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Jalasamvad

A Dialogue on Water

Editors: Dr. Datta Deshkar, Shri Satish Khade

LUPIN Human Welfare & Research FOUNDATION

Cover Story:

Simple Thinking, Simple Technique - Yet they succeeded

Privatization of Water:

■ Nature has given us five important resources to maintain your livelihood. They are Land, Minerals, Forests, Water and Air. Once upon a time, all of them were available in ample quantity because the population using them itself was very small. But as population grew, the beneficiaries increased and availability of these resources per person went down. All are becoming scarce day by day. Land, Minerals and forests have already become very scarce. Compared to them, water is on the threshold of availability and scarcity. Some time we feel that it is scarce and some time we feel that it is available in plenty.

■ Since water is life itself, some feel that it should not become a marketable commodity and they strongly oppose to its privatization. They feel that if it is privatized that would harm the interests of common men as traders would charge exorbitant rates to poor persons. But it is wrong to arrive at such a conclusion without giving proper thought to it.

■ We can take the example of telephones. Previously this system was completely in the hands of the Government of the country. But due to inefficient handling, this activity could not grow properly. Now after its privatization, we find a healthy competition amongst the operators and the customers are getting the benefit of good service at reasonable rates.

■ This has proved to be beneficial not only to telephone industry but to other activities also. Take the example of private bus services, private hospitals where private caterers are giving quite a good service at reasonable rates. Compare the services given by private banks and the nationalized banks. It is because of poor efficiency of nationalized banks, Govt. is now thinking of privatizing the nationalized banks.

■ Agriculture is the major consumer of water. 80 percent of water available is used by agriculture. Government has increased the storage capacity of water by constructing large, medium, small dams and other reservoirs but unfortunately that capacity is not being properly and fully utilized. Cultivators are taking the liberty of using water without paying the charges for its use. Considering these gaps, Government is thinking of handing over the distribution system to private traders so that efficient distribution and proper use would be possible.

■ Even after privatization of water, the Government can enjoy the right of controlling the water traders. Rules can be framed in such a manner that private operators would not be in a position to misuse their trading activity. Priority sectors can be decided by the Government and the traders can be directed to stick up to the norms finalized by the Government.

■ 'Users should pay' should be the principle of any system. Who should use that facility, how much quantity he should use, at what rate he should use can be planned so that this scarce resource is used properly. Traders are not the enemies of the Society. Service is their motto and they can give efficient and better service at a reasonable rate if controlled properly.

Jalsamvad

Mouth Piece of Bharatiya Jala Sanskriti Mandal

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Editorial .....

Severe Water crisis all over the world

These days, in almost every newspaper or a TV channel, we will find a similar headline which points to severe rains causing catastrophic situation in many areas. Meta department have flagged Orange or Red Alerts in some areas. This situation is not prevailing only in India, but is found all over the world.

We would like to draw your attention to an important piece of news regarding China a couple of days ago, that one-third of the annual national rainfall in China has occurred in one single day. Likewise, all the countries in Europe are caught in the furious rains for last few days, thereby destroying lot of public wealth and taking away many lives. In Germany, many villages are reported to have lost contact with rest of world.

There are so many news items in the media currently pertaining to heavy rains and Catastrophic flooding of many rivers. Most of the rivers in India are overflowing. Some rivers have left their basin and entered the city. A market place in the city of Chiplun has gone under water and there in Kolhapur, the river Panchganga has been flooded; it's level has risen by 8 feet since last night. At many places, cars were seen completely submerged under water and only the roof was visible. If the rain havoc still continues, it may pose a danger for some major coastal cities which may also get partially submerged.

At the same time, there are some regions in the country where there is no trace of rain as yet. In the eastern part of Madhya Pradesh i.e. in Malwa region, there are no signs of rain yet. At the same time, sowing in some parts of Marathwada has been delayed due to lack of rains; while in some other places there is a crisis of double sowing. Also, out there in the Colorado region of the United States, rivers are drying up.

The story of the icy regions is altogether different. The process of melting of ice has increased so much that mountainous heaps of icebergs are separating into large chunks and moving towards the sea. In the Himalayas, melting of snow has increased significantly. Due to this increased rate, glaciers are declining fast. As a result, the threat to animal life there, is also in the increase.

Even rise in the temperature is also being experienced globally, these days. It includes Europe also. In cold regions like Canada, surprisingly, temperatures as high as 50 degrees Celsius have been recorded in some regions. This is definitely something to worry about. May be that, the human misdeeds are responsible for this. Therefore, anyone who commits a crime in this regard must be punished. However, in fact, what happens is that, one commits a crime but the other is punished. In this way, while certain countries are prominently responsible for the rise in temperature, others are being punished.

It is not the matter that it all happened all of a sudden. Over the last few years, this is being observed continuously. But, it is too much now to bare. We have ignored this all these days and that's why we have to face the consequences of it now. There has been a lot of discussion over this in the last several years; however, there is no progress with regard to action. There can have a solution for this issue. But, the real question is that - as to what extent all countries would be willing to comply it.

Scientists say that, this is the effect of the increased carbon dioxide in the air. If so, we all need to think about how to reduce it. Plantation can be the simplest solution for this. Scientists say that, we can well balance this if we could grow more plantations on three to five times more land.

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Simple Thinking Simple Technique -

Still They Succeeded

Shri Satish Khade, Pune - M : 9823030218

(Translation in English by shri Gajanan Deshpande, Pune Mobile No 9822754768)

See how funny the things are - scarcity of water in a region where there is just 200 to 300 mm of rainfall, is well understood. But, why should there be a water shortage in a region where there is 2000 to 3000 mm of rainfall? In the Sahyadri belt, this question is always being discussed. It is true that 4-5 generations in Konkan found a solution to this problem by moving to Mumbai. However, at the same time the tribal people there clung to their natural way of life and homeland, facing the conditions of malnutrition and deprivation.

Various organizations have been working for these tribals in Thane district on different areas for over forty years. It also has many positive effects. The government is also trying their best staying within their framework. Lupin Foundation has also been working there for the upliftment of the tribals for the last five-six years. Their experiment in Palghar district is becoming a guide not only in Palghar and Thane districts but also for tribals and small landholders elsewhere. This success story of upliftment of tribal in Dhanewadi, Ranshet and Nikne villages of Dahanu taluka of Palghar district came to light through discussions with Lupin Foundation's project coordinator Mr.Nazim Pathan. The story goes like this -

Lupin Laboratory, a well-known pharmaceutical company, started village improvement work in Jawahar taluka of Palghar in 2014 through CSR. In fact, following the example of industrialists like Tata and Bajaj, the founding chairman of Lupin, Reverend Deshbandhu Gupta, founded the Lupin Foundation in 1988 in Bharatpur, Rajasthan. Long before the idea of CSR came into existence, Desh Bandhu Gupta voluntarily started working for rural development.

Today, through this foundation, various works are being carried out in 5498 villages in 23 districts in nine states of India. This is especially true in the districts where the Lupin Laboratory is located. The criteria for selecting villages for development are also very thoughtful. For example - work is preferred in the village or taluka where the number of people below the poverty line is highest. Since the company has a plant at Palghar, the Lupin Foundation started work there. They selected 66 villages in Jawahar taluka where 90 % families are below the poverty line. Initially works were started in 27 villages. Starting from health related work, it has now expanded it to various domains like education, agricultural development, women empowerment etc.

It is very difficult to start work in any new village or human community. First, a communication through a dialogue is always necessary that builds a bond of trust and then the real work begins! Mr. Nazir was appointed for Jawhar from day one. This is making a real difference in the lives of more than 500 families and thousands of people with the help of ten of Nazir's

colleagues.

In Javhar, Lupin began their work by contacting women's 'Bachat Gat' (self-help groups). With so many years of work experience, Lupin's team has come up with a general policy that women should be the first to work for social upliftment and plan for the future based on their response. Because women are more diligent and conscientious than men. This is their observation and experience to date. They further restarted the women's Bachat Gat which were closed down. For this, various measures were taken; such as conducting various training programs, guaranteeing banks for providing loans to the Bacht Gat, informing them about the responsibilities of running a Bacht Gat.

In addition, health camps were conducted with the help of "Asha" volunteers and staff of the primary health centers in the village. They also provided primary health training and also supplied equipments to primary health centers.

Various initiatives such as providing sanitary pads to women, providing them with safe drinking water, arranging immunizations for young children and creating dietary awareness among them were implemented. Thus, the Lupin Foundation succeeded in implementing such initiatives for two and a half thousand women through 210 self-help groups.

All these efforts increased the interaction with the families there. Now, there is a demand for starting new ventures for men in the family as well. This stage was very important. From this onwards, people started getting spontaneous participation in various activities. This was followed by agricultural reforms. This initiative was started by providing improved rice seeds to the farmers. With the right guidance, the agri-business flourished and the venture got started by achieving a big increase in income.

Harvesting rice during the kharif and leaving the village in December-January for labor elsewhere - this had become a custom of the people there for years. The average annual rainfall of Palghar district is 2567 mm. Despite the strong rainfall conditions, there was no water available for the rabbi crop and due to this no one was cultivating the crop during that period. Even those who had availability of water, while they farmed, the wild boar, rabbits, foxes and similar wild animals used to destroy the farm. So the rabbi's crop was almost non-existent. These people used to go for work in places like salt pans and brick kilns after the month of December.

As a solution to this, it was realised by the then State Project Head of Lupin Foundation, shri Raosaheb Badhe that the water and other resources should be made available to these people there. After having together discussions with the concerned officer of NABARD Mr. Kishor Padghan and Mr. Pathan and Mr. Badhe of Lupin team on the matter, they came up with a suitable development plan for that area.

Farm Pond Scheme : In general, it was a scheme for increasing the income of the farmers and enable them to use the farm ponds in many ways. Various activities were planned - like taking cash crops from the lake, produce from vegetables and fish farming.

Tribal farmers were seen more enthusiastic about fisheries. On an avarage, one family has two and half to three acres of land. Out of which five guntas (ares) were used for farming (thirty by fifteen by three meters). It can store upto nine lakh liters of water. Arrangements were made

to ensure that at least twenty guntas of rabi crop were irrigated using micro-irrigation. A set of drip or sprinkler was also made available there for irrigation. A separate pump set was also provided for pumping water, which would help increase the oxygen level in the pond water and also be used to irrigate the fields. Arrangements were made in such a way that the pond to be filled only with rainwater and excess water will drain out. It was decided not to take any kind of running water in to the pond i.e. from streams or fields. These ponds usually get filled in the first two-three rains. The bottom of the pond was covered with plastic sheeting to prevent water from seeping into the ground. This water was intended for fisheries and rabbi crops.

For fish farming, it is necessary to maintain a water level of four feet in the pond. As long as there is water at that level, water abstraction and fish farming should be continued. As the water level in the pond decreases after irrigating the farm and before it goes below four feet, the number of fish in the pond also need to be reduced. Also, the addition of plastic paper necessitates artificial feeding of fish. If it is cultivated in a natural pond without plastic, then algae and similar plants are formed on the edge of the pond and it is eaten by fish as their food.

The Lupin Foundation first appealed to everyone in the village to join the project. The project, however, was to be funded mostly by the Lupin Foundation and NABARD. However, it was also decided to take 25 per cent contribution from the beneficiaries. Most importantly, training in both aquaculture and vegetable cultivation was mandatory. At the beginning of the scheme, 45 people registered. But 20 of them actually paid their contribution after two weeks. The enthusiasm of those twenty people, however, was assuring. Trainers of Lupin Foundation imparted training on vegetable cultivation whereas regarding sales system, training was imparted at an NGO viz: Shramjivi at Mahad in Raigad district. This NGO institution has a special reputation for training in freshwater and saltwater fishing.

Twenty ponds were built in April and May 2018. A mixture of dung and urea was released in the ponds, as it is nutritious for increasing algae. The pond was filled during the first three rains. In July 2018, 2000 chicks of fish were released into one of the ponds. They cost two and a half thousand rupees. 50,000 chicks of fish were again released in these 20 ponds. 2000 chicks need a feed costing rupees 2000 for three months. That too was arranged. The food was to be brought by the beneficiaries for the next five months. They brought it. In March 2019, the fish turned eight months old. Their growth was complete. The fish in one pond weighed 210 to 325 kg. The tribals sold it in the local market that month, little by little. From this they got an income of 30,000 to 50,000 rupees. In addition, the tribal could get these fish for five to six months as their own food. In this way, the fish farming was successful in all the ponds. Now, 45 to 50 people have come ahead and applied to the Lupin Foundation for such farms.

