



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



STATE REPORT: GOA
SURVEY DURATION: MARCH TO APRIL 2022

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Abbreviations

AWC	Aanganwadi Centre
FHTC	Functional Household Tap Connection
Gol	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

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
- Mini-solar based piped water supply scheme in isolated/tribal hamlets
 - Single Village Scheme (SVS) in villages having adequate groundwater that needs treatment
 - Single village scheme (having adequate groundwater/ spring water/ local or surface water source of prescribed Quality)
 - 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
 - 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 Goa lies in the southern part of India and has a population of 14,58,545 (Census 2011). It has 2 districts and 378 villages, and all the villages have PWS schemes. The state was declared Har Ghar Jal in 2021. A total of 193 villages, across all districts, and 2834 households were randomly sampled for the survey, and additionally, water samples from 658 public institutions were tested.

In the assessment among sampled villages, 74% have only one scheme, 21% have 2-3 schemes, and 5% have 4 and more schemes. Mostly all schemes across the three types were found functional.

At the state level, more than 95% of the HHs covered in the survey reported overall satisfaction with regularity (98%), quality (97%), colour (95%), and taste (96%) of the tap water.

Overall functionality status of Goa

At the state level, 100% of HHs received water on the day of the survey. While 91% of the HHs were found to have fully functional tap water connections within the premises. Out of which 97% received an adequate quantity of water, 93% reported receiving a fully regular supply of water, and 90% HHs received potable water.

It was found that more than 90% of households received water all 7 days a week and 6% received at least 3 to 4 days, while 70% of the HHs received water once a week. The average duration of water supply across the state was reported to be 3 hours per day.

In Goa, 52% of the villages have reported that water is directly supplied to the households and the remaining 48% 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 Goa, 3473 samples of water were submitted, and 3330 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 72% of the HHs. The percentage was relatively higher in HFs (more than 63%), wherein there is a possibility of additional chlorine being added locally for the purification of water. None of the samples were tested positive for bacteriological contamination. Although no residual chlorine was found in the samples, a monitoring system to ensure the correct dosing of chlorine in the pipe water supply system is necessary for assuring potable water.

Out of the 2834 HHs sampled for the FHTC assessment, a water quality test was carried out in all the HHs. pH was found within the acceptable limit in 90% of households. Among the public institution, pH was found in the acceptable limit of more than 93% in AWC, and HF.

11% of villages in the state reported having available field test kits. And almost two-fifth (18%) 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 20% of villages in the state reported having a VWSC or a Pani Samiti out of which 50% of the VWSC/Pani Samitis reported to have more than 50% female members. In the state, 14% of villages reported that VWSC/ Pani Samiti is responsible for the operation and maintenance of pipe water supply.

5% of villages reported having identified skilled manpower for O&M of PWS schemes. 2% of villages in the state reported having faced challenges with respect to O&M of PWS schemes.

82% of HHs reported that they are aware of any grievance redressal mechanism w.r.t. HH tap water through PWS, but only 5% HHs have reported a complaint in the last year and only 2% of complaints have been resolved. Among those who reported complaints (i.e., 5% HHs, 139 HHs), 72% of the HHs reported their complaints to the pump operators besides other reporting channels.

Overall, 76% of villages in the state levy charge for water service delivery to households whereas 90% HHs reported paying water service delivery charges at the households.

99% of HHs reported that their daily requirement of water was being met by HH tap connections.

Overall, 95% 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, 27% HHs reported using booster pumps to maximize the water flow through their piped water connections.

It was found that 18% of the villages have schemes that are based on groundwater sources, while 21% on surface water sources.

Age-wise functionality of the schemes indicates improvement in 'always functional' schemes and a decrease in the 'non-functional scheme' in the state since 2012. 25-% point improvement in a partially functional scheme and 23-% point decrease in fully functional scheme were recorded from 2012 to 2013-18. In 2019 and later the opposite trend has maintained, however, 71% of schemes have been reported to be always functional and 2% as partially functional (i.e., a total of 73% of schemes).

Impact of JJM

Across the state, no HHs reported having an incidence(s) of water-borne diseases in the last year.

Since having a functional HH tap connection, 42% HHs across the state have reported that there has been a change in the no. of employment days of the adult HH members while 43% HHs reported no change.

Out of the HHs reported (i.e., 1101) that female members used to fetch water before HH tap connection, 94% reported that post-installation of HH tap connection helped reduce of time and effort in collection of water.

Across the state, 75% HHs reported that since having a functional HH tap connection the attendance of the girls going to schools has increased, while 25% 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	Goa
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	97
Partially adequate quantity (> 40 LPCD - < 55 LPCD) (%)	5	1
Inadequate quantity (<40 LPCD) (%)	10	2
Regularity ² of water received by households		
Fully Regular Supply (as per schedule) (%)	80	93
Partially Regular Supply (not as per schedule) (%)	14	3
Irregular Supply (less than 9 months' supply) (%)	6	4
Potable ³ (Quality) water received by households (%)	87	90
Overall functionality ⁴ (%)	62	81

Service delivery parameters	India	Goa
Overall user satisfaction on regularity at the household level (%)	83	98
Overall user satisfaction on quality at the household level (%)	82	97
Households receiving water supply daily-7 days a week (%)	74	90
Daily HH requirement of water being met by FHTC (%)	80	99
Households paying water service delivery charges (%)	35	90
Households aware of grievance redressal mechanism (%)	71	82
Households reported a reduction in time and effort in collecting water (%)	79	94
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	89
Residual Chlorine (RCL) detected within permissible limits (%)	24	72
Villages with Field Test Kits (%)	30	11
Villages in which bacteriological test was done in last 1 year by VWSC/ Pani Samiti (%)	29	17
Villages reported to have a mechanism for chlorination (%)	21	5

Institutional arrangement	India	Goa
Village reported having presence of VWSC/ Pani Samiti (%)	38	20
Villages in which VWSC/ Pani Samiti is responsible for Operation & Maintenance of PWS schemes (%)	14	5
Villages in which persons are trained to use Field Test Kits (%)	31	18
Villages levying water service delivery to households (%)	34	78
Villages having skilled manpower for Operation & Maintenance of PWS schemes (%)	31	30
Community monitoring of water wastage in villages (%)	19	19
Villages in which signages about JJM were observed (%)	15	2

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

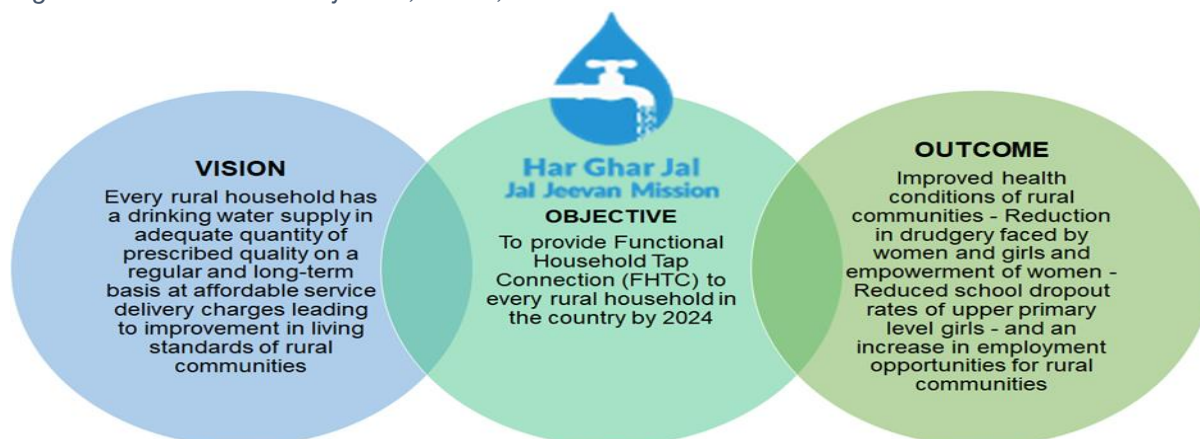
³ Potable water has been considered basis testing of water samples through laboratory tests for physical, chemical, and bacteriological parameters (within acceptable/ permissible range) and onsite testing of pH.

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: Goa

The state of Goa lies on the southern part of India and has a population of 14,58,545 people. It has 2 districts and 378 villages where all the villages have PWS schemes. The state lies on the West Coast Plains and Hills region and receives an average annual rainfall of about 3300mm. Among the villages with PWS schemes, 371 villages (98.15%) have more than 20 households with functional tap connections. The state achieved the Har Ghar Jal status in 2021, however till date XX has been certified.

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

Figure 2: State IMIS Status & Map

IMIS status:

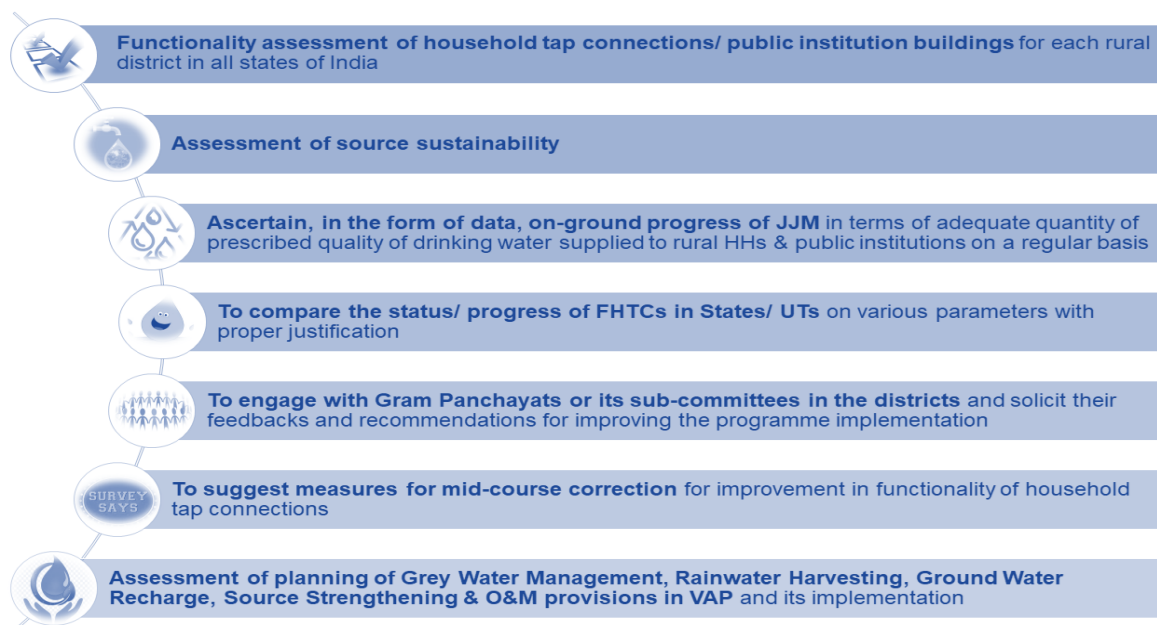
- Har Ghar Jal state since 2021.
- 2 districts are Iron affected
- 371 (98.15% of all) villages with PWS more than 20 FHTC
- 100% villages covered under HH tap connections under HGJ



2.2. FHTC Assessment Objectives

The overall objectives of the FHTC assessment are as presented:

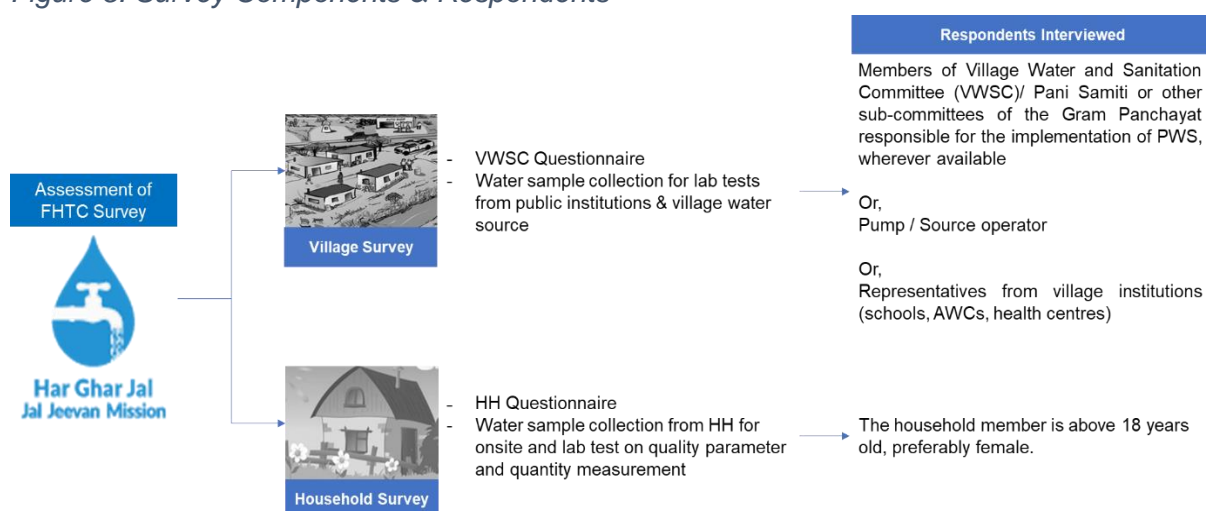
Figure 4: FHTC Assessment Objectives



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

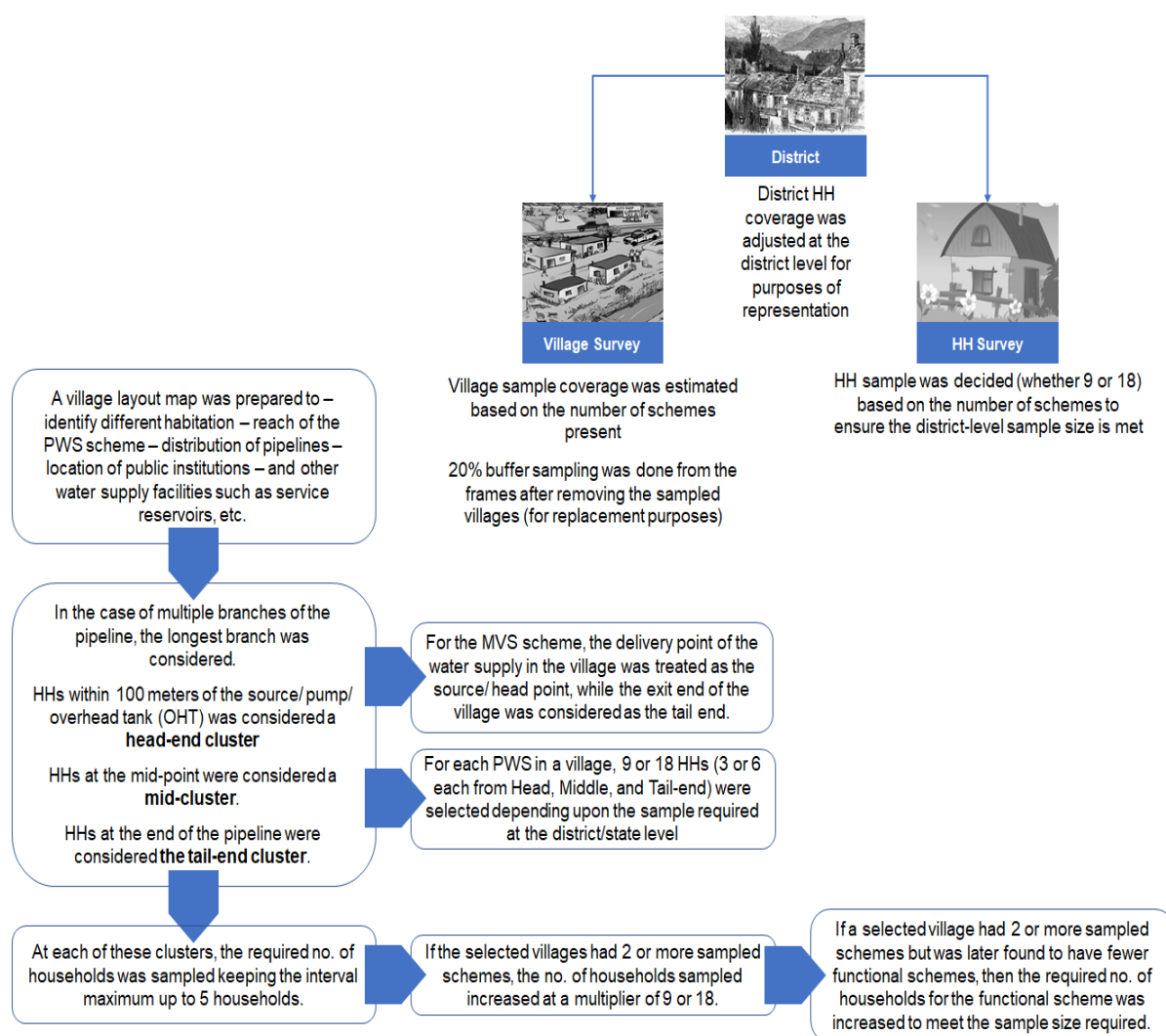
As per the design, all villages having a PWS scheme with 20 or more functional household tap connections were included in the sample frame. The probability proportionate to size (PPS) method was used for village selection in each district. The steps for random selection of villages using PPS are presented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

Figure 6: Steps for Random Sampling of Villages



Figure 7: Household Selection

The key considerations for the village and household sampling were:

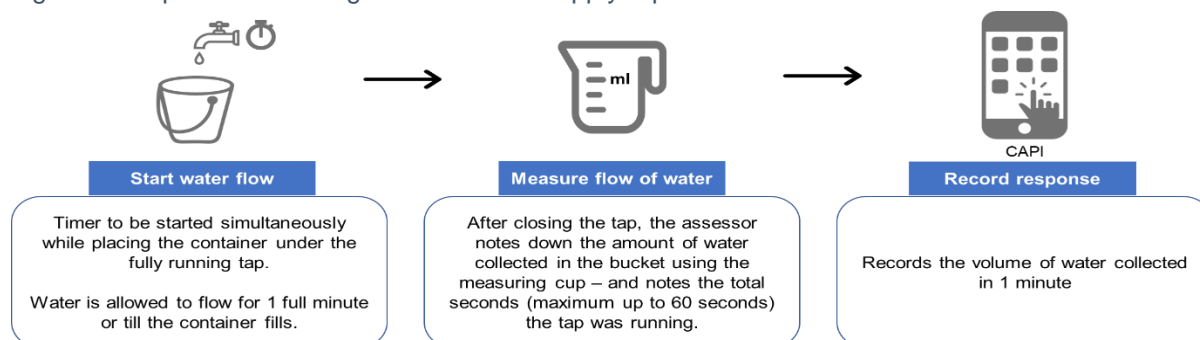


The record of all district-wise village replacements is maintained and reported as part of the annexure.

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



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

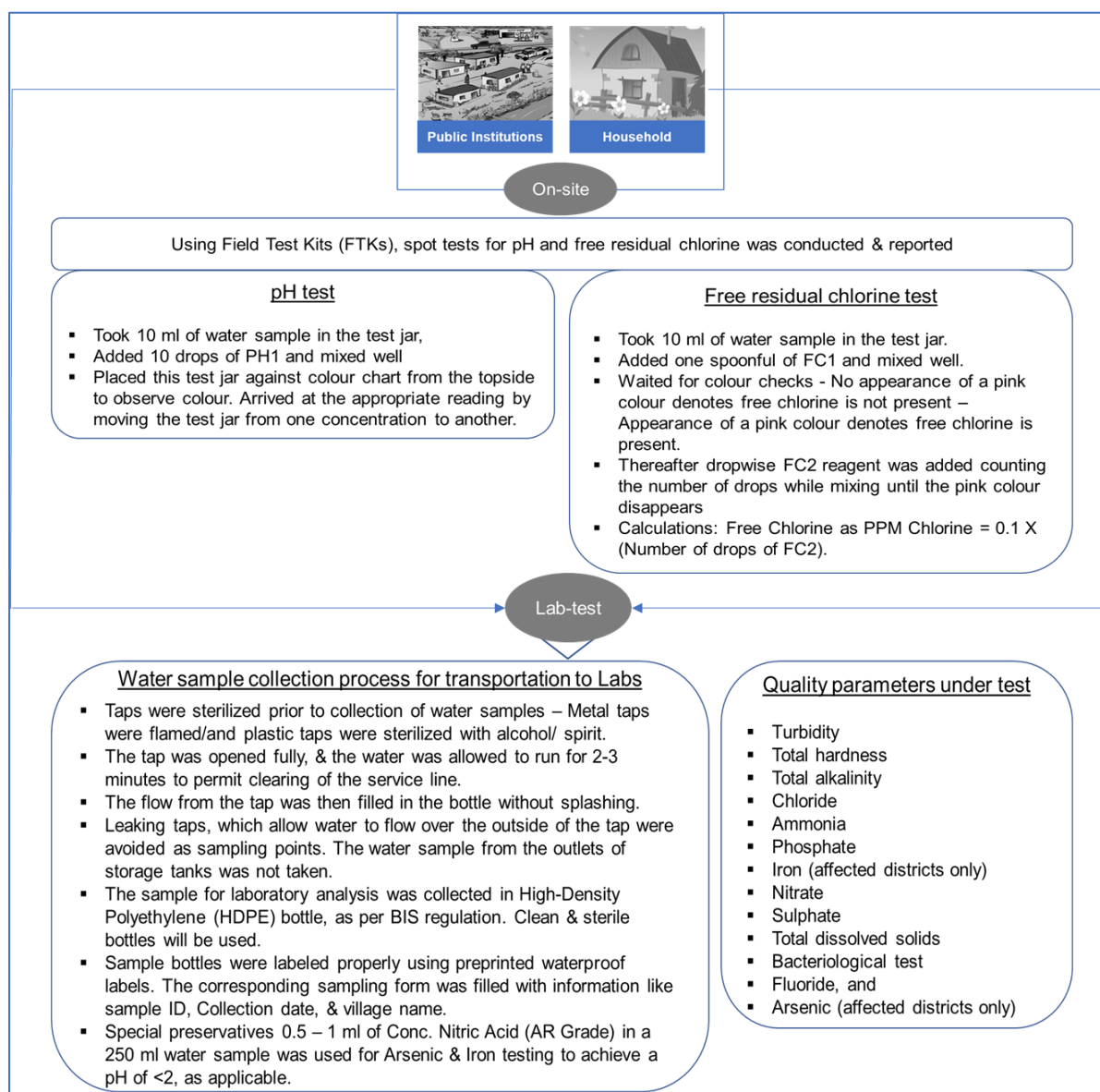
- Assessor first asked and recorded length, breadth, and height.
- Assessor dipped a 5 feet long rod, marked the level of the water table, and calculated the volume – length x breadth x-height of water.
- Next the assessor opened the valve of the connection and allowed the water to flow inside the storage 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

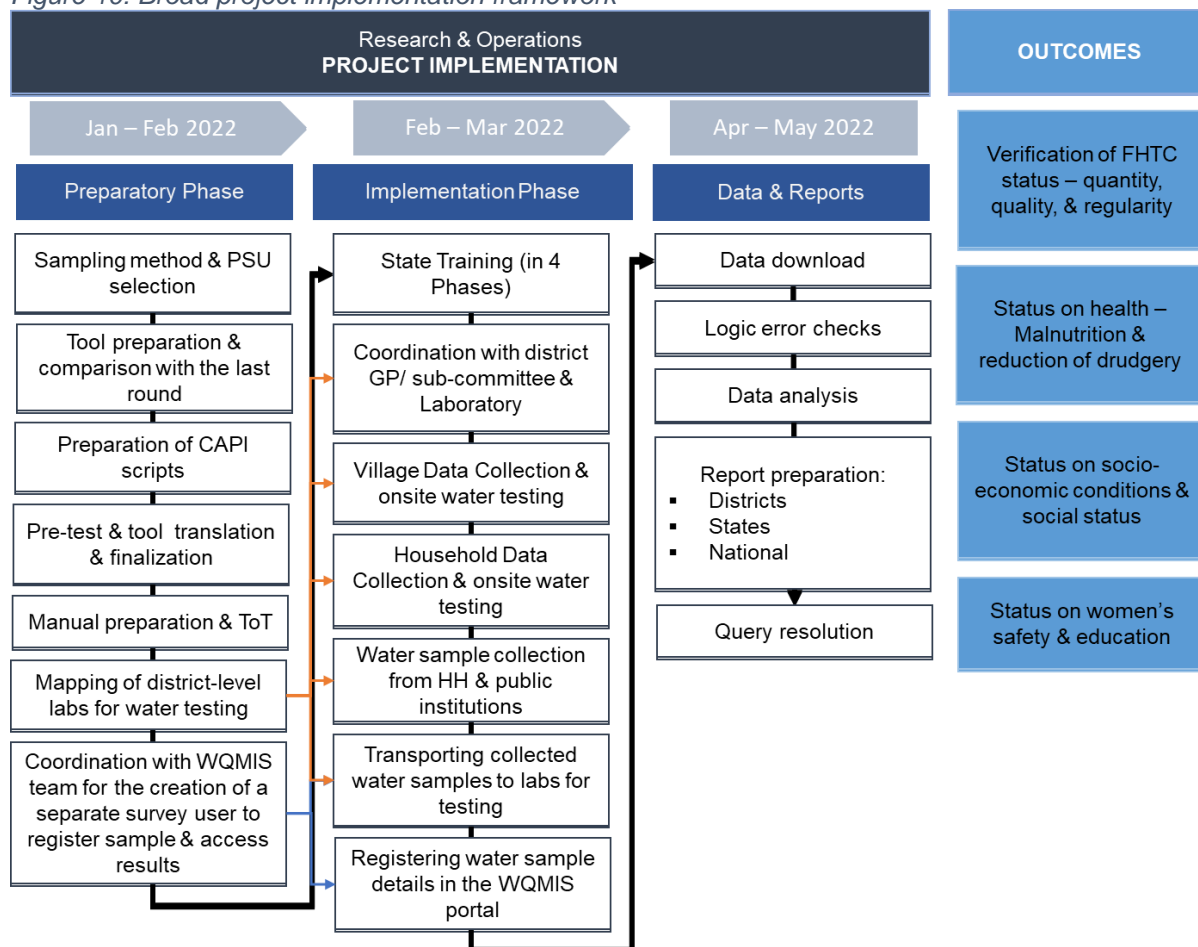


JJM, with the support of the BMI Division of ICMR, enabled a new interface on the WQMIS portal for “Functionality Assessment (FA) User” to enable seamless harmonization of water sample registration, and sample submission for testing, and sharing of results as per the applicable quality parameters.

2.8. Project Implementation

An overview of the project implementation is as presented:

Figure 10: Broad project implementation framework



A total of 5 teams (comprising 5 supervisors, 30 assessors, and 5 water collection assistants) were recruited, trained, and deployed to complete the survey across the states of Goa. 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
Goa	5 Teams	5 th March	1 st April	26 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

State	Targeted sample			Achieved sample			
	District	Village	HH	District	Village	HHs	PIs
India	712	13,300	3,00,000	712	13,299	3,01,389	16,148
Goa	2	189	2,790	2	189	2,834	658

2.10. Sampled village and household profile

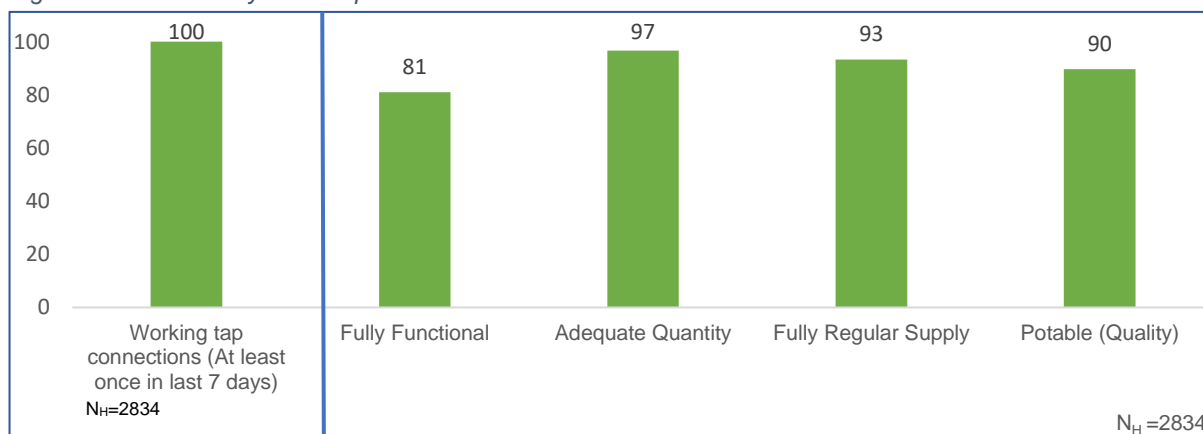
SAMPLED VILLAGES	SAMPLED HOUSEHOLDS
<ul style="list-style-type: none"> Total no. of villages covered in the state – 189 Percentage of SC dominated villages covered in the state is 0.0% (while at national level the average is 12.6%) Percentage of ST dominated villages covered in the state is 11.6% (while at national level the average is 20.2%) Higher proportion of Pump operator interviewed at the village level 1.1% of the villages reported to have any historical incidence of water contamination 	<ul style="list-style-type: none"> Total no. of households covered in the state – 2834 (Respondents: Female 1221 & Male 1613) Proportion of General – 84.7%, SC 4.2%, ST 6.2%, OBC 4.9% households 43.1% of the FHTC connections are under the name of a female member Average household size – 4.8 100% 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



* Fully Functional has been computed as = Adequate Quantity \cap Fully Regular Supply \cap Potable (Quality)

Please note: Henceforth, N_H=2834 implies all HHs where water was found on the day of the survey.

