

# **SFD Report**

## **Itahari Nepal**

### **Final Report**

This SFD Report – Intermediate SFD level - was prepared by Environment and Public Health Organization (ENPHO)

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SFD Report Itahari, Nepal, 2018

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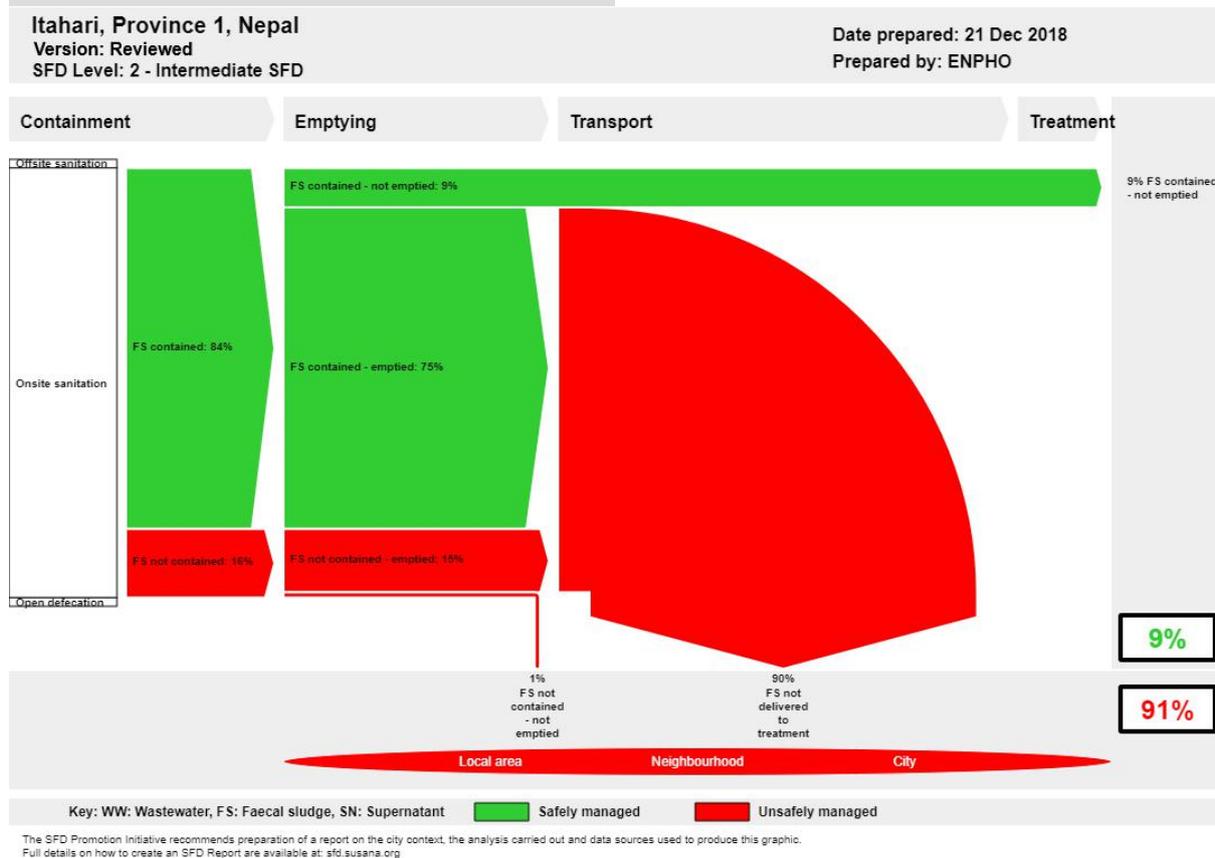
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### 1. The SFD Graphic



### 2. Diagram information

**SFD Level:**

Intermediate

**Produced by:**

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### 3. General city information

Itahari Sub-Metropolitan is the largest city in Sunsari District located in the Province No.1 of south-eastern Nepal. The municipality was established in 1997 and was declared sub-metropolitan in 2014 after merging its adjoining Village Development Committees (VDCs) like Khanar, Ekamba, Pakali and Hansposa (nepaloutlook.com, 2018).

The total population of the sub-metropolitan was 1,40,517 living in 33,794 households

extended in the area of 93.78 square kilometres and the population growth rate is 6.23 (MOPE, 2017) .Itahari sub-metropolitan receives 41.6% of inter-district migration in the Tarai towns. The city is expanding at a higher rate as it is located at prime location in the junction of major highway and other cities like Dharan and Biratnagar.

The geographical position of the sub-metropolitan is 26°39'16.84" N and 87°16'59.18" E at the elevation of 110 meters from Mean Sea Level (MSL). It has a warm and temperate climate with an average mean daily temperature of 24.6°C. The average maximum and minimum daily temperatures were 30.2°C and 19°C recorded from 1985 to 2017. The average total precipitation was 1891 mm per year where it receives its 80% of rainfall from June to September. The maximum and minimum precipitation were recorded during the month of July and November with 530.8 mm and 5.9 mm respectively (Climate-Data.org, n.d.) . It is a flood-prone area of the Tarai region that has been aggravated with poor drainage and waterlogging (Bhandari, 2018).

#### 4. Service outcomes

Overview of different sanitation technologies across the sanitation service chain is as follows:

**Containments:** The sub-metropolitan does not have municipal sewer network, thus every household rely on onsite sanitation system. The majority of households with 49% have fully lined tanks without any overflow or outlet. Similarly, in the peri-urban area, 49% of households have lined pit with semi-permeable walls and open bottom. The rest of the population rely on septic tanks (1%) and unlined pits (1%).

**Emptying and Transportation:** A traditional manual scavenging is predominant means of emptying while demand for mechanized emptying is increasing in the core city areas. There is no provision of regular emptying and containments get emptied whenever there is either overflow or blockages. Currently, two private mechanized emptying entrepreneurs have been providing service in the city.

**Treatment and Disposal/End Use:** Faecal sludge treatment facility does not exist in the sub-metropolitan. The sludge from manually emptied containments is dumped in a pit on the land owned by household's whose containment have been emptied. While the private entrepreneurs disposed of collected FS in the landfill site and occasionally applies in the farm land on the request of farmers.

#### 5. Service delivery context

Access to drinking water and sanitation has been defined as basic fundamental rights of every citizen by the constitution of Nepal. Several policies have been in placed to accomplish the sanitation need of people. Particularly, NSHMP 2011 has proved as an important strategic document for all stakeholders to develop uniform programs and implementation mechanism at all level. It strengthens institutional setup with the formation of water and sanitation coordination committee at every tier of government to actively engage into sanitation campaign. The document adopted sanitation facilities as improved, basic and limited in line with WHO/UNICEF guideline. The sanitation campaign throughout the country was focused to achieve universal access to improved sanitation.

The draft Sector Development Plan (SDP) has envisioned the delineation of roles and responsibility of federal, provincial and local

government in an aim to initiate sustainability of Open Defecation Free (ODF) outcomes from sanitation campaign and way forward to post ODF. It mainly emphasized sector convergence, institutional and legal reforms, and capacity development of the service providers. Together, with a commitment to Sustainable Development Goal (SDG) and promulgation of Total Sanitation Guideline 2017, it assists the service provider with clear indicators and targets to be achieved. The latest outcome, specifically to manage Faecal Sludge Management (FSM) in the country is the Institutional and Regulatory Framework for Faecal Sludge Management. The framework envisaged featuring of FSM on national policies through the federal government and issuing policy directives at local level along with enhancing the capacity of the service providers. The overall planning, implementation and regulating of FSM service chain have been authorized to local government. In this regard, the local government can develop a partnership with either private sector or water and sanitation user committee for effective service delivery.

#### 6. Overview of stakeholders

Based upon the regulatory framework for FSM, the major stakeholders for effective and sustaining service delivery are as presented in Table 1.