Using water from the same pond vegetables like radish, guar, chilli, brinjal and other similar vegetables are being harvested as a second crop on twenty guntas. There is a lot of local demand for this vegetable. Mr. Sitaram Gupta, Executive Director, Lupin Foundation, emphasizes on 'Vegetable Cultivation' in this agricultural reform initiative. This is because the vegetables in the field are also necessary for the family of the farmer and hence they do not suffer from malnutrition or food shortage. So, his idea behind

this is that their health stays good.

Water pumps and sprinklers are provided to supply water from the pond to the field. Now these farmers are growing vegetables and at the same time they are becoming proficient in selling agricultural commodities. In a season of three to three and a half months and in half an acre land, they have started earning thirty to forty thousand rupees. Many of them also increased the area under vegetable cultivation in the third year. For this, they have started tapping more water from the side stream or well.

This initiative has been honoured at the national level. The initiative has also received three prestigious and important awards at the all-India level.

This model can be applied in areas with high rainfall and low evaporation levels. It can also be improvised, depending on the situation elsewhere. In areas with low rainfall it is necessary to provide an inlet to inject water into the farm pond.

Another great venture has been started by Nazim Pathan and his team. It is called 'Kitchen Nutrition Garden'. It is possible to grow nine to ten types of vegetables in a space of one and a half to two guntas with a specific design. Even after using this vegetable for a family of five, it remains a balance for others. The cost of seeds is five to six hundred rupees, that's all. Since it is grown in the yard of the house, it does not require special attention. This initiative is getting a very good response especially from women.

This year, the Lupin Foundation's Palghar unit has taken up the 'Wadi' project in the fields of 450 farmers. The project is to plant orchards in one acre of each farmer's field. Out of this, 450 acres of orchards will now be established. The orchard will start earning a small income from the third year onwards and from the fifth year onwards, the project will generate an annual income of around Rs 50,000 to Rs 15 lakh.

In addition, the Foundation has provided excellent employment opportunities benefiting more than 300 women by providing training placements to the garment industry to provide skilled women workers.

The foundation also provided wells to 11 minority holders last summer. They have formed a Farmers Producer Company in which 528 tribal farmers have become shareholders. The company has achieved sales of 10 tonnes of seeds, 30 tonnes of fertilizers and 210 tonnes of vegetables in its second year. Through this, the farmers and the shareholders of the company have been handsomely benefited with an income of few lakh rupees.

Speaking on the occasion Mr. Nazim Pathan says, “We get valuable guidance from our Executive Director Mr. Sitaramji Gupta and also valuable support from Palghar Plant Head Mr. Bhupendra Gharat. Also thanks to my colleagues Avinash Chandanshiv, Shri Nadeem Sheikh and Shri Namdev Tambada, by the virtue of their support we have been able to increase the scope and quality of work."

These initiatives have stopped malnutrition of tribal farming families, improved their health conditions and also stopped their migration. So the children started getting education and financial empowerment. The income from one pond increased up to one lakh rupees. It is needless to talk about all these facts separately.

Charting India's Water Future - Vision, Mission and Passion

The Mission - Collective Action for Water Security & Sustainability

Sharad D. Mande (M) : 9860982825

1. The Scale of Our Global Water Crisis :

The problem of poor provision of safe water facilities is prominent across the globe. Currently, 785 million people lack even a basic drinking-water service, including 144 million people who are dependent on traditional methods of sourcing water from rivers and streams, that are often filled with contaminants (World Health Organization, 2019). Furthermore, at least 2 billion people use a drinking water source contaminated with faces due to improper management of water (World Health Organization, 2019). This will be a continuing issue in the future if actions aren't put in place now.

The World Health Organization predicts that by 2025, half of the world's population will be living in water-stressed areas, (World Health Organization, 2019). Whilst some may assume that this issue is just affecting poorer regions of the world, this is in fact a widespread problem affecting both developed and developing countries.

2. Challenges & Reforms for improving Water Sector :

The fall in the quality and quantity of available water resources may be due to the following reasons:

I. Shortcomings in the Design and Implementation of Legislation and Regulations, which address the problems
ii. Improper Water Resources Management
iii. Pollution of Water Resources
iv. Lack of Peoples Participation

In India water supply sector is manned by local bodies and not by utilities as per European, American way. There are more than 4000 urban service providers and about 1,00,000 rural service providers in the country who are in charge of operating and maintaining the infrastructure. These local governments are observed as weak and lacking the financial resources to carry out effective operation and maintenance. Therefore their service level is unsatisfactory. In India, water supply systems are manned by the State or Central Govt. of 73 Cantonment Boards. Thus one way or the other, in India, the drinking water sector is under direct Govt. control. In USA / Europe or in some Eastern countries, there are water utilities, managing water supply schemes and these are fully empowered for assured quantity with desired quality and thus become legally responsible for public satisfaction.

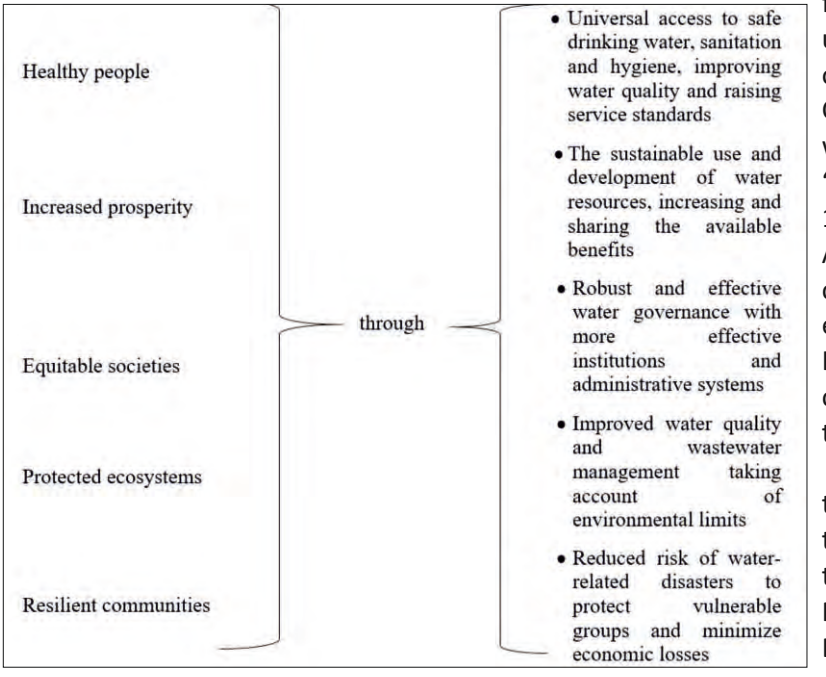
Challenges to the water sector are generally utility life is more than 30 years, house connections are just 49%, non-revenue water (NRW) is 50%, large number of stand posts, supply hours is less (even few minutes in some cities), sustainability is less as operation and maintenance cost is more than revenue generated and a number of meters are negligible.

Our Prime Minister Hon'ble Modi Sahib has announced "Water to tap for every House" thus the local governments face various difficulties, important among them is that the consumer orientation and professional approach is lacking. Relation approach for best practices is missing. There are huge arrears of loan and no attempt is being made to go for Public Private Participation (PPP). The water sector in the country is passing through a transition stage and therefore there is a need for drastic reform in water sector. The Government of India declared National Water Policy on 8th April 2012, in 2nd India Water Week

and now the draft of 3rd National Water Policy (2020) is in deliberation and will be resolved in coming years.

3. Water Security & the Global Water Agenda :

"A post - 2015 Global Goal for Water" has been approved by UN-water as its 20th meeting held on 27th Jan 2014, describes key findings & recommendations titled "Securing Sustainable Water for all" kept target as follows. Since in nutshell, it is the framework for nations to take immediate actions accordingly



4. Where We Stand :

I) India's Water Wealth - At the end of 19th century and beginning of 20th century, if we consider India as one hydrometric country, then it covered Afghanistan, Pakistan, India, Nepal, Bhutan & Brahmadesh, that means the extended area which contributes water flowing through the rivers either by precipitation or snow melting, entering into today's India. Therefore co-ordination in water management is essential factor between these adjacent nations - with reasonable co-operation or otherwise we have to face disputes. There is a good example of "Sindhu treaties" executed so successfully, after independence in the 6th decade, that there are three ultimatum wars fought between India & Pakistan but nobody has dared to touch the Sindhu treaty, and it remained in operation, since it is a win-win need of both the nations.

Coming to today's India, before Independence, in 1945 Dr. B. R. Ambedkar, was the Member of Viceroy's Executive Council during 1942-1946, when he established 'The Central Water Ways, Irrigation & Navigation Commission (today's Central Water Commission) and the 'Central Technical Power Board'. He prepared the first Water Policy for India and set up "Damodar Valley Corporation" on the lines of Tenancy Valley Corporation of USA. Similarly he was the key leader for establishing "Interstate Water Dispute Act 1956" and "River Board Act 1956". After Independence, much contribution is from Dr. K. L. Rao expert Engineer & the minister for Irrigation & Power, who has compiled & completed framework titled "India's Water Wealth".

Now it is to be kept in mind that the allocation of water flowing in the Northern rivers, of India is from the sources originating from Pakistan, Kashmir, Nepal, Bhutan, Brahmdesh etc. therefore release is dependent on the flow allowed from these countries, hence it's requirement, adequacy, discharge flooding, etc. are to be handled on this perspective.

It is expected that India's population would go to 1.7 Billion in 2050 and water requirement for all causes at that period is estimated to 1450 km^3, while availability from all causes may be 1125-1150 km^3. Thus 300 km^3 gap is to be bridged. Is it impossible for a nation like ours? may be little difficult, but can be successfully handled if implemented by at least 20%-30% improving water use efficiently in Irrigation, cutting NRW by bringing down to 20% max in domestic water consumption Reuse, Recycle & Upcycle of min. 50% used water,

water conservation & controlling pollution etc.

Govt of India, in obedience of Supreme Courts directives, formulated Task Force under Chairmanship of Prime Minister Hon. Atal Bihari Bajpeyiji, Conveyor Dr. Suresh Prabhu, Secy. Dr. C. D. Thatte & other experts and got prepared "Interlinking River Basins" project amounting to Rs. 5,60,000 crores. During last two decades only 2-3 links got started. In the similar period China has taken up two links the Central Line & Eastern Line and completed the work expediously of Central Line channeled from the Danjiangkou reservoir on the Han River - a Yangtze River and north to Tianjin & Beijing and brought 13 Billion M^3 water before Beijing 2009 Olympics, Similarly in 1950 at the time of our Independence, there were 5000 Large Dams in the world as per ICOLD report now there are more 50,000 Dams but surprisingly the status is that nearly half of these dams have been constructed by China only.

ii) More Crop Per Drop :

The continuous increase in world population requires a parallel increase in food production. This represents a formidable challenge as the land and water resources are limited. Better and efficient management of water, land and crops is the key to meet such challenge. The attempt is to address a number of approaches and cover the following aspects, to bring "More Crop Per Drop" in practice.

a) Increasing water supplies (rainfall harvesting & use of non-conventional water resources)

b) Suitable and more water use efficient irrigation systems and strategies.

c) Suitable crops including less water consuming and non-conventional crops.

d) Suitable land management to save water (conservation tillage, mulching, precision farming…)

e) Water saving through the accurate estimation of crop irrigation requirement.

f) Use of models as management tools to save water and assess the impact of climate change on irrigation requirement, growth season length and yield.

iii) Water as a whole :

In India, the subject water is handled as a "Physical & Hydrological" i.e. the dept. considers Liter per capita, MLD, Cusecs, MCFT / TMC / Dam Storage Capacity, canal losses in liters, crop Duty & Delta etc. that means, we measure physically & calculate mathematically all this statistics, taking demands, requirement as a hydrological base. Actually "water is as principal element out of 5 "Panch Mahabhute" i.e. Earth, Water, Wind, Light & Energy for human survival & development and we have neglected its social & economic values. The parameters we follow are as a consequence & application. When we understand these social & Economic values then we will manage water according to these needs and not on the parameters of Benefit Cost Ratio, Per Litre or Per MCFT, Cost, etc. yardsticks.

