

Vedic Concept of Water-Global Warming's and Remedies

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Rig Veda in its 10th Mandla (129th hymn) speak of the speculations by the seers of the time about the creation of the universe, when there was nothing but bottomless, uninterrupted and limitless water, which in fact was egg shapes from which everything emanated as laid down in Chapter 82, Shaloka 5 & 6 & 7¹.

वरो दिवा पर एना पृथिव्या परो देवे मिरसुरैर्यदस्ति।
क स्वदनर्म दघ्न आवो यत्र देवा समवश्यन्त विश्वे।
तमिदनर्म प्रथमं दघ्न आवो यत्र देवा समऽच्छन्त विश्वे।
अजस्य नामापथेकमर्चितं यस्मिन् विश्वानि भुवनानि तस्थुः॥
न तं विदाथ य इमा जजानाऽन्यधु²माकामन्तर वमूर्वा
नोहारेण प्रावृता जल्पया चाजसुतुव उभ्यशाश्रवरन्ति।

The concept of Rig Veda about the creation of life is well compatible with the current understanding of the origin of life on earth. The fossile evidence found in Western Australia, Eastern South Africa and alike, indicate that single celled bacteria and stromatolite colonies flourished in primitive oceans about 3.5 billions ago.

According to the hymns of Rigveda, water was an extraordinary and omnipresent element in Rig Veda, being upholder of all lives and savior of everything living or dead on earth. These (waters) were both mentioned as means of terrestrial and celestial. These waters when set free for movement were described as movement upwards by Indira after killing of Varitra (II 15.6, I.80.5, I. 32.12 etc.)². Their downward movement is decribed in VIII 69.11 where the seven rivers flow into the jaws of varuna (ocean).

“Apas” is also described as God of waters besides Indira, Varuna and Parjanya with independent portfolios, whether directly on indirectly.

Apath or Apas being God of water, crept from the Sanskrit expressions of Veda Ap (ap) for water which was further described in Persian as Ab.

In Mandla VII of the Rigveda³ the water is defined as ;

He whose destination is the Ocean, who purifies the world, is always flowing, such water lives in the middle of universe. Indira, who possesses Vajra and rains the desires, broke open the path for these divine waters. May these water help me and be received by me.

Shaloka 49-1

The water which is created in the universe, the water which flows in form of river etc, the water which comes from the digging of the well, canals etc, the water which is self created in form of water falls etc. who enters into ocean and who is pure and full of light, who is full of divine characteristics, help me in this world and be received by me.

Shaloka 49-2

The water is a great medicine it does away with the disease and is giver of health, strength, long life, wealth and immortality. The world prays for its favours. It invited to receive the “Som” libation.

The waters which are sent to the middle of the universe by the King varun after checking the true and untrue deeds of human being, the water which distills sweetness, full of light and is the great purifier, who is full of divine values, such water helps one in this world and be received by me.

Shaloka 49-3

The water in which the king of waters varun dwells, the water in which som lives, in whom all Gods drink exhilarating strength, the water in which the leader of all-Agni enters, who are full of divine values, help in the world.

Thus waters occupy a poivotal role in Rig Veda. The Society, like the other contemporary ones, the world over was fully aware of its importance in human as well as non human aspects of life and thus attached great value to it. It attributes its role in the functioning of the earth, and its importance in society excited adulation in all branches of human life.

I. GLOBAL CHALLENGES

1.1 Global Warming

Global warming is the long term rise in the average temperature of Earth’s climate system. Intergovernmental panel on climate change (IPCC). Fifth Assessment Report concluded “It in extremely likely that human influence has been the dominant cause of observed warming since mid of 20th century (IPCC, ARS, WGI summary of Policy makers 2013 Page 17⁴. The largest human influence has been emission of green house gases, such as carbine dioxide, methane and nitrous oxide. These findings have been recognized by the National Science Academics of the major Industrialized nations.

The effect of global warming include rising of sea levels, regional changes in precipitation, more frequent extreme, weather events such as heat waves, and the expansion of deserts⁵. (IPCC, ARS, WG2, Technical Summary 2014, Page 44-46).

Ocean acidification is also caused by green house gas emission and is commonly grouped with these effects even though it is not driven by temperature.

Surface temperature increases are extreme, having contributed to the retreat of glacier, permafrost, and sea ice. Overall, higher temperatures bring more rain and snowfall, but for some regions draughts and wildfires increase instead. (National Geographic 2019 ; NPR 2010)⁶ Climate change threatens to diminish crop yield, harming food security and rising sea levels may flood coastal infrastructure and force abandonment of many coastal cities. (National Research Council 2012, Page 26-27)⁷. The main reasons are;

1. Deforestation.
2. Global dimming because of aerosols (solid and liquid particles) from volcanoes, plankton, human made pollutants reflecting incoming sunlight cooling the climate.
3. Air Moisture. When the air gets warmer.

