Water in Hindu Scriptures: Thank You, Water!

Sudhakara Sharma and M.S. Shruthi

Introduction

Water scarcity is affecting every continent of the globe. About 43 countries with 700 million people are witnessing water crisis, and Ethiopia takes the lead followed by Haiti and Niger where water availability is least. The UN computes that although the Millennium Development Goals for clean water supply are achieved, about 800 million people will still lack proper access to safe drinking water by 2015. And 1.8 billion people will still not have access to basic sanitation. A sustained growth of population, demand for better livelihoods and urbanisation are generating a steadily intensified water crisis worldwide. Most of the 60 million people added to the towns and cities of the world every year move to informal settlements. Women spend 200 million hours a day collecting water. The major factor determining the economic growth of several countries will be access to water resources; hence, water may assume the role of prime factor behind the wars fought in the world in future. About two million tons of waste per day is discharged to receiving waters comprising human waste, industrial wastes and chemical and agricultural wastes. More than 3.4 million people die each year globally of water, sanitation, and hygiene-related causes and degraded environment.

Growing population is causing major stress on all the natural resources. Sewage and agricultural runoff has contaminated most of the water resources. Agriculture has always been a major consumer of water and accounts for around 70% of water used. Unsustainable agricultural practices are forcing farmers into resorting to undue exploitation of water. Overuse of water in agriculture is also causing land degradation threatening future food security and livelihoods. Local varieties which are geo

S. Sharma
Independent Sanskrit scholar
e-mail: sudhakarasharma@gmail.com

M.S. Shruthi (✉)
Research Assistant, Institute for Social and Economic Change (ISEC), Bengaluru, India
e-mail: shruthi_msm@yahoo.com

K.V. Raju, S. Manasi (eds.), *Water and Scriptures*,
DOI 10.1007/978-3-319-50562-6_4

specific and season specific are ignored. Further increased urbanisation has added to the complexity in cities facing scarcity, pollution, inequity, etc. Water, sanitation and hygiene-related causes result in morbidity and mortality concerns besides degraded environment. There are several trans-boundary problems due to water scarcity, like Sindhu River dispute between India and Pakistan; dispute over the sharing of Nile waters between Egypt and Sudan; the issue among Thailand, Vietnam, Lao People's Democratic Republic (Lao PDR), Cambodia, China and Myanmar pertaining to Mekong River Basin; dispute between India and Bangladesh over the sharing of Ganges waters, Egypt and Ethiopian conflict over Nile and several others.

The purpose of this paper is to illustrate from Hinduism thoughts that can help promote conservation and proper water management. The role of culture plays a significant role in effective water resources management. Identifying values in Hindu scriptures is the purpose of the paper, besides drawing lessons to aid current challenges of water management. The methodology adopted is through explaining the religion in brief as protecting nature is part of Hinduism and explaining the various literature sources from where we have sourced the values and principles drawn regarding the precious resource water.

Hinduism

Hinduism is a path of life being practised from time traced back to 10,000 BC as per the records available to the mankind till date. Hinduism is more of a way of life than a religion as this path was not propounded by a single person or an incident, but has just been naturally practised by humans from time immemorial; thus, the religion is described as *'Sanatana Dharma*, the path which does not have a beginning'. As such Hinduism keeps itself away from fundamentalist attitudes, while embracing virtues from anywhere in the universe.[1] Hence, the conception of the whole world as 'one family'[2] is derived, making Hinduism the most pacifist faith in the world.[3]

Ecology and Hinduism

The pacifism emitted by Hinduism does not get confined just to the mankind, but extends very much to the well-being of every living and inert being in the whole universe as everything in nature is equated with the almighty.[4] *God has manifested himself through the creation of this universe,* so man is forbidden from exploiting

[1] आनोभद्राः क्रतवो यन्तु विश्वतः/Aanoibhadraah krathavo yanthu vishwathah

[2] वसुधैव कुटुम्बकम्..... Vasudhaiva kutumbakam……Hithopadeshah

[3] सर्वे भवन्तु सुखिनः, सर्वे सन्तु निरामयाः, सर्वे भद्राणि पश्यन्तु मा कश्चित् दुःखभाग्भवेत्/ Sarve bhavanthu sukhinah sarve santhu niraamayaah sarve bhadraani pashyanthu maa kashchit dukha bhaagbhavethh, sarve bhadrani pashyantu maakashchit dukhkha bhaagbhaveth

[4] सर्वम् खल्विदम् ब्रह्म/sarvam khalvidam brahma

nature and is bound to live in harmony with nature and recognise the divinity that prevails in all elements, including plants and animals.[5]

This is the philosophy behind Hindus worshipping everything. As such, every rite and ritual performed through this path chants coexistence with the nature, as nature happens to be the very base of existence.[6] Thus, Hinduism has always been an ecologically insightful idea. Environmentalism is an intrinsic part of a divine world outlook in Hinduism.

Hindu Scriptures

As delineated, Hinduism, being a way of life, has branched out itself over time into various subjects and specialisations to comprehend the almighty and help humanity live in coherence with nature in all possible ways and attain the ultimate bliss.[7] The knowledge of this apparent/mortal world is termed **Avidyaa, aparaa vidya** (अविद्या/अपराविद्या) and the knowledge of the cosmic world is termed **Vidyaa, Paraa vidyaa** (विद्या/पराविद्या).[8] **The paraa janana** (परा ज्ञानम्/विद्या) has been given more emphasis but with no negligence assigned to the life in the mortal world or without compromising on the worldly life.

Vedas are the foundation rocks on which the structure of Hindu culture, life and scriptures have evolved. Vedas are the most authentic and the most ancient literature available about Hinduism. Etymologically, 'Veda' comes from the root verb 'Vid' which means knowledge; Vedas are thus a compilation of knowledge meant for guiding mankind.

The Vedas are the direct revelations made to the mankind by the supreme power as there seems to be no evidence of it being written by anybody nor is it possible for a human brain to put forth knowledge in such a perfect order.

Vedas comprise hymns fragmented into four broad chapters,[9] namely, Rig, Yajus, Sama and Atharvana, based on the themes of hymns. The Rig Veda emphasises knowledge; the Yajur Veda emphasises duties; the Sama Veda emphasises devotion; and the Atharvana Veda emphasises physical sciences.

---

[5] आप्रारजांसि दिव्यानि पार्थिवा.....प्रबाहू अस्राक् सविता सवीमनि निवेशयन् प्रसवन्नक्तुभिर्जगत्.....(ऋक् ४.५३.३)/aapraa rajaamsi divyaani paarvthiva.....prabaahu asraak savitaa savimani niveshayan prasavannaktubhirjagat.....Rigveda...4.53.3

[6] त्वं विभर्षि द्विपदः त्वं चतुष्पदः.....अथर्वणवेदः १२.१.१५/tvam bibharshi dvipadah tvam chatushpadah….Atharvanaveda…12.7.15

[7] मोक्षः/Mokshah.

[8] अविद्यया मृत्युं तीर्त्वा विद्यया अमृतत्वमश्णुत..... Avidyayaa mrutyum teertvaa vidyayaa amrutatvamashuta....Yajurveda...40.11

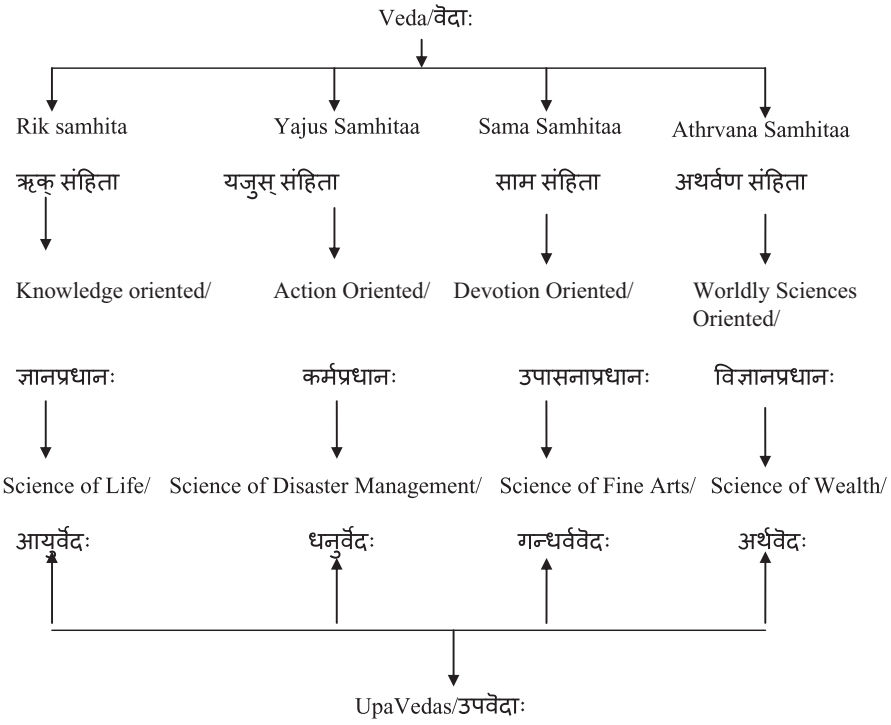
[9] ऋग्वेदोऽथयजुर्वेदोसामवेदोऽयथर्वणवः/Rigvedothayajurvedahssaamavedoatharvanah

Each of the four Vedas has its own *Samhitaa (a collection) which is, as said above, the direct revelations made to the mankind by the supreme power and is the most valid part of Hindu literature*.[10] Apart from 'Samhitaas' each Veda has been developed by human efforts with branches called 'Brahmanas', 'Aaranyakaas' and 'Upanishads' which are generally the records of discussions of the 'Samhitaas'.

An Upaveda exists for every Veda. Ayurveda, the science of life, for Rig Veda; Dhanurveda, the art of disaster management, for Yajur Veda; Gandharva veda, the science of fine arts, for Saama Veda; and Arthaveda, the science of wealth, for Atharvana Veda.

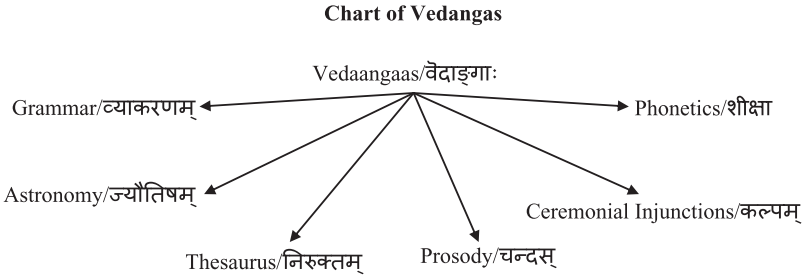
There are six Vedangas or the parts of Vedas called Vyakarana, grammar of Vedas; Chandas, the prosody in Vedas; Niruktham, the thesaurus of Vedas; Shikshaa, the phonetics in Vedas; Jyoutisha, astronomy; and Kalpa, the subject dealing with the ceremonial injunctions of principles in Vedas. *Both the Upavedas and Vedangas are the products of manual work.*

Chart 1



[10] श्रुतिस्मृतिविवादेषु श्रुतिरेव गरीयसि...,आम्नायप्रमाणम्, शब्दप्रमाणम्/ shruthismruthivivaadeshush-ruthireva gareeyasi...aamnaayapramaanam/shabdapramaanam

Chart 2 Chart of Vedangas



All the sciences or Vidya developed by the Hindu civilisation are the extracts of knowledge provided by Vedas. The historical records mention as many as 64 different branches of knowledge that were in practice, but today the literature of the past is available only for a few subjects. The below mentioned subjects could well fit for consideration for a study of the perspectives of water in Hindu/ancient Indian literature.[11]

Chart 3 Chart of literature considered

- Medicine[11]/Ayurveda, vaidyashastram/वैद्यशास्त्रम्
- Political Economy/Arthashastram/आर्थशास्त्रम्
- Architecture/Vaasthushastram/वास्तुशस्त्रम्
- Chemistry/Rasashastram/रसशास्त्रम्
- Law/Dharmashaastram/धर्मशास्त्रम्
- Literature/Kaavyaani/काव्यानि
- Astronomy/Jyoutisham/ज्यौतिशम्

Water in Hinduism

Excerpts from Verses: The abundant Hindu writings explain creation in various ways and contexts, but as mentioned earlier, the most authentic of the literature, the Vedas, describes 'Cosmology' through a set of hymns called Naasadiiya sooktham (नासदीय सूक्तम्....ऋग्वेदः..... 10.129) in the 10th 'Mandala' or the section of Rig

[11] Botany happens to be a part of the medical sciences, it is classically named as Vrukshaayurveda (वृक्षायुर्वेदः)

Veda. The Naasadiiya sooktham states figuratively that there was nothing called nothing/null/vacuum at the time of creation.[12] It clearly states that God did not craft this universe from nothing. There was something called *Ambah*,[13] the eternal and the most primordial state of elements.

Hindu or the Vedic philosophy suggests the presence of five constituents or elements 'Pancha Bhootas'; they are earth, water, fire, air and ether.[14] These elements emerged out of the 'Ambhah', one following the other. This proves that Hindu ideology had inferred that matter could neither be created nor be destroyed but only could transform, in the very early period of human history. Vedas describe that everything in this world is a mixture of the above said five elements in different proportions.[15]

Modern science speaks of 108+ elements which constitute the universe and are categorised according to their properties/features in the periodic table. These have been described under five major heads in the ancient Indian sciences thousands of years well before the construction of the periodic table.

The Ambhah advanced from ether to form to air; air emitted fire; fire moved on to shape water which, in turn, formed earth; and earth gave birth to life.[16]

Fire moved ahead to form water at 'Apraketa' (अप्रकेत) the subtle and 'Prakeeta' (प्रकेत)[17] the gross state. The 'Praketa' or the gross state of water is what is available to view, and hence, water is referred to as *Pancheekrutha tatvam.* This comes close to the proposition of modern sciences of water being a combination of two atoms of hydrogen and one atom of oxygen (H_2O).

The origin of the universe has been traced to water itself in many of our ancient texts. In the Taittiriya **Samhita**,[18] the existence of water in the beginning of creation is acknowledged, and similar declarations are made also in Satapatha Brahmana and Taittiriya Brahmana.

---

[12] नासदासीत् नोसदासीत्.....(ऋग्वेदः 10.129.1)/naasadaasiit nosadasiit.... Rigveda...10.129.1

[13] अम्भः/Ambhah

[14] इमानि पञ्च भूतानि पृथिवी वायुः आकाशः आपज्योतीषि.....ऐतरेयोपनिषत् ३-३/Imaani panchabhootani pruthivi vaayuh aakaashah aapajyotishi…..Aitareyopanishat….3.3 ???

[15] sarvadravyam paanchabhoutikamasminnarthe….Charakasamhitaa

[16] पृथिव्योष्धयः..... / tasmaadvaa etasmaadaatmana aakashassambhootah aakaashadvaayuh vaayoragnih agneraapah adbhyah pruthivi prutivyoshadayah…..taittariyopanishad….2.1.1

[17] तम आसित्तमसा गूढमग्रे प्रकेतम्। सलिलं सर्वदा इदम्। तुच्छेनाभ्वपिहितं यदासीत्। तमसस्तन्महिना जायतैकम॥/ tama aasittamasaa gudhamagre praketam. Salilam sarvadaa idam. Tuchchenaabhvapihitam yadaaset. Tamasastanmahinaa jaayataikam……Rigveda

[18] Taittariya samhitaa and vaajasaneeyi samhitaa are two samhitaa texts available for Yajurveda, of which taittariya samhitaa is not checked with prosody or chandas, a vedaanga and the vaajasaneyi samhitaa is bound by meters so could be concluded as more authentic. Taittariya samhitaa is popular in South India and Vaajasaneyi samhitaa in North India.

Several Upanishads[19] advocate 'The core of all creatures is the element earth and the essence of earth is water'.[20] 'The element earth sustains all creatures and the earth is sustained by water, the water gets transformed into herbs and vegetations, they in turn become flowers and then fruits and fruits support the creatures'[21] 'the water is the main ingredient of herbs and plants (in particular human beings)…'.[22] Every food has water as its constituent, and many times water will be a major constituent; hence, 'water is food'.[23] Brhadarhyaka Upanishad and 'Jaimini Upanishad' also say water was the primary element of creation.[24]

In 'Manusmriti', the book of law, Manu also cites 'water created the life'.[25] This is supplemented by Bhagavad Gita which says all living beings originate from food; the food is a creation of rain that is water; rain is a derivative of Yajna and Yajna activated by Karma.[26]

In the Shwetashvataropanishat, "God is proclaimed to be the source of five elements, the building resources of the cosmos; metaphorically, the almighty himself is professed as the five elements".[27]

Hence, Vedas describes water as 'Devatha', a synonym for God or 'Paramatma', the supreme soul.[28] Water is the light, the essence, the nectar and the god, the Brahman.[29]

Perceived Benefits of Water

Jeevanam is a word given to water in Vedic language and Sanskrit, the language of Indian scriptures, spoken language of ancient India and the language that linked the whole of India till the spread of English education in the country and is still studied in every part of India.

---

[19] There are more than 100 upanishads identified, the most famous among them being Esha (ईश), Kena (केन), Katha (कठ), Munda (मुण्ड), Mandukya (माण्डुकय), Pashna (प्रशन), Taittariya (तैत्तरीय), Eteraya (एतेरय), Chandogya (छान्दोग्य) and Bruhadaranyaka(बृहदारण्यक).

[20] ऐषां भूतानाम् प्रुथिवी रसः प्रुथिव्या आपो रसः.....छान्दोग्योपनिशत्...१.१.२ Aeshaam bhootanaam pruthivi rasa, pruthivyaa aapo rasah…Chandogyopanishad 1.1.2

[21] एषां वै भूतानां पृथिवी रसः पृथिव्या आपः आपां ओषधयः ओषधीनां पुष्पाणि, पुष्पानां फलानि,फलानां पुरुषः.....बृहदारण्यकोपनिषत्.....६.४.१/ Esham vai bhootaanaam pruthivi rasah, pruthivyaa aapah, aapaam oshadhayah oshdhinaam pushpaani pashpaanaam phalani phalaanaam purushah… Bruhadaranyakopanishat..6.4.1

[22] आप ओषधयो वनस्पतयः.....तैत्तरीयोपनिष्त्...१.७.१/ aapa oshadhayo vanaspatayah….. Taittariyopanishat….1.7.1

[23] आपो वा अन्नम्....तैत्तरीयोपनिषत्..३.८.१/ aapo vaa annam… Taittariyopanishat….3.8.1

[24] आपोवा अग्रे इदमासन्..... aapo vaa agre idamaasan….Jaiminyopanishat

[25] आपो ऐव ससृज आदम्..... aapo eva sasruja aadam….Manusmrithi

[26] annaabhavati bhootaani parjanyaadannasambhavah yajnaadbhavatiparjanyah yajnah karma samudbhavah…Bhagavadgeeta

[27] श्वेताश्वतरोपनिषत्.....४.२/shetaashvataropanishat….4.2

[28] आपो वै देवता..... aapo vai devataa…Yajurveda..14.20

[29] आपो ज्योती रसोऽमृतम् ब्रह्म भूर्भुवस्सुवरोम्..... aapo jyothi raso amrutham brahma bhoorbhuvassuvarom….Yajurveda…15.20

The word 'Jeevanam' is derived from the root verb 'jeeva' meaning 'Praanadharane', embracing life. Water is given the word Jeevanam to show its wonderful importance in life. Water is thus comprehended as the elixir of life.

Water is broadly found in scriptures as an utter necessity in 'snaana' (bathing), 'paana' (consumption), 'shoucha' (cleansing), 'chikitsaa' (relieving), 'upachaara' (hospitality), 'krushih' (farming) and 'tarpanam' (consoling).[30,31]

India, being a peninsula, trade associated with the means of water could never be ignored not just in the past but also at present. The word navigation is derived etymologically from the Sanskrit word 'navah' meaning boat. The traces of maritime trade in India date back to the Vedic age where we find the description reading 'although the water voyages are extremely dangerous the heroic people will win it'.[32] Indus valley civilisation was an advanced urban civilisation that began to show visible growth in both the length and the frequency of maritime voyages by 3000 BCE.

Pic 1 Indian yacht as revealed in the Fra Mauro map (1460). Source: http://en.wikipedia.org/wiki/File:WorldShips1460.jpg

The epic *Ramayana* depicts the presence of widespread waterways across the kingdom of Kosala; this is proven by the narration in the epic that Bharatha was supplied 500 different varieties of beautifully decorated strong boats by Guha to cross across Ganga with loads of commodities.[33,34]

---

[30] स्नानपानशौचचिकित्साकृषिस्तर्पणम्...../ snaanapaanashouchachikitsaa….Ayurveda

[31] snaanapaanaavagaaheshu hitamambu yathaamrutham

[32] समुद्रं न सन्चरणे सनिष्यवः....ऋग्वेदः/ samudran na sancharena sanishyavah…..Rigveda

[33] ते तथोक्ताःसमुत्थाय त्वरिता राजशासनात्। पञ्च नावां शतान्याशु समानित्युः समन्ततः॥ २.८९.१० Te tathoktaah samuththaaya tvarithaa raajashaasanaath| pancha naavam shataanyaashu samaanityuhu samantatah.....2.89.90

अन्याः स्वस्तिकविज्ञेया महाघण्टधारा वराः। शोभमानाः पातकाभरियुक्तवाताः सुसंहताः॥ २.८९.११ anyaah svastikavijneyaa mahaaghantadhaaraa vaaraah| shobhamaanaah paatakaabhiryuktavaataah susamhataah.....2.89.11

[34] ततः स्वस्तिकविज्ञेयां पाण्डुकम्बलसंवृत्तामाम्। सनन्दिघोशां कल्याणीं गुहे नावमुपाहरत्॥ २.८९.१२ Tatah svastikavijneyaam paandukambalasamvruttaamaam| sanandighoshaam kalyaaneem gruhe naavamupaaharat….2.89.12

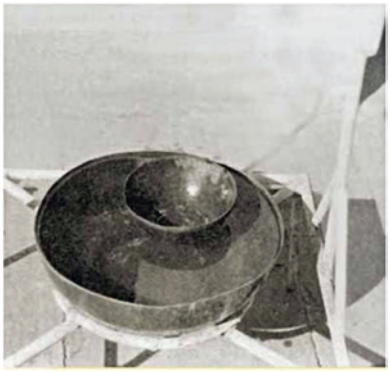
Pic 2 Satellite picture of the submerged Rama Setu Bridge constructed across Palk Straight connecting India and Sri Lanka as recorded by NASA. Source: https://www.google.co.in/search?q=Images+of+rama+sethu+along+in+the+Indian+ocean&tbm=isch&tbo=u&source=univ&sa=X&ei=UgCnUsk_yZKuB_ydgMgJ&ved=0CDMQsAQ&biw=1708&bih=739&dpr=0.8#facrc=_&imgdii=_&imgrc=lDV8aNtVlC2mJM%3A%3BelZYm8FRvWRf-M%3Bhttp%253A%252F%252Fwww.hindujagruti.org%252Fnews%252Fout%252Fimages%252F1361610027_ram-setu.jpg%3Bhttp%253A%252F%252Fwww.hindujagruti.org%252Fnews%252F15743.html%3B350%3B225

The maritime trade had also developed well under the rule of the predecessors and successors of Rama. Also it is well known that Rama got a viaduct erected between the mainland of India and Sri Lanka to make it to the city of Lanka to fight Ravana for bringing Sita back.

