Situation Assessment Report

Faecal Sludge and Septage Management

Uttarakhand State

April, 2019

This is a Situation Assessment Report of Uttarakhand State with regards to Wastewater & Faecal Sludge Management based on qualitative assessment of five towns in the state representing the diverse conditions. It has state level and city level assessment with respect to wastewater and faecal sludge management. The findings of the study will be used for the preparation of contextualised training material for capacity building of concerned stakeholders like decision makers, engineers from para statals and ULBs, elected representatives, private sector etc. in Uttarakhand State.

March 2019

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Glossary

Black water	Blackwater is the mixture of urine, faeces and flush water along with anal cleansing water (if water is used for cleansing) and/or dry cleansing materials. Blackwater contains the pathogens of faeces and the nutrients of urine that are diluted in the flush water.
Cesspit	An enclosed container used for storing sewage.
Decadal Growth Rate	The percentage of total population growth in a particular decade
Faeces	Refers to (semi-solid) excrements devoid of urine or water.
Faecal Sludge	The general term given to undigested or partially digested slurry or solids resulting from storage or treatment of blackwater or excreta.
Faecal Sludge Management	FSM is the collection, transport, and treatment of faecal sludge from pit latrines, septic tanks or other onsite sanitation systems.
Grey water	Greywater or sullage (old term) is all wastewater generated in households or office buildings from streams without faecal contamination, i.e. all streams except for the wastewater from toilets.
Septage	Liquid and solid material pumped from a septic tank, cesspool or other primary treatment source'.
Sewage	General term given to the mixture of black water and grey water.
Sewerage	All the components of a system to collect, transport and treat sewage (including pipes, pumps, tanks etc.).
Sludge	The thick, viscous layer of materials that settles to the bottom of septic tanks, ponds and other sewage systems. Sludge comprises mainly organics but also sand, grit, metals, and various chemical compounds.

1 Uttarakhand State Profile

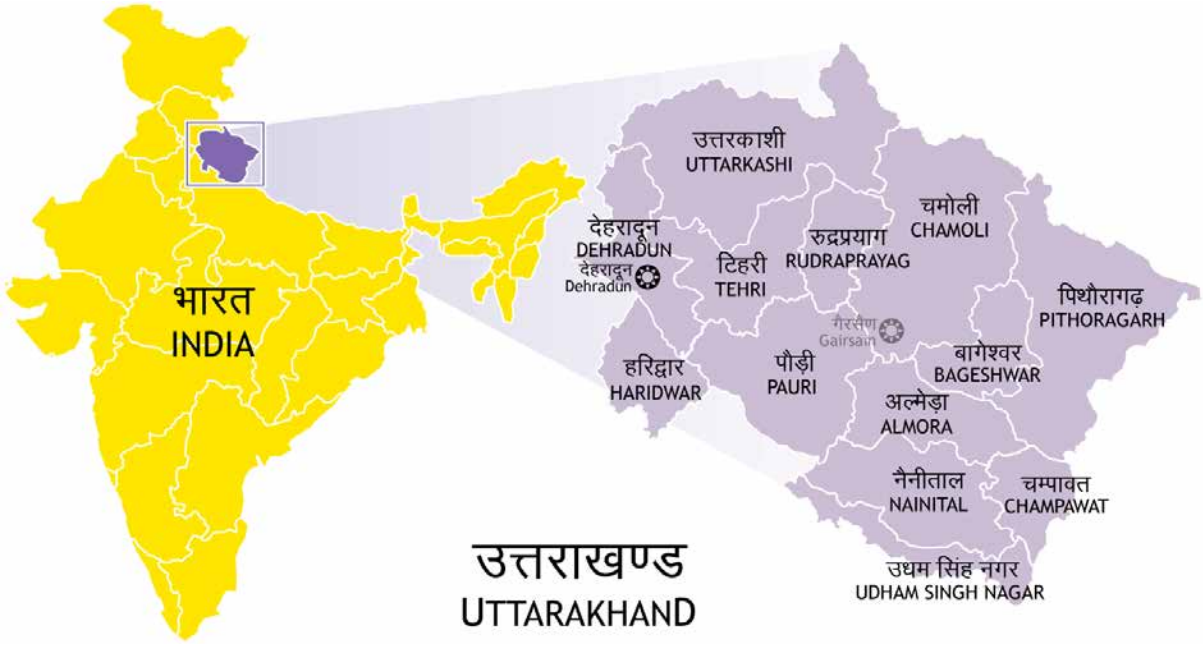


FIGURE 1: LOCATION OF UTTARAKHAND STATE

Uttarakhand state is located at the foothills of the Himalayan mountain ranges. The state shares borders with China in the north & Nepal in the east and inter-state boundaries with Himachal Pradesh in the west & northwest and Uttar Pradesh in the south. It lies in the northern part of India between the latitudes 28°43′ N and 31°27′ N and longitudes 77°34′ E and 81°02′ E and covering an area of 53,483 km^2. The elevation ranges from 210 to 7817 m. The state constitutes of 13 districts falling in two major administrative units, viz., Garhwal (north-west portion) and Kumaon (south-east portion) as shown in Figure 2. Garhwal Division consists of seven districts, i.e. Dehradun, Haridwar, Uttarkashi, Tehri, Pauri, Rudraprayag and Chamoli, while the remaining six districts, viz., Pithoragarh, Bageshwar, Almora, Nainital, Champawat and Udham Singh Nagar, fall in Kumaon Division.[1]

1.1 Geography

Geographically the state is divided into 5 zones; the Terai, the Doons, the Lesser Himalayas, the Greater Himalaya and the Trans Himalaya. 86% of the state is

[1] Overview, Uttarakhand Action Plan for Climate change, Government of Uttarakhand, 2014

mountainous. The climate, soil texture, groundwater and other features vegetation and biodiversity vary significantly from south to north of the state.

FIGURE 2 : DIVISIONS OF UTTARAKHAND

The oblique section of Uttarakhand can be divided into five geological zones,

a) The Terai: Moist, heavily cultivated plains south of the Himalayan frontal fault

b) The Doons: Coarse-gravel beds valleys between the Main Boundary Fault (MBF) and the Shivalik (Outer Himalayan) range with a ridge-line of about 2000-2500m

c) The Middle Himalaya: between the MBF and the Main Central Thrust (MCT), it is the most densely populated zone.

d) The Inner (or Great) Himalaya: the zones north of the MCT including the permanently snow-clad peaks with heights just under 8000 m.

e) The Trans Himalaya to the north of the snow-clad ridge line.

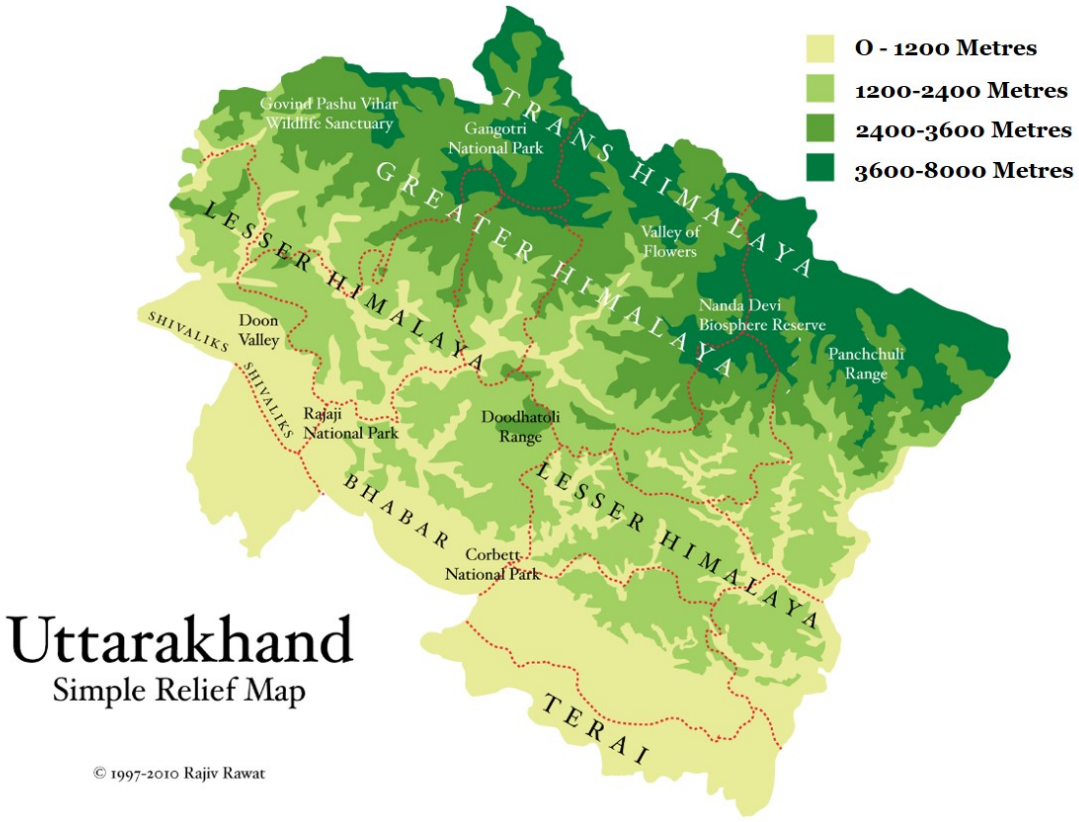


FIGURE 3: GEOGRAPHICAL MAP OF UTTARAKHAND STATE

1.2 Climate

The climate of the Uttarakhand state is highly influenced by its geography and is mainly characterised into- predominantly hilly terrain and smaller plain region. The climate in the plain regions corresponds to the climate observed across the Gangetic Plain.

Summers are exceedingly hot with temperatures crossing the 40°C mark with considerable humidity. Winters are chilly with temperatures going below 0°C at times. The climate in the northern part of Uttarakhand is typically Himalayan. The mountain range exerts an appreciable extent of influence on monsoon and rainfall patterns within the state. Within the Himalayas, climate differs depending on altitude and position. A cold alpine climate at higher reaches where summers are cool and winters are harsh can be encountered. At altitudes over 4880 meters (16,000 feet), the climate

is bitterly cold with temperatures consistently below the freezing point and the area perennially shrouded in snow and ice.[2]

1.3 Demography

As per the census 2011, Uttarakhand has a total population of 1,00,86,292 of which males are 51,37,773 & females are 49,48,519. As per population projections[3], the population of Uttarakhand in 2018 is estimated to be around 1.15 crore.[4]

TABLE 1: POPULATION GROWTH IN UTTARAKHAND

Census (1971-2011)[5]			
Year	**Population**	**Decadal Growth (%)**	**Change in Growth (%)**
2011	10,086,292	18.81	-1.60
2001	8,489,349	20.41	-2.72
1991	7,050,634	23.13	-4.31
1981	5,726,000	27.44	3.01
1971	4,493,000	24.43	1.86

Uttarakhand is primarily a rural state with almost 74.3% of the total population residing in 15,761 villages. Most of the villages have only up to 1000 households.

The urban population distribution is very uneven in the state. The three districts in the plain region – Haridwar, Udham Singh Naga and, Dehradun have more population residing in urban areas as compared to the other districts in state of Uttarakhand. The lesser Himalayas have relatively less population and is scattered across the district. The population density varies from 40 persons per sq km (Uttarkashi District, Chamoli District) to 850 persons per sq km (Haridwar District).

Urban population of the state is mainly concentrated in bigger towns of Dehradun, Haridwar and the towns located in agriculturally rich and industrially developed southern part of the state e.g. Rudrapur, Roorkee, Kashipur & Haldwani. Dehradun,

[2] mapsofindia.com/Uttarakhand/climate

[3] Discussion with Urban Development Department officials

[4] Census,2011

[5] Statisticstimes.com/demographics/population

which is state capital and centre of policy making, has witnessed drastic increase in its urban population. It has grown with an average annual growth rate of over 4% in the last decade (2001-2011).

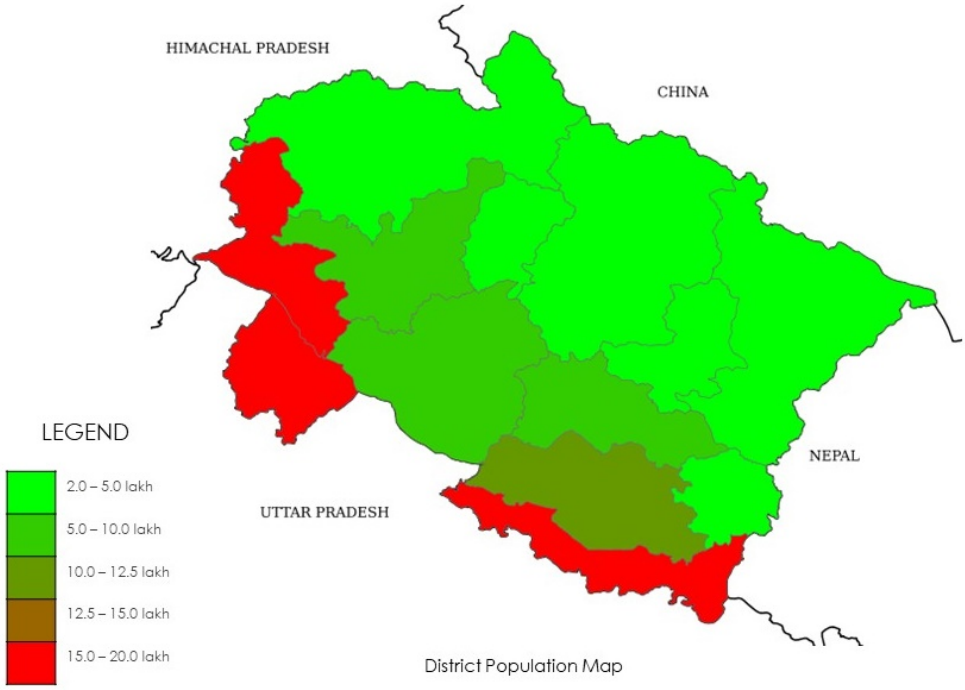


FIGURE 4: URBAN POPULATION DISTRIBUTION IN UTTARAKHAND

TABLE 2: POPULATION DENSITY AT DISTRICT LEVEL IN UTTARAKHAND

No	District	Headquarter	Population (2011)	Area (km²)	Density (/km²)
1	Uttarkashi	Uttarkashi	3,29,686	8,016	41
2	Chamoli	Gopeshwar	3,91,114	8,030	51
3	Pithoragarh	Pithoragarh	4,85,993	7,100	68
4	Bageshwar	Bageshwar	2,59,840	2,302	113
5	Rudraprayag	Rudraprayag	2,36,857	1,890	125
6	Pauri Garhwal	Pauri	6,86,572	5,399	127
7	Champawat	Champawat	2,59,315	1,781	146
8	Tehri Garhwal	Tehri	6,16,409	4,080	151
9	Almora	Almora	6,21,972	3,083	202

10	Nainital	Nainital	9,55,128	3,860	247
11	Dehradun	Dehradun	16,95,860	3,088	550
12	Udham Singh Nagar	Rudrapur	16,48,367	2,908	567
13	Haridwar	Haridwar	19,27,029	2,360	817

Apart from the resident urban population, Uttarakhand has number of tourist destinations and places of pilgrimage e.g. Mussoorie, Nainital, Haridwar, Rishikesh, Badrinath, Kedarnath, Hemkund Sahib, Gangotri, Yamunotri, Piran Kaliar etc. A large number of tourists and pilgrims ply throughout the year. As per figures from the Tourism Department nearly 311.08 Lakh and 268.09 Lakh tourists visited Uttarakhand in the year 2010 and 2011 respectively. These figures, which are nearly 3-times of the whole population of the state itself, are enough to reflect the 'tourist load' on urban infrastructure and urban services.[6]

1.4 Landuse

The landuse map of the state confirms the coverage of the forest in the plains and lesser Himalayas. The plains mostly consist of consists of rich fertile soil and hence is mostly under agriculture. The state has less than 1% area as built up area with distribution of 65% under urban and 35% under rural.

TABLE 3: LANDUSE STATS OF UTTARAKHAND STATE (SOURCE: LAND USE STATISTICS, MINISTRY OF AGRICULTURE, GOI, 2013-14)

Land Use	Area (in '000 ha)	Percentage
Total geographical area	5348	NA
Reporting area for land utilization	5992	100
Forests	3800	63.42
Not available for cultivation	450	7.51
Permanent pastures and other grazing lands	192	3.20
Land under misc. tree crops and groves	389	6.49

[6] Urban Development Directorate, Government of Uttarakhand

Culturable wasteland	317	5.29
Fallow lands other than current fallows	86	1.44
Current fallows	57	0.95
Net area sown	701	11.70

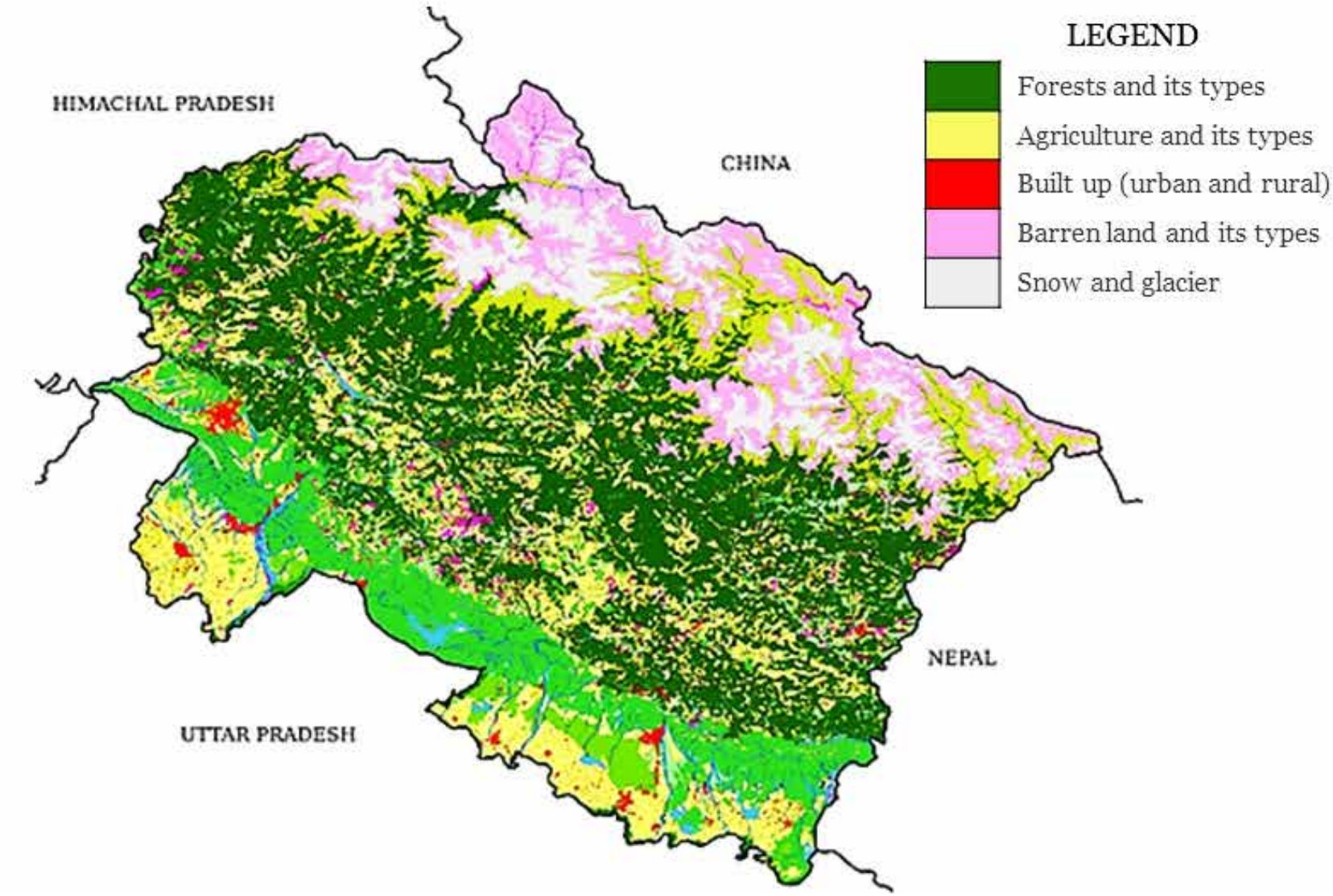


FIGURE 5: LANDUSE MAP OF UTTARAKHAND STATE (SOURCE: BHUVAN, ISRO GEOPORTAL)

1.5 Natural Resources

Uttarakhand is rich in natural resources especially water and forest with features such as glaciers, rivers, dense forests and snow-clad mountain peaks. 64% of the total state area is under forest cover. However, only 35% of it is classified as dense forest.. The reserved, protected and unclassified forests are 69.86%, 26.01% and 4.13% respectively of the total recorded forest. According to the digitized boundary of recorded forest area from the state, which covers 28,186 sq.km. (Source: The State of Forest Report, 2017); it is observed that there are 24.86% of area is under dense forest, 55.69% of area is under moderately dense forest and 19.45% area is under open forest cover (Figure 6).

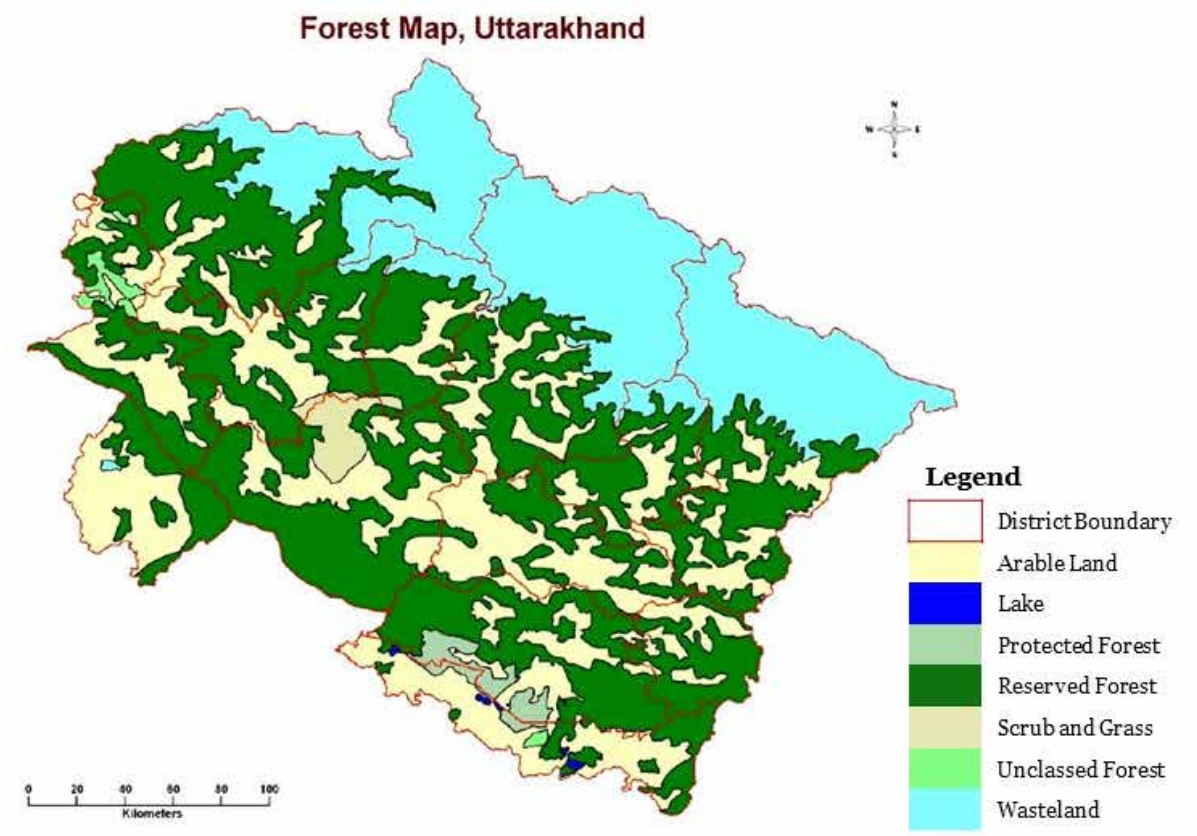


FIGURE 6: FOREST COVER MAP OF UTTARAKHAND STATE

The two main rivers in India i.e. the Ganga and Yamuna originate in the Uttarakhand State. As shown in Figure 7 there are numerous watersheds with tributaries which contribute to these rivers. In the Inner Himalaya zone of Uttarakhand state, the major rivers are glaciers-fed and fast-flowing.

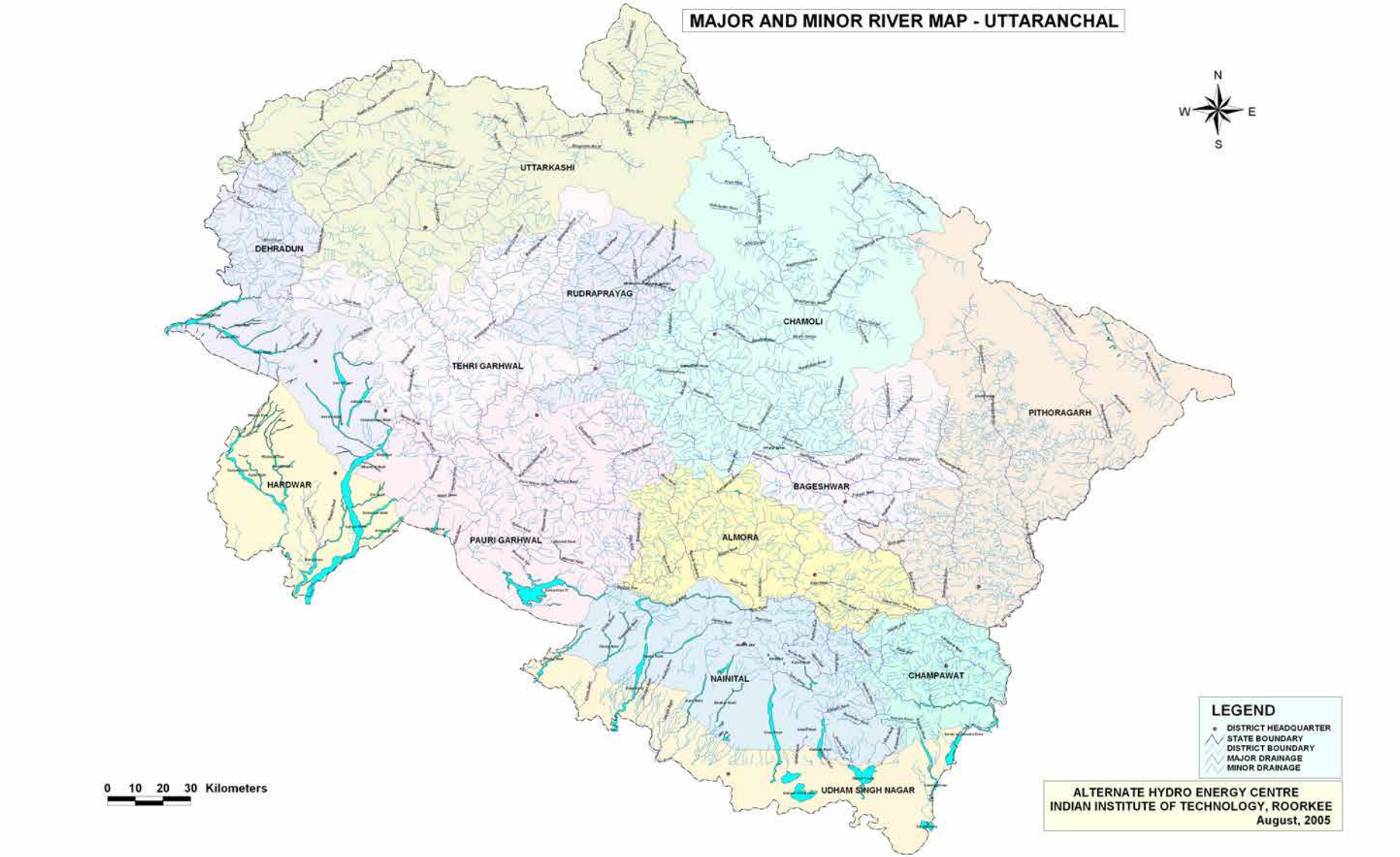


FIGURE 7: MAJOR AND MINOR RIVER MAP

Over 900 glaciers feed rivers like the Yamuna, Ganga and Kali, and their tributaries like the Tons, Bhagirathi, Bhilangana, Dhauliganga (W), Mandakini, Alakananda, Nandakini, Pindar, Dhauliganga (East) and the Goriganga among others. Rain and spring-fed rivers like the Saryu, Eastern and Western Ramganga, Kosi, Gaula and Eastern and Western Nayar nourish Uttarakhand's Middle Himalayan region. Rivers originating in the Shivalik's are essentially monsoon torrents with very little water flowing for the rest of the year. While Uttarakhand's rivers are important for agriculture and hydropower generation, thousands of springs sustain lives and livelihoods on the mountain slopes. But the loss of broad-leaved forests on the slopes has dried up a large number of natural springs and small streams.

1.6 Urban Local Bodies of Uttarakhand

Administratively the Uttarakhand state is divided into two regions i.e. Garhwal division on the west and the Kuman division on the east consisting of 7 and 6 districts respectively.

According to the current scenario, there are a total of 92 urban local bodies (ULBs) in the Uttarakhand State out of which 8 are Nagar Nigams (NN), 41 are Nagar Palika Parishads (NPP) & 43 are Nagar Panchayats (NP)(Annexure 10.1). The overall urbanisation rate in the state, which is around 30.2% is comparable with the national average of 31.2%. The population growth rate varies across districts and urban areas. However, it is noteworthy that average annual urban growth rate of 4.0% during the decade 2001-2011 is much high compared to rural growth rate 1.2% of the state[7].

Table 4 gives further details of the number of ULBs in different districts of Uttarakhand. Figure 8 shows location of various Nagar Nigams and Nagar Palilka Parishad in Uttarakhand state.

TABLE 4: ULBS IN UTTARAKHAND STATE AS PER CENSUS 2011

No.	District	Density (persons/km²)	Division	NN (no.)	NPP (no.)	NP (no.)	Total (no.)
1	Almora	202	Kumaon	0	1	1	2

[7] Urban Development directorate, Government of Uttarakhand

2	Bageshwar	113	Kumaon	0	1	1	2
3	Chamoli	51	Garhwal	0	2	6	8
4	Champawat	146	Kumaon	0	2	2	4
5	Dehradun	550	Garhwal	1	3	2	6
6	Haridwar	817	Garhwal	2	2	4	8
7	Nainital	247	Kumaon	1	3	3	7
8	Pauri Garhwal	127	Garhwal	0	4	2	6
9	Pithoragarh	68	Kumaon	0	2	3	5
10	Rudraprayag	125	Garhwal	0	1	3	4
11	Tehri Garhwal	151	Garhwal	0	3	4	7
12	Udham Singh Nagar	567	Kumaon	2	6	6	14
13	Uttarkashi	41	Garhwal	0	1	4	5
	Total			**6**	**31**	**41**	**78**

According to the Uttarkhand Urban Sector Development Investment Program, the population growth rate of Nagar Nigams is for 1991 – 2001 is 65.76% whereas the same for Nagar Palika Parishads and Nagar Panchayats is 25.58% and 35.33% respectively.

Table 5 gives the name of the ULBs with population growth rate higher than the state's average growth rate (1991-2001).

TABLE 5: ULBS WITH HIGHER GROWTH RATE IN UTTARKHAND (UUSDIP, GOU)

NPPs	**NPs**		
Gopeshwar	Kichha	Barkot	Kelakhera
Tehri	Gadarpur	Gangotri	Didihat
Rishiskesh	Bazpur	Gauchar	Dharchula
Nainital	Jaspur	Rudraprayag	Champawat
Ramnagar	Sitarganj	Kedarnath	Lohaghat
Kashipur	Khatima	Muni ki Reti	Bageshwar

Rudrapur	Dineshpur	Tanakpur	

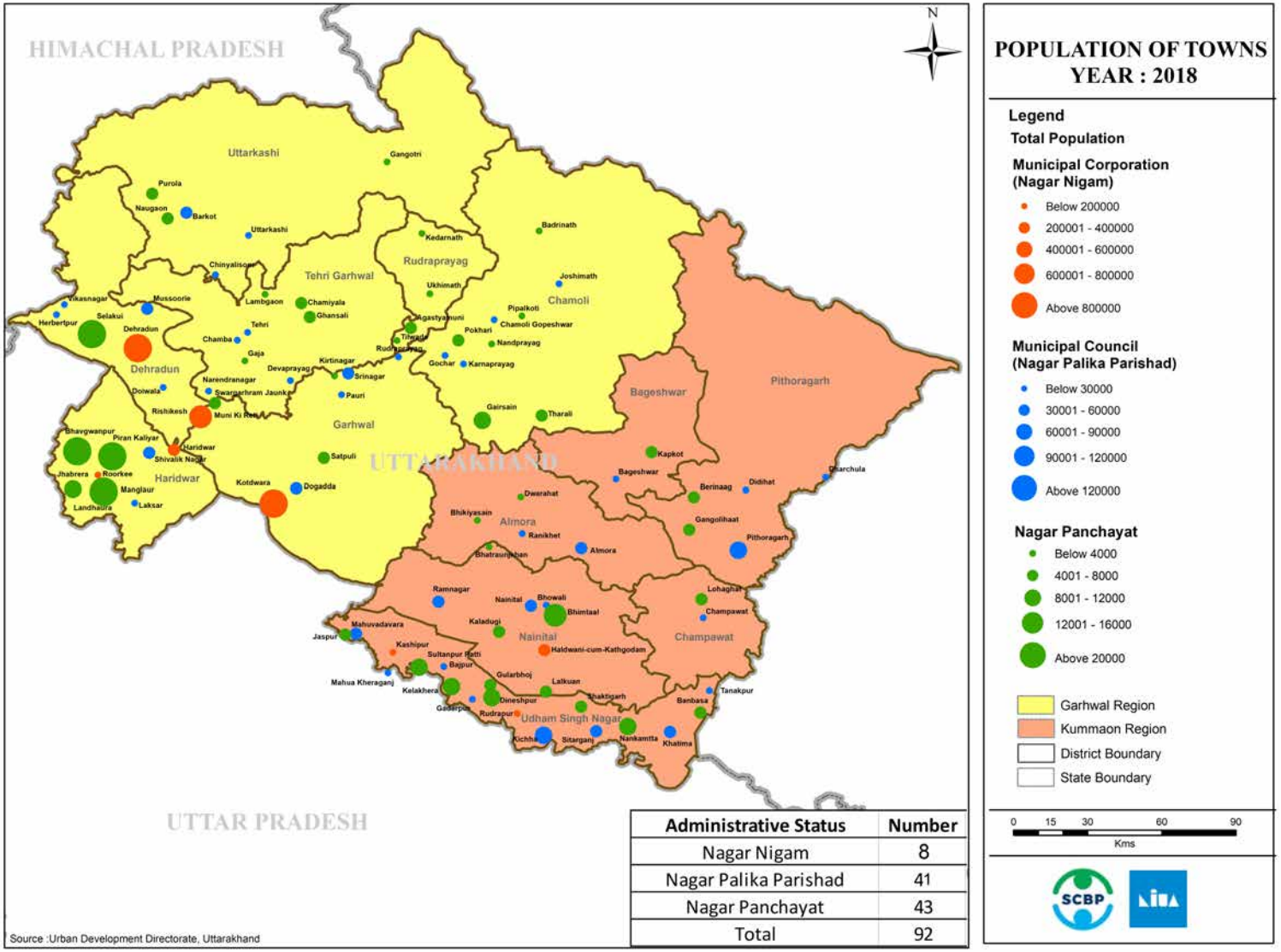


FIGURE 8: MAP OF ULBS IN UTTARAKHAND STATE (2018)

2 Urban Sanitation Policies, Laws and Governance

2.1 Laws & policies on water and sanitation

There are numerous laws in the form of acts pertaining to sanitation in the state of Uttarakhand. Some of them are adopted from the state of Uttar Pradesh after Uttarakhand was demarcated as a separate state. Table 6 gives a chronological list of acts related to water and sewerage which were passed by State of Uttarakhand.

