



Sanitation Capacity
Building Platform

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Detailed Project Report

Faecal Sludge and Septage Management

Collection – Transport and Treatment

for

Port Blair, Andaman & Nicobar Islands



National Institute of Urban Affairs





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**Collection – Transport and Treatment for
Port Blair, Andaman & Nicobar Islands**

**Detailed Project Report, Faecal Sludge and Septage Management
Collection – Transport and Treatment for Port Blair, Andaman & Nicobar Islands
under the Sanitation Capacity Building Platform**

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Executive Summary

Port Blair city is the capital of the Andaman and Nicobar Islands, an archipelago and a union territory of India situated in the Bay of Bengal. It serves as an entry point to one of the major tourist destinations in India i.e. Andaman and Nicobar Islands. Port Blair Municipal Council is the urban local body governing the city with a population of just over a lakh in 2011, which is set to increase beyond 1.5 lakh by 2021. This city is greeted by floating population equivalent to twice the residential population over the year. This subjects the solid liquid waste management infrastructure to stress which has to be catered to by the municipal council.

Due to its undulating terrain, the municipal council is unable to implement a centralized sewerage system. The population is now being served by a non-sewered system. All the households have access to toilet linked to septic tanks. The commercial properties also have sewage treatment plants which have sludge holding tanks. These containment units are emptied when full and the sludge is disposed-off at the designated landfill site under the control of municipal council.

In order to complete the sanitation value chain, a faecal sludge/septage treatment plant and a system for safe disposal/reuse of end products is required. This document creates the foundation for the treatment and 100% reuse of the end product, making the treatment plant zero discharge plant. After careful study of the local constraints and opportunities, the treatment scheme was chosen for solids and the liquid fraction of the incoming sludge. The scheme consists of natural treatment process for solid liquid separation and anaerobic digestion and further to process the separated solids and liquid, mechanized treatment components have been proposed. The solids will undergo dewatering through belt press filter and further disinfected using heat drying. The solids will be further reused in the co-composting by municipal council. The liquid will be treated using MBBR technology and the treated water will be used as process water, flushing and landscaping.

The total capacity of the treatment plant is 42 KLD comprising of 30 KLD of the settling thickening tank and 12 KLD of anaerobic digester. The solid and liquid treatment

process has the capacity of handling 4 KLD and 42 KLD of flow respectively. The total cost of implementation of DPR is 370 lakhs inclusive of the establishment cost of INR 48 lakhs. The cost of the treatment component is 105.05 lakhs and the rest are for other miscellaneous components. The miscellaneous components which do not directly contribute or assist the treatment of sludge can be developed over a period of time (ex. Road, Compound wall etc). The total annualised cost of the project is equivalent to INR 38.70 per KL which when normalised over the floating population is equal to INR 12.75 per person per annum.

The document ends with the strong recommendations which will ease the implementation and ensure smooth functioning of the faecal sludge/septage treatment.

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Abbreviations

A&N	Andaman and Nicobar
ANPCC	Andaman and Nicobar Pollution Control Committee
ASP	Activated Sludge Process
BOD	Biological Oxygen Demand
CapEx	Capital Expenditure
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CSTF	City Sanitation Task Force
C&T	Community Toilets
DEWATS	Decentralised Wastewater Treatment System
FCO	Fertiliser Control Order
FSS	Faecal Sludge and Septage
FSSM	Faecal Sludge and Septage Management
IHHL	Individual Household Latrines
IMS	Information Management System
MBBR	Moving Bed Biofilm Reactor
O&M	Operation and Maintenance
ODF	Open Defecation Free
OpEx	Operational Expenditure
OSS	On-site Containment System
PBMC	Port Blair Municipal Council
PT	Public Toilets
RAS	Rapid Assessment Survey
RCC	Reinforced Cement Concrete
SFRC	Steel Fibre Reinforced Concrete
SAFF	Submerged Aerated Fixed Film
SBM	Swachh Bharat Mission
SBR	Sequential Batch Reactor
STP	Sewage Treatment Plant
SWM	Solid Waste Management
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
ULB	Urban Local Body
UPVC	Un-Plasticized Polyvinyl chloride
USEPA	United States Environment Protection Agency
UVGI	Ultraviolet Germicidal Irradiation
WHO	World Health Organisation

Glossary

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

Detailed Project Report

Introduction & Rationale

1 Introduction

The Sanitation Capacity Building Platform (SCBP) is an initiative by National Institute of Urban Affairs (NIUA) for addressing urban sanitation challenges in India. The platform also supports and build the capacity of the cities to plan and implement faecal sludge and septage management (FSSM) systems. FSSM is the key solution to accomplish the National Policy on Faecal Sludge and Septage Management (FSSM), Swachh Bharat Mission (SBM), Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Smart City schemes.

The National Institute of Urban Affairs (NIUA), under the MoHUA, was appointed to build the capacity of governments at all levels and other sanitation actors, on decentralised sanitation management, faecal sludge and septage management. A sanitation capacity building platform was created in March 2016 at NIUA, which acts as a hub for knowledge sharing, collaboration and training among local organizations and government bodies.

The Bill and Melinda Gates Foundation (BMGF) is supporting financially in establishing and strengthening this sanitation capacity building platform. This platform is pivotal to ensure urban local bodies and other actors in the sanitation system obtain the knowledge and skills required to effectively implement decentralized sanitation. This will not be a “one size fits all” approach. Rather, the platform will work with cities and states to analyse their situation, and to develop and offer appropriate capacity building activities addressing each area's unique needs and ambitions, walking alongside each urban local body (ULB) as they plan, implement, and maintain integrated faecal sludge and septage management approach.

The activity of developing a faecal sludge and Septage Management (FSSM) detailed project report (DPR) for cities and towns is integrated into the SCBP with an aim to provide hands on experience to the ULBs in holistic planning of the faecal sludge and septage management system and services for the city.

1.1 Objectives

The objective of the process of creating an FSSM DPR is as follows;

- To assess the current situation and developing a holistic approach to tackle the issue of faecal sludge.
- To develop an FSM strategy by not looking as waste but a resource which can be recycled and reused in different sectors such as agriculture and industry.
- To assist ULB to realize FSM with an integrated approach and making it lucrative business to develop Public Private Partnership (PPP) model.

1.2 Scope of work

The scope of work of this study is to prepare a detailed faecal sludge management system for the city which will act as a complete solution for the city. The city is ready in terms of financial (operation and maintenance (O&M)) and institutional aspects to have faecal sludge collection and transportation aspects, treatment plants and reuse approach as a complete faecal sludge management chain.

1.3 Organisation of the report

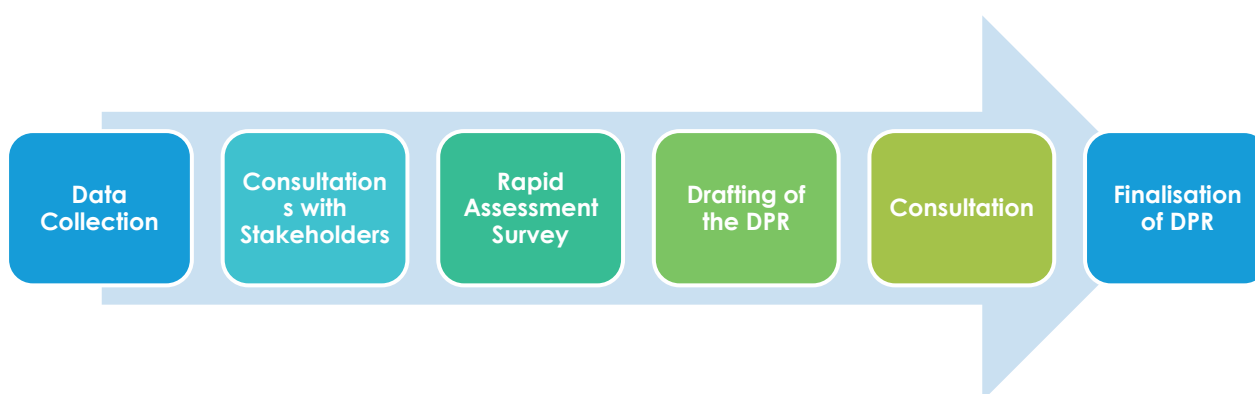
TABLE 1: ORGANISATION OF THE REPORT

<p>Section 1 <i>Introduction and Study area</i></p>	<p>Presents the introduction of the project report, overview of the project area description and the current situation analysis as follows,</p> <ul style="list-style-type: none"> • Introduction – Objectives, Scope of work, organisation of the report, Methodology • City Profile – Demographic information, Climate, Geography and Hydrogeology of the area • Situation Analysis – Sanitation value chain, FSSM gap identification
<p>Section 2 <i>Technical section</i></p>	<p>Describes the proposed requirements according to the data analysed from the existing situation in the following sections,</p> <ul style="list-style-type: none"> • FSSM Foundation – Quantification and Characterisation of FSS, Factors affecting the quantity and quality of FSS, Treatment targets and objectives, Physical, chemical, and pathological constituents. • FSS Collection and transport – Criteria for collection and transport, number of vacuum trucks, capacity of vacuum

	<p>trucks, Technical specification of storage and vacuum pump, SOP for collection, transport, disposal</p> <ul style="list-style-type: none"> • FSS treatment and disposal – collection treatment stages, process flow diagrams, Designing of FSTP • Operation and maintenance of FSTP – Daily, Weekly, Monthly, Annual O&M plan • FSTP: Description and specifications – Site selection, Plan of FSTP site, Description and specification of FSTP process, plumbing and electromechanical components
Section 2 <i>Financial section</i>	Financial estimates – capex and opex in collection and transport, treatment and disposal, financial modelling

1.4 Methodology

One of the objectives of the process of drafting the detailed project report was to provide handholding to the ULB officials. It is utmost important to understand the existing situation and the requirements of the city before starting the planning and implementation stage. The methodology adopted to create this document is as follows,



- **Data Collection:** In this process, the Service Level Benchmarking data along with other relevant documents and information was collected from ULB. The documents such as DPR of solid waste management and log book for desludging vehicles for past one years was collected. Information was collected through structured interview with the private operators and driver and operator of PBMC. All the documents and information collected became base for the analysis and appropriate inferences were drawn.

- **Consultations with Stakeholders:** In this process, the stakeholders were identified with the help of the ULB authorities and a consultation was carried out with the respective stakeholders for the understanding the current FSSM situation. The stakeholders are responsible to provide its support and inputs to the planning process from time to time. The consultation meetings have happened during the process of creating the DPR.
 - Meeting 1: April 23rd, 2018 – To discuss the project proposal of having FSTP in Port Blair by PBMC under Smart City Project.
 - Visit: May 11th, 2018 – To collect data from perform rapid assessment and conduct structured interviews.
 - Meeting 2: July 24th, 2018 – Interim consultation + review meeting to verify the data used for analysis and technology options, financial aspects.
 - Meeting 3: September 27th, 2018 – To present the draft of DPR to important stakeholders involved in the project.

The minutes of the meeting are attached in the Annexure for reference.

Rapid Assessment Survey (RAS): During the survey key focus was to identify the critical areas and cross check the data provided by the ULB. This helped to take a close look at the progress of the projects in the field of solid waste management and faecal sludge and septage management. During the RAS the solid waste processing plant along with the solid waste disposal site and potential site for FSTP was visited.

- **Drafting of the DPR:** Development of the DPR based on the data provided by ULB, inputs given by the stakeholders and impressions from the RAS. During this process, field visits were carried out along with consultation with stakeholders. This facilitate decision making in regards of the selection of site for setting up FSTP and its location in the city. A draft of the DPR was shared with the PBMC for final inputs and approval to finalize it.
- **Finalization of DPR:** The final draft of the DPR has been presented to ULB and a presentation has to be given to the important stakeholders from PBMC such as Chief Secretary, Secretary, Superintendent Engineer, Executive Engineer, Sr. Scientific Officer (A&N Pollution Control Committee) and other ULB authorities on the overall process of the creating DPR of FSSM fir their city.

2 City profile

The Andaman and Nicobar Islands is the group of 572 Islands / Islets, of which only 37 are inhabited. The Andaman and Nicobar groups of Islands are separated by the ten-degree channel. These Islands are bounded by the 10°N and 14°N latitudes as well as 92°E and 95°E longitudes. The North Andaman, the Middle Andaman, the South Andaman and the little Andaman are the major significant Islands of the group. The Andaman Islands stretches approximately for 464 km.

Port Blair city is the capital of the Andaman and Nicobar Islands, a union territory of India situated in the Bay of Bengal. It is located on the east coast of the South Andaman Island at the latitude of 11° 37' 45" N and longitude of 92° 43' 33" E. It is also the headquarters for the district of South Andaman and is the territory's only notified town. Port Blair houses the headquarters of the Andaman and Nicobar Command, the first integrated tri-command of the armed forces of India.

The administrative area of Port Blair city is expanded after delimitation of its jurisdictional limit in September, 2015 which has increased from 17.44 Km² to 41.22 Km². The population of the city is also increased from 1,08,058 (as per census 2011) to 1,40,572.

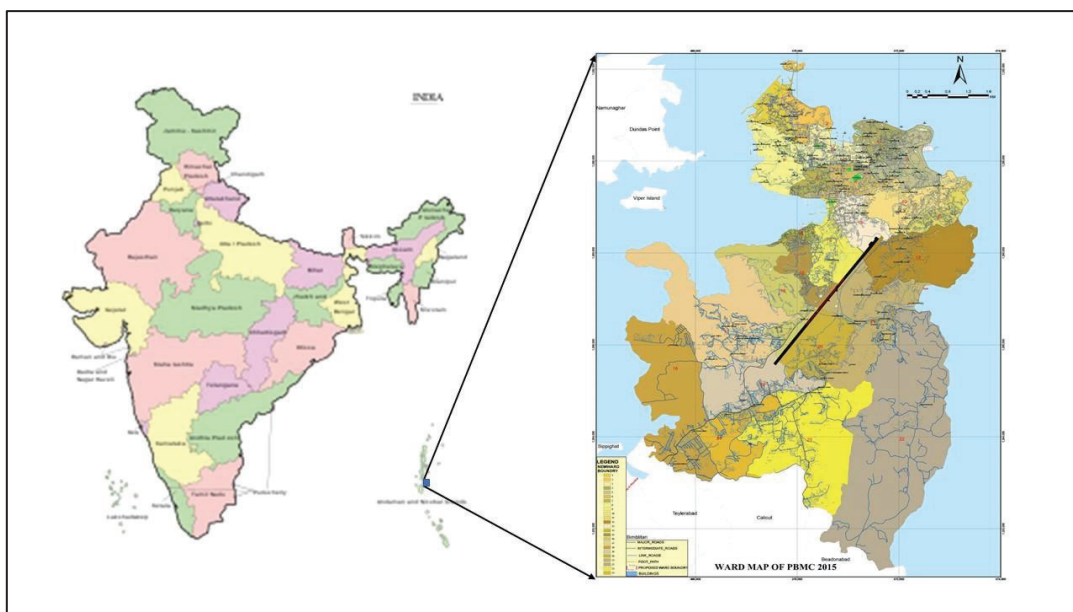


FIGURE 1: LOCATION MAP OF PORT BLAIR CITY (SOURCE: MAPS OF INDIA)

2.1 Demography

The population at Port Blair is steadily increasing from 1961 - 2018. In 1961, the population at Port Blair was 14,075. The population has shown nearly eight times increase during the period 1961-2011. As per census 2011, the population of Port Blair city is 1,08,058. The gross density at Port Blair city is 5,636 persons per sq.km. in the year 2001 and 6,033 persons per sq.km. in the year 2011. The literacy rate of Port Blair has increased from 69% in 1991, 77% in 2001 to 90.28% in 2011. As per census 2011, 93.16% of the males are literate while female literacy rate stands at 86.94%.

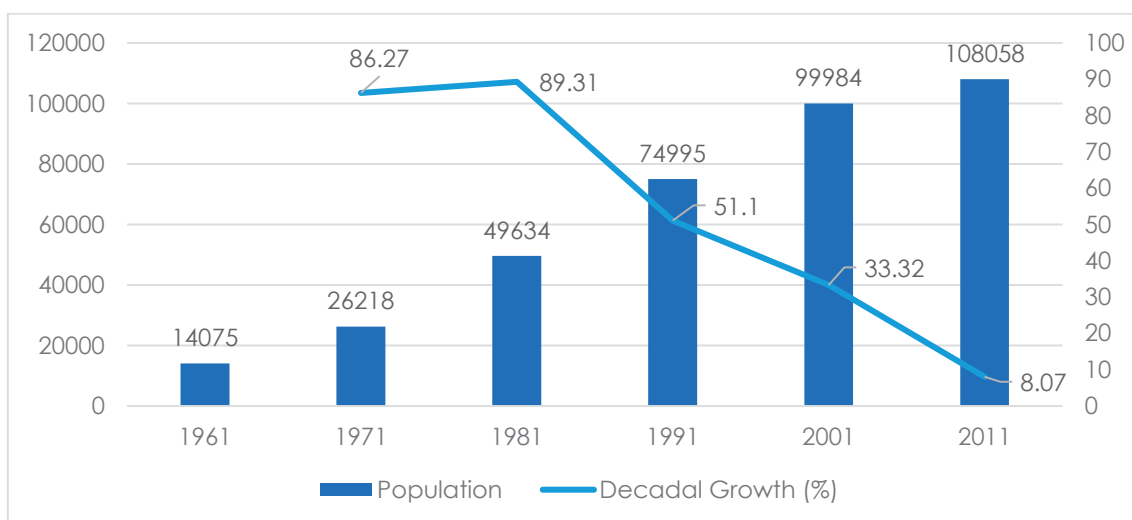


FIGURE 2: POPULATION GROWTH FROM 1961 – 2011

Figure 2 reflects that decadal growth rate is in declining format due to out-migration outside Port Blair to surrounding regions. In 2015, city administrative area expanded after delimitation of its jurisdictional limit which has increased from 17.44 Km² to 41.22 Km² and also increased the population of the city from 1,08,058 (as per census 2011) to 1,40,572 (as per 2015). It also augmented the number of wards and households from 18 to 24 and 27,049 to 48,154 respectively¹. A comparative statement of ward wise distribution of population in 2011 and 2015 at Port Blair is shown in table below,

TABLE 2: WARD WISE DISTRIBUTION OF POPULATION IN 2011 AND 2015 (SOURCE: SWM DPR, 2017-18)

Census 2011			Census 2015		
Ward No.	Population	Household	Ward No.	Population	Household
1	5890	1515	1	7384	1942

¹ SWM Collection and Transport DPR, 2017-18

2	7329	1864	2	6745	2033
3	7104	1666	3	7356	1953
4	7501	1924	4	5635	2200
5	5352	1336	5	7939	2026
6	4598	1145	6	7590	1914
7	5175	1362	7	6816	2011
8	5343	1238	8	3917	1132
9	6274	1539	9	6195	2112
10	10675	2762	10	4905	1845
11	5681	1452	11	6175	1984
12	4424	1128	12	6467	2159
13	4095	1013	13	5891	1827
14	3937	940	14	6247	1883
15	3910	1035	15	6688	1802
16	4375	1081	16	5544	1499
17	9952	2386	17	9198	3055
18	6443	1663	18	8023	2692
			19	7763	2359
			20	7857	2069
			21	5410	1358
			22	2762	611
			23	8359	2961
			24	8400	2727

Andaman and Nicobar Islands are covered with dense evergreen forests with exotic flora and fauna, sandy beaches, meandering coastline, mangrove lined creeks, and unpolluted fresh air to produce a life time memorable experience. Town of Port Blair is strategically located in South Andaman and connected to other tourist spots with an international airport. The city has around 2,00,000 to 3,00,000 floating population every year. Port Blair city has around 147 no. of hotel and resorts which serves the tourism of Port Blair and South Andaman Island.

2.2 Climate

Port Blair is located south of Tropic of Cancer and this region is surrounded by warm seas. The climate of this region is classified as Warm and Humid². The average

² Master Plan for Port Blair Planning Area – 2030, Volume-I, Planning and Country Planning Unit, Andaman and Nicobar Administration

temperature is in the range of 25^o C to 30.5^o C. The high temperature along with high relative humidity gives rise to high perceptible temperature and sultry weather. But this type of weather is tempered with pleasant sea breezes. Relative humidity is high throughout the year reaching > 90 % during the North West monsoons. The maximum temperature recorded at Port Blair is 32^o C.

The average annual rainfall is around 300 to 350 cm. Rainfall is received both from the South- West and North-East monsoon. May to August is the rainiest months and April is the warmest month in this region. It is observed that it is only the South-West monsoon that brings in most of the rainfall. During May-June, onset of the monsoon and in September- October withdrawal of monsoon is observed. The North East monsoons beginning in November continue till the end of February. March is observed to be the driest of the months. This transitional period is nonetheless disturbed by cyclonic storms which may be accompanied by thunder showers. Most of the storms experienced by the mainland and this region around Port Blair originate in Bay of Bengal. Occasionally storms originating in China Sea reach these parts of the Islands and have some impact. The climate informs of rainfall (mm), temperature (min – max, °C) and humidity (%) of the city is given in the Figure 3.

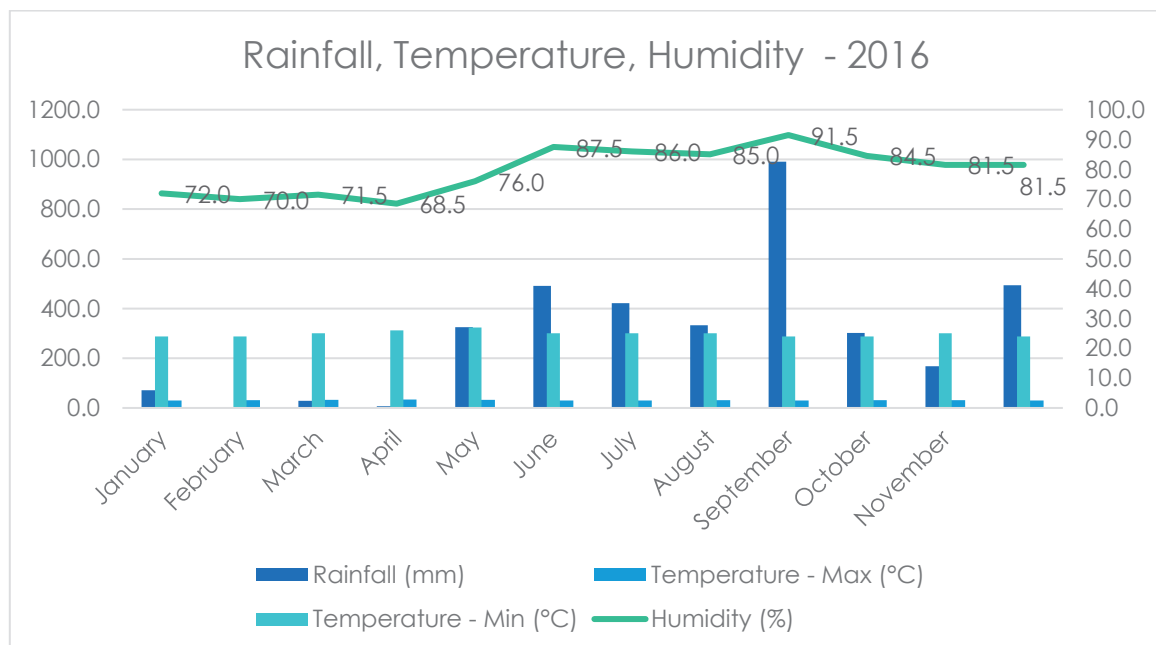


FIGURE 3: CLIMATE IN PORT BLAIR - 2016

2.3 Geography and Hydrogeology

Geologically the A&N Islands and Port Blair city have composed of thick Eocene deposits, sediment on Pre-Tertiary Sandstones, Shale's and Lime Stones. In these, sedimentary rocks have intruded basic and ultra-basic rocks. Calcareous sandstones and sand rocks occur frequently interspersed with Intercalate clays and conglomerates. Hydrogeologically, the sedimentary rocks are very poor water yielder both in shallow and deeper horizons because of preponderance of clayey materials in them (Source: Figure 4).

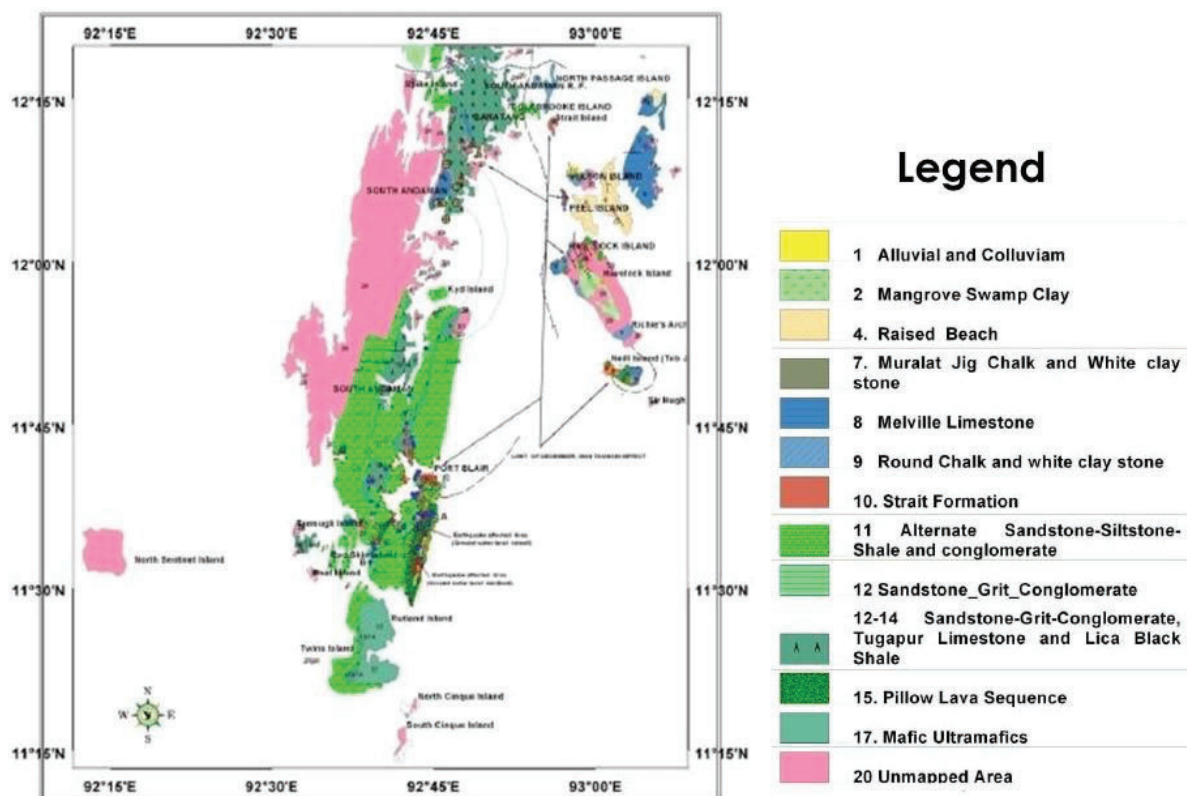


FIGURE 4: HYDROGEOLOGICAL MAP OF PORT BLAIR (SOUTH ANDAMAN) (SOURCE: CGWB, EASTER REGION, KOLKATA, 2013)

Soils are original on the hill tops and ranges whereas along the sea-coast and valleys transported soils are found. The sandy soil along the coast consists of Shingles and Corals. Lower slopes of valleys have Clayey Loams. The soils vary from heavy clays to clay-loams, gravely loams, and sandy loams. These soils have low moisture retention capacity. Humus, an organic matter is lacking even in forest areas. With regard to minerals the surveys so far conducted reveals that the region has no deposits.

These Islands are lie within the seismic zone of South East Asia (Earthquake belt) and they have been experiencing earth tremors at frequent intervals. As per the

Meteorological Department Islands are covered under Zone V, which are seismically most active region where earthquakes of magnitude 8 or more could occur.

2.4 Water Supply

The main source of water for drinking purpose and domestic consumption is through collection of rainwater in natural reservoirs and small check dams and wells. The water pumping from the sources and water treatment system is managed by Andaman Public Works Department (APWD) where they have different treatment plants namely Lambaline WTP (25 MLD, 10 MLD, 8 MLD), Garacharma WTP (8.5 MLD), Raj Niwas WTP (0.4 MLD), Birdline WTP (0.3 MLD), Nayagav WTP (3 MLD) and Jawahar Sarovar WTP (1.2 MLD). Around 26 MLD treated water from the listed WTPs is provided by APWD and PBMC is distributing it to various parts of the city, sub-urban areas, through water distribution network. At present the total demand of water for Port Blair is estimated as 28.80 MLD, leaving a short fall of around 2.80 MLD³.

³ Master Plan for Port Blair Planning Area – 2030, Volume-I, Planning and Country Planning Unit, Andaman and Nicobar Administration

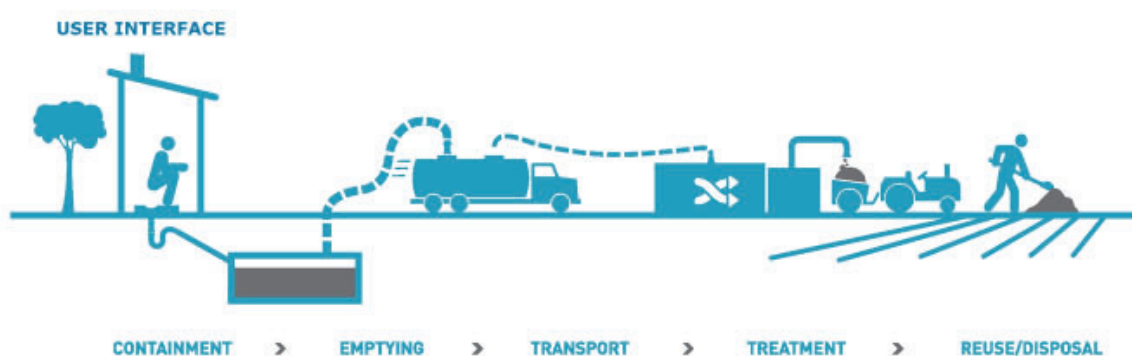
3 Existing Situation

This section will describe the current scenario in the Port Blair City with respect to five functional groups in sanitation value chain; (1) User interface, (2) Containment System, (3) Emptying and transportation, (4) Treatment and (5) Reuse and Disposal.