4. Reduction of snow cover and sea ice, resulting the increase of cloud cover, effecting the sunlight thereby cooling the planet.
5. Carbon dioxide

II. LONG TERM EFFECTS OF WARMING

On the time scale of centuries to millennia, the magnitude of global warming will be determined primarily by anthropogenic emissions. This is due to carbon dioxide's long lifetime in the atmosphere (Summary IPCC AR5, EGI, CH 12, 2013 page 88-89)⁸. These emissions are estimated to have prolonged the current interglacial period at least 10,000 years. Because the great mass of glaciers and ice caps depressed the Earth's crust, another long term effect of ice melt and deglaciation is gradual rising of landmasses, a process called gradual post-glacial rebound.

If global warming exceeds 1.5°C, there is a greater risk of passing through tipping points, threshold beyond which certain impacts can no longer be avoided even if temperatures are brought down again.

2.1 Biosphere

Global warming has contributed to the expansion of drier climate zones, i.e. the expansion of drier climate zones, i.e. the expansion of deserts in the subtropics (IPCC, SRCCL, Summary of Policy makers 2019⁹, Page 7). Rising of temperatures pushes bees to their physiological limits, could cause the extinction of bee population (Science Daily 28th June 2018). The ocean has heated more slowly than land, but plants and animals in the ocean have migrated towards the colder poles as fast as the faster than the species on land.

Ocean acidification threatens damage to coral reefs, fisheries, protected species and other natural resources of the value to the society. (UNEP 2010 Page 4-8).

2.2 Humans

All regions are at risk of experiencing negative impacts with low latitude, less developed areas, facing the great risks. The arctic, Africa, small islands, and Asian Megadeltas are the regions likely to be affected by the climate change.

2.3 Food and water

Global warming of around 4°C relative to the late 20th century levels could pose a large risk to global and regional food security. The impact of climate change on crop productivity for the four major crops was negative for wheat and Maize, and neutral for soy and rice in the years 1960-2013¹⁰. (IPCC, AR5WG2 Ch. 7 2014 Page 18 and 491-92)

2.4 Health

Generally impacts on public health will be more negative than positive including leading to injury and loss of life, besides indirect effects such as under nutrition brought on by crop failures and chances of increased number of suicides, new human diseases.

2.5 Livelihood, industry and infrastructure

In small island and mega deltas ; in undation from sea level rise is expected to threaten vital infrastructure and human settlements including homelessness in countries like Bangladesh as well as the statelessness for populations in insland nations like Malvadives and Tuvals.

2.6 Mitigations

Climate change can be mitigated through the reduction of green house gases from the atmosphere. Near and long term trends in the global energy system are incondistant with limiting global warming to below 1.5 of 2°C relative to pre-industrial levels. Current pledges made as part of the Paris Agreement would lead to about 3°C of warming at the end of the 21st century, relative to pre-industrial levels. To keep warming under 1.5°C, a far reaching system change on an unprecedented seales is necessary in energy, land, cities, transport, buildings and industry.

Emissions scenarios estimates of changes in future emission level green house gaces, depend upon uncertain economic, sociological, technological and natural development. Emission scenarios can be combined with modeling of carbon cycle to predict how atmosphere concentrations of green house gaces might change in the future. According to these combined models, by 2100 the atmospheric concentration could be as low as 380 or as high as 1400 ppm depending on the shared socioeconomic Pathway (SSP) the world would takes the mitigation scenario.

There is large potential for reductions in emissions mainly by reducing fossil fuel use and better regulating fossil fuel companies. Low carbon energic technologies such as solar energy, wind energy, battery storages have seen substantial progress over the last few years, but nuclear energy and carbon capture storage have not improved. The use of bio energy may bring negative consequences for food security. Further measures to include energy conservation and increased energy efficiency ; decarbonizing buildings and transport ; development and adoption of negative emissions and carbon reduction technologies, enhancing carbon sinks though by reforestation and preventing deforestation.

2.7 Himalyan Rivers

Himalayan mountain range is home to eight thousanders (14 separate mountains which are 8000 meters or above the sea level including K₂ (Also known as the savage Mountain or Godwin-Austen) and Mount Everest. Some of the famous rivers of the world including Indus, Gangas, Irravati, Satdru, Vipasa, Irrawati, Saryu, Brahmputra, Chander Bagha, Vatasta, Koshi, besides red river (Asia) Tarim River and Yellow river have sources from Himalyas. The collective catchment area, mountain range covers about 15000 glaciers a store house of 12000 cubic kilometers of fresh water feeding around 3 billion people i.e. 50% of the global population inhabiting in Bangladesh, Afghanistan, China, Bhutan, Nepal, India, Cambodia, Burma, Uzbekistan, Tajikistan, Khazakhstan, Vietnam, Laoes, Pakistan and Malaysia. 70 kms long Saichen Glacier located at the border of India and Pakistan is the second longest glacier in the World away from the glacial regions of North and South Poles. The other well known glaciers include Yamnotri and Gangotri (Uttrakhand) Baltoro and Biafo (Karakoram region) Nubra, Khumbu (Mount Everest region) and Zemy (Sikkim) glaciers.

