Presentation on:

"Assessment of **Non-Revenue Water** and its reduction plan in **Srinagar City**"

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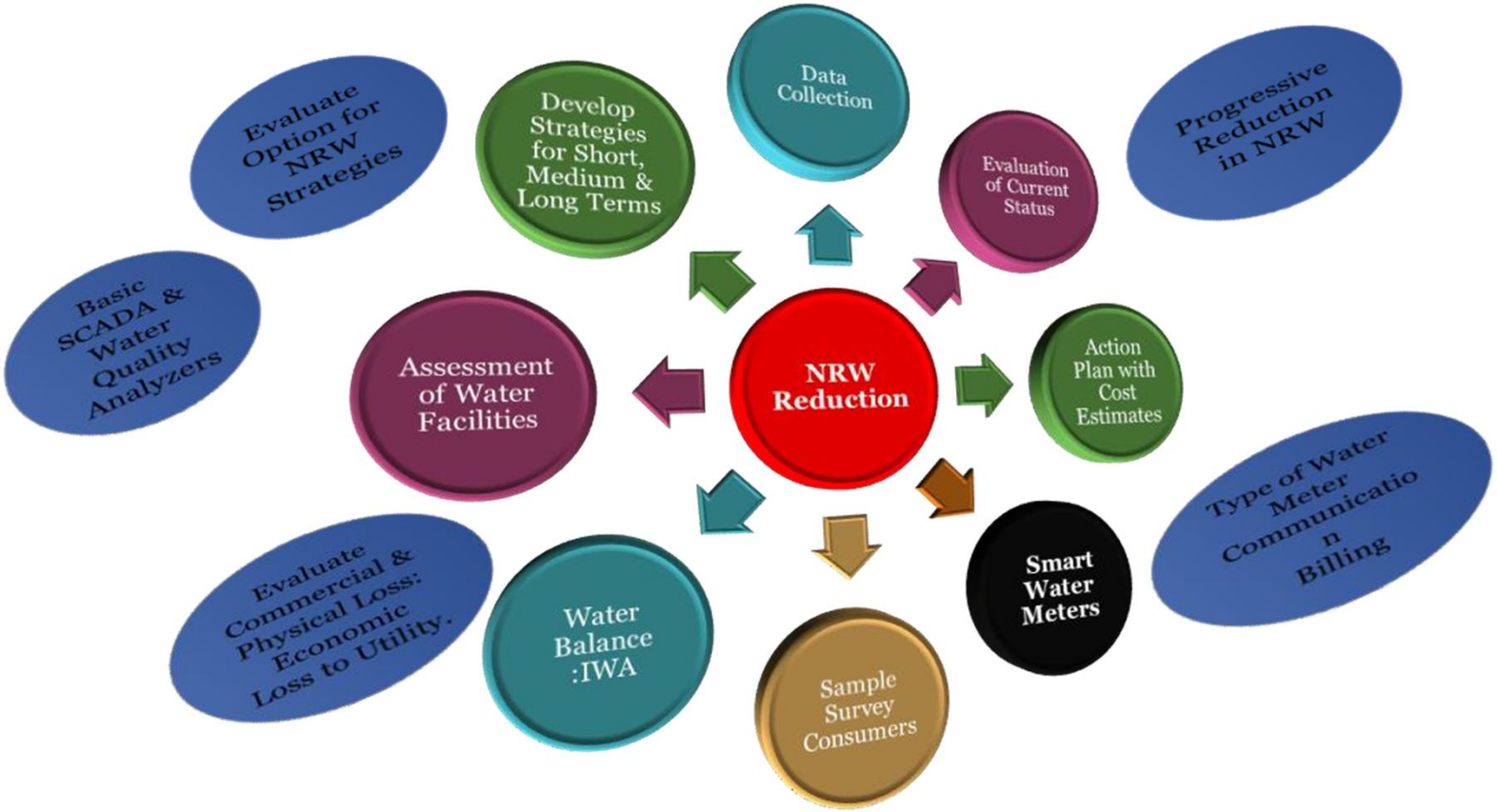
Non Revenue Water (NRW) means the volume of water lost before it reaches the customer including the Non Billed Water.

Objective

To assess:

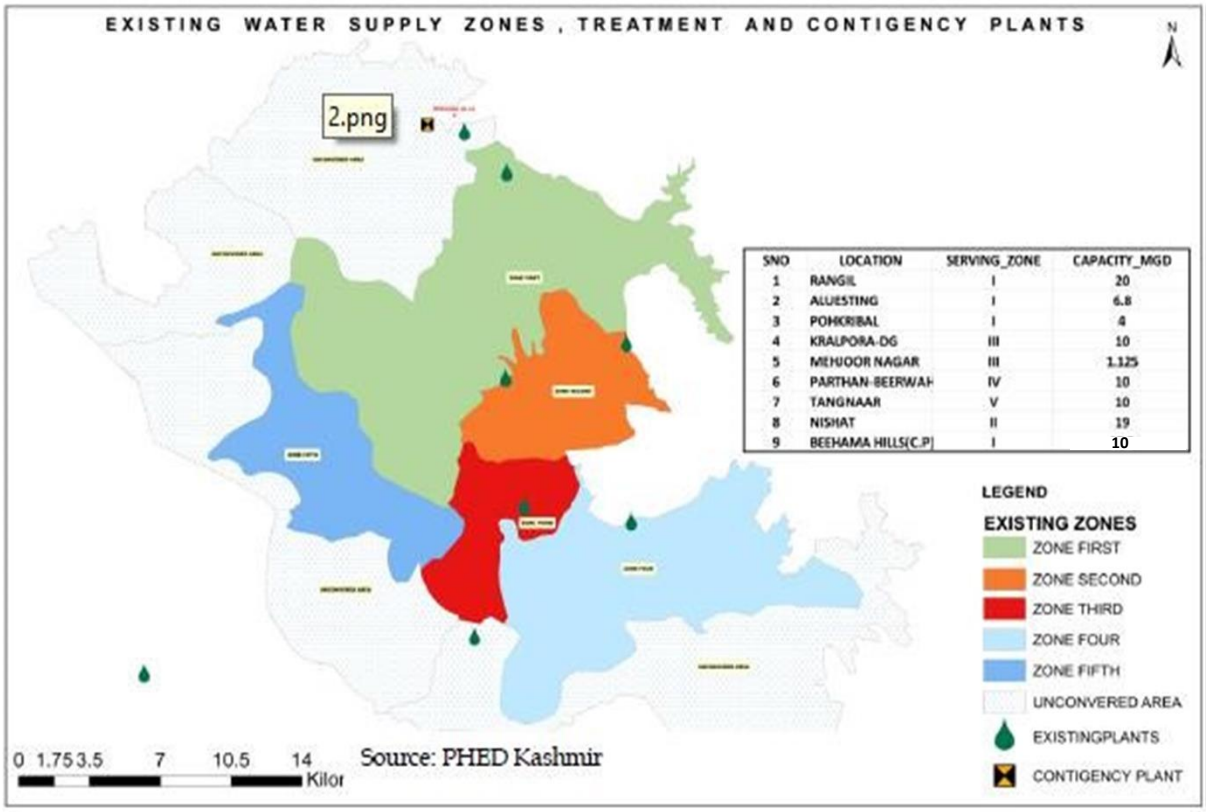
- **As is Situation.**
- **Real losses: Physical and Commercial.**
- **Apparent losses**
- **To identify Reasons for these losses.**

Activities


NRW Reduction
Data Collection
Evaluation of Current Status
Progressive Reduction in NRW
Action Plan with Cost Estimates
Type of Water Meter Communicatio n Billing
Smart Water Meters
Sample Survey Consumers
Water Balance :IWA
Evaluate Commercial & Physical Loss: Economic Loss to Utility.
Assessment of Water Facilities
Basic SCADA & Water Quality Analyzers
Evaluate Option for NRW Strategies
Develop Strategies for Short, Medium & Long Terms