Water in India has also been employed for composition of music through a mechanism of a set of ceramic or metal cups of various volumes. This is named *Jalatarang*. The earliest references to this apparatus can be traced from the same epic of 'Ramayanam'.

Pic 3 Jalatarang maestro in action. Source: https://www.google.co.in/search?q=pictures+of+jaltarang&biw=1600&bih=828&source=lnms&tbm=isch&sa=X&ved=0ahUKEwi3jJKF5JLNAhVJKo8KHS0EBkcQ_AUIBigB#imgrc=3KevfGqQON0glM%3A

A type of water clock called ghati[35] yantra was very much in use; traditionally this clock was used to set time for auspicious ceremonies; the bowl, with a small hole at its bottom, sinks after 24 min.



Pic 4 Ghati yantra. Source: Science in Ancient India, a Presentation by Michel Danino

Figuratively, the nature of water is used in several places. 'Water that rains into a fortress runs among the hills so does the Dharma in the form of its result/effect'.[36]

Chanakya in his treatise on conduct 'Chanakya Niti' has described the importance and benefits of water, so 'in the whole world, there are only three precious pearls: water, food and the subhshitas, the adages found in Sanskrit language'.[37]

Medicinal Properties of Water

Water, one of the five basic elements, is considered as a building material, a sustaining force and also as a curative medicine in ancient Indian culture. The earliest recorded Vedic literature, Rig Veda, describes water as the universal medicine.[38]

[35] A unit of time called ghati equal to 1/60th of a day.

[36] यथोदकं दुर्गे वृष्टं पर्वतेषु विधवति। ऐवं धर्मान्पृथक्पश्यान् तानेवानुविधावति॥..कठोपनिषत्..२.१.१४..... yathoodakam durge vrushtam parvateshu vidhavathil evam dharmaanpruthakpashyaan taanevaanuvidhaavathi……..Kathopanishat……2.1.14

[37] Pruthivyaam treeni rathnaani jalamannam subhashitham…..chanakyaniti

[38] Aapa idvaa u bhishjiraapo amiivachaatanih aapah sarvasya bheshajiistatre krunvanthu bheshajam….Rig 8.7.24

Ayurveda, the science of life and a derivative of Rig Veda, has embraced the Vedic principle of the universal usage, applicability and employment of water to the fullest extent. Ayurveda advocates various treatments employing water and various methods of consuming water, defines time to consume water, says how to consume and describes the various dimensions of water such as cold water, hot water, heated and cooled water, rainwater, lake water, well water, ice and so on as a medicine or otherwise.

Ayurveda describes water as the life of all living beings. The world is predominantly watery when in health or in ill health, and there can be no life without water.[39] Water is used both as an independent medicine and a base medicine. Ninety percent of the Ayurvedic medicines are concoctions of water. Water, as a medicine, has both internal and external uses as per science. Hydrotherapy, a concept of naturopathy, has got its roots in Ayurveda.

Aqua is a major chemical required for digestion of food taken in. It is advisable to sip little water during meals.[40] It is an adage prevalent in Ayurveda that during indigestion the right and suitable food is water,[41] preferably hot water. Water taken before meals will dampen the 'Jatharaagni' (the digestive power) and dilute the digestive juices, and in the long run, it results in malassimilation (ineffective assimilation). Water, when taken immediately after meal, causes obesity, and hence, it is advisable to take little water in the course of meals.[42] The same theory is propounded in other text quoting water consumed in the middle, at the end and in the beginning results in a balanced structure, obese structure and a lean structure, respectively.[43] The food doesn't get digested and assimilated if water is consumed in very high quantities. The same problem occurs when water is consumed in too low quantities. For good appetite it is essential that more water is consumed intermittently.[44]

---

[39] पानीयम् प्रणिनाम् प्राणः विश्वमेवच तन्मयं नहि तॊयाद्विना वृत्तिः स्वस्थ व्याधितस्यवा..... अष्टाङ्गसङ्ग्रहः paaneeyam praaninaam praanah vishvamevacha tanmayam nahi toyaadvinaa vrittih svasthavyaadhitasyavaa……Ashtaangasamgrahah

[40] अशीतश्चॊदकं युक्ता भुन्जानश्चान्तरां पिबॆत्.....सुश्रुतसंहिता asheetashchoodakam yuktaa bhunjaanashchaantaram pibeth……..sushruthasamhitaa

[41] Ajeerne bheshajam vaari jeerne vaari balapradam bhojane chaamrutham vaari bhojanaanthe vishapradam…….Chanakyaniithi

[42] Bhukthasyaadau jalam piitham kaarshma mandaagni doshakruth madhyegni deepanam shreshthamanthe sthoulya kaphapradam

[43] Samasthoolakrushaabhuktha madhyaantha prathamaambupaah…….Ashtaangahrudayam Sutrasthana 5

[44] अत्यम्बुपानान्न विपच्यतॆऽन्नं निरम्बुपानाच्च सयॆव दॊषः तस्मान्नरॊ वन्हिविवर्धनाय मुहुर्मुहुर्वारि पिबॆद्भूरि.....……सुश्रुतसंहिता atyambupaanaanna vipachyatennam nirambupaanaachcha sayeva doshah tasmaannaro vanhivivardhanaaya muhurmuhurvaari pibedvaari.....sushruthasamhitaa

Water taken at dawn works like the heavenly nectar, and in the process of assimilation, it bestows strength; water works like poison when taken immediately after food and as a medicine when properly employed during disease condition.[45]

Drink water at the end of night/daybreak[46] says Ayurveda; this is widely referred to as 'Ushah Paana' (उषः पानम्) (drinking of water during dawn), performed as a routine cultural practice by Hindus.

Astaangahrudayam, a prominent ancient text of preventive medication written by Acharya Vagbhata, prescribes water to be sipped not drunk at once; water should be consumed at least 45 min before food and 90 min after food.

Charaka Samhita written by Charaka also substantiates the statements made in Ashtangahrudayam, while stating that water becomes toxic when consumed at the end of a meal.

Sushruta Samhita written by Sushruta also says that water becomes toxic when consumed in too much quantity, and it is also toxic not to have water at all.

Ayurveda identifies three main defects in the human body[47] called 'vata dosha', 'pitta dosha' and 'kapha dosha'; a balance of vata, pitta and kapha indicates a normal/good health of the body; and an imbalance of them indicates ill health termed with the said doshas or defects. For those who suffer from 'vata dosha', Ayurveda advises swigging hot water, and for those anguishing from 'pitta dosha', drinking cool water is recommended.[48]

[45] उषःकाले अमृतम्वारि जीर्णेवारिबलप्रदम् विषवद्भोजनान्तेच भैषज्यम्मोगपीडिते.....चरखसंहिता Ushah kale amrutham vaari jeerne vaari balapradam vishavadbhojanaanthe cha bhaishajyamrogapidithe……Charakhasamhitaa

[46] निशान्तेच पिबेद्वारि……Nishaantecha pibedvaari

[47] वातपित्तकफदोषानि त्रीणि/ Vaathapiththa kaphadoshaani thriini

[48] Ushnam vaathe kaphe piththe raktha cha shiithalam ……Sushrutha Sutraani….46.435

Warm water restrains the imbalances of vatu and kapha, releases fat, increases the volume of the urine excreted (vasti shodhak) and dispels or reduces fever. It is favourable in the cases of cough and difficulties of breathing and is nourishing always.

Water boiled and reduced to a quarter of the initial quantity and then cooled removing its froth and ebullition would be light, clear and safe for everyone and helps balance the tri defects (vata, pitta and kapha) of the body. It is also known to be beneficial in treating diseases acquired by overconsumption of wine, dysentery, skin burns, bloody mucus, effects of any absorbed toxins, vomiting, catarrh, vertigo and unconsciousness.

Water boiled in the previous night is not recommended for quenching thirst as it would probably have acquired acidic taste and may cause kapha defect. The tender coconut water is grave and soothing, cool, enjoyable and delicious. It enhances urination, secretes semen and desists thirst and pitta defect.

Cold water is known to be helpful in treating epilepsy, in summer, in the condition of excessive body heat, the imbalance of Pittam, treating blood poisoning, problem associated with excessive consumption of wine, the state of unconsciousness, exhaustion, vertigo or dizziness, tamaka and nausea. Although cold water is good and is recommended to be used as medicine, its use is not advised under conditions, such as pain at the sides (pleurodynia), catarrh, rheumatism, diseases of the larynx, distention of the stomach by gas or air, cases of undigested faeces, acute stage of fever, just after the exhibition of any emetic or purgative remedy, severe cough and soon after consuming fatty or oily drinks or Snehapaana acute cold, vaatha diseases, sore throat, gastritis, constipation, fever immediately after dysentery and nausea, during hiccups and on consuming more of oily food.[49]

Minimum consumption of water is advised for a person suffering from loss of savour for food, heartburn, oedema, any of the wasting diseases, weakened digestion, abdominal dropsy, skin diseases, fever, diseases affecting the eyes, ulcer and diabetes (Madhumeha, etc).[50]

As already stated, in addition to internal use, Ayurveda also recommends the external use of water as a way of maintaining good health and also as a therapy. Ayurveda mandates that every human to bathe every day.[51] This is also a natural requirement in India as the weather conditions are mostly hot and humid throughout

[49] पार्ष्वशूले प्रतश्याये वातरोगे गलग्रहे। अधमाने स्थिमिते कोष्टे सद्यः शुद्धे नवज्वरे। हिककायां स्नेहपीतेच शीतांबु परिवर्जयेत्॥ सुश्रुत सम्हिता सूत्रश्तन ४५....Parshwashoole prathishyaaye vaatharoge galagrahel Aadhmaane sthimithe koshte sadyah shudde navajware hikakaayaam snehapeethe cha sheethaambu parivarjayeth (Sushruthasamhitha. Soothrasthana. 45.)

[50] An extract from the Sushruta Samhita edited and published by Kaviraj kunja lal bhishagratna with a full and comprehensive introduction and plates (in three volumes) Kalyanaraman.

[51] दीपनम् वृष्यमायुश्यम् स्नानमूर्जा बलप्रदम् कदूमलाश्रमस्वेदतन्द्रा तृत् दाह पापजित्/Deepanam vrushyamaayushyam snaanamurjaa balapradam kadumalaashramasvedatandraa truth daaha paapajith

the year. Further, it recommends massaging of the body and head with oil before bath.[52] A bath increases appetite, gives strength, adds years to life, enhances agility, nourishes and helps overcome itching, toxins, fatigue, sweating, lethargy, thirst and heat.

‘Foot bath’ is generally understood as a curative measure in naturopathy, whose origin is attributed to other than Indian. But precise reference is there in Ayurveda texts about bath. Foot bath improves eyesight and pacifies the mind.[53] This rejuvenates the circulatory system. This foot bath is recommended for curing acute headache, insomnia, disorders related to blood pressure, etc.; for a hot hip bath, the water should be around 40°C and the duration is 10 min.

Water is just H_2O at all places and at all times. But Ayurveda takes a different view. The quality and properties of water change in a subtle way depending on the season.

The seasonal impact on water is propounded as follows. ‘Although water in the spring (वसन्त ऋतु) season is sweet, owing to the generation of an astringent taste,[54] it has a sort of dry quality’.[55] In the summer (ग्रीष्म ऋतु) season, as temperature swells, water shuns surplus emanations in the body.[56] ‘The water in the rainy (वर्ष ऋतु) season is harder and causes secretions, in addition to being sweet and fresh’.[57] The same water during autumn (शरत् ऋतु) season satiates better, is light and doesn’t aggravate secretions in the body.[58] In the snowing (हेमन्त ऋतु) season, water is relatively heavy and bestows lubrication, power and strength and enhances comfort.[59] In the winter (शिशिर ऋतु) season, heat in the water is very little, and it will be light and conquer kapha and vaatha.[60]

---

[52] अभ्यङ्ग स्नानम्/Abhyanga snaanam

[53] पादावगाहनेन नेत्रपाटवः मनःशान्तिश्च/ Paadaavagaahanena netrapaatavah manah shaanthishcha

[54] ಒಗಚು/**Ogachu**

[55] कषाय मधुरं रूक्षं वासन्तिकं जलम्.....चरक संहिता सूत्रस्थानं २७, Kashaya madhuram rooksham vaasanthikam jalam. (Charakasamhitha.Soothrasthana.27)

[56] गरिष्मिकं तु अनभिष्यान्दि जलमित्येव निश्चयः.... चरक संहिता सूत्रस्थानं २७ Graishmikam thu anabhishyandi jalamithyeva Nishchayaha (Charakasamhitha.Soothrasthana.27)

[57] गुर्वभिष्यन्दि पानीयं वार्षिकं नवं..... चरक संहिता सूत्रस्थानं २७ Gurvabhishyandi paaneeyam vaarshikam madhuram navan. (Charakasamhitha.Soothrasthana.27)

[58] तनुलाघवन्भिष्यन्दि प्रायः शरदि वर्शति..... चरक संहिता सूत्रस्थानं २७ Thanu Laghvanbhishyandi praayaha sharadi varshathi (Charakasamhitha.Soothrasthana.27)

[59] हेमन्ते सलिलं स्निग्धं वृश्यं बलहितं गुरु..... चरक संहिता सूत्रस्थानं २७ Hemanthe salilam snigdham vrushyam bala hitham guru (Charakasamhitha.Soothrasthana.27.)

[60] किञ्चित्तप्तो शिशिरे कफवातजित्..... चरक संहिता सूत्रस्थानं २७ Kinchith taptho Shishire kaphavaathajith (Charakasamhitha.Soothrasthana. 27.)

Fasting once in a fortnight, preferably on the 11th day, Ekaadashi, is a part of religious practice. No food is recommended for consumption on that day. Fasting to cleanse the body happens to be the spirit of the practice. In either case fasting turns out to be beneficial when sufficient water is consumed. The water consumed cleanses the entire gastrointestinal trail and eliminates the lingering faecal stuff from the large intestine and the rectum thus checking putrification. This improves appetite and reduces the toxic condition in the body. It also helps one to control one's tongue and gluttony (palate).

The attributes of rainwater gathered prior to the contact with land are listed by Sushruta in the 45th branch of suthrasthana in his samhitha. 'It beats the disparities caused by Vaatha, Piththa, Kapha; offers vigor, augments the seven building materials of the body known as sapthadhaathus, enhances the brain activity. Once it touches the land its quality changes according to the quality of the terrain'.[61]

The water of rivers, (which drain the Jangala, desert countries) flowing into the western sea is light and, therefore, wholesome. The river waters that cross marshy (Anupa) areas and join the eastern oceans are heavy, and as such its use is restricted to minimum since they increase the oily secretions of all the organs. The water of rivers, which runs into the southern sea, is neither too heavy nor too light owing to the fact of its traversing countries which have a 'Sadharana' (ordinary) character.

The waters sourcing from the Sahyadri mountains are unsuitable for the skin, while the water originating in the mounts of Vindhyas causes leprosy and Jaundice. The water of rivers, which rises in the Mount Malaya, begets worms and intestinal vermin, while the water sourced from the Mahendra Mount begets elephantiasis and abdominal dropsy. The water of rivers, which rises in the Himalaya, produces angina pectoris, Hridroga, anasarca, diseases of the head, elephantiasis and goitre. Similarly, the water, which drains the eastern part of the land of Avanti or flows across its western fraction, begets piles, while the water that rises in Paripatra Mount is nourishing, strength giving and favourable to health. The water in a Jangala country is free of baneful traits, ideal and acidic in digestion (Vidahi), possesses commendable qualities and is pleasing and cooling. The water of a Sadharana, a temperate country is light, cool, enjoyable and tasty or Dipanam.

The waters of swift-moving and clear rivers are light and that of slow-moving and enclosed with mosses and marine growth and are weighty. The river waters of the Murudesha, presently Marwar in Rajasthan, will be saline, bitter or sweet tasting and are easily digestible and strength giving.

[61] गगनाम्बु त्रिदोषघ्नं गृहीतं यत् सुभाजने। बल्यं रसायनं मेध्यं पातापेक्षी ततः परम्॥ Gaganambu thridoshagnam Griheetham yath subhaajane।Balyam Rasaayanam medhyam paathaapekshee tathah param॥

The lake water quenches thirst, gives strength, tastes sweet and is also harsh. The pond or tank water produces Vayu, tastes sweet and is harsh and strong for digestion. The water from a large tank or Vapi supresses the imbalances of Vayu and Kapha and causes Pitta defect, is strong in taste and will be charged with alkaline solution. The waters of Chunti are good for digestion, cause dryness and taste sweet. The well (Kupa) water is appetising and causes Pitta defect. The fountain water will be light, appetising and enjoyable to drink and destroys Kapha defect in the body. The Artesian spring water tastes sweet and restricts Pitta defect. It acts as an antacid for digestion. The water of Vikira is supposed to be light, strong in taste and alluring and charges with Khara or potash.

Water which gets collected in an open area or on fallow area is grave for digestion and augments the tri defects of the body. So does the water of Palvalam, a king of waterbody. Seawater smells fishy, tastes saline and aggravates all the defects in the body.

All kinds of surface water must be collected early at dawn as that part of the day is coolest and fresh; these two attributes by far from the most commendable traits in water.

Waters getting in contact with the sunlight in the day and reflecting moonlight in the night doesn't cause Kaphdosha or dryness, and as such it is equivalent to the purest form of rainwater. Rainwater collected in good container holds the virtue of suppressing the three imbalances of vaata, pittah and kapha in the body and behaves as an elixir.

The cool and limpid washings of the gem known as the Chandra kanta Mani (the moonstone) is believed to possess the supernatural powers of warding off the strikes of beasts and evils and subdues the imbalance of Pittam. They are beneficial in fever and poisoning cases marked by a burning sensation of the body, etc.

Prayers on Water

Worshipping is the most significant part of Hindu faith. The Hindu school of thought emphasises that submitting oneself and expressing gratitude to the almighty is the most vital of routines of every human being. The directives revealed in Veda Samhitaas or any other text is mostly in the form of prayers. Hence, 'Prarthana' or praying is a canon for a Hindu, and thus, 'Prarthana' is interwoven with life completely by Hindus who pray to everything everywhere and at every step of life.

But prayer, as is presumed in general, is not a moment chosen to beg God to bless us with what we need, but actually a prayer is a declaration to commit oneself to do what is required to achieve a need.[62] Hence, everyone is required to take a pledge do the best to the nature everyday while praying for receiving all that we need from it.

[62] प्रार्थना वै संकल्पः.....निरुक्तम्/praarthanaa vai sankalpah.....Niruktham

Water, a very beautiful and precious part of nature, is revered with utmost devotion. There are innumerable hymns, statements and sayings in Veda Samhitaas and works affiliated to them such as Brahmanas, Aranyakas and other mythical works, such as Puranaas devoted to value the blessings that water bestows on living and command to preserve and safeguard it.

A very commonly used hymn in the Yajurveda states, 'Oh water you are a confirmed giver of happiness. For food and strength and to equip us to face the realities of life and to make us deserve happiness, please nourish us. Oh water, you fill the needed life into the food we eat, herbs we use. You are indeed our life giver through the food we partake. Let our creativity be enriched consuming you. The loving mother nourishes her progeny with food, milk and what not, so you are, oh water we shall become strong consuming you. Oh water, you want your abuser/enemy to get defeated I shall defeat such efforts wholeheartedly. Please bestow on me the best of powers'.[63]

Further, Yajurveda quotes, 'Let the water on earth, in the herbs, water in the clouds, the lord of water the paramatma guide me,[64] let the thundering clouds get converted into the sought after rain'.[65] It extends further and says, 'let the water be divine and peaceful which can fulfill our wishes, nourish us and be available for our consumption, let it shower on us from all sides to provide us health and happiness.[66] Let the water be helpful to us'.[67]

Rig Veda states, 'let the oceans be calm and peaceful and let the flowing rivers and water bodies bestow on us peace.[68] Let the clouds that move in the skies be peaceful.[69] Let the rains be helpful to us, the mankind'.[70]

---

[63] ओम् आपोहिश्ठामयोभुवस्तानऊर्जेदधातन महेरणायचक्षसे योवःशिवतमोरसःतस्यभाजयतेहनः उषतीरिव मातरः तस्माऽरङ्गमामवो यस्यक्षयाय जिन्वथ आपो जनयथाचनः(य़जुर्वेदः- ३६.१४,१५,१६)/ Om aapohishtaa mayo bhuvastaana oorje dadhaatana maheranaaya chakshase । yovah shivatamo rasastasya bhaajayatehanah ushateeriva maatrah tasmaa arangamaamavo yasyakshayaaya jinvatha । Aapo janayathaa cha nah ।.....Yajurveda.....36.14,15,16

[64] payah prithivyaa paya oshadhishu payo divyaantharikshe payothaah payaspathii pradishaasanthumahyam…..Yajurveda..18.22

[65] शं नः कनिक्रदद्देवः पर्जन्यः अभिवर्शन्तु (यजुर्वेद ३६.१०)/ sham nah kanikradaddevah parjanyah abhvarshantu….Yajurveda..36.10

[66] शन्नोदेवीरभिष्ट्य आपो भवन्तु पीतये, शय्योरभिस्रवन्तुनः (य़जुर्वेद ३६.१२)/sham no devirabhishtaya aapo bhavantu pitayeh shayyorabhisravanthunah……..Yajurveda…36.12

[67] आपः शन्तिः(यजुर्वेद ३६.१७)/Aapah shanthih…..Yajurveda 36.17

[68] शं नः सिन्धवः शमु शन्तौ आपः (ऋक् ७.३५.८)/sham nah sindhavah shamu shantau aapah……. Rigveda…7.36.8

[69] शं् नः अहिर्बुध्नियः (ऋक् ७.३५.१३)/sham nah ahirbhudniyah……Rigveda…8.35.13

[70] शं नः पर्जन्यः भवन्तु प्रजाभ्यः (ऋक् ७.३५.१०)/sham nah parjanyah bhavanthu prajaabhyah…. Rigveda…8.35.10

'The earth which is filled with deep-seas, brooks and straits whose cultivators yield victuals and survive in concert; where each alive being toils with vitality; such our motherland may rear us with her juices' states the Atharvanaveda.[71]

Shatapatha brahmana terms water as nectar.[72]

We find plenty of Vedic literature such as Parjanya Sooktham,[73] Varuna Sooktham, Prithivi Sooktham, Bhoo Sooktham and Aghamarshana Sooktham dedicated to studying and praying to water. Another such prayer, also referred to as Vedic National anthem, calls for timely rain and the earth to be full of vegetation.[74]

A rite called 'Udakashanthi' is observed along the length and breadth of India which is meant for creating a peaceful atmosphere, praying for timely and adequate rains.

Parjanya Yaaga is another religious ceremony conducted to invite rains through yagnas and yaagas that help in seeding of clouds.

Coconut plays a very important role in the Hindu worshipping. Coconut contains the purest form of water[75] that will be used as 'Kalasham' in which coconut will be placed on a pot containing water[76] adorned with beetle leaves or mango leaves; this arrangement occupies a very special place especially during festivities.

The initial habitat of Indians has been the basins of the seven rivers or the Saptha Sindhavah, and these rivers are Sindhu; the five rivers of Punjab, namely, Vitasta (Jhelum), Asikni (Chenab), Parushni (Ravi), Vipasha (Beas) and Satudru (Sutlej); and Saraswathi (Muller 1890, 12); the river Saraswathi is believed to have been buried underground due to certain geomorphological changes in the region.

