Pune. 2nd Year. May, 2023. 5th Issue

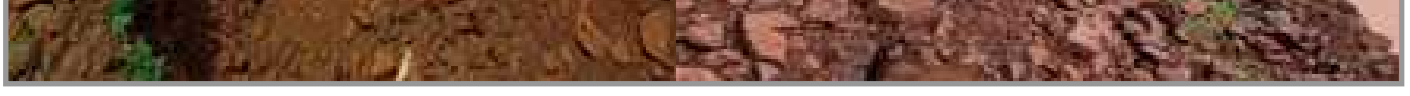
Jalasamvad

A Dialogue on Water

Editors: Dr. Datta Deshkar

Cover Story:

Seva Vardhini's contribution to Manjram Village (Dist.Nanded) in Water Conservation - Shri. Pramod Kale



Famous rivers in the world

(1) Tarim river

(2) Songhua River

(3) Saween River

(4) Jinsha river

Jalsamvad

Mouth Piece of Bharatiya Jala Sanskriti Mandal

■ **May 2023**

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Contents

Editorial .....

The fragmentation of agriculture in India is not a modern-day problem. In the second half of the 19th century and the first half of the 20th century, land fragmentation began to occur in India. This question is not only related to the fragmentation of land, but it also needs to be considered from an economic point of view as well. Dr. Babasaheb Ambedkar has presented this thought in detail through his research papers. In his various articles, Dr. Ambedkar has presented a detailed account of the agricultural land in India and the problems associated with its fragmentation, viz: the cultivation of the fragmented lands, its irrigation, fencing, labour, utilisation of human resources, and vastly mismanaged lands. He has thrown sufficient light on how all the above things subsequently affect agricultural income, which in turn hampers the agricultural economy. In this article, he has rightly considered the income from agriculture, ownership of agriculture, and production in an integrated manner.

Dr. Ambedkar further says agriculture should be seen as a means of livelihood and it would not be right to fragment it by imposing the rule of inheritance. He insisted that the division of land must be viewed as destruction from the perspective of agriculture. Due to this reason, in some countries, an attempt has been made to avoid the fragmentation of agricultural land by passing a law. In England, the land is inherited from the father to only the elder son, and in this way, the fragmentation of agricultural land has been avoided there. However, this does not happen in our country. All the sons and daughters get land in fragments as inheritance, and in this way, the farms get converted into uneconomical pieces of land.

He insists that any property must meet the criterion of economic benefit. In economics, there is a concept called economic unit. The minimum size of any property should be such that it is able to generate income. After deducting all the expenses incurred in acquiring the land, the amount received should be at least sufficient to enable the owner of the land to sustain himself properly. Let us explain the concept with an example. Let's say a farmer family needs Rs 20,000 a month to live a normal life. That means he should get Rs 2,40,000 per year from farming after deducting the cost of cultivation. If this amount is not received, then it is concluded that the farm is not economically viable. Of course, while deciding what the size of the farm should be, aspects like the texture of the land, the availability of an irrigation system, and the number of members of the family dependent on this plot should also be considered. According to Dr. Ambedkar, the size of the farm should be at least 30 acres. In short, the agricultural property should meet the criterion of economic profitability. However, in reality, there are many opinions and differences of opinions over how much farmland there should be.

The growing population makes this problem more critical. Due to this, the load on the land is increasing, and more shareholders are being created. Society seems apathetic about trying to increase income from agriculture. As a result, this increased load on the land is becoming unbearable. As the income from agriculture is used for this surplus consumers, the capital formation required for the development of agriculture does not get the desired speed. Therefore, efforts to increase production are also not visible.

We have to admit that the increased amount of labour on the land is incapable of increasing the productivity of the land. If more capital becomes available, this burden of labour may perhaps become productive, but at present, it seems to be acting not as a producer but as a consumer.

Various solutions are being suggested to solve this problem. The real question is whether the efforts made to consolidate land, with the help of laws, can achieve anything. But if we can shift the burden of labour on the land to somewhere else, the possibility of benefit cannot be ruled out. The promotion of more industrialization in the country is the real need of the hour. Industrialization can also help prevent further fragmentation of the land. If industrialization takes place, many complementary businesses can be started, that can also absorb this increased population.

Dr. Ambedkar has explained many layers in this connection in his research papers. However, it is not possible to consider all of them here, and therefore, only an attempt has been made to give a summary of the ideas presented to him. He was not only a scholar of political science or sociology but also an expert in economics. His in-depth thinking about the water problem in India has proved to be very effective for the country's water policy.

Dr. Data Deshkar, Editor

Water And Irrigation Panorama of India - 5

Dr. Suresh A. Kulkarni

M : 9820158353

1. Growth of Urban Population

The rapid growth of urban population in India has been exerting pressure by way of increasing demand for water to meet the domestic requirements and generating resultant wastewater discharge. The growth of urban and rural population since 1901 is shown in Table 1.

Table 1. Decadal Urban and Rural Population Growth

Year	Rural (Cr)	Urban (Cr)	Total (Cr)	Urban as % of the total population
1901	21.25	2.58	23.83	10.84
1911	22.62	2.59	25.50	10.29
1921	22.32	2.81	25.13	11.18
1931	24.55	3.35	27.90	11.99
1941	27.45	4.42	31.87	13.86
1951	29.86	6.24	36.11	17.29
1961	36.03	7.89	43.92	17.97
1971	43.90	10.91	54.82	19.91
1981	52.39	15.95	68.33	23.34
1991	62.87	21.76	84.63	25.71
2001	74.17	28.54	102.70	27.78
2011	83.30	37.71	121.01	31.16
2021	84.64	46.99	131.63	35.69

Source: Population census (https://censusindia.gov.in/census)

With a rapid urbanization and industrialization in India, demand for more water and better sanitation services are continuously increasing. In 2021, in urban areas, about 96 percent people had access to an improved water source. In the rural areas, which accounts for 66 percent of India's population, only 84 percent of people have access to safe water. However, only 40 percent of India's population has access to organized wastewater management services. Almost 80 percent of domestic water supply flows back as wastewater and estimated 63 percent of municipal and 40 percent of industrial wastewater is left untreated and discharged into rivers and other waterbodies.

2. Wastewater Generation and Treatment

Wastewater is the water whose physical, chemical or biological properties have been changed as a result of the introduction of certain substances which render it unsafe for some purposes such as drinking. Wastewater contains 99.9% of the water, and the rest is organic, inorganic materials and gases that added to it, as a result of the permanent movement of water in nature and its superior ability to dissolve most of the materials. Wastewater, which is now called as 'Used Water' is defined as a combination of one or more of: a) domestic effluent consisting of black water (excreta, urine and faecal sludge) and greywater (kitchen and bathing used water), b) water from commercial establishments and institutions, including hospitals, c) storm-water and other urban run-off, and d) industrial effluent,

As per the Central Pollution Control Board (CPCB), in 2020, the sewage generation from all the urban centers in India was estimated as 72,368 million liters per day (about 26 BCM/year). A total of 1469 sewage treatment plants (STPs) with the inbuilt wastewater treatment capacity of about 44 percent (31,841 million liters per day or about 12 BCM/ year) were installed throughout India. The volume of wastewater actually treated was 20, 238 million liters per day (7.4 BCM /year) which was 28

Table 2. State-Wise Sewage Generation and Installed Treatment Capacity of Urban Centers (as on 30 June 2020)

States / UTs	Sewage Generation (MLD)	Installed Capacity (MLD)	Proposed Capacity (MLD)	Operational Treatment Capacity (MLD)	Actual quantity treated	
					MLD	(%)
Andaman & Nicobar Islands	23	0	0	0	0	0
Andhra Pradesh	2882	833	20	443	309	11
Arunachal Pr.	62	0	0	0	0	0
Assam	809	0	0	0	0	0
Bihar	2276	10	621	0	0	0
Chandigarh	188	293	0	271	235	125
Chhattisgarh	1203	73	0	73	6	0
Dadra & Nagar Haveli	67	24	0	24	7	10
Goa	176	66	38	44	25	14
Gujarat	5013	3378	0	3358	2687	54
Haryana	1816	1880	0	1880	1284	71
Himachal Pr.	116	136	19	99	51	44
Jammu & Kash.	665	218	4	93	49	7
Jharkhand	1510	22	617	22	15	1
Karnataka	4458	2712	0	1922	1786	40
Kerala	4256	120	0	114	47	1
Lakshadweep	13	0	0	0	0	0
Madhya Pr.	3646	1839	85	684	536	15
Maharashtra	9107	6890	2929	6366	4242	47
Manipur	168	0	0	0	0	0
Meghalaya	112	0	0	0	0	0
Mizoram	103	10	0	0	0	0
Nagaland	135	0	0	0	0	0
NCT of Delhi	3330	2896	0	2715	2412	72
Orissa	1282	378	0	55	50	4
Pondicherry	161	56	3	56	30	19
Punjab	1889	1781	0	1601	1360	72
Rajasthan	3185	1086	109	783	47	15
Sikkim	52	20	10	18	14	27
Tamil Nadu	6421	1492	0	1492	995	15
Telangana	2660	901	0	842	706	27
Tripura	237	8	0	8	15	1
Uttar Pradesh	8263	3374	0	3224	2510	30
Uttarakhand	627	448	67	345	187	30
West Bengal	5457	897	305	337	213	4
Total	72368	31841	4827	26869	20236	28

percent of the total installed capacity (Table 2). Similarly, of the 5 BCM of annual generation of the industrial wastewater, only about 60 percent (3 BCM/year) is receiving any form of treatment.