Existing Water Supply System Srinagar City

Existing Water Supply System



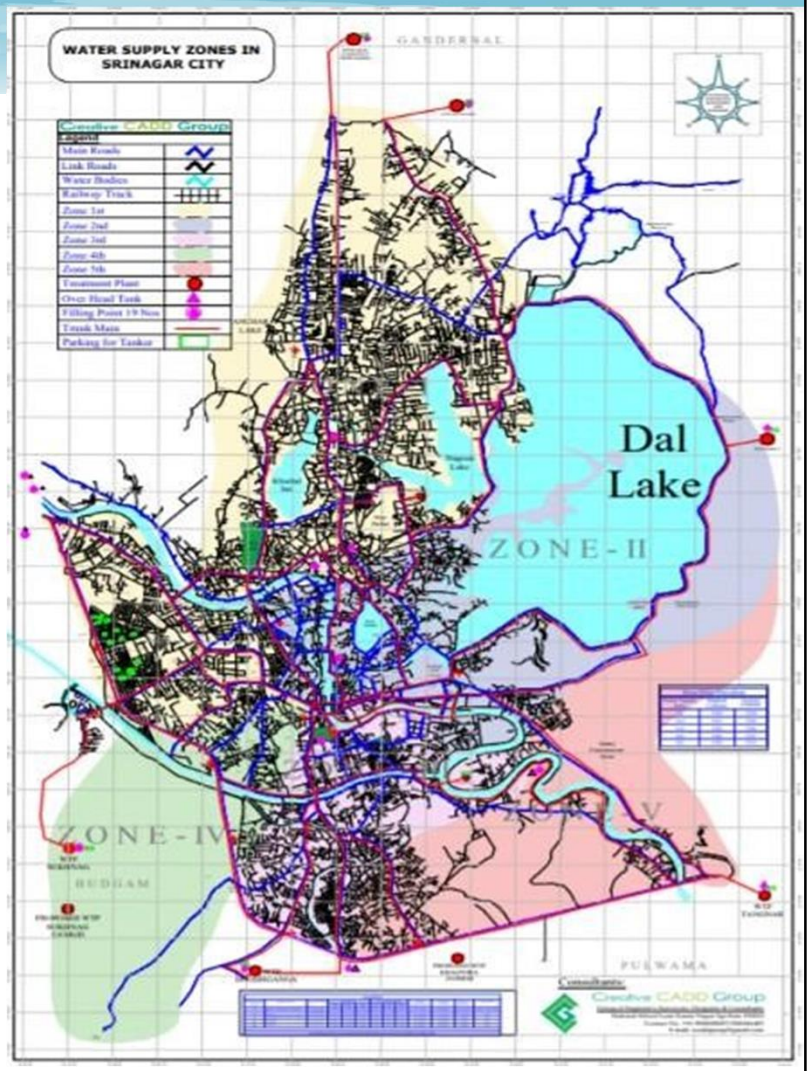
Water Works Division

Master Plan Division

WS Zone	Name of Zone	Area (SqKm)	Distribution network	Feeder main
1	Rangil / Alustang / Pokhribal	146.00	263.16	70.18
2	Nishat	75.00	135.18	36.05
3	Doodhganga and Mehjoor Nagar	23.10	41.64	11.10
4	Sukhnag	80.00	144.20	38.45
5	Tangnar	92.00	165.83	44.22
		416.1	**750**	**200**

Existing Water Supply System

Sr. No.	WS Zone	Location of WTP	Capacity at WTP in MGD (2015)	No of units	Source of Raw Water
1	Zone I (Rangil)	Rangil Old	10MGD	01	Sindh extension canal
		Rangil New	20MGD	01	Sindh extension canal
		Alustang	4.8MGD and 2MGD	02	Sindh extension canal
		Pokhribal	4MGD	01	Nigeen Lake
2	Zone II (Nishat)	Nishat	4MGD (3 nos), 2.2MGD and 4.8MGD	05	Dal Lake, Dashigam Canal and Sharab Khul
3	Zone III (Doodhganga & Mehjoor nagar)	Doodhganga	4MGD, 2.25MGD (2 nos), and 1.5MGD	04	Doodhganga Canal
		Mehjoor nagar (Padsahibagh)	1.125MGD	01	River Jhelum
4	Zone IV (Sukhnag)	Parthan	10MGD	01	Sukhnag Canal
5	Zone V (Tangnar)	Sempora	10MGD	01	River Jhelum
		Total	**90.925 MGD**	**17**	



Assessment of Water Facilities

Assessment of Water Facilities

Various onsite assessments were done, which was required to collect the data.

- Condition assessment of all Water Treatment Plants was done
- Pump details were collected
- Details about Over Head Tanks were collected.

Condition assessment Rangil WTP

Condition assessment Rangil WTP

Rangil 20-MGD			
Sr NO	Unit description	Dia. / Dimensions / Nos.	PLANT CONDITION & REMARKS
1	AERATION FOUNTAIN		
	INLET PIPE DIA.	NA	
	INLET VALVE SIZE	NA	
2	FLASH MIXER		
	FLASH MIXER SIZE	Area required = 2.432 sqm	Leaking
	INLET TO CLF-GATE		
	OUTLET TO CLF THROUGH CHANNEL SIZE		
3	CLARIFLOCCULATOR		
	CLF SIZE	Diameter-31.69 m, Depth-4.34m	Bridge to be replaced (all)
	INLET PIPE DIA		
	DRAIN PIPE & VALVE		
4	FILTER HOUSE NO.1		
	NO OF BED AND CAPACITY	10 No	Wall leaking
		Capacity Per bed = 2 MGD	
	FOR EACH BED		
	FILTER BED SIZE (10 No)	Size = 2.6m x 3.81m x 10.81m.	
	SETTLE WATER THROUGH (CHANNEL)	1 m x 1 m	Good
	SETTLE WATER INLET -GATE(10 No)	450 mm	Good
	PURE WATER OUTLET VALVE (10 No)	300 mm	Good
	WASH WATER INLETVALVE- (10 No)	350 mm	Good
	DRAIN/BACKWASH OUTLET VALVE -(10 No)	400 mm	Good
	AIR VALVE (20 NOS)	125 mm	Good
5	PURE WATER TROUGH (CHANNEL SIZE)		
	PURE WATER TROUGH CHANEL	1.3 m x 1m	Leaking
	OUTLET VALVE		
6	PURE WATER SUMP NO.1 & 2		
	SUMP CAPACITY	Capacity = 70000 Gallons	Good
	SUMP SIZE		
	INLET VALVE		
7	PUMP HOUSE NO.1		
	PURE WATER PUMPS FOR BACKWASHING	250 mm – 4 nos	Low efficient (2 Nos)
	BACK WASH TANK/SR/WASH WATER TANK		
	BACK WASH TANK CAPACITY	250000 gallons	
	SR CAPACITY (compartments: 2)	Capacity: 10MG each Size: 200.9m x 38.99m x 5.9m	

