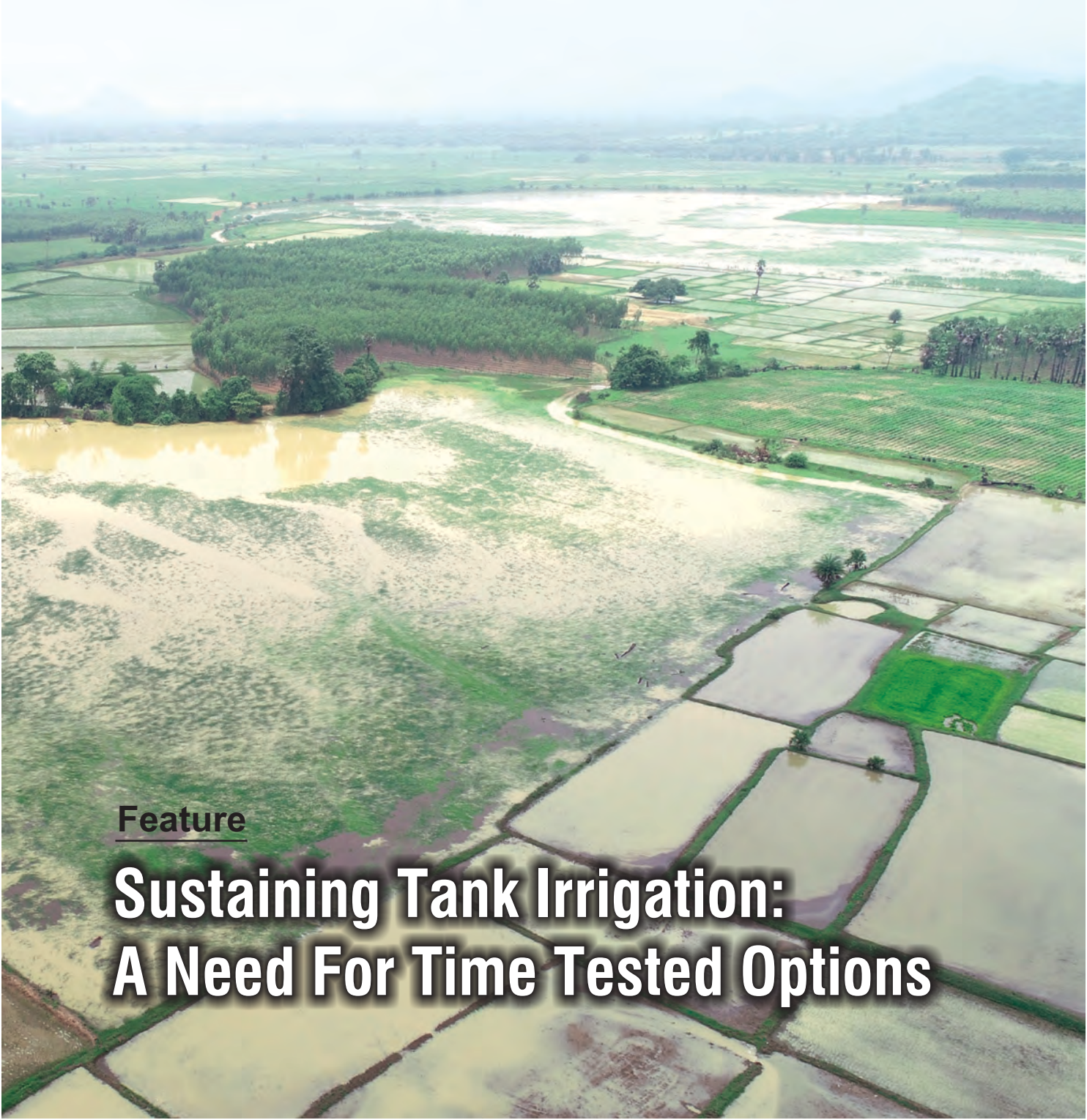
March 2020

Development Matters

Monthly Development update from DHAN Collective



Feature

Sustaining Tank Irrigation: A Need For Time Tested Options

Development Matters
Monthly Development update from DHAN Collective
Vol. X Issue 3 March 2020

Vayalagam People Insitutions in Munger Region, Bihar are enabled to conserve and develop 29 Ahars, 16 Pynes and also to excavate 25 Farm Ponds to the tune of Rs.15.72 million. A wide range of soil and moisture conservation activities were also implemented to the tune of Rs.17.20 million ensuring an additional water storage capacity of 1.29 lakh CuM. during the year 2019-20.

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From the Editors' Desk

Dear Readers,

We are happy to bring you the March 2020 issue of Development matters focusing on Water Inclusion. DHAN's more than twenty five years expertise in water conservation activities transcended the conventional way of implementation; enabling the community to be implementing agencies rather than just passive benefactors.

The lead article in this issue signifies the historical evidence of tank irrigation against the existing modernization-led tank irrigation. There are articles briefing the collaboration with international and national agencies and government entities in rejuvenating activities and in attenuating the land-water pollution through advocating mitigate measures. DHAN's way of enabling community in water conservation and livelihood activities in South Bihar are also captured in the issue. Ancestral ingenuity in constructing water bodies and the deterioration of water bodies and their qualities due to various reasons are also featured in the issue

We welcome your suggestions and feedback on the articles featured in the Development Matters. Please write to us at dhancdc@dhan.org

Happy Reading!

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Sustaining Tank Irrigation: A Need for Time Tested Options

Palanisami K *

Climate change and water supplies

In South Asia, climate change will affect water supplies where floods and droughts with high intensity are expected in the future. The predicted increased variability of precipitation, which includes longer drought periods, would lead to an increase in irrigation requirements, even if the total precipitation during the growing season remains the same. Hence, water storage is considered more important to conserve the flood waters due to intensified rains. Therefore, increasing water storage becomes the key adaptation response. Further, the impact of climate change is likely to be higher in rainfed regions, where tanks are often the major source of water storage and groundwater recharge. The experience of irrigation tanks and water harvesting structures dates back to centuries across much of peninsular India and illustrates both the potential and challenges of this adaptation response (Palanisami et al, 2010). Hence, it is important to address how best tanks could be restored so that they could act as better water storage structures in the future.

Southern India is noted for the intensity of tanks. Unlike the northern region, the rivers in the south are mostly seasonal and the plains are not very extensive. Further, the geology is not favourable for groundwater storage. The local topographic variations have been effectively exploited to impound rainfall in tanks which are used to raise irrigated rice crop and simultaneously serve as means of improving groundwater recharge in their command areas. There are about 120,000 tanks in the southern region consisting of the States of Andhra Pradesh, Tamil Nadu and Karnataka. Among the southern States, Tamil Nadu alone has about 39,300 tanks with varying sizes and types of which 12% are system tanks (which receive supplemental water from major streams or reservoirs in addition to the yield of their own catchment area); about 88% are non-system/rainfed tanks

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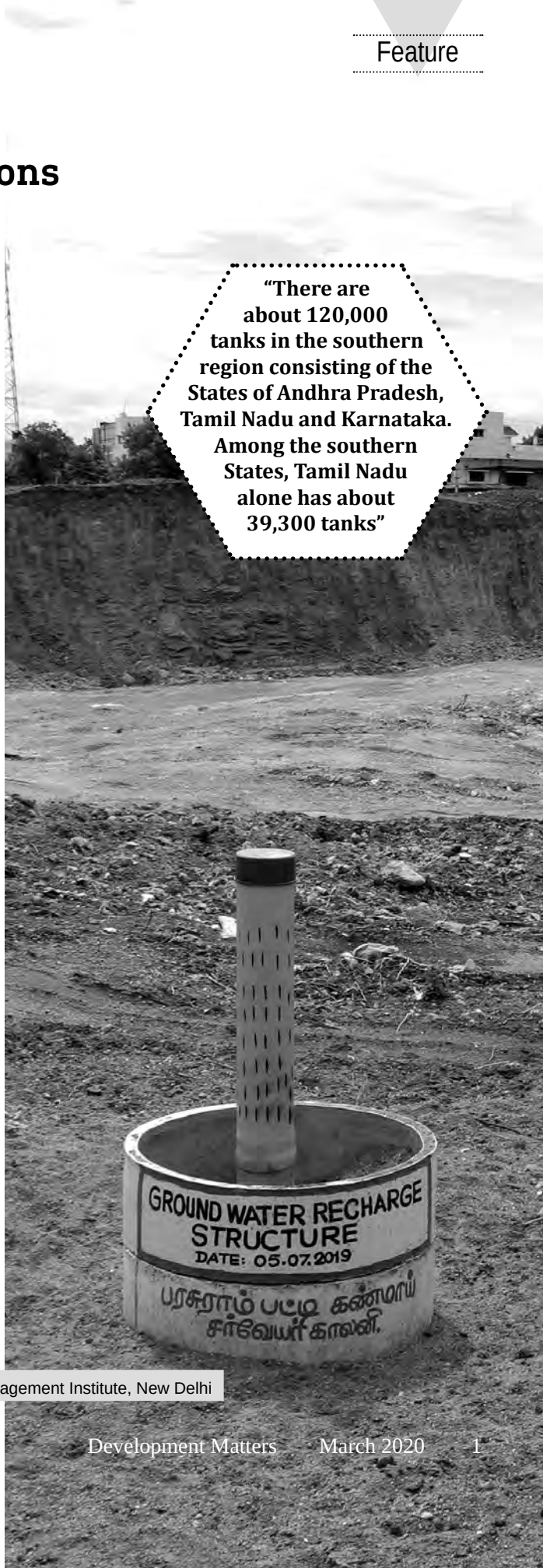

* **Mr. Palanisami K,** Emeritus Scientist, International Water Management Institute, New Delhi

(which depend on the rainfall in their own catchment area and are not connected to major streams/reservoirs). The total storage capacity of these tanks in the State is about 9,840 million cubic metres (mcm) compared to 6,896 mcm under all the major and medium reservoirs in the State indicating that tanks offer more scope for storing the surplus water from floods.

Tank performance & modernization

The performance of tanks in terms of irrigating the target command is slowly declining for the past 2-3 decades and as a consequence, tank rehabilitation programmes were initiated during the early 1980s. Bilateral agencies like European Economic Community (EEC), World Bank and Ford Foundation have supported rehabilitation programmes in States like Tamil Nadu during 90's. NGOs such as Professional Assistance for Development Action (PRADAN) and Tarun Bharat Sangh (TBS) in Rajasthan; Gram Vikas in Karnataka; Development of Humane Action (DHAN) Foundation in Tamil Nadu and Andhra Pradesh; Society for Promotion of Wastelands Development (SPWD) in different States, have also initiated programmes to revive these traditional systems. DHAN Foundation, on the other hand mainstreamed the tank conservation, watershed development and Ahar-Pyne renovation in the states like Tamil Nadu, Telangana, Bihar, Andhra Pradesh, Karnataka and Odisha during new millennium and are enhancing sustainable tankfed agriculture and improved livelihoods of small and marginal farmers and landless as well.