Sewage generation from urban centers was estimated as 72,368 MLD. Class I cities (population> 1,00,000) and class II cities (populations 50,000–99,999), which represent a major share (72 per cent) of the total urban population, produce an estimated 38,254 MLD of sewage, of which only 30 per cent is actually treated (CPCB 2021). The untreated wastewater is then discharged into natural water bodies, such as rivers and lakes, which leads to pollution and impacts the water quality, especially for the communities in the downstream areas.

As per Central Public Health and Environmental Engineering Organization (CPHEO), in 2021 the 54 cities, having population more than a million, generating 23,512 million liters per day (8.6 BCM/ year) had installed treatment capacity of 19,266 million liters per day (7 BCM/ year). Of the 54 cities 32 cities were practising recycling and reuse of the treated wastewater (TWW) for industrial and irrigation purposes. The quantity of wastewater treated was 13,157 million liters per day (5 BCM/year), of which 4,177million liters per day (1.5 BCM/year) was recycled and reused which accounts for 17.7 percent of the total wastewater generated.

There were 1,631 STPs (including proposed) with a total capacity of 36,668MLD covering 35 States/UTs. Out of 1,631 STPs, 1,093 STPs were operational, 102 are non-operational, 274 were under construction and 162 STPs were proposed for construction. Out of 1,093 operational STPs, compliance status of 900 STPs is available and only 578 STPs having a combined capacity of 12,200 MLD are found complying with the consented norms prescribed by the SPCBs / PCCs. To optimize the use of water, the Government of India is encouraging to undertake treatment of wastewater and its reuse for non-potable uses. The water reclaimed from wastewater can be used for toilet flushing, agriculture/ horticulture, fire hydrants, industries, construction activities, power plants, wetland restoration, river/stream-flow augmentation, and environmental recreation, etc. National Urban Sanitation Policy 2008 mandates reuse of at least 20 percent of treated wastewater. As per directions of Ministry of Power in 2016, it is mandatory that power plants within 50 km radius from sewage treatment plants have to develop a system for conveyance and use the treated wastewater. The urban local bodies can levy charge towards the treated wastewater supply in order to help ensure sustainability of the sewage treatment plants. It was estimated that 96,378 MLD (or 35,178 million cubic meters per year) of treated wastewater will be available for reuse by 2050 (Bassi et al, 2023).

The irrigation sector offers the major potential for reuse of the treated wastewater followed by industry and thermal power plants. As per the estimates of the Ministry of Housing and Urban Affairs, Government of India, the standard market rate for treated wastewater is Rs. 20 per cubic meter. Based on this,it was estimated that the market value of the treated wastewater available in 2021 was over Rs. 63 crore.

3. Sea Water by Desalination

In order to meet the drinking/ domestic water demands of some coastal cities of India and islands , the seawater is being desalinized at many places since decades. Seawater has a high percentage of salt whereas pure drinkable water should ideally contain less than 10 ppm of salt. Desalination is the process of removing salt and other impurities from water and rendering it fit for human consumption. The National Mission on Desalination (NMD) was set up in 2017 by the Department of Science and Technology in partnership with the concerned Ministries at the behest of NITI Aayog. The NMD envisages making use of desalinated water as a sustainable solution for water supply in the coastal states across India and paving the way for exploring different alternative technologies and viable options. In India so far, desalination projects having 950 million liters per day (MLD) were in operation in the coastal states of Gujarat, Tamil Nadu, Puducherry and Andhra Pradesh. Gujarat has the maximum desalinated water generation

capacity in the country. Tamil Nadu state is the country's second highest desalinated water producer having plants of about 200 MLD capacity. A latest seawater desalination plant deploying reverse osmosis process supplying 100 MLD of freshwater to Chennai has been built. New large-scale desalination projects of 520 MLD capacity were under construction, while another approximately 1000 MLD capacity projects were planned for construction. As per Desalination Association of India, there were more than 1000 membrane-based desalination plants of various capacities ranging from 20 cubic meter per day to 10,000 cubic meters per day in the country. Not only the desalinization requires high energy and investment but it also has environmental consequences. The challenge therefore in the water desalination industry is the large gap between affordability and willingness to pay for water vis-a-vis the cost of desalination.

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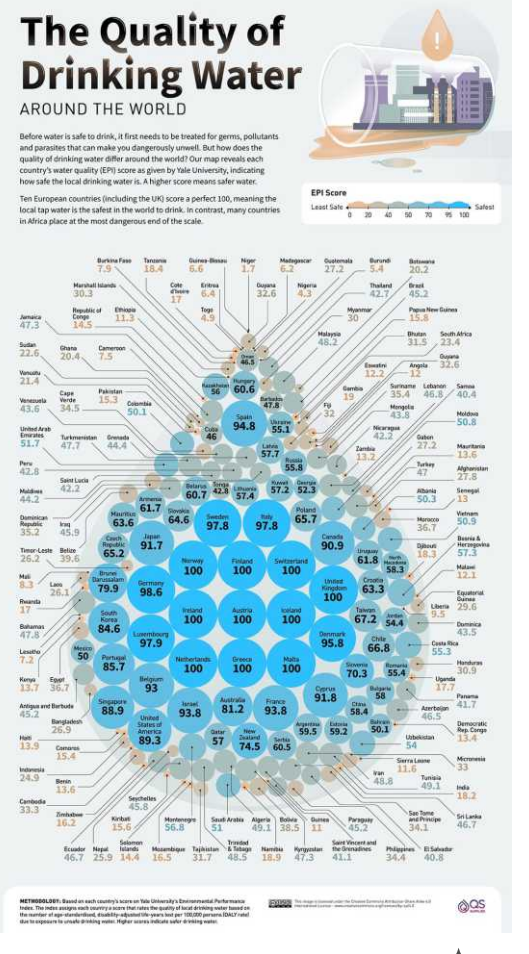

Stockholm Water Prize-2012

International Water Management Institute, Sri Lanka

Shri. Gajanan Deshpande, Pune (M) : 9822754768

(An article series has been launched in August 2020 to learn more about the World Water Prize winners and their work.)

The International Water Management Institute (IWMI), a leading organization working on water, is headquartered in Colombo, Sri Lanka. The 2012 Stockholm Water Prize was awarded to this organisation for its significant research work in developing countries to improve agricultural water management, increase food security, protect environmental health, and alleviate poverty.

Seventy percent of the worlds freshwater is used for agriculture. As global food demand is projected to double by the middle of this century, more and more food will need to be grown with less water. IWMI is a driving force in promoting policies and technologies that help farmers achieve 'more yield per drop' and implement measures that enable agriculture to grow enough food for a growing world population with limited water resources.

The Stockholm Water Prize Nomination Committee said in its citation that the International Water Management Organization is a leading organization in agricultural water management. Its work has led to new policies and investments in agriculture. This has not only made water use more productive and efficient but has also improved food security, economic development, and environmental soundness around the world.

After receiving the Stockholm Water Prize, Dr. Colin Chartres, who is the Director General of the IWMI, said it was an incredible honour for his organisation. The real winners, of course, are the dedicated staff of IWMI, which has consistently provided the highest quality research space for just over half a century. This work has had a profound impact on water management policy worldwide, with real benefits for the poor.

Over the past quarter century, IWMI has established itself as a trusted source for comprehensive resources and knowledge on global water resources. From 2002–2007, IWMI led a team of 700 scientists for a global programme of cutting-edge research in water management. The subsequent publications 'Water for Food' and 'Water for Life: A Comprehensive Assessment of Water Management in Agriculture' established an unprecedented knowledge base on the state of global water and land resources and were one of the most influential studies on water and agricultural policy ever produced. By providing clear evidence of where and how water scarcity has increased and its impact on all sectors of the economy, the report's findings have positioned sustainable water resource management as a priority issue for governments, industry, and international organisations around the world.

The organization's extensive work with irrigation sector reforms has paved the way for new and improved design, operation and maintenance of irrigation systems throughout Asia and Africa. IWMI has helped create the current international guidelines on how to safely use wastewater in agriculture. This method is used by millions of farmers worldwide. IWMI is leading innovations in developing ideal business systems to attract investment in wastewater recycling systems that can benefit rural communities in developing regions.

Mapping the World's Water Resources:

IWMI's advances in the application of

remote sensing and analysis in geographic information systems have significantly improved the ability to measure water availability and efficiency, directly enabling farmers around the world to better manage agricultural water resources. IWMI's Water Data Portal and global mapping of water scarcity, irrigation use, environmental flows and drought patterns are among the most important sources of information in the field of hydrology. More than one lakh publications are downloaded from the IWMI website every month and are widely read in leading electronic media worldwide.