**Table 1: Overview of stakeholders**

Key Stakeholders	Institutions / Organizations /
<b>Public Institutions</b>	National Planning Commission, Ministry of Water Supply and Sanitation, Ministry of Environment and Population, Ministry of Federal Affairs and General Administration, Department of Water Supply and Sewerage, Department of Environment, Local Government (Municipal Council)
<b>Non-governmental Organizations</b>	Environment and Public Health Organization (ENPHO)
<b>Private Sector</b>	Enviro care concern pvt. Ltd., Eastern Sewerage and Transportation Hygiene, JB Rai Sanitation Services
<b>Development Partners, Donors</b>	ADB

## 7. Process of SFD development

The data on the sanitation situation is collected through a household survey (ENPHO, 2015). The community mobilizers from the sub-metropolitan were mobilized after providing the orientation on sanitation technologies, objectives of the survey and using mobile application for the survey. Also, KIIs were conducted with officers from the sub-metropolitan, private emptying entrepreneurs to understand the situation across the service delivery chain.

For the preparing of SFD graphic, initially, a relationship between sanitation technology used in a questionnaire survey and SFD PI was made. Then, data were fed in the graphic generator to produce the SFD graphic.

## 8. Credibility of data

The major data were collected from random household sampling. All together 380 households were surveyed from all the wards of the sub-metropolitan. However, the data on sanitation technologies in the industrial areas of the sub-metropolitan was not available. The primary data on emptying and transportation was validated with KII from private entrepreneurs. The overall data and findings were shared with the sub-metropolitan for their feedbacks.

Major limitation during the collection of data are the types of containments whether it is lined or unlined is based upon the responses from the respondent.

## 9. List of data sources

Bhandari, D. U. M. G. G. K. B. P. L. K. P., 2018. Nepal flood 2017: Wake up call for effective preparedness and response, s.l.: s.n.

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nepaloutlook.com, 2018. Nepal Outlook .com : A data Platform. [Online]

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<http://nepaloutlook.com/municipality-itahari-sub-metropolitan-city> [Accessed 05 12 2018].

Itahari Sub-metropolitan, Nepal, 2018

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## Abbreviations

ADB	Asian Development Bank
CBS	Central Bureau of Statistics
DWSS	Department of Water Supply and Sewerage
ENPHO	Environment and Public Health Organization
FS	Faecal Sludge
FSM	Faecal Sludge Management
GON	Government of Nepal
IRF FSM	Institutional and Regulatory Framework for Faecal Sludge Management
KII	Key Informant Interview
KUKL	Kathmandu Upatyaka Khanepanu Limited
MOF	Ministry of Finance
MOFAGA	Ministry of Federal Affairs and General Administration
MOPE	Ministry of Population and Environment
MOPPW	Ministry of Physical Planning and Works
MOWSSS	Ministry of Water Supply and Sanitation
MSL	Mean Sea Level
NPC	National Planning Commission
NRWSSSP	National Rural Water Supply and Sanitation Sector Policy
NSHMP	National Sanitation and Hygiene Master Plan
NSP	National Sanitation Policy
ODF	Open Defecation Free
OSS	On-site sanitation System
PPP	Public Private Partnership
SDG	Sustainable Development Goal
SDP	Sector Development Plan
STWSSP	Small Town Water Supply and Sanitation Project
UNCIEF	United Nations Children's Fund
UWSSP	Urban Water Supply and Sanitation Sector Policy
VDC	Village Development Committee
WHO	World Health Organization
WSSP	Water Supply Sector Policy
WSUC	Water and Sanitation Users Committee

## 1 City context

Itahari Sub-Metropolitan is the largest city in Sunsari District located in the Province No.1 of south-eastern Nepal (Figure 1). It is the main transportation junction of eastern Nepal situated at the centre of the east-west Mahendra Highway and north-south Koshi Highway. The municipality was established in 1997 and was declared sub-metropolitan in 2014 after merging its adjoining Village Development Committees (VDCs) like Khanar, Ekamba, Pakali and Hansposa (nepaloutlook.com, 2018).

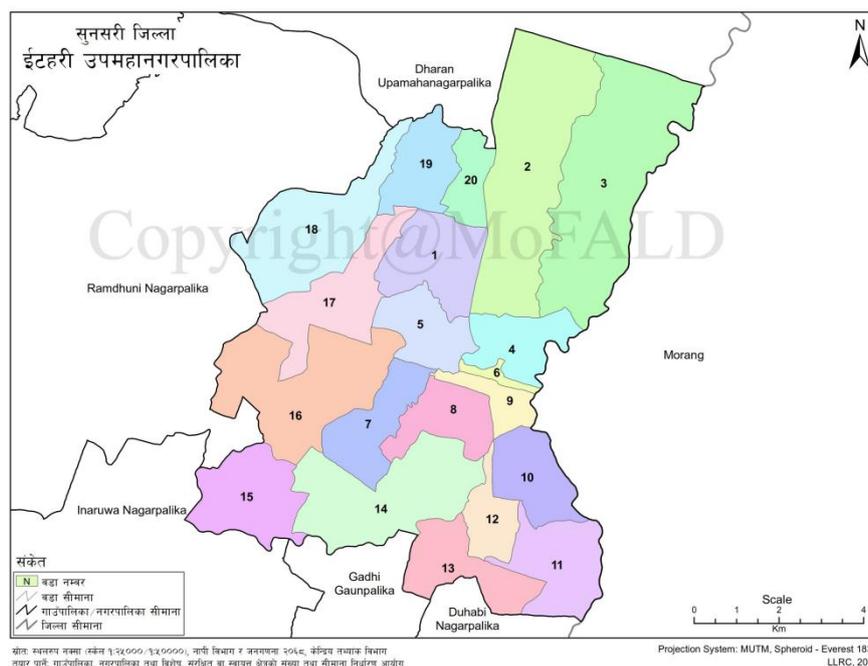


Figure 1: Boundary map of Itahari sub-metropolitan (source: MoFALD)

The total population of the sub-metropolitan was 1,40,517 living in 33,794 households extended in the area of 93.78 square kilometres. The population growth rate is 6.23 which is very high as compared to its neighbouring municipalities such as Dharan Sub-metropolitan and Inaruwa municipality with 2.29 and 2.20 (MOPE, 2017). Inter-district migration in a quest for better opportunities and services is high in the country. Internal migrants from rural areas of other districts constituted 31.6 per cent in Kathmandu Valley towns followed by 23.3 per cent in Tarai towns and 16.9 per cent in hill towns. Itahari sub-metropolitan receives 41.6% of inter-district migration in the Tarai towns (CBS, 2014).

The geographical position of the sub-metropolitan is 26°39'16.84" N and 87°16'59.18" E at the elevation of 110 meters from Mean Sea Level (MSL). It has a warm and temperate climate with an average mean daily temperature of 24.6°C. The average maximum and minimum daily temperatures were 30.2°C and 19°C recorded from 1985 to 2017. The average total precipitation was 1891 mm per year where it receives its 80% of rainfall from June to September. The maximum and minimum precipitation were recorded during the month of July and November with 530.8 mm and 5.9 mm respectively (Climate-Data.org, n.d.). It is a flood-prone area of the Tarai region that has been aggravated with poor drainage and waterlogging (Bhandari, 2018).

## 2 Service Outcomes

The National Census Report 2011 revealed among 18,270 households in Itahari Municipality, 5% of households do not have toilet facility and 94% of households have either the flush toilet or ordinary toilet while 1% HHs has not responded (CBS, 2014). It has been declared Open Defecation Free Zone, however, there has not been a detailed assessment of types of toilet installed in the sub-metropolitan. Key informant interview with major stakeholders from the sub-metropolitan and private desludging service providers was conducted to understand the current sanitation situation and service delivery mechanism.