State governments were not only partners in the large initiatives but also initiated large tank renovation programmes on their own with the support from bilateral agencies like World Bank (Reddy et al 2018). Every funded programme has its priority of interventions and accordingly tank performance also varied. For example, a study done on the EEC modernized tanks in Tamil Nadu has shown that the overall performance of the modernized tanks is not satisfactory (Palanisami, 2008). The main reason for this is the absence of follow-up maintenance activities in the programme tanks, where the systems were going back to pre-programme status. This clearly raises the sustainability of the rehabilitation programmes in the absence of budgetary provision for follow-up maintenance. This is also reflected in other studies as where a major complaint from the farmers was that rehabilitation has been treated as a one-off activity with no follow up from either the implementing agency nor the funding agency to provide advice and/or to carry out minor modifications and repairs, if any (ADB, 2006). On the other hand, some of the NGO implemented programmes have indicated better performance in terms of impact and sustainability (Reddy and Behara, 2009).

What's next? Some Time tested options

Selective modernization

"Existing capacity building and awareness programmes in the rural sector should be revised to suit the tank based villages. The role of NGOs is more crucial in achieving this"

For greater benefits as well as cost effectiveness, it is important to identify selective modernization strategies to suit different regions and tanks. Some of the important tank modernization options include full/partial desilting, strengthening the sluices and weirs, removing encroachment in supply channel and catchment and improving the water distribution systems below outlet and removing the prosophis tress in the waterspread area and ayacut area. According to the local needs, these options could be planned for implementation at tank cascade level involving the local communities.

Stabilizing groundwater supplementation

Tanks get full storage only in three out of ten years; in the remaining years, groundwater supplementation is needed. Currently about 15% of farmers have wells for supplementation. As such, groundwater supplementation reduces the variability associated with tank water. In the below normal tank supply periods, if groundwater is not supplemented then crop yield will be drastically reduced or crop will fail completely. The stabilization value of groundwater (the economic value of reducing variability in production) helps justify better investment in wells in different tank command areas. It is argued that both tank and well irrigation should be used as complementary rather than substitutes, in order to maintain a hydrological balance and manage water resources sustainably in the long run. In fact, the increase

in well irrigation is identified as the single most important factor responsible for the collective management of tank systems in Tamil Nadu in recent years. Many tanks can increase the number of wells by 25% to provide more widespread access to groundwater in the tank command areas. Technical aspects like geo-hydrology, soils, land use etc., need to be considered when planning and designing tank rehabilitation and groundwater development. Only those tanks with a long history of very low storage can be examined for converting them into percolation ponds.

Developing climate and hydrological models

Generation of climate and hydrological information at an appropriate scale should be given high priority. Particularly, monitoring rainfall quantum and intensity at tank cascade level are important as they influence the runoff and tank filling. It has been observed that even during "normal/good rainfall" periods, many tanks do not receive their designed supplies. Currently the rain-gauges are available in the block offices only and periodical measurement of the intensity of the rains is not followed. Restoration of the tank cascade and installing the rain-gauge stations at selected locations within the cascade will help to measure rainfall intensity and estimate the exact relationship between tank storage and rainfall pattern. This will answer many questions on tank storage and using this information, it is possible to group the tanks in line with their potential for effective tank filling and modernization.

Enhancing livelihood opportunities in the villages

Farmers' livelihood options should be enhanced by stabilizing their income every year irrespective of the quantum of tank filling so that their dependence on tanks will be sustained without migration. This is possible by strengthening their livestock assets, diversified crop pattern with marketing options, social capital, and off-farm based employment within the village. Existing capacity building and awareness programmes in the rural sector should be revised to suit the tank based villages. The role of NGOs is more crucial in achieving this. It should be ensured that the rural employment under National Rural Employment Guarantee Programme (NGEGP) should be integrated with only effective tank based activities.

"The State of Telangana has embarked on an ambitious tank rehabilitation programme, viz., 'Mission Kakatiya' through which it is planning to restore 9,306 tanks every year (20% of total tanks) with an eventual target of restoring the entire 46,531 tanks in five years, in a phased manner to bring 0.45 million ha. into command"

Scaling up tank modernization

Scaling up of tank modernization both at the national and State level is important for sustaining the substantial benefits to the local communities. Therefore, the efforts and allocations towards tank rehabilitation needs to be increased significantly. Financing of tank rehabilitation needs to be modified to asset based planning instead of the one-time programme based approach, in order to ensure sustainability of the tank systems in the long run. This could be done following a life-cycle cost approach (LCA) where capital (asset) management is part of project costing (Reddy et al 2018). The present cost of development of tank irrigation projects is about 1 lakh per ha for new projects (around 40 ha command area) and Rs 60,000 per ha for rehabilitation project compared to Rs. 3.75 lakhs per ha for Major & Medium projects. If the hidden costs behind Major & Medium projects are included, they would prove even more costly. The State of Telangana has embarked on an ambitious tank rehabilitation programme, viz., 'Mission Kakatiya' through which it is planning to restore 9,306 tanks every year (20% of total tanks) with an eventual target of restoring the entire 46,531 tanks in five years, in a phased manner to bring 0.45 million ha. into command. Main activities include de-silting, repairing of sluices, weirs, strengthening of tank bunds, repairing the feeder channels and re-sectioning of irrigation channels. It is important to think about implementing such models with needed changes to suit different states.

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Partnership for Enhancing Environmental Capacity

WKC and Team*

Agricultural and Water Pollution in South Asia, a South Asia Environmental Capacity Program is a three-year project funded collaboratively by the US Department of State and Caritas-Switzerland (CACH). The project partners are DHAN Foundation (India), Li-BIRD (Nepal), Caritas Bangladesh (Bangladesh) and Arthacharya Foundation (Sri Lanka).

Overview

The South Asian region is one of the most densely populated regions and accommodates a high percentage of the poor population. It remains less connected in terms of global trade (less than 5% intra-region). Though South Asia is considered an emerging economy, millions of citizens struggle to secure their food and nutritional requirements year round. Across the region, Agriculture is one of the important livelihoods especially in rural areas. With a huge potential and scope for South Asia Regional Connectivity, the US Department of State, Bureau of South and Central Asia Affairs announced a call for proposal to address the growing threat on agricultural water and land based pollution in the region, as this is considered as a slow ticking bomb and a major factor of concern as it plays a role in degrading the environment.

Agricultural pollution refers to biotic and abiotic byproducts of farming practices that result in contamination or degradation of the environment and surrounding ecosystems, which harms human lives as well as economic interests. The abiotic sources include pesticides, fertilizers, metals and the biotic sources include greenhouse gases from fecal waste, invasive species and animal waste[1].

"India generates over 40 million tonnes of waste every year. The plastic bottles consumed in India is approximately 6000 tonnes. Unfortunately, only 50% of the plastic bottles are recycled and the remaining goes to landfills"

Water pollution refers to the contamination of water bodies viz., lakes, rivers, oceans, aquifers and groundwater. This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

India – Water and Land Pollution – An ant's eye view

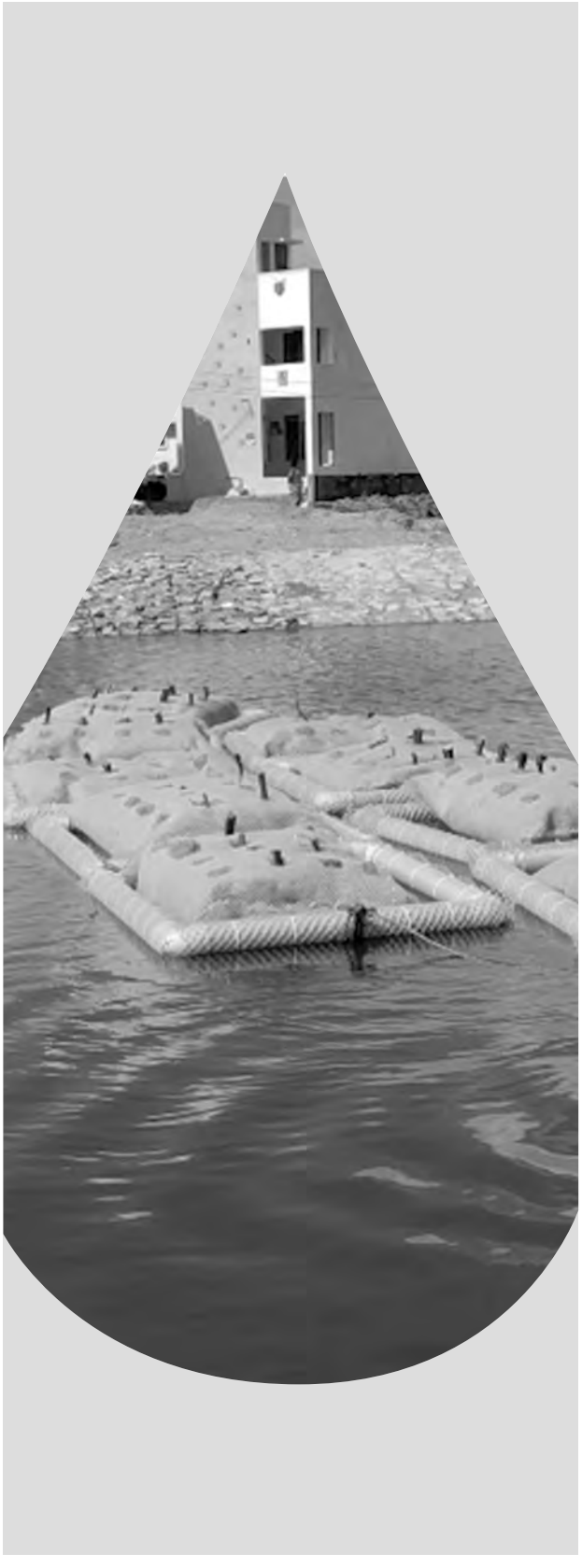
The main challenges in the Indian water sector include pollution from untreated domestic sewage and industrial waste, exploitation of groundwater, faltering rainfall patterns, low storage per capita and so on. It is estimated that about 38,000 million liters per day (MLD) of sewage and industrial pollutants are generated in the country, which were discharged by the cities into the water chain completely untreated. In addition, non-point sources of pollution such as pesticides and fertilizers that run-off from fields also contaminate water-sources[2] .

