clouds. He spreads them in the sky as He wills and breaks them into fragments. Then thou seest raindrops issuing from within them. He makes them reach such of His servants as He wills. And they are rejoicing. (Quran 30–48)

Allah is the One Who sends forth the winds like heralds of His Mercy. When they have carried the heavy-laden clouds, we drive them to a dead land. Then we cause water to descend and thereby bring forth fruits of every kind. Thus we will bring forth the dead. Maybe you will remember. (Quran 7–57)

⁷www.phoolwalonkisair.com

Against the then popular notion that groundwater owed its existence to the ingress of ocean water towards the interior of the continents,⁸ the Quran provided the following interpretation:

'We sent down water from the sky in a (definite) measured manner and lodged it in the ground. And we certainly are able to withdraw it. Therewith for you we gave rise to gardens of palm-trees and vineyards where for you are abundant fruits and of them you eat'. [Quran 23–18 to 19]

Traditional Sustainable Practices

Abstemious Use of Water

The general instruction regarding water was to minimize its use and conserve it. The Prophet is reported to have used not more than one *mudd* (approximately two-thirds of a litre) of water and two to three and half litres of water for *Ghusl* (bath). There were instructions not to waste water even if one were to take bath on the bank of a river.

Architecture and Designs for Water Storage and Conservation

Development and widespread use of Aqueducts (Qanat) or underground canals was a major contribution towards conservation and transport of water over long distances by Muslim rulers through centuries. Although these were not originally devised by Muslims, they learnt it upon arrival in the Nile Valley and were responsible for its widespread replication in the valleys of the Euphrates and the Tigris and still later in the Iberian Peninsula (Spain).



⁸G. Gastany and B. Blavoux, *Encyclopedia Universalis*, Thales of Miletus's theory as quoted by Hydrogeologists.

The Qanat system is one of the most ecologically balanced water recovery methods available for arid regions because a Qanat relies entirely on passive tapping of water table by gravity, without upsetting the natural water balance.

The Qanat system consists of underground channels that convey water from aquifers in highlands to the surface at lower levels. Qanats exploit the natural gradient of the land to transport water underground to the agricultural and urban areas below.

The conduits—which are usually 50 to 80 cm wide and 90 cm to 1.5 m high—vary between several 100 m to more than 100 km in length. In Iran alone, there are some 22,000 of them, comprising more than 273,500 km of underground channels.

The spread of Islam initiated another major diffusion of Qanat technology. The early Arab expansion helped establish Qanats across North Africa into Spain and Cyprus.

With major Islamic empires having had their sway over terrains which generally experienced harsh climate, several Muslim rulers experimented with these underground canals (aqueducts) to preserve water as well as use the gravitational flow for carrying it over long distances.⁹

Nehar e Zubaidah

Zubaidah (died 831 AD), wife of Baghdad ruler Haroon Al-Rasheed (ruled 170 AH–193 AH), realized the great scarcity of water in the holy cities of Makkah and Madinah when she herself went on a pilgrimage. She ordered the engineers and surveyors to locate some water sources in the vicinity of these places. A large spring of water was found in the Valley of Hunain on the outskirts of Madinah. She ordered that a canal be dug (roughly 500 km) on the pilgrim route to take water to the pilgrim sites of Arafat, Mina and Muzadalifah. She funded the entire project. Surveyors recommended that open canals would not be viable as harsh climate would result in evaporation of water. An underground aqueduct was recommended and water stations for pilgrims were constructed at frequent intervals for travellers to collect supplies. Parts of the Zubaidah canal can be seen even today by those who perform Hajj pilgrimage. The system was functional till some 35 years ago and supplied water to the areas. It suffered heavy damage in the form of floods in Numaan Valley and became defunct in 1400 AH (37 years ago).

⁹ Mohammed Reza Balali and Jozef Keulartz, *Technology and Religion*, The Qanat underground... irrigation system, (www.academia.edu).

Burhanpur Model

The Mughals and other Muslim rulers built water supply systems in several Central Indian towns that carried water through underground aqueducts to cities and habitations. Two such systems still survive in Burhanpur and Aurangabad where ‘qanats’ (literally underground canals) originated from a well-like vertical shaft in mountains. These used the Persian hydraulic technology. ‘Kundi Bhandara’ as it is known in Burhanpur (Indian state of Madhya Pradesh) is part of such a system which even to this day supplies clean potable water to a population of about 50,000 in the city.

The system was laid by Mughal governor of the area Abdul Rahim Khan in 1615. Seven different tunnels like qanats—broad enough to allow a man walk standing inside—emanating from the shaft in Satpura Hill ranges carried water to the city. On the way, water also seeped down from the earthen walls, thus adding to the original stream. Burhanpur is said to be a garrison town hosting an army of 250,000 with the entire supplies coming through the qanats. There were two advantages, i.e. preventing the loss from evaporation as well as averting any possibility of poisoning from the rivals. It is said at its peak, the system generated 100 million litres of potable water a day which is on par with what the City of Burhanpur needs today for a population of 300,000.¹⁰

Water Management Under Adil Shahi Dynasty

Adil Shahis of Bijapur were expert managers of water. They conceived water as a luxury commodity and not merely as an essential life resource. The water was collected from surrounding hills and brought to the city through tunnels and supplied to bavadis (or bowdies as the wells are known in the South Indian plateau) in the city.



¹⁰ Sudhinder Sharma, *Deccan Herald*, ‘A Timeless Hydrological Wonder Allowed to Go to Seed, January 4, 2013).

Ali Adil Shah built 16 lakes and talabs in and around the city during his reign, with some of them surviving even to this day. Among them, Begum Talab is considered a technological wonder of its age. Built in 1651, it is situated two miles to the south of the city. It could contain 25–30 million cusecs of water. It had been planted with trees all along its embankments to reduce evaporation and had lotus plants floating all over. Lotus is said to have purifying properties. In one corner of the talab, there is a room made of stone (now full of mud) which is said to be the room from where water flowed to the city through underground conduits. The conduits were made of earthen pipes leading the water to gunjs (underground cisterns in the localities). Gunjs are water towers ranging from 25 to 40 ft where water stood at a constant level. Many of the Gunjs are still working, collecting water.

Alongside these talabs, they also created bavadis or tanks. A few prominent among them are Taj Bavadi, Chand Bavadi and Ibrahim Bavadi. Others include Nagar Bavadi, Ibrahimpur Bavadi, Mantra Bavadi, Alikhan Bavadi, Langar Bavadi, Basri Bavadi, Hashampeer Bavadi, Jansa Bavadi, Sandal Bavadi, Bukhari Bavadi, Mubarak Khan Bavadi, etc. One Captain Sykes, who visited Bijapur in 1851, documented 200 bavadis and 300 kuwan (wells) inside the Bijapur Fort. These kuwan or wells were all interlinked in order to ensure that even the last well had an ample supply of water. Nearly 30 bavadis are serving the people's need for water even to this day. Some of these bavadis are tourist spot today for the grandeur of their architecture.