The user interface talks about the access to sanitation in terms of Individual Household Toilets (IHHTs), Community Toilets (CTs) and Public Toilets (PTs). The type of toilet prevalent in the city.

The containment system describes the kind of collection system present for the toilets such as twin pits or septic tanks etc. The emptying and transportation talks about the non-sewered collection and transportation system as the different types of motorized vehicles used for the collection of FSS and its conveyance from the consumer end to the treatment plant or disposal point. The treatment functional group talks about the availability or non-availability of the treatment facilities for FSS produced in the city. The reuse and disposal section talk about how the treated/untreated FSS is being disposed of.

3.1 Sanitation value chain



3.1.1 User interface

According to the 2011 census, there are in total 27,049 households in Port Blair City. Out of these 27,049 households, 22,285 households have IHHT and the rest 4,764 households are dependent on CTs or open defecation. After delimitation of jurisdictional limits, city population has increased with the 46,454 number of

households. Recently, Port Blair city is declared as an open defecation free (ODF) city with covering 100% household coverage of toilet facilities in form of Individual households Latrines (IHHL), Community toilets (CT) or Public toilets (PT).

As per the SBM (Urban), Port Blair city has around 52 public toilet blocks and 64 community toilet blocks with having around total 603 seats⁴. The A&N government has provided INR 14,000 as a subsidy for the construction of Individual household toilets. Ward-wise community toilet and public toilet facilities are listed in Table 3.

TABLE 3: DETAILS OF THE COMMUNITY TOILETS AND PUBLIC TOILETS⁵

Ward No.	Public Toilets No.	Seats	Community Toilets No.	Seats
Ward No. 1	3	34	2	22
Ward No. 2	2	16	2	17
Ward No. 3	2	2	7	18
Ward No. 4	3	38	0	0
Ward No. 5	9	30	0	0
Ward No. 6	0	0	0	0
Ward No. 7	2	18	5	59
Ward No. 8	0	0	4	28
Ward No. 9	4	34	1	4
Ward No. 10	4	11	0	0
Ward No. 11	1	2	1	2
Ward No. 12	3	10	4	18
Ward No. 13	3	12	0	0
Ward No. 14	2	24	1	4
Ward No. 15	2	24	0	0
Ward No. 16	0	0	0	0
Ward No. 17	1	2	1	2
Ward No. 18	3	10	5	25
Ward No. 19	5	12	1	5
Ward No. 20	0	0	2	11
Ward No. 21	2	7	8	33
Ward No. 22	0	0	12	47
Ward No. 23	1	1	1	4
Ward No. 24	0	0	7	17
Total	52	287	64	316

⁴ Swachh Bharat Abhiyan (Urban) Information Portal and Port Blair Municipal Council (PBMC)

⁵ CT & PT Data provided on Swachh Bharat Mission, Urban



FIGURE 5: NEWLY CONSTRUCTED CT (WARD 7) AND PT (WARD 9) UNDER SBM

Mostly, population from slum areas are dependent on community toilets facilities. Presently, few community plus public toilets are run & maintained by some private operators namely M/S Civic (2 block) and Sulabh International social service organization (2 block) and remaining by staff of Port Blair Municipal Council. User charges for the use of community toilets are INR.2/user. In the existing situation, PBMC has sufficient number of community toilets and public toilets infrastructure which covers the requirements from slum and even non-slum areas solving the issues of households which has issues of land as well as other constraints / restrictions for permanent constructions.



FIGURE 6: UPGRADED AND NEWLY CONSTRUCTED CT (WARD 20, 18) UNDER SBM

The city of Port Blair has 100% access to sanitation and is declared as an Open Defecation Free (ODF) City by the Port Blair Municipal Council (Oct, 2017). This implies that the city administration and citizens are quite aware about the benefits of having toilets how having one enhances the personal health and hygiene.

3.1.2 Containment system

During consultation process with ULB officials, it is observed that out of 46,454 households in Port Blair City, 100% households are connected to septic tanks, less than (Source: SBM, PBMC). It was told by the ULB officials that the septic tanks built under SBM are chambered septic tanks as per the CPHEEO norms. The details of the CT and PT with the capacity of the containment system is given the Annexure 1.

During consultation with officials of PBMC and Pollution Control Committee A&N, it is observed that A&N has a notification for hotels, resorts, lodges, restaurants and automobile service centres about the treatment of effluent and sewage. As per the guidelines, hotels and resorts with wastewater generation more than 100 KLD, or with <20, 20 - 100 rooms capacity has to install and manage their own STP at the location. It is mandatory to treat the wastewater in the range of discharge standards as per Environment (Protection) Act, 1986. The hotel, resorts or lodges in Port Blair who has their own STPs are listed in Table 4 and the notification is attached in the Annexure 2.

During consultation with the administration of Keys Hotel (Aqua Green) and Sea Shell, it is observed that they have MBBR and SBR treatment systems and the system provider is only operating and managing the STPs. The sludge generated in the units of STP after the span of treatment is desludged by the PBMC vacuum truck after each 6 – 12 months and dispose it at the designated sludge drying pit. All hotels, resorts who has the STPs are practicing this kind of sludge desludging and disposal process.



FIGURE 7: CONSULTATION WITH SEA SHELL RESORT AND VISIT TO STP (SBR TECHNOLOGY)

TABLE 4: LIST OF HOTEL OR RESORTS WITH STPs (SOURCE: PCC, A&N)

N ^o	Name of the Unit having Sewage Management Technologies	Technology (UASB/ASP/OP/SBR/MBR/FAB)	Installed capacity in KLD	Actual Utilization KLD
1	M/s Hotel Fortune Resort Bay Island, Atlanta Point, Port Blair	SAFF	55	55
2	M/s Hotel Peerless Sarover Portico, Carbyn Cove, Port Blair	ASP	60	60
3	M/s Hotel Aqua Green, Lamba Line, Port Blair		90	90
4	Dr. B.R.Ambedkar Institute of Technology, Pahargaon, Port Blair		100	100
5	M/s Milk Plant of A&N Islands Integrated Development Corporation (ANIIDCO), Dairy Farm, Port Blair		20	20
6	M/s Keys Hotel (Aqua Green), Lamba Line, Port Blair	MBBR	40	40
7	M/s Sea Shell, Marine Hill, Port Blair	SBR	25	15
8	M/s Megapod Resort, ANIIDCO, Port Blair	MBBR	40	40
9	M/s Hotel Blue sea	MBBR	25	15
10	M/s Sun rise hotel	MBBR	20	15
11	M/s Hotel Dhanlaxmi	MBBR	25	15
12	M/s AG Residency, Garacharama	MBBR	20	15
13	M/s Port Residency, Bathu Basthi	MBBR	20	15
14	M/s Coral cove, Minnie Bay	MBBR	25	15
15	M/s J Hotel, A/Bazaar	MBBR	25	15
Total			540KLD	495KLD

3.1.3 Emptying and transportation

According to the information provided by PBMC, there are only open storm water drains in the city with the 92% coverage. ULB does not have sewerage network in the city and hence it is assumed that the storm water drains are carrying some quantity of domestic wastewater. During the consultation with ULB, it was informed that around

95% households has the septic tanks as well as all community and public toilets are connected with the septic tanks.

For desludging of containment system, ULB has one vacuum truck of 8 m³ capacity for emptying of septic tank on demand basis. The ULB provides the septic tank emptying service to the households with the charges of INR 500. The household has to raise the request and pay the money and the ULB office and retain the receipt. Post payment, the ULB dispatches the vacuum truck to the household within next 48 hours. The vacuum truck empties the septic tank and takes away the faecal sludge or septage to the designated site at the SWM dumping site where they are disposing it into the entrenchment/pit.



FIGURE 8: VACUUM TRUCK OF 8 M³ CAPACITY MANAGED BY PBMC

In Port Blair, there are two private operators who are providing the desludging services. They are privately managing the activity and PBMC has restricted them to dispose the collected FSS at the designated disposal point. PBMC has charged them of INR 500 for this activity. Currently, these private operators have charges to the individual households in the range of INR 3,000 – 6,000 with respect of distance travel by the vehicle and the capacity of the containment system. The vehicles of the private are well equipped with the jetting cum vacuum pumps, cleaning equipments and desludging pipe etc. The details of the private desludging operators with the capacity of vacuum trucks are given in the following

TABLE 5: PRIVATE DESLUDGING OPERATORS AND VACUUM TRUCK CAPACITY

N ^o	Private Operators	Capacity (m ³)
Vehicle 1	Penguin Marine Services	6
Vehicle 2	Mr Venkat Shiva	4

According to the consultation with the private operators and the PBMC officials, it is revealed that currently they don't have any contract in between them, but PBMC has restriction to the operators to dispose the desludged waste at the designated site. If they will dispose it at any illegal disposal point then it will be a violation and PBMC has the fine system for the private operators.



FIGURE 9: VACUUM VEHICLES OF THE PRIVATE OPERATORS

However, after the implementation of Faecal sludge management system at city level, PBMC can issue public notice stating the empanelment of the private service providers by registering the private vacuum truck and the fixed charges to ULB by the private operators for the disposal of FSS at the legal point. The consultation with the private operators and PBMC staff is shown in the Figure 10.



FIGURE 10: CONSULTATION WITH THE PRIVATE DESLUDGING OPERATORS AND PBMC STAFF

It can be inferred that for the domestic wastewater treatment ULB should start developing the conveyance sewer system and there is requirement of sewage treatment plant for the treatment of wastewater which is not connected with the non-sewered system.

Since the ULB practices “on demand” desludging, they require the additional vacuum trucks for the FSSM. However, there are few private operators in the city which can be empanelled for the services can be useful aspect for the FSSM.

3.1.4 Treatment

According to the Service Level Benchmark and consultation with the ULB officials, there is no sewerage network in the city and they don't have the sewage treatment system for the treatment of domestic wastewater. During the consultation, it was noted that for faecal sludge or septage disposal they have the entrenchment/pit at the solid waste dumping yard where the desludged faecal sludge from the containment systems of Individual household's toilets, community toilets or public toilets have been transported and disposed of. The location of Brookshabad Solid Waste Management dumping site and FSS disposal site is shown in Figure 11

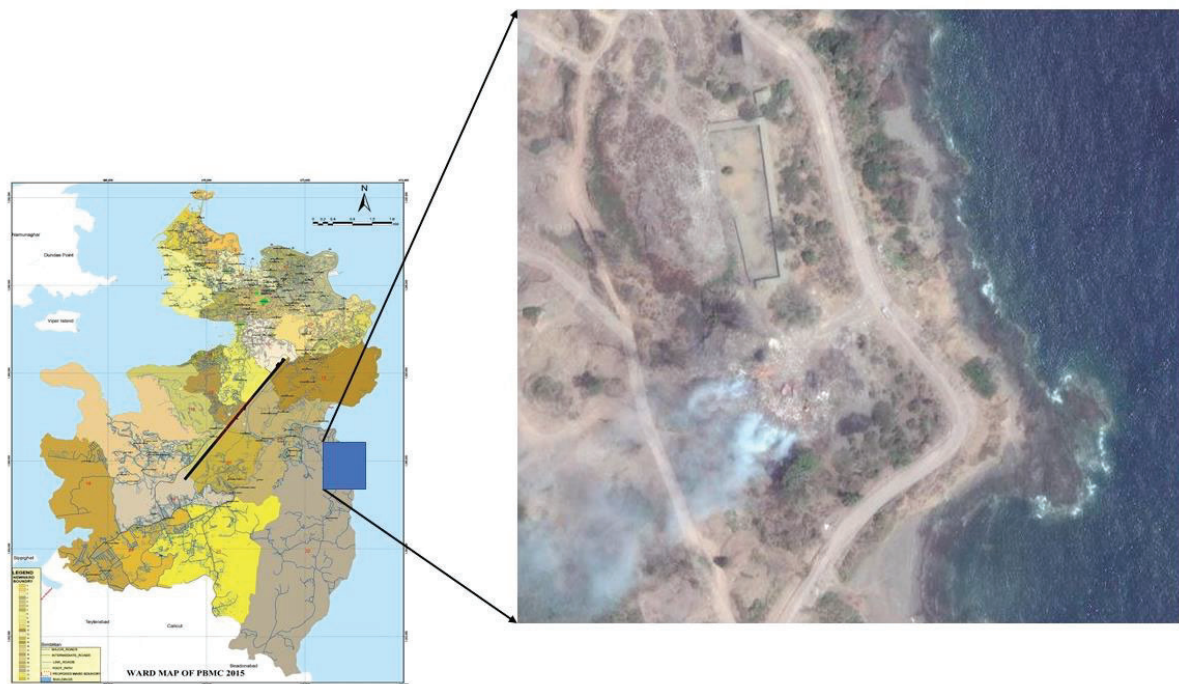


FIGURE 11: EXISTING FSS DISPOSAL SITE AT BROOKSHABAD, PORT BLAIR CITY

3.1.5 Reuse

There is no faecal sludge treatment system available at the city, hence reuse aspect is not taking place. However, there is a huge potential for reuse of treated bio-solids as a soil conditioner after proper treatment and the treated wastewater for non-potable purpose.

3.1.6 Legal and Regulatory Framework

There are some laws and regulations available in different context which has to be consider in planning and implementation of the faecal sludge and septage management. Currently, the following laws and regulation shown in the Table 6 are applicable for the Port Blair Municipal council in the adoption of FSSM,

TABLE 6: LEGAL AND REGULATORY FRAMEWORK

National Level	National Policy on Faecal Sludge and Septage Management, 2017
	New STPs Effluent Discharge Standards (2017) Amendment of Environment (Protection) Act, 1986 (Refer Annexure 3)
	Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act 1993
	Municipal Solid Waste Management Rules, 2016 has recommended the standards for the quality of compost. (In the absence of standards, it can be referred or adopted for the quality perspective of the composted FSS or bio-solids)
State Level	Guidelines for Treatment of Effluent and Sewage, Guidelines for Solid Waste Management and Good Environment Management Practices, A&N Pollution Control Committee, 2017 (Refer Annexure 2)
City Level	1983 National Building Code of India - Part IX Plumbing Services, Drainage and Sanitation. 1985 Code of practice for the design of septic tanks

3.2 FSSM gap identification

According to the existing situation detailed out in the above sections, the following gap identification was carried out with respect of sanitation value chain,

TABLE 7: GAP IDENTIFICATION IN FSSM APPROACH

Nº	Indicators	Service Level Benchmarks	Current Situation
User Interface			
1	Coverage of households with Toilets		
	Individual Households Toilets (%)	100%	100% Coverage - IHHL
	Community and Public Toilets (No.)	-	116 Blocks (603 seats)
On-site Sanitation System			
3	Coverage of households with adequate sanitation system	100%	All individual households and CT & PT have the containment system
	Sewerage Connections (%)	-	No Sewerage System
	Connected to Septic tanks (%)	-	100%*
	Connected to Soak Pits (%)	-	-
	directly connected to open drains (%)	-	-
Collection and Transportation			
4	Coverage of sewerage network (%)	100%	No sewerage network
5	Collection efficiency of FSS (%)	-	"On-Demand" based
6	Availability of desludging / cleaning services	-	PBMC (1 no), Private Operators (2 nos)
7	Number of vacuum trucks (No.)	-	3

8	User charges levied per emptying	-	Not fixed (based on the distance and capacity) (PBMC – INR 500, Private Operators – INR 3000 – 6000)
Treatment and Disposal/Reuse			
9	Adequacy of Sewage Treatment facility (%)	100%	No STP but A&N has regulations for the bulk generators (Hotels, Resorts etc) for the implementation of own STPs. 15 No. of Hotels and Resorts and their own STPs
10	Adequacy of Faecal Sludge or Septage Treatment	-	No FSTP
11	Disposal or Reuse		Currently, collected FSS is disposed of into the entrenchment/pit at the designated location
<i>Note: *information provided by PBMC, A&N and SBM database</i>			

Detailed Project Report

Technical Section

4 FSSM Foundation

This chapter provides the foundation for faecal sludge and septage management to be practiced by PBMC in Port Blair. The chapter will elaborate on quantification and characterisation of the FSS. This helps to understand what needs to be treated and managed safely and in what quantities. Factors which might affect the quantity and quality of the FSS are also detailed out with respect to Port Blair. In the end treatment targets and objectives will be set for the complete project.

4.1 Quantification of FSS

Quantification of FSS was done based on the data log of the vehicles disposing the FSS at the landfill site as mentioned in the Section 3. Analysis was carried out on the collected data to arrive at certain capacity of the treatment plant.

Daily an average of 12.42 m³ of sludge was collected and transported. Maximum sludge received was 46 m³ and a minimum on a working day was 4 m³. Figure 12 shows the number of times different quantities of the FSS was collected and transported. Nearly 25% of times FSS was collected in the range of 0-4 m³/d, 5-8 m³/d and 9-16m³/d. The percentage drops to 10% for quantities greater than 25 m³/d. The FSS collection is reduced to less than 1% for quantities greater than 33 m³/d.

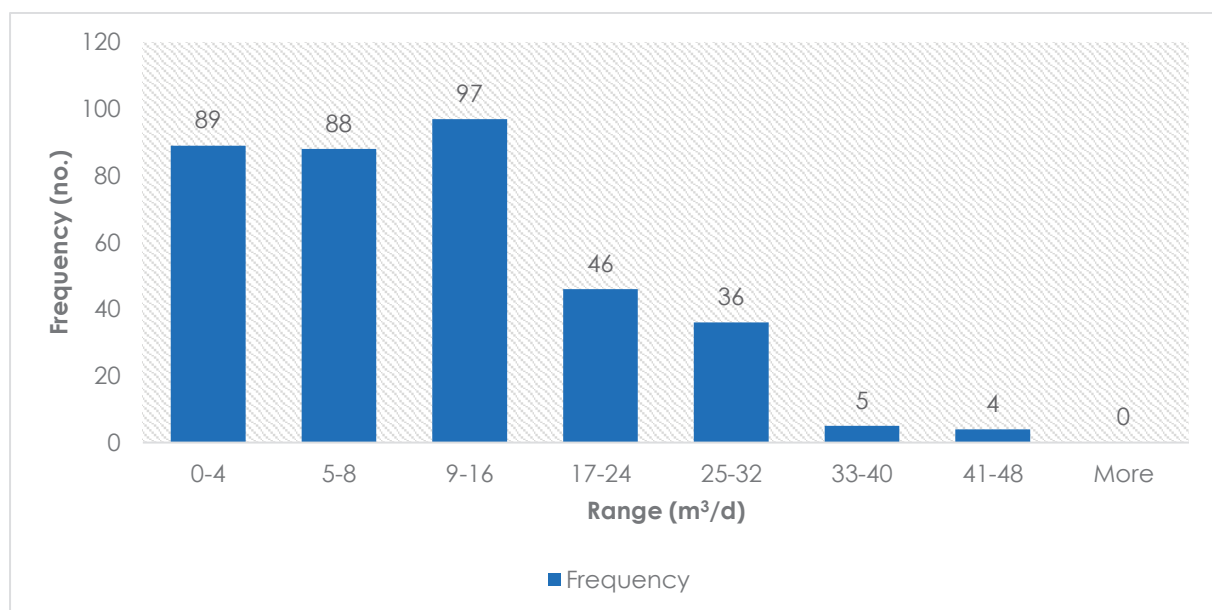


FIGURE 12: FREQUENCY OF FSS COLLECTION

Seasonal variation is also seen in the FSS collected. Typically, the demand of desludging decreases during monsoon season. Three main reasons for this are; (1) low floating population, (2) non-detection of overflowing septic tanks due to high rainfall and (3) Infiltration of water into the tanks leading to higher desludging charges.

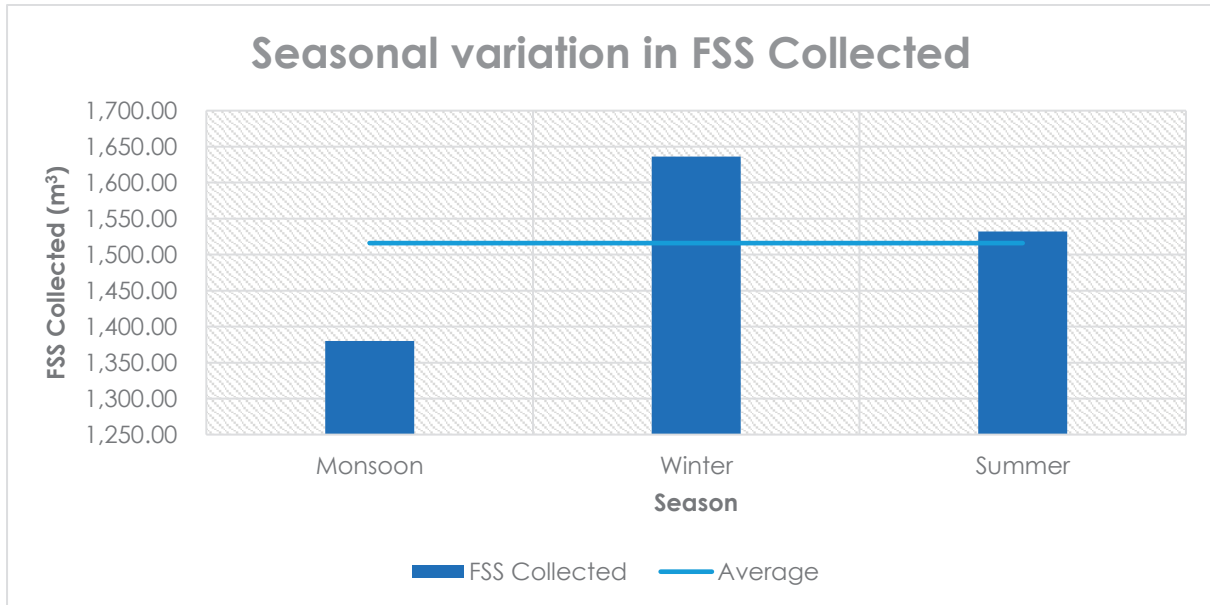


FIGURE 13: SEASONAL VARIATION IN THE DEMAND OF DESLUDGING

Monthly average collection of FSS is 378 m³ with a standard deviation of 113.7 m³/month. Figure 14 shows monthly collection of FSS.

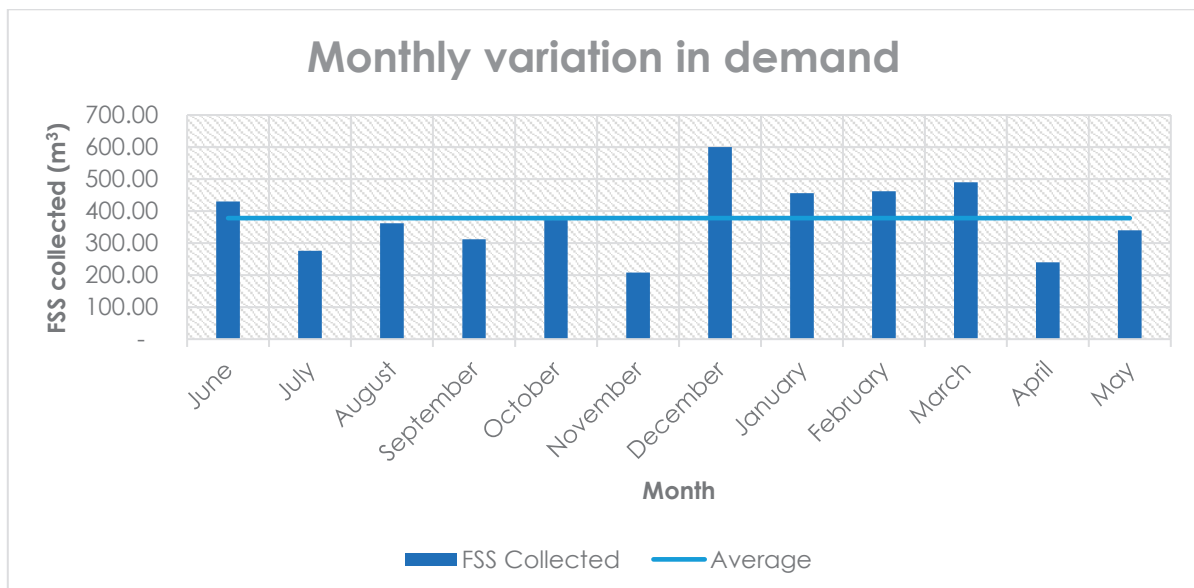


FIGURE 14: MONTHLY VARIATION IN DEMAND OF DESLUDGING

Figure 14 suggests that the critical months are June, December, January, February and March. Out of these five months, the most critical months are December, January and February as nearly 70% of the days more FSS was collected than daily average of 12.42 m³.

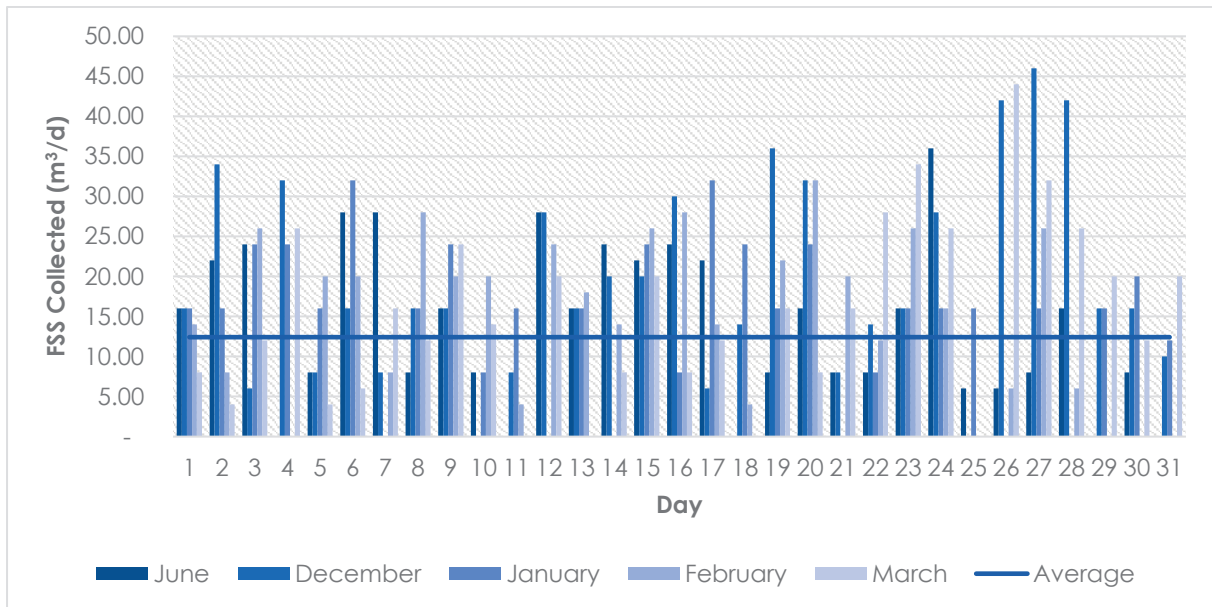


FIGURE 15: DAILY FSS COLLECTED DURING CRITICAL MONTHS

Figure 16 suggests more than 40m³ of FSS was received three times in the month of December and one time in the month of March.

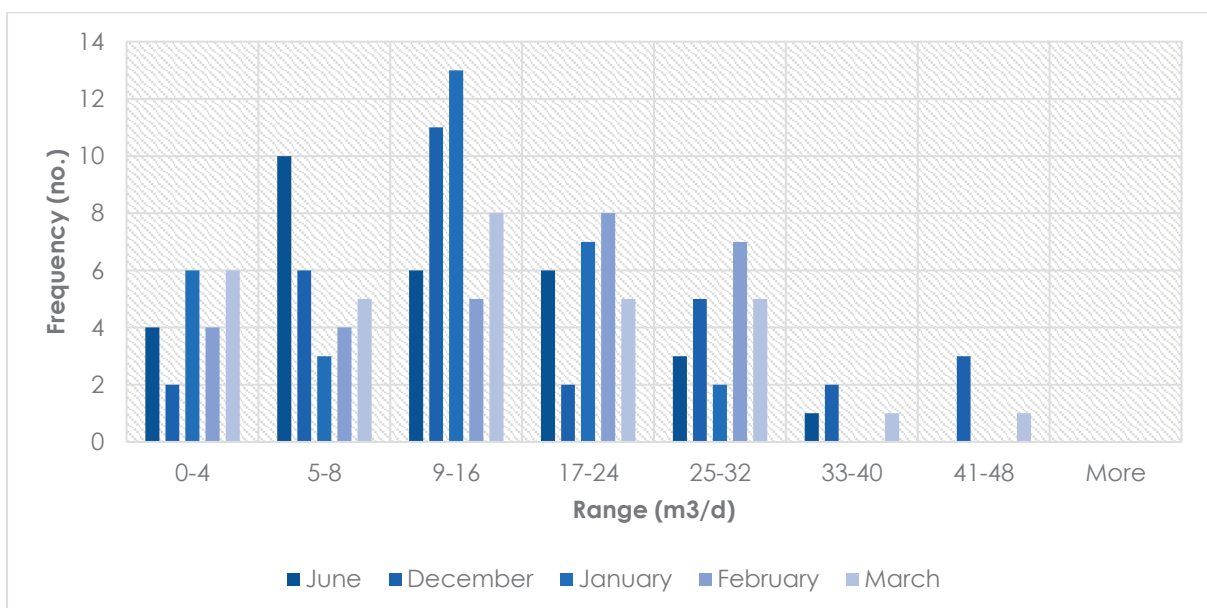


FIGURE 16: FREQUENCY OF FSS COLLECTED DURING CRITICAL MONTHS

The demand is expected to increase over a period of time. Hence it is proposed to have a solid liquid separation process of capacity 30 KLD, a stabilization process of 12 KLD and liquid treatment system of 42 KLD.

4.2 Characterisation of FSS

It is expected that three kinds of sludge are going to be received at the FSTP. (1) Septage from the septic tanks of the households, (2) Faecal sludge from the PTs and CTs and (3) Wastewater sludge from the resorts and hotel.

The septage contains well digested solids and requires less degree of treatment as compared to faecal sludge from public/CTs and wastewater sludge (sludge produced from aerobic treatment of wastewater).

From the RAS it was noticed that mostly septage is collected with few loads of faecal sludge from CTs, PTs and resorts and hotels. Hence sampling was done for septage and analysed whose reports are attached in Annexure 4.

The high COD:BOD ratio of 6.85 suggests that the sample contains difficult to digest organic particles. The wider gap between the COD and BOD also suggests that the samples has undergone anaerobic digestion in the storage and treatment unit. The low VSS:TSS ratio (0.58) confirms the higher content of inorganic matter.

