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Jalasamvad

A Dialogue on Water

Editors: Dr. Datta Deshkar, Shri Satish Khade

Now in ENGLISH too

Come on, Let us make the rivers flow round the year:

- Previously many rivers used to have water at least for eight to ten months. They were dry hardly for two to three months.
- Today the position has changed. Immediately after the rainy season is over, they go dry. Many a villages are facing water problem in recent years as water is not available in rivers for many months.
- What is the reason for this? The ground water level was higher than the river water level and there was a continuous flow of water round the year from the ground water to the rivers. Now the ground water level has considerably gone down and this seepage has stopped.
- Because of over exploitation of ground water, the ground water level is dropping down very fast. The flow from the ground water to rivers has gone down considerably and the ultimate result is that the rivers go dry immediately after the rainy season is over.
- What is the way out? Out of the total rainwater we hardly store 10 to 15 percent water under the soil. But on the other hand we lift more water than what we store. There is no wonder why the ground water level is depleting so very fast.
- Nature was helping us to store more water under the soil. But now due to tiling the ground around the buildings and wall to wall tar/cement roads construction has reduced the possibility of natural percolation under the soil. Cutting down the trees also is partly responsible for poor percolation.
- The only way to make the rivers flow round the year is to recharge the ground water. If this is done seepage from ground water to the rivers would increase and they would flow for longer period.
- Our aim should be to stop the flow of water and increase the recharge of ground water. This will enable the ground water to maintain a continuous flow to the rivers to make them alive.

Jalsamvad

Mouth Piece of Bharatiya Jala Sanskriti Mandal

- **July 2021**

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Editorial .....

What prompted me to start Jalasamvad (Dialogue on Water) in English?

After retirement I got a very good opportunity to work with the world known water activist Dr. Madhavrao Chitale. He was the then Chairman of Global Water Partnership (South Asia) funded by United Nations. Our Office was located in the premises of Water and Land Management Institute, Aurangabad. He was in need of one Office Co-ordinator and he found in me what he wanted. I had my Ph.D. degree in Agricultural Economics and enough of administrative experience to my credit. That way, water was a new field for me but because of my inquisitive nature I tried to learn lots of things about water when I came in his contact. He unfolded different aspects of water in every meeting with him in the Office. Besides my regular Office work, I was entrusted the work to handle (1) Women and water Network (2) Water and Poverty Network and (3) magazine published by our Office. I was entrusted the work of organizing South Asia Water Forum and for that I was nominated as a member of the organizing committee specially appointed for the purpose of organizing such Forums at Kathmandu and Islamabad. I presented research papers on Women and Water at Bangalore conference, Water and Poverty at Acra (Ghana) and Role of Voluntary Agencies in Water conservation at Dhaka (Bangladesh). After the term of Dr. Chitale as Chairmen was over, naturally my involvement in the Office also ended.

Earlier I had promised Dr. Chitale that I would spend my remaining life in the promotion of water literacy. As a first step, I set one target before me that I would contact one lakh school going children and make them water literate. I started moving from school to school, requested the head to arrange my lecture in the school. I am happy to state that in one year itself I completed my target. Then I thought, why I should not associate school teachers with this movement to spread this message of water literacy fast amongst students community. I decided to hold workshops for school teachers who would, in course of time, assist me in this work. I held more than 60 such workshops for school teachers and requested them to help me in doing this noble work of water literacy. Each workshop was for 100 teachers. Thus my army increased to 6000 soldiers who are sincerely doing this job entrusted to them.

Then I turned to senior citizens. We all know that even after retirement people are fit to work at least for 10 years. Thanks to the drugs which are available which keep them fit. Another factor for their long life is that the community has become more health conscious. I decided to utilize their time for my work. I approached Yashada, Pune to permit me to hold one workshop for such senior citizens who are eager to work in the field of water literacy. That institution gladly agreed to help me financially for the conduct of such a workshop. I approached the apex body of senior citizens clubs to give me two names of senior citizens from each district in Maharashtra. That organization gave me that list and I held one workshop for the senior citizens. Nearly 100 such persons attended this workshop. I requested all of them by saying, 'you have come here as senior citizens but after leaving this hall you have to reach your district as a water worrier'.

My organization-National Institute of water and culture-received a grant of Rs.1,00,000 to spread water literacy amongst women. The work was entrusted to me seeing my interest in this field. I held workshops for women at Ambajogai, Nanded, Parbhani, Jalna, Aurangabad, Pune and Mulshi. In all, more than 1000 women were benefitted.

Later I set another target of contacting 10000 farmers and promote water literacy in them. That target also I could complete in another year. I thought that Instead of moving from place to place I could reach to people through a magazine. I sought the advice of elderly people working in this field and since I got a faourable nod from them I decided to start one magazine by name Jalasamvad (A dialogue on water). It is for last 17 years I have been publishing this magazine regularly. Each magazine covers one success story in the field of water, three to four articles on water, introduction of one river, one lake and one dam in the country and outside, introduction of one institutions working in the field of water, water problem faced by one country and other useful and relevant information. One thousand copies of the magazine are sent by post to the subscribers. Jalasamvad has its own website (www.jalsamvad.com) and issues for last three years would be available on this website.

Three years before, I started one web radio by name Jalsamvad Radio which works round the clock and programmes related to water are broadcast on this radio. I have recorded the series on water and women, ground water, water and agriculture, water and environment, water and pollution, the life of a river and other variety of Information which is broadcast on this radio. I have a recording of over 60 hours and my efforts are to make more and more recordings. I have recorded interviews of various water activists which are also broadcast on this radio. Since it is a web radio it can be listened all over the world. This is a free service and you are required to pay nothing to avail this service.

As an editor of this magazine, I have taken a lead in promoting writers on water issues. People have lot of information with them on water but they have no exposure to express themselves. I persuaded them and now they write for me regularly and share their rich experiences with my readers. I have more than 200 writers who are ready to write for me. The inflow of articles has increased so much that from 15th of June this year I have started one internet issue of Jalasamvad. The original issue is that of 32 pages. This internet issue also is having equal number of pages. The annual subscription of printed Jalasamvad is Rs. 500 whereas the subscription of internet copy is just Rs.100. Matter in both these issues in altogether different.

I have written more than ten booklets on different water issues ranging from water literacy, water harvesting techniques, sustainable farming, quality of water, water and famine. Forest farming, farm ponds, what you need is with you (Tuze ahe tujpashi), Use water but with caution etc. Three of these booklets are published by Government of Maharashtra.

And now, to march one step ahead, I have decided to publish Jalasamvad (Dialogue on Water) Magazine in English language also. It would also be an internet issue with A4 size 32 pages. Renowned personalities working in the field of water have promised me to give their contribution in the form of article to this issue. I hope, you would like it. It would be published on the first day of every month and its yearly subscription would be Rs. 100 only.

I expect your full cooperation and support for this noble activity.

Dr. D. G. Deshkar
Editor

Water Productivity, Pricing and sustainability

Dr Mangesh Kashyap

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While working on SDG no 6, clean water and sanitation I found various aspects of water governance and economics, which starts from productivity and pricing. In this article I have focused on few facts and real time scenario of the water productivity and its economics mainly inclined to Concepts of Efficiency, Productivity Pricing and Sustainability. We often talk about water-use efficiency (WUE), irrigation-efficiency (IE) and WP. We then define Economic Efficiency (EE) and relate EE to IE and WP.

In general terms, we define IE as the ratio of water consumed to water supplied. WP is the ratio of crop output to water either diverted or consumed, the ratio being expressed in either physical or monetary terms or some combination of the two. There are four areas of confusion related to the concept of efficiency.

First, WUE as used in the literature, including the economics literature (e.g. Dinar, 1993) and plant-science literature (e.g. Richards et al., 1993), most commonly refers to what we have defined above as WP: that is to say, it is defined as the ratio of crop out- put to water input. We believe that in these instances WP is the more appropriate term.

Economic efficiency (EE) takes into account values of output, opportunity costs of inputs and externalities and is achieved when scarce resources are allocated and used such that the net value or net returns (returns minus costs) are maximized. Unlike IE, which is a ratio by definition, EE is a criterion that describes the conditions that must be satisfied to guarantee that resources are being used to generate the largest possible net benefit (Wichelns, 1999).

Until recently, water was not considered a scarce resource. Now, with mounting water shortages and water-quality concerns, there is growing interest in measures to increase WP, which is a specific example in the general class. WP is most commonly measured as crop output per cubic meter of water.

Partial water productivity can be expressed in physical or economic terms as follows (Seckler et al., Chapter 3, this volume):

1. Pure physical productivity is defined as the quantity of the product divided by the quantity of the input. Examples include crop yield per hectare or per cubic meter of water either diverted or consumed by the plant. For example, the International Water Management Institute (IWMI) sees as one of its primary objectives 'increasing the crop per drop'.
2. Productivity, combining both physical and economic properties, can be defined in terms of either the gross or the net present value of the product divided by the amount of the water diverted or consumed by the plant.
3. Economic productivity is the gross or net present value of the product divided by the value of the water either diverted or consumed by the plant, which can be defined in terms of the value or opportunity cost in the highest alternative use.

Economic measures of WP (2 and 3 above) are difficult to estimate. While the net value is more satisfactory than the gross value of the product, the valuation of inputs must be treated in a uniform manner across sites. This can be difficult for land, labour and water (which are also usually the most important inputs). Valuing water is at best a difficult and unsatisfactory process, considering

that the marginal value of water varies throughout the season, between seasons, by location, by type of use and by source of water.

The concept of EE, distinguishing between net private returns and net social returns and relating net returns to WP. Net private returns are defined as the market value of all outputs minus the cost of all inputs, taking into account the opportunity cost of family, labour, land and any other inputs that are not purchased in the market.

We have observed that water savings per se may or may not lead to increases in WP. Likewise, an increase in WP may or may not result in higher economic or social benefits. Following the general concepts of net returns at the system level, economists assess the merits of an investment by measuring the benefits and costs (B:C) ratio or the internal rate of return (IRR). These are measures of the performance of investments or the productivity of capital.

There are those who argue that water in large, publicly managed, irrigation systems is being poorly managed and that policy and institutional reforms are needed to create the environment and incentives for saving water and increasing WP. Charges for water or for power for lifting water (if they exist at all) are rarely adequate to cover O&M expenses. As a result, irrigation infrastructure is deteriorating at a rapid rate and overexploitation of groundwater resources is leading to a decline in the water table and in the quality of water.

Water-pricing policy :

In developed as well as developing countries, there is disagreement regarding the appropriate means by which to price water and the appropriate level of water charges. The pricing of water may involve different objectives, such as cost recovery (who has benefited from the investment in irrigation and who should pay), financing the irriga- tion agency or reducing wastage of water. Politics also enters heavily into water-pricing decisions. Moreover, many countries lack the tradition, experience and appropriate institutions for pricing irrigation water.