A similar network of aqueducts used to tap water from Hursul and Kham rivers flowing down from the mountains surrounding the town of Aurangabad in Maharashtra. The system was pioneered by Aurangabad ruler Malik Amber in 1617 AD as the town faced an extreme scarcity of water during summers. These were called 'Nehar' or Canal. More aqueducts came to be constructed in the later centuries, with the last of them coming in 1803 AD. It is said that the one constructed by Malik Amber was large enough to allow a man astride a horse conveniently negotiate all through its length up to the city. Two canals among the latter additions were Shah Mehmood Canal of Panchakki and Shah Ali Nahri. Shah Mahmood's canal brought water to the Baba Shah Musafir's Dargah in the heart of the town. It was constructed by Turktaz Khan in 1695 AD, a noble in the court of Nizamul Mulk Asaf Jah. It channelled the water from a spring through to the Dargah and was used to run a flour mill for grinding the grain for a garrison. Another stream of water was cascaded over the pool in front of the Dargah complex which comprised a serai (inn), a mosque and a madrasa. The water was used for cascading till very recently.

In a desert-like terrain, carrying water in such kutchra (unmetalled) canals exposed to the skies was not worth the effort, while for seepage and evaporation loss could be very high with a little of scarce water reaching the users' end. Hence, they had to have covered canals to carry water. The side and bed of the canals had to be made as impervious as possible, given the technology and available materials. An aqueduct is usually an elevated structure/canal for water to pass from one valley to the other. Otherwise, those canals were laid in the field in covered form. Arched elements were used for construction.

Canals Dug During Sultanate and Mughal Rule

During a 650-year Muslim rule over Delhi, the Sultans (belonging to six different dynasties between 1191 and 1528) and Mughal emperors (from Babur through to Bahadur Shah Zafar between 1528 and 1857) mainly concentrated on digging of wells and constructing of canals across rivers emerging from the Himalayas. Since land revenue was collected in kind, increased agricultural production would mean a better collection. In order to boost production, farmers were provided with loans during the reign of Muhammad bin Tughlaq (1325–1351). His father Ghiyasuddin Tughlaq dug a canal for promoting agriculture.



Ghiyasuddin Tughlaq (1320–1325) was the father of Sultan Muhammad Tughlaq. The credit for creating the biggest network of canals before the nineteenth century goes to Sultan Firuz Tughlaq (1351–1386). He constructed canals across various rivers in the north, viz., Yamuna, Sutlej, Ghaggar, Kali, etc. These canals brought in lot of irrigation water to the farmers.

The Mughal era witnessed several renovations and a further expansion of canals. Emperor Akbar renovated the Yamuna canal in 1568 originally constructed by Firuz Shah Tughlaq. However, the Mughals, the great lovers of garden that they were, added another objective to digging of canals, i.e. to supply water to gardens and fountains in their palaces. Yamuna Canal, repaired during Akbar's reign was extended further to Red Fort (Lal Qila) during the reign of Shah Jehan. He also ordered the digging of a canal from River Ravi through the Shalimar Garden at Lahore.¹¹

¹¹ P. G. Shinde, paper presented at the National Level Conference in 2005 on Water Management Scenario 2025 Problems, Issues and Challenges.

Aesthetic, Decorative and Scientific Use of Water

Water did not stand just for its use in agriculture, irrigation and industry-related and domestic needs, but also had other connotations. Under the Quranic metaphors, water symbolizes paradise, righteousness, and God's mercy. This influenced the use of water as a motif in the Islamic architecture quite frequently. From numerous references to cooling rivers, fresh rain and fountains of flavoured drinking water in paradise, one can deduce that water is the essence of the gardens of paradise. It flows through them, bringing coolness and greenery, besides quenching thirst. The believers are rewarded for their piety by 'rivers of non-stagnant water and rivers of milk, unchanging in taste and rivers of wine, delicious to the drinkers, and rivers of honey purifying' (Quran 47:15). The water in paradise is never stagnant; it flows, rushes, unlike the festering waters of hell. The Quran also equates the water of paradise with moral uprightness; 'in the garden is no idle talk; there is gushing fountain'. (88:11 to 12).

Pools were used to act as mirrors enlarging the visual space of the monuments. Channels and pools were the most important elements of Islamic gardens. Originally necessary for irrigation, they were later developed for their visual beauty besides being incorporated into elaborate architectural features. Within the palaces of the Mughals and their Rajput allies, and other ruling dynasties, variations in the systems of copper pipes carrying water for cooling terrace pavilions, channels flowing through royal chambers, fountains and water-gardens, and underwater collection tanks were the norm. Thus, here too, various water-storage methods were devised, as were a range of water-lifting mechanisms. While in religious buildings, water was mainly used for ritual cleaning, in palaces and houses, it was meant to provide coolness and décor.

Persian wheels, using the force of water for lifting water to great heights for irrigation, came to be developed in various centres of Islamic civilization such as Cordova, Grenada, Seville (all in Spain), Iran and Syria. These devices were installed across naturally flowing streams or waterfalls.

Introduced in India by the Mughals was the most advanced water-lifting device. On the Persian Wheel, a garland of pots was attached to the rim of a wheel, with a gear mechanism also attached to it. Sadly, not all the water-related architecture of Mughal India has been fully documented. Therefore, there is an urgency to do so before this unique feature of the land's hydraulic past is lost in the face of a rapid shift of water management to the municipal authorities and the destruction of many old buildings and sites!

Bowlies at dargahs: Most dargahs, mosques and Imambaras had *bowlies* (*bowdies* in South India) dedicated to the general public. Over time, the devotees associated healing properties with such water sources.

Water-Lifting Machines

When it comes to hydraulic engineering, the name of Badi al-Zaman Al-Jazri (1136–1206) should not escape a mention. Popularly referred to as Al-Jazri in the scientific literature, Badi al-Zaman was a polymath combining in him skills of an inventor, mechanical engineer, craftsman, artist and mathematician. He lived in Jazirat ibn Umar, currently known as Cizre (pronounced as Jizre) in Eastern Turkey. He is best known for his book *Al-Jami bain al-Ilm wa al-amal al-nafi fi sinaat al-hiyal* (The Book of Knowledge of Ingenious Mechanical Devices, in short *Al-Hiyal*) which he completed in 1206 in which he described 100 mechanical devices. His forte lay in producing mechanical devices rather than just theorizing them.