India possesses 14 major rivers, 44 medium rivers and at least 55 minor rivers. The total length of rivers in India is approximately over 45000 kms. But there is no legal framework available to protect the rivers and the various ecosystems that the rivers provide. Rivers are miserably seen as the carrier of pollution[2]. The main source of land pollution in the country is due to the industrial wastes and human littering and garbage. About 80 percent of river pollution in the country is due to excreta.

India generates over 40 million tonnes of waste every year. The plastic bottles consumed in India is approximately 6000 tonnes. Unfortunately, only 50% of the plastic bottles are recycled and the remaining goes to landfills. In addition, the country generates over 3.5 lakh tonnes of e-waste[3].

Due to water pollution an estimate revealed that annually around 37.7 million people in India are affected by waterborne diseases, 1.5 million children are estimated to die of diarrhea alone and 73 million working days have

* Water Knowledge Centre and Team



"According to the Central Pollution Control Board (CPCB), India's urban cities' wastes will get collected to a tune of 91 per cent, wherein only 27 per cent is treated and the rest is disposed in landfills"

been lost due to waterborne diseases. The resulting economic burden is about USD 600 million per annum. The drinking water is also contaminated with poor chemical quality and about 200,000 habitations is India had access to this poor quality of drinking water. The major chemical parameters of concern are fluoride and arsenic. Iron is also emerging as a major problem.

South Asia is a region well known for its rice production and consumption. Experts postulated there will be reduction in the paddy productivity in South Asia by 14 per cent due to climate change events[4].

India's waste production will double in the next 25 years. According to the Central Pollution Control Board (CPCB), India's urban cities' wastes will get collected to a tune of 91 per cent, wherein only 27 per cent is treated and the rest is disposed in landfills. Despite the Rules of Solid Waste Management framed in 1976, their implementation was almost zero. In 2016, the revised Solid Waste Management Rules with zero-waste management approach was evolved. It provided scope for segregation of garbage at the source, decentralized management of discards, resource recovery and initiatives to bring waste-pickers into the mainstream for better collection and recycling. The Plastic Waste Management Rules 2016 and E-Waste Management Rules 2016 also pave way for extended producer responsibility (EPR).

"In India presently the usage of pesticide has increased by 750% when compared to the mid-1900s"

For example, in India presently the usage of pesticide has increased by 750% when compared to the mid-1900s. Even pesticides prohibited by international standards have been detected in Ganga

river. In the Asian region, two key steps are needed to check pollution: one is prevention and the other is monitoring. Many countries in the Asian region have passed water quality acts and issued laws to prevent pollution and protect receiving waters. Unfortunately, enforcement of acts or rules is challenging, especially in emerging economies, where institutional capacities cannot keep pace with rapid industrialization, and economic instruments like taxation and removal of fertilizer subsidies clash with development goals[6].

In India, Telangana is one of the highest pesticide consuming states/provinces in the country. Farmers' spend Rs.5000 per acre on fertilizers and pesticides. A news report revealed that in 40.52 lakh hectare land, about 37 lakh hectare use pesticides. Out of 4,943 Metric tonnes of pesticides consumed in 2017-18, about 4,866 Metric tonnes pesticides are chemical in nature and 77 Metric tonnes are bio-pesticides. The Cereal crops consume huge quantities of pesticides to a volume of 2000 MT followed by the vegetables to the tune of 1000 MT and the remaining balance was used by oil seeds and pulses[7].

As for tube wells, they were soon caught in a vicious infinite regress, wherein the solution to a problem began to aggravate the problem itself. Water tables began to fall and serious water quality issues such as uranium, arsenic and fluoride in the drinking waters started to appear. This happened especially because 70 per cent of India's land mass is underlain by hard rocks, which have a very low rate of natural recharge. A shift towards non-chemical agriculture could help save huge amounts of water, apart from being much more cost-effective and resilient to ecological shocks[8].

Project on South Asia Environment Capacity Building-Agricultural and Land based Water Pollution in South Asia:

There are two primary goals to the project: (i) promote sustainable agriculture and related water

resource management by providing technical assistance and training on regulatory and policy strategies and (ii) promote regional level collaboration and coordination among public and private sector to promote the nexus of water, energy and agriculture/food security by organizing water conference and knowledge sharing among partner countries.

Projected Outcomes

Objective 1: Take stock of national policies, strategies, guidelines, directives and other government documents on agriculture, livestock and other land-based water pollution and identify policy gaps and capacity building needs at national and regional levels

Outcomes: Countries/provinces take initiatives to address the gaps in policies and strategies related to agriculture, livestock and other land-based water pollution (LBWP)

Objective 2: Strengthen country and regional capacity to address challenges pertaining to land-based water pollution and its impact on ecosystem, biodiversity, human health and livelihoods

Outcomes: Capacity of national and regional multi-stakeholder institutions in South Asia enhanced in addressing the problems of land-based water pollution

Objective 3: Pilot, test and exchange high-impact water pollution mitigation technologies and practices, and improve agricultural productivity and human health through action research

Outcomes: Innovative technologies and practices piloted at local and landscape levels for reducing/mitigating land-based water pollution

Objective 4: Establish a regional level multi-stakeholder and multi-disciplinary mechanism to promote regional connectivity for reducing land-based pollution

Outcomes: Effective regional partnership and cooperation established among policy makers, experts and other stakeholders to reduce land-based pollution in country and regional levels

Concrete Deliverables

DHAN Foundation has committed to deliver the key following deliverables at the end of project i.e., by October 2020:

a) Policy Brief as an outcome of reviewing national level and state level policies in vogue on the subject
b) Documentation of Best Practices and Publishing Compendium on low External Inputs to sustain agriculture
c) Bringing out ICT materials to sensitize communities, relevant development stakeholders like government line departments, agrochemical dealers, Academia & Research
d) Undertaking action research and Pilots and publishing success stories
e) Rolling out an online course on Agriculture water pollution for Project Partners and Stakeholders

* WKC – Water Knowledge Centre

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Watershed Development Activities in South Bihar

Vinay Kumar *

Indigenous system in South Bihar

"As on March 2020, DHAN Foundation is working in 31 panchayats (covering 111 villages) in Munger region"

Natives of South Bihar have foreseen that many areas are unsuitable for rice cultivation both in terms of physical access and shortage of rainfall. With their ingenuity they have devised systems through which the natural flow of water is blocked and water impounded for usage. They have also changed the course of rivers. In order to prevent the water from being wasted, long narrow artificial channels called *'Pynes,'* are led off from the rivers by means of which the water is fed to the fields. The water is impounded in extensive reservoirs called *'Ahars,'* which are formed by constructing a series of retaining embankments across the lines of drainage.

These Ahar-Pyne irrigation systems, an indigenous river-diversion cum storage systems existed in south Bihar for many centuries. These systems' prominence and relevance can also be found prevailing in Koutilya's Asthashastra. Ahar-Pyne systems as a source of irrigation were quite prominent during the Zamindari Era from the late 18th century till the middle of 20th century.

Due to poor maintenance over the period of time, many of the structural components viz., diversion structures, Pyne banks and Ahars have been damaged beyond repair and do not exist today.

Munger district

DHAN Foundation in collaboration with Sri Dorabji Tata Trust (SDTT), Mumbai implemented water conservation activities in Gaya region, Bihar. Based on the Gaya experience, DHAN Foundation in collaboration with ITC (Mission Sunehra Kal (MSK)) implemented watershed development activities in Munger district.

* **Mr. Vinay Kumar,** Senior Project Executive, DHAN Foundation

In Munger district the average rainfall is very low and most of the agriculture activities depend on the rain water. Although the Ahar-Pyne system is extremely effective in this district, most of the Ahar-Pyne systems were dismembered due to poor maintenance and lack of community support. The project aimed at providing cost-effective irrigation methods for cultivation of crops. Ensuring availability of water for irrigation and creation of livelihood was of paramount importance. Support through various training programs besides addressing the food security related issues have been conducted.

DHAN Foundation's Watershed development activities under ITC MSK commenced in November 2015 in three blocks in Munger district viz., H. Kharagpur, Tarapur and Asarganj. In the financial year 2017-18, DHAN expanded its watershed activities in one more block called, 'Dharhara.' As on March 2020, DHAN Foundation is working in 31 panchayats (covering 111 villages) in Munger region: seven panchayats (27 villages) in Tarapur, six panchayats (23 villages) in Asarganj, thirteen panchayats (43 villages) in H. Kharagpur, five panchayats (18 villages) in Dharhara.

Institution building

DHAN Foundation organizes the unorganized farming communities in the rural areas and builds them

"For the FY 2019-20, 1.29 lakh CuM. of extra storage of water has been created through renovating 29 Ahars and 25 Farm ponds"

into institutions called, 'Vayalagams.' DHAN believes involvement of the community brings the due impact of transparency as well as sustainability of the renovation works at the planning, execution and maintenance stages. These Vayalagams play a significant role in identifying the renovation works for the Ahar-Pyne systems. Vayalagams of the respective Ahar-Pyne systems hold the responsibility and accountability for administering all the renovations works. Almost all the renovation works of the water bodies, CSRs or stakeholders contribute 80 per cent of the cost, whereas the community contributes the remaining 20 per cent. The prominence of the community contribution is an indicative measurement of community owning the water body. Vayalagams formed in the community are instrumental in ensuring the community's contributions. Vayalagams also play a significant role in preserving the structures in post-renovation. Till 31 March 2020, the cumulative number of Vayalagams is 1126 with 6845 members in the four locations of the Munger region.

AFGs: Facilitating Finances

DHAN Foundation in order to facilitate finance to farmers as well as agricultural labourers organizes them into groups (12 to 20 members) called, 'Agriculture Finance Group (AFG).' These AFGs serve as micro banks inside the community, where monthly savings, internal lending will be processed during AFG monthly meetings. All the eligible groups – groups with regular savings and timely internal lending – will be linked to the banks and subsequently the eligible AFGs will avail bank loans. Farmers and agriculture labourers avail the loans for purchasing seeds, fertilizers and other agricultural equipment; for purchasing livestock, for petty shops, for children's education and for health emergencies. Till 31 March 2020, the cumulative number of active AFGs totals to 169 with 2867 members, with a cumulative savings of Rs. 55.14 lakhs in all the four locations in the region.

Cascade Level Associations

Each location is having different irrigation sources viz., river, pyne channel and ahar. Based on the source of irrigation, all the four locations have been divided into Cascade. Each cascade comprises Ahars and Pynes. In Tarapur block, 45 Ahars and 106 Pynes constitute four cascades. In H. Kharagpur block, 51 Ahars and 83 Pynes constitute four cascades. In Asarganj block, 55 Ahars and 45 Pynes constitute three cascades. In Dharhara block, 36 Ahars and 54 Pynes constitute three cascades. On the whole, Munger region consists of 14 cascades constituting 187 Ahars and 288 Pynes.