TABLE 6: ACTS & LAWS PASSED IN UTTARAKHAND STATE PERTAINING TO WATER AND SANITATION

Year	Act or Law passed
1916	Uttaranchal Municipalities Act
1959	Uttaranchal Municipal Corporation Act
1975	Uttarakhand Water Supply & Sewerage Act
2008	Uttarakhand Jal Sansthan Water Supply & Sewerage Bye-Laws
2011	Uttarakhand Building Construction & Development Bye-Laws/ Regulations
2013	Uttarakhand Urban and Country Planning & Development(Amendment) Act
2013	Uttarakhand Water Management & Regulatory Act

After the launch of National Faecal Sludge and Septage Management Policy by the Government of India, a protocol was drafted and launched by Government of Uttarakhand for Septage Management. The same has been explained in detail in section 5.2.1

After going through the CPR's report "Faecal Sludge and Septage Management in Uttarakhand: A Review of The Law and Policy Framework" it seems that there is no clear demarcation on roles, responsibilities and obligatory duties of the parastatal bodies and urban local bodies. The Municipalities Act and Municipal Corporation Act tells that the urban local body is responsible for the drainage and sewage works. The Uttarakhand Water Supply and Sewerage Act of 1975 mentions that the parastatal bodies such as Pey Jal Nigam and Jal Sansthan are responsible for water supply and sewerage works.

As far as governance is concerned, there are multiple bodies in Uttarakhand state with overlapping roles and responsibilities. Hence, the institutional framework pertaining to liquid waste management is complex. The following table state all the state level institutions and their key roles.

TABLE 7: ROLES OF DIFFERENT INSTITUTIONS AT STATE LEVEL IN UTTARAKHAND[8]

Institutions	Key Roles
Urban Development Directorate (UDD)	• Administrative department for local self-governments
State Urban Development Agency (SUDA)	• Functions under the UDD • Proper implementation and monitoring of the centrally assisted programmes for alleviation of poverty throughout the State • Swachh Bharat Abhiyan (SBA) Committee
Uttarakhand Housing & Urban Development Authority	• Development authority in relation to the whole of the State Area
Local Development Authority	• Development authority in relation to any development area
Town & Country Planning Department	• Urban planning and development control
Uttarakhand Pey Jal Nigam (UJN)	• Planning, designing and execution of sewage and water supply services in urban areas • Ganga Pollution Control unit
Uttarakhand Jal Sansthan (UJS)	• Operation and maintenance of sewage and water supply services in urban areas
Uttarakhand Environment Protection and Pollution Control Board (UEPPCB)	• Monitoring and enforcement of environmental laws enacted by the central and state governments • Regulatory role for environmental protection, most importantly prevention and control of environmental pollution during the FSSM process such as desludging, treatment and disposal
Uttarakhand Urban Sector	• Support the Government of India and State Government in their policy of balanced regional socio-economic

[8] Adopted from "Faecal Sludge and Septage Management in Uttarakhand: A Review of The Law and Policy Framework" by Centre for Policy Research.

Development Investment Program (UUSDIP)	development and poverty reduction throughout the urban sector • Funded by ADB through Multitranche Financing Facility (MFF) and also by the central-sponsored JNNURM • Executing Agency is the UDD, which has set up a state-level urban sector Project Management Unit (PMU) for this purpose • The implementation agencies are the respective urban local bodies, UPJN, UJD and PWD, which in collaboration with PMU will set up Project Implementation Units
State Ganga River Conservation Authority (State Ganga Committee)	• Effective abatement of pollution and conservation of the river Ganga and its tributaries • Implementation of the decision or directions of the NGRBA • Chairperson - Chief Minister • Nodal department and secretariat - Department of Drinking Water and Sanitation – provides logistical support
State Project Management Group, NGRBA	• Implementation of World Bank assisted 'National Mission for Clean Ganga (NMCG)' • Works under Department of Drinking Water and Sanitation
Uttarakhand State Commission for Safai Karamcharis	• Protection of the rights of sanitation workers in the state
Urban local bodies (*Nagar Nigam*, *Nagar Parishad* or *Nagar Panchayat*	• Implementation of SBM (Urban) and support in implementation of AMRUT funded projects. • Provisioning of desludging services and ensuring the safety of sanitation workers employed by the local government

2.2 Urban Development Directorate, Uttarakhand

Urban Development Directorate (UDD) is the administrative department for local self-governments in the state, the Uttarakhand Housing department plays similar role for Urban Development Authority and the Town & Country planning department, are responsible for urban planning & development control. Further the drinking water (Pey Jal) department is the administrative department of Uttarakhand Pey Jal Nigam & Jal Sansthan department ensures the water supply, sewerage & drainage services to the project towns. Moreover, there are organisations such as the Uttarakhand Environment Protection & Pollution Control Board, Public Works Department (PWD) and other line agencies functioning in the urban areas.

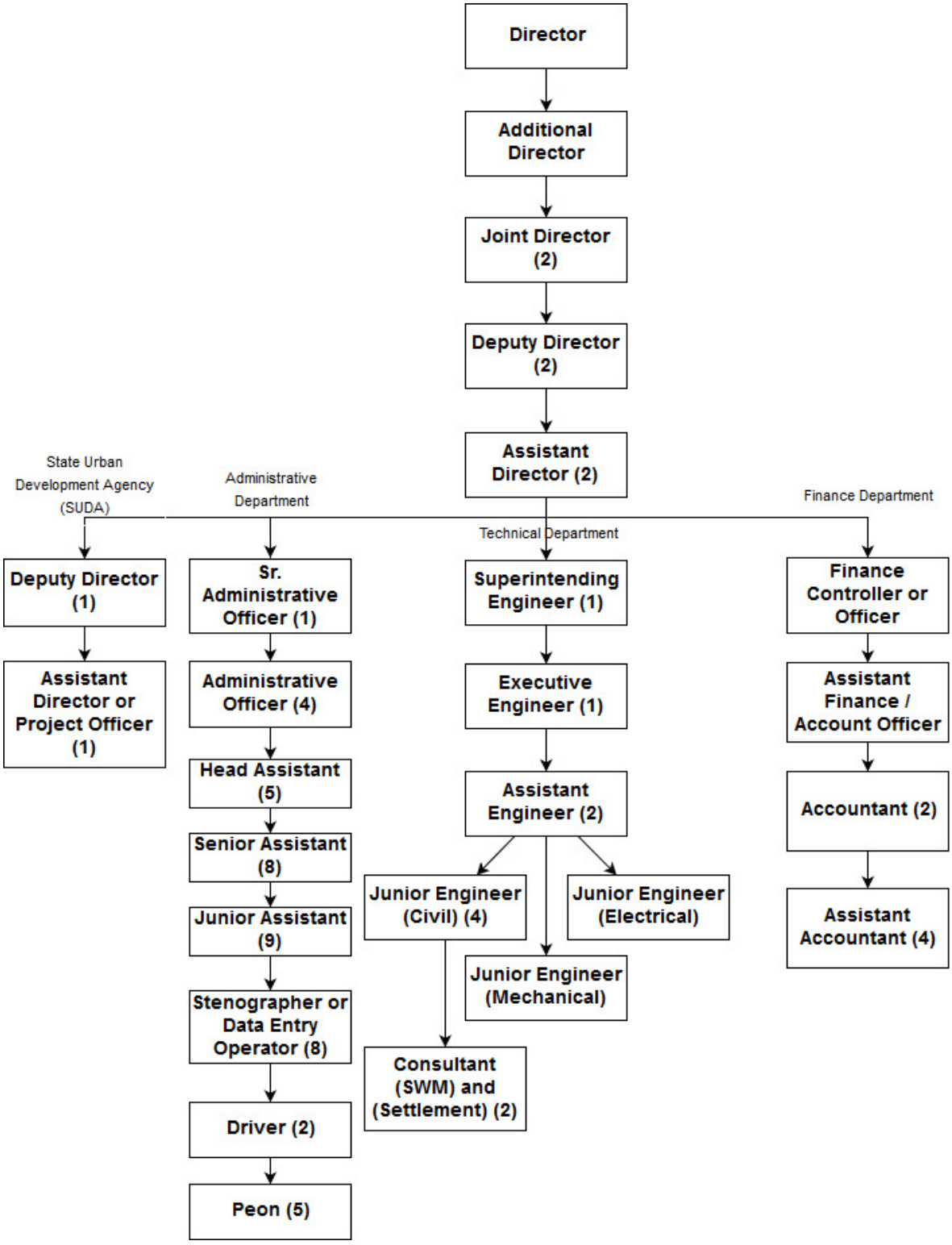


FIGURE 9: ORGANOGRAM FOR URBAN DEVELOPMENT DEPARTMENT, UTTARAKHAND

Vision

Integrated development of the urban areas by making the cities vibrant, clean and infrastructural strong and to bring about improvement in the service delivery

Objectives

- To improve the quality of life of all towns and cities with emphasis on preservation of their heritage
- To provide gainful employment to the urban unemployed or underemployed poor through encouraging the setting up of self-employment ventures or provisions of wage employment.

Schemes under UDD

- **Atal Mission for rejuvenation and Urban Transformation (AMRUT):** The purpose of AMRUT is to provide basic services like Sewerage, Drainage, Water Supply, Urban Transport and build amenities in cities. Mission cities of AMRUT are Dehradun, Haridwar, Roorkee, Rudrapur, Haldwani, Kashipur and Nainital. The total population of AMRUT cities is 15,09,253 which constitutes 49.49% of Census population of 2011.
- **Swachh Bharat Abhiyan-Urban:** Swachh Bharat Abhiyan was initiated by Prime Minister of India Mr. Narendra Modi. It includes building toilets in each household, arrangement of dustbins for garbage, daily cleaning of roads, parks and other public places.
- **Pradhan Mantri Awas Yojna-Urban (PMAY):** The primary mission of PMAY is to provide affordable houses to everyone by 2022. Subsidized cost, affordable houses in partnership with public and private sectors, promotion of houses to weaker section are the main benefits of PMAY. The mission is to provide EWS (30 sq meter), LIG (60 sq meter), MIG-1 (90 sq meter), MIG-2 (110 sq meter).
- **National Urban Livelihood Mission (NULM):** The purpose of NULM is to reduce poverty and vulnerability of the urban poor households by providing them employment and skill based opportunities. It provides Skill Development Training and certifications to individual candidates with an ample number of business opportunities.

2.3 Uttarakhand PeyJal Nigam

The major objective behind the establishment of the PeyJal Nigam is to have a responsible body for managing the water resources in the state of Uttarakhand. The PeyJal Nigam is responsible for planning, survey, design and execution of urban as

well as rural water supply and sewerage schemes for people (Urban & Rural) residing in the state of Uttarakhand. In addition to above the Jal Nigam has also been authorized as a construction agency of the sewerage networks and the water supply & distribution networks.

Functions of Pey Jal Nigam, Uttarakhand are as follows;

- to prepare, execute, promote and finance schemes for sewerage and sewage disposal;
- to render all necessary services in regard to sewerage to the State Government and local bodies, on request to private institutions or individuals;
- to prepare State plans for sewerage on the directions of the State Government;
- to establish State standards for sewerage services;
- to review annually the technical, financial, economic and other aspects of water supply and sewerage system of every JS or local bodies which have entered into an agreement with it;
- to establish and maintain a facility to review and appraise the technical, financial, economic and other pertinent aspect of every water supply and sewerage scheme in the State;
- to operate, run and maintain any waterworks and sewerage system, if and when directed by the State Government, on such terms and conditions and for such period as may be specified by the State Government;
- to assess the requirements for manpower and training in relation to water supply and sewerage services in the State

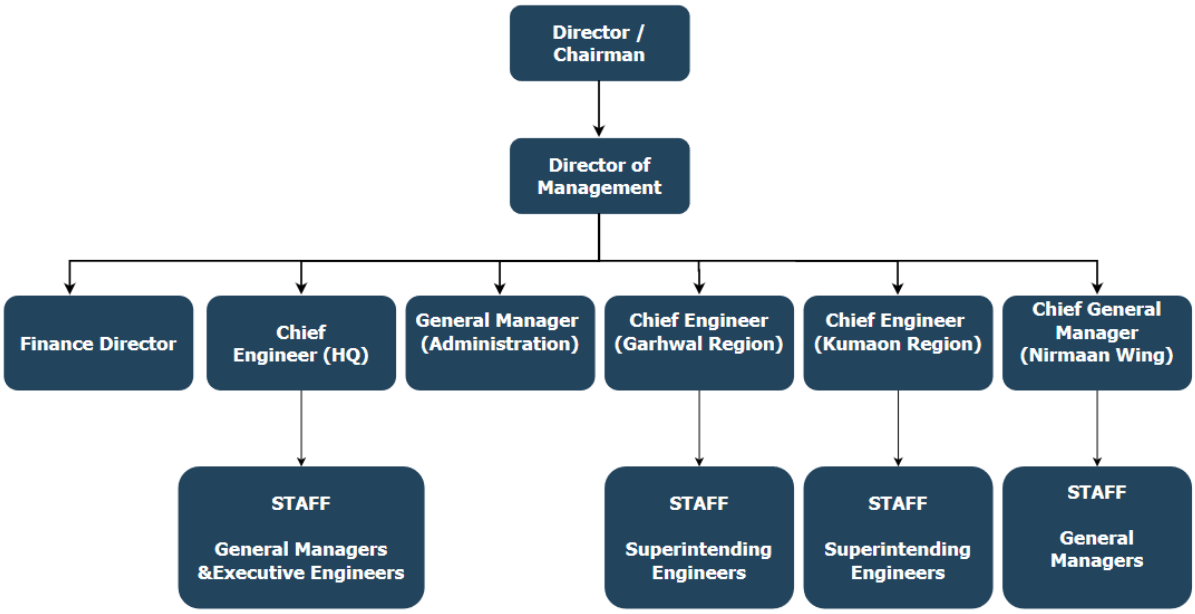


FIGURE 10 : PEYJAL NIGAM ORGANIZATIONAL STRUCTURE

2.4 Uttarakhand Jal Sansthan

"Uttarakhand Jal Sansthan" constituted under Section 18 of the Principal Act having jurisdiction throughout the state of Uttarakhand by amalgamation of "Garhwal Jal Sansthan" and "Kumaun Jal Sansthan" on 26th August 2002. It Extends to the whole of Uttarakhand excluding cantonment areas.

Uttarakhand Jal Sansthan implements the operation & maintenance activities of the water distribution and supply infrastructure and wastewater collection, conveyance and treatment in the Uttarakhand state. Additionally, revenue collection is managed by the Jal Sansthan.

Following is the flowchart for the organization structure of Jal Sansthan:

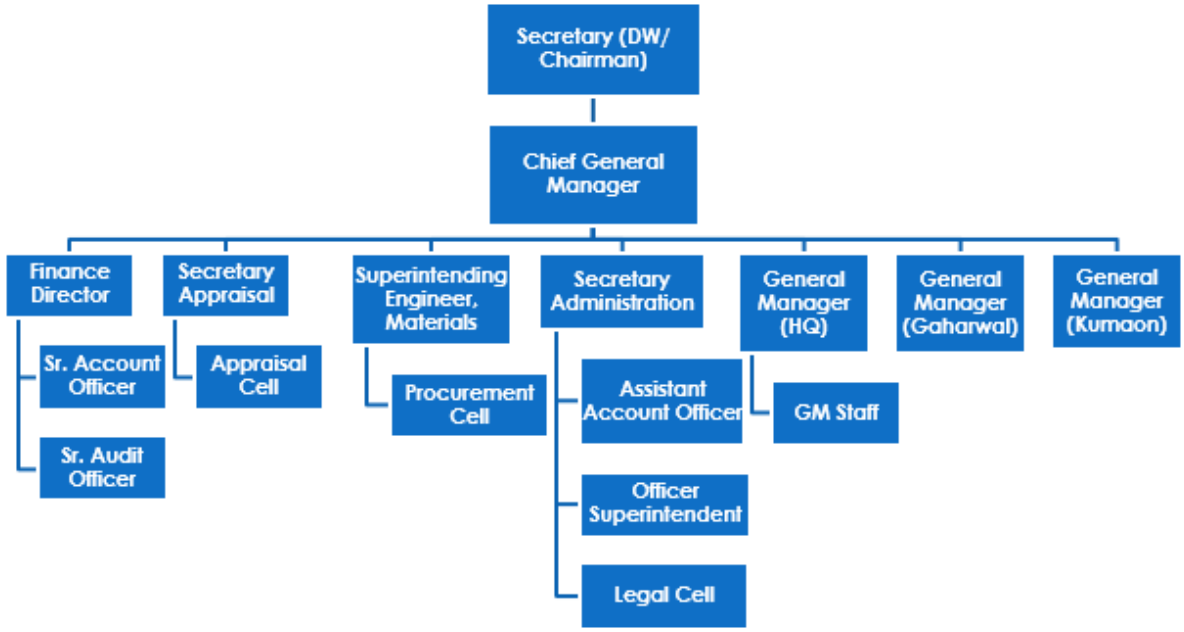


FIGURE 4: JAL SANSTHAN ORGANIZATION STRUCTURE

The General Managers at the Headquarter, Garhwal Division and Kumaon Division heads a team of Superintending Engineers and Executive Engineers placed in the districts in both division.

Function of Jal Sansthan

(1) To plan, promote and execute schemes and operate an efficient system of water supply.

(2) Where feasible, to plan, promote and execute schemes and operate, sewerage, sewage, treatment and disposal and treatment of trade effluents.

(3) To manage all its affairs so as to provide the people of the area within its jurisdiction with wholesome water where feasible, efficient sewerage service.

(4) To take such measure, as may be necessary, to ensure water supply in times of any emergency.

(5) Such other functions as may be ensured to it by the State Government by notification in the Gazette.

3 Desk Research

This section is developed based on the desk research done prior to the city visits. The data from Census 2011 is taken to assess the situation of the state according to the districts. The data pertaining to the urban part of the districts has been collated to draw inferences and qualitatively confirm them through the city visits.

3.1 Main source of Drinking Water

As shown in the Figure 11, except Udham Singh Nagar the other districts have good water supply in the form of tap water from treated source. In case of Udham Singh Nagar, almost 50% of the households are dependent on the hand pump. Census of 2011 also suggest that the access to the water within premise is more than 84%.

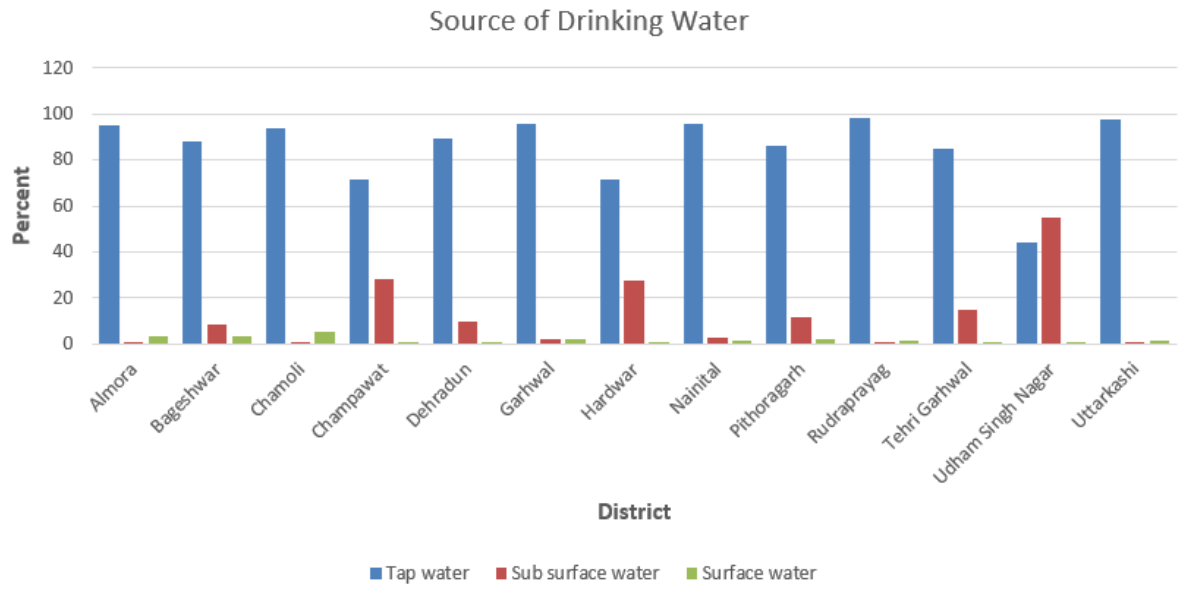


FIGURE 11: DISTRICT WISE SOURCE OF DRINKING WATER IN UTTARAKHAND

3.2 Access to sanitation

According to the Census 2011, in all the districts of Uttarakhand, more than 94% of the households in urban centres have Individual Household Toilet (IHHT). The dependence on the community toilet (CT) or public toilet (PT) is less than 5%. In 95% of the households having IHHT, flush toilets are used. Since access to water is better, flush toilets are more commonly found in Uttarakhand.

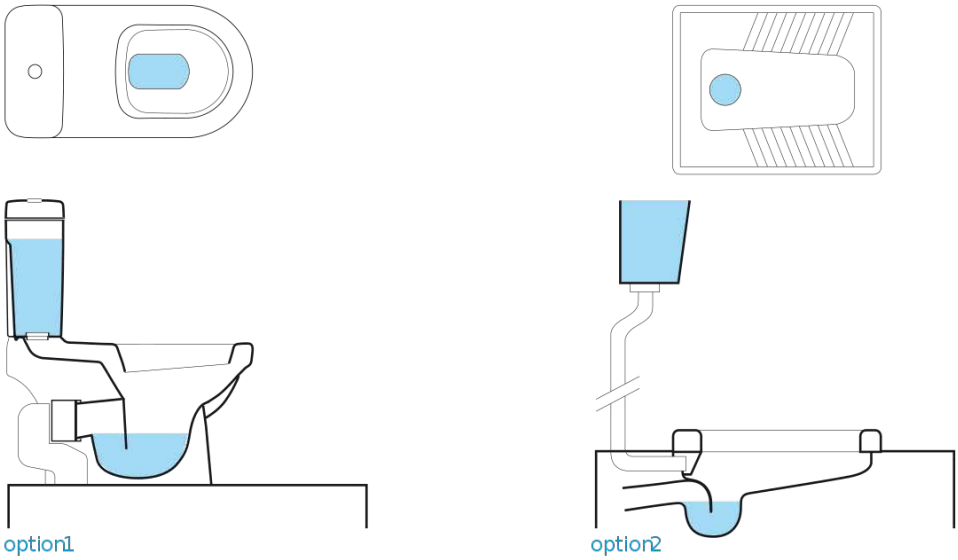


FIGURE 12: TYPES OF FLUSH TOILETS PROMINENTLY USED IN UTTARAKHAND

Figure 12 shows two different types of flush toilets used. Option one which is a western type of water closet (WC) pan is mostly used in the upper-middle class and upper-class households and hotels and resorts. The option two which is a squatting type WC pan is prominently used in lower and middle income households.

3.3 Types of sanitation system

As per the Water Supply and Sewerage Byelaws (2008) by Uttarakhand Jal Sansthan, it is mandatory for the households to either have sewerage connection or have its own septic tank. Wet sanitation systems consisting of piped sewer network and septic tank are more prevalent. Thus, the households can be classified into two types; (a) connected to piped sewer system and (b) connected to septic tank.

XX shows the ULBs and the percentage of households in the ULBs having access to piped sewer system. It can be seen that only ten out of the 92 ULBs have more than 50% of the households connected to the piped sewer. Six out of these six ULBs are in the Ganga River Basin.

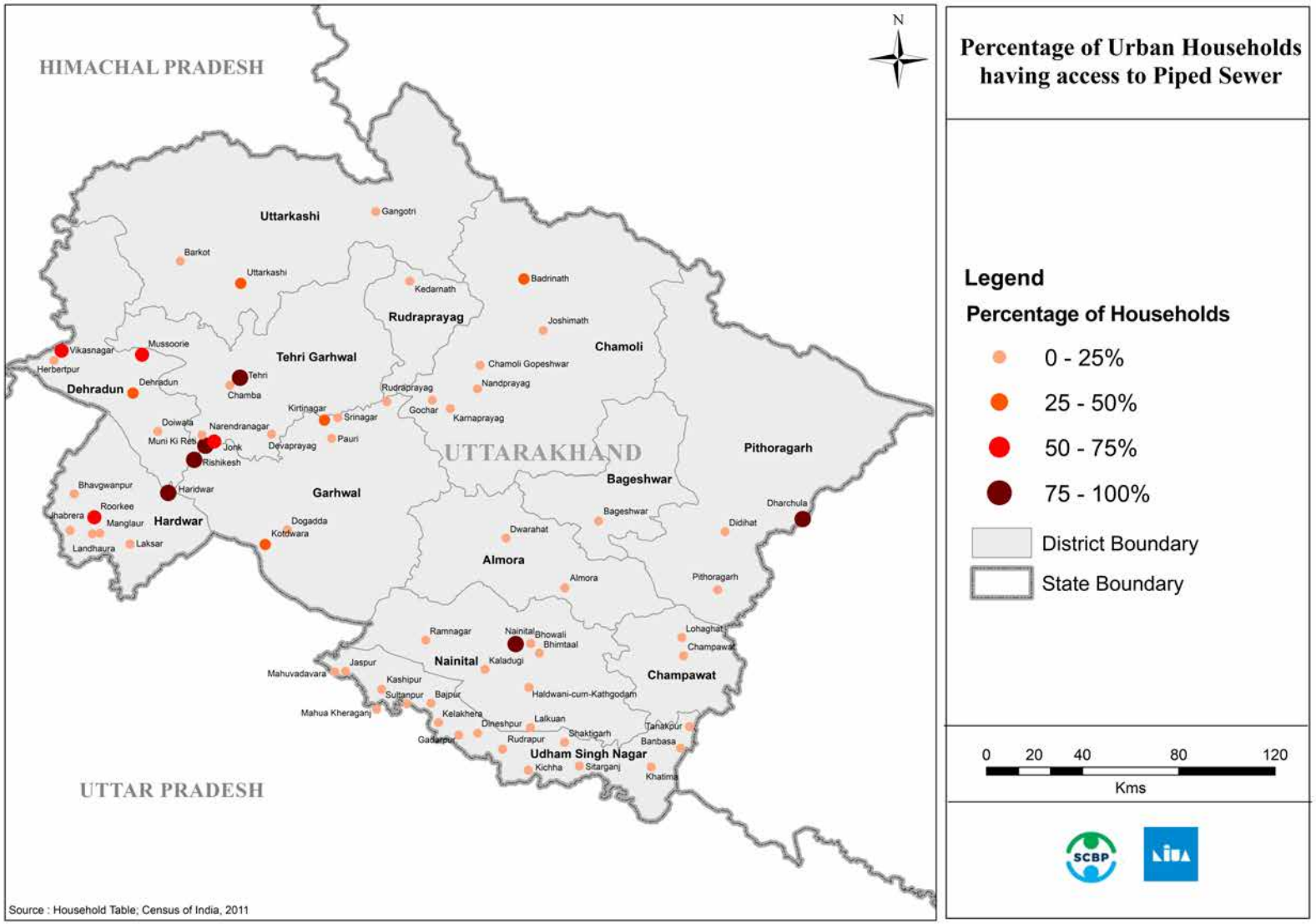


FIGURE 13: ULBS HAVING PIPED SEWER SYSTEM IN UTTARAKHAND STATE

IN CASE OF UDHAM SINGH NAGAR (DISTRICT WITH MORE THAN STATE AVERAGE POPULATION GROWTH RATE DUE TO INDUSTRIALISATION), SINCE MOST OF THE HOUSEHOLDS ARE DEPENDENT ON THE GROUND WATER FOR THEIR DRINKING WATER NEEDS, IT BECOMES UTMOST IMPORTANT THAT THE ULBS (NNS AND NPPS) SHOULD PRACTICE SCHEDULED DESLUDGING AND SUBSEQUENT TREATMENT AND REUSE OF AT LEAST SAFE DISPOSAL OF THE SEPTAGE.

Figure 14 shows that except Tehri Garhwal and Haridwar, all other districts are largely served by septic tanks.

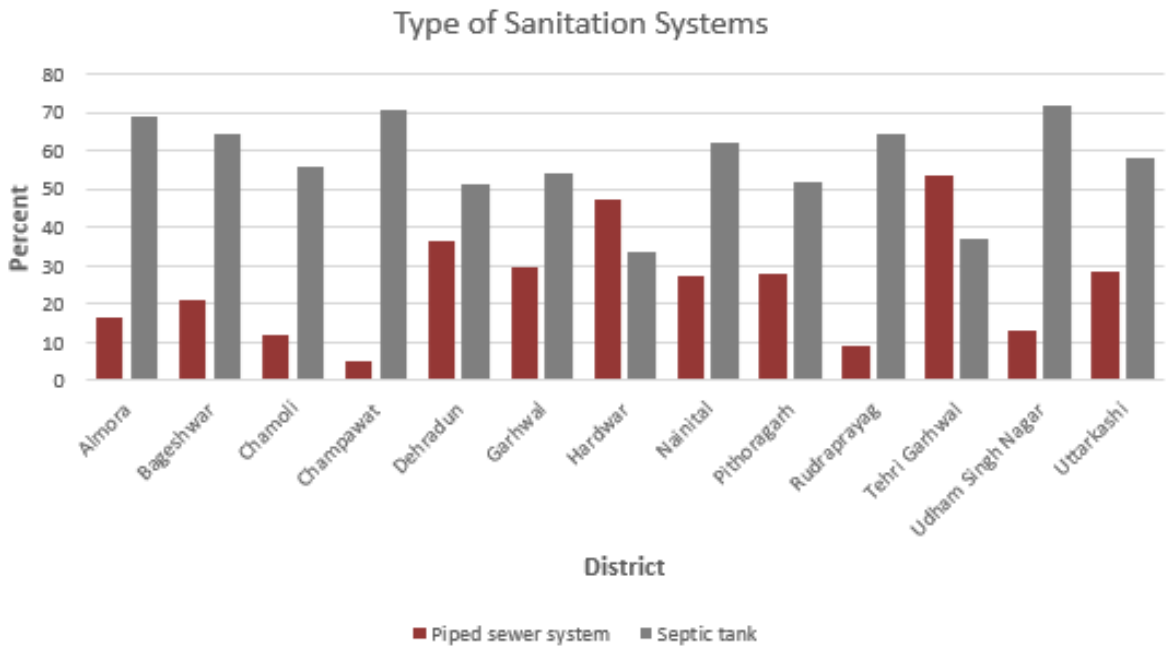


FIGURE 14: DEPENDENCE ON VARIOUS TYPES OF SANITATION SYSTEMS

3.4 Wastewater conveyance

The types of wastewater generated are, (a) septic tank effluent and (b) grey water from residential and commercial properties. The mixture of these wastewaters is managed through network of open and closed drains in the ULBs of the Uttarakhand.

Most of the cities are served by open drain, where the wastewater is collected from the properties and flows by gravity to the lowest point, which in most of the cases is surface water bodies and forest lands. The closed drains consist of lined drains with covers on it and gravity sewers.

As shown in Figure 15, the dependence of the households on the open drainages is significant in all the districts in Uttarakhand. In districts such as Chamoli, Champawat,

Haridwar and Udham Singh Nagar; more than 50% of the households are connected to open drains.

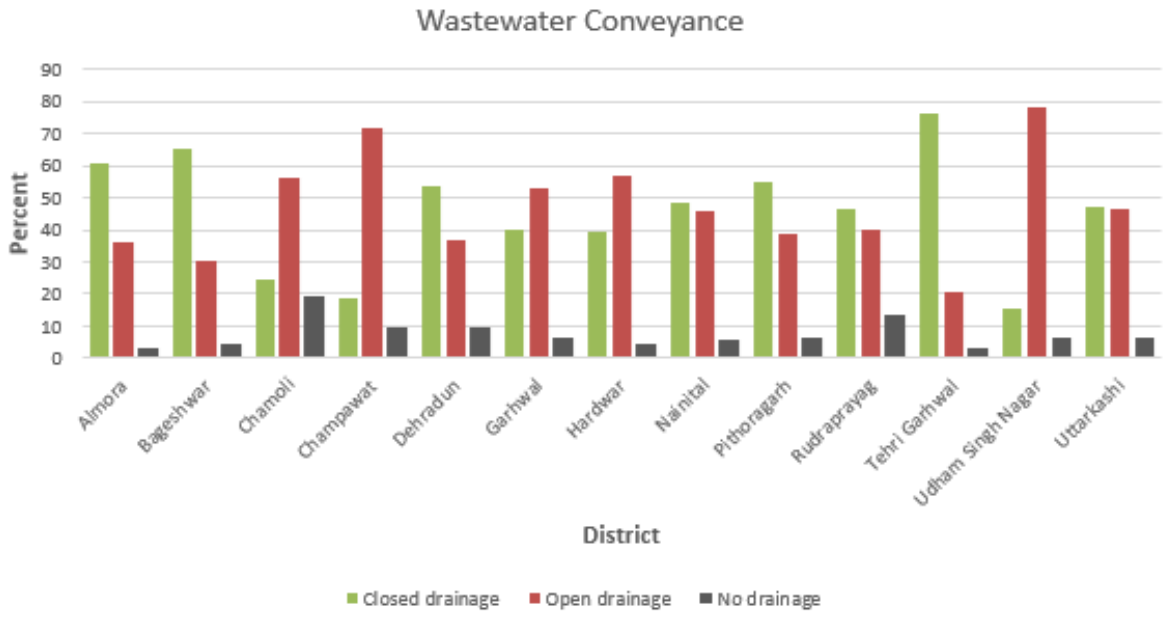


FIGURE 15: LIQUID WASTE CONVEYANCE IN UTTARAKHAND STATE

LOOKING AT THE DEPENDENCE ON THE SUB SURFACE WATER, DEPENDENCE ON SEPTIC TANKS AND OPEN DRAINS, DISTRICTS SUCH AS CHAMPAWAT, HARIDWAR AND UDHAM SINGH NAGAR ARE IN URGENT NEED OF BETTER WASTEWATER MANAGEMENT. IN LONGER RUN, THESE CITIES ARE MOST LIKELY TO FACE ISSUES RELATED TO GROUND WATER QUALITY AND PUBLIC HEALTH.

Haridwar District is focussed further under AMRUT and Namami Gange program, however the other two districts i.e. Champawat and Udham Singh Nagar needs to be prioritised by the state.

4 Program and Schemes

This section provides details of the programs and schemes pertaining to sanitation being implemented in Uttarakhand State. It includes the current progress, wastewater management and faecal sludge & septage management in the state based on primary and secondary data collected at state and city level institutions.