A-Jazri invented five machines for lifting water as well as watermills and water wheels with cams on their axle used to operate automata. Some of the devices were:



Saqiya chain pumps: Al-Jazri's saqiya machines used the crankshaft in a chain pump for the first time. He also built a water-raising saqiya chain pump which was run by hydropower rather than manual labour, even as the Chinese were using hydropower for chain pumps before him. Saqiya machines, like the ones he described, supplied water in Damascus since the thirteenth century up until modern times, and were in everyday use throughout the mediaeval Islamic world.

Double-Action Suction Pump

Al-Jazri invented a twin-cylinder reciprocal piston suction pump. This pump is driven by a water wheel, which drive, a system of gears, an oscillating slot-rod to which rods of two pistons are attached. The pistons work horizontally opposite

cylinders, each provided with valve-operated suction and delivery pipes. The delivery pipes are joined above the centre of the machine to form a single outlet into the irrigation system. This water-raising machine had a direct significance for the development of modern engineering. This pump was remarkable as it was the first known use of a true suction pipe (which sucks fluids into a partial vacuum) in a pump and could lift water up to 13.6 m.

Water Supply System

Al-Jazri developed the earliest water supply system to be driven by gears and hydropower, in thirteenth century Damascus for supplying water to its mosques and Bimaristan hospitals. The system had water from a lake turn a scoop-wheel and a system of gears which transported jars of water up to a water channel through which water flowed to mosques and hospitals in the city.

Varied Uses of Hydropower

Al-Jazri used hydropower for varied automated machines such as automatic gates driven by hydropower. He also created automatic doors as part of one of his elaborate water clocks. He also invented water wheels with cams on their axle used to operate automata. He also devised an automated flush mechanism for hand-washing, peacock fountain with automated servants, drink-serving waitresses, a musical robot band, also called 'a musical automation', which featured four musicians on a boat that floated on a lake to entertain guests. Prof. Noel Sharkey observes that it is quite likely that it was an early programmable automaton.

Water-Powered Elephant Clock

Al-Jazri devised a water-powered elephant clock which was installed in the courtyard of a mosque in Damascus. The timing mechanism was based on a water-filled bucket embedded inside the elephant. The bucket had a bowl floating in water, but with a small hole in the centre. It took half an hour for the bowl to fill up through the hole. In the process of sinking, the bowl pulled a string attached to a see-saw mechanism in the tower on top of the elephant. This released a ball that dropped into the mouth of a serpent, making the serpent to tip forward thereby pulling the sunken bowl out of water via strings. Simultaneously, a system of strings made a figure in the tower raise either the left or right hand and the mahout to hit a drum. This indicated a half or 1 h. With the gong being hit, the snake would slide back to its normal position. The cycle then repeated, as long as balls remained in the upper reservoir to power the emptying of the bowl.



A working replica was built for Ibn Battuta Mall in Dubai, United Arab Emirates, while another could be found in the Musée d'Horlogerie du Locle, Château des Monts, in Le Locle, Switzerland.¹²

Water clock: A water clock was constructed based on the Archimedes Principle by Ridwan bin Al-Saati in 1203 and was positioned at the gates of the Umayyad Mosque in Damascus.

Water Use and Management in Islamic Civilization

Rights to water got evolved over a period of centuries in the Islamic lands. Generally, three rights came to be recognized universally. For example, (1) everyone had a right to drink or slake his thirst; (2) all pets, cattle and household had a right over water; (3) right to irrigation. This established the hierarchy of use, i.e. first humans, followed by animals and farmers for irrigation.

The first two rights, i.e. quenching one's thirst and giving water to animals were generally referred to as *Chafa* in the Islamic law or laws in the Muslim lands. The third right, i.e. using water for irrigation was known as *Chirb*. Based on these two universal rights, the nature of water (i.e. groundwater in wells, springs and surface water such as found in lakes, ponds or community cisterns, or running water like in rivers) also led to laws being formulated for regulation of water supply in detail. However, following a major split between Sunnis and Shias, there were significant differences among them regarding the ownership, pricing and sale of water. Yet it must be borne in mind that even today 90% of the Muslim population falls within

¹² www.muslimheritage.com, http://en.wikipedia.org/wiki/Elephant_clock

the category of Sunnis, while the remaining 10% follows Shiite Islam. Among the 56 member-states of Organization of Islamic Cooperation (OIC)—an apex organization of Muslim countries currently, excepting Iran, Iraq, Azerbaijan, and Bahrain, all other states are dominated by Sunnis. The general principles that guided water management in the Muslim lands are outlined here:

1. Everyone had a right to access wells or water points dug for quenching one's thirst.
2. In case of scarcity, animals could be water fed after everyone has had one's share of water.
3. In the case of nomads, they had an exclusive right over the wells dug by them for the entire period of their stay; however, they were not to refuse anyone the right to slake his/her thirst.
4. After the departure of the nomadic community, the wells were to become public property with users having access to it on first-come, first-served basis.
5. Anyone who sunk a well on his own land or unoccupied land was the sole owner of water and was not required to supply water irrigating others' lands.

The Ottoman Empire which governed a vast part of the Muslim world over three continents of Europe, Asia and Africa till the beginning of the last century had codified the Islamic law pertaining to water extraction, storage, protection against pollution, maintenance and operation of waterworks and distribution of water. However, the element of conservation and augmentation was not much in evidence in this law codified around 1870s, but left a strong legacy in a majority of the nation-states that sprang out of the empire after 1921 when Turkey jettisoned all its colonies and became a secular nation-state. Broadly, the law as laid down in codified form in *Mejelle* had the following broad guidelines:

1. All waters were declared vested with the state, or crown, or incorporated in the public domain, with the state thus taking over the place of the Muslim community.
2. Every use of water (other than for drinking or watering the animals) left free under the colonial legislation or sharia was placed under the government control.
3. Water commissions were set up to survey and recognize established water rights.
4. Land registers were compiled for keeping a written record of duly recognized land and water rights.

For the legal status of water, the following points from the *Mejelle* (Book of codified law) could be pointed out¹³:

Article 1234 of the *Mejelle* defines water as an unsalable commodity to which everyone has a right (*mubah*, which means permissible). Groundwater as well belongs to the community (Article 1235).

¹³Dante A. Caponera, Principles of Water Law and Administration : National and International, Balkema, Rotterdam, 1992.

The definition of water as non-saleable, public owned commodity applies to running water which has not been appropriated to water contained in the wells dug by unknown persons and to waters of the sea and large lakes (Article 1236).

Water for drinking and for feeding animals watering (*hakki chefe*): Everyone may quench his thirst from both privately and publicly owned rivers.

Article 1268 provides that ‘anyone who has on his property a stream, basin or well may prevent any other person from trespassing into his land to obtain water except for drinking in which case, the user should not damage this property, i.e. the rim of the well or the sides of water conduits.

Everyone is entitled to use water for irrigation from lakes or streams forming part of the public domain, provided the rights of the third party are not infringed upon. Irrigation canals and ditches as well as pumping installations can be freely constructed. However, nothing should be done to cause floods, exhaust water supply or lower the water level in as much as the passage of a boat is hindered.

