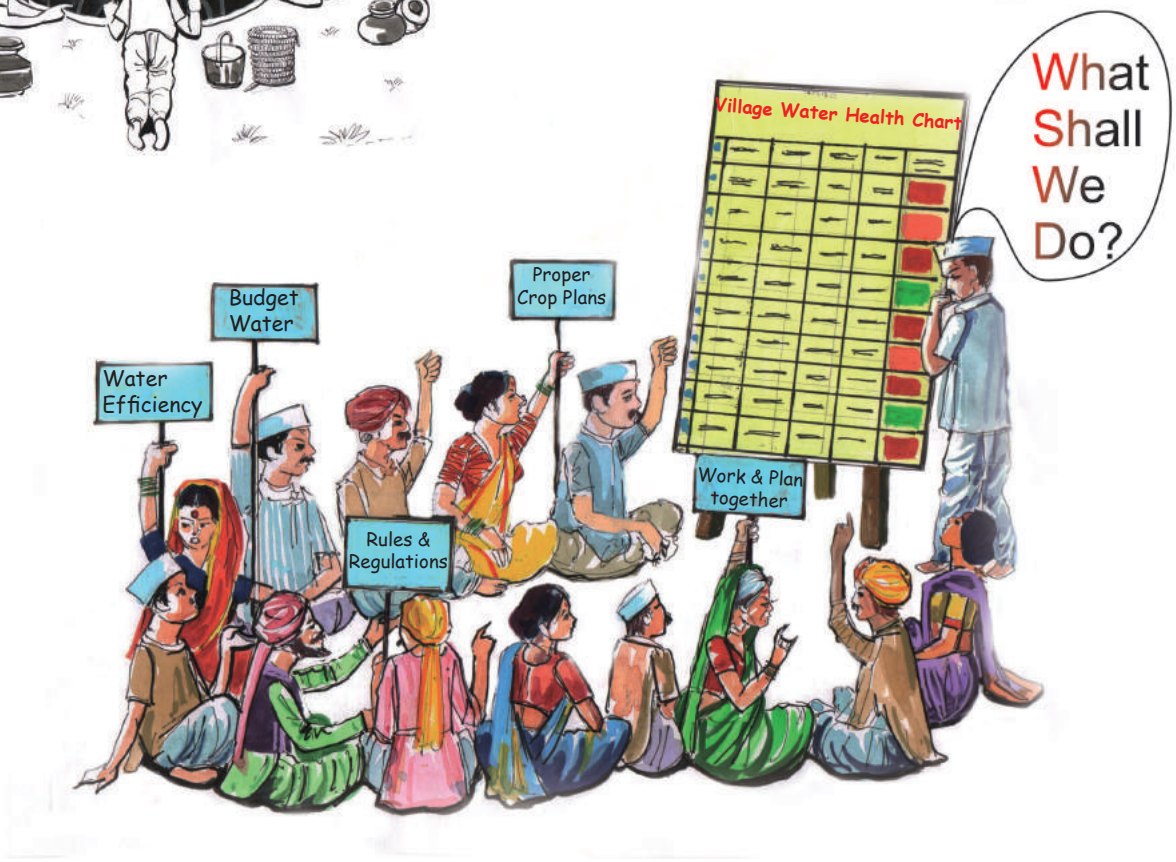
A Step Towards Quenching Rural India's Thirst

Experiences and Learnings from the Water Stewardship Initiative in Maharashtra



Marcella D'Souza, Eshwer Kale, Hemant Pinjan

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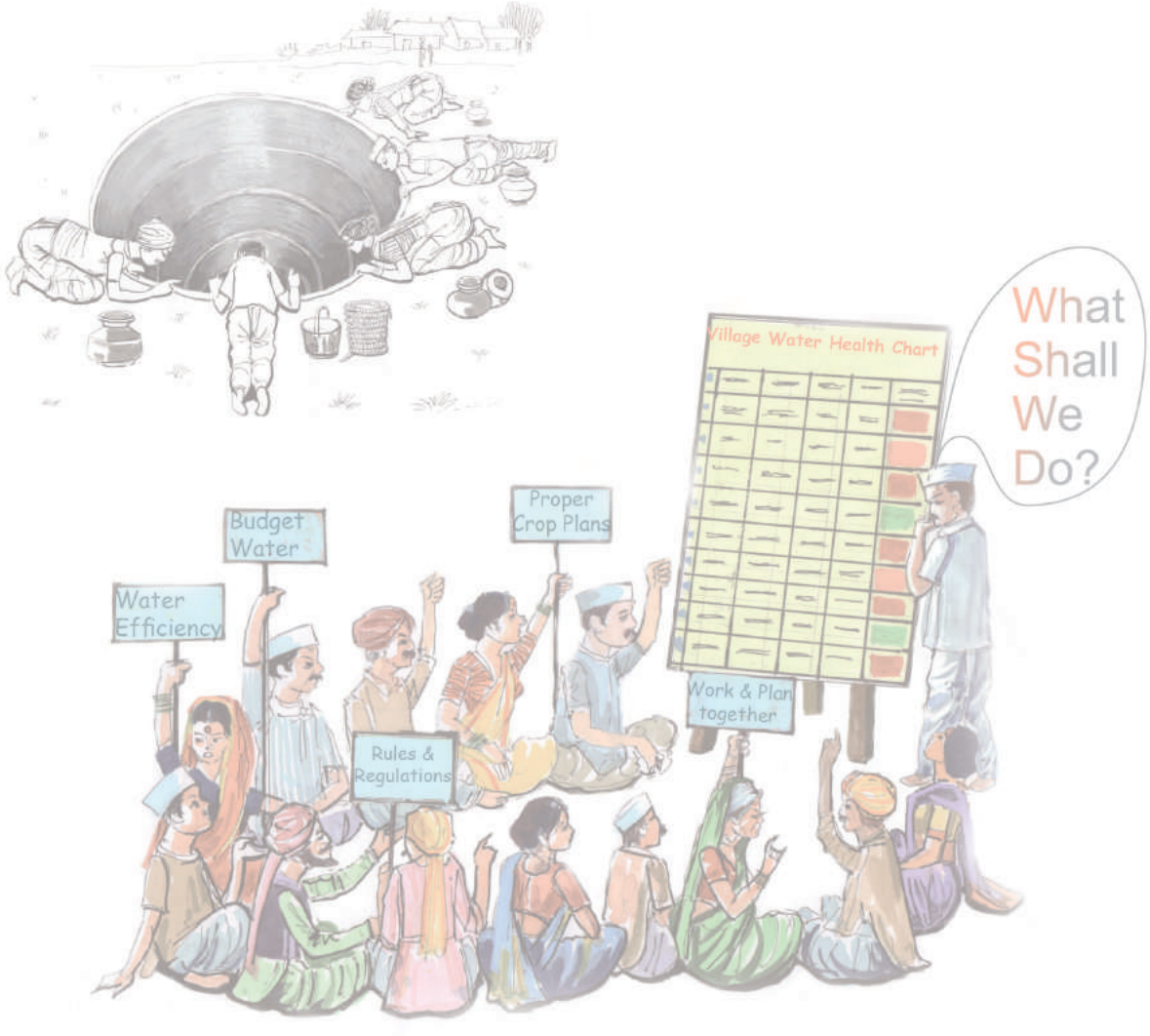

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FOREWORD

Over the last few decades, India has witnessed a growing crisis in the water sector. A rising economy, increasing demand for water from a burgeoning population, and intensive agriculture are rapidly outstripping water stocks in the country. According to the NITI Aayog, India is facing the worst water crisis in its history, with an estimated 600 million people having to deal with high to extreme water scarcity, and twenty-one major Indian cities likely to run out of groundwater by 2020. Supply side water augmentation has greatly expanded over the years through accelerated building of water impounding structures as well as watershed development interventions. However, with groundwater supplying 90% and 50% of rural and urban India's potable water needs respectively, as well as 75% of irrigation needs, the demand and use management of water is woefully inadequate, especially that of groundwater.

The situation in the state of Maharashtra is particularly distressing. Despite legislation like the Maharashtra Groundwater (Development and Management) Act 2009 being in place, the situation is getting worse. In 2016, Latur city ran out of water, and special trains had to be arranged to supply water to it. During the summer of 2019, there are 5100 GPS tagged tankers supplying water to 12,300 villages in Maharashtra.

Groundwater mining is rampant: packaged water and water tanker businesses are flourishing. Most farm ponds are filled not by surface runoff as they are meant to, but by groundwater. And millions of bore wells drain deep aquifers that take decades, if not centuries, to refill. A huge amount of water meant for irrigation is diverted to water intensive cash crops. As a result, the number of critical and over-exploited watersheds is increasing. Water conflicts between communities, various stakeholders and riparian states are on the rise, and the risks to agriculture and the food chain are exacerbating.

This alarming situation is not only due to poor rainfall and increasing claims on water, but largely due to the absence of an effective mechanism at all levels, to govern access and use of water (demand side management). Water is seen as a private commodity—a notion that is deeply rooted in social constructs. This has resulted in the commodification of water, which is a common good, and its capture by a privileged minority.

The need of the hour is to evolve a consensus among various stakeholders on how available water is to be used, backed by political and social will, adoption of appropriate technologies and the establishment of governance mechanisms that are effective, efficient, transparent, fair and consistent.

As part of our contribution towards this effort, WOTR launched a Water Stewardship Initiative which was piloted in 100 rain-dependent villages in Maharashtra during the period October 2015 to March 2018. The objective was to sensitise communities about the causes of their fragile "water health" status, develop a pedagogy to nudge them towards more efficient harvesting and use of water, and evolve a set of governance practices and mechanisms to manage water, especially groundwater, more sustainably.

Two years is too short a period to make credible assertions on the effectiveness and applicability of the methodology developed, given that issues around water are complex and contested. But the crisis is well on its way to becoming catastrophic. Hence, we decided to share our experience, despite its shortcomings and limitations, in the hope that other practitioners and programme designers might benefit from it. This is a work in progress and we welcome feedback and other experiences that will help enrich our work and further the cause of sustainable water governance, especially of groundwater, which is so urgently required in our country today.

Crispino Lobo
Managing Trustee
Watershed Organisation Trust (WOTR)

ACKNOWLEDGEMENT

The experience captured here has emerged from the implementation of a Water Stewardship Initiative that was conceptualized by Watershed Organisation Trust (WOTR). The implementation of this project and its documentation could not have been realized without the whole hearted cooperation, hard work and active involvement of the WOTR and the SIED field team, particularly Harish Daware, Prashant Kalaskar, Abhijeet Kavathekar, Shamkant Patil, Nilkanth Rane, Arun Dahale, Ganesh Kakade, Santosh Chaudhari, Mahesh Shelke, Namdeo Nagare, Divya Nazareth, Anil Hiwale and others. We are sincerely grateful to each one.

We are grateful for the feedback from Crispino Lobo, Prakash Keskar and Sandip Jadhav whose constructive comments have helped us reflect and sharpen the recommendations made. Arpan Golechha and Swati Pillai from W-CReS contributed to the initial draft of a couple of chapters. Our Wellwishers are many - government officials, scientists, social experts who have reflected with us on this journey. We sincerely acknowledge each one for their inputs.

Our interactions and discussions with *Jal Sevaks* and Village Water Management Teams provided us immense learning and reflections for this book. We appreciate the challenging work they are doing at village level to improve water governance. We thank them for all their support.

The attractive design of this publication is the effort and creativity of Vandana Salvi of WOTR. Shri Anand Gune a free-lance artist is the creator of the impressive drawings on the cover page. Thank you.

The Charity Aids Foundation India through Oracle and the Hindustan Unilever Foundation have provided their funding support to WOTR for the implementation of the Water Stewardship Initiative. We are grateful and acknowledge their support. We also thank 'Charity Aids Foundation India through Oracle' for the financial support towards printing this publication.

Marcella D'Souza, Eshwer Kale, Hemant Pinjan
The WOTR Centre for Resilience Studies (W-CReS), Watershed Organisation Trust

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EXECUTIVE SUMMARY

In these times of uncertain monsoon rains and climate change, India's dependence on groundwater for drinking and agricultural needs is growing. We urgently need to judiciously and efficaciously manage our groundwater resources for present and future needs. Recent reports of the Central Ground Water Board (CGWB) and the Groundwater Surveys and Development Agency (GSDA) of the Water Supply and Sanitation Department of the Maharashtra government, highlight the critical issue of water scarcity. These reports point out that out of 353 talukas in Maharashtra, in 230 talukas (10,167 villages) the water levels have dropped by 1 to 3 meters in the past 5 years (GSDA, 2017). Rising global temperatures and climate change makes effective water management an even more urgent necessity. Addressing water governance at the local level will help India to contribute to achieving many of the United Nation's Sustainable Development Goals (SDGs) (1, 2, 5, 6, 12, 13, 15 and 16).

The 2009 Maharashtra Groundwater (Development and Management) Act that came into effect in December 2013 is a first in the country. It places emphasis on motivating and mobilising citizens to harvest rainwater and use it judiciously on the demand end. It also underscores the need for locale specific scientific information to achieve good water governance.

