Rajiv Gandhi
Institute for Contemporary Studies

Policy WATCH

Volume XI, Issue 4
April 2022, New Delhi

Environment, Natural Resources and Sustainability

In this issue

RAJIV GANDHI
INSTITUTE FOR CONTEMPORARY STUDIES

POLICY WATCH

Volume XII, Issue 3
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Editorial

The Rajiv Gandhi Institute for Contemporary Studies (RGICS) works on five themes:

1. Constitutional Values and Democratic Institutions
2. Growth with Employment
3. Governance and Development
4. Environment, Natural Resources and Sustainability
5. India's Place in the World.

This issue of Policy Watch is on the theme Environment, Natural Resources and Sustainability. Under this we have been studying Jal, Jangal and Jameen (water, forests and land) as the basis of livelihoods of rural and tribal people.

This issue of the policy watch brings three different locally appropriate solutions for groundwater management from Indian Sundarbans, Kachchh in Gujarat, and the water-stressed Vijaypura in Deccan region of Karnataka and one case of using community forest rights (CFR) and government schemes like MNREGS to regenerate a degraded forest and build livelihoods around it.

The first two of the cases resulted from a study currently underway by the RGICS, led by RGICS Fellow Jeet Singh, on the status of groundwater in different regions of India and the relevance of locally appropriate solutions for improving the regulatory regime for groundwater management in the country.

The first article is by a team of PRASARI NGO in West Bengal, comprising Saikat Pal, Purnabha Dasgupta, Rajdeep Sarkar and Pijush Jana that has suggested a sustainable solution for rapidly depleting ground water in the Indian Sundarbans and other water quality issues. This article beautifully establishes the connection between scientific study of hydrology, hydro-geology, aquifer characteristics and social processes to ensure sustainable management of ground water.

The second article is by Deepak Yogi and Kunj Shethiya of the Development Support Centre (DSC) in Gujarat. This is a case study of a participatory groundwater management project carried out by Arid Communities and Technologies (ACT), an organization based in the coastal region of Kachchh in Gujarat. This article attempts to show the importance of blending traditional knowledge with modern science and technology for sustainable groundwater management.

The third article is by senior thinker, politician and journalist Sudheendra Kulkarni. He describes systematically coordinated projects carried out in drought-prone Vijayapura region by the erstwhile state government of Karnataka under the leadership of the then water resource minister M.B. Patil. Mr. Kulkarni argues that political will and people's participation rejuvenated the drought-prone region of Karnataka and this offers a template to re-envision in the time of climate change.

The fourth article is a case study by RGICS Research Associate Ms Sahibpreet Kaur on the Payvihir village in Amaravati district of Maharashtra. It is also accompanied by a video. Taken together, these articles powerfully illustrate two points that the RGICS has been making –
(i) that India urgently needs to invest in regenerating its natural resources – Jal, Jangal, Jameen and
(ii) that local communities if empowered with technical assistance and financial resources, can come up with very cost-effective, equitable and environmentally sustainable solutions to for managing the common natural resources.

We hope you enjoy reading these articles. We look forward to your feedback.

Vijay Mahajan
Director,
Rajiv Gandhi Institute for Contemporary Studies

Ground Water Scenario of Indian Sundarban: Its past, present and future

Mr. Saikat Pal, Dr. Purnabha Dasgupta, Mr. Rajdeep Sarkar, Mr. Pijush Jana

Introduction

The Indian Sundarbans based on the eastern coast line of West Bengal are a World Heritage site with over 2226 species coexisting with 4.5 million inhabitants in 102 of its islands (Bhadra et al., 2018). Both wildlife and livestock co-exist with human beings.

This area was a jungle even 150 years ago and most of the people came as migrant labourer either for the British rulers or for the local Zamindars majority of them are now dependent on agriculture or allied activities for their livelihood. This region gets moderate rainfall between 1600 and 2000mm per year, concentrated in 84 to 90 rainy days per year, resulting in year-round fresh water shortages for residential and agricultural usage. All are suffering from moderate to severe dearth of drinking water. This is mainly due to over exploitation of the water resources in the region (Saha and Saha, 2020). In this area, community use shallow and deep tubewells to draw water from ground, most of which become inoperable due to drop in the groundwater table from winter months to summer months. Along with this water scarcity, salinity levels reach up to 16dS/m during the summer months from end of April to beginning of monsoon in early June (Burman et al., 2019).

Moreover, rainfall is very heavy, increasing the region's vulnerability to tropical storms and tropical cyclones. . Additionally, Sundarbans is sinking as a result of alluvial soil settlement and rising sea levels, at a rate of 12mm per year since 2006 (Hazra et al., 2019). While the majority of people depend on agriculture, fishing, cattle-rearing, and non-timber forest product gathering, they face severe fresh water shortage and resort to groundwater extraction, exacerbated the water crisis throughout the summer and winter months.

In dry summer months with falling ground water tables, sea water intrusion occurs and at that time situation become even worse with the tropical cyclones which further worsen the access to drinking water. Now in recent times that pressure on land has further augmented with growing population. Further, this had increased the crop demand and as a result it impacted the ground water demand in a negative way.

The current practices of the farmers, excessive use of submersible water pumps, degraded the static ground water table by 15-45ft at places. This further limited the scope for any horticultural or agricultural crop cultivation during summer in the most of the parts of the region and created critical drinking water crisis starting from the month of February each year.

Fresh water supply is limited due to concentrated monsoonal rainfall, thus failing meet year-round fresh water demand for crops in the region. As a result, ground water abstraction became a regular practice by the farmers leading to severe water crisis during summer time.

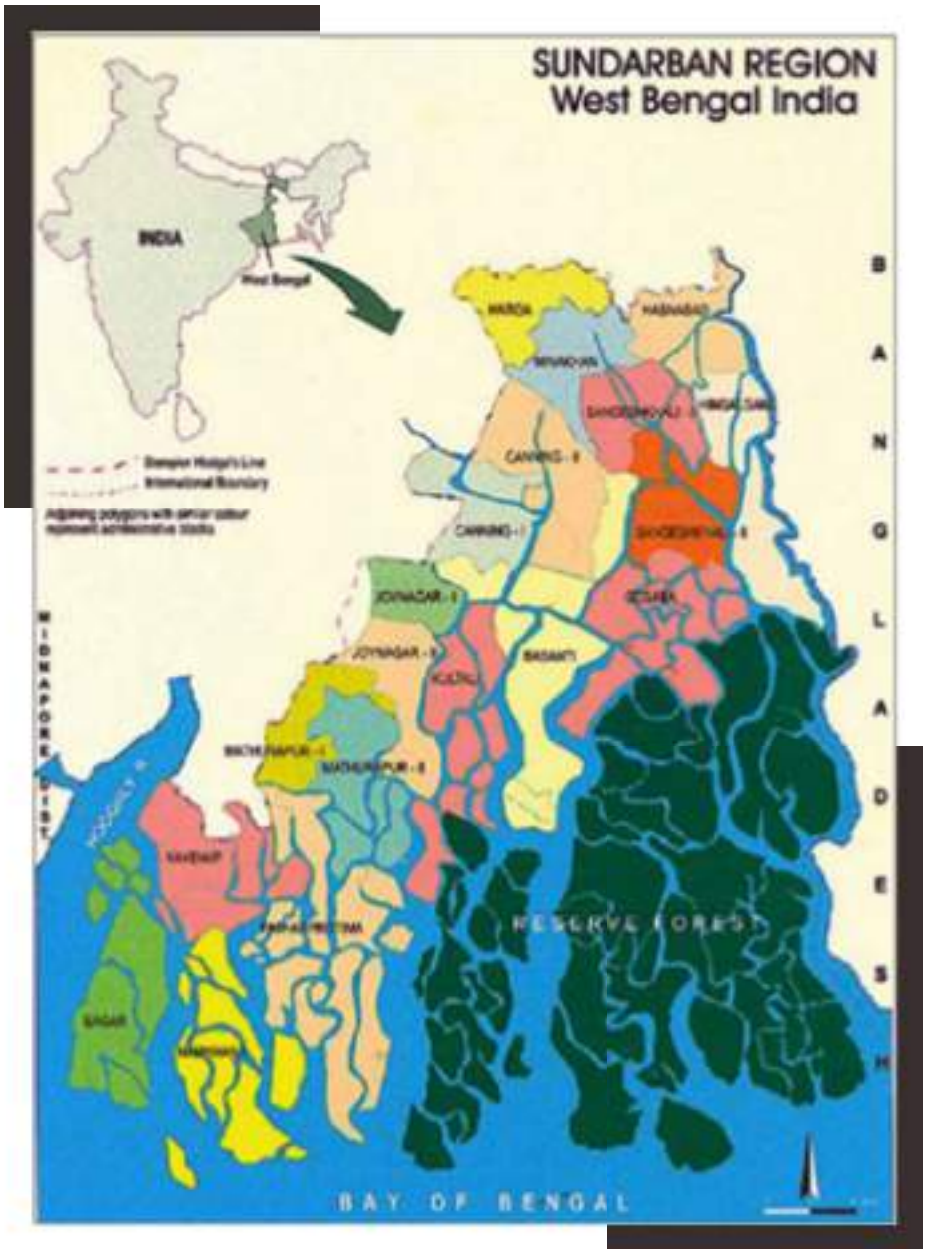


Figure 1.
Indian Sundarbans

Key points on water situation in Indian Sundarban

- Around 80% of total annual rainfall in Sundarbans falls during the south–west monsoon season, providing sufficient water for Kharif rice cultivation;
- For many years, community residents have perceived a delay in the onset of the south–west monsoon, as well as a decrease in monsoon rainfall and warmer temperatures, all of which have a detrimental effect on agriculture and community life.
- Farmers in the area have been draining groundwater to irrigate land for the production of a second season of rice known as Boro rice, which they plant in the winter and harvest in the hot summer months, lowering the water table and limiting household users' access to water;
- When combined with declining trends in freshwater availability and a rise in water and soil salinity, this man-made strain on the groundwater supply results in what people refer to as a water crisis.

The Study

This research was conducted in collaboration with water users and other relevant stakeholders to get a better understanding of the water situation in the Indian Sundarbans, both quantitatively and qualitatively (over a period of time per se). The methodology used was following the exploratory design and participatory in nature, in which the research team capacitated community to use and barefoot hydrologist didis were used selected handheld data collection devices such as salinometers, GPS devices, and field kits to test for bacterial contamination in order to establish the relationship between surface and ground water disconnections, as well as the relationship between water abstraction and water quality (both surface and groundwater) parameters collected in the field by barefoot hydrogeologists as part of our exploratory research design utilising a participatory groundwater management approach. We argue that our empirical findings demonstrate that BFGs have been implemented with adequate consideration of (1) the static ground water table and its relationship to surface water uses, and (2) the 'overexploitation' effect on groundwater, such as a reduced static ground water table and an increase in salinity over time, as evidence of how ground water quality can be impacted over time as a result of water table degeneration.

Aquifer Characteristics of Sundarban

The accumulation and movement of groundwater is a function of two basic 'hydrogeological' properties of rocks – the porosity and the hydraulic conductivity (commonly referred to as permeability). In simple terms, the porosity and hydraulic conductivity are properties of rocks, properties that broadly indicate the porous and permeable aspects of the rock. On the other hand, when aquifers are identified and described, it becomes necessary to gauge the storage capacity and the transmission capability of an aquifer. The coefficient of storage (storativity) and transmissivity define the storage and transmission functions (capacities) of an aquifer. Pumping tests constitute the most straightforward methodology for estimating the storativity and transmissivity of aquifers.

