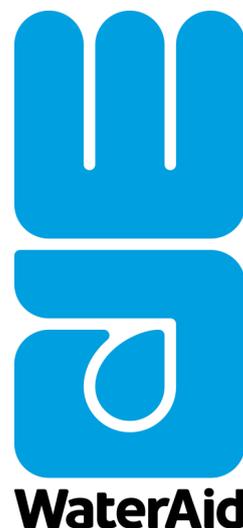




MULTI VILLAGE PIPED WATER SUPPLY SCHEME

MAKHANA,
KACHCHH, GUJARAT

September 2020



MAKHANA KACHCHH, GUJARAT

PWS: Scheme, location and water source for PWS

Gujarat Water Supply and Sanitation Board (GWSSB) was set up to regulate and control the drinking water sector in Gujarat and has executed many schemes since 1980. In the Kachchh region of the state many schemes have been developed and managed by the GWSSB and Makhana multi village piped water supply (PWS) scheme is one of those.

Makhana is a medium-sized village, situated 11 km away from Bhuj, the district headquarters of Kachchh.

Makhana pipe water supply scheme is located in Makhana village of Bhuj block. The region represents hilly and undulating terrain based on a sandstone rock formation. The scheme has been working since 1991 to supply drinking water in Makhana and the surrounding Gram Panchayats (GPs). The scheme covers 5 GPs and 10 villages. Table 1 shows a list of these villages GP-wise.

Table 1: List of beneficiary villages and demographic data (Source: Govt. of Gujarat Census Handbook 2011)

Village name	GP name	Total geographic area (in hectares)	Total population	Total HHs	HHs with tap connection
Baukho (Odhejavallo)	Baukho (Odhejavallo)	1182.54	670	106	99
Baukho (Samavallo)		1121.26	540	84	78
Tankanasar	Sumarasar (Jatvali)	1168.93	650	72	69
Pirvadi		779.06	110	23	20
Sumarasar (Jatvali)		841.71	940	195	160
Vatachhad	Kamaguna	2545.82	200	35	32
Ratiya	Ratiya	4870.59	1200	220	175
Kalyanpar		621.63	420	80	70
Makhana	Makhana	2391.73	1065	190	190
Ramvadi		Area under	150	22	22
Gross Total			5945	1027	915

There are two types of supply sources for the piped water supply (PWS) scheme - (1) deep tube wells as local sources and (2) Narmada as a distant source. Narmada pipe water has been linked with the present scheme to distribute water to targeted villages. As far as local sources are concerned, four borewells have been developed in village Makhana.

Scheme details - PWS plant, storage tank, pumping and distribution

The Makhana multi village PWS scheme is fed by four borewells equipped with submersible pumps. For distribution, two storage tanks with a capacity of 5 lakh litres each have been constructed on a nearby hill to supply water under gravity. Groundwater, as well as the water from the Narmada project, are mixed in storage tanks before distribution to improve the groundwater quality. The plant does not have a filtration unit or a treatment plant but the mixed water undergoes chlorination once a year, post monsoon. Water quality is also monitored at the plant level twice a year and samples are tested in the district lab on major chemical

and bacteriological parameters.

The tests results indicate that iron and total dissolved solids are above acceptable limits in accordance with BIS standards.

Groundwater is being lifted through submersible motors installed in all the four borewells. Electricity is supplied by the GWSSB to pump the water. Further, the distribution from the main tank to the village tank is gravity-based and carried out through a network of pipelines. Each village has its separate pipeline fitted with valves.

There are overhead storage tanks to store and distribute water to the households through the internal pipeline grid in all the villages. The internal distribution is gravity-based and does not require electricity. The capacity of the storage tank varies from village to village according to the population and the water demand. Total 30 in-village overhead tanks have been constructed in 10 villages under various government schemes, GP grants and Water and Sanitation Management Organization (WASMO) programs. Village-wise storage tank and distribution details have been presented in Table 2.