[71] यस्यां समुद्र उत सिन्धुरापो यस्यामन्न कृष्टयः संबभुवुः यस्यामिदं जीवन्ति प्राणदेजत् सा नो भूमिः पूर्वपेयै दधातु.....अथर्व वेद कांड १२/yaasyaam samudra utha sindhuraapo yasaamanna krushthayah sambabhuvuh yaasyaamidam jeevanthi praanadejat saa no bhoomih poorvapeye dadhaathu....Atharvaveda..Kanda 12

[72] अमृता वा आपः.....शतपत ब्राह्मण १-९-३-७/Amruthaa va aapah.....Shatapathah Brahmana...1.7.3-7

[73] Parjanyaayapragaayatha…….Rigveda…..5.6.2

[74] काले वर्षतु पर्जन्यः पृथिवी सस्यशालिनी /Kaale varshathu parjanah pruthivi sasyashaalini

[75] Naarikelodakam snigdham svaadu vrishyam himam laghu trushnaapiththaanilaharam deepanam basthishodhanam…….Ashtaangahridayam…5.19

[76] कलशम्, कलशपूजा/kalasham/kalashapoojaa

The satellite imagery indicates that the Sutlej, a tributary of Sindhu, was feeding saraswathi, which flowed through Rajasthan. On the banks of these and many other rivers of India, many hymns are chanted to show gratitude towards the waters, to conserve them and to pray for their peaceful flow.

Pic 5 Person engrossed in the ceremonial drills on the bank of a river. Source: https://www.google.co.in/search?q=Priest+engrossed+in+the+ceremonial+drills+on+the+bank+of+a+river&biw=1024&bih=622&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjswP739arNAhVFGpQKHdVBDnsQ_AUIBigB&dpr=1#tbm=isch&q=a+hindu+priest+performing+the+sandhyavandana+on+the+bank+of+a+river&imgdii=gNRVdfYVXsJ8dM%3A%3BgNRVdfYVXsJ8dM%3A%3BBVaUReN6SgY5bM%3A&imgrc=gNRVdfYVXsJ8dM%3A

Water is remembered also in the literary works in fine descriptions, and it also happens to be a mandate to make a mention of water in any literary work. Kalidasa, in his drama 'Abhijnanashakuntala', says water is the first of all creation.[77] Maagha, in his Shishupaalavadham, says water was the first to be given birth.[78] Bana, in his 'kaadambari', recognises, 'it is trough water one can attain sanctity'.[79] Also there are a number of works available glorifying water, the most famous among them being Gangaastava of Shankaracharya and Ganglahari of Jagnnatha Pandita.

In the tradition of music, several tunes or ragas are devoted to invoking rains, the most famous being Amruthavarshini, Devaamruthavarshini in Carnitic stream and Meghamallala in Hindustani stream.

It should be specially noted that to achieve the happenings of all the above, a human being stands responsible to do all that those events require to happen. It would simply be a waste to pray for rains while razing down all the forests and

[77] यासृष्टिस्स्रष्टिराद्याः..... अभिज्ञानशाकुन्तला/ yaasrushtissrushtiraadyaah…… Abhijnyaanashakuntalaa

[78] पूर्वमेव किल सृष्टवानापः तासु वीर्यमनिवार्यमादधौ.....शिशुपालवधम् (१४.६७)/poorvameva kila srushtavaanaapah taasu veryamanivaaryamaadadau.....Shishupaalavadham..14.68

[79] AaÉxirÉÉãSrÉå ÌuÉzÉÑÎ®È.....MüÉSqoÉUÏ / Agastyoodaye vishudhdhihi……kaadambari

cutting down trees. It would be totally irrational to beg God to shower prosperity while polluting the water bodies. Often atheists blame or express their mistrust in God for not delivering justice and being a mute spectator of the chaos caused in the world, but the critics conveniently forget the misusing of nature man often resorts to due to his greed and ignorance. It is necessary to understand nature as a cohesive though complex system, and a deliberate damage caused to it will result in calamities, as a consequence. It is as simple a rule as to keep oneself healthy; good practices and following a good lifestyle are a need, but if not done, one succumbs to diseases.

Qualities of Water

In the Vedic science, the whole universe is understood to be made up of the five basic elements, namely, space,[80] air,[81] fire,[82] water[83] and earth.[84] The characteristics of these five elements have been defined by the ancient philosophers as sound,[85] touch,[86] visibility,[87] taste[88] and smell,[89] respectively. These elements are inert in nature and are perceivable by our sense organs, i.e. the ears, skin, eyes, tongue and nose, respectively.

All that can flow down and/or is susceptible to taste has the water element. The water element in the juice of a fruit or a vegetable is apparent. A piece of jaggery or sugar candy, though solid, has an element of water in a subtle form because they can be tasted. From this broad perspective, water is present in almost everything we use. It has been the culture of the land to treat every created thing with reverence containing five elements. They are all worshipped.

[80] आकाशम्, aakaasham
[81] वायुः, vaayuh
[82] अग्निः, agnih
[83] आपः, aapah
[84] प्रुथ्वी, प्रुथिवी, pruthvi
[85] शब्दः, shabdah
[86] स्पर्शः, sparshah
[87] रूपम्, roopam
[88] रुचि/रसः, ruchih/rasah
[89] गन्धः, gandhah

The five elements earth, water, fire, air and ether are perceivable by our sense organs; the converse are those that are perceivable by our sense organs are made up of these five elements. These are inert and are without consciousness.[90] Another entity is the subjective consciousness[91] which depends upon/ resides in a body for its manifestation and expression, and the actions and reactions of an inert body which are visible and can be experienced imply the presence of the subjective consciousness within that physical structure. This physical structure is made up of the five elements, water being one.

Ayurveda, the science of life describes water as that which is volatile, cold, heavy, sticky, relatively slow moving and dense,[92] and consuming it imparts to the body and mind a nature of attachment, dampness, rawness, freshness, enthusiasm and binding.

In Indian literature the qualities and the importance attributed to the water resource can be understood through a description of the words used to call it. In the language of Sanskrit, there are at least hundred words used for calling water. Sanskrit language which has its origin in the Vedic language has a very systematic procedure of developing a word. Every word is formed from a root called 'Dhatu' with its meaning 'Dhatvarthah'. In this process, water has been named with a meaning, describing its qualities accorded to it in the language. Some of the words used for water in Sanskrit with their meanings are listed below. The words are taken from Nirukta, the thesaurus of Vedas and Amarakosha, a book of synonyms of Sanskrit language.

Generally, in any language, most of the words get their meaning by the force of usage and convention. But the Vedic language and Sanskrit derive a word scientifically and rationally step by step in accordance with the well laid-down rules of grammar. In this process of derivation, they imbibe different features of the concept or the person or the creature in a codified manner, employing specific prefixes and suffixes; this is unique to Vedic language and Sanskrit.

A deep study of the words derived in the above manner unfolds different concept processes and applications related to, in the present context, the Water resource (Table 1).

---

[90] जड, प्रकृति, अचेतन/ Jada, prakruthi, achethana

[91] जीवात्मा/Jeevaatmaa

[92] द्रवशीतगुरुस्निग्धः मन्द्रा सान्द्र गुणोल्बणं आप्यम् विश्यन्दक्लेदप्रहलदबन्धक्रुत्.....अष्टाङ्गहृदयम् ९.६ drvasheetagurusnigdhah mandraa saandra gunolbanam aapyam vishyandakledaprahladabandhakruth……..Ashtaangahrudaam….9.6

Table 1 Dileneation of qualities of water as described in Vedic and Sanskrit language

S N	Root/धातु	Root meaning/धात्वर्थः	Meaning of the word/qualities of water
1	अम्भः, Ambah, आपः, Aapah	आप्लृ व्याप्तौ	That which spreads
2	वशिम्, Visham	वश्लिृ व्याप्तौ	That which expands
3	अहिः, Ahih	अहि व्याप्तौ	That which pervades
4	कबन्धम्, Kabandham	कमु कान्तौ	That which beholds, which binds the Praanavaayu, oxygen
5	मधु, Madhu	धम गतौ	That which is enjoyable as honey
6	पिप्पलम्, Pippalam	पॄ पूरणे	That which quenches thirst
7	क्षपः, Kshapah	षप प्रेरणे	That which quenches thirst and energises
8	पुरीषम्, Purisham	पॄ पालनपूरणयोः	That which nourishes plant and animal life, that which fills during Pralaya
9	जन्म, Janma	जनि प्रादुर्भावे	That which was formed in the beginning of the universe and that which gives birth
10	सुक्षेम, Sukshema	क्षी नविसगत्योः	That which settles/establishes all living creatures
11	जाम, Jaami	जन परादुर्भावे	That which is responsible for sprouts, growth and offshoots
12	आयुधान, Ayudhaani	यू मश्रिणामश्रिणयोः, युधि संप्रहारे	That which supports throughout the span of life of a creature, that which smashes on falling and flooding
13	सहः, Sahah	सह मर्षणे	That which gives strength, that which is strong, that which gives tolerance against heat/temperature
14	क्षोधः, Kshodhah	क्षुदर् सम्पेशणे	That which gets scattered on falling over the boulders while falling down from the mountains
15	घृतम्, Grtham	घृ क्षरण सेचने, दीप्त्योः प्रसवने	That which is sprinkled by clouds, which pours down, that which shines/reflects
16	कशः, Kashah	कश गतौ	That which rushes to a lower level
17	बुसम्, Busam	ष्णा शौचे, बुस वसिर्गे	That which cleanses, that which is renounced/released by the clouds
18	बर्बुरम्, Barburam	पॄ पालनपूरणयोः	That which fills and nourishes
19	सीरा, Siraa	सृ गतौ	That which is moving
20	धस्मन्वत्, Dhasmanvat	ध्वंसु गतौ	That which destroys which crosses its path of flow
21	अक्षरम्, Aksharam	क्षर सन्चलने	That which exists in different forms
22	स्रोतः, Srothah	सृ गतौ	That which springs and flows
23	सरः, Sarah, सलिलम्, Salilam	सृ गतौ, सल गतौ	That which flows

(continued)

Table 1 (continued)

S N	Root/धातु	Root meaning/धात्वर्थः	Meaning of the word/qualities of water
24	भेषजम्, Bheshajam	भषि चकित्सायाम्	That which heals, that which is a medicine or that which is employed in treatment
25	जलम्, Jalam	जल अपवारणे, जल घटने	That which is sharp and that which covers
26	तोयम्, Toyam	तु सौत्रोधतुः आवरणे	That which encompass
27	वारि, Vaari	वृङ् वरणे	That which is worthy of selection
28	कमलम्, Kamalam	कमु कान्तौ	That which is desired
29	पयः, Payah,पानीयः, Paaneeyah	पीङ् पाने	That which is worthy of drinking
30	क्षीरः, Ksheerah	घसलृ अदने	That which is potable
31	अमृतम्, Amrutham	मृङ् प्राणतयागे	Absence of which causes death and presence of which prolongs life
32	जीवनम्, Jeevanam	जीव प्राणधारणे	That which sustains life
33	पातः, Paatah	पा रक्षणे	That which protects
34	पुष्करम्, Pushkaram	पुष पुष्टौ	That which nourishes
35	भुवनम्, Bhuvanam	भू सत्तायाम्	That which exists predominantly
36	वनम्, Vanam	वन संभक्तौ	That which is shared, spring
37	उदकम्, Udakam	उन्दी क्लेदने	That which wets
38	अम्बू, Ambu	अबि,अभि शब्दे	That which drones
39	मेघपुष्पम्, Meghapushpam	पुष्प वकिसने	That which blossoms off a cloud
40	घनरसम्, Ghanarasam	रस आस्वादने	That which is tasty
41	धरुणम्, Dharunam	धृङ् धारणे	That which bares the earth, i.e. the life on earth
42	अरिन्दानि, Arindaani	रा दाने	That which bestows unparalleled happiness given by water

It is evident that water is not just H_2O, but an essential resource with many facets. As we delve deep into the meaning, usage and etymology of the above words, we'll be more than convinced that our ancestors had a holistic view of *water*. When these words are used repeatedly over time, the value of water is perceived by the one who uses these words. This goes a long way to give a stance to the user to diligently use the water resource. This has been finely woven into from the mundane to cultural practices.

Mythological Anecdotes

Fictions are enchanting; they mesmerise and sometimes entertain. These form the reasons for creation of anecdotes and stories. They surround famous personalities or things inevitable. Imagination, exaggeration and unrealistic things galore in them and are devoid of any utilitarian application. However, to illustrate, a few anecdotes related to water are narrated.

The Course of Ganges to Earth (Ramayana)

King Sagara of the Surya Dynasty chose to perform the Ashwamedha yagna, but his royal agents lost track of the sacred horse. Sagara directed his 60,000 sons to trace the sanctified horse. The conceited and mercurial princes ranted and raved from corner to corner of Bharat, blazing jungles and displacing life and chattels to locate the stallion. They lastly got to a calm site where the Sage Kapila was seated in rumination. Next to him was tied the white colt. The infuriated princes slammed Kapila as a crook and striked at him. The Sage then unlocked his eyes; his enormous strength crooked the princes into ruins. Sagara's grandson Anshuman went in search of both the horse and his uncles and converged with Sage Kapila who informed the prince on pleading that the lone way for the souls of the deceased princes to rise to bliss would be through the offering of 'Niravapanjali'[93] with the waters of the holy River Ganga, which flowed only in the paradise.

Bhagiratha's Tapasya[94]: Bhagiratha, a descendent of King Sagara who ruled over the kingdom of Kosala[95]; the kingdom had begun to lose its peace and prosperity on account of natural disasters due to the sins of the thousand princes multiplying in destructive energy, and Bhagiratha found the kingdom not possible at all to rule. So he turned over the empire to his ministers and set out to the Himalayas to do a grueling penance in the severe environment. For 1000 years, he carried out an agonisingly rigorous penance to please Lord Brahma to sanctify his territory with the waters of River Ganga. At the end of the penance, Brahma was pleased and made Bhagiratha aware to propitiate Lord Shiva, as just he was able to break Ganga's plunge. Ganga had a powerful flow and it would have been impossible for anyone to restrain the devastating impact of the event apart from Shiva.

[93] Niravapanjali is a sacred ritual in Hinduism where after the cremation rites, the ashes are ceremonially immersed in holy water by the closest relatives, so that the soul may rise to heaven.

[94] Tapas (tapas, Sanskrit: तपस्) means deep meditation, an effort to achieve self-realisation, sometimes involving solitude, hermitism or asceticism; it is derived from the root word tap (Sanskrit: तप् or ताप) which depending on the context means 'heat' from fire or weather, blaze, burn, shine, penance, pain, suffering or mortification.

[95] A kingdom in ancient India, which is now in the state of Uttar Pradesh.

Bhagiratha took to execute a tapasya (penance) centred on Lord Shiva as outcome of which Shiva came into sight and guaranteed Bhagiratha that he would make Ganga drop on his matted locks. Ganga then surged down from heaven, as Bhagiratha and celestial spectators were horrified of the growl and amount of water approaching. But Lord Shiva came into view under the flow and confined all of Ganga in his matted locks (dreadlocks) just prior to her fall on earth. Ganga arrived to this world because of Bhagiratha's labours, so Ganga is also named 'Bhagirathi'.

Jahnavi, the Daughter of Jahnu

Ganga came down in a destructive flow destroying Jahnu Sage's ashram. This angered Jahnu and took Ganga as 'aaposhanam'.[96] Bhagiratha after that pleaded Jahnu to release Ganga and Jahnu pleased. Hence, Ganga is also called *Jahnavi*. Ganga then ran over the relics of the 60,000 precursors of Bhagiratha and fetch to them moksha, the bliss.[97] Ganga is still deemed to run from Shiva's matted locks or jataa down to earth with a composed might.

River Cauvery

There are several legends about how the River Cauvery had her birth. In the Skanda Purana, Chaps. 11–14 narrate many of them. According to the most renowned account, when the grand sea was churned by the gods and the evils, in order to acquire Amrita, the elixir of life, Lord Vishnu transformed himself into Mohini, a non-peril of immeasurable prettiness, to avert the demons and bring back the elixir to the gods. Goddess Lakshmi along with Lopamudra were sent successively. Lopamudra was sent as an apsara to lend support to Mohini. After the elixir was fruitfully restored to the Devas, Lopamudra was espoused by Brahma as his inheritor.

Following this a little later, a sage of fame called Kavera implored to Lord Brahma that he sanctify him with an offspring. Brahma was pleased by his devoutness and bestowed him with Lopamudra. Lopamudra was christened as Kaveri after the Sage Kavera assumed to be her father.

Kaveri was extremely ardent that her father has all the pleasure and wealth in life and a consecrated terrain full of noble and blissful natives. So she departed to Brahmagiri and entreated Lord Brahma that she get transformed into a river and run

[96] Aaposhanam refers to taking a sip of water in a single palm, generally right palm. The quantity of water will only be covering the palm leaving fingers.

[97] Moksha (Sanskrit: मोक्ष moksha) or mukti (Sanskrit: मुक्ति) is liberation or release. In eschatological sense, moksha is liberation from samsara, the cycle of death and rebirth.

all through the state, dispensing her blessings on the citizens and making the land rich and productive. She also requested that her waters be so divine that all those who took immersed in it might be released of all their transgressions. Brahma approved her both the boons gladly and Kaveri was truly delighted.

But something else was to occur to her shortly. Sage Agastya saw her when she was intensely meditating on the Brahmagiri hill. He fell in love with her and proposed her to wed him. Even though her courage was set on becoming a river, Kaveri couldn't turn down Agastya. But Cauvery assured him that if ever he left her unaccompanied for long, she would encompass to disown him and get to her thoroughfare. Agastya pledged it and kept his word loyally for a short while. But one fine day, he was eventful in a philosophical debate with his followers and did not adhere to keep up to his time. Kaveri waited tolerantly and a little later, she leaped into Agastya's unique sacred reservoir and gushed from it. As the disciples of Agastya witnessed the happenings, they attempted to obstruct her surge. But Kaveri swiftly went subversive, come into sight at Bhaganda Kshetra, flooded on the road to Valambari and at last joined the Bay of Bengal, and since then River Cauvery is adulated as sacrosanct throughout her course of flow.

There is one more fascinating faith dealing with the River Ganges and Cauvery that these two join underground on one occasion in a year, at some stage, in the month of Tula cited in the Hindu almanac, with the purpose of cleansing herself of the contamination caused by the mass of sinners who immerse in her waters all through the year. Kaveri is contemplated to be as holy as the River Ganga, with the similar power to sluice off sins.

Bhagamandala, where Cauvery unites with the rivers of Kummahole, Hemavathi, Lakshmanatirtha, Shimsha, etc., is deemed to be a much sanctified place. Temples built all along the banks here are visited by immeasurable number of devotees.

Similarly, Tungabhadra and Papanasini Rivers which flow across the south Indian states of Karnataka and Andhra Pradesh are held to dispel people of their transgression on plunging in them.

Promoting Conservation and Protection

Conservation, protection and enrichment of all natural resources are the key duties assigned by the ancient Indian/Vedic/Hindu school of thought to every human being.

It has specially designated the job to 'Vysya', one among the four occupational categories Varnas of Brahmana, Kshatriya, Vysya and Shudra as explained by Vedas.[98] These four Varnas or occupational categories demarcated in the Vedic texts

[98] ब्राह्मणोऽस्य मुखमासीत् बाहूराजन्यः कृतः ऊरूतदस्ययद्वैश्यः पद्भ्यां शूद्रोऽजायत..... Brahmanaosya mukhamaasith baahraajanyah kuthah oorootadasya yadvaishyah padbhyaam shoodroajaayathah…Rigveda…10.8.90.12

are often misconceived to be castes. But this in reality is a theory proposing the necessity of four different categories of labour that are a definite and inevitable necessity of a given society.

A human society, at any point of time, will need four different kinds of labour: those who acquire knowledge and spread that knowledge, otherwise called as Brahmins; people who can physically protect society from any danger or disaster, the Kshatriyas; those who distribute the natural resources in the society, the Vysyas; and those who can help society with manual and art works, the Shudras. This is a natural division of labour and has just been indicated sociologically by Vedas. It is not a measure taken by Vedas to stratify a society.

The Vysya, in this context, gets a special reference as his basic duty is conservation, protection, enrichment and distribution of natural resources. But this does not mean that people, apart from Vysyas, do not hold any responsibility with respect to the upkeep of natural resources. Veda demands every human to perform 'Deva Yajna' every day. Deva Yajna refers to nothing but conserving natural resources and using the natural resources diligently and enriching them. Deva means the one who gives[99] and yajna means the best task[100]; performing the best task to the 'Deva' or God who has manifested himself through nature is a duty of every person, and we all are bound to do the best to the nature that has given us whatever we want without any expectation in return.

We find in many ancient scriptures like 'Manusmriti', the code of ancient times in India, several guidelines given repeatedly regarding the protection of waterbodies. It was prohibited to answer the call of nature in the vicinity of a river or a waterbody.[101] It was the responsibility of everyone to keep the river and its surroundings clean and pollution free. Manu instructs further stating 'On the land which is ploughed, in the pyre, on a mountain, in a dilapidated temple, on an anthill never urinate or pass stools'.[102] 'In borrows of animals, while walking, whilst standing, on the banks of a river, at the peak of a hill don't ever excrete'.[103] 'Don't ever defecate facing the breeze, blaze, intellectual, sun and water'.[104] 'Spread some pieces of wood, soil, grass or foliage on earth, dressing the head and the higher cadaver with clothes and eliminate wastes noiselessly'.[105]

---

[99] यज्ञो वै श्रेष्ठतमो कर्मः.....निरुक्तम्/yajno vai shreshtatamo karmah.....Niruktham

[100] देवो दानात्.....निरुक्तम्/ Devo daanath....Niruktham

[101] Naapsumootram puriisham vaa shtiivanam vaa samutsrujeth amedhyalipthamanyankaa lohitham vaa vishaani…….Manusmrithi…4.56

[102] Na phaalakrishte na jale na chityaam na cha parvathe na jeerna devayathane na valmalike kadaachana…….Manusmrithi…4.46

[103] Na sasathveshu gartheshu na gachchannapi cha sthithah na nadiithiiramaasaadya na cha parvatha……..Manusmrithi….4.47

[104] Vaayvagnivipramaadithyamapah pashyamsthathaiva gaah na kadaachana kurvanthi vishanmootrasya visarjanam……..Manusmrithi….4.48

[105] Thiraskrithyochchareth kaashtaloshtapatra trinaadinaa niyamya prathayo vaancham samvithaangovaguntithah…….Manusmrithi….4.49

Manu furthermore cautions ‘anybody who purges wastes facing fire, sun, moon, water, scholar, cow and breezing air will stand to lose his merits and goes insane’.[106]

Manu also imposes codes to prohibit the poisoning of waterbodies during wars which kill innocent people and cattle who draw and drink water from them, stating ‘Also through a war, the water sources belonging to the foes should not be contaminated, as water is priceless and is property belonging to everybody’, though it is contracted to be belonging to the monarch of the land.

