Functionality Assessment of Household Tap Connection under National Jal Jeevan Mission - 2022

Har Ghar Jal
Jal Jeevan Mission

STATE REPORT: DADRA & NAGAR HAVELI AND DAMAN & DIU
SURVEY DURATION: MARCH 2022

Contents

Abbreviations

AWC	Aanganwadi Centre
FHTC	Functional Household Tap Connection
GoI	Government of India
GP	Gram Panchayat
HF	Health Facility
HH	Household
HGJ	Har Ghar Jal
JJM	Jal Jeevan Mission
LPCD	Litres per Capita per Day
MVS	Multi-village Scheme
NJJM	National Jal Jeevan Mission
RC	Residual Chlorine
O&M	Operation and Maintenance
OHT	Over Head Tank
PSU	Primary Sampling Unit
PWS	Piped Water Supply
SVS	Single Village Scheme
VAP	Village Action Plan
VWSC	Village Water and Sanitation Committee
WQMIS	Water Quality Monitoring and Information System

Glossary

1. **Community** – Group of people living in one particular area or village/habitation
2. **Cross-sectional research** – A cross-sectional study is a type of research design in which data is collected from a relatively large and diverse group of people at a single point in time
3. **Drinking water source** – Groundwater (open well, borewell, tube well, handpump, spring, etc.)/ surface water (river, lake, pond, reservoir, etc.)/rainwater, available for drinking and domestic use
4. **Improved sources** – The following sources as considered improved by the National Family Health Survey definitions: Piped water into dwelling, yard/plot with a tap, piped water connected to public stand-posts, tube well or borewell, Hand pump, dug well– protected, Spring–protected, Rainwater, Water ATM/ Community RO plant/ Community Water Purification Plant (CWPP)
5. **Unimproved sources** – The following sources as considered unimproved by the National Family Health Survey definitions: Unprotected spring, unprotected dug well, cart with small tank / drum, Tanker/ truck, Surface water (river/ dam/ lake/ pond/ canal), and bottled water
6. **Functional Household Tap Connection (FHTC)** – A tap connection to a rural household for providing drinking water in adequate quantity of prescribed quality on regular basis.
7. **Functionality of FHTC** – Functionality of a tap connection is defined as having infrastructure, i.e., household tap connection providing water in adequate quantity, as presented:

Definitions	Fully-functional	Partially-functional	Non-functional
Quantity	>= 55 LPCD	> 40 lpcd - < 55 LPCD	< 40 LPCD
Regularity	12 months or daily basis	9-12 months or < daily basis	< 9 months or < daily basis
Quality	Potable	Potable	Non potable

8. **Quantity (in litres)** of water received by households per person per day should meet the service level of 55 lpcd.
9. **Functionality Assessment** – An assessment of the functionality of rural household tap connections based on a sample survey
10. **Fully Regular –** Regularity of water is considered when a rural household receives water for 12 months on daily basis or as per schedule
11. **Potability –** Potable water is water that is safe to be used as drinking water. Parameters of potable water are mentioned below:

Parameters for potable water tested in the survey	Unit	Acceptable Limit	Permissible Limit in the absence of alternative sources
i. pH (tested on site)	-	6.5 to 8.5	No relaxation
ii. Free residual chlorine (tested on site)	Mg/litre	0.2	1
iii. Turbidity	NTU	1	5
iv. Total hardness	Mg/litre	200	600
v. Total alkalinity	Mg/litre	200	600
vi. Chloride	Mg/litre	250	1000
vii. Ammonia	Mg/litre	0.5	No relaxation
viii. Phosphate	Mg/litre	0.3	1
ix. Iron (in hotspots only)	Mg/litre	1	No relaxation
x. Nitrate	Mg/litre	45	No relaxation
xi. Sulphate	Mg/litre	200	400
xii. Total dissolved solids	Mg/litre	500	2000

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xiii.	Fluoride	Mg/litre	1	1.5
xiv.	Arsenic (in hotspots only)	Mg/litre	0.01	No relaxation
xv.	Bacteriological test for Total coliform bacteria and E. coli or thermotolerant coliform bacteria	Shall not be detectable in any 100 ml sample		

12. **Sampling** – Selection of a subset of individuals from within a statistical population to estimate water service delivery among the population. In the current study, households have been sampled to estimate the representation of the village and subsequently of the district as well as of the state.
13. **Types of schemes**: Following are the piped water supply schemes that were assessed
    a. Mini-solar based piped water supply scheme in isolated/tribal hamlets
    b. Single Village Scheme (SVS) in villages having adequate groundwater that needs treatment
    c. Single village scheme (having adequate groundwater/ spring water/ local or surface water source of prescribed Quality)
    d. Retrofitting of ongoing schemes taken up under erstwhile NRDWP for the last mile connectivity/ retrofitting of completed rural water supply schemes to make it JJM compliant
    e. Multi-village PWS scheme - with water grids/ regional water supply schemes
14. **Village Action Plan (VAP)** – Plan prepared by Gram Panchayat and/ or its sub-committee, i.e., VWSC/ Paani Samiti/ User Group, etc. based on baseline survey, resource mapping and felt needs of the village community to provide FHTC to every rural household, treat the generated greywater and plan its reuse, undertake surveillance activities, etc. VAP also indicates the fund requirement and timelines for completion of work under the Mission and will be approved by the Gram Sabha. Irrespective of the source of funding, all drinking water-related works in the village are taken up based on the VAP.
15. **Source Sustainability** – includes measures such as aquifer recharge, rainwater harvesting, increased storage capacity of water bodies, reservoirs, de-silting, etc. improve the lifespan of water supply systems
16. **Har Ghar Jal (HGJ)** – An administrative unit wherein all HHs are provided with water supply through FHTCs is called "Har Ghar Jal".
17. **Public Institutions** – The public institutions in the survey include Aanganwadi Centre (AWC), Health Facilities, Schools, Gram Panchayat, and government buildings.
18. **Working tap connection –** A tap connection supplied water at least one day in the week, preceding of survey
19. **Functional Scheme –** A scheme is said to be functional if it was reported to be working for all 12 months in a year.

Note: The detailed analysis of data at the district level has been incorporated in the District Reports presented separately. The State Reports are to be read in concurrence to the District Reports.

Executive Summary

Jal Jeevan Mission (JJM) was launched on the 15th of August 2019 with the objective to provide functional household tap connections (FHTCs) to all rural households. NJJM, GoI engaged HTA Kantar Public to conduct the 'Functionality Assessment' of the tap connection at households as well as public institutions/ buildings such as schools, anganwadis, gram panchayat buildings, public health facilities, and wellness centers in all the rural districts for the financial year 2021-22.

A cross-section research design was adopted for this functionality assessment study. As per the design, all villages having a piped water scheme (PWS) with 20 or more functional household tap connections were included in the sample frame. There after the required number of villages were randomly selected villages such that these are statistically significant at the district level.

In this study, data was collected from the households, and public institutions (i.e., schools, anganwadis, gram panchayat buildings, public health facilities and wellness centers, etc.) in the randomly selected villages. Water quantity and quality were also tested in the sampled households and public institutes. Quality testing was conducted for various parameters, out of which pH and residual chlorine were tested on the ground and for the remaining 12 different quality parameters water sample was collected and sent to the nearest NABL accredited district labs for testing.

The state of Dadra and Nagar Haveli and Daman and Diu lies in the western part of India and has a population of 5,85,764 (Census 2011). It has 3 districts and 96 villages, and all the villages have PWS schemes. The state was declared as Har Ghar Jal in 2021. A total of 77 villages, across all districts, and 1586 households were randomly sampled for the survey, and additionally, water samples from 142 public institutions were tested.

In the assessment among sampled villages, 92% of villages have only one scheme, 8% of villages have 2-3 schemes. Mostly all schemes across the state were found functional.

At the state level, 96% of the HHs were satisfied with the regularity of the supply, 96% with the quality of the water supplied, 98% with the colour of the water supplied, and 97% with the taste of the supplied tap water.

Overall functionality status of Dadra and Nagar Haveli and Daman and Diu

At the state level, 100% of HHs received water on the day of the survey. While 78% of the HHs were found to have fully functional tap water connections within the premises. Out of which 89% received an adequate quantity of water, 89% reported receiving a fully regular supply of water, and 100% HHs received potable water.

It was found that 81% of households received water all 7 days a week, 11% of the households received water 3 or 4 days a week, and 4% of the households received water at least once a week. The average duration of water supply across the state was reported to be 3 hours per day.

In Dadra and Nagar Haveli and Daman and Diu, 10% of the villages have reported that water is directly supplied to the households and the remaining 90% reported that water was supplied via an overhead tank, sump, or both.

During the roll-out of the data collection in the state, all-district level NABL accredited laboratories (labs) extended their support in accepting and testing water samples from HHs and public institutions. One of the challenges identified by the labs was the capacity to test

more than 30-40 samples within 24 hours given the shortage of technicians and availability of necessary reagents in the required quantity. In Dadra and Nagar Haveli and Daman and Diu, 1728 samples of water were submitted, and 256 were tested at the labs. The turnaround time of testing of water sample was more than 48 hours in most cases. Given this feedback, it can be conferred that these labs have limited scope to take up samples from the general public at large on a regular basis. The different quality parameters of the collected water samples that were tested were turbidity, total hardness, total alkalinity, chloride, iron, nitrate, sulphate, total dissolved solids, bacteriological test, arsenic, and fluoride.

Residual chlorine was found within the permissible limit only in 12% of the HHs. The percentage was relatively higher in Schools, and HFs (more than 14%), wherein there is a possibility of additional chlorine being added locally for the purification of water. All the water samples passed the bacteriological contamination test.

Out of the 1586 HHs sampled for the FHTC assessment, a water quality test was carried out in 1586 HHs. pH was found within the acceptable limit in 100% of households. Among the public institution, pH was found in the acceptable limit of more than 92% in all of them.

32% of villages in the state reported having available field test kits. And 45% of these reported to have either VWSC/Pani Samiti or pump operators trained to use field test kits for testing the quality of water on-site.

Water quality management in village

It was found that 61% of villages in the state reported having a VWSC or a Pani Samiti out of which 60% of the VWSC/Pani Samitis reported to have more than 50% female members. In the state, 14% of the villages reported that VWSC/ Pani Samiti is responsible for the operation and maintenance of pipe water supply.

40% of villages reported having identified skilled manpower for O&M of PWS schemes. 9% of villages in the state reported having faced challenges with respect to O&M of PWS schemes.

94% of HHs reported that they are aware of any grievance redressal mechanism w.r.t. HH tap water through PWS, but only 13% HHs have reported a complaint in the last year and only 12% of complaints have been resolved. Among those who reported complaints (i.e., 13% HHs, 200 HHs), 35% of the HHs reported their complaints to pump operators and VWSC/Pani Samiti besides other reporting channels.

Overall, 34% of villages in the state levy charge for water service delivery to households whereas 36% HHs reported paying water service delivery charges at the households.

100% of HHs reported that their daily requirement of water was being met by HH tap connections.

Overall, 91% of HHs reported using an improved source of drinking water, as their primary source. The state also needs to further strengthen communication for the quality of water supplied so that every household can use the same for drinking purposes.

Overall, 9% HHs reported using booster pumps to maximize the water flow through their piped water connections.

It was found that 22% of the villages have schemes that are based on groundwater sources, while 4% on surface water sources.
Age-wise functionality of the schemes indicates a decline in 'always functional' schemes in the UT since 2012. 7-% point increase in the fully functional scheme was recorded from 2012 to 2013-18. In 2019 and later the percentage of fully functional schemes decreased by 15% and 85% of schemes have been reported to be always functional and 5% as partially functional (i.e., a total of 90% of schemes).

Impact of JJM

Across the state, less than 1% of the HHs reported having an incidence(s) of water-borne diseases in the last year.

Since having a functional HH tap connection, 75% HHs across the state have reported that there has been a change in the no. of employment days of the adult HH members while 5% HHs reported no change.

Out of the HHs reported (i.e., 1204) that female members used to fetch water before HH tap connection, 93% reported that post-installation of HH tap connection helped reduce of time and effort in collection of water.

Across the state, 56% of the HHs reported that since having a functional HH tap connection the attendance of the girls going to schools has increased, and 33 of the HHs reported no change in attendance which could possibly be an impact of shutting down of schools due to COVID-19 related lockdown during the survey period.

1. State Factsheet

Functionality status of tap connection at households	India	D&NH and D&D
Working tap connections- HHs which received water through tap connection at least once in last 7 days (%)	86	100
Quantity[1] of water received by households		
Adequate quantity (>55 LPCD) (%)	85	89
Partially adequate quantity (> 40 LPCD - < 55 LPCD) (%)	5	5
Inadequate quantity (<40 LPCD) (%)	10	6
Regularity[2] of water received by households		
Fully Regular Supply (as per schedule) (%)	80	89
Partially Regular Supply (not as per schedule) (%)	14	10
Irregular Supply (less than 9 months' supply) (%)	6	1
Potable[3] (Quality) water received by households (%)	87	100
Overall functionality[4] (%)	62	78

Service delivery parameters	India	D&NH and D&D
Overall user satisfaction on regularity at the household level (%)	83	96
Overall user satisfaction on quality at the household level (%)	82	96
Households receiving water supply daily-7 days a week (%)	74	81
Daily HH requirement of water being met by FHTC (%)	80	100
Households paying water service delivery charges (%)	35	36
Households aware of grievance redressal mechanism (%)	71	94
Households reported a reduction in time and effort in collecting water (%)	79	93
Average no. of times water is supplied in a day	1	1
Households reported incidence of water-borne diseases in the last year (%)	2	0
Households purifying water before drinking (%)	57	96
Residual Chlorine (RCL) detected with in permissible limits (%)	24	12
Villages with Field Test Kits (%)	30	32
Villages in which bacteriological test was done in last 1 year by VWSC/ Pani Samiti (%)	29	40
Villages reported to have a mechanism for chlorination (%)	21	1

Service delivery parameters	India	D&NH and D&D
Village reported having presence of VWSC/ Pani Samiti (%)	38	61
Villages in which VWSC/ Pani Samiti is responsible for Operation & Maintenance of PWS schemes (%)	14	14
Villages in which persons are trained to use Field Test Kits (%)	31	45
Villages levying water service delivery to households (%)	34	34
Villages having skilled manpower for Operation & Maintenance of PWS schemes (%)	31	40
Community monitoring of water wastage in villages (%)	19	45
Villages in which signages about JJM were observed (%)	15	5

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[1] Quantity (in litres) of water received by households per person per day should meet the service level of 55 lpcd
[2] Regularity is receiving water for 12 months or daily basis as per schedule
[3] Potable water has been considered basis testing of water samples through laboratory tests for physical, chemical, and bacteriological parameters (within acceptable/ permissible range) and onsite testing of pH.
[4] Overall functionality has been computed as the intersection of Adequate Quantity, Fully Regular Supply and Potable (Quality) for households wherein water supply was available at the time of survey

2. Context

Jal Jeevan Mission (JJM) was launched on the 15th of August 2019 with the objective to provide functional household tap connections (FHTCs) to all rural households.

Figure 1: Har Ghar Jal - Objective, Vision, & Outcome
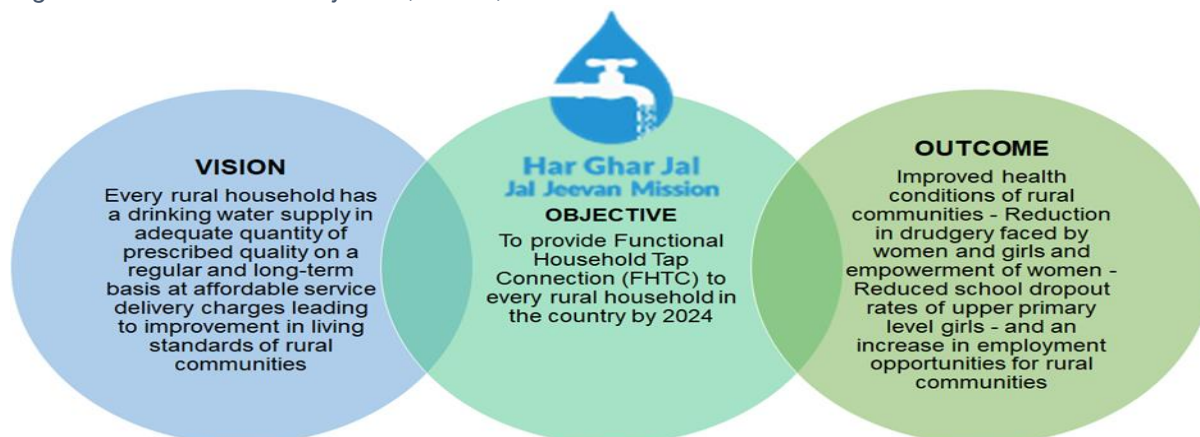
In accordance with the overall objectives as specified in the Operational Guidelines for the implementation of the NJJM, GoI carried out a sample survey to assess the functionality of household tap connections. As part of this endeavour, NJJM, GoI engaged HTA Kantar Public to conduct the 'Functionality Assessment' of the household as well as public institution/ buildings such as schools, anganwadis, gram panchayat buildings, public health facilities, and wellness centers in all the rural districts for the fiscal year 2021-22.

## 2.1. State snapshot: Dadra & Nagar Haveli and Daman & Diu

The state of D&NH and D&D lies on the western part of India and has a population of 5,85,764 people. It has 3 districts and 96 villages where 96 villages have PWS schemes. The state lies on the Gujarat Plains and Hills region and receives an average annual rainfall of about 2,300 to 4,800 mm. Among the villages with PWS schemes, 96 villages (100.0%) have more than 20 households with functional tap connections. The state achieved the Har Ghar Jal status on 2021.