Table 2: Village wise distribution system in the four study districts

Village	No. of overhead tanks (OHT)	Capacity litre	Total HH connection	Secondary local source
Makhana	5	4 of 40000, 1 of 50000	190	---
Ramvadi	2	5000, 20000	22	Wells in farmland
Vatachhad	3	10000, 20000, 30000	32	Pond, wells in farmland
Tankanasar	3	10000, 20000, 50000	69	Pond, wells in farmland



In the four study villages, there are 5 overhead tanks (OHT) in Makhana, 2 in Ramvadi, and 3 each in Vatachhad and Tankanasar with a capacity varying from 5,000 to 50,000 litres. WASMO has constructed new overhead storage tanks each in village Tanknasar and Ramvadi in the recent past with each household being provided one connection point from the internal pipeline grid. However, there are some defunct stand posts in Tanknasar and Makhana villages. The total household connections village-wise are - 190 in Makhana, 22 in Ramvadi, 32 in Vatachhad and 69 in Tanknasar. Secondary village-level water sources in the area comprise the existing village ponds and wells/ borewells in farmlands.

Profile of the beneficiary households

The PWS scheme has benefitted 10 villages from 5 GPs. There is a total of 1,027 households in 10 villages out of which 915 have access to PWS under the scheme. However, field visit and detailed study has only been conducted in three GPs and four villages- Makhana, Ramvadi, Tankanasar and Vatachhad. As per the current status, there are a total of 190 households and 1,065 people in Makhana village; 22 households and 150 people in Ramvadi village; 35 households and 200 people in Vatachhad village; and 72 households and 650 people in Tankanasar village. The major livelihood activities which people are engaged in include farming, animal rearing, agricultural labourer and wage labour.

The caste composition of the villages can be categorised as general, scheduled caste (SC) and other backward classes. There is no tribal population in the study villages. The percentage of SC in the study

villages is - Makhana (43.81%), Ramvadi (100%), and Tanknasar (14%). The major castes in these villages are Rabari, Marwada, Bavaji in Makhana village; Vankar in Ramvadi; Muslim in Vatachhad; and Muslim and Dalit in Tankanasar village.

Makhana and Ramvadi villages have 100% coverage of household-level piped water connection. In Makhana village, 20 households that were excluded earlier have been provided connections in February 2020 through the WASMO program. In Vatachhad and Tanknasar villages, 3 houses each are not connected to the PWS since these houses were constructed after the implementation of the PWS scheme. These houses have been promised a PWS connection if an infrastructure scheme is designed in the future. Currently, they fetch water from nearby houses.

Reason for introduction of PWS

Being a dry arid region, the rainfall pattern in the area is very erratic and irregular making it a drought-prone area and having a history of both severe and mild droughts. Therefore, the government has intervened to provide them with regular and safe water through the development of a central PWS scheme based on good groundwater pockets.

Scheme cost/ capital cost and contribution from different actors

The entire piped water supply scheme has been planned, executed and managed by the Gujarat Water Supply and Sewerage Board (GWSSB). In the Kachchh region, GWSSB has planned and executed many

PWS schemes post-1980. The PWS scheme is fully funded by the GWSSB. Budgetary data for the Makhana scheme is not available with the department since it was implemented over 30 years ago, much before the 2001 Bhuj earthquake, making it a very old scheme.

Water and Sanitation Management Organization (WASMO) was established in Gujarat in 2002 with the objective of drinking water security, infrastructure development and community empowerment to manager local source/ scheme long after the scheme implementation.

In the year 2004, WASMO took over the in-village interventions which included the hardware and software activities. It developed many infrastructures in the project villages like the construction of overhead tanks, cattle trough and household tap connection. Few of the overhead tanks have been constructed from the grants received from the GP, MP-MLA local area development funds, Central Finance Commission's grant and even under the entry point activity of the watershed development program.

Stakeholders and their roles

There are various stakeholders involved in the different phases of the scheme i.e. from planning to implementation as well as operation to maintenance. The GWSSB has directly implemented the scheme through the contract method and supervised it. Each GP connected with the scheme is the overall supervisor. The involvement of implementation support agencies (ISAs) or NGOs was almost negligible. The community leaders and the GP played a limited role in planning and implementation. Individual households or communities were not involved in pre-planning and planning though they were roped in later in the operations. GWSSB, being the agency operating the source maintains the water distribution from borewells to the centralised water storage tank, and onwards to the village tanks. GPs manage further distribution from the village tank to the household level as well as the overall management and maintenance. At the beneficiary level, each household has paid the cost for the tap connection from the pipeline grid to their house. However, the capital cost has not been charged from the community.