In order to understand that pumping tests were performed on pre-selected tube wells to obtain estimates of T and S values to gauge aquifer properties, understand their variability across and within aquifers While conducting systematic long-duration pumping tests is extremely challenging in areas where there is perpetual groundwater pumping, farmers in the villages co-operated enough to make this possible. However, much as one would have liked, not all pumping tests could be conducted for equal durations. PRASARI used its own automated water-level loggers (pressure sensors) to record water levels during each test; discharge rates were measured according to PRASARI's standard pumping test protocol.

The data obtained from pumping tests was used to calculate the aquifer parameters and the specific capacity of individual wells. Various methods of analysing pumping test data are available. The purpose of conducting pumping tests, in this case, was not to arrive at very precise estimates of T and S, but to make a good comparison of these values across the study area. Three methods were used to estimate aquifer and well characteristics. *The Cooper-Jacob method (1964)* was used to estimate T and S.

PRASARI has conducted many pumping tests in the area to ascertain aquifer parameters like transmissivity and storativity. Table below summarises these estimates by providing ranges of values (where they tend to vary) or specific values. Aquifer is showing good transmissivity (**273 – 308m^2/day)**; which means, the aquifer can release water to wells at this rate across a unit cross sectional area per unit time and storativity indicates that the aquifer can store 10.5% water out of its total volume.

Transmissivity (m^2/day)	Storativity
273 – 308	0.105

Socio-hydrogeology of Indian Sundarban

Korakati GP area consisting of three revenue villages of Korakati, Tushkhali and Duchnikhali is part of the Sandeshkhali II block of 24 North Parganas district of West Bengal. The hamlet has been chosen for convergence of different government programmes for beneficiaries consisting of tribal people from the area. This community has also been chosen for the Participatory Groundwater Management activities in the region to understand problems related to groundwater and water in general, research local hydrogeology, monitor rainfall and chosen tube-wells from the area to understand groundwater movement and map aquifers and perform water quality testing. The goal underlying all these efforts is to arrive at an educated knowledge of groundwater dependence and issues in the community and come up with a management plan targeted at fair distribution of this common pool resource and guaranteeing sustainability of the same.

The comprehensive survey was performed by the team members of PRASARI and the local community resource people and the main data was gathered. From the FGDs that PRASARI organized in the community identified how the frequency of deep tube-wells (DTWs) has increased since the beginning of the new millennium and how the frequency of Shallow Tube-wells (STWs) declined in that period.

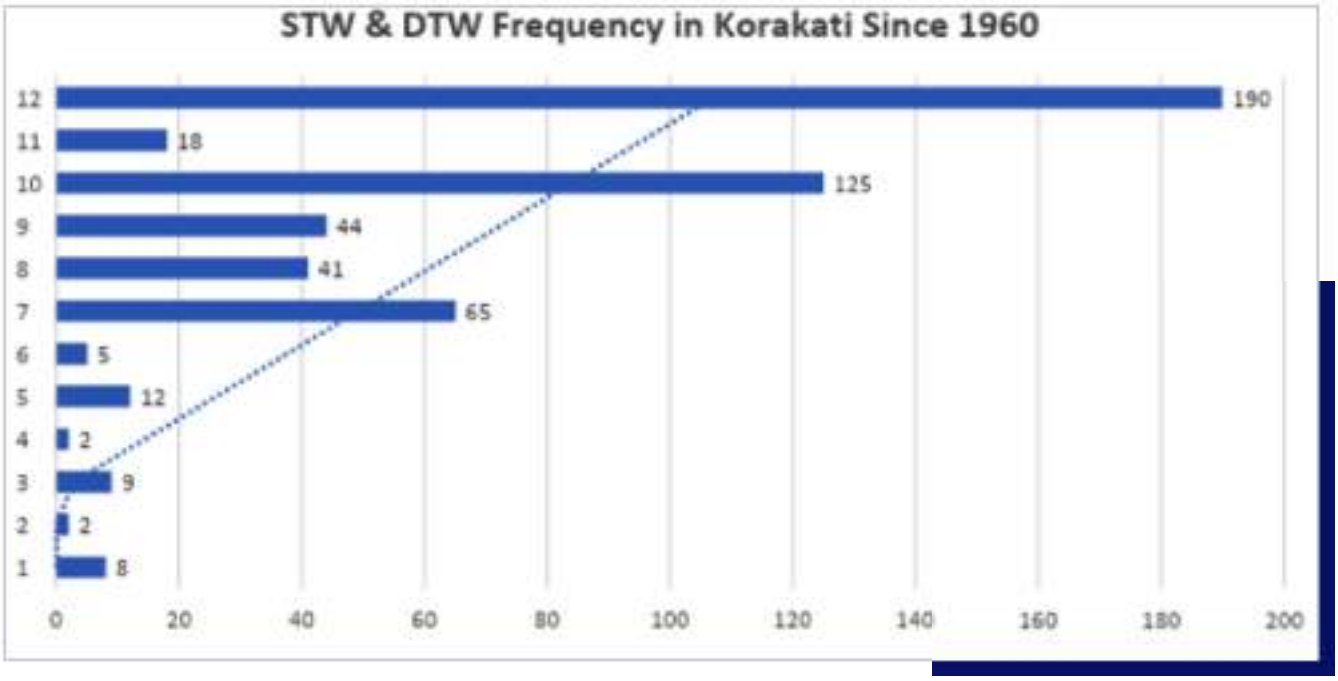


Figure 2.
Participatory mapping of Irrigation Tube-wells

The graph depicts the increasing trend of shallow and deep tube-wells in the Gram Panchayat area for crop cultivation as well as for drinking water purposes. It can be observed that about 190 tube-wells were constructed for this purpose from 2011-2020 while the percentage of DTWs are on the rise. This rate of development is alarming and poses a threat to the local water security since both the uses predominantly source water from a single aquifer system i.e., the 340-420 feet aquifer. The members of the community reported hand-pumps from this depth going dry during summer as shown in the above-mentioned figure.

Detailed interview with some farmers was conducted during our interaction through a semi structured interview schedule. It was informed that the irrigation tube-wells are being pumped for a period of 3 months from January to April mostly for cultivation of rice which is the dominant crop grown in the area. The tube-wells are pumped for 10-12 hours daily, which amounts to about 1000-1200 hours of pumping from a single such tube-well. Nowadays good quality submersible pumps are set at the depth of 350-420ft depth in order to harvest water from the second or third aquifer. These are electric pump-sets and waters were often shared between farmers at an agreed price (1200/- per bigha of Boro paddy cultivation).

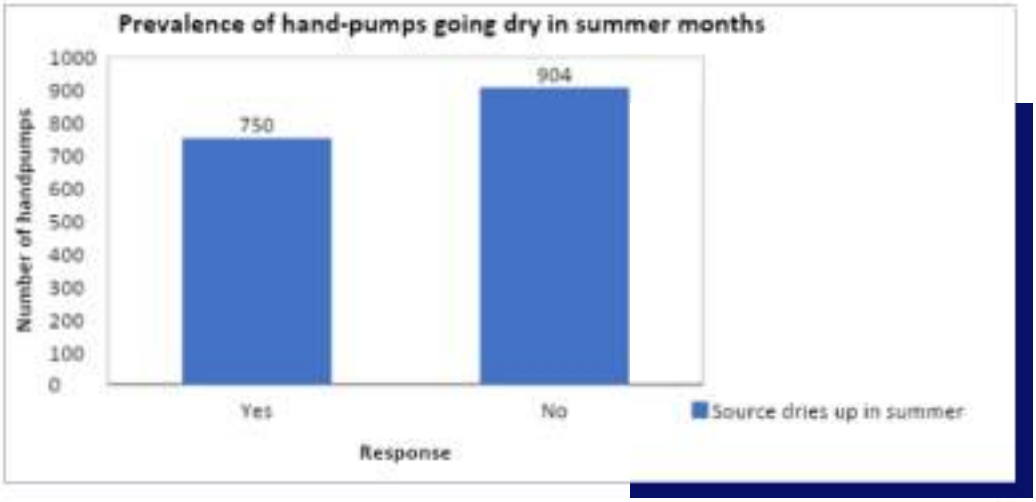


Figure 3. Participatory mapping of hand pumps gone dry in the summer months

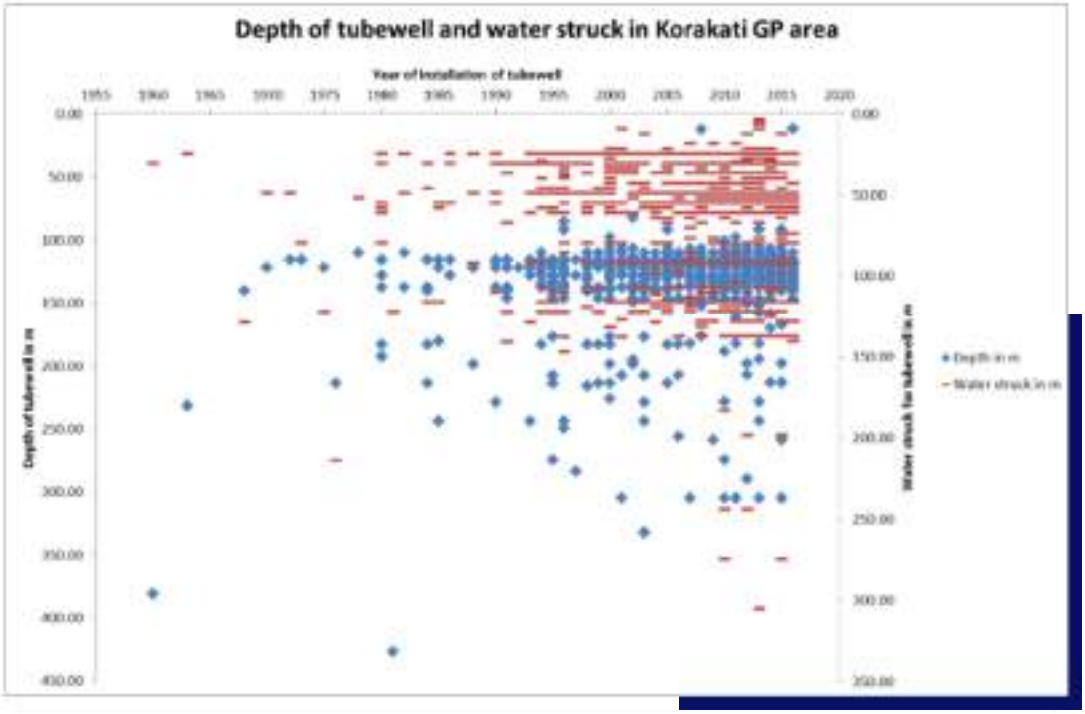


Figure 4. Depth of tube-well in the study area

Groundwater Development in Korakati GP area

Above figure depicts the development of groundwater in Korakati Gram panchayat. It is evident from the graph that there has been tremendous development of groundwater sources in the last decade and a half. This development has mostly been privately sourced. Many of these sources are being increasingly used for irrigation purposes.

Drinking water situation

Groundwater is used extensively in the region for drinking and household purposes. During one conversation, it was estimated that the Gram Panchayat had between 1500 and 1800 private tube wells and about 200 government tube wells. There are no dug-wells in the immediate vicinity. One of the explanations given by the residents was that the water at shallow depths is salty and therefore unfit for human consumption. Nonetheless, ponds may be found throughout the Gram Panchayat territory. Because the water in these ponds is salty, it is not suitable for drinking but is utilised for other household purposes. People do not treat tube-well water prior to consuming it, and therefore consider it to be of high quality. Gram Panchayats are in poor health when it comes to sanitation. Only 35-40% of homes in the Gram Panchayat have access to toilets, and many of them are seldom or completely inoperative. However, the Gram Panchayat was declared as Nirmal Panchayat years back.