2.8 Sapt Sindhu

Puranically the holy river Sindhu, the part of the devined holy Ganga being her Western Channel dropped at the globe being also called “Sapt Sindhu”. The expression Sapt Sindhu denotes a confluence of Seven holy rivers i.e. Sindhu herself, holy Devika also called Gupta Ganga flowing underground, Vitasta (Jhelum), Chander Bhaga (Chenab), Iravati (Ravi), Bipasa, Aparga (Beas), Satradu (Satluj).

2.9 Devika

Sootji transpired with Shounak ji and alike saints of Namisarana that once Maharishi Kashyapa alongwith the King of Serpents “Neel” while being a pilgrimage arrived in Madradesha where they observed turmoil and tyrannous atmosphere prevailing in the country. They had abandoned their religions, social and cultural obligations towards the society, thus this was a cause of anxiety of Maharishi Kashyapa. For establishing peace and to bring the people to the path of humanity and religion, Maharishi Sat on hard penance and satisfied the Lord-Dev-adi-Dev Mahadev. Lord Shanker, appeared in person and granted boons to Maharishi Kashyapa for the welfare of the people.

Pertinently the area of Madra desh, was established by Maharaja Puru’s dynastic ruler Madrik, also known as Dharavbhisar, named after Darvin, the son of King Ushinar from Chandravans and his queen Darva during Mahabhart period been conquered by Arjuna. All these fall as part of the region called Malesh Desh, the territories of which are located between rivers Singh and Satluj. The area of Madar desh was also known the combination of Digarta and Trigarta i.e. the areas falling between Vitasta (Jhelum) and Satradu (Satluj)

Being pleased with the prayer of Maharishi Kashyapa, the Kindful, Lord Shankar bestowed the boon for the benefaction of the misled people of Madardesh, while declaring the Goddess Uma who is presently in his body (Lord Shankar also called Ardhnarishwar) shall purify at all the seven occasions, Mountains and all the pilgrim centres of this earth and thereafter by accomplishment of such assigned task shall merge with Lord Shiva itself”

Subsequently according to the direction of Lord Shanker, The Goddess Uma who had appeared the person from the body of Lord Shiva transformed into holy river with cool, clean channel of heavenly water and fell before the feel of Lord Shiva, on the auspicious day of Falguna Krishan Chatturdashi at the time f sunrise (dawn) falling at the end of eighteenth Dawapar Yuga as per Santana calendar.

It is further said that thereafter Lord Shankar again appeared and transformed himself as a glittering on the surface of earth, along wht flowing holy Devika, which was being witnessed by Kashyap Rishi himself.

III. DESTINATIONS

3.1 Ashupati Mahadev Bhaderwah

Since the Holy Devika transformed into Gupt Ganga with territory of 5 kms or 22 kms wide range of flowing river, Thus initially appeared at Bhaderwah at the back of Gurreshwar also called Ashupati Mahadev being on the northern side of River Neeru besides also on the northern downstream of Kaplash Mountain.

3.2 Sudh Mahadev

The second stage of pilgrimage's circuit is at Sudh Mahadev. The destination where Maharishi Kashyapa had undergone penance for bringing down Holy Devika is believed to be Pap-Nashni Bowli. However the Holy Devika appears at Seejee-Da-Goth on the mountain peak at Sudhmahadev called Shounak Dhar or Shiv Gad, a place where Ved Vyas Ji performed penance with a desire to get a son from his own blood, also called this place as Budhi Sudhi other places of religious important are Sudh Mahadev after the name of demon Sudeshwar, Hari Dawar, Gouri Kund, Som Tirath, Indramarg and Vinisang.

3.3 Udhampur

The third stage of Devika appearance is at Udhampur. There are holy destinations of holy Devika appearing Gangera Hills, at Udhampur starting from Rani Ki Bowali to Mangu-Ki-Bowali, Doodh Ganga and Devika confluence near cremation ground. After udhampur, holy Devika appears at Gopal Ghat Nainsoo.

3.4 Jandhra and Sagoon

Fourth stage of Devika is at destination jandrah and Sagoon both falling in old Jammu District.

3.5 Purmandal-UHarbani Circuit

The fifth stage of pilgrimage circuit of holy Devika is Purmandal Uttarbehni circuit.

3.6 Airwan

Sixth stage of holy Devika is at Airwan in Kathua District.

Other places of appearance of Devika in Mader Desha are

1. Gupta Ganga at Kangra being part of Trigarat (Himachal Pradesh)
2. Sundar Bani Devika in Rajouri District.
3. Gupt Ganga called Khooneshwari in Village Khoon falling in Majalta Tehsil of Udhampur District.
4. Trisandaya in Marwah Dacchan area of Kishtwar District.
5. Banganga at Katra Vaishno Devi Ji.
6. Devika at Nand Babore in Tehsil Majalta of Udhampur District.
7. Neel Kanth Ghat at Basoli, presently submerged in Dam of River Ravi at Basoli.
8. Bandrakot bridge-Gupt Ganga at Kishtwar
9. Multan in Pakistan
10. A nallah near Krimachi in Udhampur District.
11. Some Nallahs in Ram Nagar area being called Devika.
12. A nallah in Kalakot is also regarded after the name of holy Devika.
13. A nallah flowing at Village Ghar in Udhampur Tehsil is also called Devika.
14. Makwalni Channel in a village falling in Tawi Deep also called as Devika.