Condition assessment Nishat WTP

Condition assessment Nishat WTP

Nishat 4.0 MGD-1			
Sr NO	Un it description	Dia . / Dimensions / Nos.	PLA NT CONDITION & REMA RKS
1	A ERATION FOUNTAIN		
	INLET PIPE DIA.	NA	
	INLET VALVE SIZE	NA	
2	FLA SH MIXER		
	FLA SH MIXER SIZE	A rea required = 4.9 sqm	Good
	INLET TO CLF-GATE		
	OUTLET TO CLF THROUGH CHANNEL SIZE		
3	CLARIFLOCCULATOR		
	CLF SIZE (1 No)	Diameter-24.4m, Depth-4 .34m	Good
	INLET PIPE DIA		
	DRA IN PIPE & VALVE		
4	FILTER HOUSE NO.1		
	NO OF BED A ND CA PACITY	3 No	Good
		Ca pacity Per bed = 1.33 MGD	Good
	FOR EACH BED		
	FILTER BED SIZE (3 No)	Size = 7.1m x 5.6m x 3.6m	
	SETTLE WATER THROUGH (CHANNEL)	1m X 1m	Good
	SETTLE WATER INLET -GATE(6 No)	3 00 mm	Good
	PURE WATER OUTLET VALVE (3 No)	3 00 mm	Lea king (2 Nos)
	WASH WATE R INLETVALVE- (3 No)	3 00 mm	Lea king (2 Nos)
	DRA IN/BACKWASH OUTLET VALVE -(3 No)	3 00 mm	Lea king (2 Nos)
	A IR VALVE (6 NOS)	8 0 mm	
5	PURE WATER TROUGH (CHANNEL SIZE)		
	PURE WATER TROUGH CHANEL	1m x 1m	Good
	OUTLET VALVE		
6	PURE WATER SUMP NO.1 & 2		
	SUMP CAPACITY (Tank)	Ca pacity = 25000 Gallons	
	SUMP SIZE		
	INLET VALVE		
7	PUMP HOUSE NO.1		
	PURE WATER PUMPS	2 n os	Low efficient
	BA CK WASH TANK/SR/WASH WATER TA NK		
	BA CK WASH TANK CAPACITY	Ca pacity: 50,000 Gallons	(common for 4.8 MGD & 4 MGD (I))
8	SR	Ca pacity: 1.7 MG each	(Common for 4.8 MGD & 4 MGD (I))

Assessment of Pumps at Rangil WTP

DETAILS OF PUMPS AT RANGIL 10MGD WTP				
1	PUMP NO./TAG NO.	UNIT	P-1	P-2
2	USER		Backwash tank	
3	STATUS		RUN	STAND BY
4	MAKE		Kirloskar	Kirloskar
5	MODEL		UP 125/25A	UP 125/25A
6	FLOW	m3/hr	239	239
7	HEAD	M	20	20
8	SPEED	rpm	1475	1475
9	ACTUAL PUMP DICH. PRESSURE	Kg/cm2	1.5	

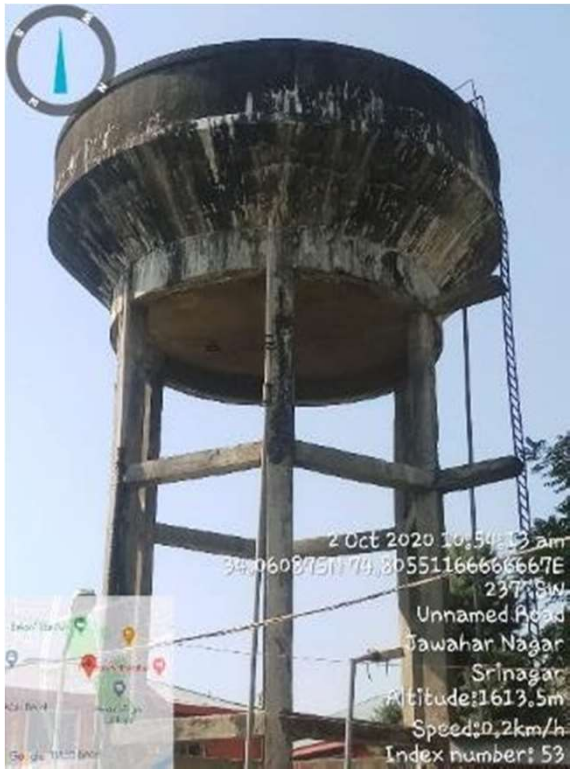
Assessment of Pumps at Rangil WTP

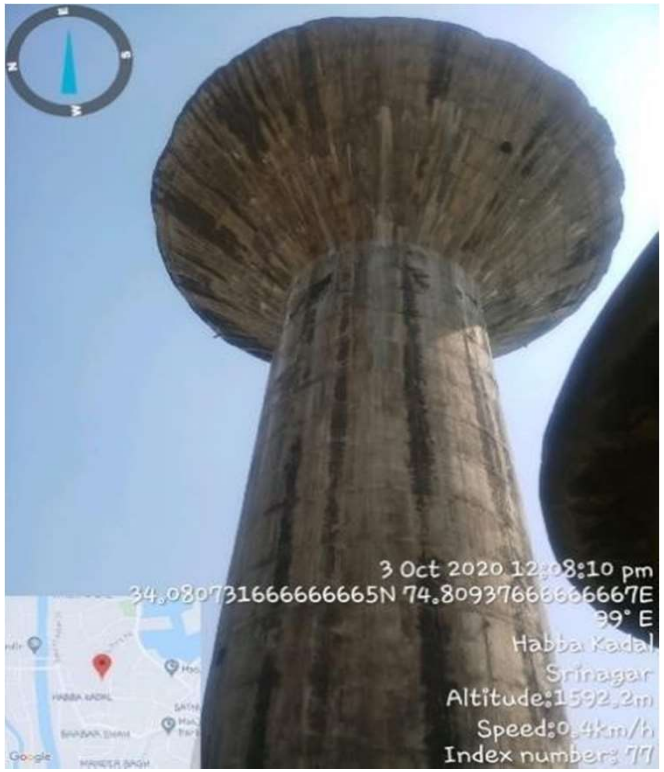
DETAILS OF PUMPS AT RANGIL 10MGD WTP				
10	MOTOR RATING	KW	22	22
11	RATED CURRENT	AMPS	54.5	54.5
12	ACTUAL MOTOR INPUT	KW	18.4	
13	ACTUAL CURRENT	AMPS	33.09	
14	FLOW	m3/hr	187	
15	VELOCITY	m/sec	2.94	
16	SUCTION PIPE	NB	150	150
17	DISCHARGE PIPE	NB	150	150
18	DISCHARGE PIPE	NB	150	