Presented here are state level information collated from the DDWS-IMIS:

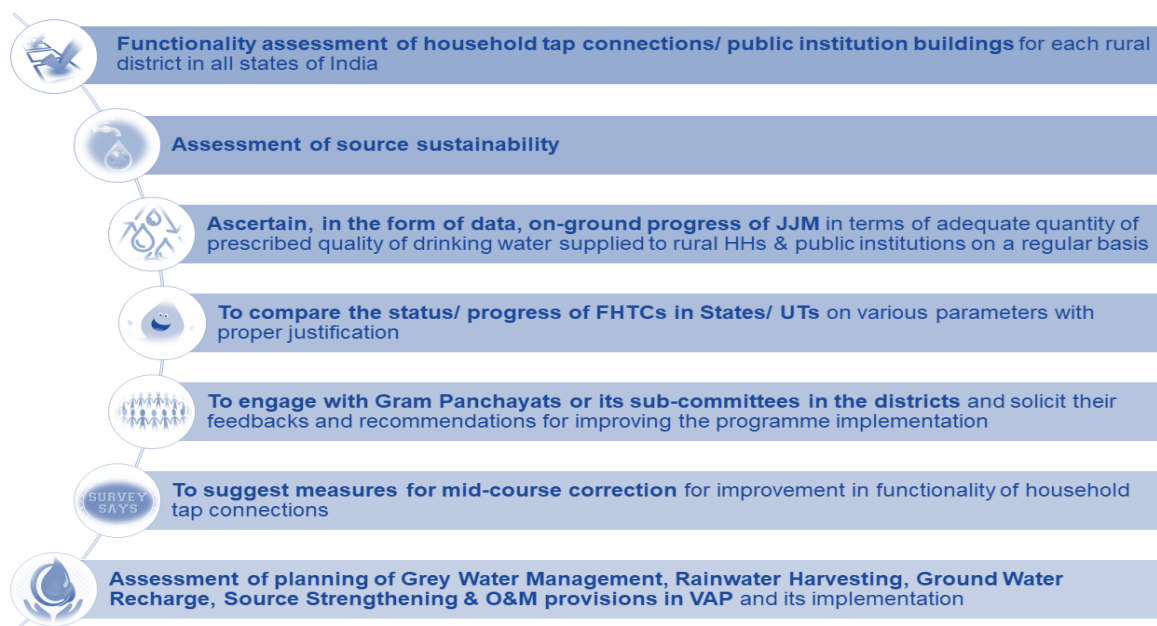*Figure 2: State IMIS Status & Map*

IMIS status:

– Har Ghar Jal state since 2021.
– No districts are Iron or Fluoride affected
– 96 (100.0% of all) villages with PWS more than 20 FHTC
– 100% villages covered under HH tap connections under HGJ
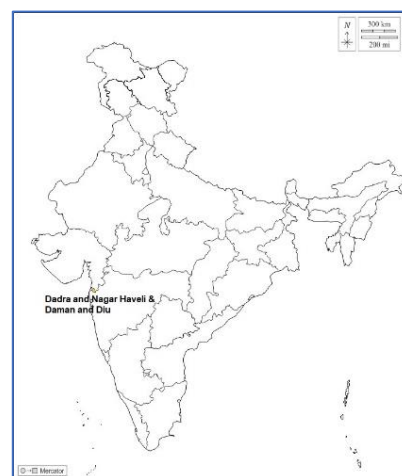
2.2. FHTC Assessment Objectives

The overall objectives of the FHTC assessment are as presented:

Figure 4: FHTC Assessment Objectives

2.3. Assessment Methodology

A cross-section research design has been used for this functionality assessment study. Quantitative data were collected from villages and households across all states/UTs using the CAPI (Computer Assisted Personal Interviewing) mode. The survey includes two components, village, and household.

Figure 5: Survey Components & Respondents
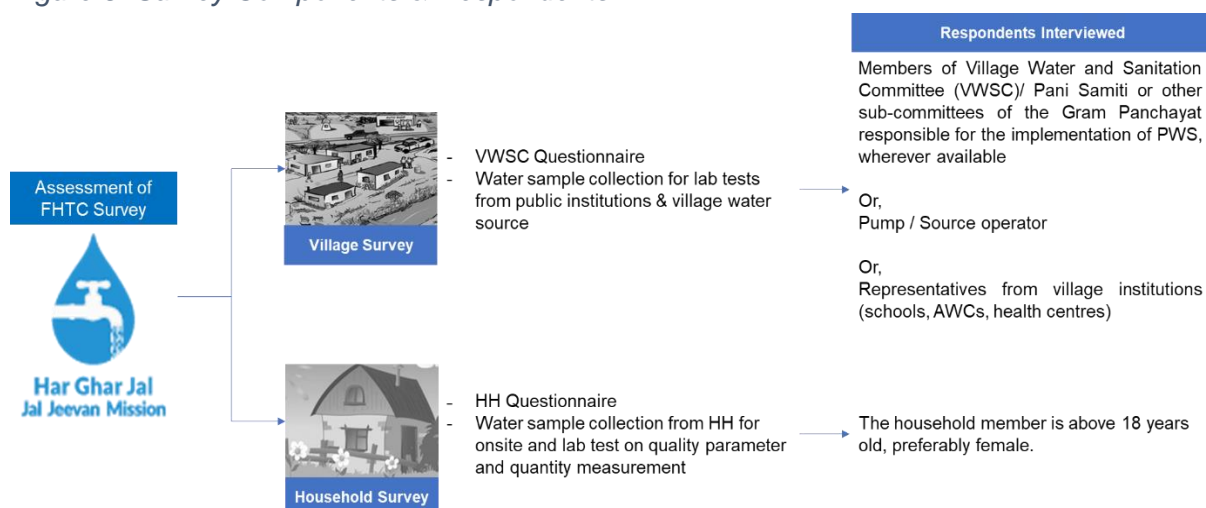
2.4. Sample Size

The sample size was calculated to provide estimates with a 95% confidence interval (CI) and 5% margin of error (MoE) after incorporating the correction factor for a finite population considering the total number of geographic units having FHTCs.
  ▪ Village sample is estimated to be representative at the state level

- HH sample estimated to be representative at the district level
- Number of Har Ghar Jal (HGJ) villages were proportionately sampled at the district level
- All PWS schemes (up to 4) were covered per village. Per scheme approximately 9 (3 each from the head, middle, and tail HHs) or 18 households (6 each from head, middle, and tail HHs) were sampled to achieve the desired sample at the district level.
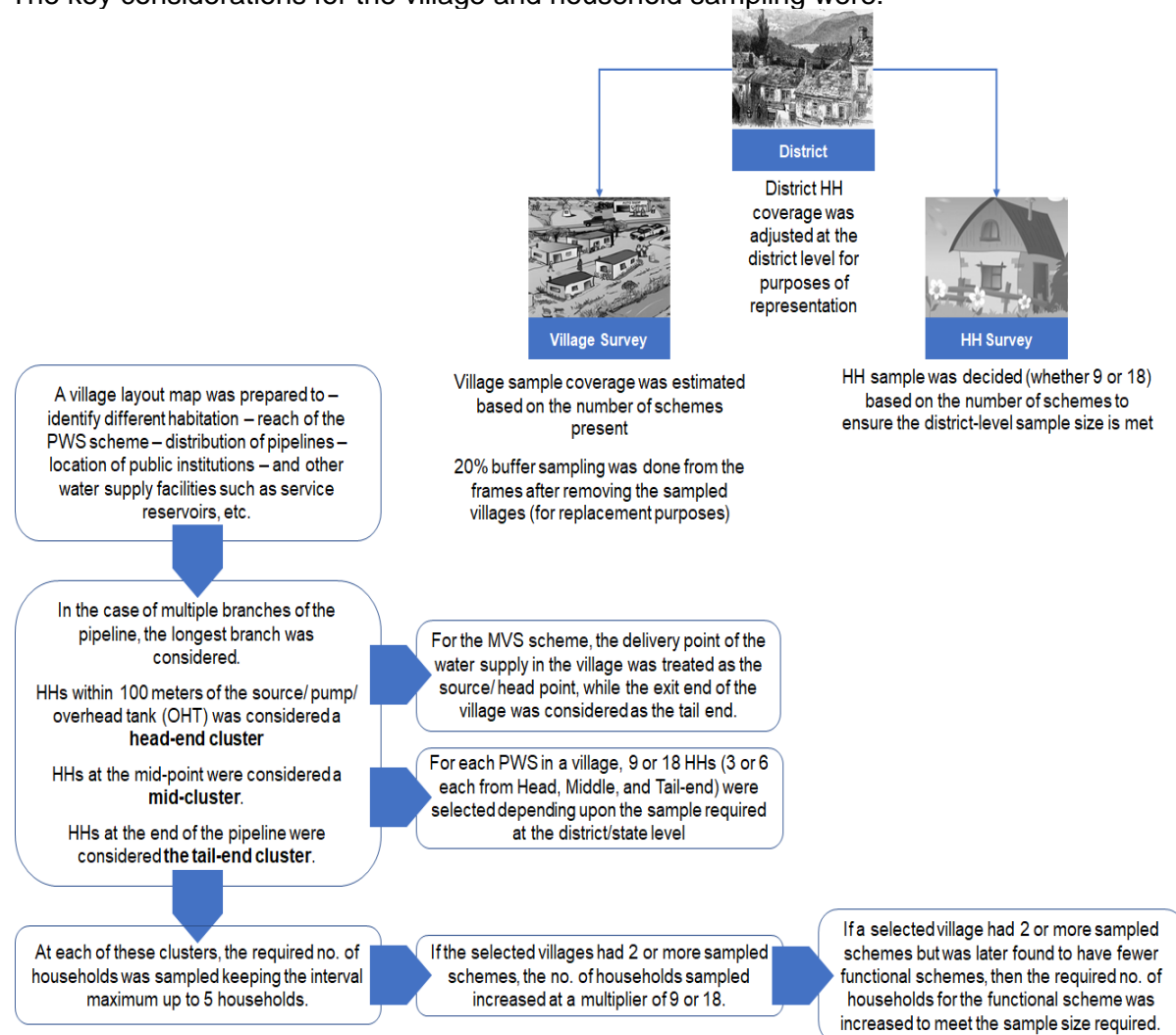
2.5. Sampling Methodology

As per the design, all villages having a PWS scheme with 20 or more functional household tap connections were included in the sample frame. The probability proportionate to size (PPS) method was used for village selection in each district. The steps for random selection of villages using PPS are presented below:

Figure 6: Steps for Random Sampling of Villages

| 1 Sample interval was estimated for each district | 2 Random number was generated for each district | 3 Required number of villages were sampled from each district frame | 4 Har Ghar villages were proportionately represented |

Figure 7: Household Selection

The key considerations for the village and household sampling were:

District
District HH coverage was adjusted at the district level for purposes of representation

Village Survey
Village sample coverage was estimated based on the number of schemes present

20% buffer sampling was done from the frames after removing the sampled villages (for replacement purposes)

HH Survey
HH sample was decided (whether 9 or 18) based on the number of schemes to ensure the district-level sample size is met

A village layout map was prepared to – identify different habitation – reach of the PWS scheme – distribution of pipelines – location of public institutions – and other water supply facilities such as service reservoirs, etc.

In the case of multiple branches of the pipeline, the longest branch was considered.

HHs within 100 meters of the source/ pump/ overhead tank (OHT) was considered a **head-end cluster**

HHs at the mid-point were considered a **mid-cluster**.

HHs at the end of the pipeline were considered **the tail-end cluster**.

For the MVS scheme, the delivery point of the water supply in the village was treated as the source/ head point, while the exit end of the village was considered as the tail end.

For each PWS in a village, 9 or 18 HHs (3 or 6 each from Head, Middle, and Tail-end) were selected depending upon the sample required at the district/state level

At each of these clusters, the required no. of households was sampled keeping the interval maximum up to 5 households.

If the selected villages had 2 or more sampled schemes, the no. of households sampled increased at a multiplier of 9 or 18.

If a selected village had 2 or more sampled schemes but was later found to have fewer functional schemes, then the required no. of households for the functional scheme was increased to meet the sample size required.
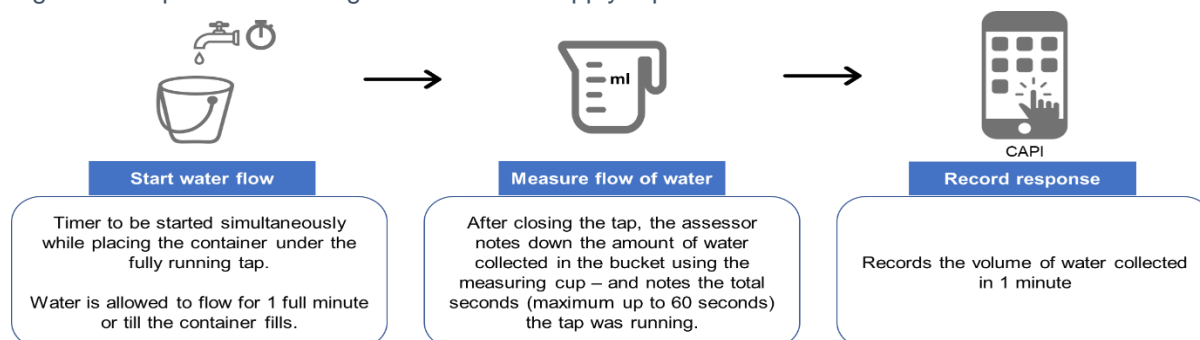
The record of all district-wise village replacements is maintained and reported as part of the annexure.

2.6. Methodology for Water Quantity Measurement at Households

The flow rate of the water supply was measured using a container with gradual markings (either 5 litres or 1 litre, based on the flow of the tap) and a stopwatch/timer-watch. The process followed is as described in Figure 6.

Figure 8: Steps for Measuring Flowrate from Supply-tap at HHs

Start water flow	Measure flow of water	Record response
Timer to be started simultaneously while placing the container under the fully running tap. Water is allowed to flow for 1 full minute or till the container fills.	After closing the tap, the assessor notes down the amount of water collected in the bucket using the measuring cup – and notes the total seconds (maximum up to 60 seconds) the tap was running.	Records the volume of water collected in 1 minute

In the case of households where the FHTC is connected directly with the storage tank, the following steps were adopted to measure the quantity:

- Assessor first asked and recorded length, breadth, and height.
- Assessor dipped a 5 feet long rod, marked the level of the water table, and calculated the volume – length x breadth x-height of water.
- Next the assessor opened the valve of the connection and allowed the water to flow inside the storage for 10 minutes.
- After 10 mins, the valve was closed, and the assessor again dipped the rod and recorded the new height of the water inside the tank. Based on this new 'height' and the CAPI calculated the changed volume.
- The difference in the volume of water in 10 minutes divided by 10 provided the flow rate of the water supply per minute.

The water flow rate was not measured for village-level public institutions.

2.7. Methodology for Water Quality Measurement

Water quality was tested for all public institutions available in the villages, including schools, AWCs, gram panchayat buildings, public health facilities, and wellness centers, and at the selected households. Two types of quality tests were carried out – a) spot test for pH and free residual chlorine, and b) water sample was collected and transported to labs for testing against 13 quality parameters (total 15) as specified in Figure 7.

Figure 9: On-site & Laboratory-Based Quality Test

Using Field Test Kits (FTKs), spot tests for pH and free residual chlorine was conducted & reported

pH test
- Took 10 ml of water sample in the test jar,
- Added 10 drops of PH1 and mixed well
- Placed this test jar against colour chart from the topside to observe colour. Arrived at the appropriate reading by moving the test jar from one concentration to another.

Free residual chlorine test
- Took 10 ml of water sample in the test jar.
- Added one spoonful of FC1 and mixed well.
- Waited for colour checks - No appearance of a pink colour denotes free chlorine is not present – Appearance of a pink colour denotes free chlorine is present.
- Thereafter dropwise FC2 reagent was added counting the number of drops while mixing until the pink colour disappears
- Calculations: Free Chlorine as PPM Chlorine = 0.1 X (Number of drops of FC2).

Water sample collection process for transportation to Labs
- Taps were sterilized prior to collection of water samples – Metal taps were flamed/and plastic taps were sterilized with alcohol/ spirit.
- The tap was opened fully, & the water was allowed to run for 2-3 minutes to permit clearing of the service line.
- The flow from the tap was then filled in the bottle without splashing.
- Leaking taps, which allow water to flow over the outside of the tap were avoided as sampling points. The water sample from the outlets of storage tanks was not taken.
- The sample for laboratory analysis was collected in High-Density Polyethylene (HDPE) bottle, as per BIS regulation. Clean & sterile bottles will be used.
- Sample bottles were labeled properly using preprinted waterproof labels. The corresponding sampling form was filled with information like sample ID, Collection date, & village name.
- Special preservatives 0.5 – 1 ml of Conc. Nitric Acid (AR Grade) in a 250 ml water sample was used for Arsenic & Iron testing to achieve a pH of <2, as applicable.

Quality parameters under test
- Turbidity
- Total hardness
- Total alkalinity
- Chloride
- Ammonia
- Phosphate
- Iron (affected districts only)
- Nitrate
- Sulphate
- Total dissolved solids
- Bacteriological test
- Fluoride, and
- Arsenic (affected districts only)

JJM, with the support of the BMI Division of ICMR, enabled a new interface on the WQMIS portal for "Functionality Assessment (FA) User" to enable seamless harmonization of water sample registration, and sample submission for testing, and sharing of results as per the applicable quality parameters.