The use of privately owned waterways is restricted to the riparian landowners. A non-riparian landowner will have to obtain the consent of all riparian landowners in the event of his using it.

The sale of rights of way, of irrigation rights and overflow of water from conduits, is permitted as part of the sale of land. However, if the owner of the land sells his land together with the right to draw water from a certain river or a canal, third parties having rights to that water of the river or the canal, benefit from the right of pre-emption (Article 1015). The landowner may, however, sell his land without the water rights.

Rivers falling in the public domain will be maintained by the State. However, expenses can be recovered from the users (Article 1321).

Private waterways will be maintained by the owners who are entitled to draw water for irrigation or for their animals (Article 1322).

All co-owners were responsible for maintenance of water courses in proportion to the benefit they derive from it (Article 1326).

The Harim (inviolable zone) around the well is fixed at 40 *arshuns* (a cubit, corresponding to 0.758 m) where the trespassing is prohibited (Article 1281).

Harims around all kinds of water bodies (rivers, springs, underground, etc.) were laid down under Articles 1282–1292.

A well dug over one’s own property (*mulk*) will have no harims. And the owner of the adjacent property too will be entitled to dig a well on his property and the former will have no right to object.

Differential Rates of Wealth Tax

Zakat or wealth tax figures among the five basic duties a Muslim must fulfil during his life. Zakat was levied at the rate of 2.5% of the accumulated wealth (i.e. if its value exceeds 88 gm of gold and if it has remained with an individual for over a

year). Zakat on agricultural produce was termed *Ush'r*, or tithe. It is derived from the Quran which says:

O Ye! Who believe! Spend of the good things which ye have earned and of that which we bring forth from the earth for you... (2:267).

The later jurists opined on the basis of the practices of the Prophet that *Ush'r* would be collected at the rate of 10% of the total harvest if the land was watered by the natural streams, springs or rivers. In case the land was irrigated by artificial means such as wells and buckets, *Ush'r* would be collected at the rate of 5% only.

Perhaps, the wisdom behind it was to maintain a difference in the tax structure between those farmers who benefitted from natural irrigation and those who invested efforts in arranging water for crops. While not too much should be read into it, it can be taken as a hint for rebate for those spending on organization of their own watering arrangements. Alternatively, it could also be interpreted as asking the beneficiaries of natural resources to cough up more by way of taxes.

Over time, Muslim communities and nations developed the norms and laws regarding ownership and distribution of water from natural sources. For instance, rivers (the Nile, the Tigris, the Euphrates and the Jordan River) were to be treated as belonging to the entire communities (read nations in the later avatar). Everyone would have the right to benefit from them, and no one would harm them. Still later, these were supplanted by the international convention of riparian rights, now universally recognized.

Muslim theologians as well as jurists divided water sources, for the sake of ownership, into wells, water springs, rainwater streams, large and small rivers, human dug canals, and irrigation channels. Generally, three categories were known:

1. Water in personal containers, treatment plants, reservoirs or distribution systems to be considered private property. Owner will have the right to own, use, trade and sell it.
2. Water sources situated on the privately owned lands such as ponds, tanks, streams and springs will have a restricted right to others. Other's rights will accompany their obligations towards them.
3. Rivers, lakes, glaciers, aquifers, seas, snow-fed streams and rainfall will be considered public property or what is in today's parlance 'Commons' and cannot be traded, sold or withheld from someone. However, those who invest in raising infrastructure or extracting it will have certain rights. (This area of legislation was not very comprehensive to fulfil today's needs. All Islamic nations today recognize the Convention on the Law of the non-Navigational Use of International Water courses which elaborately lays down upstream and downstream rights, regulations regarding the preservation of ecosystems associated with them, pollution and penalization, etc.

Quranic Message—Various Aspects

Enjoy the Sustenance Provided

As we have observed in the previous paragraphs, the advice having been given to avoid behaving outrageously, we are now being asked to enjoy the sustenance being provided. This may come as a surprise to some persons that the Quran does not advocate asceticism, but indeed it urges people to partake of the bounties provided by Him and enjoy the sustenance thus provided and of course be grateful to God. Wide ranging moral and ethical injunctions are laid down.

2:172, O you who have attained to faith! Partake of the good things which we have provided for you as sustenance, and render thanks unto God, if it is [truly] Him that you worship.

77:43 Eat and drink to your heart's content: for that you would have worked (righteously). While consuming food and drink bestowed by God, do not forget the poor—your fellowmen.

6:141... Eat the fruit when it comes to fruition, and give [unto the poor] their due on harvest day. And don't waste [God's bounties]: verily He does not love the wasteful!

Maintain Balance

This is an omnibus heading—sort of a hold-all reference point—for the word 'balance' is quite a frequently used term in the Quran. 42:17 reads, 'it is God [Himself] who has bestowed revelation from on high, setting forth the truth, and [thus given man] a balance [wherewith to weigh right and wrong]'.

A similar idea is expressed in 57:25... 'Revelation... bestowed a balance [wherewith to weigh right and wrong] so that man might behave with equity',

In Surah 55, verses (7, 8 and 9) state that ... '[He] has devised [for all things] a measure, so that you [too, O men!] might never transgress the measure [of what is right]: weigh, therefore, [your deeds] with equity, and cut not the measure short!' A reading of the above section makes it abundantly clear how this matter is emphasized in [57:25], 'Certainly We sent our apostles with manifest proofs, and we sent down with them Book and the Balance so that mankind may maintain justice...' (Translation by A. Q. Qarai)

42:17, it is God who has sent down the Book with truth and balance.

28:77, By means of what God has given you, seek the abode of the hereafter, while not forgetting your share of this world. Be good [to others] just as God has been good to you, and do not try to cause corruption (*fasad*) in the land.

Be Frugal in Use, Waste Not and Pollute Not

Some of the Quranic verses lay emphasis to state ‘... Eat of the good things that we have provided for you, and be grateful to God...’

Simultaneously, the Quran asks us not to waste (water, food, etc.). It states ... ‘But waste not by excess for God loves not the wasters’ 6:141.

The excerpts from these verses show (there are several more) that God enjoins us to eat as also enjoy whatever bounty of food and drink has been bestowed on us. But they clearly ask us not to be wasteful and extravagant.

The responsibility not to waste is squarely cast on human beings—thus each one of us has to honour/obey it.

Don’t Behave Heedlessly, Oppressively or Tyrannically

You should not consume heedlessly, i.e. far in excess—in a word, do not be a glutton. Be moderate in consuming food [water and other resources]. Don’t *splurge*. Don’t do it to show off so that people may see how well off you are!

Further, it is stated (5:87), ‘O you who believe! Make not unlawful the good things which God has made lawful for you, but commit no excess: for God does not love those given to excesses’.