Vaasthuratnaakara a renowned book of Architecture says, ‘one who renovates wells, tanks, temples gets eight times results than that of constructing new structures’.[107] Further, it also says ‘one who destroys, wells tanks or temples is a wicked person’.[108]

Padma Purana also rules that a person who pollutes waters of ponds, wells or lakes goes to hell.[109]

Vasishtasamhitaa penned by Sage Vasishta also states ‘do not foul brooks, lanes, pastures, parasol and community spaces by wastes’.[110] The reiteration of which is found in Taittariyaaranyaka that ‘no one should eject or pass urine or spit or bathe devoid of any clothes on the body in any water body’.[111]

---

[106] Prathyagnim prathisooryam cha prathisomodakadvijaan, prathigaam, prathivaatham cha pranchyaa nashyathi mehanah……Manusmrithi……4.50

[107] वापीकूपतडागेषु देवतायतनेषु च जीर्णान्युध्दरते यस्तु पुण्यमष्टगुणं भवेत्.....वास्तुरत्नाकरः/ vaapikoopatadaageshu devataayaaneshu cha jeernaanyudhdharathe yasthu punyamashtagunam bhaveth.....Vasturathnaakarah

[108] वापीकूपतडागानामाराम् सूरवेश्मतामग्र उच्छेदते निराऽशंक स विप्रो म्लेच्छ उच्यते १८३/vaapiikoopathadaagaanaamaaraam sooraveshmathaamagra uchchedathe niraashanka sa mlechcha uch yathe.....183

[109] सुकूपानां तडागानां प्राणानां च परंतप सरसा चैव भैत्तारो नरा निरयगामिनः पद्मपुराणः १९-७-८/ sakoopaanaam tadaagaanaam praanaanaam cha pramthapa sarasaa chaiva bhaiththaaro naraa nirayagaaminah.....Padmapuraanah...19.7.8

[110] न नद्यां मेहनं कुर्यान्नपथिनच भस्मनि न गोमये न कृष्टेनोप्ते शाडलोपजीव्य चायासु..... वसिष्टसंहिता/na nadyaam mehanam kuryaannapathinacha bhasmaani na gomaye na krushtenopthe shaadalopajeevya chaayaasu.....vasishtasamhithaa

[111] नाप्सु मूत्रपुरीषं कुर्यात्, न निष्टीवेत्, न वा विवसनः स्नायात्.....तैत्तरीयारण्यकः/naapsu mootrapuriisham kuryath na nishtiiveth na vaa vivasanah snaayaath.....Thaiththariiyaaranyakh

Religious Abuses and Misconceptions

It is extremely sad to find water is being polluted by misconceptions and mistaken notions in the pretext of religion which advocates strongly to keep waterbodies free of pollution. River Ganga is a classic example for the rumpus caused by Hindus for wrongly perceiving religion. Vedas have proclaimed to burn bodies on death very clearly[112] but this has not been adhered to by many. The dead, decaying and polluting matter is discarded into the waterbodies without hesitation, and no consideration is set to the values advocated by the great men of the past to adore the natural resources. This is very harshly condemned and is severely punishable under all circumstances in the scriptures.

Sustainable Practices

a. *Natural Farming*: All the civilisations of the world flourished along river banks, with agriculture as a primary occupation. But the Indus Valley civilization did not only flourish on the banks of Sindhu River but also developed into the richest economy in the world depending on agriculture till the advent of British in India. Agriculture in ancient India was the epitome of trades being the provider of all the basic raw materials necessary for survival; this principle has been highlighted by Vedic philosophy stating 'Oh humans toil, work on fields, the prosperity that comes in this way is most tenable and safe, so experience the riches that is procured through this course as the whole lot, do not ever succumb to stake'.[113] Agriculture is the most eco-friendly vocation humans can perform even in the present day and for times forward. Only agriculture can supply food and shelter to mankind. Hence, dependence on agriculture is the only sustainable way of life. Conventionally in India natural farming acknowledged as 'Rishi Kheti', the method of farming followed by sages and a method of cultivation that uses least or no application of fertilizers, even natural and water, were in practice; Indian agriculture featured multi-cropping, use of local and natural varieties of seeds, maximum dependence on rain and minimum dependence on artificial irrigation

[112] भस्मान्तं शरीरम्.....यजुर्वेदः 40.15, Bhasmaantam shareeram….Yajurveda…40.15

[113] अक्षैर्मा दीव्यस्व कृषिमित् कृषस्व वित्ते रमस्व बहुमन्यमानः.....ऋक्ü 10.34.13, krushimit krushasva akshairmaa divyasva, vitte ramasva bahumanyamaamaanah……Rigveda 10.34.13

by tanks and wells. This method of farming demanded an optimal utilisation of local resources, saved a lot of resources and thus was totally sustainable.

The statistical data of agricultural production in India prior to the arrival of Britons show the numbers much higher than what is being achieved today with the application of chemical fertilisers, insecticides, pesticides and sowing of hybrid or genetically modified seeds in the fields. This practice of using chemical fertilisers and hybrid or genetically modified seeds is not only degrading the soils' quality by mineralising them but also demands higher usage of water.

(b) *Common or Community Wells*: Vedas recommend people to maintain common sources of water, common eating habits, equal labour and equal responsibility so that everyone in the society moves ahead together as a wheel moves with numerous spokes stuck to it from the centre.[114] So it was usual to find in the villages and towns of India to have common sources of water such as a village well or lake against the present-day policy of one tube well for every household. This guaranteed sustainable mining of underground water.

(c) *Joint Family System*: Joint family was a striking arrangement made for an efficient utilisation and management of natural capital. The system ensured reduced burden on natural resources with a common living area at the first place. That common living area was passed on to the forthcoming generations again reducing burden on natural resources. Common hearth, the use of good quality materials that provided extremely good durability, was very much stressed upon for the purpose of passing on things to the following generations. The use of granite for constructing houses, good quality teak and high-quality metals that had medicinal properties such as bronze, brass, copper for utensils were a common practice. From a sociocultural dimension as well, joint family or at least extended families with parents, brood and grandparents would give physical, psychological and social security to all the members reducing the number of destitute in the society. Also the system spelt an unwritten law against fragmentation in the society.

[114] समानी प्रपा सहवॊन्नभागः समाने योक्त्रे सहवॊयुनज्मि सम्यञ्चॊऽग्निम् सपर्यतारा नाभिमिवाभितम्.....ऋग्वेद samaanee prapaa sahavoonnabhaagah, samaane yoktre sahavoyunajme samyanchoognim saparyataaraa naabhimivaabhitam……Rigveda

Awareness Through Belief Systems

Apart from religious mandates, common belief systems also helped maintain social harmony and ecological balance in the past.

It is believed all over India that 'water' should never be refused to be given to anybody when asked; if done so one will take the life of a lizard in the next birth.

There is also a belief, in normal circumstances, a person should not bathe for more than once in a day and should never take a second bath in the noon because a bath at that time implies death in the family.

Making drawings and designs on floors and walls using water is prohibited; these beliefs uphold the value of water and prevent its wastage.

Similarly during festivities, during the celebration of Gauri festival in southern state of Karnataka in particular,[115] to manage water and also time, some of the family members avoid or postpone taking 'Abhyanjana', a head bath, to the next day on the pretext that the goddess Gauri will have headache if taken bath on that day; this seems to have originated in joint family setups.

It is also believed that in the monsoon month of 'Ashada' (usually the months of July and August), no ceremonies or celebrations such as weddings, the thread ceremony or any like must be held. Since the season is monsoon season, it is recommended to concentrate on the fields and agriculture rather than celebrations to make the best use of rains and natural irrigation.

Such belief systems didn't just help maintain economical use of water resource, but also gave respect to the physical labour of the person drawing water from wells, avoiding misuse of water.

Local Awareness Through Proverbs and Sayings

The importance of water is delineated variedly in the mythology and folklore throughout India. In the mother language of India, Sanskrit, to make one aware of the importance of water, a proverb reads, "a place where there is no financier, Vedic laureate, monarch, physician and a waterway"[116] is not fit for survival even for a single day.

Varaahamihira in his treatise Bruhat samhitaa expresses 'Enter a house where flowers are in abundance, arches are aplenty and embellished with pots filled with water……..'[117]

---

[115] ಬಿದಿಗೆ ನೀರಿಗೆ ಬೀಳಲಾರೆ ತದಿಗೆ ನೀರನ್ನು ತಾಳಲಾರೆ, bidige nerige bilalaare tadige nirannu taalalaare

[116] धनिकः श्रोत्रियो राजा नदी वैद्यस्तु पञ्चमः पञ्च यत्र न विद्यते न तत्र दिवसं वसेत्/ Dhanikah shrithriyo raaja nadii vaidyastu panchamah pancha yatra na vidyathe na thatra divasam vaseth

[117] भूरिपुश्पविकर सतोरणम् तोयपूर्ण कलशोपशोभितं.....बृहत्सम्हिता..५३.१२५/Bhooriipushpa sathoranam thoyapoorna kalashopashobhitham……Brihatsamhitaa…….53.125

A common proverb in the vernacular, Kannada, to explain the role of water in a human's life says 'when someone is in town, should perceptibly fetch water'.[118]

The doctrines of maintaining water table and other intricacies of ecological balance are expressed through another proverb in the same vernacular Kannada to have at least one tree for one household and one forest for one town.[119]

Another proverb highlights the common ownership of water resources saying 'why is the master's order obligatory to obtain water from the lake'.[120]

Water Purification Practices

The treatment of water is one of the major topics in Ayurveda. Purifying water by heating it and by adding herbs, such as lavancha (a kind of grass), tulasi, doorva and various chemicals like limestone (shankha) and alum and various metals, earthen and rock containers and in combination of the said methods are available in the texts in plenty.[121] These methods were extensively employed in routine life and during special occasions. Copper vessel, soap stone ware, earthen pots, wooden ware and a few fossil stones, gold ware, silverware, iron, brass and bronze wares, etc. now could only be seen preserved as antique pieces.

Some other methods of water purification are elucidated in the Sushruta Samhita. Generally water can be purified in seven fashions immersing in the utensil containing water the Kataka fruits, the gomedha gem or other gems, lotus foliage root, marine mosses, or a semiprecious stone and tying a piece of linen around the neck of the utensil for filtration.

There are seven ways of cooling water, such as exposing a water container to currents of air, immersing the container (tied round with a piece of wet cloth) neck deep in a utensil full of water, churning it with a stick, fanning, siphoning it by means of a piece of linen, burying a water container beneath a sand bed, or keeping it hanging in a pendent bracket.

Manusmrithi, which also refers to water purification practices telling all sorts of fluids, should be filtered and consumed; the wooden materials should be pecked and smoothened to clean up.[122] Manu also says figuratively, keep a step carefully encompassed by sight and drink water that is covered by linen.[123]

---

[118] ಊರಿಗೆ ಬಂದವಳು ನೀರಿಗೆ ಬರಲ್ಲವಾ?/Oorige bandavlu niirige barallava?

[119] ಮನೆಗೊಂದು ಮರ ಊರಿಗೊಂದು ವನ/manegondu mara oorigondu vana

[120] ಕೆರೆ ನೀರಿಗೆ ಏತಕ್ಕೆ ದೊಣ್ಣೆನಾಯಕನ ಅಪ್ಪಣೆ/Kere niirige yaathakke donne nayakana appane

[121] सौवर्णे रजते ताम्रे कांस्ये मणिमयेऽपि वा । sauvarne rajathe thaamre kaansye manimayopi vaa Pushpaavathamsam bhaume vaa sugandhi salilam pibeth…….sushrutha sutraani

[122] Dravaanaam sarveshaam shudhdhiraaplavanam smrutham prokshanam samhithaanaam cha daaravaanaamcha takshanam…..Manusmrithi Chapter 5.11.5

[123] Drishtipootham nyaseth paadam vastrapootham pibejjalam…..Manusmrithi

Varahamihira, a renowned astronomer, in his treatise Bruhatsamhita, in as early as 550 AD, presented the methods of 'phytoremediation' or treating water with plants and their extracts and others for purifying contaminated water. Exposure to sunlight and air and immersing heated stones, gems, gold, silver along with using sand and iron also find a mention. The role of these herbs in purifying the biological contamination of water has now been recognised.

India's ancient wisdom stating brassware are best suitable for storing potable water has gained scientific relevance, as such water stored in brass utensils helps suppress several water-borne diseases say microbiologists.

Further the technique of zoo remediation also was very much prevalent to purify water; it included treating water, particularly well water with tortoises and certain varieties of fishes.

Use of Water in Social and Religious Traditions

Hindus, being the worshippers of nature, employ the forces of nature in their life absolutely. Water, being one of them, is used extensively in the very common and occasional social and religious traditions. The holiness attached to water in the culture clearly reflects the ecological awareness percolating into routine practices. We discuss them in further detail.

Sipping of water to keep the throat wet,[124] activating the nervous system in the sense organs[125] and sprinkling of water around the altar[126] have been inevitable parts of any Vedic ritual.

[124] आचमनम् aachamanam
[125] अङ्गस्पर्शम् angasparsham
[126] जलसेचनम् jalsechanam

It is a practice of Hindus to treat any guest in the following five ways: providing water to wash hands,[127] providing water to wash legs[128] and giving water to sip,[129] a seat to sit[130] and food to eat[131]; this is a common custom in the culture. Kathopanishad refers to this custom stating 'a learned guest who visits our dwellings is gleaming similar to fire and to appease him get water[132]'; in other words guests must be first treated with water to cleanse themselves.

In any ritual sprinkling,[133] to cleanse the place where the ceremony is conducted and the utensils used in the rituals with water is a must.

Water is predominantly used in the rites of Pumsavana, strengthening of foetus, Chooda, 'shaving the head' to remove hair acquired from birth and Upanayana, leading a boy or a girl to the teacher for acquiring knowledge and Samavarthana, the ceremony of convocation.

In the rite of strengthening the foetus in the womb, water is poured in a plate and placed on the right lap of the expectant mother indicating passing on of strength to the foetus through her, and the mother to be is then made to say that she has placed the essence of her power in the holy water.[134]

The tonsuring ritual is performed on a baby aged between 12 and 18 months with a barber being asked to perform the task safely. The razor, an indirect reference to the barber, is requested not to cause harm to the child. It is directed to sterilise the shaving instruments with hot water[135] to prevent septic and infectious conditions.

In the ritual of taking a student to a teacher which is generally understood as the sacred thread ceremony, performed on a boy or a girl in the age group of 8–12 years, a procedure is followed symbolically, called 'Jalaanjali',[136] where the mentor pours water into the joined palms of the disciple which the disciple holds for a while and pours it into a plate to symbolise:

(a) The water indicating knowledge he/she shall cleanse himself/herself of bad impressions or imprints,[137] wash them off, and shall be left with good impressions and imprints

---

[127] अर्घ्यम् arghyam

[128] पाद्यम् paadyam

[129] आचमनम् , aachamanam

[130] आसनम् aasanam

[131] आहारम्/ahaaram

[132] वैश्वानरः प्रविशत्यतिथि ब्राह्मणो गृहान्। तदृतां शान्तिं कुर्वन्ति हर वैवस्वतोदकम्॥... क्ठोपनिषत्...१.१.७/ Vashvanarah pravishatytithi braahmano gruhaan. Tadrutaam shaanthim kurvanthi hara vaivasvatodakam.Kathopanishad 1.1.7

[133] प्रोक्शणम्,prokshanam

[134] अप्सु मे सोमोऽब्रवीत्, apsu me soomoobraveet

[135] उष्णेन उदकेनेहि/ushnena udakenehi

[136] Holding water in a bowl like formation when the two palms are held together

[137] दुष्ट संस्काराः, Dushta samskaarah

(b) Shall collect from teacher all worthy knowledge, hold them, assimilate them, own them and shall spread it to others
(c) Shall inherit all the natural resources and wealth of nature, water being a representative,[138] hold them, preserve and protect them and shall pass them on to the posterity as a true trustee

A lesson of this nature when bestowed/blessed upon an adolescent goes a long way in building the personality of the boy or the girl to respect the environment and that is culture.

Similarly, in the convocation ceremony which is performed at the end of the stay in the Gurukula and the abode of learning wherein the graduate will be presented before and inducted into the regular social life to mark the end of stay in a Gurukula, the student is directed to pour down a few pots of water and drench from head to toe. This symbolises that the outgoing student has drenched himself in the ocean of knowledge. It is a holy and divine bath. Then onwards he/she is referred to as one who has taken the bath 'Snataka'.

Water is used symbolically in the act of giving anything to anybody,[139] and in the belief of consoling the dead[140] (consoling property of water), water has a role to play.

In almost all rituals, a pot[141] made of mud or copper or bronze filled with water, adorned with the sacred items of turmeric, vermillion and coconut with mango or beetle leaves, is prepared for veneration.

Water is also used generously and gloriously for various sacred baths,[142] and a special bath will be done in the ceremony of compensating for the mistakes committed[143] and getting rid of sins. Although a sin is committed through one's body, mind being the root of it, the sinful orientation is at the level of soul. The soul is of course supreme and the body and mind are under its control. The soul is the master and the body and mind the tools of expression and experience of the soul. On the contrary, when the soul is not exercising its supremacy over the body and mind or exercises partially, the body and mind work erratically, and the harmony between the operator and the apparatus will be lost. Regular baths keep the body and mind in tune and well geared and obedient to the soul. This gives the soul poise to use the tool of the body in the best way devoid of sins. It's customary in Vedic/Hindu and several other

[138] उपलक्षणम्, upalakshanam
[139] धारा, दानम्/dharaa, daanam
[140] तर्पणम्/tarpanam
[141] कलशम्, कलशपूजा/Kalasham, Kalashapooja
[142] अङ्कुरार्पणम्, अमृतस्नानम्, अवभृतस्नानम्, चक्र स्नानम्/Ankuraarpanam, Amruthasnaanam, Avabhruthasnaanam, Chakrasnaanam
[143] प्रायश्चित्तविधि/Praayashchiththavidhi

societies to take bath during overjoy and depression. A bath taken at such time balances the moods and temperaments, and the person can react to such a situation normally and in a balanced way.

Respect to Rivers in Scriptures and Mythological Descriptions

Rivers have always been an inseparable part of any civilisation. Reverence to rivers is an age-old tradition. In spite of an increasing pollution of rivers, a theoretical reverence is alive in the tradition and orthodoxy. It is believed in Hindu culture that remembering the holy rivers at the junctures of using water for bath or drinking or otherwise will make that water holy. A shloka meaning 'Let the holy rivers Ganges, Yamuna, Godaavari, Saraswathi, Narmada, Sindhu, Cauvery may assemble, flow into the water ' I am using now'[144] is chanted quite often invariably during worship; it is believed that by chanting this, the deities of the holy rivers are invited and invoked in the water that is about to be used. A few believe that chanting of this hymn showcases the cultural and territorial integrity of the diversified Indian culture.

We find in many scriptures holiness being attached to the rivers calling them goddesses[145] (Rig 10.75.7)[146] (6.45.31),[147] the shatapatha brahmana (13.5.4.11 and 13) and Aithareya Brahmana (39.9). In Bhagavadgita (10.31),[148] Krishna identifies paramatma or god with all the rivers.

The River Ganga in particular has hundreds of verses eulogising its greatness and its sanctifying power in the Ramayana and many Puranas such as the Padma, Narada, Agni and Matsya. Maharshi Vyasa describes, in the epic of Mahabharatha, the inviolability of the river Ganges, 'this auspicious and celestial river is accessible

---

[144] गङ्गे यमुने चैव गोदावरि सरस्वति नर्मदे सिन्धु कावेरि जलेऽस्मिन् सन्निधिं कुरु/gange yamune chaiva Godavari saraswathi, narmade sindhu kaveri jalesmin sannidhim kuru……..a very popular prayer

[145] अम्बितमे नदितमे देवितमे सरस्वति.....ऋग्वेदः/Ambithame nadithame devithame saraswathi…….Rigveda

[146] रुजीत्येनी ऋष्टी महित्वा परिज्रयांसि भरते रजांसि। अदब्धा सिन्धुरपसामपस्तमास्वा न चित्रा वपुशीव दर्शता॥.....ऋग्वेदः....१०.७५.७/Rujithyeni rishthi mahitvaa parijrayaamsi bharathe rajaamsi । adabdhaa sindhurapasaamapasthamaasthvaa na chitraa vapushiva darshatha॥…… Rigveda…10.75.7

[147] अधि बृभुः पणीनां वर्षिष्ठे मूर्धन्नस्थात्। उरुः कक्षौन गाङ्ग्यः॥.....ऋग्वेदः....६.४५.३१/adhi brubhuh praaninaam varshishte moordhannasyaath । uru kakshona gaangyah……. Rigveda…….6.45.31

[148] पवनः पवतामस्मि रामः शस्त्रभृतामहम्। झुषाणां मकरश्चास्मि स्रोतसामस्मि जाह्नवी॥... भगवद्गीता...१०.३१/pavanah pavathaamasmi raamah shastrabhruthaamaham । Jhushaanaam makarashchaasmi srothasaamasmi jaahnavi……..Bhagavadgeetha……10.31

to all times'. The Ganges water has an external value too, so one should certainly take a dip into it.[149] Shankaraachaarya in his 'Gangaastotram' says in praise of River Ganga, 'he who drinks thy water, O mother ganga will verily attain the highest abode. Yama, the God of death, dare not even look at him who is thy devotee'.[150] Similarly, Jagannatha Pandita's 'Gangaalahari' is another popular work dedicated to upholding the significance of River Ganga.

Like the Ganges River, the Sukumari, Kumari, Sitasi, Venika, Mahanadi, Manijala, Chakshusha and Vardhanika rivers were also considered as sacred.

Almost all the well-known rivers of India have been described in the mythological literature. Iconographical works also ascribe to them specific forms and give detailed descriptions of reverence attached to them.

Pic 6 Devotees reciting Gayatri, the guardian of the primordial energies along the bank of River Ganga. Source: http://books.google.co.in/books?id=if5BWWiEhx8C&pg=PA390&lpg=PA390&dq=Hydrology+in+ancient+India+by+the+National+Institute+of+hydrology&source=bl&ots=QTJZDWy3xx&sig=Ddn9jB6wPWcJwpoZfkmrdxBmvzQ&hl=en&sa=X&ei=ilDCUvnEMsq8rAeCooH4Cg&ved=0CGAQ6AEwCQ#v=onepage&q=Hydrology%20in%20ancient%20India%20by%20the%20National%20Institute%20of%20hydrology&f=false

[149] अनुशासनपर्वः/Anushaasanaparvah

[150] तव जलममलं येन पिपीतं परमपदं खलु तेन गृहीतम्। मातर्गङ्गे त्वयि यो भक्तः किल तं द्रष्टुं न यम शक्तः॥/Thajjalam yena pipiitham paramapadam khalu thena gruhiitham. Maathargange tvayi yo bhakthah kila tham drashthum na yama shakthah

Water Festivals

Worshipping nature and celebrating the wealth of natural resources are loftily performed by Hindus throughout the year variedly. Praying to water in particular among Hindus has taken a beautiful shape of celebration in the form of a number of festivals meant for invoking rains, showing gratitude for receiving good rains and taking oath to protect and conserve waterbodies.

> Off late worship has been construed as an offering of flowers and the like to demonstrate our reverence to the divinity existing in the five basic elements. But a true worship lies in the proper use of things made up of five elements. Thus, in the culture of the yore, eco-consciousness was embedded, and pollution of the five elements in any way was shunned and abhorred.[151]

Some of the most prominent festivals where water is adored, worshipped and enjoyed are listed in the table below (Table 2).