This work has also led to the creation of a water accounting system that can determine the amount of potentially usable water in a basin, assess where the water is going, and determine the actual cost of water per cubic metre. This tool is widely used by planners to determine where water can be saved and how it can be used most effectively.

A 2011 publication, 'An Ecosystem Services Approach to Water and Food Security' led by IWMI and the United Nations Environment Program, outlined how 'ecosystem-based' natural systems for agriculture could potentially double agricultural production. Sustained work in this area can lead to a radical change in agriculture in the future to ensure food security for a global population that will reach 9 billion by 2050.

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Organization - Groundwater Survey and Development Agency (GSDA)

Shri Vinod Hande - (M) 9423677795

The State Govt. of Maharashtra has established the Groundwater Survey and Development Agency (GSDA) during the year 1972 as per the project agreement between International Development Association and Govt. of Maharashtra. The agreement required that the State shall establish the Groundwater Agency especially for the development of minor irrigation schemes based on groundwater.

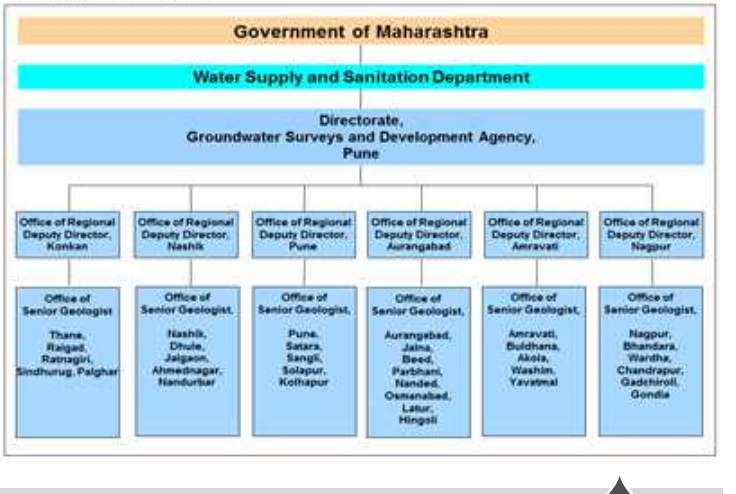
The GSDA is engaged in the exploration, development and growth of groundwater resources in the state through various schemes. This includes drilling of bore wells, tube wells under rural water supply programme, rendering technical guidance under minor irrigation programme by locating suitable dug well sites, strengthening of groundwater sources by water conservation measures, artificial recharge projects for groundwater. This also includes studies related to the periodic status of groundwater availability, protecting the existing groundwater resources.

Water plays an important role for the existence of mankind. The demand for water is rapidly increasing for drinking, irrigation and industrial use. In India Deccan Trap basaltic rock occupies about 500000 km² area predominantly in Maharashtra and spreads up to Andhra Pradesh, Madhya Pradesh and Gujarat. 91 percent of Maharashtra's geographic area is occupied by hard rock. This puts certain limitations on availability and development of groundwater. Groundwater availability depends on porosity developed as a result of weathering and fractures developed. In basaltic rock groundwater occurs under confined and semi confined conditions.

GSDA is a Govt. of Maharashtra's organization. It is reputed organization at national level for excellent work in the field of groundwater Deccan Trap. It is also one of the nation's leading institutions which has concern with groundwater survey, exploration, assessment, monitoring. Development, management, and regulation of groundwater resources for irrigation , drinking and industrial needs are also part of job of GSDA. It is also concerned with training, research and consultancy for planning, development and management of groundwater. GSDA has authentic and valuable data on groundwater resources in Deccan Trap.

GSDA is having a Director state level office at Pune. At regional level they are having office at Pune, Kokan, Nasik, Aurangabad, Amravati and Nagpur where Deputy Directors are the In Charge. Organization chart and area covered by GSDA is self explanatory in below table

Organization Structure



Activities of GSDA up to 2007 since it's foundation are listed below in chronological order,

• 1972 : Independent Directorate.

• 1974 : Village wise systematic Hydrological Survey started.

• 1978 : Drilling of Borewells for Drinking Water for Scarcity Mitigation.

• 1983 : Top priority to supply drinking water during scarcity.

• 1986 : Establishment of Research and Development cell.

• 1986 : Establishment of Special Project Division.

• 1993 : Worked under Rural Development Department and Water Conservation Department.

• 1994 : Transferred to Water Supply and sanitation Department.

• 1997 : Role of Technical Officer under Maharashtra Groundwater Act.1993 and Rule 1995. (regulation for drinking water purposes).

• 2000 : Hydrology Project initiated.

• 2002 : As per 73rd amendment the water supply related activities transferred to Zilla Parishad.

• 2004 : Technical service provider activities started.

• 2005 : Information, Education and Communication (IEC) activity started.

• 2006 : Village level water account activity started.

• 2007 : Initiation of Maharashtra water sector improvement project.

Mandate

GSDA is authorized for developing and circulating technologies, monitor and implement national and state policies for the scientific and sustainable development and management of groundwater. It also collects, evaluates, interprets data on water level and water quality to the end users. It also undertakes periodic groundwater assessment to regulate the groundwater use and guide groundwater development activities. Organization also works towards ensuring sustainability of groundwater resources on a long term basis. GSDA has power for implementation of groundwater legislation within Maharashtra.

Strength

GSDA has a team of 2200 professional and supporting staff trained in various fields. Team consists of Hydrologists specialized in remote sensing, chemists, cartographers, field surveyors with computer knowledge. GSDA has separate Engineering and Geophysical wing who are expert in groundwater development, management, protection and artificial recharge techniques. GSDA has groundwater and geological map on 1:10000 scale for 25000 villages of Maharashtra. Apart from this GSDA has got data to determine the aquifer parameter for 7000 tests conducted in various rock formation of Maharashtra. A network of 4000 observation wells and 1150 piezometers provides water level data that has been collected for over 32 years. Groundwater quality data base is built around 70000 samples, each analyzed for various parameters like pH , Electric Conductivity. Hardness, chloride, calcium, sodium, potassium, sulphate, nitrate, fluoride and iron. In addition to this GSDA has hydro fracturing unit to rejuvenate poor yielding bore wells at all six divisions of Maharashtra. Latest computers dedicated software is available in all 36 districts.

Since its establishment GSDA is engaged in the development and management of groundwater resources in the state through various scheme with a aim to provide safe and potable drinking water to the community. Work pertaining to drinking water carried out by GSDA includes following,

• Site selection for drilling of bore wells under Rural Water Supply Scheme.

• Detailed hydrological survey for village

• Identification of source for Pipe Water Supply scheme for Rural Water Supply Programme.

• Survey for drinking water source under Shivkalin Pani Sathavan Yojna.

• Implementation of hydrofracturing to increase the yield of poor yielding bore wells for drinking water source sustainability.

• Hydrological survey for technical guidance and implementation of water conservation and artificial groundwater recharge measures.

• Monitoring and implementation of World Bank aided aquifer based groundwater management projects.

• Acts as technical officer in implementing Maharashtra Groundwater (regulation for drinking water purpose) Act.1993 and Rule 1995.

• Periodical monitoring of groundwater levels and groundwater quality.
• Implementation of watershed development project under Hariyali (Parbhani, Aurangabad, Washim, Jalana, Pune.
• Implementation and monitoring of Village Water Accounts in 353 Tahasils of the state since 2004.

Outstanding works done by GSDA

• Estimation of groundwater on watershed basis since 1974.
• Rejuvenated 6872 drinking water bore wells in 4526 villages.
• Through hydrological data revenue of around 18 lakhs generated.
• In 4443 villages 12078 different measures taken up for strengthening drinking water sources and 1048 villages have been made tanker free. And so many.

Slogan of Groundwater Survey and Development Agency for water is very meaning full. Slogan is "Care for Water And Water Will Take Care of You". To strengthen the underground water Sources GSDA has come up with innovated project ideas. These are,

1. Un conventional Measure for Source Strengthening.
2. Solar Dual Pump.
3. Water lifting Device.
4. Artificial Recharge.

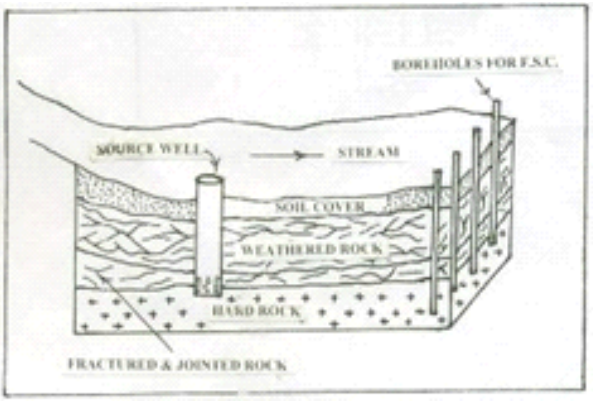
Unconventional Measure for Source Strengthening.