### 2.1 Overview

Figure 2 shows the SFD selection grid for Itahari.

List A: Where does the toilet discharge to? (i.e. what type of containment technology, if any?)	List B: What is the containment technology connected to? (i.e. where does the outlet or overflow discharge to, if anything?)									
	to centralised combined sewer	to centralised foul/separate sewer	to decentralised combined sewer	to decentralised foul/separate sewer	to soakpit	to open drain or storm sewer	to water body	to open ground	to 'don't know where'	no outlet or overflow
No onsite container. Toilet discharges directly to destination given in List B					Significant risk of GW pollution Low risk of GW pollution					Not Applicable
Septic tank					T2A2C5 Low risk of GW pollution					
Fully lined tank (sealed)					Significant risk of GW pollution Low risk of GW pollution					T1A3C10
Lined tank with impermeable walls and open bottom	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution	Significant risk of GW pollution Low risk of GW pollution					Significant risk of GW pollution Low risk of GW pollution
Lined pit with semi-permeable walls and open bottom	Not Applicable									T2A5C10
Unlined pit										T1A5C10
Pit (all types), never emptied but abandoned when full and covered with soil										T2A8C10 Low risk of GW pollution
Pit (all types), never emptied, abandoned when full but NOT adequately covered with soil										Significant risk of GW pollution Low risk of GW pollution
Toilet failed, damaged, collapsed or flooded										
Containment (septic tank or tank or pit latrine) failed, damaged, collapsed or flooded										
No toilet. Open defecation	Not Applicable									Not Applicable

Figure 2: The SFD selection grid for Itahari Sub-metropolitan

### 2.1.1 Sanitation facilities

This section presents on existing sanitation facilities in institutions, commercial establishments and industrial area.

**Public Toilets:** There are all together three public toilets installed and operated in market place of the sub-metropolitan. Public toilets in Hatiya (market) Line in ward 9 and Tarahara hatyia (market) in ward 20 are managed by the sub-metropolitan. Whereas, the public toilet located at the buspark was installed and managed by the Buspark Committee (Itahari Sub-metropolitan, 2017).

**School Sanitation:** There are all together 100 schools and five colleges in the sub-metropolitan as shown in Table 1. Some schools lack of improved facilities such as drinking water and sanitation.

**Table 1: Number of Schools and their category in Itahari Sub-metropolitan**

S.N.	School Category	Class	Quantity
1	Preliminary Child Development Center		62
2	Fundamental Education Level School	Class 1 to 5	12
		Class 6 to 8	9
3	Secondary School (General)	Class 1 to 10	7
		Class 11 to 12	6
4	Secondary School (Technical)	Class 1 to 10	1
5	Traditional Religious School	Class 1 to 5	3
	Total		100

Source: Itahari Sub-metropolitan

**Commercial areas:** Itahari sub-metropolitan is a junction for East West Highway, Dharan Sub-metropolitan and Biratnagar Metropolitan. Thus, the junction and its peripheral areas are commercial centres. There are more than 6,000 business firms from micro to large scale registered in the sub-metropolitan office. Majority of these firms are rented in the houses reside by the local thus there is no provision of separate sanitation system for these firms.

**Institutional Sanitation:** The sub-metropolitan is home to 28 different government institutions. Similarly, there are 26 health institutions providing health care services which include from primary health post to private hospitals. It was informed that the size of the containments are bigger and also emptying frequency is higher.

**Industrial Sanitation:** Khanar is an industrial area of the sub-metropolitan. Agro, beverage, brick kilns and dairy industries were installed in the area. However, there was no data on the industrial sanitation.

### 2.1.2 Containments

The sub-metropolitan does not have municipal sewerage facilities thus every household rely on onsite sanitation systems. The majority of households with 49% have constructed fully lined rectangular tanks without outlet and overflow which are locally known as septic tanks (Figure 3). However, only 1% of households have double chambered septic tank connected to soak pit. In peri-urban and rural areas, 49% of households have constructed pits with concrete rings and open bottom (Figure 4) and 1% of households have constructed unlined pits.



Figure A



Figure B

Figure 3: A fully lined tank without overflow and outlet, Figure A: An outer view and Figure B: Inner view



Figure 4: A concrete ring pit

The size of containments was calculated based upon field survey and information provided by respondents. It was observed that the size of containments was determined by the financial capacity and availability of land irrespective of a number of users and emptying frequencies. Figure 5 shows the volume of containments and family size, where the correlation coefficient is -0.15 indicating a weak negative relation.

The average size of the septic tank was 5,645 litres with maximum 6,338 litres. Similarly, the average size of the fully lined without outlet and overflow was 17,496 litres with maximum and minimum of 45,900 litres and 1,100 litres respectively. While the average size of the lined pit with semi permeable walls and the open bottom was almost consistent with 5,600 litres. The maximum and minimum size of such containments were 6,338 litres and 4,900 litres, respectively.

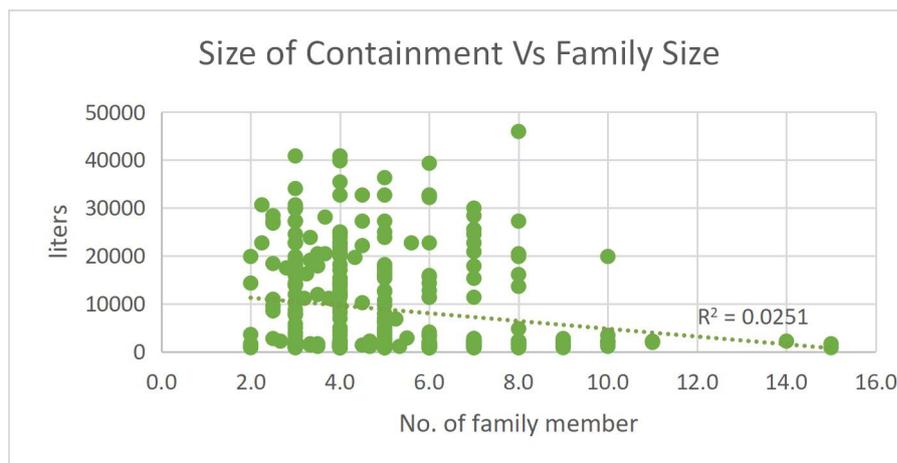


Figure 5: A graph on the size of containment with respect to family size

### 2.1.3 Emptying and Transportation

Emptying of the containments was carried out for remedying overflow and blockages instead of routine cleaning. Further 49.9% of households have never emptied their containments since installation. Most of the fully lined tanks without outlet and overflow have been using for more than 5 years while only 14% were constructed four years ago. While 70.8% of all kinds of pits have been emptied at least once after installation. The emptying interval for fully lined tanks was observed to be once every 5 years or more while almost 42% of all kinds of pits are emptied every year.

A traditional manual scavenging is predominant means of emptying containments while private mechanized emptying has been blooming in the core urban areas. Currently, two private mechanized emptying and transportation service providers have been working in the sub-metropolitan. Figure 6 shows a locally assembled mechanized suction vehicle.



Figure 6: Locally assembled mechanized emptying vehicle

A short description of private emptying entrepreneurs is listed in Table 2.