Having increased water availability in rainfed areas through watershed development in over 2000 villages in Maharashtra, Madhya Pradesh, Telangana, Jharkhand, Rajasthan and Odisha, the Watershed Organisation Trust (WOTR) realised the urgency of effective water management at the local level particularly in these times of increasing climate risks. This led WOTR to launch its Water Stewardship Initiative (WSI) with the goal to promote Climate Smart Water Governance through community participation. As part of this initiative, water users at the local level are considered as 'water managers' rather than 'beneficiaries or target groups'. This study presents the findings of 100 watershed treated villages that have implemented the WSI since late 2015 in the Ahmednagar, Dhule and Jalna districts of Maharashtra.

The WSI is based on the understanding that when various stakeholders come together and are presented with realistic information of their climate, water resources, the related productivity, and their socio-economic context, dialogue and discussions among them are inevitable. This leads to the development of a common systemic understanding of their situation and are motivated and mobilised for sustainable action towards achieving water governance.

This document presents the interventions promoted under the WSI and the response of the 100 project villages in Maharashtra. The interventions are also reviewed with respect to the 2009 Maharashtra Groundwater (Development and Management) Act.

Key interventions, observations, impacts and learnings of the WSI are as follows:

(i) Institution Building: The Village Water Management Team (VWMT) and the *Jal Sevak:* The VWMT comprises of representatives of various user groups. However, reluctance in including the landless and to some extent women was observed. With capacity building, the VWMTs were able to understand and take up their various functions as described below. *Jal Sevaks* are trained youth who provide technical guidance and are also responsible for motivating and mobilising the villagers.

(ii) The Village Water Health Chart assesses the tangible parameters of everyday life which are often taken for granted, such as, time spent by women to fetch water and if it affects the education of girls, among other parameters. In late 2015 when the WSI initiative began, the assessment showed that 20% villages had a healthy water status while 41% fell in the severely ill category. Following implementation of the WSI, in March 2018 when the project assessment was done, it was found that 57% villages were considered healthy in terms of their water status while 18% still fell in the severely ill category.

(iii) Based on the annual bore-well water levels and rainfall data, the Village Water Budget is prepared by prioritising domestic and livestock needs, following which calculations are made based on crop water requirements. All 100 villages display the Water Budget on public boards. In 2018 which was a year of drought, farmers shifted from water intensive onion and wheat to crops which require less water. Besides, 78 villages had water available for domestic use.

(iv) The Water Health Status and Water Budget provide information on the water deficit for meeting agricultural productivity. This encouraged villages to increase the water harvesting potential through the repair and maintenance of watershed structures treated earlier, as well as to construct new ones, but only in appropriate locations. During 2016 and 2017, a total of 61.44 billion litres of water were harvested through these structures.

(v) Water availability is further enhanced through water use efficiency. The promotion of water saving techniques (micro-irrigation, mulch) during the two and a half year period resulted in the saving of 3.24 billion litres by the 2000 farmers who newly started using these techniques. The uptake of micro-irrigation is slower in the Akole *taluka* (Ahmednagar) and Sakri *taluka* (Dhule), both of which have a larger tribal population.

(vi) Governance requires the setting of norms for water management. Information about the poor water health status of their villages and the demand for water, encourages the VWMTs and *Gram Panchayats* to frame village specific rules to guide them. These are discussed and then endorsed by the *Gram Sabha*. 78 of the villages formulated rules such as a ban on drilling new bore-wells, limits on the depth of bore-wells, and other such rules as acceptable to them. 22 villages did not accept the setting of water governance norms.

(vii) Stakeholder engagement constitutes the core of the WSI. It brings together the various actors facilitated by the use of games and supported by evidence from research. It encourages the voicing of concerns and needs through active discussion and urges the participants to arrive at a consensus about necessary actions to manage their water resources. Village representatives actively participated in the stakeholder engagement events.

(viii) Aquifer management brings together various villages that share the same aquifer.
The WSI has brought together the residents of 14 villages which share a common pool resource aquifer. This pilot is in line with the 2009 Groundwater Act.
The good practices initiated need time to become a habit. This can occur only when there is consistent follow-up and monitoring way beyond the 2 to 3 years of project duration.

A Step Towards Quenching Rural India's Thirst

I. Introduction

1. Challenges in the water sector in India

Groundwater is the backbone of India's agriculture and drinking water security today. India is the largest groundwater user in the world. Groundwater supports 84% of the country's net irrigated area, and 90% of its rural water needs (World Bank, 2010; Prakash, A. et al., 2013). Rapid changes in land use and land cover patterns (Duraisamy, V., Bendapudi, R. & Jadhav, A., 2018), expanding urbanisation, modern lifestyles, and the food and water needs of a growing population are putting increasing pressure on our water resources and exacerbating the water crisis.

The per capita ground water availability in India has decreased from about 5,000 cubic meters per capita per year at the time of independence, to the current availability of about 1,545 cubic meters per capita per year (Singh, Y. S. & Rahal A., 2013). Thus, India has already crossed the threshold limit of 1700 cubic meters per capita per year, making it a water stressed country. The 2014 Groundwater Assessment Report of Maharashtra presents some startling facts. It has identified 24.30 lakh abstraction structures which include 20.55 lakh dug wells and 3.76 lakh borewells. Out of the total 1531 watersheds, 76 watersheds are categorised as overexploited[1] (GSDA, 2014). By the end of March 2018, there were indications that 26,341 villages of 43,665 in Maharashtra were reportedly facing water crises (Lokmat, March 31, 2018). The Groundwater Survey and Development Agency (GSDA) further reports that out of 353 talukas, in 230 talukas (10,167 villages) the water levels have dropped by 1 to 3 meters in the past 5 years (GSDA, 2017). Yet the area under sugarcane cultivation which requires extensive irrigation, especially in the drought prone regions, has steadily increased. In fact, in 2017–18 the state witnessed its highest ever sugarcane production (Business Standard, April 3, 2018; The Indian Express, April 1, 2019). If these trends continue, Maharashtra may soon cross the threshold of no recovery.

2. Climate change, global temperature rise and the likely impacts on India and Maharashtra

India is a hotspot of climate change. The variability of the monsoons is already a feature of our changing weather patterns. With the rising global temperature which is threatening to climb up to 1.5° C above that in the pre-industrial era soon (IPCC, 2018; Yaduvanshi, A. et al., 2019), climate variability is likely to intensify and accelerate the global hydrological cycle. Precipitation forecasts for India under climate change scenarios suggest higher but more variable rainfall, except in the drier parts where rainfall may decrease. While the amount and intensity of the rainfall may increase (Revi A. et al., 2015), the number of rainy days is likely to decrease. The changing patterns of rainfall and rainwater runoff are expected to significantly impact groundwater recharge and availability. Indications are that Maharashtra could face an increase in rainfall variability, including droughts and dry spells (GoM, 2014). The global temperature is likely to go up to 1.5° C above pre-industrial levels around the year 2070, by which time in Maharashtra, the average temperature rise will be around 2.1 to 3° C, with the increase across the Vidarbha region of the state projected to be about 2.8 to 3° C (ibid). The rise in average temperature will lead to higher rates of evaporation of the surface water. While there is a global urgent call to reduce carbon emissions in order to stop rising temperatures, it is critical that we adapt to the changing and varying weather patterns so as to meet the water resources needs for our emerging economy and growing population.

[1] Over-exploited watersheds are those where the groundwater extraction is more than 100% of the recharge.

The Maharashtra Groundwater (Development and Management) Act 2009

The State Government's concern for water management was observed when it reworked the earlier 1993 Groundwater Act and formulated the Maharashtra Groundwater (Development and Management) Act 2009 that came into effect in December 2013. This 2009 Act, the first of its kind in the country, is an important step towards the judicious and sustainable management of water. However, the implementation of the Act is still a major challenge. It calls for strong motivation and mobilisation of all inhabitants for the judicious, equitable and sustainable use of water for domestic and productivity requirements. This necessarily requires putting scientific information and technology to good use in a way that is demystified, so as to positively influence behaviour of individuals and communities through better governance. At the time of the writing of this document, the operational rules for implementing the 2009 Act are under review by the State Government after inviting inputs from concerned stakeholders.

WOTR's engagement in the water sector

Since 1993, the Watershed Organisation Trust (WOTR) has been engaged in and assisted over 2000 villages in semi-arid and rainfed regions of the country to successfully regenerate their degraded landscapes. Its aim is to reduce poverty of local inhabitants, particularly of the marginalized sector, through a participatory watershed development (WSD) approach to soil and water conservation and to sustainably manage this resource base. It has developed methods and tools for upscaling and has been instrumental in developing capacities of numerous agencies such as CBOs, practitioner organizations, donor agencies, bank and government officials, both nationally and internationally.

Observing the success achieved in its project villages by the increase in water levels and of agriculture production, WOTR realised that the use of water is crucial for sustainability. Planning the use for domestic needs and productive gain with the water available i.e. preparing a Water Budget within the particular watershed / village is also necessary for adapting to climate variability. With this in mind, WOTR initiated water budget preparations around the year 2008. However, WOTR soon realised that unless there is ownership by the local community, water budgeting will be just another unfruitful activity without substantial impacts. With this in mind, WOTR launched the Water Stewardship Initiative (WSI) in 100 villages in Maharashtra.

Water in the international agenda

Water management is a fundamental constituent of the United Nation's Sustainable Development Goals. WOTR's work on participatory and integrated WSD contributes to various SDGs. Through increased agricultural productivity which bolsters livelihood security for farming communities, it reduces poverty (SDG 1) and improves food and nutrition security (SDG 2). It reduces the burden

on women who otherwise fetch water from long distances and of girls who lose schooling days (SDG 5), and makes water available for drinking and sanitation needs (SDG 6). By its judicious use, WOTR's Water Stewardship Initiative (WSI) helps communities to manage water responsibly (SDG 12) and builds their adaptive capacity to face climate change (SDG 13). When WSI is implemented within watershed treated villages, the land and ecosystems are also protected (SDG 15). By actively engaging the entire user community, including the marginalized sector, WSI can also contribute to peace and harmony (SDG 16).

Goal of the Water Stewardship Initiative

The Goal of the WSI is to promote and implement Climate Smart Water Governance in semi-arid regions. In other words, it works towards community led responsible water use, that is socially equitable, environmentally sustainable and economically efficient.

Objectives of the Water Stewardship Initiative

Water management can only be achieved by bringing the entire user community together. Backed by knowledge of the local situation, ie of the biophysical conditions, the climate context and needs of all households, they work out governance mechanisms for its sustainable use. WOTR's WSI aims to equip communities to effectively manage water and has the following objectives:

- Local communities understand their context including their resource base and judiciously manage their water resources, while deriving economic benefits from its use.
- Test the application of related components of the Maharashtra Groundwater Act 2009.
- Develop a method of community-based groundwater management that can be scaled up.

The 2009 Act has many progressive provisions, and WOTR has used the key principles of this Act to test these on a pilot basis with the intent to assess the operational feasibility of the Act.

Aim of this publication

The Water Stewardship Initiative is relevant in today's context of growing water scarcity. Through this publication WOTR wishes to share the lessons learnt from a pilot project implemented between October 2015 to March 2018 in 100 villages located in 5 *talukas* in Ahmednagar, Dhule and Jalna districts of Maharashtra. The findings from this experience will benefit practitioners working in the semi-arid and rainfed regions of the country, the donor community and also government programmes. This pilot is particularly useful for consideration as learnings are applicable for the implementation of the Maharashtra Groundwater Act 2009.