Prophet Shuaib warns his flock against behaving tyrannically. (26:130 to 134). As these verses lay down: ‘And whenever you use force and become tyrannical; So be conscious of God and follow me; [who] Gave you increase of cattle and sons, and orchards and springs. I fear the punishment of a terrible day for you’.

Referring to Pharaoh and his tyranny the verse says (28:5), ‘We wished to favour those who were weak in the land and make them leaders and heirs’.

Those who oppress and terrorize in the land unjustly are warned of painful punishment.

The concept of oppressed, i.e. of those whose rights are trampled upon by the rich/powerful forms the theme of several verses. We are citing only two of these verses, here water—a scarce resource is more often than not commandeered by the rulers, the elites, the well-off, i.e. rich and powerful while the poor/weak are denied or deprived of access to water or at least left to fend for themselves. The two verses being cited are 4:98, ‘But those who are helpless, men, women and children who can neither contrive nor formulate a plan nor do they know the way [out of their predicament]’.

Such utterly helpless people would complain (4:75) ‘What has come upon you that you do not fight in the cause of God and for the oppressed men, women and children who pray : Get us out of city, O Lord, whose people are oppressors, so send us a friend by your will, and send us a helper?’ (Translation by Ahmed Ali) (The oppressed are addressed in the Quran as *mustadhafun*).

42:42 ‘blame attaches but to those who oppress other people and behave *outrageously* on earth, offending against all right: for them is grievous suffering in store’

(Asad). Asad explains that (in footnote 44) ‘although this is primarily a reference to those who oppress [other] people and behave outrageously on earth, offending against ‘all right’, the meaning of the term is general, applying to all kinds of deliberate evildoers.

The Ethical Moral Message of the Quran on Use and Abuse of Water

Some Sociological Aspects of the Distribution of Water

Verse 41:10 states that ‘[He has].... Blessed it [i.e. the world] with plenty and growth, and ingrained the means of growing its food within it, sufficient for all seekers’, (Translation by Ahmed Ali).

This verse explains that God has blessed all those who seek to satisfy their thirst and hunger as also to satisfy related wants, with adequate means. If we look around carefully, it could be seen plainly that there exists a symbiotic relationship between man and his surroundings or environment. Before settled agriculture, i.e. in the pastoral and nomadic times, the population of earth was hardly in millions. As agriculture developed and its intensity increased, it could progressively support more and more people so much so that now the population is estimated at around 6–7 billion souls! However, the ghost of Malthus never seems to really disappear. It appears to be always looming in a corner, warning humanity that it has exceeded its welcome on the planet.

Nevertheless, humans inhabit almost all the climes: from cold Arctic zones to hottest deserts, to lands abundantly endowed with water to water-scarce areas. Men living in relatively comfortable zones may be wondering why some men are living in such inhospitable zones?

Apart from this, the innate capacity present among men varies to an astonishing degree those who have acquired more knowledge, those who are physically more dexterous, or those who are plainly more aggressive come to acquire/possess more power. A majority of them do exercise it to their advantage at the cost of the poor and the weak.

As a result of the above factors, everyone does not enjoy equal access to and use of water. Its corollary is the inability to earn/get food. Thus, we see one paradox upon another paradox. In India, e.g. physically, the minimum quantity required is available, but not all the poor have an equal access to water as also food. We have so far been viewing the side of availability of water. In this and following sections, we would like to look at the distribution side of water. How are consumers faring? How easy or difficult is for them to access their water requirements. Let’s take two or three examples by way of elucidation. This, in a nutshell, becomes an issue for justice and equity in the distribution of scarce resources, particularly water.

It is quite frequently found explained in the Quran that it is a ‘Book of Guidance for mankind’ (*Hudan-lin-nas*). This guidance is permeated by an overwhelming emphasis on ethical–moral behaviour in whatever activity one is pursuing.

The first section below sets out the Quranic injunctions and their message. The subsequent sections apply these injunctions in respect of water.

15:85 'we Created not the heavens, the earth, and all between them; but for just ends...' (Translation by Yusuf Ali).

Having created the earth, God has given it to man in trust to make best and judicious use of it. Simultaneously, He has granted/endowed him with power to think and the ability to choose between right and wrong. God assures that He will reward those who are righteous. But those who choose to go astray shall be punished for their wickedness. Naturally, those two abilities distinguish him from all other creatures of the world.

In 16:90, it is laid down: 'Behold, God enjoins justice, and the doing of good, and generosity towards [one's] fellow men, and He forbids all that is shameful and all that runs counter to reason, as well as envy, [and] He exhorts you [repeatedly] so that you might bear [all this] in mind'.

Next, it speaks of different endowments granted to men in 35:32 that 'we have bestowed this divine writ, as a heritage unto such of our servants as we choose: and among them are some who sin against themselves, and some who keep halfway [between right and wrong], and some who by God's leave, are foremost in deeds of goodness: [and] this indeed, is a merit most high!'

In a tone of astonishment, it is queried, 'Do they not reflect in their own minds?' 30:8.

Here is the call to behave equitably and justly. Verse 4:135 enjoins that 'O you who have attained to faith! Be ever steadfast in upholding equity, bearing witness to the truth for the sake of God, even though it is against your own selves or your parents and kinsfolk. Whether the person concerned be rich or poor, God's claim takes precedence over [the claims of] either of them. Do not follow your own desires, lest you swerve from justice: for if you distort [the truth], behold God is indeed aware of all that you do!'

The message as regards the importance of behaving morally is reiterated with three elements being mentioned in 11:85, 'So, O my people, weigh and measure with justness, and do not withhold things due to men and do not spread corruption in the land, despoiling it'.

Justice and Equity

One of the major and recurrent themes in the Quran is that of justice and equity. This emanates from one of the attributes of God that is justice. This question has been discussed in great detail by Daud Rahbar in his seminal work, 'God of Justice'.¹⁴

We have stated in the foregoing section that man has been endowed with the power of choosing between good and evil. The problem takes off from here. Man's

¹⁴Daud Rahbar, *The God of Justice*, Brill, Leiden, 1965.

self-interest or even selfishness manifests in unfair and unjust behaviour towards his fellowmen.

We have so far seen the various aspects of water in terms of its availability or scarcity and the various sources from which it is obtained and so on. This entire endeavour is naturally to see that all living beings get their water requirements at least in terms of a basic minimum level.

Justice (Adl)

Here, we recount three verses of the Quran which speak of justice and equity.

5:8 ‘O you who believe, stand up as witnesses for God in all fairness, and do not let the hatred of a people deviate you from justice. Be just: This is closest to piety: and beware of God. Surely God is aware of all you do’. (Translation by Ahmed Ali, later AA)

7:29 ‘My Lord has enjoined justice ...’ (AA).

