Shit-Flow-Diagram

Panchgani

India

Draft Report

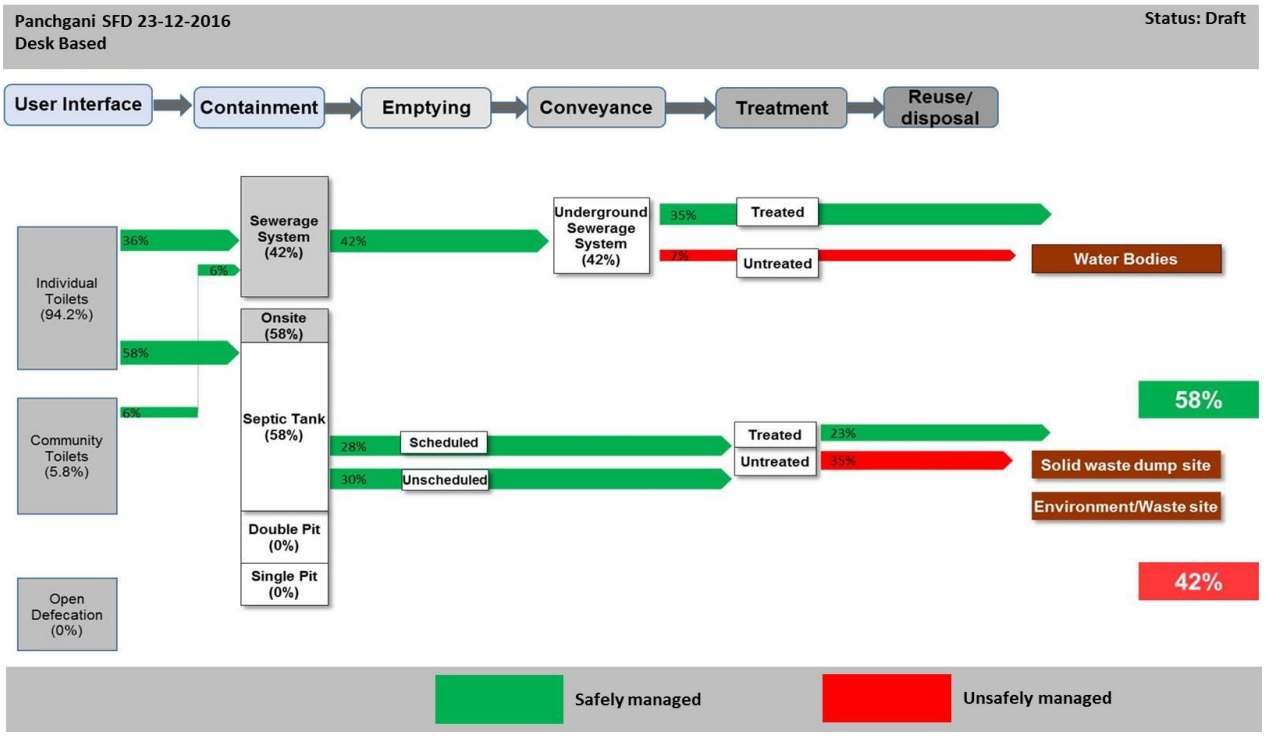
This SFD Report was created through desk-based research by CEPT University, Ahmedabad.

Date of production: 24-08-2016

Last update: 23-12-2016

SFD Report Panchgani, India, 2016
Produced by: CEPT University, Ahmedabad

1. The Diagram



2. Diagram information

Desk or field based:

This is a desk based SFD.

Produced by:

PAS Project, CEPT University, Ahmedabad

Status:

This is a draft SFD

Date of production:

24/08/2016

3. General city information

Panchgani is a hill station and municipal council in Satara district of Maharashtra state. It is situated in the middle of five hills in the Sahyadri mountain ranges.

Panchgani is situated about 285 km from Mumbai and 18 km from Mahabaleshwar, another renowned hill station in Maharashtra. The city is part of Mahabaleshwar-Panchgani Eco-Sensitive Zone declared by the Ministry of Environment and Forests, Government of India (GoI) in the year 2000. (Panchgani guidebook)

Panchgani Municipal boundary has been chosen for the SFD study. It comprises an area of 6.12 Sq. Km. (PAS Project, 2016)

As per Census 2011, Panchgani has a population of 14,897 persons, with a density of 2,434 persons per sq. km. 26% of the total population (3,850 persons) lives in slums (Census, 2011). As per PAS database, population of Panchgani is 15,530 in year 2015-16 (PAS Project, 2016).

Due to it being a prominent tourist destination, the city has a high percentage of floating population.

4. Service delivery context

"A comprehensive legal framework" to regulate wastewater disposal is absent in India. At the Union level, the Water (Prevention and Control of Pollution) Act, 1974 and the Environment (Protection) Act, 1986 include provisions for wastewater disposal. State Pollution Control Boards are responsible for their implementation. These laws also prescribe option in the case for non-compliance. However, monitoring and

implementation have been extremely poor. (The Environment (Protection) Act, 1986) (The Water (Prevention and Control of Pollution) Act 1974, 1974)

The National Urban Sanitation Policy (NUSP) of Government of India (GoI), 2008 was the first comprehensive policy statement on urban sanitation in India. While the NUSP recognized the entire sanitation cycle and need for addressing faecal sludge management, seems to not have seeped down to state and local governments. (NUSP, 2008)

The advisory note on septage management in urban India, issued by Ministry of Urban Development (MoUD) in year 2013, recommends supplementing City Sanitation Plans (CSP) with Septage Management Sub-Plan (SMP). (Advisory, 2013)

The regulatory framework for onsite sanitation comes from the Municipal Act and Bye-laws. There are also legal instruments, related to environment pollution, that provide for safe collection and discharge of waste water. The Urban Local Body (ULB) is responsible for enforcing these regulations.

Panchgani Hill Station Municipal Council (PHSMC) provides emptying services of septic tanks, which is then disposed at the existing Sewage Treatment Plant (STP). (Sanitary inspector, 2016)

5. Service outcomes

A brief overview of the different sanitation systems in use at Panchgani across the sanitation service chain, and their status is given below:

Containment: In Panchgani, nearly 94% households have individual toilet facilities, of this nearly 36% are connected to the sewerage system and the rest have onsite sanitation facilities. Around 6% of households are dependent on community toilets, which are connected to the sewerage system. The sewerage network covers less than half of the population (42%). Rest of the city is largely dependent on septic tanks (58%). The size of the septic tank depends on the availability of space at the time of construction, and hence, there is no standard size; the effluent flows into drains. (PAS Project, 2016)

Emptying: In Panchgani, Septic tanks are emptied both by PHSMC and by private operators. PHSMC owns one suction truck and the private operator owns a second one, which is licensed by PHSMC. The emptied septage is discharged either at the sewage pumping station or to the nearest sewer manhole. The fee for emptying is INR 1,000 (15 USD) for septic tanks located inside the city limits. For emptying septic tanks which are located outside city limits, the charges are INR 2,000 (30 USD). On an average around 750 septic tanks are emptied once in 3-5 years out of total 1544 septic tanks in the city while others are emptied on unscheduled basis at longer duration (~ more than 6 years). Income from septage emptying is approximately INR 1,00,000 (1,494 USD) annually. (PAS Project, 2016) (Sanitary inspector, 2016) (SLB-Panchgani, 2016).