II. THEORY OF CHANGE

WATER STEWARDSHIP: INTERSECTING SCIENCE, GOVERNANCE

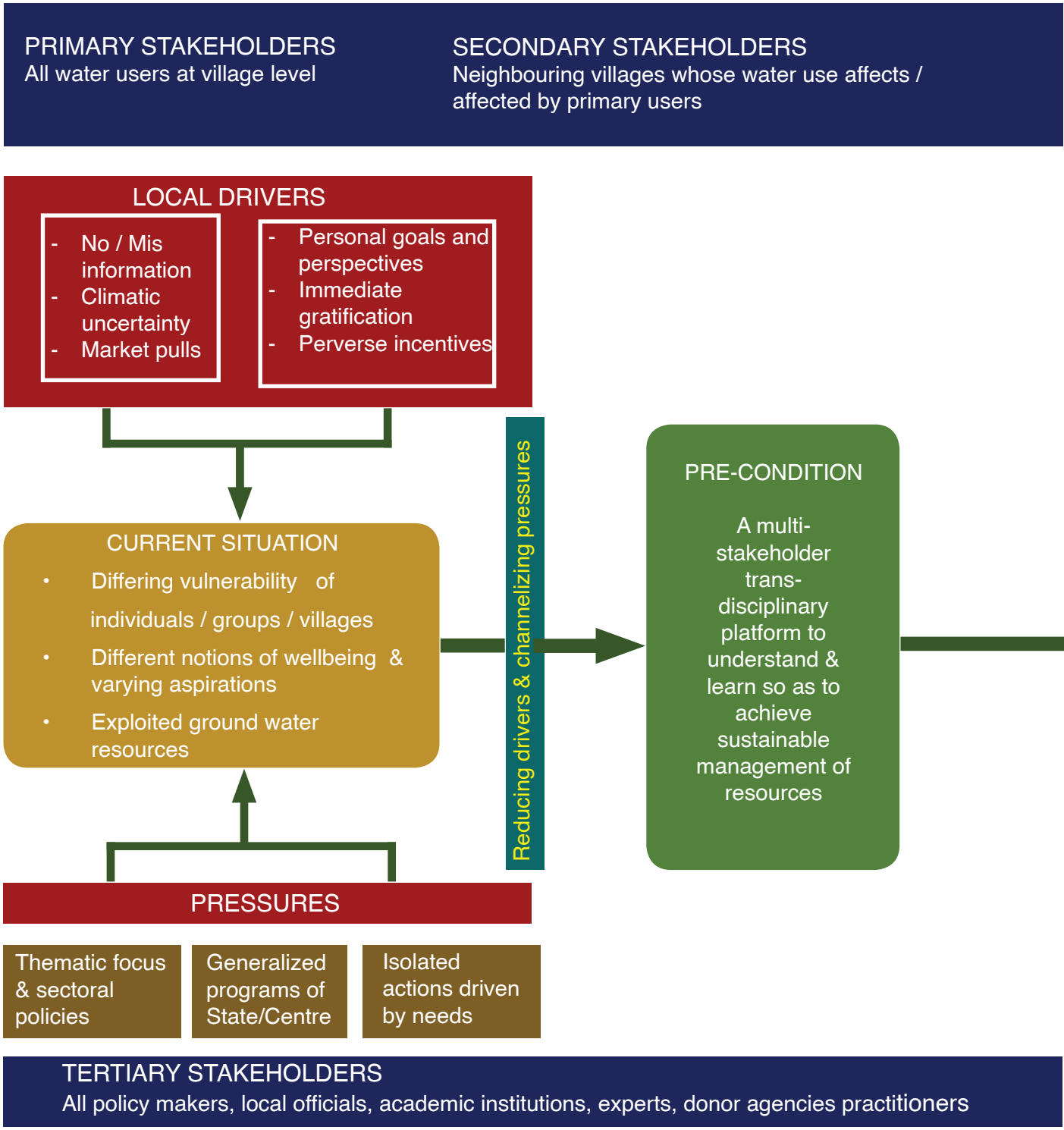
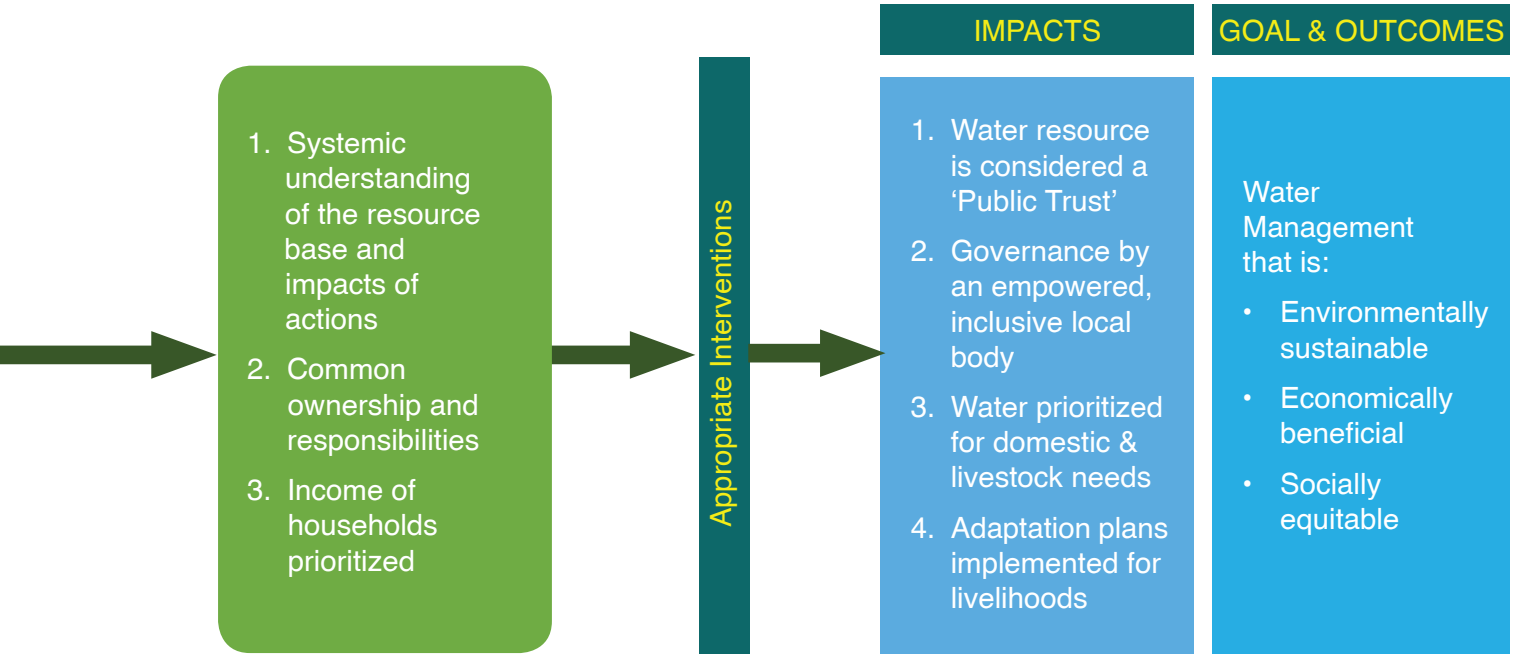


Figure 1: Theory of Change

AND PRACTICE FOR BEHAVIORAL CHANGE



The poor understanding of the local groundwater resources, weather uncertainty and market pulls compels the primary and secondary stakeholders to take uncoordinated actions to meet their individual household needs. Simultaneously the concerned tertiary stakeholders also work in isolation to address the developmental concerns of the other two stakeholders.

The Theory of Change of the Water Stewardship Initiative of WOTR works on the assumption that through a trans-disciplinary platform the primary, secondary and tertiary stakeholders develop a common and systemic understanding of the local context. Keeping sustainable management of resources, equity and income needs in view, they are provided with information about their resources, capacitated for impactful actions and guided to develop ownership and a common responsibility for their resources.

Concept and approach of the Water Stewardship Initiative

Water Stewardship is described as the use of fresh water that is socially equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive process that involves site and catchment-based actions (AWS 2019).

The concept of water stewardship considers that every individual has a right to adequate water to fulfil their domestic and livelihood needs and also considers the water requirement of the ecosystem. This right comes with a responsibility and accountability to oneself and to the community for the appropriate management of the resource. Water users are viewed not as passive beneficiaries or recipients to exploit the resource, but as custodians to use and benefit from the resource while protecting and managing it for the future. Hence water resources are viewed as a public trust rather than a private good. The stewardship approach sees the necessity of bringing different users / stakeholders together on one platform, to establish a dialogue based on knowledge and information and to arrive at a consensus for the preparation and execution of the plan for water management.

Three sets of important actors are involved in water management: (a) primary stakeholders i.e. all households within a given village who need and use water for various purposes; (b) secondary stakeholders, i.e. neighbouring villages that influence or are affected by the water resource use of the primary stakeholders including downstream and upstream villages who may share the resource, and (c) tertiary stakeholders i.e. the policy makers, district administrators, water experts, donor agencies, and civil society agencies who influence the water related efforts at the village level. These diverse stakeholders need to come together on one platform for a better understanding of the particular local context, and to collectively plan for its sustainable management. Hence, the WSI requires not just a set of actions to be carried out by the primary and secondary stakeholders, but those which are guided by sound scientific knowledge so that they make informed decisions. Moreover, consensus building through dialogue and workshops, i.e. through stakeholder engagements, are important where perspectives, desires and conflicts between the different groups are encouraged to surface and sustainable and equitable solutions are sought.

Stakeholders visualize the likely scenarios of water in the future

Overview of the Water Stewardship Initiative

The effective implementation of water stewardship calls for a multi-pronged approach. It requires capable local institutions that can prepare and execute water stewardship plans. Informed by contextual knowledge, stakeholders are motivated for collaborative action. However, legitimacy does come from state level regulations for which the implementation of key principles of the Maharashtra Groundwater (Development and Management) Act, 2009 are important.

The following interventions have been applied in all 100 villages in Maharashtra:

- Selection and intensive training of *Jal Sevaks* who are local youths. They motivate villagers and help them prepare and implement Water Stewardship Plans at the village level.
- Formation of Village Water Management Teams (VWMT) in villages where its members are approved by the *Gram Panchayat*. This team of inclusive and motivated members called 'Water Stewards' who promote and ensure effective management of the local water sources.
- Preparation and implementation of Water Stewardship Plans which comprise of 1) the water health chart, 2) village water budgets and appropriate crop plans, 3) water harvesting plans, 4) water saving plans and 5) formulation of rules at the village level.
- Periodical stakeholder engagement events bring together the diverse actors who have an important role in overall water management. In this manner, through deliberations and dialogue, clarity is sought and consensus over the possible solutions is reached.

III. Project Area

Location

The Water Stewardship Initiative was implemented since October 2015 in 100 villages in Maharashtra, largely in semi-arid, rainfed districts that frequently face drought-like situations. These villages heavily depend on ground water for domestic and livelihood needs, that is, agriculture. Figure 2 presents the location map of the 100 villages in the state of Maharashtra.

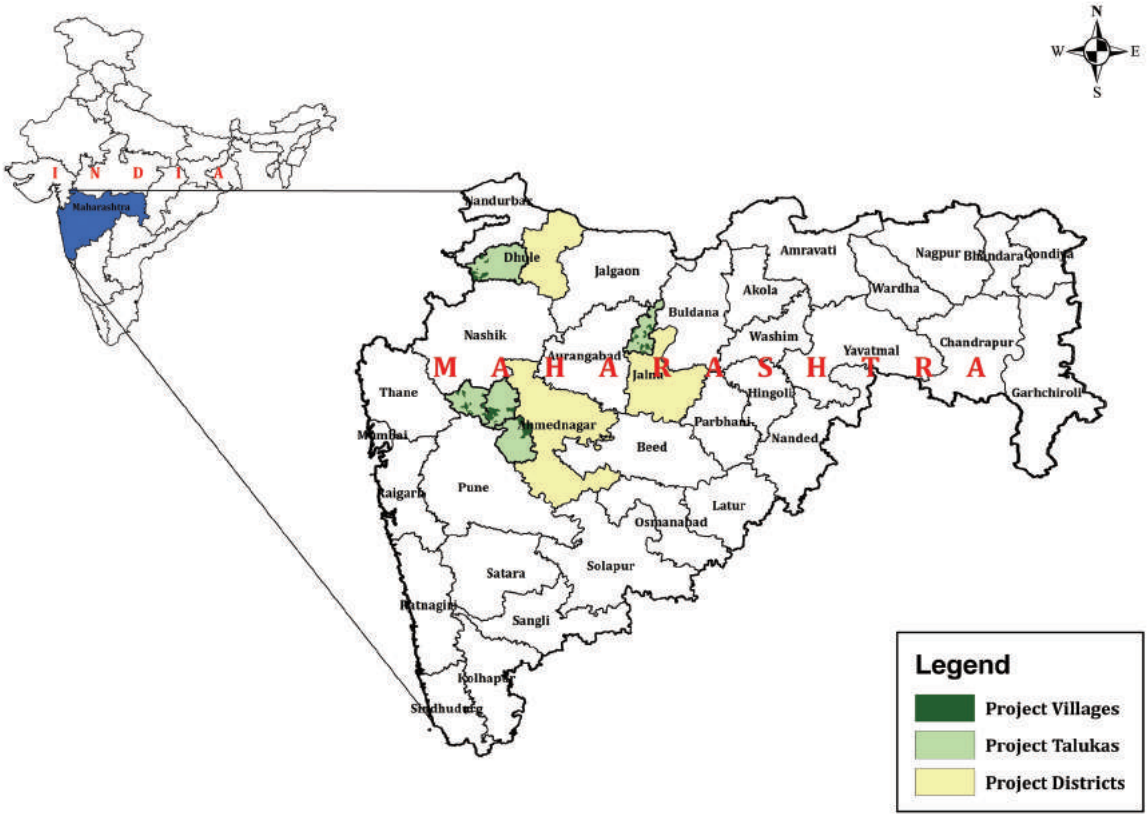


Figure 2: Location map of the Water Stewardship villages in five talukas2 of three districts
Source: Kale E., & D'Souza M. (2019).

Ahmednagar district is located in the rain shadow region of the state. The Sangamner and Parner *talukas* receive on an average 450 mm of rainfall per year, because of which the farming community frequently faces drought and drought like conditions. Sangamner is declared as 'semi-critical' by the GSDA since 2009. The Akole *taluka* of Ahmednagar district is in the hilly terrain of the Western Ghats Transition Zone 2[3] and receives more rainfall; however, most of this *taluka* is non-rechargeable, where rainwater run-off is high. The WSI is implemented in 60 villages in this district.

[2]A *taluka / tehsil / tahsil / mandal* is an administrative division of India denoting a sub-district.

[3]Transition Zone 2 is a strip adjacent to Transition zone 1 on the eastern side, running from north to south on the Western Ghats. The zone covers parts of Dhule, Sangli, Nasik, Ahmednagar, Pune, Satara and Kolhapur districts. The anual rainfall ranges between 700 mm to 1750 mm, ranging 120-150 days per annum.

Dhule district lies in the north-west part of the state. It is broadly divided into the Tapi valley proper and the region of dykes and residual hills of the Sahydari spur. Rainfall in Dhule ranges from 499 mm to 864 mm per annum. Sakri taluka of Dhule district lies in the southern part in the region of dykes.

