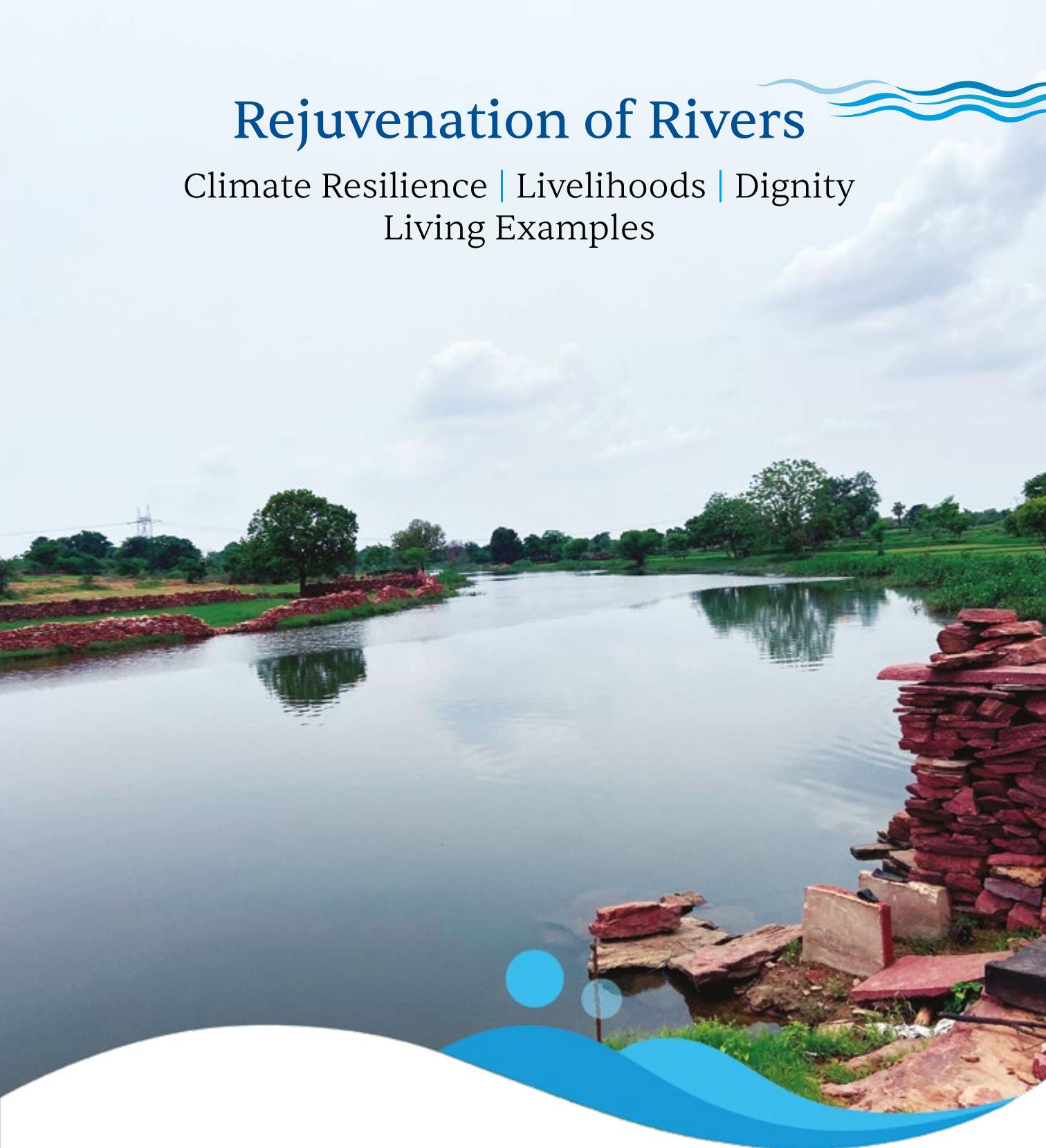


Rejuvenation of Rivers

Climate Resilience | Livelihoods | Dignity
Living Examples



Dr. Rajendra Singh and Dr. Indira Khurana





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Nurturing a fragile ecosystem



Dedicated to:

Rural communities who despite having lowest carbon footprint,
show us the path of climate change adaptation and resilience



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Foreword

It gives me immense pleasure to bring you this publication - *Rejuvenation of Rivers: Climate Resilience | Livelihoods | Dignity: Living Examples*.

Forty years ago, I gave up my government job to pursue more meaningful opportunities and landed in Gopalpura village, one of the hundreds of water-scarce villages in Rajasthan. Night blindness was prevalent due to malnutrition as agriculture was near impossible and food was hard to come by. In desperation, youth had left to eke out a living, leaving behind the older generation.

I went around treating these elder villagers for night-blindness. An old villager whom I treated berated me. He said that if I genuinely wanted to make a difference, I must address the root cause – lack of water.

I asked if he could help me learn since I knew nothing about the issue. He agreed to help me. Steeped in indigenous wisdom on harvesting rain and replenishing water resources, he shared his mantra – capture the raindrop and gently direct it into the ground. He guided me on where and which structures to build. Slowly the work gained momentum. As the wells started to fill, the youth returned to restart agriculture. As water conservation work expanded, the forests grew, and rivers began to flow, leading to prosperity and a life of dignity.

Since then hundreds of villages have conserved water, and over time the monsoon has regularised. While there are instances of inadequate monsoon, there is no urgency or panic, as water is still available – in the ground reserves and the flowing rivers. This is an example of resilience, which took 35 years to mature.

We have welcomed thousands of visitors who wanted to understand this living story. Climate scientists and villagers have sat together to analyse why the monsoon cycle changed to a more regular pattern. You can read the explanation in the Preface by Indira.

These results encouraged us to work for reviving the Sherni river in Rajasthan and Agrani river, which flows through Maharashtra and Karnataka. The landscape, the terrain, and the socio-economic structures are challenging. However, the flow in both rivers now, and other outcomes gives us confidence and conviction that this model can be successful anywhere.

Climate change is a global problem for which the solutions lie in local action. Inspired by the visit to these villages by Ashok Khurana, Ramesh Sharma, Indira Khurana, and me, this book covers our recent experiences with the Sherni and Agrani rivers. I hope you will find the living examples mentioned in this publication worthy of replication for climate resilience. I look forward to your insights.

Dr Rajendra Singh

Chairperson, Tarun Bharat Sangh

Magsaysay and Stockholm water awardee



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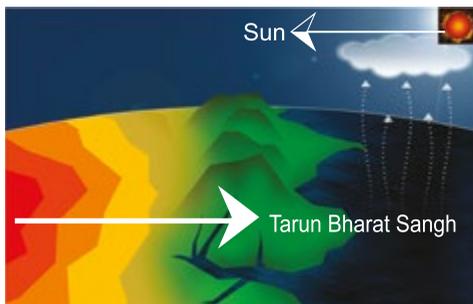
Preface

Some of the work of Tarun Bharat Sangh (TBS) is more than 40 years old. The transformation that this decentralised community-centred water conservation work brought about has thus stood the test of time. This work led to an increase in water availability, perennial flow in rivers, increase in forest cover and improved agricultural and animal husbandry activities. It has demonstrated the importance of ecosystem rejuvenation, for groundwater recharge and maintaining river flows in key.

Over time this work helped bring a shift in climate and safeguarding against climate shocks. To understand how this was made possible, discussions were held between climate scientists and local communities. The model that emerged showed the potential of this work for improving livelihoods and regeneration of natural resources in the short term, but in the long term, it also demonstrated climate mitigation, adaptation and resilience.

The model

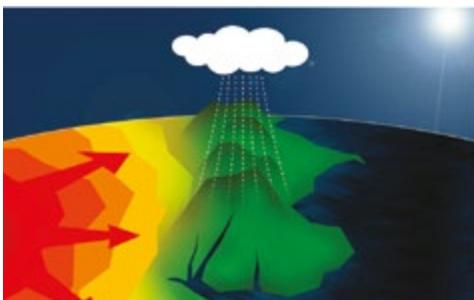
For purposes of explanation, consider the work area of TBS as the deep red area, and the situation before the water conservation work began. This model was put together by Ing. Michal Kravčik, of People and Water NGO.



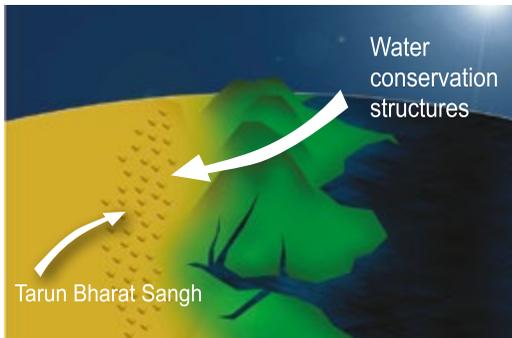
Because of the heat of the sun, saline ocean waters evaporate and form clouds. These clouds are desalinated.



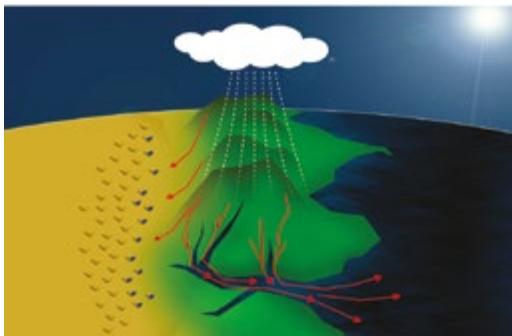
These clouds carrying moisture droplets move towards land.



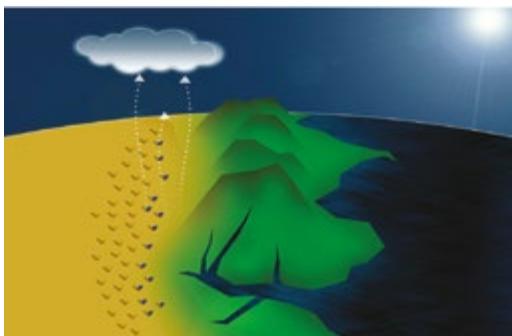
When these ocean clouds meet micro-clouds formed due to trans evaporation from forests/greenery, they condense and there is rain. In areas further inland, where there is no water and no greenery due to lack of forests/deforestation/agriculture, there is no trans evaporation. Because of this, temperatures rise, the land heats up and more areas become parched.



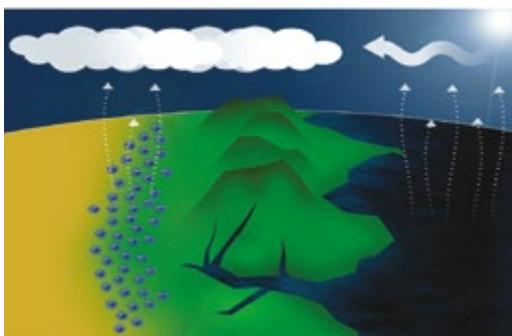
Under these circumstances, TBS began its work by constructing water conservation structures in a contiguous manner at the foothills of the Aravalli mountains. But there was still no moisture.



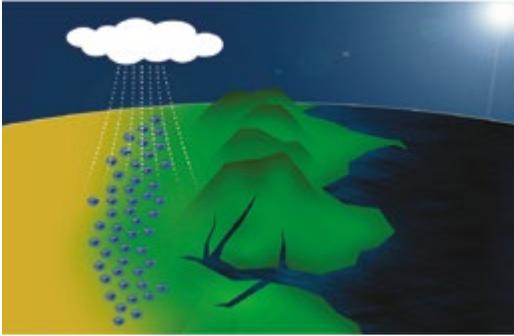
The rain runoff needed to be captured in some of these structures. So, some of the rain that fell on the hill slopes was diverted to these structures, which then began to have water.