The low BOD:TKN ratio of 1.84 suggests that the samples does not contain sufficient quantity of organics to facilitate biological removal of nitrogen by denitrification. Similarly, the low ratio of BOD:TP suggests that biological phosphorus removal is not possible.

4.3 Factors affecting the quantity and quality of FSS

The factors affecting the quantity and quality of the FSS are (1) Toilet usage, (2) Storage duration, (3) Inflow and infiltration, (4) Collection method and (5) Climate.

4.3.1 Toilet usage

Toilet usage of PTs will be higher during the peak tourist season; however, the usage of CTs and household toilets remain more or less same. During peak tourist season the

sludge from resorts and hotels will be on higher side. This leads to faster filling of septic tanks and holding tanks in the resorts and hotels.

The tourist season in Port Blair is from October to April and floating population increases during the months of December – March as observed in Figure 14.

4.3.2 Storage duration

As per the RAS carried out through interviews of stakeholders, it was noticed that the household septic tanks are desludged once in five years. The septic tanks of CTs are emptied in once in 3 years. There are few CTs whose septic tanks need to be emptied every few months. The septic tanks of PTs are emptied whenever they are filled; however, the frequency of emptying increases during peak tourist season.

4.3.3 Inflow and infiltration

Inflow and infiltration usually has effect on the consistency of the sludge. However, during the RAS, such effects were not reported by the desludging operators. From the data collected of the desludging vehicles, it is seen that during monsoon the demand of desludging decreases.

4.3.4 Collection methods

The desludging of the tanks is done using vacuum trucks. Hence the solid content in the sludge from particular tanks is more or less consistent. There are only two private operators apart from the PBMC. Hence, the practice of desludging is also similar and hence is the quality of the sludge collected.

4.3.5 Climate

The climate is tropical monsoon climate with little variation in the average temperature of 30 °C. This ensures the rate of digestion is sludge in the septic tanks is quite good throughout the year and hence there is no significant variation in the quality and quantity of the sludge due to climate.

4.4 Treatment targets and objectives

The main target of treatment of FSS is to ensure the protection of human and environmental health. Legislation that establishes regulations specifically for the treatment and discharge, endues, or disposal of FS is essential; however, in PBMC such legislation does not exist. It is recommended to have legislation passed for containment, collection & transport, treatment and endues or disposal.

Following are the treatment objectives of FSS;

4.4.1 Dewatering

Since FSS contains more than 95% water, dewatering of FSS becomes one of the main treatment objectives. Dewaterability of faecal sludge depends on various factors. The faecal sludge and wastewater sludge tends to be difficult to be dewatered as compared to septage. Hence stabilisation (digestion) of these two types of sludge is important before dewatering.

4.4.2 Stabilization

Faecal sludge and wastewater sludge needs stabilisation in order to reduce the BOD, COD of the sludge. Stabilized sludge ensures good dewaterability of the sludge in the subsequent stage. Stabilisation is done anaerobically (denitrification) or aerobically depending on the organic content with respect to the nitrogen content (BOD:TKN ratio). FSS is stabilised anaerobically as it can potentially lead to biogas generation.

4.4.3 Pathogens

FS contains large amounts of microorganisms, mainly originating from the faeces. These microorganisms can be pathogenic, and exposure to untreated FS constitutes a significant health risk to humans, either through direct contact, or through indirect exposure. FS needs to be treated to an adequate hygienic level based on the end-use or disposal option. In this case end-use will be co composting or soil conditioner.

4.4.4 Nutrients

FS contains significant concentrations of nutrients, which can be harnessed for beneficial resource recovery. The nutrients in FS can supplement synthetic nitrogen-based fertilisers that are heavily dependent on fossil fuels and phosphorus.

5 FSS collection and transport

This chapter detailed out the criteria selected for the collection and transportation of FSS for the Port Blair city as currently city has the “on demand” desludging approach. Based on the desludging approach, the estimates of collection and transportation infrastructure requirements i.e. number of vacuum tankers, capacity of vacuum tankers and technical specifications of the vacuum pumps and other necessary equipment are estimated and described in the following sections. The standard operating procedures (SOPs) for the collection and transportation activity is also described.

5.1 Criteria for collection and transport

According to the current situation, households in Port Blair city has on-site containment systems (OSS), i.e. septic tanks with 95% coverage. and soak pits (2%). Currently, PBMC don't have sewerage network and private operators are managing the cleaning services of these OSS. The FSS collected from such containment units are disposed without any treatment into the entrenchments/pits at SWM dumping site. Port Blair city requires reliable faecal sludge transport and conveyance systems to ensure end-to-end FSM services for the city. The criteria for the selection of desludging management is shown in the Figure 17

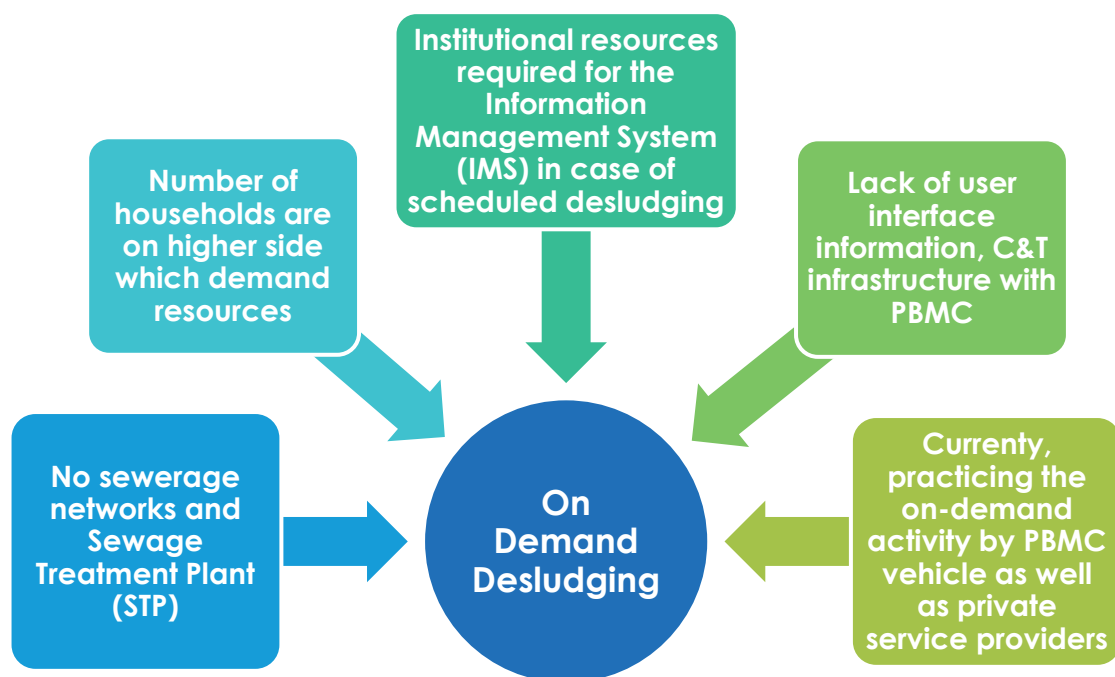


FIGURE 17: FACTORS CONSIDERED FOR THE SELECTION OF DESLUDGING MANAGEMENT APPROACH

It is observed that there is no sewerage network and sewage treatment system, the number of households (46,454) are on higher side which demand the maximum resources to manage the information management system (IMS) at city level and there is lack of FSSM infrastructure. These factors have to be considered for the selection of desludging management and it is recommended that the On-demand desludging management option will be the feasible and reliable option for the Port Blair city.


5.2 Number of vacuum tankers

Currently, PBMC has an owned vacuum truck with the capacity of 8 m³ which is operated and managed by PBMC staff. Two private operators are also providing desludging services and they have equipped vacuum trucks with the capacity of 4 m³ and 6 m³. According to the consultation with PBMC and private operators, it is discussed that the demand for the desludging service is maximum up to 1 or 2 trips per day. In FS quantification section 4, it is estimated that the if the available C&T vehicles (PBMC and Private) carry out 2 trips per day at the peak demand days it will collect around 36 m³ capacity of sludge.

In case of PBMC C&T infrastructure, the existing vehicle has difficulty in accessing the smaller lanes in the internal part of the city, even considering the capacity and collection of sludge by PBMC vehicle is also variable which is economically not viable. It is noted that the PBMC don't have any contract with the private operators so it's not ensured that the private operators will serve for the PBMC in future. It is also observed that the charges levied by the private operators for the desludging service are variable and on the higher side at around INR 3000 to INR 6000.

it is recommended that PBMC requires an additional vacuum truck with the smaller capacity of 4 m³. It is also required to empanel and have contract with the private operators for the collection and transportation service of the faecal sludge with the fixed charges for the desludging service from the generators. It is estimated that, the maximum distance to carry sludge from the end point of the city to the proposed treatment site is around 10 kms – 12 kms so PBMC can fix the charges for the desludging service for owned vehicle as well as private operators as shown in Table 8.

TABLE 8: DETAILS OF THE EXISTING AND PROPOSED C&T VEHICLES AND PROPOSED CHARGES FOR THE SERVICE

N ^o	Indicators	Number	Capacity (m ³)	Existing Charges for the service (INR)
Existing C&T Vehicles				
1	Vacuum Trucks			
	PBMC vehicle	1	8	500
	Private Operator A	1	6	2,500 – 3,500
	Private Operator B	1	4	4,000 – 6,000
Proposed C&T Vehicles				
2	Vacuum Trucks (fitted with GPS tracker)			
	New PBMC vehicle	1	4	As per proposed section
Proposed fixed Charges (INR/litre considering the distance)				
	Residential (IHHT)		Commercial (Hotel, Resorts, Industry etc)	
	Distance (kms)	Charges (INR / litre)	Distance (kms)	Charges (INR / litre)
1	0 – 5	0.50	0 – 5	1.00
2	5 – 10	0.75	5 – 10	1.20
3	More than 10	1.00	10 -15	1.50
Tipping fees from Private operators to PBMC				
1	INR 400 / 4 KL Truck			
2	INR 600 / 6 KL Truck			
3	INR 800 / 8 KL Truck			
	Note:			
	<ul style="list-style-type: none"> ❖ Example: As per the proposed charges it is estimated that if a private operator or PBMC vehicle is desludging the OSS of capacity 4,000 litres from an Individual household (Residential) which is 5.6 kms from the FSTP site then they will get service fees as INR 3,000 (5 – 10kms, INR 0.75 x 4000 litres sludge). In the same scenario, if the source is hotel or resort (commercial) then Private or PBMC will get service fees as INR 4,800 (5 – 10kms, INR 1.20 x 4000 litres sludge) ❖ It is also recommended that PBMC can get tipping fees from the private operators with the charges of INR 400 / 4 KL Truck, INR 600 / 6 KL Truck, INR 800 / 8 KL Truck. For example, to dispose the 4000 litres of FS by a 4KL vacuum truck at the FSTP site by the private operators, they have to provide tipping fees of INR 400. 			

5.3 SOP for collection & transport

It is important to have Standard operating procedures (SOPs) for different activities at specific stakeholder's level in the Faecal Sludge and Septage Management. The recommended SOPs for the collection and transport activities with respect of individual households, desludging service providers (PBMC and Private Operators), PBMC level are given in this section.

5.3.1 Conduct a baseline survey of on-site sanitation systems

PBMC has to conduct a comprehensive baseline survey of on – site sanitation systems which will provide the overview of existing situation in the city. The survey should cover the following points,

- Number of toilets connected to various type of on-site sanitation systems (twin pits, septic tanks etc)
- Existing issues with the on-site sanitation systems
- Routine O&M by property owners
- Cleaning and emptying frequency

5.3.2 Guidance to individual households on routine O&M of OSS

Routine operations and maintenance (O&M) of the complete on-site sanitation system is critical ensuring safe and efficient sludge management practices. PBMC should educate and inform individual households about the proper functioning of and maintenance requirements of the system. The onsite O&M responsibilities of sanitation infrastructure for which individual households are responsible will include,

- Repair and maintenance of toilets, septic tank, soak pit and piping system.
- Clearing pipe blocks
- Getting faecal sludge emptied from private or municipal vacuum trucks on demand at an interval of 2-3 years.

5.3.3 Standard operating procedure for desludging OSS

5.3.3.1 *Daily Preparation for the PBMC service / private emptying and transport service provider*

- Receive work orders for the day
- Check the functioning of vacuum emptier and equipment
- Check personal protective equipment – All employees should be responsible for maintaining their own personal protective equipment (such as gloves, boots, hat, face mask, Davy's lamp) in good condition
- Check Disinfecting and spill control equipment – Operators should be
- trained on identifying spills and proper methods of disinfecting. Sprinkle lime over spilled area, wait 15 minutes, then wash with water
- Check Hoses – inspect hoses for cracks and wear– discard or repair worn and broken hoses. Connecting the Hose in the correct manner using the clamp style fitting ensures a tight and leak proof connection. Use of twine and plastic for making connections causes leaks and require clean-up.

5.3.3.2 *Operating the vacuum trucks*

Vacuum truck operators (private or PBMC) should become familiar with the proper operation of the equipment in use for each operation. This includes the physical operation of the truck, and all valves, piping, power take-offs and ancillary equipment for the vacuum trucks (including the tank, valves, hoses, and fittings). The following steps has to be followed for operating the vacuum trucks,

- Reach the first site and meet the individual household owner.
- Before pumping, check the tank to look for obvious damage to the structure and to verify proper piping is in place.
- Check the water level to get clues as to tank condition: high levels (above outlet level) indicate a clogged outlet; low levels (below outlet level) indicate a leaking tank (or tank not in use).
- Check for back flow into tank during pumping and when pumping is complete. Flow back may indicate a problem with plumbing in the house or clogged disposal.
- Open the access covers, inspect the interior and exterior of the tank. If more than one, locate and remove lids (for at least 2 hours) from all compartments.

- Each compartment will require pumping after ventilating. Probe the tank with the last length of hose. This will provide an indication on the volume of sludge to pump.
- Start the pump or vacuum equipment. The operator will make sure there is suction and that the pump is operating.
- Volume in the tank should start decreasing rapidly. Use hose to break up sludge and scum to the extent possible.

After pumping is complete, check the tank for remaining sludge. If there are accumulated solids remaining, initiate the pump-back procedure, which is to send the pumped faecal sludge under pressure back into the tank and direct this flow toward the sludge mass. This will break up the mass, making it possible to pump out. When pump-back is complete, pump out the tank again (suction). When pumping is complete, wash the hoses and replace the tank lids. Clean up any spills and disinfect with lime or bleach solution.

5.3.4 Safe transport of faecal sludge to the treatment system

The desludging service provider should dispose faecal sludge into faecal sludge treatment system (FSTP) sludge receiving station. The operating procedures at faecal sludge receiving station at FSTP site are summarized below,

- Plan the trip so as to arrive at the disposal site within the specified disposal site operating hours
- Report equipment malfunctions or required repairs immediately to supervisors.
- At the disposal facility position the vacuum truck so that the faecal sludge may be directed to the receiving chamber with only one length of hose
- Open the valve and allow the sludge to flow via gravity into the receiving chamber
- When the tank is empty, disconnect hose and clean tank and hose with water
- Use all safety precautions at disposal site and keep site clean

5.4 Record keeping and Manifests

It is important to PBMC to maintain records of the collection and transport activity. Keeping accurate records regarding tanks and volume pumped is important for billing

and compliance. Recordkeeping and manifest forms are an integral part of a comprehensive FSSM.

Manifest forms are simple receipts which specify,

- the location or address of the pumped septic tank
- septage characteristics (residential or commercial)
- the name and address of the property owner or occupier
- the volume of septage pumped
- any notes regarding tank deficiencies, missing pipes or fittings, improper manholes or access ports, any other cracks or damage observed

Once completed, a copy of the manifest should be given to the individual household owner as a receipt. When desludging operator will be at the disposal site, the disposal site operator or PBMC should accept the load, verify the volume, takes a sample if needed and signs the manifest proving receipt of the volume of septage disposed of. Few sample manifest forms are given in the Annexure 5.

5.5 Faecal Sludge and Septage Manifest Form

Sample FSS Manifest Form (PBMC should modify this to fit their needs)

TABLE 9: SAMPLE FSS MANIFEST FORM

<p>Name of the City – Port Blair, South Andaman, A&N _____</p> <p>Date _____ Time _____ am/pm</p> <p>1. Basic Information (Must be completed by the septage emptier (person))</p> <p>a. What is the Volume of septage emptied (litres) _____</p> <p>b. What is the type of container emptied? (Tick the correct option) [___] Holding Tank [___] Septic Tank [___] Soak Pit [___] Other (specify) [_____]</p> <p>c. What is the user interface? [___] Residential [___] Restaurant [___] Office/commercial [___] Industrial [___] other (specify) _____</p> <p>2. Individual Household Owner (details of the User Interface)</p> <p>a. Complete name: _____</p> <p>b. Phone number: _____</p> <p>c. Complete address with landmarks: _____ _____</p> <p>The undersigned being duly authorized hereby certifies to the accuracy of the source and type of collected septage identified above and subject to this manifest. Date: _____ Signature: _____</p> <p>3. Information about the FSS emptier (vehicle):</p> <p>a. Company Name: _____</p> <p>b. Type of Vehicle: _____</p> <p>c. Vehicle Number: _____</p> <p>d. Where was the FSS taken for treatment? _____</p> <p>e. Where was the FSS dumped? _____</p> <p>f. Was the treated septage used for any other purpose? _____</p> <p>4. Acceptance by _____ Port Blair Municipal Council FORM AT FAECAL SLUDGE TREATMENT PLANT SITE Emptier (Name) _____ Vehicle Number: _____ The above emptier delivered the described septage to this disposal facility and it was accepted. Disposal date: _____ Signature of authorized official and title: _____</p>
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6 FSS treatment and end-use

This section elaborates the treatment scheme for solid and liquid fraction of the FSS coming at the treatment plant. The first section provides a list of treatment components and technologies and analysis of each option pertaining to the selection criteria and site conditions. The second section elaborates on the different stages of treatment of FSS and focuses on selected component for each stage. The third section provides a graphical representation of the process of the treatment scheme at the FSTP. The fourth and fifth section describes each component, its design criteria and assumption made. It also elaborates on the performance and strength and weaknesses. The last section describes possible end-use and disposal options.

6.1 Selection of appropriate treatment scheme

The criteria for choosing the proposed set of technologies are as follows;

1. Quantity and quality (digested and undigested) of sludge.
2. Climatic conditions all-round the year.
3. Disposal norms being a CRZ land.
4. Ease of installation and operation.
5. Area required for installation.

There are number of technology components for treating the FSS and the liquid component of the FSS. Some of the technologies considered as listed below;

TABLE 10: LIST OF TREATMENT COMPONENTS FOR SOLID AND LIQUID STREAM OF FSS FOR CONSIDERATION

Solid Treatment Systems	Liquid Treatment System
Co-composting	DEWATS
Anaerobic digestion	Constructed wetlands
Settling-thickening tank	MBBR
Imhoff tank	SBR
Sludge drying beds (planted/unplanted)	
Mechanical dewatering	
Sludge incineration	

Table 11 gives an analysis of each treatment components for solid stream of FSS under consideration. From the discussion put forward one can decide the suitability of the components in the context of Port Blair and site identified for the FSTP.

TABLE 11: ANALYSIS OF THE TREATMENT COMPONENTS FOR SOLID STEAM OF FSS

Solid Treatment Systems	Remarks
Co-composting	Co-composting needs skills and human resource for operation and maintain the C:N ratio is the key. Currently PBMC is practicing pit composting and substantial changes will have to be made in the existing standard operations carried out.
Anaerobic digestion	There is a requirement of anaerobic digestion for the faecal sludge coming from the CTs, PTs and resorts.
Settling-thickening tank	Settling thickening tank is easy to construct and operate for solid liquid separation and is used for septage coming from the septic tanks of the households.
Imhoff tank	Imhoff tanks are difficult to construct and require a longer retention time. The site constraints with respect to the depth makes Imhoff tank a costlier option.
Sludge drying beds (planted/unplanted)	The humidity is high throughout the year and rainfall is quite intense and hence the evaporation rate is lower. Hence, the sludge drying beds would require more area and will be inefficient.
Mechanical dewatering	Although mechanical dewatering required electricity, is more suitable in this case. The flexibility of operation and smaller footprint are biggest advantages in case of demand desludging.
Sludge incineration	Sludge incineration is energy intensive and needs skilled operator for consistent O&M of the system. In absence of proper O&M the cost of maintenance will be high. Daily variation in the amount of sludge collected is significant and hence estimating the exact capacity of the incinerator and its continuous operation is a biggest challenge.

Table 12 gives a detailed analysis of the three systems under consideration for treatment of liquid stream of FSS. The three systems are analysed depending on the criteria listed above and ground constraints of the FSTP sites.

TABLE 12: ANALYSIS OF THE TREATMENT COMPONENTS FOR LIQUID STEAM OF FSS

Liquid Treatment System	Remarks
DEWATS	DEWATS system is suitable & economical for treating wastewater with the COD:BOD ratio 2. Due to high rainfall, an average of 3 m ³ of rainwater will enter the system through PGF. Hence, the treated water tank will have to be provided with higher dead storage. Area required for the system is higher as compared to the other options.
MBBR	MBBR is a continuous reactor and has a flexibility in terms of process. It can very well treat different loads (quality and quantity) of the liquid stream of FSS. This system is skid mounted and hence easy to install and process is easy to operate. MBBRs have been installed in most of the resorts and hotels in Port Blair, hence its installation and O&M will be easy in longer run.
SBR	SBR gives all the advantages MBBR; however, it's a batch reactor and hence a set batch of wastewater can only be treated. SBR also provides flexibility in terms of process; however, expert operator is required for operation of SBR. Also, the number of installations of SBR are quite less as compared to MBBR.

6.2 Conceptual treatment stages

The solid treatment system is broken down into three stages; (1) Solid-liquid separation & stabilization (2) Dewatering of the digested thickened sludge and (3) Pathogen reduction.

TABLE 13: THREE STAGES OF SOLID TREATMENT SYSTEM AND THEIR OBJECTIVES

Stage	Objectives
Stage 1: Solid liquid separation and stabilization	<ol style="list-style-type: none"> 1. To separate the solids and the liquid from the FSS received. 2. To digest and hence stabilize the faecal sludge and wastewater sludge. 3. To improve the dewater ability of the sludge.
Stage 2: Dewatering	To dewater the digested sludge and remove the bulk water.
Stage 3: Pathogen reduction	To reduce the pathogens in the solids and make them safe and hygienic for handling and further use.

The liquid treatment system is broken into two stages; (1) Aerobic continuous type reactor and (2) Disinfection.

TABLE 14: TWO STAGES OF LIQUID TREATMENT SYSTEM AND THEIR OBJECTIVES

Stage	Objectives
Stage 1: Aerobic reactor	<ol style="list-style-type: none"> 1. To provide the necessary treatment to the liquid component of FSS. 2. To bring down the BOD, COD, TSS of the wastewater.
Stage 2: Disinfection system	To reduce the E. Coli to zero in order to make the treated effluent reusable.

The analysis provided in Section 6.1 led to zero down the treatment system to the individual components listed in Table 15. These components form different stages in the solid treatment.

TABLE 15: SELECTED TREATMENT COMPONENTS FOR SOLID AND LIQUID STREAM OF FSS

Solid Treatment Systems	Liquid Treatment System
Settling-Thickening Tank	MBBR
Anaerobic digestion	Pressurised filter (Activate Charcoal and Sand Filter)

Mechanical dewatering	UV Radiation
Heat drying	

The selected technologies are clubbed to form different stages of the treatment scheme. Refer to the tables below.

TABLE 16: THREE STAGES OF SOLID TREATMENT SCHEME AND ASSOCIATED TREATMENT TECHNOLOGIES

Stage	Components
Stage 1: Solid liquid separation and stabilization	Settling-Thickening Tank & Anaerobic Digester
Stage 2: Dewatering	Mechanical dewatering: Belt Press with coagulant dosing and drum thickener.
Stage 3: Pathogen reduction	Heat drying: Rotary dryer (batch type)

TABLE 17: TWO STAGES OF LIQUID TREATMENT SCHEME AND ASSOCIATED TREATMENT TECHNOLOGIES

Stage	Components
Stage 1: Aerobic reactor	MBBR with a built-in secondary tube settler
Stage 2: Disinfection system	Pressurised filter followed by UV radiation

6.3 Process flow diagram

Process flow diagram helps to understand the flow of different streams from one component to other. It recognizes, what goes in and out of each component and helps us to understand all the interlinkages between different components in a FSTP. Figure 18 shows the process flow diagram of the proposed FSTP at Port Blair.

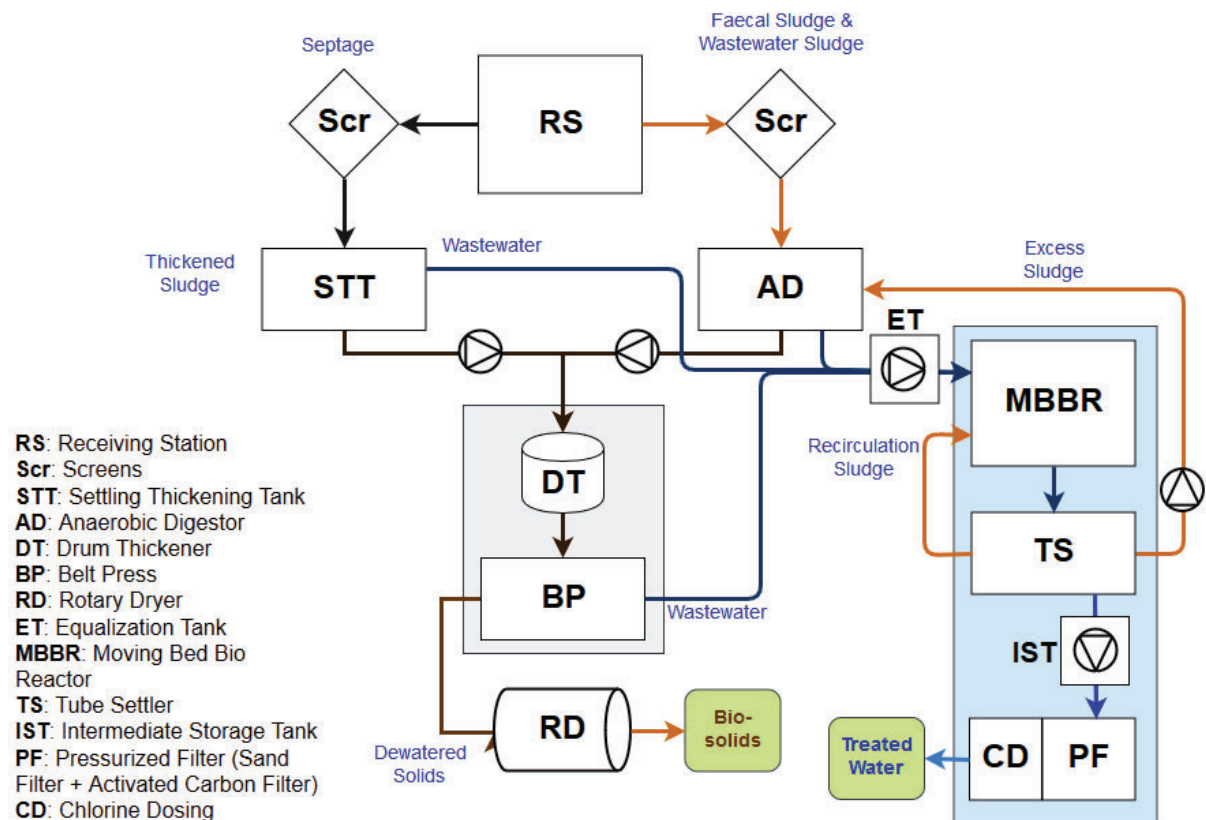


FIGURE 18: PROCESS FLOW DIAGRAM FOR FSTP

6.4 Solid treatment scheme


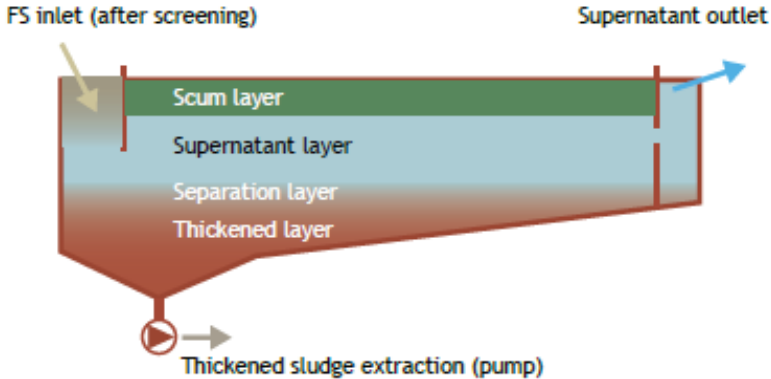
This section describes in detail the treatment scheme for solids in FSS. Starting with treatment mechanisms, followed by the criteria for design and assumptions are stated.

6.4.1 Fundamental mechanism

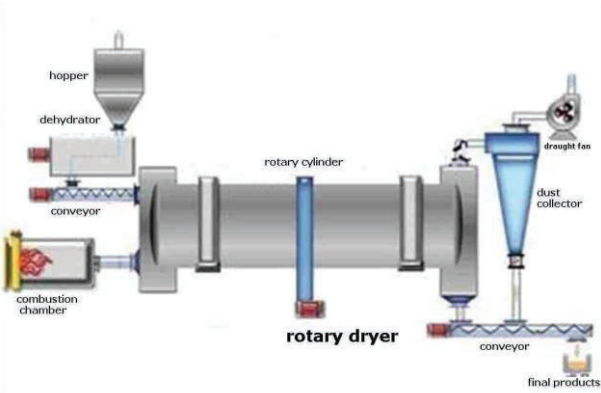
As described earlier the section 6.2 the three stages in solid treatment scheme are; (1) Solid-liquid separation, (2) Dewatering and (3) Pathogen reduction. The objectives of each stage are explained in Table 13.

Table 18 describes the treatment mechanism of each component of the solid's treatment scheme.