We need a better understanding of bio-physical and socio-economic changes in basins over time and improved measures of basin-level efficiencies before we can determine, in a given situation, the potential for increasing WP through policy and institutional reforms and which reforms are most suitable. Finally, as basins become closed, measures to increase water productivity and exploit groundwater resources are leading to a serious decline in water quality and other problems of environmental degradation. Decisions on basin-level allocations among sectors must involve value judgments as to how best to benefit society as a whole. This will include setting priorities in the management of water resources to meet objectives such as ensuring sustainability, meeting food-security needs and providing the poorer segments of society with access to water.

Water Pricing Statistics

Water Sector in India :

India, home to 16 percent of the world's population, has only 2.5 percent of the world's land area and 4 percent of the world's water resources at its disposal. Precipitation in the form of rain and snowfall provide over 4,000 trillion liters of fresh water to India but most of the freshwater returns to the seas and ocean through the many large rivers which flow across the subcontinent. A portion of this water is absorbed by the soil and is stored in underground aquifers. A much smaller percentage is stored in inland water bodies both natural (lakes and ponds) and man-made (tanks and reservoirs) of the 1,869 trillion liters of water reserves, only an estimated 1,122 trillion liters can be exploited due to topographic constraints and distribution effects. The demand for water has been increasing at a high pace in the past few decades. The current consumption in the country is approximately 581 trillion liters with irrigation requirements for agriculture accounting for a staggering 89 percent followed by domestic use at 7 percent and industrial use at 4 percent.

Water Pricing :

In the most general sense, water pricing refers to monetizing the abstraction, use or pollution of water. Following this broad definition,

pricing is not a water allocation mechanism in itself, but is a supporting policy instrument to control water use (or pollution) and (re-)finance water use-related costs (OECD 2009). Water pricing can under certain circumstances act as a de facto allocation mechanism by excluding certain users who are not able to pay the price of its use (WWF 2007), but this is rarely intended (Bosworth et al. 2002).

Variations and Objectives of Pricing Schemes

A water price is usually charged in form of either :

• A water charge/tariff, meaning that the provision of water (abstraction, treatment, transport) is charged by the providing entity (public or private)

• An abstraction tax/fee, payable to a public authority that distributes property rights.

• Varying from country to country, public revenues generated by abstraction taxes or water charges which are often earmarked for explicit water management purposes.

The pricing of water can serve as a policy instrument to achieve the following policy objectives.

• Cost Recovery: A water pricing scheme may be a financial tool aiming to recover direct (water supply and infrastructure) and indirect (environmental, social and opportunity) costs.

• Incentive Function: It may also aim to conserve water and promote a more sustainable use of the resource, address water scarcity problems and foster investments into alternative, less water-intensive crops or water saving technologies.

Cost Recovery Function There are two main aspects of cost recovery (OECD 2009) :

• Supply cost recovery: recovery of financial i.e. "internal "costs of water supply, including investments in infrastructure, O&M and administrative costs etc.

• Full cost recovery: recovery of financial as well as water use-related environmental, social and opportunity costs. If the latter is not integrated into prices, i.e. if they have not been "internalized" into prices, they are referred to as "external costs" or "externalities."

Therefore, the meaning and the level of cost recovery depends on what is actually considered to be part of the "price" of providing and using water. External costs are, by nature, much more difficult to define and quantify and are therefore rarely considered in current water tariffs (ENTEC 2010; OECD 2010c). Closely related to cost recovery issues is the question of "who" should actually bear the costs of water supply. It is generally accepted that payments should be linked to the actual use/abstraction or that there is a contribution from all users in relation to their consumption (or pollution).

Imperatives for various stakeholders in the water sector

The reliability, financial sustainability and affordability of water supply and wastewater treatment services need urgent improvement. It is important that key steps are taken by various stakeholders to improve the situation

Imperatives for the central government :

• To modify the National Water Policy to emphasize re-use of treated wastewater and reduction in groundwater usage. This is especially relevant for sectors like agriculture that consume over 80 percent of fresh water supplies.

• Expand funding for water source development, sewerage networks and sewerage treatment plants under schemes like JNNURM

• Increase technical assistance grants for capacity building of Urban Local Bodies to manage Public **Private Partnership Projects**

• Increase technical assistance grants for ULBs to set up sewage treatment facilities

• Increase technical assistance grants to ULBs for loss reduction, sewage treatment and recycling and groundwater recharge projects.

Imperatives for state governments :

• Define roles and responsibilities of each entity in the sector

• Create regulatory institutions to oversee the management of water resources and pricing of bulk water

• Initiate reforms of Urban Local Bodies to diversify revenue sources, improve creditworthiness, facilitate operational autonomy, improve technical capabilities

• Improve information sharing of state-wide water resources among agencies responsible for planning regional development

• Support ULBs in developing robust water supply and wastewater treatment project structures to attract private investment.

Imperatives for urban local bodies:

• Upgrade planning capacity within local bodies by increasing number of planners, environmental engineers.

• Initiate gradual increase in water tariffs to ensure optimum utilization of water resources.

• Develop plans for expanding sewage collection networks and building sewage treatment plants.

• Explore alternative technologies for sewage treatment like Soil Biotechnology based systems and Reed-based systems.

• Lobby to increase water and sewerage tariffs to pay for capacity expansions. Reorganize subsidy system to ensure that the subsidies reach the poor via targeted, area-based subsidies instead of general subsidies.

• Cut non-revenue water by fixing leaks, monitoring water supply quantity and quality.

Imperatives for technology companies :

• Engage with government agencies to create policy frameworks that support growth of water reuse, wastewater treatment and standards

• Invest in research and development for technologies (through investments in pilot projects) and commercial models suited to the Indian cities, towns and rural areas

• Run awareness campaigns targeted at households to monitor water quality, conserve water and provide education on managing household waste to lower costs of treatment e.g. Free distribution of water testing kits, separation of organic and inorganic wastes, use of a dual flush system

• Engage with the construction industry on designing projects for wastewater re-use.

Imperatives for agricultural users :

• Main contribution is to invest in water-use efficiency enhancing technologies such as drip irrigation and other water saving technologies.

• Organized farmers' federations could initiate industrial wastewater re-use projects in areas with industrial activity and declining water availability. Similar initiatives could be taken up by farmers' groups in city outskirts to reuse urban waste water.

Imperatives for industrial users :

• Engage with government agencies to create policy frameworks that support growth of water reuse, wastewater treatment and standards

• Invest in research and development for technologies (through investments in pilot projects) and commercial models suited to the Indian cities, towns and rural areas

• While several industries have initiated zero-discharge projects in their factories/plants, many others continue to discharge effluents without treatment. Self-monitoring and regulation must become the norm for industries that aspire to grow as environmental sustainability and corporate social responsibility are key pillars of differentiation among global firms

• Industry Associations like CII and ASSOCHAM must facilitate dissemination of best practices in water and wastewater management.

Need for Appropriate Pricing of Water

Major and medium irrigation projects are developed to benefit a large number of farmers of an irrigation command area. They are usually funded by the government. Government funding is from the taxes and other revenues which are raised from the public. Irrigation projects result in substantial financial benefits to the farmers of the command area. Hence it is necessary that appropriate cost recovery policies are developed by the government to recover the money spent on a project for investment in other projects which will benefit other members of the society and can boost the economy in terms of GDP for Sustainable development and compliance of Agenda 2030.

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Sugar Problem Of India

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There are in all more than 130 countries in the world which produce sugar. Some produce it from Sugar cane and some from sugar beet. Almost all the countries need sugar and they purchase it from the international market. Average production of sugar in the world is approximately 185 million tons. It is likely to fall to 170 million tons in the years to come. The main ten countries producing sugar are Brazil. India, European Union, Thailand. China, America, Russia, Mexico, Pakistan and Austria. For last two years (2018 and 2019) India was enjoying the first position leaving Brazil behind but now it has come down to the second position. These two countries are the leading ones producing approximately 60 million tons of sugar. At the international level, requirement of sugar is reducing as eating sugar in excess is treated as harmful to human health. Thus, there is no possibility of any increase in the demand of sugar in the international market in the near future. Thus, total demand for sugar in the international market is likely to stabilize around 175 million tons. Due to corona epidemic vehicular traffic has gone down and the demand for mineral oil is decreasing. As an impact of this, Brazil is likely to increase sugar production by curtailing ethanol production. Because of this shift, its tough competitor, India is likely to face a setback for exporting sugar as Indian sugar is costly as compared to Brazilian sugar.

In India 19 states take interest in producing sugar. Total area under sugarcane in India is around 50 lakh hectares. Total sugarcane cultivated is approximately 4000 lakh tons with annual production of sugar to the extent of 35 million tons. 70 percent of sugar is consumed in India by industrial units like cold drinks, sweets, biscuits etc. and the rest of 30 per cent is for domestic use. Use of sugar in India is around 25 million tons leaving a huge margin for exports. World import of sugar is 66 million tons. Brazil is the major exporter, its share being approximately 50 per cent. Brazilian factories produce sugar as well as ethanol where as in India only sugar is produced. Ethanol is just a by-product in our country. Brazil produces 32.55 billion liters of ethanol where as India produces hardly 3 billion liters. Export of sugar from India is very less and that too with subsidies from the Government. Thus compared to local demand supply is always more. Even during the years when rainfall is poor it leaves no impact on the sugar production.

India is one of the largest sugar manufacturing country. Sugar consumption also is quite high in the country. On an average every Indian consumes 19 Kg of sugar per year. 60 lakh cultivators cultivate sugar and more than 4 to 5 crore labourers are dependent on sugar industry. At country level, more than 700 sugar factories are there in private, co operative and state sector. Annual turnover of this industry is more that 1 lakh crore. For Governments also it is a revenue earning activity as this industry contributes 12000 crores of rupees annually in the form of revenue. Sugar in produced in India only from sugar cane.

Various tables are presented at the end of this article showing area under sugar cultivation, production of sugar cane, number of sugar factories, production of sugar, export of sugar and other relevant data related to sugar. Let us now try to draw some important inferences from the data available. From this information, it Is clear that in India the country level production of sugar is more

than demand. During some years there is a shortfall, but that is duly compensated by the balance of sugar in stock. Since the production is more than demand, there are the problems of storage, export, payment to the cultivators for the sugarcane purchased from them. There is over production of sugar but sufficient arrangements for its storage are not made. There is no demand for sugar in the international market also. The rates in the market are also low. Since the farmers are not paid for the sugar cane purchased in time, there is always an unrest in the farming community. In fact, it is expected that the cultivators should cultivate sugar cane while planning for the available crushing capacity of the factory which is going to purchase their sugar cane. Factories also do not take the cultivators in confidence while planning for the total supply of sugar cane. In fact, all the cultivators are the members of the sugar factories. There should be a proper dialogue in between the management and the cultivators. If the rainfall is satisfactory, the area of cultivation of sugar cane increases and the crushing period has to be extended. With every week of extension of the crushing season the sucrose content of sugarcane decreases and that disturbs the economics of sugar factories. On many occasions, the factory stops the purchase of sugar cane but due to pressure from the cultivators and the Government they have to extend the crushing season against their will. That ultimately increases the cost of production and also the cost of sugar and the burden passes to the sugar consumers as they have to pay higher price. Almost every year the Government has to give subsidy to facilitate the export of sugar.