Table 3: Recent infrastructure development works done in the four study villages under the WASMO Program

S. No.	Village	Scheme	Scheme cost	Year
1	Makhana	Household pipeline, a cattle trough	64,500	2020
2	Ramvadi	10 kl HGLR*, Household pipeline, cattle trough	3,45,880	2008-09
3	Tanknasar	50 kl HGLR, Household pipeline, a cattle trough	14,21,100	2017-18
4	Vatachhad	No recent work, last work done in the year 2003-04 for household tap connection, and storage tank		

* High Ground Level Reservoir or simply overhead tanks



Year and duration of various phases

The entire PWS scheme has been designed and planned by GWSSB during the year 1988-89. The scheme was first implemented by GWSSB during the period 1989 to 1991 and the work included the installation of borewells, pump houses, large reservoir tanks and village wise pipeline grids. The scheme at the main plant is looked after by the GWSSB and at the village level by the GP. Ramvadi village, which was relocated post-earthquake in 2004 and was connected with PWS in the same year. Catholic Relief Services (CRS), an NGO provided support to the Ramvadi village community for rehabilitation and drinking water security. Over the period, infrastructure development and repairs were required for efficient water supply. In Makhana village, infrastructure upgradation work was done for household tap connection, pipeline replacement, cattle trough and overhead tank during the year 2015-16 and again in 2020. In Ramvadi village, another overhead tank was built and other minor works were implemented in 2007 and 2009. In Vatachhad village, infrastructure development work was done during the year 2003-04. While in Tanknasar village, household tap connections and an overhead tank have been built during the year 2017-18.

Handover to the community

The PWS scheme is still maintained and managed by the GWSSB which takes care of the operation of - source (pumping from borewell), source to main storage tanks, and thereafter to village storage tanks. GP manages the scheme right from the village level storage tanks to the household level distribution.

Since the GP falls short of the capacity to manage the human resource, technical and financial aspects of the scheme that covers 10 villages, the overall management and ownership of the scheme is still with the GWSSB, which bears the electricity bills and maintenance - management cost of the main plant.

Impact of PWS on the life of women

The region is a drought-prone area where rainfall is irregular, which adversely impacts human life as well as the ecosystem. In the past, people were dependent on local surface water bodies as well as local groundwater sources, which get acutely affected during droughts and low rainfall.

Groundwater conditions are getting aggravated day by day resulting in the community facing drinking water scarcity. As fetching drinking water is the responsibility of women, they had to walk long distances to collect water from the dam and wells in the farmlands. In Vatachhad, women walked for 4 km on a single trip to fetch water. This impacted women's health as well their contribution to farming activities. The introduction of the PWS scheme has greatly benefitted women as they get drinking water at their residence. Due to ease in access to drinking water, women have more spare time for other social responsibilities as well as time to engage in their family's livelihood activities. Further, older women are not dependent on others for their drinking water needs

Actual involvement of each stakeholder in various phases

The entire PWS scheme is planned, designed, implemented and even managed by the GWSSB. The GWSSB managed the technical planning which included site identification, groundwater prospect and scheme design during the initial level of the scheme. Since the scheme is in Makhana village, GP and community leaders were involved in the planning phase as well. The scheme had been implemented through the contractor approved by GWSSB. The authority had assigned a technical person to look after the quality/quantity assurance as per the design. GPs were involved during the pipeline network implementation. Role of the community was almost negligible during all the three phases.

In the post-implementation phase, all stakeholders were involved right from GWSSB and GP to the benefitted households. After 2002, WASMO and Paani Samiti have played a key role in infrastructure development and community empowerment. Village Water and Sanitation Committee (VWSC)/ User Committee namely Paani Samiti is registered under the GP. The overall management and operations of the scheme is not done by the Paani Samiti, but by the GP.

Apex institution to manage water supply: Structure and responsibilities

In the absence of an apex institution, the GP manages the in-village drinking water distribution. The GP is a constitutional body having its bank account and is composed of elected members from each ward. The Paani Samiti was formed under the GP to look after the village's water supply. The Sarpanch is the designated president in the Paani Samiti. However, it was found during the study that very few members of the Paani Samiti are active in the studied village. GP does meet at a stipulated frequency. The Paani Samiti too does not meet as per stipulated norms, but only when there is new work.

Earlier, GPs comprised 8 members, but as per recent guidelines, they have 9 members including the Sarpanch. As per the rules, 50 per cent of the seats are reserved for women in GP body. Makhana GP has 9 members including an elected member from Ramvadi. Similarly, village Tankanasar largely comprises Sumarasar Jat community, where 3 elected persons are part of the Sumarasar Jat Panchayat. One elected member of Vatachhad village is a member of Kamaguna GP.