4.1 Swachh Bharat Mission

The Swachh Bharat Mission Urban (SBM-U) was launched on 2nd October, 2014 which aims at making urban India free from open defecation & achieving 100 % scientific management of municipal solid waste in 4,041 statutory towns of this country. The objectives of this mission are eliminating open defecation, eradication of manual scavenging, modern & scientific solid waste management, to effect behavioural change regarding healthy sanitation practices, generate awareness about sanitation & its linkage with public health, capacity building, etc.

As per SBM Urban portal, nearly 14,623 IHHTs, 4,459 CTs / PTs have been built since the launch of SBM program. Figure 16 shows that currently the state has declared 96 Urban Local Bodies to be ODF.

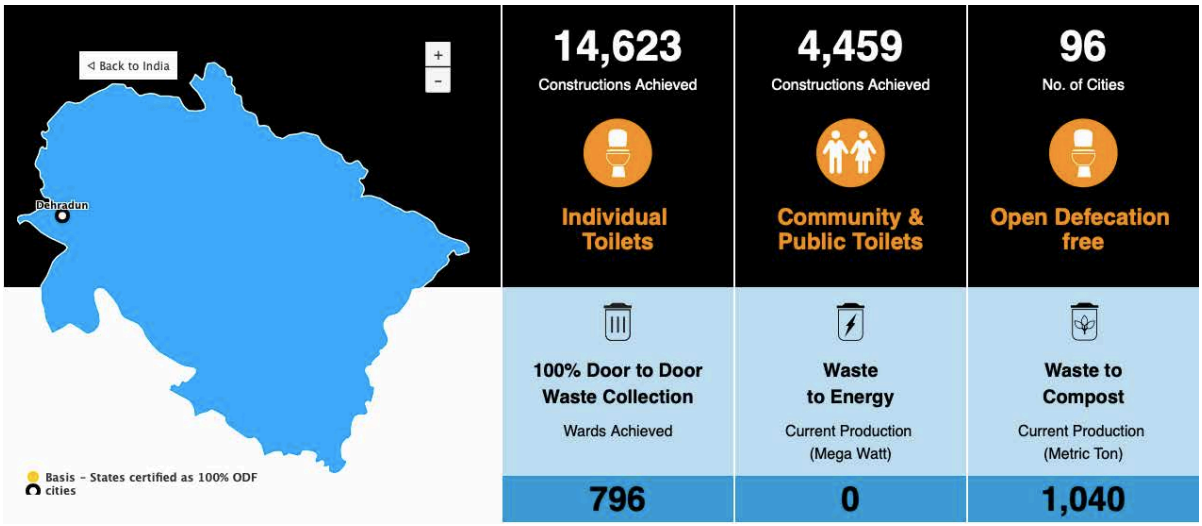


FIGURE 16: SNAP SHOT OF PROGRESS OF UTTARAKHAND IN SBM URBAN (REF: STATUS TTILL MAY 2019, SBM-URBAN)

According to the data base obtained from the SBM Urban portal, total 25,297 toilets applications have been received in Uttarakhand state out of which 9,327 toilets have been constructed and approved & remaining 6,178 toilets are constructed and still under final approval stage. As per the SBM statistics, around 95% urban area has

received the ODF status. The toilets constructed under SBM are mostly connected to septic tanks. It was reported by officials during consultative process, that in some parts of Uttarakhand, even bio digesters are installed instead of septic tank to cater to black water.

4.2 AMRUT Program[9]

The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) aims at providing basic services (e.g. water supply, sewerage, urban transport) to households & build amenities in cities which will improve the quality of life for all, especially the poor & disadvantaged. Capacity Building & a set of reforms have been included in this mission. Reforms will lead to improvement in service delivery, mobilization of resources & making municipal functioning more transparent and functionaries more accountable. Capacity building of the ULBs and other implementing agencies is important as it will empower the municipal functionaries & lead to timely completion of projects. Such capacity building program pertaining to AMRUT schemes are undertaken by state level training institutes such as Administrative Training Institute, Nainital and National Centre for Good Governance, Mussoorie in Uttarakhand.

According to the 2011 census, the total population of the AMRUT cities constitute to 49.49% (15,09,253) of the total urban population in Uttarkahand state.

The purpose of this mission is

- to ensure every household has access to water supply & sewerage connections,
- to increase the amenity value of the cities by developing greenery & well-maintained open spaces,
- to reduce the pollution by switching to public transport or constructing facilities for non-motorized transport.

As per the State Annual Action Plan (SAAP) I, II and III, a total of INR 593.02 crore budget has been sanctioned. The central government has committed to 90% i.e. INR 533.72 crore for the entire period from 2015 till 2020. Accordingly sewerage and interception and drainage schemes are under implementation in the AMRUT cities. A

[9] Amrut, UDD & Website

septage treatment plant at Rudrapur and a wastewater treatment plant with co treatment facility for septage has been planned in Kashipur through AMRUT Program.

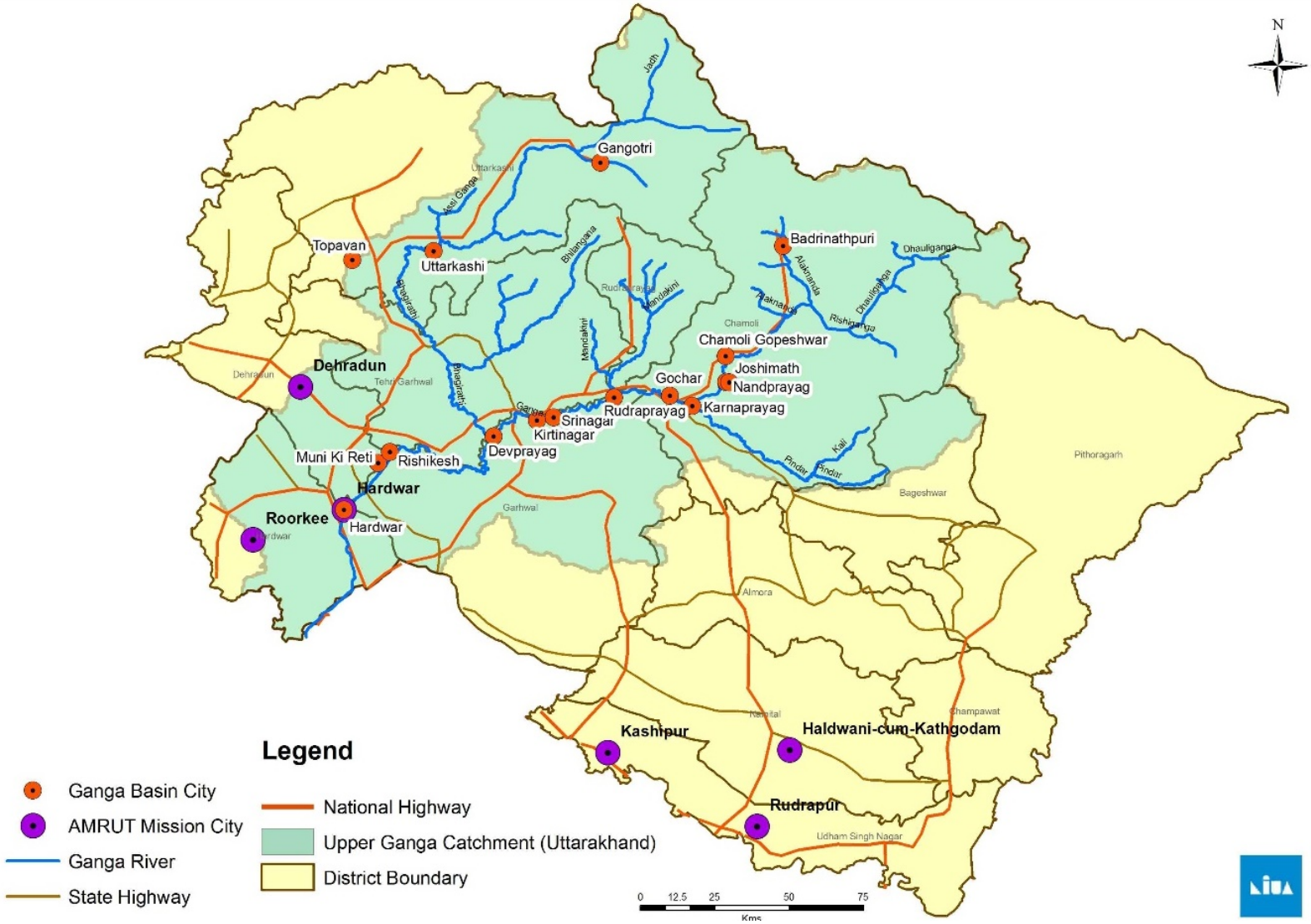


FIGURE 17: ULBS UNDER AMRUT IN UTTARAKHAND STATE

4.3 Namami Gange Program[10]

Namami Gange Program is the flagship program by the Union Government which was launched in June 2014. It is an Integrated Conservation Mission with a budget outlay of INR 20,000 Crore. The aims and objectives of the program are;

1. To ensure effective abatement of pollution and rejuvenation ot the river Ganga by adopting a river basin approach to promote inter sectoral coordination for comprehensive planning and management and
2. To maintain minimum ecological flows in the river Ganga with the aim of ensuring water quality and environmentally sustainable development.

The towns which are covered under this program from the Uttarakhand state were: Haridwar, Rishikesh, Ranipur, Joshimath, Gopeshwar, Karnaprayag, Rudraprayag, Badrinath, Srinagar, Devprayag & Uttarkashi.

One of the main activities under the Namami Gange program is the creation of sewage treatment infrastructure by intercepting and diverting (I&D) the drains. These drains are being tapped and wastewater is transferred to the sewage treatment facility. In that direction the planning of 30 STPs is under progress with a capacity of 131.75 MLD & 6 STPs are under upgradation with a capacity of 57 MLD.[11]

Table 8 shows the current progress of the projects ongoing under the Namami Gange program.

[10] National Mission for Clean Ganga website

[11] Status of works under Namami Gange Program booklet

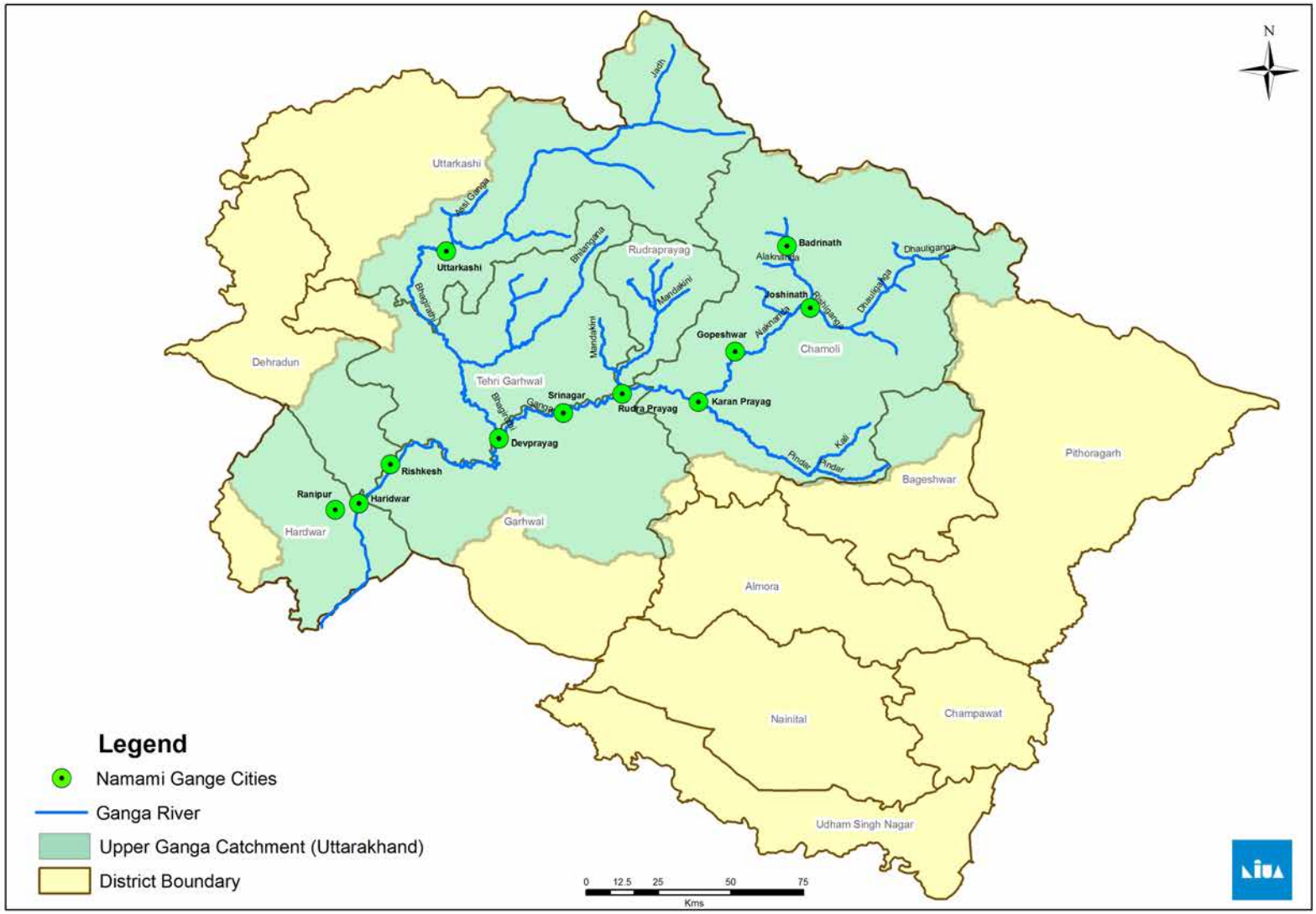


FIGURE 18: CITIES UNDER NAMAMI GANGE PROGRAM IN UTTARAKHAND.

TABLE 8: STATUS OF WORKS UNDER NAMAMI GANGE

Name of the Project	Sanctioned Cost (crores)	Funds Released (crores)	Physical Progress (%)	Financial Progress (%)
I & D part-1 Jagjeetpur, Haridwar	84.82	43.15	58	52
I & D part-2 Sarai, Haridwar	31.46	18.46	62	65
63 MLD STP, Jagjeetpur, Haridwar	230.32	21.45	38	19
14 MLD STP, Sarai, Haridwar	43.05	8.27	38	33
I & D with STP, Muni Ki Reti, Dhalwala	80.45	18.72	51	30.25
Upgradation of 3 MLD STP, Swargashram	5.20	2.20	100	69.50
Upgradation of 3.5 MLD STP, Tapovan	2.19	0.66	100	90
I & D works at 26 MLD STP, Rishikesh	158.01	17.79	19	14.55
I & D with STP, Kirtinagar	4.23	1.91	100	92
I & D with STP, Srinagar	22.51	9.51	65	60
Upgradation work of existing 3.5 MLD STP, Srinagar	15.41	2.62	60	49
I & D with STP, Rudraprayag	13.15	5.52	65	48
I & D with STP, Karnaprayag	12.09	3.55	95	65
I & D with STP, Nandprayag	6.46	2.45	100	92
I & D with STP, Chamoli- Gopeshwar	61.83	11.59	65	39
I & D with STP, Joshimath	48.43	10.39	45	36
I & D with STP, Badrinath	18.24	2.56	70	32
Upgradation of 2 MLD STP, Gyansu, Uttarkashi	10.03	3.78	93	80
Haridwar Arihant Vihar Sewerage scheme	4.68	1.05	100	47

5 Liquid Waste Management

Given that there are multiple programs and schemes undergoing in the state, this section tries to summarize the infrastructure available for liquid waste management in across the state. The state is focussing on the off-site sanitation systems and multiple projects are underway. The liquid waste management section gives a brief about the sewerage and sewage treatment plant details in the state of Uttarakhand.

TABLE 9: DETAILS OF THE PHYSICAL AND FINANCIAL PROGRESS OF PROJECTS SANCTIONED UNDER FLAGSHIP PROGRAMS (SOURCE: PEY JAL NIGAM, MIS)

Flagship Programs	AMRUT	Namami Gange
Number of schemes (no.)		
Total schemes	46	20
Ongoing schemes	42	20
Completed schemes	4	0
Financial details (lakh INR)		
Sanctioned cost	40,180.32	63,094.62
Budget released	13,357.37	25,316.15
Expenditure	12,344.37	19,586.88

Very little progress has been made by the state with respect to operationalising FSSM. The subsequent section of faecal sludge management gives a brief about the progress of the state in the direction of FSSM.

5.1 Sewage Management

According to the information available on Uttarakhand Peyjal Sansadhan Vikas Evam Nirman Nigam- Management Information System, it is observed that state has prioritized water supply projects till 2019. Table 10 gives details of the sanctioned schemes under Pey Jal Nigam, Government of Uttarakhand. It can be seen that only 2% of the total projects were based on sewerage (sewerage and STPs) out of which only 35% of the projects were completed. The progress made under sewerage is lowest among all the schemes.

TABLE 10: DETAILS OF SCHEMES UNDER PEY JAL NIGAM, UTTARAKHAND STATE (SOURCE: PEY JAL NIGAM, MIS)

Number of sanctioned projects and their status			
Schemes	**Total**	**Ongoing**	**Completed**
Water Supply	7331	1811	5520

Sewerage	166	108	58
Drainage	11	5	6
Others	537	260	277
Total	8045	2184	5861

Financial details of the schemes and progress			
Schemes	**Sanction**	**Released**	**Expenditure**
Water Supply	4,09,345.16	3,31,197.17	3,15,366.92
Sewerage	1,84,874.58	1,09,664.34	99,251.76
Drainage	1,362.23	1,075.69	837.90
Others	41,089.36	21,826.21	17,346.98
Total	6,36,671.33	4,63,763.41	4,32,803.56

Only 29% of the total budget (INR 1,84,874.58 lakhs) was sanctioned for sewerage schemes. Out of the total sanctioned budget, 59% of the funds were released and out of that 91% of the funds were utilised.

TABLE 11: DISTRICT WISE DETAILS OF THE SEWERAGE SCHEMES UNDER PEY JAL NIGAM, GOVERNMENT OF UTTARAKHAND (SOURCE: PEY JAL NIGAM, MIS)

Number of sanctioned projects and their status				
Sr. No.	**District**	**Total**	**Ongoing**	**Completed**
1	Almora	3	3	0
2	Bageshwar	0	0	0
3	Chamoli	16	9	7
4	Champawat	0	0	0
5	Dehradun	34	26	8
6	Haridwar	34	23	11
7	Nainital	23	15	8
8	Pauri	6	6	0
9	Pithoragarh	5	3	2
10	Rudraprayag	4	4	0
11	Tehri Garhwal	23	7	16
12	Udham Singh Nagar	6	1	5
13	Uttarkashi	12	11	1
	Total	**166**	**108**	**58**

Financial details of the schemes and progress				
Sr.No	**District**	**Sanction**	**Released**	**Expenditure**
1	Almora	1,146.21	523.34	522.63
2	Bageshwar	-	-	-

3	Chamoli	18,249.71	10,143.36	8,003.31
4	Champawat	--	--	--
5	Dehradun	60,658.86	45,941.44	43,595.66
6	Haridwar	56,896.31	26,708.22	24,772.93
7	Nainital	13,325.98	7,006.56	6,137.17
8	Pauri	4,383.79	2,407.37	2,054.60
9	Pithoragarh	7,458.55	4,808.55	3,939.17
10	Rudraprayag	2,215.57	789.09	536.49
11	Tehri Garhwal	12,841.19	6,997.42	5,772.65
12	Udhamsinghnagar	4,161.95	1,412.12	1,361.54
13	Uttarkashi	3,536.46	2,926.87	2,555.61
	Total	**1,84,874.58**	**1,09,664.34**	**99,251.76**

Looking at the sewerage projects sanctioned across different districts, it can be observed that maximum projects are sanctioned for Dehradun and Haridwar districts. These projects amounted to 33% and 31% of the total sanctioned funds for sewerage in Uttarakhand state.

Implementing sewerage network does not completely solve the management problem. The major challenge is the poor number of connections from the households & commercial establishments to the sewerage system. Households are reluctant to pay for getting the sewerage connections[12]. The households perceive it as recurring expense because once the connection is taken, they will also have to pay tax. Implementing appropriate byelaw and IEC campaign is required for tackle this challenge.

Not all the ULBs having sewerage network have STPs to treat the sewage, thus leaving the sanitation system incomplete. In absence of treatment facility, the pollution and its associated health risk is transferred from ward level to city level or in some cases even to ULBs located downstream of the river.

Assuming average of water consumption of 70 lpcd and generation of wastewater as 80%, total wastewater generation in the state of Uttarakhand is approximately 565 MLD. However, the design capacity of the STPs (planned, under construction, operational) is 231 MLD (only 41% of the total wastewater generated in the state). It needs to be noted that the district of Udham Singh Nagar which has three Nagar

[12] Press Information Bureau, Ministry of Water Resources

Nigams with significantly high population density only has partial sewerage network and no sewage treatment facility.

District	Population (census 2011)	Wastewater generation (MLD)	Installed Capacity (MLD)
Almora	622506	34.86	2
Bageshwar	259898	14.55	0
Chamoli	391605	21.93	0.26
Champawat	259648	14.54	0
Dehradun	1696694	95.01	134.95
Haridwar	1890422	105.86	63
Nainital	954605	53.46	12.85
Pauri Garhwal	687271	38.49	3.5
Pithoragarh	483439	27.07	5
Rudraprayag	242285	13.57	0
Tehri	618931	34.66	6.4
Udham Singh Nagar	1648902	92.34	0
Uttarkashi	330086	18.48	3
TOTAL	**10086292**	**565**	**231**

Figure 19 shows the location and design capacity of all the STPs in Uttarakhand State. The STPs shown in blue are under planning stage.

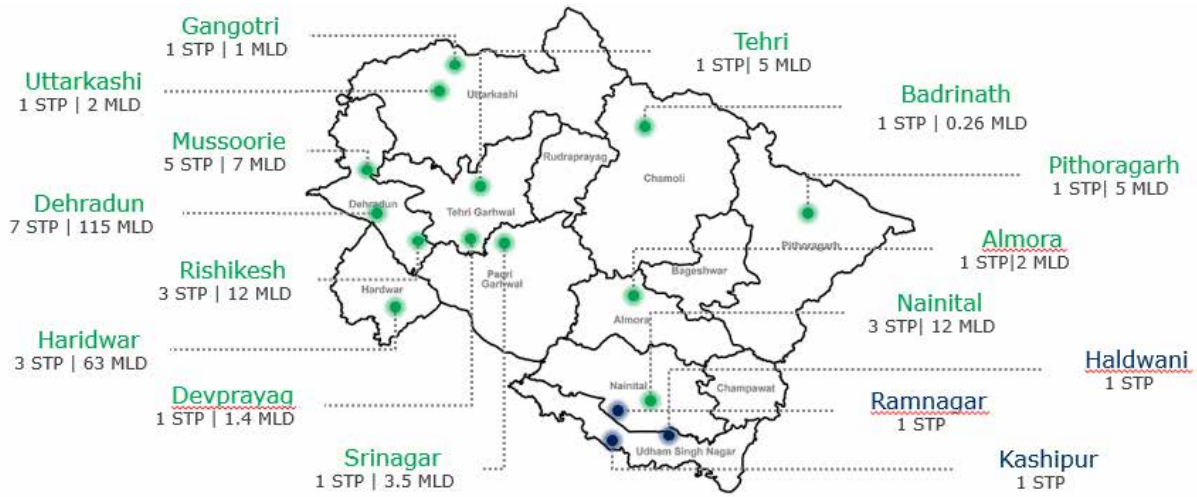


FIGURE 19: LOCATION OF STPS AND THEIR DESIGN CAPACITY IN UTTARAKHAND STATE

Table 12 gives a detailed status of the STPs in the state of Uttarakhand. The latest list of STP's under Pey Jal Nigam and Jal Sansthan is listed in the Annexure 10.3.

TABLE 12: THE STATUS OF STPS IN THE STATE OF UTTARAKHAND[13]

SR No	City/Town	STP Location	STP commissioned in year	Status	STP installed capacity (MLD)	Technology	Remarks
1	Rishikesh	Lakkarghat	1984	Operational	6	Oxidation Pond	Insufficient for present population, 25 MLD capacity is being proposed
2	Srinagar	Nr Bus Station	2009	Operational	3.5	Fluidized Aerobic Bioreactor	Operational
3	Swargashram	Ved Niketan	2010	Operational	3	Sequential Batch Reactor	Working & in use
4	Tehri	Tapovan	-	Operational	3.5	Sequential Batch Reactor	Working & in use
5	Uttarkashi	Gyansu	2012	Operational	2	Moving Bed Bioreactor	Working & in use
6	Devprayag	Bah Bazar	-	Operational	1.4	Soil Bio Technology	Working & in use
7	Bhagirathipuram	Tehri	-	Operational	5	-	Operational
8	Haridwar	Jagjeetpur	1990	Operational	18	Activated Sludge Process	Operational
9	Haridwar	Jagjeetpur	2010	Operational	27	Sequential Batch Reactor	Operational
10	Haridwar	Sarai, Jawalapur	2013	Operational	18	Sequential Batch Reactor	Operational
11	Mussourie	Bhattafall	-	Under Construction	3.12	Sequential Batch Reactor	Under Construction

[13] Status of Sewage Management in Uttarakhand, UEPPCB, 2016

12	Mussourie	Landhor South	-	Under Construction	1.30	Sequential Batch Reactor	Under Construction
13	Mussourie	Landhor North	-	Under Construction	0.80	Sequential Batch Reactor	Under Construction
14	Mussourie	Kulri	-	Under Construction	0.90	Sequential Batch Reactor	Under Construction
15	Dehradun	Kargi	-	Operational	68	-	Operational
16	Dehradun	Indira nagar	-	Ready for commissioning	5	Sequential Batch Reactor	Not commissioned yet
17	Dehradun	Mothorowala	-	Operational	20	Sequential Batch Reactor	Operational
18	Dehradun	Jakhan	-	Ready for commissioning	1	Sequential Batch Reactor	Not commissioned yet
19	Dehradun	Vijay Colony	-	Ready for commissioning	0.42	Sequential Batch Reactor	Not commissioned yet
20	Dehradun	Salawala	-	Ready for commissioning	0.71	Sequential Batch Reactor	Not commissioned yet
21	Dehradun	Kaulagarh	-	Ready for commissioning	3	Sequential Batch Reactor	Not commissioned yet
22	Almora	Bakh	2004	Operational	2	Moving Bed Bioreactor	STP damaged/ Poor operation & maintenance
23	Bhimtal	Bhimtal	2010	Operational	1.25	Upflow Anaerobic Sludge Blanket Reactor	STP damaged/ Poor operation & maintenance
24	Nainital	Rushi	2010	Operational	2 Nos. x 5	Setting tank with Trickling Filter	Working & in use

5.2 Faecal Sludge and Septage Management (FSSM)

Ministry of Housing and Urban Affairs (MoHUA) formerly Ministry of Urban Development (MoUD) recognised that the end objective & corresponding benefits of SBM cannot be achieved without proper management of faecal sludge & septage across the sanitation service chain. Further it was well understood that sewerage coverage will not meet the complete sanitation need in all areas, and a strategy which is a combination of onsite sanitation system & offsite sanitation system (decentralised & centralised) must co-exist in the cities & must be given equal attention. Over the time, relative proportions of coverage by offsite sanitation systems & onsite sanitation systems may change; however, both will need to be managed well.

So as a first step in that direction, MoHUA and a host of research & civil society organisations jointly drafted & signed a national declaration on Faecal Sludge & Septage Management (FSSM) on 9th September, 2016. Pursuant to the declaration in 2017, the FSSM policy is being promulgated to address the gaps & provide the necessary directions to diverse stakeholders engaged in provision of FSSM services.

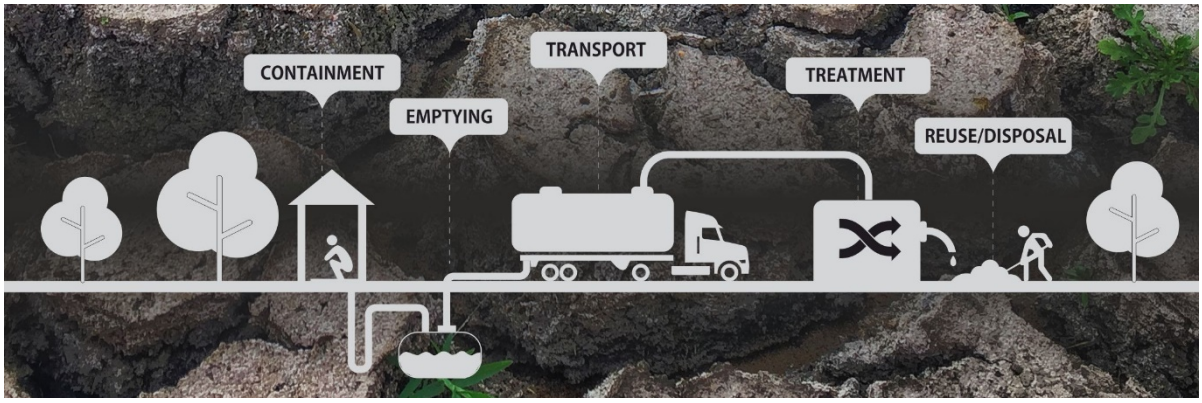


FIGURE 20: FSM VALUE CHAIN

Subsequently MoHUA had released the National Faecal Sludge and Septage Management (FSSM) Policy in Feb 2017 which instructed all state governments to develop their own state level FSSM policy. Meanwhile, a protocol was made pertaining to FSSM in the state of Uttarakhand, whose details are given below.

5.2.1 Septage Management Protocol in Uttarakhand State

With reference to the national level FSSM policy, the Uttarakhand state has also developed their own protocol for septage management which was effective from May 2017. Following stated is the purpose & scope of this protocol:

- To provide a regulatory framework for construction, routine maintenance of septic tanks & bio digesters, transportation, treatment & safe disposal of septage
- To prescribe the actions to be taken by the owners of the premises connected to septic tanks/bio-digesters & septage transporters to ensure compliance with their obligations
- To provide for appropriate inspection & enforcement mechanisms
- To ensure cost recovery on a sustainable basis for proper septage management
- To facilitate participation of private & non-government sector in septage management

Following mentioned are the elements of the septage management in the protocol:

Monitoring Committee: The following monitoring committee shall be in place to monitor the activities related to septage management at timely intervals as & when required,

TABLE 13 : MONITORING COMMITTEE FOR SEPTAGE MANAGEMENT

SR No	DESIGNATION	MEMBERS
1.	District Magistrate	Chairman
2.	Mayor/Chairman, ULB	Co Chairman
3.	MNA/Executive Officer, ULB	Member
4.	Representative from State Pollution Control Board	Member
5.	Superintendent Engineer, Pey Jal Nigam	Member
6.	Superintendent Engineer, Jal Sansthan	Member
7.	Representative from Health Department	Member
8.	Representative from Town & Country Planning Department	Member

Septage Management Cell (SMC): The State Government has notified to each Urban Local Body/District Board to create a septage management cell. This cell shall be responsible for ensuring that the septage/effluent from individual or common septic

tanks & bio digesters is collected and appropriately treated before its consequential safe disposal. The undigested or partially digested waste of bio digester cell shall also be collected & treated before its safe disposal. The manure removed from the bio digester shall be distributed free of cost to the farmers around the area. The SMC shall have the power to impose the penalty to individual, government body or private entrepreneur to enforce this protocol.

SMCs are to be formed at the ULB level and the structure for the committee has been fixed in the protocol. The structures for the Nagar Nigam and that for Nagar Palika Parishad and Nagar Panchayat are different. Following are the list of tables indicating the members of the SMC at various levels:

TABLE 14: SEPTAGE MANAGEMENT CELL AT NAGAR NIGAM

SR NO	DESIGNATION	MEMBERS
1.	Municipal Commissioner, Nagar Nigam	Chairman
2.	Representative from Uttarakhand Jal Sansthan not below E.E	Member
3.	Representative from PeyJal Nigam not below E.E	Member
4.	Representative from State Pollution Control Board	Member
5.	Representative from Health Department	Member
6.	Other persons who may be invited to provide technical advice to the SMC	Member

TABLE 15: SEPTAGE MANAGEMENT CELL AT NAGAR PALLIKA PARISHAD & NAGAR PANCHAYAT

SR NO	DESIGNATION	MEMBERS
1.	SDM of the concerned sub-division I which the NPP/NP is located	Chairman
2.	Executive Officer, NPP/NP	Member Secretary
3.	Representative from Uttarakhand Jal Sansthan not above A.E	Member
4.	Representative from PeyJal Nigam not above A.E	Member

5.	Representative from State Pollution Control Board	Member
6.	Representative from Health Department	Member
7.	Other persons who may be invited to provide technical advice to the SMC	Member

Identification of individual septic tanks, bio digester, community septic tanks/bio-digester

The SMC will be responsible for following tasks;

1. Identification of septic tanks / bio digesters
2. Location of the septic tanks / bio digesters
3. Registration of septic tank / bio digesters

It will be the responsibility of the property owner to operate and maintain the onsite sanitation system, this includes annual checking of the level of the sludge in the tanks and checking of the structural integrity of the tanks.

Creation of infrastructure for treatment of septage

This section is pertaining to the infrastructure required for collection, transport and treatment of septage. The SMC is responsible for registration and issuing license to the septage transporters i.e. desludging operators. It is specifically mentioned that only mechanized vehicles shall be used for desludging of septic tanks. The desludging operators are to observe all the safety measures mentioned in the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 and CPHEEO Manual 2013 for sewerage and sewage treatment plant.

The user charges will be decided by the SMC and are to be paid by the property owners to the authorized person or septage transporter. The user charge will consist of fee not only towards the emptying and transporting service but subsequent treatment of the septage too.

Pertaining to the treatment of the septage, it has been recommended that the septage should be transported to the STP (within 25 km) distance or otherwise to a SeTP. The infrastructure pertaining to the treatment of septage has to be constructed

by Uttarakhand Pey Jal Nigam and the maintenance will be carried out by Uttarakhand Jal Sansthan.

IEC and Capacity Building for Septage Management

This small section in the protocol mentions the need of awareness generation and handholding of the staff, however how it needs to be done or a plan for capacity building is not mentioned.

6 Overview of Sanitation Situation at ULB level

During the study it was also intended to select five ULBs for conducting preliminary assessment and conduct structured discussions with the officials from ULBs and regional officials and state officials of parastatal bodies. The assessment was intended to verify the inferences drawn from the desk research and thereby broadly understand the challenges and issues faced in sanitation systems.

The ULBs which were selected for study purpose were based on mutual discussions & considerations with the officials from the Uttarakhand Development Directorate (UDD), Uttarakhand & National Institute of Urban Affairs (NIUA). The cities selected are very different from each other according to their topography, climate, demography & the current sanitation and wastewater management practices.

The location of the ULBs is marked in the map shown in Figure 21. The primary details of the ULBs selected are given in Table 16.