In Table No. 7 information pertaining production of sugar in five important states in India is given. That indirectly shows the manufacturing capacity of these states. Table No 8 shows the inevitability of the export of sugar from the country. In Table No 9 information of export of sugar from our country is shown. Information given in these tables is drawn from various news papers published in Maharashtra.

Table No 1

Sugar production, use and balance stock of sugar in the world (Million tons)

Year	Production	Use	Balance
2014-15	181.853	179.35	2.503
2015-16	175.082	181.330	(-) 6.248
2016-17	178.329	181.807	(-)3.478
2017-18	193.702	183.177	10.525
2018-19	185.236	184.929	0.307
2019-20	176.421	187.329	(-)10.908

Table No. 2

Sugar Production in India (million tons)

Serial No	Year	Production	Use
1	2010-11	24.39	21.0
2	2011-12	26.34	22.0
3	2012-13	25.14	22.0
4	2013-14	24.36	24.0
5	2014-15	28.31	25.6
6	2015-16	25.12	24.8
7	2016-17	20.26	24.6
8	2017-18	32.32	25.4
9	2018-19	33.00	26.0
10	2019-20	26.3	26.5

Table No 3

Sugar at the State level

Sl. No.	Year	Production	Use	Balance Stock
1.	2014-15	10.51	2.0	8.51
2.	2015-16	8.41	2.1	6.32
3.	2016-17	4.2	2.2	2.00
4.	2017-18	10.72	2.9	8.42
5.	2018-19	10.67	2.5	8.17
6.	2019-20	5.5	2.5	3.00

Table No 4

Sugar cane cultivation in different states in India

S.N.	State	2016-17	1017-18	2018-19	1019-20
1	Uttar Pradesh	21.79	21.12	23.05	21.84
2	Maharashtra	6.33	9.18	9.49	8.00
3	Karnataka	4.17	4.45	4.38	5.81
4	Tamilnadu	2.61	2.54	2.37	2.02
5	Bihar	2.30	2.40	2.42	2.44
6	Gujrath	1.87	1.86	1.83	1.36
7	Andhra Pradesh	1.15	1.34	1.37	1.16
8	Madhya Pradesh	-	-	0.98	1.18
9	Uttarakhand	-	-	0.92	0.94
10	Hariyana	1.12	1.12	0.91	0.93
11	Punjab	-	-	0.86	0.84
12	Telangana	-	-	0.39	0.33
13	Chhattisgadh	-	-	0.28	0/30
14	W. Bengal	-	-	0.19	0.18
15	Orissa	-	-	0.12	-
16	Other states	2.95	4.02	0.46	0.43
	Total	45.22	47.93	50.52	47.85

Table No 5

Area Under Sugar cane in India

	Year	Area(L.H)	Production (T H)	Production	Sugar (L T)	Utara
1	1950-51	0.75	66.8	50.0	1.13	11.62%
2	2000-01	5.78	78.1	451.5	50.13	11.60%
3	2010-11	7.56	83.0	641.6	70.66	11.54%
4	2011-12	10.43	77.0	770.0	80.56	11.54%
5	2012-13	8.0	87.5	700.0	79.5	11.4%
6	2013-14	10.22	82.0	886.37	77.2	11.41%
7	2014-15	10.55	80.0	390.14	105.14	11.30%
8	2015-16	-	-	742.94	84.15	11.33% (177)*
9	2016-17	-	-	373.13	42.0	11.26% (150)*
10	2017-18	9.23	-	953.73	107.2	11.24% (188)*
11	2018-19	11.62	-	949.02	106.74	11,22% (!95)*
12	2019-20	8.43	-	492.0	55.0	11/12% (146)*
	(*Working sugar factories)					

Table No. 6
Region wise picture

S.N.	Region	Area-L.H.		Factories	Production(cane)	Production (M.T)	Utara%
		18-19	19-20	2017-18	2017-18	2017-18	2017-18
1.	Kolhapur	2.39	2.51	37	213.93	26.68	12.47
2.	Pune	4.71	3.21	61	373.71	41.70	11.16
3.	Ah. Nagar	1.49	0.81	27	148.24	16.71	10.91
4.	Aurangabad	1.42	0.84	24	87.31	8.70	9.97
5.	Nanded	1.42	0.82	32	117.34	12.50	10.06
6.	Amaravati	0.04	0.09	2	5.53	0.59	10.77
7.	Nagpur	0.13	0.11	4	4.09	0.46	9.91
	Total	11.62	8.43	187	950.74	107.34	11.24

Table No 7
Sugar Production in different States

State	2006-7	2007-8	2008-9	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Uttar Pradesh	84.75	73.19	40.64	51.79	58.87	69.74	74.85	64.87	71.02	68.41
Tamilnadu	25.39	21.41	15.97	12.80	18.46	23.79	19.06	14.13	12.18	13.62
Maharashtra	91.00	90.75	46.00	71.00	90.70	89.77	79.94	77.10	105.00	84.24
Karnataka	26.62	29.00	16.51	25.58	36.83	38.72	34.67	41.77	49.35	40.49
Gujrath	14.25	13.06	10.12	11.89	12.35	10.00	11.30	11.77	11.54	11.68

Table No 8
Table showing the over production of Sugar in the country
(figures in Million tons)

SN	Particulars	Actual production figures In 2018-19	Estimated figures 2019-20	Estimates for 2020-21
1.	Opening Balance stock	10.41	14.44	9.74
2.	Production in the year	33.13	26.30	29.10
3.	Consumption in the country	25.48	26.00	26.00
4.	Exports	3.70	05.01	04.00
5.	Stocks in Balance	14.44	09.74	08.74

Table No. 9
Export of sugar over years (in lakh tons)

SN	Year	Export
1.	2009-10	2.35
2.	2010-11	26.00
3.	2011-12	29.92
4.	2012-13	3.48
5.	2013-14	21.27
6.	2014-15	10.94
7.	2015-16	10.56
8.	2016-17	0.46
9.	2017-18	4.46
10.	2018-19	38.00
11.	2019-20	49.00

to be continued .....

Jalvardhini Pratishthan

Shri Ulhas M. Paranjpe

M : 9820788061

Jalvardhini Pratishthan is established to promote methods of rainwater harvesting and water conservation in rural India. It started operations in early 2003. The main objective is to provide technical assistance in the implementation of rain water harvesting projects in the following cases.

1) Rainfall over the roof top of a house / building.
2) Rainfall over land within the compound of a house / building.
3) Rainfall over land under cultivation.
4) Rainfall over remaining land which is not under cultivation.

So that farmer or villagers can have assured water on the basis of "Rain Water Potential" We define Rain Water Potential { RWP } is equal to Land Holding X annual average Rainfall . If land holding is 0-40-0 and annual average rainfall is 750 mm then RWP = 4000 X 0.75 = 3000 cu.m or 30 lac litres If farmer could store required quantity then his or her problem is solved This is possible in most part of Maharashtra

A.Storage of Rain Water

We have several options to store water such as a} Kokan Jalkund b| Kokan Jalkund above ground , c } Ferrocement Tank above ground , d } Ferrocement Tank below Ground , e } Coconut coir cement Tank below ground , f } Banana Fiber Cement Tank below ground g } Ambadi Fiber Cement Tank below ground and few more .

We have developed Rain Water Resource Centre to give Knowledge related to Water & Water conservation

i } Oak Vanaushdhi Prakalp - Karjat
ii } Salvi Farm ---- Vangani Taluka Ambernath, Dist Thane
iii} Senior Science College , Dapoli , Dist Ratnagiri
iv } Maharshi Karve Stree Shikshan Sanstah , Shirgaon, Dist Ratnagiri
v } Yusuf Meher Ali Cenre , Tara , Panvel Dist Raigad

Rain Water Conservation Tank at MKSSS – Shirgaon, Ratnagiri

B } Shetkari Pani Yatra / Jal Yatra

We organise Shetkari Pani Yatra . One such was organised by Shri Anil Harpude for the benefit of Farmers from Taluka Karjat on 9 th Sptember 2015

Morning they visited our Resource Centre at Salvi Farm, Vangani . We have different models or type of storage structures having capacity to store Rain Water or Water . Capacity of storage tank will depend upon individual requirement

ISKCON Talasari site

At Talasari they saw Excavated Pond, , (having capacity more than 1.5 Cr. Liters) + Ferrocement Tank both above Ground and Bellow Ground, Fiber cement Tank.}

This will help them to understand that water can be stored with simple rural methods and then one can use it as and when required after Monsoon

Pond at Talasari

Farmers at Vangani Resource Centre

C } Construction of Water storage Tank in Kokan Region

Water and Money can be best used if they are stored or collected Money everyone collects but such is not the case with water. So we Teach various methods of storage of water or rain water so that farmer can get income from his land through out the year . Here we use inherent capacity of Farmer , and provide him only missing link ,that is water to Farmer with cost effective appropriate technology .