Rainfall here is low (502 mm) which makes Sakri drought prone (CGWB, 2013). The population is predominantly tribal. The WSI is implemented in 16 villages in Sakri taluka.

The Bhokardan taluka of Jalna district falls in the assured rainfall zone receiving on an average 700 mm or rainfall per year. However, in the past decade, the Marathwada region in which Jalna lies has been facing frequent droughts. The taluka is mostly flat and has a number of percolation dams constructed for water harvesting. The WSI is implemented in 24 villages in Bhokardan taluka.

IV. Interventions and Impacts

(A) Institution Building

The Village Water Management Team (VWMT) and the *Jal Sevak*

The 'water stewardship' approach goes beyond considering water users as passive beneficiaries or target groups; on the contrary, all water users are considered 'water managers'. Since they own and share the common resource, they collectively need to assume the responsibility of adopting effective water management practices. Institutions at the local level are required to understand, plan and manage the use of water in their village. Currently, the Water and Sanitation Committee of the *Gram Panchayat* (the governing body of the village) is responsible for ensuring drinking water availability. Where watershed development has been implemented, the Village Development Committee (VDC) is responsible for its implementation as also for the maintenance of structures. However, both committees have little knowledge of the comprehensive picture of water in their village, and little or no experience in managing the water resources within.

Provisions in Maharashtra Groundwater (Development and Management) Act 2009

Section 29 of the 2009 Maharashtra Groundwater Act states, "The State Authority shall constitute a Watershed Water Resources Committee (WWRC) for the 'notified' area comprising of an area of more than eleven villages in the manner as may be prescribed to perform the functions and duties assigned to it under this Act." Section 29.6 further elaborates, "Provided that, if there are less than eleven villages within the notified area, then the State Authority shall entrust the functions of such Watershed Water Resources Committee to the concerned Panchayat or urban local body". Section 29.3 states that one-third members of the WWRC should be women. Section 33 of the Act stresses the importance of 'community ownership over the water resource'.

Doing it "The Water Stewardship Way"

Empowered and robust community-based institutions are the foundation on which the water stewardship approach is established. Being a sensitive subject, capacity enhancement and handholding support is necessary without which, ownership by the people and sustainability of their water resources is at stake. The Village Water Management Team (VWMT) is set up early in the intervention with the aid of the respective *Gram Panchayat*. The VWMT and the local villagers require information, knowledge and guidance on different aspects of their water resources and their use which is provided by *Jal Sevaks* (water caretakers). Thus the community and VWMT are empowered to assume responsibility of managing their water resources efficiently.

Village Water Management Team (VWMT)

The mobilisation and sensitisation of the community and management of the water resources rests with the VWMT. This team supports the *Gram Panchayat*. It comprises of 5 to 8 representatives of different categories of primary stakeholders based on landholding and irrigation potential, and includes the landless, women (who are to constitute one third of the members), and artisans whose livelihood depends on water. At least one person should be a member of the *Gram Panchayat* and one should be a member of the Village Development Committee, where watershed development has been implemented. Following this criteria of representation, potential VWMT members are identified in the *Gram Sabha* (village general body meeting) and ratified by the *Gram Panchayat*.

Responsibilities

The role of the VWMT is to support the Gram Panchayat in water management. Their responsibilities include: 1) Creating a positive/encouraging environment in the village for community led water governance. 2) Implementing water stewardship plans, including (a) water budget preparation, (b) water harvesting plan, (c) water-use efficiency plan, (d) guiding the formulation of rules to ensure the sustainable and judicious use of water, and ensuring that appropriate action and timely resolutions are taken; 3) assisting the *Gram Panchayat* in accessing government schemes. Its report is presented to the *Gram Sabha* twice in the year—once before the agricultural planning for the *kharif*[5] season and the second time before the planning for the *rabi*[6] season.

VWMT of Kotha Jahangir village receives the Best Water Stewardship Village award at the hands of Shri. K P Bakshi, Chair person, MWRRA. Source: Kale E., & D'Souza M. (2019).

Findings and impacts

The VWMT has been formed in all 100 villages with about 6 to 8 members. Most villages have a minimum of 4 members who have a source of irrigation, and 2 members who are rain dependent farmers. Only 11 villages include a member of the landless households in the committee. The majority of the members play some role in different village level institutions, and some are members of the *Gram Panchayat* (80): *Sarpanch* (15) and Deputy *Sarpanch* (8), one member is director of a farmer producer organisation (FPO), and one is an elected member of the *Zilla Parishad*. Six members also hold the function of *Rojgar Sevaks*[8] who play an important role in convergence activities. There are varied numbers of women representatives within the VWMTs in the 100 villages: 30 villages have 3 to 5 women members, 42 villages have 2 women members, and 16 villages did not have a woman representative.

Generally, it is observed that only a few members of the VWMT are active. And although they are interested in the subject, women members find little time to engage in the frequent trainings, meetings and work.

An assessment of the functioning of the VWMTs is included in the discussion on the various water stewardship related activities in the chapters that follow, such as the formulation of rules and regulations, the implementation of the Village Health Chart, water saving and promotion of micro-irrigation, and linking with the local government and donors to support their effort.

Observations to improve performance

While instructions are given regarding the percentage of representation of the landless and women, it is observed that the resource owning powerful groups easily promote members of their preference. This representation is particularly important in the context of the sensitive issue of setting and applying the norms for water use and management. It requires a mechanism for fair selection and its enforcement without which, villages will not know the value of including all categories of members and of having a strong representation of women in this committee.

It is necessary to ensure that the village continues to actively engage all categories of people in the VWMT so that the water resources are well managed and benefit all equitably. Hence, follow up and regular monitoring is required for a few years beyond the short project implementation duration.

[5] *Kharif* is the monsoon cropping season.
[6] *Rabi* is the winter cropping season.
[7] MWRRA Maharashtra Water Resources Regulatory Authority
[8] *Rozgar Sevak* is a village person selected by *Panchayat Samiti* (*taluka* level administration) to plan and supervise the employment generation work under the employment guarantee scheme in the village.

Jal Sevaks (Water caretakers)

Jal Sevaks are at the forefront of this initiative. They handle important roles of the VWMT as motivators, organisers and facilitator serving village communities for implementing the water stewardship plans. They are trained to perform their role, particularly to address the various challenges related to water management. Each Jal Sevak leads the project activities in his own village and the neighbouring 3 or 4 villages.

Some of the important functions of the Jal Sevaks are to enhance the understanding of villagers during Gram Sabhas / Vasti Sabhas (village and hamlet meetings) regarding their water situation and to implement related activities, such as:

- Maintain an inventory of wells and bore-wells,
- Record baseline data and track progress,
- Guide and support the VWMT to fulfil its role i.e. prepare the water stewardship plan and get it ratified in the *Gram Sabha*, pool resources from government and non-government agencies towards this purpose, and plan and conduct follow-up meetings with the VWMT.

Apart from the above, *Jal Sevaks* also play a major role in motivating and mobilising the community on a sustained basis through various sensitisation activities to promote water literacy. They are required to maintain an active interest in village development activities.

Performance of the *Jal Sevaks* is assessed and included in the various water stewardship activities described in the chapters that follow, such as functioning of the VWMTs, formulation of rules and regulations, changes observed in the village water health status, implementation of the water budgets, water saving and promotion of the use of micro-irrigation, linkage with government schemes and mobilization of villages for aquifer management.

***Jalsevaks* learn about water budgeting**

Jal Sevaks share their experiences

During the course of implementing the Water Stewardship Initiative, a total of 25 *Jal Sevaks* were engaged in mobilising inhabitants of 100 villages and guiding them to manage their water resources judiciously. The *Jal Sevaks* narrate their experiences.

"I coordinate activities of the Water Stewardship Initiative in my own village and in 4 nearby villages. I motivated villagers in 4 villages to contribute 'shramdaan'. It was indeed encouraging for me, as in Kotha Jahangir village, 95 people did 'shramdaan' to remove silt from checkdams. Through this initiative, I learnt that if we reach out to villagers, interact with them and appeal to them to contribute to village development, most people will come forward. At the same time, we also need to be cautious while handling village-level dynamics and group politics. In one of my project villages, even after substantial efforts, I could not mobilise villagers for 'shramdaan'. However, through this experience, I learnt that one may have to apply different approaches to mobilise communities in different villages."

Bhagavat Gavande,
Jal Sevak, Kolegaon,
Bhokardan

Yogesh Agalave,
Jal Sevak, Gunjalwadi,
Sangamner

"I keep villagers informed of new schemes of the agriculture department such as vermi-culture, farm ponds, micro-irrigation, etc. Although many farmers get to know about these schemes from various sources, they are not aware of the actual processes that need to be followed while applying and the relevant deadlines. We have formed a WhatsApp group called 'WOTR's Water Warriors' with all Jal Sevaks and the entire project team as members. This has become an important platform for us to share updates on different government schemes and project activities."

"Many people from our villages developed an interest in the Water Stewardship Initiative. People are motivated and attend stakeholder engagement workshops in large numbers. They actively participate in the water budgeting activities and readily contribute 'shramdaan'. We don't want to lose this momentum; therefore even after the official Water Stewardship project ends we will definitely continue these activities in our villages. Lots of villagers have shown faith in me that I will guide them to overcome water scarcity and achieve water security. I will not let down their faith in me and will continue to work for this purpose, even after the project period."

Daval Chaure,
Jal Sevak,
Khandbare, Sakri

(B) Understanding the Village Water Health Status: Village Water Health Chart

The Theory of Change in the Water Stewardship Initiative indicates the importance of motivating villagers and building their capacities as a community through an understanding of their local situation, that is, the status of their water resources, climate aspects, and the water needs of crops grown, and to plan for the judicious and sustainable use of water. The focus is on the behavioural change of users towards the adoption of appropriate water use practices, while still deriving income from their water related livelihoods, which is agriculture in this context. Preparation of the Water Health Chart of the village by the Jal Sevak and VWMT, displaying it in a public location and discussing these during the Gram Sabha is considered a good stimulant for change. Such triggers are important and necessary to reshape thoughts and action which lead towards change in behaviour (Goldsmith & Reiter, 2015).

Doing it "The Water Stewardship Way"

The Water Health Chart makes a village community aware of the real situation of their water resources and water availability for their living and livelihoods. Thus, understanding the situation and problems related to water, triggers a 'call to action' to achieve prudent water management.

The Water Health Chart assesses how domestic water for all households, including that of people living in hamlets, are met during the whole year; if fetching water affects the education of girls; if water is available for sanitation; the availability of water in dug wells and bore-wells during the year; and if meetings are regularly held related to groundwater management. It also notes the water intensive crops cultivated, and if micro-irrigation methods are used.

These parameters reflect the 'health status of water' in a village.

Findings and impacts

The Water Health Chart is prepared by the *Jal Sevaks* and the VWMTs in a cluster level event. As villagers assess the various parameters and rate their situation on the Water Health Chart, they are able to better understand the difficulties of their daily life related to water scarcity and unavailability which they have gotten accustomed to. People become aware of how the water situation impacts their lives and livelihoods. The use of the chart makes the community aware of and responsible for resolving the problems they face.

Some simple, tangible parameters of everyday life that are assessed in the Water Health Chart are:

- Is water available in the village and hamlets throughout the year for domestic and livestock needs?
- Does the village receive water in tankers? If so, for how many months? Do the hamlets also receive sufficient water?
- How much time do women in the village and hamlets spend fetching water? How much time is spent for this purpose during the summers?
- Is the education of girls affected by having to fetch water?
- Are villagers satisfied with the quality of water?
- What are the depths of the bore-wells? For how many months do these bore-wells have water?
- How many well owners are able to irrigate their winter crops?
- How many farmers use micro-irrigation or flood irrigation?
- Are the village institutions that manage water functioning?

The VWMTs of a group of villages are brought together to do their respective assessments during this process. Each parameter assessed is rated with a colour code: **Green** for (healthy); **Orange** for (ill) and **Red** for (severely ill).

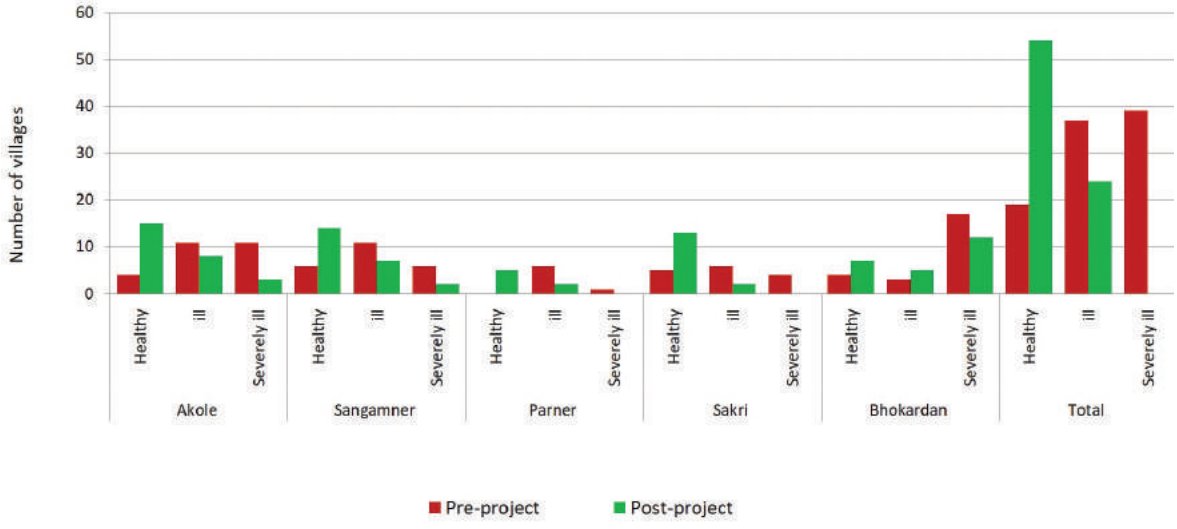


Figure 3 : Changes in the Water Health Status of villages grouped according to talukas

In the 100 villages across the 5 *talukas*, the village water health chart played an important role in mobilising and motivating the community to design and implement interventions such as water budgeting and water efficiency measures to improve their village water health status.. These actions had a positive impact on the water situation of many villages as observed in Figure 3.

