

Zindapur Piped Water Supply System

District Gaya, Bihar



A mini piped water supply system in Zindapur, a dalit village in the Gaya district of Bihar, has provided a ray

of hope by embracing an approach that gives control of the water systems to the communities. Set amidst paddy fields, the village lies about 22kms from Gaya in the district's Rauna gram panchayat in Belaganj block. It is home to Paswans (12 households), and Majhis (musahars; 45 households), both scheduled castes. The musahars or traditional rat catchers are a socially marginalised community placed at the bottom rung of the region's hierarchical caste system.

Owning small patches of land¹, the community depends on daily wage work at brick kilns or farm lands. Until recently, the women would get paid in kind for their labour while men got cash. However, MGNREGA helped change this practice and today, women get paid in cash as well. Yet, due

to the intermittent nature of schemes like MGNREGA, the community continues to be trapped in poverty.

“A vicious circle had been set up over the years, whereby the musahars, in particular, lacked positive and supportive relationships. They were prevented from participating in the local life, which in turn led to further isolation. The processes we used during the WaterAid India (WAI) project implementation had a tremendous impact on their confidence and sense of well-being,” says Pradeep Priyadarshi from Pragati Grameen Vikas Samiti (PGVS), a Bihar-based NGO and WAI's partner in the project. PGVS's experience highlights how difficult it is for people who are marginalised and have relatively little control over their lives and the resources available to them, to get involved in community-based projects. For PGVS, this project, supported by WAI, was as much a drinking water supply project as an intervention on social inclusion.

¹ Agriculture in the area comprises of traditional kharif crops of paddy, maize while rabi crops of wheat, pulses and mustard are cultivated in localized patches where irrigation facilities are available.

THE DRINKING WATER SUPPLY SYSTEM

Until 2016, the village, home to 57 households, depended on two dug wells, a hand pump² installed by the Public Health Engineering Department (PHED) and two shallow private hand pumps that would go dry when the heat intensified in the summers³ owing to their shallow depth of about 40ft. The major water-bearing formations in the area are weathered and fractured granite and alluvium. The stage of groundwater development in the district stands at 48.4 per cent, and in Belaganj block at 68 per cent, both of which are in the safe⁴ category as per the Central Ground Water Board (CGWB) data of 2013.

The river Phalgu⁵ flows about two kilometres away from the village and the water table is reasonably good at 20 to 25ft, post monsoon. The groundwater in Zindapur is not affected by quality issues, though occurrence of fluoride in excess of the permissible limit (more than 1.5mg/l) has been reported in many areas in Belaganj, including some villages of the Rauna gram panchayat.

During the summers, the water table goes below 150ft from the ground level and discharge from the hand pumps, which are the main source of drinking water in the village, decreases to eight to ten litres per minute (lpm) and eventually dries up. "People would then depend on one of the two dug wells, which were still functional in the summers or collect drinking water from the tankers sent by the government," says Bhim

Kumar Majhi, a former operator of the mini piped water supply system.

Up until 2017, villagers had to take great pains trudging to the nearest water body to get water for their homes. Collecting drinking water from the dug well had turned into a nightmare for the women who would line up in long queues at the water point. Arguments would often break out on who would collect water first. Women and children would spend hours at the water point as a part of their daily grind. They would flock to get a few buckets of mucky water for their daily activities. Due to the extra load, the hand pump would often break down.

The two dug wells did not have enough water and people had to wait for them to be recharged in the monsoons. The wells were also unlined and therefore people were always in the danger of slipping in.