Table Showing Ferro cement Tank Constructed in 5 Districts of Kokan Region up to March . 2021

District	No of Tanks	Villages covered	Taluka Covered	No of Taluka in District
Raigad	106	40	7	15
Ratnagiri	83	43	8	9
Thane	18	11	3	7
Palghar	26	18	6	8
Sindhudurga	15	6	3	8
	248	118	27	47

Rooftop Rain Water Collection for Drinking Purpose Every one need average 5 litre of potable water for drinking and cooking purpose . hence for a family of 5 will need about 10,000 litre water for entire year or 365 days We have constructed many such tanks in Taluka Karjat and 3 in Taluka Shahapur

Similarly we have constructed many water storage structures with Ferrocement and Fiber Cement Technology for the benefit of Farmers Few such Tanks are shown in following photos

We provide Financial & Technical support to needy Farmer to solve his water related problem on participatory approach

D } Water Scheme for wadi / Cluster of Houses

We provide part Financial & Technical Support for Water Scheme for Wadi or group of People so that water problem is eased on participatory approach

Water scheme Bhactachi Wadi

Water scheme at Getachi Wadi , Taluka Khed, Dist Ratnagiri

Water Scheme at Mograj , Taluka Karjat

We have helped Following Wadi people to complete Water Scheme I }Bhactachi Wadi , Taluka Karjat ii } Getachi Wadi Taluka Murbad iii } Sade Wadi Taluka Khed , iv } Bharadin Wadi – Nate , Taluka ,Rajapur , v } Mograj , Taluka Karjat vi Anari, Taluka Chiplun , vii } Mayekar Wadi - Palgad , Taluka Dapoli

E] Lecture &; Workshop Held at Engineering, Polytechnic, Architectural and Agricultural College from Oct 2015 to March 2021

From October 2015 to March 2020 we were party to conduct work shop/ Lecture at 18 Engineering Colleges, 13 Polytechnics , 3 Architectural & 2 Agricultural Colleges Subject was " Water Conservation with Ferro cement & Natural Fiber Cement Technology"

At many Colleges Students have participated in construction of Ferro cement Structure.(Tank or Varmi Compost Tank or Potter)

At Sanjivani College of Engineering (29th & 30th August 2019) Practical was conducted before Lecture. 129 Students were divided in to 4 groups. Each group completed construction of Ferrocemet Tank On 2nd day afternoon students presented their work it was followed by Lecture on Water Conservation 10 Staff members were present on both days

This is a initiative by Jalvardhini Pratishthan to introduce Ferro cement and Natural Fiber Cement Technology among Students .

VJTI Students are learning Ferrocement Technology while constructing TWO Tanks

F] Liquid Chlorine during Monsoon to Few Village from Taluka Karjat Dist Raigad

We have been distributing since 2006, Jalshuddhi Liquid Chlorine Bottles of 100 ml each to every house of about 10 Padas / Wadis in Taluka Karjat, Dist Raigad during Monsoon Period. Totally about 500 bottles are distributed each year. This 100 ml bottle is normally sufficient for one family for a period of three months. This Liquid Chlorine Takes care of water borne diseases such as Loose motion, Diarrhoea, Gastro, Typhoid etc . which are epidemic during monsoon.

Liquid Chlorine Bottle distribution in Taluka Karjat , Dist Raigad

G } Poster in Marathi and English

We provide Posters in Marathi and English to school as per their Medium of Education , so that students can understand how to store and use Rain Water for various activities

We have provided such Posters to at least 40 school in Maharashtra

H] Innovative use of Natural Fibers in Water Retaining Structures

We Have used Natural Fiber such as I } Coconut Coir, ii} Banana Fiber iii } Ambadi Fiber iv } Jute Fiber , v } Kumoya Fiber and vi } Kewan Fiber

We started using Coconut coir as a crack controlling or bonding material in 2004.

Since then we have completed many such Tanks in Kokan Region

Coconut coir Cement Tank in Taluka Karjat , Dist Raigad - 2004

Banana Fiber Cement Tank : Construction of Banana Fiber Cement Tank at Eklavya Trust taluka Wada

Banana Fiber cement Tank during construction at Eklavya Trust , Wada

In order to study usefulness of Natural fibers in construction of underground water storage Tank we approached IITB, and under RuTAG-IITB study on scale down model was carried out by Dr. Eldho T.I of IITB , Civil Dept Report dated August 2015, concludes that I] medium dense coconut fiber { 300 gm/sqm -400 gms/sq.m } based structure has been found to be more effective with respect to flexural strength and seepage cum evaporation losses After this study on scale up model was proposed by Dr Eldho T.I For study purpose. TWO tanks of size 11 m X 11 m at Top and 7 m X 7 m at bottom and 2 m deep are proposed, one with coconut lining having 300 gm/sq.m and other without lining Funds were made available by Ministry of Science and Technology ,New Delhi Tanks are constructed at Shanti Van, Panvel and in June 2019 a committee was Appointed consisting of following members. The results of the analysis are awaited and expected by this year end.

14-06-2019 : Visit of the committee members to RuTAG IITB

Dr. Dilip Mahale - Chairman Kokan Krushi Vidyapith

2. Dr. A Atre - Member - Rahuri Krushi Vidyapith

3. Dr. Ketaki Bapat - Member Secretary , Ministry of Science and Technology, New Delhi

4. Dr. Eldho PI of the project IITB

Dr Ketaki Bapat , Dr Eldho , Dr. Mahale , Dr Atre at site

Students from National Taiwan University Visited Pond at Nere on 19th July 2019

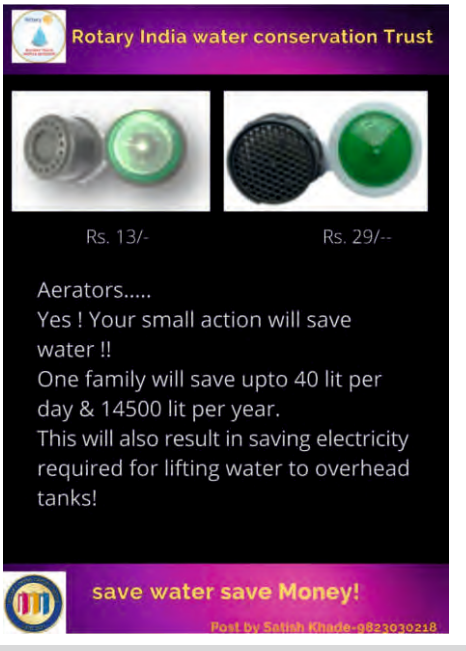
Students at site of Pond

I] Lecture and Workshop – Other than Technical Institute

We deliver Lectures To create awareness among Villagers , Students as regards Water conservation . We also teach them how to construct cost effective Water storage structures with appropriate Technology. We tell participants how assured water is possible with Rain Water Management and introduce the several methods of water storages and give them chance to have hands on experience also. More than such lecture and workshop are held for the benefit of Farmer and students

Dr J.B. Joshi talking in the Workshop, participants attending the workshop and Hands on Experience

Hands on Experience by participants , Partly completed Tank , Photos of Workshop on RWH at Shantivan Nere Panvel on 4th and 5the June 2015 jointly with CTARA ,IITB

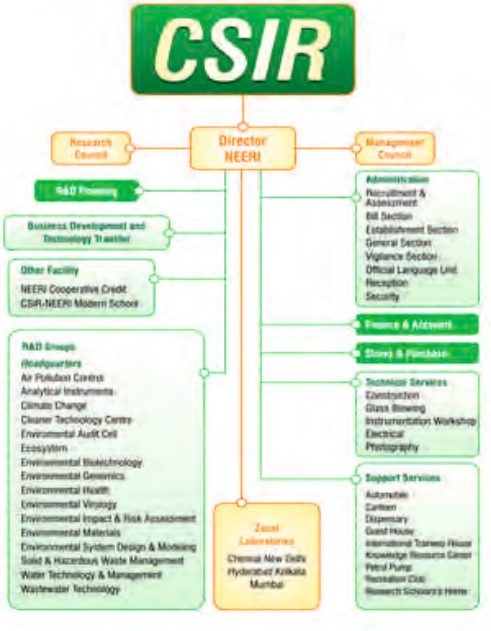


Organization - National Environmental Engineering Research Institute (NEERI)

Shri Vinod Hande - (M) : 9423677795

(Jalsamvad has started a series to introduce readers to the organizations working in the field water and water related issues in our country and abroad. First of the organization, we are introducing is NEERI.)

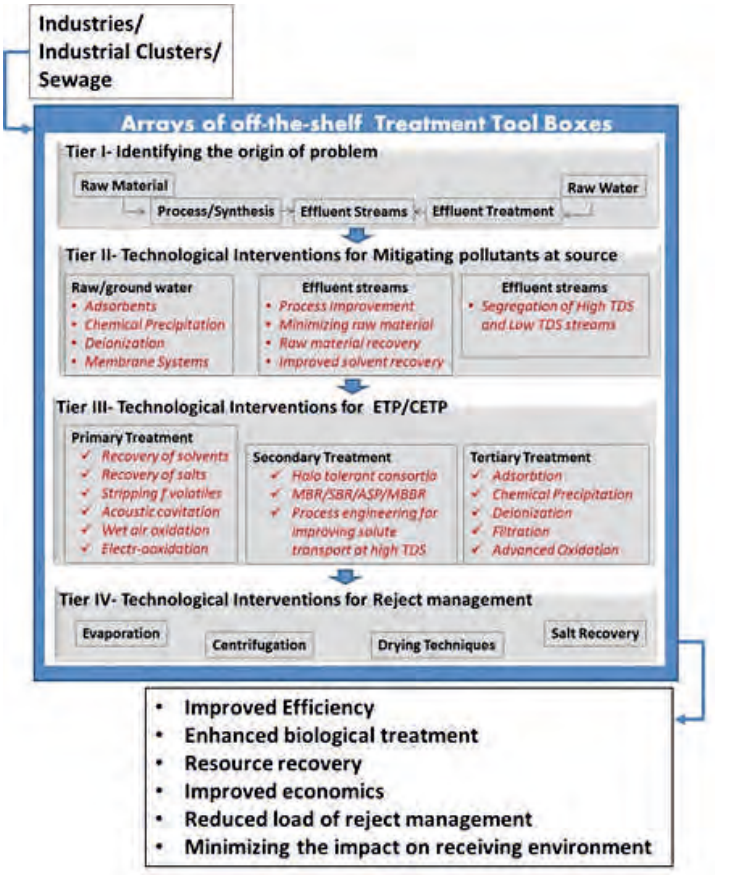
The "National Environmental Engineering Research Institute (NEERI)" is a research institute created and funded by Government of India. It was established in Nagpur (Maharashtra) in 1958 with focus on water supply, sewage disposal,



communicable diseases, industrial pollution and occupational diseases found common in post-independent India. NEERI is a pioneer laboratory in the field of environmental science and engineering. NEERI is part of Council of Scientific and Industrial Research (CSIR). With the headquarter at Nagpur NEERI has five zonal laboratories at Chennai, Delhi, Hyderabad, Kolkata and Mumbai. NEERI comes under the Ministry of Science and Technology of Central Government of India. Dr. Rakesh Kumar is Director of NEERI. Organizational structure of NEERI ,

In line with vision, Mission and CSIR policies R&D Division of Institute working in areas of Air-Pollution Monitoring and Control, Water Technology and Management, Climate change, Cleaner Technology and Modeling, Energy and Resource Management, Environmental Biotechnology and Genomics, Environmental Health, Environmental Virology, Environmental Impact and Risk Management, Environmental Materials, Solid & Hazardous Waste Management, Strategic Urban Management and Wastewater Treatment Technology.