More information on the Water Health Chart preparation is available at https://bit.ly/2KMa7HZ

Challenges encountered

While positive changes were observed in some villages during the two and a half years of the project, other villages barely improved. An important reasons noted by the field team were reluctance to 'consider water as a common good' and the local politics between farmers with adequate access to water and the rest of the households who do not have a water source. The former were reluctant to share water with others.

(C) The Village Water Budget

Efficient management of the available water is at the core of Village Water Budget plans. Preparation of the village water budget and its acceptance by the *Gram Sabha* is crucial for good water governance. While watershed development (WSD) may have been implemented to enhance the supply of water, it falls short of water management when the project is completed, unless the village water budget is implemented.

Provisions in Maharashtra Groundwater (Development and Management) Act 2009

Section 30.5 of the 2009 Maharashtra Groundwater Act states, "The Watershed Water Resources Committee shall specify the cropping pattern for the area based on the water budget and plan for the optimum withdrawal of groundwater from the existing wells for different uses like domestic, agriculture, industry or any other use, based on the Groundwater Use Plan, in the manner as may be prescribed". Section 30.2 proposes that the plans be made on an annual basis.

Doing it the "Water Stewardship Way": The Seasonal Water Budgets and Crop Plans

Once the VWMT is convinced and motivated for concrete action to improve the water health of their village and have expressed willingness to address the related problems, they are guided to prepare the village Water Budget (WB). All 100 villages prepared their respective water budgets twice each year - the first time during March / April and the second time in the month of October after the monsoon rains.

The WB prepared in March / April calculates the water requirement for the whole year including that for the proposed *kharif, rabi* and summer crops. This exercise presents the water deficit which encourages the village to undertake repairs and maintenance of the water harvesting (WSD) structures earlier constructed, so as to meet the demand estimated in the water budget.

The water budget prepared in October (post monsoons) helps in planning for the *rabi* season and to decide whether cultivating summer crops would be viable. This water budget calculates the total water available for use within the village in the following manner: (a) the water requirement is prioritised for domestic, livestock, and other livelihood needs after which the net water balance is considered available for agriculture. (b) Crops are selected and the area for their cultivation decided upon for the *rabi* and summer seasons. The data collected and maintained by *Jal Sevaks* and the VWMT which is required for calculation of the WB are: rainfall, soil and water conservation works done in the village, cropping pattern, details of wells and irrigation, and the domestic requirements for the inhabitants and livestock of the village.

More details about the Water Budgeting process is available at https://bit.ly/2ZbNdO5

As a follow up to the Water Budgeting process, three sub-plans for action are required. These are: (i) the water harvesting plan (see chapter IV D), (ii) water-use efficiency plan (see chapter IV E and (iii) social norms and rules (see chapter IV F).

Findings and impacts

The WB in 100 villages was regularly revised, based on data collected, and was displayed on public boards. In 2018 which was a year of drought, out of 100 project villages in Ahmednagar, Jalna and Dhule districts, 78 villages had water available within the villages for domestic use in January 2019. The other 22 villages received water through public tankers, 12 of which are in the Sangamner *taluka* which is classified as semi-critical (CGWB, 2014).

Table 1: Domestic water availability at the end of January 2019

Taluka	Total project villages (Nos)	Water available within village for domestic use	Villages supplied by tanker (Nos)
Akole	25	19	6
Parner	8	8	0
Sangamner	27	15	12
Sakri	16	16	0
Bhokardan	24	20	4
Total	**100**	**78**	**22**

Monitoring of groundwater levels in Kolegaon

Measuring rainfall

Experiences of changing cropping pattern based on water availability

The year 2018 tested the application of the WSI as it was drought year across the state. The following experiences gathered from villages explain how water budget preparations guided people and the actions taken.

Shobha Machhindra Fatangare from Sarole Pathar (Sangamner): *The villagers sit together to prepare crop plans, and as a result, in 2018 farmers decided to and reduced the area of wheat and onion and instead cultivated low water requiring crops such as chick pea, and sorghum for fodder. Most people followed the plans considering the possible water scarcity for drinking purpose in the summer due to poor rainfall.*

Kisan Icche, sarpanch of Kotha Jahangir village (Bhokardan) and member of VWMT: *The area under cotton has been drastically reduced and is replaced with soya bean and chick pea. He admits that water budget process initiated in the village has played a great role in achieving this. Farmers have come to know the amount of water required to grow each crop. This information has helped farmers to shift to low water requiring crops, keeping in mind the water available in the village.*

Ranjana Bhagvat Nirmal, VWMT member of Nimbola, Bhokardan: *"Because of the Water Budget processes initiated in the village, even women from the village were consulted while preparing the village crop plans. Because of the WB, even during this drought year, we still have water available in the village for drinking purpose in January 2019."*

Gajanan Narayan Icche, a farmer from Kotha Jahangir, Bhokardan: *"In the Gram Sabha we conduct the Water Budget exercise where the plans are shared with all villagers. Even in informal gatherings in the village, many a time we discuss issues related to water use and crop plans. Rainfall data and groundwater levels measured in the village help us to understand the water available for different uses. If our water budget goes into a deficit, follow up plans like water saving by using micro-irrigation help us to meet the deficit. We also plan to harvest more water to increase the groundwater level in our village.*

Pushpa Vikas Hande, VWMT member of Bhojdari (Sangamner) *said that because of the follow up plans of the Water Budget exercise, in her village the water harvesting potential has increased to meet the different water needs.*

(D) Addressing the Deficit through Water Harvesting

Harvesting water through watershed development (WSD) in particular, is an important way to increase the supply to meet the water requirements and make a village water secure. Watershed development is based on the principle of catching rainwater where it falls, by constructing locale appropriate area and drainage line structures, thus increasing the water stock on the surface and in aquifers. Therefore to implement water stewardship effectively, watershed development is essential. However, having implemented watershed treatments, regular repairs and maintenance are as important to continue receiving the benefits. All villages that were part of this experience had WSD implemented earlier. While the Village Development Committee (VDC) was responsible for maintenance of structures supported by its Maintenance Fund, reviews of structures and repairs were neglected. This chapter looks at how the deficit in the water required triggers assessments of structures and promotes repairs, maintenance and / or constructions of new structures where appropriate.

Provisions in Maharashtra Groundwater (Development and Management) Act 2009

The 2009 Act, in sections 9.2, 9.3, 30.3 and 30.4, highlights the need for artificial recharge of groundwater. This is to be implemented and managed by the Watershed Water Resources Committee, under the guidance of experts of the GSDA.

Doing it the "Water Stewardship Way"

Following the assessments carried out in the water health status and water budget exercises, the village prepares a plan for the (a) appropriate repair and maintenance of soil and water harvesting structures so that these function to their full potential, and (b) if required, and where appropriate, gap filling is done by way of new soil and water conservation structures. The latter necessarily requires technical feasibility and guidance for implementation. Repairs and gap filling are implemented through *shramdaan* (local contribution generally in kind, sweat equity) and convergence with the government (rural development, agriculture and forest departments) and other donor projects where available. The VWMT of each village assumes responsibility of this exercise, supported by the government's *Rozgar Sevak*.

Villagers contribute *shramdaan* to desilt a percolation tank in Dehed, Bhokardan

Findings and impacts

During the project period, storage and percolation structures that were not fully functional due to leakages and / or due to silt deposition were repaired. In Dehed, Kotha Jahangir and Walasa Wadala villages of Bhokardan *taluka* in Jalna district, hundreds of people came together for two days and contributed *shramdaan* to desilt percolation tanks and check-dams. People in the remote villages of Khandbara, Amali, Sukhapur and Shivkhatyal villages of Sakri *taluka* in Dhule district, constructed new structures such as water absorption trenches (WAT), continuous contour trenches (CCT), stone bunds, and earthen bunds, which greatly increased the water storage potential. Drinking water scarcity in most of the villages motivated villagers to provide *shramdaan* and work to enhance the water storage potential in their villages. (More details on water harvesting in WSI are available at https://bit.ly/2fPiPIM).

Nala bunds constructed through '*shramdaan*', Sangamner

Repairs, maintenance and new constructions through *shramdaan* and convergence with government programmes during the two years have contributed to harvesting 8.62 billion litres in the project villages (Figure 4). During this same period, the water harvesting structures (percolation tanks, cement dams and earthen nala bunds) constructed earlier, as well as the new structures and those recently repaired, contributed to a total harvest of 61.44 billion litres of water (Table 2).

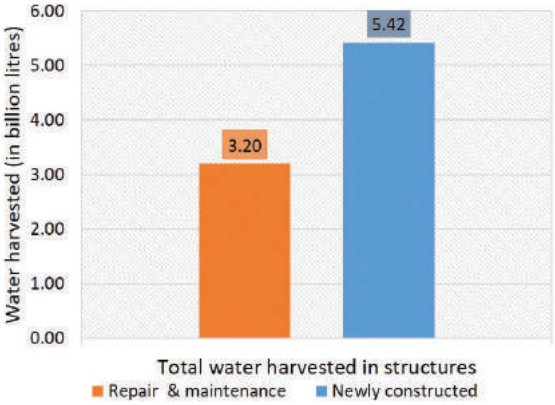


Figure 4: Water harvested through repairs, maintenance and construction of new structures (Oct 2015 to Mar 2018)

In the early years after WSD, the water harvesting potential in villages increases. However, if these structures are not repaired and maintained, the harvesting potential reduces. Water storage structures such as percolation tanks and farm ponds without lining have the capacity to store run-off rainwater, as well as recharge the wells and bore-wells. In this project, village communities learnt to assess the structures and repair them. They established linkages with government projects such as the *Jalyukt Shivar Yojana* (JSY) and the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) to implement WSD activities.

The water harvesting structures assessed included surface water bodies such as check-dams, percolation tanks and earthen nala bunds, but not the land-based treatments such as continuous contour trenches and water absorption trenches that store water underground. During the monsoons of 2016 and 2017, the average rainfall received in the 5 *talukas* (based on data from local automated weather stations) contributed to the water harvested during the same period (Table 2).

The various structures repaired, maintained or constructed across the watershed villages spread the potential of harvesting water, thus benefitting many more households, as compared to implementing only drainage line treatments.

Table 2: Water harvested in project villages during 2016 and 2017

District	Taluka & No. of villages	2016		2017		Total water harvested*
		Rainfall in mm*	Water harvested* *	Rainfall in mm*	Water harvested**	
Ahmednagar	Akole (25)	1319	2.56	1755	1.46	4.03
	Parner (8)	437	18.34	590	18.35	36.69
	Sangamner (27)	515	2.79	532	2.11	4.90
Jalna	Bhokardan (24)	669	7.99	504	4.70	12.69
Dhule	Sakri (16)	864	1.57	1236	1.56	3.13
Total			**33.25**		**28.19**	**61.43**

Note: * The average rainfall for the respective number of villages in the *taluka*

**Figures mentioned are in billion litres. This table shows water harvested by structures constructed earlier, as well as those repaired and maintained, and also new structures.

Water harvested in repaired cement check-dam in Shiv-Khatyal, Sakri

Areas of caution

1. Appropriate water harvesting structures are to be constructed only as and where applicable.

(a) The biophysical context of geographies differs. For example, Akole lies in the non-rechargeable zone hence the water harvested is low, despite having much higher rainfall as compared to Parner. There is a larger number of surface water harvesting structures in Parner as compared to other areas.

(b) It is important to note that when building structures, water flows to the downstream is also to be maintained.

2. However, while the water harvesting potential is optimised, managing water use depends on the water available through rainfall and groundwater flow.

Water arrested in a constructed Vanrai bandhara, Palsunde, Akole

(E) Water Use Efficiency to meet water demands

Despite its promotion earlier in Maharashtra, water use efficiency through micro-irrigation has been gaining ground only recently. While government programmes support micro-irrigation (for example, the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and other programmes), its uptake depends on the individual farmer. In general, farmers prefer the less cost intensive 'flood irrigation' method.

According to the Composite Water Management Index of the NITI Aayog which assesses water supply and demand as well as governance, Maharashtra ranks 5th of all states which indicates that while its performance in harvesting water is relatively good, there is a scope to improve water saving through expansion of efficiency use measures (GoI, 2018).

Provisions in Maharashtra Groundwater (Development and Management) Act 2009

The 2009 Maharashtra Groundwater Act pushes for demand-side management of groundwater to regulate groundwater use along with augmentation by supply-side dynamics.