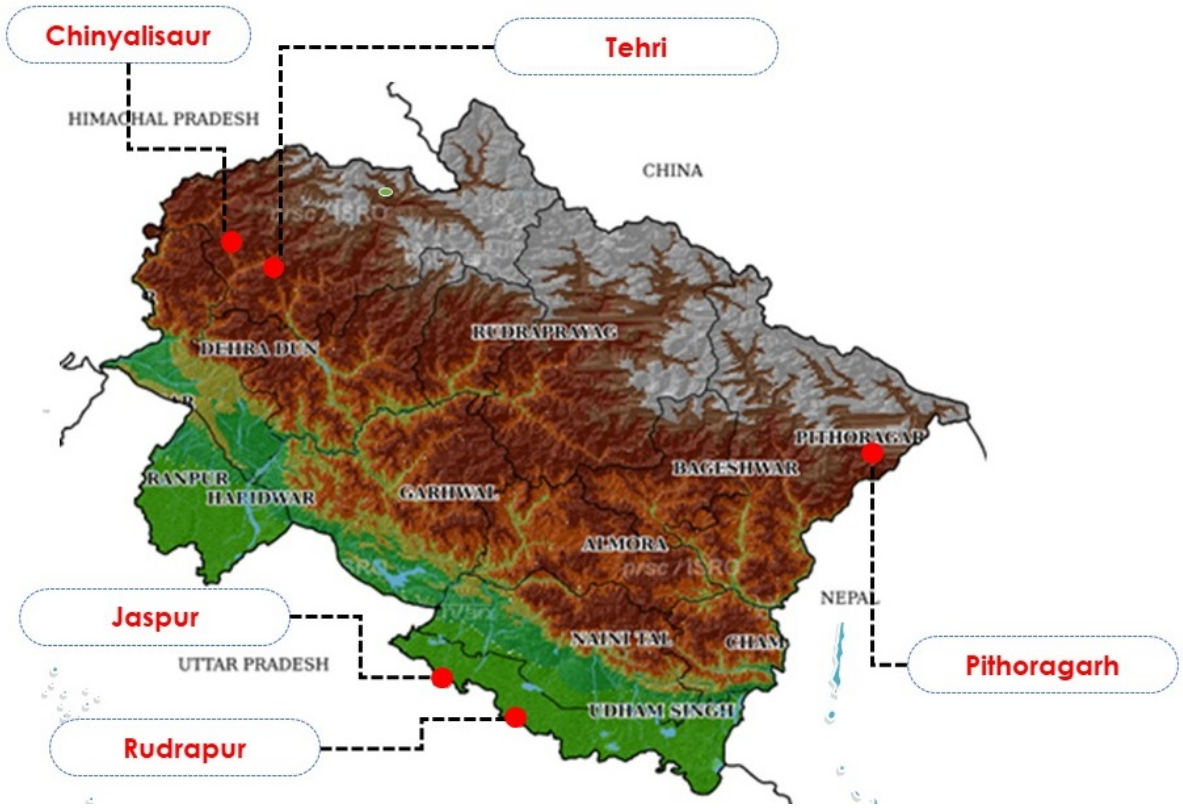


FIGURE 21: SELECTED CITIES FOR SITUATIONAL ANALYSIS STUDY IN UTTARAKHAND

TABLE 16: SELECTED CITIES FOR STUDY

Administrative Region	ULB	ULB Type	Population (Census 2011)
Garhwal	Tehri	Nagar Pallika Parishad	24,014
	Chinyalisaur	Nagar Pallika Parishad	15,500
Kumaon	Rudrapur	Nagar Nigam	1,54,554
	Jaspur	Nagar Pallika Parishad	50,523
	Pithoragarh	Nagar Pallika Parishad	56,044

The following sections detail out the inferences based on data collected and observations made through the structured interviews. It also contains photographs taken during the visits.

6.1 Tehri

6.1.1 City Profile

Tehri is a city in the Tehri-Garhwal district of Uttarakhand state. The old town of Tehri sat at the confluence of Bhagirathi & Bhilangna rivers. The construction of the Tehri dam totally covered the area of old town of Tehri which demands the whole city population shifted to the higher side and named it as New Tehri.

FIGURE 22: LOCATION OF TEHRI, UTTARAKHAND

As of 2011 census, Tehri has a population 24,014. It lies at an elevation of 5,740 feet (1,750 m). It is situated on the co-ordinates of 30.38ºN,78.48ºE[14]. The climate of Tehri is pretty cold during winters. The average annual temperature is around 10ºC while the rainfall averages around 1934 mm.

[14] Discussions with city officials, Tehri

FIGURE 23: SATELLITE IMAGERY OF TEHRI, UTTARAKHAND

6.1.2 Water Supply

As per the DPR of sewerage scheme procured from Jal Sansthan office located in Tehri, there are two main source of raw water namely- Bhagirathi river and Bhaintogi river. The raw water is lifted using pumping stations and sent to water treatment plants (WTPs). There are two WTPs in Tehri with cumulative capacity of 5.40 MLD based on technology involving sedimentation tank followed by rapid sand filter. For distribution purpose, the city has 30 storage reservoirs and piped water distribution network. There are in all 711 households connections provided through the piped water distribution system.

6.1.3 Access to sanitation

Out of 6175 households, 94.5% of the households have IHHT. Since water supply to the households is good, most of the households have flush toilet.

As shown in Figure 24 the ULB had mobile toilets procured for occasions such as Lake Festival which happens every year. It is important to have such provisions at the ULB

level for the floating population especially for a city which is located close to the backwaters of the dam.

FIGURE 24: MOBILE TOILETS EQUIPPED WITH WATER STORAGE AND LIQUID WASTE STORAGE TANKS, TEHRI NPP

6.1.4 Wastewater Management

Out of the total households 72.5% households were connected to piped sewer system and 21.8% had septic tanks.[15]. It was also informed during the interaction that the connections have increased to 85% now. However, the rest 15% of the households could not be connected as the location of the households is not favourable for connecting to the sewerage network.

[15] Census, 2011

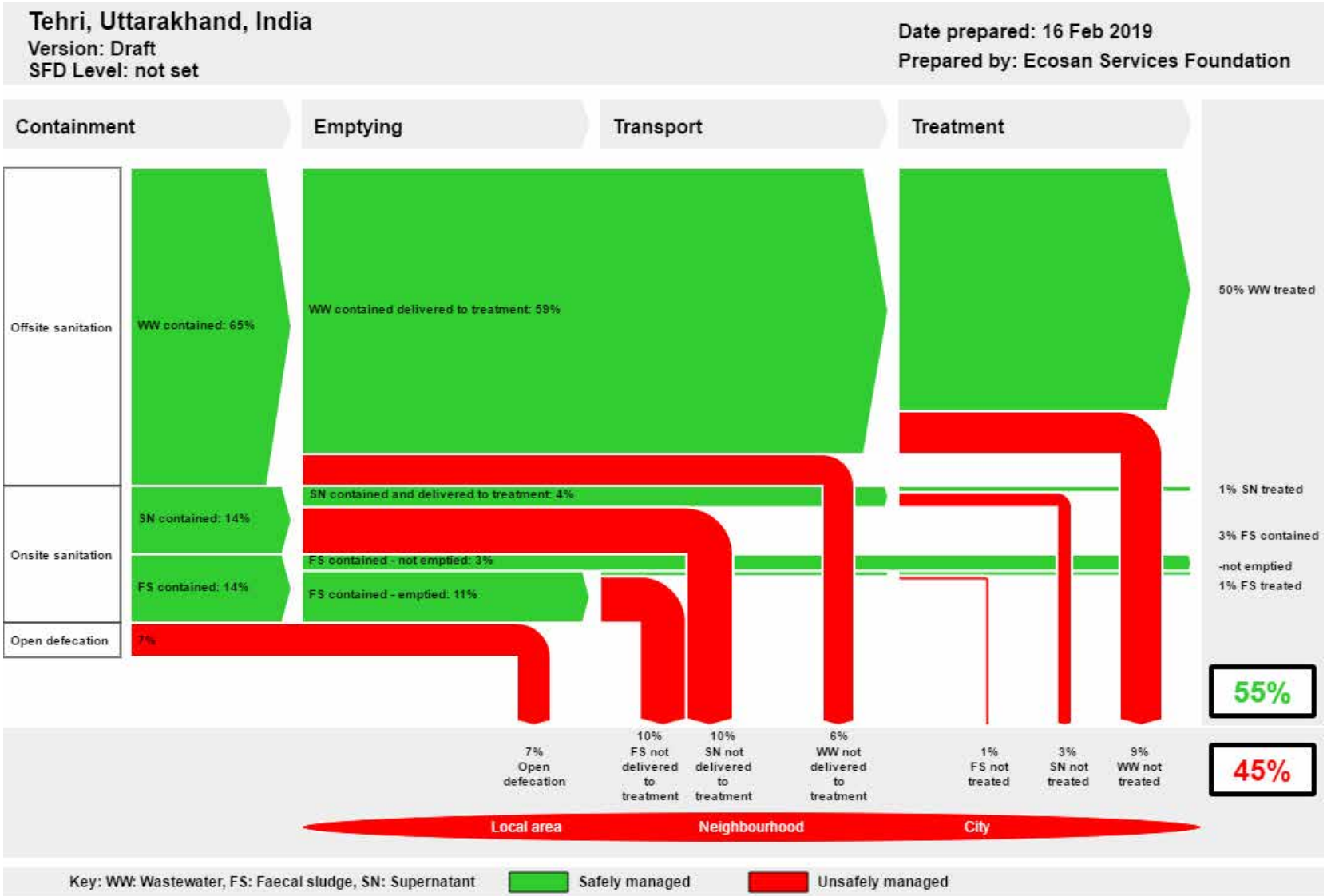


FIGURE 25: SHIT FLOW DIAGRAM – TEHRI

The sewerage network bring the sewage from the households to a STP based on activated sludge process with a design capacity of 5 MLD. The STP was operated and maintained by Jal Sansthan and was currently running under 50% utilization. Small quantity of the treated water was utilised inside the STP premise for land application, whereas the rest was discharged downstream in to the Bagirathi river. The sewage sludge was dosed with polymer before sending for dewatering using a screw press. Since, there was no proper solution envisioned for disposal of the bio solids, the dewater solids were stored for few days before allowing the farmers to take it away at free of cost.

FIGURE 26: LOCATION OF THE STP, TEHRI, UTTARAKHAND

Figure 26 shows the location of the STP. Since the ULB is located on the top of the mountain and is spread quite widely, the location of the STP is taken at the downstream of the valley. Figure 27 shows the pictures of the STP. It was observed that the STP was operated and maintained quite well. There was no odour and treated water was visible to be of good quality.

FIGURE 27: SEWAGE TREATMENT PLANT AT TEHRI WITH DESIGNED CAPACITY OF 5 MLD

6.1.5 Faecal Sludge and Septage Management

The ULB official in Tehri were of the opinion that since majority of the households are connected to the sewerage system, there is no need of FSSM per say. Also, they mentioned that liquid waste management comes under the purview of Pey Jal Nigam and Jal Sansthan and hence they did not have vacuum truck for providing desludging services to the households. Paucity of funds was also mentioned as one of the major reason why the ULB was struggling with solid waste management, leave behind the vacuum truck. The officials reported that the septic tanks which are not connected to sewerage system might be desludged manually and disposed of into open low-lying areas.

While interacting with the officials at the STP, it was informed that a private operator from Chamba (city located approximately 25 km from the STP) provides desludging services to the households in Chamba. The septage thus collected in Chamba, is brought for co treatment at the STP in Tehri. The STP operator reported that the truck comes once a month to dispose a truck load of septage. The operators charges around INR 10,000 out of which INR 2,000 is given as tipping fee to Jal Sansthan.

6.1.6 Organogram

The organizational structure of Tehri Nagar Pallika Parishad (NPP) consists of 9 staff members (excluding Safai Workers/Sweepers, Security and Drivers) headed by the Executive Officer. With respect to SBM, the major role of ULB is the management of Solid waste and Public/Community sanitation infrastructure. The organisational structure of NPP is given below,

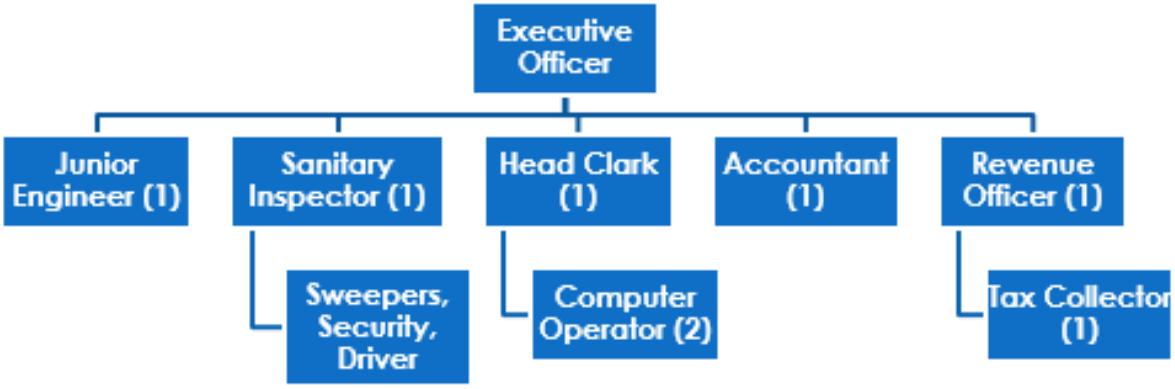


FIGURE 28: ORGANOGRAM OF ULB, TEHRI, UTTARAKHAND

6.2 Chinyalisaur

6.2.1 City Profile

Chinyalisaur is a small town in the Uttarkashi district of Uttarakhand. It is located on the banks of the river Bhagirathi. The river feeds the reservoir of Tehri Dam which is used for irrigation and drinking water in the nearby areas. It is around 70 kilometres from Chamba and 34 kilometres from Uttarkashi. It is situated at an elevation of 909 m (2,982 feet). It is located at 30.5833°N,78.3210°E.[16] Chinyalisaur is constituted as Nagar Pallika Parishad (NPP) on May 2013 and it is included in the Namami Gange program as it is situated on the bank of river Bhagirathi, a sub-tributary of Ganga River.

As per census 2011, the population of Chinyalisaur is 8844 and currently it is 15,400[17]. There are total 7 wards and city has total area of 6.19 sq.km.

[16] CSP, Chinyalisaur

[17] CSP, Chinyalisaur

FIGURE 29: LOCATION OF CHINYALISAUR, UTTARAKHAND

The climate in Chinyalisaur is mild & generally warm. The average annual temperature is around 20.8ºC. Precipitation is also observed post monsoon season. In a year the average rainfall is 1854 mm[18].

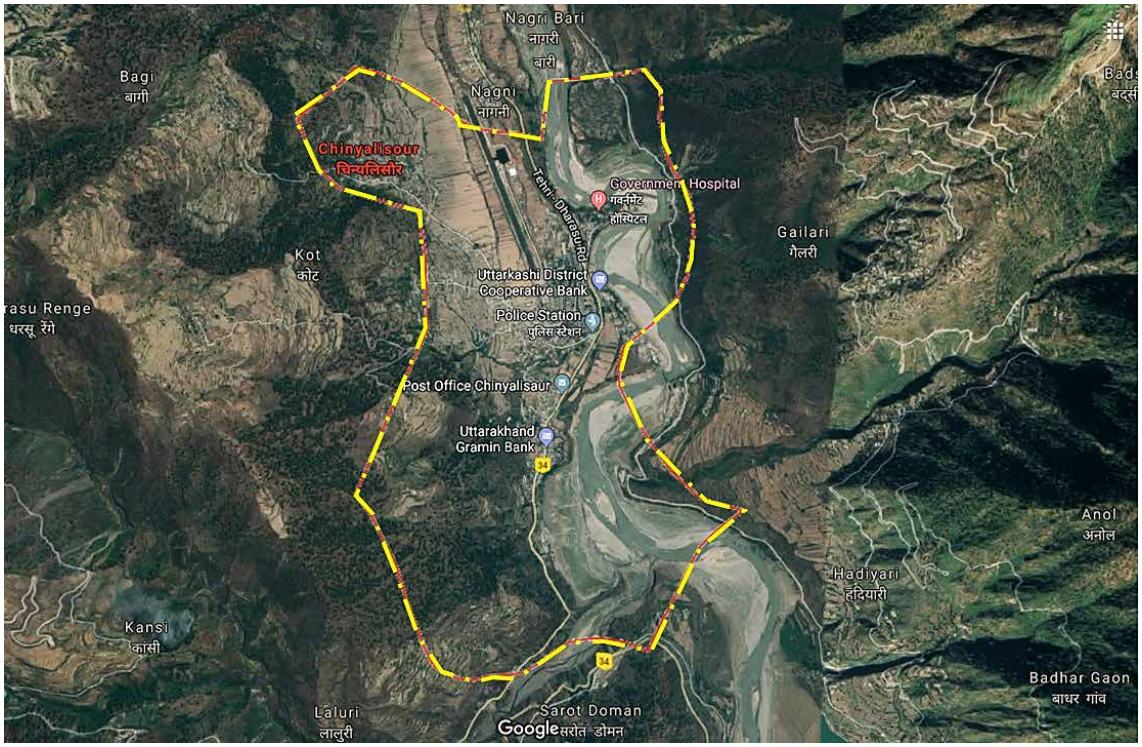


FIGURE 30: SATELLITE IMAGERY OF CHINYALISAUR, UTTARAKHAND

[18] Climate-Data.org

6.2.2 Water Supply

The water supply is provided by piped water supply. The water from the river is given basic treatment and pumped in the reservoirs for distribution. The water supply is being operated and maintained by Jal Sansthan. According to 2011 census, 94% of the households had access to tap water. However, the undulating nature of the terrain possess challenge for supplying water to all the connected households at constant water pressure.

During the interaction with ULB officials, it was informed that there has always been an issue regarding drinking water in Chinyalisaur. The water supply network is 25 years old and with growing population, the problem is becoming more severe. The newer wards aren't receiving adequate water supply.

As per the CSP of the city, the water supply needs to be improved to meet the demands of the future population. It states that the human resources for managing the water supply in the city are limited and overburdened. Further it states that the quantum of non-revenue water is high as households have taken illegal connections.[19]

6.2.3 Access to sanitation

There are 2152 households in Chinyalisaur. Out of these 2152 households, 81% of the households (1743) have IHHT. Under SBM program, additional 379 households have built IHHT. There are total 3 newly constructed community toilet block under SBM and 1 public toilet block having total 8 seats and 11 urinals. The remaining households are either using community toilets (CTs) or public toilets (PTs).

TABLE 17: STATUS OF IHHT AND CT & PT (REF: CSP, 2017)

<table>
<tr><th rowspan="2">Total Households (No.)</th><th rowspan="2">Households having IHHT (No.)</th><th colspan="3">Households dependent on Community/Public Toilet (No.)</th><th rowspan="2">Remark</th></tr>
<tr><td colspan="3">379</td></tr>
<tr><td rowspan="4">2152</td><td rowspan="4">1743</td><td></td><td>Seats</td><td>Urinals</td><td rowspan="3">379 (Newly constructed individual toilets, SBM, 2019)</td></tr>
<tr><td>CT (3 No.)</td><td>7</td><td>8</td></tr>
<tr><td>PT (1 No.)</td><td>1</td><td>3</td></tr>
</table>

[19] CSP, Chinyalisaur

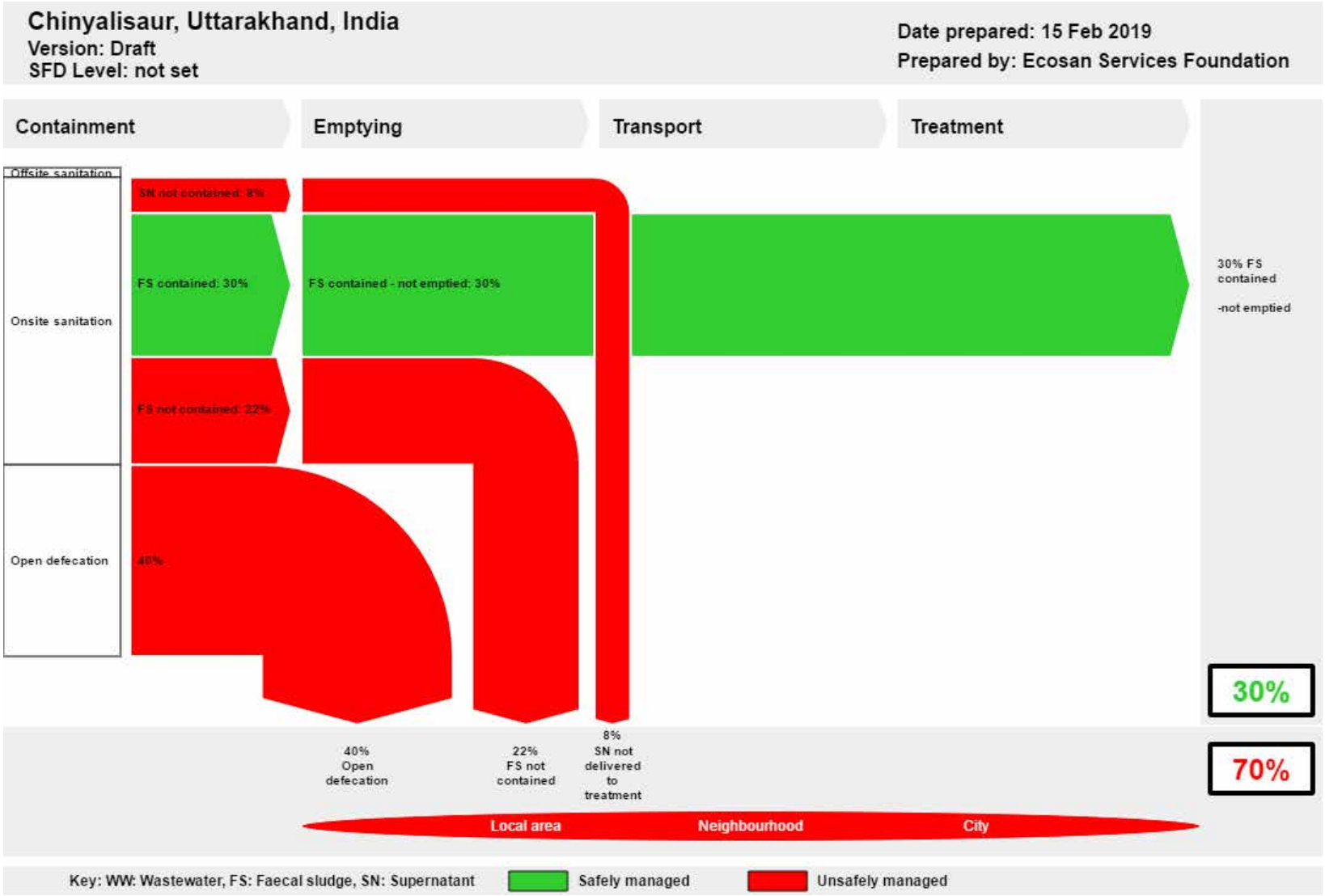


FIGURE 31: SFD - CHINYALISAUR (REF: CENSUS 2011 AND CONSULTATION WITH NPP)

6.2.4 Liquid waste management

The households having IHHT are all connected to containment unit- septic tank and soak pit. The ULB official said that approximately, 80% of the households have septic tank and the rest have twin (soak) pits. The effluent from the septic tank and the grey water is put into the network of open/closed drains. There is no proper wastewater management in the city as it doesn't have sewerage network and sewage treatment system and most of the wastewater drains off into the river downstream.

There are no equipment with the ULB to provide desludging services to the households. As a result of which the sludge or septage from septic tanks are manually desludged. To dispose the septage, unsafe entrenchment is practices. The ULB officials said that they could not provide more details about the practices, since the households avail the services directly without their knowledge.

The shit flow diagram (Figure 31) of Chinyalisaur portrays the overall sanitation situation of the town. Human waste of 70% population of the town is unsafely managed as there is no conveyance and treatment facilities available. Due to unsafe management, the hazard created is at the local level.

Open drain along the road side | Closed drain along the road side

FIGURE 32: DRAINAGE SYSTEM IN THE CITY

6.2.5 Organogram

The organizational structure of Chinyalisaur Nagar Palika Parishad (NPP) consists of 23 staff members headed by the Executive Officer. With respect to SBM, the major role of ULB is the management of Solid waste and Public/Community sanitation infrastructure. The organisation structure of NPP is given below,

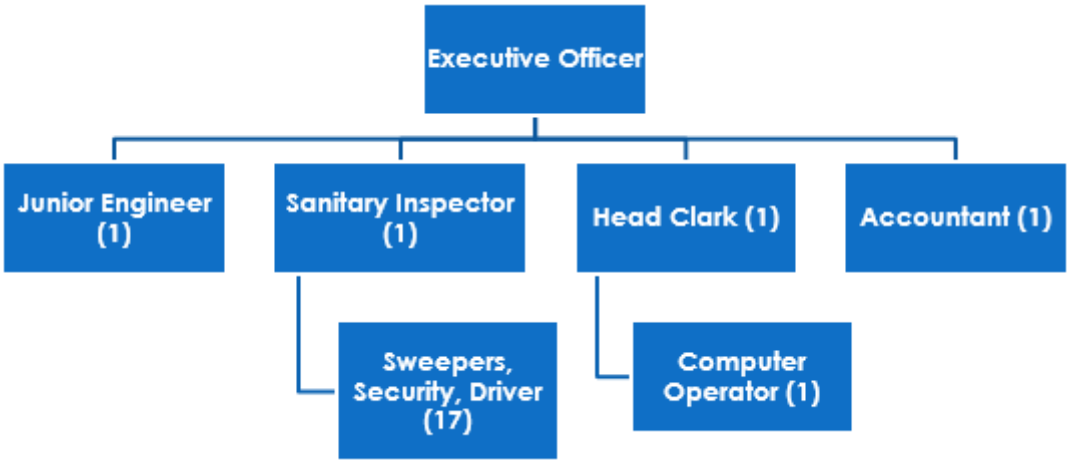


FIGURE 33: ORGANOGRAM OF THE ULB, CHINYALISAUR, UTTARAKHAND

FIGURE 34: (LEFT: COMMUNITY TOILETS, RIGHT: MEETING WITH MR.PANWAR (JUNIOR ENGINEER, CHINYALISAUR NPP)

6.3 Rudrapur

6.3.1 City Profile

Rudrapur city is the district headquarter of district Udham Singh Nagar in Uttarakhand state. The Rudrapur city is situated in Terai region of district Udham Singh Nagar at a distance of 72 Kms from Nainital. There are two rivers known as Kalyani and Begul flows through the city area.

The city is a centre of all trades and commerce in Terai region. It has the area of 27.65 km^2. It is located at 28.98ºN,79.40ºE. According to the 2011 census, the city has a population of 1,54,554 and has 29,662 households. The Rudrapur Nagar Nigam is the administrative body of the city.

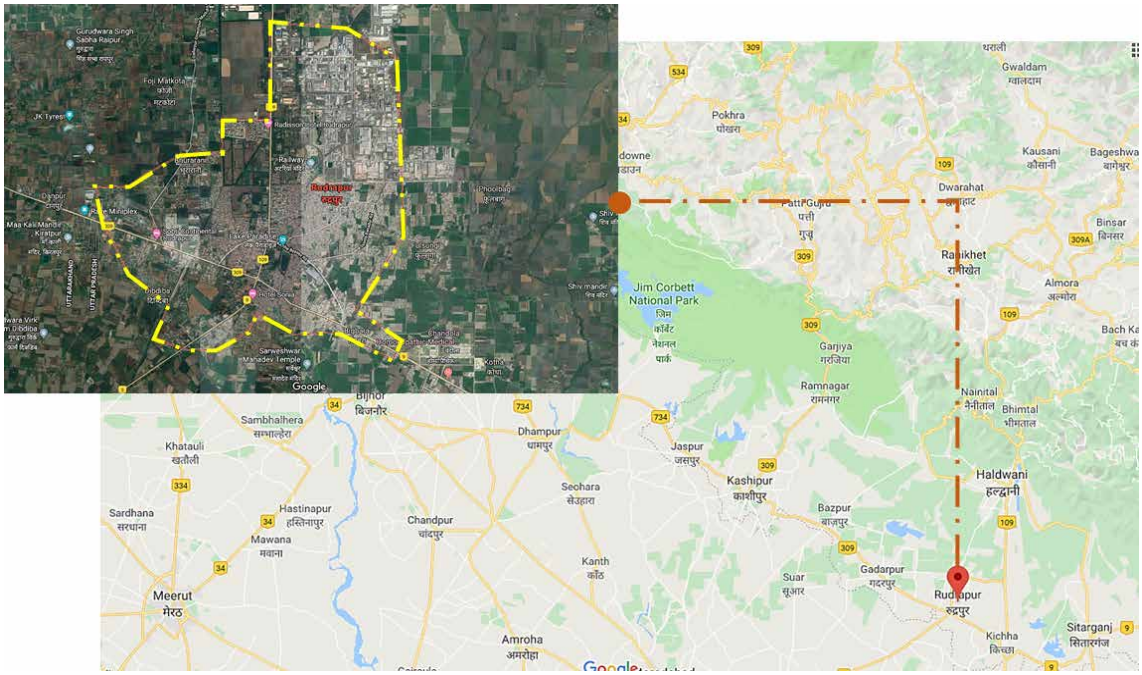


FIGURE 35: LOCATION OF RUDRAPUR, UTTARAKHKAND

The town lies in the Terai belt and has tropical climate. In Rudrapur, the average annual temperature is 24.3ºC & the average rainfall is 1302 mm[20]. The ground water level in this area is very high- ranging from 1m to 3 m.

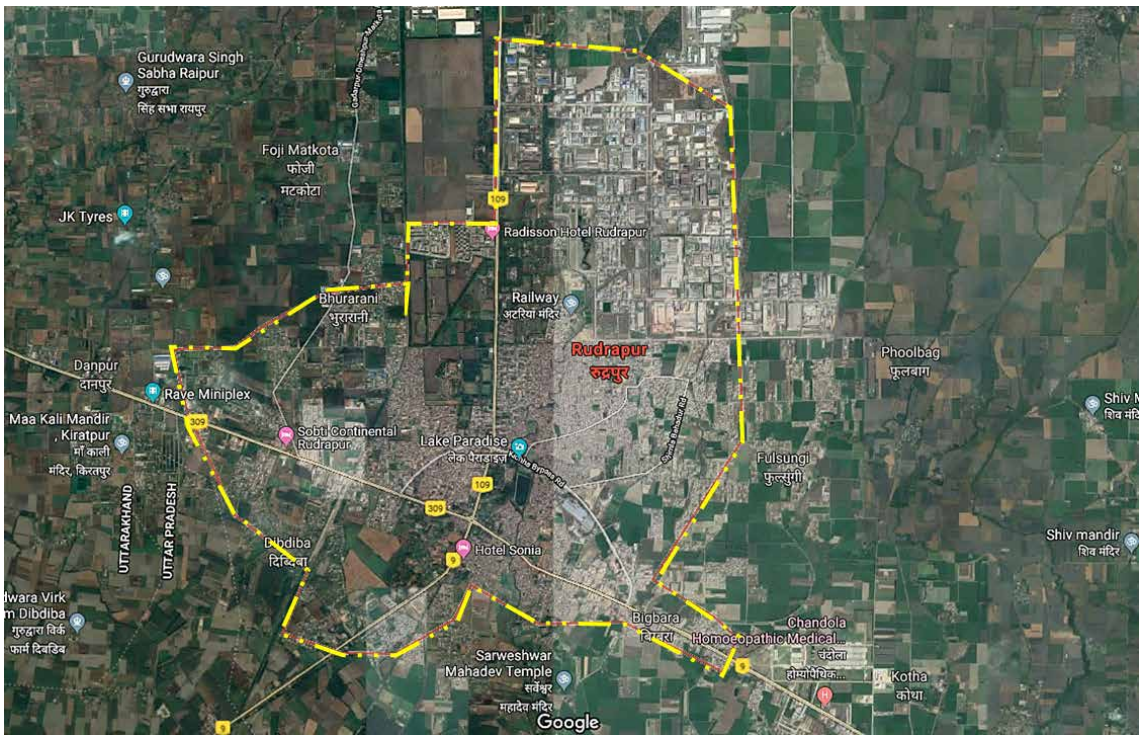


FIGURE 36: SATELLITE IMAGERY OF RUDRAPUR, UTTARAKHAND

[20] Wikipedia, Rudrapur

6.3.2 Water Supply

As the city has high water table, most of the people are dependent on ground water for their daily water requirement. It is informed that coverage of water supply network in Rudrapur city is approximately 11% with a piped water supply of 49 lpcd. Currently, under AMRUT program it is planned to have approximately 53% coverage of piped water supply with an average of 87 lpcd capacity.[21]

6.3.3 Access to sanitation

As per the Census of 2011, the total number of households in Rudrapur city was 29,662 and IHHT was available with 66.2% of the households. It was reported that 28% of the households practiced open defecation. However, post the interventions under SBM, it is expected that the access to IHHT might have increased significantly.

6.3.4 Wastewater Management

As per the 2011 census, only 8.4% of the households having IHHT connected to the piped sewer system. Due to high ground water table in the city of Rudrapur, the laying of sewer network is technically challenging and expensive. Hence, the city of Rudrapur only have partial sewerage network, most of which is non-functional. There is not sewage treatment facility. 68.4% of the households are connected to open drains which lead to the river. It will not be incorrect to say that two rivers in Rudrapur are severely polluted by the untreated discharge of wastewater and faecal sludge/septage.

6.3.5 Faecal Sludge and Septage Management

In absence of a sewered sanitation system, it is expected that the ULB such as Rudrapur should practice FSSM. The dependency on the septic tank is quite high and as described earlier the septic tank effluent and grey water drains into the network of open-closed drains. Currently demand desludging is in practice and the Rudrapur NN has 2 vacuum trailers (capacity- 4000 L). Rudrapur NN charges INR 1,000 per trip for emptying the septic tank. However, both the trailers did not look operational. Apart from this, there is a good presence of private operators who have in total 9-10 vacuum

[21] Consultation with Jal Sansthan, Rudrapur officials

trailer/trucks with varying capacity (3000 – 4000 L). These private operators charnge between INR 1,500 – 2,000 per trip.