With focus on above areas CSIR-NEERI added its attention on development and implementing technology for society. Institution installed its Restoration of Nallah with Ecological Units(RENEU) technology in six drains of Prayagraj for clean-up of river Ganga during Kumbh 2019. The wind augmentation and purifying units installed at many locations in Delhi to reduce air pollution. Institution has launched Green-Dispo which is solution for sanitary pads disposal. NEERI has started new area of Environmental Damage Cost and Assessment which helps CPCB (Central Pollution Control Board) and NGT in implementing Polluter Pays Principle (PPP). NEERI is helping State agencies for drain silt management to reduce the choking of drains and reducing the health impacts involved therein .



Institution is doing lot of work in the field of waste. They have separate "Waste Water Technology Division" from last thirty years which is providing need based solution for various industrial problems. This division also provides trouble shooting measures for efficient and effective operation & maintenance of wastewater treatment facilities. Industrial effluents are very complex in nature. Industrial sectors like textile, pulp & paper, tanneries, refineries, electroplating, coal industries, pharmaceutical, power plants etc. generate highly complex wastewater that requires different technologies for catering to their specific need of wastewater treatment and management.

Rising wastewater complex and stringent laws demand better technological solution for wastewater treatment that can deliver treated effluent at cheaper cost of treatment. Based on field experience and arrays of off-the shelf treatment tool box goals are achieved of wastewater management.

The institution is expert in,

• Wastewater treatment plant design, up-gradation and re-engineering.

• In-house process development for wastewater treatment and reuse.

• Providing customized solution to industries for wastewater treatment.

• Management plan for rivers, lakes and wetland conservation.

• River, lakes, canal, ponds rejuvenation

• Resource recovery from wastewater.

• Biological Nutrient Removal.

Phytorid Wastewater Treatment Technology

This NEERI's technology is designed for the treatment of municipal, urban, agricultural and industrial wastewater. This system is based on specific plants such as elephant grass, cattails (Typha), Reeds, cannas and yellow flag iris which are normally found in natural wetlands with filtration and treatment capability. Other plants species such as Golden Dhuranda, Bamboo, Nerium can also be used, says the Institution.

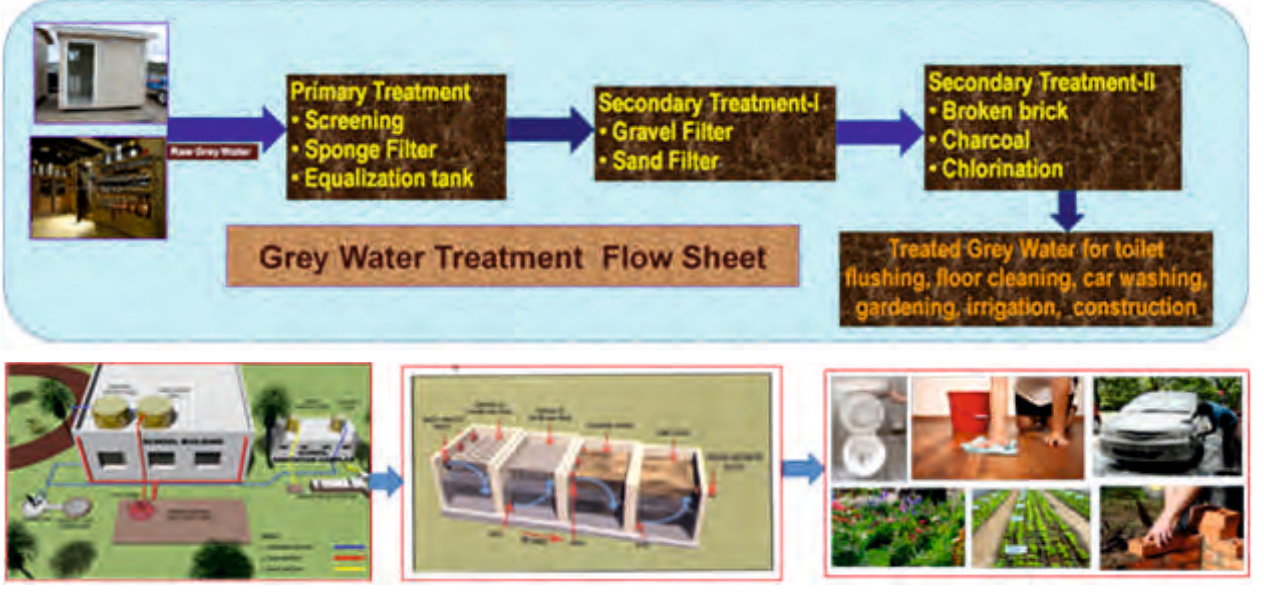
This phytorid technology can be constructed in series or parallel depending upon

Wise water Management System for Ashrams and Households

land available and quantity of wastewater to be treated. This technology is subsurface flow type in which wastewater is allowed to flow through system filled with porous media such as crushed bricks, gravel and stones. This system consists of three zones 1) Inlet zone (crushed bricks), 2) treatment zone (Plants) and 3) outlet zone. The treated effluent is useful in municipal garden, irrigation. This technology is working in Pune, Goa, Aurangabad, Mumbai, Lonar lake and New Delhi. Following are the advantages of the technology,

- Cost effective.
- Negligible operation and maintenance expenses.
- Minimum electricity requirement.
- Recycle and reuse of water.
- No foul odor and no mosquito nuisance.

Water is becoming a rare resource in the world. It is therefore essential to reduce surface and ground water use in all sectors of consumption to substitute fresh water with alternate water sources. These alternate resources are rain water and grey water. NEERI has developed the Grey water (Wisewater) management for recycling waste water generated from bathroom, laundry and kitchen. This is simple treatment process from where grey water is directed for application like



irrigation and flushing of toilet after simple process.

Salient features of Wise water Management Scheme-

- Saving of 20-30 liters of water per person per day.
- Efficient in removal of microorganism and helminth eggs.
- Easy operation and maintenance.
- Economical.
- Treated water is of better quality than other treatment methods.
- Treated water can be reused in toilets flushing, gardening, floor washing etc.

NEERI along with UNICEF has constructed around 100 grey water treatment systems in ashram schools and 100 grey water treatment systems in households in Madhya Pradesh.

NEERI-ZAR

NEERI-ZAR is a water purification system. It is suitable for potable water supply particularly under emergency situation with a wide range of flood water quality. The NEERI-ZAR meets drinking and cooking water requirements on emergency basis and serve as a disaster management tool for drinking water supply under flood affected situation. A unit with two 100 liter vessels can serve about 20-30 persons when operated for 10 hours a day on the basis of 6-10 liters per capita/day for drinking and cooking.

NEERI-ZAR Portable instant water filter

Unit comprises of two plastic containers placed at elevation difference to manage gravity flow. The oxidizing chemical solution is added into the raw water container. The water flows by gravity into the second plastic container. Second container is a sand filter. The filtered water from the tap is collected in third container. Disinfectant solution is added to this treated water container. Safe potable water is ready for use after half an hour. The filter needs periodical cleaning. Capacity of this filter unit is 20-30 liter/hr. of treated water.

Features of NEERI-ZAR filter

- Simple to fabricate.
- Easy to operate.
- Minimum maintenance.
- Light weight & easy to transport.
- Most reliable for emergency water supply.
- No power requirement

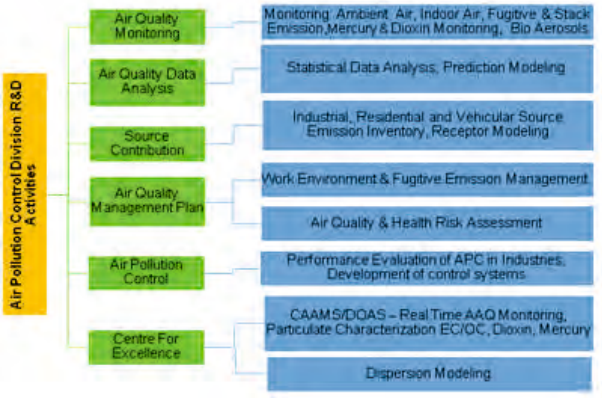
NEERI has installed 100 units in the flood affected area remote area of Barmer District in October 2006 to convert turbid and contaminated rain water into potable water. In 2009 also NEERI installed 400 units in Aila Cyclone affected villages of Sundarban district of West Bengal. In addition to NEERI-ZAR filter NEERI has designed Solar Energy Based Electrolytic Defluoridation Plants for water purification.

Hand pump attachable Iron Removal(IR) Plant

AS per Ministry of Drinking water and sanitation 25 states in India are affected due to excess Iron in groundwater. Precipitation of soluble iron by oxidation with air followed by sedimentation and filtration is a relatively simple process used for removal iron from ground water. Based on this process NEERI has designed hand pump attachable iron removal plant with 1 cubic meter per hr.. This plant is suitable for 250 persons with 40 lpcd(lit. per capita per day) with 10 hrs of daily operation.

This system treats water with iron content in the range of 1-30 mg/L. The treated water is with iron content below the drinking water standard of 0.3mg/l. This is very simple, low cost with high efficiency. No need of skilled operator, electric power and mechanical parts. Its maintenance cost is very low. System can be of RCC or FRP. Nearly 900 plants have been installed by Public Health Department of Chhattisgarh and working satisfactorily. Water supply agencies of other states have also shown interest in this IR plant.

NEERI is having a R&D Division for Air Pollution Control. Research in air quality management by monitoring, prediction,



simulation, data analysis. NEERI has accepted several challenges tasks in coal mines and industrial sectors.

Institution is having Firecracker emission testing facilities for all types of conventional firecrackers as well as their reduced emission firecrackers(REF) version was developed for measurement of Particular matter and gaseous pollutions.

As per censes of 2011, 31.6% human population is located in urban areas. This number is changing fast which requires urban management. To deal with these environmental problems NEERI has established Center for Strategic Urban Management (C-SUM) in 2016 to work on the urban environmental sustainability, waste management and green area conservation. C-SUM achieves this by providing improved policy, environmental planning and management by closely working with local administration. Fig. below shows role of C-SUM in local administration,

Role of C-SUM in local administration

R&D Division of NEERI works herein mentioned areas Environmental Monitoring & Modeling, Environmental Impact & Risk assessment, Environmental Policy, Environmental Biotechnology, Genomics & Virology, Environmental Health, Water and Wastewater Technology, Solid and Hazardous waste Management and Environmental Materials.

There's so much to talk and write about CSIR-NEERI but due to lack of space and time I stop here. Further information and details about CSIR-NEERI, if needed can be obtained from address and phone number given below.

Address,
Nehru Marg,
Vasant Nagar,
Nagpur, Maharashtra -440020
Phone- 0712-2249970
Website-www.neeri.res.in

AGRANI RIVER BASIN REJUVENATION PROJECT

Mr. Narendra Chugh

(M) : 98 5007 4952

AGRANI RIVER BASIN REJUVENATION PROJECT.
A JalBiradari Action prgramme from Maharashtra & Karnataka in India

Abstract title: Agrani River Basin Rejuvenation: Community Driven and Government Supported River basin reforms.