Doing it the "Water Stewardship Way"

The community necessarily needs to adopt water saving as part of its water management strategy. Water Stewardship promotes (a) direct water saving through micro-irrigation, (b) indirect methods to enhance the water holding capacity through increase in biomass content, such as the application of vermi-compost and organic manure, as well as (c) reduction of evaporation through mulching, and by (d) cultivating crops according to the water available through setting the norms for water management and banning the cultivation of water intensive crops. To meet the deficit in the village water budgets, the VWMT and *Jal Sevaks* mobilise farmers who flood irrigate their farms to save water through the use of micro-irrigation.

Findings and impacts

The effort resulted in saving 3.24 billion litres of water through micro-irrigation by 2000 farmers who adopted these measures between October 2015 and March 2018. During this period, the total area under drip irrigation increased by 597.27 ha and under sprinkler irrigation by 218.48 ha. The use of plastic mulch by 37 new users increased the area of its coverage by 174 ha.

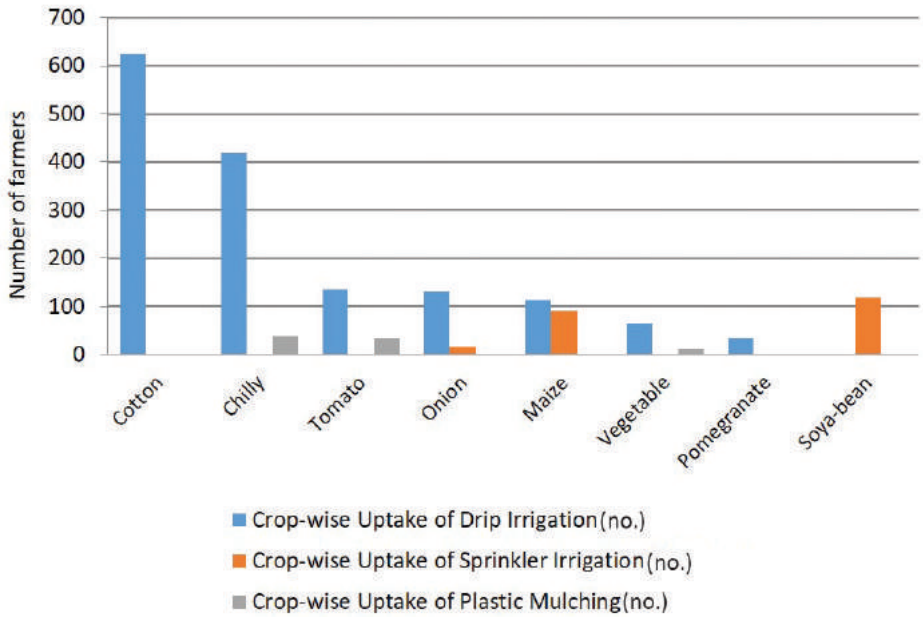


Figure 5: Crop-wise (new) application of drip sprinkler and mulch techniques during project period

It is observed that farmers opt for drip irrigation and mulching techniques for cash crops such as cotton, chilly, tomato, onion, and pomegranate, while sprinkler irrigation is used for food crops such as wheat, soya bean and maize. Plastic mulch is adopted for chilly (by 37 farmers), tomato (33 farmers) and other vegetables (12 farmers) (see Figure 5). Some farmers also use water saving techniques for watermelon, fodder and sorghum.

Drip irrigation adopted by farmers in Kumbharwadi, Sangamner

In the drought year of 2018 in Sangamner, as the rains were delayed, farmers shifted to traditional crops such as pearl millet and chick pea, as well as sorghum for fodder. In Bhokardan, farmers cultivated cotton hoping that the rainfall would be normal, however the crop yield was greatly reduced. Some shifted to soya bean, while other farmers did not lift water from their wells for irrigation; rather they preserved it for drinking water purposes for the coming summer months.

The application of drip, sprinkler and plastic mulch saved a total of 3.24 billion litres of water (1.36 billion litres in year 1 and 1.88 billion in year 2) in the 100 villages between October 2015 and March 2018. The 1656 farmers in the 24 villages in Bhokardan who adopted micro-irrigation (Figure 6) made the highest contribution (77%) to the total water saved in project villages, followed by farmers in Sangamner (12%). Uptake has been the highest for cotton (625 farmers), thus contributing to 55% of the total water saved.

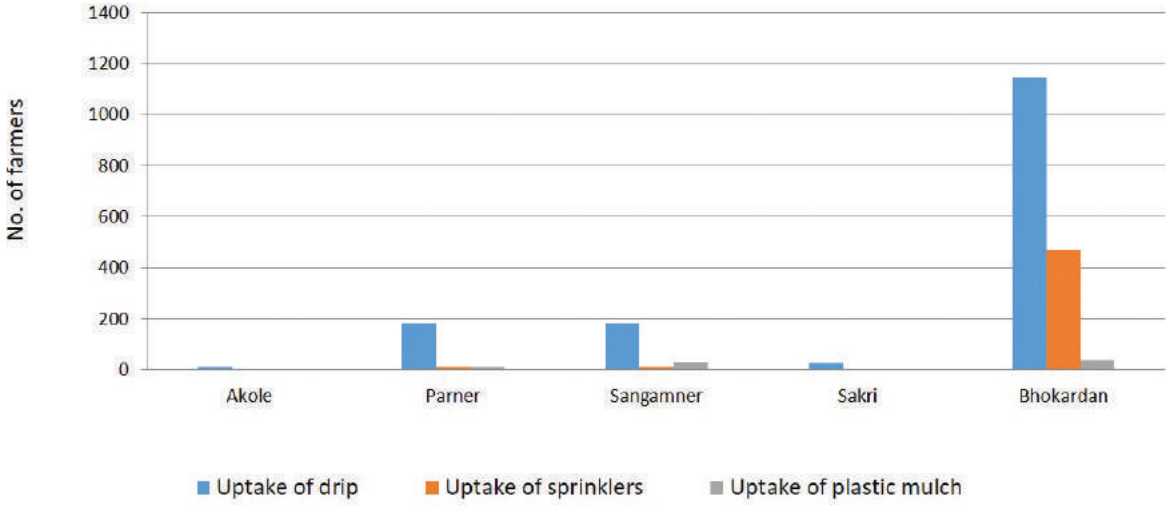


Figure 6: Uptake of water saving techniques across project talukas

Challenges addressed

Although micro irrigation has been promoted since at least two decades and having more water available appears atrractive, there are resistances encountered to its adoption.

1. Being accustomed to subsidies, farmers expect handouts for micro-irrigation equipment. Through motivation and mobilisation facilitated by *Jal Sevaks*, a slow change is observed. Based on the crops cultivated, capital available and their calculations, farmers opted to purchase cheaper micro-irrigation material (non-ISI type), or chose the ISI quality promoted material through government schemes (D'Souza, M., & Misquitta, K., 2018; Misquitta, K., & Thatte, K., 2018).

2. Initially crop planning based on the water available met with resistance. However as shared during meetings, in the course of the project farmers in some villages in Bhokardan shifted from cotton to soya bean, which requires less water as compared to the former. In Sangamner, farmers opted for chick pea instead of wheat. Area under pomegranate (requiring perennial irrigation) was reduced and replaced with soya bean and chick pea. But, in few villages in Sangamner as well as in Bhokardan *talukas*, some farmers continue to grow water intensive crops and a few have even cultivated sugarcane.

3. Figure 6 highlights the poor adoption of micro-irrigation techniques in Sakri *taluka* in Dhule district and Akole *taluka* in Ahmednagar district. These areas have a predominantly tribal and poor population. The challenges in these geographies are that Akole mainly depends on flowing water, as it is a 'non-rechargeable' area, and both areas have limited sources of irrigation, that is, very few dug wells and ponds. These areas also lack infrastructure and face frequent power shortages.

Plastic mulch applied for the tomato crop in Kothe Budruk, Sangamner

Observations to improve performance

Motivation and mobilisation through the Jal Sevaks, stakeholder engagements and trainings have begun to see results. The initiative of the people shows their willingness to adopt water saving practices despite lack of direct financial incentives from the project. While some farmers purchased and adopted micro-irrigation devices through government subsidies, many installed low cost non-ISI mark equipment purchased using their own money. Motivation and mobilisation needs to continue so as to secure agriculture in a scenario of increasing climate risks.

Mulching is an effective means for the prevention of water loss through evaporation. Farmers have begun to see the usefulness of plastic mulch and its uptake is gathering momentum. While it is beneficial in conserving water and increasing the income of farmers, the down side is the accumulation of plastic waste in rural areas and the risk of farmers opting for the cheap single use plastic mulch. It is important to have local regulation to check that only higher grade recyclible plastic is used and that there is a buy-back mechanism built into the supply chain for its re-cycling, which will incentivise farmers and prevent the careless dispersal of plastic wastes (Arjuna Srinidhi and Divya Nazareth, 2018).

Non-ISI low cost sprinkler irrigation adopted by farmers in Palsunde, Akole

(F) Setting the Norms for Water Management

Governance necessarily requires that a set of norms be established and followed by all within a particular geography or group, for achieving the specified desired outcome. Groundwater, a crucial and sensitive common pool resource, requires good management, particularly because of the growing demand and the changing climate context. Farmers generally use 'their' water resources (wells and bore-wells) as they find convenient, ignoring the impacts on wells of neighbouring farmers, as well as government norms, if they are at all aware of the latter.

Provisions in Maharashtra Groundwater (Development and Management) Act 2009

The thrust of the 2009 Maharashtra Groundwater Act is on managing the scarce resources of both surface and ground water, by enhancing water harvesting and controlling its demand. The Act provides for a decentralised engagement around the water resources through strong community involvement. However, guidelines are provided in detail mainly for 'notified' areas. They prohibit construction of new wells and extraction of groundwater from deep wells (below 60 meters / 200 feet) in both notified as well as non-notified areas. Additionally, a cess is levied on the extraction of groundwater from deep wells. (At the time of this publication, the state is in the process of firming up the rules on the extraction and use of groundwater.)

Doing it the "Water Stewardship Way"

On learning about the poor status of their water resources through assessments by way of the Water Health Status Chart, and their demands through the Village Water Budget, the VWMT is motivated to seek solutions. Hence, setting rules regarding water use is an important next step. Towards this end, the VWMT and *Gram Panchayat* members are encouraged to frame village specific rules. Government norms are presented to them. Once drafted, the VWMT presents these rules in the *Gram Sabha* encouraging fair discussion and debate, after which rules are finalised and endorsed by the *Gram Sabha*. The purpose of this process is to ensure ownership of the regulations decided by villagers and to help their execution in a manner accepted by all. The tenets of the application of the water budget prepared rely heavily on the involvement of the community, through activities like surface and groundwater monitoring, water availability assessment, crop planning and implementation of water conservation measures in order to reach an equilibrium reflecting the optimum and most efficient use of water in the respective villages.

Woman VWMT member sharing her experience in the workshop

Findings and Impacts

Of the 100 project villages, 78 villages set rules for water use and crop management (Table 3). These 78 villages have discussed these issues in *Gram sabhas* and have the rules ratified in their records, which is an important step.

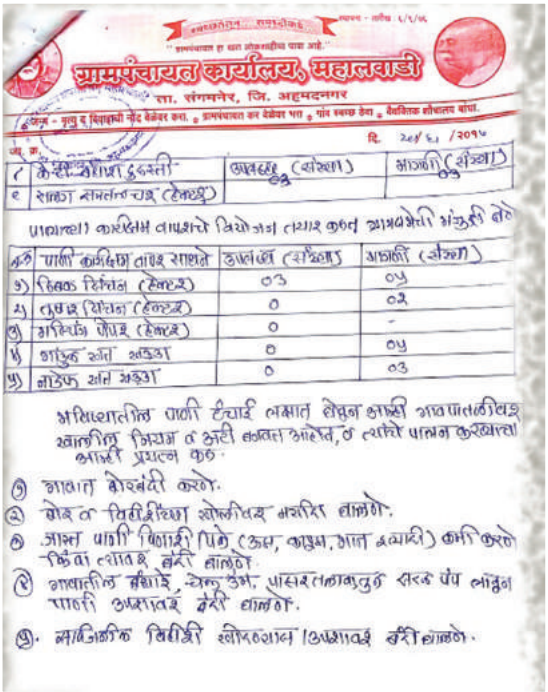
Table 3: Choice of norms as endorsed by the Gram Sabhas

Rules Approved	Villages (Nos.)	Rules Accepted	Not Accepted
Ban on drilling new bore wells	46	Akole, Parner, Sangamner, Sakri	Bhokardan
Limit on depth of wells/borewells (average 150 feet and maximum 200 feet)	73	Akole, Parner, Sangamner, Sakri, Bhokardan	
Ban on cultivating water intensive crops (sugarcane and bananas)	62	Akole, Parner, Sangamner, Sakri	Bhokardan
Ban on direct lifting of water from water harvesting structures	72	Akole, Parner, Sangamner, Sakri, Bhokardan	

Villages in Bhokardan were reluctant to frame rules to ban the drilling of borewells and the cultivation of water intensive cotton. However, they took a first step by setting a limit on the depth of bore-wells, and stopped the lifting of water from harvesting structures as well.