Assessment of Pumps at Nishat WTP

DETAILS OF PUMPS FOR NISHAT PUMPING STATION												
1	PUMP NO./TAG NO.	UNIT	P-1	P-2	P-3	P-1	P-2	P-3	P-1	P-2	P-3	P-4
2	USER		FOR 2.2 MGD			FOR 4 MGD II			FOR 4 MGD III			
	STATUS		STAND BY	RUN	RUN	STAND BY	STAND BY	STAND BY	RUN	STAND BY	STAND BY	STAND BY
3	MAKE		M&P	M&P	M&P	Baecon Wear	Baecon Wear	Baecon Wear	M&P	M&P	M&P	M&P
4	MODEL		Not Visible									
5	FLOW	m3/hr	510	510	510	510	510	510	510	510	510	510
6	HEAD	M	90	90	90	90	90	90	90	90	90	90
7	SPEED	rpm	1480	1480	1480	1480	1480	1480	1480	1480	1480	1480
8	ACTUAL PUMP DICH. PRESSURE	Kg/cm2		8.5	8.5				8.5			
9	MOTOR RATING	KW	205	205	205	205	205	205	205	205	205	205
10	RATED CURRENT	AMPS	370	370	370	370	370	370	370	370	370	370
11	ACTUAL MOTOR INPUT	KW		143.8	144.2				170			
12	ACTUAL CURRENT	AMPS		215.2	215				284.1			
13	FLOW	m3/hr		340	345							
14	VELOCITY	m/sec		1.34	1.36							
15	SUCTION PIPE	NB	300	300	300	300	300	300	300	300	300	300
	DISCHARGE PIPE	NB	300	300	300	300	300	300	300	300	300	300
16	DISCHARGE PIPE	NB		500			600			600		

Assessment of Over Head Reservoirs in Srinagar





Details of overhead reservoirs in Srinagar

Sr. No.	ZONE	Nam e of Area/Locality	Capacity OF OHT /GALLONS	Year of Instalation	Intel Line Size(mm)	Outlet Line Size (mm)	Pum p Yes/NO	Nos	Pum p HP	Pum p Discharge (Gallons / hour)	Water Source	Functional / Non Functional	Latitude	Longitude
1	1	Maharaj Gung OHT	50,000	1995	80	150	Y es	2	20	15000	Rangil	Functional	17 .37669	7 8.475662
2	1	Iqbal Park OHT	1,00,000	1992	100	100	Y es	2	7 .5	N/A	Jehlum River	Functional	14.67 056	77 .58714
3	1	Kathi Darwaza Lift Sump	20,000	2000	N/A	N/A	Y es	1	15	5000	Rangil	Functional	34.098948	7 4.812816
4	1	Jawahar Nagar OHT	50,000	1970	100	100	Y es	1	10	N/A	Harwan	NON - FUNCTIONA L	34.0639466	7 4.81493
5	1	DEVI AAGAN MAK DOOM SAH AB	50,000	1975	100	100			N/A	N/A	PUKRI BAL	Functional	34.1 05413	7 4.812603
6	1	Saida Kadal	N/A	N/A	N/A	N/A	Y es	1	7	3000	TUBE WELL	Functional	34.0837	7 4.79733
7	1	Amdakadal	N/A	N/A	N/A	N/A	Y es	1	12.5	5000	TUBE WELL	Functional	34.11555	7 4.81777
8	1	ILLAHI Bagh	N/A	N/A	N/A	N/A	Y es	1	10	3000	TUBE WELL	Functional	34.15211	7 4.82222
9	1	Hazratbal Dargah	50,000	1975	80	100	Y es	1	10	10,000	Alustang + well	Functional	34.128031	7 4.83858
10	2	Gadoodh Bagh Habbakadal	1,00,000	2005	100	65	Y es	1	2	N/A	Nishat	Functional	34.080731	7 4.80937