2.8.   Project Implementation

An overview of the project implementation is as presented:

Figure 10: Broad project implementation framework
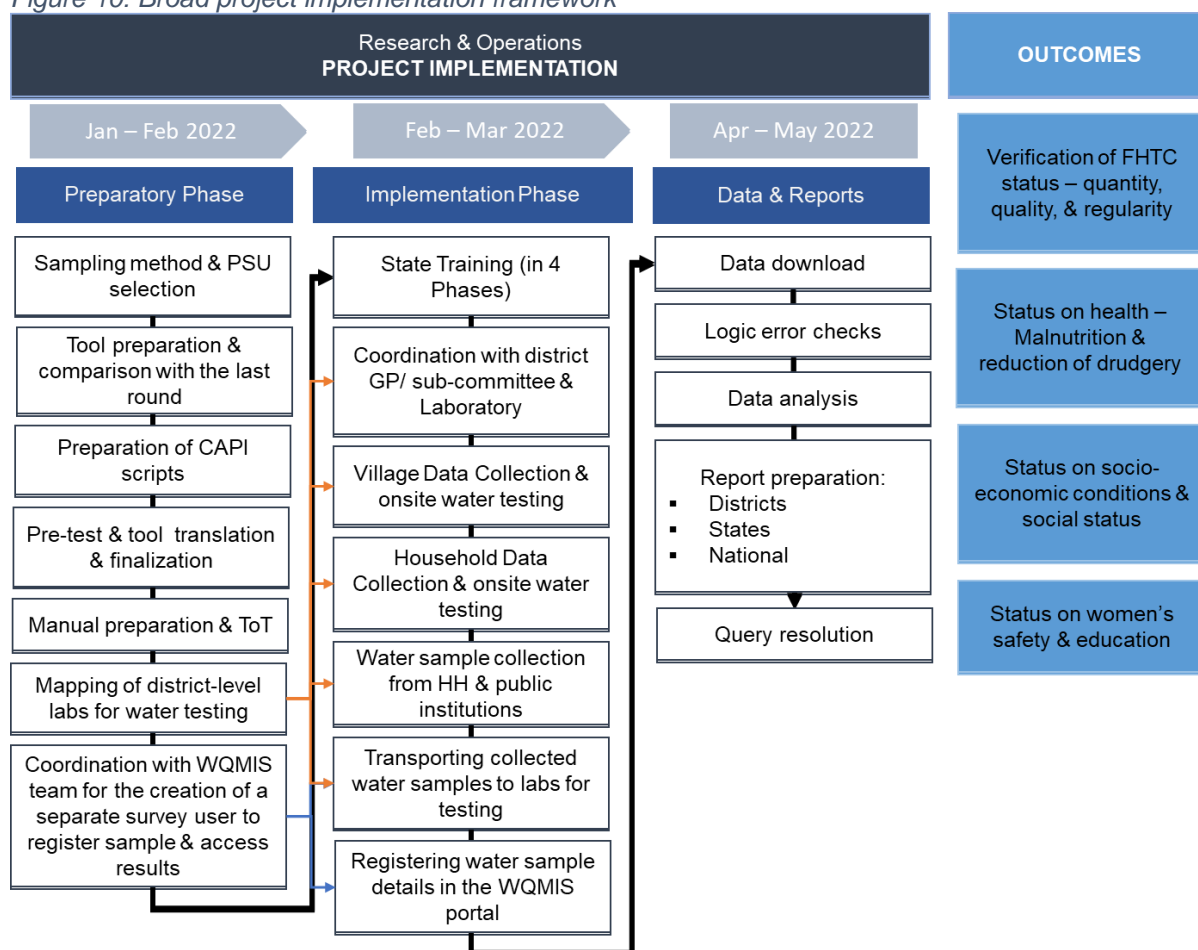
A total of 3 teams (comprising 3 supervisors, 18 assessors, and 3 water collection assistants) were recruited, trained, and deployed to complete the survey across the states of Dadra & Nagar Haveli and Daman & Diu. One survey team covered approximately 2 – 3 districts. The state-wise team deployment and fieldwork dates were as presented:

Table No. 1: Team deployment and data collection start & end dates				
States	**Teams deployed**	**Start date**	**End date**	**Total data collection days**
D&NH and D&D	3 Teams	7th March	16th March	11 Days

A four-tier quality control (QC) system was put in place. At the ground level, the data collection exercise was done using a computer-aided Personal Interview (CAPI) application which contained all logic and skip-checks inbuilt. Also, 5% of the total samples were accompanied by the supervisors. Sub-targeted QC was done by the state field managers (5%) and the central project management team (5%). Apart from this, the central research team monitored the data trend and as per requirement debriefed data collection teams to improve quality.

2.9.   Sample coverage

Table No. 2: Sample covered							
	Targeted sample			Achieved sample			
State	District	Village	HH	District	Village	HHs	PIs
India	**712**	**13,300**	**3,00,000**	**712**	**13,299**	**3,01,389**	**16,148**
D&NH and D&D	**3**	**77**	**1,422**	**3**	**77**	**1,586**	**142**

2.10.   Sampled village and household profile

SAMPLED VILLAGES	SAMPLED HOUSEHOLDS
• Total no. of villages covered in the state **– 77** • Percentage of SC dominated villages covered in the State is **0%** (while at national level the average is 12.6%) • Percentage of ST dominated villages covered in the State is **68.8%** (while at national level the average is **20.2%**) • Higher proportion of **pump operator** interviewed at the village level • **2.6%** of the villages reported to have any historical incidence of water contamination	• Total no. of households covered in the state **– 1586 (Respondents: Male 1317, Female 268 & Transgender 1)** • Proportion of General – **6.2%**, SC **0.8%**, ST **74.5%**, OBC **18.5%** households • **16.9%** of the FHTC connections are under the name of a female member • Average household size **– 5.2** • **100%** positive user experience in 5/5 measures

3. Findings

3.1. Functionality status of FHTC at household level

A. Overall Functionality* (in %)

Figure 11: Functionality of HH tap connection

N$_H$(All HHs)= 1586   N$_H$=1586
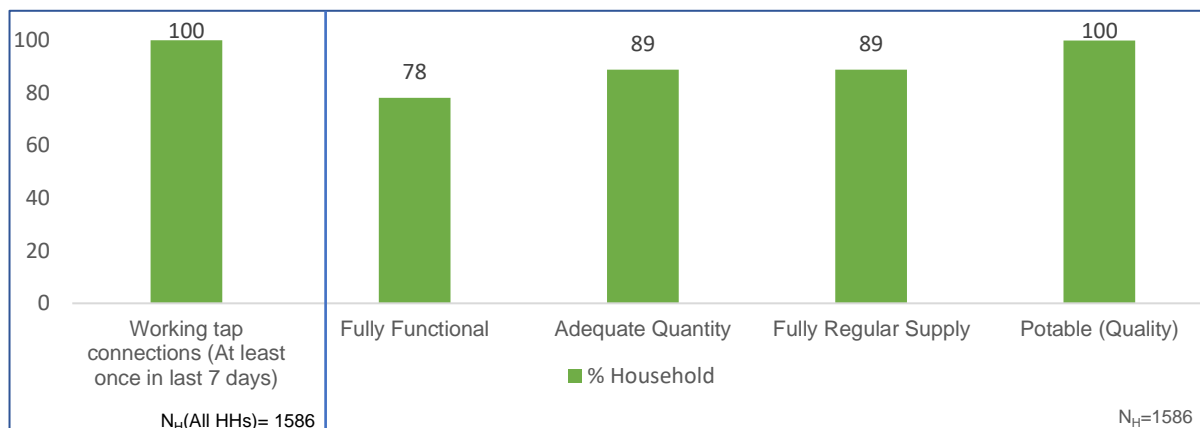
* *Fully Functional has been computed as = Adequate Quantity ∩ Fully Regular Supply ∩ Potable (Quality)*

Please note: Henceforth, N$_H$=1586 implies all HHs where water was found on the day of the survey.

It has been found that 100 percent of the sampled HHs (N=1586) had working tap connections. Moreover, 89 percent households received adequate (>=55 LPCD) water supply and almost 9 out of 10 received regular supply (89 percent) of water. The on-site testing and lab test results of the water indicates that all of the sampled households (100%) in the state receive potable water.

Out of the 1586 HHs sampled for the FHTC assessment, water quantity and quality test was carried out in 1586.

S. No.	District	Working tap connections for 7 days preceding the survey (%HH)	Quantity >=55 LPCD (% HH)	Regularity (% HH)	Potability# (% HH)
1.	Dadra And Nagar Haveli	100	86	84	100
2.	Daman	100	97	100	100
3.	Diu	100	76	87	100
4.	**Dadra & Nagar Haveli And Daman & Diu**	**100**	**89**	**89**	100

Table No. 3: Quantity, Regularity, and Quality of FHTC at the district level (%HH)

Potable water has been considered basis testing of water samples through laboratory tests for physical, chemical, and bacteriological as given in Table 5 parameters (within acceptable/ permissible range) and onsite testing of pH. The details of laboratory test are mentioned in the table given above in the glossary.

	JE-AES Affected		Aspirational Districts		Aspirational & JE-AES Affected

District level comparison across the districts indicate that Dadra and Nagar Haveli and Daman reported functionality same as the state average. The district of Daman provides more than 55 LPCD of water in more than 97 percent HHs.

100 percent HHs in the district of Daman reported to regularly receive water through FHTC. Regular supply of water is the least in the district of Dadra and Nagar Haveli at 84.

Potability of water was found to be 12 percent in the state while in Daman district potability of water was found to be 29 percent.

B. District wise functionality status

Figure 12: District wise Functionality of HH tap connection
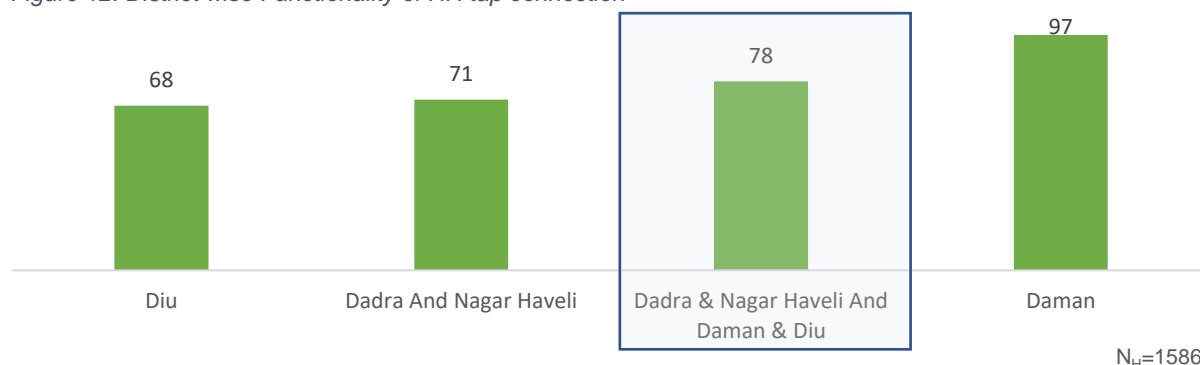
N_H=1586

* *'Functionality' has been computed as the intersection of Adequate Quantity, Fully Regular Supply and Potable (Quality) for households wherein water supply was available at the time of survey, i.e., 1586 HHs.*

78 percent HHs in the state were found to have functional HH tap water connection. Daman district reported 97 percent functional households in the state, while Dadra and Nagar Haveli and Diu reported 71 percent and 68 percent functionality.

C. Age vs functionality of schemes in the villages

Figure 13: Age vs functionality of schemes in the villages

N_s=81
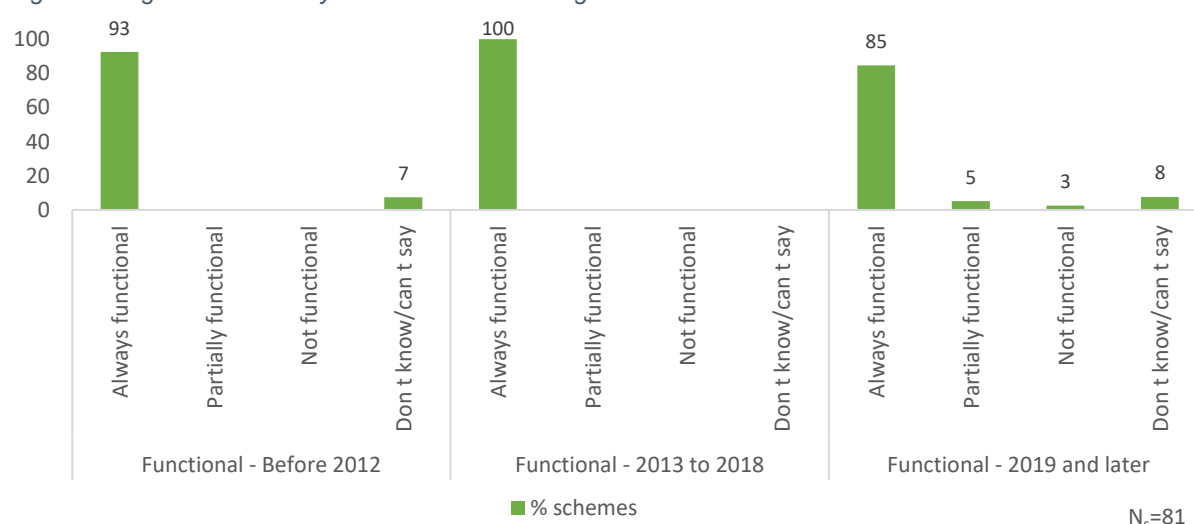
More than 8 out 10 schemes are functional since 2019 which reflects a 15-point decrease in functionality since 2018.

3.2. Quantity, Regularity, and Quality of Water

Under JJM, functionality is defined as having infrastructure, i.e., household tap connection providing water in adequate quantity (55 LPCD or more) of prescribed quality on regular basis (every day or as decided by GP and/ or its sub-committee) with adequate pressure. It also includes long-term source and system sustainability. For the purposes of this survey, the quality parameters are defined and measured on a set of 15 indicators (of which 2 indicators are tested on-site and for 13 indicators water samples have been sent to the laboratories), as mentioned in the glossary section.

A. Water quantity measured as LPCD (Litres per Capita per Day)

86% HHs reported receiving more than 55 LPCD of water.

Figure 14: Quantity of water received by households

- Adequate quantity (>55 LPCD)
- Partially adequate quantity (> 40-< 55 LPCD)
- Inadequate quantity (<40 LPCD)

N_h=1586
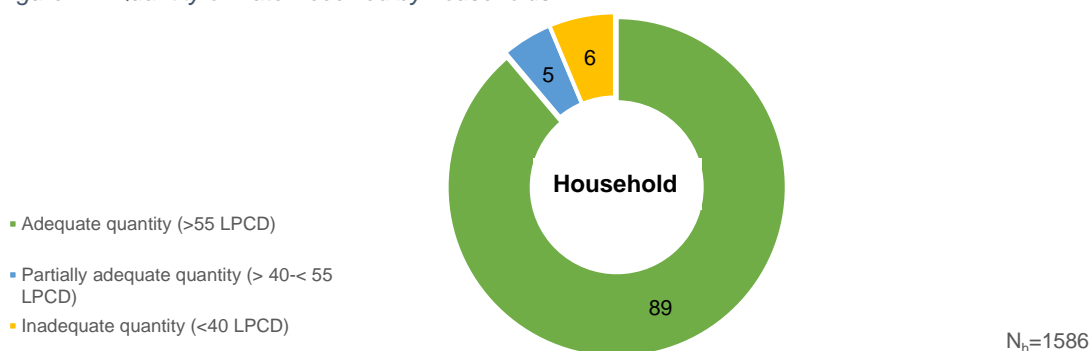
Quantity of water received across head, mid, and tail end HHs

Figure 15: Quantity of water received across head, middle and tail end households

N_h=1586
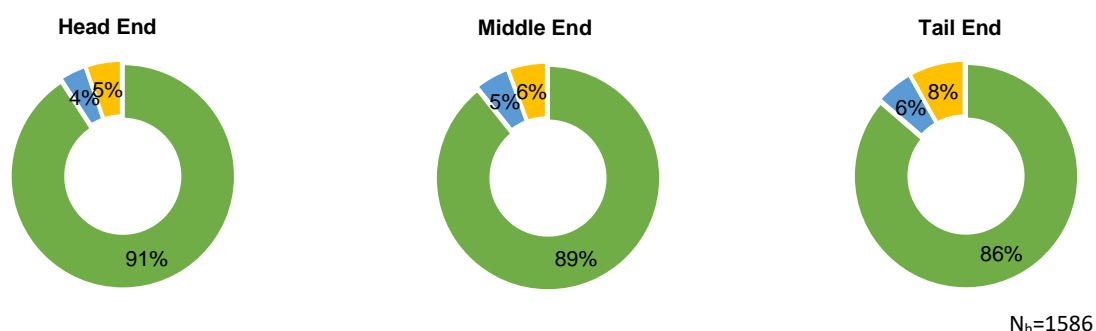
The quantity of water received across the head, middle, and the tail end was observed to have declined, and more than four-fifth (89%) of the sampled households received water in adequate quantity, i.e., greater than or equal to 55 LPCD.

Types of water storage arrangements (in %)

Figure 16: Pipe water supply storage available in village

- OHT — 25
- Sump — 10
- OHT & Sump — 55
- Direct supply — 10

N_v=77
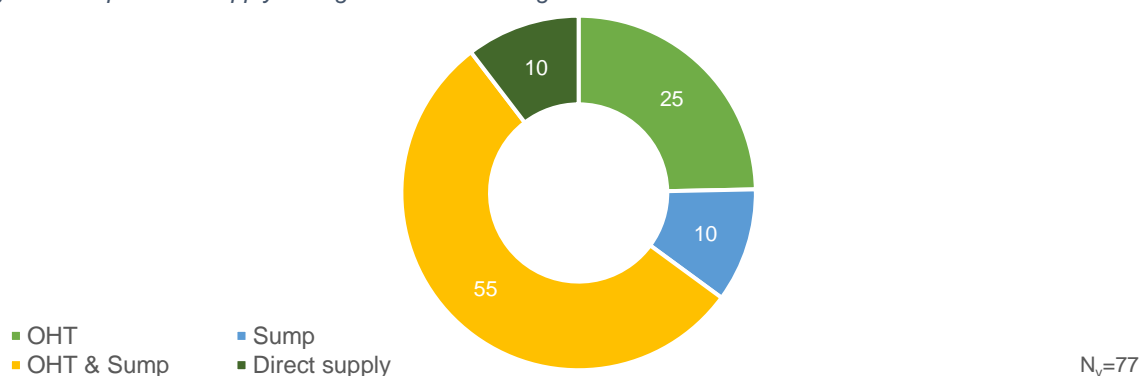
More than one out of two respondents in the state reported water being supplied through either OHT or Sump. And in 10 percent reported water being directly supplied.