In Maharashtra every year there is scarcity due to irregular rain fall. Drinking water scarcity occurs due to dug wells become dry and water level of bore wells gets depleted. In hilly area rain water goes waste due to runoff. Porosity of land is also poor in this area resulting less water gets recharge in the ground. In most of the villages water is supplied by water tanker. Therefore to overcome the drinking water problem permanently of such villages Govt. of Maharashtra started implementing water conservation program from year 1992-93. As one of the activity of water conservation program GSDA started to implement Unconventional programme to strengthen the drinking water sources. Unconventional measures as on today are,

1. Fracture Seal Cementation -
2. Jacket Well Technique.
3. Bore Blast Technique
4. Hydro Fracturing.

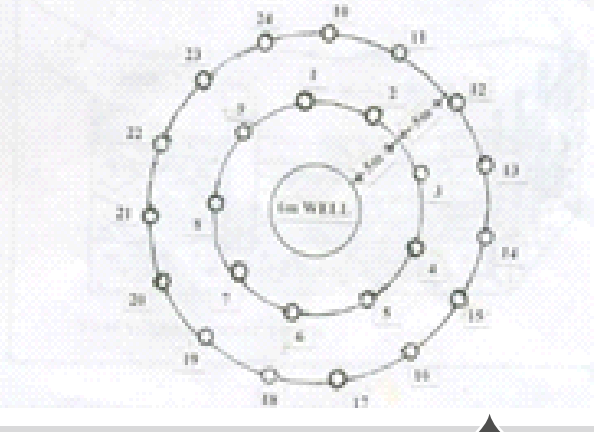
Fracture Seal Cementation :

Ground water flowing through a network of shallow depth aquifer from discharge location is arrested in this technique. It is suitable in disintegrated rock combined with fracture and granular porosity. Under this process one or two rows of suitable diameter boreholes are drilled to a depth little more than the deepest dugwell in command area of stream or nalla. These rows across the stream are filled by injecting cement slurry (liquid) under high pressure for sealing of existing fracture. This technique is useful to create an effect of "Cut Off Wall" as underground bandha.



Jacket Well Technique :

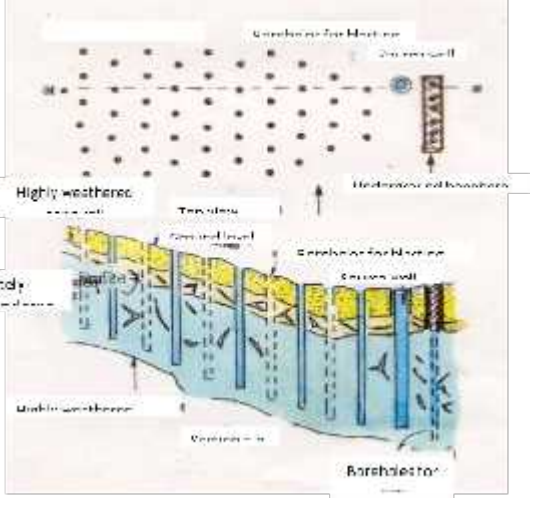
Jacket wells are constructed around dug well in hard rock area which increases effective diameter of well artificially thereby increasing



storage capacity of well. Bore wells of about 115 mm diameter to a depth of open dug well or to a shallow aquifer are drilled around the supply well. The blasting of these bores are carried out using slurry explosives, detonating cord and electrical detonators to create fractures. And inter connection between the bore holes increases effective diameter supply well and to create additional storage capacity of water.

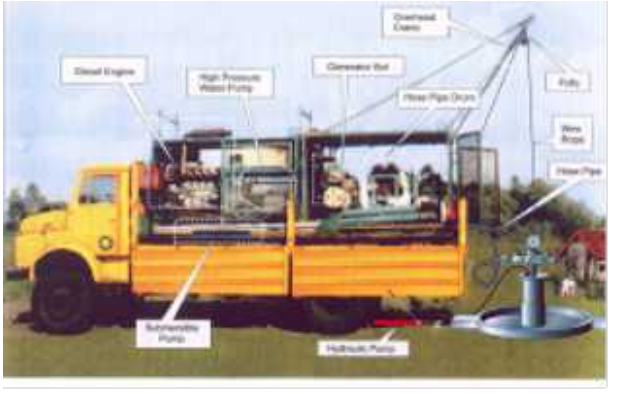
Bore Blast Technique :

This technique is also adopted to create additional storage of groundwater artificially in massive and crystalline hard rock by fracturing the bed of rock. Hydrological survey is carried out to locate such cracks before blasting. Number of holes are calculated depending on the quantity of water required. In this technique also slurry explosives are used for blasting. At a time 5 to 6 boreholes are blasted. This technique is applied in assured rainfall area and suitable for the area where population of place is around 100-150.



Hydro Fracturing :

This Technique is applied for rejuvenation of poor yielding or unsuccessful borewells. Some borewells of village are successful but poor yielding borewells indicate that fractures do not exist or if exists they are not connects to the nearby water bodies, or fractures are closed. With this technique very high hydraulic pressure is created between the confined section of borewell. This very high pressure opens the closed fractures and there by connecting to nearby bodies. This very high pressure also creates new fractures. In this way borewell yield is improved.



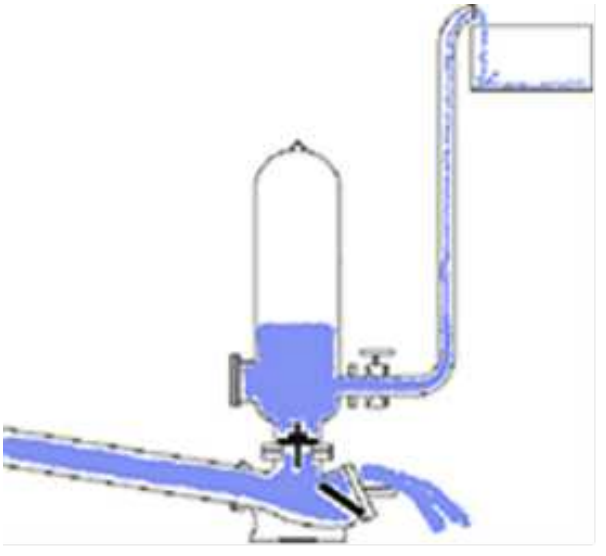
Solar Dual Pump :

GSDA is implementing the solar or electric dual pump water supply schemes under National Rural Drinking Water Programme in the area where villagers are totally dependend on hand pumps. Same programme is implemented by GSDA in hilly area where spring water is available. In this scheme 1 HP single phase electric motor is connected to existing hand pump in a bore having 2000 liter per hr. yield. The water collected in the 5000 liters storage tank and than supplied to 30-40 households through tap water connection. Since 2008-09 to 2016-17 GSDA has completed 2915 schemes.

Water lifting Device :

Goal of National Rural Drinking Water Programme is to provide every rural person with adequate safe water for drinking, cooking and for other basic needs. The basic requirement should meet minimum water quality standards with all time accessible in all situations. This is necessary to relieve women and girls. But same is required to be done in hilly areas of Satpuda range. GSDA has taken up this issue and carried out survey of 216 hilly remote habitations located in Sahayadri and Satpuda range. Fetching water in hilly and sloppy area is very risky. People residing over there use traditional and ancient method for lifting water using available wood and trees. GSDA has installed low cost, human efforts saving lifting devices using universal pumps. They have also used Hydram

Pumps which use kinetic energy of flowing water.
Principle of Hydraulic ram pump. These are water lifting devices that are powered by filling water. These pumps work by using the energy of water falling from small height to lift water to much greater height. Main advantage of this is that pumps operate continuously and automatically with no external energy. GSDA implemented these schemes on pilot basis in Aenghar and Ghotavade of Raigad dist. In more than 20 locations in hilly area this water lifting schemes are under progress.



Artificial Recharge : Chetan Pattern

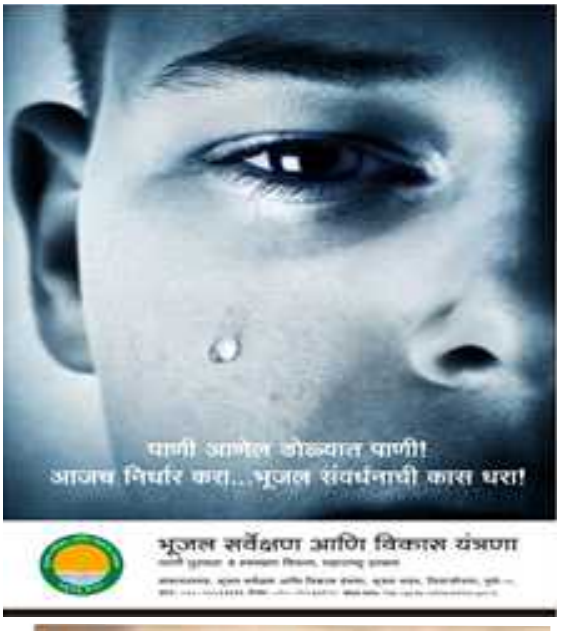
Groundwater is widely distributed as dependable source. Water can be extracted through dug well, bore well and tube well. In the last two to three decades pace of groundwater extraction increased due to introduction of scientifically based groundwater surveys, high tech drilling technology and efficient pumping device. Artificial recharge was undertaken by GSDA and MJP (Maharashtra Jeevan Pradhikaran) at village Gondumri, Taluka sakoli and Dist. Bhandara. Executive Engineer MJP Bhandara has prepared the Regional Piped Water Supply Scheme (RPWSS) for four village of Sakoli taluka namely Gondumri, Nilja, Palasgaon and Mahalgaon using surface water. The scheme was prepared with the norm of 55 liters per capita per day. Projected population of above four villages was 11600 which require 233 ML annually. For this huge requirement of water MJP consider to use water Chulband river by taking consent of irrigation Department.