It has been found that 100% of the sampled HHs (N=2834) had working tap connections. Moreover, more than 9 out of 10 households (97%) received adequate (≥ 55 LPCD) water supply and more than 9 out of 10 received regular supply (93%) of water. The on-site testing for pH and all the different quality parameters in the water tested in laboratories indicate that 90% of the sampled households in the state receive potable water.

Out of the 2834 HHs sampled for the FHTC assessment, water quantity and quality test was carried out in 2834.

Quantity, Regularity, and Quality of water of HH tap connection at the district level:

Table No. 3: Quantity, Regularity, and Quality of FHTC at the district level (%HH)					
S. No.	District	Working tap connections for 7 days preceding the survey (%HH)	Quantity ≥ 55 LPCD (% HH)	Regularity (% HH)	Potability# (% HH)
1	North Goa	100	97	90	91
2	South Goa	100	96	96	89
3	Goa	100	97	93	90
# 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

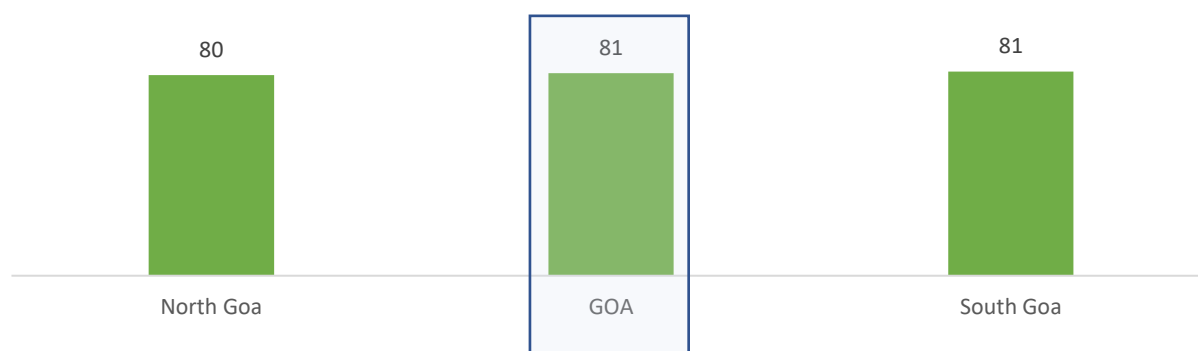
District level comparison across the districts indicate that both North Goa and South Goa reported 100% functionality. Both the districts of North Goa and South Goa FHTC provide more than 55 LPCD of water in more than 95% HHs.

96% HHs in the South Goa reported to regularly receive water through FHTC. Regular supply of water is 90% in the North Goa.

Potability of water was found to be 91% in North Goa and 89% in South Goa.

B. District wise functionality status

Figure 12: District wise Functionality of HH tap connection



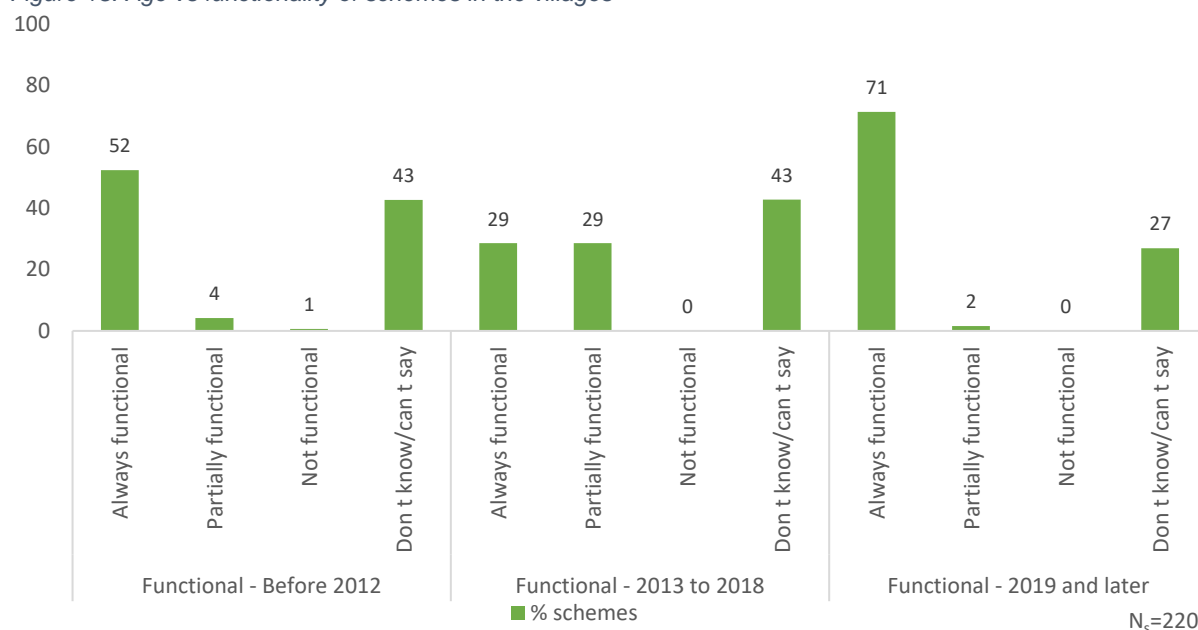
N_{HH}=2834

* '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., 2834 HHs.

81% HHs in the state were found to have functional HH tap water connection. North Goa reported 80% functional households in the state, and South Goa had 81% functionality.

C. Age vs functionality of schemes in the villages

Figure 13: Age vs functionality of schemes in the villages



More than 7 out of 10 schemes are functional since 2019 which reflects a 19-point increase from 2012.

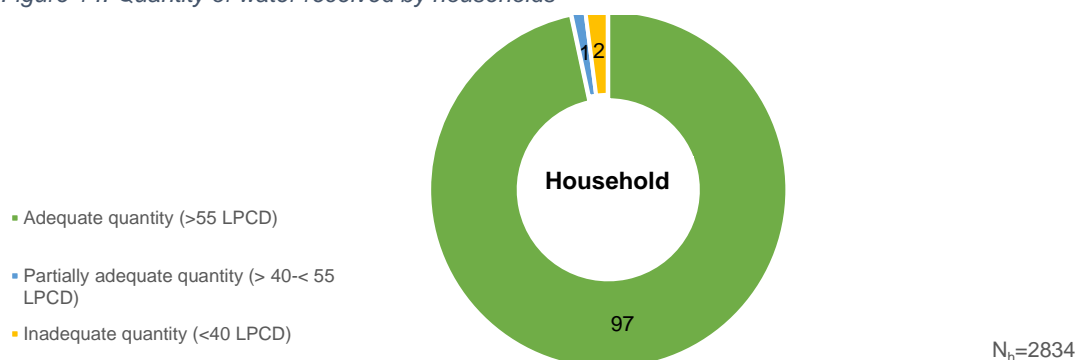
3.2. Quantity, Regularity, and Quality of Water

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. Quantity of water supplied to Households (in Litres per Capita per Day)

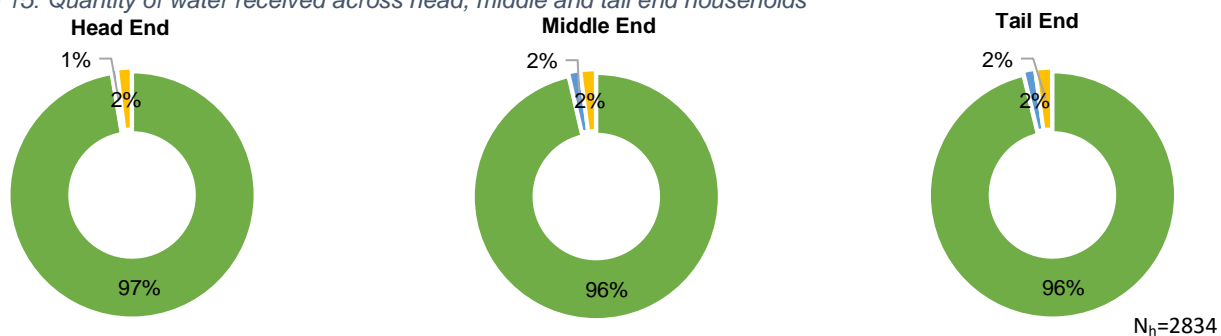
97% HHs reported receiving more than 55 LPCD of water.

Figure 14: Quantity of water received by households



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

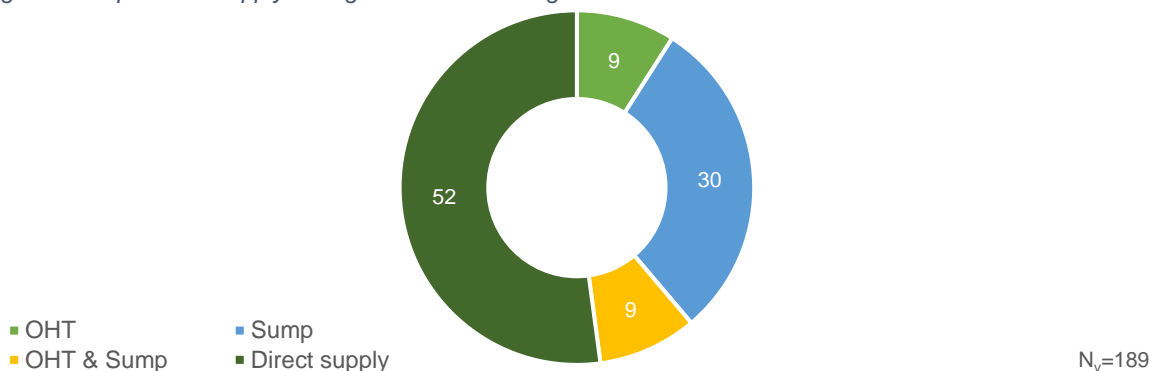
Figure 15: Quantity of water received across head, middle and tail end households



The quantity of water received across the head, middle, and the tail end was observed to have marginally declined, and more than 9 out of 10 (97%) of the sampled households received water in adequate quantity, i.e., greater than or equal to 55 LPCD.

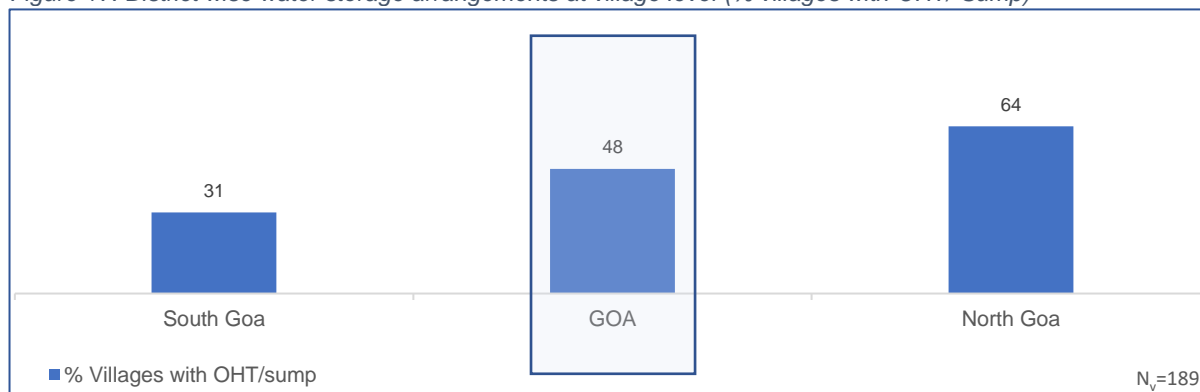
Types of water storage arrangements at village level (in %)

Figure 16: Pipe water supply storage available in village



More than one out of two respondents in the state reported water being directly supplied. And in 30% reported water being stored in sump.

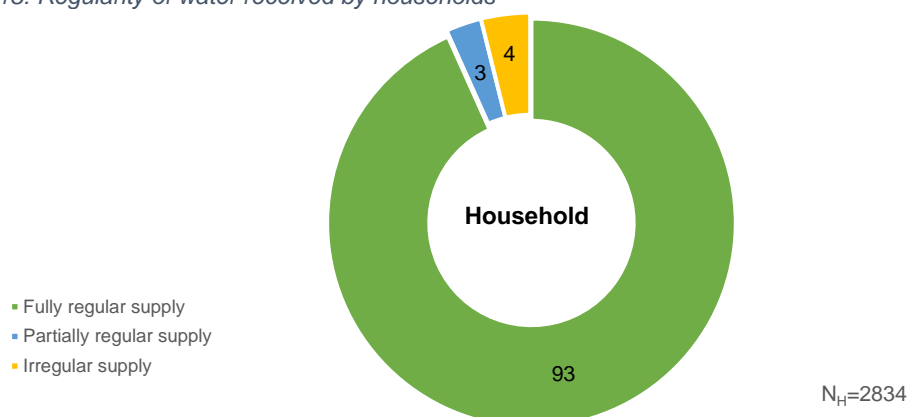
Figure 17: District wise water storage arrangements at village level (% villages with OHT/ Sump)



48% villages in the state have either an OHT or a sump for storing water for supplying to the households. North Goa and South Goa reported 64% and 31%, respectively, of OHT or Sump to store water for supplying to the households.