Transport: The sewerage system transports the collected wastewater to the Sewage Treatment Plant (STP). Septage is transported by truck mounted suction emptier truck and discharged into nearby manhole of sewerage network or on open ground outside city limit. (Sanitary inspector, 2016)

Treatment: PHSMC is operating 2 Sewerage treatment plants (STP) in the city, which use Anoxic bio reactor technology for treatment. Total Installed Capacity of STP (Primary + Secondary) is 1 MLD. Collected Septage is either disposed to nearby manholes of sewerage network or disposed on open ground outside city limit. Grey water/Effluent collected through drains is also treated at

existing STP. However, the adequacy of treatment capacity is only 83% of total wastewater generated. (SLB-Panchgani, 2016)

End-use/Disposal: Currently, treated wastewater is not reused in Panchgani.

According to PAS Project database, in the year 2016, 42% of the waste water of Panchgani flows through the sewerage system, out of which 35% gets treated and 7.0% remains untreated as adequacy of sewage treatment plant is only 83%.

Rest of Households toilets are connected to septic tanks (58%). Out of them, 28% septic tanks are safely emptied. Emptying of remaining 30% septic tanks is considered as unscheduled. The emptied septage is discharged either at the sewage pumping station or to the nearest sewer manhole.

Hence, in Panchgani, 42% of faecal sludge is safely managed while 58% is unsafely managed posing risk to environment and health. (SLB-Panchgani, 2016)

In Panchgani, FS is considered safely managed, if it is either conveyed through sewerage system and safely treated in STP or contained in septic tank from where it is emptied regularly with proper treatment. Faecal sludge which is not treated in STP or which is discharge into open ground without proper treatment is considered as unsafely managed.

6. Overview of stakeholders

The city is governed by Panchgani Hill Station Municipal Council (PHSMC) led by President and supported by 16 councillors.

PHSMC is responsible for planning, designing, and construction of sewerage network and Sewage Treatment Plant (STP). Operation and maintenance of STP is handled by private agency i.e. Aquatech Pvt. Ltd.

Maharashtra Pollution Control Board (MPCB) is responsible for waste water quality testing at STPs. Public health and sanitation service is delivered by PHSMC through the health department of the Council which is headed by the health officer. Septage management is also the responsibility of the same department. (Sanitary inspector, 2016)

Water supply is entirely handled by Maharashtra Jivan Pradhikaran (MJP), a state-wide utility. (Water Supply Engineer, 2016)

Apart from PHSMC, private emptying agency (viz. Chavhan cleaning services) is providing emptying services of septic tanks within and around the city.

Table 1: Key stakeholders (Source: Compiled by PAS Project, 2016)

Key Stakeholders	Institutions / Organizations /
Public Institutions	• Panchgani Hill Station Municipal Council (PHSMC), • Maharashtra Jeevan Pradhikaran (MJP), • Maharashtra Pollution Control Board (MPCB)
Private Sector	• Chavhan cleaning services (Septic tank emptying services) • Aquatech Pvt. Ltd. (O & M of STP)

7. Credibility of data

Two key sources of data are used: Census of India, 2011 and PAS Project, 2016. The data is verified and updated through Key Informant Interviews (KIIs) with PHSMC officials.

8. Process of SFD development

Data is collected through secondary sources. City officials were contacted on phone to conduct KIIs with relevant stakeholders, to fill in the gaps in data and to verify the data collected.

Limitations:
It is dependent on secondary data source.
Data on toilets and excreta management for commercial and institutional properties was not available and hence is not considered.

9. List of data sources

For this SFD report, primary data is collected through discussions with officials of Panchgani Hill Station Municipal Council. The secondary

data source is the Service level Benchmark (SLB) database for Panchgani city collected under PAS Project, CEPT university (www.pas.org.in) (PAS Project, 2016). The Performance assessment framework developed under PAS project is operationalized through the online SLB-PAS module, a web based system for collection and analysis of water supply and sanitation services data. It includes aspects of equity and on-site sanitation to capture the ground reality in Indian cities. All cities of the states of Gujarat and Maharashtra are using this module since year 2010.

Below is the list of data sources used for the production of SFD.

Published reports and books:

- PAS Project database, 2016 (pas.org.in)
- Census of India 2011, House listing and Housing data, Government of India
- KIIs with representatives from Government agencies: PHSMC

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Abbreviations

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BIS	Bureau of Indian Standards
BOD	Biological Oxygen Demand
CEPT	Center for Environmental Planning and Technology
CPHEEO	Central Public Health & Environmental Engineering Organization
CSPs	City Sanitation Plan
DMA	Directorate of Municipal Administration
EPA	Environment Protection Act
FS	Fecal Sludge
FSM	Fecal Sludge management
FSSM	Faecal sludge and Septage management
GoM	Government of Maharashtra
GR	Government Resolution
INR	Indian Rupee
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
KIIs	Key Informant Interviews
KM	Kilo Meter
MHADA	Maharashtra Housing and Area Development Authority
MJP	Maharashtra Jeevan Pradhikaran
MLD	Million Litres per Day
MoUD	Ministry of Urban Development
MPCB	Maharashtra Pollution Control Board
MTPVD	Maharashtra Town Planning and Valuation Department
MWSSB	Maharashtra Water Supply and Sewerage Board
NUSP	National Urban Sanitation Policy
O&M	operation and maintenance
ODF	open defecation free
OSS	onsite sanitation systems
PAS	Performance Assessment System
PHSMC	Panchgani Hill Station Municipal Council
RAY	Rajiv Awas Yojana
SBM	Swachh Bharat Mission
SFD	Shit Flow Diagram
SMP	Septage Management Sub-Plan

SNA	Sujal Nirmal Abhiyan
SPS	Sewage Pumping Stations
SS	Suspended Solids
STP	Sewage Treatment Plant
UDD	Urban Development Department
ULBs	Urban Local Bodies
USD	United States Dollar
WSS	water supply and sewerage
WSSD	water supply and sanitation department
WWTP	Waste Water Treatment Plant

1 City context

1.1 Location

Panchgani is a hill station and class C municipal council in Satara district of Maharashtra state. This all season hill station is at an elevation of 1,305 meters above sea level.