Observations to improve performance

Rule formulation depends on the level of motivation among villagers and also on local dynamics. The rules framed vary from village to village, depending on the importance given to these rules, as well as the willingness to adopt them. While some villages decide to limit the depth of bore-wells (at a maximum of 200 feet), and / or ban furrow irrigation, these rules may not be fully implemented. Although they may not be overtly violated, rules create social pressure on the local inhabitants. However, framing rules at the village level is very effective towards villagers 'owning responsibility' for their local resources, and gaining support through norms by the government. If the implementation of these rules is monitored regularly, it will empower the community to take action and help them to overcome local hurdles and power politics. Changing the age-old water use practices and compliance with the new norms agreed upon, is greatly desired, however it requires time for it to become a habit.


ग्रामपंचायत कार्यालय, महालवाडी
ता. संगमनेर, जि. अहमदनगर

Mahalwadi, Sangamner *Gram Panchayat* resolution on rules for water use

Expecting to achieve these results during a typical project perod of 2-3 years is difficult and challenging. Consistant efforts and follow up contributes to achieving the desired outcome of sustainable water management.

In Kotha Jahangir village, the *Gram Sabha* passed a resolution to ban the drilling of bore-wells beyond 150 feet. Farmers need to obtain permission from the *Gram Panchayat* before drilling a bore-well. They have also passed a resolution to ban extraction of sand from the river bed. Such rules are suitable to the local conditions.

पुढारी

दुष्काळावर मात करण्यासाठी कोळेगावकरांची शपथ

पाणी बचत करण्यासाठी थेंबन् थेंब जमिनीत जिरवण्याचा ग्रामस्थांनी केला निश्चय

भोकरदन : प्रतिनिधी

जिल्ह्यात उद्भवलेल्या दुष्काळजन्य परिस्थितीच्या पार्श्वभूमीवर भोकरदन तालुक्यातील कोळेगावच्या ग्रामस्थांनी थेंब-थेंब पाणी जमिनीत जिरविण्याची सामूहिक शपथ घेतली.

दुष्काळाच्या वाढत्या वाढत्या मग दिवस होत असताना भोकरदन तालुक्यातील कोळेगाव येथील शासकांच्या उपक्रम एकूण नवीन सुरुवात पाऊस संपला सात संपा नाही. दुष्काळ आता महापूर पाऊसन न जाता पाण्याचा प्रत्येक थेंब आणि थेंब जमिनीत जिरवून जिरोने व हिंमतीने दुष्काळाला मात करण्याची शपथ कोळेगावकरांनी घेतली आहे.

संपूर्ण महाराष्ट्रात दुष्काळाची गडद छाया पसरली असून दिवसाच्या पाण्यासाठी पुरांसाठी भटा व पाण्याचा प्रश्न आ वाढून उग्र स्वरूप आहे.

अनियमित पडणारा पाऊस, घटत चालणारी भूजलाई आणि शेतमालाला मिळणारा कमी भाव यामुळे शेतकऱ्यांचे कंबरडे पार मोडून गेले आहे.

पाणीची परिस्थिती तर अत्यंत बिकट बनत चालली आहे. भविष्यातील भीषण पाणी टंचाईचे संकट ओळखून शेतकऱ्यांनी केवळ भाग व पाण्याच्या भीतीने गुरे विक्रीस काढली आहेत.

प्रत्येक गोष्टीसाठी शासन अवलंबून राहिल्याने काहीच साध्य होणार नाही. आता आपल्यालाही सरकारच्या कोणतीने किंवा सरकारच्या दोन पावले पुढे चालणे लागेल तरच या भीषण दुष्काळाला सामना करता येईल आणि हिच खरी अपेक्षित ठरून कोळेगाव येथील आजी माजी सरपंच, विशेषक सदस्य राजकीय जोडे बाजूस काढून हनुमान मंदिर सभागृहात एकत्र आले.

सध्यातील ग्रामस्थ नागरिकांनी दुष्काळ परिस्थितीवर उपाययोजना करण्यासाठी हनुमान मंदिर सभागृहात ग्रामसेवक आर. टी. चव्हाण यांच्या अध्यक्षतेखाली सभा आयोजित करण्यात आली होती. सभासदांच नागरिकांची व महिलांची या सभेस मोठ्या संख्येने उपस्थिती होती.

भोकरदन : कोळेगाव ग्रामस्थांनी पाणीबचत करण्यासाठी सामूहिक शपथ घेतली. या उपक्रमात ग्रामस्थांनी मोठ्या प्रतिसाद दिला. पाण्याचा काटकसरीने वापर करण्याचा निश्चय ग्रामस्थांनी केला. (छाया : विजय गोवर्धने)

Figure 7: News published on Kolegaon village in Bhokardan.
Villagers make a commitment to follow water saving practices

(G) Engaging Stakeholders for Effective Water Management

Management of both surface and groundwater cannot be handled by individual households or a village in isolation. Aquifers are shared by one or many villages, and surface water flows link all farms within the micro watershed, from ridge to valley. Hence it is essential that the diverse set of stakeholders associated with water resources of a particular geography come together to understand, plan and manage this precious resource judiciously and in a manner that is equitable and sustainable. Watershed development prepares the ground for actively engaging the local community, for example, through the Village / Watershed Development Committee (VWC/VDC) supported by the *Gram Panchayat*, which brings all inhabitants of the entire village(s) together to regenerate their degraded watershed in order to enhance soil and water harvesting potential. It provides a productive basis for all primary stakeholders (of all castes, communities and classes) to work together for the revival of the watershed.

Participants in a group exercise during a Stakeholder Engagement workshop, Bhokardan

Provisions in Maharashtra Groundwater (Development and Management) Act 2009

According to Section 29 and 30 of the 2009 Maharashtra Groundwater Act, in 'notified' areas a Watershed Water Resource Committee (WWRC) of more than 11 villages will be formed. Section 9.5 stresses the engagement of stakeholders in watershed development and management to enhance the recharge of groundwater, while Section 9.9 insists on promotion of mass awareness through training programmes of stakeholders on water harvesting and artificial recharge.

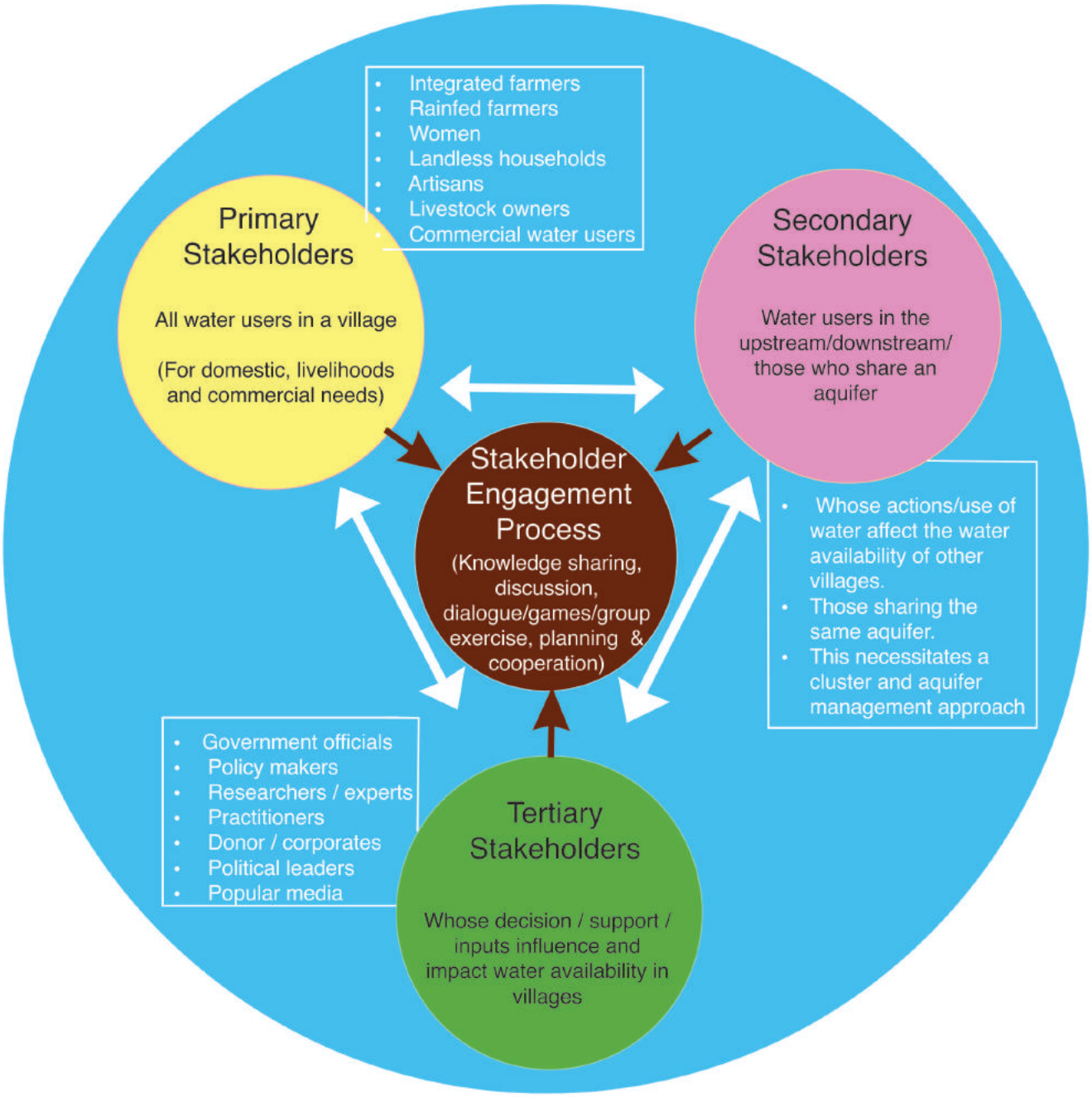
Doing it the "Water Stewardship Way"

The Theory of Change (ref page 12) "Water Stewardship: Intersecting Science, Governance and Practice for Behavioural Change" applied in the WSI, considers "stakeholder engagement (ShE)" an important component of the WSI. It brings together diverse actors in the water and allied sectors. It aims to (i) develop a common understanding based on local facts (data); (ii) encourage dialogue; (iii) identify problems and concerns of the various stakeholders, particularly the marginalised and most affected, and (iv) thus contributes to a 'buy-in' of all, for good water governance at the local level.

The ShE process brings together three levels of actors, (Figure 8) the primary stakeholders who are the direct users of water for domestic and livelihood needs at the village level; the secondary stakeholders i.e. residents of villages whose use of water affects the water resources of others or are affected by other villages, and the tertiary stakeholders who have the power to influence the water resources of the primary and secondary stakeholders.

Figure 8:

Stakeholders and the process for engaging them



Under the Water Stewardship Initiative, there are two types of ShE events:

(1) Engaging the primary and secondary stakeholders together at the cluster level and

(2) Engaging representatives of the primary, secondary and tertiary stakeholders at the *taluka* or district levels.

These ShE events are described below:

(1) Engaging the actors of the primary and secondary levels: These events bring together the VWMT having representatives of different groups in the village (see Chapter IV (A) and the cluster of VWMTs of nearby villages that share the aquifer (see Chapter V) or are adjacent to one another. Stakeholder dialogues are aided by group exercises, games and discussions. In fact, open and healthy discussions are encouraged around individual concerns and sticky problems. Appropriate scientific information is presented that provides clarity regarding the socio-economic, local biophysical and hydro-geological findings, which guides participants in taking decisions. The 'CoDriVE-Visual Integrator' (WOTR, 2013) is one such exercise that helps the participants to understand the topography and the shallow aquifer on which their villages lie. During the process, VWMTs and *Jal Sevaks* prepare water budgets followed by the water harvesting and water saving plans.

Participants of Mhaswandi village prepare the CoDriVE Visual Integrator watershed model

A rally by school children to generate awareness on water management Village: Mohagaon, Sakri

(2) ShE events are also organised at the taluka and district levels where the primary, secondary and tertiary stakeholders participate. The latter are government officials, experts in the water, agriculture and related sectors, practitioners, academic and research institutes, NABARD officials, media and others. As in the former ShE, they come together to discuss, understand and agree on strategies to be adopted to address different water related ssues. These discussions help all stakeholders to get a larger perspective of issues such as the bio-physical and socio-economic conditions of the *taluka* / district, likely impacts of climate change, causes of water scarcity, and other relevant issues. Thus, the ShE approach is an important step for developing a common understanding and enabling all stakeholders to contribute to appropriate action that is equitable, economically viable and environmentally sound.

Government officials in a stakeholder engagement event in Bhokardan

Active engagement of participants in the ShE workshops, Sangamner

Findings and impacts

The ShE events brought various stakeholders together for the first time. These helped participants to talk about their resources and needs, and guided them to develop an objective understanding of their biophysical reality. It helped them be aware of issues related to their water resources, the availability and use of water, current agricultural practices and how their decisions and current water use patterns affect themselves, others and future generations. Information gained as a community contributed to setting up institutional arrangements at the village level and establishing norms for supply and demand-side water management. Feedback from the water stewards of different regions show that discussions and information received during the stakeholder engagement workshops have contributed to a new understanding of their water issues. As shared by villagers, the stakeholder engagement workshops provided them an opportunity to deliberate and discuss 'water' as a 'shared problem', leaving aside all other differences and dynamics of the village. They learnt how to calculate the water budget and to use water efficiently. This activity also helped them to develop a common understanding of the 'hidden / unseen' sub-surface water. Many water stewards (*Jal Sevaks* and VWMT members) stated that they now understand water as a common property, that everyone has a right over water which should be used judiciously.