15. Luddar Ganga in Ramban District.
16. Gupt Ganga in Lander area Bhamag originating from Sanasar.
17. Lander spring of Tehsil Pancheri
18. Sita Ram Ki Ganga at Mouda Patti is Basoli.
19. Malti Ganga at Gurnal in Billawar Tehsil¹¹.

III. WATER CONSERVATION

Water conservation in India is not a new concept. One of the earliest sites of Indus valley civilization, Dholavira in the Gujrat state has well documented storage reservoirs in form of lakes to collect the surface run off during rainy season. Not only that there were intricate channels and check dams for various purposes.

Such structure have been found in other sites such as Harapa¹⁵ and Mohenjodaro.

1. One of the strategies in water conservation in rain water harvesting by way of digging of ponds, lakes, canals, expanding the water reservoir and installing the rain water ducts and filtration systems on homes etc. Many people in different countries keep clean containers so that they can boil it and drink it. Harvested and filtered rain water can be used for toilets, home gardening, law irrigation and small scale agriculture.
2. Another strategy in water conservation in protecting ground water resources. Water in Saturation zone is called ground water. Contamination of ground water causes the ground water supply to be unfit for source of fresh ground water and the natural regeneration of contaminated water take years to replenish. Potential source of ground water contamination include storage tanks, septic system, uncontrolled hazardous wastes, land fills, atmospheric contaminants, chemicals and road salts.
3. Ground water flows due to gravity and eventually discharges into streams. Excessive pumping of ground water leads to decrease the ground water level and if continued unabatedly it can exhaust the resource. Ground and surface waters are connected and over use of ground water, diminish the water supply of lakes, rivers and streams.
4. A fundamental component to water conservation strategy is communication and education outreach of different water programmes. Developing communication that educates science to land managers, policy makers, farmers and the general public is another important strategy utilized in water conservation. Communication of Science of how water systems work is an important aspect when creating a management plan to conserve that system and is often used for ensuring the right management plan to be put into action.

IV. AGRICULTURE

Water is also very important part in irrigation. Plants take a lot of ground water, which should replenished. As for as crop irrigation is concerned, the exercise of optimal water efficiency i.e. minimizing losses by means of evaporation, run off or sub surface drainage be opted while ensuring maximized production there from. An evaporation pan in combination with specific crop correction factors can be used to determine how much water is needed to satisfy plant requirements.

4.1 Flood Irrigation

Flood irrigation, the oldest and most common exercise is often very uneven in distribution, as some parts of a field may receive excessive water but other may remain high dry. Over head irrigation using center-pivot or lateral-moving sprinklers, has the potential for much more equal and controlled distribution pattern.

4.2 Drip Irrigation or Soaking hoses

Drip irrigation is the most expensive and at least used type, but offers the ability to deliver water to plant roots with minimal losses. There are also cheap methods similar to drip irrigation system by use of soaking hoses that can even submerged in the growing medium to eliminate evaporation.

The 2011 UNE.P. Green Economy Report¹² notes that improved soil organic matter from the use of green manures, mulching and recycling of crop residues and animal manure increases the water holding capacity of soils and their ability to absorb water during torrential rains which is a way to optimize the use of rainfall and irrigation during dry period in the season.

4.3 Reuse of water

The imbalance between supply and demand along with persisting issues such as climate change and population growth, has warranted the reuse a necessary method for conserving water i.e. adopting variety of methods used in the treatment of waste water to ensure that it is safe to use for irrigation of food crops or drinking water, or both Sea water desalination is the method used in many countries to meet with the pure water requirements.

Sand filtration is another method used to treat the water, which according to recent studies, need further improvements, which is approaching optimization with its effectiveness at removing pathogens from water. Pathogens are capable of infecting humans

4.4 Wasting of water

The concept of “water wasting” is also called the “water-use efficiency”. The use of water is considered efficient if the same purpose of its use can be accomplished with less water. Technical efficiency derives from engineering practice where it is typically used to describe of output to input and is useful in comparing various products and processes. For instance shower head would be considered more efficient than another if it could accomplish the same purpose (of showering) by use of less water or other inputs i.e. Lower water pressure

4.5 Ancient Indian water Conservation Techniques

Our ancestors from ancient India have invented so many useful things, whose references are being used in combating modern day problems from the pages of ancient India.

The excellent water harvesting and drainage system in the cities of Indus valley civilization are masterpieces of their time and were so prominent that even today’s modern day water harvesting structures can be based upon their design. The ten prime techniques of water conservation were ;

1. Jhalara

The rectangularly shaped stepwells (step down to a well) that have tiered steps on three or four sides, were constructed to collect the water from the upstream reservoir or a lake. The oldest known Jhalara dates back to 550 AD and was built to fill the water demand-supply gap during the season of scanty monsoons.