Figure 17: District wise water storage arrangements at village level (% villages with OHT/ Sump)

Daman	D&NH and D&D	Dadra And Nagar Haveli	Diu
85	90	91	100

■ % Villages with OHT/sump

N_v=77
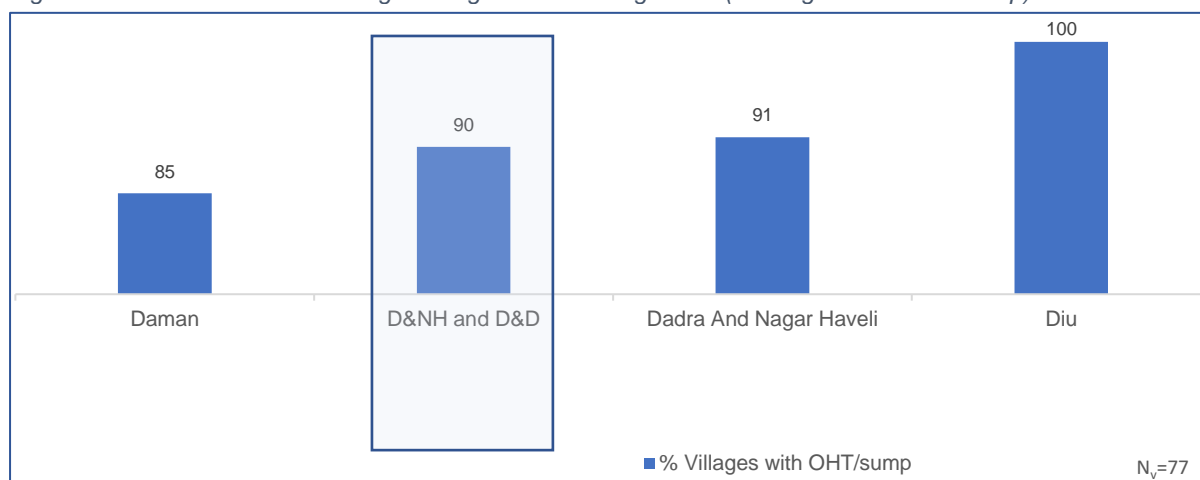
90 percent villages in the state have either an OHT or a sump for storing water for supplying to the households. Diu is the only district where all villages have either an OHT or a sump (100 percent), followed by Dadra and Nagar Haveli in which 91 percent of the villages have facilities to store water for supplying to the households.

B. Regularity of water supply to villages and households

89% HHs receive a regular supply of water (as per agreed schedule).

Figure 18: Regularity of water received by households
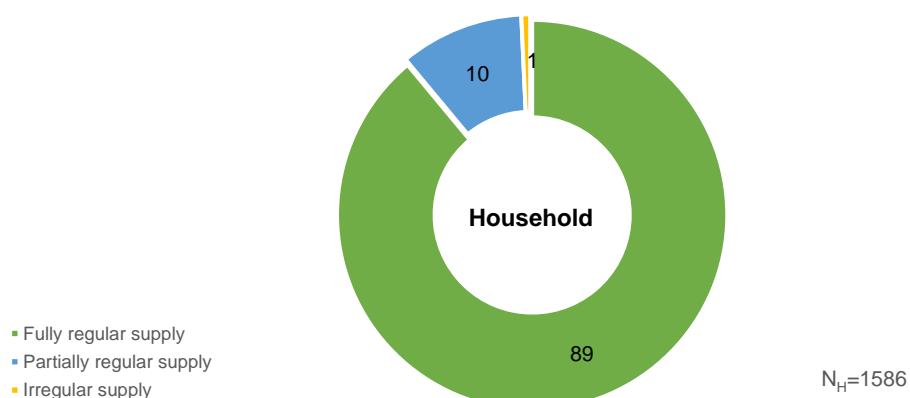
Regularity of water received across head, mid, and tail end HHs

Figure 19: Regularity of water received across head, middle and tail end households
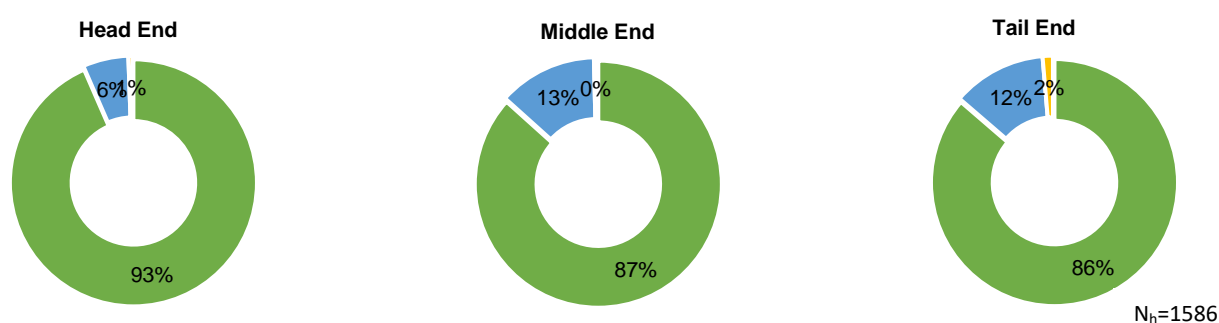
Water is more regularly available at the head-end households of the PWS in comparison to the tail end.

Figure 20: Average no. of times water is supplied in a day
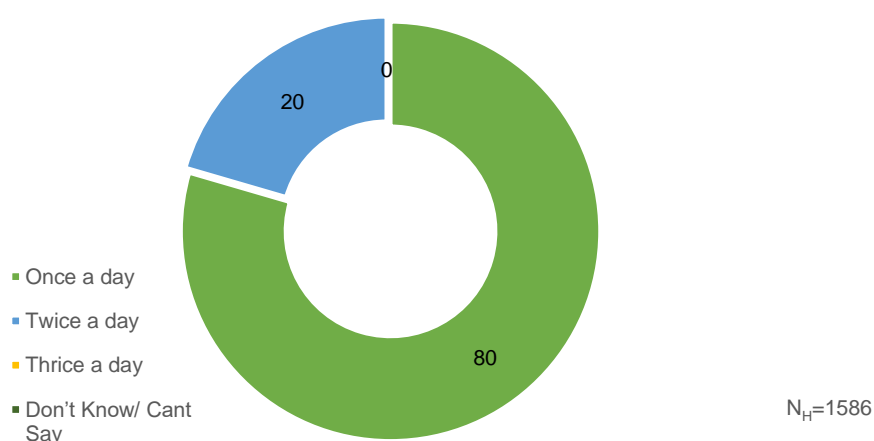
80% of households receive water once a day. The average duration of water supply across the state was reported to be **3 hours per day.**

Average water supply days in a week to households

Figure 21: Average number of days households receive water supply in a week (in %)

N_H=1586
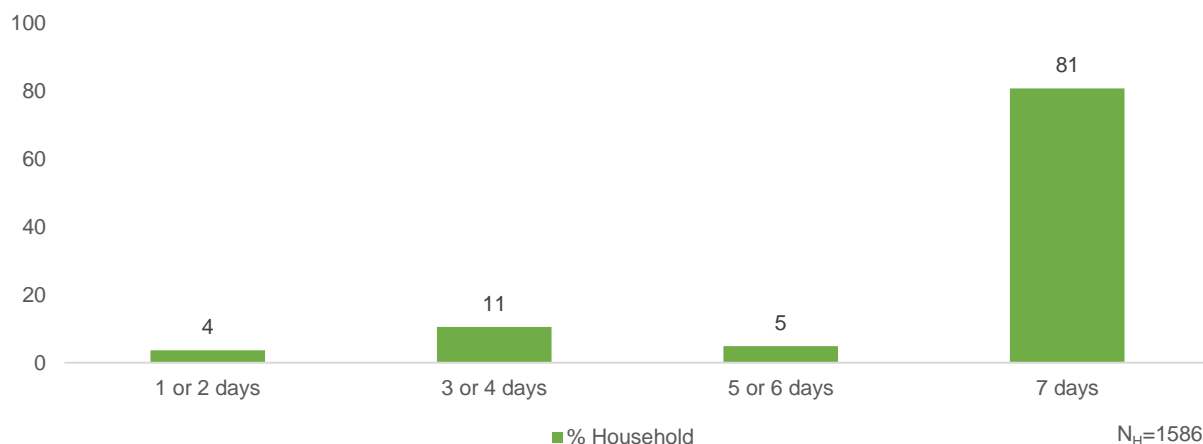
C. Potability Water – Quality

Figure 22: Potable water received by households
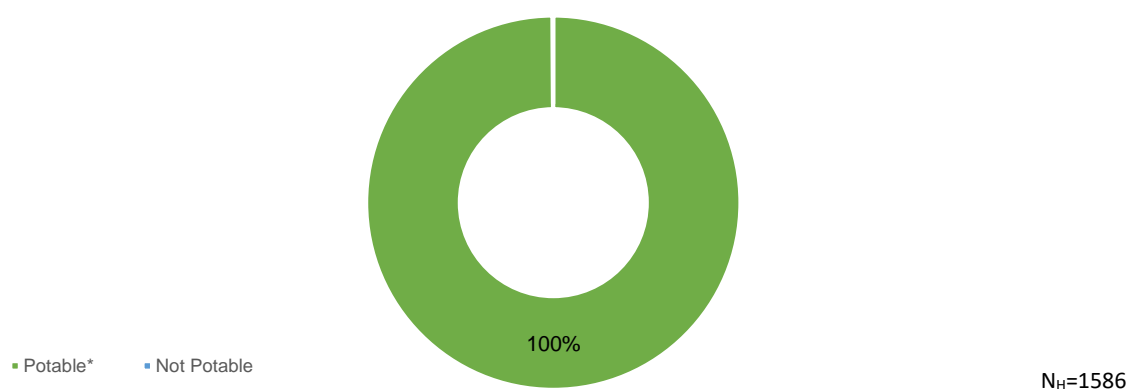
N_H=1586

*Potable water has been considered basis testing of water samples through laboratory tests for physical, chemical and bacteriological as given in Table 5 parameters (within acceptable/ permissible range) and onsite testing of pH. The details of laboratory test are mentioned in the table given above in the glossary.

Among the sampled households in Dadra and Nagar Haveli and Daman and Diu where water was found on the day of the survey, the potability of water was found to be 100%.

Table No. 4:   Village quality parameters reported within permissible range (% sample within permissible range)

Quality Parameters (N$_v$=77)	Water Samples Tested from Public Institutes			
	Anganwadi Centre	Health Facility	Schools	Others
pH (on-site)	100	100	100	100
Turbidity	100	100	100	100
Total Hardness	100	100	100	100
Total Alkalinity	100	100	100	100
Chloride	100	100	100	100
Ammonia	Not Tested			
Iron	No History			
Nitrate	100	100	100	100
Sulphate	Not Tested			
Total Dissolved Solids	100	100	100	100
Bacteriological Test (Absence)	100	100	100	100
Fluoride	No History			
Arsenic	No History			

Table No. 5:   Household water quality parameters reported within permissible range (in % sample within permissible range)

The number of water samples submitted to the laboratory for the calculation of the different parameters was the same as mentioned in the rest of the report (sample size for HH water submitted to labs=1586). However, the below data are presented based on the results received from the laboratories and the respective base sizes are mentioned for each of the parameters separately.

Quality Parameters	No of water samples tested	% Samples within permissible range
pH (on-site)	1586	100
Turbidity	157	100
Total Hardness	74	100
Total Alkalinity	74	100
Chloride	231	100
Ammonia	Not Tested	
Iron	No History	
Nitrate	74	100
Sulphate	Not Tested	
Total Dissolved Solids	231	100
Bacteriological Test (Absence)	74	100
Fluoride	No History	
Arsenic	No History	

Safeguarding piped water supply for unforeseen bacteriological contamination- Presence of Residual Chlorine (RC)

The Residual Chlorine (RC) in the UT of Dadra and Nagar Haveli and Daman and Diu was found in 12% samples. Also, 88% of the samples had no RC. 100% of water samples passed the bacteriological contamination test.

The Residual Chlorine in piped water supply is one of the most important preventive actions to assure quality of water against bacteriological contamination from source to consumption. The presence of residual chlorine within permissible limits is indicator of well-maintained and healthy piped water supply system.

It is advised that behavioural change communication campaigns on appropriate dosage of residual chlorine is held in all villages and monitoring system for chlorine dosing is established. The FTK must have residual chlorine testing facility for effective WQM&S.

Comment on functioning of District Lab:

The district lab tested water samples for 7 water quality parameters. 1728 water samples were submitted, and 256 water samples were tested, and reports made available. The turnaround time for testing was more than 48 hours in most cases. Given this feedback, it can be conferred that these labs have limited scope to take up samples from the general public at large on a regular basis.

Table No. 6:	Performance of Labs					
Sl. No	District	Lab available	HH surveyed	Samples submitted	Report received	Overall lab experience
1	Dadra And Nagar Haveli	Yes	1061	1133	0	The labs did not have capacity to test more than ~30 number of samples and had issues of human resource, regents and even another sample has been dispatched in other district labs etc
2	Daman	Yes	450	512	174	The labs did not have capacity to test more than ~30 number of samples and had issues of human resource, regents etc.
3	Diu	Yes	75	83	82	The labs did not have capacity to test more than ~30 number of samples and had issues of human resource, regents etc.

Households reported that their HH tap-water was collected and tested in the last one year

68% of HHs reported that their HH tap-water was collected and tested in the last one year.

Figure 23: HHs where water samples were collected and tested in last 1 year

■ % HH - water tested in last 1 yr

N_H=1586
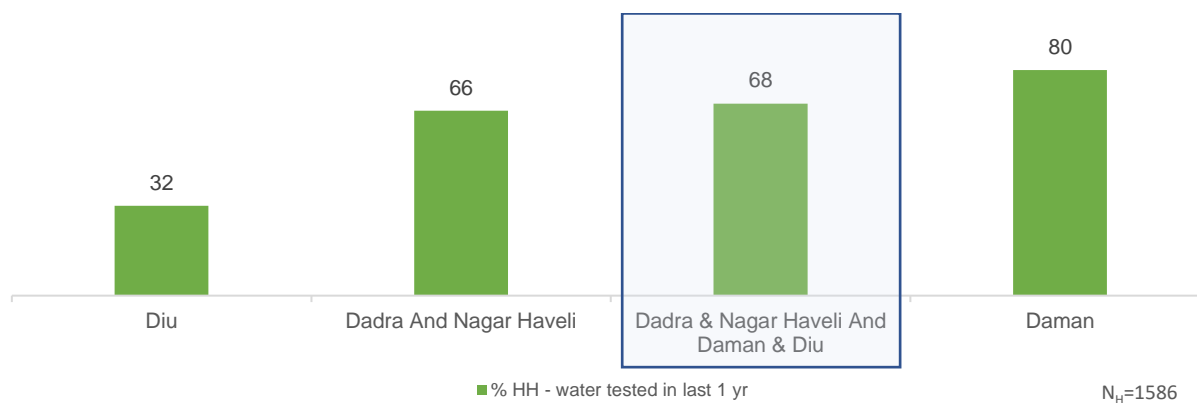
3.3. Operation and Maintenance (O&M) of schemes at village level

Schemes reported to have faced challenge in village

The single village scheme faced the most challenges (6%) in comparison to the other schemes in the state.

Figure 24: Schemes reported to have faced challenge in village
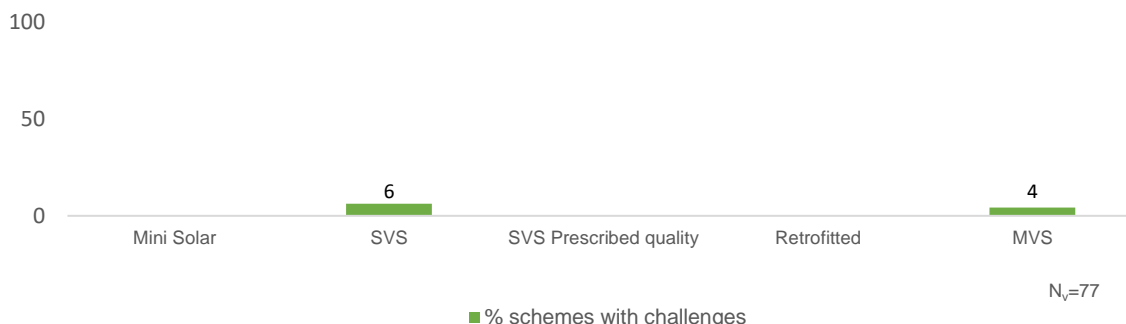
Type of challenge faced by the schemes

The most faced problem varied from one scheme to another. However, 'leakage/damage to pipeline' is a problem that was found unanimously in all the schemes.

Figure 25: Type of challenge faced by the schemes
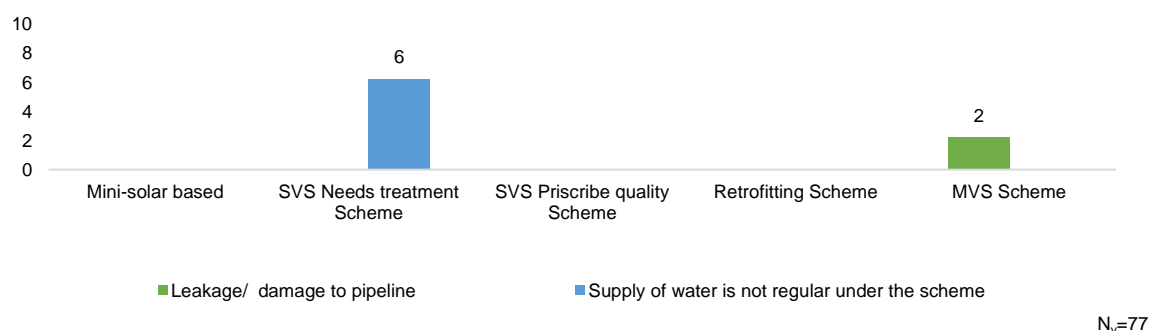
A. Presence of VWSC/Pani Samiti

61% of villages in the state reported to have a VWSC or a Pani Samiti.