TABLE 18: TREATMENT MECHANISMS OF EACH COMPONENTS OF SOLIDS TREATMENT SCHEME

Components	Treatment Mechanism	Picture
Screens	<ol style="list-style-type: none"> 1. Physical exclusion of waste depending upon the size. 2. Set of coarse and fine screens provide necessary removal of solid waste (sanitary napkins, condoms, cloths, rags, plastic bags etc.) from the FSS received through vacuum truck. 	
Settling- Thickening Tank	<ol style="list-style-type: none"> 1. Settling: Sedimentation of suspended solids due to difference in the specific gravity of the particles and water. 2. Thickening: The accumulated sludge at the bottom get further compressed due to the weight of the particles above. 3. Floatation: Due to difference in the density; the oil, fats etc. floats to the top surface of the tank. 4. Anaerobic digestion: Digestion of the settled sludge happens in the thickened layer of sludge at the bottom. 	

<p>Anaerobic Digester</p>	<ol style="list-style-type: none"> 1. Treatment of organic solids in airtight chamber to ensure anaerobic conditions. 2. The organic matter is converted into biogas and digestate. 3. Digestate is biologically stable and can be used as a soil conditioner after dewatering and drying. 	
<p>Drum Thickener</p>	<ol style="list-style-type: none"> 1. The incoming thickened sludge is dosed with coagulant and mixed in the drum. 2. The coagulant binds the smaller particles, resulting into bigger flocs of sludge. 3. The bigger flocs of sludge are easier to dewater using belt press. 	
<p>Belt Press</p>	<ol style="list-style-type: none"> 1. The coagulated sludge is pressed between two textiles and rolled over set of rollers with varying tension. 2. The sludge is pressed and bulk water is dewatered; however, the bound water still remains in the sludge. 	

Rotary Dryer	<ol style="list-style-type: none">1. The dewatered sludge goes into rotary dryer in batches, where it is exposed to heat and continuously tumbled.2. The tumbling process ensures even distribution of heat in the solids and evaporates the bound water.3. The exposure of sludge to heat above 100 °C, results in inactivation and reduction of pathogens.	
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6.4.2 Design considerations

The following Table 19 gives the design considerations for each component of the solids treatment scheme.

TABLE 19: DESIGN CONSIDERATION OF SOLID TREATMENT SCHEME

Components	Design considerations
Screens	Two sets of screens (coarse and fine) to trap the solid waste (sanitary napkins, condoms, cloths, rags, plastic bags etc.) with manual raking system to remove the solid waste.
Settling-thickening tank	Daily average flow: 20 m ³ /d; Peaking factor: 1.5; Daily hours of operation: 8 h; Up flow velocity: 0.5 m/h; SS initial concentration: 12.40 g/L; SS concentration after thickening: 80 g/L; Efficiency: 80%; Scum height: 0.4 m; Supernatant height: 0.5 m; Separation height: 0.5 m; Length:Width ratio: 5:1;
Anaerobic digester	Daily average flow: 12m ³ /d; Time of operation: 10 hr; COD _{in} : 40,000 mg/L; BOD _{in} : 8,000 mg/L; Hydraulic retention time: 30 hours; Sludge retention time: 3 months; Temperature: 30°C
Drum thickener	Daily average flow: 4 m ³ /d; SS initial concentration: 80 g/L
Belt press	Daily average flow: 4 m ³ /d
Rotary dryer	320 kg Solids per day; Moisture content: 60%

6.5 Liquid treatment scheme



This section describes in detail the treatment scheme for liquid in FSS. Starting with treatment mechanisms, followed by the criteria for design and assumptions are stated.



6.5.1 Fundamental mechanism

As described earlier the section 6.2 the two stages in liquid treatment scheme are; (1) Aerobic digestion and (2) Disinfection. The objectives of each stage are explained in Table 14.

Table 20 describes the treatment mechanism of each component of the solids treatment scheme.

TABLE 20: TREATMENT MECHANISMS OF EACH COMPONENTS OF LIQUID TREATMENT SCHEME

Components	Treatment Mechanism	Picture
MBBR	<p>It's a combination of activated sludge process (suspended growth) and biofilter processes (attached growth). Moving Bed Biofilm Bioreactor (MBBR) process uses the whole tank volume for biomass growth. It uses simple floating media, which are carriers for attached growth of biofilms. Biofilm carrier movement is caused by the agitation of air bubbles. This compact treatment system is effective in removal of BOD as well as nitrogen and phosphorus while facilitating effective solids separation.</p>	
Tube settler	<p>Tube settler separates out the activated sludge with the principle of sedimentation. Some of the solids collected in the secondary tube settler (recirculation sludge) are sent back to the aeration tank to treat more wastewater and the excess (excess sludge) is pumped to another location in the plant for further treatment. The clean water that flows out the top of the tube settler is sent along for disinfection.</p>	

<p>Pressurised filter (Dual media filter + Activated carbon filter)</p>	<p>The media in a dual or multi-media filter are arranged so that the water moves through media with progressively smaller pores. The largest particles are strained out by the anthracite. Then the sand and garnet trap the rest of the particulate matter through a combination of adhesion and straining. Since the particles in the water are filtered out at various depths in a dual or multi-media filter, the filter does not clog as quickly as if all of the particles were all caught by the top layer.</p> <p>The activated carbon is provided to strip off the odour and colour of the treated effluent. Although this is not required in ideal conditions, however, since the quality of the influent is going to vary, it is recommended to have an activated charcoal filter.</p>	
<p>Chlorine Disinfection</p>	<p>Chlorination is the most common method of wastewater disinfection and plays a key role in the treatment process by removing pathogens and other physical and chemical impurities. Chlorine's important benefits to wastewater treatment are disinfection, controlling odour and preventing septicity, controlling foaming and foul air scrubbing, destroying cyanides and phenols, ammonia removal.</p>	

6.5.2 Design of the component

The following table gives the design considerations for each component of the liquid treatment scheme.

TABLE 21: DESIGN CONSIDERATION OF LIQUID TREATMENT SCHEME

Components	Design considerations
MBBR	Daily average flow: 42 KLD; COD _{in} : 1200 mg/L; BOD _{in} : 600 mg/L; TSS _{in} : 700 mg/L
Tube settler	Average flow: 42 KLD; TSS _{in} : > 700 mg/L; HRT:
Pressurized filters (Dual media filter + Activated carbon filter)	Flowrate: <100 L/m; TSS _{in} : <50 mg/L; BOD _{in} : <30 mg/L; COD _{in} : 50 gm/L

6.6 End products and specifications

6.6.1 Bio solids (Soil Conditioner)

The use of FSS as a soil conditioner can be in the form of bagged compost that is sold as a commercial product for household level use in horticulture. Using FS as a soil amendment has many benefits over using chemical fertilisers alone. Organic matter in FSS can increase soil water holding capacity, build structure, reduce erosion and provide a source of slowly released nutrients. As mentioned above, when using FS as a soil conditioner, the fate of and exposure to pathogens and heavy metals needs to be taken into consideration, and social acceptance can be closely linked to potential commercial value. Other factors that need to be considered include nutrients, which may or may not be available in the ratio required by soil and crop systems.

In India, no regulations and standards have been set for treated bio-solids from treatment of FSS. Apart from the moisture content, pH and bulk density, other parameters of bio-solids cannot be controlled during the treatment of FSS. Hence US EPA and WHO (2006) have set standards with respect to pathogen contents of the bio-solids to be used as fertilizer in agriculture.

For dewatered septage/sludge use as fertilizer in agricultural application, it should satisfy the following criteria of Class A Bio-solids of US EPA; (1) A faecal coliform density of less than 1000 MPN/g total dry solids and (2) Salmonella sp. Density of less than 3 MPN per 4 g of total dry solids.

WHO (2006) suggests following standards; (1) Helminth egg concentration of < 1/g total solids and (2) E coli of 1000/g total solids in treated septage for use in agriculture

Following use of the bio solids are recommended;

1. The bio solids can be used in the public parks operated and maintained by PBMC for flowering plants and trees.
2. The bio-solids can be co composted with the organic waste to improve the characteristics of the compost currently being produced at the composting plant.
3. As suggested during stakeholder consultation, the bio solids can also be used for creation of small pots which can be sold to nurseries as an alternative to black plastic bags which are used for growing of plants.

6.6.2 Treated water

Liquid streams from treatment processes can be used for agricultural and horticultural irrigation, or other forms of water reclamation (e.g. non-recreational water features, industrial processes), depending on the quantity produced and the level of treatment. Water reclamation can be beneficial in areas where water resources are limited, and also for nutrient recovery. The main consideration with reclamation of liquid streams is to ensure that the treatment quality is appropriate for its intended use.

The treated water will meet the following standards laid down by CPCB on 13th October, 2017 (Annexure 3);

TABLE 22: TREATED WASTEWATER STANDARDS SET BY CPCB (2017, OCTOBER)

N°	Parameter	Concentration
1	pH	6.5-9.0
2	BOD	<30 mg/L
3	COD	<50 mg/L
4	TSS	<50 mg/L
5	Faecal coliform	<1000 MPN/100 mL

Following are the different use of treated water recommended;

1. For irrigation in the forest land.
2. For non-potable purposes like washing of vehicles owned by PBMC.
3. For irrigation in public spaces such as parks.

7 Operation and Maintenance of FSTP

Faecal sludge treatment plant (FSTP) require ongoing and appropriate operation and maintenance (O&M) activities in order to ensure long-term functionality. O&M plan for the FSTP will include the following information shown in Figure 19,



FIGURE 19: INFORMATION INCLUDED IN THE O&M PLAN OF FSTP

7.1 Procedures for receiving and off-loading of FSS at the station

It is important to take the traffic patterns and the management of truck traffic in and out of FSTPs into consideration in order to maximise the efficiency of the receiving and off-loading processes. Receiving FS loads at the FTSP involves,

TABLE 23: PROCEDURES FOR RECEIVING AND OFF-LOADING OF FSS AT THE RECEIVING STATION

Traffic control	Approval of FS discharge into the facility
<ul style="list-style-type: none"> • Provide directions of the access roads for the vacuum trucks at the receiving station, assistance to drivers to avoid accidents. • SOPs for the off-loading of FSS at the receiving station. • Vehicle parking areas 	<ul style="list-style-type: none"> • Record keeping – Approval Manifest to discharge FSS at the receiving facility (Refer: Table 9) • Vehicle driver has to fill the Manifest form at the FSS collection site and has to handover it to the operator at the FSTP receiving station. After signing the Manifest • Training to the operators of the Physical inspection (colour, odour, and presence of grease or oil) of FS samples

7.2 O&M plan of FSTP

In the section 8 of FS treatment design, the components of Faecal Sludge Treatment Plant (FSTP) are designed in detailed. The O&M requirements of the components of FSTP are given in the following Table 24 and Table 25 .

TABLE 24: O&M ACTIVITIES FOR THE COMPONENTS OF SOLID TREATMENT SCHEMES

Components	O&M Activities	Schedule
Solid Treatment Scheme (STS)		
Screens	Manual cleaning of screens after every unloading	Daily
Settling thickening tank	Scum and sludge removal	Weekly
	Start-up period - adjust the load time, assess the depths of the different zones and optimise the compaction time and sludge removal frequency.	
	Observation of Seasonal variations as loss of water through evaporation which could increase the solids content of the scum. High temperatures may also increase the anaerobic digestion process, and therefore the height of the scum layer.	Seasonal
Anaerobic digester	Removal of Sludge	After 3 months
	Checking and cleaning of blockages in pipes at all inlet chambers, manholes	Weekly
Belt Press	Washing of belt after cake is removed	Daily
	Replacement of filter belts	After its life average
	Records keeping of all press performance parameters, including the volume of biosolids fed to the press, polymer dosage, and potassium permanganate or other chemical usage.	Daily
Rotary Dryer	Routine cleaning to avoid corrosion	Daily

	Removal of scales by washing with acids or high-pressure water jets	Fortnightly
<p>Note: Operation and Maintenance Manual for belt press and rotary dryers should be provided by the treatment components provider company and those O&M activities has to be followed by the operator. Routine cleaning and oiling of pumps and maintenance of electrical components is necessary</p>		

TABLE 25: O&M ACTIVITIES FOR THE COMPONENTS OF LIQUID TREATMENT SCHEME

Components	O&M Activities	Schedule
Liquid Treatment Scheme (LTS)		
Moving Bed Bio Reactor (MBBR)	Removal of Settled Sludge	After 3 months
	Inspection of aerobic reactors for uneven air distribution and foaming	Monthly
	Regular oiling and cleaning of pumps	Fortnightly
Tube Settler	Cleaning of tubes	Fortnightly
	Removal of Settled Sludge	After 2 months
Dual Media Filter	Backwash to avoid clogging	As per the O&M manual of the provider
Chlorination	Restocking of chemical and checking of dosing equipment	
<p>Note: Operation and Maintenance Manual for the whole MBBR System should be provided by the treatment system provider company and those O&M activities has to be followed by the operator. Frequent maintenance tasks include:</p> <ul style="list-style-type: none"> • corrosion control - scraping rust, painting metal surfaces, and repairing corroded concrete; • sludge and coarse solids extraction from the basins and canals; • repacking and exercising valves (i.e. locating and maintaining fully operational valves); • oiling and greasing mechanical equipment such as pumps, centrifuges or emptying trucks; and • housekeeping activities. 		

7.3 Monitoring & Record Keeping

7.3.1 Monitoring

PBMC has to structure the monitoring program in order to provide the operations employees with adequate information to continuously optimise the plant performance, and to provide control over the effluent quality. Monitoring system will include the following aspects,

- Visual or sensory observations of the plant conditions, (example: scum on a treatment lagoon, colour of the sludge, odours emanating from a pump tank)
- Regular analysis or measurement at source (test strips or kits has to be used for the measuring pH, dissolved oxygen, temperature)
- Scheduled laboratory sample analysis.

It is recommended to PBMC for setting - up a small-scale laboratory at the FSTP site or carry out the sampling by accredited private or government labs. It is suggested to carry out the analysis of basic parameters i.e. pH, TSS, BOD₅, COD, E-Coli at certain fixed interval and analysis of treated bio-solids considering the parameters as per FCO (2013).

7.3.2 Record Keeping

It is recommended to maintain the records or reports for the effective O&M programmes of FSTP. Operators can refer maintained records in order to identify previous fluctuations in the operation of the facility and operational problems that may recur periodically, can review the effectiveness of mitigation measures that may have been used to correct past operating problems, and to optimise the O&M procedures. It is suggested to PBMC to prepare the different documentation formats for the activities listed below,

- information on the operation of the FSTP including daily operating records, the operators log book, manifest reports, the treatment unit operating data sheet and records related to FS deliveries to the plant;
- preventative and corrective maintenance records including the equipment maintenance log books and store room supply reports
- compliance reports including field and analytical data, and correspondence from regulatory officials
- employee records, such as employee schedules, time sheets and injury reports.

8 FSTP: Description and specification

8.1 Site selection

This section describes the proposed site for FSTP. The land was shortlisted, demarcated by PBMC and is located near the solid waste dumping site (11°38'21.9"N 92°44'52.6"E) in Ward 22 as shown in Figure 20.

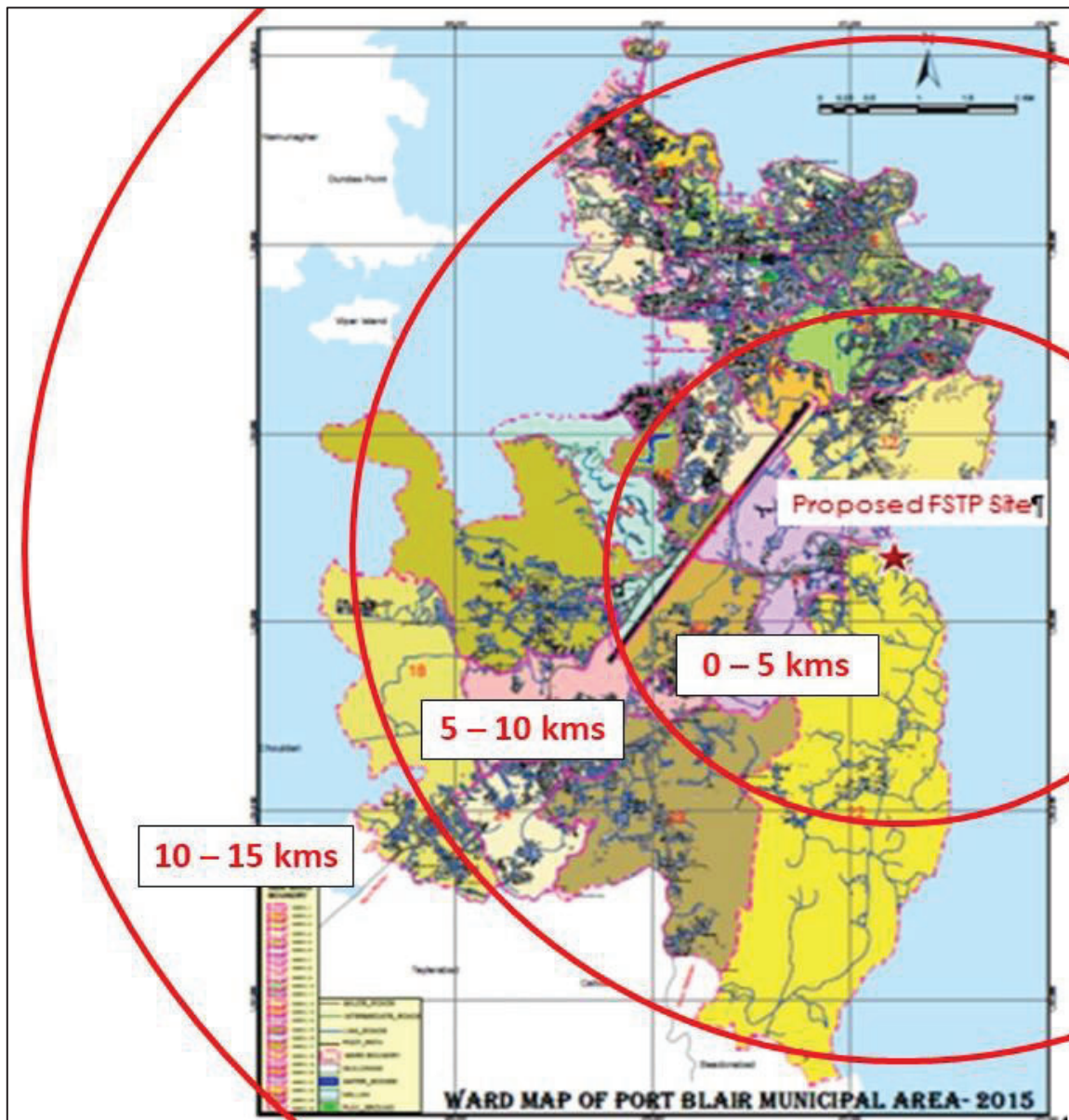


FIGURE 20: LOCATION OF FSTP SITE IN PORT BLAIR CITY

Port Blair extends in the North South direction with the air strip running across the city. The air strip divided the city into two parts. The north side of the strip is densely populated, whereas the south side is sparsely populated.

TABLE 26: TIME TAKEN FROM FARTHEST POINTS OF PORT BLAIR TO THE PROPOSED FSTP SITE

Point	Distance (km)	Time (min)
North (Haddo)	10.1	22
South (Kamraj Nagar)	8.0	19
West (Birsa Nagar)	9.6	23
South West (Kalapani Museum)	9.0	23

The FSTP site is easily accessible and will not pose any nuisance of odour and vehicular traffic to the residential areas. The site is located on the road which leads to the solid waste dumping site.

8.2 Plan of FSTP site

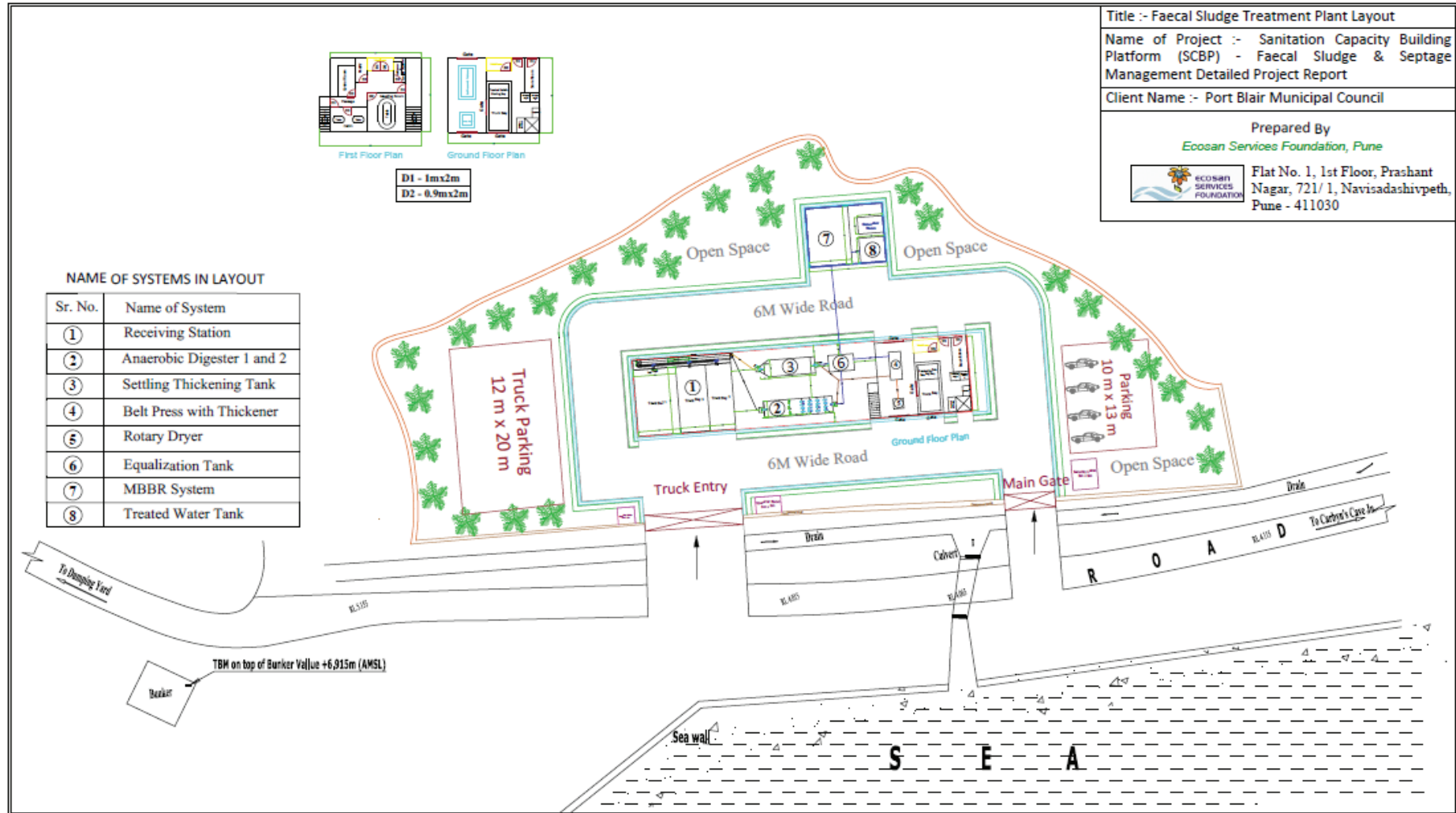


FIGURE 21: LAYOUT OF PROPOSED FAECAL SLUDGE TREATMENT PLANT (FSTP) SITE

8.3 Description and specification solid treatment scheme

An FSS receiving station is proposed before the screens at the FSTP site. The receiving station will have three truck bays. Each truck bay will have an inlet point i.e. a pipe with a locking mechanism which locks onto the outlet of the truck. Thus, three trucks can be emptied simultaneously. All the three pipes will be connected to, a channel which will hold the screens. Each truck bay will be provided with a water hose for cleaning and washing of trucks and any spillage. The water used here will be treated water from liquid treatment scheme.

TABLE 27: DETAILS OF THE RECEIVING STATION

N°	Details	Unit	Value/Description
Receiving station			
1	Number of trucks served	No.	3
2	Size of each truck bay	No.	3.5 m x 7 m
3	Slope for each truck bay	%	1
4	Area required	m ²	80

8.3.1 Screens

Two receiving channels and screens will be installed at the initial stage of FSTP (refer process flow diagram in section 6.3). The septage collected from the containment system of individual households will be transported through the dedicated receiving channel and screen whereas the collected faecal sludge or wastewater from CT/PT or Hotels/Resorts will be transported through another dedicated channel and screen. Screens will be installed in the channel of width 0.45 m having slope 1:20. The height and total length of the channel will be 0.60 m and 4.5 m respectively. The velocity of the FSS in the channel should be between 0.3-1.0 m/s. This ensures no deposition of solids takes place in the channel. The first screen will have bar spacing of 15 mm followed by second screen with the bar spacing of 6 mm.

TABLE 28: SPECIFICATION OF SCREENS

N°	Dimensions	Unit	Value/Description
Receiving channel			
1	Length	m	12
2	Width	m	0.45
3	Height	m	0.60
N°	Details of equipment	Unit	Value/Description
Coarse screen			
1	Type		Bar screen
2	Make		Stainless Steel
3	Clear spacing	mm	25
4	Angle frame size	mm	450 x 850
5	Bar diameter	mm	16
Fine screen			
1	Type		Bar screen
2	Make		Stainless Steel
3	Clear spacing	mm	10
4	Angle frame size	mm	450 x 850
5	Bar diameter	mm	16

Manual raking is proposed since not much solid waste is expected to come in the FSS. The raked out solid waste will be collected in the pan behind the screen and sent to the land fill for disposal. After the screens, the FSS will be directed to the settling thickening tank and the anaerobic digester through the screens separately.

After disposal of FSS at FSTP, the suction trucks will be washed at the receiving station platform. The washing facility with compressor and jet system will be provided at the receiving station. A 10 KLD storage tank will be provided for the storage of water pumped from the treated water tank at liquid treatment scheme.

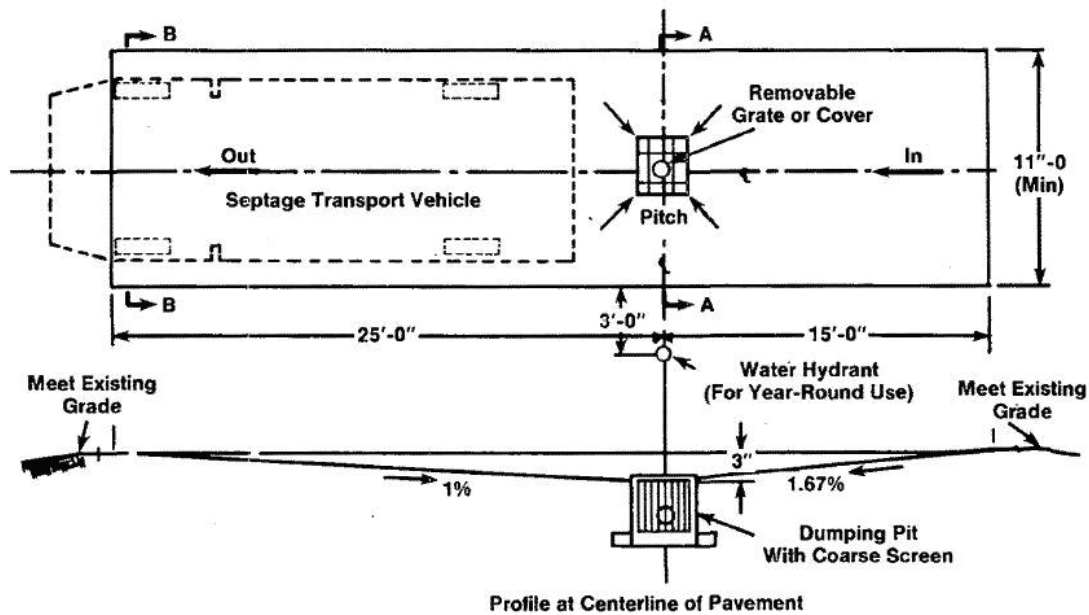


FIGURE 22: DIAGRAM OF CHANNEL AND SCREENS AT THE RECEIVING STATION OF FSTP (FOR REPRESENTATION PURPOSE ONLY; NOT TO THE SCALE)

8.3.2 Settling thickening tank

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

In the sedimentation section the velocity of the septage is reduced adequately so as to allow separation of oils-grease-fats and solids particles. The sedimentation section has a slope towards the inlet section where a small sump is created for fixing the sludge pump. This sump ensures that only thick compressed sludge is pumped out of the settling thickening tank. In normal working conditions, approximately 3 m³/d of thickened sludge needs to be pumped out of the settling thickening tank and sent to belt press for dewatering.

The outlet section is separated from the sedimentation section using another baffle wall. The outlet pipe is an inverted elbow which facilitates removal of only top layer of the water.

TABLE 29: DIMENSIONS OF SETTLING THICKENING TANK

N°	Dimension	Unit	Value/Description
1	Length	m	6
2	Width	m	2
3	Height	m	4.5
4	Area	m ²	12
5	Volume	m ³	32

TABLE 30: SPECIFICATIONS OF PUMPS TO BE INSTALLED AT SETTLING THICKENING TANK

N°	Details of equipment	Unit	Value/Description
Sludge pump: From settling thickening tank to feeder of belt press			
1	Type		2 nos. (1W + 1S) Horizontal centrifugal, self-priming, non-clog
2	Solid handling	mm	7
3	Capacity	m ³ /h	< 2
4	Head	M	10
5	Make		CI body and impeller

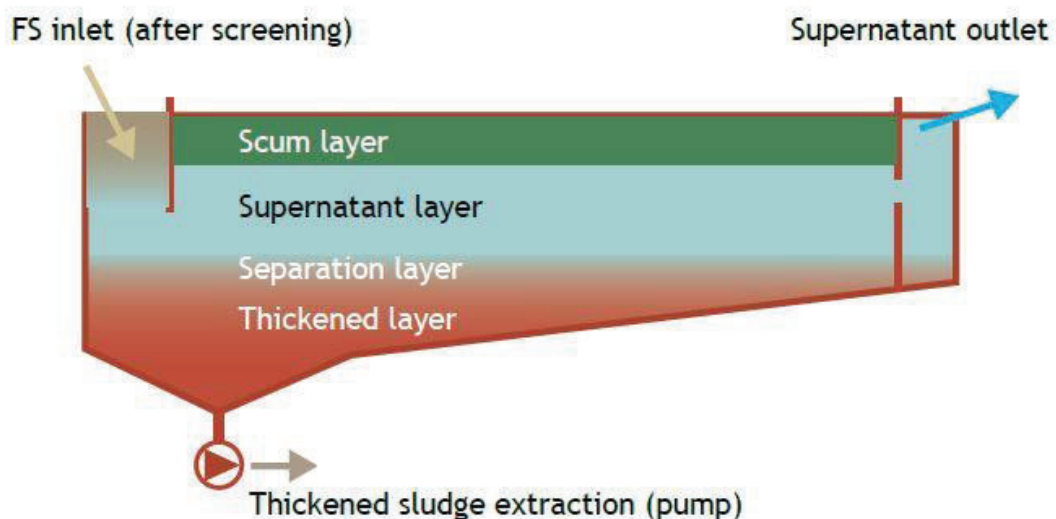


FIGURE 23: DIAGRAM OF SETTLING THICKENING TANK OF FSTP (FOR REPRESENTATION PURPOSE ONLY; NOT TO THE SCALE)

8.3.3 Anaerobic digester

The anaerobic digester consists of two sections; (1) anaerobic settler and (2) anaerobic stabilizer. The settler ensures bigger solid are separated from the liquid stream. These solids they settle to the bottom of the settler and are digested anaerobically. The liquid portion with difficult to settle solids enter the stabilizer where the incoming sludge (faecal sludge/wastewater sludge) will be brought in contact with the activated sludge. The incoming sludge has to pass through the activated sludge blanket which helps to bring down the BOD, COD and TSS of the liquid component. The sludge retention time of 3 months is provided and the hydraulic retention time of more than 30 hours is provided.