In order to ensure sustainability it was necessary to increase groundwater recharge. Senior Geologist of GSDA Bhandara has decided to propose artificial recharge of well by filter trench cum groundwater dam of Fiber Reinforced Plastic Sheet which is known in Bhandara dist. as Chetan Pattern. After completion of this artificial recharge scheme for RPWSS group of news paper reporter visited these places. They were highly impressed by the drinking water problems of four villages solved by constructing recharge structure. They asked name of structure, which has no name till then. Immediately they were named it as “Chetan Pattern” as Shri Chetan Gajbhiye senior geologist GSDA Bhandara solely proposed it. Media has given huge publicity in various newspapers.

Groundwater Survey and Development Agency is a very good knowledge center. Information about Hydrology of Maharashtra, Dist. information, Groundwater Acts & Rules, Important govt. resolutions are available on their website. Similarly they have projects and schemes for Hydrological project I & II , National Hydrology Project, Jalswarajya Project I & II and NRDPW Sustainability also. These projects can’t be discussed here for limitation of time and space. Interested reader can visit their website. Following manuals are also available on GSDA website.

• MRDWP (National Rural Drinking Water Programme) structure manual.
• Rooftop Rainwater Harvesting manual
• Water Conservation Structure manual
• GEMS(Groundwater Estimation & Management System) Installation manual and user manual.

GSDA has posters to display with very meaningful slogans which very nicely explains the importance of water in our life. Few of them are,



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Jeevitnadi: Activities for the month of March 2023

Jeevitnadi Team

Awareness :

• Volunteers spreading awareness at a school in Pimple Gurav; talking about the River Front Development and its bad effects in the current form of project.

• We participated in the National Program on discussion on Water day: Mar 21st.

• We had 3 River walks this month, interacting with over 60 students and adults together with enthusiastic students from FFF (Friday for Future).

• Interactive session with Bachelors and Master students of Social Work major, on River Ecology was at Tilak Maharashtra Vidyapeeth. This was conducted on the occasion of International Social Welfare Day.

• Session with students from Karve Institute on Ecology and rivers, for their Environment sensitivity initiative Bishnoi on 24th March.

•

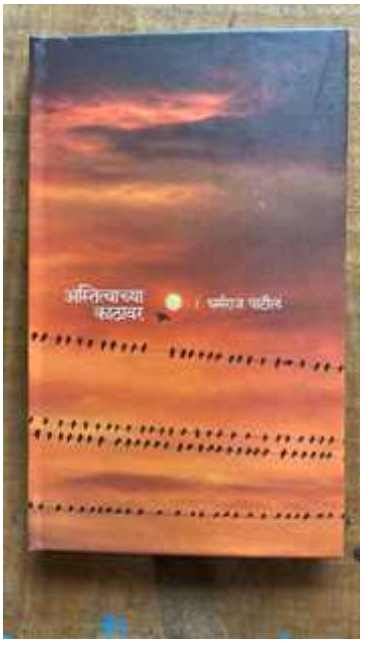
Action:

- HSBC team joined clean up at Aundh stretch on 18th March and as the cleanup was on, an artist volunteer joins in the clean-up activity and captures the action on paper!

- Conducted a session 'River & I', on the account of Women's Day, Action for River Day and World Water Day. The session consisted of all ladies associated with the river, from the source region of Mutha river through the flood plain and until the downstream region. Problems and implementable solutions were also discussed in this session.

- JN participated in the Urban Waters Forum 2023, seminar organized by Wipro in Bangalore. The forum brought together water practitioners from across the country for the purpose of knowledge sharing and discussion of new developments in the field.

- A tribute to Dharmaraj (one of our Founders), was done through the inauguration of a poetry book written by him "Astitvachya Kathava". Was indeed a very emotional but proud event for the Jeevitnadi team.



- We had an 'on road' event at Bund garden area on 19th March on

account of Action for rivers day. We had over 200 people on the ground, supporting the cause of saving the rivers. A flash mob and street play was also performed for the public.

Regular activities:

- Know your stretch series for this month featured: a shrub 'phyllanthus lawii'

- Regular cleaning activities at both the stretches were on. This month we had new students from Kaveri Arts Commerce and Science college joined us for clean up


Sunday by the river

KNOW YOUR STRETCH

Phyllanthus lawii

PhyGanthus lawii J.Graham is a glabrous shrub. It is usually seen growing along the banks of rivers towards the Konkan Ghats. These shrubs are also present in our adopted stretch - of dry river beds and along the Mula River banks in Baner.

SCIENTIFIC CLASSIFICATION:

Scientific name: Phyllanthus lawii, Kingdom: Plantae, Family: Phyllanthaceae, Order: Malpighiales, Genus: Phyllanthus, Phylum: Tracheophyta, Class: Magnoliopsida

DESCRIPTION:

HABIT:

HABITAT:

MEDICINAL USE:

Facts:

The flowering and fruiting of this species is usually in the months of December-March. The plant grows in tropical and subtropical climate over well drained sandy -loam soil for its luxurious growth.

At the Ram Mula confluence stretch, around 372 kg of waste was collected this month and we have collected 824 kg until now this year (2023)!

- The composting activity initiated by us is functional at 4 temple site ghats in Pune. Approximately 330 kg of Nirmalya has been composted from September 2022 until now.

Awards and Felicitations:

- Maha NGO award to Founder, Director, Shailaja Deshpande, on 12th March.

- "Paryavarun Dhoot' awarded to Jeevitnadi team by PMC on 31st March

Temple to Balaji & Varahaswamy in Nandyal, Andhra Pradesh

Temple to Balaji & Varahaswamy in Nandyal, Andhra Pradesh, India, by Sameep Padora & Associates

Sameep Padora & Associates creates stepped temple in Andhra Pradesh

Sameep Padora & Associates have designed a Hindu temple complex partially surrounded by a moat for the village of Nandyal in Andhra Pradesh, India.

The architecture studio created the stepped temples from local black limestone slabs to create a modern take on the traditional Hindu temple forms.

"More than the temple being different from its predecessors, I think it's more like a variant," said Sameep Padora & Associates principal Sameep Padora.

"Modernity wasn't really a preoccupation for the design of the temple," he told Dezeen. "It was about how the temple was located in its physical context, the available resources and what real value we were able to create using the temple as a catalyst."

The complex contains two tower-topped shrines, along with an elongated building that contains a kitchen for preparing offerings, public toilets and the priest's quarters. Alongside the temples is a water tank, known as a Pushkarini.

Sameep Padora & Associates based the arrangement of the buildings and water pond on a 10th-century temple that is located in Tirupathi, southern India.

"The planning of our temple carries forward the historic precedent of temple plans which addresses the two shrines and the bathing pond for the deity at the entry," explained Padora.

"It uses many of the same tropes like the elaborate horizontality in the construct of most traditionally temple design but abstracts that further," he continued.

"All of the planning was done in dialogue with temple priests who had inputs on what was placed where according to tradition."

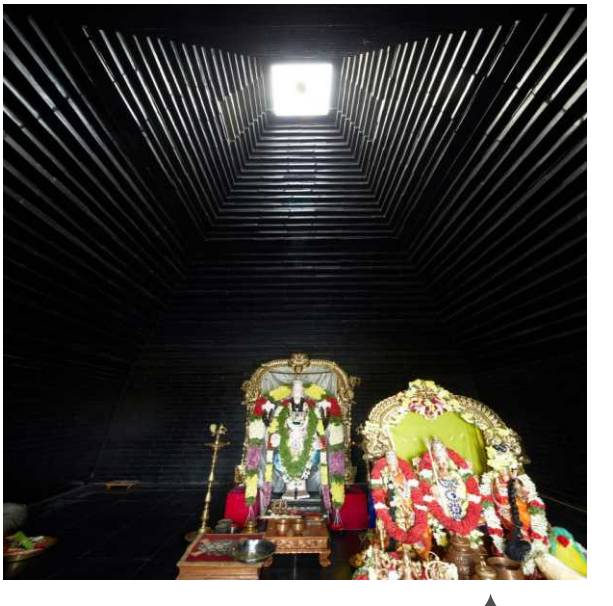
Integrating a water pool into the temple complex was one of the most challenging elements as the area chosen for the building was relatively arid.