B. Regularity of water supply to households

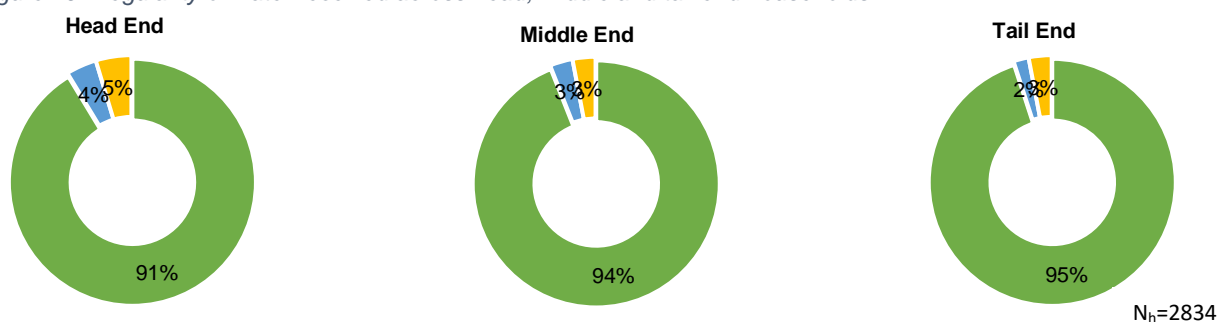
Figure 18: Regularity of water received by households



93% HHs receive a regular supply of water (as per agreed schedule)

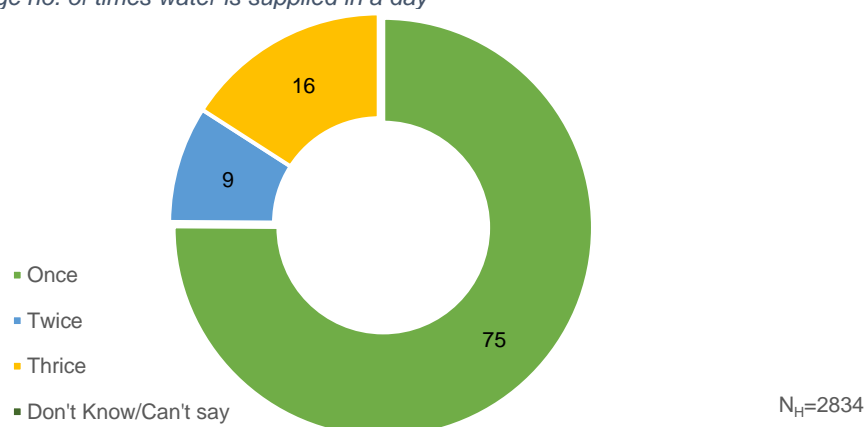
Regularity of water received across head, mid, and tail end

Figure 19: Regularity of water received across head, middle and tail end households



Water is more regularly available at the tail-end households of the PWS in comparison to the head end.

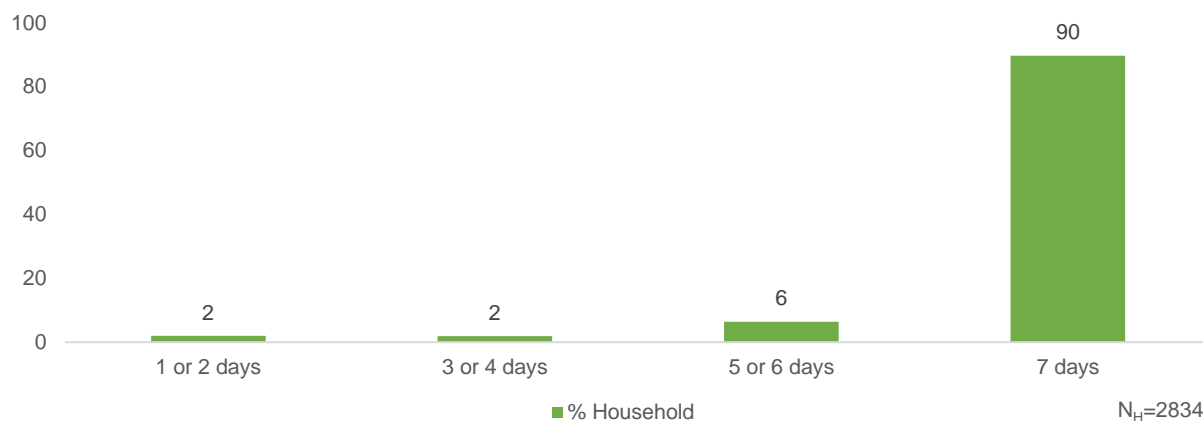
Figure 20: Average no. of times water is supplied in a day



HHs in **75% of districts** 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

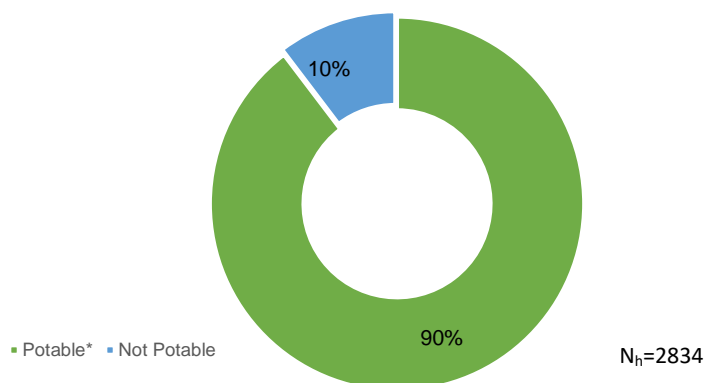
Figure 21: Average number of days households receive water supply in a week (in %)



90% of HHs reported receiving water for all 7 days in a week (daily).

C. Water quality – Potability

Figure 22: Potable water received by households



**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 Goa where water was found on the day of the survey, the potability of water was found to be 90%.

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

Quality Parameters (N _V =189)	AWC	HF	Schools	Others
pH (on-site)	93	93	91	93
Residual Chlorine (on-site)	61	63	61	100
Turbidity	99	100	99	100
Total Hardness	100	100	100	100
Total Alkalinity	100	100	100	100
Chloride	100	100	100	100
Ammonia	Not Tested			
Iron	Not Tested			
Nitrate	Not Tested			
Sulphate	Not Tested			
Total Dissolved Solids	100	100	100	100
Bacteriological Test	100	100	100	99
Fluoride	No History			
Arsenic (In Hotspots)	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=2834). 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)	2834	90
Turbidity	2583	99
Total Hardness	1891	100
Total Alkalinity	2657	100
Chloride	1675	100
Ammonia	Not Tested	
Iron	8	100
Nitrate	Not Tested	
Sulphate	Not Tested	
Total Dissolved Solids	1804	100
Bacteriological Test (Absence)	2053	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 state of Goa was found in 72% samples. While 3% samples were having RC outside range whereas 24% samples, had no RC. All of the 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:

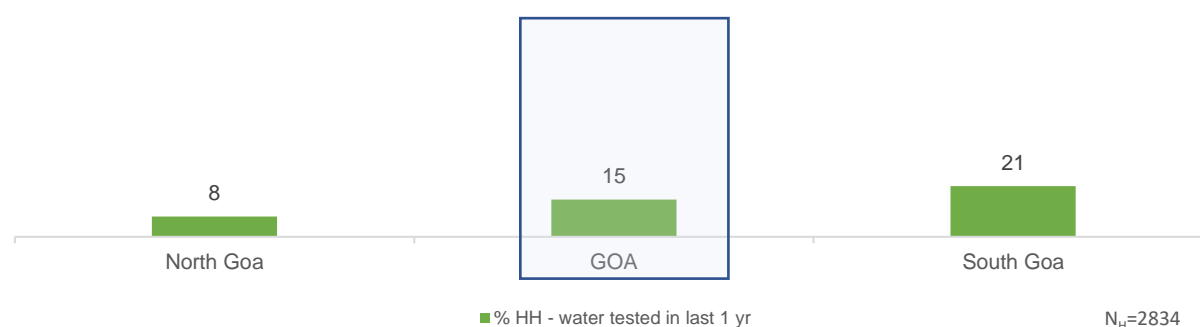
The district lab tested water samples for 8 water quality parameters. 3473 water samples were submitted, and 3330 water samples were tested, and reports made available. The turnaround time for testing was more than 48 hours in most cases.

Table No. 6: Performance of Labs						
Sl. No	District	Lab available	HH surveyed	Samples submitted	Report received	Overall lab experience
1	North Goa	Yes	1253	1613	1558	The labs did not have any issue with testing the number of water samples submitted nor had any issues with human resource, reagents etc
2	South Goa	Yes	1581	1860	1772	The labs did not have any issue with testing the number of water samples submitted nor had any issues with human resource, reagents etc

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

15% of HHs reported that their HH tap-water was collected and tested in the last one year.

Figure 23: Households where tap water was tested in the last one year



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

Schemes reported to have faced challenge in village

The Mini Solar scheme faced the most challenges (15%) in comparison to the other schemes in the state

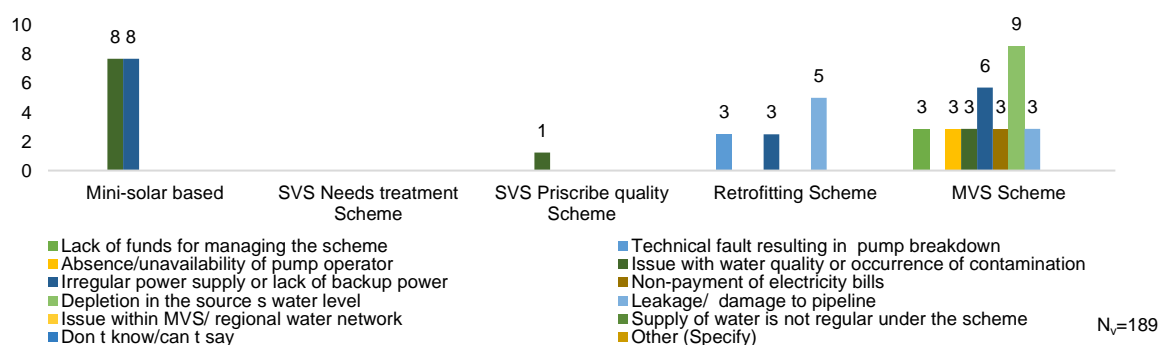
Figure 24: Schemes reported to have faced challenge in village



Type of challenge faced by the schemes

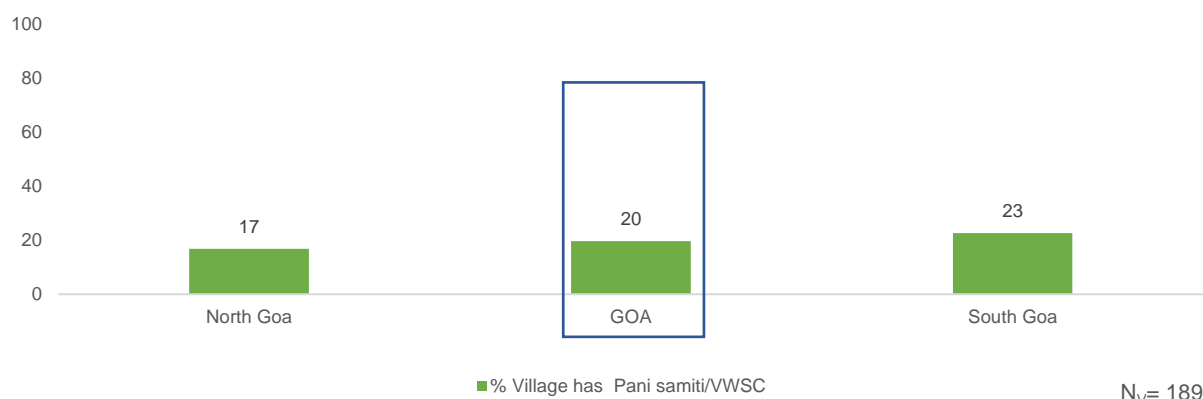
The most faced problem varied from one scheme to another. However, 'leakage/damage to pipeline' is a problem that was found unanimously in all the schemes.

Figure 25: Type of challenge faced by the schemes



A. Presence of VWSC/Pani Samiti

Figure 26: Villages where VWSC/ Pani Samiti is present

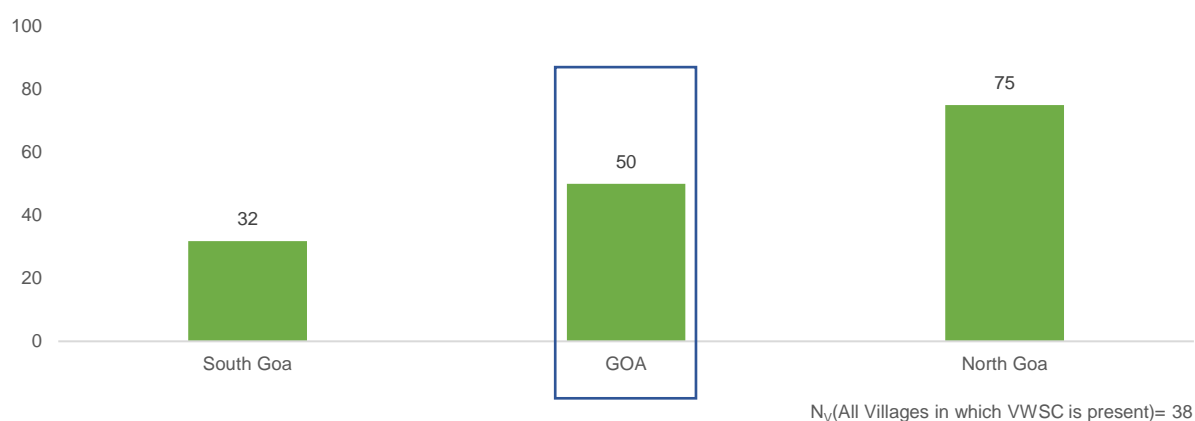


20% of villages in the state reported to have a VWSC or a Pani Samiti.

B. VWSC/Pani Samiti with more than 50% female members

50% of villages in the state reported to have a VWSC or a Pani Samiti.