Table 2: A Short Descriptions on Private Emptying Entrepreneurs

Descriptions		
<b>Entrepreneurs</b>	Eastern Sewerage and Transportation Hygiene	JB Rai Sanitation Services
<b>Basic Service Charge</b>	NRs. 1,500 to 2,000 per trip (USD 13.2 to 17.6)	NRs. 2,500 to 3,000 per trip (USD 22.0 to 26.4)
<b>Additional Charge</b>	Additional to distance	Additional to Distance
<b>Average trips per day</b>	2	6
<b>Number of trucks</b>	2	3
<b>Volume of trucks</b>	8,000 litres and 5000 litres	2,500 litres
<b>Volume of sludge per trip</b>	5,000 litres	2,500 litres

Source: (KII 1, 2015)

### 2.1.4 Treatment and Disposal/ End Use

There is no treatment facility for faecal sludge in the sub-metropolitan. The sludge from manually emptied containments is dumped into the newly dug pit in their farm land. The sludge transported by the private mechanized emptying vehicles are dumped in the landfill site. In some occasion, the collected sludge is directly used in farmland on the request of farmers. The sub-metropolitan has planned to develop a co-composting unit in its ongoing composting chamber for solid waste management shown in Figure 7.



Figure 7: An ongoing construction for compost plant

## 2.2 SFD Matrix

Figure 8: The SFD matrix

Itahari, Province 1, Nepal, 21 Dec 2018. SFD Level: 2 - Intermediate SFD  
Population: 140517  
Proportion of tanks: septic tanks: 100%, fully lined tanks: 100%, lined, open bottom tanks: 1

System label	Pop	F3	F4	F5
<b>System description</b>	Proportion of population using this type of system	Proportion of this type of system from which faecal sludge is emptied	Proportion of faecal sludge emptied, which is delivered to treatment plants	Proportion of faecal sludge delivered to treatment plants, which is treated
<b>T1A3C10</b> Fully lined tank (sealed), no outlet or overflow	49.0	87.0	0.0	0.0
<b>T1A5C10</b> Lined pit with semi-permeable walls and open bottom, no outlet or overflow	35.0	92.0	0.0	0.0
<b>T2A2C5</b> Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	1.0	100.0	0.0	0.0
<b>T2A5C10</b> Lined pit with semi-permeable walls and open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	14.0	93.0	0.0	0.0
<b>T2A6C10</b> Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	1.0	75.0	0.0	0.0

### 2.2.1 SFD Matrix Explanation

The sanitation technologies and the corresponding percentage of the population using those systems are shown in Table 3.

**Table 3: Relationship Established with sanitation Technologies Defined by SFD Promotion Initiative with Sanitation Technologies Identified at Local Context**

S.N.	Sanitation Technologies		SFD Reference Variable	Percentage of Population
	Identified by Community Mobilizers	Defined by SFD Promotion Initiative		
1	Septic Tank connected to soak pit and exist source of drinking water point within 10m of it	Septic tank connected to soak pit, where there is a 'significant risk' of groundwater pollution	T2A2C5	1%
2	Fully lined rectangular tanks without any outlet and overflow	Fully lined tank (sealed), no outlet or overflow	T1A3C10	49%
3	Circular Pits with concrete rings and open bottom and source of water does not exist within 10m	Lined pit with, semi-permeable walls and an open bottom, no outlet or overflow	T1A5C10	35%
3	Circular Pits with concrete rings and open bottom and exist source of drinking water within 10m of it	Lined pit with, semi-permeable walls and an open bottom, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	T2A5C10	14%
4	Unlined rectangular Pits without an outlet and open bottom and unimproved pits	Unlined pit, no outlet or overflow, where there is a 'significant risk' of groundwater pollution	T2A6C10	1%

Source: SFD PI

The data on proportion of faecal sludge emptied from different containments were obtained from the survey. Each respondents whose containments have been emptied were asked whether all FS was emptied or not, and if not what amount is left inside of it. The mean portion of emptied FS was calculated as shown in Table 4.

**Table 4: Types of containments, frequency of portion FS emptied and its mean**

Types of Containment	Portion Emptied	Frequency	Mean
Fully Lined Tank	50%	5	87%
	60%	4	
	75%	8	
	80%	3	

	100%	32	
Lined pits with semi-permeable walls and open bottom	50%	3	92%
	60%	4	
	65%	1	
	70%	1	
	75%	5	
	80%	9	
	100%	67	
Lined pits with semi-permeable walls and open bottom and significant risk to groundwater	65%	2	93%
	70%	1	
	75%	1	
	80%	5	
	90%	1	
	100%	25	
Septic tank connected to soak pit with significant risk to ground water	100%	2	100%
Unlined Pit with significant risk to groundwater	75%	3	75%

Source: ENPHO, 2015

### 2.2.2 SFD Graphic

Figure 9 shows the SFD graphic for Itahari. According to the SFD graphic, 91% of the excreta are unsafely managed while 9% of the excreta are safely managed.

#### Offsite Systems

Nepal Demographic and Health Survey has reported that 6.9% of urban population in the country have offsite sanitation systems connected to piped sewer networks (Ministry of Health et al., 2017). However, the sub-metropolitan only have a stormwater drainage system in the city and connecting onsite sanitation to it is strictly prohibited.

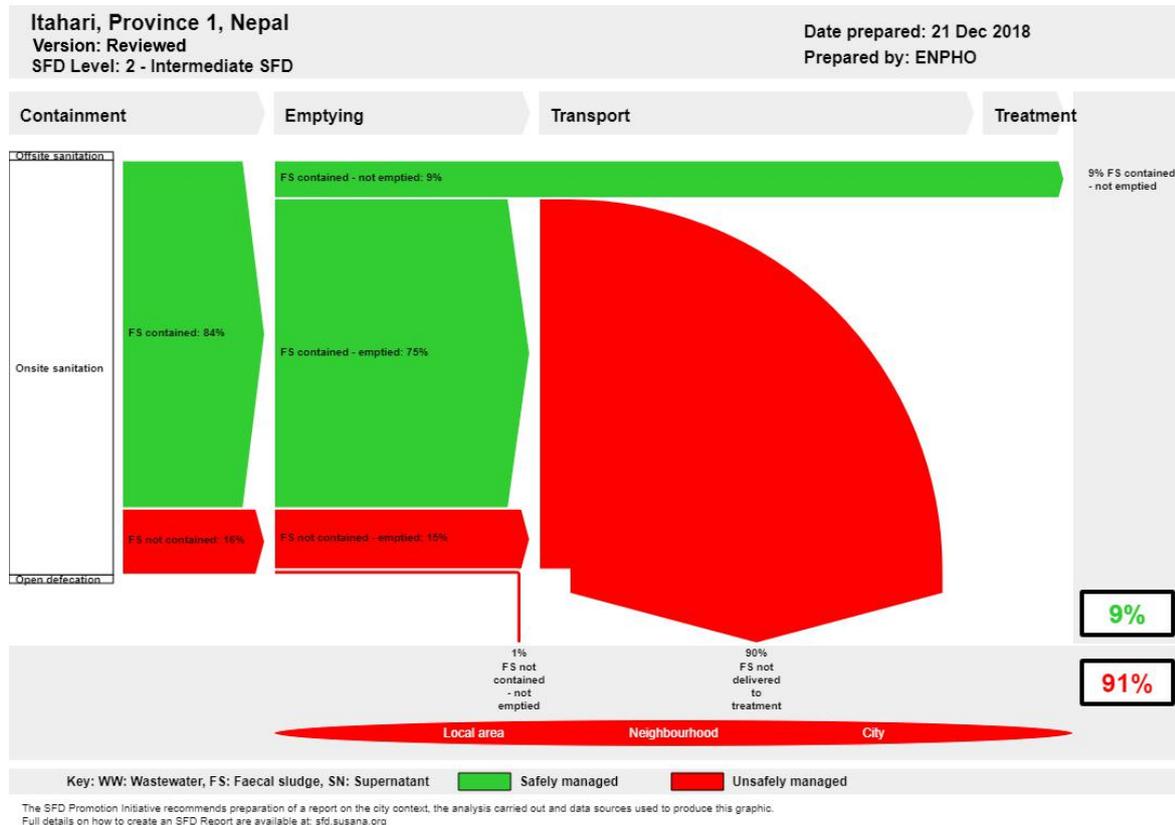


Figure 9: SFD graphic for Itahari Sub-metropolitan

### Onsite Systems

All the population depends on onsite sanitation systems, out of which 49% and 35% use fully lined tanks without outlet and overflow (T1A3C10) and lined pits with semi-permeable walls and open bottom without outlet and overflow (T1A5C10). Together these containments contributed to 84% of onsite sanitation with FS contained inside of it. Out of this, 75% of FS is emptied and not delivered to treatment plant. While 9% of FS is not emptied and stored in the containments which remained safe.