Technologies in Water Management

Awareness Regarding Water Cycle and Hydrology

The Vedic texts, which are more than 3000 years old, contain valuable references to the hydrological cycle. They are found scattered in Vedas in various hymns and prayers addressed to various deities. Likewise, even other Sanskrit literature has valuable discourses regarding hydrology.

Rig Veda (10.6.4)[152] highlights the hydrological cycle stating 'the water which gets divided into minute particles due to the heat of sun and are carried by the wind and after the conversion into cloud, it rains repeatedly'. The hymns (I, 27.6; I, 32.8) clarify that all the water that returns to the blue through the means of wind by the temperature of sunrays gets transformed to clouds, and then after the diffusion by sunrays, it rains to get accumulated in rivers, ponds and oceans.[153] The Veda explains

---

[151] पूजा नाम सत्कारः.....निरुक्तम्/pooja naama satkaarah……..Niruktham

[152] शूषेभिर्वृधो जुषाणो अर्कैर्देवा अच्छा रगु पत्वा जिगाति। मन्द्रो होता स जुह्वा यजिष्ठः संमिश्ळो अग्निरा जिघर्ति देवान्॥...ऋग्वेदः...१०.६.४/shushebhirvrudho jushaano arkairdevaa achchaa ragu patvaa jigaathi । mandro hothaa sa juhvaa yajishtah sammishlo agniraa jigharthi devaan…… Rigveda….10.6.4

[153] विभक्तासि चित्रभानो सिन्धोरूर्मा उपाक आ, सद्यो दाशुषे क्षरसि ऋक् १.२७.६/vibhaktaasi chitrabhaano sindhorurma upaaka aa, sadyo daashushe ksharasi.....Rigveda...1.27.6

नदं न भिन्नममुया शयानं मनो रुहाणा अतयिन्यापः, याश्चद्विवृत्रो महिनापर्यतष्ठ्तासामहिः पत्सुतः शीर्बभूव....ऋक् १.३२.८/nadam na bhinnamamuyaa shayaanam mano ruhaanaa athiyanthyaapah, yaashchidvrutro mahinaaparyathishtaththaasaamahih pathsuthahn shirbabhuva……. Rigveda….1.32.8

Table 2 A list of water festivals celebrated across India (pictures sourced from google)

S N	Name of the festival	Time of celebration	Place of celebration	Process of celebration	
1	Ganga Dashahara	Month of May/June	Uttar Pradesh	**Dashahara** is the tenth day[a] of the bright fortnight of the month Jyeshta according to Hindu calendar usually in the month of May. It is said to be the day on which River Ganga descended to this earth. So a bath in the river on this day especially at the Dashashvamedha Ghat of Kashi (Benaras) is believed to destroy ten kinds of sins so the festival is christened 'Dashahara'	
2	Kumbh Mela	Kumbh Mela is celebrated at different locations depending on the position of the planet of Bṛhaspati (Jupiter) and the sun. When Jupiter and the sun are in the zodiac sign Leo (Simha Rashi), it is held in Trimbakeshwar, Nashik; when the sun is in Aquarius (Kumbh Rashi), it is celebrated at Haridwar; when Jupiter is in Taurus (Vrishabha Rashi) and the sun is in Capricorn (Makar Rashi), Kumbh Mela is celebrated at Prayag; and when Jupiter and the sun are in Scorpio (Vrishchik Rashi), the Mela is celebrated at Ujjain. Each site's celebration dates are calculated in advance according to a special combination of zodiacal positions of Sun, Moon and Jupiter	Haridwar, Allahabad, Nashik and Ujjain	This is mass pilgrimage of Hindus who gather to bathe in the River Ganga in Hardwar, river Yamuna in Allahabad, river Godavari in Nashik and river Shipra in Ujjain. Kumbh Mela happens to be the biggest peaceful and religious assembly of about 100 million people held every third year in Haridwar, Allahabad (Prayaga), Nashik and Ujjain successively. Hardwar and Allahabad host half or Ardh Kumbh Mela in every 6 years. The banks of the River Ganga that flow across Haridwar, Yamuna and, the legendary Saraswati that flows across Allahabad, the Godawari across Nashik and the Shipra across Ujjain are places where this assembly takes place. The pilgrimage runs for about 45 days to get blessed by the drops of elixir that is believed to fall from the sky from the Kumbha (the Pitcher) carried by the gods while the Khsheera Sagara or the ocean of milk was churned	
3	Hariyali Amavasya	August/September	Rajasthan, Uttar Pradesh, Madhya Pradesh and Himachal Pradesh	It is a monsoon festival celebrated on Amavasya or a No Moon Day of the Shravan month according to Hindu calendar, organised at the lake precincts in the states of Rajasthan, UP, MP and HP to mark the beginning of monsoons. It is the time when the whole province turns green and water flows generously in rivers and falls. The female folk adorn in dazzling colours to rejoice Teej, on the third day of Sharavan or the months of June and July. People chiefly venerate Lord Shiva on this day for prosperity and riches and for good farming term	

(continued)

Table 2 (continued)

S N	Name of the festival	Time of celebration	Place of celebration	Process of celebration	
4	Teppotsavam	Month of February/Ratha Sapthami	All over South India	Teppotsava popurlarly is called as float festival in the temples of South India. The famous temples in South India that celebrate it are located in Mylapore, Thiruvallikeni, Thiruvidaimarathur, Tirupathi, Tirumala and Kumbakonam. Every temple celebrates this on a particular day in the year	
				It is the grace of God which helps the human beings to cross the sea of the mortal **world**[b] and reach the heaven; this will be presented in a symbolic form with a grand display of lights and colours	
				Applications: The float is made of number of mud pots of uniform size tied by bamboo poles, along the edges and rows called a paristal. The air space in the inverted pots builds up pressure due to heaviness of the objects mounted on the paristol and push of water beneath the pots The air locked in the pots hold up the float for the length of the festival appropriately	
				The deities are decorated beautifully, placed in decorated, special vehicles called 'Vimanas' surrounded by the priest offering worship, Nadasvara orchestra (traditional orchestra), and men with their instruments could be seen accompanied by Vedic laureates and others Throughout the music of Nadaswara is heard coupled with Vedic chants making the Vimanas or boat look luminous and electrified indicating great rainy season and harvest. It's a way of conveying gratefulness to the gods and broadly to the lake for holding precious water in water-scarce regions	

5	Teerthayatra	No particular time	All over India	**Teerthayatra** is a pilgrimage considered a must at least once in one's lifetime. The mode of transport earlier used was by foot preferably. It is not that other modes of transport were not known or available, but it was deliberate. Even today a pilgrimage is considered sanctified only when it is taken by walk, preferably barefoot. This helps the pilgrim to gradually get accustomed to the climatic changes in addition to a close study of ecology and culture of the land. A detailed paced appreciation of nature's beauty during the pilgrimage is an added advantage. A dip in the waters, a bath and the water falls on the way and a dip in the holy waters in the pilgrim centres are an unforgettable agenda in the pilgrimage. The waters in the pilgrim centres are considered holy because of their medicinal and health-showering properties. Many pilgrim centres like the Bendr **Teertha**[c] gained popularity because of its health-giving properties. These waters were revered and protected from over-exploitation and pollution. But off late callousness towards natural resources in particular water has rendered such spots unholy and on the verge of extinction.[d] Trips to Kailasa Manasasarovara,[e] Talakaveri,[f] Bhagamandala[g] and others are also taken up to assimilate the significance of the role played by waters in life and offering reverence to them	
6	Deepavali	End of October or the beginning of November	All over India, but (water festival in Deepavali is celebrated only in Karnataka state)	**Deepavali** is celebrated for 3 days, and the second day of it is celebrated as water-filling festival[h] in the South Indian state of Karnataka. On this day every vessel in the household will be filled with water that will be used for a special bath on the following day celebrations of 'Balipadyami'. This shows the time-management strategy that used to be followed	

(continued)

Table 2 (continued)

S N	Name of the festival	Time of celebration	Place of celebration	Process of celebration	
7	Tulasankramana	Month of October	Karnataka	River Cauvery, one of the Sapta Sindhus, the seven sacred rivers, takes origin at Talakaveri in the Brahmagiri hills. The river surfaces as a tiny perennial spring from a trench called Kundike. It is believed that every year on day of Tulasankramana Parvathi, the goddess of power appears in the Kundike with the spring of the river, Theerthodbhava, noticeable by the sudden upsurge of water, hence considered very auspicious. This moment is primely celebrated by the people of Kodagu. The sudden surge of water from the trench is regarded as goddess Cauvery appearing to bless the people. The devotees take a bath in the tank to purify their bodies and souls. The water is also carried home by the devotees	
9	Hartalika Teej	Month of August/September	Rajasthan	On this sacred day women hum traditional songs rejoicing the arrival of monsoon	
10	Ganga Mahotsav	Month of November	Uttar Pradesh/ Varanasi	As per popular belief, God descends to the River Ganga to bathe on Dev Deepavali, which is a full moon day, on the 15th day of the month of Kartika/usually November. It is during this time of the year that the Mahotsav of Ganga is celebrated to pay a tribute to this holy river of Hindus	
11	Ganga Dashami	Month of June	Uttar Pradesh	The festival marks the auspice of the descent of the River Ganga from heavens. It is venerated all along the banks of the river from Garhmukteshwar to Allahabad. Devotees cleanse themselves of their sins taking a dip in the holy river on this day alongside offering sandalwood, flowers and milk. Aquatic fauna are also fed with balls made of flour. At Varanasi a special Aarti, known as Ganga Aarti, is done to mark superiority	

12	Minjar Mela	Month of August	Himachal Pradesh	Chamba district of Himachal state hosts this mela or fair in the month of Shravana in Hindu calendar and the second Sunday of it to commemorate the victory of the king of Chamba in 935 AD and to celebrate the harvest of paddy and maize. 'Minjar', meaning a bouquet of paddy plant wrapped in golden silk and red fabric, is offered to begin with. A flag-hoisting ceremony is also conducted at this occasion at Chougan to begin a cultural and social program week. The images of Lord Raghuvira with 200 more deities are taken in a chariot pulled by folks with the ropes of the chariot. 'Kunjari Malhar', folk dance and music, makes part of the celebrations	
				A parade is taken from the Akhand Chandi Palace to Ravi River, to end the festival with offerings made to the river. Also this event is observed to remember King Sahil Verman who changed the route of the river, to facilitate devotees to access the Hari Rai temple	
13	Boat Festival	Month of October	Kerala	The whole of the southern state of Kerala hosts this boat festival as Vallom Kallies during Onam, the harvest festival conducting boat races.	
				The boat festivals in Kerala are popularly known as Vallom Kallies. The snake boat race of Chundan Vallam is the major attraction of the celebrations	
14	Adiperukku	Month of August	Tamil Nadu	Padinettam perukku or Adiperukku is signified by celebrating the rise of water at the basins of all the perennial rivers and lakes of Tamil Nadu at the onset of monsoon specially from Aadi, the 18th day of the solar month (generally first week of August). Padinettu meaning eighteen and Perukku meaning rising. Women folk predominantly observe this festival. Adiperukku is a water ritual conducted to pay tributes to nature	

(continued)

Table 2 (continued)

S N	Name of the festival	Time of celebration	Place of celebration	Process of celebration	
15	Miscellaneous	Mostly October	All over India	In every town and village when a lake or river gets filled or flows over mostly during the time of 'Navaratri', people are found to celebrate the occasion offering flowers and other holy items like turmeric, kunkum and little lamps lighted. In other words it is an occasion to celebrate as a festival	

[a]ज्येष्ठशुक्ल दशमि, Jyesta Shukla Dashami

[b]संसार/samsaara

[c]Bendr Theertha (65 km): A scenic spot on the banks of the Seerehole River, 65 km south of Mangalore and 15km from the prosperous training centre of Puttur. Bendr Teertha is the only hot water spring in South India and is located off the main road, between Sulya and Puttur in Dakshina Kannada district. Bendr Theertha is a natural hot water spring (Bendr is hot in the language Tulu) with curative powers, mainly skin ailments owing to the presence of sulphur. Though this hot spring can hardly be compared to the boiling and steaming, hot sulphur springs that dot the Himalayan foothills, the lukewarm waters of Bendr Teertha do have traces of sulphur (http://www.deccanherald.com/content/63410/will-spring-surprise.html).

Heated water can hold more dissolved solids, and warm and especially hot springs also often have a very high mineral content, containing everything from simple calcium to lithium and even radium. Because of both the folklore and the claimed medicinal value some of these springs have, they are often popular tourist destinations (http://www.india-travelite.com/indiancities/mangaloresightseeing.htm).

[d]The unabated digging of bore wells around the area has the most adverse and direct effect on the hot spring of Bendr teertha (http://www.deccanherald.com/content/63410/will-spring-surprise.html).

[e]The place of the origin of the River Ganga at the helm of Himalayas.

[f]The place of origin of Cauveri River.

[g]The place where Cauveri River joins Kannike and Sujyoti rivers

[h]ನೀರುತುಂಬೋ ಹಬ್ಬ/NiiN Niiruthumbo habba

also that water is never stationary and constantly gets evaporated, and due to tininess of particles, the upward movement of them cannot be seen.[154] More so, verses (V, 54, 2 and V, 55, 5)[155] give details about the cloud-bearing breeze as the source of precipitation.[156]

Likewise Yajurveda (10, 19)[157] and Sama Veda (6, 607)[158] clearly speak of the hydrological cycle. The Chandogyopanishad also gives a vivid picture of the hydrological cycle, perhaps the first mention of it with its accuracy: 'the rivers all discharge their waters into the sea.

Moving from one ocean to another, the clouds push them to the sky in the form of vapour and they are again released as rain'.

Numerous Puranas elucidate about several stages of the hydrological cycle. In Linga Purana, a whole chapter (I, 36) (I, 36.38-39) is dedicated to the discipline of hydrology. It scientifically explains evaporation, condensation and rainfall with suitable examples besides explaining that water cannot be destroyed; only its condition is distorted,[159] which means water escapes from all the bodies on earth to the atmosphere on getting vapourised by sunlight to turn clouds to rain.

---

[154] अतिष्ठन्तीनामनिवेशनानां काष्ठानां मध्ये निहितं शरीरम्, वृत्रस्य निण्यं विचरन्त्यापो दीर्घं तम आशयदिंद्रशत्रुः (ऋक् १.३२.१०) athishtanthinaamaniveshanaanaam kaashtaanaam madhye nihitham shareeram vrutrasya ninyam vicharanthayaapo deergham thama aashayadindrashtruh……. Rigveda…..1.32.10

[155] प्र वो मरुतस्तविषा उदन्यवो वयोवृधो अश्वयुजः परिज्रयः। सं विध्युता दधति वाशति त्रितः स्वरन्त्यापोऽवना परिज्रयः॥...ऋग्वेद....५.५४.२/pra vo maruthasthavishaa udanyavo vayovrudho ashvayujah parijrayah । sam vidhyuthaa dadhathi vaashathi thrithah svaranthyaapovanaa parijrayah ॥……..Rigveda….5.54.2

उदीरयता मरुतः समुद्रतो यूयं वृष्ठि वर्षयथा पुरीषणिः। न वो दस्रा उपदस्यन्ति धेनवः शम्भुं यतामनुरथा अवृत्सत॥....ऋग्वेदः..५.५५.५/ udirayathaa maruthah samudratho yuyam vrushtim varshayathaa purishinah । na vo dasraa upadasyanthi dhenavah shambhu yathaamanurathaa…….. Rigveda….5.55.5

[156] प्र वो मरुतस्तविषा उदन्यवो वयोवृधोः अश्वयुजः परिज्रयः, सं विद्युता दधति वाशति त्रितः स्वरंत्यापोऽवना परिज्रयः...ऋक्..१.५४.२/ pra vo maruthasthavishaa udanyavo vayovrudhi ashvayujah parijrayah sam vidyuthaa dadhathi vaashathi thrithah svaranthyaapoovanaa.....Rigveda...1.54.2

उदीरयथा मरुतः समुद्रतो यूयं वृष्टि वर्षयथा पुरीषणिः,न वो दस्रा उप दस्यन्ति धेनवः शुभं यातामनुरथा अवृत्सत.....ऋक् ५.५५.५/udiirayatha maruthah samdratho yuyam vrushtim varshayathaa puriishinah, na vo dasraa upa dasyanthidhanevah shambhum yaathaamanuratha

[157] प्र प्रवर्तस्य वृष्भस्य पृष्ठान्नावश्चरन्ति स्वसिच इयानाःताऽआवृत्रन्नधरागुदक्ताऽअहिं बुध्यमनुरीयमाणाः विश्णोर्विक्रमणसि विष्णोर्विक्रान्तमसि विष्णोः क्रान्तमसि....यजुर्वेदः.....१०.१९/pra pravarthasya vrishabhasya prushtaannaavashcharanthi svasicha iyaanaah thaavruthrannadharaagudakthaahim budhyamanuriyamaanaah vishnorvikramanasi vishnorvikranthamasi vishnoh kraanthamasi.....Yajurveda...10.19

[158] समन्या यन्त्युपयन्त्यानयाः समानमूर्वन्नद्यस्प्रृणन्ति। तमू शुचिङ् शुचयो दीदिवाङ्समपान्नपातमु पयन्त्यापः॥....सामवेदः..६०७/samanyaa yanthyupayanthyaanayaah samaanamurvannadyasprunanthi । tamu shichin shuchayo didivaanjsamapaanapaathamupayanyaapah.....Saamaveda.....608

[159] दन्धैमनैषु चरचैषु गोधूंभूतस्त्वभः नष्क्रमन्ती या या ऊर्ध्वा मस्त्रैनैरित वै तस्तस्त्वभम्यग्निवायुच. अतो धूमाग्निवतनं संयोगस्त्वमुच्यते वारीणि वर्षतीत्यभ्रंभरस्येषः सहस्त्रादिक्.....लिङ्ग पुराणम् १.३६/dandhaimanaishu charachaishu godhubhuthasthvabah nashkramanthi yaa yaa urdhvaa mastrainairitha vai thasthasthvabhamyagnivaayucha atho dhoomaagnivathanam samyogasthvamuchyate vaarni varshathityahrambharasyesha sahastraadik…..Linga Puranam…1.36

Thus, a combination of smoke, fire and air is the cause behind cloud formation. These clouds cause rainfall under the guidance of Lord Indra, having 1000 eyes. The Linga Purana also states that water can neither be created nor destroyed; only its state is changed.

In Matsya Purana (1,54.29-34, Sharma, 1989) and Vayu Purana (51.14-16: Shastri, 1987), there are references to the hydrological cycle. Vayu Purana (51. 14-15-16) states like this, "the water evaporated by sun rises to atmosphere by means of the capillarity of air, and gets cooled and condensed there. After the formation of clouds, it rains by the vigor of breeze. In this way, aqua doesn't go missing in any of these manners, but gets changed from one form to the other endlessly".[160]

Agriculture was a multifold activity in India encompassing a wide spectrum of branches. Evidences suggest that during Vedic period, agriculture developed as a science. Some of the treatises have been solely dedicated to agriculture written by Parashara and Surapala. Some of the important things worth noticing in it include details of 'Krushipanchang', particularly the methods of a standardised measurement of rain and forecasting. Alongside a high importance was placed on irrigation.

Several apparatus were developed to measure rainfall during the fourth century BC, the time of Kautilya that indoctrinated the principles of modern hydrology excepting the use of 'Drona', the weight measure in the place of depth measure. Indians had developed the method and instrumental devices for measuring rainfall by this time. Varshaman[161] was the name given for the rain gauge. Kautilya says 'at the door of store in a house, a utensil, Kunda of nearly 18 inches wide mouth could serve as a rain gauge' (Arthasastra, Book II, Chap. V).

Kautilya was well versed with the distribution of rainfall in various areas. He furnishes a very accurate scientific account of it with statistical data.[162] The amount of precipitation received in the Jangala or the desert countries is 16 dronas,[163] amounting to one half of what is received in moist countries, 13.5 dronas in the Asmakas country (the state of Maharashtra at present), 23 dronas in Avanti, the border of the Himalayas and the countries where water channels were used in agriculture. From this, it is evident that the essence of the methodology for measurement of rainfall given by Kautilya was the same as we have today with the only

[160] आदित्यपतीतम् सूर्यगणेह सोमं सन्क्रमतै जलम्, नदीभिर्वायुयुक्ताभिर्लोकधनं प्रवर्तितै, य्त्सोमत्स्त्रवतै सूर्य तद्भैष्ववतीष्टतै मेघ वायूनिघतै विस्रजन्त जलं भुवि, ऐवमुतिक्शप्यतै चैव पततै चंपुनर्जलम् ना नश्मूदकस्यस्ति तदेव परिवर्ततै/Aadityapatitham suryaganeha somam sakramatai jalam nadibhirvaayuyukthaabhirlokadhanam pravarthitai, yathsomasthsthraivathai surya thadbhaishvavathishtathai meghaa vaayunighatai visrajantha jalam bhuvi evamathikshapyathai chaiva pathathai champunarjalam naa nashmoodakkasyasthi thadeva parivarthatha

[161] The historical records and archaeological findings indicate that rain gauges were installed for the first time in India.

[162] द्रोणाष्टांशाम्यधिके वृष्ठोगर्भत्रुतो भवति २ / Dronaashtaamshaamyadhike vrustogarbhathrutho bhavathi 2 Kautilya

[163] 10

difference being that he expresses it in terms of weight measures, while we use a linear measure nowadays (Arthashastra, Chap. XXIV, Book II, P. 130).

Further, while discussing the geographical details of rainfall, he observes 'if a third of the necessary measure of rain occurs during the beginning and final months of the rainy season, with two thirds in between, the rainfall can be considered very even'. Talking about the categorisation of clouds and the relationship between rainfall and farming, the author states, 'the clouds that continuously shower for seven days; and those which pour tiny drops; and that which come into view along with the sunshine are the various kinds of clouds'.

The treatises of Brurhat Samhita (~550 AD) and Mayuracitraka produced by Varahamihira[164] are two very important works which are abounding with the data of climatology and meteorology. The Brihat Samhita has three chapters (21st, 22nd, and 23rd on climatology and meteorology). Chapter 21 speaks of pregnancy of clouds, chapter 22 speaks about pregnancy of air, and chapter 23 speaks of quantity of rainfall. Slokas 1 and 2 of Dakargelam (Chapter 54 of Vrahat Samhita) state the importance of the science of groundwater exploration which helps man ascertain the existence of water veins beneath the earth that resemble veins in the human body. The rainwater assumes various colours and tastes based on differences in the nature of the earth.[165]

Varahamihira has also referred to water divining[166] art and science where in the natural vegetation and terrains are observed keenly and the presence of the quantity of and also the nature of the underground water is identified. Just a few examples are given hereunder. 'The underground water resembles the veins in the human body'. 'The color and taste of the rain water undergoes changes owing to the difference in the nature of the land upon which it falls'.[167] 'Wherever a purple berry tree[168] along with an anthill is found to the east of it, sugary or sweet water is indicated at a

---

[164] Varāhamihira (505–587 CE), also called Varaha or Mihir, was an Indian astronomer, mathematician, and astrologer who lived in Ujjain. He was born in Avanti region, roughly corresponding to modern-day Malwa to Adityadasa, who was himself an astronomer. According to one of his own works, he was educated at Kapitthaka [1]. He was considered as one of the nine jewels (Navaratnas) in the court of legendary ruler Yashodharman Vikramaditya of Malwa.