As water gradually became available, greenery expanded. Trans evaporation took place. Some agricultural activities began, adding to greenery and trans evaporation. Micro- clouds began to form.



As more water was conserved, youth returned, agricultural activities picked up, greenery spread, trans evaporation increased attracting rain-bearing clouds from the ocean.



Gradually the rainfall became regular as greenery led to increasing micro cloud formation. Rivers began to flow and over time turned perennial. The water resources so created provided cushioning and resilience against climate shocks. This cycle continued.



As more and more cloud formation took place, all of the sun's rays could no longer beat down upon the land, and this resulted in a decrease in temperature.

The timeline for this entire process took around 35 years in the case of TBS. This living and proven model drives the work for river rejuvenation in Rajasthan and Maharashtra which began between 10-15 years ago. Global and local problems need local decentralised solutions. We invite you all to study this work so that it can spread.

Indira Khurana

Chair, Indian Himalayan River Basins Council

Vice Chair, Tarun Bharat Sangh



Indira Khurana



Chapter 1

Water: Actualising hope

As long as there is hope, solutions are possible. Willingness to act realises that hope.

Even when there is hunger in the belly and parched throats; when fields lie fallow, and livestock are dehydrated; when people, bereft of choice, snap the umbilical cord with their lands and seek survival elsewhere, there is still hope. When people helplessly take to a life of crime, always under constant threat of injury, even death, police action and jail, options appear limited, and the future bleak and hopeless, there is still hope.

Where 'happiness index, peace, safety and security and independence' and a 'life with dignity' appears a futile dream, there is hope. That hope lies in water, becoming water secure. With water, slowly, the tables turn, life takes a turn for the better, and happiness returns, as does dignity.

Where there is water, there is optimism, renewed energy, and a desire to work hard. Wells have water, borewells are recharged, and you the flow of rivers can be heard. Agriculture production jumps up, and livestock becomes more productive. There is food on the table. Biodiversity resurfaces, money flows in, and generosity flows out as water is shared across villages. Forests come alive, buzzing with life forms and animals wallow in waterbodies as is their wont. There is happiness, peace, and security.

How: By slowing the flow of rainwater and enabling the flow of rivers:

Water conservation structures slow the flow of the rain, capturing the raindrops and nudging them to recharge the groundwater. Slowly, this captured water restores the lost connection between ground and surface water. With the strengthened connection, stretches of rivers come alive. Slowly, the entire river is awakened and flows freely, sometimes even perennially.

Forests regenerate due to rainfall and in turn attract clouds and encourage rain, slowing their flow and reducing soil erosion and consequent siltation of riverbeds. We notice a perceptible difference in heat intensity – it is more regulated, perhaps, even reduced. Life regenerates and finds new meaning. **That water is climate and climate is water, is comprehended. The capacity to adapt to climate shocks increases and the communities become resilient.**

We live in a world which is increasingly grappling with disaster, aggression, conflict, and insecurity. The impacts of climate change have intensified globally. The time is ripe to appreciate how water brings peace, security, dignity, and equality. Community-based, decentralised and ecoregion water conservation holds the key to climate adaptation is now observed in more than 40 years of ground experience and more recent water conservation

As long as there is hope,
solutions are possible.
Willingness to act
realises that hope



Water can heal a climate change-affected planet. Solutions to global challenges lie in local solutions

works in different parts of India by Tarun Bharat Sangh (TBS).

There is but one world, and there is one water. Water can indeed heal our climate change and conflict-ridden planet. If arms used for theft can be exchanged with ploughs, this transformation can happen anywhere. The work of TBS in Karauli, Dholpur, and Kota districts of Rajasthan and in Sangli district of Maharashtra are living examples of how it is possible to reach out to the most marginalised. If change is possible here, it is possible everywhere. Just give water a chance.



Tarun Bharat Sangh

Community participation in water conservation leads to...



Indira Khurana

... Recharged aquifers, and ...



... Flow in rivers and revived ecosystems



The bald landscape before work on Sherni began (above) and changed landscape after water conservation efforts (below)





Chapter 2

Sherni river rejuvenation: Creating ripples

The absence of water and presence of hunger limits livelihood choices. Water availability opens up a basket of opportunities to assuage hunger

Ongoing efforts for rejuvenation of the Sherni is translating into rejuvenation of life, livelihoods and dignity in villages of Dholpur, Karauli and Kota districts of Rajasthan.

The Sherni river is part of a Himalayan River Basin. The river is 70 km long and flows through 108 villages. It is a tributary of the Chambal which in turn is a tributary of the Yamuna river that originates near Yamunotri in the Himalaya.

The rocky terrain of villages in the Aravalli hills region is beautiful, though terrain is tough. Communities in several villages face extreme marginalization by society and coupled with a lack of water, legitimate livelihood opportunities are hard to come by. Meeting basic needs of family and putting food on the table is a daily challenge and cause of stress. The absence of choice has often led to despair, desperation, migration as labour, family fragmentation, and resorting to illegal occupations, even dacoity for survival. Conflicts are abound and communities are restless. In such a scenario survival is a struggle.

And yet. Change is possible. Through love and respect: Love for nature and respect for communities, and then nurturing of both. Through understanding the terrain – the endless recharge possibilities that the fractured rocks offer – and then healing the environment through appropriate water conservation structures and involving the people and their contribution. Lastly, through maintaining transparency.



Consistent conversation with villagers builds trust and hope, spurring contribution and action

Water conservation structures on the Sherni river and streams that flow into the river are contributing to its flow.

Here TBS is working in the gram panchayats of Dhaund and Golari Mathara in Sarmathura block of Dholpur district which shares large portions of its boundary with the Chambal region, known for its ravines. There is a severe



Village Maharajpura proved to be a catalyst of change for other vilages as water conservation efforts spread

water crisis here and people have sometimes resorted to crime to survive and support their families. This is a life fraught with danger.

TBS is working in the region for the past 20 years. This work is visible in the forested Aravalli and the greenery around the water conservation structures and agriculture fields. Below are examples of some of TBS’s recent work.

Maharajpura village: The frontrunner and catalyst

This village with 100 households inspired several other villages. Recalls Ranveer of the TBS team working here, “In 1990s, all water sources in the village had dried up: The villagers had sucked out water from all 28 dugwells. Then the villagers began to dig borewells and soon the village had 70 borewells. These borewells had good water at depths ranging from 70-200 feet. Unfortunately, the villagers continuously sucked out water from the womb of the earth, and as a result, by 2005, all the borewells were dry.”

Not surprisingly, the villagers faced an unprecedented water crisis. Agriculture dwindled and milk yields were low. This crisis continued for ten long years and had implications. The villagers would migrate with their livestock and work as labour in the mines. This led to silicosis disease amongst them (See Box: Silicosis) and meagre earnings were spent in treating the disease. Children suffered from lack of education, becoming engaged in livestock rearing and mining by the time they were 8-10 years old. Only rainfed agriculture of mostly *bajra* (pearl millet) and *til* (sesame) was possible. Threat of livestock theft was constant. People in power would would bully the villagers and demand contributions. Life was hard.

With survival at stake and hungry bellies, developing self-reliance and improving quality of life was a mirage.

Silicosis

Silicosis is an occupational hazard, caused by inhaling silica dust. Silica is naturally found in certain types of stone, rock and clay. Working with these materials leads to inhalation. Silicosis is common amongst mine workers.

Silica dust particles become trapped in the lung tissue, causing inflammation and scarring. This scarring affects oxygen uptake by the lungs, thus reducing their performance and capacity. It is permanent and progressive disorder, debilitating, even fatal. Medical costs are high.

Several mine workers die due to silicosis, mostly before they reach the age of 40, leaving behind a mountain of debt and a bereaved family.



Tarun Bharat Sangh

Silicosis leads to mounting health costs and shorter life spans

With agriculture now possible, villagers no longer needed to work in mines. No longer exposed to mine dust, their health improved

Bringing in change

In 2012-13, TBS initiated another round of discussions with the villagers and construction of water conservation began with community contribution. Each family first contributed Rs 2,500, so community contribution amounted to Rs 250,000. With TBS contributing two-thirds (Rs 500,000), the total funds available amounted to Rs 750,000. And thus, was constructed the first talaab or pond: Maharajpur dhaani ka talaab.

Came the first monsoon and the *talaab* filled up with water and as a result, wells and borewells were recharged. Within one season itself, the villagers received manifold returns on their investment. Fodder was available and there was food on the table.

Application of physics at its best

One very interesting practice is that farmers connected their adjacent fields with the *talaab* through flexible pipes, and using siphon action draw water for agriculture. There is no use of power and thus a saving in energy. A perfect example of contributing to climate change mitigation by reducing energy footprint.

With this *talaab*, some 200 hectares of land is now under cultivation, and productivity has increased by 40-60 percent.

Ripple effect

Over the years, the groundwater level has increased in Maharajpura and surrounding villages as well. The wells and borewells continue to hold water, fodder is available, forests have water. The recharged groundwater has contributed to flow of Sherni river and its rejuvenation. Looking at this surrounding villages have also made *talaabs*, *pokhars* and anicuts. The *taalab* in Koripura is a result of this Maharajpura talaab as are water conservation works in villages Mardei, Sharakpura, Bhud Kheda and Braitai amongst others.

Whatever water conservation works have been done in the Sherni river basin



Sometimes, all it takes is success in one village for others to follow suit. Good work spreads



(including its contributing streams) are inspired by the Maharajpura dhani ka talaab. This *talaab* is the catalyst, guiding light and beacon of hope in villages in the Sherni River basin.

Naharpura village: Recharging agriculture

This village was without water and barren. Wells were dry. The people were involved in mining or theft, often resulting in skirmishes with the administration. The other livelihood persuite was rearing of stolen buffaloes.

TBS worked towards making the village water sufficient, thus leading to food and livelihood security and improvement in quality of life. TBS began by holding discussions in the village, urging the people to give up their illegal activities and 'pick up the plough' for agriculture.

With the support of TBS, a bandh or bund was constructed in the village. In the first monsoon itself after the bandh was constructed, a marked difference in water availability was observed. Wells became charged and field are alive again, humming with agricultural activity.

The water conservation work facilitated by TBS led to a spurt in agricultural and animal husbandry activities



Indira Khurana

As water becomes available, a smile of hope in Naharpura

Water brings people from different walks of life and different geographies come together

Personal account: Presence of water or providence?

- Indira Khurana

As we visit the bandh in July 2022, we are standing on the land where the structure was created. This is personal land. We spot a small hut and the men folk emerge and walk quickly towards us, inviting us to have tea and some respite from the blistering heat.

Says Khurwa, on whose land the bandh has been made, "We stayed away from our fields and are homes are elsewhere. Our land was not worth watching over since we were not growing crops. How could we in absence of water? When we saw that water is now available, we quickly worked on our fields to make these cultivable. We built a temporary hut so that we can watch over our fields. I have other barren lands also which I will now work on to make them conducive for sowing. The water available here is used by our livestock and the livestock of nearby villages." Jokingly he adds, "If it was not for water, I would not be here, and neither would you. Its water that has brought us together and I thank TBS and water for that."

Says his son Lokendra, "With this bandh will come stability, prosperity and peace of mind." The women of the house emphatically nod their head in agreement. Insisting, they also felicitate us, and thank us for the visit. We respectfully acknowledge their hospitality and blessings as we reluctantly leave."



Indira Khurana



Indira Khurana

Water conservation brings together people who would have otherwise never met



The earth responds to water. As greenery spreads and crops sway in fields, generosity spreads

Koripura village: With water, comes generosity, peace and security

There are 100-125 households in this village. At the source of the Sherni river, Kanjira ka talaab is the first *talaab* built here, which played a vital role in rejuvenation of the river. The villagers invested one third of the funds required. The remaining two-thirds was supported by TBS.