Panchgani is located at 17° 55′ 30″ N Latitude and 73° 48′ 0″ E Longitude in the middle of five hills in the Sahyadri mountain ranges. It is 285 KM from Mumbai and 18 KM from Mahabaleshwar, another renowned hill station in Maharashtra. It comprises an area of 6.12 Sq. Km. (PAS Project, 2016)

Scenic Panchgani was discovered by the British during the colonial rule as a summer resort. The five hills surrounding Panchgani are topped by a volcanic plateau, which is the second highest in Asia after the Tibetan plateau. These plateaus, alternatively known as "table land", are a part of the Deccan Plateau and they were raised by pressure between the earth plates. The area has high seismic activity, with an epicentre near Koynanagar. (Panchgani guidebook)

1.2 Climate

The climate of Panchgani is pleasant throughout the year. During the coldest months of Oct- Feb, the temperature here is 20-25 °C during the day and 10-15 °C during the nights. During summer period of March-May, the temperature here is 25-30 °C during the day and 15-20°C during the night. Monsoon is usually between June-September & rainfall is approximately 65 to 80 inches. Panchgani escapes the heavy rains & fog of Mahabaleshwar & is sheltered somewhat from the East winds by Table Land. The pleasant climate makes Panchgani a popular tourist destination throughout the year. It is also famous for the strawberry farms; a Strawberry Festival is held every year in summer. The global charity initiatives of change opened "a centre for introspection and dialogue", a 68-acre campus called Asia Plateau at Panchgani in 1967. Over the past four decades, Asia Plateau has been used for holding training programmes and conferences of Initiatives of Change. (Maharashtra State Gazeteers)

1.3 Demographics

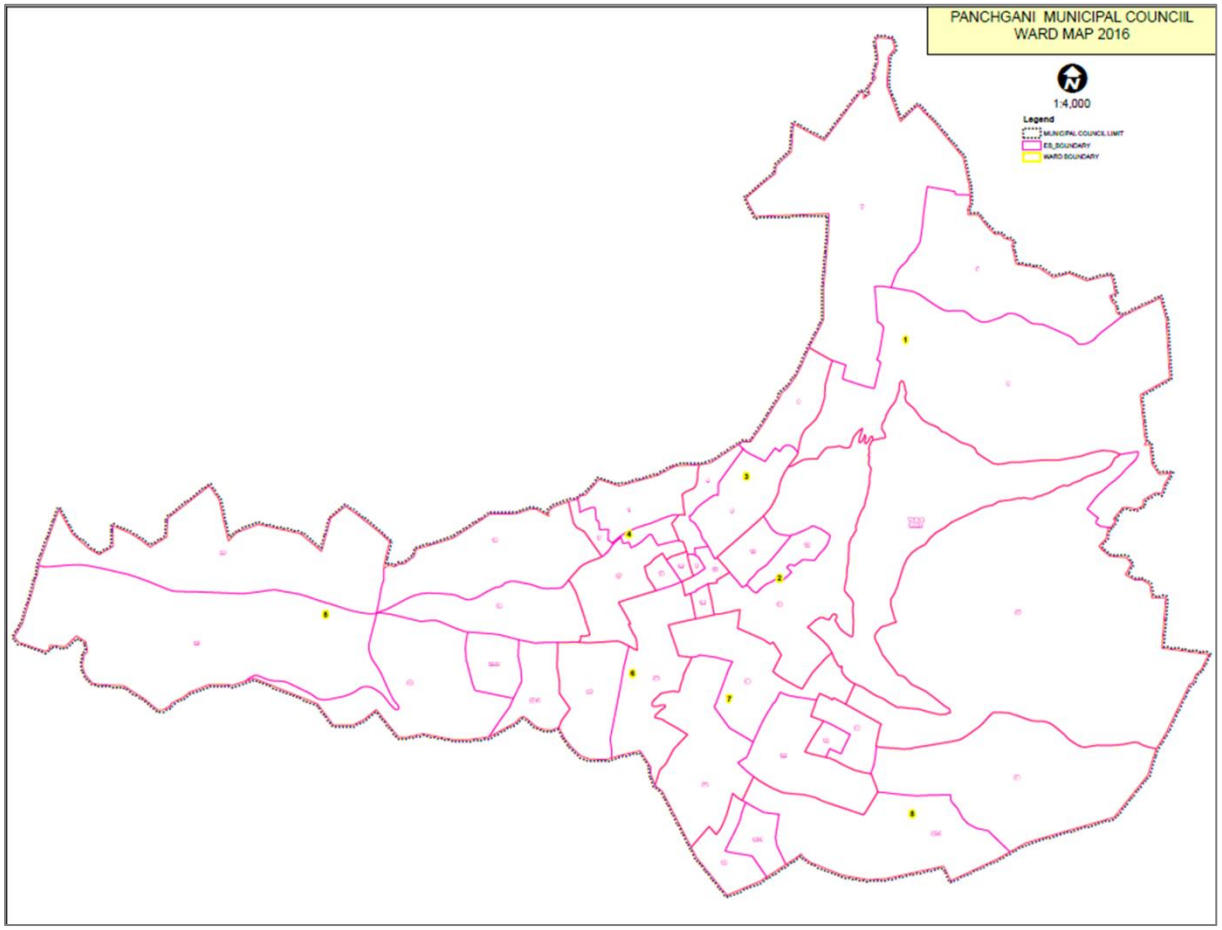
The population of the Panchgani city, as per Census 2011 is 14,897 persons. The Decadal growth rate is 12.18%. The density of the city is 2,434 persons per sq. km. The city comprises a huge floating population in the form of tourists. In 4 slum settlements, reside 3,850 persons which constitute 26% of the total population (PAS Project, 2016) (Census, 2011). As per PAS database, population of Panchgani is 15,530 in year 2015-16 (PAS Project, 2016).

The scenic city is home to nearly 40 residential schools and also a major shooting location for Indian cinema. The city is part of Mahabaleshwar - Panchgani Eco-Sensitive Zone declared by the Ministry of Environment and Forests in the year 2000.

The city is governed by Panchgani Hill Station Municipal Council (PHSMC) led by President Mrs Laxmi Karhadkar and supported by 16 councillors. The executive wing is headed by Chief Officer Smt. Vidyadevi Pol. (PAS Project, 2016).

Map 1 Location of Panchgani in Maharashtra

Map 2 Ward map of Panchgani



Source: Panchgani Hill Station Municipal Council

For this SFD report, 2 major data sources have been used. The secondary data source used is the Performance Assessment System (PAS) Project (www.pas.org.in).This data was verified and triangulated through primary data collection from Panchgani Hill Station Municipal Council (PHSMC). The discussions were carried out with city officials of PHSMC for general information on city and Sanitation services in the city.

The Performance Assessment System (PAS) Project is about developing appropriate methods and tools to measure, monitor and improve delivery of water and sanitation in cities and towns in India. The PAS Project aims to work with state and local governments to address these constraints in the two western states of Gujarat and Maharashtra in India. The project is being implemented by the CEPT University (CEPT) with funding from the 'Bill and Melinda Gates Foundation'. Service delivery level data on water and sanitation for Panchgani available on the PAS website is used to create SFD matrix.

The Performance assessment framework developed under PAS project is operationalized through the online SLB-PAS module, a web based system for collection and analysis of water supply and sanitation services data. It includes aspects of equity and on-site sanitation to capture the ground reality in Indian cities. All cities of the states of Gujarat and Maharashtra are using this module since year 2010. Consequently, other states like Chhattisgarh, Telangana, Assam and Jharkhand states have also started using PAS online module for publishing service level benchmarks.

2 Service delivery context description/analysis

2.1 Policy, legislation and regulation

Sustainable Sanitation is not only about providing toilets. The full cycle of sanitation management consists of providing access to toilets, collection/ containment of black and grey water, conveyance, treatment and final disposal and reuse through appropriate means. The judiciary has declared sanitation as a part of fundamental right to life under Article 21 of the Constitution of India. According to the Constitution of India, water and sanitation are state subjects. Statutory powers are conferred to the state for making laws on water and sanitation.