In one of the Mouza (revenue village) Korakati, a 'Jal Swapna' under Public Health Engineering Department's water supply system was built in 2018 at 1300-1400ft depth by boring which supplies domestic water to the Mouza's individual homes and clusters through pipe water supply. Most of the homes are now fetching water from the taps but also maintaining irrigation and drinking water tube-wells as alternative sources for natural calamity.

Agriculture water situation

Tube-well reliance for drinking water is being questioned as more tube-wells are being sourced for agricultural reasons. Paddy is the area's only crop. It is consumed twice a year, during the monsoon and throughout the winter. Winter paddy, on the other hand, needs considerable irrigation, which is provided by these tube-wells. These tube-wells are equipped with three- to five-horsepower pumps. Centrifugal pumps are utilised, not submersible pumps. There are about 500 tube-wells being utilised for irrigation reasons at the moment, according to information gleaned from local conversations. In the hamlet, feeder separation has been accomplished, and an irrigation power schedule is being followed. While the area under winter rice cultivation is restricted at the moment, an increasing number of individuals are installing shallow tube wells in order to grow an irrigated winter crop. According to reports, the Tushkhali Mouza has the most irrigation infrastructure among the three revenue villages.

The region's perceived groundwater issue is the depletion of water in these tube wells from February to March each year during the last several years. The rise in area under winter agriculture, the growth in the number of tube wells, and the reduction in rainfall are cited as causes for the region's groundwater depletion. The area's in-situ water quality is poor; salinity and total dissolved solids levels are slightly over the permitted range. Additionally, the iron content exceeds acceptable limits in a variety of hand pumps and tube-wells.

Ground Water Scenario of the study area

Revenue village	GW Dependence	GW occurrence Depth levels	GW related issues
Duchnikhali	Irrigation + Drinking water	1200 ft, 600 ft, 400 ft	Drying up of tube wells during summer months
Tushkhali	Irrigation + Drinking water	1150 ft, 600 ft	River embankment, GW competition
Korakati	Drinking water	450 ft	No issues reported

Ground Water Balance

Order	Particular	Year
A	Year of calculation	2021-22
B	Potential aquifer storage	3465 mm
C	Actual aquifer storage	2100 mm
D	Total groundwater abstraction through pumping	408,25,920 Cum

To get a quantitative knowledge of aquifers, both the inputs (recharge) and outputs (discharge) from the aquifer must be quantified (Harvey et al., 1995). Due to the fact that assessing the ground-water balance of a restricted aquifer using the water level fluctuation technique is not feasible, additional variables such as aquifer storage and total groundwater abstraction have been calculated. Aquifer storage has been estimated using the aquifer's thickness and storativity. The aquifer's storativity value was determined via pumping tests. There is a significant gap between potential and likely aquifer storage, which may be closed by expanding groundwater augmentation initiatives.

Projected Outcome from ASR

Cooper Jacob expression used to calculate groundwater mounding over a 100 day injection period in Indian Sundarbans and the following graph was generated for different Q value and injection rate.

$$h_w - h_o = \frac{2.3Q_D}{4\pi T} \log \frac{2.25Tt}{r^2S}$$

Range was taken between: 0.1 to 2.3 l/sec

Preferred values of T (Transmissivity) & S (Storativity):

T = 200 m2/day; S = 0.0001

Max Pumping Rate (Q): 2 l/sec; 10 m3/day

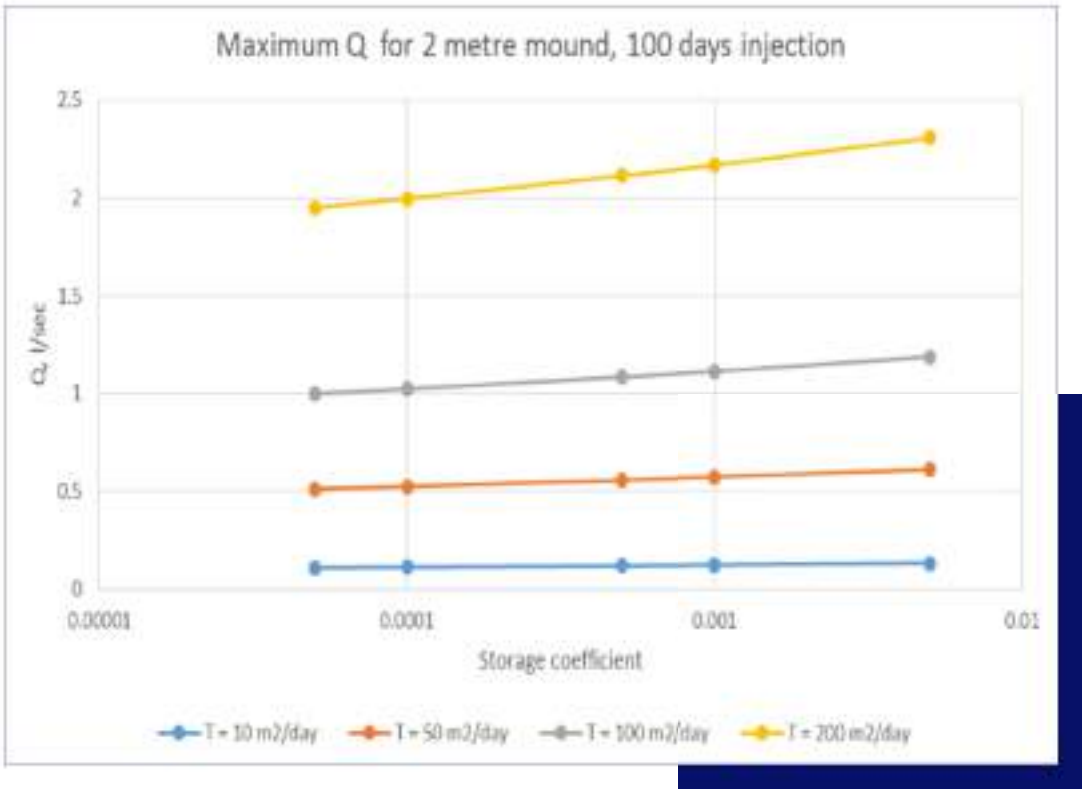


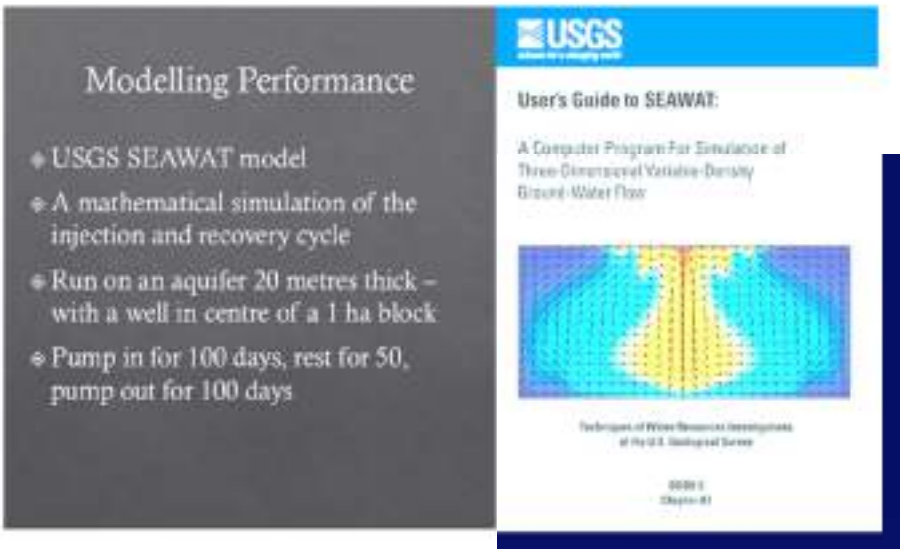
Figure 6. Injection rate at different depth in the ground of Indian Sundarbans

Aquifer Storage and Recovery System

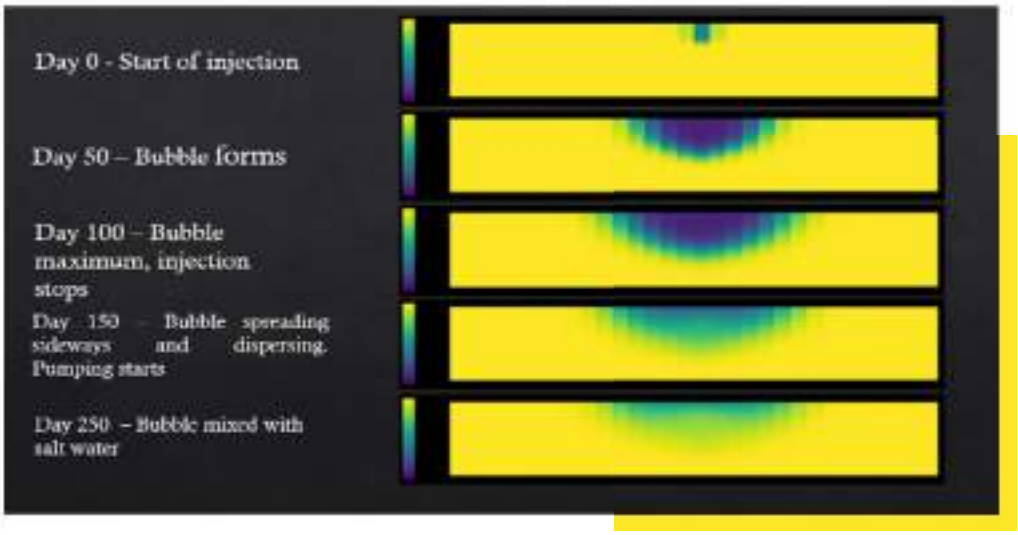
Aquifer storage and recovery (ASR) is a way of managing water resources to meet existing and future freshwater demands. It is the direct injection of surface water supplies such as potable water, reclaimed water (i.e. rainwater), or creek water into an aquifer for later recovery and use.

In this case we are supposed to use the reclaimed water method and want to store it in the saline aquifers using the injection method and extraction through well. This rainwater ASR is supposed to help to keep the rainwater within an area. ASR water can be used for any purposes but in this project we are considering agricultural purposes only.

Simulated model of ASR for Indian Sundarbans



Modelling Performance of ASR in Indian Sundarbans



Is it feasible to implement ASR on Sundarbans?

Performance of an ASR system is complex and depends on aquifer properties, water qualities and fluid-rock interactions all of which can greatly affect ASR system performance. We've gone through following four stages:

i) Conceptual modelling of aquifer system (developed through PGWM), quantifying depths and aquifer properties.
ii) Project specific field data collection gathering data on the lithology and chemical isotopic analysis with purposive sampling considering salinity and depth into account. Analytical assessment for system operation using the data gathered in stage 'i' to confirm the feasibility the system as designed and test its sensitivity to range of aquifer properties with economic feasibility check.
iii) Numerical modelling- SEAWAT Model was used to simulate system performance over repetitive injection and abstraction cycles.
iv) As a result, in this study we have gathered as much lithology data possible to generate through first hand data collection method and validate the same through participatory aquifer storage and recovery management to run solute-transport groundwater modelling; required to predict how stored water will migrate over time, given different conditions and how saline aquifer properties will affect the quality of stored water. It has been well-demonstrated, by model generated using Jupyter Notebook (in python), that ASR systems can provide very large volumes of storage at a lesser cost than other options in Indian Sundarbans. The challenges moving forward are to field test the success of ASR systems, optimize system performance, and set expectations appropriately.