2. Talab / Bandhi (Ponds)

The Talabs are the medium sized reservoirs (more than 5 bighas). They are either natural or man-made structures which were used to store water for household consumptions and drinking purposes. They were also built to regulate the flow of water and prevent flooding. The largest man-made Talab in India (area-wise) is the lake Hirakund in Odissa built on Mahanadi. It has the area of 750 square kilometers.

3. Bawari

Bawari is an another type of stepwells built around the reservoirs to narrow and deepen them, which helps in minimizing the loss of water through evaporation. In the areas where rainfall is scanty, like Rajasthan, the Bawari was the intricate part of cities, water storage network. With the construction of the canal that used to divert the rainwater into human made tanks, the major water issues of population were solved. Also, the water could percolate into the ground and raise the water table, thus recharging the aquifers. Chand Baori in Rajasthan is the deepest and largest Bawari in India with 3500 narrow steps built over 13 storeys.

4. Taanka

Taanka is like a modern day tank used in rain water harvesting system, for storing huge amount of water. This water harvesting technique is indigenous to the Thar desert region of Rajasthan. The taanka is built as cylindrical paved underground pit which is filled with rain water received from rooftops, courtyards or other manmade catchment areas. It can store water which can last throughout the dry season and can save the tedious labour of fetching water from distant places to meet everyday necessities.

5. Ahar Pynes

Native to South Bihar, Ahar Pynbes as reservoirs with embankments on three sides, built at the end of diversion channels like pynes, for harvesting flood water. This helped in saving the civilization from the havoc of floods alongwith providing great reserves for irrigation in the dry months. Due to Aharpynes. The high-water demanding Paddy cultivation can be done without apprehensions.

6. Johads

A naturally occurring three sided high elevated region were excavated for building an eastern storage pit called Johads, and were oldest systems that were built to conserve and recharge ground water. The excavated soil was used to built a wall for covering the fourth side of the region. Several Johads were made into a long network by

interconnecting each other to form a strong structure which is resistant to any damage. The network has a single outlet opening into a river or nearby stream.

7. Panam Keni

A special type of cylindrical well called Panam Keni was made by the Kuruma tribe, a native tribe of Wayanad, Kerala by soaking the stems of toddy palms in water. Due to soaking for long period, the core rots away, leaving only the hard outer layer. These cylinders of four feet in diameter and depth are immersed in ground water springs in the fields of forests. This structure helps in supplying abundant water even in the hottest months of the year. These wells are considered sacred, that is why even till today, the tribal use the keni water for cooking or drinking purposes only and not for washing clothes or bathing. Wearing footwear near these wells was considered sinful. At present, there are 200 kenis in Waynads.

8. Khadin

A 15th century irrigation method, Khadin were constructions designed to harvest surface runoff water for agriculture. Pallwal Brahmins of Jaisalmer were the first to bring the method of water conservation into implementation. Khadin (also known as Dhora) was the long earthen embankment that was built across the hill slopes or gravelly uplands where sluices (channels) and spillways allow excess water into drain off. The land with saturated water can be used for crops production.

9. Kund

According to the pages of history, Raja Sur Singh was believed to have built the earliest known kund in the Village of Vadi-Ka-Melan Somewhere around 1607 A.D. A Kund was a saucer-shaped catchment area that has gentle slope towards the central circular underground well. It was designed to harvest rainwater for drinking. The ancient harvest version of Kund were covered in disinfectant lime and ash, but modern kunds simply use cement for their construction.

10. Baoli

Baoli is another stepwell structure, beautifully created into arches, carved motifs and at some places, rooms on either side. A Baoli represent different significance, based on the location it was built. A village Baoli was used for social gathering and utilitarian purposes ; a Baoli on trade routes served as a resting place. This structure is open for the free drawing of water by people of any religion or caste. Chandi Baori, Rajasthan, Agrasen ki Baoli Delhi, Ran Ki Var Gujrat, Hampi Pushkarani Karnatka are some famous Baolis.

V. TRADITIONAL KNOWLEDGE OF WATER CONSERVATION¹³

Ladakh -Zing

Almost every region in India has its own unique method of storing and conserving water prevalent since times immemorial. While some method such as Baolis in Delhi have been long forgotten. Others such as guls in Uttrakhand are commonly used even today.

1. Jammu and Kashmir, Ladakh -Zing

Zing is basically a system of collecting water from melting glaciers. Common in Jammu and Kashmir region and LadakhZings are small tanks that collect water that melts from glaciers and can be used in other seasons.

2. Uttarakhand, Naula, Gul, Dhara, Dhan, Simar, Khal

Uttarakhand has a rich tradition of water conservation. Although the state is richly endowed in terms of water availability. The system to supply is scarce even today. Many ingenious systems have been in place to collect and supply water to the regions in Uttarakhand.