Capacity Building

Water conservation activities alone never suffice the socio-economic development of the farmers. Capacity building programmes were organized in various themes viz., Livelihood & Plantation, Ahar- Pyne renovation & Sustainable development, Fishery in Ahar and its Economics, Strengthening Banking & community finance, Goat rearing & fishery, Function of Block Level Coordinating Committee and AFGs; their roles and responsibilities and Resolving conflicts among the Vayalagam; altogether 600 programmes in the six specific themes were organized.

For the FY 2019-20, 1340 plants have been planted on the bunds of renovated Ahars. Plant selection was based on the suggestion of International Union for Conservation of Nature (IUCN) for ensuring biodiversity in DHAN's Munger working area. Zero Tillage mechanism for wheat cultivation has been initiated by providing demo plot support of 45 acres to the farmers. A total of 587 farmers adopted and practiced the Zero Tillage Mechanism in their 571 acres of agricultural land. To arrest the soil erosion, 62 kgs of Doob Grass Seeds (Carpet Lawn) were sown in 32 renovated structures. To enhance the livelihood of the farmers, three training sessions were provided on Mushroom Cultivation and Marketing, Fishery Training and de-worming methods in collaboration with animal husbandry department. A total of 121 farmers have benefited through these training programs.

"Instead of employing machinery, 20 Pynes will be renovated engaging wage labourers, which creates 15000 man days of employment"

Impact

In the year 2019-20, 33 Vayalagams involved in conservation and developmental activities in all the four locations. 33 Vayalagams involved in renovating 29 Ahars, 16 Pynes and 25 Farm ponds at a cost of Rs. 15.72 million. Soil moisture conservation activities at a cost of Rs. 17.20 million were implemented across all the four locations. For the FY 2019-20, 1.29 lakh CuM. of extra storage of water has been created through renovating 29 Ahars and 25 Farm ponds. More than 40982 CMT of excavated soil was utilized in protecting the 2012 acres of land prone to soil erosion. 1398 households were directly benefited by getting irrigation water to their agricultural fields. In the FY 2019-2020, a total of 2857 hectare of command area benefitted from the renovation works implemented in all the four locations. In addition to this, in collaboration with the Soil Conservation department, 17 new farm ponds have been excavated in the agricultural fields of DHAN Vayalagam members in five villages. This prompted the Vayalagam members in other blocks to go for excavation of farm ponds in their own agricultural fields as well.

Financial Year 2020-2021

For the FY 2020-2021, the proposed activities include renovating 49 water bodies in collaboration with ITC Mission Sunehra Kal (Munger) and renovating 40 water bodies through Jal Jeevan Hariyali schemes. Envisaging the unemployment due to lockdown, few incorporations were made in the FY 2020-2021. Instead of employing machinery, 20 Pynes will be renovated engaging wage labourers, which creates 15000 man days of employment. In addition to this, forecasting the unemployment, DHAN Munger team initiated the process of enrolling the eligible members in MGNREGA scheme. So far 245 members have been identified with no job cards and initiations are being carried out to enroll them in MGNREGA scheme. To execute the renovation works immediately after the lockdown, 13 NOCs have been procured by the Vayalagam leaders. To enhance the livelihood activities of the farmers, 50 training programs (including Water Literacy Programmes and Participatory Irrigation Management) will be organized in the financial year 2020-2021.

Water Quality Assessment of Village Drinking Ponds

Praveen Kumar S *

Village drinking water ponds also known as Ooranies are traditional rainwater harvesting structures, which have been serving as drinking water sources for villages as well as for small towns of India for many centuries. These traditional water bodies are now under threat due to lack of maintenance by the local administration and the community. The interventions of various other sources viz., piped water supplies and bore wells have also contributed to the degradation. Lack of maintenance and other available sources reduced the communities' dependency on these local water bodies. Nevertheless, several villages in the southern part of the country still depend on these Ooranis for domestic water purposes. One such block is Thiruppulani block. Ooranis are prevalent in most of the villages in the block, wherein villagers are utilizing the water for domestic purposes and many of the poor families are even utilizing the water for drinking purposes after filtering the water via local methods viz., boiling the water and filtering using porous clothes. To revive the traditional water bodies in Thiruppulani block of Ramanathapuram district, DHAN Vayalagam Tankfed Foundation (DVTF) in collaboration with National Stock Exchange of India (NSE) Foundation, proposed to renovate 70 water bodies consisting of 30 Irrigation tanks and 40 Ooranies.

Study Area and Methodology

Villages

In the first phase of the proposed intervention, fifteen villages were selected to carry out the water quality assessment in the water bodies viz., Pallapatcheri, Kaikilarmadam, Thinaikulam, Vellaiyanvalasai, Mottaiyanvalasai, Pathiratharavai, Keelathilaiyenthal, Kulapatham, Velanur, Karukkathi, Kombuthi, Kalari, Nallirukkai, Pukkulam and Panaikulam.

Sampling Timeline

Three rounds of samples were collected to assess the basic water quality parameters of the Ooranies in all the fifteen villages. Foreseeing the seasonal variations on the water quality, samples were collected in three seasons: sample 01 before the onset of monsoon (November), sample 02 during the monsoon (December) and sample 03 after the monsoon (February).

Parameters Tested

The physical and chemical parameters of the samples collected have been tested and the results were compared with the permissible limits of the drinking water quality standards issued by the Bureau of Indian Standards. The results were thus analyzed to conclude the suitability of utilization.

Physical parameters include: Appearance, Colour, Odour, Turbidity (NTU; Nephelometric Turbidity Unit), Electrical Conductivity (EC) and Total Dissolved Solids (TDS).

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Chemical parameters include: pH, pH Alkalinity as CaCO3, Total Alkalinity as CaCO3, Total Hardness as CaCO3, Calcium (Ca), Magnesium (Mg), Total Iron (Fe), Sodium (Na), Potassium (K), Free Ammonia (NH3), Nitrite (NO2), Nitrate (NO3), Chloride (Cl), Fluoride (F), Sulphate (SO4) and Phosphate (PO4).

Test Analysis

The collected samples test results when compared against the permissible limits clearly indicated that some of the Ooranis results were exceeding the permissible limits. For better understanding of the analysis, parameters such as pH, Turbidity, Total Dissolved Solids, Total Alkalinity, Total Hardness, Ammonia, Iron and Phosphate are being portrayed in the article.

1. Turbidity

Turbidity is the measure of the light scattered by suspended particles. It consists of suspended particles in water and is usually affected by factors such as clay particles, dispersion of plankton organism, particulate organic matter as well as pigments caused by decomposition of organic matter. The permissible limits of Turbidity for drinking water as per BIS are 1 NTU to 5 NTU. Among the 15 village Oorani samples, 'Mottiyanvalasai village' water sample collected during November (before the monsoon) was within the permissible limits. All the remaining samples were exceeding the permissible limits, ranging between 110 NTU (min.) to 700 NTU (max.) in November, 16 NTU to 440 NTU during December and 40 NTU to 900 NTU in February.

Village	5-Nov-19	20-Dec-19	27-Feb-20
Pallapatcheri	390	280	210
Kaikilarmadam	330	210	350
Thinaikulam	480	240	420
Vellaiyanvalasai	600	70	900
Mottaiyanvalasai	4	16	40
Pathiratharavai	300	200	120
Keelathillaiyendal	110	100	150
Kulapatham	110	75	160
Velanur	380	250	140
Karukathi	600	220	105
Kombuthi	700	380	220
Kalari	370	250	350
Nallirukkai	115	90	90
Pukkulam	580	400	420
Panaikulam	540	440	240

2. Total Dissolved Solids (TDS)

Total dissolved solids (TDS) indicates the existence of various kinds of minerals in water. The permissible limits for TDS as per BIS are 500 mg/l to 2000 mg/l respectively. Test results indicated that all the 15 village Oorani samples were well within the limits, during all the three seasons. The results of the test ranges for samples collected during November is 74 mg/l (min.) to 1533 mg/l (max.), during December is 63 mg/l (min.) to 1190 mg/l (max.) and February is 113 mg/l (min.) to 553 mg/l (max.).

3. pH

The pH (Potential Hydrogen) of a solution refers to its hydrogen ion activity and is expressed as the logarithm of the reciprocal of the hydrogen ion activity at a given temperature. The permissible limits of pH in drinking water are between 6.5 and 8.5. In November and December, all the 15 village Oorani samples were well within the permissible limits. In February (after the monsoon), Kaikilarmadam and Velliyanvalasai village Ooranies were exceeding the permissible limit and test results reported 8.6 and 9.2 respectively. In November, all the test sample results reported between 6.8 (min.) and 8.45 (max.); Mottaiyanvalasai village Oorani sample reported the maximum value of 8.45 indicating that the water is more alkaline and the remaining samples reported values less than 7.8. In December, all the test sample results were between 7.2 (min.) and 8.1 (max.), indicating the increase in the alkalinity during the monsoon.

4. Total Alkalinity

Water alkalinity is a measure of its capacity to neutralize acids and the buffering capacity of the water. The permissible limits for total alkalinity (as CaCO3) according to BIS are 200 mg/l to 600 mg/l. Test results reported all the samples were well within the limits. In November, all Ooranies except 'Mottaiyanvalasai' Oorani reported well below the acceptable limit of 200 m/l; ranging between 0 mg/l to 100 mg/l. In December, Velliyanvalasai, Mottaiyanvalasai, Kulapatham village Ooranies sample results reported are 100 mg/l, 400 mg/l and 140 mg/l respectively. In February month, six village Ooranies reported the test results above 100 mg/l. These test results indicate many Ooranies are acidic in nature, even in the monsoon periods.

5. Total Hardness

Hardness of water is a measure of its capacity to form precipitates with soap and scales with certain anions present in the water. Total hardness of water is used to describe the effect of dissolved minerals (mainly Ca and Mg), which determines the suitability for domestic and industrial purposes which is attributed to the presence of bicarbonates, sulphates, chlorides and nitrates. The permissible limits for Total hardness as per BIS are 200 mg/l to 600 mg/l. All the samples were well within the limits. But many samples reported values less than 100 mg/l. In November, the test results ranged between 36 mg/l (min.) to 540 mg/l (max.). In December, the test results ranged

between
32 mg/l (min.)
to 440 mg/l (max.).
In February, the test results
ranged between 40 mg/l (min.) to 120
mg/l (max.).