The village is a striking example that outlines how water scarcity translates into poverty, helplessness and desperation. The water crisis was serious and worrisome. Even drinking water was hard to come by. In summer, during wedding season, water tankers were called from the adjacent Boodh Kheda village. Livestock was in bad shape, unhealthy looking and milk production was sub-optimal, at a daily average of 3-4 litres.

The people depended on rainfed agriculture alone. Groundwater was not available, as the people had exploited all the groundwater. They had no option but to migrate as hard labour. Some 80 per cent were engaged in illegal mining activities to survive and put to food on the table for their families. Some would take their livestock and migrate for 6-8 months where fodder and water was available and then return during the monsoon.

Education was near nil. In any case transport services for ferrying the children to nearby schools was not available. Small children would get involved in mining with their father and livestock rearing. Life span of the men was in mid-40s. Whatever they earned went into healthcare and treatment of silicosis.

The *talaab* soon brought tangible fruit. As water became available, the transformation was visible. Greenery spurted. Recharged wells and borewells had water. Drinking water was available for humans, livestock, and wildlife. Buffaloes now had adequate waterbodies available to wallow. Fodder was available. Food was now easily available and on the table. The people who would migrate with their livestock now had green fodder available within the village itself. Milk production spurted from 3-4 litres to 10-12 litres per day: A 2.5 - 3.0 times increase.



Indira Khurana

Ripples created by water harvesting in Koripura reached outwards and led to prosperity, generosity and happiness



From helplessness to helping others

There are many facets of the transformation.

-This work has helped in providing water to Sherni river.

- The villagers who were first dependent on others have now become capable of giving labour to others.

On an average the increase in annual income is between Rs 300,000-400,000, since agriculture has picked up. Villagers now get labour from outside for harvesting with the increase in yields. During harvesting season which lasts for around 20 days, there is a daily 400-500 labour requirement at daily wage rate of Rs 350 labour. In this way, between Rs 1.5-2.0 million wages were given to labour that came from other villages.

-Energised villagers are now preparing their fields for agriculture. To set the boundaries of their fields, they are engaging labour from other villages at a rate of Rs 3-4 per foot of boundary wall.

-The village is now water sufficient. In November 2021, in the lean season, they released water from the *talaab*, to provide water to villages downstream.

As incomes rise, agriculture picks up. Suddenly former labourers transform into farmers who employ labour. The unemployed are able to offer employment



"I don't feel the need or desire to leave my village now. I am at peace:" B. Singh

Recalls Bhairon Singh from the village who played an active role in the entire process, "Off and on efforts were there but nothing provided for long term solutions. Some 15 years back an organisation invested some Rs 1.5 million, but the water situation remained unchanged. When TBS came here in 2018, we were reluctant, but the team was unfazed and even relentless in pursuing discussions. We slowly developed faith, and then optimism, and finally cooperated. The moment the bandh was created within one year itself, our efforts started flowing in with sufficient levels of water."

From then on, there has been no looking back. "We now are taking two crops. Getting wheat yields between 60-70 quintals from my fields is possible now. I have just sold 70 quintals of wheat. I don't even need to go searching for



Water conservation creates ripples that benefit nature and society rejuvenation. Groundwater banks provide much needed security against weather shocks

buyers. I get a call, and the wheat is picked up from my village itself. Now we have adequate food for our family and livestock. We have more land which we will prepare for cultivation, now that we have water,” says Bhairon.

Naresh from the same village appreciates the transparency and the efforts of the villagers and TBS. “We have maintained all financial records. The villagers contributed around Rs 850,000, and Rs 1.8 million was put in by TBS, so we had a budget of Rs 2.7 million for the *talaab*. All records of expenditure are carefully and transparently maintained.”

Bhairon also shared how the annual operation and maintenance is managed by the villagers themselves. “Annually we spend between Rs 80,000-100,000 to repair the bund. Given the economic and other benefits this work has given us, the villagers willingly contribute for maintenance,” he informs.

Ripple effect

This *talaab* has resulted in much prosperity for 25 downstream villages, which now have water also. The biggest concern of green fodder and water for livestock has been addressed. Agricultural activities have picked up in these villages also.

The biodiversity of the forests has returned, and so with water, the gene pool has increased. Informs Naresh, “The forests have – khair, bargali, dho, dhok trees. Dhok is the best (See Box - Dhok: The Aravalli wonder tree) . This tree gets green with one shower and is very useful for livestock. Wildlife water needs are met. Animals here include wild pig, leopard, fox, *siyar*, and hyena. All are able to quench their thirst.

If the villagers downstream are short of water, we open the gate. Because of horizontal fractures, 4-5 villages upstream have also increased water availability.”



Ashok Khurana

As water becomes available for livestock, their productivity increases

A talaab that allows for storage of three-foot height provides water security for one year in the event of drought

With water becoming available, mining activities have stopped. Though there is a ban on mining since 1999, in absence of other earning opportunities, mining continued in an illegal manner.

“We are in total *anand* (contentment) in our village now. I no longer feel like venturing out,” says a peaceful and content Bhairon Singh. “We have all the *panch tatvas* or five elements needed for life here. Why would I venture outside?”

Clearly the happiness levels have increased dramatically.

A bandh that allows for storage of three-foot height provides resilience for one year in absence of water. It brings food and money, spreads cheer, generosity, revives the ecosystem and protects against monsoon shocks. Most of all, it offers dignity, peace and security.

Dhok: The Aravalli wonder tree

Also known as purple heart tree, *dhok* (*Anogeissus pendula*) is the wonder tree of Aravalli. This is perhaps the best tree for the ecology: It survives harsh conditions. The uniqueness is that it can grow on a rocky surface, with little soil and water. The roots have the ability to bind well with the mountainous slope of the Aravalli, without the need to go in deep, so the roots are more horizontal, spreading on all sides, than vertical. It usually grows in clusters. The tree can be used to regenerate degraded land.

The leaves of the *dhok* change colour during winter, almost turning crimson. In summer it reduces transpiration after the leaves dry up and fall on the ground. The shedding of the leaves helps it survive dry summers. It looks like the tree is dead, but one shower and the tree turns green and provides shade and coolness.

Being nutritious, the dry leaves are also eaten by livestock, their ‘crunchy’ food, joke locals. When villagers buy fodder and cereals for their buffaloes, they look for *dhok* leaves. Being a hardwood tree, it is useful for making handles of agricultural implements.

In *ayurveda* the tree is used for treatment of dysentery and as an anti-oxidant.



Indira Khurana



Indira Khurana

The dhok is a wonder tree of the Aravalli



Water conservation structures were designed to capture the rain for groundwater recharge. This contributed to the flow of the Sherni river

Bhood Kheda village: Calculating Return on Investment is tough

The 60 families here live in typical 'Chambal area' topography: Sandy hillocks and ravines that have given the village its name. TBS began its meetings with the villagers in 2016, when only one well had water, in spite of their being 14 hand pumps, 17 wells and 27 borewells. In June that year, women were queueing up for drawing water. They would carry pots of water on their head to quench the thirst of their livestock. The lines were obviously long. They would also go to the forest to get wood and fodder. The drudgery was endless. They would buy flour from the market since they were unable to produce their own food. Children would migrate to Mumbai, Bengaluru and other cities in search of work. Water was scarce and so poverty prevailed.

Benefits often are beyond simple math

Recalls Ranveer of TBS, "Our discussions in the village led to trust and confidence building. They were ready to contribute towards construction of the talaab, and each family initially contributed Rs 5,000 and hence the village contribution stood at Rs 300,000. TBS committed to contribute two-third share, the funds available stood at Rs 900,000. With these funds, when work began, realization dawned that more funds would be needed for the talaab. The villagers again dipped into their savings and contributed Rs 5,000 per family again. Still the funds were not enough and third time round the villagers contributed Rs 2,000. In this way the people contribution amounted Rs 840,000. Double the amount was paid by TBS. Total expenditure stood at around Rs 2.6 million. When the *talaab* was made, and when the rains came, the bore wells on which the community had previously invested, began to have water and so the benefits of this investment also started to bear fruit. All the wells recharged, and the water was used for irrigation. Just with the first rains, the agriculture yield was worth Rs 10 million. Even mathematically, the returns were well worth the investment.

Beyond numbers

This *talaab* brought contentment and security in the village. There is a visible change in the village. Benefits began to spiral outwards in different directions:

- This talaab played a role in rejuvenating Sherni river and the forests.
- With this talaab the youth have started staying back and working on their fields.
- The migration and search for water and fodder for livestock has eased.
- Tree plantation – especially fruit trees got a boost: The villagers are now planting fruit trees such as jackfruit, *jamun* (Indian gooseberry), lemon, guava in their backyards.
- The umbilical cord between villagers and their lands has strengthened.



Now that water is available, the villagers have started working in their fields, sowing their lands and also turning uncultivable lands to productive fields.

- Women now have easy access to water to meet domestic needs.

Environment of peace and security

There is now an atmosphere of peace and calm in the village. Earlier there was always a threat of police action because of the illegal activities. The men would come home for an hour or so, have food and disappear back to the forests. Sometimes when they would be caught for their actions, they would face sentences in jail ranging from months to years. Then the second round of illegal activities would be launched since money would be required for hiring a lawyer. This had led to a never-ending cycle and entanglement in the web of crime, emerging from which appeared difficult, even when the desire was there. Water offered an alternate life trajectory.

With water comes peace, security and happiness. This makes a life worth living



Indira Khurana

As agriculture becomes possible, the villagers return to watch over their fields



Other examples

Several water conservation structures have been made in Narapura and Mathara villages. The Taliya ka taal for instance serves three villages. It provides for drinking water and water for livestock. Because of the recharge, groundwater levels are rising, forests rejuvenating and the stream that contributes to Parvati river, the Bawani, will also revive.



Ponds such as this added to the flow of the Sherni – and of life

Wells and borewells have water. Agriculture is blossoming and livestock is thriving. There are visible differences in the physical appearance of cattle: Their bodies and skin appear healthier. They have ample waterbodies to wallow in during the peak summer. Livestock from adjacent villages also quench their thirst in these waterbodies.

Responding to a question in a discussion held in Mathara village, the villagers are quick to reel out the benefits that have accrued. 'We have long back recovered the contribution that we made for construction of the talaabs. We contributed one-third and TBS two-third. We were very skeptical in the beginning, since we had lost all hope and previous efforts by the government and other civil society organisations had yielded nothing, only pain,' they inform.

The youth is now engaged in productive activity of food production. More importantly, there is peace and a sense of tranquility: The ever present threats because of criminal activity has disappeared. For the villagers now, its onwards and forwards.

Mohanpura village, Kota district

There are 55 families of the Rabari community living in this village. This is an extremely marginalized community, engaged in livestock rearing, mostly camels, with limited land under rainfed agriculture. Wheat is cultivated by a mere three families. The villagers inform that earlier when water was

Working with marginalised societies in difficult geographies is time consuming. When the first monsoon showers fill up the structures and water overflows from spillways, the joy is boundless

It is possible to find low-cost, long-term solutions for water starved villages by involving the people. Their knowledge of local terrain and rainfall helps design of suitable water conservation structures

available there were some 5,000 camels reared in the village which have now dwindled to 1,500. These camels are usually taken to the forest where they find food and water. Villagers themselves have hardly any water to drink. The borewells have poor yields: When they pump this water out the yield they are able to get varies between 150-300 litres. Then they have to turn off the motor and wait a while before turning it on again. The entire village is engaged in milk business.

This *talaab* was in broken condition and repaired in three months by TBS at a cost of Rs 2.12 million. The water holding capacity of this structure is considerable. With the first rains in 2022, the *talaab* filled up and water flowed from the spillway.