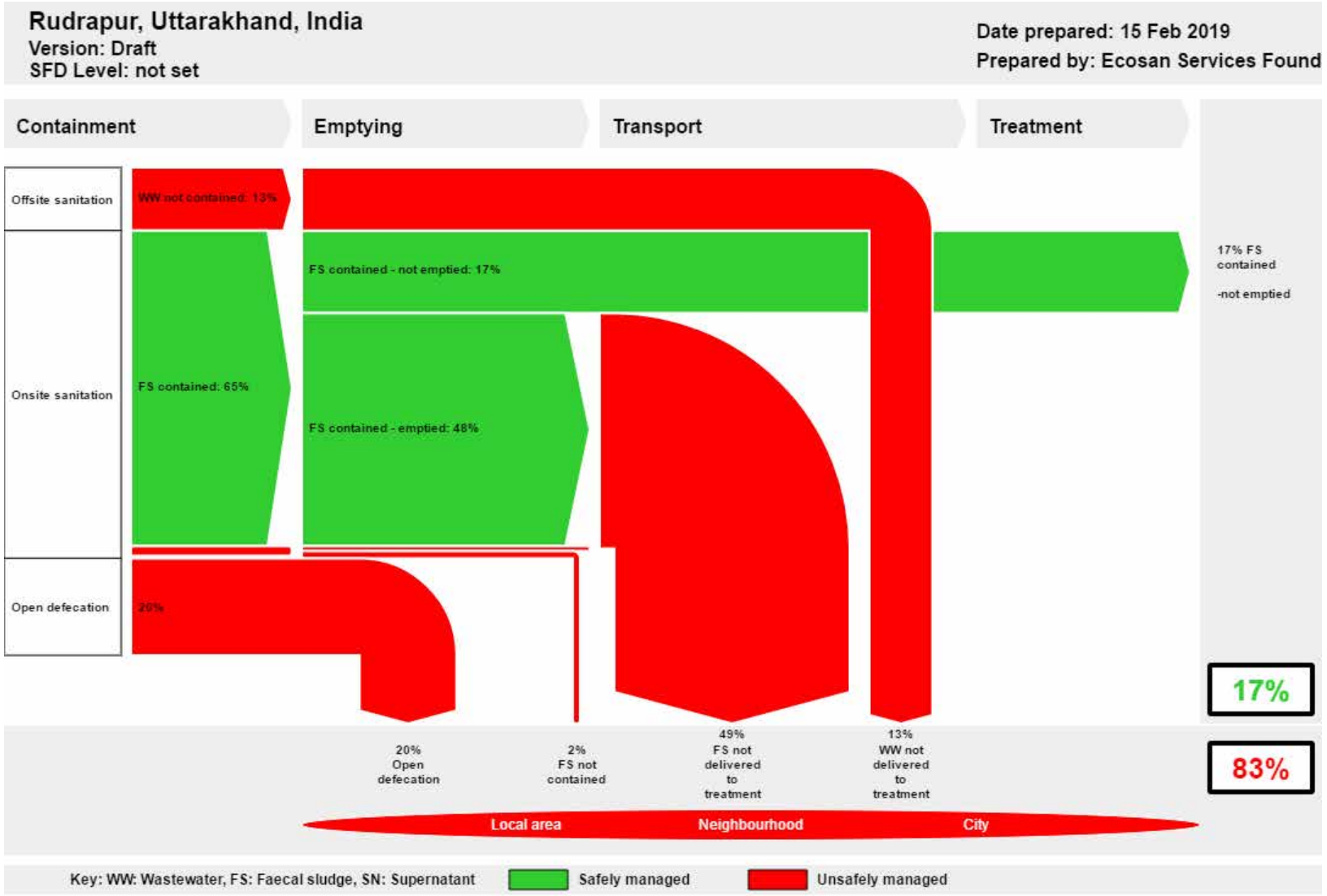


FIGURE 37: RUDRAPUR SHIT FLOW DIAGRAM

FIGURE 38: DESLUDGING VEHICLE OF PRIVATE OPERATOR AND CONSULTATION WITH PROVIDER

While interacting with the ULB officials and private operators, it was informed that there is a standard operating procedure set for availing the service from the NN. The households needs to visit the NN office and place the request and pay the feed in advance. A receipt of the payment is issued, which he needs to show during the time of desludging. After this, it usually takes a day or two for the NN to attend to the request. The procedure is quite tedious. Since the households avail the desludging service only when there is an emergency, they prefer to get the service immediately. As a result of which households prefer to get the avail the service from the private operators.

The septage collected from the households is indiscriminately disposed into the nallahs and stream leading to the river.

Through AMRUT, Pey Jal Nigam had proposed a septage treatment plant at Rudrapur of design capacity- 125 KLD. The DPR was prepared b external consultant where a mechanized treatment technology based on UASB (Upflow Anaerobic Sludge Blanket Reactor) was proposed. A sum of INR 6 crore was budgeted along with area of 90 m^2 in the city. A DBOT tender was floated by Pey Jal Nigam twice, but only one bid was received.

Since the officials from Pey Jal Nigam were not sure regarding the availability funds to run a mechanised treatment technology, they requested NIUA to provide technical support to design a treatment plant based on non-mechanised treatment technology

such as DEWATS. The work is in progress and soon Pey Jal Nigam is expected to float a BOT tender for the septage treatment plant in Rudrapur.

6.3.6 Organogram

The organizational structure of Rudrapur Nagar Nigam (NN) consists of 31 staff members (excluding Environment Staff, Sweepers, Security, Driver etc) headed by the Municipal Commissioner. With respect to SBM, the major role of ULB is the management of Solid waste and Public/Community sanitation infrastructure. The organisational structure of NN is given below,

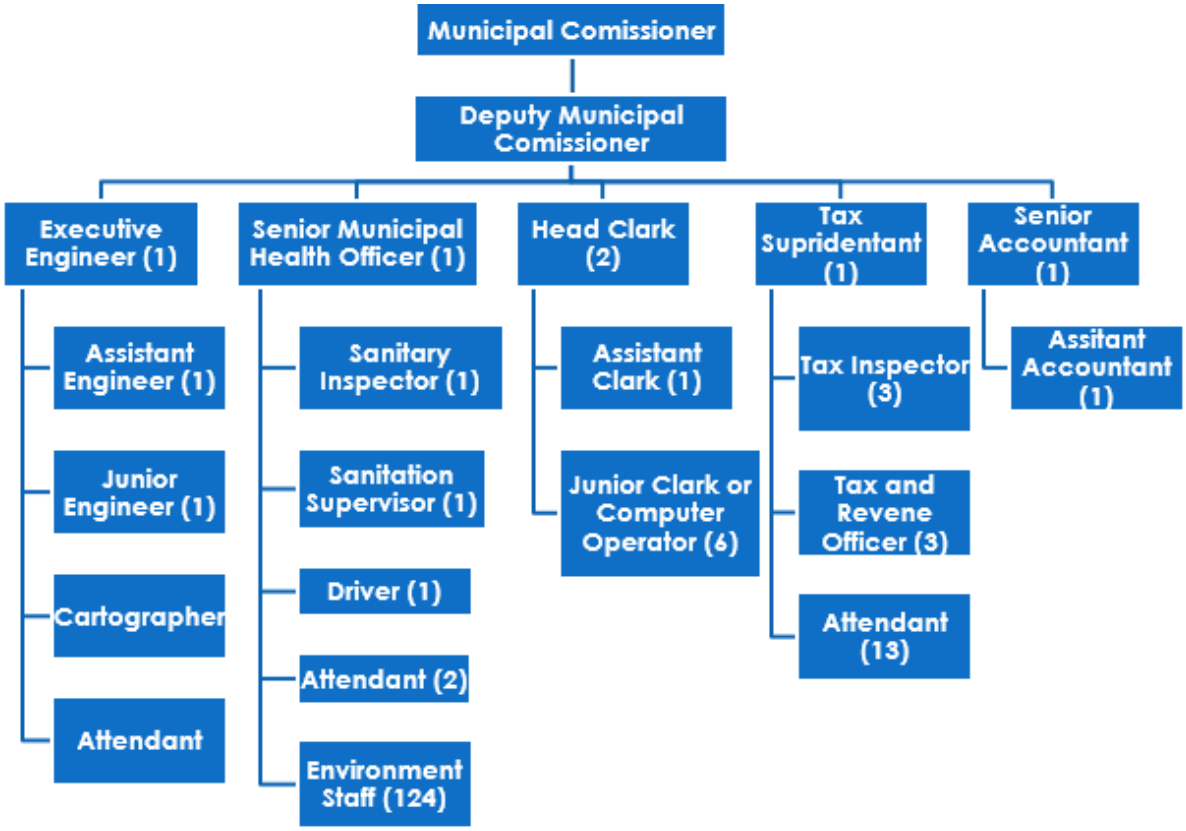


FIGURE 39: ORGANOGRAM OF THE ULB, RUDRAPUR, UTTARAKHAND

FIGURE 40: MEETING WITH MR. TARUN SHARMA (EXECUTIVE ENGINEER, JAL SANSTHAN) AND MR. AJAY BANSAL (URBAN INFRASTRUCTURE EXPERT, AMRUT, RUDRAPUR)

FIGURE 41: MEETING WITH MR. SANJAY SHARMA (SANITARY INSPECTOR, RUDRAPUR, NAGAR NIGAM

6.4 Jaspur

6.4.1 City Profile

Jaspur is a town in the Udham Singh Nagar district of Uttarakhand state. It is a small city which is located at 29.28ºN,78.82ºE. It has an average elevation of 1050 feet (320 m). It is the border town of Uttarakhand. As per 2011 census, the population of Jaspur NPP is 50,523 and has 8451 households.

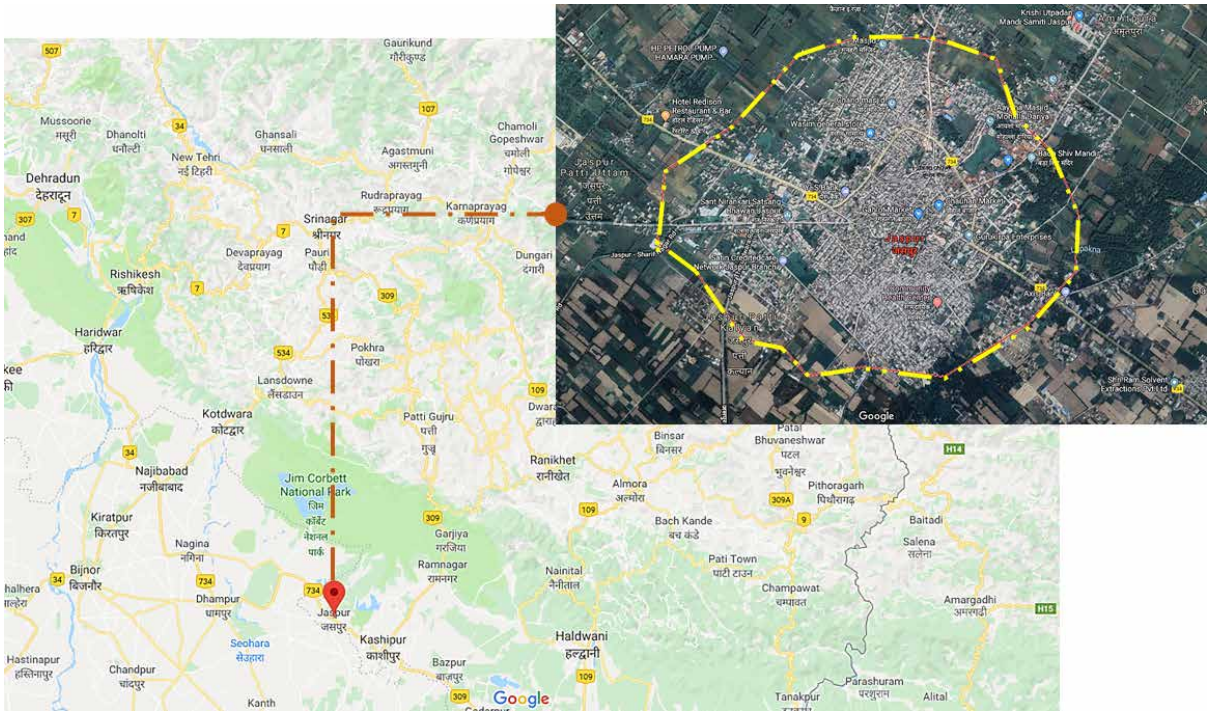


FIGURE 42: LOCATION OF JASPUR, UTTARAKHAND

The land around Jaspur town is quite fertile and well irrigated by the canals and tube wells and agriculture is the main occupation of the area. The NPP has seen tremendous development in last decade due to the establishment of agriculture-based Industries such as sugar factories, spinning mills, rice mills etc. The climate here is warm & temperate during summers & cold during the winters. The average temperature is around 16ºC. While the rainfall averages around 1262 mm[22].

[22] Discussions with city officials, Jaspur

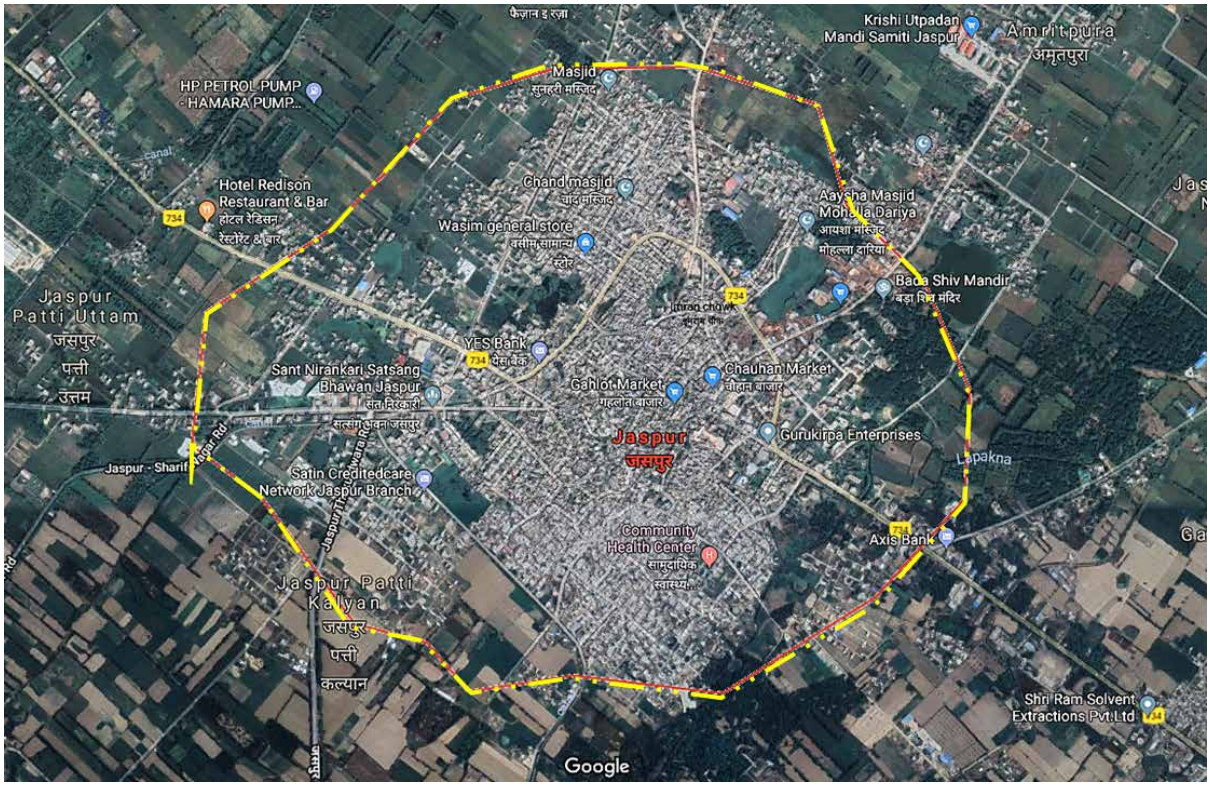


FIGURE 43: SATELLITE IMAGERY OF JASPUR, UTTARAKHAND

6.4.2 Water Supply

The ULB has water supply scheme which covers around 40 - 50% of households which is operated and maintained by Jal Sansthan. PeyJal Nigam already planned a new water supply scheme for Jaspur city which will cover around 80-85% of households in the city. As Jaspur area has high water table, there is major exploitation of groundwater through handpumps, tube wells and borewells.

6.4.3 Access to sanitation

As per the census of 2011, it is noted that 98.9% households do have IHHT, 0.2% were using CTs/PTs and 0.9% were practicing open defecation. However, post SBM, it is expected that the coverage of IHHT as well as CT must have increased considerably.

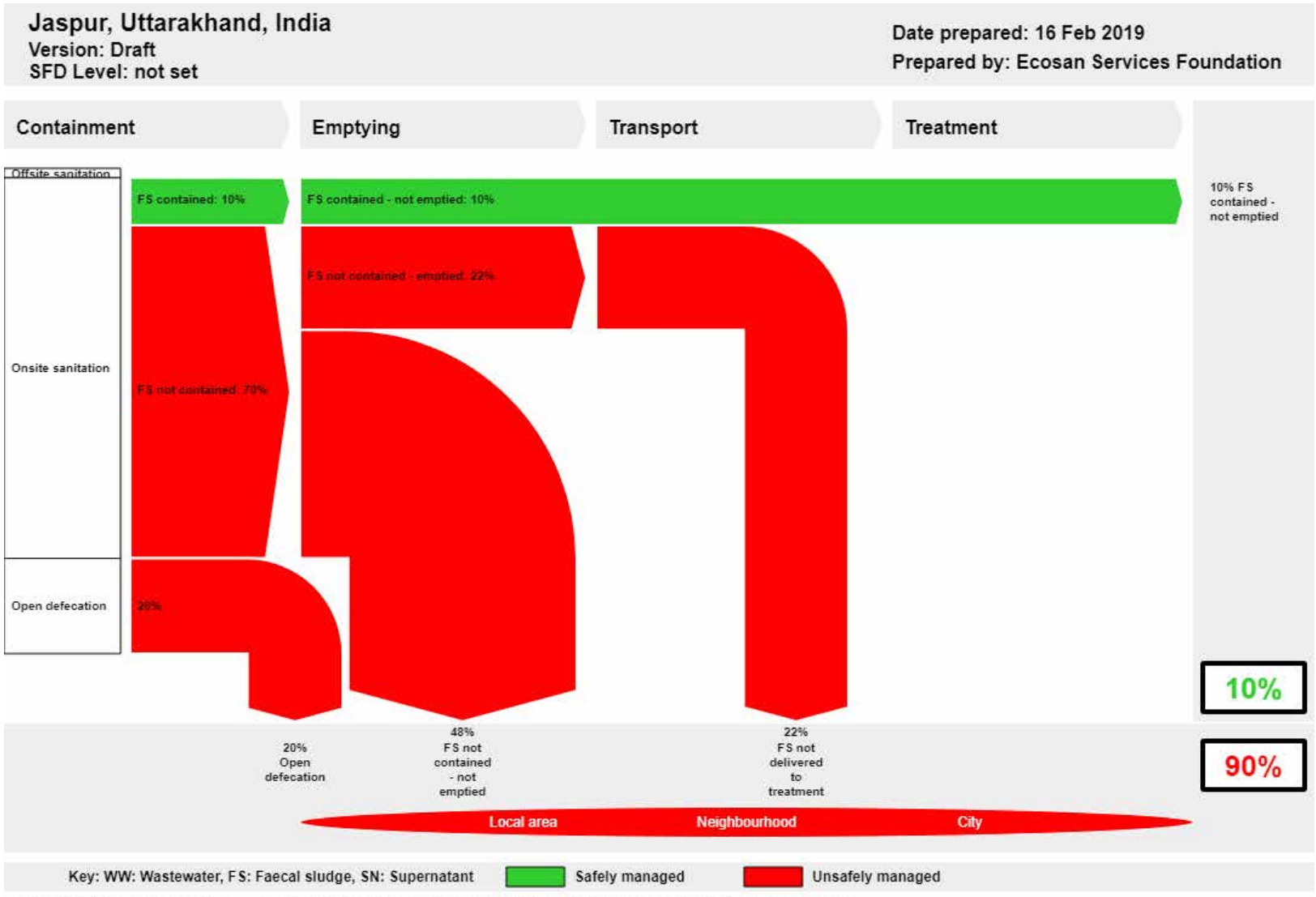


FIGURE 44: SHIT FLOW DIAGRAM – JASPUR CITY

6.4.4 Wastewater Management

Out of the total households of 8451, 80% of the households were connected to septic tank. Subsequently, 85% of the households are connected to open drains.[23]

There are open drains along the sides of each road through which all the wastewater flows & gets mixed into the nearby water bodies. There is no sewerage network in the city as the water table in Jaspur city is very high and laying of sewers is not feasible option in this area. There is no treatment facility in the town in wastewater management and sewage is directly disposed in the surface water bodies through open drains all over the city. As per consultation with PeyJal Nigam officials, there is no land available for the construction of a treatment plant.

As city doesn't have sewer network, the ground water sources and surface water sources are potentially at threat of contamination and needs attention on wastewater management.

[23] Census, 2011

FIGURE 45: DIRECT DISPOSAL OF WASTEWATER THROUGH OPEN DRAINS IN JASPUR TOWN

6.4.5 Faecal Sludge Management

As there is no sewer network in the city, majority of the households are connected to septic tanks & soak pits. Currently for the de-sludging of these tanks, private operators are called from Kashipur to empty the on-site treatment system i.e. septic tanks. There are no desludging providers in the Jaspur. In some places, manual scavenging is practiced for the desludging of faecal sludge from household septic tanks.

Interaction was done with few contractors and masons in the town regarding the construction of septic tanks. Although the masons were quite knowledgeable and knew advantages of chambered septic tank over holding tank. However, in most of the cases, they said that it is the household which decides the size of the tank.

FIGURE 46: SEPTIC TANK WITH INCORRECT DESIGN AT A HOUSEHOLD CONSTRUCTION SITE AND CONSULTATION WITH LOCAL MASONS

6.4.6 Organogram

The organizational structure of Jaspur Nagar Pallika Parishad (NPP) consists of 7 staff members (excluding Sweepers, Security, Driver etc) headed by the Executive Officer. With respect to SBM, the major role of ULB is the management of solid waste and public/community sanitation infrastructure.

FIGURE 47: MEETING WITH MR.UDAY SINGH (SANITARY INSPECTOR, JASPUR NPP)

The organisational structure of NPP is given below,

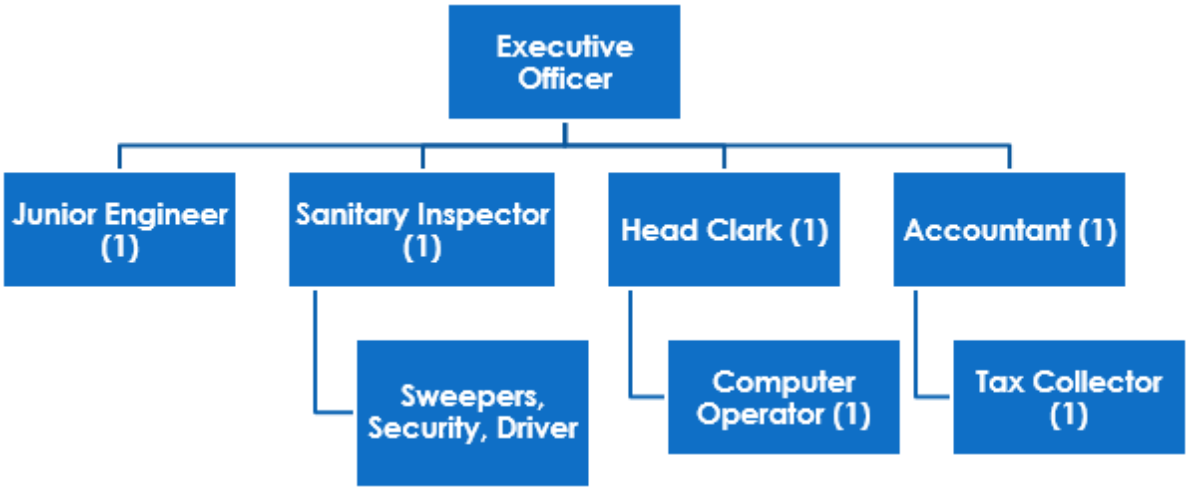


FIGURE 48: ORGANOGRAM OF ULB, JASPUR, UTTARAKAHAND

6.5 Pithoragarh

6.5.1 City Profile

Pithoragarh is the largest city in the eastern Himalayan region of Uttarakhand state. It is the easternmost ULB of Uttarakhand, neighbouring Tibet in the north & Nepal in the east. Pithoragarh is situated on the coordinates of 29.58°N, 80.22°E. It has an average elevation of 5,315 feet from mean sea level.

FIGURE 49: LOCATION OF PITHORAGARH, UTTARAKHAND

The climate is cold throughout the year as it is situated in the eastern Himalayan region of Uttarakhand state. The temperature ranges from 23.19ºC to 2.12ºC. The average precipitation is 1051.4 mm[24].

According to the 2011 census, the population in Pithoragarh was 56,044. It is estimated by Pithoragarh NPP that the current population of city is around 80,000.

[24] CSP, Pithoragarh

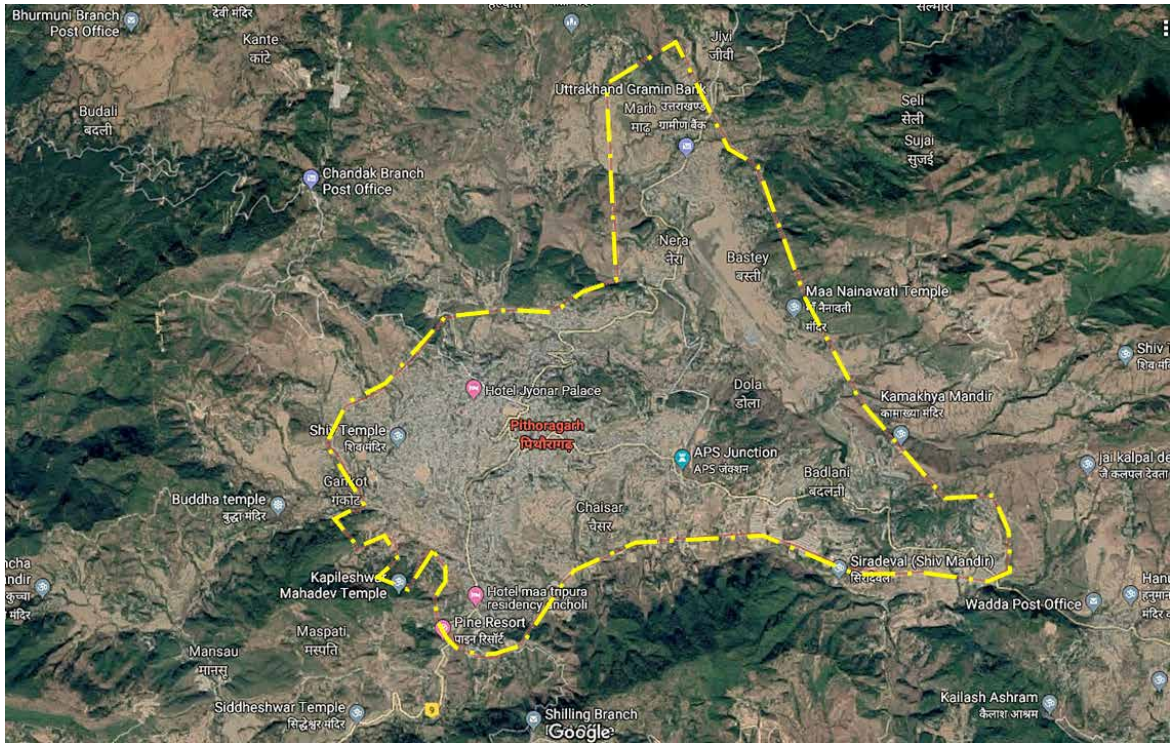


FIGURE 50: SATELLITE IMAGERY OF PITHORAGARH, UTTARAKHAND

6.5.2 Water Supply

The water source for Pithoragarh city comprises of 3 river based pumping schemes & 2 gravity based schemes serving the city. Since the source of water is situated far away in the valley, after primary filtration of raw water, the purified drinking water is pumped long distance to the gravity based distribution network. As per the consultation with Jal Sansthan officials, there are total 6,353 household water connections having 135 lpcd water supply.

Piped Water Supply

Water Tanker

FIGURE 51: STATE OF WATER SUPPLY PROVISIONS IN PITHORAGARH, UTTARAKHAND

Table 18 gives the details of water supply pumping schemes,

TABLE 18: DETAILS OF WATER SUPPLY PUMPING STATIONS

Sr. No.	Pumping Schemes	Treatment	Capacity
1	Ghat Station	Rapid Sand Filtration (RSF)	2 MLD
2	Thulighat	Rapid Sand Filtration (RSF)	3 MLD
3	Rai Station	Slow Sand Filtration	0.5 MLD
4	Awalaghat – 1	Infiltration Well	4 MLD
5	Awalaghat - 2	River Bank Filtration	6.5 MLD

6.5.3 Access to Sanitation

There are 14,031 households out of which 13,574 households have individual toilets and remaining households are dependent on community toilets or practicing open defecation (Ref: CSP, 2016). There are 2 community toilet blocks having total 9 seats (6-Male, 3 Female) and 8 Public toilet blocks having total 32 seats (24 Male, 8 Female) and 2 Urinals. The details of the IHHL and CT&PT are given below,

TABLE 19: STATUS OF IHHL AND CT&PT' (SOURCE: CSP, 2016)

Total HHs (No.)	HHs with IHHT (No.)	Community Toilets			HHs w/o IHHT	Remarks
		Blocks	Seats	Urinals		
14,031	13,574	2	9	-	457	347 HHs has now IHHT through SBM

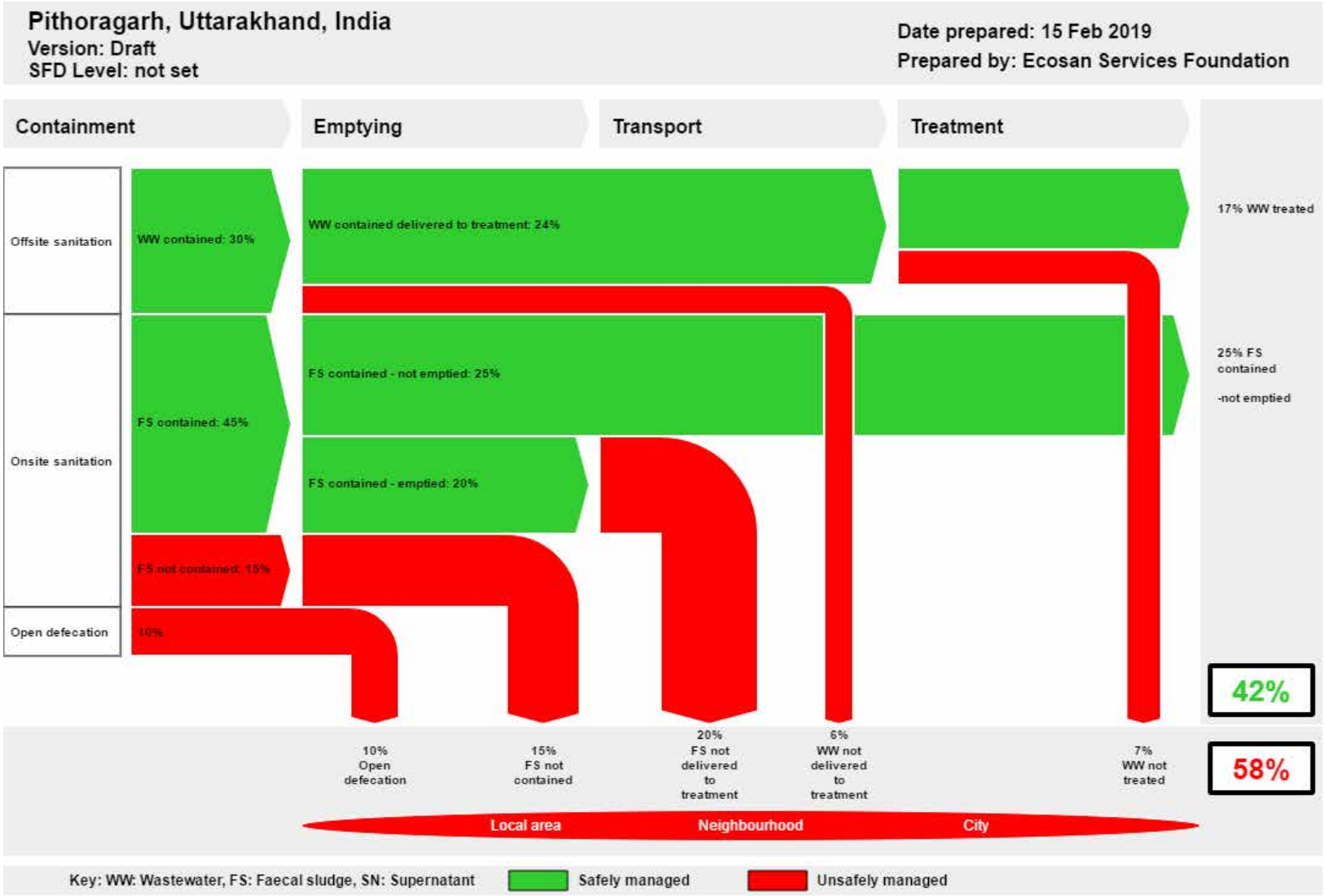


FIGURE 52: SHIT FLOW DIAGRAM OF PITHORAGARH

FIGURE 53: COMMUNITY TOILET WITH SEPTIC TANK AND OPEN DRAINS IN CITY AREA

6.5.4 Wastewater Management

There is old sewerage network scheme from year 1965-66. Currently, PeyJal Nigam department has already proposed and sanctioned the sewerage scheme for 57 kms out of which 23 kms network is already completed which has a total of 938 household connections. Due to inadequate funding, the laying of sewerage network has come to standstill.

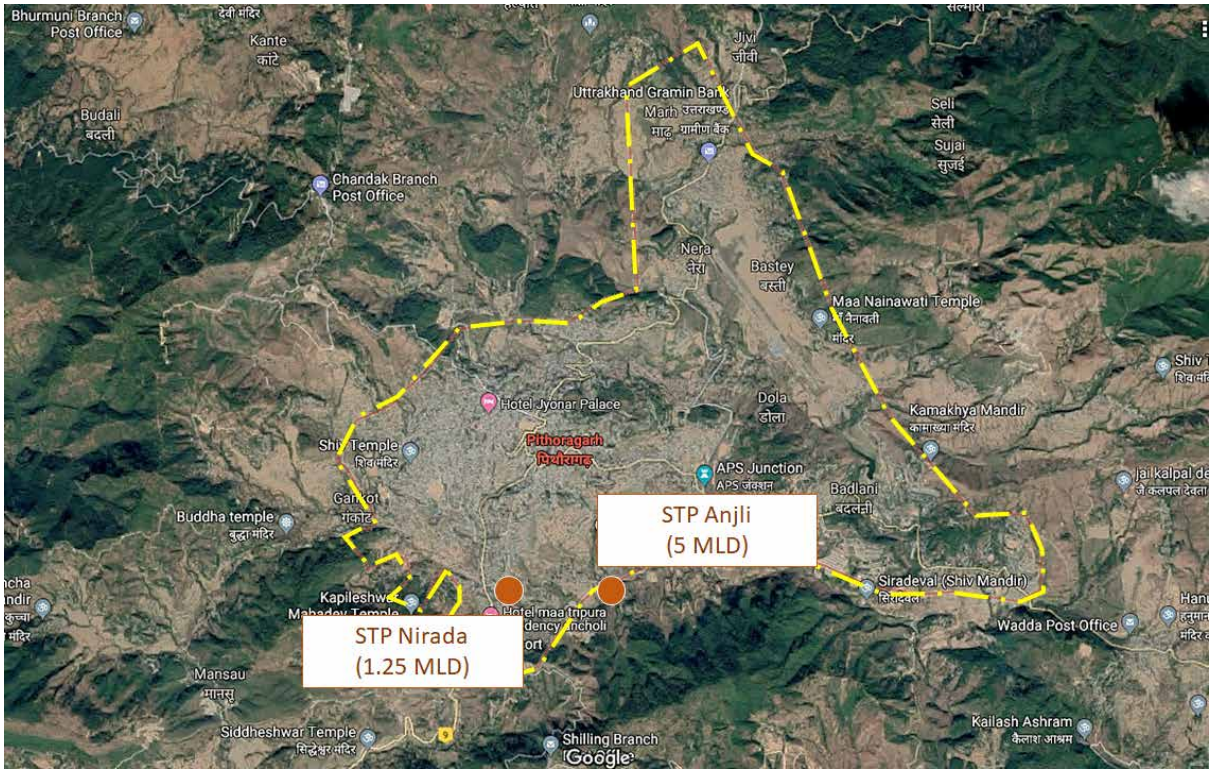


FIGURE 54: LOCATION OF THE STPS IN PITHORAGARH, UTTARAKHAND

FIGURE 55: SEWAGE TREATMENT PLANT AT NIRADA, PITHORAGARH (1.25 MLD CAPACITY)

There are two STPs proposed and sanctioned out of which the STP near Nirada is executed and trial runs are under process. The another STP at Anjoli area is under construction and will start functioning from 2019 onwards. The details of two STPS are given below,

TABLE 20: DETAILS OF STPS AT PITHORAGARH

Sr. No.	STP Location	Technology	Capacity
1	STP, Nirada Area	Sequential Batch Reactor (SBR)	1.25 MLD
2	STP, Anjoli Area	Sequential Batch Reactor (SBR)	5 MLD

FIGURE 56: SEWAGE TREATMENT PLANT AT ANJOLI, PITHORAGARH OF 5 MLD CAPACITY

6.5.5 Faecal Sludge Management

According to the 2011 census data, 3269 households are connected to piped sewer system and 8406 households are connected to septic tanks. However, there is no faecal sludge management practice in Pithoragarh.