Village	5-Nov-19	20-Dec-19	27-Feb-20
Pallapatcheri	36	32	48
Kaikilarmadam	40	36	60
Thinaikulam	40	36	40
Vellaiyanvalasai	40	88	100
Mottaiyanvalasai	540	440	100
Pathiratharavai	60	60	120
Keelathillaiyendal	60	60	60
Kulapatham	100	160	100
Velanur	60	64	100
Karukathi	60	40	40
Kombuthi	80	60	60
Kalari	60	48	40
Nallirukkai	120	120	120
Pukkulam	60	60	60
Panaikulam	60	60	60

6.Ammonia

Ammonia's natural presence in the water bodies arises from the microbiological decomposition of nitrogenous compounds in organic matter. Fish and other aquatic organisms also excrete Ammonia. Ammonia may also be discharged directly into water bodies by some industrial processes or as a component of domestic sewage or animal slurry. Ammonia can also arise in water due to the decay of discharged organic waste. The permissible limit of free ammonia (as NH3) is 0.5 mg/l. In November, the test results reported between 0.41 mg/l (min.) and 1.12 (max.). In December, the test results reported between 0 mg/l (min.) and 0.83 mg/l (max.). In February, the test results reported between 0.588 g/l (min.) and 0.99 mg/l (max.). Test results depicted that the values decreased from November to December and then increased in February.

Village	5-Nov-19	20-Dec-19	27-Feb-20
Pallapatcheri	0.86	0.415	0.749
Kaikilarmadam	0.66	0.415	0.583
Thinaikulam	0.747	0.664	0.585
Vellaiyanvalasai	0.83	0.415	0.749
Mottaiyanvalasai	0.41	0.581	0.581
Pathiratharavai	0.83	0.664	0.83
Keelathillaiyendal	0.871	0.83	0.747
Kulapatham	0.747	0.58	0.747
Velanur	0.664	0.747	0.747
Karukathi	1.12	0.664	0.664
Kombuthi	0.99	0	0.83
Kalari	0.83	0.664	0.83
Nallirukkai	0.78	0.581	0.664
Pukkulam	0.74	0.581	0.833
Panaikulam	0.83	0.09	0.99

7. Iron

Iron is an essential mineral, but it has to be removed from drinking water. It is classified as a secondary contaminant. The permissible limits for total iron (as Fe) is 0.1 mg/l to 1 mg/l. All the samples tested contained iron above the permissible limit. Mottaiyanvalasai village Oorani reported within the limit for November month samples but showed 1.2 mg/l in December and 2 mg/l in February. For all the samples, the test results ranged between 0.2 mg/l and 70 mg/l (November), 1.2 mg/l and 24 mg/l (December) and 2 mg/l and 30 mg/l (February). Most samples showed a declining trend from November to December and an inclined trend from December to February. Few samples depicted the reverse trend.

8. Phosphate

The permissible limit of Phosphate is 0.5 mg/l. When analysed the fifteen village Ooranies sample for all the three seasons, it was observed that there was no definite fixed trend. For November, the minimum and maximum values were observed in Karukathi and Kombuthi samples (0 mg/l) and Kaikilarmadam sample (0.85 mg/l). For December, Thinaikulam (0.03 mg/l) observed the minimum and Velanur (2.5 mg/l) observed the maximum. For February, Karukathi (0.195 mg/l) observed the minimum of all the fifteen samples and Pukkulam (1.17 mg/l) observed the maximum value.

Consolidated Water Quality Assessment

1. **Turbidity:** All the Ooranies are above the permissible limit
2. **Total Dissolved Solids:** All the Ooranies allre within the permissible limit
3. **pH:** All the Ooranies are within the permissible limit
4. **Total Alkalinity:** Except Mottaiyanvalasai Oorani which is 307 mg/l, remaining all the Ooranies are below the acceptable and permissible limits.
5. **Total Hardness:** Except Mottaiyanvalasai Oorani which is 360 mg/l, remaining all Ooranies are below the acceptable and permissible limits.
6. **Free Ammonia:** All Ooranies are above the permissible limit.
7. **Iron:** Except Mottaiyanvalasai Oorani which is 1 mg/l, remaining all Ooranies are above the permissible limits.
8. **Phosphate:** Ooranies in– Pallapatcheri, Thinaikulam, Mottaiyanvalasai, Pathiratharavai, Keelathillaiyendal, Kulapatham, Kombuthi, Nallirukkai are within the permissible limits and the Ooranies in – Kaikilarmadam, Velliyanvalasai, Velanur, Karukathi, Kalari, Pukkulam, Panaikulam are above the permissible limits.

The average of three samples is furnished below. Water sample (all the three seasons) test results from all the Ooranies indicated that water is chemically non-potable due to presence of excess turbidity, total iron, ammonia and phosphate. Exception is Mattiyanvalasai Oorani in November, but for the remaining two reasons the test results indicated that it is non-potable.

Index	Parameters							
	Turbidity	**TDS**	**pH**	**Total Alkalinity**	**Total Hardness**	**Free Ammonia**	**Iron**	**Phosphate**
Units	NTU	mg/l	Nos	mg/l	mg/l	mg/l	mg/l	mg/l
Permissible limits	1 to 5	500 to 2000	6.5 to 8.5	200 to 600	200 to 600	0.5	0.1 to 1.0	0.5
Pallapatcheri	293	90	7.27	41	39	0.675	16	0.480
Kaikilarmadam	297	119	7.67	34	45	0.553	16	0.608
Thinaikulam	380	99	7.77	48	39	0.665	22	0.406
Vellaiyanvalasai	523	196	8.05	75	76	0.665	28	0.517
Mottaiyanvalasai	20	1036	7.95	307	360	0.524	1	0.289
Pathiratharavai	207	268	7.50	96	80	0.775	9	0.441
Keelathillaiyendal	120	138	7.55	67	60	0.816	13	0.403
Kulapatham	115	427	7.37	113	120	0.691	10	0.236
Velanur	257	222	7.33	88	75	0.719	15	1.249
Karukathi	308	124	7.60	56	47	0.816	20	0.292
Kombuthi	433	174	7.57	72	67	0.607	27	0.429
Kalari	323	119	7.73	57	49	0.775	22	0.585
Nallirukkai	98	422	7.47	107	120	0.675	7	0.361
Pukkulam	467	231	7.53	71	60	0.718	27	0.878
Panaikulam	407	172	7.67	75	60	0.637	24	0.766

Conclusion:

Back in olden days, the villagers used the Ooranis as the main source of drinking water, which led the community to safeguard the Ooranis in the forefront. Advent of various water supply sources, shifting of management and administration from community to authorities, subsequently communities' complete disengagement with the water bodies –resulted in degrading the quality of water and eventually the water bodies as a whole. Through the proposed intervention, DVTF envisaged to revive these traditional water bodies, subsequently improving their water quality as well. As such it is important to perceive that the water quality will not be improved to the best quality immediately, since it depends on various factors. The first step is to correct the structural deficiencies thereby enhancing the water storing capacity of water bodies. With the persistent efforts, the Ooranies can be improved and restored to their original glory and can be utilized as drinking water sources.

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Urban Waterscape in Madurai – Virtue, Vandalism and Vitalization

Elamuhil S *

"Water above the soil belongs to human, animals and insects;
Water in the soil belongs to plants, trees and creepers;
Water below the soil belongs to God, which should never be touched"

"One of ancient Tamil literatures refers Madurai city as 'Maadakula Keezh Madurai,' meaning Madurai city was established in the downstream of Madakulam Irrigation Tank, indicating the communities' significant reliance on the irrigation tank system"

Karuppayurani is one of the localities in the peri-urban region of Madurai. One of the elderly members in the locality shared the story behind the name Karuppayurani. 'About 500 years ago, a shepherd woman named, *'Karuppayee'*, discovered a spring in the region while she was facilitating the grazing of her goats. Realizing the water is potable to drink, she travelled back to her village to inform the community. As the community was suffering from drinking water scarcity, they then decided to resettle themselves around the spring. They subsequently transformed the spring into a Oorani (pond) and with the excavated soil they constructed their houses. The shepherd woman's family resided close to the Oorani till their last breath. Out of gratitude towards Karuppayee the villagers named the Oorani after her name, Karuppayee Oorani. As the villagers' settlements were based around Karuppayee Oorani, the village was known as Karuppayurani.

The elderly member continued, "all of us used to utilize the Oorani's water for drinking purpose. Only during summer, we used to fetch water from the nearby well. But for the last 30 years, we stopped using the Oorani's water for drinking purpose. Nowadays, we are utilizing water supplied through Cauvery integrated drinking water project".

Today, Karuppayee Oorani is a filthy dump-yard, filled with community waste. Residential establishments have encroached the feeder channel. Space around the Oorani premises is used as cow sheds, wherein the washes of cow dung and urine is polluting the Oorani further. The retaining walls of Oorani have been collapsed. Recently, a temple has been constructed by a particular community (caste) at a corner encroaching the Oorani area; an act of establishing their authority over the Oorani. Now the Karuppayee Oorani as a drinking water source prevails in the stories from elders and in the name of the locality. Karuppayee Oorani is just one among the many such Ooranies whose drinking water/domestic usage purpose have been degraded to filthy dump-yard sites.

Maadakula Keezh Madurai

Like Karuppayurani, most of the villages in Madurai are named after waterbodies that sustained their living and livelihood: *Kodikulam, Thattankulam, Thallakulam, Aalangulam, Kosakulam, Sakkiliyankulam, Ilanthaikulam, Paraiyathikulam, Aathikulam, Sevanthikulam, Melanedunkulam,Karisalkulam, Kananendhal, Kadachanendhal, Thavaranendhal, Thennaneri, Anthaneri, Silayaneri, Koothiyarkundu,* Kosavankundu, are some of the villages that were named after the water bodies the villages depended on. The suffixes –kulam, endhal, eri, kundu– refer to water bodies. One of ancient Tamil literatures refers Madurai city as *'Maadakula Keezh Madurai,'* meaning Madurai city was established in the downstream of Madakulam Irrigation Tank, indicating the communities' significant reliance on the irrigation tank system.

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Wisdom of Waterbodies

The ancient Madurai city was established centering Meenakshi Amman Temple along the banks of river Vaigai and Gridhumal. The rivers being non-perennial, civilizations couldn't have survived just with seasonal rivers. Therefore, each village of Madurai landscape was enriched with large number of surface waterbodies viz., *Eri, Kanmoi, Yenthal, Thaangal, Kulam Kuttai, Kundam, Kuttam, Kundu, Valayam, Oorani, Theppakulam, Theertham, Agazhi* which served their specific purposes. Irrigation tanks *(Kanmoi)*, drinking water ponds *(Ooranis)* were predominantly spotted in and around Madurai with few temple tanks *(Koyil kulam, theppakulam, theertham)*.