Indira Khurana



Tarun Bharat Sangh

In July 2022, this water conservation structure in Mohanpura was full (left above). It was time to celebrate (top right) as the water spilled over and flowed through the natural stream (bottom)



Indira Khurana



Impressions along a flowing Sherni river

Below are the impressions captured after visiting villages in Dholpur, Karauli and Kota districts in July 2022.

Ashok Khurana, Director General (Retd), Central Public Works Department, Government of India

“Revived flow of Sherni, a river in a rocky area, is indeed a big achievement. It tells us that:

It is possible to find low cost, long-term solutions for water-starved villages by involving local communities. Local communities have knowledge of local terrain, sub-terrain and rain pattern. With this knowledge they use their indigenous wisdom, and with local materials create water conservation structures such as small bunds with weir/overflow. This has provided space to store rainwater that flows from the catchment, leading to groundwater recharge. In this way, additional groundwater recharge systems are created, leading to flow of groundwater to the river in lean season and to rejuvenation. This in turn has led to revival of agriculture and animal husbandry, increased tree cover, revived forests replete with plant biodiversity and wildlife, resulting in economic growth, reverse migration, employment opportunities to ‘outsiders,’ or villagers from surrounding villages. This work has also supported livelihood of marginalised nomadic villagers.

The geology of the region comprises of sedimentary rocks with horizontal fractures. Water conservation structures made here by the villagers, took this into account. As a result, in Koripura village for example, with a joint

As long as we take care of water, we can be saved from climate change effects. Waterbodies and flowing rivers provide cushioning against climate shocks



Indira Khurana

Flow in the Sherni shows the power of local knowledge, coupled with the use of local materials and people’s participation

Water supports all forms of life. In the Sherni river basin, it has given birth to a new and rejuvenated village community

expenditure of Rs 2.7 million, and combined effort, there is now water for the villagers, their agriculture, their livestock, the forests, and wild animals. There is prosperity all round. This water is available for not only them, but also for 24 villages downstream and five villages upstream as well. It shows that because of the horizontal fractures, the underground water has spread in all four directions. This is indigenous knowledge.

There is now prosperity in all directions. Forest department is digging pits for plantation in forest areas. This also shows how the investment made by one village has resulted in prosperity all round. Improved the environment all-round. The village which has spent the money has no regrets whatsoever since this prosperity in their surroundings is experienced by them. They feel good that they are now living in a prosperous and nature replete area.

This work shows that so long as we take care of water, we will survive and can be saved from the climate change effects. These waterbodies and flowing river not only provide water: These created cushions serve to absorb intense rain spells, thus saving the people from the negative impacts of climate change.

We can observe that micro efforts of creating contiguous water conservation structures in and around each village, parched open lands and forests lands in a lead to macro-level change in a large area, which will help in climate change adaptation and resilience. Small water conservation structures thus serve a dual purpose: Socio-economic growth and climate adaptation. This community-driven noble work needs to spread for climate resilience.”

Ramesh Sharma, former head of Gandhi Peace Foundation

“We saw hope and optimism in the eyes of the villagers here. But while recalling their past, we saw sadness also. When they recall their helpless days when there was no water, when they would migrate in search of labour, travel long distances with their livestock in search of green pastures and water for the animals, and work as labour in the debilitating mines. They recall



Indira Khurana

Water sets in motion life and life forms. It brings hope of a life of happiness



The flowing Sherni (tigress) river has made us all tigers and tigresses and reinforced our commitment to rejuvenate other rivers in India and the world

how their scant earnings would soon run out.

With the work on water conservation, the villages say that *anand aa gaya* (we are now content). Water is a life supporter. When water is available, thirst is quenched for all life forms, the earth, wells, springs, streams and rivers. Water gives a boost to biodiversity. In other words, the thirst of earth is quenched. All forms of life rejuvenate, and life thrives.”

Just as we respect and take care of our elders, children, family members, relatives and others, in the same manner we should respect springs, streams, rivers, ponds, talaabs, johads and other water bodies. When we do this, there is prosperity and happiness all around. When we went to a village where the water conservation work had just started, the physical appearance of buffaloes – their skin, their bone structure – all indicated poor health and water scarcity. When we went to a village where the work was a few years old, we could see a marked difference in their physical appearance. The skin appeared healthy and their bone structure strong. Their skin was glistening, as if the buffalo was saying that she now had sufficient access to water. It therefore was no surprise that the milk production increased between 2.5 – 3 times.

This change that we see gives birth to a new, vibrant and rejuvenated community. Where there is water, begins a story of life and living.”

Rajendra Singh, at a rejuvenated Sherni river

“Our ancient texts, mention that we need to capture the raindrops, and get them into the ‘womb’ of mother earth, or groundwater recharge. A person who does this finds special mention in the Rig Veda. The same Rig Veda also mentions that the flowing river must not stop: A river must be allowed to flow. When humanity stops the flow of the river, not only does the river dies, and along with it dies culture, and the community.

In the past 40 plus years, TBS has only captured the drops of rain that fall from clouds and used it for groundwater recharge. We never even attempted to halt the flow of rivers, in fact our work has contributes to the flow of rivers, due to which they have started flowing again and even become perennial. This work shows climate resilience.

Monsoon have been highly deficient in Bhagani river basin, and surface water levels are low. Yet people are able to cultivate, livestock have water as do wild animals. One good monsoon and are structures will all fill up. The villagers are prepared to capture every drop as they have always been doing for so many years now.

In the Sherni river basin, as on July 9 2022, some 150 different water conservation structures – talaabs, johads, taals, bandhs right from the source to the confluence and on different streams that feed into the Sherni across 70 villages have been made. The rains have still not arrived, here, and yet, because of previous water conservation work and last year’s monsoon, there is flow in the river.



Today, on July 09, 2022, I am standing on the banks of the river and the river is flowing. This flow is not only on the surface, it is also in the eyes, heart of the people, within the earth and this is what gives us peace. While travelling to villages here, in their own words I heard their increasing peace and sense of security. This is what we call the index of happiness. In this area the villagers say, “Look now, water has come. What more can we ask for? The rest will come Now we are happy.” These words give me energy, happiness and motivation to continue work other rivers such as Tevra, Parvati, and other rivers so that they also flow, and with them flows a stress-free life and happiness. This increases my happiness index. This Sherni (tigress) river is our river and it is its flow that makes tigers and tigresses of all of us, and we are able to continue with full vigour our efforts to make our country water secure and climate resilient.”



The flowing Sherni makes us even more determined to rejuvenate rivers across the country. Nothing appears impossible

Sangli River Tale

*Can a river be a happy one
If she never dries up?*

*Can a river be a happy one
If its dry bed never hear
the sigh of a thirsty cow,
the silent prayer of the blessed grain
whose time is to sprout out
whose time is to sprout out...*

*May there be a happy river
When the fish and the birds
Are no more around,
When the nests are eggless
When the cradle beneath is voiceless
When the ocean is waiting for my sand
When the ocean is faithfully waiting for my salt...?
And salt is not coming.*

*Can a river be a happy one
If she never dries up?*

*Once upon in time
I use to be a happy river
With no drought in my memory
With no moon consoling me
Until the one cursed grain of greed sprouted out
Until the one cursed grain of greed rose and
Sucked my all groundwater out
Until the one grain of greed
Took away my salty tears and
Took away my happy days*

*Other rivers in Sangli valleys
Sung their happy songs
Along with their birds and fish
Along with their brides and grooms
With no moon consoling them
For me the monsoon rain was the
Only consolation remained
For me the monsoon rain was
Only grain of hope that remained*

*Can a river be a happy one
If she never dries up?*

*I heard these words in the morning
When high was sorrow
When hope was low
I heard this voice offering
His hand, his heart and his mind
To make my groundwater high again
To make my rocky bed wet again
To make nests full of eggs again
To make cradle cradling again
To make my life back again.*

*I have joined rest of Sangli rivers again
We are singing the same old songs together again
And while singing I wonder does anyone know
My happiness while washing feet of the
People who once joined hands, hearts and minds
To make me happy again.
Can a river be a happy one, If she never dries up?*

Muhamed Cengic
Vasant Vihar, July 14, 2022



Muhamed Cengic

Chapter 3

Agrani river rejuvenation: Towards climate adaptation

Support is always available for those who pick up the mantle of rejuvenating rivers

The Agrani river rejuvenation work was initiated by the Jal Biradari (Maharashtra) team mentored by Dr Rajendra Singh and led by Narendra Chugh, as a program of Tarun Bharat Sangh (TBS). The work began in 2013 to link the hearts, minds and hands of people with the revival and rejuvenation of the river and the river basin. Jal Biradari is a network of water community that work collectively as volunteers inspired by, and under the mentorship of Dr Rajendra Singh.

The Agrani river is a 105 km long river flowing through the states of Maharashtra (60 km) and Karnataka (45 km). In Maharashtra the river flows through 5 blocks and 107 villages of Sangli district. The area of the Agrani river basin is 1,388 sq km. The origin of the river is in Maharashtra and the confluence with the Krishna is in Karnataka. The river originates at a height of 2,900 feet in Ainwadi village.



Google map



Agrani river team

Google map showing the Agrani (left) and its origin at Ainwadi

Genesis

Discussions around rejuvenation of the Agrani river basin began in Jan 2013. During informal discussions after a public meeting addressed by Dr Rajendra Singh in Pune, a group of Jal Biradari from Sangli and Pune informed about the dried Agrani river and asked him to help revive the river. Dr Rajendra Singh assured support, provided they took up the mantle to work on the rejuvenation along with communities and exploring decentralised community-based and ecological water conservation methods. The Pune and Sangli group picked up the challenge and requested for support from the TBS team, experienced in water conservation and revival efforts.

Times were tough in the Agrani river basin. The climate of this region is suitable for grape cultivation, most of which is exported, but water was a



limiting factor. Those who could afford, would get water through tankers for their grape vineyards. Some others migrated and turned up as goldsmiths, sitting outside the shops of jewelers, melting gold and undertaking minor repair of jewelry.

Getting going

The clock began to tick that January. The best beginning of river rejuvenation is to understand and walk with her, talking to communities that reside along the riverbank, and that is what the group did.

River walks reveal facets and aid solutions

In Feb 2013, the Jal Biradari team along with the villagers of Balavadi and downstream villages of Agrani river had their first meeting in the dry riverbed. Passersby were curious as they saw a group of people squatting in the dried river discussing and trying to understand the river, and soon joined by them.

East Sangli lies in the rain shadow region and gets showers of the returning monsoon, around August-September. The group was puzzled, "People in the upstream portion of the river would say that it rained heavily at night, but come morning, the landscape hardly bore any evidence of the rains. Meanwhile bridges downstream would be flooded. They then decided to walk upstream towards the source of the river. They were accompanied by Gopal Singh from TBS, a soft-spoken villager steeped in knowledge of river flow, and soil, biodiversity and village ecosystems.

A river is best understood by walking along her, listening to her, and talking to people along the way



Agrani river team



Agrani river team

The first meeting on Agrani dried river bed (left) and a visit to a water conservation structure by district administration (right)

The river walk, especially up to the origin of the river was an eye opener. The Agrani originates at Ainwadi village which is 885 m (metres) above mean sea level. Within the first 20 km itself, there is a drop of 180 m.

"We walked along the upper 25 km stretch, up to the village Karanje where the river crosses the road through huge pipes. The entire water in the upper catchment area used to rush down and reach Karanje, flooding the village road. There was no proper bridge and this road would be submerged. We would get reports from downstream that roads are flooded. When we saw the slope within the first 20 km, we realized why there was no water in the

Discussions pave the way for collaboration and cooperation as misconceptions are cleared. Rivers flow

upper reaches and flooding at mid-level. There was a need to slow and arrest the flow of water in the upper reaches to recharge groundwater and reduce flooding in the lower reaches,” explains Narendra. Solving these two issues at the same time would help in climate resilience.