After stabilization, the liquid component is collected in a separate tank from where it will be pumped into the Liquid Treatment Scheme. The 3 m³ of digested sludge needs to be removed every week from the digester and sent to belt press for dewatering.

TABLE 31: DIMENSIONS OF ANAEROBIC DIGESTOR

N°	Dimension	Unit	Value/Description
1	Length	m	8.10
2	Width	m	2.0
3	Height	m	1.8
4	Area	m ²	16.20
5	Volume	m ³	31.10

TABLE 32: SPECIFICATIONS OF PUMPS TO BE INSTALLED AT ANAEROBIC DIGESTER

N°	Details of equipment	Unit	Value/Description
Sludge pump: From anaerobic digester to feeder of belt press			
1	Type		2 nos. (1W + 1S) Horizontal centrifugal, self-priming, non-clog
2	Solid handling	mm	7
3	Capacity	m ³ /h	< 1
4	Head	m	10
5	Make		CI body and impeller

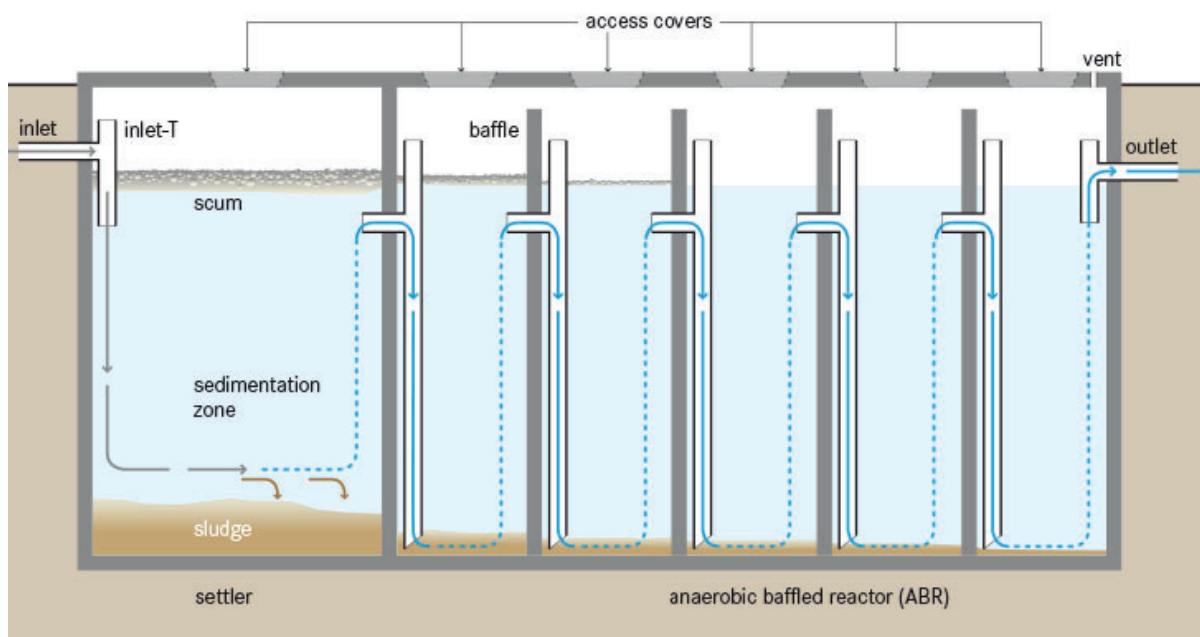


FIGURE 24: DIAGRAM OF ANAEROBIC DIGESTOR OF FSTP (FOR REPRESENTATION PURPOSE ONLY; NOT TO THE SCALE)

8.3.4 Belt press

The thickened sludge from the settling thickening tank and the digested sludge from the anaerobic settlers will be fed into the belt press. The belt press is integrated with a drum thickener. A polyelectrolyte (coagulant) is added to the incoming stream and passed through drum thickener, resulting in a good consistency sludge. Polyelectrolyte consumption is between 2.5-4 kg/ton of dry solids and depends on the concentration of the solids in the thickened sludge. The conditioned sludge falls on the belt and is pressed between series of rollers to remove the bulk water from the sludge.

The resultant sludge contains only bound water in the moisture form. This sludge is further sent to rotary dryer in batches.

TABLE 33: DIMENSIONS OF BELT PRESS

N°	Details of equipment	Unit	Value/Description
1	Dimensions	mm	3350 x 1350 x 1700
2	Dry weight	kg	1020
3	Belt width	mm	600
4	Installed power	kW	2.75

5	Wash water flow rate		4.5 m ³ /h @ 6 bar
6	Pneumatic air		0.1m ³ /h @ 7 bar
7	Belt tracking system		Pneumatic
8	Belt tensioning system		Pneumatic
9	Back was water pump		Double Impeller Centrifugal

TABLE 34: SPECIFICATIONS OF THE BELT PRESS

N°	Component	Description		
Drum thickener				
1	Belt	Polyester		
2	Screw flight	SS 304		
3	Screw shaft	SS 304		
4	Wash water header	SS 304		
5	Filtrate tank	SS 304		
6	Sludge discharge chute	SS 304		
7	Hardware	SS 304		
Belt Press				
1	Belt	Polyester		
2	Frame and structure	SS 304		
3	Filtrate collection tank	SS 304		
4	Belt guide gasket	Neoprene		
5	Washing nozzles	SS 304		
6	Scraper blade	Teflon		
7	Hardware	SS 304		
Rollers				
N°	Component	Quantity	Dimension	Make/Coating
1	Belt tensioning roller	1	275 mm	SS 304
2	Belt alignment roller	1	173 mm	MS; suitable non-corrosive coating
3	Perforated drum	1	600 mm	SS 304

4	Belt transmission roller	3	173 mm	MS; suitable non-corrosive coating
5	Tubes	3	60 mm	SS 304
N°	Component	Description		
Electrical drives				
1	Drum thickener	0.25 kW; IP55, 415v, 50hz		
2	Belt press	0.25 kW; IP55, 415v, 50hz		
3	Wash water pump	2.20 kW; IP55, 415v, 50hz		
Instrumentation				
1	Pneumatic group	2 no. FRL with gauge, 1 no. solenoid valve, 1 no. pressure switch, 2 no. air bellows, 1 no. pneumatic cylinder		
2	Electrical group	1 no. inductive sensor, control panel- PLC operated with display and alarm included.		



FIGURE 25: DIAGRAM OF BELT PRESS (FOR REPRESENTATION PURPOSE ONLY; NOT TO THE SCALE)

8.3.5 Rotary dryer

The dewatered sludge from the belt press is fed into the rotary dryer in batches and dried with moisture content between 10-40% depending on the operation time of the dryer. The dryer consists of the arrangement where the drum is heated and rotated and the moisture laden air exists the system. The dried, sterilised sludge comes out of the system. The treated solids are proposed to be stored in the ware house for further reuse.

TABLE 35: SPECIFICATIONS OF THE ROTARY DRYER

N°	Component	Description
Rotary dryer		
1	Batch volume	500 litres
2	Capacity	250-300 kg @ 0.6 gm/cm ³ bulk density
3	Make	Contact parts and drum in SS 304
4	Drum size	600 mm diameter and 1200 mm length
5	Electrical	36kW
6	Operational temperature	130 to 160 °C
7	Maximum temperature	200 °C
8	Voltage	415 v AC 3 phase
9	Insulation	100 mm 96 kg/m Cu Rockwool
10	Motor	AC geared 3 HP
11	Control panel	Automatic temperature controlled by PID controller, heater control, speed control by AC frequency drive, Safety controller, ammeter indicating light emergency stop, completed wired electrical cum instrumentation
12	Loading	SS 304 top Silo 200 litres
13	Discharge	Ss 304 bottom discharge



FIGURE 26: PICTURE OF ROTARY DRYER (FOR REPRESENTATION PURPOSE ONLY; NOT TO THE SCALE)

8.4 Description and specification of liquid treatment scheme

8.4.1 MBBR

The MBBR consists of tank filled with special media. These media are made of specially developed material of control density such that they can be fluidised using an aeration device. A bio film develops on the media which moves along with the effluent in the reactor. The movement within the reactor is generated by providing aeration with the help of air grids placed at the bottom of the reactor. The thin bio film on the media enables the bacteria to act upon the bio degradable matter in the effluent and reduce the BOD and COD content in the presence of oxygen from the air that is used for fluidization.

The aerated liquid will overflow to Tube Settler for separation of solids from liquid. The settled sewage will be collected in intermediate storage tank.

TABLE 36: SPECIFICATIONS OF MBBR SYSTEM

Nº	Parameter	Unit	Concentration
1	Daily average flow	m ³ /d	42
2	Influent BOD ₅	mg/L	600
3	Influent COD	mg/L	1200
4	Influent TSS	mg/L	700

Area required: 60 m² (subject to vary depending on the site conditions during execution)

TABLE 37: OTHER REQUIREMENTS OF MBBR SYSTEM

Nº	Unit	Quantity	Make	Dimensions
1	Equalization tank	1	RCC	Volume: 20 m ³
2	MBBR tank	1	MSEP	Volume: 10 m ³ Thickness: 5 mm
3	Media for MBBR		PVC/PP	Specific surface area: 400 m ² /m ³
4	Tube settler tank	1	MSEP	Volume: 5 m ³ Thickness: 5 mm
5	Media for tube settler		PVC	Height: 510 / 750 mm

6	Intermediate storage tank	1	MSEP	Volume: 2m ³ Thickness: 5 mm
7	Treated water tank	1	RCC	Volume:20 m ³
8	Equipment foundation	1	RCC	Area: 35 m ²
9	Panel cum operator room	1	RCC	Area: 40 m ²

TABLE 38: ELECTROMECHANICAL REQUIREMENTS IN MBBR

N°	Details of equipment	Unit	Value/Description
Sewage pump: Equalization tank to MBBR reactor			
1	Type		2 nos. (1W + 1S) Horizontal centrifugal, self-priming, non-clog
2	Solid handling	mm	7
3	Capacity	m ³ /h	2
4	Head	M	10
5	Make		CI body and impeller
Filter feed pump: Intermediate storage tank to pressurised filters			
1	Type		2 nos. (1W + 1S) Horizontal mono-block, closed impeller, gland packing
2	Capacity	m ³ /h	2
3	Head	M	26
4	Make		CI body and impeller
Electrical panel			
1	Type		LT, cubical type, non-compartmentalized
2	Protection		Indoor type, IP42
3	Mounting		Floor / wall
4	Cable entry		Top / bottom
5	Incomer switch		Incoming power control switches SFU
6	Starters		Individual MCB and starter
7	Operations		Level switch-based operation of pumps

8	Cable		Power and control copper / Aluminium cable
9	Cable tray and conduit		Suitable make
Instrumentation			
1	Pressure gauge		On pump discharge header and blower discharge header
2	Level switch		For on-off of pumps

8.4.2 Aeration equipment

The aeration facilities of the ASP are designed to provide the calculated oxygen demand of the sewage against a specific level of dissolved oxygen in the wastewater. The aeration devices, apart from supplying the required oxygen demand shall also provide adequate mixing or agitation in order that the entire mixed liquor suspended solids present in the aeration tank will be available for the biological activity.

The recommended dissolved oxygen concentration in the aeration tank is in the range 0.5 to 1 mg/l for conventional ASP and above 2 mg/l when nitrification is required in the ASP.

The specifications of the aeration equipment depend on various parameters. Few parameters are size of the tanks, oxygen requirement for removal of carbonaceous BOD removal and nitrification, type of aerators etc. The compressor capacity needed for ensuring adequate mixing energy is also important. In actual design, the power requirements are calculated separately for aeration & mixing and the higher of the two is chosen. Mostly, the power required for mixing is always higher.

The oxygen transfer capacities of fine and coarse diffused air systems under standard conditions lie between 1.2 to 2 and 0.6 to 1.2 kg O₂/kWh respectively. However, it is necessary to secure the test certificates for the same from the diffused air system vendor before deciding on the tendered offers.

TABLE 39: SPECIFICATIONS OF AERATION EQUIPMENT TO BE INSTALLED AT FSTP

Nº	Details of equipment	Unit	Value/Description
Air blower			
	Type		2 nos. (1W + 1S) Twin lobe rotary
	Operating pressure	kg/cm ²	0.50
	Operating discharge	m ³ /h	80
	Make		Casting CI, Shaft EN19
	Air for agitation in tanks		Equalization and Intermediate storage tank
	Air for activated sludge process		MBBR reactor
	Motor		Suitable for blower
	Type		IP55, foot mounted, IE2
	Acoustic hood		Suitable size
	Noise level at 3 m		85 +/- 5%
Fine bubble diffusers			
	Type		Fine bubble diffuser, non-clog type
	Make		EPDM
	Location		MBBR reactor
	Assembly		Retrievable

8.4.3 Pressurised filter and Disinfection

The liquid from the intermediate storage tank will be passed through the sand filter and activated charcoal filter under pressure. These processes reduce the colour, odour and TSS content and provide further clarification to the water. After clarification the treated water passes through the UVGI for disinfection and is stored in the treated water storage tank.

TABLE 40: REQUIREMENTS OF PRESSURISED FILTERS

Nº	Details of equipment	Unit	Value/Description
Dual Media Filter			
1	Make		MS with internal EP and external enamel paint
2	Diameter	mm	500

3	Height on straight	mm	1000
4	Capacity	m ³ /h	2
5	Working pressure	kg/cm ²	2.4
6	Shell thickness	mm	6
7	Type of media		Pebbles, gravels, sand & anthracite
Activated carbon Filter			
1	Make		MS with internal EP and external enamel paint
2	Diameter	mm	600
3	Height on straight	mm	1000
4	Capacity	m ³ /h	2.0
5	Working pressure	kg/cm ²	2.4
6	Shell thickness	mm	6
7	Type of media		Pebbles, gravels, sand & activated carbon
8	Activated carbon		900 IV
Chlorine dosing			
1	Pump capacity	Lph	0-6
2	Lid tank	L	50



FIGURE 27: PICTURE OF A MBBR WASTEWATER TREATMENT PLANT (FOR REPRESENTATION PURPOSE ONLY; NOT TO THE SCALE)

8.5 Description and specification: Plumbing

The fixtures and plumbing should be done as per the drawing provided with the DPR.

TABLE 41: USAGE OF PIPES, VALVES FITTINGS ACCORDING TO LOCATIONS

Nº	Location	Type of pipe
1	Pump suction, discharge and header lines for sludge	SS 304
2	Pump suction, discharge and header lines for wastewater	UPVC SCH 40
3	Interconnecting gravity lines	UPVC SCH 40
4	Exposed air lines	MS B Class
5	Submerged air lines	UPVC SCH 40
6	Pipes below 1 m ground level	HDPE
7	Butterfly valve (>65 NB) for water and wastewater	Make: CI, sandwich type
8	Non-return valves (>65 NB) on the discharge end of the pumps	Make: MS, clapper type
9	Plug valve (>65 NB) for sludge	Make: CI, non-lubricating, eccentric type

The specifications, advantages and disadvantages of the various pipes and appurtenances used are given in the section below.

8.5.1 Steel pipes

Specifications:

Steel pipes shall be coated inside by high alumina cement mortar or polyurea and outside by epoxy. Steel pipes shall conform to IS 3589. Electrically welded steel pipes of 200 mm to 2,000 mm diameter for gas, water and sewage and laying should conform to IS 5822.

Advantages:

Steel pipes can withstand internal pressure, impact load and vibrations much better than CI pipe. They are more ductile and withstand water hammer better. For buried pipes, spirally welded pipes are relatively stronger than horizontally welded pipes.

Disadvantages:

The disadvantage of steel pipe is that it cannot withstand high external load. Further, the pipe is likely to collapse when it is subjected to negative pressure. Steel pipes are susceptible to various types of corrosion. A thorough soil survey is necessary all along the alignment where steel pipes are proposed.

8.5.2 UPVC pipes

Specification:

IS15328 deals with non-pressure plasticized polyvinylchloride (PVC) for use in underground piping system. IS9271 deals with the un-plasticized polyvinyl chloride (UPVC) single wall corrugated pipes for drainage.

Advantages:

The chief advantages of UPVC pipe are resistance to corrosion, light weight for transportation, toughness, rigidity, economical in laying, jointing, and maintenance and easy to fabricate.

Disadvantages:

The UPVC pipes are susceptible to buoyancy in high ground water table conditions. To prevent buoyancy the pipes can be tied to poles driven into the ground.

8.5.3 HDPE pipes

Specification:

Standard specifications have been framed by the BIS in IS 14333 for sewerage related application. Methods of joints are usually fusion welded or flange jointed depending on straight runs or fittings.

Advantages:

The advantages of these pipes offering smooth interior surfaces and offering relatively highest resistance to corrosion are recognized and they are available in solid wall. When laid in straight gradients without humps or depressions, they can easily offer longer life cycle.

8.5.4 Butterfly valve

In butterfly valves, the flow is regulated through a disc-type element held in place in the centre of the valve by a rod. Similar to ball valves, valve operation time is short because the valving element is simply rotated a quarter turn (90°) to open or close the passageway.

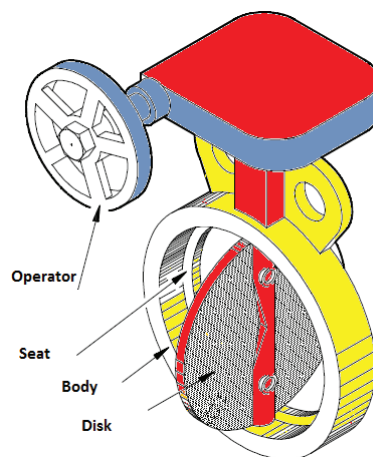


FIGURE 28: SCHEMATIC REPRESENTATION OF THE BUTTERFLY VALVE

Butterfly valves are characterized by their simple construction, lightness in weight, and compact design. Their face-to-face dimension is often extremely small, making the pressure drop across a butterfly valve much smaller than globe valves. Materials used for the valving element and sealing can limit their applications at higher temperatures or with certain types of fluids. They are generally used for handling large flows of gases or liquids, including slurries, but should not be used for throttling for extended periods of time.

8.5.5 Plug valve

A plug valve is a rotational motion valve used to stop or start fluid flow. The name is derived from the shape of the disk, which resembles a plug. The simplest form of a

plug valve is the petcock. The body of a plug valve is machined to receive the tapered or cylindrical plug. The disk is a solid plug with a bored passage at a right angle to the longitudinal axis of the plug.

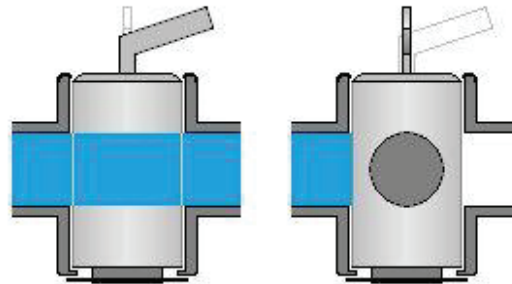


FIGURE 29: SCHEMATIC REPRESENTATION OF PLUG VALVE

In the open position, the passage in the plug lines up with the inlet and outlet ports of the valve body. When the plug is turned 90° from the open position, the solid part of the plug blocks the ports and stops fluid flow. Stem corrosion is minimal because there are no screw threads. Almost all plug valves now are furnished with an elastomer-coated plug and will seal off drip tight. However, plug valves are available in much larger sizes than ball valves and are highly suitable for use in wastewater plants.

8.5.6 Non-return valve

A non-return valve can be fitted to ensure that the medium flows through a pipe in the right direction, where pressure conditions may otherwise cause reversed flow. A non-return valve allows a medium to flow in only one direction. The flow through the non-return valve causes a relatively large pressure drop, which has to be taken into account when designing the system.

There are different types of non-return valves, such as spring-loaded, swing type, and clapper type valves.



FIGURE 30: SCHEMATIC REPRESENTATION OF NON-RETURN VALVE (LEFT) CLAPPER TYPE AND (RIGHT) SPRING TYPE

8.5.7 Slopes of pipes

The slopes of pipes depend on various things, however following table can be used for pipes where gravity flow is expected.

TABLE 42: MINIMUM SLOPES REQUIRED FOR PIPES CONVEYING LIQUIDS (WASTEWATER)

Pipe size (mm)	Minimum slope	
	As percent	As 1 in
150	0.60	170
200	0.40	250
250	0.28	360
300	0.22	450

8.5.8 RCC manholes

Given the site conditions that the ground water table is as high as RCC manholes is essentially recommended to quicken the work of construction in the roads by adopting precast sections assembled at site. The provisions of IS 456 and IS 3370 Parts I, II and IV shall apply to the design. The entire structure shall at all times be designed to the condition where the ground water is at ground level itself and the inside is empty and there is no superimposed load on the manhole to counter the uplift force and not considering the skin friction of the manhole sidewall with the soil.

8.5.9 Covers and frames

The size of manhole covers should be such that there should be clear opening of not less than 560 mm diameter for manholes exceeding 0.9 m depth. The frames of manhole shall be firmly embedded to correct alignment and level in plain concrete on the top of masonry. The precast frame and cover can also be of steel fibre reinforced concrete (SFRC) conforming to IS 12592 and shall be of approved make. The frame and cover shall be of specified grade, size and thickness as mentioned in the description of the item.

8.6 Non-treatment components of FSTP

8.6.1 Vacuum truck

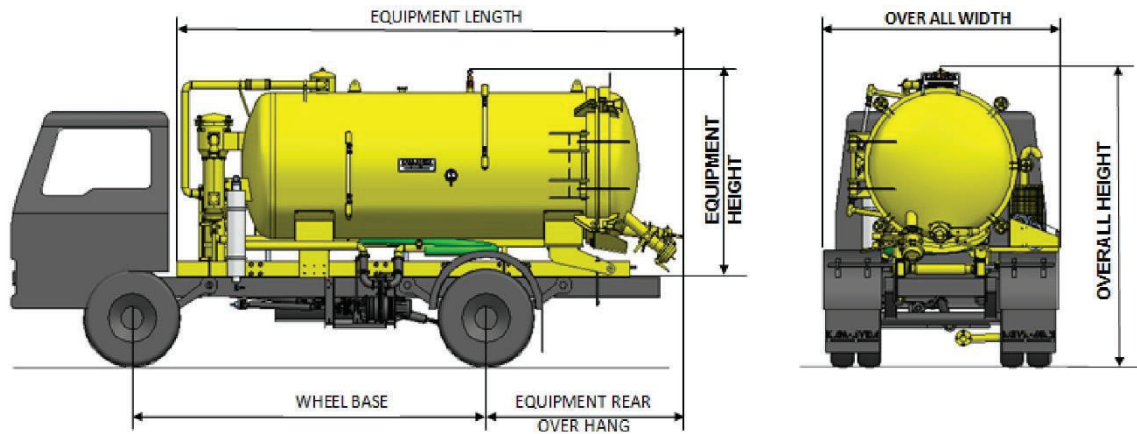
The technical specifications for the vacuum truck are given in the following Table 43

TABLE 43: TECHNICAL SPECIFICATIONS OF VACUUM TRUCK

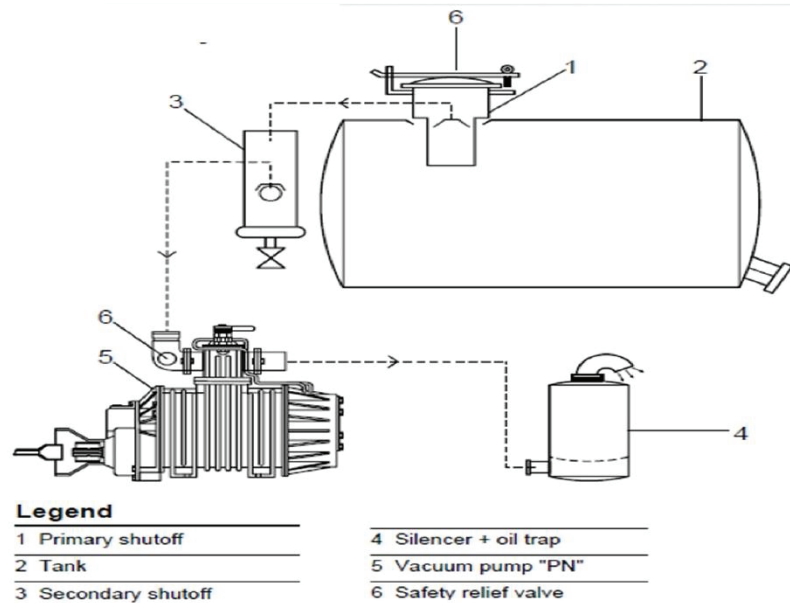
N°	Specifications	Units	Values
1	Sludge Collection Tanks		
	Type	Cylindrical design manufactured from IS 2062 structural grade steel	
	Volumetric capacity	litres	4,000
	Features	a) Cylindrical designs ensure complete and fast offloading of the material b) Fully open-able type rear dished end	
2	Vacuum Pump (Exhauster / compressor)		
	Type	Air-cooled, asbestos free, heat-resistant, rotary sliding vane type	
	Operating vacuum	%	80
	Max blank-off vacuum	%	92
	Max pressure	Bar	1.5
	Free Air Displacement (FAD)	LPM	6,500
	Drive	Vehicle's auxiliary PTO and Articulated shaft with belt and pulley drive configuration	
3	Equipment Features		
	Safety	a) Vacuum and pressure relief valves, b) Check valve, c) Pump safety filter, d) Primary Shut-off, e) Cyclone cum Secondary Shut-off, f) Exhaust silencer cum oil separator	
	Standard supply	VHose end Suction Nozzle and Strainer	
	Optional Supply	a) Combined clean water and sludge tank with wash down system, b) Suction Derrick Arm, Hydraulic / Spring Loaded c) Continuous duty, Water cooled, Rotary Sliding Vane, Vacuum Pump, d) Tri-lobe, Exhauster / compressor – oil free, Zero wear and zero maintenance pumps	

TABLE 44: TECHNICAL SPECIFICATION OF VACUUM TRUCK CHASSIS

N°	Particulars	Specifications
1	Performance	
	Engine	Tata 3.8 SGI NA Engine
	Emission Norms	BS-IV
	Displacement (cc)	3800
	Max Power	83.8bhp @ 2500rpm
	Max Torque	270Nm @ 1500-1800rpm
	Transmission	Manual
	Clutch	Single Plate dry Friction Type (280 mm)
	Gearbox	5-Speed
	Fuel Tank (Litres)	430
	Gradeability (%)	18
	Turning Radius (mm)	6750
	Max Speed (km/h)	84
2	Design and Build	
	Body Option	Half Body
	Chassis Type	Chassis with Cabin
	Cabin Type	Day Cabin
	Axle Configuration	4x2
	Front Tyre	8.25 x 16-16 PR
	Rear Tyre	8.25 x 16-16 PR
	Wheelbase (mm)	3800
	Ground Clearance (mm)	217
	GVW / GCW (Kgs)	10550
3	Comfort	
	Steering	Manual Steering
	Seat type	Standard
4	Safety	
	Brakes	Air Brakes
	Front Suspension	Semi elliptical Leaf spring
	Rear Suspension	Semi elliptical Leaf spring
5	Others	
	Length mm (ft.)	5050(16.56)
	Width mm (ft.)	2042(6.7)



Vacuum System:-



Drive System :-



FIGURE 31: SCHEMATIC REPRESENTATION OF VACUUM TRUCK WITH 4 CUM CAPACITY AND ITS VACUUM SYSTEM AND DRIVE SYSTEM

8.6.2 Internal road

The 6 m wide internal ring road of around the building and the treatment system has been proposed at the FSTP. A concrete road has been proposed, as it is faster to

construct and demonstrates much better performance as compared to a bituminous road. The specification of the road are as follows;

“Design mix cement concrete of M-30 grade, in roads/ taxi tracks/ runways, using cement content as per design mix, using coarse sand and graded stone aggregate of 40 mm nominal size in appropriate proportions as per approved & specified design criteria, providing dowel bars with sleeve/ tie bars wherever required, laying at site, spreading and compacting mechanically by using needle and surface vibrators, levelling to required slope/ camber, finishing with required texture, including steel form work with sturdy M.S. channel sections, curing, making provision for contraction/ expansion, construction & longitudinal joints (10 mm wide x 50 mm deep) by groove cutting machine, providing and filling joints with bitumen hot sealing compound filler and sealants.”

8.6.3 Solar power system

Photovoltaic (PV) modules make electricity from sunlight, and are simple, effective, and durable. They sit in the sun and, with no moving parts, can run your appliances, charge your batteries. To use the energy from the array, one needs other components, such as inverters, charge controllers and batteries, which make up a solar-electric system. The components required are dependent on the system type designed. These systems require a battery bank to store the solar electricity for use during night time or cloudy weather, a charge controller to protect the battery bank from overcharge, an inverter to convert the DC PV array power to AC for use with AC household appliances, and all the required disconnects, monitoring, and associated electrical safety gear.