To create it the architecture studio diverted waste water from a nearby quarry into an area of low lying land and to create a water retention basin that was planted with vegetation to naturally clean it.

"This single programmatic addition, begins the dialogue, between the temple form, the access steps and the water," he continued.

"It becomes an architecture that is part landscape and part building, modulated through the module of single corbel creating a scale that is both intimate and distinct."

Black limestone slabs were used to create steps that rise out of the pool. These slabs were also used to create the stepped forms of the temples, which are planted with greenery on the lower levels



to buffer the interiors from the heat.

The larger of the pair of spire-topped temples contains the Balaji shrine, while the smaller temple contains the Varahaswamy shrine.

The combination of the water and traditional spire-topped temples defines the religious space said Padora.

"The temple precinct through its association with the water takes two distinct forms of sacred spaces, the temple shikhara – spire above the sanctuary, and the kund – stepped water tank, and integrates it into a single manifestation of the sacred precinct," he added.

Sameep Padora & Associates is a Mumbai-based architecture studio that has previously designed a Buddhist education and meditation centre built using rammed earth that contains volcanic dust and a school library topped by an undulating brick roof.

Photography is by Edmund Sumner

World Water Day-2014

Water and Energy

Shri. Gajanan Deshpande, Pune -(M) : 9822754768

(A new article series 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.)

On the occasion of World Water Day 2014, the theme of water and energy was adopted for global awareness. It emphasised the interdependence of water and energy and gave special attention to the water-energy nexus. Further, the development of inter-sectoral water-use networks, the facilitation of integrated operations, and sustainable water availability to secure green economy objectives were highlighted on the occasion of that year's World Water Day.

Hydroelectricity or hydroelectric power is the oldest and largest source of renewable energy, which uses the natural flow of water to generate electricity.

The three resources - water, food, and energy, that are at the heart of development share a sustainable relationship. Food production and energy are highly dependent on water. Agriculture is the largest consumer of the world's freshwater resources, and one-quarter of the energy consumed globally is spent on food production and supply.

Energy depends on water, and water depends on energy. This interdependence of water and energy is set to intensify in the coming years, with significant implications for both energy and water security.

About 8% of the energy generated globally is used to pump water, treat it, and transport it to various consumers. Apart from this, hydroelectric, nuclear, and thermal power generation also require the use of water resources.

Energy and water are closely related to each other. Most energy production is closely related to water. Water consumption is essential for almost all forms of energy production. For example, coal-fired power plants, nuclear reactors, and crop production for biofuels use water.

All energy sources (including power generation) require large amounts of water at

various stages in the production process. A lot of water is required for coal mining or other raw material production for power generation, growing crops for biofuels, powering turbines, draining out coal ash from thermal plants, and cooling the furnace temperature, which rises considerably during the process of power generation. For this purpose, large water reservoirs are specially constructed near those plants.

Increasing pressure on the water-food-energy nexus threatens the set goals of sustainable development. As water becomes scarcer, its ability and sustainability to support many Sustainable Development Goals—particularly poverty, hunger, and environmental progress—diminishes.

Water availability has already affected India's power supply. India lost 14 terawatt hours of thermal power generation in 2016 due to drought and water scarcity. You will also notice that more than half of the thermal plants in India are located in areas with high water stress.

Water scarcity is already affecting energy production and reliability. These difficulties, which loom larger, may call into question the physical, economic, and environmental viability of future projects. A growing global population, rapid urbanisation, changing diets, and economic growth are putting pressure on these interrelationships. Therefore, an integrated and sustainable management of water, food, and energy must be ensured to meet these current and future stresses and challenges.

India's energy sector development plans over the next two decades have a backdrop of increasing water stress. India accounts for only 4% of the global water supply, but 18% of the population. It is one of the most water-stressed countries in the world. India's rapid economic growth in recent years has led to a huge increase in demand for both energy and water, putting these interrelated resources under increasing pressure.

Agriculture accounts for 80% of India's water demand. But water is just as important to the energy sector, especially power generation. The development of India's energy sector in the next two decades will only be possible keeping in mind the increasing water stress, climate change, and increasing demand for water in the agricultural, residential, and industrial sectors. Looking at the current rate of water consumption, the projected demand for water will be much higher than the available supply in the coming years, and dealing with it is going to be a major challenge for the energy production of the country.

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‘World’s longest river cruise’

(News)

‘World’s longest river cruise’ could threaten endangered Ganges dolphin, experts warn.
This article is more than 2 months old.
A luxury cruise has been hailed as the start of a new age of Indian tourism. But conservationists fear the impact of increased river traffic and pollution.

The Indian prime minister, Narendra Modi, has officially launched the “world’s longest river cruise” from the city of Varanasi in Uttar Pradesh. The luxury voyage will last 51 days, travelling 3,200km via Dhaka in Bangladesh to Dibrugarh in Assam, crossing 27 river systems.

The three-deck MV Ganga Vilas, with 18 suites, is the latest venture in a trend for cruise tourism in India being promoted by the government. Modi hailed the cruise industry on the Ganges as a “landmark moment”, which will herald a new age of tourism in India.

However, environmentalists and conservationists say the rise in cruises could do lasting damage to the habitat of the Ganges river dolphin (Platanista gangetica).

The MV Ganga Vilas will pass through Kaithi village, 30km from Varanasi at the confluence of the Ganges and Gomti River, where

the deep water and slower currents around the intersection provide a safe habitat for the endangered dolphin. In October, wildlife officials spotted a pod with calves, and put the number of dolphins in the area at 35 to 39.

It is one of a number of protected cetacean habitats on the route of the cruise, including Vikramshila Gangetic Dolphin Sanctuary in Bihar.

Platanista gangetica is one of the two freshwater dolphin species in south Asia, alongside Platanista minor or the Indus river dolphin, found in Pakistan and the Beas River in north India. The Ganges river dolphin faces a number of threats, including water pollution, excessive water extraction and poaching.

“The cruises are a dangerous proposition in addition to all the existing risks for the dolphins,” said Ravindra Kumar Sinha, whose conservation efforts led the government to designate Gangetic dolphins as a protected species in the 1990s. Their numbers have risen in recent years, with about 3,200 in the Ganges and 500 in the Brahmaputra,

The endangered Ganges river dolphin (Platanita gangetica) already faces threats from pollution, water extraction and poaching. Photograph: Roland Seitre/naturepl.com

due to improved water conditions and conservation initiatives. But Sinha fears cruise tourism will undo these gains. He believes Gangetic dolphins may follow the fate of Baiji dolphins in China, which were declared functionally extinct in 2006 due to increased river traffic on the Yangtze. "There's no doubt that disturbances from cruises will gravely impact the dolphins, which are sensitive to noise," he said.

Gangetic dolphins are "almost blind" and navigate the murky waters and forage for food using echolocation clicks. Jagdish Krishnaswamy, an ecohydrologist from the Indian Institute for Human Settlements in Bangalore, said: "The underwater noise pollution due to the increased traffic of cruise, cargo vessels and mechanised boats interferes with the echolocation clicks making their very existence arduous."

A 2019 study by Krishnaswamy and three other experts, using cetacean and porpoise detection devices to log the echolocation clicks, found major alterations to the acoustic responses of Gangetic dolphins from high underwater noise due to motorised vessels. Chronic noise exposure elevated stress levels leading to fatigue, and changed foraging behaviour, causing them to feed more to compensate for energy loss. Disorientation from prolonged response to underwater noise also increased the risk of clashing with vessels and getting entangled with propeller blades, leading to injury or death.

Cruises between Varanasi and Kolkata began in 2009. But a World Bank-funded project to develop inland waterways, called the Jal Marg Vikas Project or National Waterway-1 (NW-1) on the Ganges, is being used by the Bharatiya Janata party government to boost tourism and promote cargo movement in an "eco-friendly way".

Kashif Siddiqui, marketing director of Antara cruises, said the MV Ganga Vilas cruise was so popular that trips were sold out for the next two years. "We are following all the environmental precautions and government guidelines," he said. Promotional material for the cruise, says: "With sustainable principles at its heart, the Ganga Vilas incorporates pollution prevention and noise control technologies to honour the ancient rivers travelled through."

At present, about 100 cruise trips operate on the NW-1 Ganges and NW-2 Brahmaputra routes, with the government looking to increase the number 10-fold. Development on this scale, environmentalists say, would have huge adverse effects on the riverine ecosystem. In 2019, a turtle wildlife sanctuary spanning a 7km protected area in the Ganges at Varanasi, was denotified, in what critics said was a move to open up the area to development of the waterway.

An increase in motorised river traffic could interfere with the dolphins' use of echolocation fo navigation and foraging. Photograph: Shutterstock

There are also fears over high vibrations and noise from dredging operations to maintain minimum depths for navigation of cruise vessels on the NW-1 Ganges route.

An environmental assessment carried out by the Inland Waterways Authority of India said that behavioural changes in fish, dolphins and turtles due to dredging noise "may not be significant" and mortality is not anticipated, because these organisms "normally move away from the dredging spots".