This river walk laid the foundation of the work that began near Balavadi village, where a *bandhara* or cement check dam was constructed. The site of the check dam was carefully chosen: It was at the confluence of two streams that flowed into the Agrani. Thus began the work for reviving not only the river, but the entire river basin.



Agrani river team

In July 2022, the music of a flowing river could be heard from afar

Changing mindsets

The next step was to hold discussions with the irrigation department and explain the need for construction of check dams in this upper stretch. The officials responded by saying that all the storage structures required to serve this catchment area was completed. However, the team explained that the large reservoir Siddhewadi Talaav was 25 km downstream at Savlaj. Groundwater overextraction upstream had led to drying of this river in 1980s-1990s. There was no way that this impounded water would recharge groundwater upstream. The team reasoned, “You have been supplying water to upstream villagers through tankers through the drought season. This is proof that there is a need to replenish the dried-up groundwater resources in the upper reaches of the river.”

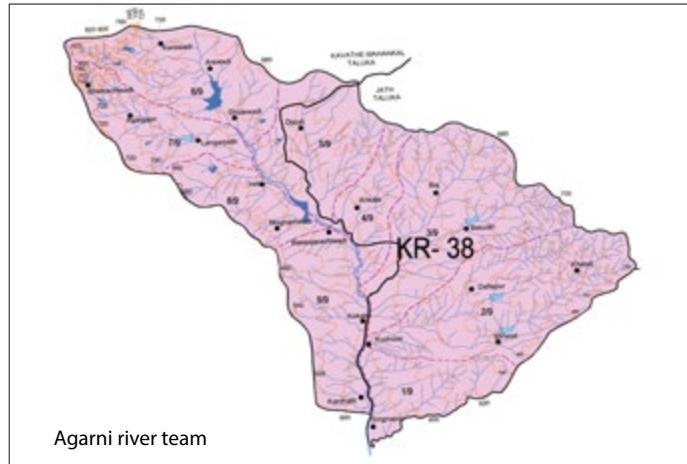
This discussion paved the way of cooperation and collaboration for river rejuvenation efforts.

Discussions were held in villages through which the river flowed. While the villagers knew about the importance of the river, there was a perception that this concern was largely limited to the village boundaries. A decision was taken to supplement the knowledge of waterbodies and the Agrani with maps



Revival of rivers need a systematic approach that includes rejuvenation of streams that feed into them

to show how this river was shared with others. This would also help shift the mindset from rights over the river to responsibilities and duties towards the river. For this, formation of Agrani Karya dals (Agrani service volunteer groups) in every village began. Many villagers were aware about the revival of rivers in Alwar district, Rajasthan and glimmers of hope were visible in their eyes.



Map showing the confluence of the Agrani and the Mahakali

Systematic approach

The approach included several steps as given below.

- 1. Preparation of detailed multilayered digital map of the Agrani river basin:* These maps depicted watersheds and micro watersheds, first to fourth order streams feeding the river, waterbodies, existing water conservation structures using Topo sheets and various GPS based IT-enabled systems; and geological rock formation and their percolation and recharge potential, land use and current cropping pattern and spatial and temporal rainfall data.
- 2. Widening work of Agrani river and streams feeding the river:* Due to deforestation and cutting of trees on the ridge of the river basin soil erosion had resulted in silting of streams and the river. Moreover, as the river and the streams dried up rampant encroachment was resorted to by the farmers on the banks of river. Efforts to raise sensitivity of the importance to remove encroachment were made and slowly removal began.
- 3. Construction of small cement check dams in series on the upper stretches of the river and its streams originating on the ridge and joining the river:* The river originates at an altitude of 885 metres above sea level and has a drop of some 180 m in a stretch of 20 km. Due to this steep slope, there was rapid rainwater runoff in the top stretch of 20 km, and the villagers were high and left dry. To counter this situation 47 small check dams were constructed in series on the river as well and large streams and tributaries feeding the river. As a result of this, 35 million cubic metre water storage capacity was created.



Indira Khurana

Widening and deepening of streams that feed into the Agrani

River banks need to be protected against siltation and erosion

4. *Stone pitching, plantation of bamboos and grass:* Stone pitching helped in avoiding erosion of the riverbanks, also supported by bamboo and grass plantation to hold the soil together.

5. *Rejuvenation and development of wastelands:* The fertile soil recovered during widening and deepening of streams and river was transported and spread over barren wastelands there by making 2,000 hectares of land fertile and fit for cultivation. Ironically, the owners of these lands were working as labour in the fields of others since their own fields were '*banjar*' or unfit for cultivation. These very farmers have now begun cultivating on their own fields.



Indira Khurana

Still waters run deep and offer recharge possibilities



The idea of making the Agrani river basin a kesar mango production zone arose from the need to provide secured and additional income

6. *Repair and maintenance of waterbodies:* Existing and dilapidated percolation and storage tanks, human-made lakes and other water conservation structures which were dry were identified, desilted, repaired and restored. This resulted in an augmentation of water storage: An additional 30 million cubic metres of water storage capacity.

7. *Forest lands treatment:* Continuous Contour Trenching (CCT), Deep Continuous Contour Trenching (Deep CCT), were dug on more than 500 hectares, and construction of small pond structures as watering holes, afforestation work, terracing work in the hills and ridges of Agrani river was implemented by the local communities in close co-operation and the forest department.



Distribution of kesar mango saplings

8. *Making Agrani river basin a Kesar (variety of mango) mango production zone for additional or survival income:* The Agrani river basin lies in the rain shadow region and is drought-prone. But soil and climatic conditions are suitable and conducive for the growth of Kesar mangoes. To augment the income of farmers 70,000 kesar mango saplings of a target of 500,000 saplings have been distributed. This massive kesar mango plantation drive spread over 107 villages will boost production – and farmer income – and make this region a kesar mango production zone. With each mature tree giving fruit worth between 3,000-5,000, this will boost income by between Rs 1.5 - 2.5 billion, all as additional income. In case water scarcity prevailed due to poor monsoon, these mangoes would provide survival income.

“In the initial years, while working on main drainage, there was always a lurking fear about scanty rain and whether the structures would hold up. That’s when the idea of kesar mango plantation came, to augment the earning by 25,000-30,000 per year for each family,” reveals Narendra.

9. *Recharge of openwells and borewells through rainwater harvesting:* This effort by the villagers will help revive their assets and bring in additional groundwater reserves.

Local low-cost solutions for local environments

Work on revival of the Agrani river proved yet again the importance of basing water conservation work on local conditions of terrain and geology.

Balavadi village: Frontrunner in rejuvenation efforts

This was the first village where work began. It was not easy. Previous experiences had proved that when 'outsiders' visited the village, promises were made but rarely kept. People promised and disappeared but the water scarcity continued. Nothing changed.

This time round, when Rajendra Singh and the Agrani team met the villagers, something changed. People began to believe yet they held back. Work could not begin without their consent and support. As the *status quo* continued, three villagers – Popat Gaikwad, Parshuram Gaikwad and Vilas Gaikwad came forward and contributed Rs 25,000 each. That they took a loan from a money lender for this was subsequently revealed. This gave other villagers the confidence to contribute. And the contributions slowly came in.

The first check dam was built in this village. The site where this water conservation structure should be constructed was suggested by Gopal Singh of TBS. The design of the check dam, the materials required and the cost estimates was compiled by Vilas Chauthai, Executive Engineer (Retd), Irrigation Department. This process instilled confidence amongst the villagers.

Now that there is adequate water in the village, grapes and some cash crops such as tomato are being cultivated. This village is now tanker-free. In absence of adequate income, Popat worked as a jeweler artisan in cities, sitting outside jeweler shops, melting gold or undertaking small repair. He is now back in the village where he belongs and living a peaceful life with dignity. Tanaji Patil from the village exports all his grape produce and even has a cold storage facility.

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Community contribution sometimes takes time. Previous bitter experiences stand in the way of trust



Indira Khurana



Indira Khurana

Seeing is believing: Before (left) and after (right) pictures of the dried river at Sultangade



Savlaj village

Savlaj is 30 km away from the origin of the Agrani, with a population of 10,000. As the river flows down it gets wider. Because of the steep slope in the river it keeps getting wider, Savlaj being in the plains, most of the sand got deposited here: The layer of sand in 25-30 feet deep. Villagers wanted to impound the water through small structures as was done for Balavadi, but a check dam here would be costly. They evolved the idea of *bhumigat bandhara* (underground soil filled check dam), removed 30 feet deep layer of sand and in the trench thus created, placed a plastic sheet, filled up the trench with clayey soil, covered it and compacted it by using a road roller. This proved to be a good barrier to stop the sub-flow, and consequently add to groundwater recharge and river revival.

Four streams, Jeet Odha, Mali Nagar Odha, Sakharpan Odha, Adhira Odha that fed into the Agrani were silted here and encroached upon. Widening and deepening work of these streams was done with Jal Biradari providing the machinery and diesel contribution by the people.

Underground check dams prove to be a good solution to lower costs and at the same time, take advantage of sand's water holding capacity



Agrani river team

Widening and cleaning of streams lead to Agrani river flow

Lonarwadi village

This is the last village through which the river flows before entering Karnataka. The width of the river here is around 100 m and it was not possible to construct a check dam here. The depth of the sand was around 15 feet with a capacity to hold 40 per cent of water, which meant that there was tremendous capacity to hold water. Not to be deterred, a *bhumigat bandhara* was constructed here, by excavating the sand and making an underground checkdam made of 20 cm-thick concrete wall. Interestingly, one bank of the river is in Maharashtra and the other in Karnataka.

After hearing about how villagers in Savlaj had constructed a *bhumigat bandhara*, the villagers thought that the same could be done here. They

Site selection for water conservation structures should be based on an understanding of the terrain. This maximises benefits at lower costs

excavated the sand to a depth of 10 feet and constructed a 20 cm wide RCC wall. This enabled the slowing down of subsurface groundwater and recharge. Even though water was not visible as surface flow, the wells were recharged. So saline was the water here that the villagers along the riverbank depended on tanker supply for drinking water. This situation has now changed.

Karanje village



Agrani river team

Underground check dams make the invisible visible through the recharge offered

In Karanje village, the work was initiated by the leader of the Karanje Shetkari Kaamgaar Paksh Party, a party, formed in the pre-independence era. At their village, there was a deep layer of sand in the river: they approached the government and negotiated the construction of a check dam here. Because of sandy soil, and the need for resting the foundation on rocky strata, the costs would be high. With the river being wide here, they suggested an appropriate site where the width was minimum and took on the responsibility of monitoring construction. This way they could bring about a reduction in cost by 33 per cent.



Agrani river team

In Karanje village, suitable site selection reduced costs significantly



Dongarsoni village

This village lies in hilly area and middle part of the river basin. Of the 9,000 ha of forest land in the river basin, 900 ha are in this village itself. For strengthening the origin and the middle part of the river continuous contour trenches (CCTs) were made and afforestation measures carried out. The government is convinced that afforestation is necessary, without which water to the river cannot be assured.



Agrani river team

CCTs on the hilly slopes of Dongarsoni capture rainwater

As news about successful water conservation spread, the demand for scaling up this work from villages grew

Good work and good news spreads

When people see for themselves the results of the honest intentions and good work, confidence in themselves and in others builds up, and action follows. They overcome previous disappointing experiences where their hopes were dashed.

Benapur village

While the Jal Biradari team was returning from a function of dedication of the check dam to the Balavadi villagers, they were stopped on their return journey by an old man, Maloji Shinde a wrestler in his prime. During interaction, he confessed that initially he, like many others, was skeptical that any good would come out of the work done in Belavadi. The skepticism was not without reason. The villagers had burnt their fingers earlier by trusting others who promised water. Suspicion of vested interested was thus high.