Figure 26: Villages where VWSC/ Pani Samiti is present
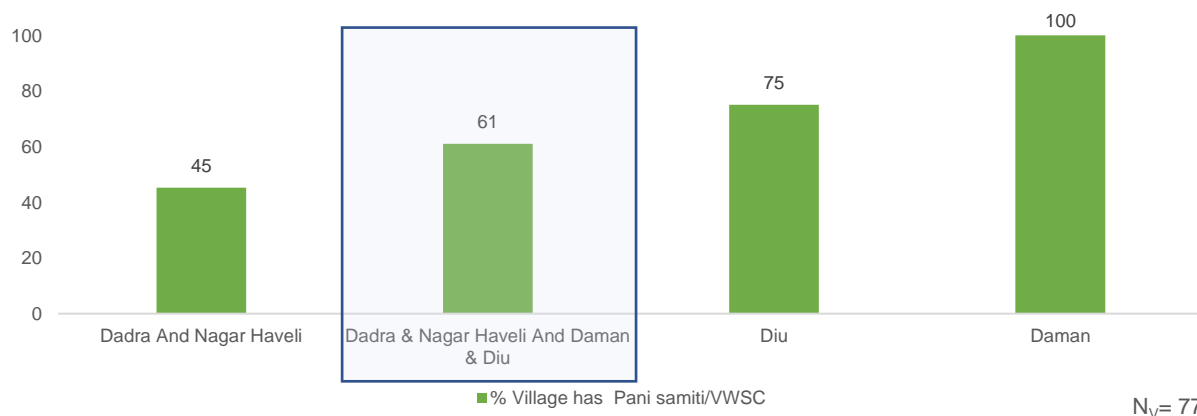
B. VWSC/Pani Samiti with more than 50 percent female members

60% of villages in the state reported to have a VWSC or a Pani Samiti where more than 50% of the members are female.

Figure 27: VWSC/ Pani Samiti with more than 50 percent female members

N_V(All Villages in which VWSC is present)= 47
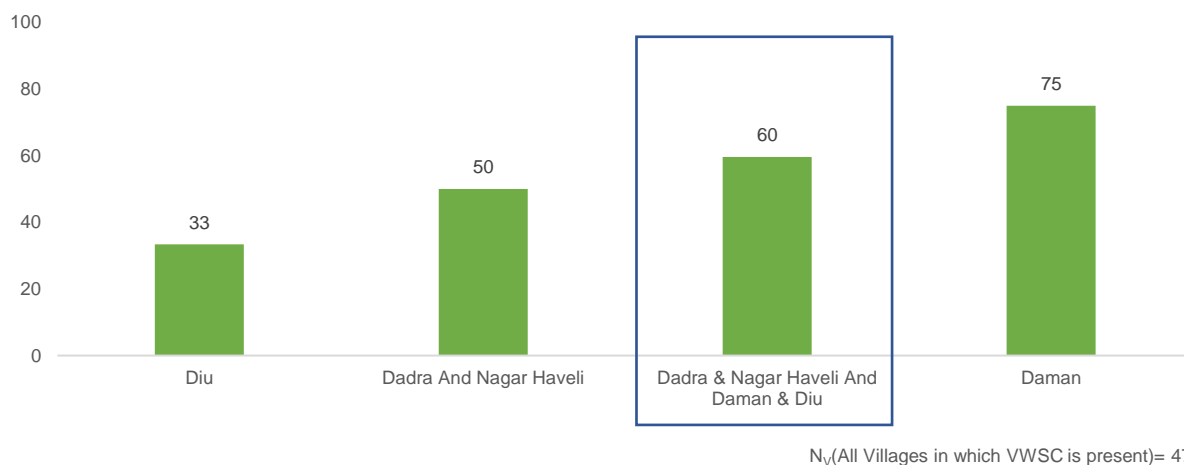
C. VWSC Meetings in last one year

Across the villages in the state, that reported to have VWSC/Pani Samitis (47 villages), 2 meetings in last one year was reported the most (51%)

Figure 28: VWSC meetings held in last one year

■Once ■Twice ■Thrice ■Four times ■More than 4 ■Never N_V=47
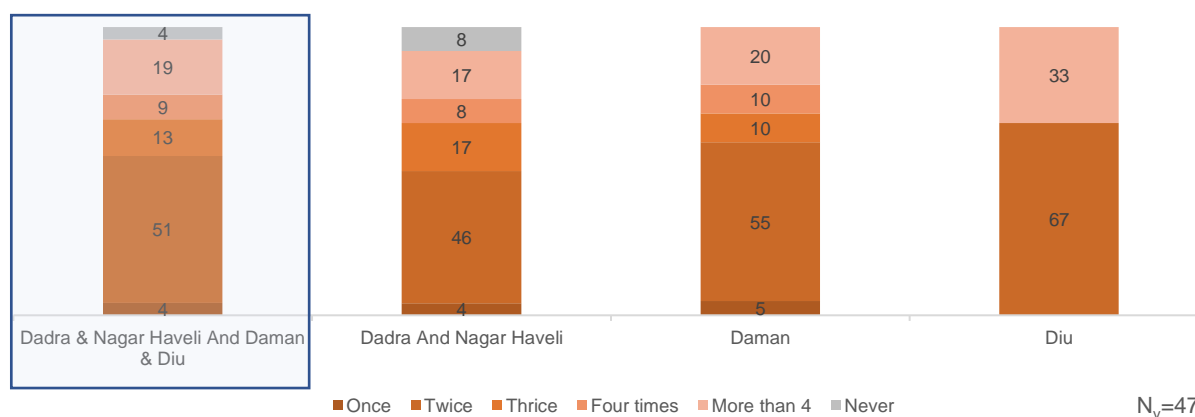
3.4. Utilization of water at HHs for drinking and other activities

100% of HHs reported that their daily requirement of water was being met by HH tap connections

Figure 30: Daily household's requirement of water being met by FHTC

- Fully met
- More than 3/4th
- > Half but <3/4th
- Half or less

N_H=1586
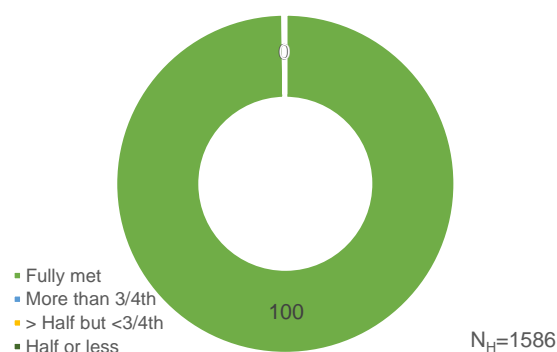
91% HHs reported HH tap connections as their primary source of drinking water

Figure 29: Households reported FHTC as primary source of drinking water

- Unimproved Source
- FHTC Source
- Other Improved Source

N_H=1586
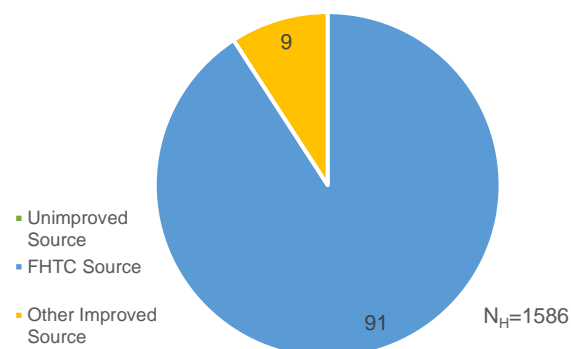
All (100%) HHs reported their daily requirement of water being fully met by the HH tap connections. And 91 percent HHs reported used household tap connection for drinking water (primary source). About 9 percent of the HHs even though have reported household tap connections to fully meet their requirements, were not found using the same for drinking purposes.

Overall, **100% of HHs** reported using improved primary source of drinking water, out of which **91% of HHs** reported HH tap water as their primary source.

Figure 31: District wise distribution of household's reported FHTC as primary source of drinking water

- % HH using FHTC source
- % HH using other improved source
- % HH using unimproved source

N_H=1586
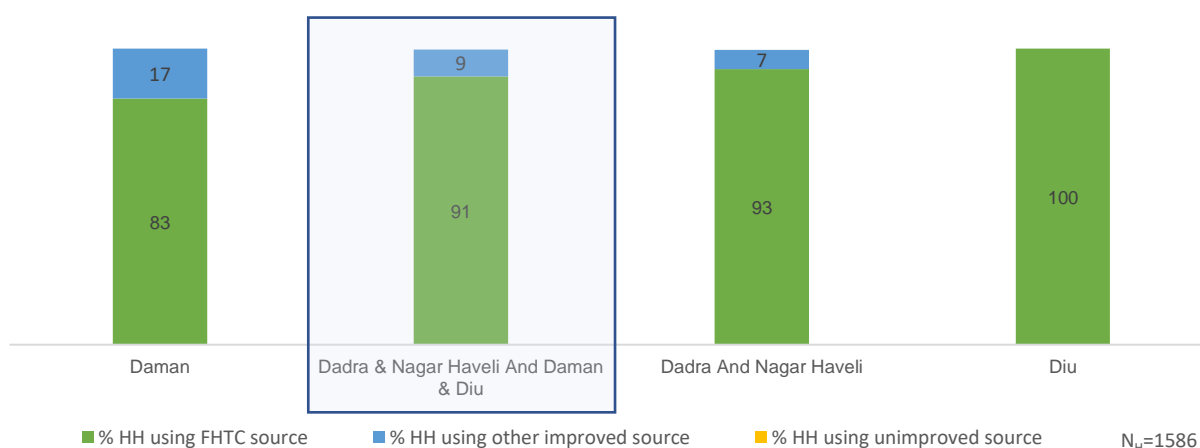
A. Households who practice purifying of water before drinking

Figure 32: Households who practice of purifying water before drinking

Legend: ■ % HH purifying water before drinking   ■ % HH not purifying water before drinking N_H=1586
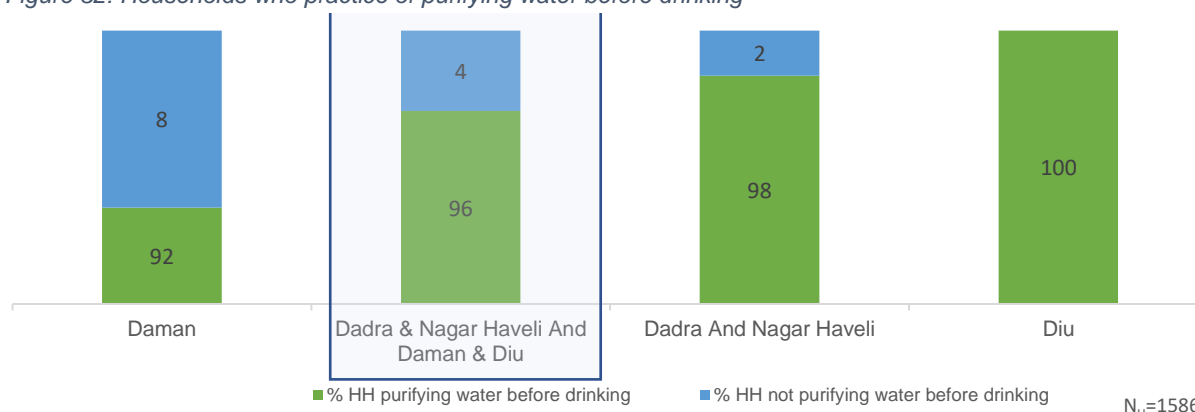
Practice of purifying water before drinking was reported all households in Diu (100%) where 100% HHs reported using HH tap water as primary drinking water source, while the least was reported in Daman (92%) where 83% HHs reported using HH tap water as a primary drinking water source.

B. Households paying water service delivery charges

In Dadra and Nagar Haveli and Daman and Diu, around 36% of the sampled households were found to be paying service delivery charges, Diu being the district with the highest percentage of such households (100%) and Dadra and Nagar Haveli being the districts in which only 6% households reported paying water service delivery charges.

Figure 33: Households paying water service delivery charges

Legend: ■ % HHs paying service delivery charges N_H=9064
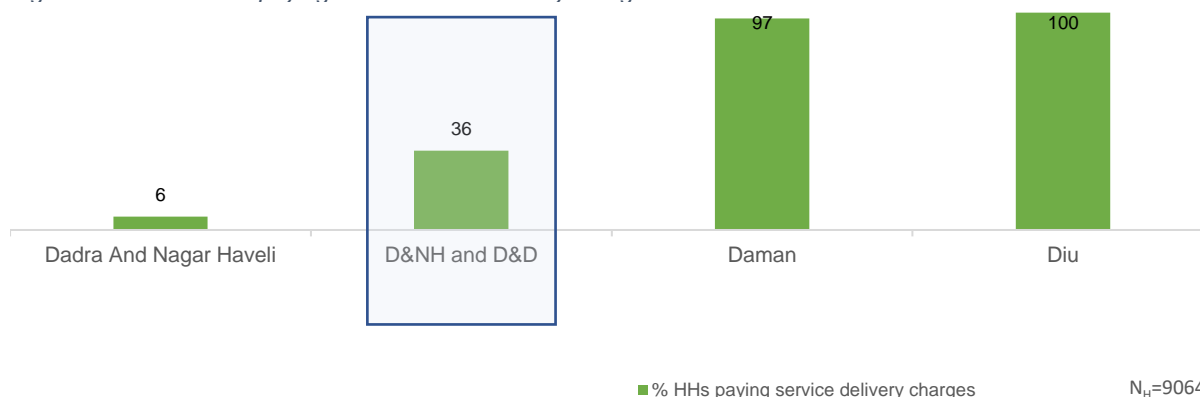
C. Storage mechanism used by households

Figure 34: Households reported using some storage mechanism

% HHs with storage mechanism   % HHs without storage mechanism

N_H=1586
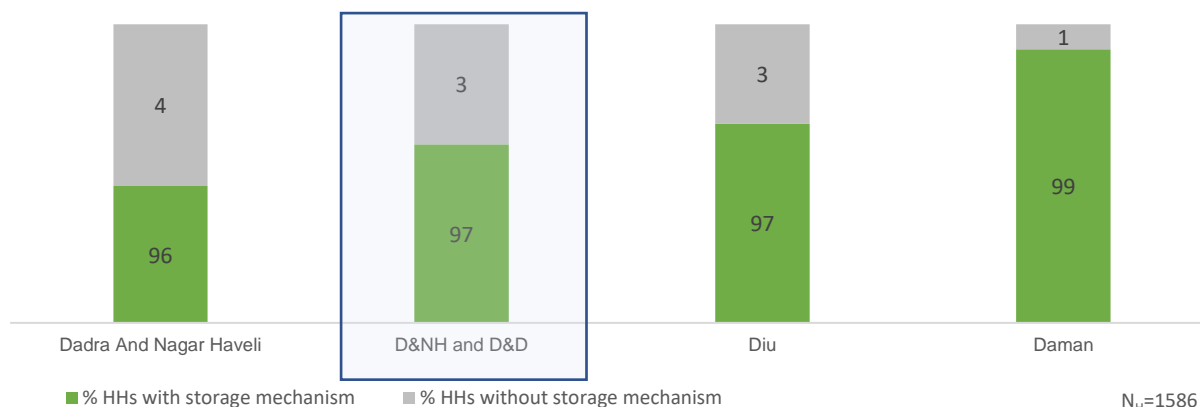
D. Households using booster pumps

Overall, **9% HHs** reported using booster pumps to maximize the water flow through their piped water connections. Diu reported 45% of HHs using booster pump in the state while Dadra and Nagar Haveli reported only 5%

Figure 35: Households reported to use of booster pumps

% HHs using booster pumps

N_H=1586
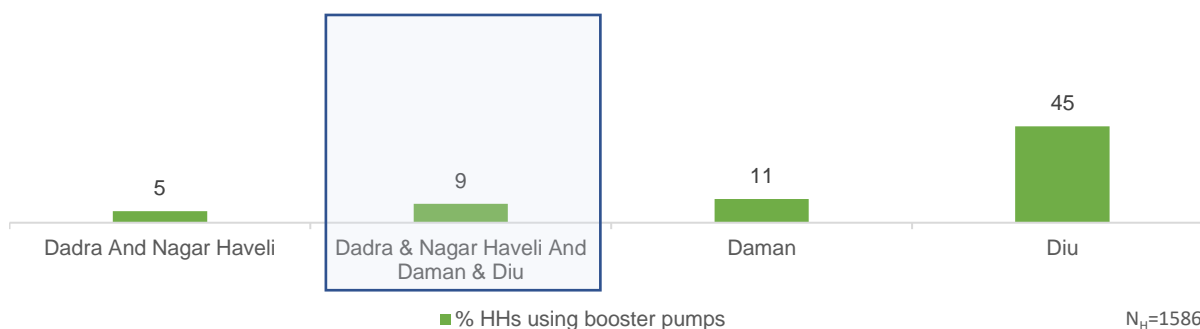
E. Households who faced shortage of water

In the state, **26% HHs** faced shortage of water during any time of the year, while all **26% HHs** reported having some mechanism to cope with scarcity of water.