- Fabricated panels consisting of four solar panels of capacity 320 W, thus the capacity of one fabricated panel I 1 kW,
- Online inverter of 1.5kW,
- Internal wiring with junction boxes DCDB / SCDB.

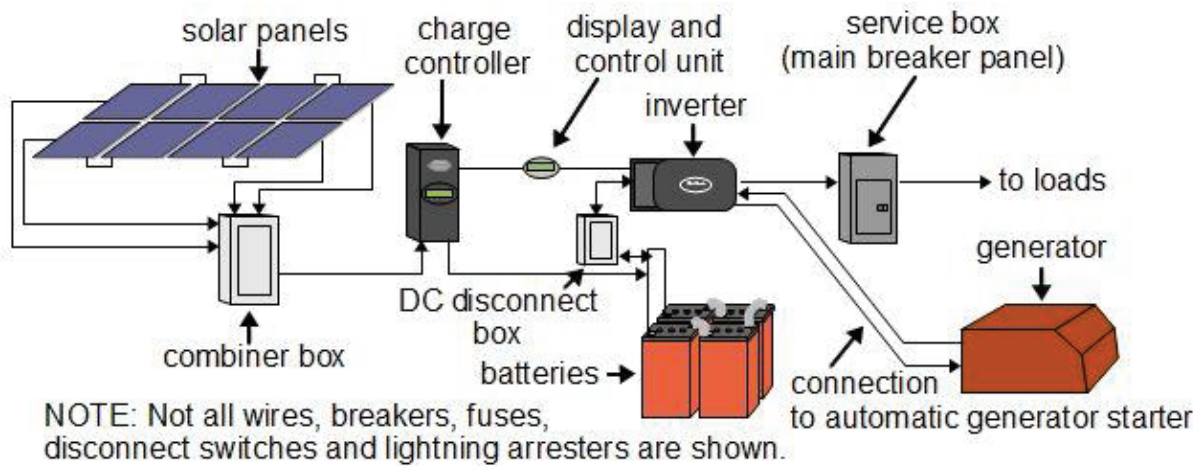


FIGURE 32: SCHEMATIC REPRESENTATION OF PHOTO VOLTAIC POWER SYSTEM

8.6.4 Power generator

Electrical power generators, also known as alternators, transform mechanical energy into electrical energy. They can be used as backup for emergency power or as an alternator on board a vehicle. Generators can produce either AC or DC power and are typically powered by a fuel engine. Generators produce electricity from mechanical inputs through the physical process of electromagnetic induction. In their simplest form, generators harness mechanical energy by rotating a coil through a magnetic field or electromagnets around a fixed coil in order to induce an electrical current.



FIGURE 33: SCHEMATIC REPRESENTATION OF POWER GENERATOR

Diesel is a high-octane fuel that is easy to refine while its shortcoming stems from the amount of pollutants it contains. Diesel generators boast high efficiency producing more energy on a normalized basis when compared to gasoline. Diesel fuel burns hotter, leaving fewer residues on internal combustion chambers, allowing for increased engine life as well. Recent developments to integrate an exhaust scrubber have impacted the efficiency of diesel generators while they still outperform other gensets in energy efficiency.

TABLE 45: TECHNICAL SPECIFICATION OF THE DIESEL POWER GENERATOR

DG Set Model	Rating (kVA)	Canopy Size (LxWxH)	Starting System	Weight (Kg)
--	62.5	2800x1100x1595	12V DC	1420
No. of Cylinders	Bore (mm)	Stroke (mm)	Total Displacement (cc)	Lube oil Sump Capacity (Ltrs)
4	96	112	3240	10
Fuel Tank Capacity (Ltrs)	Engine Model	Engine Make	Engine Power (bhp)	Rated Speed
150	4R1040TA G1	Kirloskar Green/ KOEL	83	1500
Aspiration	Cooling System	Type	Frequency	Voltage
TA	WATER	Brushless, H Class Insulation	50	230/415

8.6.5 Closed circuit television (CCTV)

Closed-circuit television (CCTV), also known as video surveillance, is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. In plants, CCTV equipment may be used to observe parts of a process from a central control room, for example when the environment is not suitable for humans. CCTV systems may operate continuously or only as required to monitor a particular event.

A simple CCTV system consisting of bullet camera and monitors placed in the operator's room and a separate connection to the engineer's cabin is proposed.

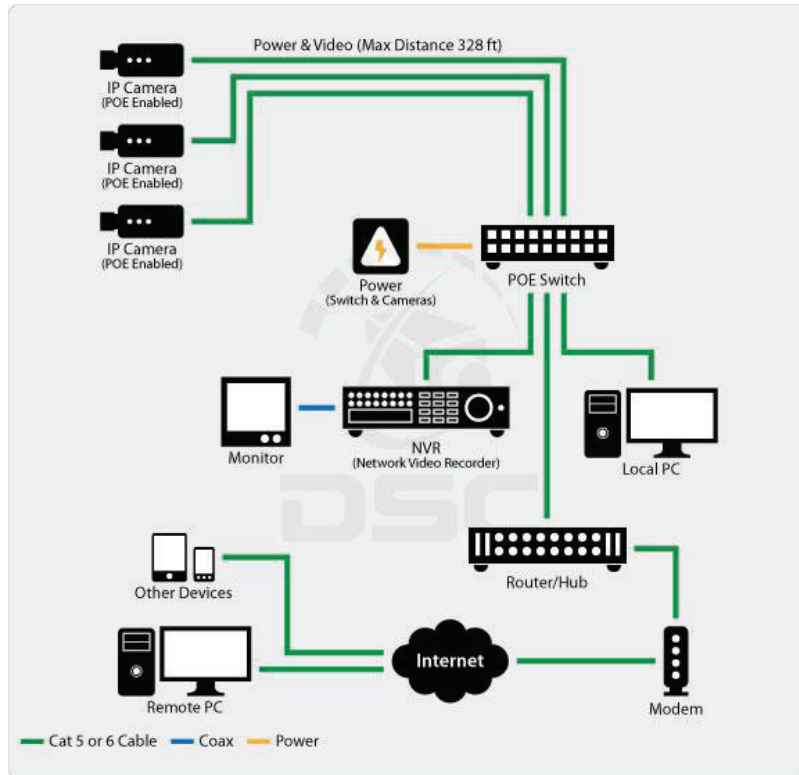


FIGURE 34: SCHEMATIC REPRESENTATION OF THE COMPONENTS INVOLVED AND WORKING OF A CCTV

8.6.6 Rain water harvesting

Rainwater harvesting is a technique used for collecting, storing and using rainwater for landscape irrigation and other uses. The rainwater is collected from various hard surfaces such as rooftops and/or other manmade aboveground hard surfaces. The RWH system proposed here consists of catchment surface (roof of the office building), gutters and downspouts, leaf screen, first flush valve, storage tank, delivery system.

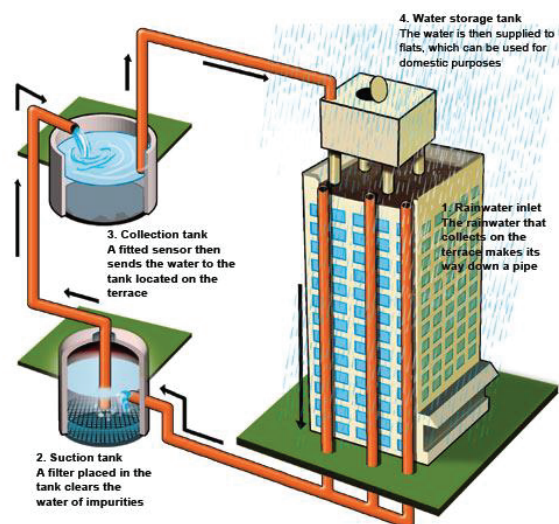


FIGURE 35: SCHEMATIC REPRESENTATION OF RAIN WATER HARVESTING SYSTEM

8.6.7 Storm water drains

A storm water drain is designed to drain excess rain water from the impervious surfaces such as paved streets, car parks, parking lots etc. Although this is the primary function of a storm water drain, in the case of FSTP, the important function is to avoid water logging and flooding of the site. Since the tanks (for treatment and treated water) are underground it is necessary that the storm water should not enter these tanks and should be drained as quickly as possible.

Since the site is located on the downside of the hill, a storm water drain has also been suggested along the outer boundary of the FSTP in order to drain all the runoff water from the FSTP Site.



FIGURE 36: SCHEMATIC REPRESENTATION OF STORM WATER DRAIN ALONG THE RING ROAD

8.6.8 Water tanker

Water Tanker will be required to transport treated water for application in gardens or other users. There will be requirement of two water tankers 5 KL capacity. There are many providers of water tankers trucks like Tata, SML Isuzu, Eicher Motors etc. Even, private fabrication companies usually provide the tankers using the chassis of trucks provided by the above providers.

TABLE 46: GENERAL SPECIFICATIONS OF WATER TANKER TRUCKS (5 KL CAPACITY)

Wheelbase (mm)	3335	Capacity (Litres)	5KL
GVW (Kg)	6180 /8720 / 10250/12990	Body Material Options	Mild Steel/Stainless Steel
Max. Engine Output	BSIII Mech- 75 Kw @3000 rpm BSIV CRDi- 75 Kw @2800 rpm	Fuel Tank (Litres)	90
Max. Torque	BSIII Mech - 315Nm@1500-1750 rpm; BS-IV CRDi - 296Nm@ 1500 ± 50 rpm	Brakes	Hydraulic Vacuum assisted/Air Brake
No of Tyres	4+1	Tyres Size	7.50" X 16" -16 PR / 8.25" X 16/20" - 16 PR
Displacement (cc)	3455	Steering	Mechanical /Power Steering (Optional)
Drive Type	Left Hand Drive	Customize Option	With Filtration System



FIGURE 37: SCHEMATIC REPRESENTATION OF WATER TANKER

9 Financial estimates

For budget estimation, technical, managerial, administrative, personnel, financial and social aspects need to be considered. The most important problem is there are no norms for getting proper budget funds for O&M. Simply because some decades ago funds were allotted as an ad hoc procedure, the same is followed every year with an escalation. Newer schemes sanctioned for construction also follow the same approach. Since O&M of sanitation works consists of a lot of diverse activities, the example of norms for a proper budget for O&M is proposed in this chapter.

9.1 Collection and transport

9.1.1 Capital Expenditure

Currently PBMC only has one truck of capacity 8 m³, which is also used to de-sludge multiple houses in a day. The larger vehicles are uneconomical if the households are situated at far distances. It is proposed that the PBMC should buy a vacuum truck of capacity 4 m³. This truck can serve households and can easily do multiple trips in a day.

The purchase cost of a vacuum truck of capacity 4 m³ is INR 18.65 lakhs (exclusive of registration, taxes and transportation cost to A&N).

Two tankers of 5 KL capacity are also suggested to transport the treated water to the public parks and public spaces. The cost of this truck is INR 12.50 lakhs (exclusive of registration, taxes and transportation cost to A&N).

9.1.2 Operational Expenditure

Human resource

Each truck should have a team of at least two people i.e. a truck driver accompanied by an operator. The operator will perform the desludging process with the assistance of driver. Hence it is estimated that the 4 m³ truck will have two people and 8 m³ and 10 m³ truck will have three people assigned to it. Same is applicable in the case of water tanker. Two persons per truck are proposed. Thus, yearly expense is estimated to be 15.12 lakhs per annum (Annexure 6)

Consumables and fuel

Assuming that the 4 m³ truck does 2 trips, the 8 m³ truck does 1 trip every day and each 5 m³ truck does 2 trips every day; the 4 m³ truck will need fuel worth INR⁶ 325, the 8 and 5 m³ trucks will need fuel worth INR 780 and INR 245 respectively.

Although it is quite difficult to estimate the annual expenditure on the fuel, looking at the past one-year data, it is estimated to be approximately INR 4.00 lakh/annum.

Apart from the fuel, there are oil changes etc required. These costs are estimated in repairs and renewals.

Repairs and renewals

The repair and renewals required for the trucks^{is} taken to be 5% of the purchase cost of the vehicle. Hence it is estimated to be approximately INR 2.20 lakh/annum.

9.2 Treatment and disposal

9.2.1 Capital Expenditure

Capital expenditure (capex) consists of (1) cost of civil constructions such as receiving station, tanks, rooms, roads, boundary wall, stormwater drains etc., (2) Cost of purchase of electromechanical components such as belt press, rotary dryer, pumps, panels, wiring and plumbing etc. and (3) Establishment cost primarily consist of cost of supervision during implementation phase and shipping, freight, insurance of the equipment etc.

Cost of construction

The cost of construction as suggested above includes cost of all the civil work to be carried out for execution of the project. As per the Annexure 6, is it estimated to be INR 216.22 lakhs.

⁶ Assuming mileage of the 4m³, 5 m³ and 8m³ truck to be 6, 5 and 4 km/L and cost of diesel to be 65.00 INR/L.

Cost of purchase

The purchase cost includes cost of all the electromechanical components involved in the execution of the project. As per the Annexure 6, it is estimated to be INR 106.26 lakhs.

Establishment cost

The present practice is to arrive at the establishment cost as a percentage of the project cost as per the age-old practice of PWD, where the establishment charges are taken as anywhere between 12 to 15 %.

Although in our case the treatment modules (Belt Press, Rotary Dryer and MBBR) will be purchased and installed/assembled, the civil component is still 67% when taken into consideration civil works other than the treatment system. Also, in this case the establishment cost includes the cost of shipping, insurance and expert man-day cost required during assembly and commissioning of plants.

For this purpose, the establishment cost is taken on higher side i.e. 15% of the total cost of construction and purchase which is equivalent to INR 48 lakhs.

9.2.2 Operational Expenditure

Human resource costs

Human resource in the form of experts, skilled and unskilled persons are required for proper functioning of any facility. In this case, a team of 2 operators, 2 semi-skilled labourers, 3 unskilled labourers, 4 security guards, computer operator and a lab assistant are recommended to be posted at FSTP. The Junior Engineer and Chemist will be coming once a week to check the records and functioning of the FSTP. As per the Annexure 6, it is estimated to be INR 27.46 lakhs per annum.

Energy costs

The energy costs are straightforward calculation based on the running kW, numbers and hours of electrical equipment. Usually, these cannot be worked out in detail at

the stage of project proposal. However, the table in Annexure 6, is an attempt to summarise the major electricity consuming equipment used for treatment of FSS.

The annual energy cost when all the electromechanical equipment's are working on full capacities is INR 2.11 lakhs.

Consumables and fuel

Chemical consumption in a FSTP is mainly for conditioning of thickened sludge before dewatering and chlorine in case of disinfection of treated water. This cannot be easily calculated as it might vary depending on the characteristic of the sludge and water from time to time. The requirement of polyelectrolyte is 2.5-4 kg/ton of dry solids. The cost of polyelectrolyte varies from supplier to supplier; however, it estimated to be INR 200/kg. The cost of chlorine is approximately estimated to be INR 20,000 per annum.

As per the Annexure 6, it is estimated that expenditure towards consumables would be INR 0.80 lakhs per annum.

Fuel is required to run the generator. Assuming that for each working day if the power cut happens for 1 hours, then approximately 20 litres of diesel would be required. This amount to INR 4.00 lakhs per annum. In total the expenditure towards consumables and fuel is INR 4.80 lakhs per annum.

Repairs and renewals

The repairs and renewals for civil works, mechanical and electrical equipment is carried out at different durations. Usually it is estimated that the civil works in sanitation liquid waste treatment plants cannot go on for 30 years as in the case of normal civil structures as per the PWD norms. Table 47 gives life span of various components at FSTP.

TABLE 47: LIFE OF VARIOUS COMPONENTS AT FSTP

Component	Life
Civil works	25 years
Mechanical equipment	10 years
Electrical equipment	15 years

It does not mean that the tanks cannot function properly and needs to be demolished. It only means that there is a need to look into the state of civil works and carry out rectifications of masonry or concrete or roof protection items. The cost of repairs and renewals cannot at the DPR stage; however, for estimating purpose, it is taken to be percent of capital/purchase cost.

TABLE 48: ESTIMATED REPAIR AND RENEWAL COST OF VARIOUS COMPONENTS AT FSTP

Component	Percent of construction/purchase cost
Civil works (buildings)	5%
Mechanical equipment	40%
Electrical equipment	30%

As per the Annexure 6, the equivalent cost of the repairs and renewals of the all the components at FSTP is INR 27.37 lakhs.

9.3 Financial modelling

This step is necessary to arrive at a life cycle cost of treated solids and treated water over the design period. The financial modelling of the CAPEX, OPEX and the potential revenue generation through sell of the end products is done in this section. The costs linked to increase in human power required for co composting of treated bio solids, packaging, distribution, marketing and sale of soil conditioner is not accounted for in the OpEx.

When the FSTP is running at full capacity, the generation of bio solids is estimated to be 400 kg/d along with 37 KLD of treated water. The cost of the soil conditioner is assumed to be INR 10 per kg and that of treated water it is estimated to be INR 100 per KL. Apart from this the FSTP can have one more revenue stream in the form of tipping fee which is INR 100 per KL of FSS. Thus, annually a revenue of 35.70 lakhs can be generated the when the FSTP is working on full capacity.

10 The following tables summarises all the costs listed in section

Financial estimates. These costs are further used to derive the annualised cost of running the FSTP at its full capacity.

TABLE 49: SUMMARY OF COSTS OF IMPLEMENTATION AND OPERATION OF FSTP

N°	Type of expenditure	Cost
A	CAPEX	(lakh INR)
A1	Cost of construction	₹ 2,16,22,660.00
A2	Cost of purchase	₹ 1,06,26,285.75
A3	Establishment cost	₹ 48,37,341.86
	TOTAL	₹ 3,70,86,287.61
B	OPEX	(lakh INR/annum)
B1	Human resource cost	₹ 42,58,800.00
B2	Energy cost	₹ 2,11,537.21
B3	Consumables and fuels	₹ 4,80,680.00
B4	Repairs and renewals	₹ 27,37,272.14
	TOTAL	₹ 76,88,289.35
C	Revenue	(lakh INR/annum)
C1	Soil conditioner	₹ 12,00,000.00
C2	Treated water	₹ 11,10,000.00
C3	Tipping fee	₹ 12,60,000.00
	TOTAL	₹ 35,70,000.00

As per the calculations in Annexure 7, the total annual cost of the FSTP when utilised 100% of its capacity comes out to be INR 4.00 lakhs per annum. When operated on full capacity, this annual cost translates into approximately INR 38.70 per KL. This cost has to be borne by the ULB to maintain and manage the faecal sludge management in the city of Port Blair.

This cost, if distributed over the current floating population translates to approximately INR 12.75 per person per annum. The recovery option for this cost are mentioned in the following section Recommendations.

11 Recommendations

11.1 User Interface

PBMC should ensure about the availability of flush toilets constructed with properly designed containment systems at the *new* Individual Households in the Port Blair city.

11.2 Containment System

- ✓ PBMC should make sure about the design and construction of new containment systems (septic tanks etc) at the Individual households' level or Community Toilets/Public Toilets as per the standards given in CPHEEO Manual⁷.
- ✓ The old containment systems (older than 30 years) should be subjected to structural audit and its functionality. If the containment systems fail the audit, the HH should be mandated to take appropriate measures to make it safe for himself as well as environment.

11.3 Conveyance

- ✓ PBMC should ensure about the proper operation and maintenance of the suction trucks with safety of the staff. Staff should follow the standard operating procedures (SOPs) for the smooth operation of the conveyance system.
- ✓ PBMC should follow the proper documentation process and should maintain the same which will help them to estimate the life cycle assessment. Such exercise helps to determine the cost of contracts for operation of desludging through private contractors and O&M of the FSTP.
- ✓ A scheduled emptying services should be started for the commercial properties in the city of Port Blair. The commercial properties such as the resorts and the hotels are the bulk generators of the sludge and the risk of not

⁷ Source: Source: Central Public Health and Environmental Engineering Organization (CPHEEO) and Japan International Cooperation Agency (2013), "**Manual on Sewerage and Sewage Treatment Systems, Part A – Engineering**", Chapter 9 – Onsite Sanitation, Page no: 9-15 to 9-21.

emptying the tanks in these cases is relatively high as compared to the septic tanks installed at household level.

- ✓ The domestic wastewater generated and which is not connected with the non-sewered system proposed in the detailed project report (DPR), it should be transported and treated in a proper manner. It is recommended that PBMC should start developing the small-bore sewers and there is the requirement of proper Sewage Treatment Plant (STP) for the treatment of wastewater.

11.4 Treatment

- ✓ PBMC should make sure about the proper O&M of the FSTP. The designated staff should follow the SOPs defined for the system with safety.
- ✓ Ensuring proper O&M of the FSTP helps to keep the risk of breakdown as low as possible and at the same time gives good returns on investment by maintaining the quality of the end products.

11.5 Disposal or Reuse

The treated sludge (biosolids) should be transported to the Solid Waste Management processing site where it can be co-composted with the organic compost. After proper processing, the co-composted (biosolids and organic manure) manure should be properly packaged with appropriate branding. The branded manure can be sale in the market for gardening or farming. PBMC should regularly check the quality of compost and should monitor it for the regular revenue. Even as per the previous discussions, PBMC can use the co-composted manure for making pots, which can be used in nurseries for cultivating ornamental plants for landscaping.

The treated water from the FSTP will be reused as process water for during the treatment of solids. It will also be used for landscaping, washing of vehicles belonging to PBMC and flushing of toilets at the FSTP. The remaining treated water will be transported for landscaping to public parks and public spaces.

Detailed Project Report

Annexures

Annexure 1

List of Community Toilets and Public Toilets

TABLE 50: LIST OF COMMUNITY TOILETS IN PORT BLAIR (SOURCE: PBMC, PORT BLAIR)

Sr. No.	Location of Community Toilet	Ward No.	Availability of Water Supply (Yes/No)	Number of Seats	Capacity of On-Site Treatment System (Septic Tank) (m ³)
1	Chandran Footpath Well Area, Near Forest Club, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	1	Yes	10	9
2	Swaraj Youth Club, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	1	Yes	12	5
3	Burning Ghat Near Sea Shore Area, Prem Nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	7	Yes	10	100 user
4	Machi Jopdi Near Ganga Temple, Andaman and Nicobar Islands	9	Yes	4	25 user
5	Mutton market Junglighat, Port Blair, South Andaman, Andaman and Nicobar Islands	9	Yes	4	25 user
6	Gandhi Nagar Science Center Compound Wall, Port Blair, South Andaman, Andaman and Nicobar Islands	12	Yes	6	50 user
7	Gandhi Nagar Church Foot Path, Port Blair, South Andaman, Andaman and Nicobar Islands	12	Yes	6	50 user
8	Nepali Basthi, Port Blair, Port Blair, South Andaman, Andaman and Nicobar Islands	12	Yes	4	50 user
9	Attam Pahad, Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	4	75 user

10	Attam Pahad Birsa Nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	4	75 user
11	Near Kali Mandir, Bangali Basti, Garacharama , Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	6	5
12	Bharat nagar, Garacharama, Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	6	5
13	Near APWD Pump House, Rajaji Nagar, Garacharma, Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	6	8
14	Parking Area, Bathu basti , Port Blair, South Andaman, Andaman and Nicobar Islands	19	Yes	2	15 user
15	Veg Fish Market Bathu Basti, Port Blair, South Andaman, Andaman and Nicobar Islands	19	Yes	4	15 user
16	Grave yard Andal Basti, Opposite to Protherapur G.S.S.School, Protherapur, Port Blair, South Andaman, Andaman and Nicobar Islands	19	Yes	5	25 user
17	Rajiv Nagar Maha nagar (Near Utkrosh Area), New Pahargaon, Port Blair, South Andaman, Andaman and Nicobar Islands	20	Yes	4	25 user
18	Thambu Basti Near Councilor house W/21, Brookshabad, Port Blair, South Andaman, Andaman and Nicobar Islands	21	Yes	10	75 user
19	Quarry Road Ranchi basti -I, Near Lord Shree Hanuman Temple, Brooksha bad, Port Blair, South Andaman, Andaman and Nicobar Islands	21	Yes	3	75 user
20	Quarry Road Ranchi basti -II, near hanuman temple turning, Brookshabad, Port Blair, South Andaman, Andaman and Nicobar Islands	21	Yes	2	75 user

21	Back Side Umat Public School Brookshabad, Port Blair, South Andaman, Andaman and Nicobar Islands	21	Yes	4	25 user
22	RDS Area, Port Blair, South Andaman, Andaman and Nicobar Islands	21	Yes	4	25 user
23	Tsunami camp –I B-1, Near Tsunami tower, Port Blair, South Andaman, Andaman and Nicobar Islands	21	Yes	4	25 user
24	Tsunami camp –I B-2, Port Blair, South Andaman, Andaman and Nicobar Islands	21	Yes	2	25 user
25	Quarry Road-1 Brookshabad Near APWD Water Treatment Plant, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
26	Quarry Road-1 Brookshabad-II Near Dry Resource Centre, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	6	65 user
27	Ranchi Basti Near Pooja Pandal, Brookshabad, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
28	Sub Center Road B/I Brij gunj, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
29	Adjacent to Culvert, Sub Centre Road B/II Brij gunj, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
30	RDS Crusher Plant, Brij gunj, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
31	Near Burma jail Area Tsunami Camp-II, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	3	65 user
32	Ranchi Basthi Opposite to Community Hall, Brookshabad, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	3	65 user

33	Ranchi Basti, Khenchi Nalla B-I, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
34	Ranchi Basti Khenchi Nalla B-II, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	3	65 user
35	Ranchi Basti khench Nalla Near Ram Temple B-IV, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
36	Bird line Barud godown Near APWD pump house (Hattinallah), Port Blair, South Andaman, Andaman and Nicobar Islands	23	Yes	4	25 user
37	Anganwadi –I Road side end, Rajaji nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	24	Yes	2	25 user
38	Near Anganwadi Down Area, Port Blair, South Andaman, Andaman and Nicobar Islands	24	Yes	2	25 user
39	Anganwadi –I Road side, CARI BOUNDRY Rajaji nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	24	Yes	2	25 user
40	Near Ram Temple M/Road Rajaji Nagar Solar Plant area, Port Blair, South Andaman, Andaman and Nicobar Islands	24	Yes	2	25 user
41	Ganesh Temple F/Path Area Rajaji Nagar Solar Plant Area B-I, Port Blair, South Andaman, Andaman and Nicobar Islands	24	Yes	2	25 user
42	Near Nagamma Mandir Rajaji Nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	24	Yes	4	25 user
43	Near Nagamma Temple(down) Rajaji nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	24	Yes	3	25 user

TABLE 51: LIST OF PUBLIC TOILETS IN PORT BLAIR (SOURCE: PBMC, PORT BLAIR)

Sr. No.	Location of Public Toilet	Ward No.	Availability of Water Supply (Y/N)	Number of Seats	Capacity of On-Site Treatment System (Septic Tank) (m ³)
1	Sulabh Suvidha Kendra, Ranchi Basti Area, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	1	Yes	14	36
2	Seamen Hostel Area near Ranchi Basti, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	1	Yes	10	5.04
3	Near Latha Singh Ground, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	1	Yes	10	5
4	Near Ratri Niwas, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	2	Water available	10	5
5	Near Childrens Park, Hanuman Junction, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	2	Yes	6	5
6	Beside Mini Zoo Malay bijan, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	2	Yes	10	5
7	Near PBMC Site Office–W/2 Malay bijan, Haddo, Port Blair, South Andaman, Andaman and Nicobar Islands	2	Yes	7	5
8	Near Valmiki Nagar MahaveerNagar, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3	Yes	3	4
9	Valmiki Nagar Dharmpal line, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3	Yes	2	4

10	Near Valmiki temple, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3	Yes	2	4
11	Valmiki Nagar Near K.muniyandi house , Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3	Yes	2	4
12	Alagar Foot Path, Ambedkar colloney, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3	Yes	2	4
13	Chellam line Ambedkar colloney, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3	Yes	3	4
14	Painter Nagaraj Ambedkar colloney, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3	Yes	4	4
15	IOCL- Petrol Pumps & filling station, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	3		1	5
16	Nagar Palika Sulabh Suvidha Kendra, near Pvt. Bus Stand, Aberdeen Bazar, Por Blair, South Andaman, Andaman and Nicobar Islands	4	Yes	12	67.5
17	Near Vegetable Market, Mohanpura, Aberdeen Bazar, Port Blair, South Andaman, Andaman and Nicobar Islands	4	Yes	16	60
18	A&N State Transport Service Bus Stand (Govt.), Mohanpura, Aberdeen Bazar, Port Blair, South Andaman, Andaman and Nicobar Islands	4	Yes	9	30
19	Rathna market Area, Aberdeen/Bazar, Aberdeen Bazar, Port Blair, South Andaman, Andaman and Nicobar Islands	5	Yes	6	8
20	Civic International Social Service Organisation, Beside Model Sr. Sec. School, Aberdeen Bazaar,	5		6	60

	Port Blair, South Andaman, Andaman and Nicobar Islands				
21	Near Cellular Jail Veer Savarkar Park, Port Blair, South Andaman, Andaman and Nicobar Islands	5	Yes	2	6
22	Near Water Sports Complex, Port Blair, South Andaman, Andaman and Nicobar Islands	5	Yes	2	5
23	Inside Marina Park, Por Blair, South Andaman, Andaman and Nicobar Islands	5	Yes	5	5
24	Near PBMC-Food Court, Por Blair, South Andaman, Andaman and Nicobar Islands	5	Yes	2	4
25	IOCL- Petrol Pump Aberdeen Bazar, Por Blair, South Andaman, Andaman and Nicobar Islands	5	Yes	1	5
26	Thiranga Park, Aberdeen Bazaar, Por Blair, South Andaman, Andaman and Nicobar Islands	5		1	2
27	Teluga Basti, Near Raj Niwas, Opposite to Gandhi Park, Port Blair, South Andaman, Andaman and Nicobar Islands	5	Yes	4	5
28	Near Office of Sr. Sanitary Inspector, PBMC, Delanipur, Port Blair, South Andaman, Andaman and Nicobar Islands	7		17	60
29	Fishermen Colloney Burning Ghut, Port Blair, South Andaman, Andaman and Nicobar Islands	7		24	10
30	Burning Ghat Junglighat, Port Blair, South Andaman, Andaman and Nicobar Islands	7	Yes	1	3
31	Safai Karmchari Area P/Nagar, Prem Nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	7	Yes	7	5
32	Sweeper colony (Near ground), Prem Nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	7	Yes	10	5