However, the legal framework governing sanitation remains underdeveloped in India; there is no specific law on sanitation. The regulatory framework relating to sanitation comprises laws, and different national and state-level policies and programmes, which are not legally binding and susceptible to modification/withdrawal.

2.1.1 National Level:

At the National level, the Water (Prevention and Control of Pollution) Act, 1974 and the Environment (Protection) Act, 1986 include provisions concerning wastewater disposal. State Pollution Control Boards are responsible for their implementation. These laws also prescribe remedies for non-compliance. However, monitoring and implementation have been extremely poor. (The Environment (Protection) Act, 1986)

The National Urban Sanitation Policy (NUSP) of Government of India (GoI), 2008 was the first comprehensive policy statement on urban sanitation in India. While the NUSP recognized the entire sanitation cycle and need for addressing faecal sludge management, this message did not percolate

down to state and local governments. This is evident from the fact that there was no proposal for septage management to the central government for funding under the JNNURM programme during 2008-12. (NUSP, 2008)

Under municipal laws, owners/occupiers of buildings are also required to comply with a number of provisions, such as ensuring that no building is constructed without drainage and separation of rainwater and wastewater should be ensured. Penalties can be levied if the owner/occupier of a property is found negligent in appropriate maintenance and emptying of the septic tank and proper removal of the faecal sludge.

The Jawaharlal Nehru National Urban Renewal Mission (JnNURM) in 2005 focused (in sanitation) on investments in large-scale centralized sewer systems. Septage management and onsite sanitation, in general, were not covered.

The National Urban Sanitation Policy (NUSP) 2008 has set up an ambitious goal of providing safe sanitation to all in urban India. The specific goals of this policy are awareness generation and behaviour change, creating open defecation free (ODF) cities and integrated citywide sanitation.

The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act was enacted in the year 2013. This act prohibits employment of manual scavengers and installation of insanitary latrines. This act has become instrumental in eradicating manual scavenging from India. (Prohibition of Employment as Manual Scavengers and Their Rehabilitation Act, 2013)

The advisory note on septage management in urban India, issued by MoUD in 2013, recommends supplementing CSPs with Septage Management Sub-Plan (SMP) as a part of the CSP, being prepared and implemented by cities. (Advisory, 2013)

The Atal Mission for Rejuvenation and Urban Transformation (AMRUT), launched in 2015, considers Septage management as one of its mission components and allocates financial support for the same. (AMRUT, 2015)

The Swachh Bharat Mission (SBM), launched in 2014, supports the goals expressed in the NUSP financially with a focus on the needs of the urban poor. Swachh Bharat Mission (SBM) was launched with a vision to ensure hygiene, waste management and sanitation across the nation. This mission will be implemented across all the cities of India and will be a tribute to Mahatma Gandhi on his 150th birth anniversary to be celebrated in the year 2019. As per the guidelines of Swachh Bharat Mission (urban) (SBMU), all the urban local bodies have to provide a toilet to all the households having no latrine within premises, and an effective solid waste management system. (SBM, 2014)

At National level, MoUD and a host of research and civil society organisations jointly drafted and signed a National Declaration on Faecal sludge and Septage management (FSSM) on 9th September, 2016. Pursuant to the Declaration, this FSSM Policy is being promulgated to address the gaps and provide the necessary directions to diverse stakeholders engaged in provision of FSSM services.

2.1.2 State Level:

Maharashtra adopted the guiding principles of NUSP in its Sujal Nirmal Abhiyan (SNA), a vision statement for the urban water supply and sanitation sector. SNA prescribes certain measures, mainly addressing community/public latrines, but falls short of addressing the entire FSM chain.

In May 2008, water supply and sanitation department (WSSD) of Maharashtra issued a Government Resolution (GR) which has guidelines for constructing toilets. The GR stated that every city should follow standards prescribed by the National Building Code, 2005. The Urban Development Department, GoM, issued a GR encouraging cities to develop plans to recycle and reuse at least 20 percent of waste water generated.

For the implementation of the Swachh Bharat Mission (SBM), Government of Maharashtra has launched "Swachh Maharashtra Mission" at the state level to run until 2nd October 2019. Swacch Maharashtra Mission in urban areas is being implemented by Urban Development Department (UDD) through a dedicated Swachh Maharashtra Mission Directorate. The Government of Maharashtra also has state level guidelines for septage management and handbook for cities to become open Defecation free. So far, around 52 cities have been declared as open defecation free by Government of Maharashtra. After self-declaration by cities, onsite validation at the district level is done by the district collector office. A State Level Validation Committee then conducts an in-depth validation as per the standard process set by the GoM. As a long term vision, GoM aims to move towards improved sanitation by encouraging access to own toilets with safe management of faecal waste. With many new toilets being built under SMMU, cities have to face increased challenges in disposing the faecal waste. For creating awareness about the need of own toilets and safe and regular management of faecal waste SMMU has identified the whole process of 'granting' ODF status to cities. In order to encourage ULBs for taking into consideration entire service chain of sanitation, GoM has developed the concept of "ODF+ Cities" and "ODF++ Cities". At the city level, the Mission is being implemented by Urban Local Bodies (ULB). (SMM, 2014)

2.1.3 City Level:

At the city level, ULB is responsible for the provision of basic services like water, sewerage and solid waste in their city. The Urban Local body is required to provide proper sanitation services including safe collection, conveyance, treatment and disposal/reuse. (PHSMC)

Panchgani was declared Open Defecation Free in the first phase of Swachh Maharashtra Mission (Urban) on 29th September 2015. (ODF, 2016)

2.2 Institutional roles

Management and delivery of urban basic services are governed by various institutions. The following are the institutions responsible for policy making, service provision and regulation of urban services. (CEPT University, 2013)

1. Urban Development Department (UDD)
2. Water supply and sanitation Department (WSSD)
3. Maharashtra Jeevan Pradhikaran (MJP)
4. Maharashtra Pollution Control Board (MPCB)
5. Panchgani Hill Station Municipal Council (PHSMC)

2.2.1 State level:

In Maharashtra, at the state level, three departments/agencies play a crucial role related to policy making and oversight of septage management in ULBs. The Urban Development Department (UDD) and its unit the Directorate of Municipal Administration (DMA) look after the overall urban

development policy, staffing, budgets and monitoring of ULB's performance. Policies regarding sanitation/septage management are also formed by this department. The Water Supply and Sanitation Department (WSSD) formulates policies and guidelines for water supply and sanitation in rural and urban areas. There is thus, some overlap in this function with UDD. The Maharashtra Water Supply and Sewerage Board (MWSSB) was established as per MWSSB Act 1976 for Rapid development and proper regularization of water supply and sewerage services in the State. MWSSB was subsequently named as Maharashtra Jeevan Pradhikaran (MJP) in 1997. MJP is responsible for Planning, designing and implementation of water supply and sewerage schemes in rural and urban areas of the state, including facilitation for necessary financial provisions.

The Maharashtra Pollution Control Board (MPCB), a state-level environmental regulator is limited to monitoring of pollution of surface water bodies. ULBs are informed about the quality of water in lakes and rivers and asked to take appropriate actions. MPCB does not have any role in regulating faecal sludge management in cities.