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



C. VWSC Meetings in last one year

Across the villages in the state, that reported to have VWSC/Pani Samitis (38 villages), 3 meetings in last one year was reported the most (34%)

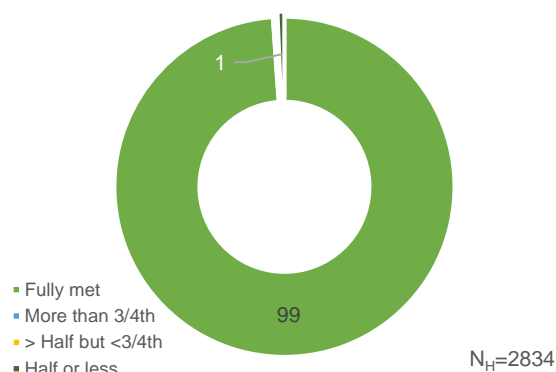
Figure 28: VWSC meetings held in last one year



3.4. Utilization of water at HHs for drinking and other activities

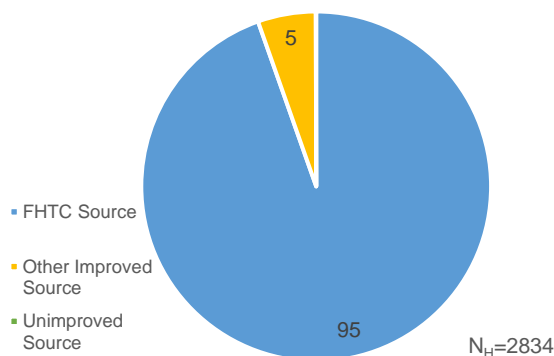
99% of HHs reported that their daily requirement of water was being met by HH tap connections

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



100% HHs reported HH tap connections as their primary source of drinking water

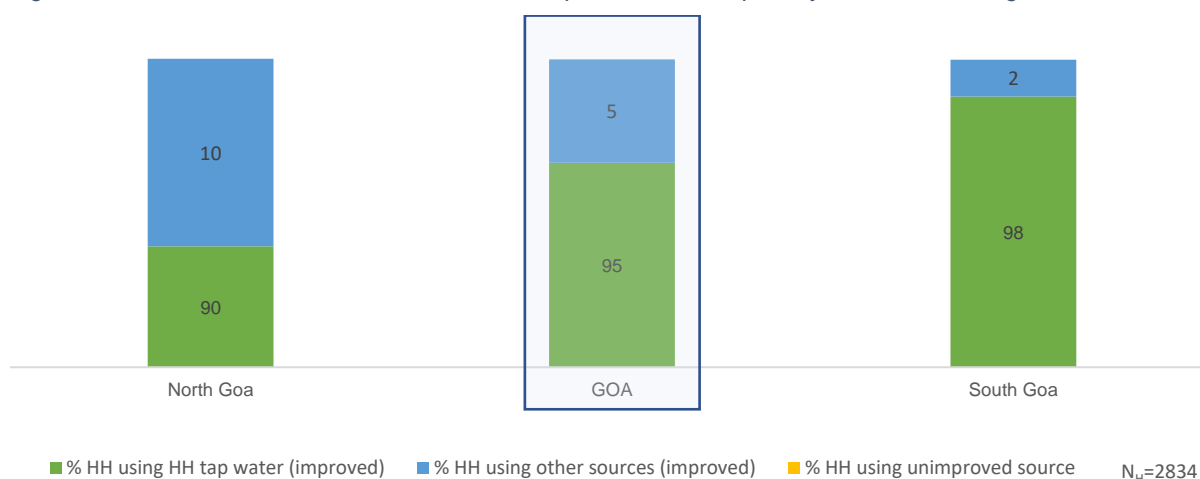
Figure 29: Households reported FHTC as primary source of drinking water



Almost every (99%) HHs reported their daily requirement of water being fully met by the HH tap connections. And 95% HHs reported using household tap connection for drinking water (primary source). About 1 HH even though have reported household tap connections to fully meet their requirements, were not found using the same for drinking purposes.

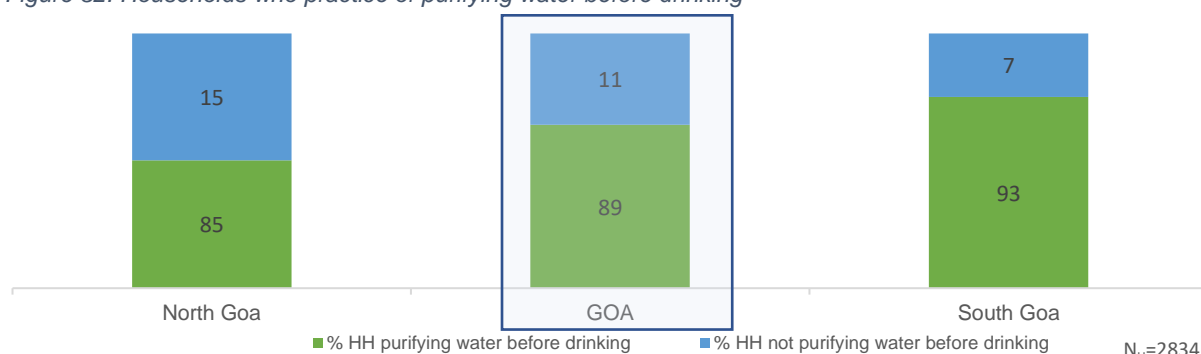
Overall, **100% of HHs** reported using improved primary source of drinking water, out of which **95% of HHs** reported HH tap water as their primary source.

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



A. Households who practice purifying of water before drinking

Figure 32: Households who practice of purifying water before drinking

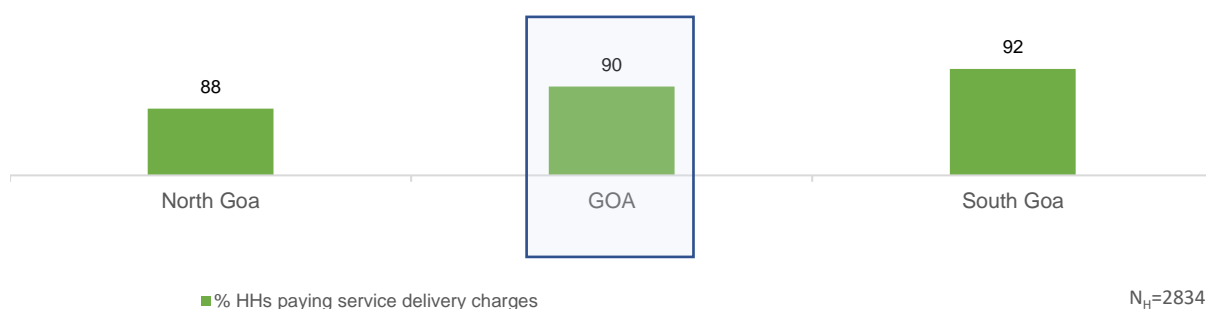


Practice of purifying water before drinking was reported the most in South Goa (93%) where 98% HHs reported using HH tap water as primary drinking water source, while the least was reported in North Goa (85%) where 90% HHs reported using HH tap water as a primary drinking water source.

B. Households paying water service delivery charges

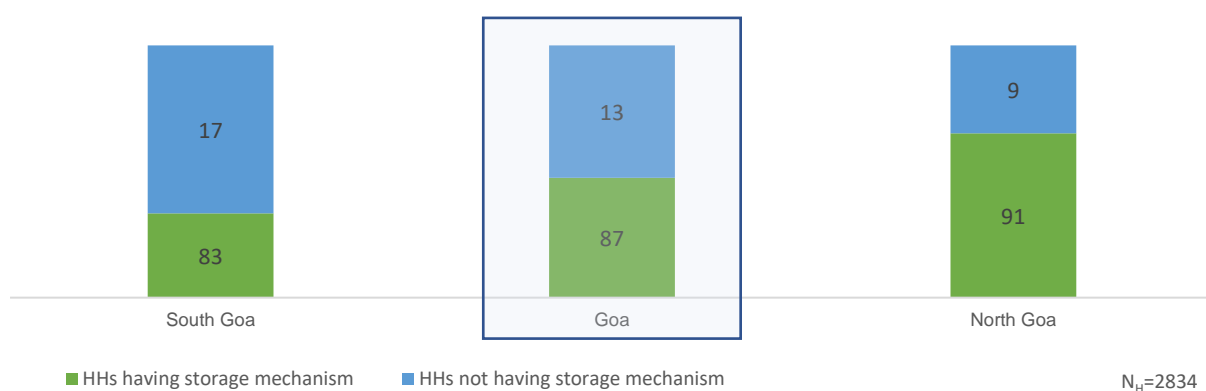
In Goa, around 90% of the sampled households were found to be paying service delivery charges, South Goa being the district with the highest percentage of such households (92%).

Figure 33: Households paying water service delivery charges



C. Storage mechanism used by households

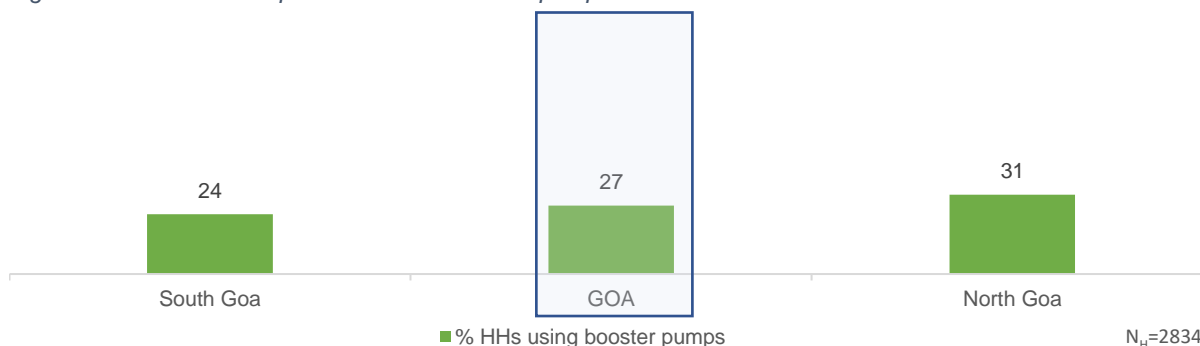
Figure 34: Households having storage mechanisms



D. Households using booster pumps

Overall, **27% HHs** reported using booster pumps to maximize the water flow through their piped water connections. North Goa reported 31% and South Goa reported 24% of HHs using booster pump in the state.

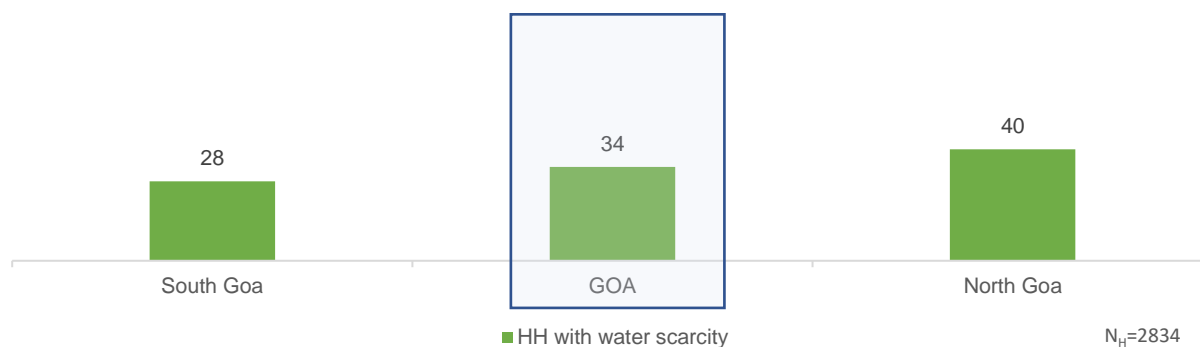
Figure 35: Households reported to use of booster pumps



E. Households who faced shortage of water

In the state, **34% HHs** faced shortage of water during any time of the year, while **33% HHs** reported having some mechanism to cope with scarcity of water.

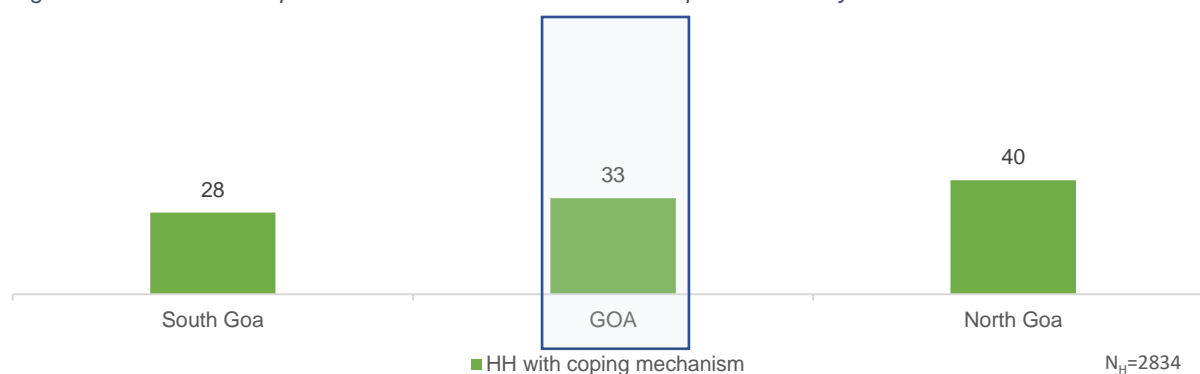
Figure 36: Households who faced water scarcity



F. Household with a mechanism to cope water scarcity

33% 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

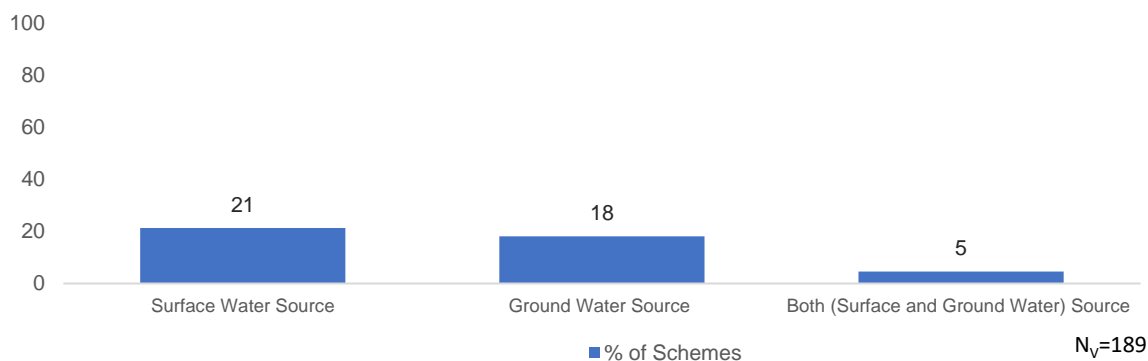


3.5. Source sustainability at the village level

Schemes based on surface and ground water

21% of schemes reported to be based on surface water source while **18% of schemes** reported to be based of ground water sources

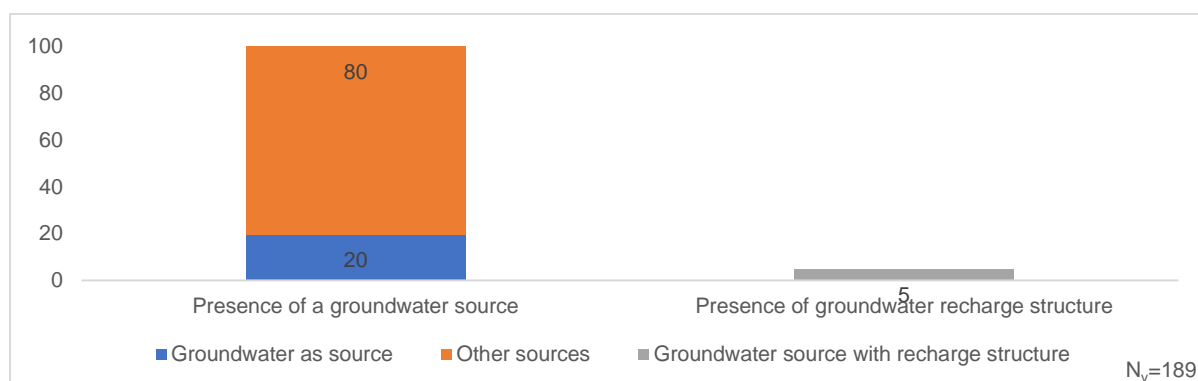
Figure 38: Schemes based on water source in village



*'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

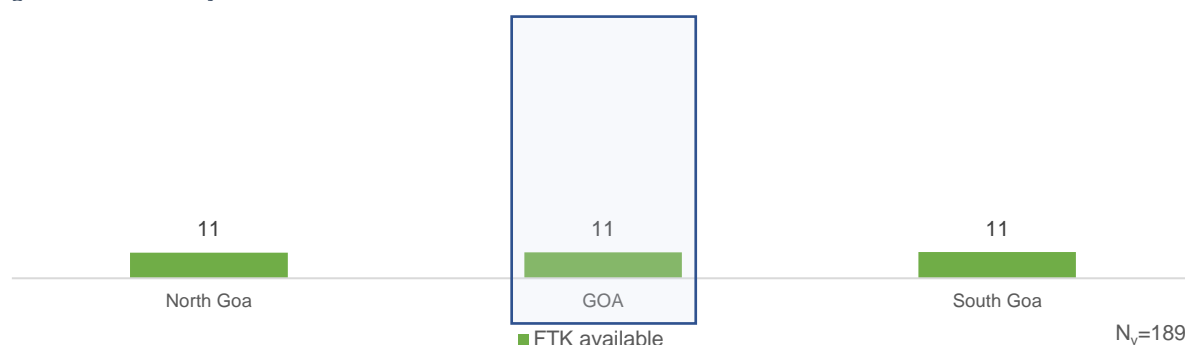


In the state, **20% villages** reported the presence of groundwater sources like improved dug wells and borewells. Out of which, 5% of villages reported (i.e., 9 villages) reported having a recharge structure.