[165] धर्म्यं यशस्यं च वदाभ्यतोऽहं दकर्गलं येन जलोपलब्धिः, पुं सां यथाङ्गेषु शिरास्तथैव क्षितावपि प्रोन्नतनिम्नसंस्थाः ऐकेन वर्गेन रसेन चाम्भ्यश्च्युतं नभस्तो वसुधाविशेषात् नानारसत्वं बहुवर्णातां च गतं परोक्ष्यं क्षितितुल्यमेव.....बृहत्संहिता ५४.१/२/ Dharmyam yashasyam cha vadaabhyathoham dakargalam yena jalopalabhdhih pum saam yathaangeshu shirasthathaiva kshithaavapi pronnathanimnasamsthaah ekena vargena rasena chaambyashchutham nabhasto vasudhaavisheshaath naanaarasathvam bahuvarnaathaam cha gatham parokshyam kshithithulyameva…… Brihathsamhitha….54.1/2

[166] Water tracking or water finding discovering the presence of underground water, जलशोधनम्/ Jalashodhanam

[167] पुंसां यथाङ्गेषु शिरास्तथैव क्षितावपि प्रोन्नतनिम्नसम्स्थाः| ऐकेन वर्णेन रसेन चाम्भश्च्युतं नभस्तो वसुधाविशेषात्, नानारसत्वं बहुवरणतां च गतम्||.....बृहत्संहिता.५४.१२/ pum-saam yathaangeshu shirasthathaiva kshithaavapi pronnathanimnasamsthah | Ekena varnena rasena chaambashchyutham nabhasto vasudhaavisheshaath naanaarasathvam bahuvaranathaam cha gatham……. Brihathsamhithaa …54.12

[168] जम्बू/ Nerale in Kannada/Jamun in English

distance of three cubits to the south of the tree and at a depth of ten cubit'.[169] 'A vein of good water to the west in about three cubits and at a depth of 12½ cubits is indicated where we find and Indian fig tree'.[170] It is further confirmed by a white snake at a depth of five cubits and the presence of a stone as dark as collyrium.

'There will be sweet and never failing water at a depth of nearly 11 cubits at a distance of 3 cubits to the south of an indigo tree,[171] an indigo tree with an anthill nearby',[172] 'where bael[173] and Indian fig[174] tree are found together, it can be construed that there will be water at three cubits in the south direction and at a depth of 15 cubits',[175] 'palm tree or a coconut tree if covered with anthills denotes a southerly water vein at a depth of 20 cubits and at a distance of six cubits to the west of the tree'[176] 'when a thorny tree flourishes in the midst of non thorny trees or vice versa, water can be found at a depth of nearly 18 cubits and at a distance of 3 cubits to the west'[177]. Many such valuable references are found in the 54th chapter of the Bruhatsamhitaa, and study of it by itself is worth a serious research.

Jains have made a considerable contribution to the field of meteorology. The 'Prajnapana' and 'Avasyaka Curnis' supply stupendous information of a variety of winds. This tradition must have been far older than these treatises. The 'Prajnapana' makes a reference to snowfall and hailstorm. The 'Trilokasara' of Nemichandra names seven kinds of episodic clouds that shower for 7 days during the rainy season. Then there are 12 species of white clouds. They also bring rains for 7 days each. Thus, the season of rainfall extends over 133 days in all.

---

[169] जम्बू वृक्षस्य प्राग्वलीको यदि भवेत् समीपस्थः| तस्मात् दक्षिण पार्श्वे सलिलं पुरुषद्वये स्यात्॥.....बृहत् संहिता ५४.९/jambu vrikshasya praagvaliko yadi bhaveth samipasthah | Thasmaath dakshina paarshve salilam purushadvaye syaath…… Brihathsamhithaa…54.1

[170] पश्चादुदुम्बरस्य त्रिभिरेव करैर्नरद्वयेसार्धे। पुरुषे सितोऽहिरष्मान्जनोपमोऽधः शिरासुजला॥..... बृहत्संहिता..५४.११/pashchaadudumbarasya tribhireva karairdvayesaardhe | purushe sitohirashmaanjanopamodhah…….. Brihathsamhithaa…54.11

[171] निर्गुण्डि.....Nirgundi

[172] व्ल्मीकोपचितायां निर्गुण्ड्यां दक्शिणेन कथित करैः पुरुषद्वये सपादे स्वादु जलं भवति चाशौष्यं.....बृहत्संहिता....५४.१४/valmikopachitaayaam nirgundyam dakshinena kathitha karaih prurushadvaye sapaade svaadu jalam bhavathi……. Brihathsamhithaa…54.14

[173] बिल्व/bilva

[174] उदुम्बरा/udumbara

[175] बिल्वोदुम्बर योगे विहायहस्तत्रयन्तु याम्येन पुरषैस्त्रिभिरम्बु भवेत्.....बृहत्संहिता....५४.१८/ bilvodumbara yoge vihayastatrayantu yaamyena purushaisthribhirambu bhaveth…….. Brihathsamhithaa…54.18

[176] वल्मीक संवृत्तो यदि तालो वा भवति नारिकेला वा। पश्चात् षड्भिर्हस्तैर्नरैचतुर्भिः शिरा याम्या..... बृहत्संहिता...५४.४०/valmika samvriththo yadi taalo vaa bhavathi naarikelaa vaa | pashchaath shadbhirhasthairnaraichaturbhih…….. Brihathsamhithaa…54.40

[177] कन्टक्यकण्टकानां व्यत्यासेम्भः त्रिभिः करैः पश्चात् खात्वा पुरुषत्रितयं.....५४.५३/kantakyakantakaanaam vyathyaasembhah thribhih karaih pashchaath khaathvaa purushathritayam….. Brihathsamhithaa…54.43

Buddhists too, at least before 400 BC, attempted at a very scientific classification of clouds; four varieties revealed by them are comparable with the most significant four sorts enumerated in modern meteorology. So much of a subtle observation at such an early date is an achievement of the finest order.

The references to the hydrological cycle make it abundantly clear that the ancient Indians were well aware of the different components of the hydrological cycle, the role of solar energy in sustaining the processes and also the general distribution pattern of water. The definitions of hydrological cycle found in some of the ancient works are as good as the modern definitions on this scientific concept.

The impact of the yajna, woods and tanks on precipitation, cataloging of clouds based on their colour, estimation of rainfall based on naturally visible events as the colour of the sky or clouds and the direction of the wind and lightning and the behaviour of flora and fauna all were well understood in India even before the tenth century BC. An ancient text Kadambini describes such method of forecasting of rains in detail.

Traditional Sustainable Practices

A study of history, say a few decades earlier, unfolds before us the systems of managing and monitoring and coordinating with nature in a very simple and decentralised way. The whole modus operandi was woven into the agrarian and community/social routine way of life.

Prayers are generally understood as a besceechment, entreaty or asking the divine forces for something. But, in fact, prayer means complimentary volition[178] and its implementation. The prayers will not be answered unless suitable steps are taken. So it implies that we, our projects and our way of life, should not intervene with the nature in general and in this context natural water cycle. On the contrary, water cycle should be sustained. So, several practices existed to maintain water cycle, some of which are mentioned below.

The link between forests and rainfall was well understood and interwoven with life and religion and took the shape of 'Devavanam/Devara kaadu'/the temple forests**.** As recently as five decades ago, every temple in India had its own forest, an area which nobody owned or possessed and exercised rights upon, but today there is a severe destruction of culture by consecutive governments, and the practice is now mostly limited to a place in Karnataka called Kodagu. Panchavati or Panchavalkala forest is a miniature forest of five different trees, bael (Bilvapatra), a detoxifying tree; gooseberry large (Bettada nalli), a good immuniser; caraka (Ashoka), which is a coolant; banyan (Aala) again a coolant; and peepal tree (Ashwatha) used to be a common sight. This miniature forest used to be part of every village or locality. These trees were also part of every temple as well.

[178] प्रार्थन वै सन्कल्पः.....निरुक्तम्/praarthana vai sankalpah….Niruktham

The above trees are ecologically very significant as they do not just possess medicinal and curative properties, but help maintain water tables as the roots of the trees spread very deep into the ground and upgrade the water-hoarding capacity of the earth under it. Since the branches of the trees spread a lot wider, the evaporation rate of water will also be checked to a great extent.

Apart from Panchavalkala or panchavati forests in several places, 'Nakshatravana', a miniature forest that used to have 27 different trees associated with 27 nakshtras or Stars mentioned in Hindu calendar; 'Raashi Vana', a tiny forest that used to have 12 different trees associated with 12 Rashis or zodiacs mentioned in Hindu calendar; and 'Nagavanas' were also there, which exist even today, but rarely.

Gomala: These were pasture or grazing lands for cattle. These used to be maintained in every village to have a constant supply of fodder for the cattle and also to prevent forested lands from being overgrazed by animals, thus passively helping the conservation of water through forests. These were grown, away from ponds and waterbodies.

Besides maintaining forests, measures were also taken to see that the water seeped into the underground levels that would help it have an upward movement. This was achieved by digging trenches and pits in the catchment area everywhere. Vegetation of all varieties used to be planted and grown which, in association with the roots, would check the flow of water and help in the upward movement of water. Some of the other sustainable practices were small tanks with vents—this was a simple system of Kodi (in vernacular Kannada) which determined the volume of water to be collected in a tank with the surplus water flowing out to fill the next tank. Thus, linking tanks in a chain allowed harnessing maximum amount of rainwater without causing any ill effect.

Pic 7 Small tanks with vent. Source: https://www.google.co.in/search?q=manmade+lakes+with+vents&biw=1777&bih=930&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjJxsPT-ZXNAhWJNY8KHdhiBBQQ_AUIBigB&dpr=0.9#tbm=isch&q=manmade+lakes+overflowing+in+india&imgrc=6Ku15NQmeXLxGM%3A

The top soil, the fertile layers of the land, naturally gets washed out or eroded due to rains and gets collected in the tanks as silt, thereby reducing the water-storing capacity of the tanks. During summer, when the water in the tanks was minimum/nil, de-silting used to be a major activity in villages. This used to coincide with the post-harvest season wherein the agricultural work was minimum/nil. This would be a community activity with at least one member from each household voluntarily participating in de-silting. The silt removed was ploughed back to the field, recharging, re-establishing and rejuvenating its fertility.

The benefits of concerted community activity are many and invaluable and form the basis of ecological awareness woven into the cultural fabric.

Pic 8 Compiled by Authors

Sustainable Extraction of Groundwater

The water from the wells was lifted using man/animal power, and value of physical labour and water was known. Water was drawn to the required extent and was not wasted because it meant wastage of man/animal power. There was the system of a water wheel run by bullocks

Pic 9 Water wheel run by bullocks. Source: https://www.google.co.in/search?q=Images+of+persian+water+wheel&tbm=isch&tbo=u&source=univ&sa=X&ei=dsLPUsHiOIflrAfkuIGQDA&ved=0CCoQsAQ&biw=1024&bih=598#facrc=_&imgdii=_&imgrc=ICp65apO1nQn9M%253A%3BWdY1atIUtC0LhM%3Bhttp%253A%252F%252Fepanchatantra.com%252FPT%252Fpics%252F789.jpg%3Bhttp%253A%252F%252Fepanchatantra.com%252FPT%252Findex.asp%253FNo%253D102%3B622%3B462; https://www.google.co.in/search?q=Images+of+persian+water+wheel&biw=1455&bih=756&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiQkpbvotzPAhWKQo8KHaE_BokQ_AUICCgB#imgrc=2vQksgQX-6MA8M%3A

Pic 10 Water wheel. Source: https://www.google.co.in/search?q=Images+of+persian+water+wheel&tbm=isch&tbo=u&source=univ&sa=X&ei=dsLPUsHiOIflrAfkuIGQDA&ved=0CCoQsAQ&biw=1024&bih=598#facrc=_&imgdii=_&imgrc=ICp65apO1nQn9M%253A%3BWdY1atIUtC0LhM%3Bhttp%253A%252F%252Fepanchatantra.com%252FPT%252Fpics%252F789.jpg%3Bhttp%253A%252F%252Fepanchatantra.com%252FPT%252Findex.asp%253FNo%253D102%3B622%3B462; https://www.google.co.in/search?q=Images+of+persian+water+wheel&biw=1455&bih=756&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiQkpbvotzPAhWKQo8KHaE_BokQ_AUICCgB#imgrc=2vQksgQX-6MA8M%3A

Or a system consisting of pulley, rope and bucket worked by oxen on an inclined plain[179]

‘Thoobu’ as described in the vernacular Kannada is a sort of simple minor irrigation systems that ensured rationing of water by local management

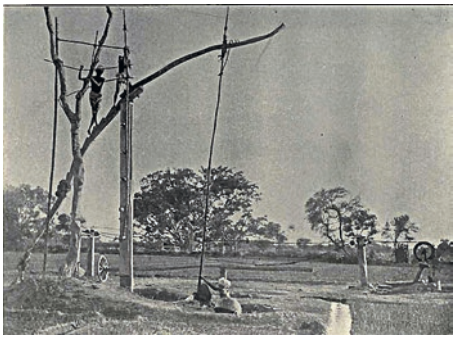
Pic 11 Water pulley. Source: https://www.google.co.in/search?q=Images+of+persian+water+wheel&tbm=isch&tbo=u&source=univ&sa=X&ei=dsLPUsHiOIflrAfkuIGQDA&ved=0CCoQsAQ&biw=1024&bih=598#q=Image+of+a+system+consisting+of+pulley%2C+rope%2C+bucket+worked+by+oxen+on+an+inclined+plain+to+lift+water&tbm=isch&facrc=_&imgdii=_&imgrc=mCpmHgEre0qFVM%253A%3BRF_5jfLImLvWoM%3Bhttp%253A%252F%252Fwww.payer.de%252Fquellenkunde%252Fquellen0563.jpg%3Bhttp%253A%252F%252Fwww.payer.de%252Fquellenkunde%252Fquellen054.htm%3B393%3B555; https://www.google.co.in/search?q=water+pulleys+in+combination+with+oxen&biw=1777&bih=930&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiQ1u29g5bNAhXCqJQKHTmVCw4Q_AUIBigB&dpr=0.9#imgrc=ZN4kO_gXpdscKM%3A

[179] (Kapali), (kapale), (kapile), (kavile), (kavule) in Kannada, a vernacular language.

Pic 12 Water pulley in combination with oxen. Source: https://www.google.co.in/search?q=water+pulleys+in+combination+with+oxen&biw=1777&bih=930&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiQ1u29g5bNAhXCqJQKHTmVCw4Q_AUIBigB&dpr=0.9#imgrc=ZN4kO_gXpdscKM%3A

The employment of electricity and irrigation pumps made drawing of water from irrigation wells easier and began an era of squandering of and indiscriminate use of water. Easier a thing got, carless one spends it. As a few decades passed the upper water table depleted, at this juncture instead of coming to the upper layers emphasising on rain harvesting and recharging of wells the greedy went downwards and hit the lower water tables, thanks to the bore wells and submersible pumps. In no time tanks and wells dried and bore wells went deeper and deeper. This has resulted in serious water crisis. Stringent laws checking the digging and using of bore wells and emphasis on harvesting rainwater and rejuvenating well culture are the need of the hour. It should be borne in the mind and heart that there is no other alternative. It is also worth to note that a large number of waterbodies on the surface and the upper layers of the earth help radiate substantial amount of humidity that successfully counters the greenhouse effect or global warming.

'Etha' was another system or equipment for lift irrigation employed for a sustainable extraction of groundwater in fields.



Pic 13 Etha. Source: https://www.google.co.in/search?q=Images+of+persian+water+wheel&tbm=isch&tbo=u&source=univ&sa=X&ei=dsLPUsHiOIflrAfkuIGQDA&ved=0CCoQsAQ&biw=1024&bih=598#q=Image+of+system+water+lifting+consisting+of+pulley%2C+rope%2C+bucket+worked+by+oxen+on+an+inclined+plain&tbm=isch&facrc=_&imgdii=_&imgrc=hsuP7i4nFgAwAM%253A%3BRF_5jfLImLvWoM%3Bhttp%253A%252F%252Fwww.payer.de%252Fquellenkunde%252Fquellen0553.jpg%3Bhttp%253A%252F%252Fwww.payer.de%252Fquellenkunde%252Fquellen054.htm%3B693%3B548

Soaking Pits: Every household used to maintain a pit in the premises to let out the waste water generated at home; this system also used to be modified in case of availability of a larger space in the form of a backyard garden. These steps also helped maintain the water table besides maintaining cleanliness in the living spaces. Today the drains which have replaced the soaking pits are the victims of a severe negligence causing water logging, diseases and destruction of waterbodies along with other miseries.

Architectural Designs for Water Storage and Conservation

The knowledge of hydrology was deep rooted in the science of ancient India with extensive constructions made for water resource engineering. A variety of water structures were in place much before the deliberately believed Greek, Roman or other civilisations. Every province of India had unique water harvesting techniques developed to suit the local geographical and cultural condition.

Ancient India gave birth to 'Shilpashaastram',[180] a science which deals with the creation of 'Shilpa' or the artifacts, in a wider sense, engineering. The word Shilpa which is derived from the root Shila samaadahu means anything that pleases the

[180] Shilpashastra or engineering includes many articles (things), machines, innovations, metals and artificial means.

mind, deviating from the popular notion of presuming only the icons or sculptures as shilpa. 'Shilpa samhitaa' is a compilation of rules and procedures related to shilpashastra. 'Sthapati' is one who has a complete knowledge of shilpashastra, an engineer or an architect.[181]

There are about 1000 Shilpasamhitaas available. The most popular of them are 'Vishwakarma' or 'Mayamata', Bhartha's Vimanasutras and Matangavaasthu.

King Bhagiratha was actually the first irrigation engineer of India and probably even the world witnessed; he drew the path of Ganga to his kingdom to facilitate people with the waters of the river. Sage Kashyapa reclaimed the waterlogged land of Kashmir, the land of Kashyapa. Varaahamihira was the first hydrologist to predict the locations of aquifers. Sage Parashar developed astronomical methods to predict rainfall (Parashara Krushi shastram).

The properties of flowing and still water were described by sage Vasishta and sage Bhrugu much before Archimedes. Water mills were developed in India before they were adopted in Persia (अरिहत्त, rope pots, seen in the previous section). Kautilya gave guidelines for construction of dams, canals and wells, prevention of water pollution, well-organised water pricing system, etc. Various references are available in the Vedas elucidating the importance of an efficient water use so as to reduce the intensity of water scarcity and drought-like conditions. The botanical names of trees mentioned in Bruhatsamhitaa, calamas rotang rattan (vetas vet) and dalbergia latifolia sissoo tree (shishampaaa shishava),[182] are employed in phytoremediation. Apart from this, several texts refer to a description of designs and qualities of ponds and tanks, (जलाश्यातक लक्षण कथनम्), arch bridges (प्रणालीसेतु लकषण कथनम्), water forts (जलदुर्ग लक्षण), river forts, etc. (वाहिनीदुर्ग लक्षण).

In Narada shilpa shastra, the three (Jalashastra) techniques for storage of water 'Stambham', distribution of water; 'Sanchetanam', drainage of water; and 'Samharanam'—are mentioned. Kunda, veshanta, palavala, haouda, kaasara, tadaaga, saara, mahaa saaraa, subhadraa and saagara are the ten types of tanks.[183]

In 'Amarakosha', a thesaurus of Sanskrit language, several kinds of waterbodies and the words affiliated to them are identified such as jalanirgamaa for the valve of the tank and the channel; koopakaaha and koopaha wells; vidaarakaaha for spring; naavyam, navigable river; srootaha for the fountain head; nimnam, gabheeram, gambheeram and hradaha for a deep source of water; uttaanam, for shallow water; agaadham and talasparshe for an abyss; jalaashayaha and jalaadharaha for waterbodies; aahaava and nipaanam for small tanks for domestic animals to drink water from; dhuhu, prahihi and udapaanam for a well from which water is drawn; pushkarini and khaatam, a square manmade lake; akhaatam and devakhaatakam for a natural pond; padmaakaraha and thataakaha for a tank containing lotuses; kaasaaraha, sarasi and saraha, a lake with lotuses; veeshantaha palvalam and alpasaraha for a barrage; vaapi

[181] Shilpashastra literature compiled by Sri G. G. Joshi, Nagpur, works of late K. V. Vaze who has deciphered and translated many ancient Sanskrit texts of shilpasamhitaa.

[182] वेतस वेत, शिशंपा शिशव/vethasa vetha, shishampaa shishava

[183] कुंड, वेशन्त, पलवल, हौद, कासर, तडाग, सार, महासार, समुद्रा, सागर/Kunda, Veshantha, Palavala, Hauda, Kaasara, Tadaaga, Saara, Mahaasaara, Samudraa, Saagara

and deerghika for a lake; aadharaha for a channel; nadi and sarith for a river, taranginii, sahivalinii, thatinii, hraadinii, dhunii, srothasvinii, dweepavathii, sravanthii, nimnagaa and aapagaa for a river; kulyaa for a small dug river, etc.

Panini's Ashtadhyayi, Katyayana'a Vartika and Patanjali's Mahabhashyam have used hundreds of words which throw light on agricultural operations and irrigation prevalent in the past.

In the eleventh century AD king Bhoja came up with 'Samaraanganasutradhara' (समराङ्गणसूत्रधारा), combining all the other ancient works of engineering in which he speaks of Krudaartha or Yantradhara (कृदार्थ/यन्त्रधारा), fountain, Vaariyantra (वारियन्त्र), machine used to move water, Paata yantra (पातयन्त्र), water fall machine, Samanaadikaa (समनादिका), the release of water from a higher level, Paatasamuchchraaya (पातसमुच्छ्राय),

Bored columns were used to let down water from a height and to take it back through an upslant called Uchchraya (उच्छ्राय). The treatise also provides a bounty of references about the Variants of samanaadikaa, Samuchcharaya tatva (समुच्छ्राय तत्व), principle of circulation of water based on the underground canal that brought water from a remote source to a tank, bathroom with shower Dhaaragruham (धारागृहम्), Pravarshana (प्रवर्शण), the shower, Pranaala (प्रणाल) the pipe, Jalamagna (जलमग्न), the subaquatic, Jalayantraputrikaa (जलयन्त्रपुत्रिका), the sprays, Svayamvaahaka (स्वयं वाहक) automatic, Sakruth Prerya (सकृत्प्रेर्य), occasionally propelled, Antaritha (अन्तरित) and Alakshya (अलक्ष्य), the principle of action and motor mechanism hidden from public view and Vaahya (वाह्य), a machine to be carried by another.[184]

The Traditional Water Harvesting Systems That Are Still in Use

'One tank, one temple and a grazing land for cattle for a village' was the concept of our ancestors for supporting a sustainable growth. Tanks are one of the oldest designs in irrigation engineering found all over India. Water tanks served purposes such as controlling floods, checking erosion of soil, recharging groundwater and reduction of run-offs. The management of tanks was given to individuals or village communities or temples. The entire tank system was suitable for direct irrigation for agriculture and was easy to manage. Tanks were constructed using stone, cement, mud or a combination of these.