Details of overhead reservoirs in Srinagar

Sr. No.	ZONE	Nam e of Area/Locality	Capacity OF OHT /GALLONS	Year of Instalation	Intel Line Size(mm)	Outlet Line Size (mm)	Pum p Yes/NO	Nos	Pum p HP	Pum p Discharge (Gallons / hour)	Water Source	Functional / Non Functional	Latitude	Longitude
11	2	RUSTOM GALI U.N.O OFFICE	40,000 60,000 25,000	1995	100	100	Y es	4	40	12000	Nishat	Functional	34.074125	74.835233
12	2	Tally manzil	N/A	N/A	N/A	N/A	Y es	1	12.5	3000	TUBE WELL	Functional	34.07 955	74.858333
13	2	Attagati	N/A	N/A	N/A	N/A	Y es	1	12	2500	TUBE WELL	NON - FUNCTIONAL	34.07 955	74.85833
14	2	Fairview	N/A	N/A	N/A	N/A	Y es	1	12.5	5000	TUBE WELL	Functional	34.07 955	74.85833
15	2	MALBAGH	N/A	N/A	N/A	N/A	Y es	1	5	3000	TUBE WELL	Functional	34.1392	74.80266
16	2	Hari niwas	50,000	N/A	N/A	N/A	Y es	1	12.5	5000	TUBE WELL	NON - FUNCTIONAL	34.08233	74.86855
17	2	Zethiyari & iv	## ## ## #	N/A	N/A	N/A	Y es	2	12.5 10	4000	MS TANK/TUBEWELL	Functional	34.07 399	74.835888
18	2	Zethiyar 2nd	N/A	N/A	N/A	N/A	Y es	1	15	1500	TUBE WELL	Functional	34.07399	74.835888
19	2	Zethiyar 3rd	1,00,000	N/A	N/A	N/A	Y es	1	12.5	2500	MS TANK/TUBE WELL	Functional	34.07 399	74.835888
20	2	Rajbawan	N/A	N/A	N/A	N/A	Y es	1	25	7 000	MS TANK/TUBEWELL	Functional	34.07 399	74.835888

Details of overhead reservoirs in Srinagar

Sr. No.	ZONE	Nam e of Area/Locality	Capacity OF OHT /GALLONS	Year of Instalation	Intel Line Size(mm)	Outlet Line Size (mm)	Pum p Yes/NO	Nos	Pum p HP	Pum p Discharge (Gallons / hour)	Water Source	Functional / Non Functional	Latitude	Longitude
21	2	Cheshmashahi	40,000	N/A	N/A	N/A	Yes	1	15	4000	MS TANK/TUBE WELL	Functional	34.13144	74.882999
22	3	TULSI BAGH OHT	50,000	1970	80	80	Yes	2	15	N/A	Doodh Ganga	Functional	34.0608875	74.80555
23	3	Baghi mehtab	50,000	1970	100	80	Yes	1	15	N/A	Doodh Ganga	Functional	34.02999	74.804555
24	3	MISQEEN BAGH OHT	38,000 12,000	2002	150	150	Yes	3	15	10000	Doodh Ganga	Functional	34.091786	74.8232916
25	N/A	Bal-Garden OHT	N/A	N/A	N/A	N/A			N/A	N/A	N/A	NON - FUNCTIONAL	34.077888	74.801133
26	N/A	BOYS HOSTEL BEMINA OHT	N/A	N/A	N/A	N/A			N/A	N/A	N/A	NON - FUNCTIONAL	34.07 0999	74.763999
27	N/A	Bilal colony Bemina	N/A	N/A	N/A	N/A			N/A	N/A	N/A	NON - FUNCTIONAL	34.070999	74.763999
28	N/A	LAL BAZAR BOTKADAL	N/A	N/A	N/A	N/A			N/A	N/A	N/A	NON - FUNCTIONAL	34.13311	74.84077
29	N/A	H.M.T ZAINAKOTE	75,000	1975	100	100			N/A	N/A	N/A	NON - FUNCTIONAL	34.0993	74.735833
30	N/A	KHASHPORA H.M.T	N/A	N/A	N/A	N/A			N/A	N/A	N/A	UNDER SECOP DEPT.	34.0993	74.735833

Consumer Survey Details

Details of Registered consumers

S no	Division	Size / Type	15	20	25	40	50	90	100	Total
1	Zone1	Residential	54028	0	0	0	0	0	0	54028
		Non-Residential	196	9	6	2	1	1	1	216
		Commercial	364	0	0	0	0	0	0	364
		Total	54588	9	6	2	1	1	1	54608
2	Zone2	Residential	38822	0	0	0	0	0	0	38822
		Non-Residential	506	40	17	4	3	0	1	571
		Commercial	1683	24	7	4	0	0	0	1718
		Total	41011	64	24	8	3	0	1	41111
3	Zone3	Residential	31586	0	0	0	0	0	0	31586
		Non-Residential	316	33	14	2	0	0	0	365
		Commercial	650	20	3	2	0	0	0	675
		Total	32552	53	17	4	0	0	0	32626
4	Zone4	Residential	15658	0	0	0	0	0	0	15658
		Non-Residential	15	7	19	1	0	0	0	42
		Commercial	82	8	2	0	0	0	0	92
		Total	15755	15	21	1	0	0	0	15792
5	Zone5	Residential	692	0	0	0	0	0	0	692
		Non-Residential	2	2	0	0	0	0	0	4
		Commercial	1	0	0	0	0	0	0	1
		Total	693	2	0	0	0	0	0	696
		Grand Total	144599	143	68	15	4	1	2	144833