Similarly, 14%, 1% and 1% of the population use lined pits with semi-permeable walls and open bottom (T2A5C10), unlined pits (T2A6C10) and septic tanks with soak pits (T2A2C5) located in areas with a significant risk to groundwater pollution, respectively. These systems contribute to 16% of FS not contained where 15% is emptied but not transferred into treatment plant. While only 1% of FS not contained is not emptied which either remained in containment or infiltrated into ground.

### Open Defecation

The sub-metropolitan has been declared open defecation indicating all the households have access to a toilet.

Descriptions of the variables related to the outcome of the SFD are summarized in Table 5.

Table 5: Descriptions of variables used in the SFD

System Type	Variables	Description	Percent of Population
Offsite	WW from offsite sanitation system	WW from offsite sanitation system	0%
Onsite	FS Contained Not Emptied	FS from fully lined tanks (T1A3C10) and lined pits with semi-permeable walls and open bottoms without significant risk to ground water (T1A5C10) which are not emptied	9%
	FS Contained Emptied _Not Delivered to Treatment Plant	FS from fully lined tanks (T1A3C10) and lined pits with semi-permeable walls and open bottoms without significant risk to ground water (T1A5C10) which are emptied	75%
	FS Not Contained Emptied _Not Delivered to Treatment Plant	FS not contained, emptied but not delivered to treatment from onsite sanitation systems (T2A5C10, T2A6C10 and T2A2C5) which are located in areas where there is a high risk of groundwater pollution	15%
	FS Not Contained Not Emptied	FS not contained and not emptied from onsite sanitation systems (T2A2C5, T2A5C10 and T2A6C10) which are located in areas where there is a high risk of groundwater pollution	1%
Open defecation	Open defecation	With no user interface, users defecate in water bodies or on open ground, consequently, the excreta is not contained	0%

### 2.2.3 Risk of Groundwater Contamination

The land characteristics of the tarai region in the country is recent post Pleistocene alluvial deposits forming piedmont plain (JRM, 2009) . The alluvial deposits mostly consist of well-sorted to semi-sorted clay, silt, gravel and sand. The shallow aquifers in Nepal are vulnerable to pollution as the surface sediments are sandy and permeable (British Geological Survey, 2001) . Thus, groundwater in the sub-metropolitan could be assumed as vulnerable to contamination from unmanaged sanitation systems.

The core urban areas of the sub-metropolitan are served by piped drinking water supply whereas the households in the peri-urban and rural area depend on shallow ground water. In an aggregate, 46% of total households rely on shallow tube well installed at their housing premises. However, the record in the sub-metropolitan shows 52% of the households rely on shallow tube well/hand pumps for drinking water (Itahari Sub-metropolitan, 2017). The survey shows that 27% of households have installed their sanitation facility within the periphery of the drinking water source. Moreover, 27% and 12% of households with unlined pits have a source of drinking water (Shallow Tube Well) within the distance of 5m and 10m respectively.

#### 2.2.4 Discussion of Certainty/uncertainty levels of associated data

There was a lack of secondary data on the sanitation systems in the sub-metropolitan. Also, the Central Bureau of Statistics (CBS) data from 2011 provides only information about whether the sanitation system is flush or pour flush system. Thus, a household survey was conducted through mobilization of community mobilizer from the sub-metropolitan. All the data are based on the responses and direct observation by the enumerators. Also, the data on emptying and transportation are triangulated with key informant interviews with private emptying entrepreneurs. However, data on ground water table was not available.

### 3 Service delivery context

#### 3.1 Policy, legislation and regulation

##### 3.1.1 Policy

Access to drinking water and sanitation has been defined as basic fundamental rights entitling concurrent powers to Federal and Provincial governments to deliver and manage sanitation services by the constitution of Nepal 2015. Similarly, it has authorized local governments (municipalities) for planning and implementing basic health and sanitation programs in its jurisdiction (GON, 2015).

Earlier, National Sanitation and Hygiene Master Plan (NSHMP) 2011,, in an aim to foster sanitation movement in the country, has been a key guiding document in the sector to achieve a millennium development goal.. It was formulated based on National Sanitation Policy (NSP) 1994, Water Supply Sector Policy (WSSP) 1998, National Rural Water Supply and Sanitation Sector Policy (NRWSSSP) 2004 and Urban Water Supply and Sanitation Policy (UWSSP) 2009. NSHMP basically focused on Open Defecation Free as an indicator of universal access to improved sanitation with due consideration on sustainable changes on hygiene behaviours including proper use of toilet and waste management practices in the urban and rural areas. It also provided with strategic direction for all the concerned stakeholders to formulate an enabling environment for harmonizing the efforts of stakeholders, maintaining uniformity and standards and developing institutional arrangement at all levels of government (NPC, 2011). It strengthens institutional setup with the formation of water and sanitation coordination committee at every tier of government in a participatory approach. Also, it defined what sanitation facility should be promoted to achieve universal access to improved sanitation.

Upon achieving good progress towards the sanitation coverage after the endorsement of NSHMP 2011, the Government of Nepal (GON) drafted Nepal Water Supply, Sanitation and Hygiene Sector Development Plan (SDP 2016-2030) in 2016 emphasizing sector convergence, institutional and legal reforms, capacity development of the sector institutions and establishing coordination and harmonization. The draft SDP has classified service system and delineated roles and responsibility accordingly for effective and sustainable service delivery as shown in Table 6.

**Table 6: System classification and delineation of roles and responsibility**

System Classification		Minimum Key HR Required	Regulation & Surveillance	Financing & Construction	Ownership of System	Service Delivery	
Size	Sanitation					Provision	Production
<b>Small</b>	Onsite sanitation	Water Supply and Sanitation Technician (WSST)	Federal and or Provincial Government	User+ / community+ / other			
<b>Medium</b>	Septage Management	Sub-engineer	Federal and or Provincial Government	Provincial+ / Local Govt+ / Community+ / Private Sector	Local Govt	Users committee / Utility manager	
<b>Large</b>	Septage or FSM Management	WASH Engineer + finance & admin staff	Federal and or Provincial Government	Provincial+ / Local Govt+ / Community+ / Private Sector	Local Govt	Utility Manager	
<b>Mega</b>	Septage/ FSM Management	WASH Engineer + finance & admin staff	Federal and or Provincial Government	Provincial+ / Local Govt+ / Community+ / Private Sector	Local Govt	Utility Manager	

Source: MoWSS, 2017

Together, with a national commitment to pursuing and achieving the Sustainable Development Goals (SDGs) by 2030, National Planning Commission (NPC) formulated targets and indicators for coordinated efforts to achieve the goals in 2017. Similarly, Total Sanitation Guideline 2017 has envisioned sustaining ODF outcomes and initiating post-ODF activities through an integrated water, sanitation and hygiene plan at every local level. It has set various indicators and remarkably redefined sanitation as management of services and facilities to safely dispose of/reuse faecal sludge, collection and treatment of solid waste and wastewater to establish the hygienic environment and promote public health (NPC, 2017).

All these above-mentioned policies and guidelines state Faecal Sludge Management (FSM) as a component of the sanitation system. Lack of concrete policies, guidelines and indicators on FSM was felt in the sector for effective planning, implementation and service delivery. Thus, through in-depth discourses on FSM, Ministry of Water Supply and Sanitation (MOWSS) through its Department of Water Supply and Sewerage (DWSS) articulated and endorsed Institutional and Regulatory Framework for Faecal Sludge Management in Urban Areas of Nepal in 2017.