3.6. Water quality monitoring and surveillance in the villages

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

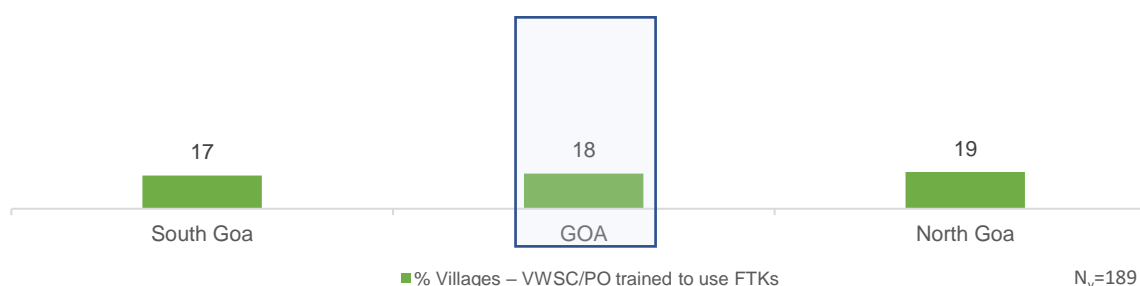
Figure 40: Availability of field test kits with VWSC/ Pani Samiti



With regards to water quality testing in the village by VWSC, 11% villages in the state reported having available field test kits. Both North Goa and South Goa reported 11% villages having available field test kits for water quality testing.

B. Persons trained to use field test kits

Figure 41: Persons trained to use field test kits

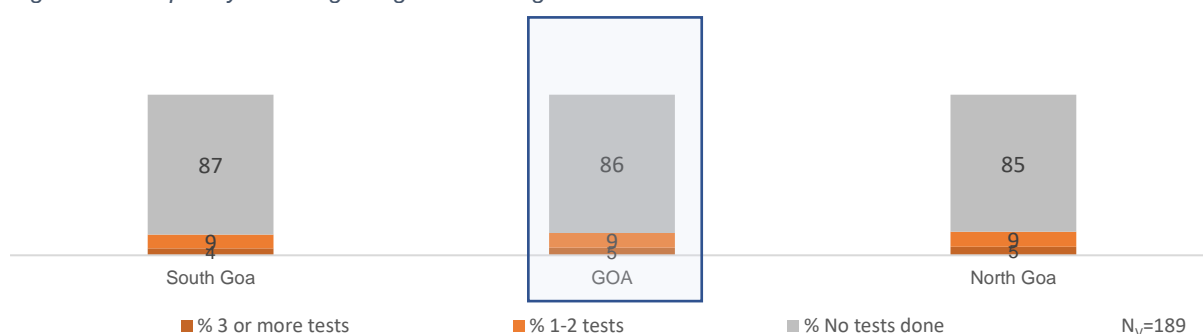


Overall, **18% of villages** in the state reported to have either VWSC/Pani Samiti or pump operator trained to use field test kits for testing the quality of water on-site. North Goa reported 19% and South Goa reported VWSC/Pani Samiti or pump operator trained to use field test kits.

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

Across the state, one-tenth of the sampled villages (9%) reported that the quality of water (at different points in the respective villages) was checked one to two times using FTKs in last one year. Among the districts, both North Goa and South Goa wherein 9% of its villages reported using FTKs one or two times in last one year.

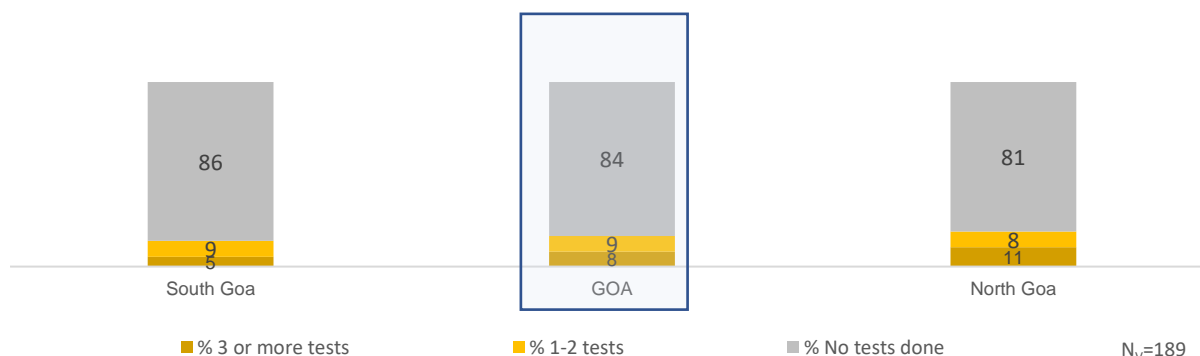
Figure 42: Frequency of testing using FTK in villages



D. Water quality management by VWSC: Frequency of lab testing

Across the state, less than one-tenth of the total sampled villages (8%) reported that the quality of water (at different points in the respective villages) was checked at least three times through laboratories in last one year. North Goa had the highest proportion of such villages, wherein 11% of its villages reported tests through laboratories - three or more times in last one year.

Figure 43: Frequency of lab testing



E. Water quality management by VWSC: Bacteriological test done in last one year

With regards to water quality testing in the village by VWSC, **17% villages** in the state reported having bacteriological test done in the last one year.

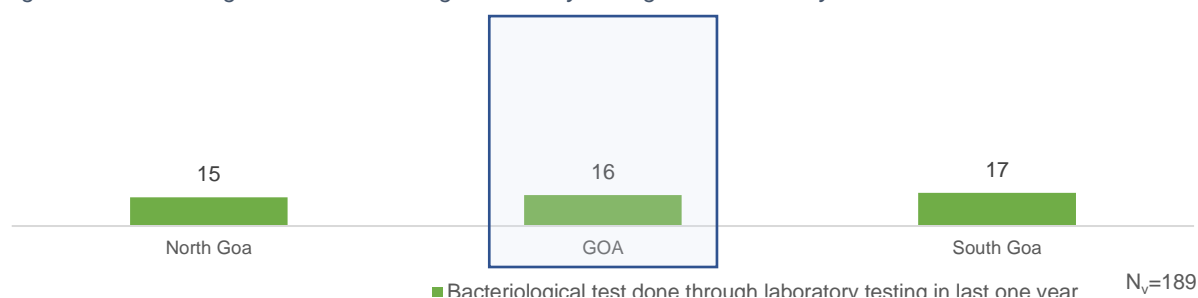
Figure 44: Percent villages in which Bacteriological test was done in the last one year



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 16% of sampled villages. South Goa reported 16% while as North Goa reported 15% to have had bacteriological tests done through laboratories in last one year.

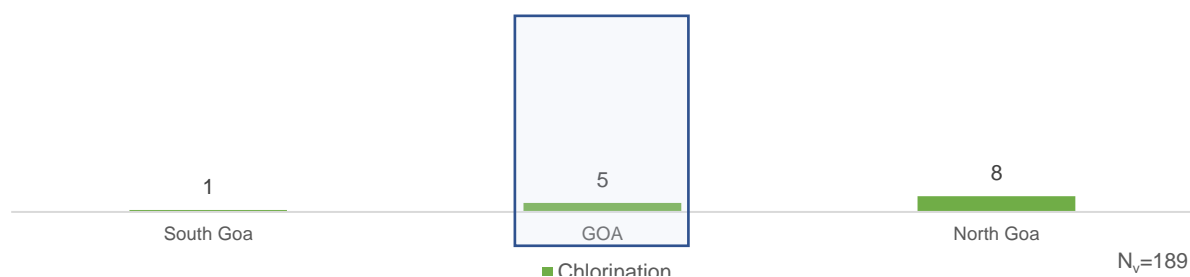
Figure 45: Bacteriological test done through laboratory testing in the last one year



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

Only **5% villages** reported that there is availability of chlorination mechanism in the village but during onsite testing of water at household level only 75% households tested to have for presence of chlorine.

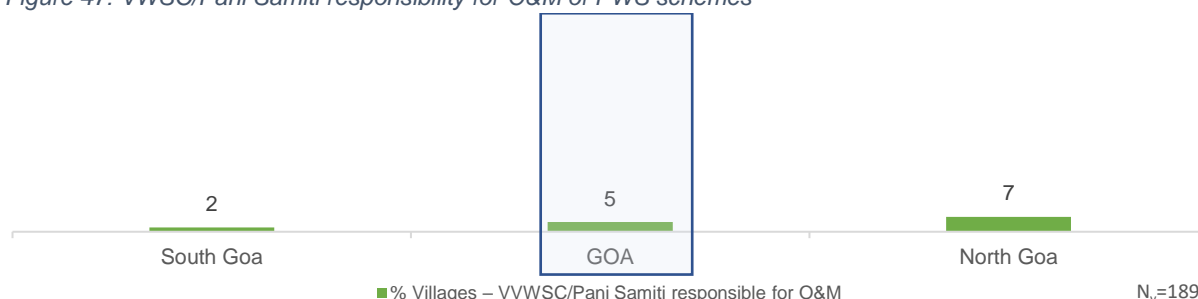
Figure 46: Villages having a mechanism for chlorination



3.7. Management of water service delivery at village level

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

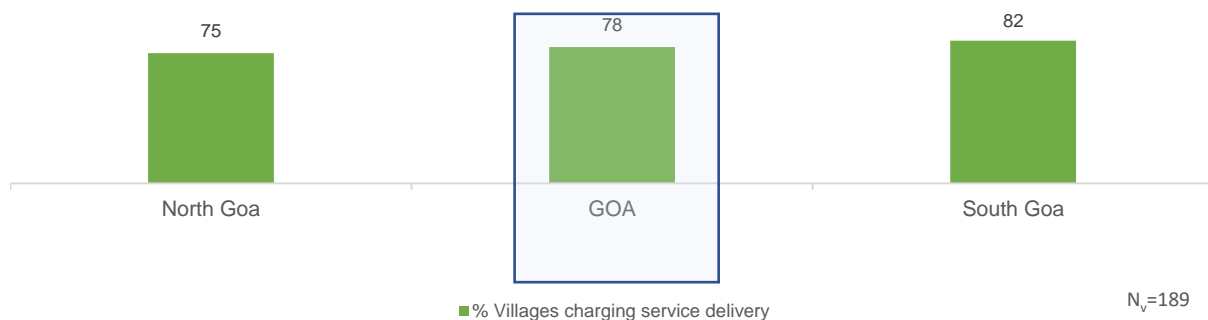
Figure 47: VWSC/Pani Samiti responsibility for O&M of PWS schemes



In the state, **5% villages** that have VWSC/Pani Samiti reported to be responsible for operation and maintenance of PWS. South Goa reported 7% and North Goa reported 2% VWSC/Pani Samiti are responsible for operation and maintenance of PWS.

B. Villages levying water service delivery charges from households

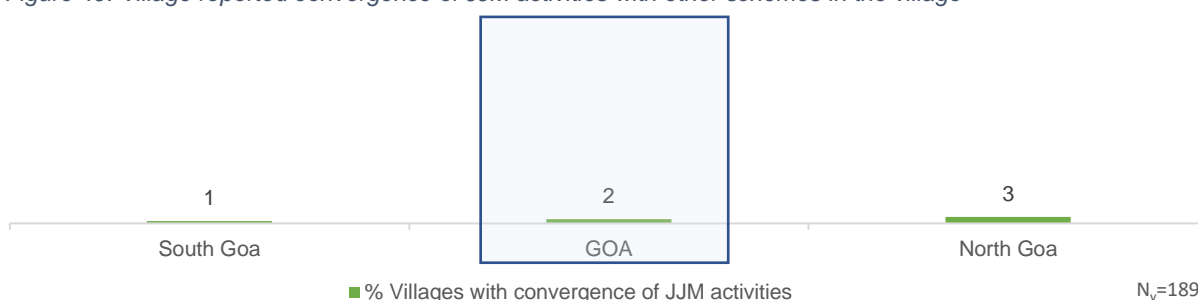
Figure 48: Villages levying water service delivery charges from households



Overall, **78% of villages** in the state levy charge for water service delivery to households whereas **90% HHs** reported paying water service delivery charges at the 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

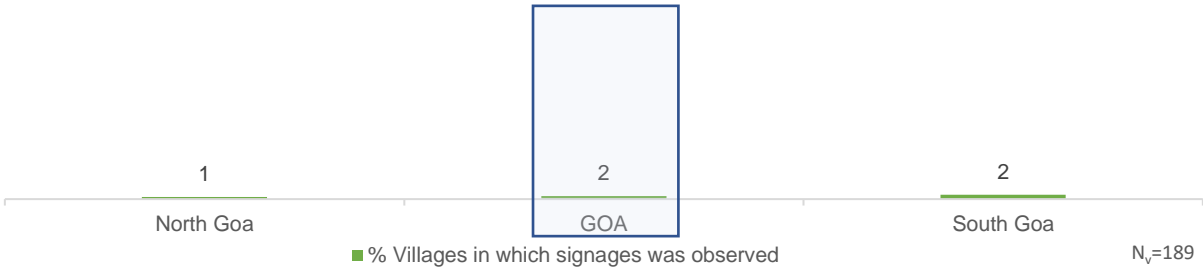


In the state, only **2% villages** in the state reported convergence of activities under JJM with other government programmes/ schemes on skill development, capacity building and training, and awareness generation.