The GP is responsible for regular water supply and in-village maintenance of the scheme. Makhana, Ramvadi and Tankanasar villages have appointed one person as the valve man who works under the guidance of the GP. Sarpanch/ members remain in close coordination with the valve operator who operates and monitors the supply from the main scheme to the village tank, and thereafter its internal distribution. If any disruption occurs, the community informs the valve operator or the GP and action is taken to repair and regularise the supply.



In village institution to manage water supply

There is a legal provision for the formation of a water and sanitation committee headed by the sarpanch under the regulations of the GP. Makhana and Tankasar villages have village water and sanitation committees (VWSCs) formally known as Paani Samitis with 12 members at present. Earlier there were 10 members. Six of the twelve members are women. Vatachhad and Ramvadi, are two of the four study villages, without a Paani Samiti. Overall, three out of the ten villages (Ramvadi, Pirvadi, Vatachhad) do not have a Paani Samiti, since beginning, because of the low number of households in these villages (around 35), all belonging to a single community.

Reconstitution of the Paani Samiti takes place every five years following the GP election. However, at present, the Paani Samitis have been formed for the purpose of overlooking the execution of the WASMO program. The Paani Samiti mostly remains disengaged when the WASMO program is not under execution. It does not have any meeting frequency and meets only when WASMO has any in-village related work concerning PWS.

The deputed valve man looks after the village level water supply operation and maintenance in Makhana, Ramvadi and Tankanasar village. While in Vatachhad village, a GP member looks after the scheme management. GP and valve man together handle supply management and maintenance. There are multiple actors behind this entire scheme such as GWSSB at scheme level and the GP along with the valve operator at the village level. Along with this, at the regional level of the scheme, the decision-making power

remains with the GWSSB. Sometimes few members along with the sarpanch and the valve operator play a role in specific matters.

Quantity of piped water supply

The main PWS scheme runs for 24 hours a day as it supplies water to 10 villages located at different distances. The scheme was designed to provide an average water supply of 75 litres per capita per day (lpcd). The quantity is inadequate for Vatachhad and Tanknasar, both tail-end villages, about 10 km away from Makhana scheme. These villages receive water at low pressure often creating a problem in maintaining a full storage volume in the village tanks.

The frequency of water supply is different in all the villages. Makhana and Tanknasar villages receive water every alternate day. Ramvadi village, a small habitation connected with the regional pipe to Ratiya village gets daily water supply. Vatachhad village receives water once in three days. Normally water is supplied in the morning or evening as per the convenience of the valve operator and depending on when the village storage tank gets filled. Due to this, people do not get enough water. When tanks get filled, the valve operator starts the water supply irrespective of the time duration.

Water is regularly supplied, but at times due to some unexpected events such as the breakdown of supply pipelines, water supply gets disrupted. There is a quick repair mechanism in place for handling such instances, and the equipment is repaired in a day or two. In the summer season, the frequency of interruption increases as many people puncture the pipeline. As a secondary source, people fetch water from existing ponds and wells

Table 4: Village wise details: Access to piped water supply

Detail	Makhana	Ramvadi	Vatachhad	Tanknasar
Frequency of PWS at HH level	Alternate	Daily	Three days interval	Alternate
Supply times/ day to the HH	Once, morning	Once, evening	Not fixed, when tank filled	Once, evening
Hours of water supply	2.5 hour	1.5 hour	1 hour	1 to 1.5 hour
Specific month of water supply disruption/ restriction	Not specific	Not specific	Throughout the year	Peak summers
Reasons behind water supply disruption/ restriction	Only when pipeline breaks down	Only when pipeline break down	When the pipeline breaks down, in summers, water supply is less with low force	
Alternate sources to access water during supply disruption/ restriction	Not required, within a day it gets repaired	Not required, within a day it gets repaired	Village ponds, wells in the farm, sometimes tanker supply in the summer season	

mainly in Vatachhad and Tanknasar villages. A water meter system has not been introduced under the PWS scheme.

Monthly tariff/ operational expenditure

The monthly tariff is meant to serve as a financial provision for effective water supply. It is charged to the community as payment for the received water supply services. Out of the four studied villages, two villages, Makhana and Ramvadi have a household level monthly tariff system in place. In Tanknasar and Vatachhad, there is no tariff system. The valve operator from Tanknasar works for GWSSB and receives a direct payment from the Board. Hence, the GP does not incur any

operational costs and therefore does not collect tariff. The fourth village Vatachhad receives meagre water supply which demotivates the community from paying tariffs.