Rajasthan, an area largely covered by the Thar Desert, has had a long and the best tradition of water conservation. For example, the builders of the famous Bundi and Chittorgarh forts harnessed the natural catchments found in the forts formed by undulating hilltops. Rainwater was collected in several ways and water flowing down the hill slopes was also stored in waterbodies. Two pictures below of Bundi fort illustrate it. Picture 14 shows a water path, i.e. rainwater flowing down a hill purified by a 'Jaal' (sieve) between the two structures. It then flows into the waterbody and gets accumulated as seen in the picture.

[184] Yantras or Mechanical Contrivances in Ancient India, Raghavan V, 1952, Indian Institute of Culture, Basavangudi, Bengaluru

Pic 14 Source:http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-Harvesting-and-applicability-2.aspx

Talab/Bandhis

Reservoirs natural or manmade were called by different names in various places. They were called Talabs, in general, and pokhariyan, talai and bandhi at some places. Big lakes were also named sagar and samand. These waterbodies were constructed for irrigation and supply of drinking water.

Pic 15 Source: https://www.google.co.in/search?q=images+of+talabs

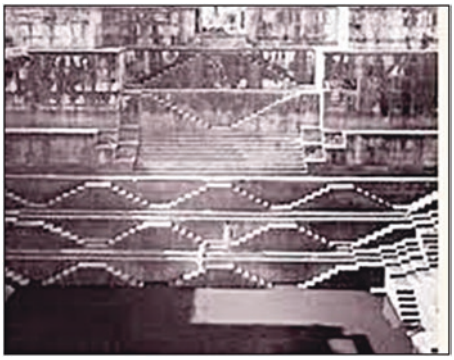
Johads were small earthen check dams built to capture and conserve rainwater, thus improving percolation and recharging of groundwater.

Pic 16 Source:http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-Harvesting-and-applicability-2.aspx

Baoris/bers were community wells, found in the state of Rajasthan, that were used mainly for drinking water supply. Most of them were built by 'Banjaras'. They could hold water for a long time because of an almost negligible rate of evaporation.

Pic 17 Source:http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-Harvesting-and-applicability-2.aspx

Jhalaras were artificial deep tanks, found in Rajasthan and Gujarat, essentially meant for community use and for religious rites and not potable purposes. Often rectangular in shape, Jhalaras were stepped on all or three sides. The Jhalaras gathered subterranean seepage of a waterbody located upstream.



Pic 18 Source:http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-harvesting-and-applicability-2.aspx

Water Temples or 'Step Wells'

The most unique construction for harvesting rainwater in the arid regions of the country was the step well. Step wells are also known as water temples. These constructions ensured a sufficient water supply through periods of drought. Some step wells were dug near tanks to have an access to water all through the year. Step wells are also christened Vav, Vavadi, Bawdi, Bawri, Baoli and Bavadi. These structures are found amply in the states of Gujarat and Rajasthan. Adalaj Vav is a very well-known step well located 20 kms away from Ahmedabad. It is built in the form of a temple that ends into a well. This is about six storeys below ground level.

Pic 19 Source: https://www.google.co.in/search?q=Images+of+persian+water+wheel&tbm=isch&tbo=u&source=univ&sa=X&ei=dsLPUsHiOIflrAfkuIGQDA&ved=0CCoQsAQ&biw=1024&bih=598#tbm=isch&q=images+of+adalaj+vav&imgrc=IvWqAhBse2_i9M%3A

Kunds are covered tanks used to be built to deal with drinking water shortages. Usually built using local materials, kunds were most widespread in the western parched areas of Rajasthan and in places where groundwater was inadequate and tasted saline. In such conditions, kunds provided clean and sweet water for drinking. They were also rampant in Gujarat and Uttar Pradesh states.[185]

Pic 20 The picture is of a Kund in the state of Rajasthan that is still in use. Source: http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-harvesting-and-applicability-2.aspx

Tanka**,** most dwellings in Bikaner, had underground tanks built used for storing water. Circular holes were made in the ground, lined with refined lime, in which rainwater used to get collected.

[185] copyright Centre for Science and Environment or CSE

Temple architecture is a very interesting discipline for study. Although today, it has been a centre of faith and a place of idol worship, it was originally a community centre wherein people used to gather, listen to lectures and music and witness dance performances. Many a time, the programmes would go on for several days. The presence of a central dais,[186] kitchen,[187] dining hall[188] and parking places for vehicles of that day[189] in the plan of a temple proves the said as a fact. Water supply to the community was essential for cooking to ablutions, and hence, either the temples were constructed on the banks of rivers or a pond was an inseparable part of the temple precincts.

The temples in South India have huge tanks or ponds[190] as part of the temple premises. Some temples have more than one tank. These ponds were meant to serve the needs of the temple besides the supply of water to devotees for cleansing themselves before Darshan. These tanks even help enhance water table. The picture below shows a water tank in the Chidambaram temple, followed by the pond of Meenakshi Temple in Madurai, Tamil Nadu, and the pond of Venkateswara Temple in Tirumala, Andhra Pradesh.

Pic 21 Chidambaram Temple, Tamil Nadu. Source: https://www.google.co.in/search?q=Chidambaram+Temple+pond&biw=1777&bih=930&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjI8qmj-JXNAhXHOo8KHUiTBj0Q_AUIBigB&dpr=0.9#imgrc=VSDRhzTvj9o-kM%3A

[186] नवरङ्गशाला, navarangashala

[187] पाकशाला, paakashala

[188] भोजनशाला, bhojanashala

[189] अश्वशाला, गजशाला, ashwashaala, gajashaala

[190] कल्याणि, सरोवर, पुष्करिणी, kalyaani, sarovara, pushkarini

Pic 22 Meenakshi Temple, Tamil Nadu. Source: https://www.google.co.in/search?q=beautiful+pictures+of+Meenakshi+temple,+Madurai&biw=1366&bih=599&source=lnms&tbm=isch&sa=X&ei=WLGQUr3yKMLArAerwIHQDA&ved=0CAkQ_AUoAQ

Pic 23 Venkateswara Temple pond, Andhra Pradesh. Source: http://withfriendship.com/user/fraud/tirumala-tirupati-temple-photos.php

Harvesting of water in fortresses and hillocks/catchment areas was also a common technique, and it was known to the culture of the land since ages. Two significant examples are Chitradurga Fort in Karnataka, where not even a single drop is allowed to escape.

Pic 24 Chitradurga Fort, Karnataka, and the other one are the lake at the foothill of Shravanabelagola, Karnataka. Source: http://elusive42.windforwings.com/2011_05_01_archive.html

Pic 25 Shravanabelagola, Karnataka. Source: http://en.wikipedia.org/wiki/Kingdom_of_Mysore

Pic 26 Ancient canal. Source: http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-Harvesting-and-applicability-3.aspx

Kuls are water channels found in precipitous mountain areas like Himachal Pradesh and Kashmir. These carried water from glaciers to villages. In the muddy terrains, the kul was lined with rocks to prevent clogging.

In Assam region, big ponds were constructed for preserving rainwater. In some places, the Garh was used to channelise river water to agricultural fields. A Garh is like a big canal, where both sides have big and long embankment and the middle side is left open for water to flow.

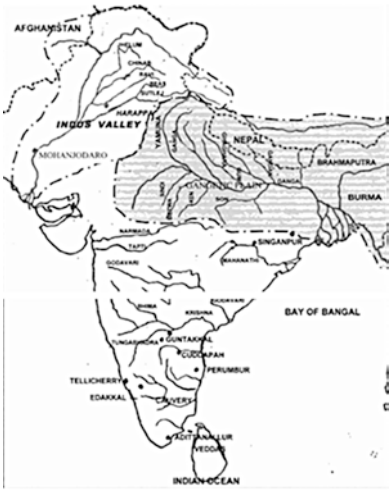
It is apparent that scores of communities in India have efficiently employed water harvesting methods to meet their water requirements. The sustaining strategies were appropriately based on the idea of land-water-vegetation. Any surplus (food, fodder, etc.) generated at the village level supported the towns and cities. The prosperity of villages could be attributed to the water harvesting structures, which assured supply of water for irrigation especially all through the year. Efficient use of water, lining of canals and construction of dams; essential needs for the construction

of good tanks, bank protection methods and spillways; and additional aspects were paid due attention.

Water Management During Various Hindu Civilisations

Indus Valley Civilisation

The first major human settlements in India are believed to have begun in the valley of Sindhu or Indus River around 3000 BC in the northern and Western India. The civilisation was prominent in hydraulic engineering and had many water supply and sanitation devices that were in use and were first of their kind. Among them are the earliest known systems of flush toilets in the world. Many homes had it constructed and were connected to a universal sewerage pipe. Private wells were also commonly found. City walls served as an obstruction to floods.



Pic 27 Rivers and sites of early civilisations of India. Source: http://books.google.co.in/books?id=if5BWWiEhx8C&pg=PA390&lpg=PA390&dq=Hydrology+in+ancient+India+by+the+National+Institute+of+hydrology&source=bl&ots=QTJZDWy3xx&sig=Ddn9jB6wPWcJwpoZfkmrdxBmvzQ&hl=en&sa=X&ei=ilDCUvnEMsq8rAeCooH4Cg&ved=0CGAQ6AEwCQ#v=onepage&q=Hydrology%20in%20ancient%20India%20by%20the%20National%20Institute%20of%20hydrology&f=false

Dholavira, an important site of Indus Valley, contained several tanks for gathering rainwater. 'The system of Harappans of Dholavira was very efficient in conserving, harvesting and storing water. The unique features of Dholavira are the sophisticated water conservation system comprising of channels and reservoirs used for storing freshwater of rains and storing the water diverted from two nearby brooks. This came in the wake of the desert climate of Kutch, where several years could pass without precipitation. A seasonal stream running across the site was dammed at numerous points.

Pic 28 Water reservoir with steps at Dholavira. Source: http://en.wikipedia.org/wiki/Dholavira

Lothal is located close to the village of Saragwala in the Dholka Taluk of Ahmedabad. Dating back to 2400 BCE, the dock of Lothal was the earliest known dock in the world linking the city with the track of the Sabarmati River on the trade route between Harappan cities and the Saurashtra Peninsula. It was a significant and flourishing trade centre at that time.

In the excavation which resumed in 1961, archaeologists discovered trenches sunk in the northern, eastern and western borders of the stack, bringing to light the cove conduits and ravine and connecting the waterfront with the river. The discovery comprises of a mound, a township, a marketplace, and the dock.

In Lothal in Gujarat, Inamgaon in Maharashtra and other places in the north and western parts of India, small bunds were extensively constructed for harvesting rainwater.

Pic 29 An old well in Lothal. Source: http://en.wikipedia.org/wiki/Lothal

Pic 30 The dock, with a canal opening to allow water to flow into the river, thereby maintaining a stable water level. Source: http://en.wikipedia.org/wiki/Lothal

The *Harappans,* the ancient people who lived in the Indus Valley from about 3300 BCE to 1600 BCE, were far ahead of their time, especially in architecture. Although not every Harappan house had a well, they were quite common and comprised one of the most identifiable feature of Harappan urbanism. Gradually, the streets and houses were heightened due to amassing of rubbish. This is why tall wells are commonly seen at Harappa and in the neighbouring areas.

Mohenjo Daro is the most studied settlement of the Indus Valley civilisation featuring the Great Bath, the first of its kind in the primitive period. The cisterns at the centre of a courtyard are rectangular structures. Across the lane to the north of the great bath, there is an eight-block bathroom arranged in two rows, one on either side of a drain. A well that is double ringed is seen in one of the rooms meant for supplying water to the bath which is reached by a flight of steps on the sides. This antique city also had about 700 wells, and almost all houses had one private well. Indus Valley Civilisation: *Mohenjo Daro*

Pic 31 Great Bath, Mohenjo Daro. Source: http://en.wikipedia.org/wiki/Mohenjo-daro

Water Management During Various Dynasties

Vedic Period

Vedas recommend a common source of water, common food habits and an equal burden of labour so that everyone in the society could move ahead together[191] sowing the seeds of community living which is the actual philosophy of modern communism centuries before Karl Marx. Intervention of law and governance though was warranted many a time to exercise a good control over water management.

Progress of unfailing sources of water such as reservoirs, ponds, lakes, irrigation canals and others came to be observed as an indispensable part of quality governance. Monarchs and rulers not only got a variety of waterbodies built but also encouraged village communities and individuals to build these on their own. Wide-ranging decrees were passed for regulating their construction and preservation as also the proper distribution of water.

During the period of Rig Veda (VI, 24.6),[192] the relationship between slope and velocity of flow was known reflecting the understanding about the physics of flow. Atharvana Veda (II, 3.1)[193] states that the rivers having their birth in the snow-clad mountains keep flowing in summer also; all the major rivers flowing from the Himalayas were perennial since they were fed by rains during monsoon and snow melt during summer. Atharvana Veda (2.3.1) also quotes so regarding management of water that 'if brooks, wells, pools and others are appropriately used and looked after, will lessen the intensity of drought and scarcity of water'.

---

[191] samaaniiprapaa sahavonnabhagah sammane yoktre sahavoyunajmi samyanchognim saparyathaaraa naabhimivaabhitham.....Atharvaveda...3.30.6

[192] वि त्वदापो न पर्वतस्य पृष्ठादुक्थेभिरिन्द्रानयन्त यज्ञैः। तं त्वाभिः सुष्टुतिभिर्वाजयन्त आजिं न जग्मुर्गिर्वाहो अश्वाः....ऋग्वेदः....६.२४.६/vi thvadaapo na parvatasya pushtaadukthoobhirindraanayantha yajnau । Tham thvaabhih sushtuthibhirvaajayantha aajim na jagmurgirvaaho ashvaah….. Rigveda…..6.24.6

[193] आदो यदवदावत्यवत्कमधि पर्वतात्। तत्ते कृणोमि भेषजं सुभेषजं यथाससि॥.....आथर्वणवेदः.....२.३.१/ aado yadavadaavatyavathkamadhi parvataath । Thaththe krunomi bheshajam subheshajam yathaasasi…..Atharvaveda……2.3.1

Ramayana (7000 BC) King Bhagiratha, the ancestor of **Srirama**, was the first irrigation engineer who tailored the path of Ganga to the empire of Kosala, presently Awadh in Uttar Pradesh. His efforts are well known as 'Bhagiratha Prayatna' like the Herculian task in English.

The Era of Mahabharatha (3139 BC)

People in the time of Mahabharata saved water in big tanks. After suffering to get water in the country, King Yavakri constructed many ponds and tanks. Wells were constructed in various places and houses for an easy and adequate supply of water. The King also ordered the digging of wells on the sides of big Rajamargas/prominent roads for the comfort of the travellers.

Rules for preserving purity and sacredness of water (as rivers, lakes, tanks, ponds, etc.) and description of several rivers, lakes, tanks, etc. are found in the epic of Mahabharata.

In the Kingdom of Chedi, lakes in the forests were full of clean waters. The Gandhamardana mountain lakes were neat with clean banks, and its water had good healing power because of the presence of cane trees around it.

Sage Narada asks Yudhishtira if he has built reservoirs for storing rainwater for irrigation purposes, saying agriculture should not depend on rains alone.

The largest inland salt lake of India, the Sambhar Lake is a bowl shaped encircling the Sambhar Lake Town located 96 kms from the city of Jaipur in Rajasthan. Sage Shukracharya was known to have lived in this region. The Shukraniti, written by the sage, prescribes that the king should construct wells, tanks and reservoirs to store water for agriculture.[194] He also states that the land revenue should be set on the basis of the irrigational facilities available on it.[195] If a farmer has got wells and water canals constructed on his own, he should be exempted from land taxes till the income is double the cost of cultivation.[196] The sage also uses words referring to artificial lake (कृत्रिम नदी),[197] and there is also a mention of a machine called Udayanayantram (उदयनयन्त्रम्) which probably was something like bucket wheel.

[194] shukraniithi 4.363

[195] शुक्रनीति ४ २२४/shukraniithi 4.224

[196] शुक्रनीति ४ २३२,२३३/shukraniithi 4.232 & 233

[197] शुक्रनीति ४ २३२/shukraniithi 4.232

Mauryan Empire (322 to 185 BCE)

Chanakya or Kautilya, the kingmaker, laid the foundation of Mauryan Empire and penned 'Arthashastra', a book of political economy of ancient India. Arthashastra gives an extensive account of dams and bunds that were built for irrigation during the reign of the Mauryas. The water supply systems were well organised in a framework of stringent policies. Various types of levis were collected from the farmers based on the nature of irrigation. The rate of tax was 25% of the production in case the water was drawn from natural sources such as rivers, lakes and springs. If water was obtained from storages constructed by the Monarch, the rate of tax differed with the method of drawing; it was 20% of the production for water taken manually, 25% for water pulled by bullocks and 33% for that diverted by means of channels. Taxes were exempted if a farmer built or improved irrigation facilities himself. The exemption period was 5 years for new tanks and bunds, 4 years for restoration of old structures and 3 years for clearing overgown weeds along the constructed irrigation amenities.

Kautilya states of all the irrigation works perennial flow is the best and among the perennial projects, that which can irrigate a vast area is most valuable (Chapter 52.3). Arthashastram (2.1.20) reads 'reservoirs should be built using natural springs and water brought from other places'. 'Shades, courtyards, latrines, fire places, places for pounding grains and open spaces are to be used as common properties' Arthashastram (3.8.28).

Chapter 8 of Arthashastra gives an extensive account of laws pertaining to buildings and their architecture.[198] This chapter reads laws that were enacted to design discharge mechanism of waste and waste water from every house, and from each house a water track of adequate gradient at a distance of 3 padas or 1.5 aratnis from the adjacent spot shall be built so that water flows from it in a constant line or falls into the drain. Violators of this shall be penalised with a fine of 54 panas. If a ditch, strides, water track, ladder, manure hill or anything else of a dwelling bothers outsiders hampers others' delight or causes water to get collected and thus damage the wall of an adjoining house, the violator shall be penalised with a fine of 12 panas. If the displeasure is owing to faeces and urine, the fine shall be doubled. The same fine should be meted out also to a tenant who, even when asked to evacuate, lives in the house, along with the owner.

It is also seen from the ancient treatise on administration that a specific officer was responsible for irrigation works. Waterbodies like reservoirs, bunds and tanks were also privately owned, and the owner was free to sell or mortgage them in expectation for a share in the production. Waterbodies had to be maintained by the inhabitants of the village in the absence of the owner.

[198] Vastushastra is the name given to the discipline known as architectural science in modern times.

The first version of the water law is also found in this ancient document. It talks of a set of sentences lay down for breach of water laws like:

- Damage other's ploughed or sown field by letting water flood from a tank or a reservoir.
- Causing damage to gardens, parks and bunds.
- Owner of a higher tank preventing the filling of a lower tank
- Failure to maintain the waterbody.
- Out-of-turn drawing of water from a tank.
- Building a well or a tank on someone else's land.
- Selling or mortgaging a waterbody meant for charitable purposes.
- Penalty of death was ordered for breaking a reservoir filled with water.

Development During the First Century BC

Satvahanas who ruled between first century BC and second century AD in southern India pioneered the concept of brick and ring wells. Lake and well irrigation were developed at a large scale in the reigns of Pandyas, Cheras and Cholas also in south India between the first and third century AD, and large constructions were made across the rivers of Cauvery and Vaigai. The renowned Cauvery anicut was a work of this epoch. Tataka, tanks for tapping rain water, were also built on a large scale. Natural depressions were also developed into irrigation tanks.

Pic 32 This oldest dam in the world, Grand Anicut (Kallanai), is located in Tamil Nadu built by the Chola King Karikalan in the first century AD. Source: http://www.tamilspider.com/resources/3363-Grand-Anicut-Kallanai-Tamilnadu.aspx

The Gupta Empire (320 to 550 AD): The Golden Age of Gupta reign was marked by colossal progress in every aspect of civilisation that shaped up the elements of what is in general branded as Hindu culture. Water resources development on a large scale took place during this period.

Drought was common in the Gupta Empire, so irrigation was essential and taxes were levied on water. Every month people gave a day of labour to maintain wells, irrigation, ditches, reservoirs and dams. The province had a very profitable trade through the Mediterranean Sea.

> The Bruhatsamhita (54.118; Achyntananda Jha, 1988), attributed to 550 AD, the period of Gupta Reign, describes the utility of ponds for effective storage of water: 'A pond constructed facing west from east holds water for long while that built from north to south gets spoilt by the waves raised by winds'. The shores of such tanks must be protected by planting of certain trees, the species of which are spelt out; one is tempted to compare this with the catchment treatment measures recommended in modern times for soil and water conservation.

Irrigation in Karnataka was properly taken care of right from the Ganga Dynastic rulers' times in the ninth century with the **'Bittuvatta' system** (the tradition of setting some piece of land in every village as 'Bittuvatta'. Persons enjoying such land were charged with the responsibility of the upkeep of the village's irrigation facility) for their proper upkeep.

The Rajput Period (Ninth to Twelfth Century AD)

The Rajput dynasty (1000–1200 A.D.) highly promoted works in the area of irrigation in northern India which is very much evident in the state of Rajasthan which still have innumerable canals, dams, and reservoirs built in their time still in use. Rajputs also got built the beautiful temples at Khajuraho and also many well-known temples in Gujarat and Western Rajasthan in the tenth and eleventh centuries. Their architecture represents a pleasing blend of Hindu and Muslim styles. Among the more notable are forts at Chitor, Gwalior and Jodhpur and the 'Palace of Winds' (Hawa Mahal) in Jaipur. Jai Singh II, the King of Jaipur, got astronomical observatories constructed in Jaipur and Delhi in the early eighteenth century.

Pic 33 Ana Sagar lake. Source: https://www.google.co.in/search?q=ana+sagar+lake&biw=1600&bih=828&tbm=isch&imgil=RCqVxCFEcN2BdM%253A%253BtGx8tV2eZ9PzlM%253Bhttp%25253A%25252F%25252Fwww.columbia.edu%25252Fitc%25252Fmealac%25252Fpritchett%25252F00routesdata%25252F1100_1199%25252Fmuinuddin%25252Fanasagar%25252Fanasagar.html&source=iu&pf=m&fir=RCqVxCFEcN2BdM%253A%252CtGx8tV2eZ9PzlM%252C_&usg=__q9ygqJAq5Xe9_9euhUrmWpjualk%3D&ved=0ahUKEwjH-M_q8ZLNAhUBQY8KHcjFD6sQyjcIMA&ei=uCdVV8e8EoGCvQTIi7_YCg#imgrc=RCqVxCFEcN2BdM%3A

Ana Sagar is a manmade lake sited in the Ajmer city of the state of Rajasthan. The grandfather of Prithvi Raj Chauhan, Anaji Chauhan, got it built in 1135–1150 AD and was named after him. Local populace built the catchments. Jehangir got the Daulat Bagh Gardens made along its banks, and Shahjahan got the Baradari or the pavilions built for it. The lake covers an area of over 13 square kms.