There is an urgent need to change the total mind set for deciding priorities of implementing schemes depending upon the social needs & economics of implementation not on cost basis only but on rationale benefits, so that to give justice "Water as a whole".

iv. Administrative Frame work :

India was never a united country before 19th century, after East India Co. and later due to British regime, Britain has set up administrative framework in the country in such a way, so as to govern successfully this a vast country from 10000 km by their small nation. Therefore, whatever Britishers have governed in India for handling mostly Irrigation & Water related projects, was importantly for the administrative control they wanted to exercise than the benefits to the country. "The subject water", therefore was dealt by Britishers through administrative aspects and not from social Engineering base. Today, after 70 years of Independence same framework is followed i.e., instead of Chief Engineer of a river basin under whom Superintending Engineer of sub-basin, Ex. engineer of sub-sub basin etc., today the controlling and Governing officers are Secretary in Mantralaya, Commissioner of Revenue Division, Collector in District & Tahsildar of Taluka. Thus when the same mind set is adopted, the water subject is being handled in the similar paradigm,

which is now required to be essentially shifted.

Constitutional Provisions - Our constitution is one of the best written Constitution in the world, using Parliamentary Democratic System. England has its customs & hierarchical constitution. In USA, there is Parliamentary Democracy, but led by the President that means in USA the constitution applicable to 50 States separately. It therefore acts as a bundle wrapped of 50 sticks, while in India it acts a tree having 30-35 states as its branches. Thus, fundamentally in India, administration is centrally controlled but water is allotted to States. Therefore each state has to deal in own structure. In most of the cases we suffer not due to lack of availability of water but mainly due to mismanagement. Thus when it comes for disputes, these are fought at village, town, state levels i.e. on Individualistic level mostly by the politicians and not resolved considering the merit and importance in larger benefits of the nation. we have "Gandhiji" as our “Father of Nation". He has advocated throughout his life to discuss, deliberate, plead the case but to see that on getting justice, the other party should be satisfied conveniently and one should make fully convinced the other party, without prejudice Gandhian principals are required to be followed freshly while resolving disputes, amongst states or districts or talukas.

v. Indian Constitution and other Policy Acts (in Brief)

Water in Indian Constitution :

The constitutional provisions in respect of allocation of responsibilities between the State and Centre fall into three categories: The Union List (List-I), the State List (List-II) and the Concurrent List (List-III). Article 246 of the Constitution deals with subject matter of laws to be made by the Parliament and by Legislature of the States. As most of the rivers in the country are inter-State, the regulation and development of waters of these rivers, is a source of inter-State differences and disputes. In the Constitution, water is a matter included in Entry 17 of List-II i.e. State List. This entry is subject to the provision of Entry 56 of List-I i.e. Union List.

Article 262

In case of disputes relating to waters, Article 262 provides:

Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter-State river or river valley.

Entry 56 of List I of Seventh Schedule

Provides that "Regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest".

Entry 17 under List II of Seventh Schedule :

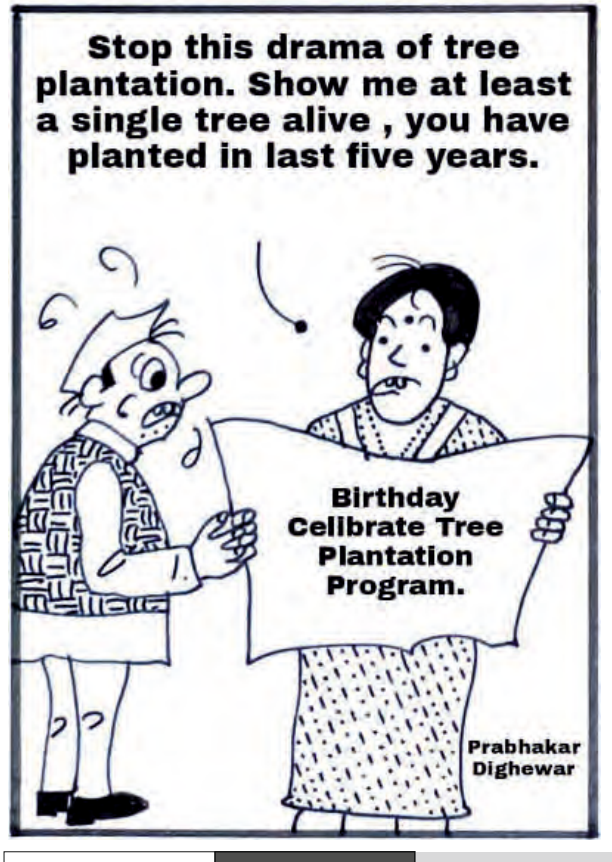
Provides that "Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of Entry 56 of List I". As such, the Central Government is conferred with powers to regulate and develop inter-State rivers under Entry 56 of List I of Seventh Schedule to the extent declared by the Parliament by law to be expedient in the public interest. It also has the power to make laws for the adjudication of any dispute relating to waters of Inter-State River or river valley under Article 262 of the Constitution.

In USA, at the top of facade of Supreme Court, it is engraved boldly that “Equal Justice Under Law” and it is learnt that inside, it is written “In this court justice is given, either you may win or the Govt., but by giving proper justice Govt. always wins”. This is very core heart of the justice. In India, we have framed constitution on the style of Britain, but following in practice on USA style, however losing the core practically. Moreover, now-a-days, it has become a habit to enter in to court immediately on any matter without waiting for in-depth application of consensus between both the parties amongst the experts in the field and to resolve matter amicably by give & take policy, but to avoid entering in the court. Courts are places for cases where legal clarification and solutions in case of ambiguity and doubtful interpretation are solved, but not to be used for engineering, health or religious matters where issues are very clearly

solved by experts. Therefore, it is essential to avoid entering into court of law every now and then, instead of which, there must be engineer oriented highest basin wise constitutional central apex mechanism to resolve the matters within short period.

5. Approach Needed for Better Water Management For good Water Management, we can learn lessons from Israel, where annual precipitation is about 18% compared to India, but become self-reliant by observing the key titles (Collected from "Israel's Solutions for a Water-Starved World - LET THERE BE WATER by Seth M. Siegel") Israel Story -

1. The Water Belongs to the Nation
2. Cheap Water is Expensive
3. Use Water to Unify the Country
4. Regulators, Not Politicians
5. Create a Water Respecting Culture
6. All of the Above
7. Use Water Fees for Water
8. Innovation Wanted
9. Measure and Monitor
10. Plan Today for Long into the Future
11. Advocates Needed
12. The time to Act Is Now



Another success story is of Singapore, which has adopted 'ABC' module "Aesthetics, Beautification & Clean" and there are many small nations in Europe, who have solved there water supply problems. We have to learn from their experience, need not to copy similar modules for such as vast country but to be adopted appropriately. More over in many countries, nearly 80-90% food grains, vegetables, milks, oil etc. are imported externally from country like ours. All world can not survive dealing with by developed infrastructure or NEwater factories & similar schemes, but there must be some nations who grow up and supply food the rest of whole world.

We should be proud of the achievements during last 7 decades, through democratic to resolve lacunae in water sector, & to understand the other shining side in larger framework of the society. This will mark how India, has brought "Vision" translating into "Mission" & to practice hence for as "Passion".

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Give Before you receive
The Abundance Principle

Once a man got lost in a desert. The water in his flask had run out two days ago, and he was on his last legs. He knew that if he didn't get some water soon, he would surely die. The man saw a small hut ahead of him. He thought it would be a mirage or maybe a hallucination, but having no other option, he moved toward it. As he got closer, he realized it was quite real. So he dragged his tired body to the door with the last of his strength.

The hut was not occupied and seemed like it had been abandoned for quite some time. The man entered into it, hoping against hope that he might find water inside.

His heart skipped a beat when he saw what was in the hut - a water hand pump..... It had a pipe

going down through the floor, perhaps tapping a source of water deep under-ground.

He began working the hand pump, but no water came out. He kept at it and still nothing happened. Finally he gave up from exhaustion and frustration. He threw up his hands in despair. It looked as if he was going to die after all.

Then the man noticed a bottle in one corner of the hut. It was filled with water and corked up to prevent evaporation.

He uncorked the bottle and was about to gulp down the sweet life-giving water, when he noticed a piece of paper attached to it. Handwriting on the paper read : "Use this water to start the pump. Don't forget to fill the bottle when you're done."

He had a dilemma. He could follow the instruction and pour the water into the pump, or he could ignore it and just drink the water.

What to do? If he let the water go into the pump, what assurance did he have that it would work? What if the pump malfunctioned? What if the pipe had a leak? What if the underground reservoir had long dried up?

But then... maybe the instruction was correct. Should he risk it? If it turned out to be false, he would be throwing away the last water he would ever see.

Hands trembling, he poured the water into the pump. Then he closed his eyes, said a prayer, and started working the pump.

He heard a gurgling sound, and then water came gushing out, more than he could possibly use. He luxuriated in the cool and refreshing stream. He was going to live!

After drinking his fill and feeling much better, he looked around the hut. He found a pencil and a map of the region. The map showed that he was still far away from civilization, but at least now he knew where he was and which direction to go.

He filled his flask for the journey ahead. He also filled the bottle and put the cork back in. Before leaving the hut, he added his own writing below the instruction: "Believe me, it works!"

This story is all about life.

It teaches us that We must GIVE before We can RECEIVE Abundantly.

More importantly, it also teaches that FAITH plays an important role in GIVING. The man did not know if his action would be rewarded, but he proceeded regardless. Without knowing what to expect, he made a Leap of Faith.

Water in this story represents the Good things in Life - something that brings a smile to your face. It can be Intangible Knowledge or it can represent Money, Love, Family, Friendship, Happiness, Respect, or any number of other things you Value - Whatever it is that you would like to get out of life - that's water.

The water pump represents the Workings of the Karmic Mechanism.

Give it some "Water" to Work with, and it will RETURN far more than you put in.....!!!

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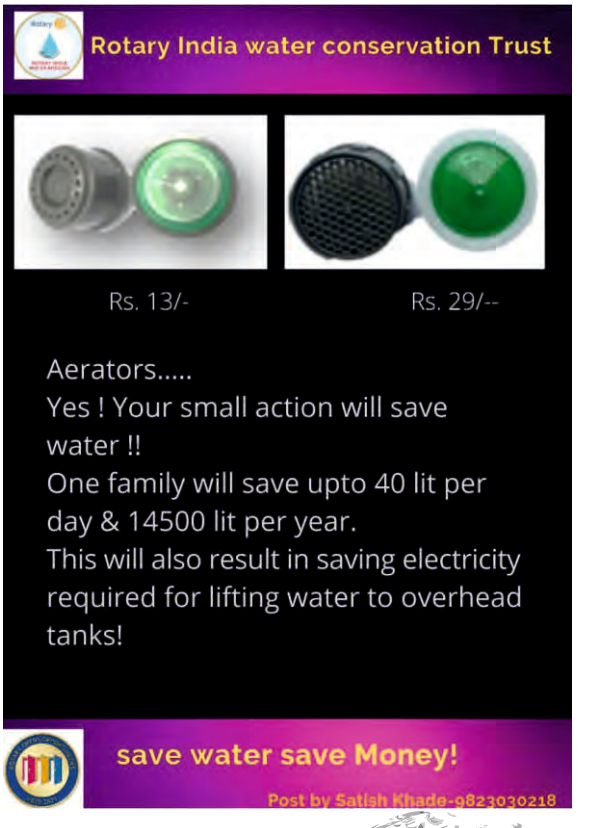


Water in Nature

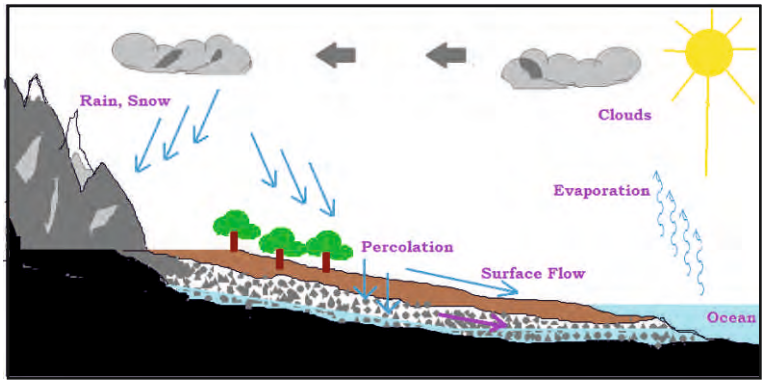
Chetan Pandit

(M) : 9423174594

Hydrologic Cycle :

In this article I am going to explain the circulation of water in nature, known as the hydrologic cycle. However, this is not a text book of hydrology, this is an article for information of casual readers, and therefore what I shall be presenting is a slightly simplified version. That incidentally will hold true for all the remaining articles too.