"Irrigation tanks were constructed to serve various purposes viz., drinking water source for community as well for livestock, irrigation water source, fish rearing, lotus cultivation, tank bed cultivators, benefitted herb collectors, washer communities and many"

One can witness our forefathers' ingenuity in the layout, planning and construction of these small surface water bodies. All the water bodies were graded according to the contours. The strong hydrological network and the concept of decentralized village administrations were the key factors behind its existence even after centuries. These traditional water bodies are the evidence to prove that the local communities, landlords, kingsmen and kings who created these water bodies had a strong sense of topography, geology, hydrology, hydraulics, climatology which reflected in the designed water bodies.

Construction and conservation of water bodies – A Social Virtue

Irrigation tanks were constructed to serve various purposes viz., drinking water source for community as well for livestock, irrigation water source, fish rearing, lotus cultivation, tank bed cultivators, benefitted herb collectors, washer communities and many. These tanks were administered by decentralized social structures governed by local leaders. They have generated direct revenues through the crop yield, fish rearing, lotus cultivation, tank bed cultivation and produces of tank bund trees. The dependency of the community over the tank for their livelihood and living, developed the sense of *'stake'* over these tanks. Though the *'stake'* was never *'equity'*, the social regulations developed over generations were instrumental to the stability of these tanks and tank based communities.

One of the classic examples for such social regulation is *'Kudimaramathu.' 'kudi'* mean citizens, *'maramathu'* means *'repair/rehabilitation'*. It is a citizen engaged rehabilitation process where communities having stake over these water bodies, involve themselves in renovation activities viz., desiltation, weed removal, bund strengthening and other repair works. This community process was inculcated in the social concise through strict social mechanisms and mythological stories. Though landlords had major hold on decisions over the tank system, communities from various social strata exercised their roles and responsibilities in tank operations and maintenance. *'Neerkatti','Madayar'* and *'Kulathuppallar'* are some of the communities who solely engaged in tank operations. Practice of celebrating festivals (Thiruvizha) for folklore Gods and Goddesses such as *'Ayyanar, Madaikaruppar, Yezhu kannimar, Esakki and Muni'* in the tank bund, connected communities of multiple strata together to work for the common cause; i.e., tank restoration. Ancient Tamil literature also emphasized that *'Creation of groves and ponds are virtues'*.

The Disengagement

When British East Indian Company took hold over these areas, the irrigation works also became the company's property. Revenue officials were made responsible for the maintenance of the tank systems. The orientation of the revenue officials was of no help and later transferred to a section of civil engineers (Public Works Department Water Resources Division). Though the local communities lost ownership over these tanks, their stake existed.

"The built-up area of Madurai City has increased five times (from 13.5 sq.km. to 67.5 sq.km.) in just four decades. This increase in built-up area engulfed almost 60% of agriculture land (command area) and waterbodies"

Construction of dams and implementation of various irrigation projects such as Periyar Main canal (PMC) irrigation and Nilayur Canal irrigation project by the PWD-WRD department 'intensified irrigation'. 'Intensive agriculture' through the green revolution shifted the focus of the community towards direct irrigation and bore well pumps. The implementation of the rejuvenation process was met with differences in Canal Irrigation and Tank Irrigation. As the canal irrigation system needs regular maintenance compared to the tank system, budget allocation for tank

rehabilitation was postponed or neglected. This led to deterioration of the tank system and the community's stake over the tank. The deterioration was further catalyzed by the global factor; urbanization.

Urbanization: The Vandalizing factor

"In 2019, Madurai Municipal Corporation, Hi-Tech. Arai Pvt. Ltd and DHAN Foundation initiated rejuvenating ten Ooranies in Madurai urban"

Post-Independence, Madurai, grew as the third largest city in Tamil Nadu. The city expanded itself as a hub for administration, spiritual tourism, heritage, agro-market and center for the service sector. The *'thoonganagaram'* (Sleepless city) opened up greater and wider opportunities, pulled non-natives, accelerating demand for residential space. Increase in land value encouraged the landlords to invest in real estate, converting the tank command area that belongs to individuals into residential spaces.

Silayaneri in zone 1 of Madurai Corporation was one such agrarian village sustained with an irrigation tank and an Oorani. The Silayaneri villagers, predominantly landless agricultural labourers, depended on the two surface water bodies to fulfill their domestic and irrigation water demand. The irrigation tank that irrigated more than 100 acres of command area, fed the Oorani too. The tank sluices were opened for irrigation only after filling the Oorani. Initially, the tank received its source from surplus of the upstream tank and later also from the PMC. The villagers flourished with two crops. Majority of the land holding belongs to less than 10 families. In the process of urbanization, landlords of Silayaneri tank converted their command area into *Sanjeevi Nagar, Tamil Nagar, Chellaiya Nagar, Kodal Nagar, Sangeeth Nagar* and *Ganapathy Nagar*. In this land cover conversion, as the land value was high, the feeder channel of the Oorani was ignored in the layout and encroached by the new residents. As the command area was lost, small, marginal farmers and landless communities of Silayaneri village shifted to alternative occupations. The Silayaneri villagers were slowly alienated from their ancient land. The new residents never bothered about the Oorani because of the abundant groundwater reserve. The Oorani with no source remains dysfunctional for more than 20 years and turned into a nuisance. A part of Oorani was officially converted into Uzhavar Santhai (Farmers' market), a portion of the Oorani was encroached by a temple constructed by new residents and a boundary wall was constructed to avoid further encroachments.

The built-up area of Madurai City has increased five times (from 13.5 sq.km. to 67.5 sq.km.) in just four decades. This increase in built-up area engulfed almost 60% of agriculture land (command area) and waterbodies. Increase in demand for public infrastructure and lesser availability of *'purambokku'* (common wasteland) lands pressed city planners to treat tanks with no or less command area as purambokku lands. The irrigation

tanks were converted into courts, administrative offices, colleges, housing board apartments, bus terminals and other public infrastructures. Along with water bodies, waterways were also converted into alternative usages ignoring their hydrologic functions. Since the public infrastructures such as centralized drinking water system, sewage system and waste management system could not support the urban sprawl, urban communities moved towards poor-alternatives. Groundwater aquifers were treated as an infinite source and subjected to abundant extraction. Solid and liquid wastes were disposed of in adjacent waterways, filling up in nearby irrigation tanks and Ooranis. Gradually, Madurai city became fresh water scarce and grey water rich city.

DHAN's Centre for Urban Water Resources

Over a decade NGOs, volunteer groups, youth groups, government departments, legal groups, corporates, political parties and individuals of Madurai have been taking various initiatives towards conservation of the urban water bodies. DHAN Foundation through its Vaigai River Restoration Committee and Centre for urban water resources (CURE), is striving hard in restoration of traditional water bodies, piloting various alternative technologies, carrying out researches and disseminating 'water knowledge' towards communities.

In 2019, Madurai Municipal Corporation, Hi-Tech. Arai Pvt. Ltd and DHAN Foundation initiated rejuvenating ten Ooranies in Madurai urban. DHAN Foundation, as a philosophy promotes Vayalagam, a waterbody association inclusive of primary and secondary stakeholders. All the renovation activities are carried out by these Vayalagams with techno-managerial support of DHAN Foundation. In villages, primary stakeholders are well defined, either farmers or villagers. Therefore, they will be enabled to promote Vayalagam inclusive of marginalized communities. But in urban areas, water bodies have lost the purposes they were created for and so have lost their stakeholders.

Vitalizing Urban water bodies

Identifying primary stakeholders for promoting waterbody restoration association, tracing back original feeder channels or exploring alternative feasible sources, handling encroachments and designing waterbodies for newly defined purposes are the major challenges in rejuvenation of urban water bodies.

"In Sinthamani, one third of Kaluvadiyan Oorani was encroached by the Kamatchi Kaluvadiyan temple authorities, wherein they have established a papad factory. The local community is insisting on evicting the factory, not the temple"

Urban communities in the vicinity of water bodies are diversified. There are residential associations, caste based associations, youth welfare associations, temple trusts, women SHGs, political parties, unorganized individuals, native villagers and marginal communities. The objectives of these communities are different with some intersections. Among the residential associations, youth welfare associations and women SHGs show greater interest in restoration of these water bodies. In the process of building the 'executive body' of the waterbody association, behavior of communities around every Oorani is unique.

Community- Stakes and Mistakes

In Silayaneri, residential associations equally represented the 'executive body' but they showed great resistance against inclusion of native villagers in 'the executive body'. The conflict worsened when these associations dug a new feeder channel through few private fallow lands without proper approvals. The villagers who still hold a few acres of land in the tank command area (Stake) showed resistance against sharing irrigation tank water with the Oorani.

Similar was the case with Uthangudi Oorani. As the villagers have no stake over the feed for the Oorani, they showed less resistance. The 'executive body' built by residential associations was receptive to share the leadership with women but was not ready to take financial accountability. They fear that financial accountability will cause conflict among these residential associations.

Experience of Sooravalimedu Oorani was unpredicted. The residential associations, women SHGs and youth welfare associations equally represented 'the executive body'. But there was strong resistance from a caste welfare association against one of the office bearers of the executive body, as he belongs to a minority caste. All the associations showed unified resistance against this 'caste politics' and succeeded.

Encroachments – For and Against

Encroachments play a critical role in the restoration of water bodies and waterways. A land survey performed by Madurai Corporation shows that almost all Ooranies and their waterways have been encroached. The community dynamics towards encroachment differs with nature of encroachment. In all the Oorani restoration meetings, the first agenda proposed by the community was about 'encroachment eviction'.

As the communities have strong socio-religious connect with these temples (encroachment), they were ready to take up the restoration initiative only if the temple remains undisturbed. Though all these temples belong to some individuals, the socio-religious connect triggers the sentiments of the community. The same community was mute when there is no socio-religious connect with the temple. In Sinthamani, one third of Kaluvadiyan Oorani was encroached by the Kamatchi Kaluvadiyan temple authorities, wherein they have established a papad factory. The local community is insisting on evicting the factory, not the temple.

When it comes to encroachment such as individual houses, residential associations are supporting the violators who are members of the association. It's the political

"History teaches us that 'inclusiveness' is not a 'threat', it's an opportunity. It highlights marginal communities such as Madayars and Neerkattis played a critical role in conservation and operation of waterbodies"

party that strives for the encroachments made by unorganized and marginal community. In Kalthar and Semb Ooranies, major encroachers showed greater interest in holding leadership of 'the executive body'.

Designing waterbodies for newly defined purposes is a collective multiple stakeholder process. Defining the purpose depends on the inclusive participation of diversified communities. When the process includes women, marginalized communities and specially challenged, the purpose and design components attains new heights. When a wide range of diversified communities participate in the designing process, translating too many ideas, priorities and concerns into design is a real challenge.