D. Villages where signages were observed

Signages about JJM were observed in 2% of the sampled villages. South Goa had the highest proportion of villages where signages were observed (2%).

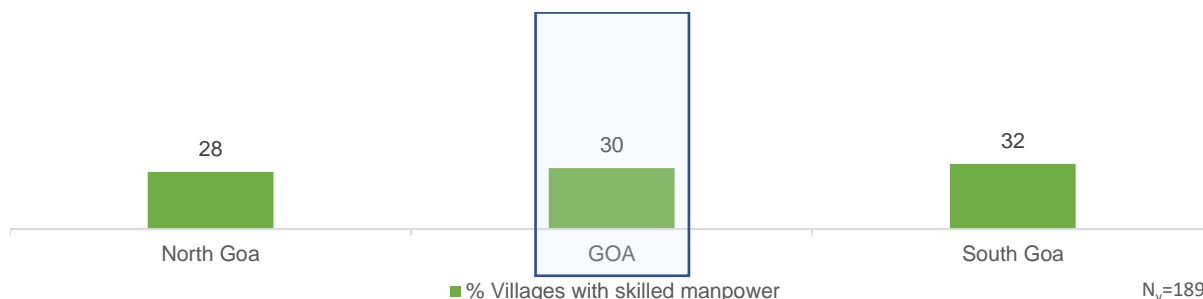
Figure 50: Villages in which signages about JJM was observed



3.8. Status of Operation & Maintenance

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

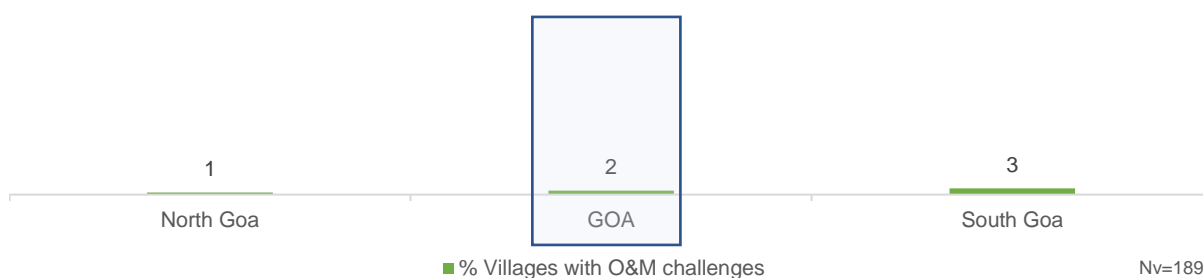
Figure 51: Villages reported having skilled manpower for O&M of PWS schemes



Across the state, **30% villages** in the reported having identified skilled manpower for O&M of PWS schemes, the most reported to be in South Goa (32%) and the least in North Goa (28%)

B. Villages with O&M challenges

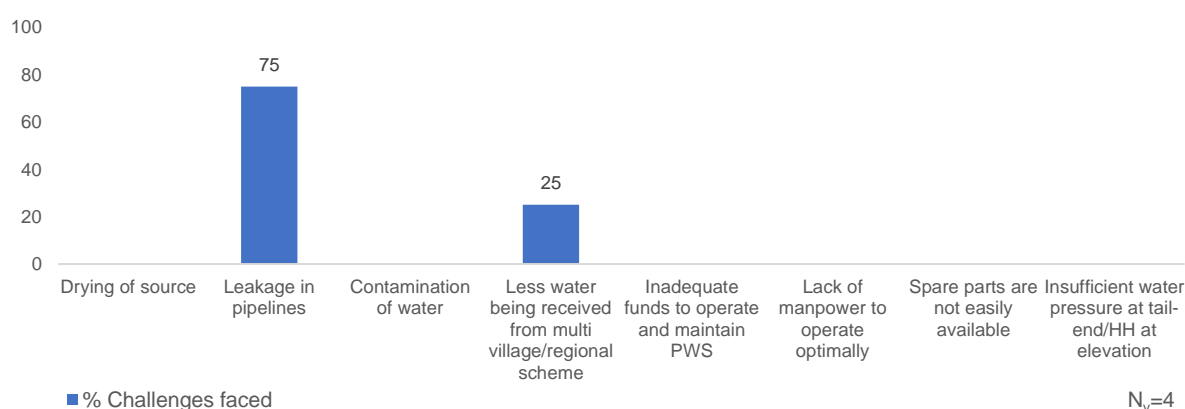
Figure 52: Villages reported having faced O&M challenge



In the state, **2% of villages** in the state reported to have faced challenges with respect to O&M of PWS schemes

C. Details of challenges faced

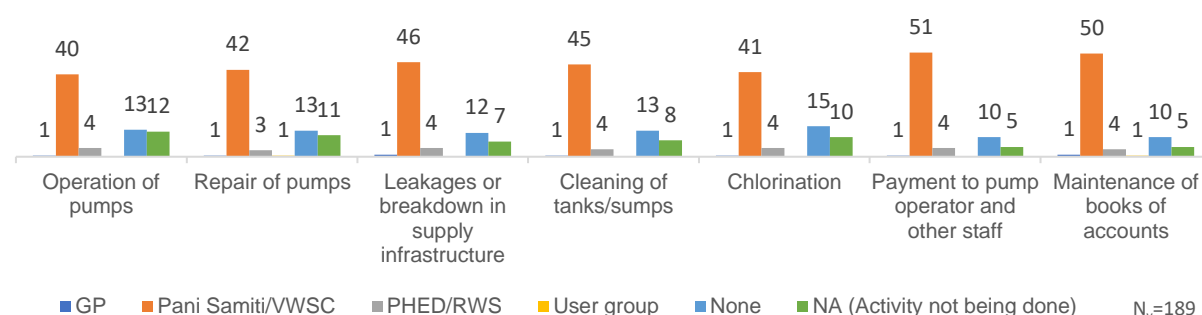
Figure 53: Details of O&M challenges faced by village



Out of the 2% of villages that had faced challenges with respect to O&M of PWS schemes (4 villages), 'leakage in pipelines' was attributed the most – at 75%.

D. Responsible for O&M

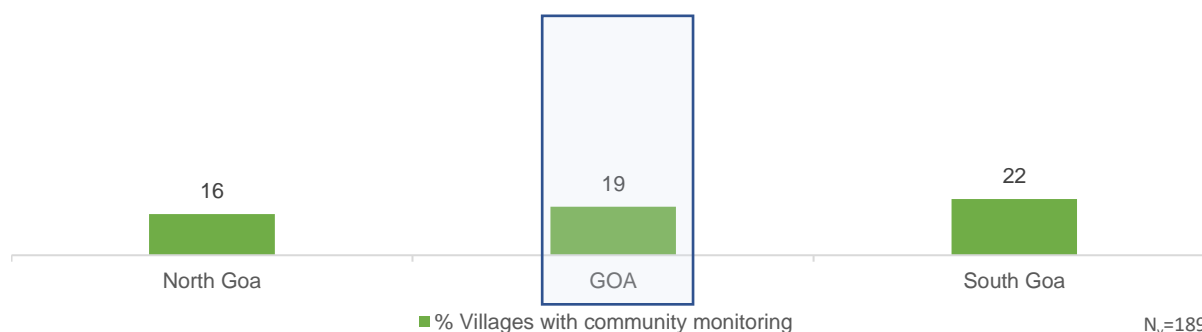
Figure 54: Different bodies responsible for O&M



Across the state, villages reported 'Pani Samiti' 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

Figure 55: Villages reported having community level monitoring of water wastage



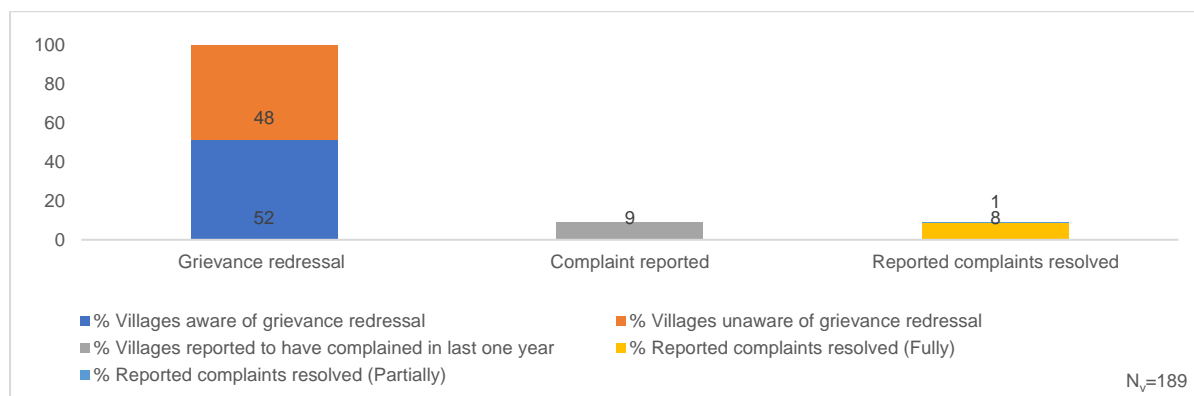
19% of villages in the state reported to have community level monitoring of water wastage

3.9. Status of service delivery related grievances and redressal

A. Village level

Grievance redressal at village

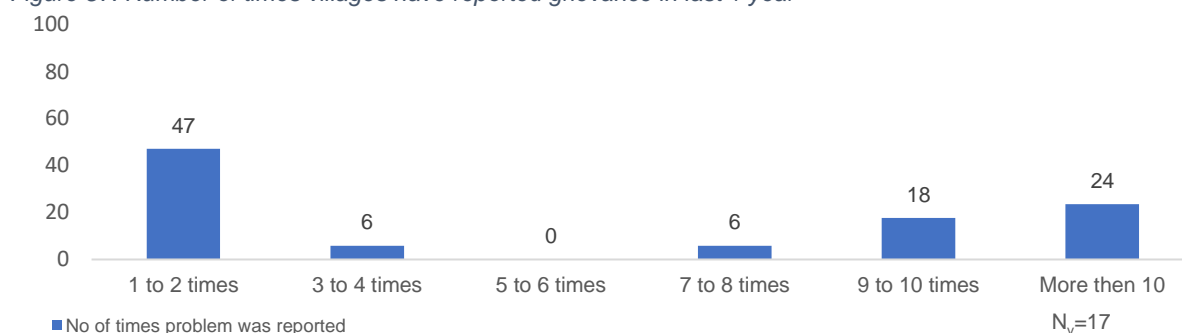
Figure 56: Reporting of grievance redressal at village level



In the state, **52% of villages** reported that they are aware of any grievance redressal mechanism, and only 9% HHs have reported a complaint in the last one year amongst which 100% reported that the complaints are fully resolved and 1% is partially resolved.

Problem reported in last 1 year

Figure 57: Number of times villages have reported grievance in last 1 year

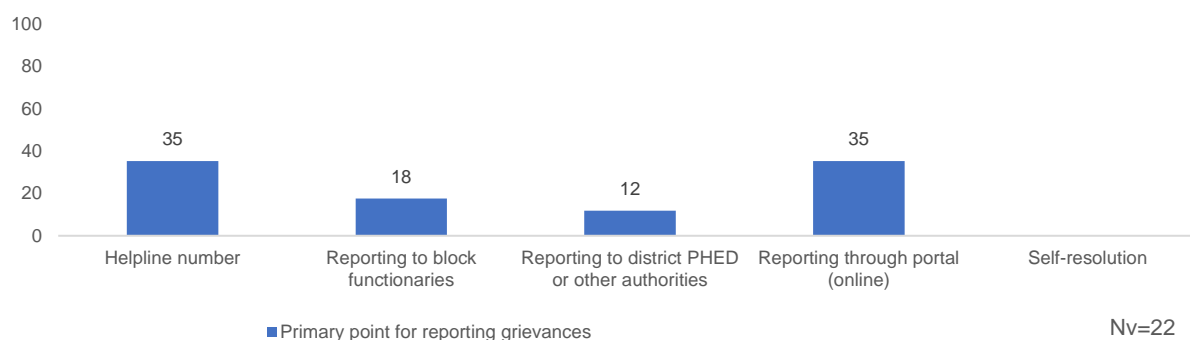


Among the villages who reported a complaint (i.e. 17 villages), 47% villages have reported a complaint one to two times in the last one year, while 24% reported a complaint more than ten times.