The main objective of the FSM framework is to define specific roles and responsibilities of key institutions for the effective management and regulation of FSM. It is framed upon

existing laws such as Environmental Protection Act and Rules 1997, Self-Local Governance Act and Rules 1999, Environmental Standards on Effluent Discharge 2000, Nepal National Building Code 2003, and Land Acquisition Act amendment 2010 (MOWSS, 2017). The framework primarily envisioned featuring FSM in the national policy and issuing policy directives into local government to incorporate FSM in their urban planning along with strengthening and enhancing the capacity of the local government to deliver effective services. A local government has been endowed with overall responsibility to plan, implement and regulate the FSM services within its jurisdiction. The provision of ability to engage the private sector and other relevant stakeholders such as Water and Sanitation Users Committee (WSUC) in the framework reflects a participatory approach that would help in sustaining the interventions.

### 3.1.2 Institutional roles

At federal government, National Planning Commission (NPC) is responsible for planning the national sanitation programs in coordination with the respective ministry. Department of Water Supply and Sewerage under Ministry of Water Supply and Sanitation (MOWSS) is a lead authoritative agency for development and implementation of sanitation policy and programs. Earlier, the sanitation programs were implemented through its regional offices at the local level. However, at the present context with provincial and local governments entitled with power for sanitation interventions as per decentralization principles, regional offices of the DWSS has yet to be set. Alternatively, the policies formulated had to be channelized through Ministry of Federal Affairs and General Administration (MOFAGA), a ministry at federal government accredited with the role of coordination, cooperation, facilitation and monitoring and evaluation of activities undertaken by local governments; regulation and management of the civil service in the country.

Ministry of Physical Infrastructure and Development is entitled with authority for water supply and sanitation programs at the provincial government. The draft SDP has envisioned the role of provincial government as roles of regulation and surveillance on small scale sanitation systems implemented by local government whereas it is responsible to undertake implementation program of medium to mega scale sanitation interventions in coordination with federal and local government.

The Constitution of Nepal 2015 and Local Government Operation Act 2017 enabled local government to implement sanitation interventions to enhance public health and living standards. Generally, local government in coordination and partnership with Water and Sanitation User Committee (WSUC) and developing agencies have been implementing water supply and sanitation programs. Particularly, draft SDP 2017 and IRF FSM has clearly defined roles of institutions at various tiers of government regarding sanitation and particularly FSM interventions as presented in Table 7.

**Table 7: Leading Agency in Sanitation Sector and their Roles and Responsibility**

S.N.	Agency	Government	Roles and Responsibilities
1	National Planning Commission	Federal Government	<ul style="list-style-type: none"> <li>• Formulate basic development policies and prepare periodic development plans.</li> <li>• Explore internal and external resources and recommend suggestion to GON.</li> <li>• Provide guidelines, advice and suggestions to sectoral ministries, departments, other agencies and local bodies and assist them in plans and projects.</li> </ul>
2	Department of Water Supply and Sewerage	Federal Government under the Ministry of Water Supply and Sanitation	<ul style="list-style-type: none"> <li>• Provide and ensure safe, convenient and adequate water supply to all, with sanitation as an integral component.</li> <li>• Develop policy, planning and execution and regulation of WASH Sector.</li> <li>• Particularly in FSM, develop and disseminate FSM treatment plant designs, operational guidelines, financial and technical assistance, support institutionalization of the framework in local level and strengthen institutional and management capacity of local government for effective service delivery of sanitation and FSM.</li> </ul>
3	Ministry of Infrastructure and Development	Provincial Government	<ul style="list-style-type: none"> <li>• Planning, execution of WASH Infrastructure.</li> </ul>
4	Municipality	Local Government	<ul style="list-style-type: none"> <li>• Develop a plan, implement and regulate sanitation programs.</li> <li>• IRF for FSM specific, Overall planning and regulation of FSM.</li> <li>• Provide land and access road to the purposed site for FSTP.</li> <li>• Establish the FSM committee for effective implementation.</li> <li>• Partnership with WSUG/ private sector for effective service delivery.</li> <li>• Monitoring and regulation of the services.</li> </ul>

### 3.1.3 Service provision

Urban Water Supply and Sanitation Policy 2009 has emphasized Public Private Partnership (PPP) in water supply and sanitation to improve service delivery (MOPPW, 2009) . Also, Public Private Partnership Policy 2015 encourages private sector investment on development and operation of public infrastructure services for comprehensive socio-economic development. The policy has aimed to remedy challenges such as structuring of projects, land acquisition, coordination and approval, payments to private sectors and approval for environment impact (MOF, 2015) . In this regard, Itahari Sub-metropolitan has initiated a PPP model for solid waste management since 2011. It has made an agreement with service level agreement with Enviro Care Concern Private Limited for the door to door collection of solid waste and managed it through the generation of compost out of organic waste.

Similarly, Drinking Water Rules 1998 has envisioned formation of water users committee for effective service delivery of water supply and sanitation in the community. In line with this provision, Small Town Water Supply and Sanitation Users Association has formed through the implementation of Small Town Water Supply and Sanitation Project (STWSSP) in the sub-metropolitan. However, it primarily focuses on effective service delivery of water supply. Whereas, Water Supply Management Board Act 2006, has the provision of forming water supply board to manage water supply in the big cities. Currently, Kathmandu Valley Water Supply Management Board formed under this act is responsible for water supply and wastewater management in the valley. It has issued a licence to Kathmandu Upatyaka Khanepani Limited (KUKL) for overall management (GoN, 2006) . Under KUKL, with the support of the Asian Development Bank (ADB), initiation of wastewater management is being carried out.

Particularly, IRF for FSM has the provision of private sector engagement for effective service delivery at various value chain. Though the framework is yet to officially implement in the sub-metropolitan, informal manual emptier and private mechanized emptying service providers have been engaged in the business.

### 3.1.4 Service standards

The sanitation service standards have been proposed in the draft Nepal Water Supply, Sanitation and Hygiene Sector Development Plan (2016-2030). It has classified sanitation services as high, medium and basic on the basis of knowledge and facilities in place. The sanitation service levels with indicators are shown in Table 8.

**Table 8: Sanitation Service Level and its Components**

S.N.	Service Components	Service Level		
		High	Medium	Basic
1	Health and Hygiene Education	✓	✓	✓
2	Household Latrine	✓	✓	✓
3	Public and School Toilets	✓	✓	✓
4	Septic tank sludge collection, transport, treatment and disposal	✓	✓	✓
5	Surface drains for collection, transmission and disposal of grey water	✓	✓	✓
6	Small bore sewer collection for toilet and septic tank effluent, low-cost treatment and disposal		✓	
7	Sanitary sewers for wastewater collection, transmission, non-conventional treatment and disposal	✓		
8	Sanitary sewers for wastewater collection, transmission conventional treatment and disposal	✓		
9	Limited solid waste collection and safe disposal	✓	✓	✓

Source: MoWSS, 2017

## 4 Stakeholder Engagement

### 4.1 Key informant interviews

The KIIs were conducted with the stakeholders having a role in sanitation from the sub-metropolitan office and FSM service providers in the city. Then, executive officer and an officer from environment and social development unit of the sub-metropolitan were interviewed on the sanitation status and service delivery mechanism by the sub-metropolitan together with a future plan for sustainable sanitation. Similarly, chief of Enviro Care Concern Private Limited was interviewed to gather information on solid waste management and possibilities on the integration of FSM particularly co-composting of FS with organic waste collected from the sub-metropolitan. Likewise, proprietors from private mechanized emptying services were interviewed on their business. The interview was mainly focused on their current service area, a number of emptying vehicles, its registration, service charges and challenges they faced in the business.