2.2.2 City level:

At city level, ULB is responsible for providing water and sanitation services in the city. ULBs are required to play a dual role of the service provider (providing drains, cleaning drains, constructing and maintaining public toilets and community toilets, etc) and of a regulator (ensuring compliance to building bylaws, ensuring proper discharge of waste water to drains etc.). In larger cities, there are separate departments that perform these dual roles – the Town Planning Department, Drainage Department and Public Health Department (PHSMC).

However, in performing these dual roles, ULBs are constrained by limited staff and technical capacity. Recruitment of sanitary workers (*Safai Karmacharis*) in the ULBs is guided by rules framed by the state government and ULBs do not have much flexibility.

Septic tank/pit emptying is done only when it is full, and that is once in seven to ten years. ULBs do provide the emptying service and dump the septage at nearest manhole or at sewage treatment plant for proper treatment.

The following table summarizes the roles and responsibilities of various institutions:

Table 2: Institutional roles and responsibilities (CEPT University, 2013)

Institution	Roles and responsibilities
Urban Development Department (UDD)	Allocation of budget, regular monitoring and functioning of ULBs. Approval of municipal budgets, funding of CSPs and other proposals.
Water supply and sanitation Department (WSSD)	Preparation of state urban sanitation strategies, policy, guidelines, schemes.
Maharashtra Jeevan Pradhikaran (MJP)	Key financing vehicle. Plans and constructs urban Infrastructure. However, it is not involved in the management of onsite sanitation systems.
Maharashtra Pollution Control Board (MPCB)	Advises state on pollution related standards and policies. Monitoring of treatment plants. Key regulator for pollution related issues.
Panchgani Hill Station Municipal Council (PHSMC)	Planning, designing, implementation, operation and maintenance (O&M) of urban infrastructure. Development control. Overall management of the civic services in the city. Responsible for septage emptying, transportation and disposal.

The following table shows the responsibilities for sanitation service delivery within PHSMC.

Table 3: Institutional framework for the sanitation sector (CEPT University, 2013)

Urban Service	Planning	Execution	O & M	Tariff fixation and collection
Water Supply	MJP	MJP	MJP	MJP
Sewerage	Health department PHSMC	Health department PHSMC	Health department PHSMC Aquatech Pvt. Ltd. for O & M	Tax Department PHSMC
Onsite sanitation	Health department PHSMC	Health department PHSMC	Health Department PHSMC, Private contractors	PHSMC / Private contractors
Public and Community Toilets	Health department PHSMC	Health department PHSMC	Health Department PHSMC	PHSMC

As stated in Table 3, Health department of PHSMC is responsible for the Planning and execution of sewerage and onsite sanitation services. Operation and maintenance is the responsibility of the Health department as well as ULB.

2.3 Service provision

PHSMC is the service provider for water and sanitation services in Panchgani city. The Table 4ollowing table gives an overview of existing sanitation and water supply services in the city.

2.3.1 Water supply services:

The water source for Panchgani city is Vena Lake, which is 20 km away from the city. The water supply scheme was started in 1968-69. Water supply is privatized and being operationalized by Maharashtra Jivan Pradhikaran (MJP). Total 2 MLD water flows by gravity from source. Out of total 2,638 water connections, 2,533 are metered. The metered connections are charged telescopic rates. (Water Supply Engineer, 2016)

2.3.2 Sanitation services:

City is dependent on mixed sanitation system (underground sewerage and onsite sanitation). Household toilets are connected to wither sewer system or septic tanks. There are 1,565 households which are connected to septic tanks in the city. These are connected to drains for effluent discharge. PHSMC operates 1 vacuum emptier truck of capacity 3,000 litres for the emptying of septic tanks. For septic tanks outside the city limits, a private agency i.e. Chavhan Cleaning services operates another vacuum emptier. There is also no monitoring of other private agencies involved in the septage management business.

The drainage and sewerage system of Panchgani was established during the British times. Presently, the new underground drainage system is being laid at a cost of INR 159.8 lakhs (Approx. 233000 USD) under Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT).

There are 2 sewage treatment plants in the city. One with capacity 0.35 MLD situated at Shivaji Nagar and other with 0.65 MLD capacity located at Siddharth Nagar. Anoxic bio reactor technology is being

used in STPs. Total Installed Capacity of STPs is 1 MLD. The STP is operationalized and maintained by the private agency named Aquatech Pvt. Ltd. Keeping in mind the conservation of this eco-sensitive area, one more new Sewage Treatment Plant (STP) of 1.5 MLD capacity is proposed at Gavthan area.

Exclusive data on about institutional services as schools, government buildings, etc. was difficult to obtain and hence is not included in SFD report. However, it is included in overall data which represents the services given to entire city. (Sanitary inspector, 2016)

Table 4: Water and Sanitation services in PHSMC (SLB-Panchgani, 2016)

	Description	unit	Value (2015-16)
Sanitation	Households with toilets	No.	2,534
	Households with sewer connections	No.	969
	Households with toilet connected to septic tanks	No.	1,565
	Length of sewer network	km	4
	Estimated number of septic tanks cleaned annually (ULB and Private operators)	Number	150
	Treatment capacity	MLD	1
Water Supply	Length of water supply network	km	23
	Domestic water connections	No.	2,343
	Non domestic water connections	No.	283
	Public taps	No.	12

Photo 1: Sewage treatment plant

Table 5: Key stakeholders (Source: Compiled by PAS Project, CEPT University, 2016) (PAS Project, 2016)

Key Stakeholders	Institutions / Organizations
Public Institutions	• Panchgani Hill Station Municipal Council (PHSMC), • Maharashtra Jeevan Pradhikaran (MJP), • Maharashtra Pollution Control Board (MPCB)
Private Sector	• Chavhan cleaning services (Septic tank emptying services) • Aquatech Pvt. Ltd. (O & M of STP)

2.4 Service standards

The Ministry of Urban Development (MoUD) launched the Service Level Benchmarking (SLB) initiative covering water, sanitation, solid waste management and storm water drainage in 2009. Service Level Benchmarking has been developed and published by the MoUD, which seeks to (i) identify a minimum set of standard performance parameters for the water and sanitation sector that are commonly understood and used by all stakeholders across the country; (ii) define a common minimum framework for monitoring and reporting on these indicators and (iii) set out guidelines on how to operationalize this framework in a phased manner (MoUD, 2015). However, the SLB indicators of the Government of India are focused only on conventional underground sewerage systems and onsite sanitation system is not captured in these indicators. (PAS Project, 2016)

Table 6 shows the Service Level Benchmarking (SLB) status for sewerage and water supply services in Panchgani city for the year 2015-16. (PAS Project, 2016)

Table 6: Service level benchmarking status for sewerage and for water supply indicators in 2015-16 (SLB-Panchgani, 2016)