But then he saw the transformation: The handholding that continued during the construction, the rigour that went into construction and the transparency around finances, the filling up of water in the check dam and, finally, the dedication of the asset to the villagers. He wanted the same for his village. "When I saw the water I decided that our village must make efforts for water conservation. I am calling a meeting of the villagers tomorrow and I will put forth the proposal for the construction of two check dams – one at entry and one at exit of village," he said.

Jal Biradari provided vital technical support – identification of site, drawings and details.



Goodwill generated between the administration and Jal Biradari helped the completion of a stalled water project

Supporting the powerless

Over the years as the work on Agrani River rejuvenation continued, the engagement with the administration and different departments continued. This led to the creation of goodwill, confidence and positive action from all sides.

Jirgyal village

In 2004-04, construction of a medium irrigation soil dam project had begun in this village. Work came to a halt after almost 80 per cent of the work was completed. As the result the village remained waterless.

In 2016, this was brought to the notice of the Jal Biradari team by a newly elected young sarpanch, who shared the details, including why it was stopped: Compensation was awaited for 100 plus families. In absence of water, many migrated. Over time, the file lay buried.

The Jal Biradari team held discussions with the villagers and took up the case with the then Collector of Sangli District, who immediately swung into action. The file started moving, a meeting with the villagers was called and compensation at current rates was assured. The list of persons awaiting compensation was provided to the administration. Within six months compensation was given and revival of project work began. The project got completed in eight months and is now providing irrigation to at least 5,000 ha of agriculture land. This matter was thus amicably resolved and water assured.

Recreating Mahakali's magic

The Mahakali river is a tributary of the Agrani, and joins the Agrani in Nagnur village, nearly 22 km from its origin. The Mahakali is wider than the Agrani.

So far, 10 check dams have been constructed for the revival of the Mahakali:



Agrani river team

A flowing Mahakali adds to the flow of the Agrani



Water used as a tool of social control leads to inequality. The series of check dams on the Mahakali resulted in abundant water availability for water-starved villages

Five check dams on the main Mahakali river and five on a tributary of Mahakali. The largest check dams in the district have been made here with community participation and the Jal Biradari team without any financial assistance from government.

These check dams have transformed the river. Even though this river was wide, the people never saw flowing river, except only during monsoon, and that too for a month or so, but never from one bank to another.

Rejuvenating the Mahakali river has led to groundwater recharge, community ownership, water responsibility, improvement in agriculture-based livelihoods and resilience against climate change challenges. It has also shifted the water inequality imbalance.

Another significant intervention has been the change in government records of the Mahakali from being documented as a *nallah* or drain (which it is not), to a river (which it is).

Setting right water inequality

Kokale village is around 8-9 km away from the origin of Mahakali.

Shares an ex-serviceman Major Patang Patil from the village, “The village was deliberately kept away from water, because near the origin of Mahakali – when the talaab overflows, the river would flow. Villagers here recall that the last time the talaab overflowed was in the late 1990s. The village Bassapachiwadi is upstream, and the people cultivate sugarcane here. For cutting the sugarcane, they depended on the cheap labour sourced from the waterless Kokale and other villages and so they ensured that water was not available downstream. Water was never discharged.”

This is water politics. All the rich had pumps installed in the *talaab* to ferry water kilometres away to their fields.

Discloses 65-year-old Arun Pawar, “I got into politics at an early age of 19. Throughout these years, I have interacted with politicians across all parties. All I got from them was assurances, and little action. Many Ministers visited



Agrani river team

Taking care of what lies beneath can create flowing surface water



our village on my request for a check dam. They would send their officials who after a cursory visit would order soil investigation and inform the politicians that the village did not meet the yardstick of check dam construction. In spite of my influence, this was the unfortunate state of affairs. These five check dams have created a revolution of sorts.”

Measuring impact

An impact assessment was conducted two years after completion of five check dams on the Mahakali river, as part of the efforts to rejuvenate the Agrani. The assessment covered seven villages in two blocks of Sangli district.

Main findings:

The impact of these check dams are multidimensional:

- Check dams have helped improve groundwater recharge up to 800 m distance at one side and 2 km range at the other side of the Mahakali.
- Farming and opportunities for dignified livelihoods have increased. So far, approximately 5,000-plus families across some 750 acres are benefitting in seven villages. This number and area will increase in the near future. The villages have become tanker free, have surplus fodder and food grain and adequate water for drinking purpose of cattle and human beings.
- This project helped to bring the community together for a common goal: Revival of the Mahakali. Villagers are conscious about judicious use of water and sustainable water management practice.
- Positive change in community perspective towards natural resources given the current climate scenario is relevant. Capacities for climate change adaptation have increased.

What has made this all possible?

According to Narendra, “Commitment of the Jal Biradari team and the villagers, the administration and business community. Confidence building measures and transparency. The villagers contributed in different ways. The mentorship of Dr Rajendra Singh and his constant availability, practical solution-oriented approach and encouragement for pushing the bar higher at every stage, continues to drive us. It gives us confidence in ourselves.”

Commitment leads to conviction and contribution

There were so many different ways in which the villagers contributed:

- | | |
|----------------------------------|----------------------------------|
| - Cash | - Labour |
| - Earth and excavation machinery | - Fuel for running the machinery |
| - Cement curing | - Monitoring of construction |

When people begin to believe, they contribute in different ways to take work forward. This is ownership and determination to work towards a common future



**Learning never ceases
when water becomes
available**

Recalling the journey: Narendra Chugh

“The work started in April 2013. While the monsoon arrives in June, being in rain shadow region, rains arrive in the Agrani river basin in August -September. Sitting in Pune, and watching the rains, we would be convinced that the rain gods would be showering their blessings in Sangli also. Almost on daily basis, we would call the villagers in Belavadi, asking them, ‘Has it rained yet? Finally, when their patience was at an end, they responded to our calls, saying, ‘Don’t call us, we will call you when it rains.’

And we waited. One early morning I got a call, and I could barely understand the words, so great was the excitement. ‘It has rained! Our check dam is full. Listen to the sound of water flowing.’ Saying this he held the phone near the water and I could hear the sweetest music in the world – that of water flowing.

As the work grew, so did I. I witnessed nature changes that this water brought. Wild animals, birds, all had water. Butterflies and bees returned. The earth sprung up with different forms of life. Greenery grew and spread. Tense expressions on faces of villagers were replaced by contentment. Helplessness gave way to opportunities. I was fortunate to be part of this journey.”

Onwards and forwards

So far, 47 structures have been completed in the Agrani river basin, of which 10 are in the Mahakali and its tributaries 17 are by people’s participation, with no funds from the government. Others were constructed by the government department, with technical input provided by the Jal Biradari team for several of these. The irrigation department has come around to appreciate the value of small structures that can impound even five feet of standing water, and that



Agrani river team

Expanding greenery as water flows in the Agrani river

Revival of river in Rajasthan had led to reverse migration. Jal Biradari's efforts in Agrani made this possible in Sangli as well

large impounding structures can be done away with. This work has built up capacities and natural assets to withstand climate change shocks.

This work has shown how it is possible for the people, civil society, government and corporate sector to come together for nourishment of nature. In 2013, the district administration appointed an Agrani River Basin Rejuvenation Officer to coordinate and bring about convergence amongst different departments like Block Tahsildars, Forest, Social Forestry, Agriculture, Horticulture, Irrigation, Minor Irrigation, Zilla Parishad, Ground Water Survey and Pollution Control Board, and other stakeholders. Meetings continue as required, an example of government, people and society coming together successfully for a common cause.

For safeguarding the Agrani river and protecting her rights while meeting the needs of society, Agrani Vishwasth Dals (Agrani trustee volunteer groups), comprising of 10 volunteers from each village are being set up in all villages. These youth groups will be from different backgrounds. An Agrani River Basin Sansad or Parliament was formed in early 2022, to bring representation of all the stakeholders (government, villagers and others) together on a single platform to discuss how this water can be judiciously used so that supplies are accessible equitably, perennial and intergenerational. Each village will be represented by one representative. The communities will then own the river and the river basin in its true sense.

The significance of Agrani river rejuvenation: Spirit of cooperation and collaboration

- Rajendra Singh

“The Agrani river regeneration work was based on the revival of five rivers of Rajasthan: Arvari, Sarsa, Ruparel, Bagani and Jahazwali. These five rivers had dried up and were dead like the Agrani. After these rivers were revived, reverse migration had taken place: The young people who had returned to their villages were able to successfully engage in agriculture.

Narendra Chugh and others from the Maharashtra Jal Biradari had heard about this local happiness that this river rejuvenation work had brought. He asked, ‘Why can’t the same kind of work be done in Maharashtra, where people are committing suicide due to lack of water? We need you here.’ I replied, ‘If you ready I will work with you all. This will not only happen by me.’ The team agreed to pick up the challenge.

I began working with the team. I sent Gopal Singh a TBS member who did the entire mapping of river and selected sites where water conservation structures could be built, after which Rajendra Madane, Sampat Pawar, Ravinder Vora, Narendra Chugh, Vinod Bodhankar and Sunil Joshi met with the villagers. Three of the villagers took a loan and committed to pay Rs 25, 000. Soon others came forward. Work began and was completed



Agrani river rejuvenation is a symbol of cooperation between the people and the government and between states

within five months. When it rained, the waterbody filled up and I went to see it.

As I was returning one old man said, 'We had little confidence that you would and could do this, but you took money from people like us and did such good work. I am ready to do two structures like this in my village. Just teach me.' I sat in his house and discussed with his son and villagers and told him and Narendra would come to meet him and begin the work. This Agrani work came into the eyes of the government and the then Chief Minister quietly came to see the work. We had a meeting with Collector and a River Nodal Officer post was sanctioned. Narendra and Dr Ravinder Vora began coordinating with the district administration and took the work forward and contributed in all ways to take this work to scale. In this way, *raaj* (government) and *samaaj* (people, civil society) began working together on this river and created several water conservation structures. Within four years the Agrani began to flow.

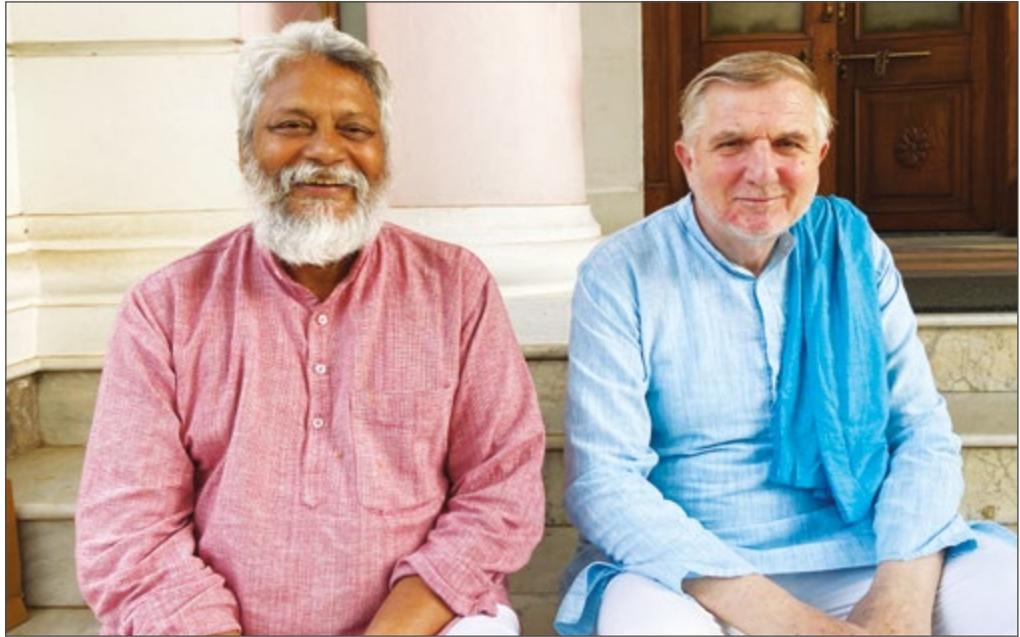
The government began to lift water from the Krishna river to fill the old water structures. The TBS team supported them by discussing how and when these bandhs should be filled. This way this river flows perennially and there is water in every inch.