Naula is made traditionally from stones and is basically a small hut like structure that houses a spring. The floor should be left pervious.

Gul is more of system to divert and supply water rather than to store water. Gul are small channels that originate from a source (usually underground but may even be surface) and they are diverted to fields or whatever needed. Now days, guls are permanent feature and usually built from stone masonry works and channelize water primarily to supply into agriculture fields.

Dhara is again simple and spring source, in Uttrakhand, there was a practice of providing attractive features such as the mouth of lion or bull at the mouth of the spring and some such dharas can be found near temples and important rest points such as bus stations.

3. Himachal Pradesh – Kul, Khatri

Kul is just like a gul and is a channel to divert away water from a source (usually a glacier). Khatri is basically a rain water harvesting tank built out of stone to grant it some permanency. The structure should be impervious so the water doesn't percolate.

4. Rajasthan – Jahad Bawaris, Tananka

Johads are connecting rain water. A pit is dug and the connecting Johads are connected to it. When many Johads lead into to such a pit, the amount of water collected can satisfy a village's requirements. Rajinder Singh of Tarun Bharat Singh made Johads popular and is popularly known as waterman for this immense contribution.

Bawaris are step wells. Rain water is collected inside step well which also provides some protection against evaporation. The rain water collected helps in raising the ground level of water in the area something that Johad can also help in achieving.

5. Nagaland – Zoo

Zabo is practiced in some areas in Nagaland. The first stage includes conservation of forests, since they help in increasing rainfall and are an important source of catchment. Small channels are built that divert water from such forest hill tops in to a reservoir at a lower level. The water is then used for farm lands. The water during its run-off accumulated organic matter such as dung and other plant waste which serves a nutrient for the farm lands.

6. Bihar Ahar Pynes

Ahar are reservoirs and include an movement of flood water. So an Ahar Pyne is basically a system for flood water diversion and storage and ahars are usually built close to a drainage source.

7. Uttar Pradesh – Kunds

A Kund is basically a reservoir usually shaped like a saucer and into a well that is used to store rain water. The lining is done with lime to prevent contamination.

8. Maharashtra – Bhandara Dhad, Ramtek

A Bhandara is a check dam that is used to increase the water level of a river or stream so it starts to channelize and can fulfill the irrigation requirements of the region a very popular practice in ancient times, it is now redundant. The Ranitek model is named after the town in Maharashtra where the practice originated. It is an elaborate network of channels with underground supply and the water is channelized through an extensive network of tanks, baolis that replenish the water supply.

9. Madhya Pradesh and Orissa – Katas / Mundas / Bhandhas

Usually prevalent in ancient times, the practice is almost non-existent nowadays. Small check dams were erected which are known as Katas. The entire area would be blocked off to collect water in a region which would serve to help the community needs for irrigation. The shape would generally reasonable a triangle or rectangle and would be used for large fields.

10. Tamil Nadu – Eri, Ooranis

Erie and Ooranis are tanks constructed to collect and house water that can be used during the dry season for irrigation needs.

11. Assam – Dongs

Dongs are small ponds which are constructed to collect water and can help in restoration of to collect water levels and serves an important sources of reservoirs for community.

12. Delhi- Baolis, Dighis

Baolis are step wells and many survive till today in Delhi. Raja Ki Baoli is one famous structure which is now famous as a tourist site.

13. Meghalaya – Bamboo Drip Irrigatrion

Bamboo drip irrigation system primarily used for black pepper cultivation is an ingenious system prevalent in the state of Meghalaya. Bamboo channels, it reaches the fields where it can serve irrigation purposes.

14. Arunachal Pradesh – Apatani

This is wet rice cultivation seed fish farming system practiced by Apatani tribes in Arunachal Pradesh. The entire region is terraced in to plots separated by dams which are in turn supported by bamboo frames. All plots have water of low-lying plot functions as an outlet of the high- lying plots. Deeper channels connect the water purpose to outlet purpose.

15. Gujrat- Virdas

Virdas involved digging out small walls in a low lying areas to collect and harvest rain water.

16. Kerala- Surangam, Korambus

Surangams are tunnels that divert the water away from a well that is dug deep into the ground. The practice was widely used in Kerala. At the mouth of the Surangam, a reservoir is constructed to collect and store water.

Korambu is a temporary dam stretching across the mouth of channels, manufactured from brushwood, mud and grass. Korambu is made to boost the water level within the canal and to divert the water into field channels. Water is allowed to result one field to a different till all the sector is irrigated.

17. Andaman and Nicobar Island – Jackwells

Jack wells are small ponds which are used to harvest rain water. Similar to bamboo drip irrigation bamboo strips are used to channelize the water and an intricate system of jack wells would be built leading from smaller ponds to bigger ones that served as reservoirs. The entire system is constructed keeping in mind gravity so that the natural flow is maintained.