Solar energy in the sunlight causes large amounts of water from the oceans and other large water bodies to evaporate. The water vapour rises to upper atmosphere to become clouds. Under certain atmospheric conditions, which I shall explain shortly, the water in the clouds precipitates, i.e. forms large water droplets which fall back to the earth, as rain, snow or hailstones, though rain is the dominant component. A large amount of rain takes place on the oceans itself. But a substantial amount of cloud mass, driven by the winds, travels to the land area causing rain or snow on the land.



The rain water flows along the land slope and finds its way to rivers and flows in the rivers to eventually return to the oceans. The snow also melts and the melt water follows the same path to return to oceans. Some water percolates underground but doesn't remain static at one place. Although the flow velocities underground are much slower than velocities in the rivers, but the ground water is also in a state of flow and eventually returns to oceans. Thus, except for the small quantity of water that gets bound in chemical reactions, such as growing of plant biomass, all the water eventually flows back to the oceans. This is the hydrologic cycle. The journey of water from oceans to clouds and finally rain/ snow, is called the atmospheric phase, and journey on or below the land surface back to ocean is called the land phase, of the hydrologic cycle. And this is how it has been going on for, probably, millions of years.

Hydro-Meteorology :

Meteorology is the specialised branch of science that deals with the atmospheric phase of hydrologic cycle, and hydrology is the specialised branch of engineering that deals with the land phase of hydrologic cycle. In general, science is about observing and understanding natural processes whereas engineering is about intervening and modifying natural processes. Man can not intervene in the atmospheric phase of hydrologic cycle. A meteorologist can not make rain happen if there is too little of it, nor can he make the rain stop if there is too much of it. Therefore, meteorology is considered a science.

But man can and does intervene in land phase of the cycle. Dams and barrages are the means by which mankind modifies natural river flow. Artificial reservoirs created by construction of

dams store the water for use after the rains have stopped; or to moderate a large flood. Embankments are constructed to restrict the width of a river channel and prevent floods from spilling over in to human habitations; etc. All these are interventions that modify the natural process, and therefore hydrology is considered a branch of engineering.

Clouds and Rain :

Contrary to popular belief, clouds are not made entirely of water vapour. Vapor is transparent and we can not see it. But we can see clouds. Evaporation changes water from liquid to vapour. As the moist air with water vapour rises, the temperature at the higher levels is much less and some of the vapour condenses into water droplets or ice crystals, which are opaque and therefore we see them, as a cloud.

Water droplets in the clouds are about one hundredth of a millimeter in diameter, and ice crystals are slightly larger, about a tenth of a millimeter long. Upwards forces of turbulent air acting on a particle are proportionate to the surface area of the particle, which in turn is proportionate to square of the diameter. Downward force of gravity is proportionate to the volume of the particle, which in turn is proportionate to cube of the diameter. As the size of a particle reduces, the volume and therefore the gravity forces reduce more rapidly than does the surface area and the upward forces of air. A time comes when the upward forces of moving air dominate over the downward force of gravity, and the particle remains suspended in air. This is the same mechanism by which minute dust particles remain suspended in the air, despite being heavier than air. Another effect of small size is, the droplets can remain as liquid even at temperatures well below the freezing point. This state is called super-cooled liquid.

Types of Clouds and Rain Formation :

Clouds are divided in to several types depending on their shape, colour, height and other such properties. The four main types are :

Cumulus: Heaped, like a head of cauliflower. White on the sunlit parts, dark underside.

Stratus: Sheet like, layered. Usually gray.

Cirrus: Thread-like, curled, like swept hair, composed of ice crystals and therefore white.

Nimbus: Dark and dense, rain bearer.

Rain is caused when the size of droplets in the clouds becomes large enough so the gravity force dominates and they start falling down. This growth of the droplet size is a complex process. It may start with an ice crystal, or some other such small particle, acting as a nucleus on which smaller droplets deposit and grow into a larger drop. It can also take place by smaller droplets colliding with each other and combining to form larger drops.

You may have heard of artificial rain. Some times rain bearing clouds hover over but rain does not take place because, for whatever reason, the crucial process of nucleation fails to start. In such cases rain can be caused by sprinkling the clouds with fine particles of some relatively harmless material that aids the nucleation process. This is called “cloud seeding”. Solid carbon dioxide and silver iodide are the materials typically used for seeding. However, it must be understood that:

- This works only if rain bearing clouds are present and some other favourable conditions also exist.
- The process is very expensive and is resorted to only as a desperate measure when an area is facing severe drought.
- There is no certainty that such artificial seeding will cause rain.
- Even if the attempt succeeds, the rain caused at one place will deprive some other area of rain.

That is why we do not count this intervention sufficient to consider meteorology as engineering, because cloud seeding is resorted to only very rarely, with uncertain outcome, and its impact on the overall hydrologic cycle is negligible.

High up in the atmosphere the precipitation may start as ice crystals but melt as these pass through warmer layers on their way down, thus causing rain. Conversely the precipitation may start as rain but pass through colder layers on the way down and solidify, causing snow or hailstones.

The diameter of the rain drops may vary from 0.1 mm in light drizzle to 2.5 mm in heavy rain

and the drops hit the earth with a velocity ranging from 0.7 meters per second (2.5 Km/H) for smaller drops to 9.1 meters per second (32.7 Km/H) for larger ones.

Rainfall Causing Mechanisms :

There are four main rainfall causing mechanisms.

- As the ground surface becomes heated during the summer, some air may get much hotter than the air surrounding it. The hot air mass rises by convection. As it rises it cools rapidly which results in condensation and precipitation. This is called Convective rainfall.
- Moving clouds collide with a steep mountain range and rise up rapidly along the mountain slope. As they rise they get cooler, larger droplets are formed and rain is caused. This is called Orographic rainfall. This is the mechanism that causes heavy rain on the western slopes of Western Ghats.
- When two cloud masses travelling at different velocities collide, the lighter cloud mass climbs over the denser cloud mass, rises higher, gets cooler, and rain is caused. This is called Frontal rainfall.
- Sometimes an area of reduced pressure, called a "depression", may be formed at some place high up in the atmosphere. Air from surrounding area rushes in to the depression to equalize the pressure. The air rushing in sideways can get in to a spiral like circular motion. The whirling air mass rises up and causes very heavy rain. This is called a Cyclone or cyclonic storm. Cyclones are usually formed over ocean and move towards land.

You may have heard the term cloud-burst. During a normal orographic or convective rainfall, sometimes a sudden upward rush of hot air may push the falling raindrops back in to the clouds, thereby causing an accumulation of rain in the clouds. This state can't be sustained for long, and then the "stored" raindrops fall quickly, causing a very large quantum of rain in a very short time. Cloud bursts usually affect only a small area.

In the last week of July 2021 there has been very heavy rainfall in some parts of Western Ghats in Maharashtra, viz. Konkan and Mahabaleshwar. In the media this is being referred to as cloud-burst, ढगफुटी in Marathi. But that is incorrect. As explained above, cloud burst is caused by a sudden upward rush of hot air, and that doesn't happen in coastal areas. What has happened in Konkan is just unusually heavy rainfall. Cloud burst can occur on the Western Ghat ridge, viz. at Mahabaleshwar. However, cloud burst is a short duration event, typically a few hours. Mahabaleshwar received incessant rainfall for 2 days, 480 m on 22nd July and 594.4 mm on 23rd July and that is also not cloud burst.

Land Phase of Hydrologic Cycle :

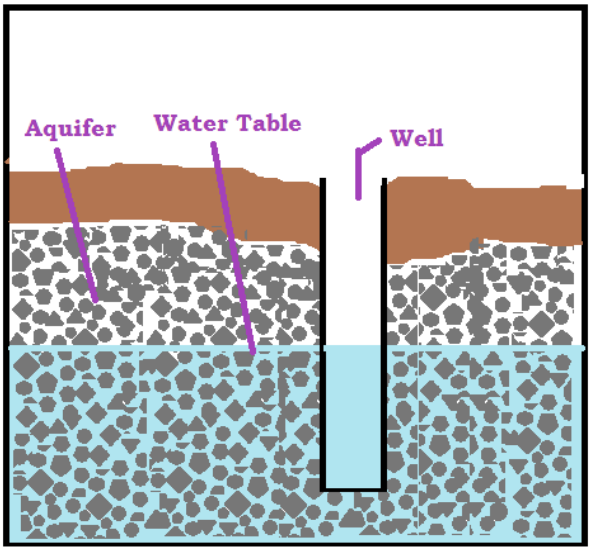
A considerable portion of the rain falling on a forest area is first intercepted by the foliage of the trees. A tree with dense foliage can intercept a significant amount of rain, which is how we can take shelter under a tree, if caught outdoors in rain, and hope to stay reasonably dry for quite some time. The rain thus intercepted by the foliage is called interception storage.

If the rain continues after most of the foliage is wetted then any further rain will slide off the wet leaves and fall on to the ground. Once it reaches the ground we stop calling it rain any more and think of it as water. Rain is something that is still in the air, in the act of falling down. What flows over the land and in the rivers and is stored in lakes and is found in wells, is water.

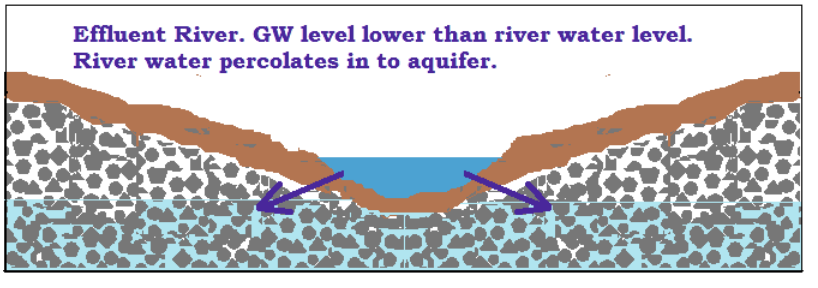
The water that falls on the porous natural surfaces as exist in forests, farms, gardens and parks, will initially wet the earth and then percolate downwards in to underground strata. However, percolation is a slow process and usually the rate of rainfall exceeds the maximum possible rate of percolation. This excess water that can not percolate, at least not immediately, starts flowing on the general land mass. This flow is called overland flow.

The rainwater falling on to impervious surfaces like rocks, paved roads, cemented courtyards, roof tops etc. immediately starts flowing in the direction of the natural slope. This and also the overland flow, collects into and flows in small gullies. The gullies join together to form

small streams, the streams join to form rivulets and the rivulets join to form rivers. First, small rivers and then larger ones.



What happens to the water that has percolated in to the ground? Underground layers of gravel, sand, pebbles, and such loose coarse material have lot of spaces between the solid pieces/particles, in which water can be stored. Such layers are called aquifer. The level of water in an aquifer is called the water table. If a well is dug intercepting the aquifer, water will rise in the well to the same level as the water table.



Some areas, like most of Maharashtra, have solid rock under the top soil, no aquifer. But even the apparently solid rock has cracks and fissures in it due to millions of years of weathering, and some water can be held in these spaces, though not as much as in an aquifer.

If the water level in the river is higher than that in the ground water formation, then the water seeps from the river into the ground. Such a river reach is called effluent river. In monsoon when the rivers have plenty of flow, this acts as GW recharge. However, in summer, when there is no rain and flow in the river is already very little, a long effluent stretch may cause all the water to percolate in to the subsurface layers, causing a river to run completely dry.

The inverse of this is when the ground water level is higher than the water level in the river channel and water oozes from the soil banks and bed in to the river. Such a river reach is called influent river. Ground water thus oozing out in the river sustains some flow in rivers after the rains have stopped. This flow is called “base flow”.

Ground Water :

Finally, the water that has percolated below the surface, also flows towards lower levels. The strata that holds the water, whether an aquifer or rock mass, itself can be sloping and the water flows within it to lower levels just as it does in the rivers, though much slowly. Eventually, the aquifer may also open up into the ocean and water then flows from the aquifer into the ocean.

In the next article, we will learn about how the large quantities of water, as in rain, river, aquifer, are measured or estimated. Till then, take care and stay safe.