The Agrani flows through the two states of Maharashtra and Karnataka. In both states the Collectors sat with the people to spread knowledge about water conservation and Agrani river rejuvenation. The people of Karnataka were shown the river work in Maharashtra and vice versa. The river now flows in both states. This way the people and governments from two states, showed how this difficult work was possible in the spirit of cooperation. That is why this is the best part.

In both states, bandh, barrages and other water conservation have been made assured but without conflict. This was possible because transparency was maintained between both states. Both were informed and shown the



The Karnataka MLA reiterating his commitment to the Agrani, July 2022



A flowing Agrani makes Rajendra Singh and H E Muhamed Cengic smile

Short term benefits of water conservation include increase in agricultural outputs and reverse migration. Long term benefits are climate resilience

work happening across state borders and that is why people in both states were happy.

That is why when Indira Khurana and the Bosnia Ambassador H.E Ambassador Muhamed Cengic visited the Agrani river, the MLA from Karnataka Shrimant Patil, and his team visited me and Narendra and thanked me. He said, 'I will fully support river rejuvenation work.' He promised again visit to Maharashtra.

This work proves when communities internalise and realise and work themselves, they reap short term and long-term benefits. The short-term benefits are increase in agricultural income, reverse migration, decline in suicide. The long-term benefits are climate change mitigation and adaptation which is good for showing the whole world.

After seeing the work on Sangli river, H.E. Muhamed Cengic said, 'This work is a matter of pride for the people of Sangli and India. There is a need for the whole world to learn from this. This community-driven decentralised water management is a great example for the world's river basins which are facing drought and flood displacement, destruction and disaster. Solutions lie in local community conservation and sustainable management.'

Kote Mahakaal block of Sangli district is a critical drought and disaster prone affected region with low rainfall. If this region can become rejuvenated and prosperous with this work, this kind of work can be done in any part of the world."





Chapter 4

Rivers for climate resilience

Rivers are key to survival and climate change mitigation and adaptation and must be allowed to flow freely and remain clean. Globally rivers are under threat. Their rejuvenation is possible even in the most extenuating of circumstances, as the living examples cited here have proven.

Respecting rivers

What really is a river?

According to noted environmentalist, Dr G D Agarwal, who sacrificed his life for the River Ganga, 'A river is self-flowing, carrying water from the snow, rain, under the ground, flowing continuously, pure and free from the origin to the confluence. From ages, freely touched by the sun, air and soil, a river is never bound, given life by nature and giving life to nature.'

A complex of small streams and rivers often combine to produce a main river, akin to the human circulatory system. If a river has to be saved, the springs, streams and rivulets that feed into it must be healthy and flourishing, since their drying will impact the overall flow

Rivers as pulsating heritage

"To put your hands in a river is to feel the chords that bind the earth."

- Barry Lopez, American author and nature writer

Rivers are much more than water.

A river, its catchment, floodplain and basin form a water course made by nature over an evolutionary time scale of millions of years. Himalayan rivers such as the Alaknanda and Bhagirathi, both tributaries of the Ganga, the Indus and the Brahmaputra are probably older than the mountains they travel through. Evidence indicates that the Himalaya rose so slowly that these older rivers could continue to flow through their original channels and rise with the mountain range.

Rivers are living ecosystems that link various elements of nature including humans. Ancient civilizations such as Mesopotamia civilization in the Tigris-Euphrates river system, Egypt civilization along the Nile and the Indus valley civilization, all grew and drew sustenance from river.

Rivers are thus melting pots of culture and spirituality. Several rivers are considered sacred and include the Ganga, Yamuna, Narmada, Cauvery and others in India, Bagmati in Nepal, the Jordan river in the Middle East, the Columbia and Missouri in the US, Whanganui in New Zealand, Indus in Tibet in Pakistan and Tibet, Klabona headwaters in Canada, Osun in Nigeria and the Urubamba in Peru.

Rivers are living ecosystems that link various life forms, people, spirituality, culture, food habits, livelihoods and way of life



River health is linked to human health. Rivers will be healthy if allowed to flow free and clean

Rivers as life support

The health of rivers is linked to human health: Without rivers, there can be no life.

Rivers support life in all forms. Rivers support biodiversity within their waters and outside of it. Rivers provide essentials of drinking water and food, and when allowed to flow unfettered and pure, enable clean water to flow into wells. Rivers help maintain a balance with groundwater aquifers, enabling water availability during water scarcity and drought. Rivers and their floodplains help soak up excessive rains, thereby reducing flooding intensity, sometimes even preventing it. This cushioning is an important role for climate change resilience. Some of the linkages with rivers include:

- a) *Human health and the health of rivers are directly connected:* If humans are to live a healthy life and a life of peace and security, then rivers need to be healthy. Up to 60 per cent of the adult human body is comprised of water: Less consumption of water (in drought like situations) affects every organ and system and also future generations. Drinking polluted water causes diseases that range from infections to organ failures and cancer. Some pollutants found in rivers are 'forever chemicals,' and have intergenerational health implications.
- b) *Importance of streams, springs and rivers that feed into larger river systems:* A river system can be compared to the human circulatory system wherein arteries veins and capillaries that extend to every part of the human provide nourishment and remove waste even from extremities. Similarly, small rivers and streams often feed into larger rivers and river systems, recharging groundwater, enabling base flows and providing water to communities along the banks and close by, the health of larger rivers is thus also heavily dependent on the health of these streams.
- c) *Livelihoods, food and nutrition security:* Rivers are a source of livelihood for farmers, livestock rearers, fisherfolk and boat communities. The food provided through rivers provide much needed food and nutrition security.
- d) *Rivers maintain balance with groundwater flows:* Rivers and other surface waterbodies and groundwater aquifers share a dynamic relationship between each other. Replete groundwater aquifers provide base flows to rivers and river flows recharge groundwater aquifers. During the monsoon, the river replenishes the aquifer. Floodplains provide space for rivers to spread their water. When this relationship is maintained, there is water security and if this relationship is disrupted, then rivers dry up and groundwater tables decline, overall impacting water availability and leading to water scarcity.
- e) *Biodiversity conservation:* A healthy river is a robust living ecosystem supporting aquatic and terrestrial biodiversity. Biodiversity is critical for ecosystem health and for the provision of food and nutrition security.



- f) *Sense of well-being*: Rivers are linked to our culture, spirituality and sense of well-being and security, providing psychological support and peace of mind, contributing to the state of living vis-à-vis mere existing.

How do rivers flow?

According to scientists, the capacity of rivers to flow freely is governed by the connectivity of pathways that enable the movement and exchange of water and of the organisms, sediments, organic matter, nutrients and energy that it conveys throughout the riverine environment. River connectivity extends in four dimensions: Longitudinally (up- and downstream in the river channel), laterally (between the main channel, the floodplain and riparian areas), vertically (between the groundwater, the river and the atmosphere) and temporally (seasonality of flows).

River connectivity is also dynamic, largely driven by the natural flow regime, enabling and regulating hydrological, geomorphic and ecological processes in river networks and providing the aquatic medium for matter and species to move along the river and into adjacent habitats. Humans have altered this natural river connectivity in multiple ways, either directly, by placing structures into the longitudinal or lateral flow paths, such as dams and levees, or indirectly, by altering the hydrological, thermal and sediment regimes of the river. The ecosystem services provided by floodplains, one of the most productive and diverse riverine ecosystems globally, are disrupted when these are disconnected from the upstream catchment or river channel, leading to disruption of natural flood storage, nutrient retention and flood-recession agriculture. Constructions on rivers have resulted in the decline of aquatic and terrestrial species and fish catch. Sediment capture by dams has disrupted the river and deltas have shrunk.

Rivers under threat

According to the first global initiative that assessed water security for people and river biodiversity, rivers of the world are threatened due to mismanagement and pollution, which endangers eight of every 10 people as well as 10,000-20,000 species. Some of the factors behind this are overextraction, encroachment, river pollution, intensive agriculture, catchment disturbance, deforestation, sand mining and dam building. Over-extraction has affected their flow and several perennial rivers have now turned seasonal. Some have even disappeared. Dams and barrages have affected the river ecology and the habitat of river species, and caused disasters and displacement. Sand mining has altered riverbeds, resulting in a river changing course, causing flood and reducing recharge. Domestic, sewer and industrial pollution have affected water quality and turned rivers to receptacles of human generated waste.

Thirty of the 47 largest river systems which together discharge half of the global runoff to the oceans are at risk. In 2019, a paper in the science journal Nature informs that only 37 percent of the planet's longest rivers remain free

Globally rivers are under threat, even when they are key for human survival



Climate change is affecting river flows because of rapid melting and shrinkage of glaciers and erratic monsoon. Yet rivers serve as cushions, absorbing climate shocks

flowing. Nearly 60,000 dams have been built worldwide, with more than 3,700 under construction or planned.

The pollution of rivers does not remain confined to the rivers themselves, and spills over into groundwater, lakes floodplains and into seas and oceans. And from there, this pollution enters the human body, causing debilitating disease and even death.

Climate change and rivers

How is climate change affecting our rivers, and through rivers, us?

1. For a start, rapid melting of glaciers will increase flow in rivers, causing floods, and as glaciers melt away, glacier fed rivers will gradually run dry. According to Navroz Dubash, in the Indian Himalaya, small glaciers of less than 1 sq km have been retreating quickly. In the Chenab basin in Himachal Pradesh, the area of small glaciers has decreased by 38 per cent between 1962-2004, while the area of large glaciers (greater than 10 sq.km) has decreased by 12 per cent in the same period.
2. As the monsoon pattern changes, increased precipitation within short intense spells will lead to floods in rivers and flooding of adjacent areas. Up to August 2021, India witnessed several extreme weather events, affecting humanity and the ecology, with widespread devastation from rural, urban and semi-urban areas, all in the time of COVID 19. As on July 2022, different parts of India witnessed devastating floods: Assam, Bihar, Uttar Pradesh, Maharashtra, Andhra Pradesh, Himachal Pradesh, and Tamil Nadu.
3. With the symbiotic relationship between groundwater and rivers disrupted in most places, rivers will turn seasonal, dry up, and lead to drought. These are no longer projections and predictions. Drought in the US has led to decline in water availability in rivers such as the Colorado. Droughts, floods extreme weather events are increasing in intensity all the way from Madagascar in Africa to Iran in Middle East, to Asia and South America's Pantanal, the world's largest tropical wetland. In the first half of 2021 itself, drought was prevalent in most continents according to an August 2021 paper published in Nature.
4. As climate-related disasters increase, so will displacement, distress and migration, with incalculable health, psychological, social and economic burdens. As water-related disasters continue to rise, cause misery, poverty and inequality, it is time to face water challenges head on by strengthening efforts on adaptation for developing resilience.

Climate change has thus resulted in an increase in number and intensity of natural disasters such as cyclones, storms, floods and droughts.

Healthy rivers offer cushioning against climate change

Rivers can significantly help in adaptation and developing resilience. Rivers and their floodplains have the potential to function as sponges for climate



Rivers will be effective climate cushions only when they are protected from overextraction, encroachment and pollution, their sources are protected and feeder rivulets rejuvenated

change, absorbing excess water and pushing it into groundwater ‘banks,’ and offering water in times of drought. When the rivers are allowed to flow uninterrupted, water is available year-round. Rivers thus offer protection against climate shock. For this, the connection and symbiotic relationship between groundwater and surface water needs to be functional: Rainwater needs to recharge groundwater and rivers need to be allowed to flow.