Conclusion

As a result of the participatory nature of the research it is revealed that ensuring participation is very crucial for successful understanding of the groundwater dynamics and planning activities for the same. In this connection a participatory data repository along with community data sharing platform was created with water users to regulate and maximize optimal use of freshwater. Simulated model on artificial recharge in this regard shows monsoonal rainfall in Indian Sundarbans was sufficient to generate alternative water source option for the region during summer and winter season.

References

Bhadra, T., Das, S., Hazra, S., & Barman, B. C. (2018). Assessing the demand, availability and accessibility of potable water in Indian Sundarban biosphere reserve area. Int J Recent Sci Res, 9(3), 25437-25.

Burman, D., Mondal, M. K., Khan, Z. H., Sutradhar, A. K., & Kamal, F. A. (2019). Soil and Water Resources of Sundarbans. In The Sundarbans: A Disaster-Prone Eco-Region (pp. 163-196). Springer, Cham.

Harvey, R. W., Kinner, N. E., Bunn, A., Macdonald, D., & Metge, D. (1995). Transport behavior of groundwater protozoa and protozoan-sized microspheres in sandy aquifer sediments. Applied and Environmental Microbiology, 61(1), 209-217.

Hazra, S., Bhadra, T., & Ray, S. S. (2019). Sustainable Water Resource Management in the Sundarban Biosphere Reserve, India. In Ground Water Development-Issues and Sustainable Solutions (pp. 147-157). Springer, Singapore.

Saha, S., & Saha, S. (2020). Toward Sustainable Conservation Plan for Fragile Ecosystem in Indian Sunderban. In Urban and Transit Planning (pp. 193-202). Springer, Cham

Maska modal of Participatory Groundwater Management Solutions in Coastal Area of Kachchh

Mr. Deepak Yogi and Mr. Kunj Shethiya

Kachchh is the largest district of Gujarat, in the western-most part of India. It is an arid district, with very scanty and irregular rainfall across the all blocks. The Kanakavati sandstone is spread across Abdasa, Mandvi, Mundra and Anjarblocks in Kachchh district of Gujarat and is the only dominant groundwater resource in coastal Kachchh areas. Around 5.43 lakh people in these 4 blocks – 3 lakh rural people and 2.43 lakh urban people depend on the shared aquifer for their water needs. Industries in the region - thermal power projects, ports and other manufacturing industries and Special Economic Zones (SEZs) are also heavily dependent on groundwater making it economically significant. Three of the 4 blocks including Mandvi have been declared dark zones by the CGWB. The water has high TDS in all blocks, and over 50% of all villages in Abdasa block report saline ingress. The aquifer being shared between a variety of users and uses has led to competition and conflict between various groups and irregular rainfall worsen the situation.

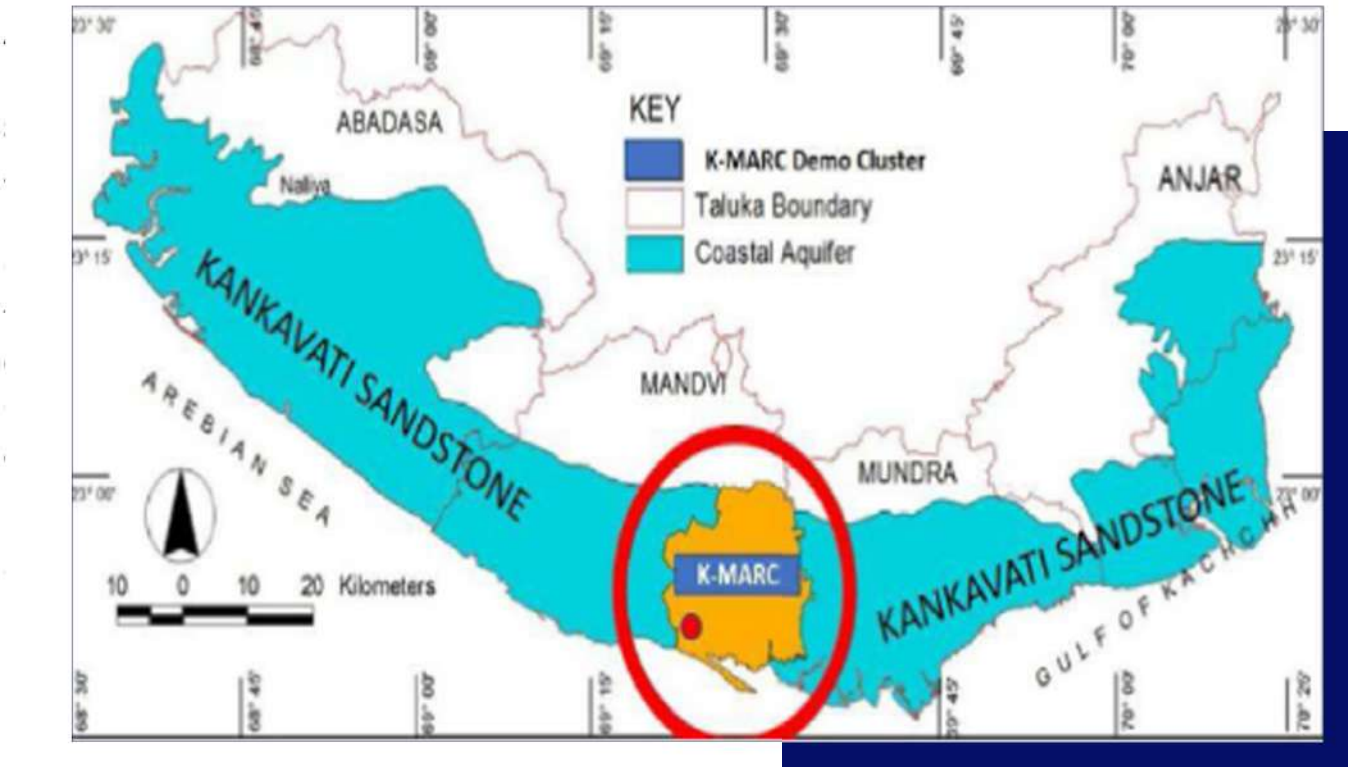


Figure 1.
Location of Maska (K-MARC)

Maska is a coastal village of Mandvi block in Kachchh with a total population of 5617 (as per Census 2011). The village is totally depended on ground water for meeting out its domestic and agriculture demand. Being a coastal village Maska used to suffer not only from ground water depletion but at the same time, salinity was a major issue affecting daily lives of local villagers badly. TDS concentration of drinking water borewell was 6800 PPM.

Over time, drastic population growth, consumption-oriented lifestyles are other factors put severe pressures on the aquifer which has affected both quantity and quality of water available. Due to over-draft of ground water a vacuum was created underground there which was filled through sea water intrusion, this polluted remaining groundwater as well hence people of Maska suffer from salinity. In this situation ground water management becomes important to maintain the ground water level and as well as to prevent ground water quality.

Intervention

Arid Communities and Technologies (ACT) is a well-known professional Civil Society Organization based at Bhuj- Kachchh working on Participatory Ground Water Management as one of its major objectives. ACT has worked extensively in the Kanakavati sandstone to demonstrate a science based, participatory approach to help manage the aquifer. In Maska ACT initiated a participatory ground water management project named; Kankavati Manage Aquifer Recharge through Community, (K-MARC).

The Participatory Groundwater Management approach of ACT has the following steps:

- Awareness generation among local community and Capacity building.
- Understand the aquifer better through participatory learning methods.
- Analysis of situation for designing most appropriate intervention.
- Involving all stakeholders throughout the process.
- Sharing information with the community and government.

In awareness component, ACT organized number of interactive sessions in form of public meetings, orientation, training workshops and Participatory Rural Appraisal activities at village level just to ensure participation of the local community in proposed ground water management initiative. During the consultation process community was oriented on technical issues such as water balance, institutional deficit infrastructure at the same time community shared its traditional knowledge and experience. During the next phase of understanding aquifer, BhujalJaankar, (trained barefoot geologists) collected baseline data from the village which were essential for preparing Village Water Security Plan such as land use pattern, surface water and ground water estimation, assessment of local water uses etc.

During data collection from the field BhujalJaankar oriented local people about the current ground water situation and future consequences. After data collection analysis process started involving local community, Panchayat and other stakeholders, which went up to selection of appropriate intervention for ground water management at village level.

In Maska, community who was the major stakeholder has been involved in the planning and site identification process to make process more effective and a right fit. To improve the water quality and dilute sea water salinity impact, a riverbed has been identified with support of local community and gram Panchayat. Two check dams have been improved by desilting and repairing. The upstream check dam's storage capacity has been increased by de-silting of about 8000 cum, resulting in increased storage capacity of about 23000 cum, with silt distributed to the village farm.

The downstream side check dam abutment wall was repaired to store overflowing water from up-stream structures at end point of the rivulet. Three injection structures have been constructed in the surface water harvesting structures to recharge groundwater at various depths:

i) A 50 m deep tube well for deeper aquifer recharge (as per given in the figure)
ii) River bed recharge to trap surface runoff and provide lateral flow to the shallow zone
iii) Convert one defunct and dry open well into filter well again to recharge at intermediate depth.