### 4.2 Random Household Survey

The random household survey was conducted in coordination with the sub-metropolitan to acquire the status of sanitation situation. The questionnaire was developed to understand the characteristics of the collection unit, emptying and transportation mechanism, disposal or reuse practices. Also, it was aimed to determine calculating the total sludge generated in the collection unit and their knowledge towards safe management of FS.

The community mobilizer was engaged after orientation on the questionnaire and its objectives. They were trained to use the inbuilt questionnaire in mobile application and uploading it. The surveyors were taught on how to observe the types of containments and determine the size as far as possible.

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## 7 Appendix

### 7.1 Appendix 1: Stakeholder identification

Table 9: Stakeholder identification

S.N.	Stakeholder group	In Itahari context
1	Municipal Council	Municipal Council, Itahari Sub-metropolitan
2	Ministry in charge of water supply and sanitation	Department of Water Supply and Sewerage
3	Ministry in charge of environmental protection	Department of Environment
4	Service provider for solid waste management	Itahari Sub-metropolitan, Envirocare Concern Pvt.Ltd.
5	Service provider for construction of onsite sanitation	Local masons
6	Service providers for emptying and transportation	Traditional manual emptying providers, Private mechanized emptying service entrepreneurs
7	Service provider for operation and maintenance of treatment infrastructure	N/A
8	Market participants practicing end-use of FS end products	N/A
9	Service provider for disposal of FS (sanitary landfill)	Itahari Sub-metropolitan, Community Forest User Groups
10	External agencies associated with FSM services	Environment and Public Health Organization

## 7.2 Appendix 2: Tracking of Engagement

Table 10: Tracking of stakeholders engagement

S.N.	Name of Organization	Designation	Date of Engagement	Purpose of Engagement
1	Itahari Sub-metropolitan	Executive Officer	07/12/ 2015	KII
2	Itahari Sub-metropolitan		07/12/2015	KII & Household survey
3	Enviro Care Concern Pvt. Ltd.	CEO	07/13/2015	KII
4	Eastern Sewerage and Transportation Hygiene	Proprietor	07/14/2015	KII
5	J.B. Rai Sanitation Services	Proprietor	07/14/2015	KII
6	Itahari Sub-metropolitan	Community Mobilizers	07/13/2015	Household survey

### 7.3 Appendix 3: Sampling Procedure

Random sampling method was followed and the sample size was calculated based upon probability sampling method:

**Sample Size -Infinite Population** (where the population is greater than 50,000)

$$SS = (Z^2 \times p) \times (1-p) / C^2$$

Where, SS: Sample Size

Z: Z-value (e.g., 1.96 for a 95 percent confidence level)

p: Percentage of population picking a choice (worst case scenario is 50 %)

C: Confidence interval, expressed as decimal (e.g., 0.05 = +/- 5 percentage points)

Thus,

$$SS = (3.8416 \times 0.5 \times 0.5) / 0.0025$$

$$SS = 384$$

**Sample Size – Finite Population** (where the population is less than 50,000)

$$\text{New SS} = SS / (1 + ((SS - 1) / \text{Pop}))$$

\*\*Pop = Household of Itahari is 33794 according to census 2011.

$$\begin{aligned} \text{Example} \quad \text{New SS} &= 384 / (1 + ((384-1) / 33794)) \\ &= 380 \end{aligned}$$

Each ward of the sub-metropolitan were considered as primary sampling units. The number of households to be sampled in each ward were determined with the ration of a number of households residing in each ward. The selection of households as ultimate sampling unit was carried out in the field. The selection was done by using equal probability linear systematic sampling.

## 7.4 Appendix 4: Location Map of Surveyed Household

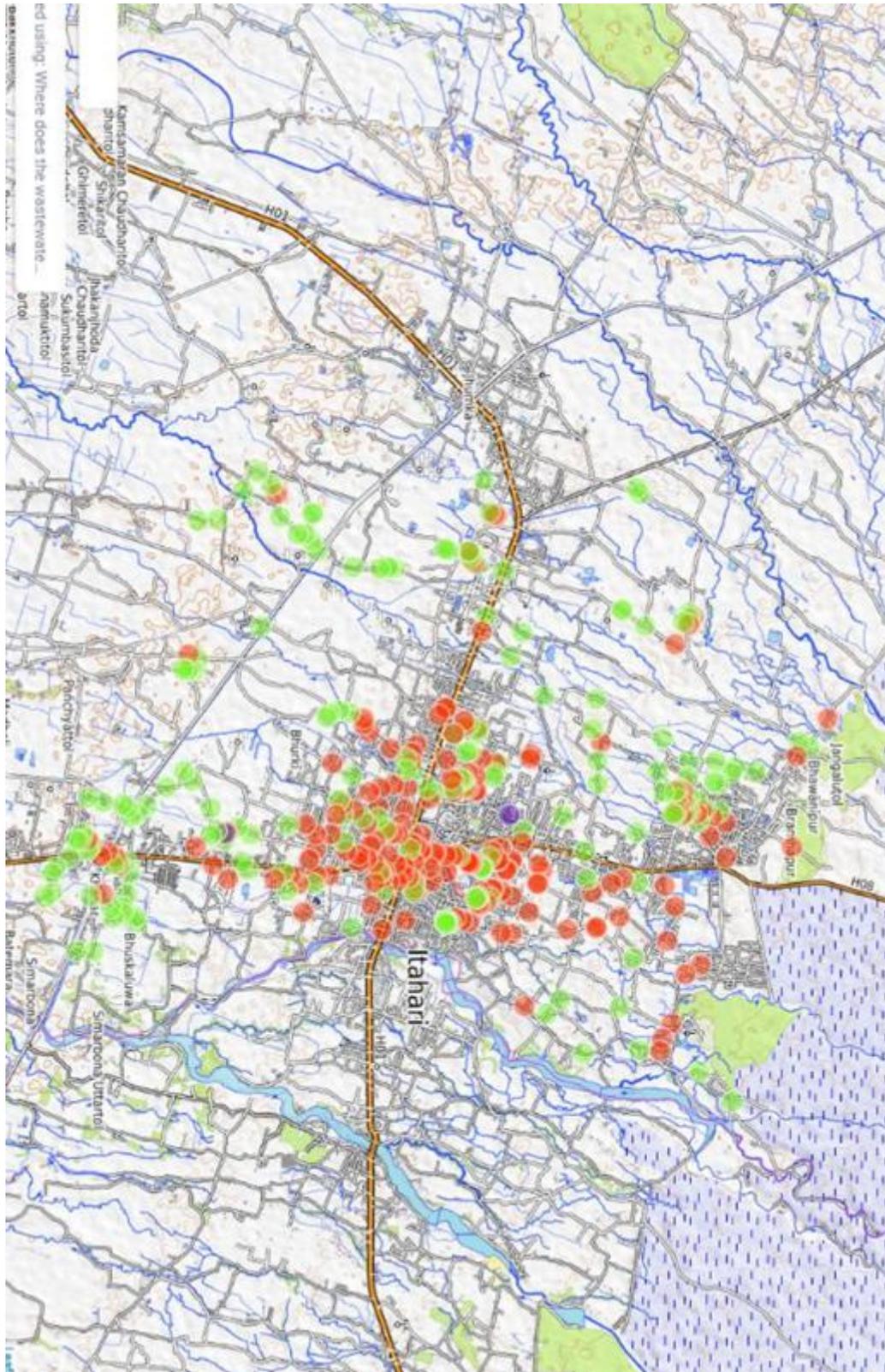


Figure 10: Map of Household Surveyed Location



## 7.5 Appendix 5: Questionnaire used for Household Survey

We are volunteers from Environment and Public Health Organization (ENPHO). We are working on a project concerned with urban sanitation. I would like to talk to you about Faecal Sludge Management (FSM). The interview will take about 20 minutes. All the information we obtain will remain strictly confidential and your answers will never be shared with anyone other than project team

Demographic Information

**District**

---

**Municipality**

---

**Ward No.**

---

**Tole/ Community name**

---

**House Number**

---

Household Characteristics

**name of Respondent**

---

**Gender of Respondent**

- Male
- Female
- Other

**Are you head of the Household?**

- Yes
- No

**What is name of Household Owner**

---



**Typology of house**

- Colony
- Apartment
- Rented House
- Own House
- Chawl
- Hut
- others

**Name of Apartment/Colony**

---

**Do you know how many flats are there in this apartment?**

- yes
- No

**How many flats are there?**

---

**How many flats are occupied?**

---

Please provide information on number of persons living in this house

**Children below 5 years**

---

**Male**

---

**Female**

---

**What is monthly average Household income?**

- Below 10,000.
- Between 25,000 to 50,000
- More than 50,000.