Agrani River Basin Rejuvenation project was initiated by Jalbiradari Team Led by Mr. Narendra Chugh and Mentored by Dr. Rajendra singh ji waterman of India. Work started 7 years ago to Restore and Rejuvenate the Dry river Flowing through a chronic arid drought prone area of Maharashtra and Karnataka state.

Agrani River an interstate river is a 97 Kms long Tributary of 4th largest river Krishna of India. Agrani River Basin extends over 107 Villages in Maharashtra, spread across 5 Talukas i.e Khanapur, Tasgaon, Kawthe Mahankal , Miraj and Jat. in Sangli District of Maharashtra and 42 Villages in Karnataka in Athani Taluka. Population of this River Basin is 0.42 million. Agrani River Basin extends over an area of 1848 Sq.Kms.

This sub basin of Krishna river has 7 watersheds. The details are as given in the table.

Watershed No	KR-36	KR-37	KR-38	KR-39	KR-51	KR-52	KR-53	7 Watersheds
No of Micro Watersheds	11	5	9	5	5	5	3	43 Micro Watersheds
No of Villages	34	15	20	16	10	9	3	107 Villages of Maharashtra
Ground water Level	Over Exploited	Over Exploited	Semi Exploited	Critical	Safe	Over Exploited	Over Exploited	

These categorizations of watersheds make it evident that ground water has been over exploited resulting in drought conditions in that region.

1) Evolving a paradigm of Duties and Responsibilities towards rivers as an eco-system as against mindset of Rights on river water only:

a) Work started by involving and motivating the communities to accept river basin wide vision as against their localized vision of the river. Communities were primarily focused on their rights for water From the Agrani River and hence there was over exploitation of surface and ground water. As also upper riparian, lower riparian, and interstate disputes over water sharing. Maharashtra state Jalbiradari Team along with Karnataka state Jalbiradari Team worked extensively on this issue.

Through communication and sharing of River basin wide technical data like Maps,

watershed maps, micro watershed maps, Geological structure of river basin, Water availability in the entire river basin, recharge zone maps of each village, water budget of each village ,awareness of belonging to Agrani River basin was seeded amongst the Population of this basin. This sharing of data and information helped the communities to develop a holistic understanding of river basin wide issues.

The communities were in position to appreciate and understand the cumulative total demand of water in the river basin, as against the total water supply in the river basin. With this understanding ground was created for co-operation and collaboration to enhance the water storage capacity on the one hand and realign the demand for water with respect to availability (realigning the cropping pattern with the rain pattern). Attempt is to make the community members realized that we are part of a river basin, and a larger eco-system where demand of various stakeholders is viewed in the right perspective.

a) Agrani Karya-Dal (Group of Sensitive youths active in solving water problems) :

Agrani karya-Dals were formed. Members of this Karya-Dal under took the Physical tour of the entire stretch of 97 Kms of Agrani River. along with Jalbiradari technical team comprising of civil engineer's hydrological engineers, landscape designer and geologist Ridge to valley studies were conducted. Recharge zones identified. Type of Geological Fractures and underground study of aquifers was done. This scientific and technical data was integrated with the local time tested traditional wisdom of water conservation and management of the people. Detailed project report of probable works for integrated development of this sub basin, watershed was prepared, based on the above integrated study.

This river basin has 9400 hectares of forest lands. Most of the forest lands were barren and neglected. Importance of Restoration of green tree cover on these lands was critical. The role of bio-diversity and green tree cover in creating micro climatic conditions for rain formation was well understood by the local communities with this understanding the road map for community driven decentralized water Conservation activities and greening of forest lands was ready for all the 149 villages within the Agrani River Basin.

b) Jalbiradari Team has always worked on the premises and under the imperative that sustainable water conservation work to ensure water security cannot be achieved unless the water experts/ professionals, enlightened civil society members and Governments work in tandem and synchronize their activities to meet the water challenge. In furtherance of this principle the involvement of the local govt in this project was of utmost importance and hence local government was convinced and prevailed upon to be an active part of this Agrani River Basin Rejuvenation project. Officer on special duty having the responsibility of Rejuvenation of Agrani River basin was appointed by the Collector Sangli District to co-ordinate the activities of various departments like Irrigation, Water Conservation, Agriculture, Forest, Social Forestry, Horticulture, Ground water survey and development dept , Water pollution control, Employment guarantee scheme. Primary

responsibility and duty of this officer was to dovetail the plans of these departments related with water sector and the plans made by the 149 Villages of this basin based on local geo-cultural ground realities created by the local communities.

This exercise catalyzed and Facilitated by the Jalbiradari team culminated in creation of an Actionable Detailed Project Report. The implementation of various components of water conservation as detailed in this report is being done by utilizing the joint resources raised by the community, local government and corporate social responsibility funds.

Activities, Achievements on actionable points proposed in the Detailed project report :

1. Preparation of Detailed Digital Map of the Agrani River Basin :

In order to pictorially represent and understand the Agrani River Basin multi layered Digitized Map of Agrani River Basin was prepared.

a) depicting 7 Watersheds, its micro watersheds, 1st to 4th order streams feeding the river, water bodies and existing water conservation structures, using Topo sheets , and various GPS based IT enabled systems

b) Showing the Geological Rock formation and their respective Water percolation, Rain water Recharge Potential and other relevant Geological characteristics of every village in this River Basin.

c) Land use and its current cropping pattern.

d) Spatial and temporal rain fall data.

2. Widening work of Agrani River & streams feeding the river :

Due to deforestation and cutting of trees on the ridge of the river basin soil erosion had resulted in silting of streams and the river. Moreover, as the river and the streams dried up rampant encroachment was resorted to by the farmers on the banks of river. Local Communities realizing the need to increase the water carrying capacity of river by facilitating and actively participated in removal of encroachments

a) Widening of 55 Kms of Agrani river was

pattern (to base their cropping decisions on the water availability in the river basin and implication of their decisions on other stake holders like fishing communities and minimum ecological flow required to sustain the aquatic life and bio-diversity of the rivers eco-system.

c) To ensure that river basin community adopts the mindset of its duty to keep the river perennial and healthy and enable the river to nourish the nature, flora and fauna of the river basin.

d) To ensure the water security for this river basin by protecting the catchment area from degradation and over exploitation.

Core values and principles of Co-operation and collaboration of JalBiradari team are the driving force behind the progress of work in the Agrani river Basin. Co-operation and collaboration between the local communities, the local administration, water experts and philanthropists lending financial support is key for the success as reflected on the ground.

Due to Unstinted support by Government to the Agrani River Basin Population and jalbiradari teams untiring efforts of Water shed development works coupled with with Rain Gods showering their blessings for last 2 years 2019 and 2020 Agrani River is Flowing continuously for last 2 years. This is considered as a Miracle by the local beneficiaries as the river and its tributaries had dried up since last 30 to 35 years and carried water for few days when it rained.

Jal Shakti Ministry has Taken due recognition of this transformational work and awarded Sangli District of West Zone First Prize For Agrani River Rejuvenation Work on 11th November 2020.

Jalbiradri Team has resolved to work with Agrani River Basin People with more enthusiasm and dedication and Achieve the target of Sustainable Total Water Security of this River Basin.

THE FUTURE COURSE OF ACTION WILL BE GUIDED BASED ON VISION & MISSION REALIZATION PROCESS

Agrani River Basin Rejuvenation will be fully REALIZED when ALL THE STAKEHOLDERS -

a. KNOW THE VISION,
b. ACCEPT THE VISION and Derived Actions as a MISSION,
c. ARE ENTHUSED BY THE VISION,
d. ACT ON THE VISION, PERSONALLY,
e. COLLABORATE FOR THE VISION,
f. INITIATE STUDIED FIELD-WORK FOR THE VISION,
g. CREATE REPLICABLE PILOT-PROJECTS FOR THE VISION,
h. SHARE PILOT PROJECT EXPERIENCES AND SUCCESS TO SPREAD THE VISION,
I. WIDEN THE REACH AND APPLICATION OF THE VISION,
j. INTEGRATE ALL ASPECTS OF RIVER BASIN LIFE & PROJECTS TOWARDS THE VISION.

This mission and vision is propelling us to realize the dream of rejuvenation of Agrani river Basin.

JAL- BIRADARI TEAM :

Dr. Ravindra Vora, Mr. Vinod Bodhankar, Mr. Sunil Joshi, Mr. Vilasrao Chouthai, Mr. Shrinivas Vadagbalkar, Miss. Devyani Kulkarni, Mr. Ankush Narayankar, Mr. Rajendra Madane, Mr. Sampatrao Pawar, Mr. Prasanna Kulkarni, Mr. Raju Gandhi, Mr. Munir Mulla, Mr. Prabhakar Bandhekar, Mr. Suhas Patwardhan. Mr. Ramakant Kulkarni, Mr. Uday Joshi,

The Story of Water

Chetan Pandit

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1- Introduction :

Billions of years ago life originated in water. Next to oxygen, water is the most vital substance necessary for sustenance of life. It is possible to live without food for several weeks, but without water, life comes to an end in a few days only. We use water for drinking, cooking, washing and cleaning; for growing various crops; to generate electricity; large water bodies supply fish, an important food for billions of people; water is an important input in many industrial processes; water carries away city wastes; and also serves as a medium for transportation, in rivers and canals for inland transportation, and in oceans for transportation across the continents; water is used for sports, for recreation; and many other uses.

Since time immemorial, mankind has chosen areas close to the banks of rivers to settle down. Civilizations flourished when the river was friendly, and suffered when the river turned hostile. Because of its immense importance in our daily lives, water is worshiped in many cultures across the world. We often hear that water could be a cause of wars in future, though I believe this to be a gross exaggeration. But there is no doubt that water can lead to acute tensions in the societies. Water is a crucial input for enabling economic growth.

Water is so common place, yet it has so many different faces. Water is food and water is health; water is energy and water is industry; water is spirituality and water is fun; water is essential for life but, some times, water is also cause of death. From the rhythm of the rain to mystery of the mist; from the fury of the floods to silence of the lakes; and from the fragile snowflakes to awesome icebergs, water presents itself to us in innumerable fascinating forms.

Any place on the earth receives an annual supply of water mostly from rains and some snowfall. Rainfall in India is neither uniform in time, nor uniform in space. Most of the rainfall takes place in four months of June to September. In some places, like in the North-East and in the Western Ghats, the rainfall is very heavy while in Central India it is moderate, and in certain parts, like Western Rajasthan, it is very scanty. This is the case now, and this was the case in the past also.