In Makhana village, the monthly tariff at the beginning of the scheme was kept as low as Rs. 10 per month. However, it is now Rs. 25 per month. While in Ramvadi village, the monthly tariff has been Rs. 50 per month from the beginning. The higher charges can be attributed to the lower number of HH connections in the village (22), which escalates the operational cost of the scheme per household. Charges have been kept uniform for everyone, regardless of the socio-economic background of marginalised sections.



FGD with women in Vatachhad, Makhana.

The responsibility of the monthly tariff collection has been assigned to the valve operator. In villages paying the tariff, the number of defaulters is quite low and as such no big issues have been raised or no strict actions have been taken against them.

Rather defaulters have been exempted from paying water supply charges in certain months of the year. The accumulated tariff amount directly goes to the valve operator as his salary. In Tankansar village, one person is associated with GWSSB to look after repairs and maintenance. Along with this, he voluntarily manages in-village water distribution whereas in Vatachhad, the community has not assigned any person to look after PWS.

Capital maintenance expenditure

The water distribution duty from the overhead tank to household level has been assigned to the valve operator. The valve operator and the GP look after the pilferages, leakages, and broken pipelines. Minor issues such as leakages etc. are resolved by the GP, while for any major repairs GWSSB offers its expertise.

Regarding repair mechanisms, for all minor or major repairs, households contact the GP. Minor repairs are conducted by the valve operator or local plumber/ technician under the supervision of GP by using its funds. In case of a major breakdown, the replacement of existing infrastructure takes place by WASMO. Any in-village related new construction is taken care of by WASMO using GP funds. For any major issue at the plant level,

GWSSB comes into action, e.g., it replaced the corroded iron pipeline from the source to Makhana village in 2019. GWSSB does maintenance work from a fund/corpus created through the ongoing budget of the Department, Government of Gujarat.

Operation of in-village PWS

Community-engaged valve man manages the distribution of water supply from the overhead tank/ distribution source to the household level except in Vatachhad village. In the recent past, no water wastage has been observed, even when there are no measures ready for preventing wastage or overuse of the water. If any disruption occurs, community members inform the valve operator and the GP, who make a joint visit to identify any leakages, pilferages and breakages of pipelines. Households are responsible for rectification of disruptions in the pipeline in their homes. GP comes into action to resolve issues related to the village pipeline.

In Makhana and Ramvadi village, tail-end ward areas receive the same quality and quantity of water as those nearer to the source tank, though there is a slight delay. Poor pressure issues are noticed in areas that lie at higher elevations. In Tankanasar village, tail-end users are located at a higher elevation and get less water at low pressure in comparison to low-lying head-end households. In Vatachhad village, the storage tank usually does not get filled due to low pressure from the source, which in turn affects equitable water supply in the village. Households in elevated areas do not get water when pressure is low.

Repair (major and minor)

The community contacts the valve operator and the GP in case of minor repairs. In-village, minor repairs are taken care of by the GP. If the GP feels repairs require a higher budget then, GP applies to WASMO for internal infrastructure repairs/replacement. Minor repairs like leakages and breakdowns require a day at most to be repaired. If the disruption occurs in the main scheme pipeline, GP contacts the appointed valve operator of GWSSB, and subsequently, the repair is done within two days.

In village back-up systems

The scheme consists of four borewells equipped with separate pumping machinery apart from the connection with the Narmada pipe water project. Therefore, if an issue occurs in one system, there is backup support of the remaining borewells for pumping and the Narmada water project. No issues have been reported of supply disruption in case of power failure. If the submersible pumps become dysfunctional, water is supplied from the secondary source i.e. Narmada. If any infrastructure breaks down, people get water from local sources like ponds and borewells. In the summer season, tankers supply water to villages during a major breakdown.



Sarpanch and Valveman in Makhana gram panchayat.

Human resource

Human resources engaged in the scheme management are employed at different levels ranging from the GWSSB to the village level valve operator. GWSSB has its management team comprising an engineer, a valve operator and a site supervisor. At the village level water distribution, community/GP has appointed a person as the valve operator to take care of water distribution. Out of the study villages, Makhana village has appointed Mr Samat Bhudha Chanepar and Ramwadi village has appointed Mr Lalji Sumar Siju as their valve operators. The village water distribution in Tankasar is taken care of by the GWSSB valve operator residing in the village.