Primary points for reporting grievances

Among those who reported complaint (i.e., 22% HHs, 17 villages), **41% of villages** reported that they report their grievances to other grievance points, besides, 35% reported to Helpline number and through online portal as reporting-points

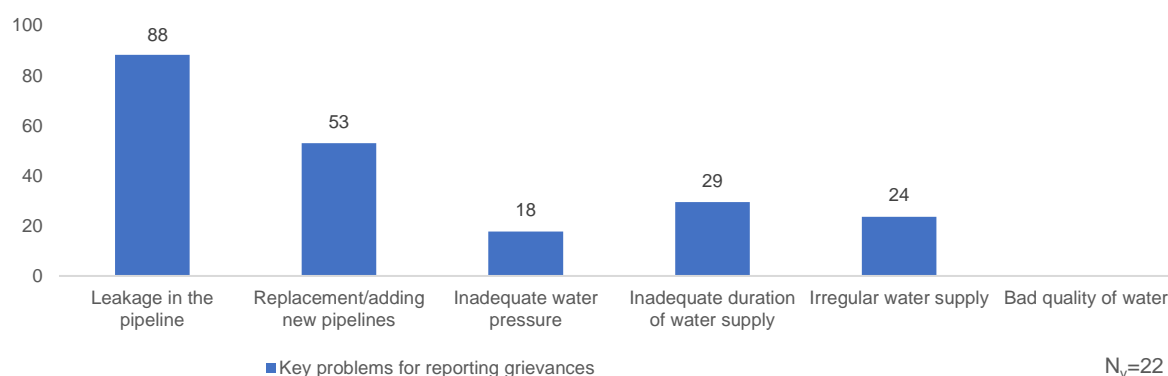
Figure 58: Primary points for reporting grievances by village



Key problems for reporting grievances

Overall, among those who reported complaint (i.e., 22% HHs, 17 villages) **88% of villages** reported that **leakage in the pipeline** is their most encountered problem for reporting grievances

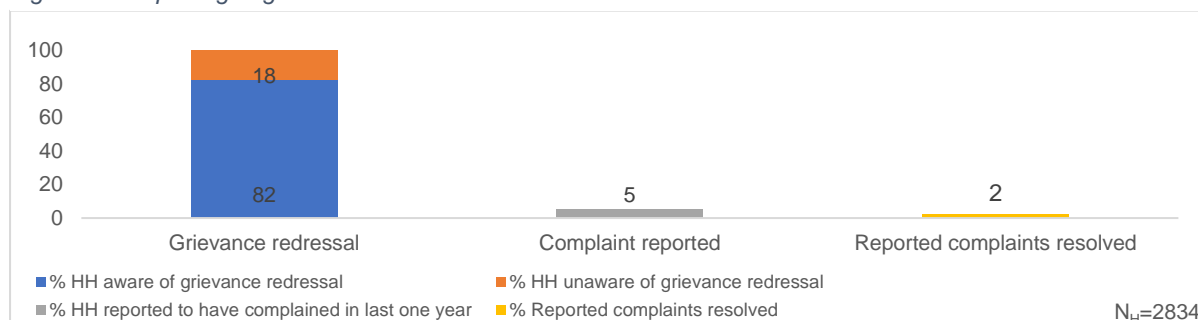
Figure 59: Key problems reported by village



B. Household level

Awareness of grievance redressal at household

Figure 60: Reporting of grievance redressal at household level

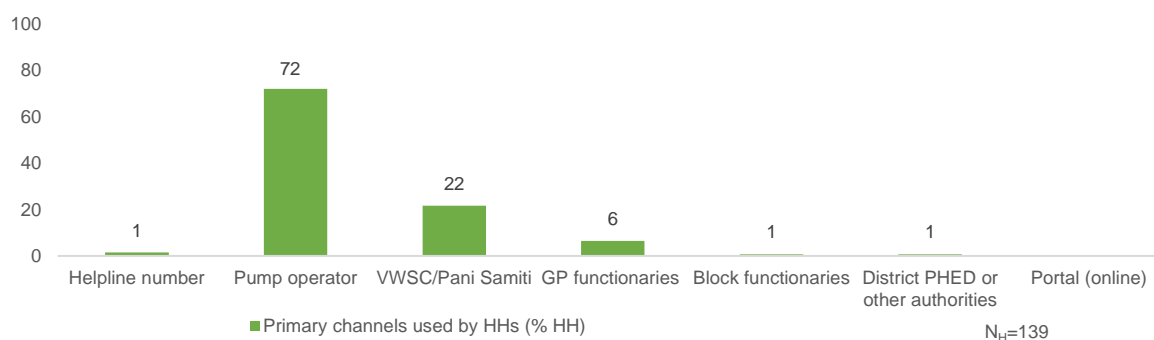


In the state, **82% of HHs** reported that they are aware of any grievance redressal mechanism w.r.t. HH tap water through PWS, but only 5% HHs have reported a complaint in the last one year and only 2% of complaints have been resolved.

Primary channels for reporting grievances by households

Among those who reported complaint as shown in the above graph (i.e., 5% HHs, 139 HHs), **72%** of the HHs reported their complaints to the **pump operators** beside other reporting-channels

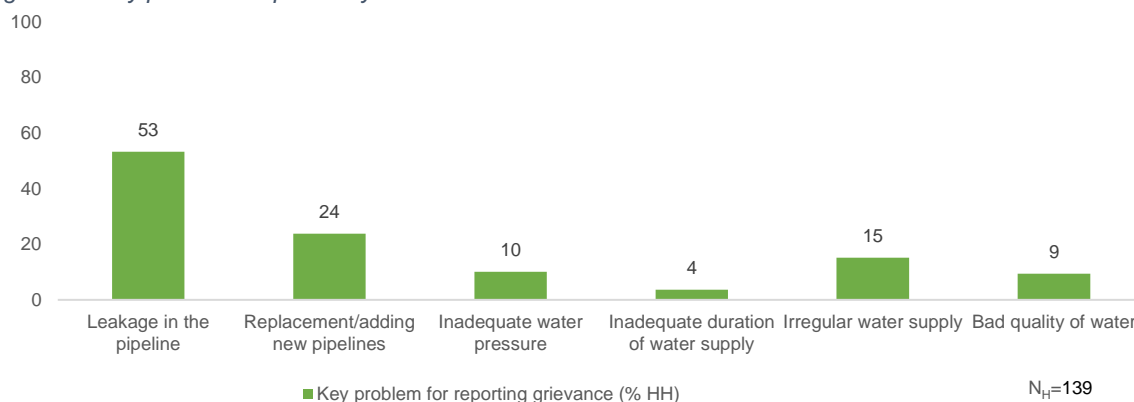
Figure 61: Primary channels for reporting grievances by households



Key problems for reporting grievances

Overall, among those who reported complaint (i.e., 5% HHs, 139 HHs) **53%** of the HHs that reported problems was of **leakage in the pipeline** beside other problems

Figure 62: Key problems reported by households

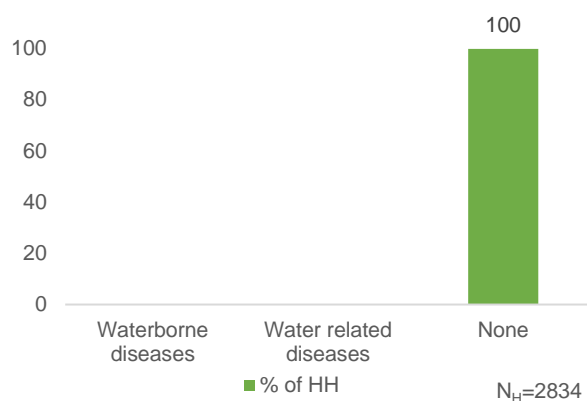


3.10. Perception of HHs on Outcome Indicators

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

Across the state no HHs reported having an incidence(s) of water borne diseases in their household in last one year.

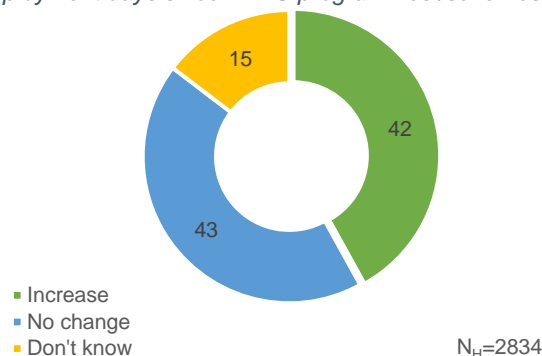
Figure 64: Household reported incidence of water borne diseases in last one year



B. Change in employment days since FHTC programmes/schemes

Since having a functional HH tap connection, 42% HHs across the state has reported that there has been a change in the no. of employment days of the adult HH members while 43% HHs reported no change

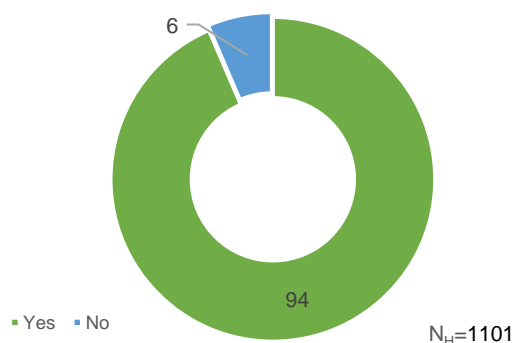
Figure 63: Household reported a change in employment days since FHTC programmes /schemes



C. Reduction in time and effort in collecting water

Out of the HHs reported (i.e. 1101) that female members used to fetch water before HH tap connection, 94% reported that post installation of HH tap connection it helped reduction of time and effort in collection of water

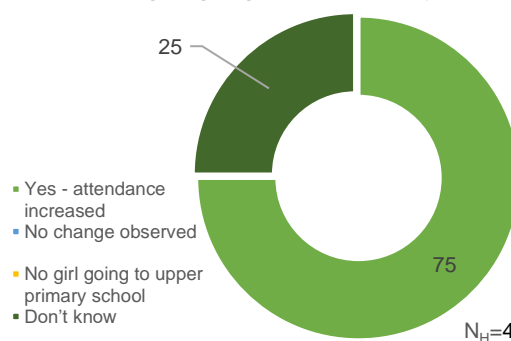
Figure 66: Households reported reduction in time and effort in collecting water



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

Across the state, 75% HHs reported that since having a functional HH tap connection the attendance of the girls going to schools increased, while 58% 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

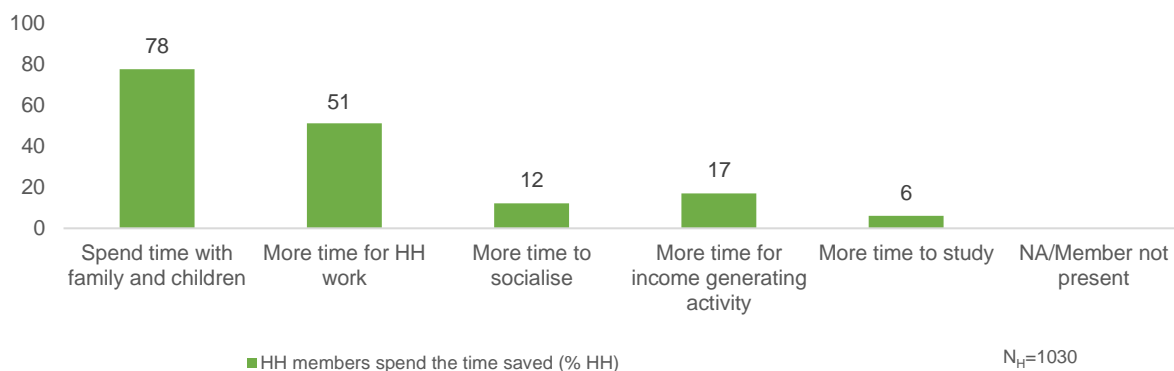
Figure 65: Households reported increase of attendance of girls going to upper primary school



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 (78%).

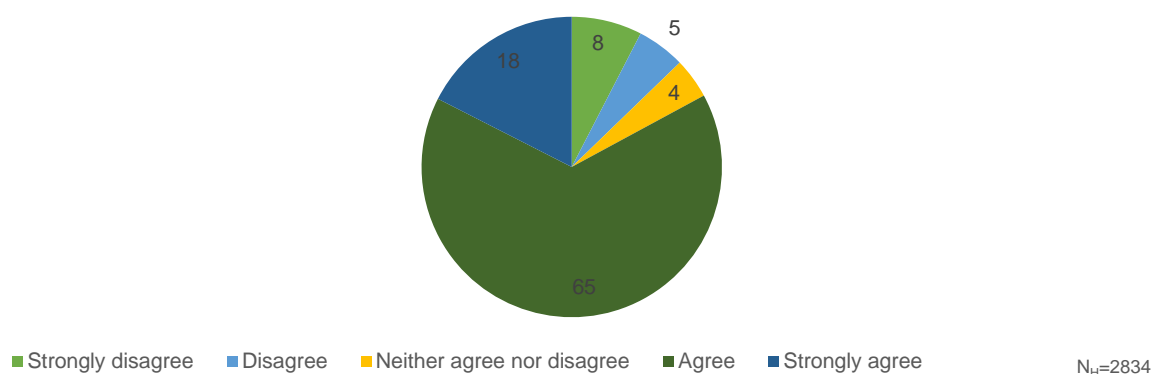
Figure 67: Utilization of time saved by households post installation of HH tap connection



F. Change in social status

Sense of pride and positive change in social status was reportedly realized by 65% of HHs post the installation of HH tap connections.

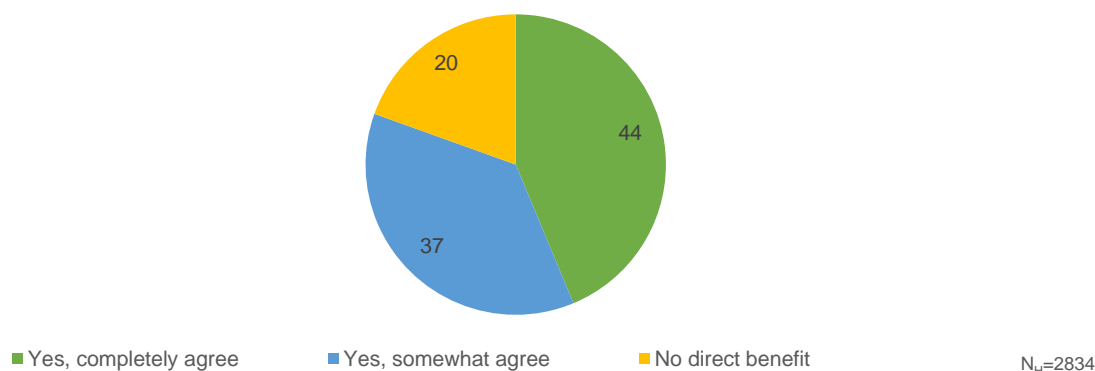
Figure 68: Households reported to have a positive change in social status








G. Direct benefits in terms of income due to FHTC

Across the state, 44% 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 37% 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



3.11. User satisfaction

Table No. 7: User satisfaction - more than 75% happy with FHTC services			
S. No.	Parameter (N _H =2834)		In %
1	Regularity		97.7
2	Overall quality		96.6
3	Colour		94.9
4	Taste		95.7
5	Odour		94.6

Note:

Base (N_V)=189 means all villages sampled and covered in Goa state

Base (N_H)=2834 means all households sampled and covered across the 189 villages in Goa state

Base (N_H)=2834 means all households sampled where water sample be collected across the 189 villages in Goa state

Base (N_H)=1101 means all households sampled where female members used to fetch water before HH tap connection

Base (N_H)= 4 means all households sampled that had adolescent girls as one of HH members

4. Annexure

Table No. 8: List of replaced villages				
S. No.	District Name	Village Name	Status of the Scheme (No Scheme/Replaced & Defunct)	Remarks
1	North Goa	Alorna	No Scheme	No Scheme present in the sampled village, hence replaced with Village- Agarvado. Scheme found to be functional in replacement village
2	South Goa	Barcem	No Scheme	No Scheme present in the sampled village, hence replaced with Village- Adnem. Scheme found to be functional in replacement village
3	South Goa	Quisconda	No Scheme	No Scheme present in the sampled village, hence replaced with Village- Bendordem. Scheme found to be functional in replacement village
4	North Goa	Reis Magos	No Scheme	No Scheme present in the sampled village, hence replaced with Village- Sangolda. Scheme found to be functional in replacement village