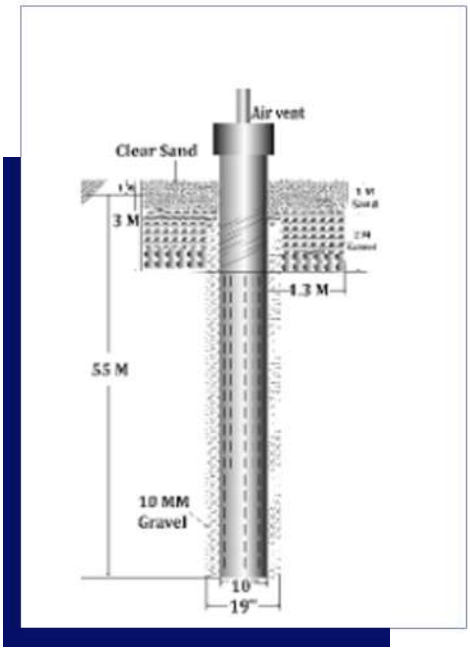


Figure 2

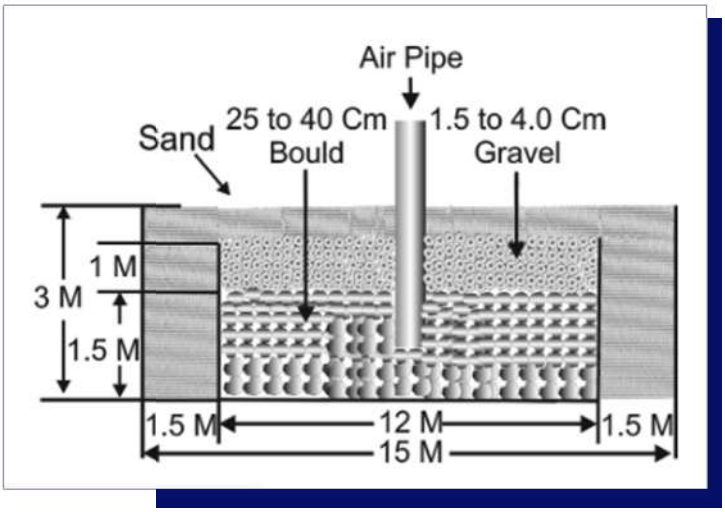


Figure 3

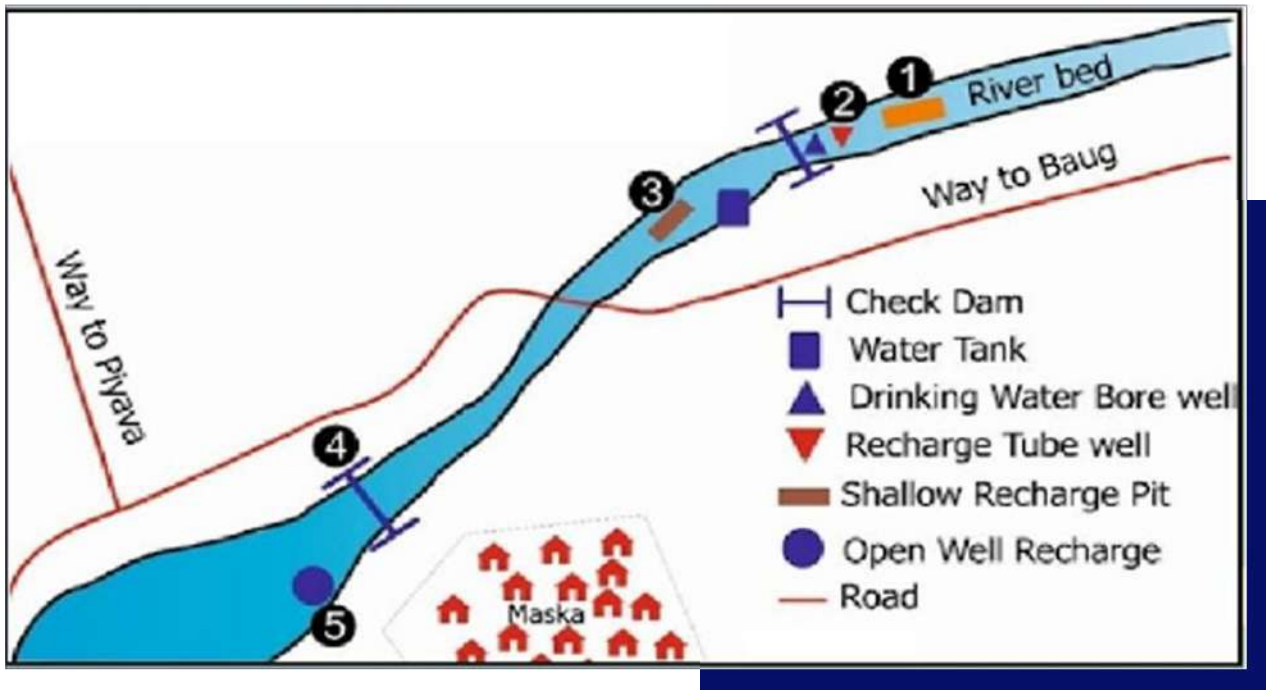


Figure 4
Overview of Shallow and deeper aquifer recharge structures

Figure 5. Overview of various structures developed under the intervention

All these interventions have been made during post monsoon season of year 2018 and pre monsoon season of year 2019.

Financial cost of the intervention:

The total financial outlay of the intervention was 7.31 lakh rupees. As per data given in the following table an amount of 3.15 lakh rupees was incurred on de-silting of local pond which increased its water storage capacity.

A shallow recharge pit of 3 meters was also developed under this intervention, which costed 2.15 lakh rupees. An amount of 1.39 lakh rupees invested for development of the tube well recharge structure. For restoration of a check dam 55,000 rupees incurred while for another open well recharge structure 7,000 rupees were incurred.

Table: 01
Financial cost incurred on the groundwater management solution

S.N.	Activity	Investment (INR)
1.	Pond De-silting (8000 cum) and spread of slit in 48 ha. of farm areas.	3,15,000
2.	Shallow Recharge pit of 3 m (D) x 15 M (W) x 15 M (L) size	2,15,000
3.	Recharge tube-well (50 m depth)	1,39,000
4.	Check dam restoration	55,000
5.	Open well recharge	7,000
	Total	**7,31,000**

Impact

Maska is a good example of blending traditional knowledge with modern science and technology for ground water management. The intervention in Maska resulted not only in improvement in ground water level but also quality of the groundwater.

S.N.	Parameter	Before Intervention	After Intervention
1.	Water Level (M)	**95** (November 2018)	**91** (November 2019)
		98 (January 2019)	**91** (January 2020)
		90 (March 2019)	**91** (March 2020)
		97 (May 2019)	**95** (May 2020)
2.	TDS (PPM)	**6110** (November 2018)	**1600** (November 2019)
		6100 (January 2019)	**1910** (January 2020)
		6110 (March 2019)	**2080** (March 2020)
		7490 (May 2019)	**2690** (May 2020)

Table: 02
Pre and intervention comparative analysis of Water level and TDS

An improvement of average two meters in ground water level and decrease of 50% in salinity was observed within one year after the project implementation. Pre-intervention, the water level used to deplete from April and salinity level used to reach up to 7400 PPM by July. Post intervention the scenario has a remarkable change in TDS. The lowest TDS value was recorded 1200 PPM, in September 2019. After which, the groundwater uses increased and TDS reached up to 2690 which was within permissible limits.

This intervention ensured drinking water security for people of Maska for longer period in a year which itself is an indicator of success of the intervention. Based on the results so far, continuous recharge for three year is predicted to ensure stability in water level as well water quality round the year.

Figure 6
Researcher at the intervention site at Maska

Conclusion

Maska is a remarkable example of participatory ground water management solution in coastal area of Gujarat. ACT, which was implementing agency made efforts to ensure active participation of not only local community butalso other stakeholders from government, local Gram Panchayat, and civil society organizations such as Costal Gujarat Power Limited, WIN Foundation, GSS. These agencies not only participate but also contributed which made this intervention successful.

Once-dry Vijayapura now Brims with Water, a Testament to the Transformative Powers of United Effort

Sudheendra Kulkarni

Water is life. It is as simple and as basic as that.

In Hindi, the point can be driven home better with the force of alliteration – jal (water) is what sustains jan (people), jameen (land), jungle (forest), janwar (wildlife) and, cumulatively, jeevan (life).

Water sustains not only human life but also the life of fish in lakes, of migratory birds, of farmers' crops and cattle, and of grass and sacred trees, under one of which the Buddha attained enlightenment.

The complex web of life of humans, animals, plants and trillions of micro-organisms cannot survive without water. Yet, ominously, large parts of the world are staring at a rapidly worsening water crisis.

In India, according to the Niti Aayog, 40% of the country's population will have no access to drinking water by 2030. Sixty crore Indians are facing high-to-extreme water stress and nearly 2,00,000 die every year due to inadequate access to safe water. In many cities and towns, 24x7 water supply has become a luxury.

The lack of piped water supply and over dependence on wells and bore wells has resulted in the over-exploitation of groundwater, which is the source of 48% of urban needs in India. Yet, in seven of India's 10 most populous cities, groundwater levels have dropped dangerously. In rural India, weak monsoons and recurring droughts are starving humans, crops and animals of water.

In the midst of this gloomy scene, the Union Jal Shakti ministry has announced an ambitious plan to provide piped water connections to every household in India by 2024. Laudable, yes. But doable? Achieving this aim would demand a holistic, scientific, government-supported but people-driven mission, undertaken on a war footing, to conserve and manage every drop of water.

Traditional water bodies, both over ground and underground, have to be recharged even as we harness new sources of water and new technologies to recycle and reuse it.

Rapid urbanisation is resulting in the indiscriminate felling of trees, which not only provide rains but are also nature's own carbon sequesters. Hence, protecting forests and enlarging tree cover is critical for overcoming the water and climate crisis.

This calls for a mammoth national effort, or what Hindu mythology calls “Bhagirath Prayas”. It refers to King Bhagirath whose power of tapasya, or penance, blessed by Shiva, brings the river Ganga from the heavens to earth.

The parable tells us that sincere, dedicated and persistent efforts are bound to succeed, howsoever difficult the challenge may be. Every effort of this kind – big or small, global or local needs to be studied, popularised, lauded and replicated.

This is the story of one such inspiring “Bhagirath Prayas” by a politician in Karnataka, of which not much is known nationally. During my visit in late December, I saw its remarkable accomplishments, which have lessons for the rest of India and beyond.

Bijapur then, now

It is a cool winter evening and I am sitting at the edge of Bhuthnal Lake on the outskirts of Bijapur, the historic city in north Karnataka that was renamed Vijayapura – city of victory – a few years ago. The lake, one of the largest in the state spread over 530 acres, is full. Egrets are flying languidly over its still waters. The sky is serene, lit by the light of a crimson setting sun.

At the other end of the lake is a 13.5-km-long aqueduct, one of Asia’s longest. It is part of a massive irrigation and drinking water initiative that provides water to over 6.5 lakh acres of farm land and fills 240 lakes and tanks in Vijayapura and neighbouring districts.

Behind me is a forest in the making. Once the trees planted four years ago on 540 acres of this once-barren land grow tall, it will be one of the largest urban forests in Asia. They are watered by solar-powered drip irrigation.

My eyes cannot believe what they see.

I am familiar with Vijayapura because my childhood was spent in this vicinity. My hometown Athani in neighbouring Belgaum district is just 70 km away. Vijayapura was then a perennially drought-prone district, the most backward in Karnataka, as dry as Jaisalmer in Rajasthan.

The city was known as much for its terrible water woes as for the Gol Gumbaz, the grandest of many monuments built by rulers of the Adil Shahi kingdom who had made the area their capital during their reign from 1489-1686.

In the summer, the supply of drinking water, never regular at the best of times, was restricted to just once a week for a couple of hours. Bhuthnal Lake, never full even in rainy months, would become a bed of parched mud. So would the city’s centuries-old fabled bawdis, or stepwells, built when the city prospered under one of the more progressive kingdoms in medieval India.

Anyone who could leave the city in the summer did so eagerly. Thousands of poor families migrated each year to far-off places in search of work. Those who stayed on would wait anxiously for the day of weekly water supply.

“Some of us would take half-day leave from work just to make sure we stored every drop of water that came in our taps,” an old resident told me.

"The situation was so bad that if someone in the family died on that day, people in the household would first collect their weekly quota of water and then attend to the funeral preparations."
— *An old resident of Vijayapura*

Now, it is different.

Since 2016, Vijayapura city's five lakh residents have been enjoying 24x7 water supply, even during summer – thanks to the Bhuthnal Lake that is filled with water from the reservoir of the Alamatti Dam across the river Krishna, 60 km away. Several of the city's large bawdis – two famous among them being Chand Bawdi, built around 1570, and Taj Bawdi, 1620 – are full, cleaned up, and their architectural glory restored.

In addition, the drinking water needs in almost all the villages in Vijayapura district and the neighbouring Bagalkot district – and some in my own Belgaum district along the border of Karnataka and Maharashtra – have also been met by providing safe surface water from the Alamatti and Narayanapur dam reservoirs.

This has been done by building nearly 2,000-km of canal networks and filling of lakes and traditional minor irrigation tanks between 2015 and 2021. This has recharged natural aquifers. As a result, the groundwater table has risen and farmers are delighted to see water in their wells throughout the year. Many of them now grow two crops a year. The distress migration of poor people has significantly reduced.