Climate resilience is thus strengthened through healthy ecosystems, of which rivers are key. In the words of Rajendra Singh, “We must link the hearts, minds and action of the people with rivers for a healthy ecosystem and for our own health, peace and security.”



Climate change and biodiversity loss threaten the world. Biodiversity affects climate and vice versa

Chapter 5

Biodiversity for resilience against environmental shocks

Two crises threaten our existence – climate change and accelerated biodiversity loss. Both are affected by each other, and both can help deal with each other.

While some biodiversity loss is expected, the current rate of extinction of species is up to a devastating 1,000 times this natural rate. In September 2021, the IUCN World Conservation Congress held in Marseilles, France, emphasized that humans have reached a tipping point, and the window to respond to both these crises is closing fast.

The Convention on Biological Diversity (CBD), biodiversity is ‘the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, which includes diversity within species, between species and ecosystems.’

Biodiversity and climate change relationships

The relationship between biodiversity and climate change is simple – yet complex. Biodiversity loss (deforestation for example) leads to climate change. Even small changes in temperatures (global warming) that change weather patterns affect biodiversity and ecosystems. Higher temperatures dry up soil and leaves, and lead to forest fires. The destruction of forests and other ecosystems undermines nature’s ability to regulate greenhouse gases in the atmosphere and protect against extreme weather impacts. This, in turn, accelerates climate change and increases vulnerability to it.

Robust natural ecosystems are biodiversity rich. These support life and sponge up stresses related to the environment. A more diverse ecosystem is thus naturally more resilient to climate fluctuations.

Why biodiversity is always important

Some of the reasons why biodiversity is important are given below.

- *Biodiversity enables local to global food security:* Biodiversity is critical for safeguarding global food security, underpinning healthy and nutritious diets, improving rural livelihoods, and enhancing resilience against social, economic, and environmental shock. Lesser varieties of species imply greater susceptibility to pests and disease. As the climate gets more extreme and unpredictable, it is stress tolerant diversity (for example, drought and salinity tolerant varieties) that will help in times of need. Natural diversity in animal, aquatic and plant foods are thus a kind of insurance to aid food production, specially in difficult times.



Biodiversity offers tremendous choice in food. There are some 6,000 plant species cultivated for food, and then there are the wild edible plants. Wild species are those which are not dependent on human intervention for their survival. In the year 2000, New Zealand Scientist Barbara Burlingame estimated that one billion people worldwide incorporate wild foods in their diet.

Wild edible plants have been an integral part of the diet and are included into local food culture. Communities with little access to markets, but knowledge about wild edible plants survive on these. Wild edible plants thus need to be taken care of and promoted for local self-sufficiency in food and nutrition and easy access, especially for the poor and those living in and around forests. Harvesting wild species is a well-known coping strategy for addressing food and nutrition security, especially in rural areas. These also play a role in improving tolerance and yields of



Indira Khurana

Biodiversity provides local to global food security, livelihoods, health care and ecosystem stabilisation

Nature offers choice within choices which must be savoured and saved

cultivated edible species. Unfortunately, some 24 per cent of wild food species are decreasing in abundance while the status of 66 per cent is simply unknown. In India, wild edible plants have been an integral part of the diet and are included into local food culture. As biodiversity is lost, with it the traditional knowledge around its sustainable use and, where it could be found, its food and nutrition value is also lost.

- **Health benefits:** Biodiversity helps in healthcare through boosting immunity and treatment of illnesses and disease. When habitats are lost, sources of traditional remedies are lost as are potential allopathic drugs. To add insult to injury, habitat destruction also leads to new zoonotic diseases: COVID 19 is one such disease caused by a virus that has jumped from animals to humans. Around 75 per cent of new infectious diseases are due to zoonotic viruses, which cross over to humans when their natural habitat is lost. With the climate heating up,

Biodiversity needs to be celebrated and conserved in gene banks and on site with people's participation

as species migrate to cooler climes, diseases migrate too. With the food chain getting disrupted due to species decline and extinction, microbes survive by adapting to other hosts. In the process new diseases can emerge in these new hosts, including humans with potential to take on pandemic proportions.

- *Biodiversity offers livelihood and shelter:* For sections of society, especially those living close to forests and with nature, their shelter are made and livelihoods earned from this diversity. For example, thatched roofs, walls, floors and other shelter requirements are met through the use of biodiversity. Forest produce and forest-based products offer opportunities for livelihood.
- *Biodiversity offers stability of natural ecosystems:* Robust natural ecosystems support life and act as cushions for absorbing stresses related to the environment, and thus, more diverse systems are also more resilient to climate fluctuations.

Biodiversity contributes to both the health and wealth of nature which underpins human survival, and yet the political seriousness to address this crisis is missing. In 2011, the UN declared the beginning of the Decade of Biodiversity, a ten-year effort to combat loss of biological wealth. In 2020, not one of the twenty targets were achieved globally.



A diverse healthy forest attracts rain and protects river sources

Biodiversity must be celebrated for the colour, taste, smell, culture and tradition, protection and security that it offers. We need to realise the role biodiversity plays in our lives, in mitigating and adaptation to climate change, in developing resilience. Biodiversity conservation is possibly by storage in gene banks and in situ with people's participation and sustainable use.



Indira Khurana



Chapter 6

Water for climate resilience

The world today faces unprecedented challenges due to climate change, leading to global insecurity. Caused partly by nature destruction, climate change is now also affecting natural resources, resulting in deepening of poverty, hunger, and inequality; emergence of new diseases; displacement; and climate refugees seeking asylum.

It was hoped that the COVID-19 pandemic would bring about a paradigm shift in working towards a common future, but this has not happened. Temperatures are breaking once in 100, even 500-year records. Forest fires are raging, tropical storms are increasing in intensity and frequency, ocean waters are warming, sea levels are rising, glaciers are melting, water resources are drying, cloud bursts are increasing, cities are drowning, and crops are wilting. Flash droughts are increasing and, coasts eroding. Biodiversity is vanishing, and ecosystems are threatened. The threat of new pandemics looms large.

The planet needs healing. While climate change is global, solutions need to be local. The living examples from Rajasthan and Maharashtra demonstrate how this is possible.

Rays of hope

Two main streams of thought and action can provide solutions: Taking cue from the local ecology, and working towards water security. Climate resilience will depend on how we respect and act on both.

The experiences of Tarun Bharat Sangh, some of which are more than four decades old, form the basis of the above premise. This experience proved to us how decentralized, community-driven water conservation leads to climate change adaptation and resilience. This work has led to nature regeneration through groundwater recharge, river rejuvenation, increase in forests and biodiversity, livelihood security, socioeconomic change, increase in rainfall, and a reduction in temperatures.

It is with this experience that work began in new areas in Rajasthan and Maharashtra. Using indigenous knowledge and community-centred water conservation methods, and with an understanding of the local ecology and geology it has been possible to increase groundwater resources and revive rivers in districts of Rajasthan and drought-prone Sangli district of Maharashtra. The example of Sherni river shows us that this is possible even in rocky areas hilly areas, by involvement and participation of marginalised communities, some of whom were engaged in a life of crime for survival. If community-centred, decentralised water conservation is possible under such circumstances, it is possible anywhere. The example of Agrani river demonstrates how it is possible to work towards revival of a transboundary river (shared between states of Maharashtra and Karnataka) in the spirit of cooperation and learning.

Climate change can lead to global insecurity



Water is key for climate resilience. Healthy rivers cushion against extreme weather events

Both the examples show the ripple effects of water conservation. Capturing the rain for groundwater recharge led to augmentation of groundwater resources and rejuvenation of rivers. It led to revival of forests and land, boost in agricultural income, animal husbandry, fisheries, increase in biodiversity, and decline in distress migration.

The lessons learnt which can be used for framing policy and influencing action include the following:

1. Clouds store sufficient water

Monsoons fail when clouds sail away. Water conservation results in an increase in greenery. As agriculture increases and forests regenerate, evapo-transpiration increases, and the environmental processes thus put in place attract these clouds and rain falls on parched lands. Forests attract the rain.

2. Rivers provide cushioning effect against climate change

Healthy and flowing rivers are critical for climate resilience. Rivers cushion against extreme weather events. Rivers can be brought back from their ill-health by focusing on the various streams that contribute to its flow. For rivers to be healthy, these small streams and rivulets must be rejuvenated. The land of a river and its flood plains must be protected. The rivers need to be protected against encroachment and overextraction. The rainfall needs to be harvested for groundwater recharge. Healthy river flows contribute to groundwater recharge and the reverse is also true. The symbiotic relationship between groundwater and surface water must be maintained for climate cushioning.



Indira Khurana

Life flows with a flowing Sherni river

Capturing the raindrop for groundwater recharge and letting rivers flow together develop a system that regenerates life in the short term and resilience in the long term

3. *Interventions must centre on the local ecology*

Suitability of the location of the structure depends on an understanding of the local ecology, topography, geology, and rainfall pattern. India's ancient water conservation wisdom is based on this knowledge. Local water security leads to immediate boost in income and revival of nature, and thus begins the nature regeneration process.

4. *Recognise the power of small interventions for water conservation*

Small/ micro water conservation structures are powerful. They lead to immediate benefits in surrounding areas and if constructed over a large area, lead to macro nature rejuvenation and livelihood benefits, without displacement or destruction. Over time, with judicious use of water these structures contribute to river flows and to cushioning against extreme weather events.

5. *Water conservation leads to healthy and biodiverse forests which in turn regulate the water cycle*

Forests attract rain and regulate temperatures. Forests slow runoff and protect against soil erosion. Forests help recharge groundwater. A healthy ecosystem that is rich in biodiversity offers protection against climate change shocks.

When groundwater aquifers are filled, and streams flow, soil is hydrated and the earth springs up different plants and trees. The biodiversity increases, birds and animals visit to quench their thirst. Wildlife gets a big boost, there is an increase in species and populations. With water being available at different points in the forest, as against fixed watering holes,



Ankit Khurana

With water, crops swaying in the breeze become a reality



poaching declines as poachers can no longer identify where the animal will go to quench thirst.

6. *Water availability needs to turn into water security*

As water becomes available, prioritising its use becomes important. For this agro-climatically suitable cropping patterns need to be adopted and efforts should be made to minimise water use. This is critical for climate adaptation and resilience.

7. *Waterbodies provide boost for fisheries*

Surface waterbodies created make fisheries possible. This increases the economic benefits. The money generated is additional common financial



Water conservation leads to water availability for wildlife, who thrive. Poaching declines

resource pool that can be used for maintenance of the water conservation structures. Aquatic biodiversity gets a boost and avian species, including migratory birds, can quench their thirst.

8. *Involve the people*

The asset created must be with people's involvement. This results in ownership and care of the assets so created. Communities contribute cash, kind, and labour for creation of the structure and with the benefits accrued, can manage the maintenance by themselves. A handover of the assets to communities helps build responsibility.

Water generates life, livelihoods, and dignity. Water conservation and healthy rivers cushion against climate change. Water enables peace and happiness. The key to climate resilience is water.



About the Book

Climate change is a global problem, but the path for adaptation and building resilience depends on local action. For this the key element is water.

Most disasters ascribed to climate change are water related. Rejuvenating our water systems will define how well we mitigate these disasters and develop resilience. We must slow the flow of rain and direct it into aquifers and allow rivers to flow, freely, cleanly. Achieve this and life forms will thrive as nature heals. Migration reverses, erstwhile labourers now offer employment, and happiness levels shoots up.

There is honest livelihood, food on the table, dignity.

The forty-year experience of Tarun Bharat Sangh (TBS) has demonstrated how rivers can be revived and over time, the efforts result in climate resilience. The book covers living examples from these efforts which show that turnaround is possible, even in the most difficult of circumstances. The lessons learnt provide pointers for policy and action.

This kind of work needs to spread. The reader is invited to experience this work firsthand.