Figure 36: Households who faced water scarcity

HH with water scarcity

N_H=1586
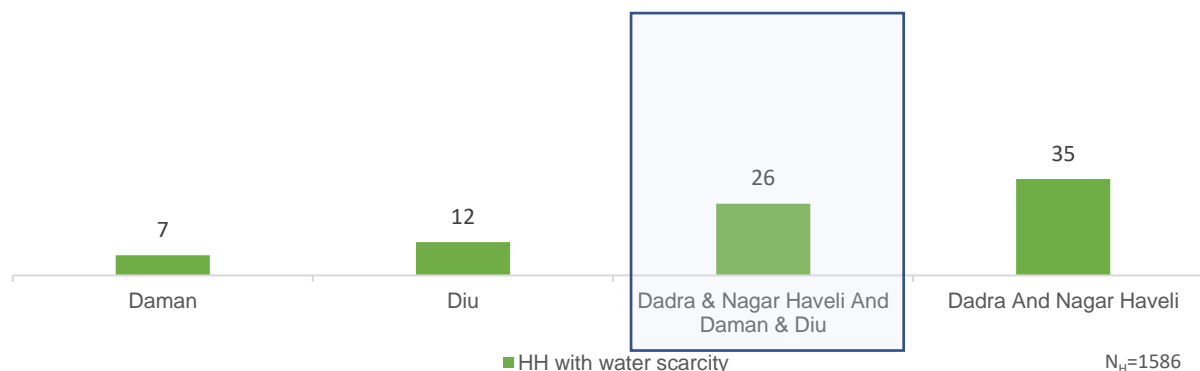
F. Household with a mechanism to cope water scarcity

30% HHs reported having some mechanism to cope with scarcity of water.

Figure 37: Households reported to have some mechanism to cope with scarcity of water

N_H=2721
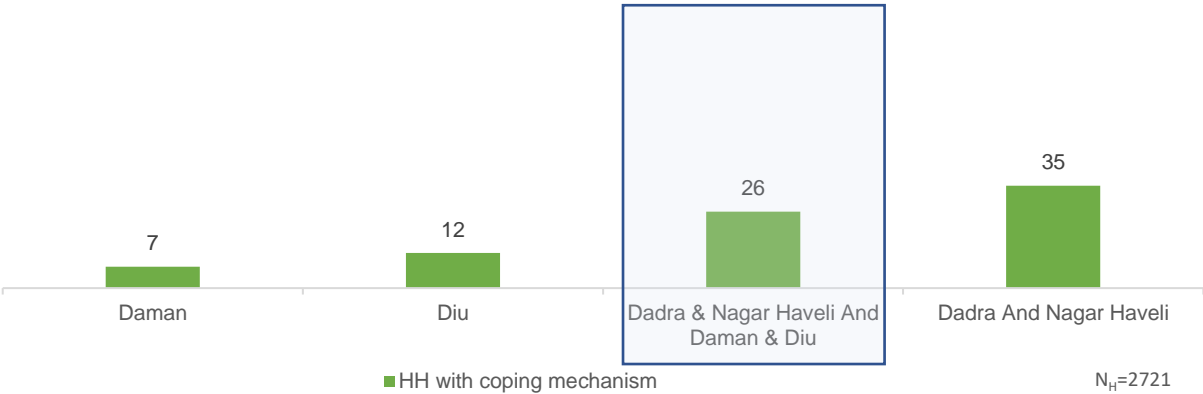
3.5.   Source sustainability at the village level

Schemes based on surface and ground water

4% of schemes reported to be based on surface water source while 22% of schemes reported to be based of ground water sources

Figure 38: Schemes based on water source in village
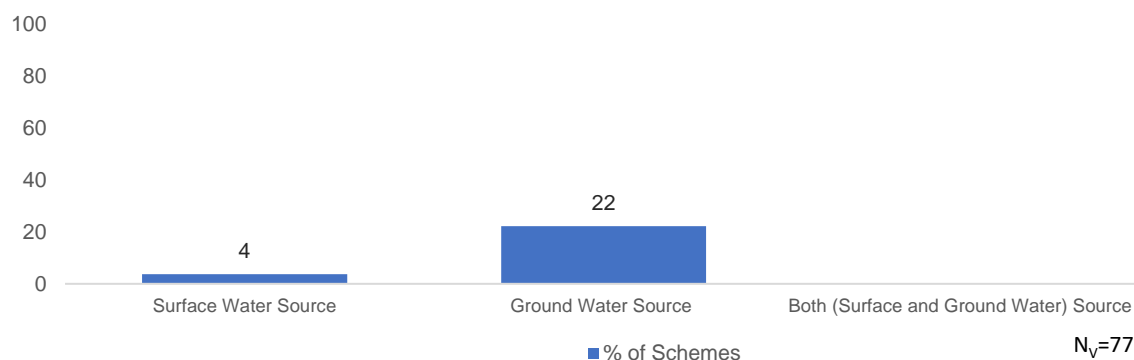
*'Surface Water Source' is Stream, Spring, Glacier, River, lake, pond etc. and Groundwater Source is open well, borewell, tube well, handpump, spring, etc.

Villages reported having presence of a groundwater source

Figure 39: Villages reported the presence of groundwater sources and among those how many reported to have a recharge structure
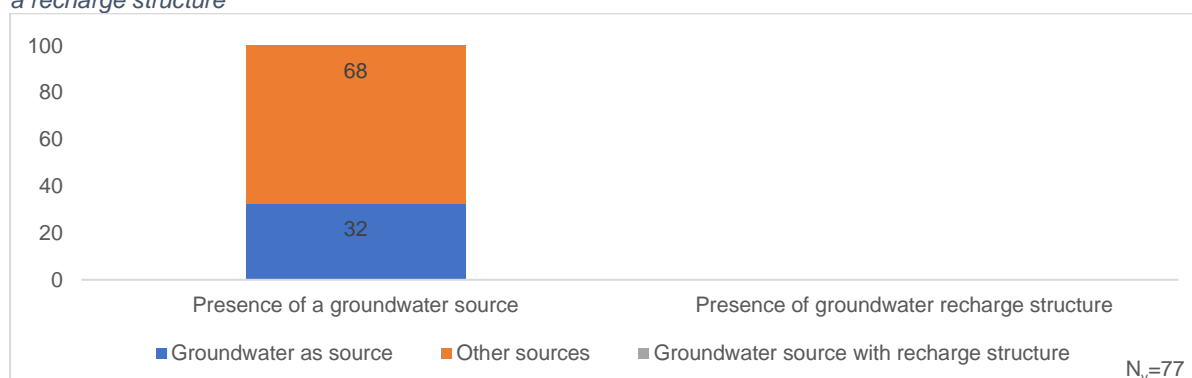
In the state, **32% villages** reported the presence of groundwater sources like improved dug wells and borewells. Out of which, no villages reported reported having a recharge structure.

3.6. Water quality monitoring and surveillance in the villages

A. Water quality management by VWSC: Availability of FTK with the Pani Samiti/ VWSC

Figure 40: Availability of field test kits with VWSC/ Pani Samiti

Diu	Dadra And Nagar Haveli	Dadra & Nagar Haveli And Daman & Diu	Daman
25	32	32	35

■ FTK available

N_v=77
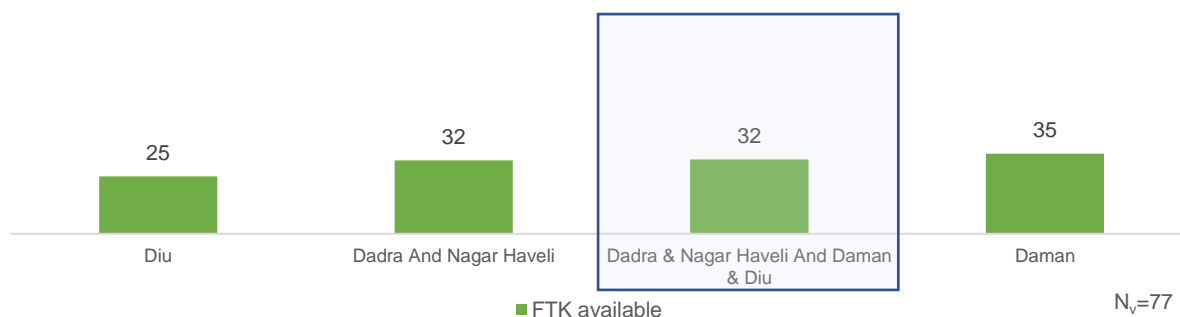
With regards to water quality testing in the village by VWSC, 32% villages in the state reported having available field test kits. Daman reported 35% villages having available field test kits for water quality testing, while Diu reported only 25%.

B. Persons trained to use field test kits

Overall, **45% of villages** in the state reported to have either VWSC/Pani Samiti or pump operator trained to use field test kits for testing the quality of water on-site. Daman reported 60% VWSC/Pani Samiti or pump operator trained to use field test kits while Dadra and Nagar Haveli reported 40%.

Figure 41: Persons trained to use field test kits

Dadra And Nagar Haveli	Dadra & Nagar Haveli And Daman & Diu	Diu	Daman
40	45	50	60

■ % Villages – VWSC/PO trained to use FTKs

N_v=77
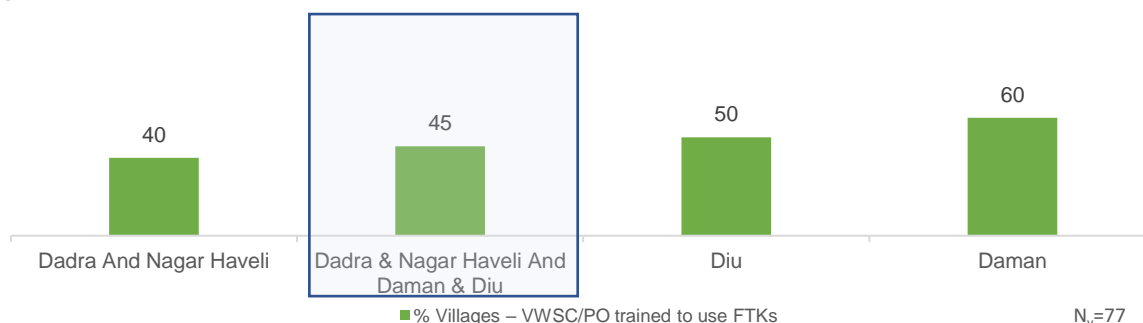
C. Water quality management by VWSC: Frequency of testing using FTK

Across the state, about two third of the total sampled villages (64%) reported that the quality of water (at different points in the respective villages) was not checked using FTKs in last one year. Among the districts, Diu had the highest proportion of such villages, wherein 25% of its villages reported using FTKs three or more times in last one year.

Figure 42: Frequency of testing using FTK in villages

Legend: ■ % 3 or more tests   ■ % 1-2 tests   ■ % No tests done N_v=77
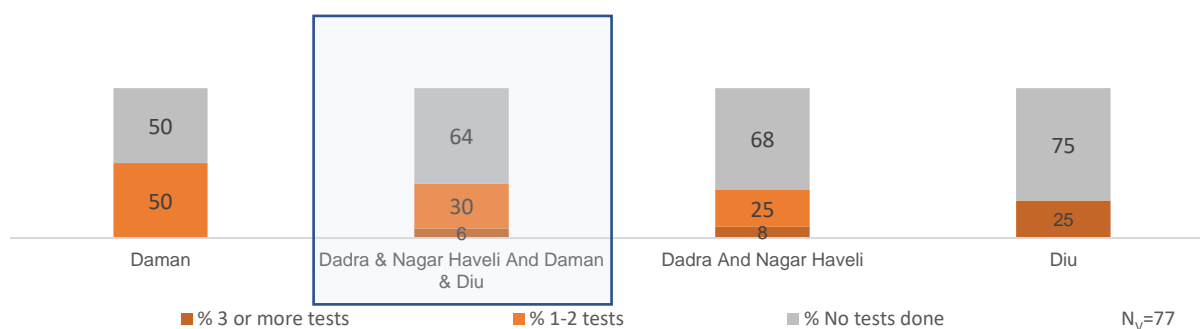
D. Water quality management by VWSC: Frequency of lab testing

Across the state, about two third of the total sampled villages (62%) reported that the quality of water (at different points in the respective villages) was not checked using FTKs in last one year. Among the districts, Diu had the highest proportion of such villages, wherein 25% of its villages reported using FTKs three or more times in last one year.

Figure 43: Frequency of lab testing

Legend: ■ % 3 or more tests   ■ % 1-2 tests   ■ % No tests done N_v=77
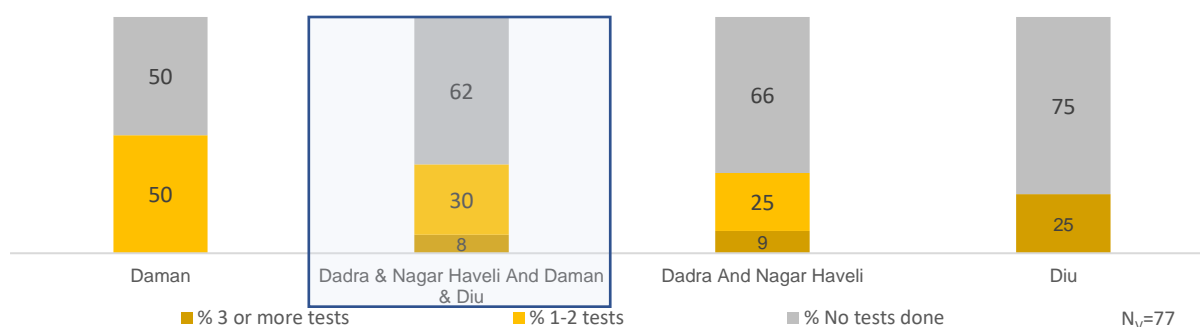
E. Water quality management by VWSC: Bacteriological test done in last one year

With regards to water quality testing in the village by VWSC, **40% villages** in the state reported having bacteriological test done in the last one year.

Figure 44: Percent villages in which Bacteriological test was done in the last one year

Legend: ■ Bacteriological test done in last one year N_v=77
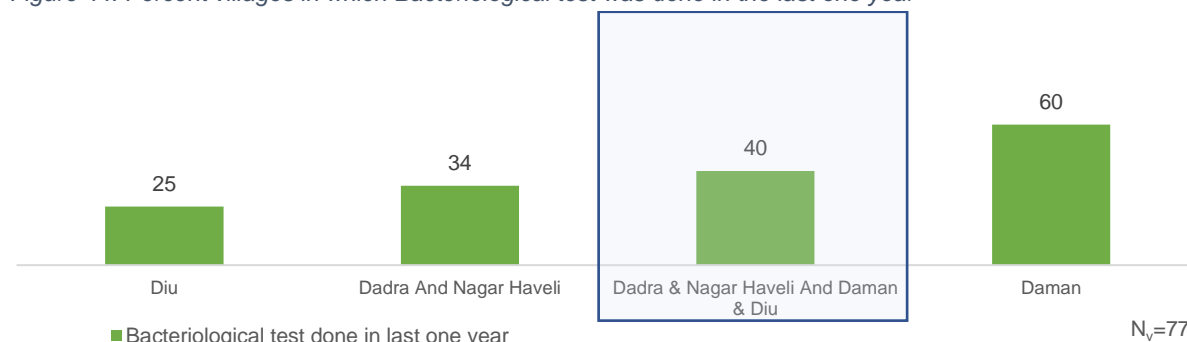
F. Water quality management by VWSC: Bacteriological test done through laboratory testing in the last one year

Laboratory based bacteriological tests, in last one year, was reported by **36%** of sampled villages.

Figure 45: Bacteriological test done through laboratory testing in the last one year

N_v=77
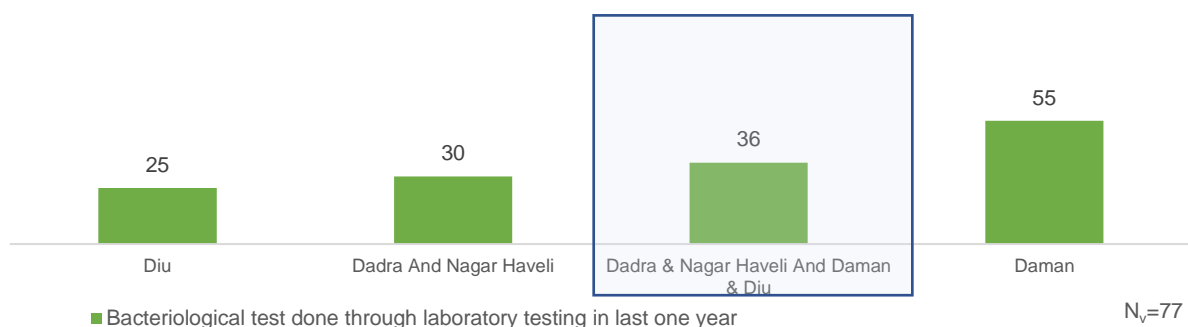
G. Water quality management by villages: Availability of chlorination mechanism in the village

Only **1% villages** reported that there is availability of chlorination mechanism in the village but during onsite testing of water at household level only 12% households tested to have for presence of chlorine.