In my childhood, whenever I travelled from Athani to Vijayapura, I would only see arid land for kilometres on end. Now, my eyes feast on greenery everywhere. Today, the grape farms of Vijayapura and Bagalkot vie with the ones in California. At 25,000 acres, the land under grape cultivation has tripled in the past five years. Thanks to the area's unique climatic conditions, excellent raisins are produced here.

The production of tur dal, red gram, has gone up significantly, a welcome development since India imports large quantities of pulses.

Power of political will

At the heart of the effort to bring water to Bijapur is MB Patil, a 54-year-old veteran Congress politician. It took a combination of common sense, strong political will and people's participation to bring about this change.

A former member of parliament and a five-time Congress legislator, Patil became the state's water resources minister in the government headed by Siddaramaiah from 2013-'18. The aim of liberating his district from water scarcity had been close to his heart ever since he joined politics in 1991.

Common sense dictated making full use of the four main rivers that flow through Vijayapura and Bagalkot districts – the Krishna and its tributaries: Bhima, Ghataprabha and Malaprabha. They are in spate in monsoon months due to the heavy rainfall in Mahabaleshwar in Maharashtra's Western Ghats – where the Krishna originates – and drain into the Bay of Bengal.

"We used to witness this cruel paradox in the past – overflowing rivers in the rainy season and drought during most parts of the rest of the year," Patil said. "I thought, why not stop this loss of water to solve our problems?"

During his five years in office, Patil implemented a series of massive projects that lifted water from these rivers and created a network of pipelines, pump houses, canals and aqueducts – wherever the topography was uneven – and filled lakes and tanks, constructed check dams and other minor irrigation facilities.

He also encouraged the installation of thousands of farm ponds, which are lined with polythene to prevent water from percolating into the ground, and promoted drip irrigation in a big way.

"I believe in the 'more crop per drop' philosophy of farming," said Patil. "Every drop of water is valuable and must be conserved for increasing agricultural production and maintaining the health of soil."

The Ramthal-Marola project in Bagalkot district, which Patil helped conceptualise and execute, is one of the biggest community-based automated drip irrigation schemes in the world. The government of Karnataka invested Rs 7,500 crore in all these multifarious projects.

But there was one seemingly insurmountable problem in harnessing the abundant waters of the Krishna river. Patil's dreams were hamstrung by the longstanding Krishna river water dispute involving Maharashtra, Karnataka, Andhra Pradesh and Telangana.

In 2010, the second Krishna Water Disputes Tribunal headed by Justice Brijesh Kumar, a retired Supreme Court judge, awarded 666 thousand million cubic feet of water to Maharashtra, 907 thousand million cubic feet to Karnataka and 1,001 thousand million cubic feet to Andhra Pradesh.

Specifically, it permitted Karnataka to raise the height of the Almatti Dam, a major multi-purpose reservoir project on the Krishna river from 519.60 metres to 524.25 metres, which would facilitate the storage of 303 thousand million cubic feet of water.

However, this award was challenged by Andhra Pradesh, which argued that its share was reduced after the state's bifurcation and the creation of Telangana in 2014. The Tribunal eventually declined to reallocate the river water among the four states. Patil played a pivotal role in the crucial hearings before the Tribunal about all water issues related to Karnataka.

Armed with the Tribunal's award, and with the backing of the chief minister, Patil started implementing water projects in mission mode. This was evident when I visited the site of the Rs 3,600-crore Tubachi-Babaleshwar lift irrigation project.

Most government schemes suffer inordinate delays and incur huge time and cost overruns. This one was completed in less than three years. It now provides irrigation to 1.30 lakh acres of land. A supervisory control and data acquisition software system centrally monitors the delivery of water right up to the tail end of the canal 80 km away.

Another mega lift irrigation project at Mulawad is Asia's largest. It irrigates 5.3 lakh acres. The construction of the aqueduct, a part of which passes near Vijayapura, was completed in a record 155 days.

River water from these projects is transported to fill lakes and ponds twice a year – once during monsoon and later before the beginning of summer. This has revived several lakes that had almost become extinct.

For example, Kaatrala Lake, spread over 270 acres and constructed in 1979 in the wake of a severe famine, had been full only four times in its 38-year history. When a newly constructed 92-km-long canal released Krishna river water into this lake, there was a festive atmosphere in the nearby villages.

Similarly, the famous temple town of Badami Banashankari had been suffering from water scarcity. It sprang back to life when a 130-km-long canal filled the temple's pushkarni, or sacred tank, with river water.

Patil also paid great attention to the problems of other water-deficit districts in the southern and eastern parts of Karnataka. He initiated measures to fill more than 3,500 tanks across the state. As much as Rs 44,500 crore was spent on irrigation in five years. Karnataka's performance was appreciated by the Central Water Commission, and the state earned the "Certificate of Excellence" twice.

Biodiversity returns to life

A memorable experience awaited me when I visited Mamadapur Lake, about 30 km from Vijayapura. This water body is spread over 500 acres. Built in 1645 by Mohammed Adil Shah, its impressive stone embankment is still intact. Due to recurring drought, siltation and neglect, it had almost completely perished.

Now, cleaned up and brimming with water from the Krishna river, the lake is a treat to the eyes. On one side of the lake is government-owned land of 1,600 acres, which had been reserved as a forest area. But because there was no water, there was no forest. Now that the lake has come alive, so will the forest.

I was accompanied by VP Huggi and Muragesh Pattanashetti, who teach at the technology and management institutes in Bijapur, two of the over 80 educational institutions run by Patil's Bijapur Lingayat District Educational Association. The two professors have been working closely with him, providing technical support for his projects.

Huggi, who served as a director of the Karnataka government's irrigation corporation, said, "We have irrigated the entire district." He said that in the past, most of the villages used to depend on water tankers in summer months but they have become water secure.

One crore trees

Pattanshetti said that they wanted to take me to Almatti dam, to see not just the spectacular reservoir but also one of the state's best nurseries. Patil's other pet mission is afforestation. In 2016, he launched the Koti Vruksh Abhiyan to plant one crore trees in Vijayapura district in five years. He successfully completed the programme in 2021.

The campaign needed saplings to be made available at an affordable cost to people on a large scale. His team, in collaboration with the forest department of the Karnataka government, encouraged farmers and non-governmental organisations to develop nurseries. The nursery at Almatti has so far produced over 10 lakh saplings.

“We want to make Bijapur [Vijayapura] and Bagalkot districts as green as Malenadu,” said Mahesh Patil, a range forest officer. Malenadu is famous for its thick forests in the Sahyadri mountain range near the coast of Karnataka.

PKM Prashanth, a young and committed district forest conservator, described to me the scale of afforestation in Bijapur in the past few years. Prashanth said there are 420 trees per person in the world. But the figure in India is 28 – and in Karnataka, it is seven. “In Bijapur, it was only 0.11 in 2016,” said Prashanth. “It has now gone up to about 0.28.”

“How could this impressive feat be achieved?” I asked him, as we took a walk around the lake and the forest near Bhuthnal Lake.

Prashanth replied: “This is because it has truly become a people’s movement. We encourage and support farmers and city people to ‘Plant, Donate, Adopt’ trees wherever they can.”

He added: “When you ensure adequate water, it does wonders to the rural environment. Water catalyses agriculture, social forestry, animal husbandry, dairy, poultry and fishery. Water has also brought about a change in the micro-climate of Bijapur [Vijayapura]. The city has become a little cooler. This lake and the forest behind us have begun to attract many new animals and migratory birds.”

Dhruv Patil, MB Patil’s 18-year-old younger son, concurred. A passionate animal lover and an accomplished wildlife photographer, he founded a non-governmental organisation called Society for the Protection of Plants and Animals when he was eight years old. “Earlier flamingos were unseen and unheard of in our district. Now flocks of flamingos have started coming to the newly revived lakes in the district,” he said.

Prashanth is an example of how dedicated government officers can make a big impact on the development of the place he serves, and how the place in turn can redouble their dedication.

He told me he hails from southern Karnataka and that when he took the posting in Bijapur his wife said, “Why are we going to this god-forsaken place?” “Today I thank God for giving me an opportunity to work with such good people here,” said Prashanth.

Transforming a hill, and harmony

Rural India opens up a floodgate of surprises if you are looking for ordinary people with extraordinary accomplishments. I saw an incredible example of the success of the Koti Vruksh Abhiyan at a village called Domnal about 25 km from Vijayapura on the road to Solapur in Maharashtra.

This road, recently converted into a superb highway by Nitin Gadkari, the Union minister of road transport and highways, is one of the many visible markers of the way this once-sleepy district has been changing. Our car swerved off the highway and took a narrow country road. Soon, we came near a lush green hill, the site of an amazing success story in social forestry.

The hero of this story is Nanasaheb Patil. In 2014, he retired as deputy tehsildar and returned to his village with a strong desire to help transform it. The hill is his ancestral property, covering an area of 34 acres. It was completely barren.

In 2016, he started planting trees on it under the guidance of the forest department. He used all his retirement earnings for this. Water was scarce. Luckily, the nearby Domnal Lake had been filled with water from the Krishna river by then. Nanasaheb Patil nurtured the saplings himself using a small, self-driven water tanker.

Within five years, the hill became unrecognisably green. "We have planted over 10,000 trees of 50 different varieties here," he said. "Now, this hill is home to over a hundred species of birds," he said proudly. At his urging, I planted a sapling there as well.

The hill had another surprise in store for me. As we walked up to its summit, I saw a small shrine with a green dome. "This is the dargah of Baba Daval Malik, a Sufi saint who came here some 400 years ago," Nanasaheb Patil told me. In disbelief, I asked him, "You are the owner of this hill. So how come there is a Muslim saint's shrine here? Who maintains it?"

He replied, "This is maintained entirely by Hindus. Muslims are a tiny minority in our village." Nanasaheb Patil said that every year, on Gauri Purnima, a five-day urs – to mark the saint's death anniversary – is organised and attended by thousands of people, mostly Hindus. "There is no Hindu-Muslim problem in our villages," he said.

Prashanth, who had accompanied me on this visit, remarked: "There are two saints on Domnal Hill. One is Baba Daval Malik. The other is Nanasaheb Patil."

A self-effacing person, Nanasaheb Patil demurred. "What we have achieved here is a collective effort," he said. "It's not a one-man show. If you start doing something to help society, good people will join you automatically."

What lessons does Vijayapura's ecological transformation have for the rest of India, I asked M. Madan Gopal, a widely respected Indian Administrative Service officer who served as the additional chief secretary of forest, ecology and environment in Karnataka. According to Gopal: "In view of the visible changes in climate, shifting rainfall pattern and people's growing water needs, it is necessary to promote such innovative initiatives all over India through active community involvement and sustained ownership that will facilitate much-needed equitable development."

MB Patil is no longer a minister, although he continues to be a state legislator. There is a Bharatiya Janata Party government in Karnataka now.

What struck me at the end of my two-day travels in Vijayapura and Bagalkot districts is that even though Patil is out of power, he and his colleagues continue to be deeply engaged with the mission to transform the region. This is not easy because politics breeds local rivalries and a change in government causes a change in priorities.

The 'hundredth monkey'

"Cities must reintegrate nature into their spatial planning decisions, and restore the 'natural layer' as the backbone of their development," says the World Economic Forum in its report BiodiverCities by 2030: Transforming Cities' Relationship with Nature published on January 17. "This means preserving natural habitats within and around cities, renaturing degraded land (through, for example, community-based tree planting) and 'growing smart' by embedding nature in new or upgraded infrastructure."