'Neernilai porampoke' – A public space

In the past, *'Neernilai porampoke'* such as tanks, ponds and Ooranis in Madurai was a real 'public space'. It was accessed by farmers, women, fish rearers, lotus cultivators, washer men, pottery makers, livestock rearers, landless, nomads, etc. Water bodies were customized in such a way that it could serve a wide range of 'public'. This was possible only because of the 'inclusive' nature. Though there were discriminations in point of access (separate access Ghats for women and marginal communities), they were never fenced. Oorani was the only *'Neernilai porampoke'* fenced, predominantly to restrict polluting 'the drinking water' by animals. The interdependency and social harmony that existed among rural communities helped in developing and implementing the 'community policies and regulatory mechanisms' towards 'sustainable water bodies'.

Is 'Public' waterbody really public?

Urban communities lack social harmony due to 'less interdependence' among them. Until the first decade of the 21st century, these communities were ignorant about 'waterbody conservation' thereby treating *'Neernilai porampoke'* just as *'other porampoke'*. Drastic decline in groundwater reserve that troubled their living stimulated the community's attention towards waterbody restoration and conservation. Many residential associations came forward to restore water bodies in their vicinity. They saw these *'Neernilai porampoke'* just as groundwater recharge points and recreational space. These associations were less comfortable in 'social inclusiveness' of marginal communities. The marginal communities were misunderstood as polluters and violators. Many associations are pushing hard to fence the water bodies to restrict their access. Some tanks (Sellur, Kosakulam tanks) were even fenced but couldn't stop the pollution. The reason for this failure of fencing is in the 'History of tanks'. History teaches us that 'inclusiveness' is not a 'threat', it's an opportunity. It highlights marginal communities such as *Madayars* and *Neerkattis* played a critical role in conservation and operation of waterbodies.

Let the communities negotiate!

In a less interdependent urban environment with no direct beneficiaries, defining and expanding the term 'public' is critical and challenging. Water bodies become more 'public' when they are designed for providing 'multiple services'. Developing such multi-dimensional design with alternatives is possible only when the restoration association is highly 'inclusive' in nature. 'Design alternatives' translates into implementations only when 'inclusiveness' turns into 'equal representation / equity'. 'Community negotiation' is a vital process in achieving the same. It is the live wire behind creating a common platform for equal representation, mutual prioritization, collective decision, responsible implementations, shared accountability and transparency. It is a steady evolutionary process where people of diversified traits are facilitated to attain a 'unified' decision.

"Water above the soil belongs to human,
animals and insects;
Water in the soil belongs to plants,
trees and creepers;
Water below the soil belongs to God,
which should never be touched."

The above quoted lines are the virtue/philosophy of Rajasthan nomads. It reflects the hydro-cultural relationship, shared responsibility, interdependency and oneness evolved by the nomads. **What would be the virtues and philosophies of the communities of Madurai Urban?**

DHAN's Way in Vizianagaram MoRD-MGNREGA bilateral project

DVTF Vizianagaram Team *

"The total budget of the pilot project was Rs. 2425.90 lakhs; wage component under MGNREGS is Rs. 840.32 lakhs and material support under PMKSY (Pradhan Mantri Krishi Sinchal Yojana) -MGNREGS (MoRD-GIZ) is Rs. 1,585.58 lakhs"

In 2016, DHAN Foundation's DVTF (DHAN Vayalagam Tank Foundation) collaborated with MoRD-MGNREGA-GIZ for 'Rejuvenation of Rainfed Champavathi River through Restoration of Tank Cascades', a three-year bilateral pilot project of Vizianagaram, to render its more than two decades of expertize with water conservation and development activities by providing its technical assistance.

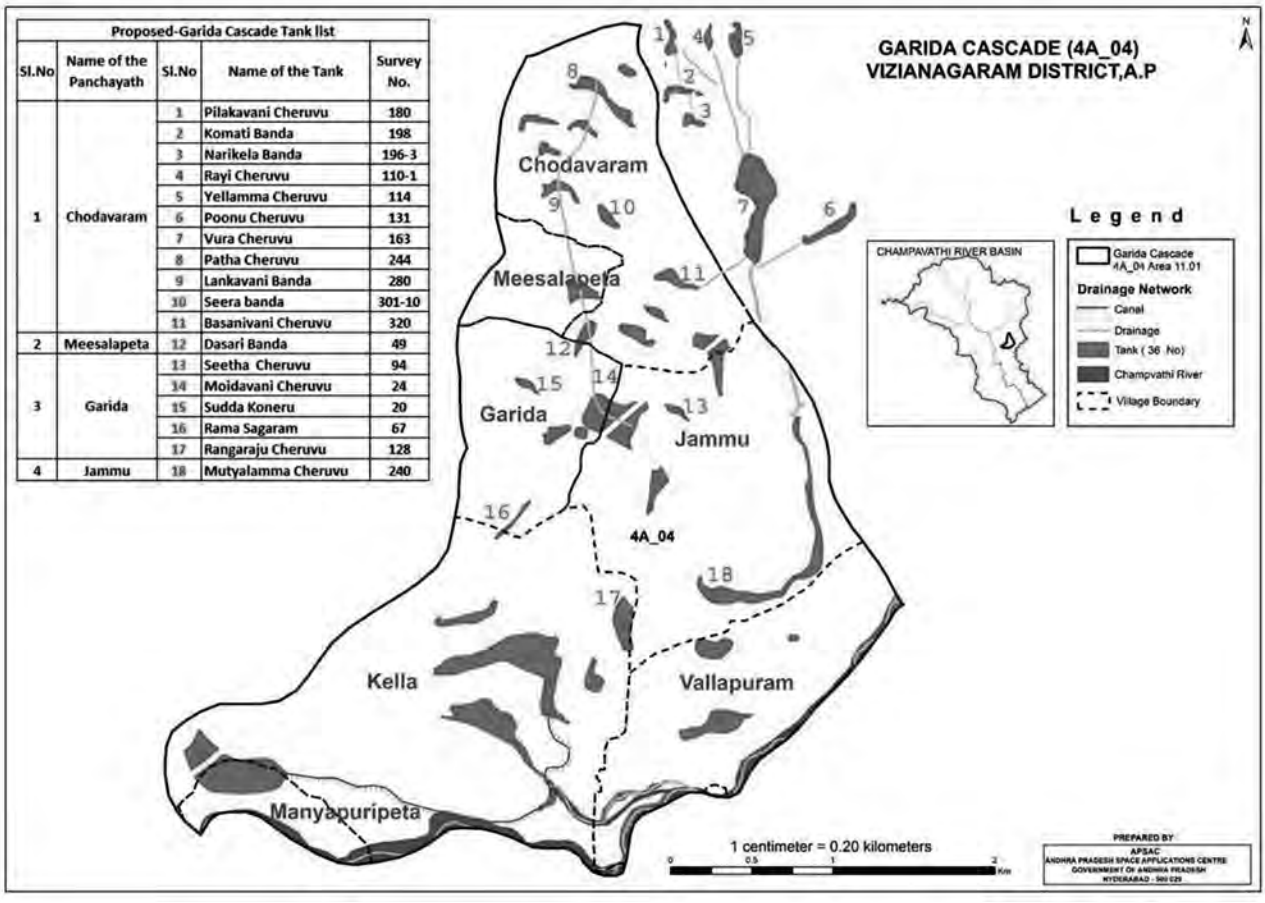
Tanks of Vizianagaram

Vizianagaram is one of the districts of Andhra Pradesh, wherein 82 per cent of the population live in rural areas and their livelihoods majorly depend on agriculture. The average annual rainfall of the district is 1,131 mm. Paddy crop is cultivated mainly during the Kharif season with the rain-fed tanks irrigating up to 80 per cent of the area. The major rivers flowing in the district are Nagavali, Champavathi, Gosthani and Kandivalasa Gedda. The total number of tanks existing in the district are 9,183 (out of which, 459 tanks are having more than 100 acres of ayacut and 8,724 tanks are having less than 100 acres of ayacut). Champavathi is a rain-fed river basin in the district flowing through 14 Mandals in the district. It has a total drainage area of 1,463.45 km2, feeding 3,673 tanks of 124 tank cascades in 24 sub-basins with a capacity of 11,519 mcft. These tank cascades and tanks were mostly dysfunctional and deteriorated and serving far less than their original designed capacities due to the shift to groundwater dependent systems, prolonged and continuous neglect of maintenance, heavy silting of the tank bed, choked-up feeder channels and encroachment by farmers in the tank bund areas. DHAN Foundation involved in sharing its more than two decades of experience in water body works by assuming the role of technical supporter in the bilateral project facilitated by GIZ, funded and implemented by MoRD-MGNREGA (through Environment Benefits (EB) scheme) – GoAP. Since the project was funded by the central government and implemented by the state government through its district and mandal administrations, to provide DHAN's expertise and experience to the project, the project evoked the DVTF Vizianagaram team to have various collaborations with the state administration, district administration and also with the mandal and panchayat level administrations.

Collaborations: Central, State, District, Mandal and Panchayat Level

GIZ, the facilitating entity of the bilateral project ensured in presenting the project updates with various collaboration of the project, wherein the DVTF Vizianagaram team ensured in providing the practical field adoptable plans to the facilitating agency.

* DVTF Vizianagaram Team



DHAN Foundation's collaborations: At the central level, the primary project partners were the Ministry of Rural Development (MoRD) along with GIZ (German Corporation for International Cooperation; based at New Delhi). At the state and district level, Department of Panchayat Raj & Rural Development (PR&RD) along with District Water Management Agency (DWMA) were the core partners respectively. In addition to DWMA, the other district level line departments viz., Minor Irrigation Water Resources Department, Agriculture department, Horticulture department, Fishery department, Revenue department and Ground water department were the core partners in the project. At the Mandal level and Village level, the primary project partners were MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) Mandal officials (Assistant Project Directors and Assistant Executive Officers) as well as Mandal field staff, Agriculture and Revenue officials and all the Panchayat Presidents' of the two identified cascade villages.

Tank Cascades

"Around 87,000 worksite supervisors and NREGA labourers in 371 villages of 14 mandals of the Champavathi river basin were trained on the technical aspects during work execution"

Based on the hydrological conditions, slope gradients, GIS information provided by the APSAC, Participatory Rural Appraisals and Participatory Tank Appraisals, tanks were selected and grouped into two cascades viz., Tettangi and Garida cascades in Gurla mandal (project area) of Vizianagaram. Tettangi cascade covers six Gram Panchayats has a geographical area of 12.29 km2, with a total population of 9,956, comprising 2,486 households, linking 29 water bodies. Garida cascade covers seven Gram Panchayats has a

geographical area of 11.01 km2, with a total population of 12,357, comprising 3,571 households, linking 49 water bodies. The 78 tanks in the two cascades are hydrologically connected and the surplus from each cascading network at the end joins the Champavathi river. The overall objective of the project was the conservation and development of the 78 tanks in the two cascades, thereby rejuvenating the Champavathi River and augmenting the water storage for agriculture and ensuring stabilized farm production under all these 78 tanks. The total budget of the pilot project was Rs. 2425.90 lakhs; wage component under MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme) is Rs. 840.32 lakhs and material component under PMKSY (Pradhan Mantri Krishi Sinchal Yojana)-MGNREGS (MoRD-GIZ) is Rs. 1,585.58 lakhs.