In another instance, the Quran enjoins in 49:9 ‘...Deal equitably [with them] for verily God loves those who act equitably’.

Trusteeship

Man a Trustee, Not a Despoiler

The scheme of creation as outlined in the Quran may be summarized thus. In 2: 30, it is stated, ‘and Lo! Thy Sustainer said unto the angels: ‘Behold, I am about to establish on earth one who shall inherit it’. Asad explains that ‘establish on earth a successor or vicegerent (i.e. the *Khalifa*). Derived from the verb *Khalaif*, which means succeeded, {another} it is used in this allegory to denote man’s rightful supremacy on earth. It is most suitably rendered by the expression ‘he shall inherit the earth (in the sense of being given possession of)’. In some verses, human beings are described as *Khalaif al Ard* (2:30 and footnote 20). In 35:39, it is stated ‘He is who has made you inherit the earth’.

The earth has been endowed with vast resources, which can be used—utilized by man to satisfy his myriad wants. In this vein, there are several verses in the Quran.

Here, we can recall the adage, life, food and water, form a closely knit continuum (page 1 above). Food and water are the basic minimal requirements for survival of all forms of life. Besides this, as the awareness of man increases, so do his wants. To satisfy them, he has to explore, test, devise and manufacture commodities. It may easily be seen that food and water occupy the apex position so to say of his wants.

The hierarchy from the point of view of the needs of human beings could start from food and water followed by raw materials for production of various commodities and so on.

The basic approach taken is that these resources are placed at the disposal of man and he is to act as a 'trustee' of the resources; as such, it is incumbent on him to use them circumspectly, carefully and frugally. He should not wantonly spoil or damage these resources.

Several of these issues are discussed in the following sections. It may be appreciated that all these resources in the form of water, food and all other raw materials are finite in quantity as part of the earth's system. Except for the input of solar radiation, which comes from outside the earth, everything else originates in earth and thus finite. We have seen above that, of water available on the planet, only 1% or so is freshwater. It is the same water that the dinosaurs drank several millennia ago. When we view the problem from the overall planetary system, it becomes quite clear that there is no scope for man to behave irresponsibly, wantonly and mindlessly, especially when utilizing water (as also all other resources). This is the reason why the Quran repeatedly calls man as a trustee of such resources. We may emphasize that some of these resources are vast, but nevertheless finite. They are most emphatically not infinite.

Equity and Trusteeship

We have seen above that the Quran lays emphasis on the concept of trusteeship of wealth. What's more, this is being stressed without any ambiguity. God is the Creator of the earth, sun and moon, indeed the entire universe. It is also laid down that the wealth that is legitimately acquired by dint of hard work is declared as *Halal* earning and that the wealth acquired through deception, deceit, aggression, etc. does not fall under the *Halal* (permissible/approved) category. Although in general parlance, a person of such wealth is called its owner, it may be noted that the possession itself turns out to be quite transitory or ephemeral. He is in temporary possession of it and that as a matter of fact, he cannot arrogate to himself the ownership thereof. Thus, he can enjoy the usufructs associated with it for the time being. In the Quran, he is called the trustee of such wealth. That he should meet his obligations towards charity, be compassionate towards the poor and the have-nots. These principles are enshrined in the text, however, the praxis is far from this ideal, in that these ideals are heard and understood, but not followed in practice. As a result, so far as water is concerned, the rich/powerful continue to enjoy a much higher share than what they are entitled to all through these centuries.

If you look at the situation prevailing in the twentieth century, we find that it was a time of considerable tumult when a number of ideologies were in sharp conflict with each other. Capitalism, socialism and communism were competing with each other. At this juncture, there was the voice of Gandhiji who advocated four essential principles of his philosophy. They were truth, ahimsa, trusteeship and constructive cooperation.

Gandhi said trusteeship was a means through which the wealthy people would be trustees to the wealth and look after the welfare of people in general. Such a view

was condemned by socialists as being in favour of landlords, the feudal princes and the capitalists. Gandhi believed that people could be persuaded to give their (surplus wealth) to help the poor. This is how the Mahatma put it, ‘Supposing I have come by a fair amount of wealth—either by way of legacy, or by means of trade and industry—I must know that all the wealth does not belong to me, what belongs to me is the right to an honourable livelihood no better than that enjoyed by millions of others. The rest of my wealth belongs to the community and must be used for the welfare of the community’.¹⁵

As Stiglitz puts it, capitalism moved towards a situation akin to robber baron era of the nineteenth century USA. The financial meltdown was the result of a quite suspicious, nay dishonest activity of the financial sector.

Ecological Balance and Pollution

We have seen above that the Quran states that whatever has been created by God is according to a plan, executed as per the blueprint. Everything that goes into making a thing strictly follows the prescribed measure and is well proportioned. It is thus fine-tuned to perfection. In other words, it is truly balanced in terms of several dimensions. When such a balance and equilibrium is disturbed or deformed, we could call it that the substance/thing has been degraded or polluted.

This issue is dealt with in 30:41 which reads as follows ‘Pollution has appeared in land and sea because of what man’s hands have wrought, so that He may let them taste something of what they have earned, in order that they will turn back [in repentance]’. Here, pollution refers to the disturbance/disruption wrought by the activities of human beings. That has led to—from mild to serious consequences. They have to face the consequences of their misdeeds. If they take a remedial action immediately, the intensity of consequences may be either mitigated or eliminated.

In this verse, the word used is ‘Fasada’—a polysemic word. Hence, several meanings have been derived from this word and the verse. It is often translated as corruption, imbalance and disturbance from equilibrium, etc....here *fasada* has been translated as pollution. It can be viewed as disturbance from an ecological balance point of view. Let us now see what explanation is offered by M. Asad for this verse in his Chapter 30, footnote 39, ‘thus, the growing corruption and destruction of our natural environment, so awesomely—if as yet only partially—demonstrated in our times, is here predicted [predicated too] as an outcome of what men’s hand have wrought, i.e. of that self destructive—because utterly materialistic—inventiveness and frenzied activity which now threatens mankind with previously unimaginable ecological disasters: an unbridled pollution of land, air and water through industrial and urban waste, a progressive poisoning of plant and marine life, all manner of genetic malformations in men’s own bodies through an ever-widening use of drugs and seemingly “beneficial” chemicals, and the gradual extinction of

¹⁵Trusteeship of M. K. Gandhi, compiled by Ravindra Kumar, 4/68.

many animal species essential to human well-being. To all this may be added the rapid deterioration and decomposition of man's social life, the all-round increase in sexual perversion, crime and violence, with, perhaps, nuclear annihilation as the ultimate stage: all of which is, in the last resort, an outcome of man's oblivion of God and, hence, of all absolute moral values, and their supersession by the belief that material "progress" is the only thing that matters.'