Mr Mulaji works on a contractual basis as a valve operator and has the responsibility of looking into repairs and maintenance at the scheme level but he also looks at his village-level water distribution voluntarily. Vatachhad village does not have an

appointed person. Anyone can turn the valve on and off. Mr Umarbhai Sameja, a GP member is responsible for the overall care of the system. The salary of the valve operator in Makhana and Ramwadi villages are paid by the community from the collection of a monthly tariff of Rs. 25 and Rs. 50 per household respectively in the two villages. In Makhana the monthly salary of the valve man comes to an average Rs. 5000 and in Ramwadi to Rs. 1100. Tankanasar valve man is paid Rs. 5000 a month by the GWSSB.



Interview with the community in village Tankanasar, Makhana.

Source sustainability

The scheme has two sources i.e. local groundwater and Narmada pipe water. Narmada water supply is an external source from Sardar Sarovar Dam that has assured water storage. The primary water source is the Bhuj sandstone aquifer, a deep aquifer that provides good quality and adequate water. In the coming years, the aquifer needs to be replenished through rainfall to balance the inflow and outflow. Even in recent times, the groundwater table has gone down along with a deterioration in its water quality. There is no concrete plan for groundwater recharge surrounding the scheme site and depleting groundwater can be foreseen.

Inter village issues

In the recent past, there were no major inter-village disputes, but several in-village disputes have taken place due to the following reasons: -

Break down of the main pipeline by cattle rearer in the summer season leads to an interruption in the water supply.

Illegal connections have been taken from the main pipeline by few people and social dispute erupts whenever the community, panchayat or the valve operator advises them to close the connection.

In tail-end villages, water supply is not adequate. Therefore, tail-end villages blame upstream villages for the interruption. In village Tankanasar and Vatachhad, households are at a higher elevation than the tank. Even the in-village tanks in these two villages remain half-filled due to low pressure.



Technological and other innovations

The innovation in the scheme lies in the two water sources: (a) four local groundwater based borewells each equipped with pumping machinery and (b) a distant surface water source from the Narmada canal-based drinking water supply project. There is a connection between the Narmada water supply and the central storage tank. This has strengthened drinking water sustainability. Narmada piped water is mixed with moderate quality groundwater to improve the overall water quality.

Challenges faced by the scheme

As explained in earlier segments, challenges can be summarized as -

- Iron concentration in groundwater leads to blockage in the pipeline every few years. The rusted iron in the pipeline decreases the water supply and pressure. Consequently, suspended iron particles are found in drinking water at the household level.
- Tail-end villages are not getting adequate water supply due to corrosion in pipe, excess withdrawal by intermediate users and technically faulty laying of pipes in the undulating terrain. Therefore, these households need to coordinate with the Paani Samiti and WASMO to overcome technical issues.
- It is observed commonly that there are many illegal connections in the main pipeline of the grid.
- There is a lack of a uniform management system in all the villages. So, beneficiary villages do not get together under one platform to deal with issues as well as management and protection plans.
- The management system of the entire scheme is at two different levels (main plant level by the GWSSB and village level by GP and WASMO) where there is a lack of internal coordination and dialogue.
- There is a dearth of active participation by the community and Paani Samitis in many villages.
- Groundwater resources in the region have shown a declining trend over the years as well as water quality deterioration. In such a scenario, the groundwater recharge plan is essential for sustainability but the scheme has no such recharge arrangement plan.

Suggestions for improvement

- It is strongly recommended to form an apex institution consisting of representatives from GWSSB, WASMO, and all the beneficiary villages for scheme management right from the central to the household level.
- A management committee must frame rules and regulations for all the villages and look after efficient management. The committee will also be responsible for resolving the issues between villages.
- High iron concentration in groundwater needs to be treated through a filtration process at the scheme site level. This will reduce the management and maintenance cost for the pipeline replacement as well as for water quality assurance to a potable standard.
- Moreover, water quality monitoring measures need to be in place for periodic water quality monitoring at the plant and household level.
- It is strongly recommended to prepare and execute a groundwater recharge plan for source sustainability through technological innovation.
- The design of the water supply system should be planned keeping local circumstances in mind, including geography and socio-cultural factors which may be different in each village under the scheme.

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September 2020

We acknowledge the inputs of Sazina Bhimani, a consultant field researcher for this study, in data collection and in preparation of the draft report. Amita Bhaduri helped us in editing and finalising the reports. The study was undertaken by the Policy Unit at WaterAid in September 2020, led by Nirma Bora and guided by VR Raman.

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