DHAN's Way

DHAN's way of implementation is community driven, regardless of the programme and the project, everything can be implemented in ways and means that empower and engage the local communities thereby establishing their active role and participation in their own development.

a. Project Uniqueness and MGNREGA work

The uniqueness of the MoRD-MGNREGA bilateral project was, unlike the MGNREGA implemented conservation and water development activities wherein the budget for labor component should be 60 per cent and the material component 40 per cent, the MoRD-MGNREGA bilateral project was planned in such a way that 60 per cent of the budget is allocated to material component (source of funding: PMKSY) and 40 per cent of the budget is allocated to labour component (source of funding: MGNERGS).

Hitherto the community engaged in the MGNREGA works were complete unaware of the significance of the works implementation, thereby failing to ensure the quality of the works being implemented. Furthermore, majority of the labourers (especially men) employed in MGNREGA works only for few hours finishing a portion of the work they were assigned due to various reasons; moreover, most of the people don't even know the maximum wage per day from the MGNREGA work in their locations. The labourers ensure their presence in the worksite till the worksite supervisor takes the attendance and measures the quantity of work done and records it against their names in the m-book. Besides, majority of works under MGNREGA comes under the water conservation and development works, and all the eligible people in the panchayat will be employed in their own panchayats, engaged in desilting and bund strengthening activities in their own village water bodies. At the outset, the dual benefactors are the command area farmers – who are none other than most of the laborers (all the small and marginal) engaged in the MGNREGA works – since the ensured quality of MGNREGA works leads to augmenting the water storage in the water bodies, thereby enhancing the crop productivity.

Comprehending the field working reality of the MGNREGA work, DVTF Vizianagaram team has come up in conceptualizing the bilateral project into three major components envisaging the holistic approach whereby ensuring the overall socio-economic development of the community.

b. Expertize Matters

In order to encompass the aggregate benefits of the renovation works thereby augmenting the water storage in the water bodies and enhancing the livelihood of the small and marginal farmers, the work components were conceptualized in meeting the prime requirements. In according to that, the overall tank works were categorized into three major components.

Restoration of tank works aimed at livelihood and assets creation for the command area farmers by augmenting the tanks storage capacity and stabilizing the command areas under the tanks through effective and qualitative desiltation and tank bund strengthening

"The Ministry finds this model suitable for replication under MGNREGA, and the States may adapt the model to suit the local context. The States/UTs interested in replication of this model may kindly send the details to the Ministry by 10th August 2018"

works (MGNREGA component). Furthermore, as part of material component of works, identifying the dilapidated sluices and surplus weir, link channels (feeder channels, supply or surplus course) and proposing the repair and reconstruction works.

Catchment area development works aimed at preserving the tanks from sedimentation caused by erosion, augmenting the water table in the wells and increasing the farmer's socio-economic condition of the farmers. One of the major threats to the water bodies regardless of the context – rural or urban – is encroachment. In urban space the construction industry was the threat, whereas in rural space the farmers are the encroachers. Encroachments reduces the tank size thereby facilitating the reduction in the water storage capacity and affecting the crop productivity of the command area farmers. DHAN Foundation in all its intervention location and through its various programmes ensures, at the forefront and as a foremost thing, forming people institutions.

Two of the many roles these people institutions are: as mini banks addressing the financial needs of the community and as administration entities wherein community involves in solving community issues keeping the benefit of community at large. DVTF's people institutions – Water User Associations – play a significant role in encroachment eviction for the respective tanks.

Furthermore, in order to avoid the future encroachments, boundary plantation is being initiated demarking the boundary of the water body. This plantation also helps is arresting some portion of the sediments (silt) that is being carried along with the runoff. In addition to this, to complete arrest the sediments from joining the water body and also to prevent the encroachments, peripheral

trenches (boundary trenches) were excavated. To improve the socio-economic conditions of the farmers, the sediments that got collected/gathered in the trenches – which is significantly high in nutritional values – will be used to apply in the agricultural fields and excess will be safeguarded as sediment/silt banks at the village common land to avail it in the future seasons.

Foreshore area and plantations aimed at improving the fodder and fuel wood situations and also creating income generating resources to the small and marginal farmers.

c. Experience Speaks

Since the inception of the MGNREGA, though the scheme was commended as a boon in the lives of the poor and vulnerable sections, the scheme was equally condemned for its way of execution for not ensuring the quality of the unskilled works being executed. DVTF Vizianagaram team, postulating the commends and condemns of the MGNREGA to the Commissionerate of Panchayat Raj and Rural Development (GoAP), proposed for organizing technical as well as onsite training programs for all the MGNREGA Functionaries – Mandal level staff, Field functionaries and Worksite supervisors – for effective work execution as well as ensuring the quality of work being implemented.

DHAN's way of implementation established its unique recognition among the various development sectors as well as among the various state and central level government bodies across the nation; Government of Andhra Pradesh (GoAP) was no exception to this. DVTF's reputation of more than two decades of working in grassroots, community-led conservation and development of water resources, resulted in keeping assurance of the outcome of the training programmes despite the Department of PR & RD was strongly opined it couldn't be possible to enhance the quality of work execution as it has been continuing since the scheme's inception.

District level and mandal level meetings were held with DWMA and MGNREGA departments and a framework has been evolved in organizing the training programmes. Technical training programmes (ToTs) were organized for 114 Mandal staff across the 14 mandals of Champavathi river basin and guidelines in creating model tanks with the labor component was provided for the immediate implementation at the mandal level. The work executioners at the field level were the worksite supervisors and the labourers, hence training them at the worksite during the work execution was considered as appropriate, efficient and the need of the hour. Therefore, Gram Panchayat level onsite trainings were organized for worksite supervisors as well as labourers explaining them the importance of ensuring lump sum free silt disposal onto the tank bund, gradient to be ensured for the upstream and downstream side of the bund while depositing and compacting the silt, the depth of silt to be excavation in the tank bed and also the berm provision. A total of 87,000 worksite supervisors and labourers across 371 villages in 14 Mandals of the Champavathi river basin were trained at the worksite during the work execution in these Gram Panchayat level onsite training programmes. Weekly monitoring visits, were paid by the DVTF Vizianagaram team, to the worksite to evaluate the outcome of the training programmes.

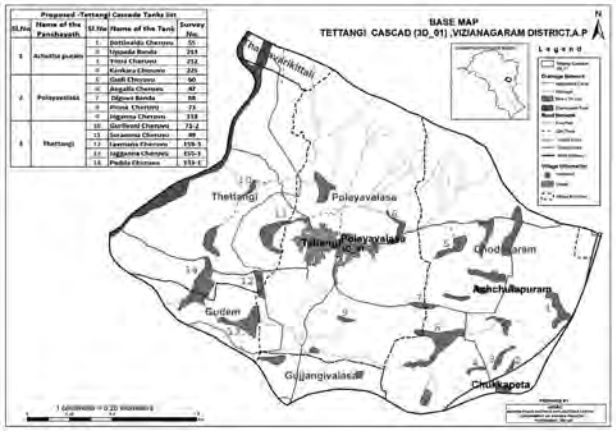
d. The Integrated Approach

DHAN Foundation has pioneered in its integrated approach and holistic way of implementation in all its

interventions with aim at serving and benefitted the community at large. Hence, upon water intervention also, DHAN Foundation aims at creating additional livelihood sources for the community. In line with, throughout the project period, DVTF team has organized several livelihood enhancing camps and training programmes. In collaboration with the veterinary department, 26 veterinary camps were organized in 13 Gram Panchayats (two camps for each panchayat) treating 3,745 livestock. In collaboration with the fishery department, inland fish rearing activities were taken up in 31 tanks and two ponds. 21 fishermen were trained to enhance their livelihood through fishing activities. In collaboration with officials of the district and mandal agriculture department, six farmer field schools were organized in Tettangi and Garida cascade Gram Panchayats. In addition to this, farmers (40 Nos) belonging to the two tank cascades were facilitated for exposure visits to Chittoor and Madurai district, to observe the tank systems, cascading models and the micro-finance facilitates of the farmers' associations.

e. One in Many

DVTF's unique contribution toward the water conservation and watershed development activities has been continuing for more than twenty years. During this whole journey, innumerable methodologies have been evolved, technical advancements has been made and hundreds and thousands of cubic meters of water has been stored and created several additional livelihoods for small and marginal farmers. DVTF's expertise and experience have been captured in the form of journals and books which have been used in many educational



institutions as a reading material for the undergraduates. This is a common phenomenon with all the DHAN interventions largely because the focus has been given for the community development by enabling the community as the implementers rather than passive observers.

With the DHAN's intervention in Vizianagaram, DVTF Vizianagaram team has received appreciations from the administration of the department of PR&RD, when the training programmes resulted in enhancing quality of work done. This once again positioned DHAN Foundation strongly at the district level, wherein the DVTF's regional team were invited to participate in the meetings related to water conservation and development works at the district and mandal level.

The recognition for the pilot project came in the form of a circular issued from MoRD. The Ministry of Rural Development (MoRD) on 1st August 2018 issued a letter on, 'Reviving tank cascade systems through MGNREGA – A model for replication.' An Excerpt from the letter:

"The Government of Andhra Pradesh (AP), with the support of MoRD-GIZ bi-lateral project, 'Environmental Benefits through MGREGA' has developed a model for reviving tank cascade systems through MGNREGA. The model is currently being implemented in developing 124 tank cascades in the Champavathi River Basin of Vizianagaram district in AP.

The revival of tank cascades in the Champavathi River Basin has a three-pronged approach including development of the catchment area, foreshore area and command area. The model has contributed to enhanced water conservation and management, increase in water for irrigating the fields in the command area as well as for alternate livelihood options such as fisheries. The tank also acts as climate resilient infrastructure thus helping the area sustain floods and drought conditions. Water User Associations have been formed under the leadership of the Gram Panchayat for the tank maintenance.

The Ministry finds this model suitable for replication under MGNREGA, and the States may adapt the model to suit the local context. The States/UTs interested in replication of this model may kindly send the details to the Ministry by 10th August 2018."

Save Water: Save Generations

Water is Elixir of Life

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