The report, which "provides a vision for cities of the future", urges a paradigm shift in urbanisation to tackle "the interconnected biodiversity and climate crises".

Bijapur's "Bhagirath Prayas" for the revival of its ecological heritage has prefigured, to some extent, the vision put forward by the World Economic Forum. It has made the region "Sujalam Suphalam", or rich with water and fruits, as our national song Vande Mataram has envisioned India to become.

However, it is just the beginning, and it is not without flaws. But it is surely an audacious beginning, whose one important lesson is this: it demonstrates how a combination of government plans and resources, committed political leadership and people's enthusiastic participation can bring about a positive change.

Is it replicable? I found the answer to this question in the pages of Jnanpith laureate Amitav Ghosh's acclaimed book *The Nutmeg's Curse – Parables for a Planet in Crisis*. Ghosh describes local efforts of this kind as vital "Earth-centred mass movements" that could save the planet from the climate crisis.

He says they could start a "social epidemic" in which a good effort in one place has a demonstration effect on other places to trigger large-scale changes. Referring to Bron Taylor's book Dark Green Religion – Nature Spirituality and the Planetary Future, Ghosh cites the fable of the "Hundredth Monkey".

"If an isolated group of monkeys living on an island learns a new behaviour, goes the story, there will come a point when, if enough of them adopt that behaviour, then other monkey populations on other nearby islands will also follow suit…The lesson, in any event, is 'that everyone must optimistically and continually do their part to promote the needed spiritual, ecological, and political changes, because one never knows who the decisive monkey will be'."

Courtesy: first published by www.scroll.in on March 27, 2022
(https://scroll.in/article/1020269/once-dry-vijayapura-now-brims-with-water-a-testament-to-the-transformative-powers-of-united-effort)

Ecological, Economic and Social Benefits of Community Forests: A Case Study of Payvihir Village along with a Video

Sahibpreet Kaur, Research Associate, RGICS

Overview

The village Payvihir is nestled at the foothills of the Melghat range in the Amravati district in north east Maharashtra. The Satpura range in the north separates the district from the state of Madhya Pradesh. The region boasts of a hot and dry climate with the monsoons season stretching from June to October. The average rainfall is 700-800mm in the region. The temperature in summer can go as high as 46° C, whereas in winters it can dip to 11°C.

Located in the Achalpur taluka of Amravati district, Payvihir is a medium sized village. It is home to 110 families mostly belonging to the Korku tribe and some Balai families. The population of the village as of Census 2011 was 490, with 255 males and 235 females. The literacy rate in 2011 for the village was 64.48%, which is speculated to have increased in the recent years as per the locals.

The story of Payvihir village in Amravati district of Maharashtra began with water scarcity, migration, and poverty, like many other tribal villages across the country. It was when a few literate youth became acquainted with an NGO and learnt about their rights that the fight for a better future began. The village united and got the community ownership of their traditional forest land as 'Community Forest Right' (CFR) through the Forest Rights Act (2006). However, the forest land was highly degraded.

Through Joint Forest Management (JFM), Mahatma Gandhi National Rural Employment Guarantee Act/Scheme (MGNREGA) and other related schemes, the people began work on the forest and within a few years the forest started regenerating. Water became available again within the village for the people to practise agriculture and birds and animals started visiting the forest again. There was enough fodder again available in the forest for the villagers of Payvihir to be able to rear cattle and livestock. MGNREGA and works under JFM brought employment opportunities within the village and reduced outmigration for work. Today, Payvihir is an example of how schemes such as FRA, JFM and BDA can be successfully implemented at a decentralised level to bring meaningful development in marginalised people's lives and give them a better standard of living.

The ownership of a forest has completely changed the lives of the people of Payvihir. With the availability of work in the village, people stopped migrating out. Soil and water conservation works rejuvenated the groundwater levels, making it possible for the villagers to dig borewells in the village and install taps in all households. All of this has increased enrollment of children in school, improved the health and nutrition status of the villagers, and improved the outcome of agriculture with water available for irrigation.

The many works carried out on the CFR land such as plantations and soil and water conservation works created employment opportunities for the villagers around the year through MGNREGA. With work available in the village itself, families stopped migrating out for work.

The forest received under CFR has a huge patch of custard apple and tendu trees which have become a major business opportunity for the Payvihir Gram Sabha. This case study looks closely at the process and challenges of implementing FRA in a tribal village in Maharashtra to understand how such a model can be replicated elsewhere.

Payvihir Forest and Forest Based Livelihoods

Payvihir is located along a reserved forest on which the people of the village were dependent for majorly fuelwood needs. The approximately 192 ha of forest area which the people of the village traditionally accessed was degraded and under-stocked with heavy soil erosion and water runoff. The soil types found in the forest are sandy clay loam, gravelly clay loam and gravelly sandy loam.

The major tree species found in the area are palash, tendu, bharati and sitaphal. Other species that constitute the vegetation are neem, nirguri, bor, khair, amaltas, babul, rosha grass and kusa grass amongst others. The girth of the trees indicate a young forest although it might have had slow growth due to high soil water run-off. The wildlife found in the forest includes jungle owl, grey partridge, lizard porcupine, wild boars, bear and deer. Occasionally leopards and snakes are also spotted in the area. The water level was extremely low in the forest and the barrenness had barely enough food and fodder for the wild animals.

Before the CFR, a JFM committee used to manage the forest. However it only became active around a year before the village received their CFR rights. With the members of the village becoming active in the JFM, some soil and water conservation works were started with the help of MGNREGA. Prior to that, the reserve forest came under the jurisdiction of the state forest department. The people of the village were only able to extract fuelwood.

The villagers of Payvihir were mostly dependent on the forest for fuelwood. As recollected by the interviewees, people did not collect any Non-Timber Forest Produce (NTFP) before receiving CFR, as the forest was managed by the Forest Department.

There was a huge water crisis in the village in the 2000s. This made the practice of agriculture or rearing livestock or cattle difficult. Most villagers would migrate to other places to work as farm or contractual labourers to earn a livelihood. A major source of livelihood for the villagers back then was extraction of fuelwood in bundles, which they would then sell in the nearby city of Paratwada or Pathrot, a town nearby.

The issue of water scarcity in Payvihir was so grim that every day, in each household, one person had to stay back and trade off on work or education, just to ensure there was water in the house. There are no major water bodies near the village and drinking water had to be collected from a farm that had a borewell, at least a kilometre away. Villagers had so little water that even in extreme heat; they could either take a bath or use the water for cooking, cleaning and drinking. Agriculture could not be practiced due to the same reason.

All rainwater was lost due to surface runoff. This acute shortage of water to even survive, led to a need to do something in the village amongst some youth, who later on, took the leadership to claim for CFR. Water scarcity also impacted the scope of activities the people of Payvihir could take up to make a livelihood. Around 70% of households in the village do not own any land. Limited access to forest meant no income from MFPs or cattle/livestock (grazing in forest).

While the forest used to provide fuelwood and some area for grazing, that depleted highly over the years. Receiving the CFR and managing the forest would provide an opportunity to regenerate the forest and earn an income in the form of MFPs, grazing ground and regeneration activities.

The Community Mobilization Process in Payvihir

Claiming of community forest rights under the Forest Rights Act, 2006 requires consensus within the village, participatory planning and democratic process of decision making. These are not pre-requisites only for claiming forest rights but also determine sustainable and equitable usage of forest resources. However, the Payvihir village was deeply divided into two constantly fighting fractions. A group of young people from the village led by Mr. Ram Lal with the help of an NGO KHOJ - a quest for Knowledge Hope Opportunity & Justice - took this challenge to unite the village. This group used cultural and religious events, symbols and institutions to unite the village.

There were conflicts within the Korku community itself because of which there was segregation within the community. A few youth of the village, studying at an adivasi hostel in nearby town, who were childhood friends, realised this. There was so much segregation and conflict amongst villagers they could only meet at the hostel, despite being from the same village. They realized how this conflict amongst the community was detrimental to the future of the village.

This conflict would come forward when there was some event or festival in the village. Especially during festivals like Ganesh Chaturthi or Navratri. At that time they didn't understand the need for development or such, and they were just concerned about their friendship. However, in a few years they realised that the survival of the village depended on the survival of the community. At the same time, they also met people from a local NGO- KHOJ at the village. This group of friends then approached the elders behind the two main groups and asked them what the reason for this conflict was; both of them started blaming each other. These young boys realized that they were just creating conflict amongst the villagers for their own greed. They started talking to the people of the village regarding this and stated the need to unite.

Around the same time Mr. Ram Lal, a part of this group of young men, participated in the andolan for NREGA as a volunteer with the NGO KHOJ. At the same time FRA was also being drafted. This made him realise even more the importance of unity in the village to be able to reap the benefits of these policies. Following this, he decided to set up another Ganpati in the village during Ganesh Chaturthi, a festival celebrated widely in Maharashtra. He with his friends announced that people from either group in the village can come and part of their Ganesh Chaturthi festival. People were confused as they would only go to the festivities of their group. However, the youth convinced them that this is God's festival and there is no harm in eating food arranged at their stall. This proved to be a big step in bringing the people of the village together. Within two years, this young group of friends were able to unite their village. This was just in time as the FRA came about.

The group of youth also used the traditional institutional mechanism in the form of Jati Panchayat. The Korku community of the village had their own system of governance which is centuries old. They called this the Jati Panchayat. The existence of this system in the village, also helped in bringing people together for Gram Sabha meetings. Jati Panchayat is called Chawari in their local language. The system has a non-political head called the Mukhiya, there is a chundri who calls people to the meetings. It is compulsory to be attended by at least one member of each household.

Earlier the issues taken up in Jati Panchayat constituted issues in the community, such as any conflicts within the community, weddings, festivals, pooja or collection of funds and/or resources for these activities. The Mukhiya had the authority to resolve conflicts anywhere, anytime. Big events in the village like festivals or weddings could be initiated only in the presence of the Mukhiya. The villagers after discussing the Forest Rights Act, 2006 agreed to use the Chawari as Gram Sabha for under the FRA, 2006. Today, along with its traditional tasks, the Chawari is functioned as an effective Gram Sabha in Payvihir.

The nature of issues discussed in Jati Panchayat changed as it became gram sabha. The Gram Sabha meetings are recorded in writing. One of the reasons CFR implementation has been successful is because the system of Jati Panchayat, a way of bringing people together, was alive in Payvihir.

Exposure Visits and Support from Forest Officials

While in the process of mobilizing villagers and bringing unity, the group Korku youth also filed a claim of community forest right (CFR) under the Forest Rights Act, 2006. In this process the team of KHOJ helped them in filing claims.

An exposure visit was arranged by the forest department in 2011. This was after the claim was submitted. It was crucial to show the rest of the villagers that it was really possible. Around 13-14 people from the village including women went to Mendalekha. People were impressed to see that getting rights over forest land was actually possible, as this was also an adivasi community that lived and worked in a similar manner. And they had won rights over a dense forest.

After that, they went to Hiware Bazar village in Maharashtra. This village does not have a tribal community, but the gram panchayat managed to work in a partnership with the forest department through the JFM on water conservation in watershed and plantation. That is where they learnt that JFM can be a channel of funding through which they could regenerate the forest. For the people of Payvihir, Mendalekha was an example of a governance model of decentralisation and Hiware Bazar was a model of utilising JFM for water conservation and forest regeneration. Pictures taken in these exposure visits were shown to the rest of the villagers on their return and this had a huge impact on the people.