However, Sunil Kumar Chaudhary, a member of Bihar State Ganga rejuvenation, protection and management committee, said: "Unlike the ocean, river landscape is restricted, and dolphins do not have a vast area to manoeuvre at the time of dredging activity."

Avli Verma, a researcher at Manthan Adhyayan Kendra centre in Pune, which studies water and energy policies, said the government had set aside necessary environmental safeguards in favour of an "ease of doing business" approach.

"If precautionary conservation principles are not applied today, waterways will not be sustainable in the long term. You cannot promote cruises on Ganga as eco-tourism, while endangering the habitat and the existence of Gangetic dolphins."

This article was amended on 19 January 2023 to clarify that there are about 100 cruise trips a year on the NW-1 Ganges and NW-2 Brahmaputra routes, rather than about 100 cruise companies operating on the routes as an earlier version could have suggested.

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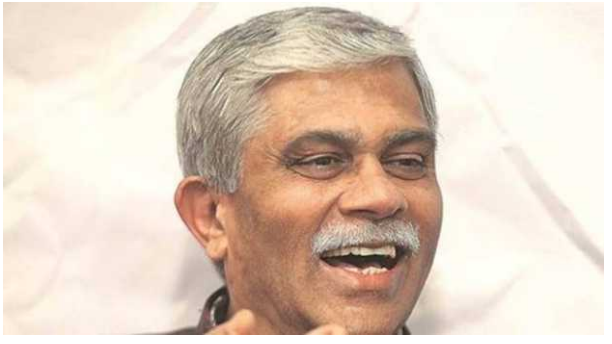
Note : While designing the issue of Jalsamvad - English we find very interesting news, information and articles specially on water and its management. That tempts us to include the same in our issues. Getting formal permission for this inclusion is that way difficult. Therefore our effort is to print them as it is in our magazine. We may kindly be excused for such inclusions. We express a deep sense of gratitude to the original writers.

Thanks.

'Skilled manpower important for sustained efforts in water conservation'



Nitin was speaking at the concluding function of 'Jaldoot 2.0' a three-day pilot initiative organised by NGO Sevavardhini.

"Though water is a subject very close to our hearts, when we discuss water management and water conservation, we tend to forget the methods and solutions harnessed by our earlier generations. However, if we want to engage in sustained efforts in the field of water conservation, we need skilled and trained manpower," said former vice-chancellor of Savitribai Phule Pune University, Dr Nitin Karmalkar.

He was speaking at the concluding function of 'Jaldoot 2.0' a three-day pilot initiative organised by NGO Sevavardhini.

Jaldoot is a pilot project of Sevavardhini in the field of water conservation. The organisation is actively involved in many projects linked to Jaldoot in 25 villages across Maharashtra for the last 13 years.

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By 2030, 40% of India will have no drinking water

Nagpur : By 2030, 40 % of India will have no drinking water, said Vinod Hande, retired assistant general manager with BSNL.

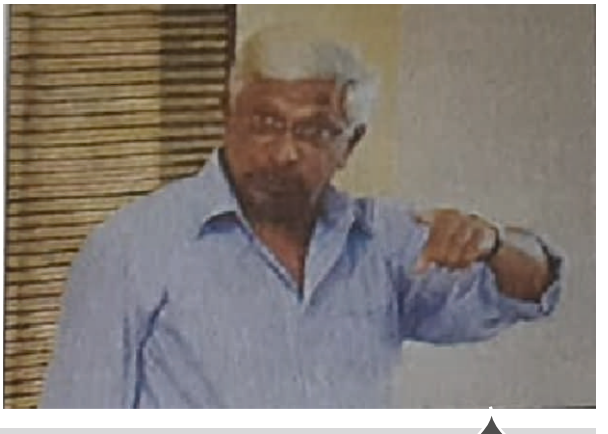
As per NITI Aayog water quality index, India is at the 120th position among 122 countries. They have evaluated that by 2030 as much as 40 % of India will have no drinking water. The situation will be utterly grim then, said Hande, while delivering a lecture on Emerging patterns of Indian memorials and statues, under Dnanyoddha Lecture Series organized by Dr. Hedgewar Vyaspeeth, at Shahapurkar Hall, Dharampeth Boys School.

Hande put up the point while giving his lecture on sudden spurt in statue and memorial tourism in the country.

He said Actually, there are two sides to the sudden escalation in the memorializing drive the country is currently subjected to. Along with the boost in tourism, generation of employment opportunities and economic growth, the detrimental effects like environmental damage and overexploitation of tourist places get the better of the advantages.

Addressing the issue of statue tourism, with special significance to the tallest statue on the world, Hande said India needed the statue of the Iron Man of India Sardar Vallabhbhai Patel, because his contribution to the national movement was not recognized at par with Mahatma Gandhi and Jawaharlal Nehru.

Talking about the under construction Shivaji Memorial in Mumbai, he said, The idea for the Shivaji statue first emerged in 1980. In 2004, the budget was around Rs. 100 crore, which jumped to Rs. 700 crore in 2009 and Rs. 1400 crore in 2013. In 2016, the estimate for phase 1 and 2 was Rs. 3600 crore. Earlier this year, the Supreme Court had directed the state government to stop the construction of the statue with immediate effect due to environmental issues.



Hande discussed the characteristics of other monuments and structures like ISKCON Vrindavan Chandrodaya Mandir, Ram Mandir in Ayodhya, Ram statue at Sharyu river, Netaji Subhash Candra Bose's memorial at India Gate. The Thiruvalluvar statue, Jatoli Shiv Temple in Himachal Pradesh, Shiva idol in Udaipur and Cauvery statue on Karnataka.

Highlighting the problems that could have been solved with the funds invested in these memorials, he said, India's ranking in the Global Hunger Index comes under the status of serious hunger. A lot could have been done with the money.

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'Residents revive their pasturelands of Boojh Village

Aarti Kelkar Khambete

Residents of Boojh village in Rajasthan overcome fodder crisis by reviving their pasture lands.

Residents from Boojh village in Udaipur district of Rajasthan depended on fodder to feed their livestock that supported their livelihoods for generations, but fodder availability continued to decline due to population growth and fragmentation of landholdings. By the 2010s, the situation became so dire that people had to buy fodder from a private beed (pasture) some 7 kilometres away with the price of the beed depending n the owner's whim.

In 2016, Boojh residents got in touch with the Foundation for Ecological Security (FES), a non-profit that works with communities across the country on ecological restoration. FES researchers advised them to overcome fodder crisis by reviving and managing the shamlat or village common land.

Following this, all the households in the village came together to set up a "pasture development and management committee" and decided to revive a 15 hectare pasture they shared with neighbouring villages.

The committee fenced the patch and planted 2,500 saplings of local tree species such as neem, amla, khejri and mahua as well as various perennial native grass species. They then built loose boulder check dams to harvest rainwater and ensure that the hilly terrain retained moisture. As a result the whole area was filled with 1-1.5 metre tall grasses within two years.

The committee decided to allow harvesting of the fodder grass, but only one person from each household was given permission, to prevent overharvesting. A fine of Rs 1,000 was imposed on those who let their cattle wander into the revived pasture and Rs 500 for chopping trees. The committee collects a fee of Rs 20 from each family, which is then spent on the maintenance of the pasture.

Following the success of this initiative, the residents of Boojh in 2019 initiated the development of another pasture, spanning 16 ha. Every family in Boojh now harvests 90-100 bundles (200-250 kilogram) of fodder and the the pastures have helped each family save Rs 1,000 a year (DownToEarth)

A Himalayan village leads the way in the renewable energy drive

Frequently battered by strong winds and landslides, Hengbung village in Manipur located at the foothills of the Himalayas was used to frequent power cuts. However, the challenging terrain of the village is now proving a boon for the village to ensure reliable electricity for the community.

A pumped storage hydropower system fitted with solar powered pumps was installed and has started operating in the village. It is built on a stream and has two interconnected reservoirs that work as a giant water battery which stores renewable power for release during grid outages or when demand is higher.

Atleast 350 households in the village now have constant lighting in their homes and streets and this has changed the lives of villagers by keeping the environment clean while illuminating their homes.

Pumped hydrostorage projects (PSP) have been hailed as a key solution and India's power ministry has recently published draft guidelines to promote this technology. There are currently eight operational PSPs in India with 4.7 GW capacity,

most drawing their operating power from the national grid (Economic Times)

Women run farmer producer organisations (FPOs) in Rajasthan set an example for others to follow

Farmer producer organisations (FPOs) formed in Rajasthan by bringing together many women self-help groups (SHGs) are proving to be highly successful. Many women's SHGs were formed in the state through Rajasthan Grameen Aajeevika Vikas Parishad (Rajeevika) to empower rural women. All the 35 FPOs had been constituted as allotted by the Government of India in 2022-23.