The households are connected to septic tanks & soak pits but no information regarding desludging activity was available with the ULB. The ULB do not own desludging equipment, neither there are private operators. Thus, it can be inferred that manual scavenging might be practised for emptying of the containment systems of the septic tanks.

6.5.6 Organogram

The organizational structure of Pithoragarh Nagar Pallika Parishad (NPP) consists of 180 staff members headed by the Executive Officer. With respect to SBM, the major role of ULB is the management of Solid waste and Public/Community sanitation infrastructure. The organisational structure of NPP is given below.

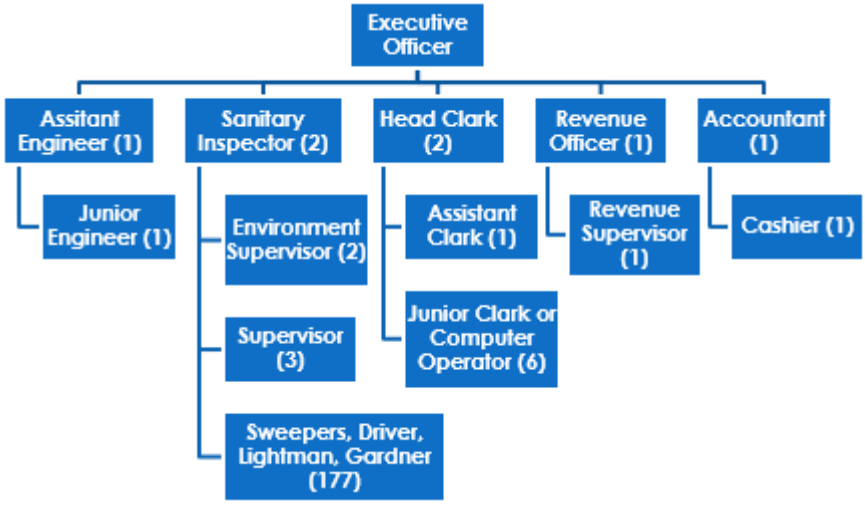


FIGURE 57: ORGANOGRAM OF ULB, PITHORAGARH, UTTARAKHAND

FIGURE 58: CONSULTATION WITH MR. SACHIN KUMAR (SANITARY INSPECTOR, NPP) AND MR.RANJIT SINGH (EXECUTIVE ENGINEER, PEYJAL NIGAM)

At the end of each town profile, it would be good if we can capture key issues, challenges, best practice across the FSN value chain. This way we would be able to bring out geographical, climate, and other variables contextual to the town and can compare between towns as well. This was our idea when we started with assessing towns representing diverse conditions within the state.

7 Issues and Challenges – Liquid Waste Management

7.1 Shit Flow Diagram

Based on Census 2011 data of the ULBs, a Shit Flow Diagram (SFD) was plotted for the state of Uttarakhand. SFD is a tool to readily understand and communicate how excreta physically flows through a city or town. The objective of making an SFD diagram for the state of Uttarakhand is as follows:

- To have a clear picture of how wastewater and faecal sludge management (FSM) services are delivered in a city, and the resulting challenges.
- To identify the aspects of service delivery where improvements are needed.
- To support decision-making on urban sanitation planning and programming.

Through the SFD shown in Figure 59 and understanding of the progress of various programs and schemes in the state, following inferences can be made;

1. More households (56%) are dependent on on-site sanitation system i.e. they are connected to septic tanks and twin pit soak pit as compared to off-site sanitation systems- sewerage network and STP.
2. In absence of regulations and records pertaining construction of septic tanks, it cannot be verified whether the septic tanks are built according to the IS 2470 Standards. An improperly constructed and maintained septic tank will not give expected efficiency of solids removal. It is believed that approximately 6% of the faecal sludge is not contained properly and hence it creates public hazard at the local level.
3. Poor construction techniques, followed by high ground water table in certain districts might lead to contamination of water resources, creating a health risk at the local & neighbourhood level. It is believed that approximately 21% of the supernatant is not contained properly, creating health hazard at the local – neighbourhood level.
4. The faecal sludge and septage from the septic tank (10% of the faecal sludge originating from the households) which is emptied manually creates a health hazard at the local and neighbourhood level as it is managed at the house/community level.

5. The faecal sludge and septage which is emptied and transported (5% of the faecal sludge generated at households level) using vacuum truck is mostly

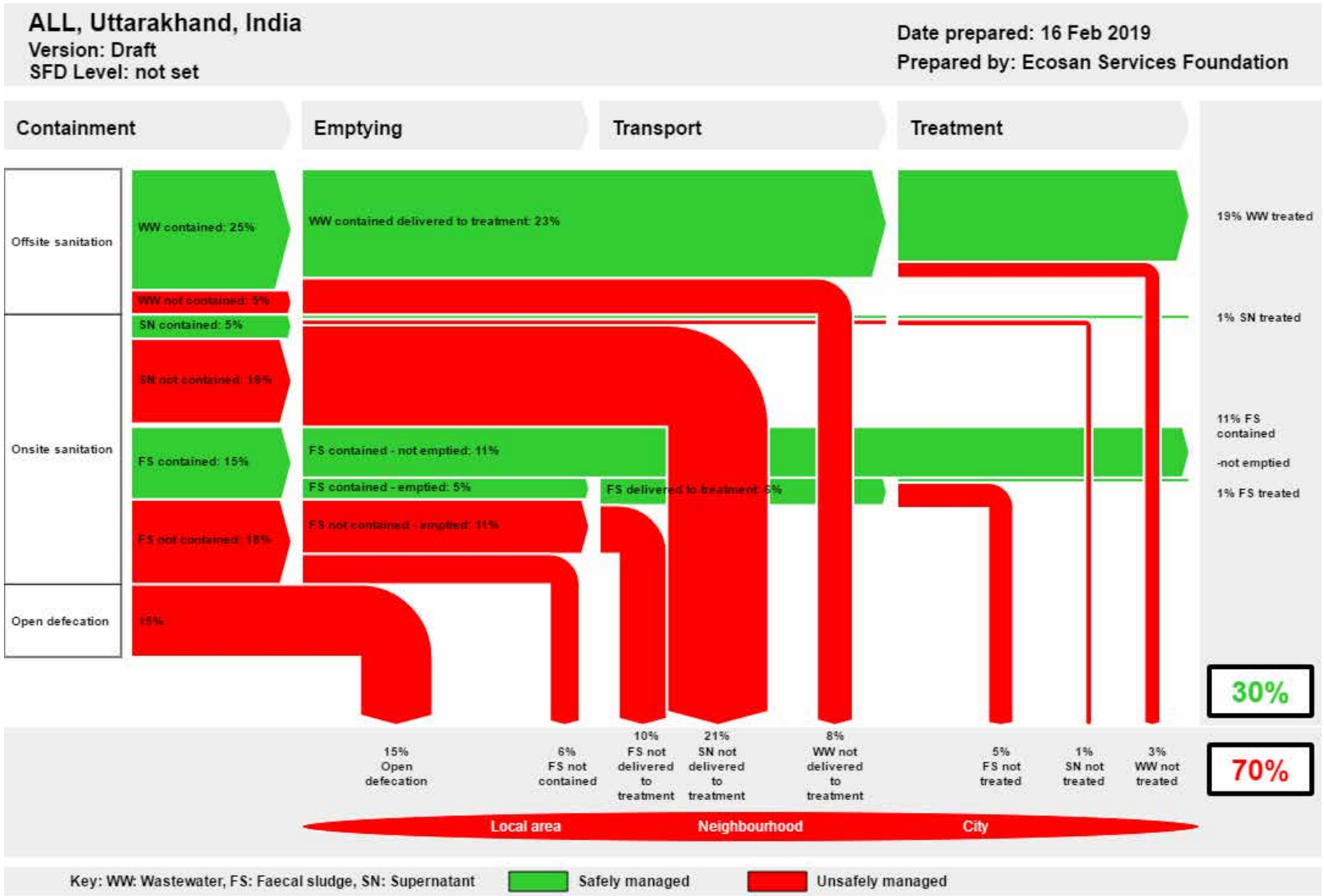


FIGURE 59: SHIT FLOW DIAGRAM OF UTTARAKHAND STATE

disposed into the environment indiscriminately, hence the health hazard is created at city level.

6. The supernatant from the septic tank is collected using the network of open and close drains, however, no treatment facility is present and hence goes untreated into the surface water bodies. This creates health hazard at and beyond city level.

So it inferred that up to 70% of the liquid waste (wastewater and faecal sludge) is unsafely managed in the state of Uttarakhand. This number will decrease once the STPs under planning, construction and commissioning stage are made operational. However, it should be noticed that only supernatant and wastewater from off site sanitation system will be treated and managed safely. The faecal sludge and septage from the septic tanks will still be creating health hazard in absence of proper regulations for co treatment, safe disposal or treatment facilities.

The inferences from the SFD were confirmed through city visits. Although Pithoragarh do have sewerage system, the coverage is very limited. The sewerage system is planned but the execution of it is slow due to lack of funds. The STP were under commissioning stage. In case of the Tehri, the coverage is relatively better as compared to Pithoragarh, however, it was reported that nearly 20% of the households cannot be connected to the sewerage system due to technical issues and their distances from the sewerage line.

In case of off-site sanitation systems, the conveyance of the FS needs to be done by vacuum trucks. Most of the ULBs do not have vacuum trucks. Since the demand for desludging currently is very limited, the private operators are limited in ULBs situated in mountainous terrain. Except Rudrapur, none of the other ULBs had vacuum trucks for providing the service of septic tank emptying. However, during the visit to the ULB, it was observed that the vacuum trailer was in a dilapidated state. It can be inferred that either the trailer was not used quite often or the O&M of the trailer was not being done regularly.

FIGURE 60: VACUUM, TRUCK, RUDRAPUR MUNICIPAL CORPORATION

7.2 Sewered Sanitation System

The state has proposed and planned for centralised sewered sanitation system under the AMRUT and Namami Gange program. As discussed earlier, the interception and drainage work is mostly being carried out and construction and commissioning of the STPs is taking place.

Figure 61 gives an overview of the sewered sanitation systems in Uttarakhand state. Few of the observations and inferences based on the consultation with the officials from ULB and Pey Jal Nigam and Jal Sansthan are cited below;

1. Due to undulating terrain, approximately 20% of the households in the ULB situated in the hilly terrain cannot be connected to the sewerage system. Due to scattered housing in NPP and NPs, the cost of providing sewerage connection to these houses is high.
2. The technical challenges and cost of laying gravity sewers is significant due to undulating terrain. Number of drop manholes are required for maintain the gradients of the pipes and cost of construction of these drop manholes it high.
3. In region with water table, laying of piped sewers is challenging task. Due to presence of water, dewatering needs to be done in trenches while laying the pipes. The pipes needs to be anchored properly and extra precautions needs to be taken to avoid buoyancy effect on the appurtenances in sewerage network. The cost of implementing technically correct and well-functioning sewerage network in high water table region is high.

- Due to availability of water, flush toilets are prevalent,
- 100% utilization of sewerage network is not achieved in any city,
- Approximately 20% of the households in most of the cities cannot be connected to sewerage due to site constraints.

- Silt carried by storm water clogs the sewers,
- In Terai region, the presence of high water table makes laying of gravity sewers and its operation difficult,
- In Lower Himalayan region, the requirement of drop manholes is high. This increases the cost of the laying sewers.

- Many STPs are under execution. Those which are built are yet to be commissioned,
- Due to inadequate utilization of sewerage network, the STPs are underutilized,
- Underutilizing the STP capacity, increases unit cost of treatment of wastewater.

- Reuse of the treated wastewater is not practiced due to easy availability of fresh water,
- The disposal of the wastewater is mostly done in the surface water bodies such as rivers.

FIGURE 61: SEWERED SANITATION SYSTEM

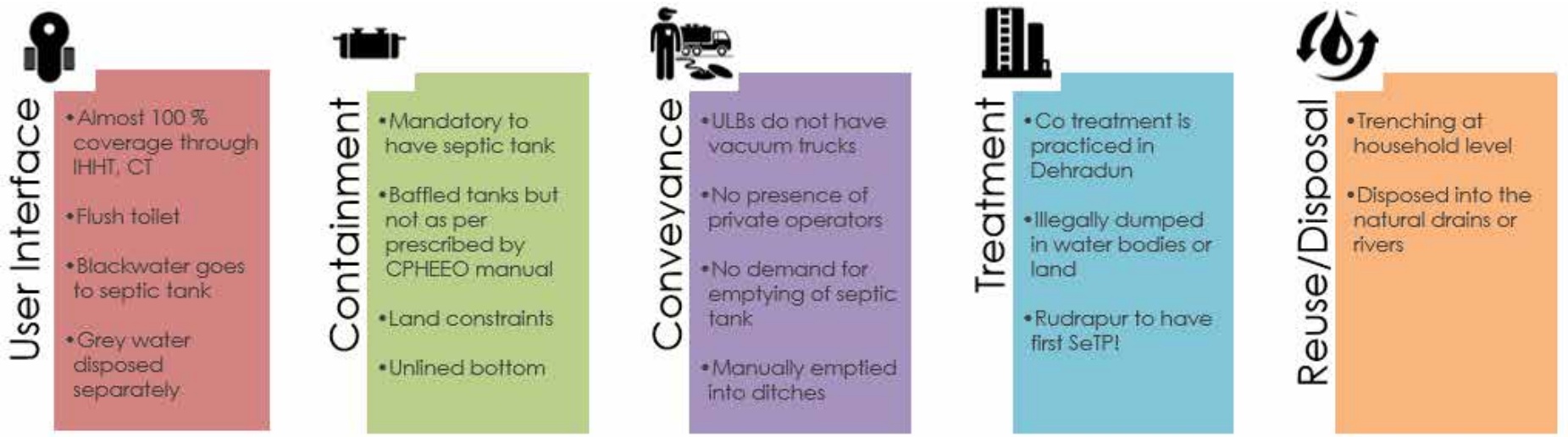
4. Interception and Drainage (I&D) works are cheaper as compared to laying a sewerage network and providing individual household connection. I&D is practiced in the state. However, it is reported that the silt carried by the wastewater from the open and closed drains is the main cause of clogging of the pipes and chambers. In order to keep the piped sewers operational, maintenance is frequently required.
5. At state level, the current capacity of treatment of the wastewater is far less as compared to the quantity of wastewater produced in the state. Very few STPs reported by Pey Jal Nigam are at commissioning stage. Most of the STPs are under construction or at planning stage.
6. The cities having gravity based sewerage network are yet to achieve 100% designed connection. Since the implementation of the sewerage network is being done in phases, none of the cities are able to achieve 100% spatial coverage. As a result of this, the STPs remain underutilised.
7. Underutilised STPs have higher cost of treatment of wastewater. Due to the I&D projects, the organic loading is far less than the designed organic loading rate. This creates operational challenges at the STPs hampering the economic viability of the sewered sanitation projects.
8. Since Uttarakhand is located on upstream of two major rivers in India, it is of utmost importance that the wastewater needs proper treatment before its disposal. The risk of non-performing and inefficient STP or its failure will create a higher degree of health hazard at the downstream of the rivers.

7.3 Non Sewered Sanitation System

As stated in the section Shit Flow Diagram, off site sanitation i.e. non sewered sanitation system is prominently prevalent in the state of Uttarakhand. This system also has challenges and operational issues. However, due to ground constraints and lack of funds, non sewered sanitation is most promising approach for the state to provide better sanitation coverage on ground. The state also realizes the same and hence have come up with a Septage Management Protocol.

During the survey, it was observed, that most of the ULBs are not aware of the septage management protocol. None of the ULBs mentioned about the formation of septage

management committee and its roles and responsibilities or work done by them for improving faecal sludge and septage management.



- Due to availability of water, flush toilets are prevalent,
- Blackwater consisting excreta, urine, anal cleansing and flush water enters the septic tank,
- Grey water from the kitchen and bath is disposed separately into the drains.

- If sewerage network connection is not possible, households need to have a septic tank,
- Standard designs are not followed for constructing of septic tank,
- Sloppy terrain puts land constraints during construction of septic tanks.

- Most of the ULBs are not equipped to provide desludging services,
- Private operators are not present because of meager profit margins,
- Manual emptying of septic tank is prevalent in cities located in mountainous region.

- Co Treatment is practiced at certain STPs in the state; ex. Dehradun and Tehri
- No treatment of septage is practiced before disposal
- A SeTP is planned in Rudrapur of capacity of 125 KLD.

- Co treatment is practiced in STP in Dehradun,
- In most of the ULBs the septage is disposed illegally on land or surface water body,

FIGURE 62: NON SEWERED SANITATION SYSTEM

Figure 62 describes the challenges and issues in non sewered sanitation systems. Some observations are cited below;

1. Septic tanks or holding tanks are mostly prevalent as the containment systems. These tanks are not built as per the norms and standards such as IS 2470.
2. Most of the tanks are intentionally left unlined, assuming that this prolongs the necessity of the desludging of the tank.
3. As the demand for desludging of septic tanks is less, the ULBs do not have vacuum trucks.
4. Due to prolonged desludging intervals, the supernatant contain settleable solids. These solids along with the solids in the grey water, settle in the drains creating unhygienic conditions and nuisance.
5. As the conveyance of septage is costly in mountainous terrain and lack of disposal points, there are limited or no private operators who can provide desludging services.
6. Some cities did report that manual emptying of septic tanks is done and the content of the septic tank is emptied into the pits. However, this practice not only violates the Manual Scavenging Act but also poses threat to ground water resources.
7. The ULBs such as Rudrapur and Dehradun, where desludging services are provided by the ULBs and private operators, there are no treatment facilities. Due to this the faecal sludge and septage is disposed indiscriminately in the surface water body.
8. In Terai region, illegal dumping of septage into the surface water bodies poses greater threat to the environment and hence, if not complete treatment but safe disposal should be practiced until the septage treatment plant is set up.

The next section details out the solution to overcome the challenges, however, it should be noted that these technical and managerial solutions will only be successful when they are complimented by appropriate faecal sludge and septage management policy, guidelines and its enforcement at the state level.

8 Way forward

The state of Uttarakhand lacks a strategy for FSSM. Currently a septage management protocol is there as a guideline; however, during the study it was realized that challenges and issues faced by ULBs vary with the geography and hence one policy cannot fit all the ULBs.

Ex. "Co-treatment should be practiced if the STP is up to a distance of 30 km." This is being practiced in Tehri, however the fee collected in Champa for desludging is INR 10,000. Such a high cost of desludging the septic tank discourages the households from desludging their septic tank.

As per the FSSM Protocol, a committee constituting heads/regional managers of Urban Development Department, Pey Jal Nigam and Jal Sansthan and few ULBs needs to be made to steer the agenda of FSSM at state level. The committee should form a state specific FSSM policy, followed by guidelines for para-statal agencies and ULBs for FSSM. A plan for capacity building of the respective officials in FSSM needs to be chalked out by the state so that implementation and enforcement of the policy can be done. The implementation and enforcement of the FSSM plan needs to be carried out by the ULB level committee.

8.1 Economics of population

The population density in the state varies with its geography and hence in most of the ULBs in the mountains it is less than 100 persons per km^2. In such cases, safe emptying of the septic tank followed by safe disposal of septage is the basic necessity. The quantum of septage emptied every day is so small that scientific land disposal or capturing the solids through solid liquid separation will be suffice until treatment facilities are available. The supernatant (liquid) can be either applied to land or discharged safely into a soak away zone.

Clustered approach can be used in ULBs having moderate population density. A cluster of ULBs will be served by an independent FSTP located in the highly populated city in the cluster. The smaller ULBs within the distance of 10 km can dispose of the septage directly in the FSTP; however, the ULBs between 10km – 20 km should have transfer stations or septage receiving station, where pre-treatment is taking place. It is

advisable to manage the solids from the septage at the local level whereas the liquid can be pumped or transported by pipe under gravity for treatment.

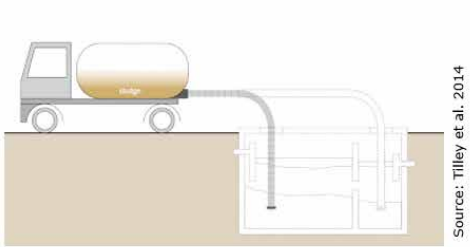
In ULBs in the Terai region, the population density is quite high, however due to high ground water table, implementation of gravity sewer network becomes a challenging task. Hence the cities need to develop a strong FSSM strategy and inch towards scheduled desludging so that in coming decade, when the quantum of septage becomes large, the solids and the liquid is safely treated and reused or disposed. In this case, having independent FSTP is highly recommended.

In the Ganga River Basin, number of STPs have been proposed and under construction. A good spread of transfer station coupled with septage receiving stations linked to the sewer network can virtually expand the reach of the STPs to neighbouring smaller ULBs where funding is an issue.

8.2 Solutions for FSSM

8.2.1 Vacuum Truck

Vacuum truck is a most sophisticated equipment which is widely used for desludging of containment systems such as septic tanks. The vacuum trucks come in different sizes and types. As shown in Figure 63 trailer mounted tank fitted with vacuum pump is the most basic form of equipment. In this case, the trailer can be tugged with tractor and the vacuum pump is operated using diesel run motor. Vacuum truck and trailers are quite common and used in ULBs across India.



Vacuum Truck	1000 L, 2000 L, 3000 L, 4000 L, 6000 L, 8000 L, 9000 L
Price range	10 Lakhs and above

FIGURE 63: SCHEMATIC REPRESENTATION OF THE VACUUM TRUCKS AND ITS STANDARD AVAILABLE SIZES

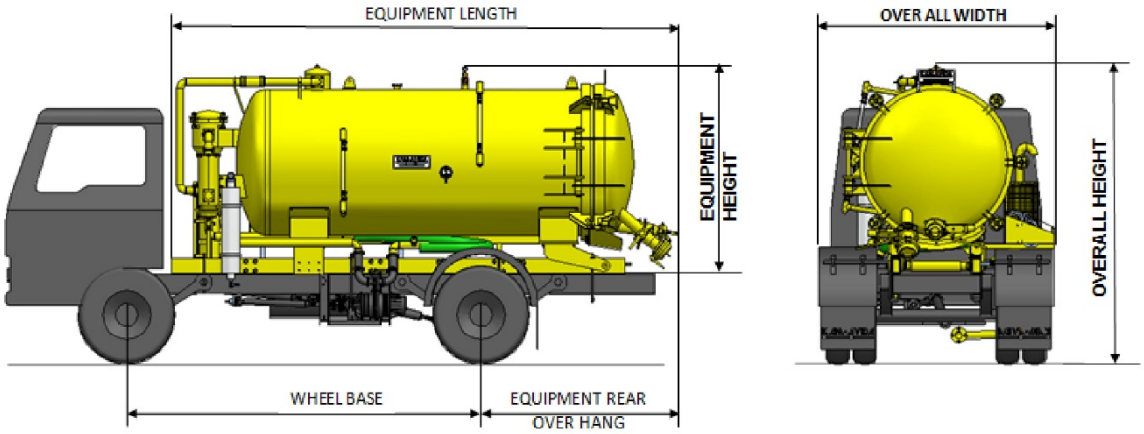
An improved version is a truck mounted tank fitted with the vacuum pump. In this case there is possibility that the vacuum pump can be coupled with the drive train of the truck, thus eliminating the need of separate diesel run motor. Now a days, vacuum trucks fitted with jetting equipment is also available for cleaning sewerage network and manholes.

The technical specifications for the vacuum truck with a storage capacity of 4 kL are given in the following Table 21

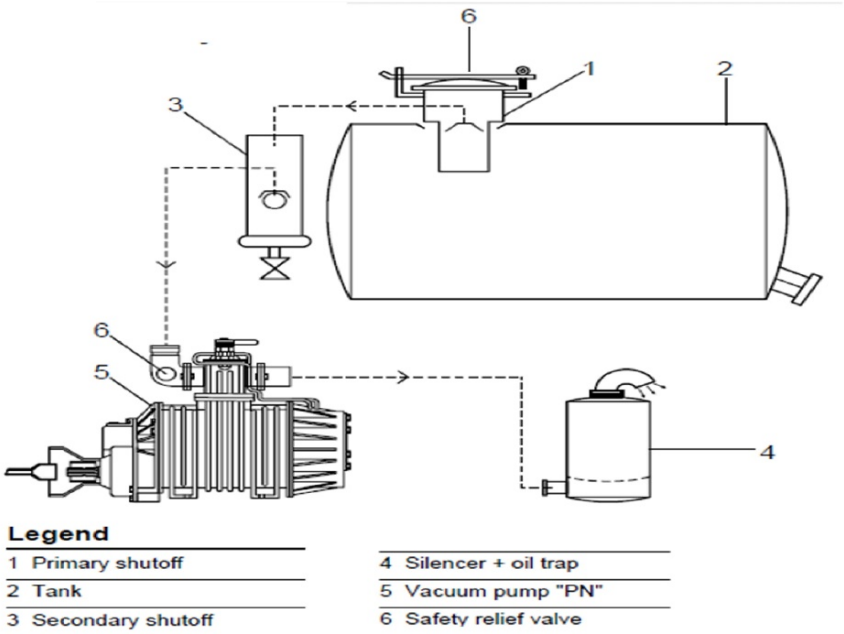
TABLE 21: TECHNICAL SPECIFICATIONS OF VACUUM TRUCK

N°	Specifications	Units	Values
1	**Sludge Collection Tanks**		
	Type	Cylindrical design manufactured from IS 2062 structural grade steel	
	Volumetric capacity	litres	4,000
	Features	a) Cylindrical designs ensure complete and fast offloading of the material b) Fully open-able type rear dished end	
2	**Vacuum Pump (Exhauster / compressor)**		
	Type	Air-cooled, asbestos free, heat-resistant, rotary sliding vane type	
	Operating vacuum	%	80
	Max pressure	Bar	1.5
	Drive	Vehicle's auxiliary PTO and Articulated shaft with belt and pulley drive configuration	
3	**Equipment Features**		
	Safety	a) Vacuum and pressure relief valves, b) Check valve, c) Pump safety filter, d) Primary Shut-off, e) Cyclone cum Secondary Shut-off, f) Exhaust silencer cum oil separator	
	Standard supply	V Hose end Suction Nozzle and Strainer	
	Optional Supply	a) Combined clean water and sludge tank with wash down system, b) Suction Derrick Arm, Hydraulic / Spring Loaded c) Continuous duty, Water cooled, Rotary Sliding Vane, Vacuum Pump, d) Tri-lobe, Exhauster /	

		compressor – oil free, Zero wear and zero maintenance pumps



Vacuum System:-



Drive System :-

FIGURE 64: SCHEMATIC REPRESENTATION OF VACUUM TRUCK WITH 4 CUM CAPACITY AND ITS VACUUM SYSTEM AND DRIVE SYSTEM

8.2.2 Vacu tugs

Vacutug is a smaller version of the trailer mounted type of vacuum truck. The need of such a smaller size desludging equipment arises from the fact that not all the containment units are easy to access. Especially in the unorganized settlements such as urban slums, the access roads are small and a vacuum trucks cannot be driven to the household. Hence, vacu tug is used to empty the content of the septic tank in batches and empty it into the bigger truck. The tugs can be as small as 300 kL. The most important thing which making a vacu tug is to keep in mind that it should be easy enough to pull it by persons or vehicle.

Vacutugs are used in Bangladesh and Southeast Asian countries such as Philippines and Vietnam. Bangladesh is a country which is mostly dependent on non sewered sanitation system. Since in unorganized habitations, access roads are quite small, vacutugs are the solution to service the septic tank. In such cases, usually the vacutugs are used to empty the septic tank and convey the septage to the normal vacuum truck. The vacuum truck transports the septage to treatment/disposal facility.

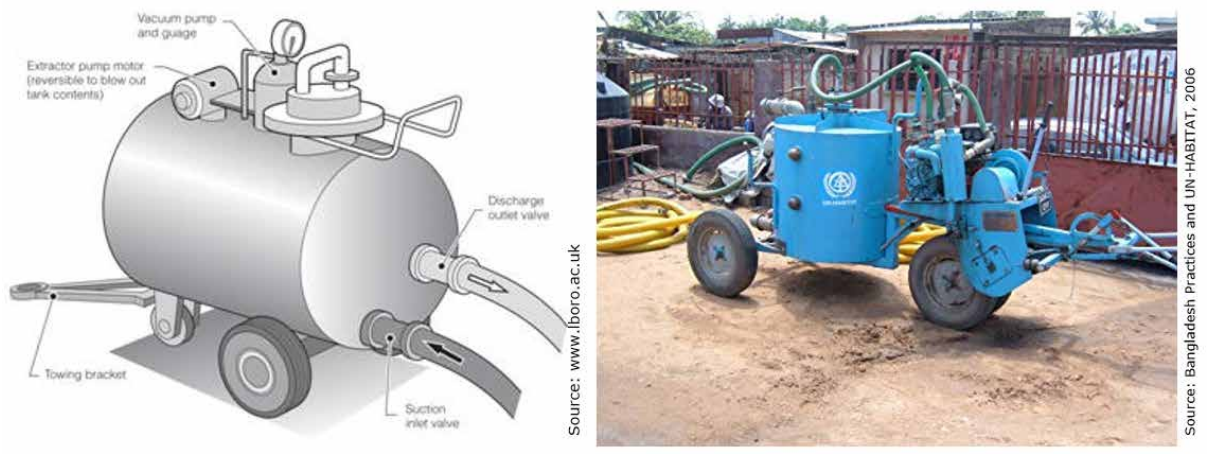


FIGURE 65: REPRESENTATION OF VACUTUGS USED FOR DESLUDING OF DIFFICULT TO ACCESS SEPTIC TANKS

8.2.3 Dewatering trucks

In the hilly terrain, the desludging vehicles spends more time and money in conveying the septage from the household to the designated location for disposal (in ideal case a FSTP). During the study, it was observed that in ideal conditions, the truck will spend close to 140 min per cycle of desludging as shown in the figure below. The cycle of desludging includes, time required to empty the septic tank, transport the septage to

the FSTP, decanting the septage at FSTP followed by pretreatment and returning to the next households for desluding.

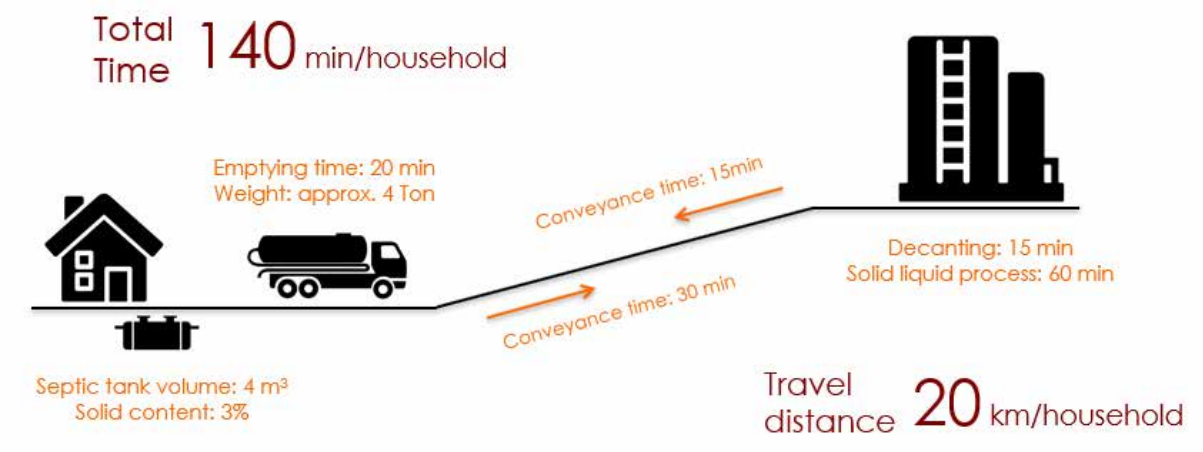


FIGURE 66: ECONOMICS OF DESLUDGING SEPTIC TANK IN HILLY TERRAIN

Hence there is a need that in hilly region, where the population density is low, at least solid liquid separation is practiced. Solid liquid separation can be done on site using the dewatering truck i.e. a truck equipped with a dewatering machine. The solids which are captured will be stored in the truck whereas the liquid can be disposed in the septic tank again. Such trucks can cater to up to 10 households before needing emptying itself. Hence now the average time per cycle can be close to 70 min.

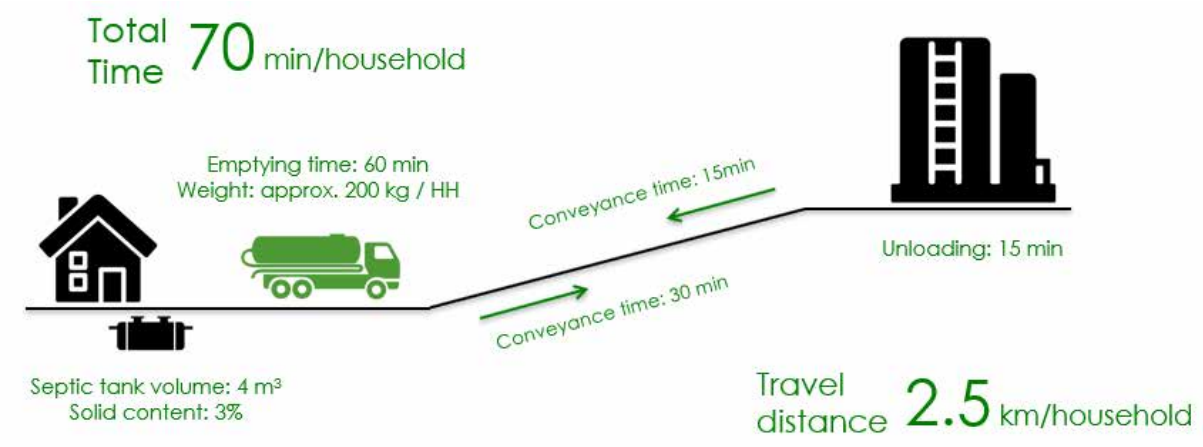


FIGURE 67: ECONOMICS OF OPERATING THE DEWATERING TRUCK

The dewatering trucks if operated well can capture solids from the septage efficiently, there by restoring the volume of septic tank reserved for solids. Moreover the arrested solids are the major contributor to the pollution (turbidity and organic solids) in the septage. The oxidation of these solids over a period of time reduces the dissolved

oxygen level of the surface water body. The Figure 68 shows the quality of the liquid effluent post dewatering using a dewatering truck fitted with a belt press.