**What is an average monthly expenditure of the household?**

- Below 10,000.
- Between 25,000 to 50,000.
- More than 50,000.

## Water Use

**What are major sources of water?**

- Municipal/city Water Supply
- Dug Well
- Tube Well
- Natural Spring
- Rainwater Harvesting
- Private Tanker Water
- Public/ Community Water Supply
- Others

**What is the daily water consumption?**

- less than 500 L
- Between 500 to 1000 L
- Between 1000 to 1500 L
- Between 1500 to 2000 L
- More than 2000 L

**How much money do you spend monthly for water?**

- Less than 1000
- Between 1000 to 2000
- Between 2000 to 3000
- More than 3000
- None

## Sanitation System

**Do you have toilet on your premises?**

- yes
- no

**Where do you and your other members go for defecation?**

- Use a shared toilet
- Use a public toilet
- Open defecation
- Others

**How many Users are there?**

- less than 6
- 7 to 12
- 13 to 18
- 19 to 24
- 25 to 30
- more than 30

**What type of toilet do you use?**

- Water Sealed
- Drop Hole
- Don't Know

**When was the toilet constructed?**

- less than a year
- 1-3 years ago
- 4-6 years ago
- more than 6 years ago

**How many toilets are there in this property?**

---

**What is flushing system in the toilet?**

*If there is more than one toilet and using both systems of flushing, use which flushing system is used in maximum number of toilet.*

- Pour Flush
- Cistern Flush

**Do all family members use the toilet regularly?**

- Yes
- No

**Who are non users?**

- Children under 6 years
- male members
- Female members
- Elderly members of family

**What are the reasons for not using toilet regularly?**

- No water to Flush
- Superstructure/ seat broken
- Used for some other purposes
- habitual Issues
- others

**If the own / individual toilet is not functional, what do you do?**

- use a toilet shared with neighbours
- Use a public toilet
- Open defecation
- Others

**What is the toilet connected to?**

- Holding tank
- Septic tank with no any outlet
- Septic tank with outlet
- Pit
- Single offset pit
- Double offset pit
- To drain
- to water bodies
- to Open Environment
- Others



Where does the effluent or overflow from the containment go?

- Soak-age pit
- Sewerage System
- Drain
- Reused on property
- Open environment
- Don't know
- Other

sepcify

---

No. of septic tanks in the property?

- 1
- 2
- 3
- don't know

What is shape of your septic tank/ pit?

- Rectangular
- Circular
- Don't know

Please provide dimensions of septic tank/pit

Length (ft)

---

Width (ft)

---

Depth (ft)

---

Diameter of ring (in inch)

---

**Number of Rings**  

---

**How is dimensions of septic tank/ pit obtained?**

- Measured by enumerator
- Known and given by respondent
- Obtained from septic tank design shown by respondent

**How many chambers are there in septic tanks?**

- Single chamber
- Two Chamber
- Three Chamber
- Don't know

**Is there manholes on tanks /pits?**

- yes
- No
- Don't know

**Where is septic tank/pit located?**

- Inside the main building
- Outside the building
- Outside the property boundary
- cannot be found

**What is the type of floor above Septic tank/pit?**

- Unfinished concrete
- Tile
- soil
- Other

**Specify**  

---

**If septic tank/ pit is located under a building and there is no access port, are you willing to break the floor to install a proper access port (manhole)?**

- Yes
- No

Is wastewater from Kitchen and laundry connected to septic tank/ pit?

- Yes  
 No

How far is your containment from nearby water resources?

- Below 5 m  
 5 to 10 m  
 11 to 20 m  
 21 to 50 m  
 51 to 100 m  
 more than 100 m  
 None

Is your containment lined?

- Fully Lined  
 Bottom is unlined but walls are lined  
 Unlined  
 Others

others

---

Accessibility to Onsite- Sanitation Systems

Is there access to road nearby your septic tank/pit?

- Accessible by Truck  
 Accessible by medium sized vehiclesOption 2  
 Accessible by tricycle/motorcycle only

Is there Vehicle parking area?

- There is designated off street truck parking within 40 meters of tank or pit.  
 There is on-street parking within 40 meters of the pit – some traffic blockage will occur  
 There is on-street parking within 40 meters of tank or pit, but all traffic will be blocked  
 There is no place for the truck to park for the desludging

If no onsite vehicle parking, how far to the nearest parking place for sludge transfer (transfer station)

- 0 to 1 Km
- 2 to 3 Km
- 4 to 5 Km
- More than 5 Km

How long will it take the motor cycle tanker to drive from the site to the truck parking?

- 0 - 5 minutes
- 6 - 15 minutes
- 16 to 30 minutes
- More than 30 minutes

distance of the tank or pit from the vehicle parking area

- 1 - 5 meters
- 6 - 10 meters
- 11 - 20 meters
- 21 -40 meters
- 41 - 60 meters
- more than 60 meters

Emptying

When was the containment last emptied?

- last month
- 6 month ago
- 1 year ago
- 2 year ago
- 3 year ago
- 4 year ago
- 5 year ago
- 6 to 10 years ago
- more than 10 years ago
- never emptied
- I don't know

**What will you do after the pit get filled?**

- Cover with soil and abandoned
- abandoned only
- Dig a new hole

**At what time interval is the containment emptied?**

- More than 3 times a year
- Twice a year
- Every year
- Every 2 years
- 3 to 5 years
- 6 to 10 years
- more than 10 years

**What was the reason for emptying?**

- Routine cleaning
- Due to blockage
- Overflow or filling up
- foul smell
- others

**Who empties the containment?**

- Private manual
- Private mechanical
- Municipality
- Self manual
- Both manual and mechanical
- others

**Specify**

---

**How much water was used during the emptying the septic tank/pit latrine?**

- less than 100L
- 101-200 L
- 201-300 L
- 301-400 L
- 401-500 L
- more than 500 L
- Don't Know
- Not Necessary

**Was water available at the site for mixing the sludge into slurry?**

- Unlimited water was available
- Only limited water was available
- No water available on site

**Is the tank emptied completely?**

- Yes
- No
- Don,t Know

**How much stays behind?**

- more than half
- half
- 25%
- less than 25%
- Don't Know

**How many trips did they/ do you make for emptying?**

- 1
- 2
- 3
- more than 3



**From where did you get information about this service?**

- Neighbour/Friends/Relatives
- Newspaper/Radio/TV Advertisement
- Broker
- Municipality
- Service provider was in contact

**Do you have contact number?**

- Yes
- No

**Contact Number**

---

**What were problems during emptying septic tank/pit?**

- Access or distance for suction truck to house
- Break Floor tiles to access septic tank
- Break concrete manhole to access septic tank
- Difficult to locate septic tank
- Smell
- No any problem
- Others

**specify**

---