FPOs formed by Rajeevika have greatly helped by adding value to agricultural products such as apple custard pulp, nutritious soybean ladoos, cattle feed, honey and mustard oil. An example of a successful FPO is the Jhalawari Mahila Kisan Producer Company in Jhalawar, women's FPO, which is producing and marketing honey. The number of women members is around 700. This FPO was started with a share capital of around Rs 19 lakh and the government provided an equity grant of Rs 10 lakh, whereas Rs 6 lakh per annum has been kept for the management of the FPO. The honey produced by this FPO is marketed in the name of 'Madhusakhi Jhalawari Honey'.

Similarly, Badi Sadri Mahila Kisan Producer Company — Badi Sadri in Chittorgarh district — is a company that has 666 women members and the main work is to produce and market kachchi ghani mustard oil. Looking at the success of these FPOs, the central government has set a target to form 30 additional women's FPOs in the state (Business Standard).

Digital technology helps Indian farmers maximise their profits

KissanGPT is a powerful AI chatbot that has been launched to bridge the information gap between farmers and experts, providing farmers with the knowledge and resources they need to improve the quality and quantity of produce in their fields. It is designed to help farmers with their agricultural queries, providing real-time advice on crop cultivation, pest control, soil management, irrigation and other farming related topics.

With its user-friendly interface and multilingual support, KissanGPT is proving to be a valuable resource for farmers across India, helping them to overcome the challenges of farming and has been touted as a game-changer for farmers who rely solely on farming for their livelihood.

It is very easy to use and farmers can interact with the chatbot via their smartphones, making it an easily accessible and convenient tool for them to use. KissanGPT has already received positive feedback from farmers who have used it, with many saying that it has helped them to make better decisions about their crops and improve their yields (Business Insider).

Renewable energy sector financing must go up to $600 bn to meet 2030 goals

Amita Bhaduri

Investors deploying sizable capital as they are confident of India's long-run robust demand for renewable energy (8–10 GW/year)

India is amidst a monumental energy transition—with global consequences. India's population is primed to continuously grow, industrialize, urbanize, and electrify their lives. Over the next two decades, it will urbanize 300 million people, double building space, add 640 million air conditioning (AC) units, and add 240 million road vehicles. During this period, India's new total energy demand will be 25% of the global increase in total energy demand.

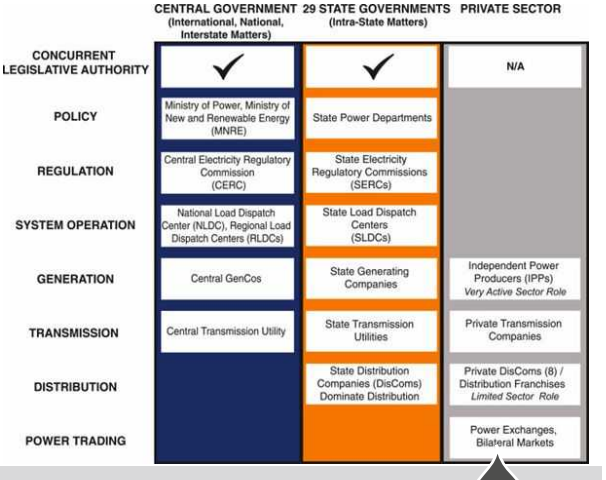
Meeting India's doubling electricity demand will require adding power capacity equivalent to the European Union's (EU) entire power system today. Consequently, how it chooses to meet its future energy demand growth will have profound global environmental and market implications.

India has set an ambitious renewable energy (RE) target of 450 GW by 2030. Meeting the target will require $600 billion in financing for new generation and grid infrastructure, including $200 billion for photovoltaic (PV) and wind capacity. The required new financing dwarfs present sector capital flow. Mobilizing increased capital will only be possible if stakeholders are confident, they can navigate the sector's significant investment risks.

A recent paper 'Strategic investment risks threatening India's renewable energy ambition' reviews strategic investment risks in India's renewable energy sector and discusses investment risk mitigation strategies.

The paper published in the journal on 'Energy Strategy Reviews' has insights distilled from interviews with leading sector investors, Independent Power Producers, and policymakers. The analysis is relevant to emerging markets with power sector structures.

Rapid massive deployment of renewable energy (RE) has emerged as the centrepiece of India's energy transition strategy. RE offers India persuasive advantages versus its historical paradigm of burning imported coal: reduced electricity costs, reduced current account deficits, increased energy security, pollution mitigation and a pathway to deliver on its global

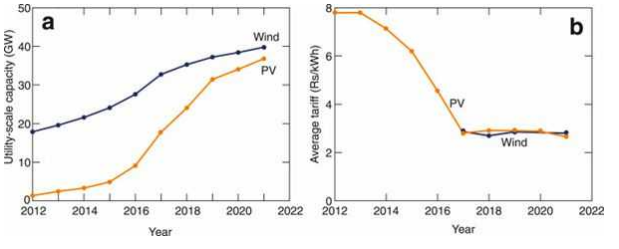


climate commitments.

The federal political-economic structure of the Indian power sector.

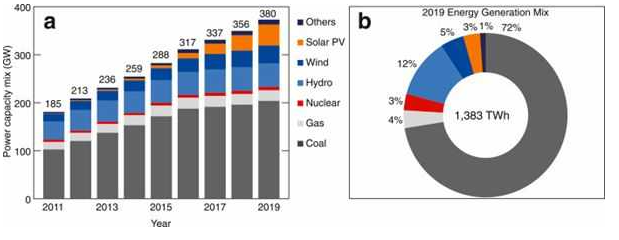
Policy pulls and market forces have unleashed rapid RE progress with cumulative installed PV and wind capacity at 46 GW and 40 GW, respectively. Concurrently, average utility-scale PV and wind tariffs have dropped, respectively, by 66% and 27%.

While coal still dominates India's total power capacity and energy generation mix, PV and wind's combined share of power capacity has surpassed 20%. India's installed PV and wind capacities are the fifth and fourth largest in the world, respectively. Recent RE tariffs of Rs 1.98–3.0/kWh ($0.03–0.04/kWh) are among the



world's lowest.

Annual Indian a) cumulative installed utility-scale PV and wind capacity and b) weighted average utility-scale tariffs at auction. Data



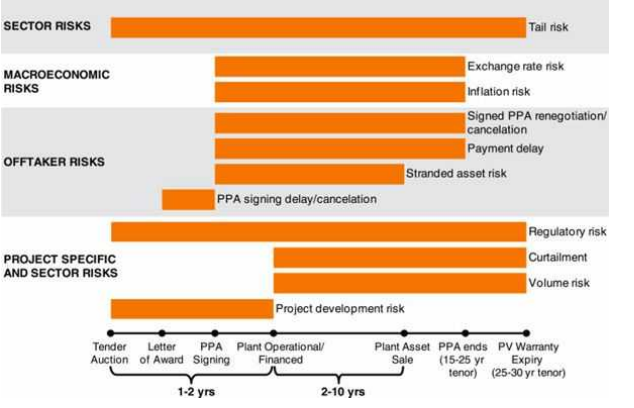
courtesy of Bridge to India.

India's power generation mix by a) annual cumulative capacity b) generation in 2019. PV capacity is in DC. Data courtesy of BNEF

All eyes are watching India navigate its energy transition. Sector financing must scale rapidly to meet this target. Mobilizing needed capital will be difficult given the complex renewable energy (RE) sector investment risks.

The financial distress of India's DisComs is emphasized in the paper along with its troubling impact on RE investments. Subsequently, nine strategic sector investment risks and corresponding mitigation strategies are discussed: project development risk, offtaker risk, stranded asset risk, volume risk, curtailment, regulatory risk, inflation, exchange rate risk, and tail risk.

The paper details offtaker risk, the most significant risk. Risks derive from politicization of the power sector, poor legal contract enforceability, a competitive market environment of rapidly falling RE tariffs, and inflexible power procurement models. These have led to a status quo where project execution is difficult, and DisComs have neither the ability nor incentive to make timely payments, honour contracts, and facilitate private



distributed RE projects.

Timeline of strategic investment risks over an RE project's life.

Prior efforts to reform DisComs–including three bailouts in the last eight years–have failed to make lasting improvements because the centre has limited constitutional ability to unilaterally reform the power sector. It instead can only rely upon its soft power to incentivize or coax states to reform.

Central offtakers now dominate utility-scale auction capacity as intermediaries to insulate IPPs from directly contracting with risky DisComs Presently billions of dollars have been invested in this large market for 7–9% USD returns and growth opportunities.

Current investors, however, are neither investing at the levels nor the rate required to meet India's 450 GW target. The ultimate resolution to

offtaker/stranded asset risks would be a combination of major policy reform and adoption of more flexible power procurement models. How, if, and when these transpire remains uncertain.

The trajectory of new RE project tariffs (i.e., continuing fast declines) will shape future PPA signing delay/renegotiation and stranded asset risks. Tariffs will be determined by PV module costs and financing costs.

Present drivers for higher module costs are inflationary pressures, supply-chain bottlenecks, silver price increases, module made-in-India auction requirements, and announced 40% import duty. Competing drivers for lower module cost are PERC technology improvements and manufacturing scale-up, and fierce manufacturer competition. Financing costs will be determined by evolving international/domestic interest rates, plus the sector risk premium.

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