If we go back 150 years or more in time, we find that the manner of using water was very simple. Water for domestic use was drawn from a dug-well or taken from a stream/ river/ pond. The rich had their own dug-well, within the precincts of their homes. The not-so-rich shared a community well or fetched water from a stream, often from long distances. In north India, water from the river was delivered to homes in bags made of animal skin, and the people who provided this service were called Bhishti.

As for farming, some irrigation was done by extracting water from a dug-well located in the farm itself, but the extraction was by animal power and limited in quantity. Irrigation, if at all, was only nominal. Agriculture was mostly rain-fed single crop. This had its impacts on the life of the people and economy of the nation. Even in the year when the rains were good, productivity of rain-fed agriculture was very poor and the nation could not build a buffer stock to tide over a year when the monsoons rains were less than average. Failure of monsoons for just one year could cause a famine. Wikipedia mentions 12 famines between 1769 and

1944, in which tens of lakhs of people died. As recently as 1960s, India could not grow enough food grains for a population of just 50 crores, and had to depend on food grains imported from USA, as charity.

The quality of water for domestic use was also not good. Cholera pandemics were frequent, not only in India but elsewhere too. Wikipedia mentions seven cholera pandemics between 1817 and 1975, of which 3 affected India and tens of lakhs of people died in these pandemics.

All that has now changed, and some would not like to admit it, but has changed for the better. About 680 lakh hectares has been brought under irrigation. In many places the irrigation is backed by reservoirs. A second irrigated crop is quite common and in some places the farmers are taking even a third crop. With assured timely irrigation, land productivity has increased and although the population is now more than 135 crores, we have such a huge stock of food grains that there is difficulty in storing it. India is now a food grains exporting nation.

Piped water supply for domestic use has reached almost 100% of urban households and 30% of rural households, and is expanding. Chlorination has put an end to Cholera pandemics. About 48% of the area vulnerable to floods has been provided with reasonable flood protection.

However, there still are many misconceptions about how should we manage our water resources; why do we manage them the way we do; are there any better alternate water management paradigms; what is a dam or a barrage and what are its components; and why do we need them if these indeed cause some adverse social and environmental impacts.

Are you troubled by these and similar questions ? Well, I plan to explain all that in a series of articles which make the “The Story of Water”. There will be perhaps 20 articles one in every issue, wherein we will cover

- the occurrence and movement of water in nature;
- a bit of meteorology;
- dynamics of ground water and river flow;
- measurement of water – in rainfall, ground water, and rivers;
- India’s water budget, how much water do we have and how much do we need.
- the engineering interventions like the dams, barrages, hydro-power stations and river linking;
- floods and droughts;
- water quality issues;
- India’s water management paradigm and alternate paradigms.
- Displacement, and environmental impacts of dams
- major water related institutions in India;
- the Constitutional provisions relating to water, and the inter-state water disputes.

I will be telling this story of water purely from an engineering and management perspective. Obviously, there will be a few technical terms. But I will keep them to a minimum and will explain them as we go along, ensuring that the narrative is understood by non-technical readers, who are my target audience.

I think that is sufficient for an introduction. In next article I will discuss the hydrologic cycle, some meteorology, ground water and river flow. Till then, take care and stay safe.

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

Sharad D. Mande (M) : 9860982825

1. It happened in California, and thus in USA :

On 9th May 2016, Governor Jerry Brown signed Executive Order B-37-16, 'Making Water Conservation - a California Way of life' - a key part of the 2014 California Water Action Plan. The executive order established long term Water Conservation framework that will enhance the resiliency of the state against future (2025) climate change and drought - by using water more wisely, eliminating waste, strengthening agricultural use efficiency and drought planning etc. The Action Plan covers making mandatory for all 410 Urban utilities to prepare their own annual water use targets, controlling down NRW upto max. 10% only, Agriculturists having +10,000 Acres farmland to prepare Water Management Plans & budget for next 5 years, for industries to lower down consumption and to make Reuse-Recycle of effluent effectively.

When this order was issued, many Californians shocked and said surprisingly that they were not knowing at all that there was a drought in the State. It was so happened, because the State administration has taken steps so effectively that the general public could not get sufferings, naturally they were not knowing of this drought.

California - A rich State, in rich America on the Western side, facing Mountainous Ridge facing to Pacific Ocean. Food Bank not only of America but for the World too. The Northern Sacramento & Ciera Mountainous ice cap, then the central valley of 650 km x 70 km wide mud bowl producing more than 50% of America's Vegetables, Fruits, Beef etc., about 80% Almonds of the world and contributes more than 20% GDP of the country. During last 60 years nearly 1400 dams have been built up and extensive water grid developed.

Regarding water quality, on establishing, the US Environmental Protection Agency (USEPA) in 1970, and applying rigorously Clean Water Act (CWA) of 1972 and Safe Drinking Water Act (SDWA) of 1974 transformed the scenario of USA water quality. Despite economic growth, India is facing water resources challenges such as cleaning its water bodies, providing safe drinking water, protecting public health, reversing declining water levels etc. Many of such water issues are similar to what the US was encountering prior to establishing USEAP. Therefore, this line of action California is adopted can be followed from these experiences, for achieving "Better Water for Better India".

2. World Water Scenario & the Indian Status :

Water on this planet is finite, it neither increases nor decreases, only its nature differs, such as vapor, frozen ice or liquid water. The total amount of water on Earth is 1357.5 quadrillion Cubic Meter (QCM) but only around 1% circulates through the hydrological cycle, falling as rain or snow, infiltrating into the soil, leading subsurface flow, as rivers to the sea and evaporating. Only 2.5% of the Earth's total water resources are freshwater, out of which as 0.5% is directly usable, the rest remain as ice and glaciers (UNEP, 2000). In totality, less than 3/10th of 1% earths freshwater are in the lakes and rivers, that serves as the major sources of water throughout most of human history. But the availability of fresh water which was 12050 m^3 in 1950, has reduced to 7310 m^3 in 2000, likely to decline in 5120 m^3 2025 and alarmingly to 4580 m^3 in 2050. This will be the eyeopener statistics to deal with water in future. The distinctive features of water resources of any nation include their

multiple uses, the significance of quality & quantity and sharing across the national, political boundaries. Without adequate supplies and management of fresh and similarly salt-water resources, socio-economic development simply cannot take place. India is a large country which supports about 1/6th of the world's population, occupied 1/50th of the world's land and has 1/25th of the world's water resources (Water Management Forum, 2003). India faces serious challenges to sustain its water resources mainly as Agriculture, Domestic, Industrial & Environmental.

There is a general feeling that, India with mighty rivers like the Ganga, the Brahmaputra, the Krishna, the Godavari, the Narmada etc. has abundant water resources. But from the last decade it was realized that this postulation is not correct. As mentioned above, out of the total precipitation & snowfall, of around 4000 BCM, the availability in the country from surface water and replenishable ground water is 1869 BCM, however because of topographical and other constraints, about 60% of this i.e. 690 BCM from surface water and 433 BCM from ground water only can be put to beneficial use (NWP, 2002). With the increasing population as well as all round development in the country, the utilization of water has also been consequently increasing at a faster rate.

The per capita average annual fresh water availability has reduced from 5177 M^3 in 1951 to 1869 M^3 in 2001, which is estimated to further come down to 1341 M^3 in 2025 and 1140 M^3 in 2050, for forecasted population of 170 crores. Therefore, it is estimated that water requirement in 2050 from all sectors would reach to 1425 km^3, when availability is predicted to 1125-1150 km^3 only. That means there is a gap of 300 km^3 which is to be bridged. Is it impossible? No, certainly not, if effective measures are taken right from hence onwards, this can be achieved.

3. An era of Water Security :

There is a wide scope for bringing more land under irrigation nearly doubling the present area, through harnessing Water Resources and similarly utilization of treated effluent for agriculture, relieving stress on fresh water stocks. A key lesson from history is that most of the irrigation based civilizations, those who have not paid attention to wise management of water have been later on failed. As we enter in 3rd decade of twenty first century, we are entering a new era - an era of Water Security. We have taken it for granted seemingly endless supplies of water flowing from reservoirs, wells & diversion projects, but the last decades of profligacy and mismanagement of the World's Water Resources have produced signs of shortages & environmental destruction. For protecting rivers & vital ecosystems, even as we aim to produce enough food for the projected a Billion people, by the year 2050, we have to go for innovative technologies & strategies to alleviate hunger and environmental stress at the same time. Today, the knowhow tool is in hand and with methods already in use, farmers could cut their demands for water by 40-90 percent, cities by one third, without sacrificing economic output or quality of life by investing in water efficiency, recycling and conservation to meet rising demands and stave off disaster. But the priority is as common recognition of the gravity of the position & with that a wide spread push for institutions to manage sustainable use of water.

"Countries those who have managed their available water resources intelligently have become rich", for example Israel with 19% of precipitation as compared to India has become pioneer & leader in the water sector. Similarly, 10 years back Singapore has released its National Water Policy declaring that by 2020, Singapore will be self-reliant and decided to conclude its agreement with Malaysia preponing from 2030 to by end of 2020. Can we not learn lessons from these countries?

4. Marching towards Blue Revolution :

India, China, Japan i.e. many eastern countries like Egypt, Iran, Iraq, UK have a long heritage of 4000-5000 years back into the history, but from medieval period i.e. 14th-15th century after Industrial Revolution in Europe and subsequently followed by French Revolution propagating Democratic fundamentals, human development attracted towards growth of wealth,

culture & happy life. India and many companion countries were at that time on top in Philosophy, Culture, Art, Religious Principles, Trade etc., but later on due to aggressions from outer forces, these countries have gone under control of Islamic or then under English realm. This imperialism has extracted all the resources of these countries, leaving them in down trade, losing self-confidence, ongoing dried resources, dependency on others. At the dawn of 20th century, these countries realized their own capabilities and geared up own conscience to get liberation from the external forces. India got freedom in 1947 and similarly many countries like Malaysia, Korea, Sri Lanka, Myanmar, Pakistan become liberated and started their own development, in the same period.

India a vast country, having 3500 Km seashore, tropical in climatic condition, annual precipitation varying from 300 mm to 6000 mm, average & 12000 exclusively in Northern states, all biodiversity, rich in mining, resourceful intelligence opened a new vista in the world horizon. The 350 Million Population in 1947, planned its development under leadership of Pandit Jawaharlal Nehru. But, it was a history that in 1960-70, India has to wait for ships arriving from USA bringing bread & butter under "PL-480" or to stand in a queue for half of liter Milk, but today rapid growth in agriculture under the leadership of Dr. M. S. Swaminathan and guidance from Norman Borlog, we have not only become self-reliant but become one of the exporter of food to the world. Thus, India succeeded in implementation of "Green Revolution". Similarly, under the guidance of Dr. Verghese Kurien, India is now become the second largest milk producing country in the world making "White Revolution". India is also proved to be one of focal point for delivering services in software & IT field, which may be designated as "Colourless or Intelligence Revolution", but when still we have to face water problem, then the question arises, what about "Blue Revolution"?