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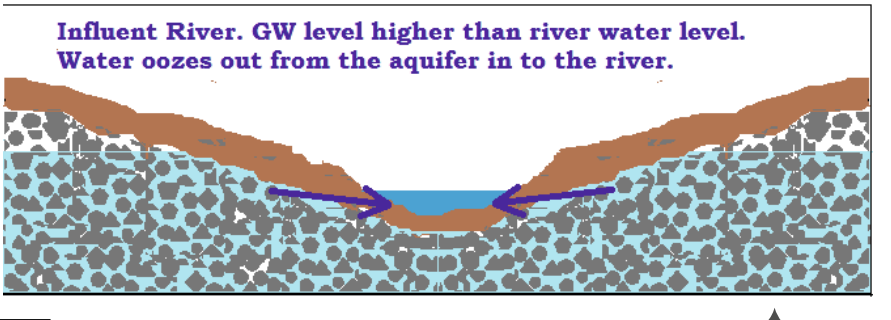


Organization - Central Soil Salinity Research Institute (CSSRI)

Shri Vinod Hande - (M) : 9423677795

Central Soil salinity Research Institute (CSSRI) is a premier research institute dedicated to pursue research on salinity / alkalinity management and use of poor quality irrigation water in different natural zones of country. The Govt. of India constituted an Indo-American Team to assist the Indian Council of Agriculture Research to develop a comprehensive water management program for the country. On the recommendation of this council it was decided to establish 'Central Soil salinity Research Institute' in the fourth Plan. Functioning of this institution started on 1st March 1969 at Hisar in Haryana but subsequently shifted to Karnal In Oct. 1969.

In 1970 'Central Rice Research Station' (CRRS), canning Town, West Bengal also transferred to CSSRI to conduct research on problems of coastal salinity. Another 'Regional Research Station' which is carrying out research in problems of inland salinity prevailing in the black soil region of the western region of country started functioning at Anand, Gujarat from 1989. The coordinating unit of AICPR (All India Coordinated Research Project) on management of salt affected soils and use of saline water in agriculture is located at the institution with network of eight research centers at Agra, Bapatala, Bikaner, Gangawati, Hisar, Indore, Kanpur and Tiruchirapalli. These centers work on pre-indentified projects of regional and national importance.

The institute has developed technologies for the reclamation of alkali soil with the addition of chemicals amendments, reclamation of saline soils through surface drainage, development and release of salt tolerant crop varieties of rice, wheat and mustard. Nearly 1.5 million ha. Salt affected land has been reclaimed and put to productive use. Reclaimed area is contributing more than 15 million tonnes food grains to the national collection. For water logged saline soils, subsurface drainage technology developed by the Institute initially for Haryana and then adopted by Rajasthan, Gujarat, Andhra Pradesh, Maharashtra and Karnataka. About 60,000 ha. waterlogged saline area has been reclaimed by using this technology. Artificial groundwater recharge is another area of interest for regions with depleting water table. Institution has been also developed technologies for salt affected area of coastal region of the country.

An International Training Centre was also established in 2001 under Indo-Dutch collaborative research program to impart training at national and international level. The Institute also developed Post Graduate Education Programme in association with State Agriculture Universities (SAUs). Notable programmes include IRRI (International Rice Research Institute) sponsored rice improvement programme. ACIAR (Australian Centre for International Agriculture Research) sponsored programme for wheat improvement. A central laboratory with modern equipment has been established at the institute. CSSRI is an autonomous institute of higher learning established under the umbrella of Indian council of Agriculture Research (ICAR) by the Ministry of Agriculture, Government of India for advanced research in the field of soil sciences. The institute is located on Kachawa Road in Karnal in the state of Haryana . It is 125 km from New Delhi.

Vision and Mission of institute

Vision

Productive utilization of salt affected soil and poor quality water resources in varying agro-ecological situation.

Mission

Generating new knowledge and understanding of the process of reclamation and developing technologies for improving and sustaining productivity of salty land water.

Definition of healthy soil as per Institution is ,

The main achievements of CSSRI listed are as,

- Reclamation of alkaline soils with addition of chemical amendments.
- Reclamation of saline soil through surface drainage.
- Development and release of salt tolerant crop varieties of rice, wheat and mustard.
- Reclamation of salt affected soils through salt tolerant trees.
- Replenishment of depleting water tables by artificial ground water recharge.

The Institute is engaged in multi research activity which are carried out through four divisions.

Soil and crop management division- This division conducts research on resource conservation and cost effective farming system. It prepares and maintains digital databases of salt affected soils and conducts periodic assessments of soil resources. It also focuses on agro-forestry on salt affected soil.

Irrigation and Drainage Engineering division- The division attends to the area related to groundwater recharge technology, subsurface drainage for improvement of waterlogged saline soils .

Crop improvement division- Development of saline development crops such as rice, wheat and mustard through conventional breeding.

Technology Evaluation and transfer division- This division undertakes studies on the various aspects of land reclamation to rural development.

Agro-forestry :

The Institute is coordinating unit for the 'All India coordinated project for Research' (AICRP) on management of salt affected soils and use of saline water in agriculture. The research is carried out at Agra, Bapatla, Gangawati, Kanpur, Indore, Bikaner, Pali, Hisar and Tiruchirapalli centers.

The project is mandated with the responsibility to :

- Conduct survey and characterize the salt affected soils and the quality of ground water in various irrigation areas.
- Develop guidelines and standardize procedures for the assessment of irrigation water.
- Conduct studies on the effect of poor quality water on soil and crops.
- Prepare strategies for the reclamation of salt affected soil.
- Identify and develop crop cultivars and trees suitable for cultivation in salinity and alkalinity soil conditions.

Reclamation and management of Alkali soils

Chemical amendment (gypsum) based technologies for reclamation of alkali soils has been developed and popularized by the institution. These technologies are then handed over to State land Reclamation Corporation for implementation. Around 1.8 lakh ha area has so far been reclaimed. On an average 45000 ha alkali land is being reclaimed annually since the inception of the institute which is contributing 12-15 million tones of paddy and wheat annually. It has ensured house hold food security and changed the economic condition of more than 9 million people residing in rural part of India. Besides this it has benefited large number of landless laborers by generating 75 million man-days of employment each year for rice and wheat cultivation on the reclaimed lands.

Management of Poor Quality waters :

Increasing urbanization and industrialization have created huge pressure on good quality groundwater resources, forcing the use of poor quality waters for irrigation in agriculture. Location specific technologies have been developed based on soil management irrigation water management, rainwater management and chemical amendment. Out of 13.2 M ha. ground water use, about 3.2 M ha. is through exploitation of poor quality water. Contribution of it, in food grain production is expected to the tune of Rs. 800 crore. It also generates rural employment.

Management of Waterlogged saline Soils :

Subsurface drainage technology consists of a concrete or PVC pipes covered with gravel or synthetic filter, installed manually or mechanically at a design spacing and depth below the soil surface to control water table and help in the leaching process.

This technology was developed for Haryana and then adopted by Rajasthan, Gujarat, Punjab, Andhra Pradesh, Madhya Pradesh, Maharashtra and Karnataka. Around 50000 ha waterlogged saline soils have been reclaimed in different states of India where crop yield increased 45% for paddy, 111% for wheat and 215 % for cotton.

Bio-drainage for land reclamation :

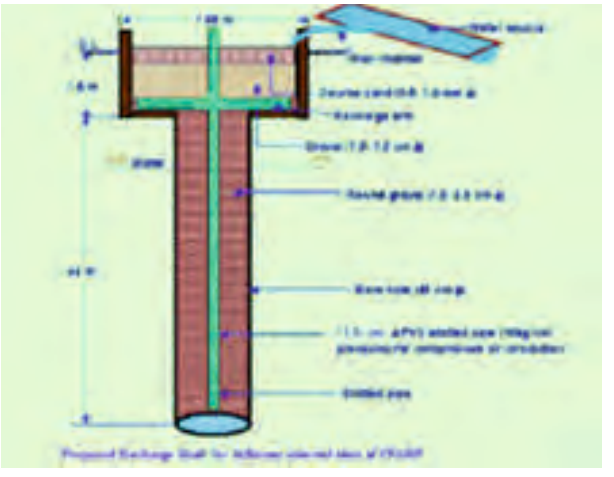
Bio-drainage technology developed to prevent and reclaim waterlogged saline soil in canal command areas by raising Eucalyptus plantation in Baas and Puthi villages. Farmers harvested good rice and wheat crops in such areas besides having 36 tones per ha of total wood biomass.

Bio-drainage for wastewater disposal :

In this technology large quantities of wastewater generated in peri-urban areas are being used indiscriminately as raw or with little treatment for irrigating food crops including vegetables. Institute also developed technology for Wastewater Reuse and Bio-Remediation.

Artificial groundwater recharge :

In North-Western states of our country like Punjab, Haryana and Uttar Pradesh, the sustainability of agriculture is threatened due to alarming decline in water table. Water decline rate varies from 0.2m/annum to more than 1m/annum with an average of about 0.6m/annum.



To augment groundwater resources and improve water productivity per drop of water, recharge shaft and recharge cavity wells were installed at 70 sites in Punjab, Haryana, Gujarat and UP which have raised groundwater levels and improved groundwater quality considerably. Recharge shaft also acts as a local surface drainage outlet to save crops from water stagnation. The institute also works in the field of Water Management. To improve irrigation water efficiency and system performance have been undertaken by the institute to develop on-farm and off-farm strategies.

Apart from developing technologies , institution publishes publications also. The institution published 93 research papers , 23 books/manual, 21 technical bulletins. Besides this 16 papers were presented in different National and International seminars and conferences. To upgrade their knowledge and skill 13 scientist of the institute visited different countries like United Kingdom, Hong Kong, Canada, Japan, Australia, Philipines, Turkey, Dubai and Bangladesh in the year 2019.

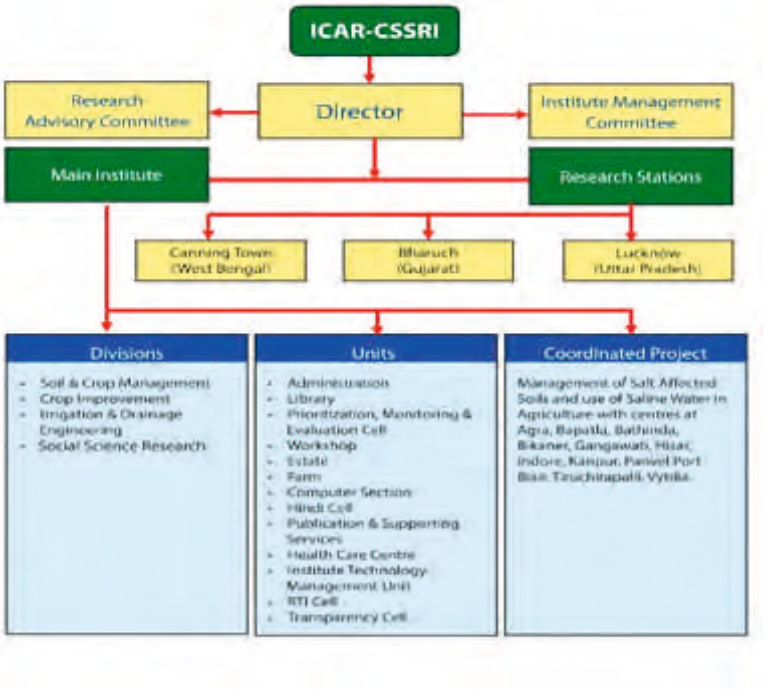
The institution is having a huge library which plays a crucial role in supporting research and academic programmes of the institute. Library possesses Indian and foreign publications related to the field of Water Management, Soil Salinity, Drainage, Alkalinity, Water resources etc. to achieve mandate of the institute. Presently library has total collection of 15736 books. There are 8451 bound volumes of journal. About 162 theses on subjects relating to Soil Science, Agriculture engineering , water Management ect. are available in library. Institute provides e-services where more than 3000 scientific research journals are available.

To talk about awards received by institute,

- In 2008 they received "Ganesh Shankar Vidyarthi Hindi Krishi patrika Puraskar".
- In 2009 again "Ganesh Shankar Vidyarthi Hindi Krishi patrika Puraskar".
- In 2009 "Groundwater Augmentation Award – 2009 of ministry of water Resources (Govt. of India) and so many.
- In 1998 it received ICAR Best Institute Award too.

Organizational setup of CSSRI is nicely explored in following chart where Director is the head of institution. Sr. Prabodh Chandra Sharma is Director of institute.

To know about the Institution in more details, and technologies they have developed or developing, one can contact institute on following address or contact details.