After the exposure visit, an expert, forester C Sreenivasan was called to better understand the forest, and the kind of work that should be done. However, people were still hesitant to believe it would happen to their village. The NGO KHOJ facilitated in bringing the Chief Conservator of Forest (CCF) Mr. Mohan Jha to the village in 2011. This was the first time that in their village 17-18 cars came with a red beacon. The entire village waited for them and Mr. Jha sat with the villagers. This made the villagers believe in the youth. The elders especially felt that they must be doing something right if they could call a forester of that position to the village.

Mr. Jha told the villagers that the forest was theirs and the foresters were with them. He asked about the JFM, and that is when the JFMC became active in Payvihir. This way NREGA work started in the forest. Finally in June, 2012, Payvihir was allotted CFR on 192.98 Ha of forest land benefitting a total of 113 Korku and Balai families in the village.

Community Led Regeneration of Payvihir Forest

The Payvihir village has travelled a long way from claiming degraded forest land to regenerating it and finally promoting forest based sustainable livelihoods. Following are few factors which contributed in this successful and replicable achievement of the Payvihir.

People's participation and leadership

One of the most crucial factors in the successful implementation of FRA in Payvihir has been an active and engaging community. The leadership taken up by a few youth in uniting the community and then actively participating in the process of claiming and then managing CFR has been crucial. The gram sabha of the village recognises its authority in a decentralised governance structure and fearlessly asserts it. With the help from government departments and KHOJ, they have kept themselves updated with the knowledge and technical expertise required to manage their forest and develop their village.

The traditional governance system of the village known as jati panchayat made it easier to bring together people of the village to disseminate information about FRA. This old system has been moulded into what is now the gram sabha of the village. The jati panchayat ensured there was a sense of community in the village which has translated into a strong, united and empowered gram sabha of Payvihir. Where earlier, personal matters were discussed in the jati panchayat meetings, issues of CFR and biodiversity management and overall development have become more important in the meetings of the gram sabha.

Institutional Innovations at the Village Level

Even after getting the CFR title and years of managing the CFR land, the awareness campaign managing the resources such as forest, fuelwood, and especially water continue within the village. These topics are regularly taken in gram sabha meetings and are an important topic of discussions in the Mahila Sangh as often the women are the ones managing water resources in the household. Water karamcharis have been appointed in the village to ensure there is no wastage or leakage at any point in the village.

One peculiar and clever management scheme of the villagers in Payvihir has been the uniformity of members across committees formed for management of forest. The committee elected by the gram sabha to carry out the duties as under section 5 of the FRA has the same members as the JFM committee and the Biological Diversity Management Committee. The uniformity in the committees has eased the decision-making process and reduced the chances of conflict.

The group of youth who initiated the process of claiming for FRA have never taken any position of authority within any committee in the village. Rather, all people of the village are encouraged to take up different positions in these committees to ensure active participation and instil a sense of responsibility and inclusion in them.

Managing Commons across Villages

The Gram Panchayat of Upatkheda, of which the village Payvihir is a part, collectively manage around 1200 ha of forest land under CFR titles. The four villages in the GP are in constant contact and design their management plans together. If one village faces a conflict, the other three also come forward to facilitate conflict resolution. This has helped build community resolution, mitigating measures and unity amongst the villages.

How Shalikram's Life changed for the better due to development in his village Payvihir

Shalikram's story illustrates how one household amongst many, has benefited from schemes through convergence.

For all his life Shalikram used to work as a servant in the nearby town (big village) of Pathrot. When the milch cattle scheme of the forest department was introduced in the village, Ramlal suggested that Shalikram get a buffalo. The scheme implemented by the JFM and Gram Sabha provided a buffalo or cow to beneficiary households at the cost of Rs 52,000. The amount for the cattle would be paid in parts by the forest department, the gram sabha (as a loan on 0% interest) and the rest by the beneficiary. Shalikram did not have any farm land and wondered how he would arrange for fodder if got cattle and hence, was hesitant to apply for the scheme. He was assured by Ramlal that he could get fodder from the designated CFR land. After convincing a lot, he finally got a buffalo and sold its milk.

Within a few years, Shalikram's cattle increased and out of the 6 buffaloes he had, 4 regularly gave milk. He was able to earn Rs. 2000 weekly. His son also joined in looking after the buffaloes and would take them for grazing. Gradually, his condition improved so much that he started farming in a sharecropping agreement with a farmer, for whom he earlier used to work as a servant. In the year 2021, he decided to sell 4 of his buffaloes. Since his buffaloes were of very high value as they used to provide a lot of milk, he was able to make enough money out of it to buy 2 acres of farmland.

Today, Shalikram is no longer a servant, he is a farmer, with his own land and a milch cattle rearer who daily supplies milk to many households in the village.

Support of the Maharashtra State Government Departments

The case of Payvihir demonstrates how a good system can work. While the people are willing and driven, the government is also responsive. Throughout the claim-making and management process, Payvihir has been supported by the forest and tribal department with technical expertise and knowledge. One major milestone in this regard has been the District Convergence Committee which calls for the convergence of all line department schemes at the district level for holistic development of CFR management plans[1]! Through convergence, the village of Payvihir benefited in the form of soil and water conservation through MGNREGA, drip irrigation in forest land through JFM, cement and jaali bandhaare through JFM, Solar plants through Vidarbha Maha Mandal Board and JFM, Biogas plant through the tribal department, interpretation centre from Collector's fund amongst others.

[1] Sahu et al, 2019b

Sustainability of Payvihir Model

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An instance to understand the strength of the Gram Sabha and their understanding of decentralised governance was during the COVID 19 pandemic. The Gram Sabha at Payvihir was able to save money received in schemes by getting works done in lesser amounts. For instance cement bandhare costs Rs. 8-10 lakh by the government. The Payvihir gram sabha was able to do this work for Rs. 2,60,000. The government gave them Rs. 25 lakhs for check dams which they were able to build in Rs. 12 lakh. When the government got to know, they asked for the money back which was not proposed for any project. The gram sabha decided not to return it back as it was their saving. They had not used corrupt measures, and saved the money for their development. They said we will propose new projects. The gram sabha understood their authority in keeping the money with them.

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Custard Apple Business by the Gram Sabha of Payvihir

The forest received under CFR has a huge patch of custard apple and tendu trees which have become a major business opportunity for the Payvihir Gram Sabha. The custard apple produce from the forest was earlier auctioned by the forest department to traders. The people of Payvihir at that time in 2012, had no idea how to run a business. They were able to bring a trader to their village to sell the fruit and the first year itself they made a turnover of Rs. 40,000 and a profit of Rs. 16,000 for which a bank account in the name of gram sabha was opened. They realised that the custard apple business had a lot more potential.

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Benefits to CFR villages by Maharashtra Government

The CFR title did not just give the ownership of forests to people but also opened up avenues for development in other areas. The CFR villages have been made the agency for implementing MGNREGA works in their forest and village, giving them the authority to decide the works best suited to their village and implementing them. CFR villages in Maharashtra got the benefits of a host of schemes under convergence. In October 2016, the Maharashtra government issued a Government Resolution (GR) on the formation of the District Convergence Committee to boost implementation of conservation and management plans in CFR villages.

Effective and Innovative use of Joint Forest Management Scheme

The JFMC became active around a year before receiving the CFR title. The people of Payvihir had been exposed to the potential of JFM in Hiware Bazar village in Maharashtra. They were quick to realise that JFM could be a great source of funding for forest regeneration and management projects which is why the JFMC is still active and utilised till date to acquire funding for forest related projects. The first watershed activities to address soil erosion were implemented through JFM. CCT was constructed on 30 ha of forest in 2012.

The Maho-bandh dam was constructed with funding received from Maha Jaluk Shivir through JFM in 2014. A milch cattle scheme was implemented via JFM in 2015 which benefited 12 households. A 5.5 HP solar motor and bore well were installed via JFM in 2016. Cement bunds, stone bunds and solar fencing also came to the CFR land through JFM.

The many plantations carried out by the villagers with the help of MGNREGA and JFM have helped revive the degraded forest and brought back birds and wildlife that had not been spotted for years. Payvihir's impressive work on their CFR land has helped them get the benefit of convergence schemes and CSR funds to further protect and manage their forest. Through such schemes, a solar drip irrigation plant, a forest pond, a biogas plant, and works like continuous contour trenches (CCT) and Water Absorbent Trench (WAT) have been done on the CFR land.

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Before the season's sale, a group of youth was sent to the nearby city of Akola to explore the market. A separate team was made to collect and pack the fruit. And a team of youth would go to the market to sell the fruit. In the second season, they had a turnover of Rs. 2.75 lakh out of which Rs. 72,000 was their profit. Within a year of getting the CFR title, a forest that was degraded was giving people employment and a business opportunity. This strengthened their will to protect and manage their forest better and reinstated trust within the community to work together. In the subsequent years they took their fruit to farther markets of Nagpur and even to Mumbai.

By 2017, they created a brand called Melghat Naturals. They observed the market and also worked on their packaging and branding accordingly, as they observed people selling in boxes, they also got boxes to sell the custard apple in cities. KHOJ helped in making these boxes. Their profits continued to surge throughout the years. However, in 2018, a fire struck the forest and destroyed their custard apple trees. It is expected that the patch of trees will be ready with produce by 2023.

Going Beyond Payvihir to Other Villages in their Gram Panchayat

Payvihir's lessons were first spread to the other three villages of the Gram Panchayat of Upatkheda, of which the village Payvihir is a part. These villages now collectively manage around 1200 ha of forest land under CFR titles. The four villages in the GP are in constant contact and design their management plans together. If one village faces a conflict, the other three also come forward to facilitate conflict resolution. This has helped build community resolution, mitigating measures and unity amongst the villages.

Biodiversity Park in Upatkheda

In the Gram Panchayat Upatkheda (of which Payvihir is a part), a Biodiversity Park has been constructed on Upatkheda village's CFR land.

The park is a repository of local biodiversity and attracts various birds as well. The park consists of a nursery, garden, teak park, non-timber park, oil garden, bamboo garden, sitaphal patch, and a Melghat park consisting of all dominant species of trees found in the Melghat region and a bird watching tower amongst others.

The park is expected to become a popular picnic spot for locals, especially school children, who would be able to enjoy as well as learn about the biodiversity in their region.

Going Beyond their Panchayat to Other CFR villages

Payvihir villagers reached out to other villages in the district and in nearby districts to work together. They found one common link in the tendu patta business, in which the tender leaves of Diospyros melanoxylon are plucked and shade dried and bundled, for transporting to beedi production factories. After getting CFR, the Gram Panchayats were supposed to run this business.

Payvihir took the lead in explaining to the others how this business can be done profitably. Today, they have a federation of 40 CFR villages from which they earn Rs 1.5-2 Crore every year. KHOJ assists them with legal paperwork. In 2022, they are planning to sell a pack of 1000 leaves for Rs. 4,650. The gram sabha has become a business entity which maintains all paperwork and is audited every year.

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Awards and Recognition

From a degraded forest, soil erosion and water scarcity, the village of Payvihir has come a long way to now be known as an 'eco village'.[2] For its impressive work on soil and water conservation and afforestation on CFR land, Payvihir was awarded the UNDP's Biodiversity Award in 2014, giving the village a cash prize of Rs. 1 lakh and a citation. For its contribution to environmental conservation, the village was awarded the Maharashtra Wildlife Service Award presented by Sanctuary Asia in 2015.

[2] thebetterindia, 2017

Click on the link below to watch a video on Payvihir:

https://youtu.be/akA6BJCKV84

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