18. Karnataka – Madakas, Neeruganti method

Madakas are naturally occurring depressions and gravity is utilized to divert the rain water run-off which is then stored. The Neeruganti was a person who can be thought of as an irrigation officer in a village. The practice is used even today in Uttrakhand to maintain and distribute water from guls and the person is as Kotwal. In such a system, the water from a reservoir would be diverted to different fields and the person incharge takes care of how often and what time the water will be allocated. Usally the village elects or nominates a person who looks after the system.

19. West Bengal – Dungs, Jampols

Dungs or Jampols are an elaborate but tiny network of irrigation canals that divert water away from a river or stream and into the fields for irrigation primarily.

20. Andhra Pradesh – Cheruvu

A Cheruvu can be a tank or small pond that was used as a reservoir to conserve and store water cheruvus are highly polluted as of today and practice is dying.¹³

Geographical Location of Jammu region and the Contingencies of Water Conservation with Ancient Practice.

Jammu region of the erstwhile state of Jammu and Kashmir as stood on 15th August 1947 including the territories of 78000 sq.kms being in illegal occupation of the Pakistan as well as 43000 sq.kms in illegal occupation of china (including Aksai-chin, 5180kms unauthorisedly, transferred by Pakistan to China), consists of;

1. Sub-montane and Semi-mountainous track, consisting of plain continuous to Punjab and broken Kandi area skirting the Himalaya ranges. The rivers Chenab, Ravi, Tawi and Ujh and several perennial streams flow though southern plains, which borders upon Himachal, Punjab and west Pakistan areas. Rice, wheat, maize and other crops are generally grown in this region. Canals drawn from the big rivers and small village streams are the main sources of irrigation. The northern portion of the region called Kandi has an altitude of 2000 feet or less. Its soil is stony and cultivation depends mainly on seasonal rainfall.

2. The outer hills, consisting of the comparatively low hills to the south of the Mountain ranges, comprising whole area covered by the ranges of low hills to south of the Pir Panjal mountains, which divide the two regions of Jammu and Kashmir, one from the other. The altitude of the greater part of this belt varies from 2000 feet to 4000 feet, though the hills in Badarwah and Kishtwar reach heights of over 5000 feet. On the lower levels and stretches between the hills are patches of cultivated land or stunted forests. The higher cultivated are covered by pine and deodar forests. The cultivation is greatly helped by proximity of the Pir Panjal mountains, whose tremendous altitude causes moisture bearing winds to deposit most of their aqueous vapours in this part of Jammu region. Rice and wheat are grown in some parts while maize is the staple food¹⁴.

The total area of Jammu region now presently under control of India practically is 26293 square kilometers for 10152 sq miles (excluding major portion of JK POJK) with population on the basis of 2011 census in 53,50811 i.e. District wise as Jammu 15,26,406, Kathua 6,15,711, Samba 3,18,611, Udhampur 5,55,357, Reasi 3,14,714, Rajouri 6,19,266, Poonch 4,76,820, Doda 4,09,576 Ramban 2,83,313, Kishtwar 2,31,037.

The climate of Jammu region varies with altitude In and around Kandi areas and planes the climate is similar to the adjoining Punjab region with hot summers, rainy monsoon, mildly cold and foggy winters. However the higher hills and mountains are snow capped during winter. The region has forest cover of about 10497 square kilometers i.e. 9750 sq kms as Dense forests, 550 sq kilometers as open forests, 22 kms as scurb and 135 sq kilometer as non forest as stood in the year 2003.

Since ages, people across our Jammu region have experienced either excess or scarce water due to varied rainfall and land/soil surface topography. Management to irrigate their agriculture fields or to meet with domestic needs, the water harvesting or judicious utilization has come in place by their traditional ways though less popular are still in use and efficient. The experience which speaks of the enriched with knowledge of our ancestors, despite their illiteracy but successful water managers by way of proper tapping and judicious distribution of all available natural resources of water being not only since-quo-non for hilly Tarreins but in the scarcity faced zones.

The sources of water as experienced since the time immorial could be subsumed as a Natural lakes in local dialects called as Sars, Ponds, Chamachas or Sub lakes created by the needy, channels so created from natural sources by means of diversion in water nallahs or big rivers, water bodies at natural water sources called in local dalect as Bowalis, Sultas, natural water falls called as nadas, use of water by creating artificial lakes, ponds, check dams in nallahs and rivers, digging the wells, for both potable water or irrigation purposes small drainages called Kuhls so as to maintain sustainability of water use and conservation. The outlet of all such distribution channels (Kools) are called Moggha in local dialect. In Jammu region the two main canals viz Ranbir canal originating from River Chenab and a Partap Canal originating from River Ujh besides a casual from River Ravi, and Partap Canal to irrigate Western area of Chenab at Akhnoor to meet with dire need of the people of Kandi areas facing acute draught during hot summers. The channel system called as Kuhls in dialect comprised of main reservoir for collecting water from the perennial sources and its diversion through drainage system upto the stage of its distribution in fields, surface, Kuhls, Aerial Kools called as wooden flumes and Mogghas i.e. the final distribution systems for fields from Kuhls.