Address

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The vehicles, used in the country for transportation, emit large amounts of carbon-di-oxide gas. The number of vehicles is increasing day by day, thereby adding more in to the grave situation. As a solution to this, if we could make some proper modification in the fuel, it would provide a great relief over this problem. If we use electricity or ethanol as a fuel for vehicles, that would help reduce the proportion of carbon-di-oxide emission significantly. India has taken appropriate steps in this regard. Today, there is a huge emphasis on production of ethanol in India. For large scale ethanol production, sugarcane molasses and the food grains like wheat and rice can also be used. We can gain a triple benefit out of this. This can lead to an increase in rural employment, thereby making a substantial increase in the income of farmers. At the same time, the cost of fuel required for purchasing from abroad, will be saved, which in turn would lead to an increase in our foreign exchange and most importantly, we would be greatly successful in reducing the carbon emissions.

Hydrogen can also be considered as an effective fuel for the purpose. There is no harm due to its combustion, on the contrary, water is produced from it. However, one important danger that we cannot hide the outlook is that, hydrogen is so flammable that there may arise certain potential dangers from its use.

It is not too late to improve the situation. If we all work together, we would be able to do something concrete. However, this will require a strong will power and awareness on a global scale.

Dr. Datta Deshkar, Editor

World water Day - New event of civilized world

Gajanan Deshpande, Pune - (M) : 9822754768

World Water Day - A New Event In The Civilized World

(A new series of articles has been launched from August 2021 to learn more about the importance of World Water Day and the various water awareness programs implemented every year.)

March 22 has a unique general significance around the world as 'World Water Day'. It is like a new festival to be celebrated with a sense of unity in the world towards civilization, which is celebrated all over the world in a spirited and festive atmosphere for water enlightenment.

In 1992, at the United Nations Conference on Environment and Development in Rio de Janeiro, there was an in-depth discussion on the rapidly evolving issue of "Water and the Environment" and the need to raise awareness on these issues globally. As a result, the idea of a quick celebration was born out of that churning. The United Nations passed such a resolution at its General Assembly, ensuring that March 22 of each year is celebrated as 'World Water Day'. In this connection, it was appealed to every nation to plan various programs related to the water resources of their nation and to celebrate this day with enthusiasm every year. Accordingly, the celebration of 'Water Day' started from 1993. Every year it is being celebrated with more vigor.

This is a matter of special joy for Indians. That is because the concept and inspiration behind this is basically Indian. It is believed that it has come to fruition through the concept and efforts of internationally renowned water expert Dr. Madhav Chitale. He was the Secretary of the Department of Water Resources of the Government of India. Water Resources Day is celebrated in India since 1987 with his inspiration. This concept is very much rooted in the minds of the people. He also raised the issue with the international community in various forums. The decision of the United Nations to celebrate 'World Fast Day' is the result of all his efforts.

In order to organize and coordinate various events on the occasion of World Water Day, a special responsibility is given to one of the United Nations organization every year. Important topics related to water to attract the attention of the people are accepted as the main stream of the Water Resources Day of that year.

We all know that India's history in terms of water and culture and its intertwined relationship is ancient and profound. For Indians, the importance of water is not only related to water consumption but also has a religious and spiritual impact. Indians believe that water is our culture, as well as our life. The Indian Council for Water and Culture, Aurangabad has been working with this mainstream for the last several years. It is pertinent to mention here that this Council has been entrusted with the responsibility of streamlining the network of 'Water and Culture' programs in the South Asian region through international water partnership.

Water-Partnership:

In the course of time, different cultures were created in the world and they became the ones which gave a different identity to their respective societies. These cultures have proved to be extremely conducive to exchange, innovation and new creation due to the diversity hidden in

them. In that sense, they are the true inheritors of humanity, and maintaining their identity will surely benefit future generations. Preserving the diversity of these diverse cultures must be our first duty to the world. Cultural rights are an integral part of human rights and must be used to protect those cultures. If the global community embodied in these diverse cultures wants to thrive in this world, it will be better for them to become more empowered by exchanging good things, knowledge, craftsmanship and technology in each other's cultures. The main direction of the next course of action will be to create more participation with each other on various issues. UNESCO has planned its work in this regard.

World Water Day-1993:

The first year of World Water Day-1993 focused on the importance of fresh water and sustainable management of freshwater resources. On this occasion, various water awareness programs were organized in the developing countries to highlight the availability, purity of fresh water and the improvements required for it.

The three most essential things for human beings to survive on this planet are air, water and food. As our population grew, so did the pressure on resources, which led to the increasing use and exploitation of all natural resources. Centuries of human greed have resulted in severe water shortages and pollution worldwide. Today, there is a crisis in the world where sixty five million people are living without safe water supply. They have to spend hours fetching water from distant sources. In addition, they have to deal with the health effects of using contaminated water.

This world is not only for us, but also for future generations. So it is important that we leave behind a warm and fresh environment for future generations. For that, water is as valuable as gold and we need to be aware that we will not waste it unnecessarily. While taking care that water should be pollution free, we should encourage more water conservation techniques like water recharge and reuse of water for sanitation and gardening. As a conscious citizen we can play a great role in creating this awareness in the society. It should be the first responsibility of every citizen of the world so that we can make this world a beautiful and civilized place. That is the main purpose behind the idea of celebrating Water Day every year.

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Water and Industrial Growth

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Water is primarily used for three different purposes viz. for agriculture, for domestic use and industries. On an average, 80 percent of it is used for agriculture, 10 percent for industries and the balance for domestic purposes. That way agriculture also is an industry but in our country it is treated as way of life. As it is not treated as an economic activity, the rules of Economics are also not applicable to use of water by agriculture. Generally speaking land is cultivated years after years even when it does not give adequate return to the cultivator. As such, economic terms like price, cost of production, productivity, competition, market share, cost of transportation, profit etc. become redundant for cultivation. Of course, that is not the case with all cultivators. Many of them really treat it as economic activity and all these considerations are valid for them. Till now we were dividing the economy in two parts, i.e. urban and rural economy but now the rural part also is further divided in two parts i.e. cultivators who are using their land for commercial purpose and remaining ones who are cultivating land as way of life. If we move in any village these two categories could be very well identified.

Even after using 80 percent water we are irrigating hardly 20 percent of land and the rest of the land is being cultivated without any irrigation facilities. It is because five to ten percent of farmers use nearly 75 percent of water made available to agriculture. They give water to the land and not to the crops. If water is not used judiciously the productivity decreases instead of increasing. Thus those farmers who use water in such a way cannot reap the advantage from irrigation made available to them.

There is a basic difference in the demand for water in agriculture and industry. That is inelasticity of demand for water. In agriculture, this demand is more inelastic as compared to its demand in industry. Once we select one crop for cultivation, its demand for water is committed. Unless that much water is made available, the crop cannot survive. It means that that much water has to be reserved for that crop. That is not the case with industry. The demand for water in industry is more elastic. Considering the availability of water working hours can be increased or decreased or more or less shifts can be started or closed. This is how elasticity of demand for water can be increased or decreased. We can take the example of bear factories in Aurangabad. When there was acute shortage of water in Marathwada region these factories carried their activity even with less water.

What for water is needed by indutries :

Let us prepare a list of activities for which water is needed in a factory :

1. For the production process
2. For keeping the temperature cool
3. For developing the garden
4. For canteens
5. For toilet blocks
6. For other cleaning activity.

Some of the production processes are such that they need water. In some cases water is consumed by that process whereas in some cases we get the water back, may be in polluted form. Various chemicals or waste particles of the raw

material used get mixed up with water to make it polluted. In some cases, due to heat water gets converted in vapor. If there is adequte arrangement to cool that vapor we can get the water back, Such an effort is made by one sugar factory in Osmanabad District. Such regained water can again be used in the production process or even for other activities. By doing so, this sugar factory has brought its demand for water to zero. This experiment has become so very successful that other sugar factories in and out of the country have started copying this experiment in their own factories.

There are two reasons for which industries are criticized for indiscriminate use of water.

1. It is said that industries use water at the cost of agriculture. The tariff of water for industries is quite lucrative to the Government that it supplies more water to industries even at the cost of agriculture. The Government gets negligible revenue from agriculture for its water use. But there is no truth in this criticism. As it is, there is huge wastage in water used in agriculture. Where one liter is required, agriculture is spending more than five liters. Farmers should learn how to use water and then criticize the industries. Those farmers can and should criticize the industries who are paying their water bills regularly. Scientists have found out new techniques where water can be judiciously used. Very few cultivators are using these techniques. Such farmers have no right to criticize the industries. Industries have started making proper use of water with minimum of wastage.

2. It is said that industries heavily pollute water. There is a cent percent truth in this criticism. They allow untreated polluted water to flow in the nearby nallas or streams. This waste water has a large portion of chemicals, oil, metals and other particles which spoil the rest of the water flowing in those streams. These streams ultimately join some river nearby and thus river water also gets polluted. As per law, to allow this untreated water to flow outside the factory area is a criminal offence. There is a special Board set up by the Government known as Pollution Control Board which is expected to look after this work. But unfortunately that Board does not use its power to punish these industries which are following these criminal practices. Can you quote a single example where any industrial unit is severely punished for following these practices?

The problem does not stop here. That untreated water percolates in the soil and that spoils the ground water as well. It is comparatively easy to treat the surface water but is very difficult to treat the ground water. Once the ground water is polluted there is no treatment available to purify it.

Treated water can be used in very many ways. Treating water is as good as increasing the water supply. In untreated water the amount of pollution is hardly 5 to 10 percent. If that is removed that water is available for use again. There are some countries which treat the water several times and increase the water availability. Singapore is such a country which purifies water and makes it potable. There is acute shortage of water in that country. That is why it was compelled to find out ways and means to increase the water supply. Initially people hesitated to consume that water but by mouth and radio publicity and television publicity it was successful to make the people use it even for drinking. Partially treated water can be used for toilets and gardens in the factory premises. In English there is one Proverb: One run saved is one run gained. We can modify that proverb: One drop saved is one drop gained.

What can industrial establishments do to promoted water literacy?

1. Every industrial unit has its own campus having many buildings like workshop shed, administrative units, staff quarters etc. Each building has a big roof. It can take resort to roof top harvesting. The expenditure involved is minimum but the benefits are permanent. If every unit can solve its own problem and collect enough water the pressure on the public bodies would be sufficiently reduced.

2. Every industrial unit owns a big plot. Of that the construction is done nearly to the extent of 30 to 40 percent. Rest of the land is open to sky. In that open space they can erect water harvesting structures

and collect the rainwater which can be beneficially used later. I was invited as a guest for one function in one industrial establishment at Aurangabad. Casually I asked the in charge the size of the plot. It was seven acres. If the average rainfall of the town is 750 mm, in seven acres the total amount of rainwater available is (28,00,000 per acre x 7 acres)= 1,96,00,000 liters. When I told this fact to the in charge he was astonished to learn that figure. He said if this much water is collected it would be 10 times more than what he requires to maintain his factory.

3. Every factory should prepare its water budget. There by it knows how much water is available and how that much water can be utilized. It has to purchase water and that is how it becomes a part of the production cost. The world has become so competitive now a days that even a slight increase in cost may cost you the deal itself. I visited one factory where they were using 35000 liter of water per day when their actual requirement was just 3500 liters. This sheer wastage may reduce your competitive edge.

4. Budget and audit always go together. Budget without audit does not carry any meaning. Audit tells you those point where there is a misuse of water. Proper control on water use can be exercised where figures of actual use could be compared to the budgeted figures.

5. Factory canteen is a place where maximum misuse is possible. You would find non stop flowing water taps in the canteen and the toilet blocks attached to the canteen. There, every body's business is nobody's business. The waste water in the canteen can be very well used for the gardens.

6. Timings of watering the plants in the garden should be before the day's temperature increases. If they are watered early in the morning or late evening, the evaporation losses can be averted. Now a days, due to global warming, the temperature is on the increase. Huge water can be saved if the timings are strictly adhered to.

7. Every factory should have its own water treatment plant. If it is installed, the waste water can be reused. Now a days green technology is also available for this type of treatment.

8. In no case the waste water should be allowed to flow out of the premises. That is the social responsibility of every industrial unit. Try to take the blessings of the community where the factory is located. You might be reading in the news papers how the polluted water causes pollution in the nearby areas. Such polluted water is the root cause of various epidemics spread in the community.

9. In your premises water saving slogans should be written on the walls where water is actually used. Canteens, toilets, production processes are the common places where water is wasted. Such slogan posters should be displayed at these places.