Many countries which are advanced and developed like UK imports 70% its food, Singapore 90%, Malaysia, Thailand 60%, Arabian & Gulf Countries 80%, then the question arises that can the world will survive only on infrastructural development without food production & whether the required food be produced without water? here lies the answer that the developing world require adequate food from India and for that purpose India needs effective "Blue Revolution".

5. Financial Picture :

The report on "Water Markets - a strategic analysis prepared by "World Water Council" at the University of Wisconsin - Milwaukee", Few findings are put up herewith to bring out to the notice that the commerce in this sector, at world level and in India for comparison. The largest market in USA is 107 Billion Dollar, while in India it is 5-9 US Billion Dollar. Nevertheless, the world's water market is estimated to be $483 billion in 2010, in which capital expenditure on water infrastructure are estimated to be $89 billion in 2010, rising to $131 billion by 2011. This will grow with to $600 billion by 2016. If compared with the world's IT Market today is $650 billion, the cellphone market is $600 billion, Pharmaceuticals are $450 billion and Telecom equipment is $300 billion. Thus, the water market is on higher side as compared with other modern amenity markets. Can one handle cellphone or telecom, without water? Water market is to run till the end of history, other markets can fluctuate as per demands, on the contrary, more availability of water, the food security, improvements in life style, more happiness resulting more markets to other enjoyable articles. Water market is the Mother Market of all other markets.

The fastest growing water market (2010-2016) is 15% and above Billion Dollar. Spain, Hungary, Argentina while Indian market is 5.9 US Billion Dollar.

- Global Water Capacity Expenditures 2010

Chart on the next page -

Markets	Dollars ($B)	% of Total
Equipment	44	25
Site Work	35	20
Pipes	35	20
Pumps & Valves	22	13
Pipe Rehab		
Services	17	16
Professional		
/ Other	12	7
Total	175	101*

* Rounding error
Source GWI 2010

Above statement explains the scope and growth in different sectors.

- Demographic Indicators for India

Population	2009	2016
Urban Population	357.82 million	426.00 million
Rural Population	844.02 million	893.75 million
Total Population	1,2.01.84 million	1,319.75 million
Population Growth Rate	**2005-2010**	**2010-2015**
Urban Population Growth Rate	2.39%	2.50%
Rural Population Growth Rate	1.07%	0.77%
Total Population Growth Rate	1.51%	1.35%

Source GWI 2010
Above statistic will help to compare the magnitude of the issue and potential of business.

From the tables it will gather that there is huge potential of financial investment in USA itself, but the growth rate is stagnant, however in other major countries, the growth rate fastly rising and there is a wide gap between the targets and present stage, therefore there is large scope of expansion with less investment in foreign. The USA companies have business opportunities offshore, particularly in India. In future, may California think to seek market in India.

6. The Visionary Thoughts :

As mentioned above, while going through UNwater report & following UN Sustainable Development Goal No. 6, similar framework to expand activities and business in water sector vision is framed on the following analytical brief -

• A working definition of water security provides a common framework for collaboration across the UN system. Water security encapsulates complex and interconnected challenges and highlights water's centrality for achieving a larger sense of security, sustainability, development and human well-being. Water security needs to be accelerated in the formulation of the Sustainable Development Goals (SDGs).

• Recognition of the human right to safe drinking water and sanitation by the United Nations General Assembly and the UN Human Rights Council is an important step towards ensuring water security at the individual and community levels. India should be active enough for achieving this goal. Successful transboundary water security can stimulate regional cooperation. Good water governance is essential to achieving water security, and requires well-designed and empowered institutions with supporting legislative and policy instruments.

• In conflict and disaster zones, threats to water security increase through inequitable and difficult access to water supply and related services, which may aggravate existing social fragility, tensions, violence, and conflict. Water security will be compromised by the consequences of climate change, as the vast majority of its impacts will be on the water cycle, resulting in higher climatic and hydrological variability, with important consequences. Ensuring that ecosystems are protected and conserved is central to achieving water security - both for people and for nature. India will lead in this regard. Policy-makers need to identify existing capacities, as well as gaps, in order to properly address the water security challenge.

• Water security can only be achieved if it is supported by an enabling environment that establishes systemic and cross-cutting changes, including integrated policies targeting synergies across sectors, while managing the demand for water by all users and stake holders.

America's popular President John F. Kennedy, once said that "One who will solve water supply problem in the world will get Two Noble Prizes, one for innovation in science and another for establishing peace on this planet". Not as a

aspirant for claiming these two prizes, but for better future of our next generations, we have to resolve for water secured world. In fact it may be noted that there only four scientists in the history of Noble Prizes who have been awarded Noble Prizes two times, and even out of these Linus Pauling, from California Institute of Technology (Caltech), California, USA is the only person who have been awarded two unshared Noble Prizes - the 1954 in Chemistry and in 1962 for peace, and that to in two different fields.

China and India are being recognized now-a-days as Asian Tigers of the Eastern World – however, China's concentration on water issues is much alarming for example Three Gorges Dam on Yangtze River, or commissioning World's 2nd largest - the Baihetan, Hydropower station in Southwest China or Construction of more than 25000 large dams (nearly half of the world) during last half century, etc. Therefore, we have to keep in pace with China, by accelerating our Water Projects.

Abundant land, tropical environment, adequate water, Intelligent and young 1.3 billion population can certainly bring this "vision" in to reality, only the need is to work on it as a "Mission", & to practice as a "Passion".

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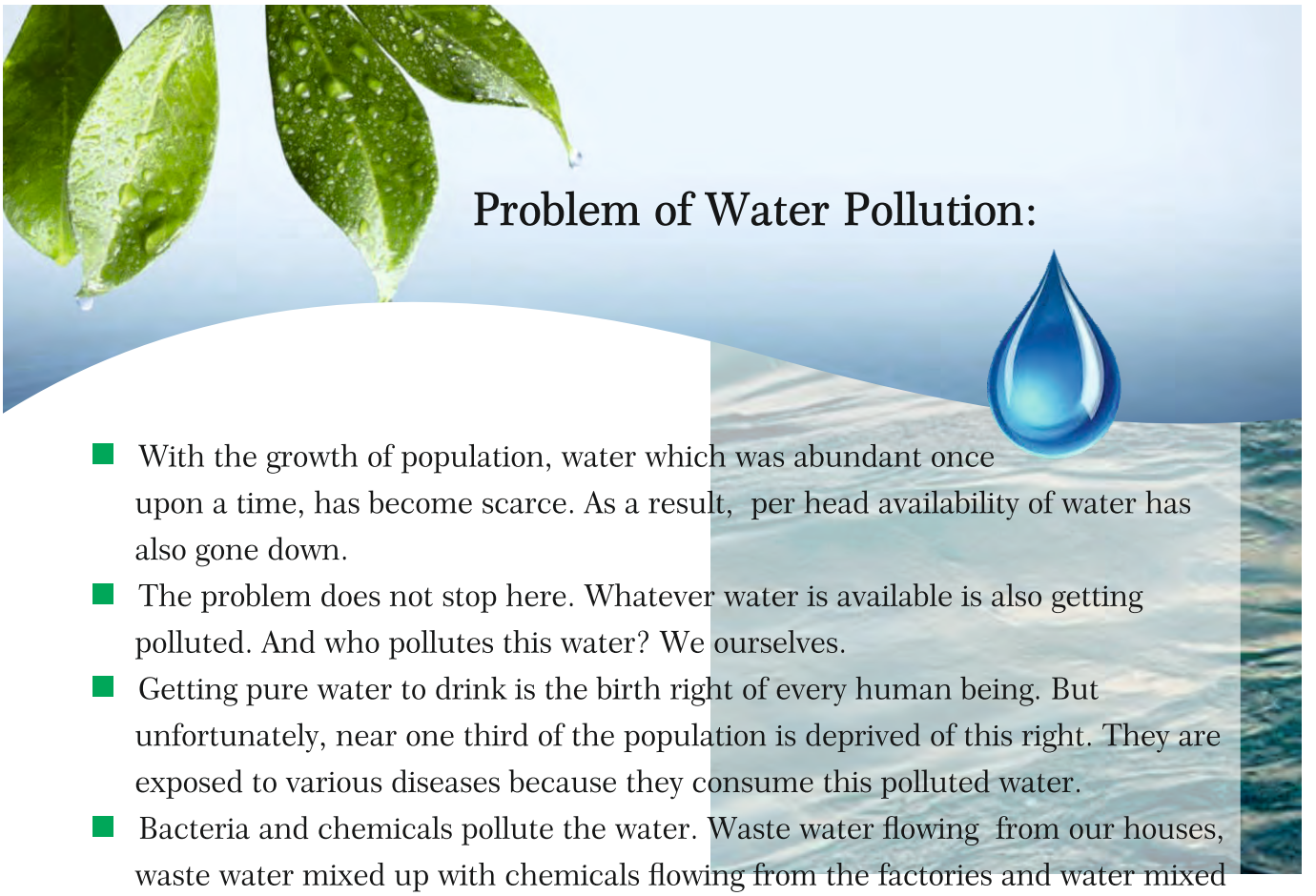

Problem of Water Pollution:

- With the growth of population, water which was abundant once upon a time, has become scarce. As a result, per head availability of water has also gone down.
- The problem does not stop here. Whatever water is available is also getting polluted. And who pollutes this water? We ourselves.
- Getting pure water to drink is the birth right of every human being. But unfortunately, near one third of the population is deprived of this right. They are exposed to various diseases because they consume this polluted water.
- Bacteria and chemicals pollute the water. Waste water flowing from our houses, waste water mixed up with chemicals flowing from the factories and water mixed up with insecticides flowing from agricultural lands are the main factors responsible for this pollution.
- The problem does not end here. Polluted water percolates in the soil and when it gets mixed up with ground water, it pollutes the ground water also. Surface water can be cleaned very easily but that is not the case with ground water. Cleaning it is next to impossibility.
- Thus, what we find is that every source of water – the rivers, streams, lakes and even ground water – is polluted. This has affected the health standards. The entire society is required to face the music of water bourn diseases.
- Most tragic part is that we treat rivers are our mother and because of our misdeeds our mother is on the death bed. There is not a single river in the country where we can drink its water without proper treatment.
- River water is mostly used for irrigating agricultural land. Unfortunately, the yield we get from land also carries those impurities caused by polluted water.

- If we want to lead a safe life, it is our primary duty to see that we (households, factory owners and farmers) do not pollute water and allow it to get mixed up with pure water.

Heartiest greetings form the Jalasamvad family

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