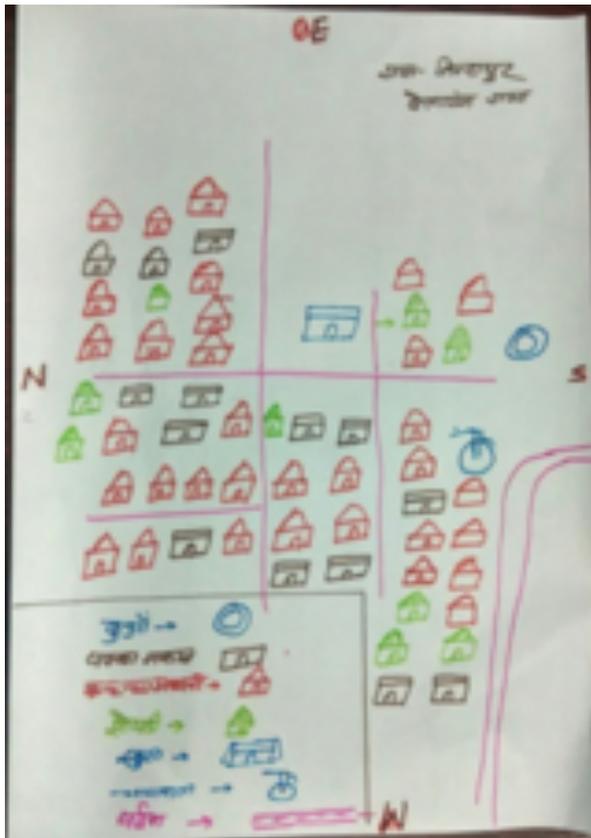
On the whole, the water supply was erratic and as a result of this persistent scarcity of potable water, there was a need for water supply augmentation. When PGVS approached the community in late 2016 with the idea of a piped water supply (PWS) scheme, the community was struggling for basics like clean water and decent toilets. It took them a while to understand the approach. "When the PGVS team initially approached the community, they struggled to change their behaviour with regard to toilet use, water handling, and other hygiene-related issues. Interactions with them revealed that the community severely lacked water and sanitation infrastructure," says

² Mark II hand pump

³ The annual average rainfall in the area is 1086mm.

⁴ <=70% is 'safe' i.e. below the threshold of concern (over exploited, critical and semi-critical)

⁵ Unlike other rivers in the district, the river Phalgu formed by the union of two large hilly streams originating in the Hazaribagh plateau –Lilajan and Mohana – flows from south to north through the area. The river brings in high floodwater during the peak rainy season, but flows as a tiny rivulet meandering through wide sandy beds otherwise.



Social map of Zindapur indicating the selected site where the community has donated land for installation of the mini piped water supply system with overhead tank. (Image: PGVS)

Pankaj Kumar, WAI. This was the first and foremost challenge which the community wanted to address.

Prior to the initiation of the project, Rapid Rural Appraisals (RRAs) were conducted with the men and women of the community in Zindapur. Discussions were carried out on issues related to the present water sources—community’s access to water and sanitation infrastructure, how they were used seasonally, use of water for drinking and domestic purposes, water scarcity, exclusion based on caste, disposal of used water, hygiene, sanitation and waste management, water quality, as well as the community’s willingness to handle a project on piped water supply, ensure operations and maintenance, and partially contribute to its capital costs.

The RRA approaches included mapping, ranking, interviewing, seasonal calendars, oral testimonies, participant observation and more. The project adopted a demand-driven approach for village selection as there were other water-scarce villages too, but the need for water was strongest felt by the community in village Zindapur.

In March 2017, the village embraced a decentralised community-managed piped water supply system that allowed them to have tap connections and enjoy water supply for two hours each, thrice a day. WAI and its partner, PGVS, supported the developmental activities as well as construction work. A strong emphasis was laid on the water and sanitation approach for strengthening of environmental catchment protection and water security. For the musahars, the intervention went beyond breaking free from the struggles of accessing potable water. It was about restoring their dignity and bringing them out of marginality, a fate that they had suffered for centuries.

Assessment of the overall water requirement of the village in various sectors, such as drinking, domestic etc., was done keeping in mind the population in 2016 as well as the design population ten years down the line, i.e. till the year 2026.

Households came together to identify the site for the mini piped water supply scheme with the help of PGVS. Local labour was involved to dig the ground and lay pipes and pumps. Very early into the project, the villagers realised the importance of maintenance. The design of the project took measures for inclusion, transparency, and accountability.

The slope of the terrain as well as the habitation spread was considered while deciding on a groundwater-based system.