10. Now a days we always talk on social responsibility of business. We are the part and parcel of the Society. We are there because the Society is there. It is our moral (and legal also) responsibility to promote water literacy in the Society. We can organize lectures in nearby schools and colleges to promote water literacy. We can conduct essay competitions, elocution competitions, drawing competitions for the school children. I was one of the favoured few who got Rs. 50,000 each year from Mahindra and Mahindra to organize drawing competition for school children in Pune city. You can also adopt villages where water problems exist. Some industrial establishments like Bajaj, Gupta Foundation have started their own charitable institutions to promote water literacy.

Water is a precious economic resource. Recharge, Reuse and Recycle is a proper technology practiced all over the world. Why not your unit be a part of this activity?

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Stockholm Water Prize 1991

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Stockholm Water Prize 1991 - David W. Schindler, Canada

(An article series has been launched in August 2021 to learn more about the World Water Prize winners and their work.)

Set against the backdrop of Canada's mountainous rocky lakes, David W. Schindler is an aspiring scientist. He is Professor of Biology at the University of Alberta, Edmonton. This beautiful part of Canada is protected by a wide range of national park ranges. It has become a major summer attraction for millions of people for tourism. This nature lover, who is constantly searching for something related to his work from his boat in the lake, has undoubtedly lived a life experiencing the pleasures of the beautiful nature. The nature-loving man in the canoe is no doubt enjoying the beautiful scenery around him. However, he is so much involved in his work that yet he has not come to Jasper National Park as a tourist.

His usual business is to collect samples of aquatic plants and animals from the lake with the help of nets and fill them in his boat, dig up the bottom mud with a tool and stick them on the boat, and collect samples of water from different layers of the lake in plastic bottles. It provides knowledge about the abundance of specific species in the lake, its biodiversity, the acidity level of the water as well as the factual content of nutrients, toxic metals as well as the density of chlorinated organic matter. He is very keen in going in deeper and study some of these matters.

David Schindler has been involved in research on mountain lakes and waters of Canada for more than three decades. In 1968, he set up an experimental lake project in Ontario for the Department of Fisheries and Oceans of Canada, and it has been running ever since. He headed this research work for 22 consecutive years till 1989. As a Lake Scientist and Ecologist, his goal was to create a lake as an integrated ecosystem.

Schindler's results, particularly from the late 1970s and early 1980s, were to be instrumental in convincing regulators in the United States and Canada to introduce stricter controls on phosphates and acidifying pollutants such as sulphur dioxide. Measurements of eutrophication levels showed quite clearly that atmospheric nitrogen and carbon have important effects in maintaining phosphorus limitation in lakes, as well as promoting blooms of blue-green algae.

A photograph of a lake in Canada drew the world's attention to the effects of sulfur and was later widely praised. It has been instrumental in building public support for tackling the growing problem of decay. Excess of nutrients - This is the main problem caused by atrophy which is a very serious environmental threat to the ecosystem. Freshwater as well as semi-enclosed water reservoirs such as the Baltic Sea will have to deal with these adverse effects. Since then, the photograph has been re-displayed hundreds of times for the enlightenment of students, scientists and the general public.

Equally important was the research that showed that the effects of acidification can work their way through the food chain, and once again photographic documentation was a crucial factor in shaping public opinion. Many of the results of the project have proved to be highly relevant in the

context of sustainable development worldwide.

Dr. Schindler received his Water Prize in 1991, he embarked on a number of innovative programs to study the fate and effects of organic pollutants, as well as to increase the ambient temperature around mountains and boreal lakes in the Arctic. Many of the findings from these projects are consistently relevant to sustainable development around the world.

Dr. Schindler received several awards for his work. In 1998, he was promoted to Pvt. He also received the Volvo Environmental Award jointly with Malin Falkenmark. In short, he was honoured for his special insights into the process of etrophication and acidification of sweeteners and the ways in which they can be remedied.

Schindler has received a number of additional awards for his work. In 1998, he and Professor Malin Falkenmark shared the Volvo Environment Prize; in particular, he was cited for his "insights in the processes of etrophication and acidification of freshwater and of ways to counteract these processes Dr. Schindler has also received the Gerhard Herzberg Gold Medal for Science and Engineering, Canada's highest scientific honour, and he has been elected to the

U.S. National Academy of Sciences, the Royal Society of London, and the Royal Swedish Academy of Engineering Sciences.

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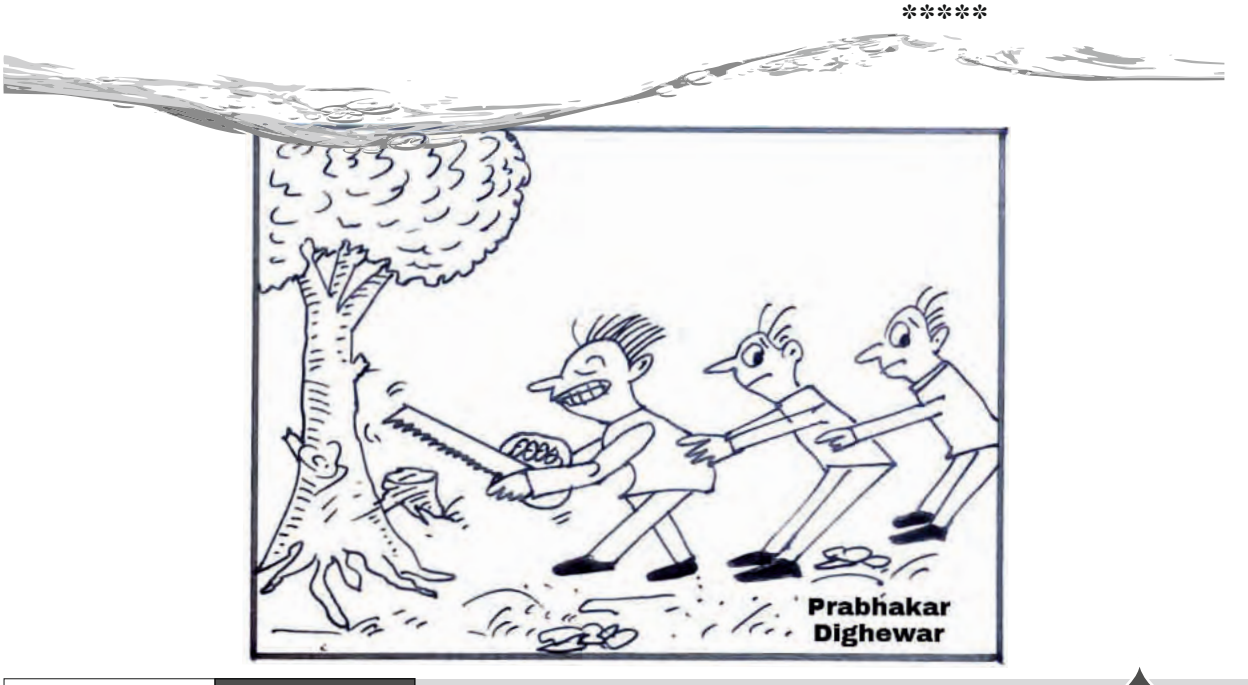


Saurashtra Branch Canal Pumping Scheme

on Sardar Sarovar Project in Gujarat

Ravi Ulangwar - (M) : 907500659

Preface:

The Saurashtra Branch Canal is one of the largest branch canal in Narmada Canal system of Sardar Sarovar project, a multipurpose dam built on River Narmada by Sardar Sarovar Narmada Nigam Ltd. The Saurashtra Branch Canal Pumping scheme is one of the largest Pumping system in the world constructed to lift the 410,000 liters of water per second against the gravity. This project showcase many technological innovations like Siphon system and Concrete Volute Pumps. This project is the life line of Saurashtra region as it has transformed the entire region by providing much needed drinking water to 3 Crs. people and irrigation water to 5 Lakhs hectare of command area bringing green revolution.

Author has been involved from inception to construction in successful implementation of this iconic water project. This article provides the interesting details of this fascinating water project and its overall economic benefits to the millions of people in the region. This article also provides some of the most interesting details of one of the most successful water management project ever built in our country.

The Narmada River :

Narmada River is one of the largest river in Peninsula Indian river system. It is the 5th Largest River in India with total length of 1312 kms. It originates from Amarkantak platue in Vindyanchal ranges in Amarkantak district in Madhya Pradesh and meets in Bay of Khambhat near Bharuch in Gujarat. This is also the largest west flowing river in Indian River system.

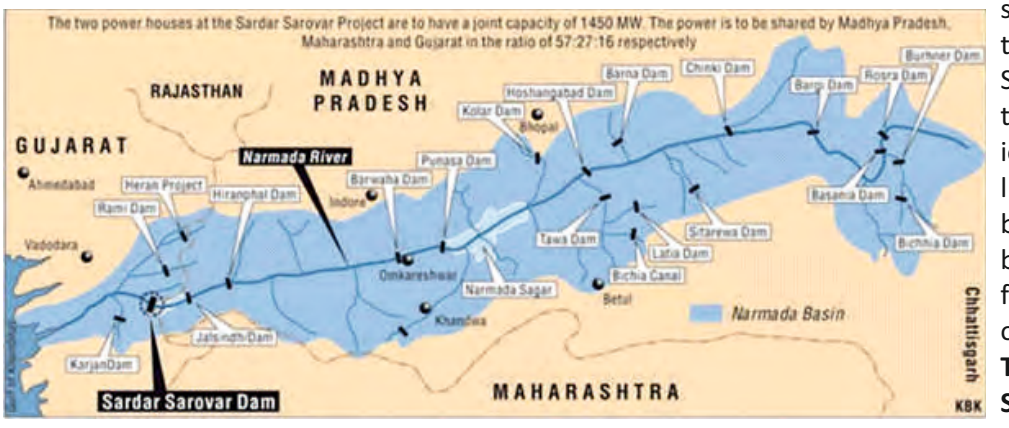
The Average Discharge of Narmada River is 1457 M3/ Sec. The total area of Narmada basin is 98,796 Sq. Km. It forms the natural boundary between Northern and southern India. The Narmada basin, hemmed between Vindya and Satpura ranges lies between east longitudes 72 degrees 32' to 81 degrees 45' and north latitudes 21 degrees 20' to 23 degrees 45' lying on the northern extremity of the Deccan Plateau.

It is one of the rivers in India that flows in a rift valley, bordered by the Satpura and Vindhya ranges. River flows in a deep narrow channel through the magnesium limestone and basalt rocks called the Marble Rocks near Jabalpur and famous for its beauty in full moon day.

As a rift valley river, the Narmada does not form a delta; Rift Valley Rivers form estuaries. Narmada river is also known as "Life Line of Madhya Pradesh and Gujarat" for its huge contribution to the state of Madhya Pradesh and Gujarat in many ways.

(The path of Narmada River)

There are 30 major dams, 135 medium dams and around 3000 minor dam projects proposed along with long canals on the Narmada Basin by NVDA.



(The Narmada River Basin and major Dams built in basin)

The Sardar Sarovar Dam:

It is the concrete dam Near Navagam in Narmada District, Gujarat. It is the 2nd largest concrete dam in the world in terms of the volume of concrete. The final height of the dam is 139 M and total length is 1210 M. The total irrigation area is 18.73 Lakh Hectare out of which 18 Lakh Ha area is in Gujarat and 73,000 Ha area is in Rajasthan. The dam is also called the multi-purpose dam as it generates 1450 MW of Hydro power generation and also provides drinking water to 10,900 Villages and 176 Towns in Gujarat and Rajasthan.

(The Sardar Sarovar Dam)

The statue of unity is built in the memory of iron man and India's first Home Minister Shri Sardar Vallbhbhai Patel overlooing the sardar sarovar reservoir near Navagam in Gujrat. This is the tallest statue in the world taller than the Statue of Liberty in the USA. Due to this iconic strcture this location has become one of the biggest attraction for tourist from all over the world.

The Narmada Canal System:

The Narmada Canal is a contour canal in northwestern India that brings water from the Sardar Sarovar Dam to the state of Gujarat and then into Rajasthan state. The main canal has a length of 458 kilometres (285 mi) in Gujarat and 74 kilometres (46 mi) in Rajasthan. The main canal is connected with 42 branches resulting in a Culturable Command Area (CCA) of 2,129,000 hectares (5,260,000 acres).

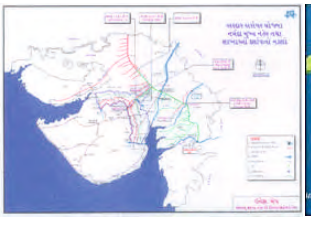
(The statue of Unity)

It has carrying capacity of 1150 cumec at its head in Navagam and is decreased to 74 cumecs at Sanchore in Rajasthan. On the way, Narmada main canal crosses many rivers and water bodies. The Narmada Main Canal connects mainly major rivers like Mahi, Sabarmati Luni and minor rivers such as Banas, Saraswati, Vatrak, Som so in true sense it is also called river linkage project.