Figure 46: Villages having a mechanism for chlorination

N_v=77
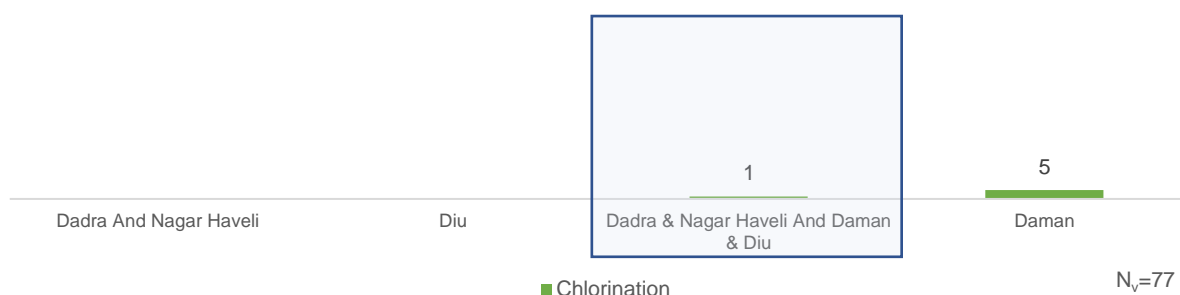
3.7. Management of water service delivery at village level

A. VWSC/Pani Samiti responsibility for O&M of PWS schemes

Figure 47: VWSC/Pani Samiti responsibility for O&M of PWS schemes
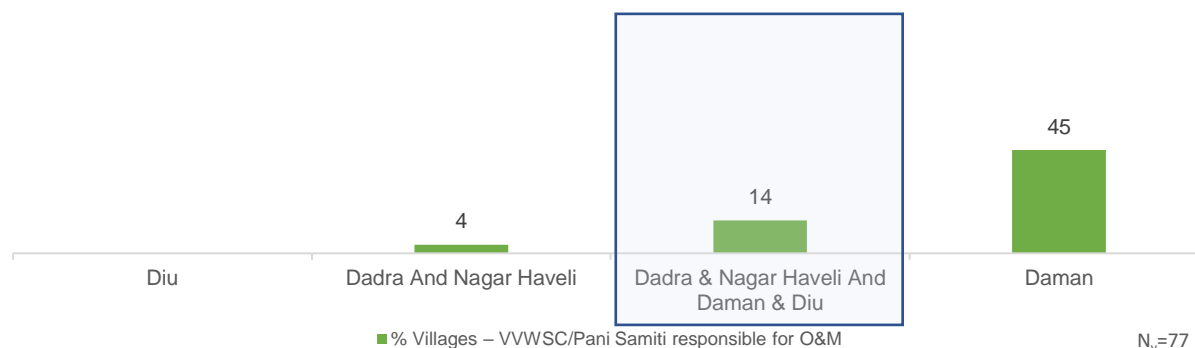
In the state, **14% villages** that have VWSC/Pani Samiti reported to be responsible for operation and maintenance of PWS. Diu district reported that VWSC/Pani Samiti are not responsible for operation and maintenance of PWS.

B. Villages levying water service delivery charges from households

Figure 48: Villages levying water service delivery charges from households
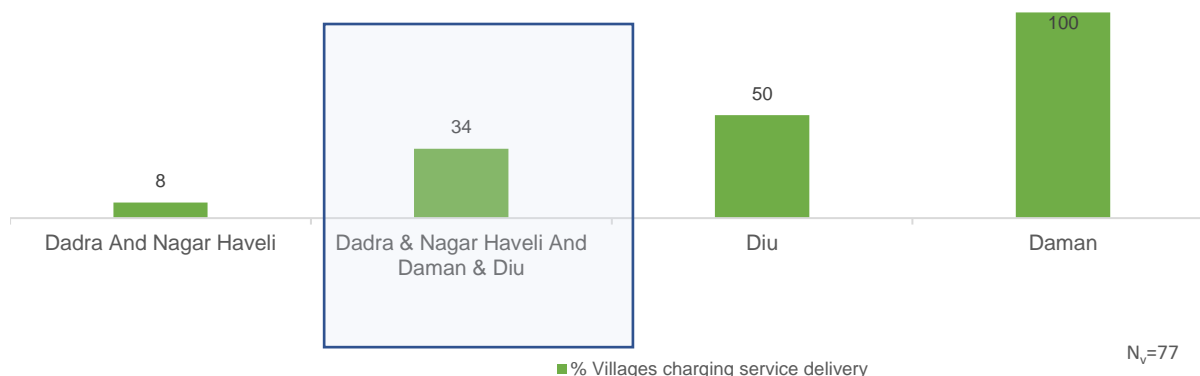
Overall, **34% of villages** in the state levy charge for water service delivery to households.

C. Convergence of JJM activities with other schemes in villages

Figure 49: Village reported convergence of JJM activities with other schemes in the village
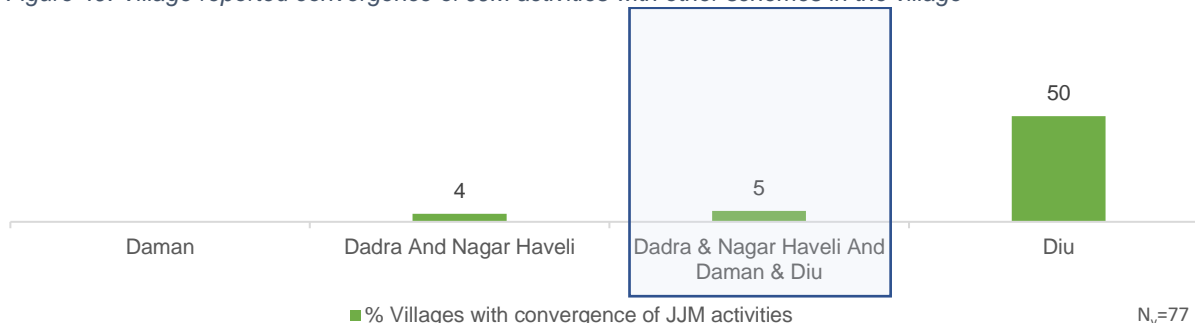
In the state, only **5% villages** in the state reported convergence of activities under JJM with other government programmes/ schemes on skill development, capacity building and training, and awareness generation.

D. Villages where signages were observed

Signages about JJM were observed in 5% of the sampled villages. District Diu had the highest proportion of villages where signages were observed (25%).

Figure 50: Villages in which signages about JJM was observed

% Villages in which signages was observed

N_v=77
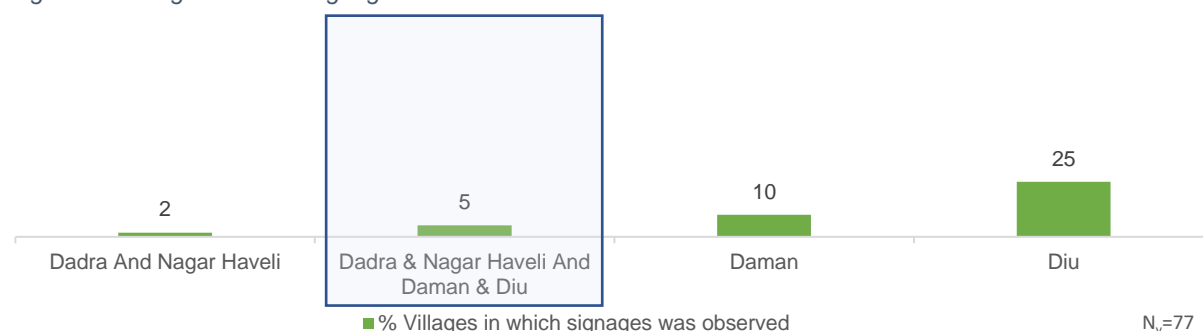
3.8.   Status of Operation & Maintenance

A. Villages with skilled manpower for operation and maintenance (O&M) of PWS schemes

Figure 51: Villages reported having skilled manpower for O&M of PWS schemes

% Villages with skilled manpower

N_v=77
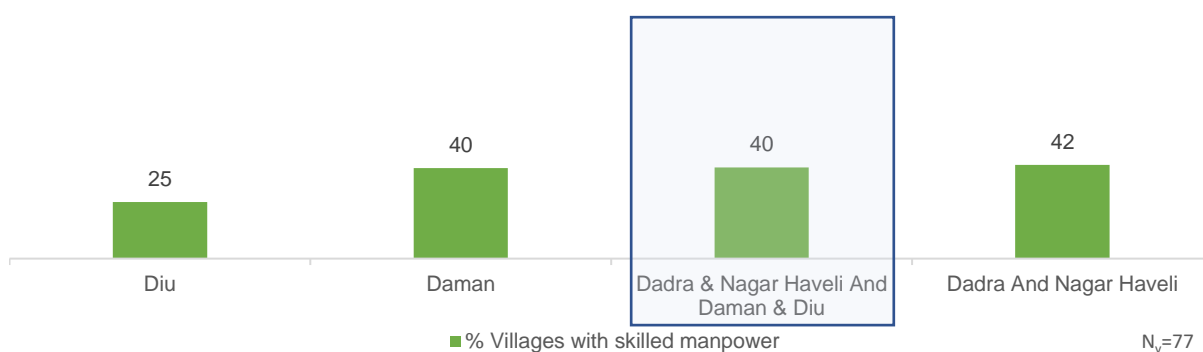
Across the state, **40% villages** in the reported having identified skilled manpower for O&M of PWS schemes, the most reported to be in Dadra and Nagar Haveli (42%) and the least in Diu (%)

B. Villages with O&M challenges

In the state, **9% of villages** in the state reported to have faced challenges with respect to O&M of PWS schemes

Figure 52: Villages reported having faced O&M challenge

% Villages with O&M challenges

Nv=77
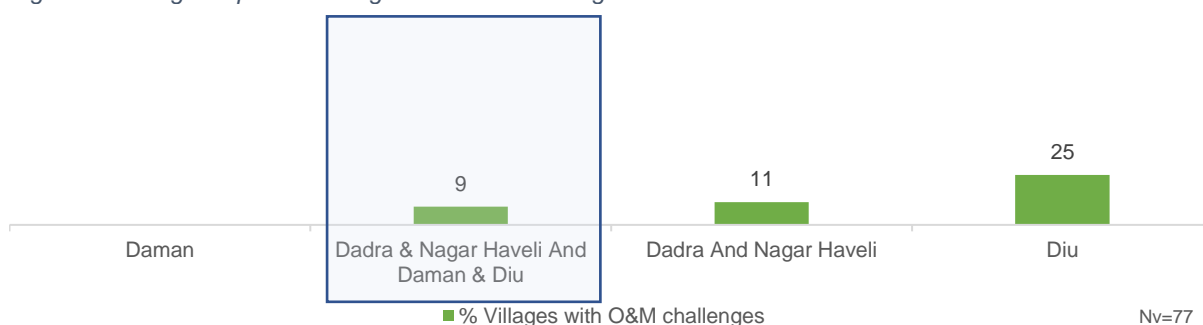
C. Details of challenges faced

Out of the 9% of villages that had faced challenges with respect to O&M of PWS schemes (7 villages), 'less water being received from multi village/regional scheme' was attributed the most – at 86%.

Figure 53: Details of O&M challenges faced by village
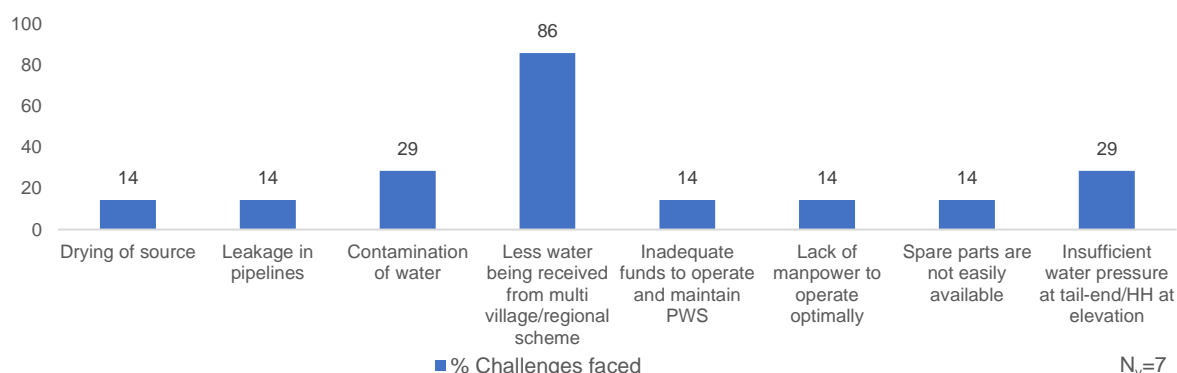
D. Responsible for O&M

Figure 54: Different bodies responsible for O&M
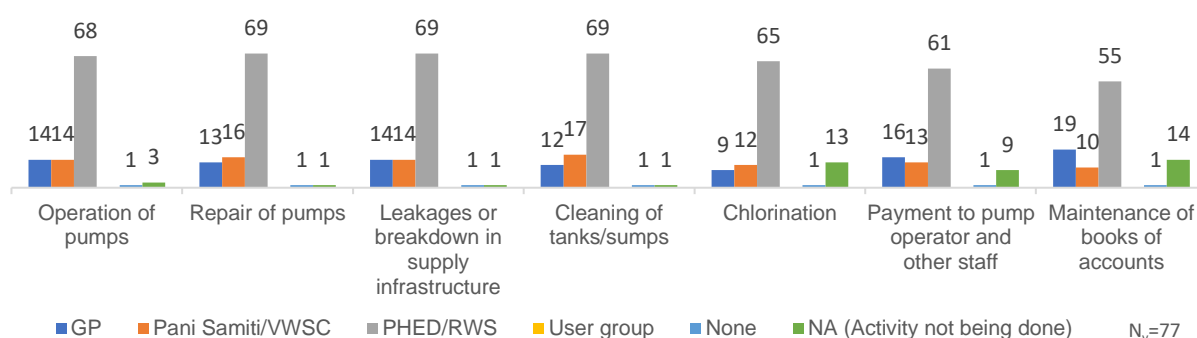
Across the state, villages reported 'PHED' the most for being responsible for all essential aspects about operation and maintenance of PWS schemes.

E. Villages with community level monitoring of water wastage

45% of villages in the state reported to have community level monitoring of water wastage.

Figure 55: Villages reported having community level monitoring of water wastage
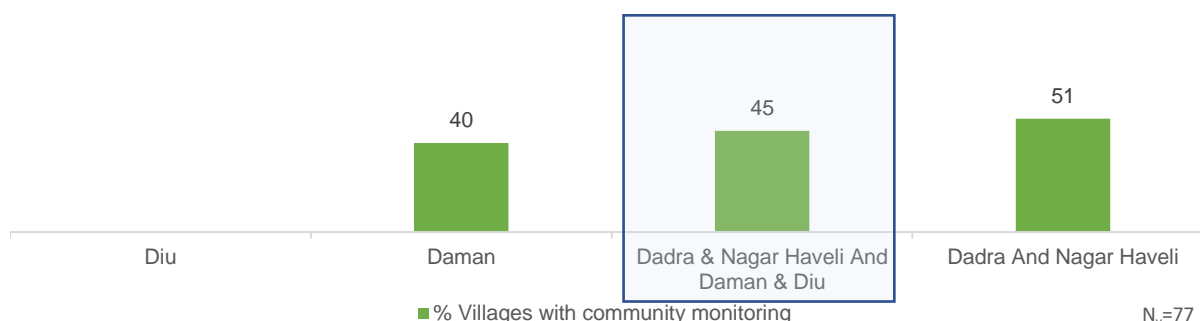
3.9. Status of service delivery related grievances and redressal

A. Village level

Grievance redressal at village

Figure 56: Reporting of grievance redressal at village level
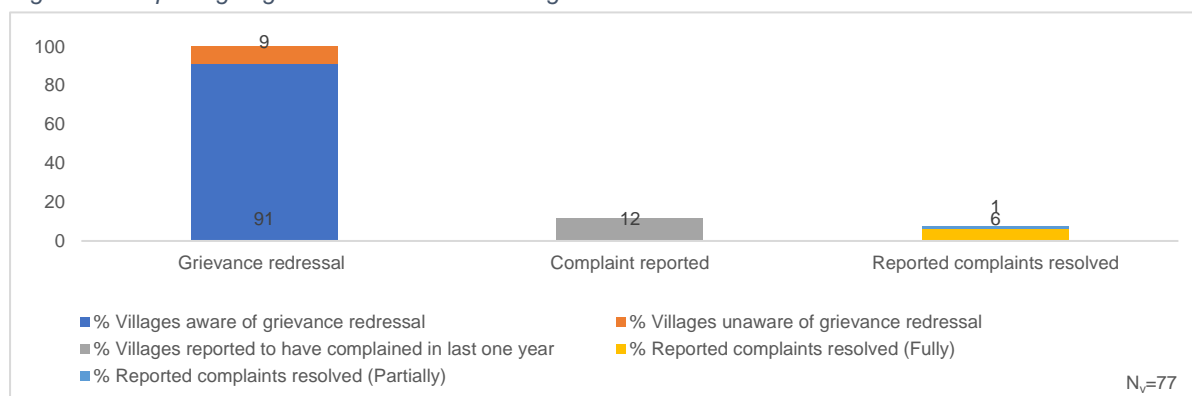
In the state, **91% of villages** reported that they are aware of any grievance redressal mechanism, but only 12% villages have reported a complaint in the last one year amongst which 6% reported that the complaints are fully resolved while 1% of complaints have been partially resolved.

Problem reported in last 1 year

Figure 57: Number of times villages have reported grievance in last 1 year
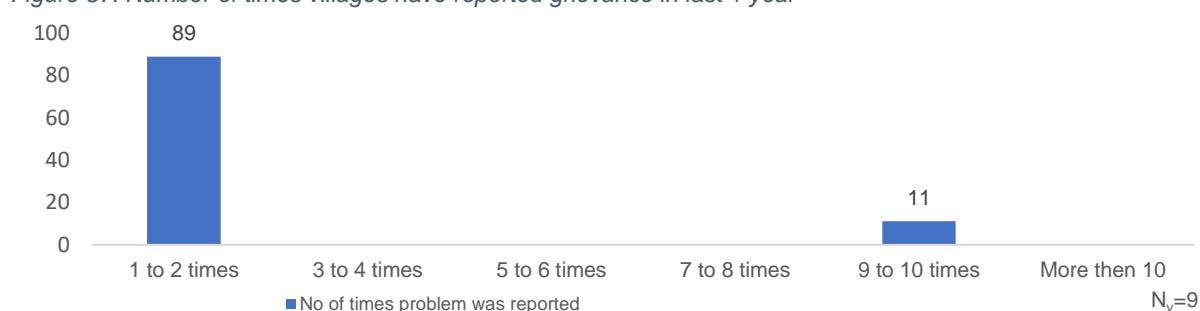
Among the villages who reported a complaint (i.e. 9 villages), 89% villages have reported a complaint 1 to 2 times in the last one year, while 11% reported a complaint 9 to 10 times.

Primary points for reporting grievances

Among those who reported complaint (i.e., 12% Villages, 9 villages), **56% of villages** reported that they report their grievances to **block functionaries and PHED** beside other reporting-points.