More details about the stakeholder engagement process in the WSI is available at https://bit.ly/2JUm3HR

Knowledge sharing during a stakeholder engagement workshop at Sangamner

Participants share their experiences and the impacts of the Stakeholder Events

It is difficult to attribute a specific activity as solely contributing to people's actions. However, participants expessed how the ShE events played a role in bringing about some important changes.

"Earlier, no private well owners allowed others to draw water from their wells, even to meet drinking water needs. After the exposure visit and ShE workshops and discussions in the village, some well owners switch on their private pumps to allow others to collect water for domestic requirements. Besides, as water is required for the animals and birds, we have made provisions for special water troughs for the animals in the remote hilly areas where monkeys, wild boar and deer can find water during summer months. Wild animals frequently visit these troughs during summers to quench their thirst."

Mrs. Meera Ramesh Shinde (VWMT member, Lingewadi, Jalna)

Kisan Icche (VWMT member and Sarpanch, Kotha Jahangir, Jalna)

"The ShE workshops motivated us and we passed a resolution in the Gram Sabha to ban the drilling of new bore-wells and change the crops grown in the rabi season. We tried to convince every irrigated farmer to use sprinkler and drip instead of flood irrigation and as a result, during 2017–18, almost 60% to 70% farmers installed drips and sprinklers. Because of this rule not a single bore-well was drilled during this year in my village."

And the Challenges Continue…..

Involving all stakeholders in the dialogue on water resources and water use at village level is essential for arriving at a consensus for action that is vital for addressing the water crisis in the state. However, Limbaji Kannar of Aadha village in Jaffrabad says, “People’s mentality of ‘not accepting to change’ is the real challenge. People don’t change their behaviour and practices very easily. People also have fear that they will lose their existing share of water use because of water budgeting. It is difficult to convince people the perception that ‘to the landowner belongs all water below their land’ is problematic. Even when applying water budgeting processes, we will continue to face the challenge of village level politics where the different groups within a village always take positions opposed to one another. Hence, arriving at a consensus on decisions and actions on water budgeting is an uphill task. People are more concerned about the immediate benefits hence, it is difficult to mobilise them for long-term water security and achieving the goal of Water for All.”

With the local stakeholders becoming more informed through ShEs, impacts begin to be observed in action and development at the village level. Several water budgeting plans were made and followed through, which improved water sufficiency, provided drinking water security, reduced crop losses. At the same time, introduction of villagers to water saving and harvesting techniques improved water availability and water-use efficiency through the changed behaviour of farmers. The rules and regulations made at the village level enhanced the power and reliability of local institutions in water management by increasing unity among the village community. This enabled some villages to improve their level of efficiency in water use by the adoption of good practices in agriculture, water and soil health.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Prof. Carlo Carraro

Direttore, *Initiative on Climate Change Policy and Governance*

Certificate awarded by ICCG for Best Climate Practice to WSI

V Managing Groundwater at the Aquifer level

Watershed Development brings people together to develop their degraded landscapes. While water is harvested on the surface and in the aquifers, the shallow and deep aquifers do not always follow the watershed boundaries. Since groundwater plays a big role in the lives and livelihoods of rural households, bringing people who share an aquifer together is essential for its appropriate management.

Provisions in the Maharashtra Groundwater (Development and Management) Act 2009

Section 29.1 of the 2009 Maharashtra Groundwater Act informs: "The State authority shall constitute a Watershed Water Resources Committee (WWRC) in the notified areas comprising of an area of more than 11 villages." Section 29.6 further elaborates that if there are less than 11 villages, the functions will be entrusted to the local *Gram Panchayat*. This WWRC is to comprise of representatives of the participating villagers, in addition to various experts at the *taluka* level, who are to collectively manage the aquifer in a sustainable and judicious manner. Section 9.9 of the 2009 Act emphasises that mass awareness and trainings are essential for the WWRC members, as well as for all stakeholders.

A Woman Aquifer Management Committee member explains the CDVI maps to the villagers

The experience of aquifer management in the Water Stewardship Approach

A pilot project of aquifer management was initiated in Jalna with the following objectives:

1. Raise awareness and mobilise the primary and secondary stakeholders sharing the shallow aquifer to come together for planning and managing this common pool resource.

2. Institutionalise participatory management by organising the stakeholders into (a) Village Water Management Teams (VWMTs) at the village level, and (b) the Aquifer Management Committee (AMC) at the shallow aquifer level.

3. Build a cadre of 'Water Stewards' (*Jal Sevaks* and VWMTs) at the aquifer level who understand their responsibility and effectively, efficiently and sustainably manage the use of water at the aquifer level.

4. Make all stakeholders vigilant about groundwater dynamics and the consequences of over-extraction, and ensure that they adopt self regulations for appropriate remedial measures.

5. Promote the water budget preparation as a tool to empower farmers to choose appropriate crops based on the available aquifer stock, while prioritising drinking water for all households throughout the year.

Location of the Aquifer Management Pilot

The aquifer selected is located in the Bhokardan taluka of Jalna district. Following the hydrological assessment through a geophysical study, the Malegaon aquifer (named after the village at the centre of the aquifer) was selected for this pilot. This aquifer is a large one, shared by 14 villages.

Interventions and strategies

The Aquifer Management team and its functions are as follows:

- **Village Water Management Teams (VWMT) at the village level**

  The VWMT is set up in each village (see chapter IV (A)) for management of the water resources in their respective villages.

- **Aquifer Management Committee (AMC)**

  - Each *Gram Panchayat* nominates two members from its VWMT to the AMC, one of whom is a member of the *Gram Panchayat*.

  - The AMC is responsible for the following: (a) present the Community Driven Vulnerability Assessment Visual Integrator (CoDriVE-VI or CDVI) model of the aquifer to each village, and motivate and mobilise the community; (b) communicate the plans and decisions made at the AMC meetings to each *Gram Panchayat* and discuss them with the villagers; (c) based on the discussions and suggestions, revise the aquifer level plan, keeping in focus the health of the aquifer; following which, (d) the aquifer level plans are finalised and executed them in the respective villages.

AMC members gathered for planning workshop at Bhokardan

Findings and impacts

During the 3 AMC workshops, aquifer literacy and the concept of a shared aquifer were emphasised to motivate the participants for resource ownership by all. The relevant components of the 2009 Act (aquifer level water management; formation of the WWRC, the limit on the depth of borewells, need for water harvesting and budgeting) were presented and discussed. Although it was challenging, participants realised the value of the same and decided to take action to avoid further depletion of groundwater. This triggered (a) plans to harvest water to recharge their aquifer (currently structures are being constructed to address this need); (b) demand management through appropriate crop planning; (c) water saving by micro-irrigation and (d) formulation of village level rules for water use and crop selection.

The Malegaon AMC has 15 members, one representative of each village, and the *Jal Sevak* on this committee. The most important indication that the Malegaon AMC is serious is that it has initiated the process for its registration under the 1860 Societies Registration Act.

Display of CDVI Maps of aquifer to the villagers during a village fair

VI. CONCLUSION

The aim of the Water Stewardship Initiative is to improve governance of water resources at the community level. The expected outcome is to facilitate sustainable, inclusive and efficient use of water through adoption of appropriate supply and demand side management practices.

Although the WSI effort has been marked by difficulties, it has taken us one step forward. The outcomes of this effort have been positive and encouraging. At the end of the project period in March 2018, of the 100 villages where WSI work was carried out, the performance of 46 was satisfactory, that of 35 was moderately satisfactory, while 18 villages have underperformed.

All the communities have become aware of the causal relationship between the water crisis facing them and their water usage and management practices. In all the villages, communities have drawn up water stewardship action plans, and 75% have submitted these to the authorities. People have taken steps small and big, some more and others less, at both the household and village levels to manage and use water efficiently. Small behavioural changes with regard to water use are observed at home and in the fields. The number of farmers adopting water efficient technologies and better farming techniques is increasing across all villages. Moreover, water harvesting capacity and availability in all the villages has increased through community contribution and governmental action.

However, 2018 was a year of drought. The overall performance was relatively low, given that the project had also stopped in many villages. Yet most villages undertook the Water Budget exercise. Micro-irrigation was practiced where water was available, although the area was reduced, due to the reduced availability of water. The CoDriVE Visual Integrator model for the Malegaon common aquifer was displayed and discussed in each of the 14 villages to motivate communities. The Aquifer Management Committee took advantage of *yatras* to educate the large gatherings about the judicious use of their aquifer. They also set up an advisory group to support the VWMT in each village. Moreover people contributed financially towards the registration of their Advisory Management Committee.

Motivation and mobilization for community action have helped to realise these outcomes. The VWMT and the *Jal Sevaks* played an important role in sensitising people and organising them to undertake

the necessary actions at the village level. Stakeholder engagement events brought together village representatives, experts, service providers and government agencies and provided a platform where local water challenges were discussed, Water Stewardship Plans finalised and joint action plans agreed upon. On the part of the government functionaries, this led to a better appreciation of the underlying causes of the local water crisis and a significant "buy-in" which resulted in committed implementation of measures in these villages. Equally importantly, it built up the knowledge, skills and confidence of villagers and the *Jal Sevaks* in their ability to address the challenges they face and in approaching and accessing publicly financed benefits and entitlements.

The WSI has provided valuable experiences and lessons in understanding the complex relationships and compulsions that influence behaviours which determine access to and use of water at the ground level. The project has also highlighted the need to develop an enabling policy and institutional framework that facilitates and incentivises community and other stakeholders' participation across society. However, to achieve sustained impacts particularly with changing externalities, guidance and monitoring support to the community is required from time to time and for years beyond the short duration intensive implementation period. It is important that the donor community and practitioner agencies factor this aspect into project plans. These efforts must be accompanied by sustained and large-scale, multi-format sensitisation campaigns, capacity building and skill upgradation of water users, better governance measures, and the constitution of developmental and regulatory agencies at all levels. The establishment of a mechanism that enforces related policies and regulations for the common good in a transparent, fair and consistent manner is necessary if the culture and practice of "water stewardship" is to become a way of life.

The Maharashtra Groundwater Act, 2009, is a much needed first step in this direction, but it needs to be effectively implemented. Other states in the country will eventually have to legislate and enforce similar policies in order to secure social stability, economic growth and environmental integrity.

The Water Stewardship Initiative has led to the development of an approach and a pedagogy that, at the level of implementation, can help rural communities collectively adopt practices that can significantly improve their "water health status", secure their livelihoods, and enhance their well-being.

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22. Yaduvanshi A, et al. (2019). 'Impacts of 1.5° C and 2° C Global warming on regional temperature and rainfall across India', working paper at WOTR by Yaduvanshi A, Zaroug M, Bendapudi R and New M

PUBLICATIONS

FILMS ON WATER STEWARDSHIP

Sr. No	Film Name	Duration	Year	QR Code	Language
1	Creating a desired future for Water Security	13.52 min	May-19	Watch video	English
2	Shramdaan….the game changer in drought	3.26 min	Jul-16	Watch video	English
3	Water Stewardship Initiative by WOTR COP	7.25 min	Nov-17	Watch video	English
4	Jalsevak: The story of water steward	9.42 min	Aug-18	Watch video	Marathi
5	Engaging Multi-Stakeholders: A Strategic Approach for Improving the Water Governance	11.11 min	Jul-18	Watch video	English
6	पाण्याचे कारभारी (Water Stewards)	7.25 min	Mar-19	Watch video	Marathi

OTHER PUBLICATIONS ON WATER STEWARDSHIP

- Kale E., D'Souza M. (2019) Water Stewardship in Rainfed Agrarian Maharashtra. In Suresh Kulkarni (eds) Water Conservation and Saving in Agriculture: Initiatives, Achievements and Challenges in Maharashtra, Water Resources Department, Government of Maharashtra, India, Chapter available at https://wotr.org/publications/water-stewardship-rainfed-agrarian-maharashtra
- Kale E., D'Souza M. (2018) Building Resilience to Climate Change: Water Stewardship in Rainfed Agrarian Villages in Maharashtra, India. In: Leal Filho W. (eds) Handbook of Climate Change Resilience. Springer, Cham, available at https://link.springer.com/referenceworkentry/10.1007%2F978-3-319-71025-9_51-1

About WOTR

Watershed Organisation Trust (WOTR) is a non-profit organisation established in 1993, that engages at the intersection of practice, knowledge and policy across scales and in collaboration with stakeholders from across sectors. Headquatered in Pune, WOTR has supported and carried out developmental work in over 4122 villages across 7 states of India.

WOTR assists rural communities to assess their vulnerability to climate and non-climatic risks. It organizes them in a socially and gender inclusive manner to help themselves out of poverty by regenerating their ecosystems in a holistic and integrated manner, conserving and optimising resource use, especially water and undertaking climate smart sustainable livelihoods.

WOTR has set up the WOTR Centre for Resilience Studies (W-CReS) through which it undertakes applied research and closely engages with institutions and governance actors so that insights and good practices derived from ground experience contribute to shaping enabling policies and effective programs. With a view to upscaling succesful interventions, WOTR develops pedagogies for implementation and organizes a variety of knowledge sharing and capacity building events for stakeholders across the civil society, developmental and governance spaces, from India and other countries.

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