The dug well was renovated and a cover was installed to prevent accidents.

The PWS provided connections to all the 57 households through 40 household⁶ connections apart from providing water to the primary school, whose hand pump had become defunct over time.

Since Zindapur is a habitation and not a revenue village, it did not have the government-mandated Village Water and Sanitation Committee (VWSC). The responsibility of providing water services therefore, rested with the community, which formed the Grameen Peyjal Swachhata Samiti (GPSS), a water beneficiary committee established at the village level and constituted primarily for this scheme. In Bihar, VWSCs have been constituted on paper, but functional committees are absent on the ground. The scheme-level committee or GPSS at Zindapur comprises eight members who manage the water supply scheme. It has a president, secretary, and treasurer. GPSS has

five women members, of whom one is the treasurer.

The users were fully involved in all the implementation activities, right from identifying the sources, deciding on the technology to be utilised, community contracting (purchase of pump etc.), implementation, as well as the operations and maintenance (O&M) aspects of the scheme. All contracting of goods, works, and services was done at the committee level itself for which adequate training was provided.

The committee also appointed an operator who manages the pump for drawing water and its subsequent distribution. The responsibility of day-to-day maintenance of the water supply system lies with them. The operator, along with some other community members, has also been trained in the O&M of the system. Training sessions were conducted by PGVS on water quality testing

⁶ Some are joint families, hence just 40 connections instead of 57. The system covered all households.



The project model was based on the community's involvement through all stages that finally resulted in community management.

and O&M which includes minor repairs, do's & don'ts, and handling of the electric motor pump etc.

The training sessions helped impart knowledge about the technical aspects of the system and the cleaning process of the tank so that the operator could effectively manage the entire system for smooth functioning of the initiative. The operator was also trained on various aspects of the water supply system and informed about the agencies to be contacted when faced with operational and functional challenges. The operator has also been designated to collect O&M charges from the users. The monthly user charge has been jointly decided by the community at INR 30 per month per household. The operator is paid INR 500 a month for his services, such as attending to minor repairs. Electricity consumed for pumping water to the overhead tank is not metered so the community does not pay towards its charges.

Water is supplied thrice a day as the operator switches on the motor between 6–9am (three hours), 1–2pm (one hour) and 5–8pm (three hours). The operator maintains a log book for water supply timings and regulates water supply based on the decisions made by the committee. The per capita availability of water is maintained at 70lpcd. The committee also keeps an eye on wastage and leakage of water and points it out to the users. At their end, the households keep an eye on the water pressure and point out any related problems to the committee and the operator.

The tank is cleaned once in four months with bleaching powder. All repair and renovation work is funded through the user charges collected from the community. The quality of groundwater is tested twice a year (pre- and post-monsoon) by the committee members, who have been trained to use the fluoride testing kit. Laboratory-based tests are also conducted with the support of WAI.

The committee has opened a joint account in a bank in the name of the president and treasurer who are joint signatories of the account. The collected water charges and the security money have been deposited in the bank. User charges for a year were collected in advance and deposited in the account. The committee maintains income and expenditure details of the water supply scheme as well as records like cash book and expenditure vouchers. It provides a receipt of water charge to the user against the payment. A check and balance is done annually through a social audit by the community to take account of the total income and expenditure by the committee.

The members have been continuing with the same roles and responsibilities since the inception of the committee in 2017. The operator changed six months back. Water User Committee (WUC) guidelines on O&M by the committee have been painted on the wall of the mini piped water supply system.

This system has been designed for a population of 458 (57 households) at the rate of 70lpcd. The daily water demand at present is 32,060 litres. The system has been designed for a period of ten years; the projected population being 573, considering the decadal growth rate of Gaya for 2001–2011 as 26 per cent.