Figure 58: Primary points for reporting grievances by village
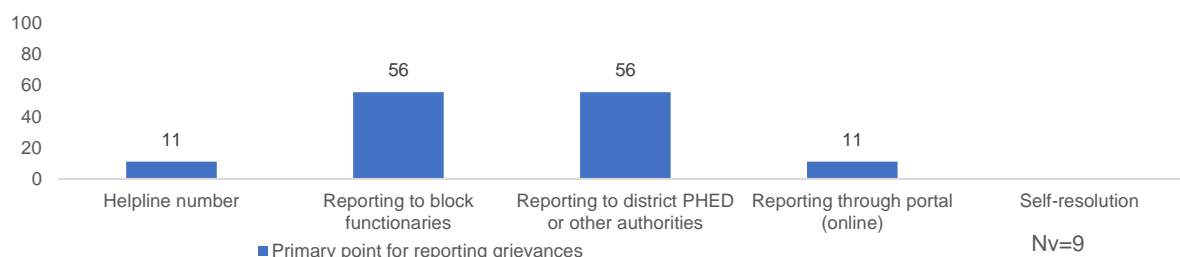
Key problems for reporting grievances

Overall, among those who reported complaint (i.e., 12% HHs, 9 villages) **56% of villages** reported that **leakage in the pipeline** is their most encountered problem for reporting grievances

Figure 59: Key problems reported by village
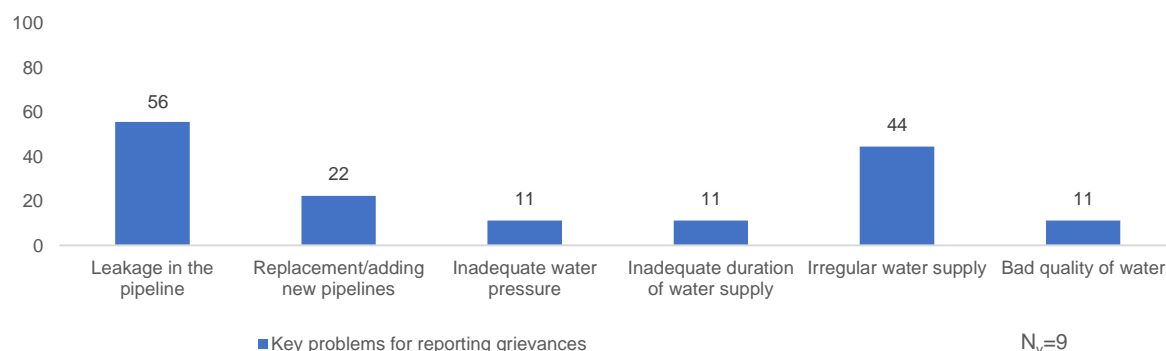
B. Household level

Awareness of grievance redressal at household

Figure 60: Reporting of grievance redressal at household level
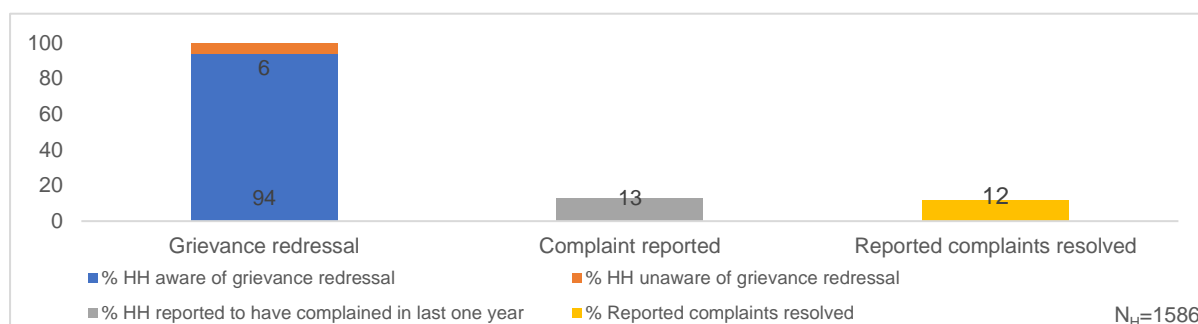
In the state, **94% of HHs** reported that they are aware of any grievance redressal mechanism w.r.t. HH tap water through PWS, but only 13% HHs have reported a complaint in the last one year and only 12% of complaints have been resolved.

Primary channels for reporting grievances by households

Among those who reported complaint as shown in the above graph (i.e., 13% HHs, 200 HHs), **35%** of the HHs reported their complaints to the **pump operators** and VWSC/Pani Samiti beside other reporting-channels.
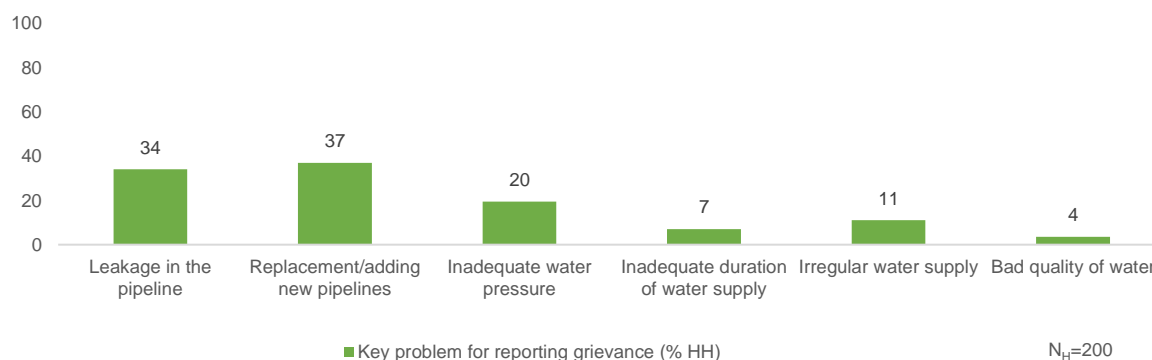
Figure 61: Primary channels for reporting grievances by households

Primary channels used by HHs (% HH)

Helpline number	2	
Pump operator	35	
VWSC/Pani Samiti	35	
GP functionaries	16	
Block functionaries	3	
District PHED or other authorities	25	
Portal (online)		

N_H=200
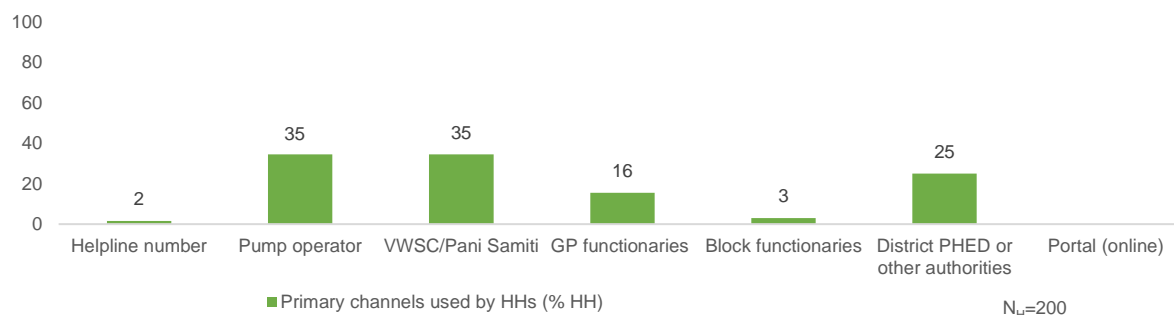
Key problems for reporting grievances

Overall, among those who reported complaint (i.e., 13% HHs, 200 HHs) **37%** of the HHs that reported problems was of **replacement/new pipeline** beside other problems

Figure 62: Key problems reported by households

Key problem for reporting grievance (% HH)

Leakage in the pipeline	34
Replacement/adding new pipelines	37
Inadequate water pressure	20
Inadequate duration of water supply	7
Irregular water supply	11
Bad quality of water	4

N_H=200

3.10. Perception of HHs on Outcome Indicators

A. Incidence of water borne diseases at HH level in last one year

Across the state only no HHs reported having an incidence(s) of water borne diseases in your household in last one year. The cases recorded were of Dysentery, Diarrhoea, Cholera and Typhoid

Figure 64: Household reported incidence of water borne diseases in last one year

N_H=1586
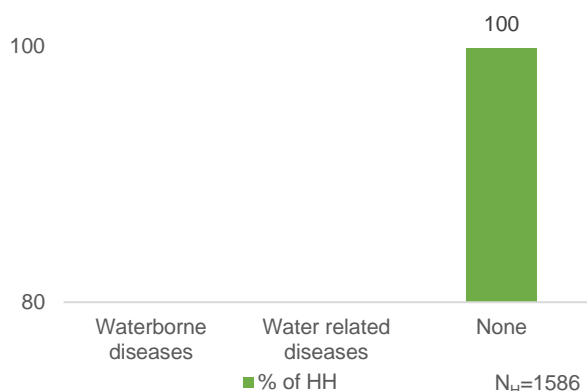
B. Change in employment days since FHTC programmes/schemes

Since having a functional HH tap connection, 75% HHs across the state has reported that there has been a change in the no. of employment days of the adult HH members while only 5% HHs reported no change

Figure 63: Household reported a change in employment days since FHTC programmes /schemes

- Increase
- No change
- Don't know

N_H=1586
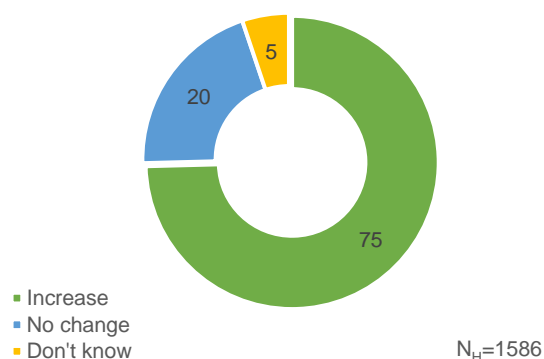
C. Reduction in time and effort in collecting water

Out of the HHs reported (i.e. 1204) that female members used to fetch water before HH tap connection, 93% reported that post installation of HH tap connection it helped reduction of time and effort in collection of water

Figure 65: Households reported reduction in time and effort in collecting water

- Yes - No

N_H=1204
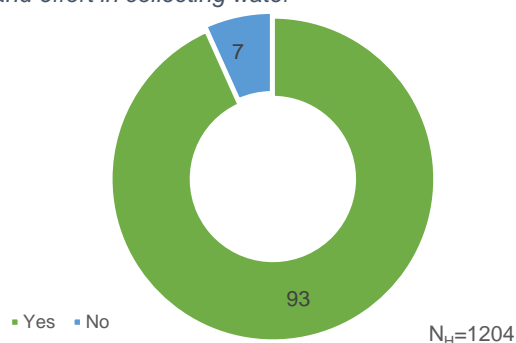
D. Impact on attendance of the girls going to upper primary

Across the state, 56% HHs reported that since having a functional HH tap connection the attendance of the girls going to schools increased, while 33% HHs reported no change in attendance which could possibly be an impact of shutting down of schools due to COVID-19 related lockdown during the survey

Figure 66: Households reported increase of attendance of girls going to upper primary school

- Yes - attendance increased
- No change observed
- No girl going to upper primary school
- Don't know

N_H=9
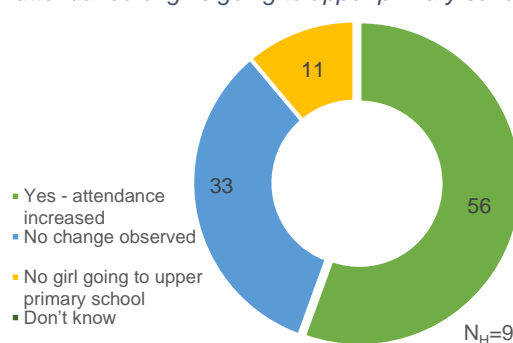
E. HHs are using time saved due to provision of tap connection

Time saved by female HH members against collecting water, post installation of HH tap connections, was reportedly most utilized for other HH work (70%).

Figure 67: Utilization of time saved by households post installation of HH tap connection

HH members spend the time saved (% HH)

N_H=1123
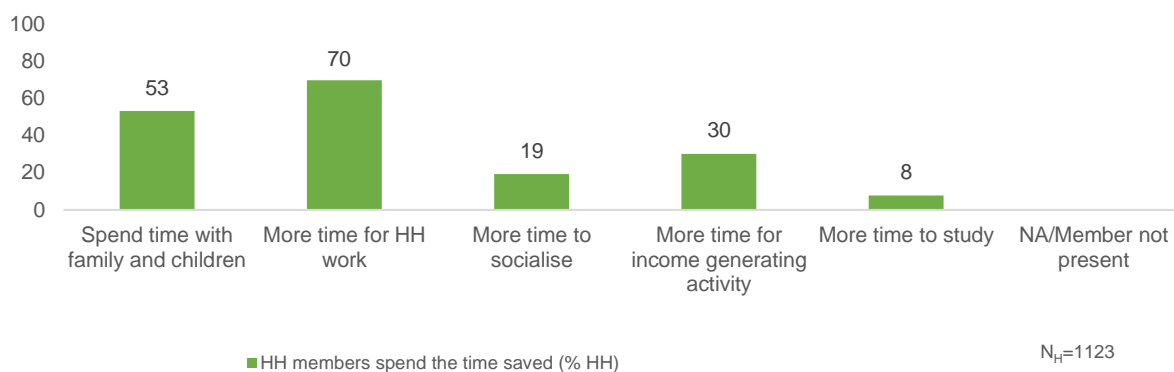
F. Change in social status

Sense of pride and positive change in social status was reportedly realized by 58% of HHs post the installation of HH tap connections.

Figure 68: Households reported to have a positive change in social status

■ Strongly disagree ■ Disagree ■ Neither agree nor disagree ■ Agree ■ Strongly agree

N_H=1586
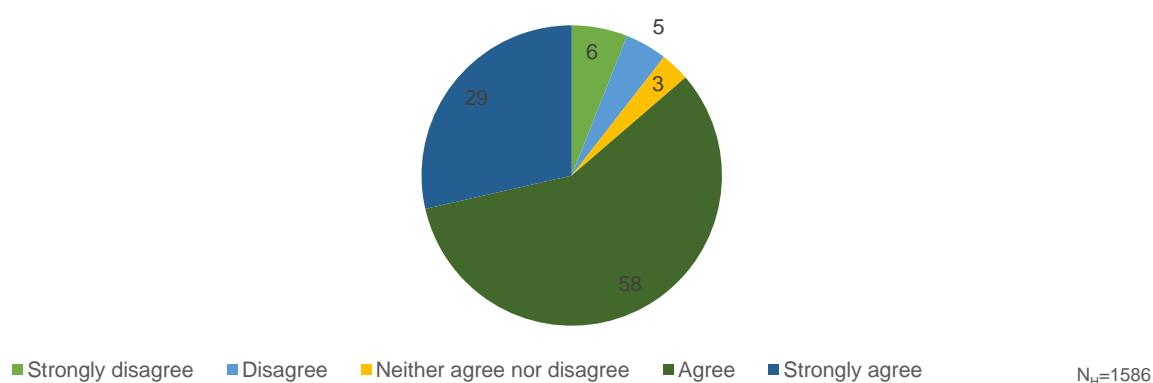
G. Direct benefits in terms of income due to FHTC

Across the state, 62% of sampled HHs reported being in complete agreement that there had been direct benefits on their HH income since the installation of HH tap connection, while 36% HHs reported being in partial agreement against the same.

Figure 69: Households reported to have received direct benefits in terms of income due to FHTC

■ Yes, completely agree ■ Yes, somewhat agree ■ No direct benefit

N_H=1586

KANTAR PUBLIC | HTA
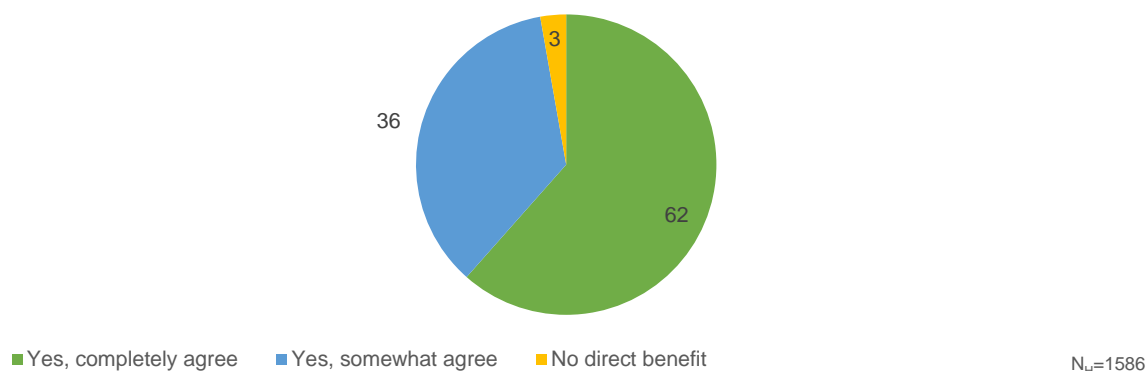
3.11. User satisfaction

S. No.	Parameter (N_h=1586)		In %
	Table No. 6: User satisfaction - more than 75% happy with FHTC services		
1	Regularity	😃	96.2
2	Overall quality	😃	96.3
3	Colour	😃	97.9
4	Taste	😃	97.4
5	Odour	😃	98.4

Note:
Base (N_v)=77 means all villages sampled and covered in Dadra and Nagar Haveli and Daman and Diu state
Base (N_H)=1586 means all households sampled and covered across the 77 villages in Dadra and Nagar Haveli and Daman and Diu state
Base (N_H)=1586 means all households sampled where water sample be collected across the 77 villages in Dadra and Nagar Haveli and Daman and Diu state
Base (N_H)=1204 means all households sampled where female members used to fetch water before HH tap connection
Base (N_H)=9 means all households sampled that had adolescent girls as one of HH members

4. Annexure

No sampled village replacement was made in the state.