Problems Associated with Commons

We have cited Marshall who in his (*Principles of Economics*) holds that sunshine, air and water are free goods provided by nature to man (page 3 above). We have stated there perhaps in the 1890s and early 1910s, this might have been not an entirely untrue view to hold. But in today's situation, freshwater (as also fresh air) has become a scarce resource indeed.

Those goods and sources used and enjoyed by everyone generally can be referred to as 'commons'. You may have, e.g. a road, brook, beach and mountain scene. Everyone can enjoy it both individually and in the company of others. However, if road is found unpaved/kutchha path, on which not much expenditure has been incurred initially, nor is there a heavy maintenance expenditure involved, its use may be quite free. However, if the road has been built involving a heavy investment by the State or any other entity, and costs quite a bit for maintaining it, it may be necessary for the user of such a pucca road to contribute towards its cost by way of toll.

If water were to flow in a jungle stream before accumulating into a natural depression, i.e. a small tank, then the public can certainly use it without paying any toll. But if a reservoir is built across a river with a considerable initial investment and it costs to maintain it, the question that arises here is: an agriculturist taking water for irrigating his field, should he get it (a) entirely free of any charge; (b) -meet the cost partially; and (c) meet the full cost? Similarly, if water from this reservoir is piped to a city where it is filtered, stored and distributed, could a system of piped delivery to homes be free or the consumer should pay (a) some nominal cost; (b) a modest bill; (c) meet the total cost? We have no scope to enter into elaboration of these options. But suffice it to say that one can certainly go to a river, and drink water to his fill without paying anything, but to get the same water through a tap in his house, a considerable cost has to be borne to access it. Here, conceptually, water is free, but delivery at the 'end of the pipe' has to be paid for by the consumer. This principle has to be understood by all those who clamour that water is a free good that nature provides—why should we pay for water at the tap? In view of the above explanation—such a view is clearly naïve or uninformed one.

We may thus state the premise that water is of course a free good provided by nature. But if it has to be stored, cleaned, filtered and piped to your house, you may have to pay a price for it. It becomes a priced commodity, far from being a free good. So a free good so modified emerges as a priced good. This gives rise to the question of pricing, cross subsidy, etc.

In this case, there are several stakeholders, but we will take up the most relevant of them: the consumer (individual), the community and the State.

Naturally, the individual may like to pay the lowest price. The community is expected to take a broader view in terms of willingly paying more than what the individual would like to pay. Here, the State should play the role of a moderator or arbiter. The issue should be discussed among the three stakeholders thoroughly and they should strive to come to an amicable outcome. If they find themselves unable to come to any workable solution, it will be a recipe for chaos which should be avoided at any cost.

If such a tangle were to arise, the aforesaid principle of justice and equity, of fairplay—guidance could/should be drawn from textual sources, and they should strive to solve the problem faced by all the stakeholders. The principle that natural resource like water is a bountiful gift from God and that they are only trustees should not be lost sight of. The trustees should act morally to keep his private interests in check as a fair-minded operator (this applies to all the stakeholders mentioned above).

Here, rules and regulations properly worked out through a consensus and promulgated by the State should go a long way towards an equitable solution to problems that might arise.

Water Is No Longer a Free Good

Water is a basic need of life. The question whether it should be available to all as a free good or marketed as a commodity has cropped up in the wake of neoliberal economic liberalization. Urbanization has brought in new demands that have changed the mode of thinking vis-à-vis the needs of life. Freshwater is no longer accessible as it used to be for people inhabiting villages normally around tanks, river banks or community wells. Although governments, under the obligation of making the basic needs of life accessible to all, have invested hugely in building up a basic infrastructure of water supply network, electricity, housing and roads, are finding it hard to maintain them due to low and unsustainable returns. Hence, much of the cost of infrastructure gets subsidized only to be extracted from citizens by way of taxes on other services that the State renders.

Supplying water to millions of people inhabiting our megalopolises entails pumping water from distant sources. Electricity to pump this amount of water itself costs 30 to 50% of what most cities spend on their water supply. A huge network of pipes, overhead tanks, underground reservoirs, valves and siphons have to be maintained for building up reserves and maintaining supply schedules. Often a basic cleaning of water at the source and protection against pollution require proper monitoring.

Not merely supply, even the collection of used and wastewater through an intricate network of gutters, sewers, and storm water drains has also emerged as the concomitant civic responsibility to ensure hygienic conditions and public health.

So, many of mediaeval ethos, norms and regulations regarding water use may not be simply applicable to the modern times. Even the basic premise, i.e. whether water should remain a free good, is begging a reexamination in a setting where 'free' is becoming synonymous with 'poor quality, unreliability and, to some extent, 'risky'. If huge investments on water were to remain bereft of prospects of any returns, or returns not adequate enough to sustain, what hope is there of guaranteeing their quality and reliability in the long run. Similarly, if it were to be priced, what yardsticks are to be followed by a society so very stratified? Could there be differential rates for the use of the precious liquid in urban homes which range from using water merely for basic cooking, washing and drinking to villas that employ it for car-washing, lawn-watering, swimming, musical fountains and for fish ponds. Could water supply rates be fixed proportionate to the floor-space area, inmates of premises, income levels of households, etc. need to be addressed.

Learning for the Future

Development in Near Future

Large dams: Twentieth century saw the era of mega dams. The slogan was bigger the better, e.g. Tennessee Valley Authority and Colorado dams in the USA, similarly, large dams came to be built in the then Soviet Union including those which sought to change the course of the rivers flowing towards Arctic circle to drain into the middle of the Soviet Union and their fiasco. In India, Damodar Valley Authority, Bhakra Nangal, etc. were built. Multipurpose dams—generating hydro power and supplying water for irrigation flood control was the rage during those days after independence. They held that bigger was better and larger dams were synonymous with growth and development. That resulted in not so benign consequences and sometimes even serious ones. This has resulted in a full scale reappraisal of the theology of large dams.

Nevertheless, the shortsighted greed of the State and of the people in taking up or planning a very large number of small dams in a known quake prone area like the Himalayas is very unnerving a prospect. We had a foretaste of the catastrophe that was likely to happen when these projects were under way in Uttarakhand and Arunachal Pradesh.

In this connection, we come across a number of warnings and admonitions cited in the verses.

RO System

A human body can be thought of as a series of pumps—big and small; a series of valves and above all membrane filtration systems. Taking a leaf from this, a remarkable development took shape during the last half of the century. From being a lab

curiosity, reverse osmosis (RO) process has emerged as a successful industrial process for turning salty to highly brackish water into potable water. It is a process which is scalable from 5 L a day to 5 million litres a day output! As compared to water→steam→water process—the energy input is extremely favourable in RO. Further improvements to reduce the cost are, of course, constantly being made. Arid areas in the USA and the Middle East have huge facilities for RO. Households in India are big users of RO. This is indeed a most welcome development in providing good potable water where none was available before.