Description	Definition	unit	Benchmark	Status FY 2015-16
Waste water Management				
Coverage of toilets	This indicator denotes the extent to which citizens have access to a toilet (whether individual or community) in a service area. The toilets would include those in the category of residential, commercial, industrial and institutional properties.	%	100	100
Coverage of sewage network services	Total number of properties with individual toilet connections to sewerage network as a percentage of total number of properties in the city.	%	100	36
Collection efficiency of the sewerage network	Quantum of wastewater collected at the intake of the treatment plant to the quantity of wastewater generated.	%	100	36
Adequacy of sewage treatment capacity	Adequacy is expressed as secondary treatment capacity available as a percentage of normative wastewater generation.	%	100	83
Reuse and recycling	Quantity of wastewater that is recycled or reused after secondary treatment as a percentage of quantity of wastewater received at the treatment plant.	%	20	0
Quality of sewage treatment	Quality of treatment is measured as a percentage of WW samples that pass the specified secondary treatment standards, that is, treated water samples from the outlet of STPs are equal to or better than the standards lay down by the GoI agencies for secondary treatment of sewage.	%	100	100
Cost recovery	The extent of cost recovery is expressed as wastewater revenues as percentage of wastewater expenses, for the	%	100	0.25

Description	Definition	unit	Benchmark	Status FY 2015-16
	corresponding time period.			
Efficiency of collection of charges	Efficiency in collection is defined as current year revenues collected, expressed as a percentage of total operating revenues, for the corresponding time period.	%	90	18
Water supply				
Coverage of water supply connections	Total number of households in the service area that are connected to the water supply network with direct service connections, as a percentage of the total number of households in that service area. Service area implies a specific jurisdiction in which service is required to be provided.	%	100	87
Per capita supply	Total water supplied to consumers expressed by population served per day.	lpcd	135	74
Metering of connections	The total number of functional metered water connections expressed as a percentage of the total number of water supply connections (including public stand post connections)	%	100	96
Non-Revenue Water (NRW)	This indicator highlights the extent of water produced which does not earn the utility any revenue. This is computed as the difference between the total water produced (ex- treatment plant) and the total water sold expressed as a percentage of the total water produced. NRW comprises: a) Consumption which is authorized but not billed, such as public standposts; b) Apparent losses such as illegal water connections, water theft and metering inaccuracies; and c) Real losses which are leakages in the transmission and distribution networks.	%	20	18.48
Continuity of supply	Continuity of supply is measured as: Average number of hours of pressurized water supply per day. Water pressure should be equal to or more than a head 7 metre (m) at the ferrule point/ metre point for the connection (7m head corresponds to the ability to supply to a single storey building)	hours	24	1.67
Quality of water supplied	Percentage of water samples that meet or exceed the specified potable water standards as defined by the CPHEEO. The sampling regimen should meet standards and norms laid down.	%	100	100

However, the current framework for service level Benchmarking under the PAS Project includes questions for onsite sanitation system. To capture the service performance of different sanitation systems, a revised set of indicators termed 'San Benchmark' have also been developed covering all components of the sanitation service chain. San Benchmarks provides a new framework for performance assessment of citywide sanitation by capturing the onsite sanitation systems along with the conventional sewerage systems.

Table 7: Revised sanitation indicators-San Benchmark (PAS Project, 2016)

Sanitation Revised Indicators	Definition	Unit	Status FY 2015-16
Mixed Indicators			
Coverage of households with adequate sanitation system	Percentage of households with individual or group toilets connected with adequate sanitation systems (sewer network/ septic tank / double pit system) to total households in the city.	%	94
Collection efficiency of sanitation system (weighted average)	Weighted average of collection efficiency of each sanitation system, weighted by share of households dependent on each sanitation system.	%	66
Adequacy of treatment capacity of sanitation system (weighted average)	Weighted average of adequacy of treatment plant capacity available for each sanitation system, weighted by share of households dependent on each sanitation system.	%	83
Extent of reuse and recycling in sanitation system (weighted average)	Weighted average of extent of reuse of treated wastewater and sludge after adequate treatment as a percentage of wastewater and sludge received at the treatment plant, weighted by share of household dependent on each sanitation system.	%	0
Quality of treatment of sanitation system	Weighted average of quality of treatment of each sanitation system, weighted by share of households dependent on each sanitation system.	%	100
Onsite and conventional Sewerage Indicators			
% of HHs toilets connected to septic tank	Percentage of households with individual or group toilets connected with septic tank to total households in the city. Households with access connection to the individual or community septic tanks should be included. Households that directly connect their outlet to open drainage system should not be considered.	%	58
% of HHs connected to septic tank as per design standards	Percentage of households with connections to septic tank constructed as per design standards guidelines of CPHEEO / NBC / IS 2470 to total number of households with septic tank in the city	%	No data
% of HHs connected to twin pit / other safe system	Percentage of households with connections to twin pit system to total number of households in the city. Households with access connection to the twin pit system should be included. Households that are connected to only single pit should not be considered.	%	0
% of septic tanks connected to settled sewer/ drains for effluent disposal	Percentage of households with septic tank connected to settled sewer / drains for effluent disposal to the total households with septic tank.	%	100
% of septic tanks connected to soak pit for effluent disposal	Percentage of households with septic tank connected to soak pit for effluent disposal to the total households with septic tank.	%	0
Collection efficiency of	Quantum of septage collected at the intake of the treatment plant / disposal point to the quantity of septage generated (as	%	22

Sanitation Revised Indicators	Definition	Unit	Status FY 2015-16
septage	per septage management advisory note, a normative standard of 230 liter per capita per year is used).		
Collection efficiency of effluent (from septic tank) and grey water	Quantum of effluent / grey water collected at the intake of the treatment plant / disposal point and disposed by soak pit to the quantity of wastewater generated (as per CPHEEO, 80% of water consumed is wastewater generated by households connected to septic tank).	%	100
% of septic tanks cleaned annually	Percentage of septic tanks cleaned annually to total number of septic tanks in the ULB.	%	10
Adequacy of septage treatment facility	Available capacity of treatment plant that can treat septage to desirable standards as a percentage of normative septage generated.	%	83
Adequacy of effluent (from septic tank) and grey water treatment facility	Available capacity of effluent treatment plant that can treat effluent / grey water to desirable standards as a percentage of normative wastewater generation.	%	83

3 Service Outcomes

Service outcome analysis is based on secondary sources. Two key sources of data are PAS Project, 2016 (PAS Project, 2016), and Census of India, 2011 (Census, 2011). The data is verified and updated by key informant interviews (KIIs).

3.1 Overview

3.1.1 Sanitation facilities

The vast majority of the households in Panchgani city have toilet facilities within the premises (94%), while 6% of the population rely on community toilets. There are 21 community toilets in the city having 48 seats for males and 55 seats for females. Across the city, there are 3 public urinals. These are mostly situated at bus stands, railway station and market areas. The Panchgani city was declared Open Defecation Free (ODF) on 29th September 2015. (PAS Project, 2016)

3.1.2 Containment

According to PAS Project 2016, 42 % of the individual toilets in PHSMC are connected directly to the sewer system, while 58% HHs toilet are connected to septic tanks. Septic tanks are further connected to drains for effluent disposal. None of the individual toilets was found to be using single or double pit latrine systems. All the community toilets are connected to the sewerage network. (PAS Project, 2016)

3.1.3 Emptying

In Panchgani, Onsite sanitation facilities are emptied by PHSMC and Private agency. Septic tanks are emptied on demand basis. Septic tanks emptied on regular basis (after every 3-5 years) is considered as scheduled emptying, whereas those septic tanks which are emptied after 6-10 years are considered as unscheduled emptying.