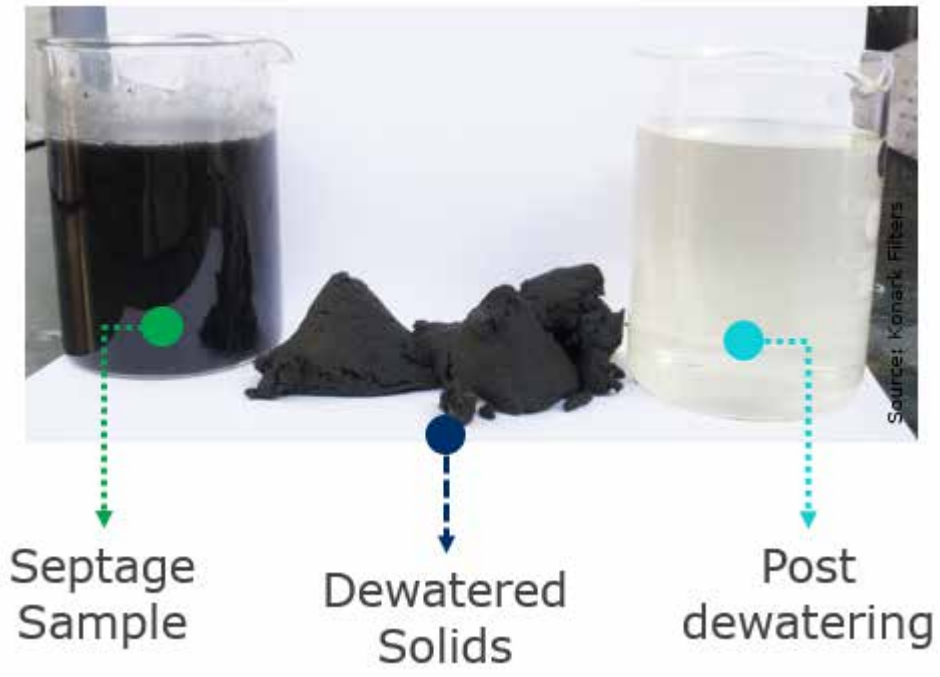


FIGURE 68: PICTURE DEPICTING THE INFLUENT AND EFFLUENT OF A DEWATERING TRUCK

A dewatering truck comes in different capacities. The capacities can be defined in two ways, (1) the capacity of the truck to hold the mass of dewatered solids before it needs to be emptied and (2) the capacity of the intake of septage by the truck (flow rate). The later defines the time required by the truck to process the septage from a septic tank. Dewatering trucks are used in countries such as Malaysia, US & Canada, Japan and China. The dewatering trucks can be fitted with any dewatering technology such as screw press, belt press, geo tube etc. Figure 69 shows one such dewatering truck.

FIGURE 69: PICTURE OF A DEWATERING TRUCK FITTED WITH MECHANISED DEWATERING EQUIPMENT

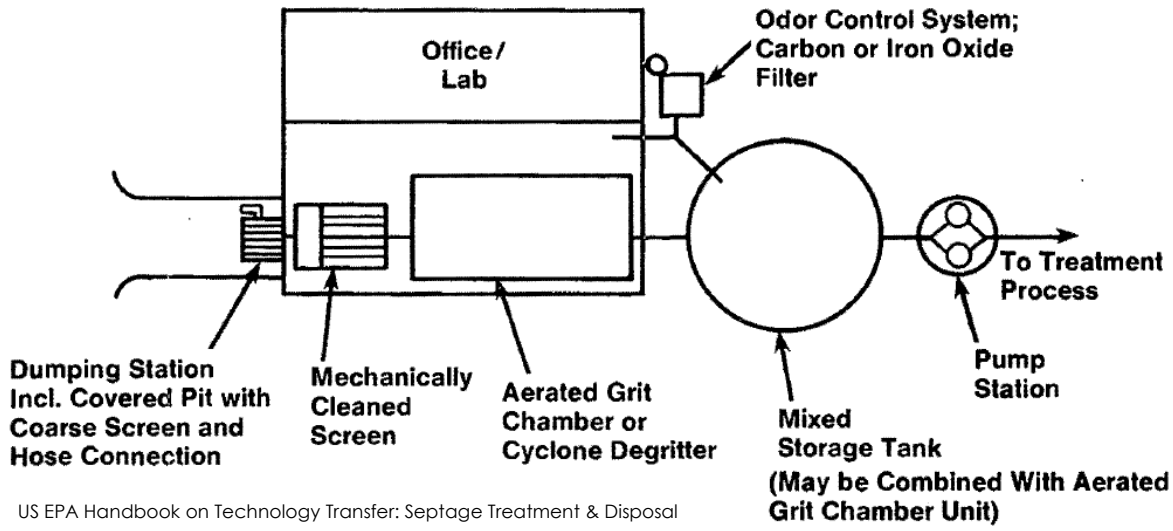
8.2.4 Co treatment

Although septage is much more concentrated, co treatment with sewage at STP is possible. It is safe to co treatment, if pre-treated septage is dosed properly to the incoming sewage.

The new built STP remains underutilized in initial years of its life. In this duration, co treatment of septage at STP can be practiced. With number of STPs proposed and under construction in the state of Uttarakhand, co treatment is a viable option for smaller ULBs where sewerage network will not be installed. The septage thus can be collected and transferred via transfer station or septage receiving station. Vigilant monitoring at the septage receiving station and STP is needed during co treatment in order to adjust the loading of the septage. The septage transfer station and receiving stations are widely used in European countries and US & Canda.

1. Septage Receiving Station

The function of a septage receiving station is to safely transfer the septage and pre-treat the septage. A septage receiving station consists of following components; (1) dumping station, (2) screens, (3) grit removal, (4) equalisation tank, (5) odour control unit. Septage receiving station is installed at the existing or newly constructed STP. The main aim of having such station is to ensure that the STP does not face shock load in terms of BOD and COD.



US EPA Handbook on Technology Transfer: Septage Treatment & Disposal

FIGURE 70: ILLUSTRATION OF SEPTAGE RECEIVING STATION

2. Mechanized Septage Receiving Station

A mechanised septage receiving station is recommended in places where there are space constraints and multiple trucks will be decanted in a day. Mechanised receiving station is a state-of-the-art station which has all the components integrated into a same unit. Such stations are easy to install and are usually plug and play type. Additional features of washing of screenings and grit can be provided if required which allows safe handling of the solids removed from septage.

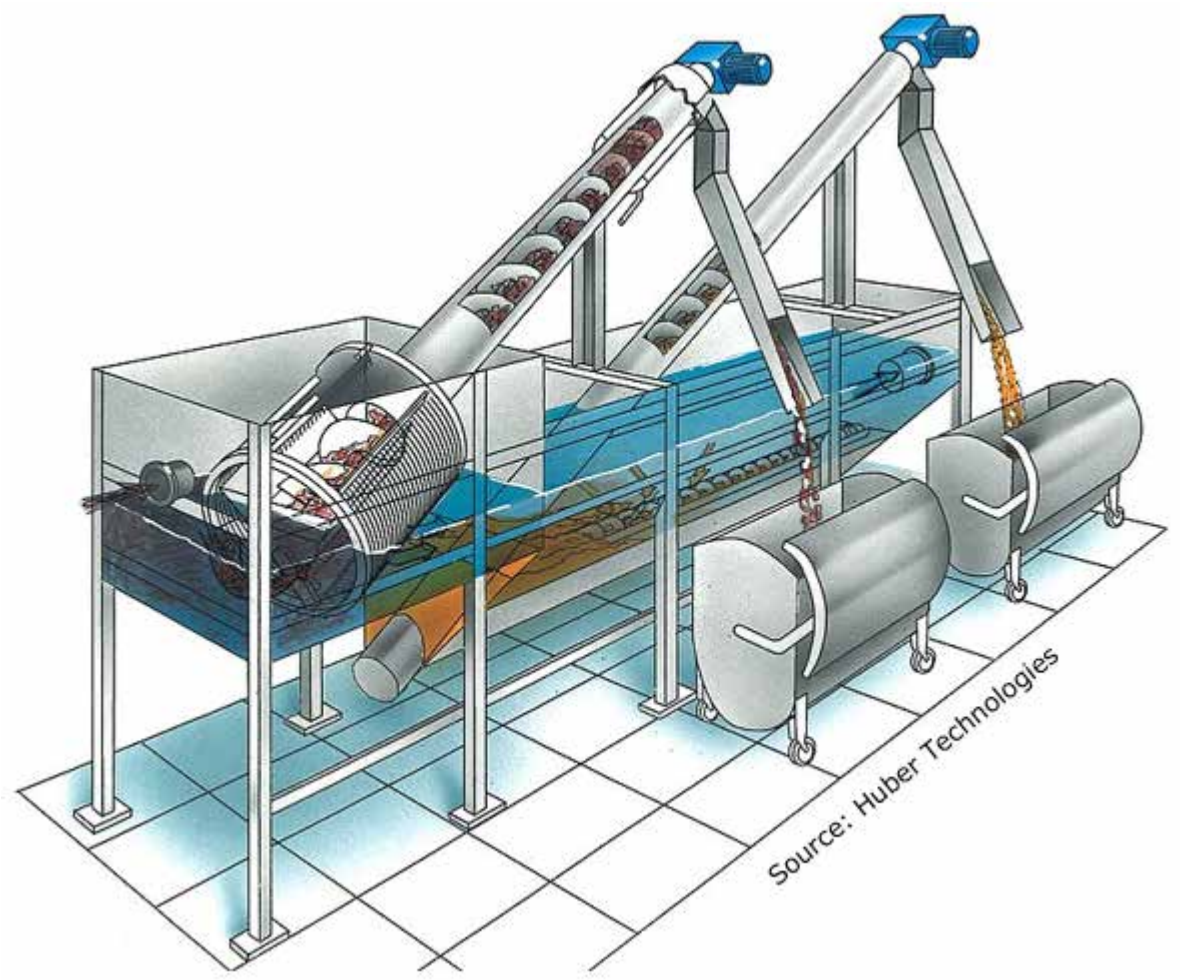


FIGURE 71: ILLUSTRATION OF MECHANIZED SEPTAGE RECEIVING STATION

3. Septage Transfer Station

Septage transfer station are constructed when hauling distances are uneconomical. The main function of the septage transfer station is to accumulate the septage from smaller vehicles, so that it can be transferred to treatment plant. This process optimises the conveyance and reduces the conveyance cost. Such septage transfer stations can be installed at the smaller ULBs and villages.

8.2.5 Scientific land disposal

The state of Uttarakhand is rich in forest. The land use map of the state shows, that considerable part of the land is designated as scrub land or wasteland in the hilly regions. In such situations, the patch of forest or the scrub land or wasteland can be used for scientific land disposal of septage.

For scientific land disposal of septage, a site needs to be identified. The US EPA manual suggests the criteria as shown in the figure below.

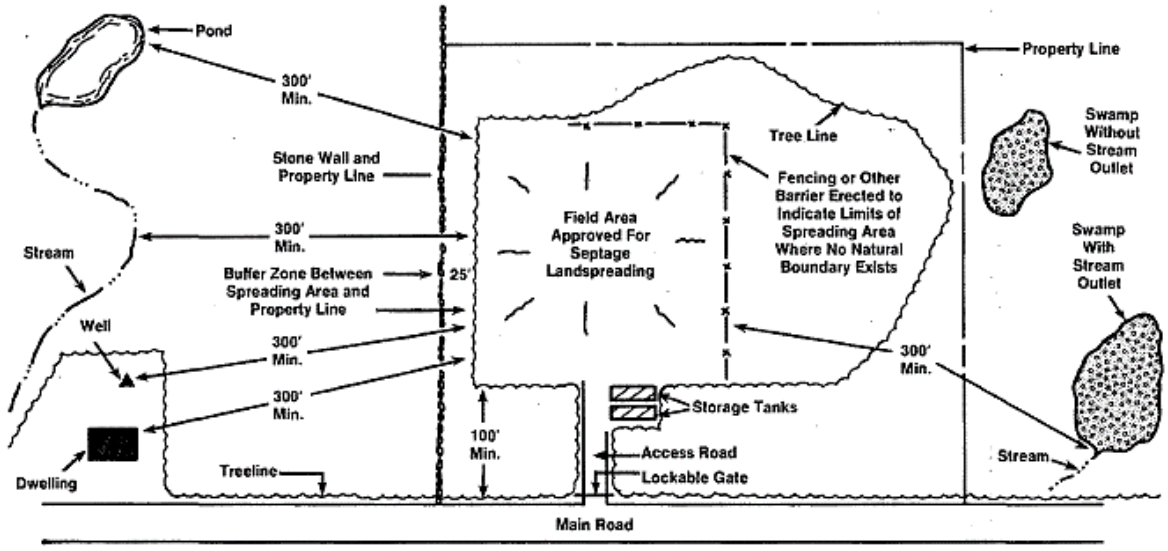


FIGURE 72: TYPICAL SEPTAGE APPLICATION SITE AS SUGGESTED IN US EPA MANUAL

There are three ways of performing scientific land disposal;

1. Surface application

In this technique ridge and furrow irrigation method is used for surface application of septage. This can be performed in the forest land, scrub land or wasteland. The pine trees are robust and can withstand the septage. The septage will provide the necessary nutrients and improve the biomass production.

In case of scrub land and wasteland, application of septage will improve the soil conditions thereby improving the ground cover. Improving the vegetation cover on these scrub lands will reduce the soil erosion and curtail the probability of landslides.

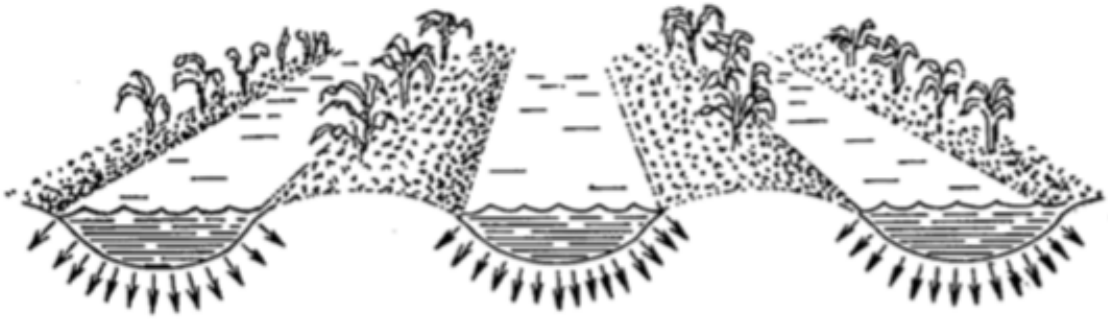


FIGURE 73: RIDGE AND FURROW IRRIGATION METHOD FOR SEPTAGE APPLICATION

2. Sub surface incorporation

For performing sub surface incorporation of septage, special equipment is needed. This equipment is mounted on the tractor and behind the septage tank. The septage is fed to the dispenser. The dispenser is located between the circular plates. These plates, open on the upper layer of soil and close the ridge after the septage is applied. This type of application can be performed only on flat land. However, this is one of the safest way to apply septage to the land.

FIGURE 74: EQUIPMENT REQUIRED FOR SUB SURFACE INCORPORATION (SOURCE: SOURCE: R. MAGUIRE, VIRGINIA TECH)

3. Deep row entrenchment

Deep row entrenchment (DRE) is done in places where the ground water table is low and the surface water bodies are not nearby. Entrenchment can be performed on sloped or plain land.

Currently, DRE is widely practiced in state of Odisha in India and African countries. In case od Odisha, the ULBs are instructed to practice DRE wherever treatment facility is not available for septage.

FIGURE 75: DEEP ROW ENTRENCHMENT BEING PRACTICED FOR SAFE DISPOSAL OF SEPTAGE (SOURCE: OWSSB, ODISHA)

8.2.6 Faecal sludge and septage treatment

Faecal sludge and septage treatment have four stages; (1) solid liquid separation, (2) stabilization, (3) dewatering / drying and (4) pathogen reduction. Stabilization is an optional process which is required in case of faecal sludge. Faecal sludge is fresh and undigested; hence solids require further stabilisation in order to reduce the COD and BOD. Following treatment chain is recommended based on the ground conditions observed during the study.

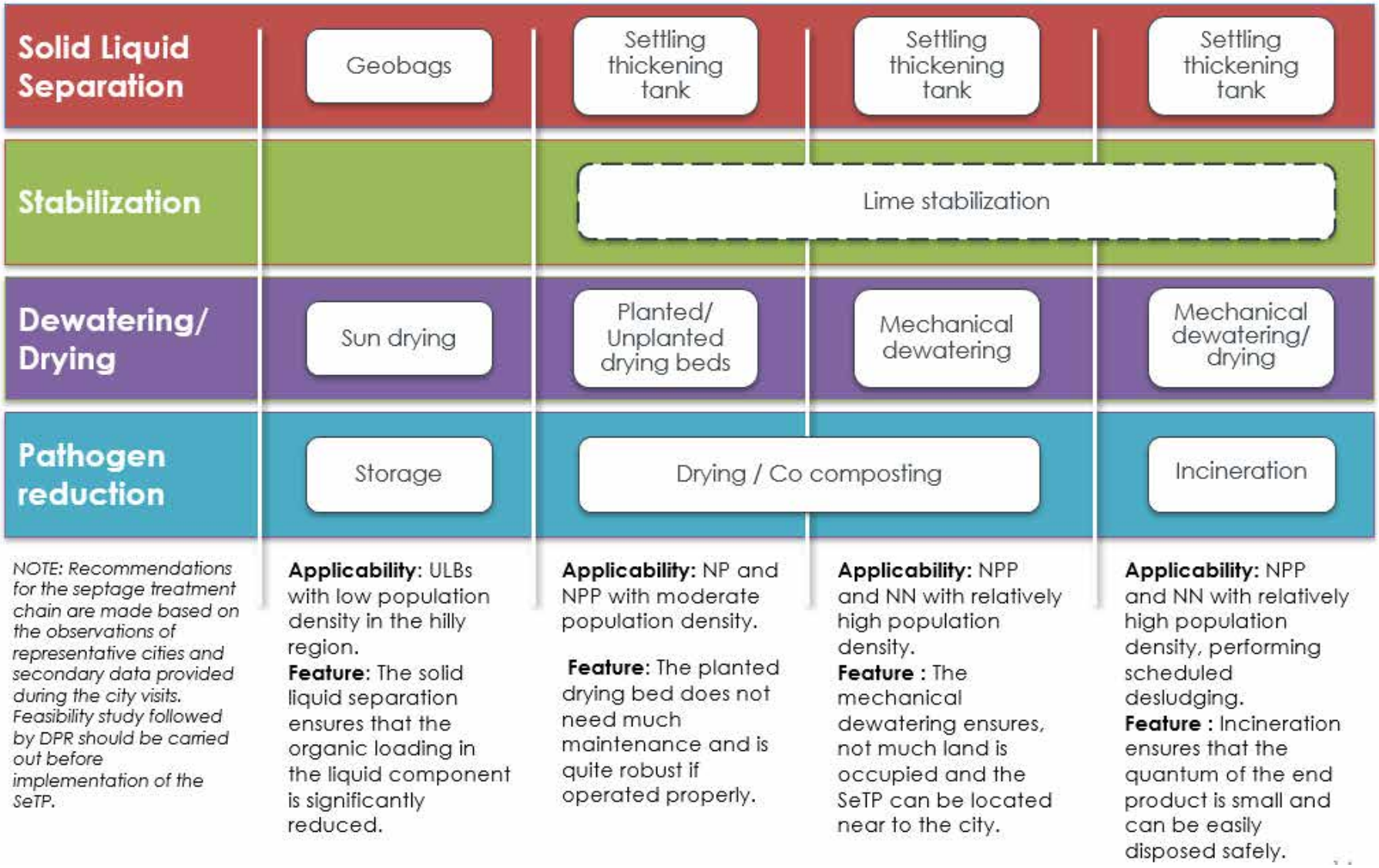


FIGURE 76: POTENTIAL FAECAL SLUDGE AND SEPTAGE TREATMENT CHAIN IN HILLY AREAS

It is recommended that in case of ULBs with more than average population density, should also practice treatment of liquid fraction of the septage. The liquid fraction of the septage has characteristics similar to that of wastewater and can be treated with any wastewater treatment systems such as DEWATS, SBR, MBBR, MBR etc.

Geotubes / Geobags

Geotubes are made from a specialised woven fabric made out of polypropylene material. The fabric has pores of fixed size. When the septage is pumped into the geo tube, the solids bigger than the size of the pores is retained inside and the liquid bleeds out of the tube. The free water leaves the geo tube immediately, however, the bound water takes seeps out of the tube over a period of day. Once the tube is filled and the seepage stops, the bags are cut open for sun drying of solids as shown in the picture below.

FIGURE 77: PICTURES OF GEO TUBES AT VARIOUS STAGES

The geotube cannot be reused for solid liquid separation and hence needs to be washed before repurposing or disposing. The fabric can later be used for protecting surface from soil erosion or slope stabilisation in land slide prone area.

Settling Thickening Tanks

The settling thickening tank has three sections, inlet section, sedimentation section, outlet section. The inlet section is designed in a way that, (1) no dead zones are created at the corners of the tank and (2) the velocity of the incoming septage is gradually reduced. A baffle wall helps to separate out the inlet section from the sedimentation section.

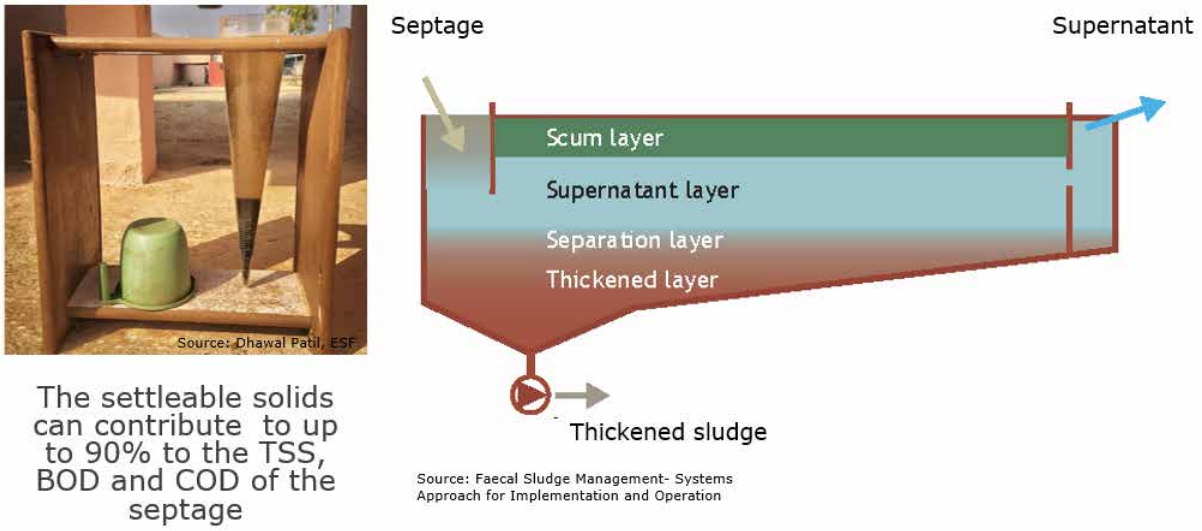


FIGURE 78: SCHEMATIC REPRESENTATION OF SETTLING THICKENING TANK

In the sedimentation section the velocity of the septage is reduced adequately so as to allow separation of oils-grease-fats and solids particles. The sedimentation section has a slope towards the inlet section where a small sump is created for fixing the sludge pump. This sump ensures that only thick compressed sludge is pumped out of the settling thickening tank. In normal working conditions, approximately 3 m^3/d of thickened sludge needs to be pumped out of the settling thickening tank and sent to belt press for dewatering.

The outlet section is separated from the sedimentation section using another baffle wall. The outlet pipe is an inverted elbow which facilitates removal of only top layer of the water. Settling thickening tank are widely being used in state of Odisha at septage treatment plants.

Lime stabilization

Lime stabilization involves the addition of either quicklime (CaO) or hydrated lime ($Ca(OH)_2$), also known as calcium hydroxide or slaked lime, to the sludge. Both increase the pH of the sludge and quicklime also reacts with the water in the sludge to raise its temperature. To ensure pathogen inactivation, the lime must be evenly mixed through the sludge. Lime-stabilized biosolids can be added to soil, increasing the pH, and so are particularly beneficial for acidic soils.

FIGURE 79: LIME STABILIZATION TECHNIQUES IN PHILLIPINES (LEFT) AND THE US (RIGHT)

Lime can be applied to faecal sludge or septage prior to solids–liquid separation and dewatering, when the relatively high water content facilitates mixing. Adding lime to septage or faecal sludge at the start of the treatment process reduces odours but increases the volume of sludge to be dealt with at later in the treatment process. the use of lime as a long-term response to sludge stabilization and pathogen reduction needs will only be viable if hydrated lime is available at an affordable price.

Unplanted drying bed

Unplanted drying beds are shallow filters with filter bed made out of combination of gravels and sand. The beds have under drain to collect the filtrate which is collected in filtrate sump by gravity. The free water in the sludge drains out of the filter bed and the bound water is removed from the sludge by evaporation. The design of the sludge drying bed is based on the evaporation rate which is determined by the average temperature and humidity. The operational cycle of unplanted sludge drying beds ranges into weeks depending upon the local conditions. The sludge drying beds have

relatively higher CAPEX and since they are easy to operate have low OPEX. The biggest limitation of drying beds is their area requirement is quite high and if not operated properly the odour can be a nuisance. Unplanted drying beds are being used widely in India and outside India. In India, they are demonstrated at Devanhalli near Bangalore.

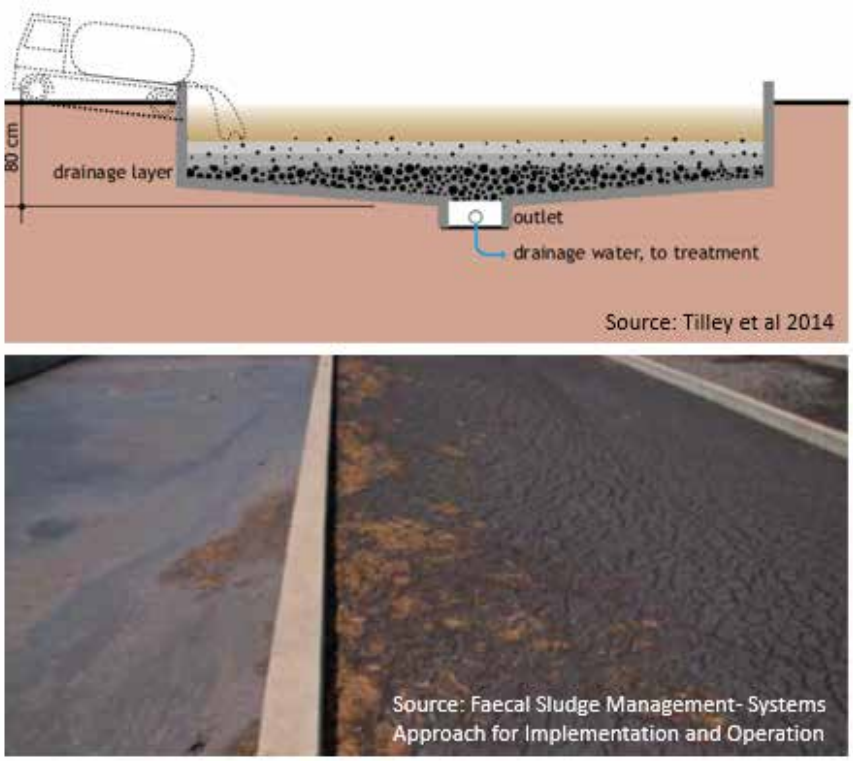


FIGURE 80: REPRESENTATION OF UNPLANTED DRYING BEDS

Planted drying beds

Planted drying beds are similar to the unplanted drying beds having macrophyte such as cattail, typha etc. In this case the bound water is removed by evapotranspiration.

The difference between the planted drying bed and unplanted drying bed is the way they are operated and stabilization of sludge. Unlike unplanted drying beds, the operational cycle of planted drying beds is in months. Each bed is used for months before it is made non-operational. Since the sludge stays in the beds for a long time, mineralisation of the sludge also occurs. The nutrients are taken up by the plants leaving behind mineralised solids.

In most of the cases the planted drying beds are made dysfunctional, however there are cases where the filter media has been removed, washed and reinstalled. The application criteria, advantages and limitations are similar to unplanted drying beds.

Planted drying beds have been implemented at Faecal Sludge Treatment Plant in Leh, Jammu & Kashmir.

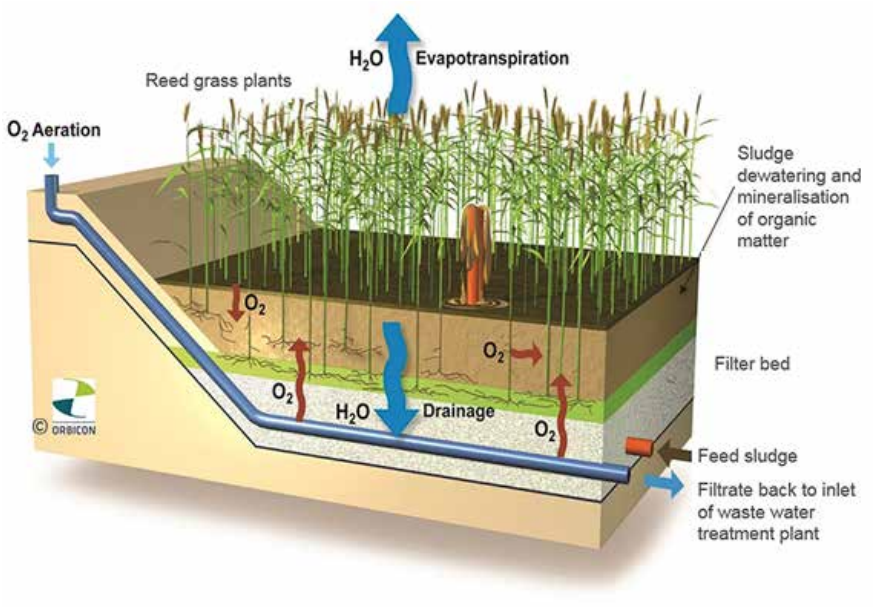


FIGURE 81: REPRESENTATION OF PLANTED DRYING BEDS

Mechanical dewatering – Screw press

A screw press consists of a rotating screw placed in a perforated cylinder. The sludge is loaded at one end and the dewatered solids is discharged at the other end. A screw press has two zones, first is the thickening zone where free water drains out and the next is dewatering zone. Here the sludge is it is compacted due to a diminishing distance between the screw and the cylinder, and the liquid that is squeezed out is removed through the pores in the cylinder.

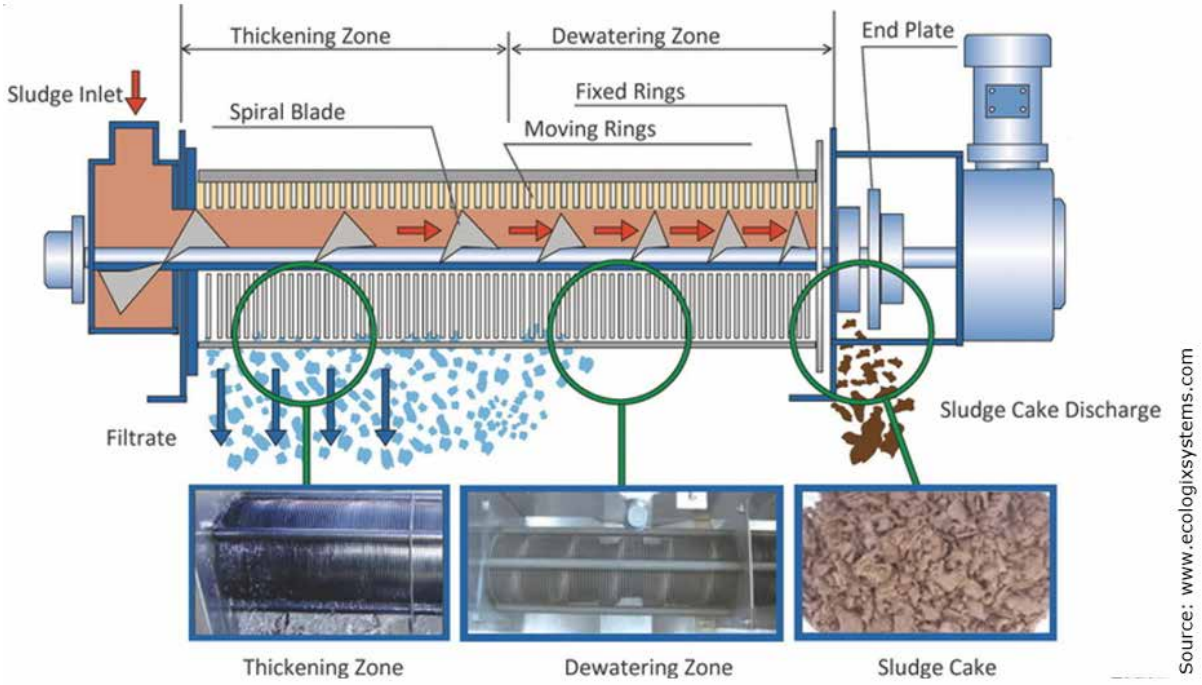


FIGURE 82: REPRESENTATION OF MECHANICAL DEWATERING UNIT- SCREW PRESS

Although the screw press can operate for varying solid content, it is recommended to operate it at a consistent solid loading rate. This can be achieved by conditioning the sludge using polymer before it enters the screw press. This increases the CAPEX of the system as now it needs polymer making and dosing equipment. Although this increase in the cost is quite small, the operational expenditure increases as a good quality polymer can be quite expensive.

Alternative to this is, to have a settling thickening tank, which thickens the sludge to adequate consistency. Typically a solid content up to 25% can be achieved using screw press. The dewatered solids now only contains mostly bound water which can only be removed using evaporation.

Screw presses are quite widely used in STP to dewater sewage sludge. They have also been used in FSTP implemented at Wai, Maharashtra. Outside India, screw press has been used for dewatering septage in Malaysia and Philippines.

Co-composting

Composting uses aerobic decomposition to break down organic material under controlled conditions and produce stabilized products that do not smell. The activities of the aerobic microorganisms that use oxygen to convert carbon to carbon dioxide generate heat and raise the temperature of the compost. Pathogens in the

composting material will be inactivated if the compost temperature can be maintained in the thermophilic range (40–70°C) over a sufficient time period.

Achieving the required temperature conditions requires that the water content and carbon to nitrogen (C:N) ratio of the composting material are maintained within fairly restricted ranges and that sufficient free air space is available to provide the oxygen required for aerobic microbial activity. To achieve these conditions faecal sludge is usually co-composted with a suitable bulking agent: a material that has both a high carbon content and a low water content. It may also be necessary to add water to maintain the moisture content within the optimum range. Materials commonly used as bulking agents include municipal solid waste, agricultural waste, and sawdust. The volume of bulking agent required is typically 2–5 times the volume of faecal sludge, the ratio depending on the C:N ratio and the water content of the sludge and bulking agent. The stabilized product is a dark, humus-like material, which can be added to soil to increase its organic content and improve water retention.