Root-Zone Irrigation

The other development in this vein is root-zone irrigation or drip irrigation which is especially crucial to water hungry crops. This has proven to be extremely useful in areas with a high degree of scarcity of water.

Industry Needs to Economize on Water Usage

In industry, water is mostly used as a mass-transfer medium by various industries including chemical processing industries. Water was free once upon a time or cost very little. A lot of work is under way to economize use of water, but more important breakthroughs could be expected only when there is a change of mindset among the captains of industry.

A breakthrough towards in situ desiccation of human excreta in combination with solar power could be done economically. It would dramatically reduce the consumption of freshwater as a mass-transfer medium besides reducing the pollution load too...several interesting developments is on the anvil.

This is a very short recounting of the possibilities and developments that are going on in various fields.

May we be permitted to close this section with the fervent hope as follows?

16:8 ‘and [it is He who creates] horses, mules and asses for you to ride, as well as for [their] beauty: and He will yet create things of which [today] you have no knowledge’.

Asad inter alia—explains this by saying let’s God will create new things of which you have no knowledge [today] is valid for every period—past, present and future’.

Salient Points That Emerge

1. Earth’s useable water resources are finite and represent only 0.5% of water on the planet.
2. We are making excessive demands on this stock of water by way of using, polluting and depleting it at a rate much more than the nature’s capacity to replenish it.

3. Stockholm Water Symposium held in 2000 declared that 31 countries are facing water stress and scarcity with over a billion people having no access to safe drinking water. It also urged the world to recognize the terrible reality that by 2025, two-thirds of the world population will be living with acute water scarcity.
4. Humanity in the past was mainly guided towards a frugal use of water for its daily needs more due to inaccessibility to water than its unavailability. Technology was the main constraint in accessing water sources.
5. Although nature's conservation was not so much of a concern then, the religious saints and scriptures with their dominant sway over people motivated them to be modest in the use of water, instilling a fear of accountability to God as also inculcating a sense of sharing of earth's resources with fellow human beings.
6. With complicated waterworks awaiting development and advent of relevant technology, religious leaders, in their own humble way, created common facilities such as public wells, cisterns, saqqa Khanas or bowlies at Dargahs for access to and availability of water to the common folk. Perhaps, this could be the only way to ensure an equitable access to and availability of water to people. It implies the recognition of water being 'a common good' with no authority and control over it. The *kuwan* (well) and *bavadis* (step well) etch to relief the different roles these water bodies were to play in public life. While wells were generally considered meant for private use, the step wells by their distinct architecture implied that everyone was welcome to benefit from them including animals free of cost. It was essentially a usufruct model which allowed everyone to derive profit from these water bodies without claiming any right over them, or causing any damage to or depletion of its supplies.
7. If not exactly sacred, water in Islam was considered 'a common property' with the religious prescriptions recognizing the right of everyone when it came to slaking one's thirst and water feeding animals even from private wells. Islam recognized the role of human beings only as a trustee of Natural resources, not as owners or proprietors.
8. Finally, it was only in very well-developed civilizations such as Ottoman Empire or Mughal rule that Muslims could conceive of building large water storages and a public distribution system as discussed under Burhanpur and Aurangabad models.
9. A cursory look at the hydraulic technologies developed/promoted by Muslims suggests that they largely catered to the premises occupied by the elite and were not capable of democratizing the water supply as is done today.

The Threat of Globalization

Meanwhile, globalization has come to dominate the world economy during the last quarter century. It aims at rendering water, just as any other natural resource like mines, forest and land, a private commodity to be sold and traded on the open

market. They no longer view water as a social resource essential to all life forms on the planet earth, but an economic resource to be managed by market forces, akin to any other commodity. While in public discourses they are not tired of talking of privatization of water services as being socially beneficial, in practice, it is the economic imperatives that take precedence over social and environmental concerns. CEOs and literature meant for investors of companies such as Canada's Global Water Corporation, France's Lyonnaise des Eaux and Wetco, a water exporting company from Alaska, have often advertised their services as water sellers declaring that 'water has moved from being an endless commodity that may be taken for granted to a rationed necessity that may be taken by force'.

The neoliberal economic model strikes at the concepts of sanctity (as in Hindu culture) or trusteeship (as in Islam) and puts everything on sale like seeds and genes, culture and heritage, water and food. Perhaps air too would be commodified if scientific developments could bring in ways to ration it in future.

Even the so-called public-private partnerships are of no worth as private companies have to assure a return to shareholders even as they secure guarantees from the governments who enter into such partnerships. For instance, Chile had to guarantee a profit margin of 33% to Lyonnaise des Eaux as a condition of the World Bank, regardless of performance. What is obvious is that these monopolies usurp huge infrastructures raised by governments in the past, but are committed to their shareholders. Rising of water tariffs to an exorbitant extent by Bechtel brought the people in Bolivia on to the streets in the past leading to the government scrapping such partnerships ultimately.¹⁶

There are savants who view water as a metaphor, a metaphor for food and water. Others think of it as a symbol/metaphor for all the array of resources on which man depends for his survival. Some consider water as a 'social good' in the same league as air and food.

There are sociologists, anthropologists and historians who have undertaken studies of water with reference to and/or in relation to their area of study. There are scholars who view the problems associated with water from a legal point of view. There are those who view water from the vantage point of their religious books and dogmas.

Thus, we come across an astonishingly large variety of approaches towards the study of water. Each one of these studies is of considerable use as also of keen interest to persons working in a particular field. Some of these studies may be of interest to general readers. Our study here looks at how religious scriptures—in this case Quran—deal with the question of water. This study is focused on a specific area. Even so, the literature available in this niche is remarkably vast. In fact, the import being we are, as it were, touching only the fringe of the vast reservoir!

While summarizing the study, we could appreciate the import of what Quran affirms: 'there are enough resources to satisfy the legitimate needs of all human beings on the earth'. However, along with food water is not adequately available to

¹⁶ <http://democracyctr.org/bolivia/investigations/bolivia-investigations-the-water-revolt/bolivia%E2%80%99s-war-over-water>.

the poor/weak in the society. Quran is particularly concerned that men (a) develop water resources; (b) use it equitably and judiciously without wasting it. They should avoid polluting the supplies along with their environment. Thus, the overwhelming emphasis in the Quran is on distributive justice.

Websites

<http://english.islammessage.com/articleDetails.aspx?articleid=305>

For zamzam: http://www.irfi.org/articles4/articles_5001_6000/abe%20zamzam.htm

For water clock: http://en.wikipedia.org/wiki/jayrun_waterclock

For Qanat system: http://www.academia.edu/432605/Technology_and_religion. The Qanat underground irrigation system.

For Ush'r on agricultural produce: www.muslimtents.com/shaufi/b