As the septic tanks are emptied on demand basis, the cycle of emptying varies for every septic tank. Hence it is considered as unscheduled emptying. PHSMC operates two vacuum emptier machines for septic tank emptying (One owned by PHSMC and other is private, but licensed by PHSMC). The capacity of these trucks is 3000 litres each. Citizens have to submit an application for emptying of septic tanks. (PAS Project, 2016)

The fee for emptying is INR 1,000 (15 USD) for the septic tank inside city limits. For emptying tanks outside city limits, the charges are INR 2,000 (30 USD). Income from septage emptying is approximately INR 1,00,000 (1494 USD) annually. A private operator, Chavhan cleaning services, licensed by PHSMC performs septage emptying services outside the city area. (PAS Project, 2016)

3.1.4 Transportation

This faecal sludge is considered safely managed, when it is either conveyed through sewerage system and safely treated in STP or contained in septic tank from where it is emptied regularly with proper treatment.

Out of 58% of Households toilets which are connected to septic tanks, 28% septic tanks are safely emptied regularly on scheduled basis (3-5 years).Remaining 30% septic tanks are emptied on irregular basis and at longer duration(~6-10 years). Such emptying is considered as unscheduled.

Septage is transported by truck mounted suction emptier truck and discharged into nearby manhole of sewerage network or on open ground outside city limit.

Septic tanks outlets are connected to drains. Grey water/Effluent collected through drains is also treated at existing STP. Storm water is transported through separate covered storm water drains of 16.5 Km as well as open storm water drains 5.4 Km. Storm water is not treated and directly disposed off in water body. The sewage is pumped via 2 Sewage Pumping Stations (SPS) to the STPs. (Sanitary inspector, 2016)

3.1.5 Treatment and disposal

PHSMC is operating 2 sewerage treatment plants (STP) in the city. Anoxic bio reactor technology is used in Sewage treatment plant. Total Installed Capacity of STP (Primary + Secondary) is 1 MLD. This STP treats sewage received from sewerage network and also septage collected by emptying of septic tanks. (Sanitary inspector, 2016) However, the adequacy of treatment capacity is only 83% of total wastewater generated.

The effluent from waste treatment plant meets the standards for Biological Oxygen Demand (BOD) and Suspended Solids (SS), and is discharged into the water bodies. Efficiency of treatment plant in terms of quality parameters of treated wastewater is given in appendix 4. Currently, treated wastewater is not reused in Panchgani.

3.2 SFD Matrix

The final SFD for Panchgani is presented in appendix 3.

3.2.1 SFD Matrix Explanation

In Panchgani city, around 94% of households are dependent on Individual toilets and only 6% of households are dependent on community toilets. Out of this, 42 % of households toilets are

connected to the sewerage system and rest 58% households toilets are connected to septic tanks with drains. All community toilets are connected to the sewerage system.

Only 28% septic tanks are safely emptied. Emptying of remaining 30% septic tanks is considered as unscheduled. The emptied septage is discharged either at the sewage pumping station or to the nearest sewer manhole.

Wastewater collected in the sewer system is conveyed to the treatment plant, however as the capacity of the treatment plant is less than wastewater conveyed and hence only about 35% of wastewater conveyed gets proper treatment.

Hence, in Panchgani, 42% of faecal sludge is safely managed while 58% is unsafely managed posing risk to environment and health. (SLB-Panchgani, 2016)

In Panchgani, FS is considered safely managed, if it is either conveyed through sewerage system and safely treated in STP or contained in septic tank from where it is emptied regularly with proper treatment. Faecal sludge which is not treated in STP or which is discharge into open ground without proper treatment is considered as unsafely managed.

3.2.2 Risk of groundwater contamination

The water table, in general, is deep, varying from 24 to 60 metres below ground level. The water table varies in Gavthan area and in outskirts of the city. No faecal coliform contamination is observed in ground water. The rock type is weathered basement. Sanitation facilities in the city are mostly located far from the groundwater sources. No drinking water is produced from any of the ground water sources. Hence there is very low risk of groundwater contamination in the city. (Satara district ground water profile, 2013) (Water Supply Engineer, 2016)

4 Stakeholder Engagement

4.1 Key Informant Interviews

The SFD is prepared from the PAS data base for the year 2015-16. The diagram is generated using an excel based SFD generator developed in-house at PAS. Desk based SFDs of PAS cities can be automatically generated using this tool. Every year city fills the detailed checklist on PAS web-portal for water, sanitation, storm water and solid waste management sector. Handholding support is provided to cities by All India Institute of Local Self Government (AIILSG), Mumbai and PAS team during data entry process. Data validation rules are inbuilt in the checklists to ensure that data entered by city officials is clean. This data is further verified by PAS team, after which the city is allowed to “submit” the checklist. The Key Performance Indicators (KPI) generated from PAS database is then gazetted at state level every year.

Key Informant Interviews were conducted with concerned ULB officials to verify available datat and collect more detailed data requirement.

The KIIs and data collected helped in understanding the existing situation and upcoming development plans in the sanitation sector. Due to the limitation of desk-based study all the key stakeholders engaged in sanitation services could not be interviewed in person.

5 Acknowledgements

This report was prepared by PAS Project, CEPT University. We would like to take this opportunity to thank Mr Ganesh Kasurde, Sanitary Inspector; PHSMC, Mr. Nikhil Pawar, Engineer, PHSMC and Mr. Suresh Madkey, Sanitary Inspector; PHSMC for their constant support in providing all the information needed to complete the report. Previous