33	Sweeper colony, Prem Nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	7		8	4
34	Telugu Basti near Ganesh temple F/Path, Buniyadabad, Port Blair, South Andaman, Andaman and Nicobar Islands	8	Yes	4	5
35	Near Ayyappa Temple, Buniyadabad, Port Blair, South Andaman, Andaman and Nicobar Islands	8	Yes	8	100
36	H/Block company, Buniyadabad, Port Blair, South Andaman, Andaman and Nicobar Islands	8	Yes	10	5
37	Near Ayyappa Temple, Buniyadabad, Port Blair, South Andaman, Andaman and Nicobar Islands	8	Yes	6	5
38	Lal Bijan, Dairy Farm, Port Blair, South Andaman, Andaman and Nicobar Islands	9		13	60
39	Ranchi Basti Lambia line, Port Blair, South Andaman, Andaman and Nicobar Islands	9		16	60
40	Petrol Pump Lamba Line Manoj Marketing, Port Blair, South Andaman, Andaman and Nicobar Islands	9		1	3
41	Gandhi Park, Port Blair, South Andaman, Andaman and Nicobar Islands	10	Yes	2	3
42	Joggers Park, Port Blair, South Andaman, Andaman and Nicobar Islands	10	Yes	2	3
43	Bagam Priyal Temple, Police line PBMC Water Tank Area, Port Blair, South Andaman, Andaman and Nicobar Islands	10	Yes	5	3
44	Shiv Temple SouthPoint Opp. Masjid, Port Blair, South Andaman, Andaman and Nicobar Islands	10	Yes	2	15 user
45	Ayyanar Temple south point, Port Blair, South Andaman, Andaman and Nicobar Islands	11	Yes	2	15 user

46	Mariyamman Temple, South Point, Port Blair, South Andaman, Andaman and Nicobar Islands	11	Yes	2	15 user
47	Mazar Pahad Shiv Temple, Port Blair, South Andaman, Andaman and Nicobar Islands	12	Yes	2	15 user
48	Mazar Mandir Dargah, Port Blair, South Andaman, Andaman and Nicobar Islands	12	Yes	4	15 user
49	G.E.L Church Dhood line, Port Blair, South Andaman, Andaman and Nicobar Islands	12	Yes	4	
50	ANIIDCO-IOCL Petrol Pump, Junglighat, Port Blair, South Andaman, Andaman and Nicobar Islands	13		2	3
51	VIP Road Near Shiv Temple Junglighat, Port Blair, South Andaman, Andaman and Nicobar Islands	13	Yes	2	4
52	ITF –Ground -VIP Road, Port Blair, South Andaman, Andaman and Nicobar Islands	13	Yes	8	10
53	Near Urban Health Centre Dairy Farm, Port Blair, South Andaman, Andaman and Nicobar Islands	14		12	60
54	Karuppan Temple Japan road, Port Blair, South Andaman, Andaman and Nicobar Islands	14		4	15 user
55	Near Fish landing Jetty Junglighat Near Muchi Chopdi , Port Blair, South Andaman, Andaman and Nicobar Islands	14	Yes	12	20
56	Bamboo Basti, Dairy Farm, Port Blair, South Andaman, Andaman and Nicobar Islands	15		14	60
57	Ranchi Basti, Back Side VKV-II Tekri, Port Blair, South Andaman, Andaman and Nicobar Islands	15		10	10
58	Post Office Area Dolly Gunj, Port Blair, South Andaman, Andaman and Nicobar Islands	17	Yes	2	15 user
59	Near Cattle Pond Shiv Colony Dolly Gunj, Port Blair, South	17	Yes	2	15 user

	Andaman, Andaman and Nicobar Islands				
60	Near Hindu Grave Yard (Bharat Nagar), Garacharama, Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	6	8
61	Near TTI Collage Ground, Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	2	15 user
62	Ayyappa Temple, Near TTI Collage, Garacharama, Port Blair, South Andaman, Andaman and Nicobar Islands	18	Yes	2	15 user
63	Petrol Pump Bathu Basti Oriental Filling station, Port Blair, South Andaman, Andaman and Nicobar Islands	19		2	4
64	Near IOCL-Petrol pump, Bathu basti, Port Blair, South Andaman, Andaman and Nicobar Islands	19	Yes	2	15 user
65	Lord Shree Rama Temple, Pathergudda, Port Blair, South Andaman, Andaman and Nicobar Islands	19	Yes	2	15 user
66	Mariamamma Temple (Austinabad), Port Blair, South Andaman, Andaman and Nicobar Islands	20	Yes	7	4
67	Sai baba Temple, Chakkargoan, Port Blair, South Andaman, Andaman and Nicobar Islands	21		2	5
68	Carbins Cove Beach (Changing room), Andaman and Nicobar Islands	21	Yes	4	10
69	Ranchi Basti Opp Govt – M/School Brookshabad, Andaman and Nicobar Islands	21	Yes	4	25 user
70	Ranchi Basti, khench Nalla Near Ram Temple B-III, Port Blair, South Andaman, Andaman and Nicobar Islands	22	Yes	4	65 user
71	Ganesh Temple, Near PBMC Complex Kamaraj Nagar, Port Blair, South Andaman, Andaman and Nicobar Islands	23	Yes	1	25 user

Annexure 2

Guidelines for Treatment of Sewage and Effluent, Pollution Control Committee, A&N

अण्डमान तथा
Andaman And



निकोबार राजपत्र
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अण्डमान तथा निकोबार प्रशासन
ANDAMAN AND NICOBAR ADMINISTRATION
प्रदूषण नियंत्रण समिति
POLLUTION CONTROL COMMITTEE
DEPARTMENT OF SCIENCE AND TECHNOLOGY
Dolly Gunj, Port Blair Ph. No. 250370, Tel. FAX 251395

NOTIFICATION

Port Blair, dated the 22nd September, 2017.

No. 226/2017/F. No 6-3/PCC/Executive Meeting/2014.— In exercise of the powers conferred under Section 5 of the Environment (Protection) Act, 1986 (29 of 1986), read with Notification No.S.O.667(E) dated 10th September, 1992, the Lt. Governor, A & N Islands is pleased to lay down the following Guidelines to regulate the sewage and effluents discharged by industries and comply with the effluent standards provided under Environment (Protection) Rules, 1986 made under Act aforesaid by putting in place an appropriate effluent treatment system by various categories of industries in Andaman and Nicobar Islands as per the Revised Classification of Industrial Sector under Red, Orange, Green and White, adopted in 22nd meeting of ANPCC held on 18.04.2017, as under :

A. GUIDELINES FOR TREATMENT OF EFFLUENT AND SEWAGE

- (i) HOTELS/RESORTS/LODGES AND RESTAURANTS'
- (ii) AUTOMOBILE SERVICE CENTRE

B. GUIDELINES FOR SOLID WASTE MANAGEMENT AND GOOD ENVIRONMENT MANAGEMENT PRACTICES

- (i) HOTELS/RESORTS/LODGES AND RESTAURANTS
- (ii) AUTOMOBILE SERVICE CENTRE

(A) (i) All the hotels/resorts and restaurants are required to install effluent treatment systems as per the following categorization and comply with the Effluent standards as prescribed under EPA, 1986 and its subsequent amendments:

Sl. No.	Type of Hotel/Resort/ Lodge/Restaurant	Category	Effluent Treatment System
1	Having overall waste water generation @100KLD and more	Red	They are required to install Sewage Treatment Plant (STP) including proper Oil and Grease Trap for the effluents arising from kitchen and shall comply with the following standards: (i) pH -- 6.5 - 9.0, (ii) BOD- 10mg/l, (iii) COD 50mg/l, (iv)TSS- 10 mg/l, (v) NH ₄ -N-5mg/l, (vi) N-Total- 10mg/l, (vii) Fecal Coliform <230 MPN/100ml, (viii)-PO ₄ -P-2mg/l

			<p style="text-align: center;">AND</p> <p>The units with laundry facility are required to install Effluent Treatment Plant (ETP) to meet the standards laid down at Serial No. 55 of Schedule 1 of the Environment (Protection) Rules, 1986 made under the Environment (Protection) Act, 1986.</p> <p>They shall -</p> <ol style="list-style-type: none"> (i) Install Effluent Treatment Plant / Sewage Treatment Plant to treat the entire waste water generated. (ii) Treat the waste water upto tertiary level for reuse of the treated effluent at least for Cooling Tower/ AC Plant and in Horticulture and in flushing of Toilets wherever possible/ applicable as prescribed in the Environmental Clearance/ Consent Conditions. The treated effluent shall be reused upto the maximum extent possible to achieve the objective of zero discharge. They shall submit water mass balance chart regarding consumption of water, waste water generation and use of treated effluent (in the given format annexed). (iii) Provide Rain Water Harvesting System. (iv) Install Solar Water Heating System. (v) Provide Organic Waste Converter for composting of organic waste or waste to Bio - fuel Plant. (vi) Convert/Switch Over from Oil Fired Boiler to Natural Gas Based Boiler wherever Gas Supply is available. (vii) Develop Green Belt to create Buffer Zone from main roads. <p>They are also required to take appropriate environment- friendly measures, waste reduction measures, water conservation measures, energy conservation measures. The hotels/resorts which have been given Environmental Clearance shall have to comply with the conditions of Environmental Clearance.</p> <p>They shall also submit Quarterly Report for the Effluent Treatment Plant and Sewage Treatment Plant from any of the Empanelled Consultants of MoEF&CC/NABL Accredited Laboratories.</p>
2	Having more than 20 rooms and waste water generation less than 100KLD and having a coal/oil fired boiler	Orange	<p>They are required to install Sewage Treatment Plant (STP) including proper Oil and Grease Trap for the effluent arising from kitchen for atleast 4 hours duration and shall comply with the following standards:</p> <ol style="list-style-type: none"> (i) pH -- 6.5 - 9.0, (ii) BOD- 10mg/l, (iii) COD 50mg/l, (iv) TSS- 10 mg/l, (v) NH₄-N-5mg/l, (vi) N-Total- 10mg/l, (vii) Fecal Coliform <230 MPN/100ml, (viii)-PO₄-P-2mg/l <p>They shall -</p> <ol style="list-style-type: none"> (i) Install Sewage Treatment Plant to treat the entire waste water generated from the hotel.

3	Hotel(< 3 star) or hotels having >20 rooms and less than 100 rooms, with or without coal/oil fired boiler		<p>(ii) Treat the waste water upto tertiary level for reuse of the treated effluent atleast for Cooling Tower/ AC Plant and in Horticulture and in flushing of Toilets wherever possible / applicable as prescribed in the Environmental Clearance / Consent Conditions . The treated effluent shall be reused upto the maximum extent possible to achieve the objective of zero discharge. The hotels/resorts shall submit water mass balance chart regarding consumption of water, waste water generation and use of treated effluent.</p> <p>(iii) Provide Rain Water Harvesting System.</p> <p>(iv) Install Solar Water Heating System.</p> <p>(v) Provide Organic Waste Converter for composting of organic waste or waste to Bio-Fuel Plant.</p> <p>(vi) Convert/switch over from Oil Fired Boiler to Natural Gas Based Boiler wherever Gas supply is available.</p> <p>(vii) Develop Green Belt to create Buffer Zone from main roads.</p> <p>They are required to take appropriate environment friendly measures, waste reduction measures, water conservation measures, energy conservation measures. The hotels/resorts which have been given Environmental Clearance shall also comply with the conditions of Environmental Clearance.</p> <p>They shall also submit Quarterly Report for the Effluent Treatment Plant and Sewage Treatment Plant from any of the Empanelled Consultants of MoEF&CC/NABL accredited Laboratories.</p>
4	The units having more than 20 rooms and waste water generation less than 10 KLD and having no boiler & no hazardous waste generation	Green	Exempted from installation of STP and however, they are required to have septic tank with soak-pit for sewage treatment and shall provide proper oil and grease trap-cum-settling tank for holding the effluent arising from the kitchen and shall comply with standards laid down at Serial No. 39 of Schedule 1 to the Environment (Protection) Rules, 1986 made under the Environment (Protection) Act, 1986.
5	The units having upto 20 rooms and without boilers		
6	Restaurants / Eating Houses / Dhabas and other such establishments (Having Seating Capacity less than 36)/Sweet Shops/ Halwais and Other such Establishments (with Annual Average Production of less than One Tonne/Day)/ Banquet Halls/ Party Lawns (with Floor Area less than 100 m ²)	-	Proper Oil and Grease Trap-cum-Settling Tank for holding the effluent arising from kitchen and washing activities for atleast 4 hours duration.

7	Restaurants / Eating Houses / Dhabas and other such establishments (with minimum Seating Capacity of 36) / Sweet Shops/ Halwais and Other such Establishments (with Annual Average Production of One Tonne / Day or more)/ Banquet Halls/ Marriage Hall/Party Lawns (with minimum Floor Area of 100 m ²)	-	<p>They are required to install Sewage Treatment Plant (STP) including proper Oil and Grease Trap for the effluent arising from kitchen for atleast 4 hours duration and shall comply with the following standards as prescribed under Serial No. 39 of Schedule 1 to the Environment (Protection) Rules, 1986 made under the Environment (Protection) Act, 1986 :</p> <p>(i) pH -- 6.5 - 9.0, (ii) BOD- 10mg/l, (iii) COD 50mg/l, (iv)TSS- 10 mg/l, (v) NH₄-N-5mg/l, (vi) N-Total-10mg/l, (vii) Fecal Coliform <230 MPN/100ml, (viii)-PO₄-P-2mg/l</p> <p>They shall submit Quarterly Report for the Effluent Treatment Plant and Sewage Treatment Plant from any of the Empanelled Consultants of MoEF&CC/NABL accredited Laboratories.</p>
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(A) (ii) All the Automobile Service Stations are required to install effluent treatment systems as per the following categorization and comply with the Effluent standards as prescribed under Environment (Protection) Act, 1986 and its subsequent amendments:

Sl. No.	Type of Servicing Station	Category	Effluent Treatment System
1	Automobile servicing, repairing and painting (excluding only fuel dispensing) with waste water generation is more than 100 KLD	Red	The unit is required to install Effluent Treatment Plant (ETP) and meet the standards laid down at Serial No. 105 of Schedule 1 to the Environment (Protection) Rules, 1986 made under the Environment (Protection) Act, 1986.
2	Authorized service centers having discharge more than 100 KLD		They are required to submit Quarterly Report for the Effluent Treatment Plant assessed by any of the Empanelled Consultants of MoEF & CC / NABL accredited Laboratories.
3	Automobile servicing, repairing and painting (excluding only fuel dispensing) with waste water generation is less than 100 KLD	Orange	
4	Authorized service centers having discharge less than 100 KLD		
5	2 wheelers and 3 wheelers automobile service station excluding authorized service centers of manufacture and servicing upto 5 vehicles per day	-	Shall be exempted from installation of ETP but is required to install Oil and Grease Trap-cum-Settling Tank for holding the effluent for atleast 4 hours duration and shall comply with the standards laid down at Serial No. 105 (i) of Schedule 1 to the Environment (Protection) Rules, 1986 made under the Environment (Protection) Act, 1986.

(B) (i) The Guidelines for Solid Waste Management and Good Environment Management practice in the Hotels/ Resorts/ Restaurants/ Eating Houses / Dhabas / Sweet Shops / Halwais / Banquet Halls / Marriage Hall/ Party Lawns.

All Hotels/ Resorts/ Restaurants/ Eating Houses / Dhabas / Sweet Shops/ Halwais / Banquet Halls/ Marriage Halls/ Party Lawns shall make necessary arrangement for segregation of waste at source as prescribed under Solid Waste Management Rules, 2016 and related rules notified by the local bodies.

1. Facilitate collection of segregated waste in separate bins, handover recyclable material to either the authorised waste pickers or the authorised recyclers of Port Blair Municipal Council or by the Local Body.
2. The bio-degradable waste should be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible.
3. The residual waste shall be given to the waste collectors or agency as per the rules notified by the local body.
4. All the plastic waste should be disposed as per the Plastic Waste Management Rules, 2016 and the rules made and notified by the Local Body.
5. The hazardous waste generated, if any, should be disposed of as per the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.
6. As and when renovation of work are undertaken, the construction and demolition waste should be disposed of as per the provision of Construction and Demolition Waste Management Rules, 2016.

II. WATER CONSERVATION

1. Entire waste water generated from the kitchen, laundry and domestic sewage should be treated in a STP/ETP and shall be reused.
2. Utilization of treated water can reduce substantial load of supply of water requirement on the water supply system and ground water as well as waste water load on nearby coastal area and any other water source.
3. Installation of rain water harvesting for roof top and the reuse of the same.
4. Conventional water heating systems be replaced in a phase manner and solar water heating system be installed.
5. Water saving devices and mechanism are to be installed and adopted to reduce water consumption.

III. ENERGY CONSERVATION MEASURES

1. Energy saving and energy efficient appliances/devices should be installed e.g. occupancy and daylight sensors, in-room card-slots for turning on electricity etc.
2. Use weather stripping to close air gaps around doors and windows.
3. Installation of solar water heating/ parabolic concentrator for cooking / solar lighting/ solar AC.
4. Preference of use of inverters instead of Diesel Generation Sets.

IV. GOOD ENVIRONMENT MANAGEMENT PRACTICE

1. The units shall adopt Good House Keeping practices, shall properly channelize the fugitive emissions including emissions from cooking & kitchen operations by providing proper ducting / hood arrangement and proper exhaust system and emissions shall be discharged atleast 2 meter above the roof of the building.
2. Development of green belt to create buffer zone from main roads.
3. Preference of gas based boiler over oil fired/coal fired boiler.
4. Purchase refillable soap, hair rinse and hand lotion dispensers for guest rooms.
5. Purchase towels and sheets made from 100% natural cotton, containing no chemical, dyes or bleaches.
6. Purchase recycling bins for guest rooms or floors.
7. Wait to replace half filled toilet paper, rolls and tissue boxes until they are almost completely used.
8. Provide guest rooms with unwrapped, reusable drinking glasses and coffee cups.

All Hotels/ Resorts/ Restaurants/ Eating Houses / Dhabas / Sweet Shops/ Halwais / Banquet Halls/ Marriage Halls/ Party Lawns shall make necessary arrangement for segregation of waste at source as prescribed under Solid Waste Management Rules, 2016 and related rules notified by the local bodies.

1. Facilitate collection of segregated waste in separate bins, handover recyclable material to either the authorised waste pickers or the authorised recyclers of Port Blair Municipal Council or by the Local Body.
2. The bio-degradable waste should be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible.
3. The residual waste shall be given to the waste collectors or agency as per the rules notified by the local body.
4. All the plastic waste should be disposed as per the Plastic Waste Management Rules, 2016 and the rules made and notified by the Local Body.
5. The hazardous waste generated, if any, should be disposed of as per the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.
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6. Purchase recycling bins for guest rooms or floors.
7. Wait to replace half filled toilet paper, rolls and tissue boxes until they are almost completely used.
8. Provide guest rooms with unwrapped, reusable drinking glasses and coffee cups.

Annexure 3

Effluent Standards, Environment (Protection) Amendment Rules, 2017

रजिस्ट्री सं० डी० एल०-33004/99

REGD. NO. D. L.-33004/99



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असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (i)

PART II—Section 3—Sub-section (i)

प्राधिकार से प्रकाशित

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पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 13 अक्टूबर, 2017

सा.का.नि. 1265(अ).—केन्द्रीय सरकार, पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 6 और धारा 25 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, पर्यावरण (संरक्षण) नियम, 1986 का और संशोधन करने के लिए निम्नलिखित नियम बनाती है, अर्थात् :—

- संक्षिप्त नाम और प्रारम्भ :—**(1) इन नियमों का संक्षिप्त नाम पर्यावरण (संरक्षण) संशोधन नियम, 2017 है।
(2) ये राजपत्र में उनके प्रकाशन की तारीख को प्रवृत्त होंगे।
- पर्यावरण (संरक्षण) नियम, 1986 की अनुसूची-1 में, क्रम संख्यांक 104 और उससे सम्बन्धित प्रविष्टियों के पश्चात्, निम्नलिखित क्रम संख्यांक और प्रविष्टियां अन्तःस्थापित की जाएगी, अर्थात् :—

क्र. सं.	उद्योग	मानदंड	मानक
1	2	3	4
		बहिर्भाव निस्सारण मानक (निपटान के सभी ढंगों को लागू)	
"105	मल उपचार संयंत्र (एसटीपी)		अवस्थान
			सांद्र का निम्नलिखित से अधिक न होना
			(क)
		पीएच	(ख)
			देश में कहीं भी
			6.5-9.0

			अंदमान और निकोबार द्वीप, दादरा और नागर हवेली, दमण और दीव और लक्षद्वीप के सिवाय, सभी राज्यों की राजधानी।	
			ऊपर उल्लिखित से भिन्न क्षेत्र/प्रदेश	30
		कुल निलंबित ठोस पदार्थ (टीएसएस)	महानगर* अरुणाचल प्रदेश, असम, मणिपुर, मेघालय, मिजोरम, नागालैण्ड, त्रिपुरा, सिक्किम, हिमाचल प्रदेश, उत्तराखंड, जम्मू-कश्मीर राज्यों और अंदमान और निकोबार द्वीप, दादरा और नागर हवेली, दमण और दीव और लक्षद्वीप के सिवाय, सभी राज्यों की राजधानी।	<50
			ऊपर उल्लिखित से भिन्न क्षेत्र/प्रदेश	<100
		फैकल कोलीफॉर्म (एफसी) (अतिसंभाव्य संख्या प्रति 100 मिलीलिटर एमपीएन/100 मिलीलिटर)	देश में कहीं भी	<1000

*मुम्बई, दिल्ली, कोलकाता, चेन्नई, बेंगलूरु, हैदराबाद, अहमदाबाद और पुणे महानगर हैं।

टिप्पण :

- (i) पीएच और फैकल कौलीफॉर्म के सिवाय, मिलीग्राम/लिटर में सभी मूल्य।
- (ii) ये, मानक जलाशयों में निस्सारण और भूमि निपटान/अनुप्रयोगों के लिए लागू होंगे।
- (iii) फैकल कौलीफॉर्म के लिए मानक औद्योगिक प्रयोजनों के लिए उपचारित बहिर्वाह के उपयोग के सम्बन्ध में लागू नहीं होंगे।
- (iv) ये मानक 1 जून, 2019 को या उसके पश्चात् कमीशन किए जाने वाले सभी मल उपचार संयंत्रों (एसटीपी) को लागू होंगे और पुराने/विद्यमान मल उपचार संयंत्र (एसटीपी) राजपत्र में इस अधिसूचना के प्रकाशन की तारीख से पांच वर्ष की अवधि के भीतर इन मानकों को प्राप्त करेंगे।
- (v) समुद्र में उपचारित बहिर्वाह के निस्सारण के मामले में, इसे उचित समुद्री मुहाने के माध्यम से किया जाएगा और विद्यमान तट निस्सारण को समुद्री मुहानों में संपरिवर्तित किया जाएगा और उन मामलों में, जहां समुद्री मुहाना निस्सारण के बिन्दु पर 150 गुणा न्यूनतम आरम्भिक तनुकरण और निस्सारण बिन्दु से दूर 100 मीटर के किसी बिन्दु पर 1500 गुणा न्यूनतम तनुकरण प्रदान करता है, तब विद्यमान सन्नियम साधारण निस्सारण मानकों में विनिर्दिष्ट किए गए अनुसार लागू होंगे।
- (vi) उपचारित बहिर्वाह का पुनःउपयोग/पुनःचक्रण तथा उन मामलों में, जहां उपचारित बहिर्वाह के भाग का पुनःउपयोग और पुनःचक्रण किया जाता है जिसमें मानवीय सम्पर्क की सम्भावना अन्तर्वलित है, ऊपर यथा विनिर्दिष्ट मानक लागू होंगे।
- (vii) केन्द्रीय प्रदूषण नियंत्रण बोर्ड/राज्य प्रदूषण नियंत्रण बोर्ड/प्रदूषण नियंत्रण समितियां, पर्यावरण (संरक्षण) अधिनियम, 1986 की धारा 5 के अधीन स्थानीय परिवेश को ध्यान में रखते हुए, अधिक कठोर सन्नियम जारी कर सकेगा/कर सकेगी।

[फा. सं. क्यू-15017/2/2008/-सीपीडब्ल्यू]

अरुण कुमार मेहता, अपर सचिव

टिप्पण : मूल नियम भारत के राजपत्र, असाधारण, भाग II, खंड 3, उप-खंड (i) में का.आ. सं. 844(अ), तारीख 19 नवम्बर, 1986 द्वारा प्रकाशित किए गए थे और तत्पश्चात् उनमें निम्नलिखित अधिसूचनाओं द्वारा संशोधन किए गए थे, अर्थात् :—
 का.आ. 433(अ), तारीख 18 अप्रैल, 1987; सा.का.नि. 176(अ), तारीख 2 अप्रैल, 1996; सा.का.नि. 97(अ), तारीख 18 फरवरी, 2009; सा.का.नि. 149(अ), तारीख 4 मार्च, 2009; सा.का.नि. 543(अ), तारीख 22 जुलाई, 2009; सा.का.नि. 739(अ), तारीख 9 सितम्बर, 2010; सा.का.नि. 809(अ), तारीख 4 अक्टूबर, 2010; सा.का.नि. 215(अ), तारीख 15 मार्च, 2011; सा.का.नि. 221(अ), तारीख 18 मार्च, 2011; सा.का.नि. 354(अ), तारीख 2 मई, 2011; सा.का.नि. 424(अ), तारीख 1 जून, 2011; सा.का.नि. 446(अ), तारीख 13 जून, 2011; सा.का.नि. 152(अ), तारीख 16 मार्च, 2012; सा.का.नि. 266(अ), तारीख 30 मार्च, 2012; सा.का.नि. 277(अ), तारीख 31 मार्च, 2012; सा.का.नि. 820(अ), तारीख 9 नवम्बर, 2012; सा.का.नि. 176(अ), तारीख 18 मार्च, 2013; सा.का.नि. 535(अ), तारीख 7 अगस्त, 2013; सा.का.नि. 771(अ), तारीख 11 दिसम्बर, 2013; सा.का.नि. 2(अ), तारीख 2 जनवरी, 2014; सा.का.नि. 229(अ), तारीख 28 मार्च, 2014; सा.का.नि. 232(अ), तारीख 31 मार्च, 2014; सा.का.नि. 325(अ), तारीख 7 मई, 2014; सा.का.नि. 612(अ), तारीख 25 अगस्त, 2014; सा.का.नि. 789(अ), तारीख 11 नवम्बर, 2014; का.आ. 3305(अ), तारीख 7 दिसम्बर, 2015; का.आ. 4(अ), तारीख 1 जनवरी, 2016; सा.का.नि. 35(अ), तारीख 14 जनवरी, 2016; सा.का.नि. 281(अ), तारीख 7 मार्च, 2016; सा.का.नि. 496(अ), तारीख 9 मई, 2016; सा.का.नि. 497(अ), तारीख 10 मई, 2016; सा.का.नि. 978(अ), तारीख 10 अक्टूबर, 2016; और अंतिम बार अधिसूचना संख्यांक सा.का.नि. 1016(अ), तारीख 28 अक्टूबर, 2016 द्वारा संशोधित किए गए थे।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 13th October, 2017

G.S.R. 1265(E).—In exercise of the powers conferred by sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Environment (Protection) Rules, 1986, namely:—

1. **Short title and commencement.**—(1) These rules may be called the Environment (Protection) Amendment Rules, 2017.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. In the Environment (Protection) Rules, 1986, in Schedule – I, after serial number 104 and the entries relating thereto, the following serial number and entries shall be inserted, namely:—

Sl. No.	Industry	Parameters	Standards	
1	2	3	4	
		Effluent discharge standards (applicable to all mode of disposal)		
“105	Sewage Treatment Plants (STPs)		Location	Concentration not to exceed
			(a)	(b)
		pH	Anywhere in the country	6.5-9.0
		Bio-Chemical Oxygen Demand (BOD)	Metro Cities*, all State Capitals except in the State of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir, and Union territory of	20

		Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep	
		Areas/regions other than mentioned above	30
	Total Suspended Solids (TSS)	Metro Cities*, all State Capitals except in the State of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep	<50
		Areas/regions other than mentioned above	<100
	Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100ml)	Anywhere in the country	<1000

*Metro Cities are Mumbai, Delhi, Kolkata, Chennai, Bengaluru, Hyderabad, Ahmedabad and Pune.

Note :

- (i) All values in mg/l except for pH and Fecal Coliform.
- (ii) These standards shall be applicable for discharge into water bodies as well as for land disposal/applications.
- (iii) The standards for Fecal Coliform shall not apply in respect of use of treated effluent for industrial purposes.
- (iv) These Standards shall apply to all STPs to be commissioned on or after the 1st June, 2019 and the old/existing STPs shall achieve these standards within a period of five years from date of publication of this notification in the Official Gazette.
- (v) In case of discharge of treated effluent into sea, it shall be through proper marine outfall and the existing shore discharge shall be converted to marine outfalls, and in cases where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100 meters away from discharge point, then, the existing norms shall apply as specified in the general discharge standards.
- (vi) Reuse/Recycling of treated effluent shall be encouraged and in cases where part of the treated effluent is reused and recycled involving possibility of human contact, standards as specified above shall apply.
- (vii) Central Pollution Control Board/State Pollution Control Boards/Pollution Control Committees may issue more stringent norms taking account to local condition under section 5 of the Environment (Protection) Act, 1986".

[F. No. Q-15017/2/2008-CPW]

ARUN KUMAR MEHTA, Addl. Secy.

Note : The principal rules were published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i) *vide* number S.O. 844 (E), dated the 19th November, 1986 and subsequently amended *vide* the following notifications, namely:—

S.O. 433 (E), dated the 18th April 1987; G.S.R. 176(E) dated the 2nd April, 1996; G.S.R. 97 (E), dated the 18th February, 2009; G.S.R. 149 (E), dated the 4th March , 2009; G.S.R. 543(E), dated the 22nd July,2009; G.S.R. 739 (E), dated the 9th September, 2010; G.S.R. 809(E), dated the 4th October, 2010, G.S.R.

Annexure 4

Faecal Sludge Analysis - Test Reports

Hubert Enviro Care Systems (P) Ltd.

18, 92nd Street, Ashok Nagar,
Chennai - 600 083.
Ph: 42985555 Fax : 42985500
E-mail : labsales@hecs.in

Laboratory Services Division

Accredited by NABL in the fields
of Chemical & Biological Testing
Recognized by MoEF.
FSSAI Notified Laboratory
ISO 9001, 14001 & OHSAS 18001 Certified.