NRW Calculation IWA Format

Non Revenue Water – Complete Srinagar City

<table>
<tr><td rowspan="6">System Input Volume 78 MGD</td><td rowspan="3">Authorized Consumption 37.76 MGD 48.41 %</td><td rowspan="2">Billed Authorized Consumption 37.56 MGD 48.16 %</td><td>Billed Metered Consumption NIL</td><td rowspan="2">Revenue Water 37.56 MGD 48.16%</td></tr>
<tr><td>Billed Unmetered Consumption 37.56 MGD 48.16 %</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption 0.20 MGD 0.25%</td><td>Unbilled Metered Consumption NIL</td><td rowspan="5">Non-Revenue Water (NRW) 40.44 MGD 51.84 %</td></tr>
<tr><td>Unbilled Unmetered Consumption 0.20MGD 0.25 %</td></tr>
<tr><td rowspan="3">Water Losses 40.24 MGD 51.59 %</td><td rowspan="2">Commercial Losses 9.45 MGD 12.11 %</td><td>Metering inaccuracies NIL</td></tr>
<tr><td>Unauthorised use 9.45 MGD 12.11%</td></tr>
<tr><td rowspan="4">Physical Losses 30.79 MGD 39.48 %</td><td>Real loses up to treatment. 2.34 MGD 3.0 %</td></tr>
<tr><td>Leakage and overflows at storage tanks 0MGD; 0 %</td></tr>
<tr><td>Leakage at mains 28.45 MGD 36.48 %</td></tr>
<tr><td>Leakage at service connections 0MGD; 0 %</td></tr>
</table>

Technical reasons for Non Revenue Water

- Old distribution pipes, causing frequent leakages.
- Not Hydraulically Designed.
- Lack of Asset Management system, leading to unsystematic maintenance of assets.
- Lack of awareness on latest technology.
- Lack of measuring parameters to assess system efficiencies & actual wastage of water.
- Overall physical losses : >29.17%, too high.

Non technical reasons for Non Revenue Water

- **Fixed tariff system irrespective of consumption.**
- **Poor arrears recovery due to yearly billing.**

O&M reasons for Non Revenue Water

- Lack of understanding on system flow and pressure management.
- No established operational procedures, guide lines and formal training
- Lack of Leakage reporting system.
- No active leakage control teams.
- Limited understanding on NRW and water Audit.

Strategies for reduction of NRW in Srinagar city

Strategies for Non Revenue Water

•Local Leak repair and leakage control •Reduction in unauthorized connections •Water Quality •Base Maps, Asset Mtg •Hydraulic Modeling •Quality & Equitable Water Supply to Citizen	•Leakage detection survey (Departmental Level)
	•Training to PHE department staff, Awareness Campaign
	•Removing structural leakages at all water facilities i.e. the filter bed and GSR etc.
	•Consumer Survey, Water meter at Pilot Zones and leakage management at consumer level
	•Regularizing unauthorized water connection
	•Implementation of bulk flow meters
	•Online Chlorine, Turbidity & Ph measurements
	•Replacement of valves, old fittings of WTP and reservoirs

Strategies for Non Revenue Water

Method	Work Plan
Medium Term Measures	
•Infrastructure management •PRV & Equitable water Supply •PMA and DMA formation	•Replacing valves with PRV, Pressure Loggers, 100% Bulk Flow metering
	Basic SCADA and Automation
	•Replacement of Water existing old Pipeline phase wise
	•Discontinuation of interconnections and bypass

Strategies for Non Revenue Water

Method	Work Plan
Long Term Measures	
•Infrastructure management •24x7 Water Supply & Adv SCADA	•Replacement of existing old water supply Lines,
	•Active Leakage Control, Smart Water Supply
	•Conversion of DMAs to 24-7 water supply, Advance Billing System, AI & ML based Intelligent system

Short term Strategies for reduction of NRW

Continuous Interventions

- Awareness Campaign through IEC activities
- Capacity Building for PHE and Revenue staff of Jal Shakti

Short Term Interventions

- Immediate drive to attend all visible leaks
- Strengthening the Leak Reporting system
- Conduct Door to Door survey of all properties
- Detection of all illegal connections
- Metering all unmetered commercial and Industrial connections

Medium term Strategies for reduction of NRW

Medium Term Interventions

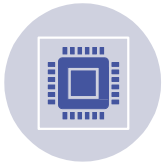
- Hydraulic modeling.
- DMA design.
- Supply and fixing Electromagnetic flow meters and isolation valves.
- Metering all the existing unmetered connections.
- Appointing meter readers with handheld billing machines.

Long term Strategies for reduction of NRW

- Augmentation of the source for reliable supply and network improvement
- Computerization of all records pertaining to water supply.
- Establishment of SCADA system.
- Establishment of Active Leakage Control Team with equipment
- Institutional changes to suit the O&M requirements of the entire water supply system.

Objectives of SCADA System for Srinagar city

Objective of SCADA System



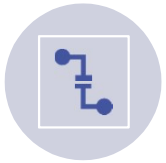
REAL TIME REMOTE MONITORING AND AUTOMATION OF THE WATER SUPPLY SYSTEM FOR SRINAGAR CITY ON THE PARAMETERS OF VALVES & MOTORS CONTROLS ,FLOW, PRESSURE, LEVEL, ENERGY CONSUMPTION AND WATER QUALITY.