COMMUNITY-OWNED WATER SCHEME

Village Zindapur, where once the need and subsequently the demand for safe drinking water, at household level, seemed difficult to generate, now has a functional household tap connection. The project focused on empowering the users to plan, operate, and maintain their own water supply systems; a

sharp contrast from the top-down manner of planning and delivering local schemes. The scheme cost was INR 6,31,000 and the villagers contributed about 10 per cent of the cost (INR 63,000), while WAI provided the rest. The gram panchayat donated a 20x20ft plot for construction of the system while the community contributed 12 days of labour and INR 1,000 per household as connection charge. However, both labour and connection charge were waived off for the two women-headed households.

Care was taken to plan and run the mini piped water supply system in a manner that it could meet the O&M expenditure and be financially self-sustainable. The idea is that the committee should have substantial reserve funds to deal with any exigencies as well as earn a decent amount of interest on the deposit.

The committee has been successful in this and has a decent reserve fund. It also managed to get a new transformer for the village, which reduced power cuts and thereby assured supply of drinking water. They also lobbied for and got funds to the tune of INR 50,000 from the gram panchayat funds for renovation of the primary school. The scheme made everyday life much easier for people, especially the women who earlier had to undergo hours of backbreaking labour to fetch water each day.

The WAI-PGVS project brought water to each household by putting local communities in charge of managing their own water supply scheme. However, improved water access increased wastewater generation. Subsequently, the community demanded a proper drainage system as well. The committee has been trying to leverage

Operation and Maintenance - Cost Projections

Cost recovery	Expenses (projected and actual)
Per household O&M cost @ Rs. 30/month collected from 57 HH	Annual maintenance charges comes to 0.25% of the total project cost at Rs. 6,31,000 = Rs. 1,577
Per household O&M cost per year Rs. 360	Projected salary towards operating staff @ Rs. 1,000 per month = Rs. 12,000 Actual maintenance charges of operating staff @ Rs. 500/month= Rs. 6000/year
Per month collection of O&M charge from 57 households @Rs. 30 = Rs. 1,710	Reserve fund - Projected and actual both - 5% of annual income as reserve fund Rs. 1,026
Annual income Rs. 1,710*12 = Rs. 20,520	Total costs (projected) = Rs. 14,603
	Total costs (actual) = Rs. 8,603
Total profit (projected) Rs. 20,520 - 14,603 = Rs. 5,917	
Rs. 20,520 - 8,603 = Rs. 11,917	

panchayat funds for household drainage connections as well as pavement for roads. Despite multiple attempts, their pleas have gone unheard possibly due to petty politics within the gram panchayat.

PGVS plans to pilot household-level metering in the village. The rise and fall of the groundwater table is monitored by keeping a record of the water level in a nearby dug well, but resources are not available for groundwater monitoring. The pyne system⁷ as well as a sanitary dug well which is within 100m from the borewell of the piped water system, serves as a recharge unit.

Numerous meetings and discussions were facilitated by PGVS and attended by the sarpanch, concerned authorities, and government officials before the community decided to initiate the project. The scheme faced challenges until the summers of 2019, as a handful of the community members refused to pay the monthly water charges.

This was however resolved internally in their committee meetings.

The project has shown that the poor are able and willing to pay a nominal fee for getting water. Clearly, the project promoted local leadership amongst the community members. Several women are actively involved in the working of the water supply system. "Women who would formerly not even come out of their houses, today actively participate in the committee as well as in other village meetings," says Krishna Paswan, president of the committee.

The village with no toilets till only a few years back, now boasts of 22 toilets. Now the water sources do not get contaminated during the monsoon, which has led to a reduction in the health problems of the people. The project also involves teachers to talk regularly about cleanliness and the importance of washing hands.

⁷ Ahar-pyne are traditional floodwater harvesting system indigenous to south Bihar. Under the system, water- channels called pyne divert water from rivers to a tank, locally called Ahar.



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The technology is simple and comprises an electric power pump fitted into a borewell. It has a submersible boring (80lpm discharge) to a depth of 120ft and 70ft pipe lowering, a two horse power (HP) motor and two 5,000 litre water storage tanks. Each overhead tank gets filled in about an hour and water is made available to the community members through household tap connections. Each household has two pipe connections – one in the toilet and one in the kitchen.