Pic 34 The Mansagar lake. Source: https://www.google.co.in/search?q=man+sagar+lake&biw=1600&bih=828&tbm=isch&imgil=RCqVxCFEcN2BdM%253A%253BtGx8tV2eZ9PzlM%253Bhttp%25253A%25252F%25252Fwww.columbia.edu%25252Fitc%25252Fmealac%25252Fpritchett%25252F00routesdata%25252F1100_1199%25252Fmuinuddin%25252Fanasagar%25252Fanasagar.html&source=iu&pf=m&fir=RCqVxCFEcN2BdM%253A%252CtGx8tV2eZ9PzlM%252C_&usg=__q9ygqJAq5Xe9_9euhUrmWpjualk%3D&ved=0ahUKEwjH-M_q8ZLNAhUBQY8KHcjFD6sQyjcIMA&ei=uCdVV8e8EoGCvQTIi7_YCg#imgrc=RmCjLZZWr_bd7M%3A

During 1596 AD, when there was a severe famine in the Rajput province, there was a consequent acute shortage of water. The monarch of Amer was then motivated to have a dam built for collecting water to beat the severe adversities caused by the crisis. A dam named Man Sagar was built, across the eastern valley between Amer hills and Amagarh hills with earth and quartzite. The dam is about 300 m long and 28.5–34.5 m wide at present. Three sluice gates are provided for it for release of water to the downstream area. The dam and the palace in its centre have gone through renovation under various rulers numerous times, but the last renovation was taken up by Jai Singh II of Amer in the eighteenth century. The king also got numerous other constructions made of historical and religious significance, some of which being the forts of Amer, Jaigarh, Nahargarh, Khilangarh and Kanak Vrindavan Valley, which lie in the vicinity.

Pic 35 Balsamand Lake. Source: https://www.google.co.in/search?q=images+of+Balsamand+Lake&tbm=isch&tbo=u&source=univ&sa=X&ei=8LWmUrHhJ4exrgeEg4CwCw&ved=0CCoQsAQ&biw=1366&bih=599#tbm=isch&q=balasmand+lake&imgrc=MTJGRzM7r3TqOM%3A

Balsamand Lake is located 5 km from Jodhpur, Rajasthan along the road of Jodhpur Mandore Road. The lake was built by Balak Rao Parihar in the year 1159 AD. It was planned to fulfil the water needs of the people of Mandore. The lake stretches to a length of one km and a breadth of 50 m and is 15 m deep.

Pic 36 Rajsamand Lake. Source: https://www.google.co.in/search?q=images+of+Rajsamand+Lake&tbm=isch&tbo=u&source=univ&sa=X&ei=8LWmUrHhJ4exrgeEg4CwCw&ved=0CCoQsAQ&biw=1366&bih=599#tbm=isch&q=Rajsamand+Lake&imgrc=i5_5-CfIlQXBqM%3A

Rajsamand Lake is a lake situated near the town of Rajsamand in the state of Rajasthan. Located at 66 km off from the north of Udaipur, the lake lies between the cities of Rajnagar and Kankroli. The lake is also known by the name of Rajsamudra Lake in Rajasthan. Built by Maharana Raj Singh in 1660, the width of the lake is about 2.82 kms, the length is about 6.4 kms, and its depth is 18 m. The lake has a catchment area of close to 196 sqm as it is built across the rivers of Gomati, Kelwa and Tali. Rajsamand Lake is one of the five popular lakes of Mewar. This lake also has the pride of a magnificent dam built in seventeenth century. A huge embankment is built in white marble on the southern end of the lake. The marble terraces and stone steps touch the waters of the lake. Here, the five toranas (weighing arches) are also found, where Maharana Raj Singh and his descendants arranged Tuladan in which Kings used to weigh themselves in gold before distributing it among the Brahmans.

In eastern India Pal and Sen Kings (760–1100 A.D.) got a number of large tanks and lakes constructed in their empires. Kalhana's Rajtarangini gives a thorough description of the development of irrigation systems in Kashmir in the twelfth century.

The Vijayanagara Empire (Fourteenth to Sixteenth Century AD)

The rule of Krishnadevaraya witnessed several diversion works across Tungabhadra River with the construction of numerous canals of extensive irrigation and water supply to the palaces of the kings and the capital city that was thickly populated. The royal centre of the palace consisted of bath structures and temple tanks. These systems continue to supply water to agricultural fields even to this day, with some changes from time to time. The important channels still functioning are the Raya and the Basavanna canals supplying water to the fields of Hospet and Kamalapuram near Tungabhadra River. The canals were constructed during the medieval period. Currently, the modern Tungabhadra Dam at Mamallapuram feeds the canals as the original diversion structures remain submerged by the Tungabhadra reservoir. The low-lying canal of the Tungabhadra Dam gets integrated with the old Raya canal. The Basavanna canal had originally irrigated large tracts of agricultural land between Vallabhi Puram and Amaravati (Bhavanishankar, 2007).

Madhava Manthri, a Vijayanagara officer at Talakad, raised the famous Madhava Manthri Katte between the places Hemmige and Muduktore across the River Cauvery in about the year 1341, and a record of the year 1638 speaks of it as Madarasa Vodeyara Katte Kaluve. There is an old anicut at Dhanagere across Cauvery in Kollegala Taluk and another at Ganiganur across Suvarnavathi River (Bhavanishankar, 2007).

Around Hampi, the capital of the empire, are the remains of ancient aqueducts and canals as seen in the picture below and were used for bringing water from the Tungabhadra River to the tanks and baths. Water inside the temples was usually supplied by underground aqueducts.

Pic 37 Source: https://www.google.co.in/search?q=Aqueducts+of+Vijayanagara+empire&tbm=isch&tbo=u&source=univ&sa=X&ei=sq6lUu_7MciJrQf2sYHYBQ&ved=0CDwQsAQ&biw=1366&bih=599

Pic 38 Source: https://www.google.co.in/search?q=temple+ponds+in+the+vijayanagara+empire&biw=1600&bih=828&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjwmrWa9ZLNAhWLo48KHbjmC90Q_AUIBigB

Pic 39 A canal linking to a small tank at Hampi. Source: https://www.google.co.in/search?q=A+canal+linking+to+a+small+tank+at+Hampi&biw=1600&bih=828&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj9qsO79ZLNAhUHQI8KHZnNCBUQ_AUIBigB#imgrc=vMl8sb0kYzwfYM%3A

The Wodeyars (1399–1947 AD)

The Wodeyars who ruled the princely state of Mysore from the fifteenth century onwards built a number of irrigation diversion works across the River Cauvery in South India, and many structures are in existence even today working very well. The Bangara Doddi Kaluve aqueduct, carrying a distributary across the River Cauvery, more than four centuries old, is in good working condition and probably the oldest aqueduct in service in the world.

There are many epigraphical records that indicate that irrigation had been practised from historical times in the erstwhile Mysore State, now merged in Karnataka. The inscriptions of the Ganga, Cholas, Hoysalas and the Vijayanagara and Mysore rulers not only speak of tanks, canals, sluices and other means helpful to facilitate irrigation but also mention about the steps taken for the conservation of such means of irrigation like repair of embankment, desilting of tanks, etc.

The creation of a canal by directing the flow of the Lakshmana Tirtha River, a tributary of Cauvery, is mentioned in a record of the year 1669 with the tank named ‘Kanteerava Samudra’. Tipu Sultan, the popular Muslim ruler of Mysore State in those times, raised a bund of 70 ft high in Anandur in Mysore Taluk. In the days of Dewan Purnaiah, a renowned minister during the rule of Krishnaraja Wadiyar III, the Sagarkatte Dam, was raised across Lakshmana Tirtha. At Devanur, the construction of a tank, Devarakatte, is spoken of during the nineteenth century. Chunchanakatte has an old dam ascribed to one Chuncha. The Mysore rulers of those times, Kanthirava and Chikka Devaraja, had undertaken a number of irrigation works.

The Mysore rulers of the recent times have constructed the major irrigation works of the present Karnataka state, the most notable of them being *The Krishna Raja Sagara Dam* (in the picture) built across Cauveri River during the reign of Krishnaraja Wodeyar IV as a life-giving river for the Mysore and Mandya Districts, in 1924. Sir Mokshagundam Visvesvaraya served as the chief engineer during the construction of this dam.

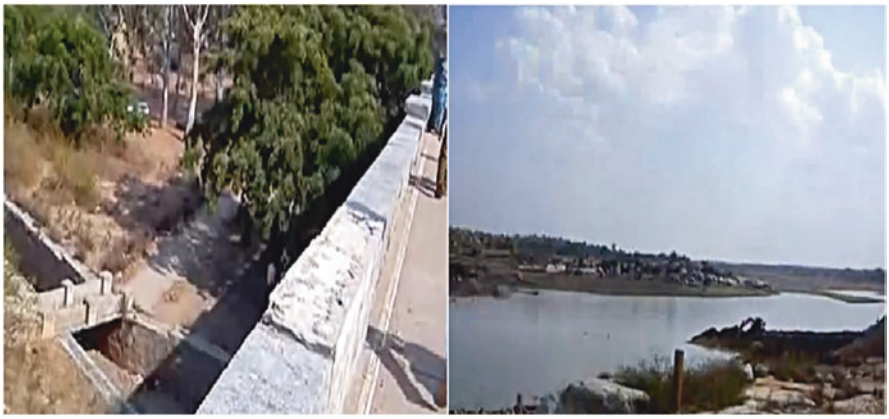
Pic 40 Source: http://en.wikipedia.org/wiki/Krishna_Raja_Sagara

Vani Vilasa Sagara Dam was also built in pre-independence time across the river Vedavathi.

The dam is a beautiful piece of architecture, a marvel of engineering, providing water to lots of surrounding cities, towns and villages, which are largely dry lands belonging to the Deccan area of Central Karnataka.

Pic 41 Source: http://en.wikipedia.org/wiki/Vani_Vilasa_Sagara

Budikote Dam, located 125 km off from Bengaluru, was one of the popular dams in the late 1980s, serving eight villages close by.



Pic 42 Source: http://www.google.co.in/imgres?imgurl=http://i.ytimg.com/vi/reTWHCG8Pic/0.jpg&imgrefurl=http://www.digplanet.com/wiki/Kolar_district&h=360&w=480&sz=21&tbnid=YLkQI3LexNjHnM:&tbnh=127&tbnw=169&zoom=1&usg=__azbiiSqHDYE1JLULpZG25ki0nmk=&docid=cOiVELIfDqBYRM&sa=X&ei=WBDVUsOWJsW5rgfKq4D4Aw&ved=0CC0Q9QEwAA

Kempe Gowda who ruled Bengaluru and its neighbouring areas in the state of Karnataka in the fifteenth century had a number of tanks built. The most well known among those were the Kempambudhi, Dharmambudhi, Sampangi and Siddakatte Kere tanks.

Role of Communities and Individuals: In yester centuries, the village communities and individuals were encouraged to build their own water harvesting structures to meet their domestic water requirements. The communities being closely knit had a strong culture of providing voluntary labour and material contributions towards building these facilities for the welfare of all. The social norms of the community members helped in maintaining these facilities, conserving and protecting water from pollution and guaranteeing just distribution. It is discovered that there was no problem of water scarcity wherever the communities were strong, and people on their own built water harvesting structures. On the contrary, situations were bad where the people depended entirely on the state for water.

Some Observations

Water is inert, without consciousness, and is indifferent to an expression of our gratitude or ingratitude, but the traditional perspective is that water is divine and is invaluable. In our ancient culture, we look at all the natural resources and forces of

nature as 'Deva' or 'Devatha'. These words never mean god or goddess as construed today. Deva is a Vedic word, meaning 'that which gives'. Once we receive something, we are indebted to the Deva or Devatha,[199] and a feeling of indebtedness and preparedness to clear the debt is termed as 'gratitude'.[200] If it is a person who has given, it is reciprocated by giving something similar or something else immediately or at times of need. If it is nature which has given, a sense of gratitude is defined as:

a) Using it diligently and deliberately avoiding misuse/abuse of it, that is, preventing pollution at any scale
b) Protecting it to be benefitted time and again in return
c) Sharing the benefits with fellow beings and creatures and perpetuating it for the benefit of generations to come
d) To enrich it wherever and whenever possible

It is apparent that a person with a sense of gratitude is aware of the importance and value of the thing or person towards which he/she expresses gratitude. Alternatively a person without gratitude will squander the thing that has bestowed benefits on him and shows disrespect towards a person who has helped. This is what is happening with respect to water and other natural resources in the present context.

Losing this gratitude in the present-day context has been the main cause behind all the disasters and chaos in relation to water in particular and natural resources in general. But, gratitude, in fact, liberates the one who expresses gratitude. This is one of the foundation stones of Indian/Human/Vedic culture. Thus, an expression of gratitude makes one deserve and enjoy perennial fruits. The ungrateful will miss all this for oneself and put others also on tenterhooks. This is the present scenario.

An in-depth analysis of the problematic scenario and a sincere implementation of the remedial measures are the need of the hour, and this is a verbal sketch of the above. This is guided by an awareness of ecology and scientific exposition, an inseparable part of Indian culture.

Finally, it is the duty of every human to identify the purpose of this mortal life and mortal world which is a beautiful path that leads the soul towards the divine bliss in the super soul which could never be achieved causing wreckage in this world. Submission to God is obvious to attain bliss, but submission to God means not just believing in the existence of almighty, but also respecting his creations and leading life in coherence with the laws of the nature.

This is the story of our glorious tradition of water harvesting in short reflecting the wisdom of our ancestors who thought harvesting of water and managing it effectively is an essential element of culture and life with community. This meant that these systems were perceived by the common man as his sacred duty as also the communities as part of a good local self-governance and social responsibility. This ancient knowledge at every level of society ensured an equitable distribution of

[199] देवो दानात् ..... निरक्तम् , Devoo daanaath…..Niruktham
[200] देवऋणम्.....Deva rinam

water, which, in turn, formed the basis for an all-round development and prosperity. Let us revive and extend this old knowledge for the advantage of all our people especially those in the rural areas. We can do it. We, the authors, humbly submit that the subject has not been covered exhaustively. There are many other facets to the subject and we have tried our best just to give a bird's eye view of the subject. The final message could be *Thank You Water*, we shall preserve you.

Acknowledgements Amarakosha, twelve.vaarivarga.259,260,261 (published by Prasaaranga Mysore university Mysore, Edited by Louis Rice)

Kittel, Rev F, Kannada English dictionary (Asian Educational Services, New Delhi)

Edited by Baale, Chandrashekara ಕೃಷಿ ಭಾರತ್, (Krushi Bharath), Kannada Monthly

All India Chinmaya Yuva Kendra, August 2003, Awakening Indians about India

Bhat, Dr K Narayana, 1998, Yaskapranitam Niruktham

Chaturvedi, Sudhakara, 2003, Arya Samaj, Bengaluru, Vedokta Jeevana Patha

Ramaswamy Vanitha, 1993, Shree Prakashana, Prachina Vanijya Charitham

Danino Michel, 2009, Landmarks of Science in early India

National Institute of Hydrology, 1990, Dehradun, Hydrology in Ancient India

Navaratna, Shesha, 1994, Samaja Pustakalaya, Dharawad, Manusmrithi

Raghavan V, 1952, Indian Institute of Culture, Bengaluru, Yantras or Mechanical Contrivances in Ancient India

Ramakrishna Math, 1993, Bengaluru, Saswara Rigveda & Taittareya Samhitaa

Vedabhashya Prakashana Samithi, 2001, Arya Samaja, Bengaluru, Saama Veda Samhitaa,

Shastry, GVV, 2011 February, Prakruthi Prathisthana, Tumkur, ರೋಗದ ಭಯವೇಕೆ? (Rogada Bhayaveke)

Somayaji. CS, 2011 Ayurveda Academy, Aushdham Jahnavi Toyam

Appendix

S N	Subject	Popular texts
1	Medicine/Ayurveda	1. Ashtaanga hrudaya (अष्टाङ्गहृदयम्)
		2. Astanga sangraha of Vaagbhata,
		3. Charaka samhita(चरखसंहिता) of Charakhaachaarya,
		4. Sushrutha Samhitha(सुश्रुतसंहिता) of Sushrutha and
		5. Vrukshaayurveda of Surapala
2	Prosody/Chandas	1. Pingala's Chadashshastra
3	Thesaurus/Nighantu	1. Nirukta (निरुक्तम्) of Yaaskacharya
		2. Amarakosha (अमरकोशः) of Amarasimha
4	Upanishads	There are more than 100 Upanishads found but mostly 10 are considered which are
		1. Esha (ईश)
		2. Kena (केन)
		3. Katha (कठ)
		4. Munda (मुण्ड)
		5. Mandukya (माण्डुक्य)
		6. Prashna (प्रश्न)
		7. Taittariya (तैत्तरीय)
		8. Aithareya (ऐतरेय)
		9. Chandogya (छान्दोग्यम्)
		10. Bruharaaranyaka (बृहदारण्यकम्)
5	Grammar/ Vyakaranam	1. Ashtadyaayi (अष्टाध्यायी) of Paanini
		2. Varthika (वार्तिका) of Katyaayana or Vararuchi
		3. Mahabhaasya (महाभाष्यम्) of Patanjali
6	Political economy/ Arthashastram	1. Arthashastra (अर्थशास्त्रम्) of Kautilya
		2. Shukraniti
		3. Naradaniti
		4. Viduraniti
7	Engineering/ Shilpashastram	1. Samaraanganasutradhaaraa (समराङ्गणसूत्रधारा) of Bhoja
8	Architecture/ Vaastushastram	1. Matangavaastu
		2. Maya samhitaa
		3. Vaasthuratnaakara
9	Law/ Dharmashastram	1. Manusmrithi(मनुस्मृति) of Manu
		2. Naradasmriti
		3. Parashara Smrithi

(continued)

S N	Subject	Popular texts
10	Chemistry/ Rasashastram	1. Rasahrdayatantra by Govind Bhagwatpad
		2. Srasaratnakara by Siddha Nityanatha
		3. Rasarnava by an unknown author
		4. Srasendracudamani by Somadeva
		5. Rasaratnasamuccaya by Vagbhatta
		6. Rasaprakasasudhakara by Yasodhara
		7. Rasarajalaksmi by Ramesvara Bhatta
		8. Rasendracintamani by Dhundukanatha
		9. Rasendracintamani by Ramacandra Guha
		10. Rasasara by Govind Acarya
		11. Rasakaumudi by Sarvajnacandra
		12. Rasabhesajakalpa by Surya Pandita
		13. Rasasamketakalika by Camunda
		14. Lohapaddhati by Suresvara
		15. Kankaligrantha by Nasirshah
		16. Rasamuktavalina by Devanatha
11	Literature/Sahitya	1. Raghuvamsham(रघुवंशम्) &
		2. Kumarasambhavam(कुमारसंभवम्) of Kalidasa
		3. Kirataarjuniyam(किरातार्जुनीयम्) of Bharavi
		4. Shishupaalavadham(शिशुपालवधम्) of Magha
		5. Naishadheeyacharitham(नैशधीयचरितम्) of Sriharsha
		These are called the 5 ‘Mahakaavyas’ or the greatest among the available ample literary works. The other prominent poets are Bhasa, Bana, Bhavabhuthi, Dandi, Shudraka, Bhatti, Vishaakhadutta, Bhartruhari, etc.
12	Epics/Akhyayika	1. Srimadraamaayanam (श्रीमद्रामायणम्) by Maharshi Valmiki
		2. Srimanmahabharatham (श्रीमन्महाभारतम्) by Bhagawan Vyasa
		3. Astaadashapuraanaani (अष्टादशपुअराणानि) by Bhagawan Vyasa
13	Astronomy/ Jyoutisham	1. Bruhatsamhitha (बृहत्संहिता) of Varaahamihira
		2. Aryabhateeyam
		3. Surya Sidhdhanta
		4. Lilavathi

References

Bhavanishankar BS (2007) Irrigation systems in Vijaynagar empire times and irrigation structures in the old Mysore state

International History Seminar on Irrigation and Drainage, Tehran-Iran May 2-5, 2007, https://www.civilica.com/Paper-IHSID01-IHSID01_002=IRRIGATION-SYSTEMS-IN-VIJAYNAGAR-EMPIRE-TIMES-AND-IRRIGATION-STRUCTURES-IN-THE-OLD-MYSORE-STATE.html

Websites

http://en.wikipedia.org/wiki/Bhagiratha
http://en.wikipedia.org/wiki/Kaveri#Significance_in_Hinduism
http://en.wikipedia.org/wiki/Talk%3AMadikeri
http://www.indialine.com/travel/karnataka/fairs-festivals.html
http://www.nih.ernet.in/rbis/vedic.htm#water_purification
http://www.slideshare.net/ashoknene/environnement-protection-awareness#btnNext
http://www.esamskriti.com/essay-chapters/Traditional-Methods-of-Water-Harvesting-and-applicability-2.aspx
http://www.ssmrae.com/admin/images/0d0c3d83c5f336f7ab602c80838e191f.pdf
http://www.fordham.edu/halsall/india/kautilya1.asp#Book III, Chapter 8
http://en.wikipedia.org/wiki/Sambhar_Salt_Lake
https://www.google.co.in/search?q=images+of+Balsamand+Lake&tbm=isch&tbo=u&source=univ&sa=X&ei=8LWmUrHhJ4exrgeEg4CwCw&ved=0CCoQsAQ&biw=1366&bih=599#q=images+of+Man+sagar+Lake&tbm=isch&undefined=undefined&facrc=_&imgdii=_&imgrc=RmCjLZZWr_bd7M%3A%3BSPwG9Iv98Ps0DM%3Bhttp%253A%252F%252Fwww.birdfair.org%252Fimages%252F09.jpg%3Bhttp%253A%252F%252Fwww.birdfair.org%252Fman_sagar_lake.htm%3B500%3B228
http://en.wikipedia.org/wiki/Dhebar_Lake
https://www.google.co.in/search?q=irrigation+in+vijayanagara+empire&biw=1366&bih=599&tbm=isch&tbo=u&source=univ&sa=X&ei=1b6mUviEPIGRrQeU94H4CQ&ved=0CD4QsAQ#q=water+management+in+vijayanagara+empire&tbm=isch&undefined=undefined&imgdii=_
http://water.org/solutions/
http://en.wikipedia.org/wiki/Colorado_river_dispute
http://www.salmanmasalman.org/wp-content/uploads/2012/12/InternationalWaterDisputes2.pdf
http://en.wikipedia.org/wiki/Indian_maritime_history
http://en.wikipedia.org/wiki/Harappan_hydraulic_engineering
http://en.wikipedia.org/wiki/Gandaki_River
http://en.wikipedia.org/wiki/Hot_spring
http://en.wikipedia.org/wiki/1993_Latur_earthquake
http://astrouniverse.com/articles/tepotsava.php
http://www.udaipurblog.com/celebrating-the-greenery-hariyali-amavasya.html
http://www.hinduwisdom.info/Nature_Worship.htm
http://en.wikipedia.org/wiki/Kumbh_Mela
http://www.everyculture.com/wc/Germany-to-Jamaica/Rajputs.html#ixzz2ndKvhepY
http://www.iwmi.cgiar.org/Publications/Water_Policy_Briefs/PDF/wpb16.pdf
samskritabh...@yahoogroups.com
http://www.indiawaterportal.org/articles/hydrology-ancient-india-book-national-institute-hydrology-1990

http://www.slideshare.net/D5Z/f3t356
http://ia.rediff.com/news/2005/apr/11brass.htm
http://www.new1.dli.ernet.in/data1/upload/insa/INSA_1/20005b5f_327.pdf
http://www.lonelyplanet.com/india/himachal-pradesh/events/other/minjar-festival#ixzz2qM6RMR2V
http://hinduism.about.com/od/godsgoddesses/a/ganga.htm
http://en.wikipedia.org/wiki/Vallam_Kali#The_most_renowned_of_these_races