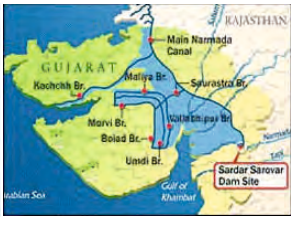
The main canal itself can hold 220 MCM (Million cubic metre) of water at Full Supply Depth (FSD). It is designed not only for the water supply but also the storage of water to improve the response time of the canal network.

The Saurashtra Branch Canal (SBC)

Saurashtra Branch is the largest of these branches which has a length of 104.46 km and discharge of 425 cumes of water. It off takes from Main canal at 246 km chainage near Kadi in Gandhinagar District of Gujrat. As Saurashtra was island thousands of years back and merged with main land subsequently it forms the partition line. Due to this typical geography in initial reaches of 52 Km chainage there is sloping ground and once it reaches the deepest point in alignment there is rising ground in rest of the chainage. So the complete topology is like bowl.



(The Narmada Canal Netowrk)



(The Saurashtra Branch Canal)

So in the intial chainage till SBC reaches the deepest location near Viramgam the water is flowing by gravity and once it reaches to lowest point near Nal sarovar region Canal requires to be lifted so that water can flow against gravity till it falls in Bhogavo Reservoir near Surendra Nagar town in Saurashtra.

Sardar Sarovar Naramada Nigam Ltd. (SSNNL), a wholly owned undertaking of Government of Gujarat is responsible for construction of Sardar Sarovar Dam and its entire Canal Network. In early 1990s when SSNNL started planning to build the SBC canal network they came across the challenging assignment of lifting such a high amount of water on rising section of SBC. During this period some of the leading organisations like NTPC and Kirlosakar Brothers Ltd joined hands with SSNNL to provide the solution for designing the pumping system. I had privilege to be a part of this core team which got involved in designing the perfect solution.

To take the complete advantage of the topography it was decided to construct 3 mini Hydroelectricity plants to utilize the energy from water at the fall of 52 metres (171 ft) in first 59 km. Subsequently, in the 59 to 104.46 km span five pumping stations to pump the water 66 metres (217 ft) up before tailing into Bhogavo - II reservoir were proposed. This was unique and innovative scheme as it was utilising all the potential hydro power on fall and same can help to compensate the power required to lift the water by pumping on rising section.

Considering the longitudinal section of ground along its alignment it was decided to plan the five pumping stations in the final reaches from 68 kms onwards in the sector where ground is continuously rising. These total 5 pumping stations are located on the canal. Its location and distance between two adjacent pumping stations are shown in following table.

Pumping Station	Chainage in Kms	Name of Village
PS 1	68.485	Dhanki
PS 2	77.615	Lakhtar
PS 3	87.950	Bala
PS 4	93.205	Rajpur
PS 5	102.840	Dhudrej

(Note: 0 Chainage indicates off take of SBC from Narmada Main Canal)

Considering the large size of the project it was decided to develop the complete project in 4 different phases so that project is commissioned progressively to match with irrigation water requirements in command areas as it gets developed over the period of time.

Each pumping station will lift the water and put it into higher level discharge canal and then it will travel by gravity few kilometres till next pumping station. On the way water is also distributed into right and left bank canal so as to

reach to command areas. Between PS 1 and PS 2 total 110 Cumec water is distributed and between PS3 and PS4 total 110 Cumes water is distributed in branch canals.

The pumping station wise and phase wise flow distributions is explained clearly in the following table given below at the end

Considering the large flow rates more numbers of Pump sets are installed at each locations so that flow can be divided among the battery of pumps in each pumping stations. Two types of pumps are installed one is Vertical turbine type and second one is concrete Volute type. The main purpose of VT Pumps are to provide water for drinking purpose which will operate all the 12 months throughout the year whereas Concrete Volute Pumps are provided to fulfill the varying requirement of irrigation water in the command area. The scheme is very intelligently designed by keeping the depth of the pumping station in VT Pump section more so that enough water is pumped even during the summer days when water level in the canal is reduced to its lowest level.

The size of each Concrete Volute Pump is 20 Cumecs and VT Pump is 5 Cumecs. Number of such pumps are installed in each pumping stations so as to optimize the operation of the pumping schemes depending on seasonal variation in the flow in SBC canal.

The innovative technology of Concrete Volute Pumps:

Since each pump is designed to handle 20,000 litres of water per second the size of the pump is very large. It was very difficult to manufacture the casing for such a large pump in the foundry using the metal and then machining such large size casting was another big challenge as there was no such facility available in India then. Even transportation of such large pump casing by road to project site would have posed numerous challenges of logistic. Installation of such large and heavy components would have required very large and specially designed cranes at site.

To overcome this challenge the innovative concept of Concrete Volte Pump were introduced in this project. In such case the pump casing, the largest part of pump, is manufactured in-situ at site in concrete, eliminating the requirement of metal casing. The size of the casing is as big as any large conference room and whole truck can travel in this casing. These pumps are vibration free and also seismically more stable than conventional metallic Pumps. Other than numerous technical advantages there are also financial benefits for using this concrete volute technology in such large size project of national importance. There are such 26

Pumping station wise and Phase wise Flow Data of SBC Pumping Scheme				Number of CV Pumps	Numbers of VT Pumps
Pumping Station	Flow (Cumec) Ph I+II	Flow (Cumec) Ph III+IV	Total Flow (Cumec)		
1	230	180	410	19	06
2	120	180	300	14	04
3	120	180	300	14	04
4	80	120	200	09	04
5	80	120	200	09	04
Total	630	780	1410	65	26

large concrete volute pumps are installed in this project.

The Innovative Concept of Siphon Technology :

Every pump needs valve in discharge line to control the flow. However in this case the size of each CV Pump is so large that the delivery pipe of each pump is almost 4.0 m diameter. It was big challenge to design the valves of this large size and then transport it to site by road. Additionally such large valve in flow path will incur additional friction losses increasing the pump head and there by higher power consumption by pumps.

To overcome this technical challenge it was decided to design the system with use of simple concept of siphon in discharge duct. This siphon will help to establish the flow when pumps are operating and stopping the reverse flow when pumps are stopped preventing draining of delivery canal.

The use of this energy efficient siphon system has resulted in to huge energy saving for pumping and there by almost Rs.15 Crores per annum in terms of electricity cost avoiding the costly maintenance of large size valves. The advanced pneumatically operated Israel make high quality diaphragm valves are installed to make and brake the siphon system. This innovative energy efficient design of Siphon was awarded USA patent to Kirloskar Brothers Ltd

Installation of Siphon at site

Inside the casing of Concrete Volute Pump

The Importance of the Scheme:

As Saurashtra region being drought prone area was facing actuate shortage of water. Since there are no major rivers and rainfall was also very scanty there were no source of even drinking water. People of Saurashtra were facing hardship due to this geographical and climatic conditions. Many a times during summer season government had to provide the drinking water by goods trains to many areas of Saurashtra. Considering this background this SBC pumping scheme is boon to entire area as it is the only source for water supply to Saurashtra region.

After commissioning of the SBC Pumping project government of Gujarat has constructed very large network of pipeline, Water Treatment Plants and Pumping stations and provided the drinking water to every nook and corners of region. This project provides safe and clean Drinking water to 3 Crs. people of Saurashtra region in 11 Districts, 251 Talukas and thousands of villages. Due to this project the ground water table has also increased considerably in the entire Saurashtra which has also rejuvenated many dead bore wells, open wells and other water bodies in the region.

Projects also provided much needed irrigation water to 5 Lacs Hectares farmland. The entire land in Saurashtra region is now receiving the irrigation water during Khariff and Rabi seasons. Due to the year round availability of irrigation water the salt content in the ground has reduced considerably over last few years and thus the land has become more fertile. Now this area is growing bumper yields of many cash crops like Cotton, Groundnut and Tobacco making farmers atmanirbhar.

(Drinking water Pipe network built using the SBC as a source for raw water)

In the given map you can observe the Drinking water pipeline Network developed by Gujarat Water Infrastructure Limited (GWIL) using the Narmada water brought by SBC Pumping scheme.

Conclusion:

This project is one of the engineering marvel in the world and has brought overall economic growth in one of the drought prone areas of country making the whole Gujarat state in one of the most advanced and prosperous state in the country. Due to all around economic development of region it has also stopped the migration of people from rural areas to cities helping to solve many issues related to unplanned urbanization. The entire natural eco system is re balanced in the region giving new lease of life to flora and fauna.

This project also establishes the finest example of how successful implementation of such large scale water project can transform the lives of millions of people and their living standards for generations to come bringing overall economic development and growth. Learning lessons from the success of this important project Government should plan many such projects in other part of the country.

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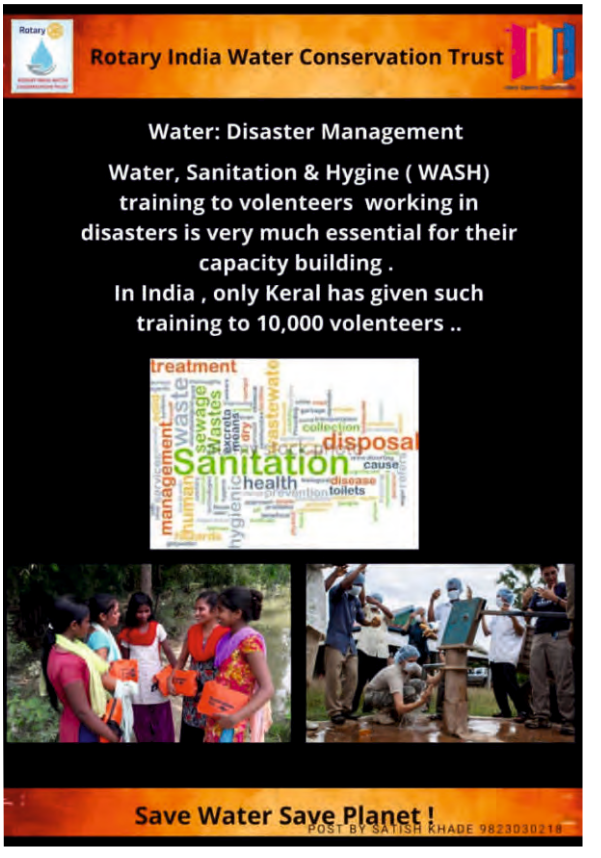

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Virtual Water:

- If you consume a cup of tea how much water is needed for that? You may say, is it a question to be asked? Just a cup of water would be needed, you may say. Sorry friend, you are wrong. For one cup of tea you need water, sugar, tea powder, gas and water for cleaning the cup and other utensils after the consumption is over. For all this, you may even need at least 15 liters of water. Like this we can find out the foot print of water for each and every commodity we consume. This is called virtual Water.
- The direct consumption of water is much less as compared to virtual water. Thus, if we stretch our imagination, we can find out water required for each and every commodity we consume. For one banana we need 100 liters, for one mango we need 560 liters, for one apple we need 70 liters, for one orange we need 50 liters, for one coconut we need 2500 liters and so on. It naturally means, if we export one mango to some country we are exporting 560 liters of water.
- In Singapore, it is obligatory for every producer to mention the foot print of water on every commodity he produces and markets. This enables the customer to find out how much water he would be consuming by purchasing that commodity. And if he is interested in saving water, he would purchase that brand which consumes less water. There are two tags on every product- one is price tag and the other is water foot print tag. A novel way to save water!
- Virtual water plays a very important role in export market. Arab countries have abundant mineral oil but they do not have water. They are required to purchase all their requirements from the world market. It naturally means that they import that much water from other countries. If agricultural products are exported to these countries, exporting countries are exporting that much water. If a foreign national visits India and stays in a five star hotel, he generally consumes 1000 liters of water per day. This is also export of water to foreign countries.
- ndia is facing a very peculiar problem. It is the second largest country producing sugar in the world. 80 percent of the irrigation potential is used by sugarcane producers in the country. In fact, that much sugar is not needed by the country. Export of sugar is also not possible as the rates of Indian sugar are high as compared with other countries. That extra sugar produced lies in the godowns unused. It is as good as storing that much water in the godowns. When there is acute shortage of water in the country such storage of water in the godowns is criminal.

Heartiest greetings form the Jalasamvad family

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