The scheme provides clean drinking water, is user-friendly, time-saving, has low O&M costs, and is environment friendly. The community has also tried to ensure sustainability of the source by taking up Integrated Water Resource Management (IWRM) activities from 2018, such as roof rainwater harvesting at community places and individual household-level water recharge, cleaning of the nearby

well and making it ready for rainwater harvesting. Activities like plantation, desilting of field ponds and ahar-pyne were leveraged through MGNREGA schemes.

Tubewells for irrigation purposes are not present in the village, and widespread groundwater extraction is yet to emerge as a problem here. Bihar has a Groundwater (Regulation and Control of Development and Management) Legislation since 2015 which restricts⁸ boring without permission in notified areas where there has been a rapid depletion in the groundwater table.

FAILED ATTEMPTS AT SCALING UP

The system was replicated through government funds from the Panchayati Raj Department and executed by the Department of Rural Development (DRD) in the neighbouring village of Lodhipur but

⁸ Existing borewell owners in notified areas are required to get themselves registered with the State Groundwater Authorities and for installing tubewells in notified areas, a permit would be required and penalties could also be imposed for failure to comply with the provisions of the act.



(L-R) The president with the present and the former operator of the Zindapur scheme.

became defunct in the absence of community organisation efforts. "The community refused to undertake O&M and pay for user charges to maintain the system after they were handed over the scheme," revealed Ramprakash Paswan, the secretary of the committee at Lodhipur. This top-down supply-driven approach yielded low ownership by the community, while a nominal recovery rate led to the system going defunct once the motor broke down. The small 5,000 litre tanks required the operator to pump water at least four times a day. The tardy collection of user charges made it difficult to pay the operator's salary or the electricity charges. No care was taken here by the DRD to ensure that the gram panchayat or habitation be selected only if it demonstrates willingness and commitment, through a resolution, to take up the scheme and is supported by a resolution by the gram panchayat.

Toilets constructed in the villages in this area were reported to be shallow, single pit toilets, which would get filled up in a short duration, leading to seepage of wastewater into the soil, causing further contamination of groundwater and affecting the piped water supply source in the future.

RURAL WATER SUPPLY SCENARIO IN GAYA, BIHAR

The gram panchayats are also being covered under the 'Har Ghar Nal Ka Jal' programme of Bihar, which aims to provide clean drinking water to every citizen, without any discrimination. This is a resolute endeavour to provide clean drinking water to approximately two crore households in the state with a view to end their dependence on hand pumps and other sources of drinking water.

The state has endeavoured to move towards decentralised service delivery arrangements with increased Panchayati Raj Institution (PRI) and community participation, improved financial sustainability, and enhanced accountability at all levels. Discussions with the block and gram panchayat level functionaries identified the following key issues in the Belaganj block of Gaya:

- (a) Inadequate or disrupted water supply,
- (b) Bacteriological contamination of surface and groundwater,
- (c) Presence of fluoride concentrations exceeding the permissible levels in drinking water,
- (d) Lack of adequate sanitation facilities in some pockets, and
- (e) Lack of adequate waste (solid and liquid) disposal systems.

All the ongoing schemes in Gaya are single-village piped water supply (PWS) schemes and the previous 'Chapakal Yojana' (hand pump scheme) has been discontinued.

The PWS schemes is an attempt to try a bottom-up approach of project delivery as desired in the National Rural Drinking Water Programme (NRDWP) guidelines. This entailed the establishing and strengthening of institutional structures at the block and village level so that the process of decentralisation could be achieved and community-driven approaches could be rolled out. The schemes being implemented by DRD necessitated the work to be done by VWSC, instead of a contractor-driven approach, as preferred by the PHED. The mechanical and civil wings of PHED were often approached by DRD engineers seeking technical guidance⁹. Due to the lack of proper guidance to DRD, whose technical cadre continues to be weak, there were design and execution issues in the tasks undertaken by them. The government had to roll back its former stand and curtail the role of DRD to avoid delays in project delivery as well as maintain construction quality.

⁹ Construction is being taken up by the civil wing while the mechanical wing looks after operations like getting electricity connection and operation of machines