TO MONITOR THE OPERATION AND PERFORMANCE OF WTP

TO CONTROL & MONITOR ALL RAW & CLEAR WATER PUMP HOUSES

PROVISION OF WATER BALANCE BY FLOW METERING

TO AUTOMATE / CONTROL PARAMETERS FROM ZONAL CONTROL FOR THE WTP



TO AUTOMATE / CONTROL MOTORS & VALVES FROM CENTRAL MONITORING STATION

REAL TIME ASSESSMENT OF WATER SUPPLY SITUATION BOTH IN TERMS OF QUANTITY & QUALITY

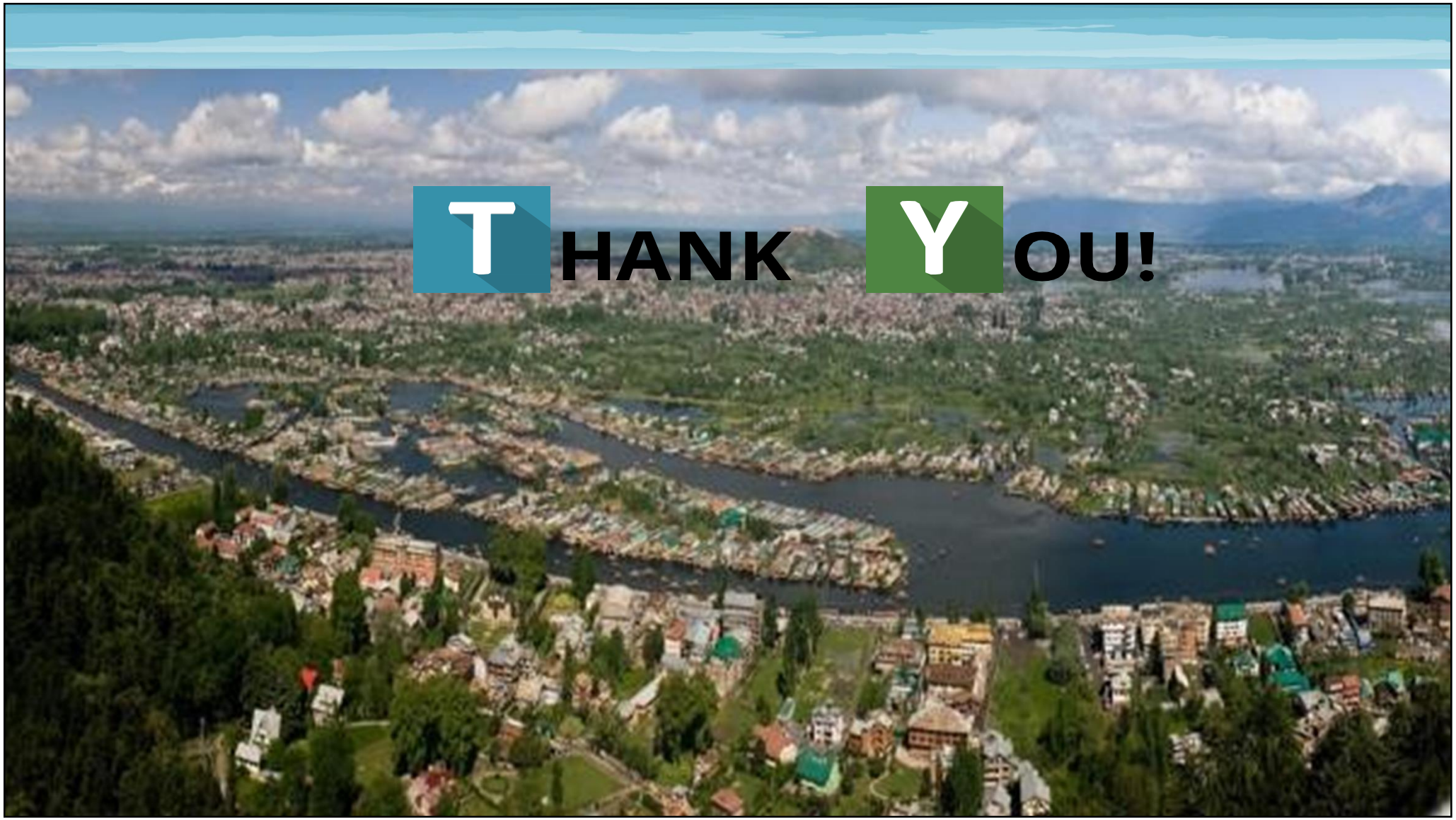
Objective of SCADA System

To provide alert and diagnosis in case of deviation to set parameters

To identify UFW (unaccounted flow of water) in the system upto the primary & secondary distribution

To have a reliable database/ benchmark on filling & emptying of ESR/ GLSR, its level monitoring, correct data building and record keeping of complete system and its parameters such as flow, volume & pressure at Pump House and ESR

Create Central / Zonal SCADA to operate, control, monitor and measure all parameters including on going works.


THANK YOU!