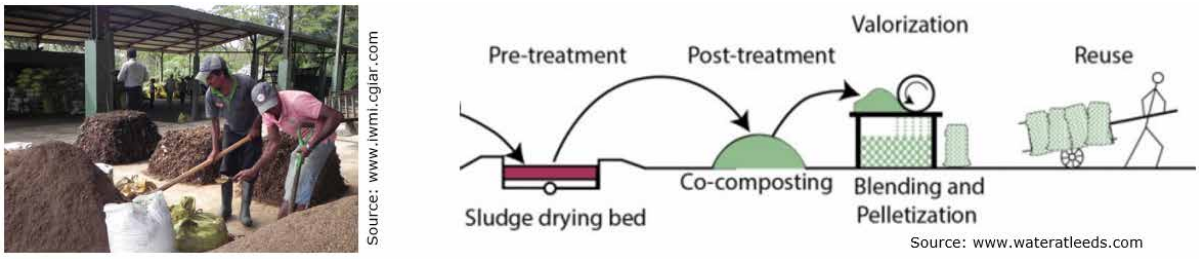


FIGURE 83: REPRESENTATION OF COMPOSTING OF DEWATERED FAECAL SLUDGE AND SEPTAGE

Co composting is practiced at a septage treatment plant in Bhubanehswar, Odisha. It is also practiced on large scale in other countries such as Sri Lanka, Vietnam, Bangladesh, Kenya, Ghana and Haiti.

Incineration / Pyrolysis

Incineration or Pyrolysis is considered as thermal treatment for faecal sludge and septage management. This comes as a single unit which can be fitted with mechanical dewatering unit. Thus, the dewatered sludge is dried using the hot air from the combustion chamber. The dried solids then fall into the combustion chamber. This chamber can be operated as an incinerator or pyrolizer.

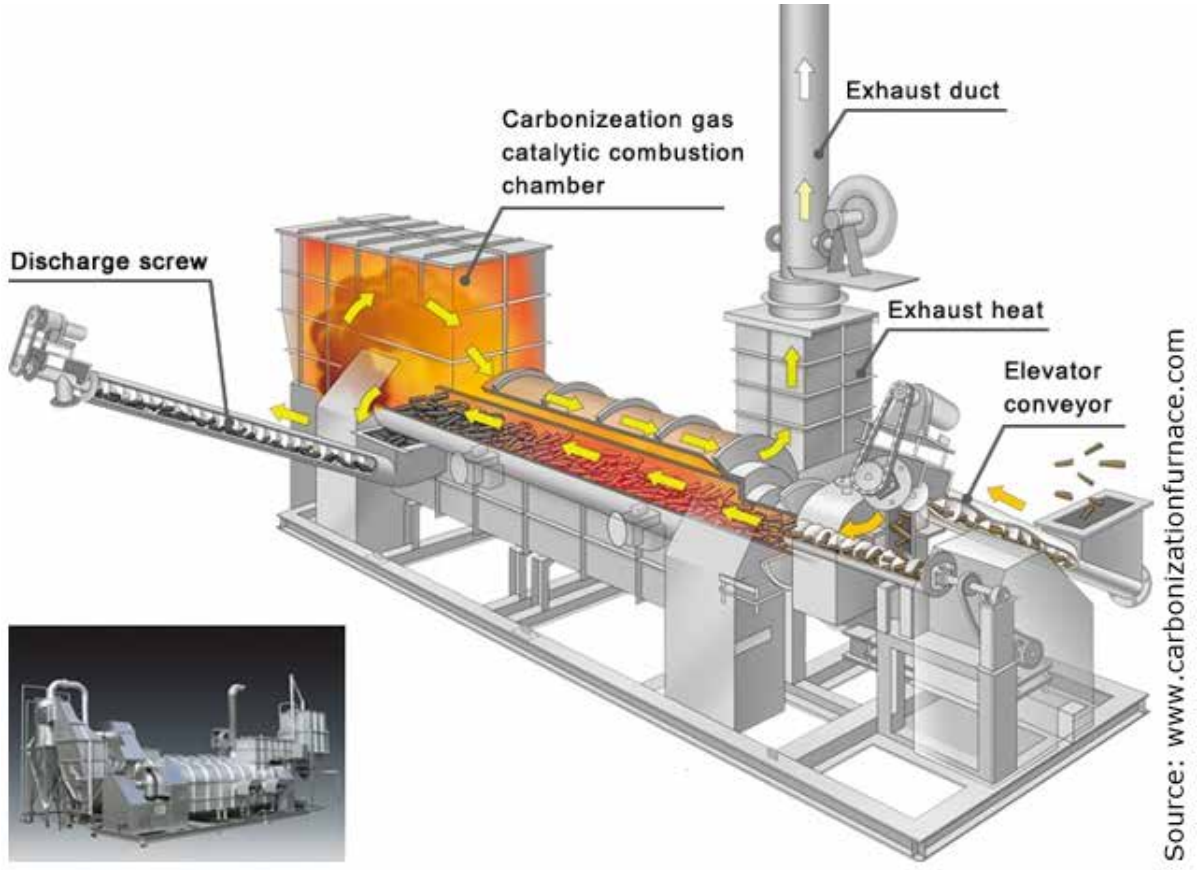


FIGURE 84: REPRESENTATION OF THERMAL TREATMENT FOR PATHOGEN REDUCTION

The operating temperature and supply of oxygen determines of the combustion process. The solids are first converted in to carbon (commonly known as bio char) at a lower temperature (400^0 C – 600^0 C) and further the bio char burns to produce more heat and higher temperature up to 800^0 C – 900^0 C.

There is complete elimination of pathogen from the solids and significant volume reduction is also achieved. The advantage of such system is it is very compact and gives quite consistent results. The end product such as bio char has good calorific value and can be used in furnaces. However, economic viability needs to be checked. Disadvantages are the high CAPEX, need of electricity to for treatment and requirement of skilled persons makes it costly and difficult to operate.

Pyrolysis plants has been set up at the FSTP in Wai and Nasrapur in India.

9 Proposed engagement under SCBP

Under the Sanitation Capacity Building Platform, the state of Uttarakhand can be supported in the policy development, facilitating the formation of the FSSM committee or a task force, capacity building of the officials from para statal agencies and ULBs who are part of monitoring committees and septage management cells, technical support to the agencies practicing FSSM in the hilly areas.

Capacity building can be anchored through two training institutes; (1) National Centre for Good Governance, Mussoorie and (2) Administrative Training Institute, Nainital. It is very important to build the capacities of the para statal bodies, since they are responsible for liquid waste management in the state. The para statal agencies have a good reach in each district and officials are placed in most of the NPs and NPPs.

Presence of a feasible and functional policy along with a state-wide strategy for FSSM at the state level is very important. The document including guidelines for ULBs (and para statal agencies in the case of Uttarakhand) can be developed. Co treatment of septage has great potential for the STPs planned under Namami Ganage. Scientific land disposal is also one solution which can lead to safe disposal of septage in hilly region. Such solution will definitely operationalise FSSM with small investments (when compared to cost of STPs and cost of revising the water bodies). It is only after formulation of such vision documents, that the success of the capacity building exercise can be ensured.

10 ANNEXURES

10.1 List of Urban Local Bodies[25]

TABLE 22: LIST OF THE NAGAR NIGAM

Sr. No.	Name of the Nagar Nigam	Name of the District	Population (2011 census)	Population density (person/km²)
1.	Nagar Nigam, Dehradun	Dehradun	5,69,578	1900
2.	Nagar Nigam, Rishikesh		70,499	8851
3.	Nagar Nigam, Haridwar	Haridwar	3,20,892	18604
4.	Nagar Nigam, Roorkee		3,50,442	14575
5.	Nagar Nigam, Kotdwara	Pauri	33,035	360
6.	Nagar Nigam, Haldwani	Nainital	2,44,886	8100
7.	Nagar Nigam, Rudrapur	Udham Singh Nagar	1,54,554	5100
8.	Nagar Nigam, Kashipur		1,38,839	22275

TABLE 23: LIST OF THE NAGAR PALLIKA PARISHAD

Sr. No.	Name of the Nagar Pallika Parishad	Name of the District	Population (As per census 2011)
1.	Nagar Pallika Parishad, Mussoorie	Dehradun	30,118
2.	Nagar Pallika Parishad, Vikas Nagar		13,927
3.	Nagar Pallika Parishad, Herbertpur		9,782
4.	Nagar Pallika Parishad, Doiwala		8,709
5.	Nagar Pallika Parishad, Manglaur	Haridwar	52,971
6.	Nagar Pallika Parishad, Laksar		21,760
7.	Nagar Pallika Parishad, Shivalik Nagar		15,970
8.	Nagar Pallika Parishad, Uttarkashi	Uttarkashi	17,475
9.	Nagar Pallika Parishad, Barkot		6,720
10.	Nagar Pallika Parishad, Chinyalisaur		15,500
11.	Nagar Pallika Parishad, Chamoli - Gopeshwar	Chamoli	21,447
12.	Nagar Pallika Parishad, Joshimath		16,709

[25] List of ULB's, Uttarakhand Development Directorate

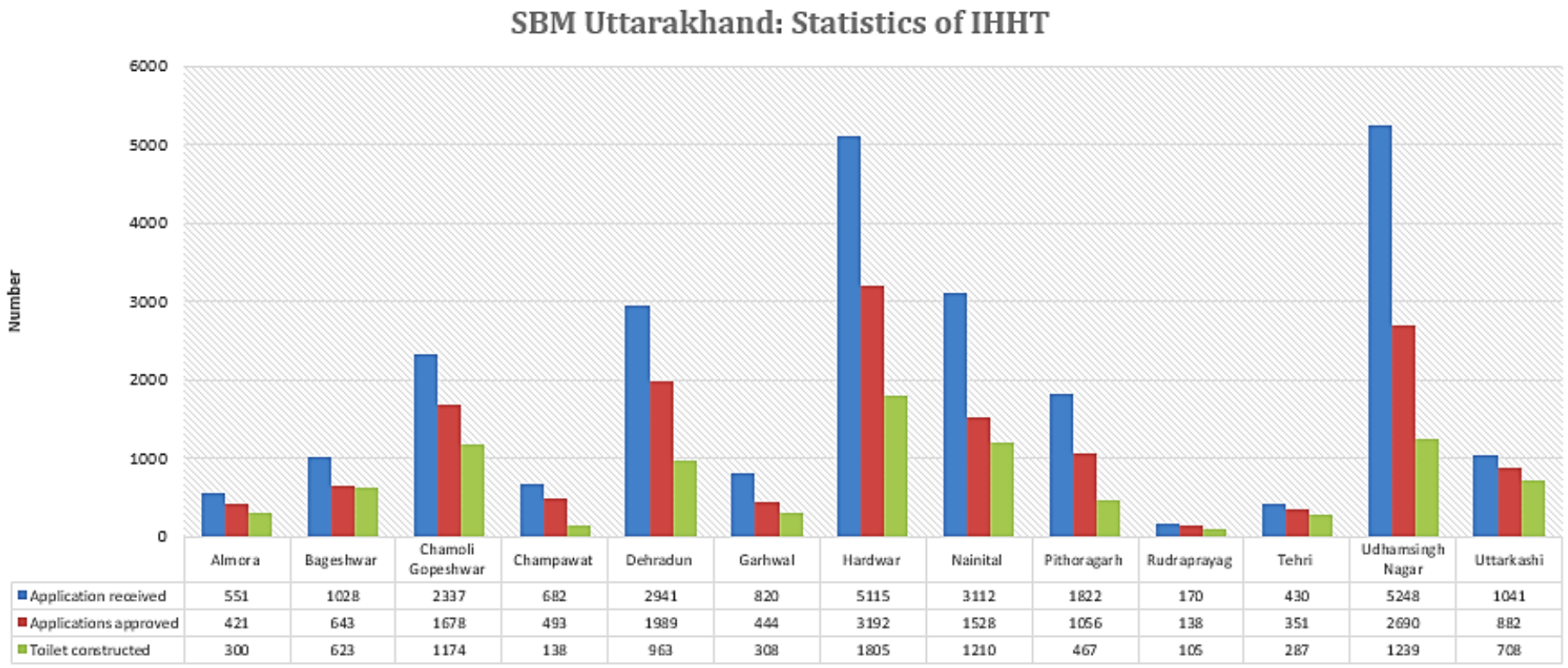
13.	Nagar Pallika Parishad, Gauchar		8,864
14.	Nagar Pallika Parishad, Karnaprayag		8,297
15.	Nagar Pallika Parishad, Tehri	Tehri	24,014
16.	Nagar Pallika Parishad, Narendra Nagar		6,049
17.	Nagar Pallika Parishad, Muni Ki Reti - Dhalwala		10,620
18.	Nagar Pallika Parishad, Chamba		7,771
19.	Nagar Pallika Parishad, Devprayag		2,152
20.	Nagar Pallika Parishad, Rudraprayag	Rudraprayag	9,313
21.	Nagar Pallika Parishad, Pauri	Pauri	25,440
22.	Nagar Pallika Parishad, Srinagar		20,115
23.	Nagar Pallika Parishad, Dugadda		46,796
24.	Nagar Pallika Parishad, Pitthoragarh	Pitthoragarh	56,044
25.	Nagar Pallika Parishad, Dharchula		7,039
26.	Nagar Pallika Parishad, Didihat		6,522
27.	Nagar Pallika Parishad, Champawat	Champawat	4,801
28.	Nagar Pallika Parishad, Tanakpur		17,626
29.	Nagar Pallika Parishad, Almora	Almora	34,122
30.	Nagar Pallika Parishad, Ranikhet Chinyanaula		55,000
31.	Nagar Pallika Parishad, Bageshwar	Bageshwar	9,079
32.	Nagar Pallika Parishad, Nainital	Nainital	41,377
33.	Nagar Pallika Parishad, Ramnagar		54,787
34.	Nagar Pallika Parishad, Bhavali		6,309
35.	Nagar Pallika Parishad, Gadarpur	Udham Singh Nagar	19,301
36.	Nagar Pallika Parishad, Jaspur		50,523
37.	Nagar Pallika Parishad, Bajpur		25,524
38.	Nagar Pallika Parishad, Kicchha		41,965
39.	Nagar Pallika Parishad, Sitarganj		29,965
40.	Nagar Pallika Parishad, Khatima		15,093
41.	Nagar Pallika Parishad, Mahua kheraganj		12,584

TABLE 24: LIST OF NAGAR PANCHAYATS

Sr. No.	Name of the Nagar Panchayat	Name of the District	Population (Census 2011)
1.	Nagar Panchayat, Selakui	Dehradun	N.A
2.	Nagar Panchayat, Zabareda	Haridwar	5,539
3.	Nagar Panchayat, Pirankaliyar		10,043
4.	Nagar Panchayat, Landhaura		18,370
5.	Nagar Panchayat, Bhagawanpur		7,573
6.	Nagar Panchayat, Naugaon	Uttarkashi	N.A
7.	Nagar Panchayat, Gangotri		110
8.	Nagar Panchayat, Purola		N.A
9.	Nagar Panchayat, Badrinath	Chamoli	2,438
10.	Nagar Panchayat, Nandprayag		1,641
11.	Nagar Panchayat, Tharali		N.A
12.	Nagar Panchayat, Pipalkoti		N.A
13.	Nagar Panchayat, Gairsain		7,138
14.	Nagar Panchayat, Pokhri		N.A
15.	Nagar Panchayat, Ganja	Tehri	N.A
16.	Nagar Panchayat, Kirtinagar		1,517
17.	Nagar Panchayat, Lambgaon		N.A
18.	Nagar Panchayat, Ghansali		392
19.	Nagar Panchayat, Chamiyala		N.A
20.	Nagar Panchayat, Kedarnath	Rudraprayag	612
21.	Nagar Panchayat, Agastyamuni		N.A
22.	Nagar Panchayat, Ukhimath		612
23.	Nagar Panchayat, Tilwara		N.A
24.	Nagar Panchayat, Swarashram Jonk	Pauri	1,085
25.	Nagar Panchayat, Satpuli		N.A
26.	Nagar Panchayat,	Pitthoragarh	
27.	Nagar Panchayat, Gangolihat		N.A
28.	Nagar Panchayat, Berinag		N.A
29.	Nagar Panchayat, Kapkot	Bageshwar	N.A
30.	Nagar Panchayat, Lohaghat	Champawat	7,926
31.	Nagar Panchayat, Banbasa		7,990
32.	Nagar Panchayat, Dwarahat	Almora	2,749
33.	Nagar Panchayat, Bhikiyasain		N.A
34.	Nagar Panchayat, Kaladhungi	Nainital	7,611
35.	Nagar Panchayat, Laal Kuan		7,644
36.	Nagar Panchayat, Bhimtaal		7,722
37.	Nagar Panchayat, Mahua dabra	Udham Singh Nagar	7,326
38.	Nagar Panchayat, Nanakmatta		N.A
39.	Nagar Panchayat, Sultanpur Patti		9,881

40.	Nagar Panchayat, Kela khera		10,929
41.	Nagar Panchayat, Dineshpur		11,343
42.	Nagar Panchayat, Shaktigadh		6,309
43.	Nagar Panchayat, Gularbhoj		N.A

10.2 Swachh Bharat Mission Urban – Uttarakhand



	Almora	Bageshwar	Chamoli Gopeshwar	Champawat	Dehradun	Garhwal	Hardwar	Nainital	Pithoragarh	Rudraprayag	Tehri	Udhamsingh Nagar	Uttarkashi
Application received	551	1028	2337	682	2941	820	5115	3112	1822	170	430	5248	1041
Applications approved	421	643	1678	493	1989	444	3192	1528	1056	138	351	2690	882
Toilet constructed	300	623	1174	138	963	308	1805	1210	467	105	287	1239	708

Figure 85: Summary of the SBM Urban data of Uttarakhand State

TABLE 25: ULB WISE DETAILS OF PROGRESS UNDER SWACHH BHARAT MISSION URBAN

Sr. No.	District	ULB Name	No. of Applications Received	No. of Applications Approved	No. of Constructed Toilet Photo
1	Almora	Almora (CB)	27	0	3
2	Almora	Almora (NPP)	362	298	233
3	Almora	BHIKYASAIN (NP)	71	65	0
4	Almora	Dwarahat (NP)	82	58	60
5	Almora	Ranikhet (CB)	8	0	4
6	Almora	RANIKHET-CHILIANAULA (NPP)	1	0	0
7	Bageshwar	Bageshwar (NPP)	676	339	346
8	Bageshwar	Kapkot (NP)	352	304	277
9	Chamoli Gopeshwar	Badrinathpuri (NP)	35	19	0
10	Chamoli Gopeshwar	Chamoli Gopeshwar (NPP)	505	410	315
11	Chamoli Gopeshwar	Gairsain	268	240	147
12	Chamoli Gopeshwar	Gochar (NP)	162	119	118
13	Chamoli Gopeshwar	Joshimath (MB)	419	266	103
14	Chamoli Gopeshwar	Karnaprayag (NP)	325	319	293
15	Chamoli Gopeshwar	Nandprayag (NP)	70	68	39
16	Chamoli Gopeshwar	Pipalkoti (NP)	0	0	0
17	Chamoli Gopeshwar	Pokhari	551	237	157
18	Chamoli Gopeshwar	THARALI (NP)	2	0	2
19	Champawat	Banbasa (NP)	51	13	7
20	Champawat	Champawat (NP)	141	53	42
21	Champawat	Lohaghat (NP)	65	59	3

22	Champawat	Tanakpur (NPP)	425	368	86
23	Dehradun	Chakrata (CB)	9	0	1
24	Dehradun	Clement Town (CB)	0	0	0
25	Dehradun	Dehradun (CB)	4	0	0
26	Dehradun	Dehradun (M.Corp)	2363	1547	691
27	Dehradun	Doiwala (NP)	45	40	31
28	Dehradun	Herbertpur (NP)	113	95	84
29	Dehradun	Landaur (CB)	0	0	0
30	Dehradun	Mussoorie (NPP)	22	21	15
31	Dehradun	Rishikesh (NPP)	136	79	63
32	Dehradun	SELAQUI (HOPETOWN) (NP)	135	134	21
33	Dehradun	Vikasnagar (NPP)	114	73	57
34	Garhwal	Dogadda (NPP)	41	32	27
35	Garhwal	Kotdwara (NPP)	283	84	17
36	Garhwal	Lansdowne (CB)	2	0	1
37	Garhwal	Pauri (NPP)	174	150	153
38	Garhwal	Satpuli (NP)	175	33	2
39	Garhwal	Srinagar (NPP)	124	124	108
40	Garhwal	Swargashram Jonk	21	21	0
41	Haridwar	Bhagwanpur (NP)	1437	866	240
42	Haridwar	Haridwar (NPP)	628	557	553
43	Haridwar	Jhabrera (NP)	1189	941	457
44	Haridwar	Laksar (NP)	613	249	41
45	Haridwar	Landhaura (NP)	104	97	78
46	Haridwar	Manglaur (NPP)	394	107	62

47	Haridwar	PIRAN KALIYAR (NP)	311	0	1
48	Haridwar	Roorkee (CB)	1	0	0
49	Haridwar	Roorkee (NPP)	433	375	373
50	Haridwar	Shivalik Nagar	5	0	0
51	Nainital	Bhimtal (NP)	25	21	0
52	Nainital	Bhowali (NPP)	203	96	1
53	Nainital	Haldwani-cum-Kathgodam (NPP)	2020	920	784
54	Nainital	Kaladhungi (NP)	318	244	199
55	Nainital	Lalkuan (NP)	52	47	36
56	Nainital	Nainital (CB)	2	0	0
57	Nainital	Nainital (NPP)	227	50	2
58	Nainital	Ramnagar (NPP)	265	150	188
59	Pithoragarh	Berinag (NP)	280	188	12
60	Pithoragarh	Dharchula (NP)	219	31	12
61	Pithoragarh	Didihat (NP)	265	190	78
62	Pithoragarh	Gangolihat (NP)	458	300	79
63	Pithoragarh	Pithoragarh (NPP)	600	347	286
64	Rudraprayag	Augustmuni	46	43	43
65	Rudraprayag	Kedarnath (NP)	2	0	0
66	Rudraprayag	Rudraprayag (NPP)	100	74	44
67	Rudraprayag	Tilwara (NP)	19	19	16
68	Rudraprayag	Ukhimath	3	2	2
69	Tehri	Chamba (NP)	14	11	12
70	Tehri	Chamiyala (NP)	55	53	39
71	Tehri	Devaprayag (NP)	127	105	93

72	Tehri	GAJA (NP)	0	0	0
73	Tehri	Ghansali (NP)	11	9	3
74	Tehri	Kirtinagar (NP)	67	36	42
75	Tehri	LAMBGAON (NP)	14	11	0
76	Tehri	Muni Ki Reti (NP)	39	38	38
77	Tehri	Narendranagar (NPP)	57	51	24
78	Tehri	Tehri (MB)	46	37	36
79	Udham Singh Nagar	Bazpur (NPP)	202	179	18
80	Udham Singh Nagar	Dineshpur (NP)	1082	866	556
81	Udham Singh Nagar	Gadarpur (NPP)	157	131	39
82	Udham Singh Nagar	GULARBHOJ (NP)	195	194	33
83	Udham Singh Nagar	Jaspur (NPP)	256	203	135
84	Udham Singh Nagar	Kashipur (NPP)	333	103	114
85	Udham Singh Nagar	Kela Khera (NP)	18	15	3
86	Udham Singh Nagar	Khatima (NPP)	216	211	3
87	Udham Singh Nagar	Kichha (NPP)	588	363	228
88	Udham Singh Nagar	Mahua Dabra Haripura (NP)	115	50	1
89	Udham Singh Nagar	Mahua Kheraganj (NP)	141	116	26
90	Udham Singh Nagar	NANAKMATTA (NP)	147	57	20
91	Udham Singh Nagar	Rudrapur (NPP)	830	26	39
92	Udham Singh Nagar	Shaktigarh (NP)	65	11	2
93	Udham Singh Nagar	Sitarganj (NPP)	93	44	19
94	Udham Singh Nagar	Sultanpur (NP)	810	121	3
95	Uttarkashi	Barkot (NP)	55	50	37
96	Uttarkashi	Chinyalisaur	382	379	365

97	Uttarkashi	Gangotri (NP)	4	0	0
98	Uttarkashi	NAUGAON (NP)	192	56	82
99	Uttarkashi	Purola	259	257	147
100	Uttarkashi	Uttarkashi (NPP)	149	140	77

10.3 List of STPs under Pey Jal Nigam[26]

TABLE 26: LIST OF SEWAGE TREATMENT PLANT UNDER PEY JAL NIGAM AS ON JANUARY 2019

Sr. No.	Name of the town	Name of the STP	Installed Capacity in M.L.D	Average quantity of sewer received at plant in MLD On 31/03/2018
1	Dehradun	Kargi	68	12
2		Motharawala 1	20	12
3		Indranagar	5	1
4		Jakhan Doon Vihar	1	0.3
5		Salawala	0.71	0.3
6		Vijay Colony	0.42	0.3
7		Motharawala 1	20	0
8	Mussoorie	Kurli	0.9	0
9		Landhor North	0.8	0
10		Happy Valley	1.2	0
11		Landhor South	1.3	0
12		Bhatta Gaon	3.12	0
13	Haridwar	Jagjeetpur 1	18	18
14		Jagjeetpur 2	27	27
15		Sarat	18	18
16	Rishikesh	Swargashram	3	3
17		Tapovan	3.5	0.7
18		Lakharghat	6	6
19	Badrinath	Bamini Area	0.26	0.22

[26] List received from officials of Pey Jal Nigam, Uttarakhand

20	Srinagar	Srinagar	3.5	1.3
21	Devprayag	Devprayag	1.4	0.3
22	Uttarkashi	Gyanshu	2	2
23	Gangotri	Gangotri	1	0.1
24	Almora	Almora	2	0
25	Nainital	Russi Village	10	0
26		Hari nagar	0.8	0
27		Krishnapur	0.8	0
28	Haldwani		0	0
29	Pithoragarh		5	0
30	Ramnagar		0	0
31	Kashipur		0	0
	TOTAL:-		**224.71**	**102.52**

10.4 List of STP Under Jal Sansthan for Operation and Maintenance[27]

TABLE 27: LIST OF SEWAGE TREATMENT PLANTS UNDER JAL SANSTHAN AS ON JANUARY 2019

Sr No.	District	Name of Division	Name of the STP	Handed over to Uttarakhand Jal Sansthan	Capacity in MLD
1	Dehradun	South	Dehradun	April, 2017	68
2	Pauri	Pauri	Shrinagar	April, 2011	3.5
3	Tehri	Tehri	Tehri	April, 2006	5
4		Devprayag	Bah Baazar	April, 2016	1.4
5	Uttarkashi	Uttarkashi	Uttarkashi	June, 2017	2
6	Nainital	Nainital	Harinagar Dhobighat	September, 2017	0.45
7			Krishnapur	September, 2017	0.8
8			Rooshi	September, 2017	9.9
9			Bhimtaal	September, 2017	1.25
10	Almora	Almora	Bakha	Spetember, 2013	2
	TOTAL:-				**94.3**

[27] List received by officials of Jal Sansthan, Uttarakhand

10.5 Flagship Programs of Uttarakhand State[28]

TABLE 28: DETAILS OF THE FLAGSHIP PROGRAMS IN UTTARAKHAND STATE

Sr. No.	Name of Sector	Name of Programme	Total Schemes	On-going Schemes	Completed Schemes	Sanctioned Cost (In Lakh)	Budget Released (In Lakh)			Total Expenditure (In Lakh)		
							Till March 2018	In FY 2018-2019	Total	Till March 2018	In FY 2018-2019	Total
1	Centrally Sponsored Schemes(CSS)	AMRUT	46	42	4	39568.14	6649.58	3529.5	10179.08	6605.33	3801.17	10406.5
2	Centrally Sponsored Schemes(CSS)	Namami Gange	20	20	0	63094.62	6311.69	11173.91	17485.6	4643.23	9903.62	14546.85
3	Centrally Sponsored Schemes(CSS)	NRDWP (Coverage)	541	314	227	113496.6	81589.08	15014.76	96603.84	74791.15	10054.57	84845.72
4	Centrally Sponsored Schemes(CSS)	Shyama Prasad Mukherjee Ruban Mision	5	5	0	721.82	202.11	282.81	484.92	0	410.05	410.05
5	Other/Deposite Work	JNNURM (Sewer)	5	2	3	17154.33	15428.89	240	15668.89	16200.55	6.37	16206.92
6	Other/Deposite Work	JNNURM (Water Supply)	5	2	3	16334.33	14414.07	686.75	15100.82	13810.25	14.9	13825.15
7	State Sector	Urban Drinking Water	90	27	63	34348.87	23135.94	3907.08	27043.02	22979.55	1495.17	24474.72
8	State Sector	Urban Sewerage	43	24	19	16864.01	9788.21	684.26	10472.47	8254.36	470.05	8724.41
9	State Sector	Urban Water Supply (SCP)	1	1	0	164.95	65.98	50	115.98	70.36	23.83	94.19
		Total	756	437	319	**301747.7**	**157585.6**	**35569.07**	**193154.6**	**147354.8**	**26179.73**	**173534.5**

[28] http://www.peyjalmis.uk.gov.in/Boundry/SchemeAndProgramManagement/DashboardHome.aspx

10.6 Sewerage Project Details[29]

Sr. No.	Sector	Programme	Total Work Done						
			Pump House	Toilet	Nala Tapping	Sewerage Line	S.P.S.	S.T.P.	Rising Main
1	Centrally Funded(State Share)	JNNURM(UIDSSMT)	0	0	0	64	0	10	0
2	Centrally Sponsored Schemes(CSS)	Accelerated Urban	0	0	0	0	0	0	0
3	Centrally Sponsored Schemes(CSS)	AMRUT	0	0	0	67	0	0	2
4	Centrally Sponsored Schemes(CSS)	Central Special Assistance	0	0	0	0	0	0	0
5	Centrally Sponsored Schemes(CSS)	Namami Gange	0	0	12	8	1	25	19
6	Centrally Sponsored Schemes(CSS)	National Ganga Basin Authority	0	0	23	81	8	23	6
7	Centrally Sponsored Schemes(CSS)	NRDWP(Coverage)	0	0	0	40	0	0	0
8	District Sector	Minimum Need Program	0	0	0	2	0	0	0
9	Other/Deposite Work	13 Finance	0	0	0	185	0	1	0
10	Other/Deposite Work	JNNURM (Sewer)	0	0	0	120	8	11	3
11	Other/Deposite Work	Kumbha Mela	0	0	0	1	0	0	0
12	Other/Deposite Work	Other Departments Deposite work	0	0	0	1	1	0	0

[29] http://www.peyjalmis.uk.gov.in/Boundry/SchemeAndProgramManagement/DashboardHome.aspx

13	State Sector	Land Purchase for Water supply and Sewerage Schemes	0	0	0	0	0	0	0
14	State Sector	Maintenance and Resurrection of Resources	0	0	0	2	0	0	0
15	State Sector	Making Pollution Free to Ganga and Yamuna	0	0	0	0	0	0	0
16	State Sector	Natural Calamity	0	0	0	0	0	0	0
17	State Sector	Operation and Maintenance of STP and Sewerage Schemes	0	0	0	0	0	0	0
18	State Sector	Urban Sewerage	0	0	0	65	2	1	1
		Total	**0**	**0**	**35**	**636**	**20**	**71**	**31**

10.7 Consultations with State and City level officials

TABLE 29: LIST OF OFFICIALS AT STATE LEVEL BODIES

Date of the visit/ meeting	Name of the person	Designation	Organization	Contact	E-mail Id	Remarks
28-11-2018	Mr. Kamal Bhatt	Engineer, SBM	State Urban Development Authority, Dehradun	7533907912	sbmurbanuk@gmail.com	Overall data of the toilet coverage
28-11-2018	Mr. Gurbaz Singh	Urban Planner	Amrut, State Urban Development Authority, Dehradun	8146359803		Amrut cities general information
28-11-2018	Mr. Upendra Tadiyal		State Urban Development Authority, Dehradun	9410173599	sbmurbanuk@gmail.com	CSP's of all the cities
30-11-2018	Mr. D.K.Bansal	Executive Engineer, Project Implementation Unit	Amrut, Uttarakhand PeyJal Nigam, Kashipur	9456805060		Overall situation in Rudrapur & Kashipur
30-11-2018	Mr. Ashok Swarup		Uttarakhand PeyJal Nigam, Rudrapur	7409230003	ashokswarup89@gmail.com	Current situation in Jaspur, Proposed DPR for Jaspur septage scheme
18-12-2018	Mr. Ravi Pandey	Superintendent Engineer	Urban Development Directorate, Dehradun	9837256961 / 7533907944	ravipandeylko@yahoo.com	Protocols & other information

18-12-2018	Mr. Lalit Roy	Junior Engineer	Jal Sansthan, Dehradun	9760146141	roy.lalit7@gmail.com	Overall structure at Jal Sansthan

TABLE 30: LIST OF OFFICIALS AT CITY LEVEL BODIES

Date of the visit/ meeting	Name of the person	Designation	Organization	Contact	E-mail Id	Remarks
19-12-2018	Mr. Ashish Topaar	Sanitary Inspector	Nagar Pallika Parishad, Tehri	9058324272	npptehri80@gmail.com	CSP & other information regarding Tehri
19-12-2018	Mr. Satish Nautiyal	Executive Engineer	Jal Sansthan, Tehri	9410071076		Visit to STP & DPR information
20-12-2018	Mr. Panwar	Junior Engineer	Nagar Pallika Parishad, Chinyalisaur	9456590190	nagarpalikchinyali23@gmail.com	CSP & other information regarding Chinyalisaur
26-12-2018	Mr. Ashok Kumar	Executive Engineer	Jal Sansthan, Pithoragarh	9411113344		Overall situation in Pithoragarh
26-12-2018	Mr. Binay Joshi		Jal Sansthan, Pithoragarh	7088006281	eepit-ujs-uk@nic.in	Information regarding water connections & pumping schemes
26-12-2018	Mr. Ranjit Singh	Executive Engineer	PeyJal Nigam, Pithoragarh	9411557744	ee.cdpeyjal@gmail.com	Visit to STP & information regarding sewerage
26-12-2018	Mr. Sachin Kumar	Sanitary Inspector	Nagar Pallika Parishad, Pithoragarh	9997980037		CSP & information about Pithoragarh
26-12-2018	Mr. Dipak Kumar	Executive Officer	Nagar Pallika Parishad, Pithoragarh	7351716564		Overall situation in Pithoragarh

27-12-2018	Mr. Uday Veer Singh	Sanitary Inspector	Nagar Pallika Parishad, Jaspur	8057976465		Current situation in Jaspur
28-12-2018	Mr. Tarun Sharma	Executive Engineer	Jal Sansthan, Rudrapur	9412088189		Water connection in Rudrapur
	Mr. D.K.Bansal	Executive Engineer	Amrut, Rudrapur & Kashipur	9456805060		
	Mr. Umed Joshi	Junior Engineer	Amrut, Rudrapur & Kashipur	6761744838		
28-12-2018	Mr. Jai Bharat Singh	Municipal Commissioner	Nagar Nigam, Rudrapur	9456334433		Pointed out the persons who can provide the relevant data
28-12-2018	Mr. Ajay Bansal	Urban Infarstructure Expert, Amrut	Nagar Nigam, Rudrapur	9568165991		Information regarding septage management in Rudrapur
28-12-2018	Mr. Sanjay Sharma	Sanitary Inspector	Nagar Nigam, Rudrapur	8859502027	nagarnigamrudrapur@gmail.com	Details about the desludging operators
28-12-2018	Mr. Anil/ Bittoo	Desludging Tank Driver	Nagar Nigam, Rudrapur	9917813825		
28-12-2018	Mr. Omprakash Yadav	Desludging Service Provider	Nagar Nigam, Rudrapur	9897126688		