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7 Appendix

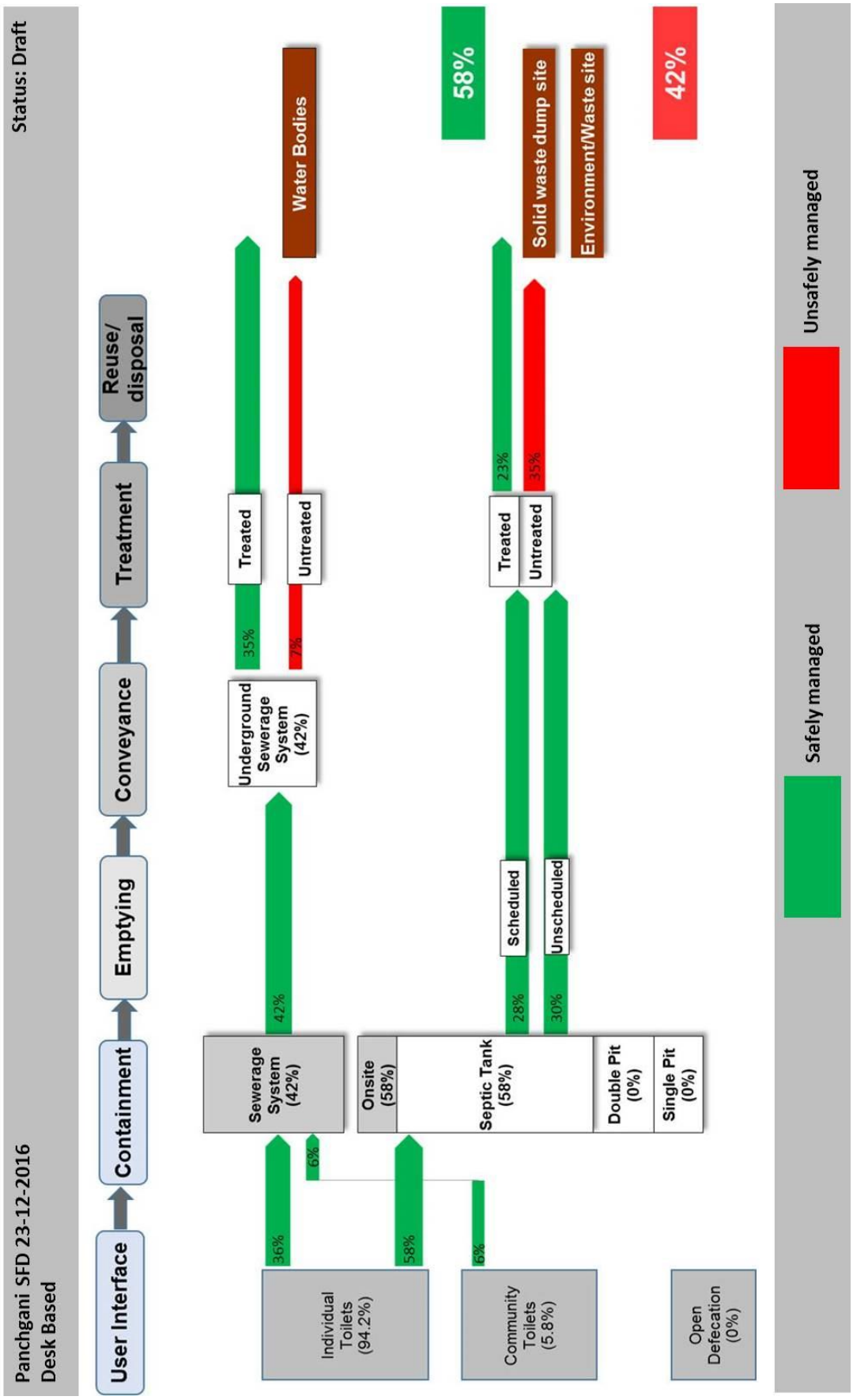
7.1 Appendix 1: Stakeholder identification

No.	Stakeholder group	In Panchgani context
1	City council / Municipal authority / Utility	Panchgani Hill station Municipal Council
2	Ministry in charge of urban sanitation and sewerage	Urban Development Department, GoM
3	Ministry in charge of urban solid waste	Urban Development Department, GoM
4	Ministries in charge of urban planning finance and economic development.	Urban Development Department, GoM
5	Service provider for construction of onsite sanitation technologies	Local masons
6	Service provider for emptying and transport of faecal sludge	Chavhan cleaning services (Septic tank emptying services)
7	Service provider for operation and maintenance of treatment infrastructure	Aquatech Pvt. Ltd. (O & M of STP)
8	Market participants practising end-use of faecal sludge end products	N/A
9	Service provider for disposal of faecal sludge	Panchgani Hill station Municipal Council Chavhan cleaning services (Septic tank emptying services)

7.2 Appendix 2: Tracking of Engagement

Name of organisation	Name of contact person	Designation	Date of engagement	Purpose of engagement
PHSMC	Mr. Ganesh Kasurde	Sanitary Inspector, PHSMC	9-5-2016	Data collection
PHSMC	Mr. Ganesh Kasurde	Sanitary Inspector, PHSMC	10-5-2016	Data collection
PHSMC	Mr. Ganesh Kasurde	Sanitary Inspector, PHSMC	11-5-2016	KII
PHSMC	Mr. Ganesh Kasurde	Sanitary Inspector, PHSMC	30-5-2016	Data collection
PHSMC	Mr. Ganesh Kasurde	Sanitary Inspector, PHSMC	16-6-2016	Data collection
PHSMC	Mr. Ganesh Kasurde	Sanitary Inspector, PHSMC	29-6-2016	KII
PHSMC	Mr.Nikhil Pawar	Engineer, PHSMC	29-6-2016	KII
PHSMC	Mr. Ganesh Kasurde	Sanitary Inspector, PHSMC	4-7-2016	Data collection

7.3 Appendix 3: SFD matrix



7.4 Appendix 4: Quality test result of sewage treatment plant of Panchgani city

HORIZON SERVICES
Analytical Laboratory

Lab Approved by MoEF, New Delhi. Lab NABL Accredited - Chemical Field.

"Shree", K 3/4, S. No. 10, Erandawane Housing Society, Opposite Deenanath Mangeshkar Hospital, Pune 411 004.
• Tel.: 020 - 25460202, 25460203, 25460023, 25460033. • Email : kmn@hespl.co.in / md@hespl.co.in • www.hespl.co.in

ANALYSIS REPORT

F/LAB/04/01/17.12.2012

CLIENT'S NAME & ADDRESS		
Aquatech Solutions Pvt. Ltd Kothrud Pune	REPORT NO	HS/LAB/WA/1130A
	DATED	5/11/2016
	LAB REFERENCE NO	HS/LAB/WA/630A
	DATE OF SAMPLING	02/11/2016
	DATE OF ANALYSIS	02/11/2016

DETAILS OF SAMPLE	SAMPLE COLLECTED BY	NATURE	LOCATION
Domestic water Sample	The Client	Untreated / Treated	0.65 MLD STP Panchgani

RESULTS OF ANALYSIS

SR NO	DESCRIPTION	UNIT	RESULT	
			Untreated	Treated
1	pH	---	7.42	7.68
2	Suspended Solids	mg/lit	205.00	31.00
3	Total Dissolved Solids	mg/lit	1860.00	1136.00
4	Chemical Oxygen Demand	mg/lit	325.00	81.00
5	Biochemical Oxygen Demand	mg/lit	178.00	34.00
6	Oil & Grease	mg/lit	8.00	NIL

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ANALYSIS REPORT

F/LAB/04/01/17.12.2012

CLIENT'S NAME & ADDRESS		
Aquatech Solutions Pvt. Ltd Kothrud Pune	REPORT NO	HS/LAB/WA/1134A
	DATED	5/11/2016
	LAB REFERENCE NO	HS/LAB/WA/631A
	DATE OF SAMPLING	02/11/2016
	DATE OF ANALYSIS	02/11/2016

DETAILS OF SAMPLE	SAMPLE COLLECTED BY	NATURE	LOCATION
Domestic water Sample	The Client	Untreated / Treated	0.35 MLD STP Panchgani

RESULTS OF ANALYSIS

SR NO	DESCRIPTION	UNIT	RESULT	
			Untreated	Treated
1	pH	---	7.21	7.62
2	Suspended Solide	mg/lit	167.00	27.00
3	Total Dissolved Solids	mg/lit	1759.00	1035.00
4	Chemical Oxygen Demand	mg/lit	342.00	71.00
5	Biochemical Oxygen Demand	mg/lit	164.00	30.00
6	Oil & Grease	mg/lit	7.00	NIL

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