The check dams are usually created for raising the water levels and the ponds in the forests and grazing yards are created as a source of drinking water for wild animals in forests besides in grazing yards for domestic animals and raring ligve stocks.

Natural Lakes of Jammu region are called as Mansar Lake, Surinsar Lake, Sanasar, Dalsar (in Ramnagar Tehsil), Ramchana Sar (Near Latti Dhuna), Dehra Topsar, Ram Sar (Chanunta Village) Sar Dabbar (Mongri area), Kapilas Kund (Origin of River Tawi) Surya Kund (near Kaplas Kund), Soul Kund (Near Basantgarh) Durga Kund (Near Kaplash kund), Rishi kund (Near Durga Kund), Dain Kund (Near Kapilash Kund), Badnazar (in Padder area) Todvar Sar (Kala sar in Paddar area) Nainasar (Paddar area) Sarvai Sar (Padder area) Sherath Sar (Paddar Area) Haksho (in Paddar area) Dakksar (Madna area), Brahmsar in Kishtwar District), Brahm kund (on the peak of Brahm mountain in Kishtwar), Sarkut near Gouri Shankar Temple near Kishtwar. Tangsar and Jabbadsar are two natural lakes in Ramban District. Samotsar, Chandan Sar, Sukhsar, Akaldarshanisar, Nandansar, Katurisar, Yagsar, Padyuarnsar Part I, Padyarnsar Part II, Gumsar, Katoria Sar, Kokar sar, Neelsar, Bhagsar, Chamarsar, Chamrsar, Kalda Cheensar, kamsar, Mansar, Ktirimsar all in Pir Panjal range of Jammu region besides the artificial lakes created for Salal Hydro Project in Reasi District, Bagliar Dam Lake created in Ramban and Doda District, Ranjit Sagar created at Basoli for Power Project in Kathua District are worth noticing. Now the Irrigation system has further been stepped up by constructing Ravi Tawi Irrigation complex in Kathua-Samba and Jammu District, Tawi left Irrigation Project for irrigation Project, Udampur multipurpose canal for Hydel Power generation and Irrigation purpose, Duddar Kanal and number of small and Kohls in all the Districts of Jammu region.

Another system of potable water as well as for irrigation purpose has been opted by means of dug well, Tubewell and hand pumps besides also water left schemes from the following nallahs.

VI. CONSTRAINTS

1. Pollution of water bodies and flowing rivers, nallahs, bowalis, ponds and other water reservoirs at all places, creating dangers for the human life.
2. Ridiculous minings from the rivers creating dangers to the beds of all such rivers resulting lowering down the ground water levels.
3. Deconstruction of ponds so dug by our ancestors for the drinking water facilities at all available spaces so as to make the lives of wild life, raring live stock and grazing animals as more comfortable and environment free atmosphere.
4. Disappearance of all catchment areas inlit channels so kept for the water reservoirs for storage of rainy waters, a vital reason of environment imbalance.
5. Lack of authorities in not proper maintenance of sewage effluents but litting them to emerge in the flowing rivers with poisonous substances.
6. Disappearance of all ponds, shirking of natural lakes besides pollution of water with dangerous elements mixtures in such waters.
7. Global warming
8. Ridiculous excessive pumping of water from hand pumps, Dug wells and Tubewells.
9. Ridiculous wastage of water.
10. Disappearance of wet lands.
11. Illegal encroachments over all flowing rivers, nallahs, waterbodies and their catchments areas.
12. Deforestation and rich colour felling of trees.
13. Decline of traditional methods of water conservation by public participation.

VII. CONCLUSION

Undoubtedly our ancestors, having regard to the vitality for the human life, a sacred element held our Vedas as well, the waste of water or the pollution there of coupled with ridiculous dangers creating warnings by Global Warming, speedily melting glaciers, ridiculous mining from the rivers and nallahs, disappearance of check dams, ponds and other sources of charging the earth soil causing lowering water level underground are serious threats to our global life.

Although the indigenious practices and dynamics mechanism have proved to be innovativeness towards the management of water an essential part of life but the decline is an alarm for global ecology especially in the wake of poisonous effluents drained out in holy rivers, nallahs creating contaminations at all water bodies.

Need of the hour in the given to up keep the environmental standards by augmenting remedial measures by fostering close association of communities in afforestation, conservation of water by reservoirs in creating their

respective rain catchment areas, reducing avoidable concretization, check on avoidable wastages and creating and maintaining hygienic friendly water storages, natural water falls, water bodies spring, Lakes and ponds and all technologies well suiting to the regions, judicious use of water through canals, Kuhles and channels, drains, by avoiding ridiculous excessive minings besides proper disposals of sewages and other effluent pollutants. Sustainability of water conservation by maintaining ecology, addressing climate change in the Himalayan and ecosystem, heritage site experience from the befitting areas of our region, prioritization of traditional tribal fields, bio-mulching for seasonal vegetable crops managements. Cultural conservation of marine ecosystem,. Watershed programmes, erosion control and soil moisture conservation.

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