TEST REPORT

Page : 1 of 1

Name of the Client : M/s. Ecosan Services Foundation.,
Address of the Client : 1st Floor,24,Prashant Nagar,721/1 Navi Sathashiv
Peth Pune-611030

Report No. : HECS/SL/001/120518
Report Date : 18/05/2018

Sample Description : Sludge
Sample Mark : Faecal Sludge Analysis
Sample Drawn By : Hubert Enviro Care Systems Pvt Ltd
Sampling/received Date : 12/05/2018 -12/05/2018
Analysis Commenced On : 12/05/2018

Completed On : 17/05/2018

S.No.	Parameters	Units	Results	Test Method
1	PH @ 25°C(20% Solution)	NA	7.72	IS 2720 (Part 26)-1982
2	Ammonical Nitrogen	mg/kg	2380.52	HECS/SL/SOP/043
3	Chemical Oxygen Demand	mg/kg	43200.0	HECS/SL/SOP/046
4	BOD 3 Days @ 27°C	mg/kg	7650.0	HECS/SL/SOP/047
5	Total Phosphorous as P	mg/kg	452.60	IS 10518-1982 Reaff 2003
6	Nitrate	mg/kg	BDL(DL 1)	IS 14684:1999
7	Total Kjeldahl Nitrogen	mg/kg	3450.26	EPA 821-1687
8	Total Nitrogen As N	mg/kg	150.24	EPA 821-1687
9	Total Solids	mg/kg	30400.0	EPA 821-1684
10	Volatile Solids	mg/kg	17450.0	EPA 821-1684
11	Total Suspended Soilds	mg/kg	12950.0	EPA 821-1684

Note:- Mg/kg- Milligrams per kilograms , NA-Not Applicable.

End of Report



C.P. Sivaraman
Authorized Signatory
C.P. SVARAMAN
Laboratory Manager

Hubert Enviro Care Systems (P) Ltd.

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ISO 9001, 14001 & OHSAS 18001 Certified.

TEST REPORT

Page : 1 of 1

Name of the Client : M/s. Ecosan Services Foundation.,
Address of the Client : 1st Floor,24,Prashant Nagar,721/1 Navi Sathashiv
Peth Pune-611030

Report No. : HECS/M/013/120518
Report Date : 21/05/2018

Sample Description : Sludge
Sample Mark : Faecal Sludge Analysis
Sample Drawn By : Hubert Enviro Care Systems Pvt Ltd
Sampling/received Date : 12/05/2018 -12/05/2018
Analysis Commenced On : 14/05/2018


Completed On : 21/05/2018

S.No.	Parameters	Units	Results	Test Method
1	Faecal Coliform	MPN/100ml	1600	IS-1622
2	Total Coliform	MPN/100ml	1600	IS-1622
3	E.coil	MPN/100ml	1600	IS-1622
4	Sulfur reducing bacterial	MPN/100ml	1600	IS-1622

Note:- MPN - Most Probable Number .

End of Report




Authorized Signatory
K. KALEESWARI
SENIOR MICROBIOLOGIST

Hubert Enviro Care Systems (P) Ltd.

18, 92nd Street, Ashok Nagar,
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TEST REPORT

Page : 1 of 1

Name of the Client : M/s. Ecosan Services Foundation.,
Address of the Client : 1st Floor,24,Prashant Nagar,721/1 Navi Sathashiv
Peth Pune-611030

Report No. : HECS/SL/001/150518
Report Date : 18/05/2018

Sample Description : Sludge
Sample Mark : Faecal Sludge Analysis
Sample Drawn By : Hubert Enviro Care Systems Pvt Ltd
Sampling/received Date : 15/05/2018 -15/05/2018
Analysis Commenced On : 15/05/2018

Completed On : 18/05/2018

S.No.	Parameters	Units	Results	Test Method
1	PH @ 25°C(20% Solution)	NA	7.24	IS 2720 (Part 26)-1982
2	Ammonical Nitrogen	%	2243.62	HECS/SL/SOP/043
3	Chemical Oxygen Demand	mg/g	42800.0	HECS/SL/SOP/046
4	BOD 3 Days @ 27°C	mg/g	7600.0	HECS/SL/SOP/047
5	Total Phosphorous as P	mg/kg	424.56	IS 10518-1982 Reaff 2003
6	Nitrate	mg/kg	BDL(DL 1)	IS 14684:1999
7	Total Kjeldahl Nitrogen	mg/kg	3382.64	EPA 821-1687
8	Total Nitrogen As N	mg/kg	146.24	EPA 821-1687
9	Total Solids	mg/kg	28360.0	EPA 821-1684
10	Volatile Solids	%	16520.0	EPA 821-1684
11	Total Suspended Soilds	mg/kg	11840.0	EPA 821-1684

Note:- Mg/kg- Milligrams per kilograms , % percentage , Mg/g- Milligrams per grams ,NA - Not Available.

End of Report



C.P. Sivaraman
Authorized Signatory
C.P. SIVARAMAN
Laboratory Manager

1. The report in full or part shall not be used for any promotional or publicity purpose without written consent by HECS organization 2. Samples are not drawn by HECS unless or otherwise mentioned 3. Unless specifically requested by customer the test items will not be retained more than 15 days from the date of issue of test report. 4. Under no circumstances lab accepts any liability or loss / damage caused by use or misuse of test report after invoicing or issue of test report. 5. The test results relate only to the test items.

Hubert Enviro Care Systems (P) Ltd.

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Recognized by MoEF.
FSSAI Notified Laboratory
ISO 9001, 14001 & OHSAS 18001 Certified.

TEST REPORT

Page : 1 of 1

Name of the Client : M/s. Ecosan Services Foundation.,
Address of the Client : 1st Floor,24,Prashant Nagar,721/1 Navi Sathashiv
Peth Pune-611030

Report No. : HECS/M/011/150518
Report Date : 22/05/2018

Sample Description : Sludge
Sample Mark : Faecal Sludge Analysis
Sample Drawn By : Hubert Enviro Care Systems Pvt Ltd
Sampling/received Date : 15/05/2018 -15/05/2018
Analysis Commenced On : 15/05/2018

Completed On : 22/05/2018

S.No.	Parameters	Units	Results	Test Method
1	Faecal Coliform	MPN/100 ml	1600	IS-1622
2	Total Coliform	MPN/100 ml	1600	IS-1622
3	E.coil	MPN/100 ml	1600	IS-1622
4	Sulfur reducing bacterial	MPN/100 ml	1600	IS-1622

Note:- MPN - Most Probable Number.

End of Report



Authorized Signatory

K. KALEESWARI
SENIOR MICROBIOLOGIST

Annexure 5

Sample Manifest Forms

Septage Transporter Permit for _____ Municipality		
In accordance with all the terms and conditions of the current _____ Municipality's Rates, Rules and Regulations, the special permit conditions accompanying this permit, and all applicable rules, laws or regulations of Government of Maharashtra, permission is hereby granted to:		
NAME	OF	PERMITTEE:

ADDRESS: _____		

For the disposal of septage from domestic septic tank or commercial holding tank at the _____ treatment facility.		
This Permit is based on information provided in the Septage Transporter Permit application which constitutes the Septage Management Hauled Permit.		
This Permit is effective for the period set forth below, may be suspended or revoked for Permit Condition Non Compliance and is not transferable. The original permit shall be kept on file in the Permittee's office. A copy of this Permit shall be carried in every registered vehicle used by the permittee.		
EFFECTIVE DATE:		
EXPIRATION DATE:		
____ CHECK IF RENEWED PERMIT		
Permit is liable to be cancelled in case of violations of any Acts, Rules and Regulations relating to the operation of Septage System or in cases of safety protocols not being adhered to or in case of non-permitted disposal.		

⁶ Source: Operative guidelines for septage management for urban and rural local bodies in Tamil Nadu.(2014)

Sample Form to be filled by Operator / Transporter of Septage

i. Identification of Waste:

- a) Volume _____
- b) Type: _____ Septic Tank _____ Others
- c) Source: _____ Residential _____ Commercial _____ Restaurant _____ Portable Toilet _____ Others

ii. Details of Waste Generator

- a) Name:
- b) Phone Number:
- c) Address:
- d) Pin:
- e) Property tax no.:
- f) Any kind of deficiencies, missing pipes or fittings, improper manholes or access covers, any other cracks or damage observed: _____

The undersigned being duly authorized does hereby certify to the accuracy of the source and type of wastewater collected and transported.

Date: _____ Signature: _____

iii. Details of Transporter / Operator

- a) Company Name:
- b) Permit:
- c) Vehicle License:
- d) Pump out date:

The above described wastewater was picked up and hauled by me to the disposal facility name below and was discharged. I certify that the foregoing is true and correct:

- e) Signature of authorized agent and title: _____

iv. Acceptance by _____ Municipality's authorized STP

The above transporter delivered the described wastewater to this disposal facility and it was accepted.

Disposal date: _____ Amount Collected from Transporter (if any): _____

Signature of authorized signatory and title: _____

⁷ Adapted from operative guidelines for septage management for urban and rural local bodies in Tamil Nadu.(2014)

Annexure 6

Financial Estimates

TABLE 52: OPERATIONAL COST OF COLLECTION AND TRANSPORTATION

Description		Monthly Salary
Driver + operator	9 persons	₹ 10,000.00
Monthly salary in Rs lakhs	₹ 0.80	
Leave salary allowances as %	15	
Administrative overheads as %	10	
Margin for emergencies as %	5	
Retirement benefits as %	10	
Monthly salary in Rs lakhs	1.26	
Annual HR Cost	₹ 15,12,000.00	

TABLE 53: COST OF CIVIL WORKS AT FSTP

Component	Capacity	Cost
Receiving station + screening	3	₹ 27,71,048.00
Settling Thickening Tank	30	₹ 7,91,408.00
Anaerobic Digester	12	₹ 11,19,250.00
Equalisation tank	20	₹ 3,30,840.00
Treated water tank	20	₹ 3,46,918.00
Road + Culvert	225	₹ 69,72,603.00
Solids handling room + Office building	150	₹ 83,46,271.00
Boundary wall	100	₹ 6,61,122.00
Gate	10	₹ 1,00,000.00
Rainwater harvesting system for office building	1	₹ 1,83,200.00
	TOTAL	₹ 2,16,22,660.00

TABLE 54: PURCHASE COST OF ELECTRO-MECHANICAL COMPONENTS AT FSTP

Component	Capacity	Cost
Belt Press	5	₹ 17,11,000.00
Rotary dryer	300	₹ 14,16,000.00

MBBR + foundation	42	₹ 20,18,141.00
Generator with generator room	1	₹ 5,40,000.00
Pumps (solid handling + water)	2 each	₹ 96,560.00
Prefabricated toilet	1	₹ 1,35,000.00
Desludging truck 4000 L	1	₹ 18,65,254.00
GPS system for desludging vehicles	4	₹ 70,800.00
CCTV System	1	₹ 88,500.00
Water tanker 5 KL	2	₹ 25,00,000.00
Solar power system (2 kWp)	1	₹ 1,50,000.00
Tools	1	₹ 35,000.00
	TOTAL	₹ 1,06,26,285.00

TABLE 55: OPERATIONAL COST OF FSTP

Description		
Operating KLD of FSTP	42	Monthly pay
Junior Engineer	1	₹ 30,000.00
Portion of time charged for FSTP	0.25	
Operator	2	₹ 20,000.00
Semi-skilled labourers	2	₹ 10,000.00
Unskilled labourers	3	₹ 8,000.00
Watchman & security	4	₹ 10,000.00
Office computer operator	1	₹ 15,000.00
Chemist	1	₹ 25,000.00
Portion of time charged for FSTP	0.2	
Lab assistant	1	₹ 12,000.00
Monthly salary in Rs lakhs	1.635	
Leave salary allowances as %	0.15	
Administrative overheads as %	0.1	
Margin for emergencies at %	0.05	
Retirement benefits	0.10	
Monthly salary in Rs lakhs	2.29	
Annual HR Cost	₹ 27,46,800.00	

TABLE 56: COST OF ENERGY CONSUMPTION

Equipment	kW rating	Load factor	Working	Operating load in kW	Running hours	kWh
Sludge pump (Settling thickening tank - Belt Press)	1.50	0.85	1	1.28	2.00	2.55
Sludge pump (Anaerobic digester - Belt Press)	1.50	0.85	1	1.28	0.01	0.02
Drum thickener	0.25	0.85	1	0.21	16.00	3.40
Belt Press	0.25	0.85	1	0.21	16.00	3.40
Wash water pump	2.20	0.85	1	1.87	16.00	29.92
Rotary Dryer	36.00	0.85	1	30.60	2.00	61.20
Wastewater pump (Equalization tank - MBBR)	1.50	0.85	1	1.28	22.00	28.05
Blower (MBBR)	2.20	0.85	1	1.87	22.00	41.14
Sludge pump (Tube settler - Anaerobic digester)	1.50	0.85	1	1.28	8.00	10.20
Water pump (Intermediate storage tank - Pressurised filter)	2.20	0.85	1	1.87	22.00	41.14
Chlorine dosing pump	0.75	0.85	1	0.64	22.00	14.03
Total	49.85					235.04

Total electrical consumption in kWh	235.04
Rate of electricity	₹ 3.00
Daily expenditure	₹ 705.12
Annual expenditure	₹ 2,11,537.21

TABLE 57: COST OF CONSUMABLES AND FUEL FOR FSTP

Description	Unit	
Poly electrolyte	Kg/ton	3.25
Daily requirement	Kg	1.3
Rate	Per kg	₹ 200.00
Poly electrolyte	Per annum	₹ 60,000.00
Chlorine	Per annum	₹ 20,000.00
Power cut	h/d	1
Fuel requirement	l/h	21
Cost of fuel	INR/l	63.6
Annual cost of fuel	INR	₹ 4,00,680.00
Total consumables		₹ 4,80,680.00

TABLE 58: COST OF REPAIR AND RENEWAL

Description	Cost (in lakhs)
Present assessed cost of a plant	₹ 322.49
Percent of civil costs	0.68
Percent of mechanical costs	0.27
Percent of electrical costs	0.05
Cost of civil works	₹ 219.33
Cost of mechanical works	₹ 87.78
Cost of electrical works	₹ 15.38
Life of civil works before renewal in years	25
Life of mechanical works before renewal, in years	10
Life of electrical works before renewal, in years	15
Interest rate in percent	1.3
Compounding factor for civil works	1.38
Compounding factor for mechanical works	1.14
Compounding factor for electrical works	1.21
Percent of civil cost for repairs	5

Percent of mechanical costs for renewal	40
Percent of electrical costs for renewal	30
Compounded value of civil works at renewal year	15.15
Compounded value of mechanical works at renewal year	39.95
Compounded value of electrical works at renewal year	5.60
Rate of interest for equivalent cost factor	6.25
Equivalent cost factor for civil renewals	₹ 0.22
Equivalent cost factor for mechanical renewals	₹ 0.55
Equivalent cost factor for electrical renewals	₹ 0.40
Equivalent cost at zero year for civil works renewal	₹ 3.33
Equivalent cost at zero year for mechanical works renewal	₹ 21.79
Equivalent cost at zero year for electrical works renewal	₹ 2.26
Total equivalent cost at zero year for all renewals later	₹ 27.37

Annexure 7

Financial Modelling

TABLE 59: CAPITAL EXPENDITURE OF TREATMENT COMPONENTS OF FSTP AND ESTIMATED CIVIL, MECHANICAL AND ELECTRICAL COST OF IMPLEMENTATION

Component	Cost (in lakh)	Civil		Mechanical		Electrical	
		%	Cost	%	Cost	%	Cost
Receiving station + screening	₹ 27.71	100%	₹ 27.71	0%	₹ -	0%	₹ -
Settling Thickening Tank	₹ 7.91	87%	₹ 6.89	10%	₹ 0.79	3%	₹ 0.24
Anaerobic Digestor	₹ 11.19	87%	₹ 9.74	10%	₹ 1.12	3%	₹ 0.34
Equalisation tank	₹ 3.31	100%	₹ 3.31	0%	₹ -	0%	₹ -
Belt Press	₹ 17.11	0%	₹ -	85%	₹ 14.54	15%	₹ 2.57
Rotary dryer	₹ 14.16	0%	₹ -	85%	₹ 12.04	15%	₹ 2.12
MBBR + foundation	₹ 20.18	21%	₹ 4.24	52%	₹ 10.49	27%	₹ 5.45
Treated water tank	₹ 3.47	100%	₹ 3.47	0%	₹ -	0%	₹ -
TOTAL	₹ 105.05		₹ 55.35		₹ 38.98		₹ 10.71

TABLE 60: CAPITAL EXPENDITURE OF OTHER COMPONENTS OF FSTP AND ESTIMATED CIVIL, MECHANICAL AND ELECTRICAL COST OF IMPLEMENTATION

Component	Cost (in lakh)	Civil		Mechanical		Electrical	
		%	Cost	%	Cost	%	Cost
Road + Culvert	₹ 69.73	100%	₹ 69.73	0%	₹ -	0%	₹ -
Prefabricated toilet	₹ 1.35	100%	₹ 1.35	0%	₹ -	0%	₹ -
Solids handling room + Office building	₹ 83.46	100%	₹ 83.46	0%	₹ -	0%	₹ -
Generator with generator room	₹ 5.40	0%	₹ -	80%	₹ 4.32	20%	₹ 1.08
Pumps	₹ 0.97	0%	₹ -	85%	₹ 0.82	15%	₹ 0.14
Boundary wall	₹ 6.61	100%	₹ 6.61	0%	₹ -	0%	₹ -
Gate	₹ 1.00	100%	₹ 1.00	0%	₹ -	0%	₹ -
Desludging truck 4000 L	₹ 18.65	0%	₹ -	100%	₹ 18.65	0%	₹ -
GPS system for desludging vehicles (4 no.)	₹ 0.71	0%	₹ -	0%	₹ -	100%	₹ 0.71
CCTV System	₹ 0.89	0%	₹ -	0%	₹ -	100%	₹ 0.89
Water tanker 5 KL (2 No.)	₹ 25.00	0%	₹ -	100%	₹ 25.00	0%	₹ -
Tools	₹ 0.35	0%	₹ -	0%	₹ -	100%	₹ 0.35
Rainwater Harvesting System (RWH)	₹ 1.83	100%	₹ 1.83	0%	₹ -	0%	₹ -
Solar Power System for Office Building (2 kWp)	₹ 1.50	0%	₹ -	0%	₹ -	100%	₹ 1.50
TOTAL	₹ 217.44		₹ 163.98		₹ 48.79		₹ 4.67

TABLE 61: CALCULATION OF ANNUALISED COST FOR EXECUTION OF PROJECT

Sr. No.	Description	Unit	Cost (in lakh)
1	Planning and shipping cost including overheads (% of the CapEx)	INR	48.37
2	Equivalent cost of repair and renewal	INR	27.37
3	Cost of civil structure (% of the CapEx)	INR	219.33
4	Cost of electromechanical components (% of the CapEx)	INR	87.78
5	Cost of electrical and plumbing (% of the CapEx)	INR	15.38
6	Total investment cost	INR	398.24
7	Rate of interest (Rate of interest in bank - inflation rate)	%	1.30%
8	Interest factor (q)		1.01
8a	Interest factor for civil structure Qcs		0.05
8b	Interest factor for electromechanical components Qec		0.11
8c	Interest factor for electrical and plumbing Qep		0.07
9	Annualised capital costs		
9a	on cost of civil structures	INR/year	13.90
9b	on electromechanical components	INR/year	9.42
9c	on electrical and plumbing	INR/year	1.14
10	Annualised capital cost	INR/year	24.45
11	OpEx	INR/year	49.51
12	Revenue	INR/year	35.70
13	Total Annual Cost	INR/year	38.26
		per KL cost	303.68

Annexure 8

Minutes of the Meeting / Consultations

MINUTES OF THE MEETING HELD IN CHAMBER OF EXECUTIVE ENGINEER-III (WORKS & SWM), PBMC WITH THE TEAM OF NATIONAL INSTITUTE OF URBAN AFFAIRS, MoH&UA, GoI., TO DISCUSS THE PROJECT PROPOSAL OF FAECAL SLUDGE TREATMENT PLANT IN PORT BLAIR BY THE PORT BLAIR MUNICIPAL COUNCIL UNDER SMART CITY PROJECTS.

Following were present during meeting:

1. Shri. Avinash Kumar Singh, Executive Engineer-III (Works & SWM), PBMC,
2. Shri. Zaki Ahmed, Executive Engineer (E & M), PBMC,
3. Shri. Rishikesh, Senior Scientific Officer, Department of Science & Technology & A&N Pollution Control Committee, A&N Administration, Dolly Gunj, Port Blair,
4. Shri. Doab Singh, Programme Officer, NIUA,
5. Shri. Jyoti Dash, Programme Manager, NIUA,
6. Shri. Dhawal Patil, General Manager, ECOSAN Services Foundation,
7. Shri. P Umamaheswara Rao, Junior Engineer (SWM), PBMC

In the beginning, the Executive Engineer-III (Works & SWM), PBMC briefed the NIUA Team and other officials that, the size and shape of the Port Blair city i.e. 1.5 Lakhs Population in 24 wards and has 46,454 households. As of now every households including encroachers having Toilet facilities either by constructed own or constructed/ benefitted through/ under the Swachh Bharat Mission (Urban).

Further it is added that, there are more than 100 Nos. of Hotels and 2469 Nos. of Micro, Small & Medium Enterprises, in which most of the Hotels have established their own captive Sewage Treatment Plants (STPs) as per the direction issued under the A&N Gazette Notification mandating the installation of STPs for Hotels & Others having rooms 20 & above, but they are unable to treat their septic sewage.


In response to the query raised by the NIUA Team, the Executive Engineer-III (Works & SWM), PBMC informed that, presently, Port Blair City does not have any **scheduled policy for cleaning of septic tanks**, however the cleaning is done as per the **demand** of household/ establishments. For emptying the septic effluents of septic tanks, there are 03 cesspool emptier vehicles operational in Port Blair city, in which 01 is operated by the Port Blair Municipal Council (PBMC), whereas other 02 are being run by the private agencies.

The NIUA team & Shri. Dhawal Patil, General Manager, ECOSAN

The Senior Scientific Officer-II mentioned that, there is a project of making the earthen pots for saplings with the dried sludge. The committee agreed and informed that, it will be made as per the quality of dried sludge. Further, he added that, this kind of project may be extended to the Neil, Havelock Island and the North & Middle Andaman also for the total solution of their faecal sludge waste.

The NIUA team informed that the team for preparation of Detailed Project Report (DPR) will be deputed at the earliest and the implementation of FSTP will be fully supported by the NIUA in all spirit and manner.

The meeting ended with vote of thanks.



Executive Engineer-III (Works & SWM)
Municipal Council

No. 11-13/SWM [FSTP]/JE(CIVIL)/SWM/MC/2017-18/13

Dated. 23.04.2018

Copy to:

1. PA to Secretary, PBMC for kind information of Secretary, PBMC.
2. Steno to Superintending Engineer, PBMC for kind information of Superintending Engineer, PBMC.
3. The Architect, PBMC for information.
4. The Executive Engineer (E&M), PBMC for information.
5. The Senior Scientific Officer-II, Dept. of S&T and A&N Pollution Control Committee, Dolly Gunj, Port Blair for information.
6. The Member Secretary, A&N Pollution Control Committee, Dolly Gunj, Port Blair for information.


Executive Engineer-III (Works & SWM)
Municipal Council



No.: 1-13/ SWM (FSTP)/ JE (CIVIL)/SWM/ MC/ 2017-18/ 85

नगरपालिका परिषद का कार्यालय
OFFICE OF THE MUNICIPAL COUNCIL
पोर्ट ब्लेयर
PORT BLAIR

Port Blair, dated 24.07.2018

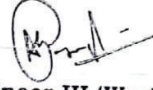
MEETING NOTICE

A consultation meeting cum presentation has been convened under the Chairmanship of Secretary, PBMC with the Officials of National Institute of Urban Affairs (NIUA) has been convened on 25.07.2018 at 04:00P.M. in the Conference Hall of Port Blair Municipal Council, Port Blair to discuss on the Detailed Project Report (DPR) prepared by NIUA for setting up of 30KLD Faecal Sludge Treatment Plant (FSTP) for Port Blair city.

The following are the proposed agenda:

1. To verify the details (facts, figures) given in the existing situation section.
2. There are few data gaps which need to clarify with PBMC.
3. Details of technology options, financial aspects, etc.
4. To discuss the sustainability of the system in both aspects as technically and financially.

Kindly make it to convenient to attend meeting on date and time mentioned above.


Executive Engineer-III (Works & SWM)
Municipal Council

To:

1. The Member Secretary, A&N Pollution Control Committee, Department of Science & Technology, A&N Administration, Port Blair.
2. Sr. Scientific Officer-II, Department of Science & Technology, A&N Administration, Port Blair.
3. The Sanitary Officer, PBMC.

Copy To:

1. PA to Secretary, PBMC for kind information of Secretary, PBMC.


Executive Engineer-III (Works & SWM)
Municipal Council

MINUTES OF 2ND REVIEW MEETING HELD UNDER THE CHAIRMANSHIP OF SECRETARY, PBMC ON 25.07.2018 IN THE CONFERENCE HALL OF PORT BLAIR MUNICIPAL COUNCIL TO DISCUSS ON THE DRAFT DETAILED PROJECT REPORT (DPR) ON FAECAL SLUDGE AND SEPTAGE MANAGEMENT FOR PORT BLAIR, ANDAMAN & NICOBAR ISLANDS PREPARED BY NIUA.

Following were present during meeting:

1. Shri. Suneel Anchipaka, IAS (Secretary), Port Blair Municipal Council.
2. Shri. Avinash Kumar Singh, Executive Engineer-III (Works & SWM), PBMC,
3. Shri. Abdul Wahab, Assistant Engineer-III (R/ Works & SWM), PBMC,
4. Shri. V.P. Tiwari, Sanitary Officer, PBMC,
5. Shri. Rishikesh, Senior Scientific Officer, Department of Science & Technology & A&N Pollution Control Committee, A&N Administration, Dolly Gunj, Port Blair,
6. Smti. Shipra Halder, Environmental Engineer, , Department of Science & Technology & A&N Pollution Control Committee, A&N Administration, Dolly Gunj, Port Blair,
7. Shri. P Umamaheswara Rao, Junior Engineer (SWM), PBMC
8. Shri. Doab Singh, Programme Officer, NIUA,
9. Shri. Saurabh Kale, ECOSAN Services Foundation,
10. Shri. Dhawal Patil, ECOSAN Services Foundation,

At the outset, Secretary, PBMC welcomed the team of National Institute of Urban Affairs (NIUA) & ECOSAN Services Foundation and A&N Pollution Control Committee officials. He informed the gathering about the following agenda of the meeting on the Draft Detailed Project Report for Faecal Sludge Treatment Plant (FSTP) prepared by the NIUA & ECOSAN Services Foundation:

1. To verify the details (facts, figures) given in the existing situation section.
2. Details of technology options, financial aspects, etc.
3. To discuss the sustainability of the system in both aspects as technically and financially.

The team of ECOSAN Services Foundation has made a presentation of the DPR of FSTP and detailed about the layout, components, units and technology which are as follows:

1. Existing situation for Collection and Transportation mentioned that, at present no sewerage system/ network exists in Port Blair city. The Faecal/ septage is collected as per the "On demand basis", for the collection & Transportation by 03 Cesspool emptier (de-sludging service providers).
2. There is No STP exists, but A&N Administration has made a regulations for the bulk generators (Hotels, Resorts etc.) for the implementation of own STPs. In which 15 No. of Hotels and Resorts are having their own Captive STPs.
3. Currently, collected FSS is disposed off into the pit at the designated location.
4. Detailed various graphs are prepared on the data i.e., Season Vs. Collected, Frequency Vs. Range (cum./ day).

5. The flow chart showing the mechanism of treatment based on the component functions were explained, which are Receiving Station, Screening, Settling/ Thickening Tank, Anaerobic digester, Drum Thickener, Belt Press, Rotary Drier. For the waste water treatment Equalization tank, Moving Bed Bio-Reactor, Tube Settler, Intermediate Storage Tank, Pressurized Filter, Chlorine dosing, Collection tank, etc., were explained.
6. Layout plan showing the component placement in the proposed location with other details/ facilities like motorable road, laboratory, watchman shed, computer operator room, entrance & exit gate, etc.
7. Under Financial Estimates, explained CAPEX, OPEX & Revenue Model for the proposed project.
8. Based on the inputs i.e., data provided by the PBMC the proposed designed capacity of the FSTP is 42KLD instead of 30KLD.
9. And explained the queries raised by the PBMC. The team also explained the CAPEX, OPEX and Revenue generation through the FSTP.
10. The outputs/ by products obtaining from the FSTP were also explained, which are manure and treated water, in which treated water can be used for all purposes and the composting can be used as co-composting to gain a good texture and soil conditioner.

After detailed presentation, the presentation team asked for the inputs/ changes/ acceptance on the following and other points:

1. Verify the details (facts, figures) given in the existing situation section.
2. To discuss the feasibility of MBBR technology w.r.t. CAPEX and OPEX.(Section6.1)
3. To discuss the sustainability of system in both aspects astechnically and financially.

Based on the detailed deliberations, following were proposed:

1. At Page No.21 of the Draft DPR, the figures mentioned at Point No.:03 is to be corrected as mentioned below,

On-site sanitation system	current situation
Coverage of Households with adequate sanitation system	
Connected to septic tanks (%)	100
Connected to soak pits (%)	10
Directly connected to Open Drains (%)	0

2. Based on the methodology explained the MBBR process is finalized for treating the waste water. Since, all the hotels having their treatment units with MBBR technology and there is a easy access/ availability of service providers of MBBR for any repair & maintenance.
3. and It is requested to cancel the laboratory Room, since the parameters of FSTP to be tested in the accredited laboratory, however a small mobile laboratory having a facilities like BOD, COD, pH, Turbidity meter, etc..

4. The PBMC will hire any NABL accredited laboratory for testing the treated water quality and submit the same as a compliance.
5. The PBMC proposed to incorporate the office cum conference hall instead of laboratory Room.
6. Sr. Scientific Officer-II, ANPCC has suggested to have a fish pond/ tank before the treatment water collection chamber, so as to ensure the treatment of waste water through traditional method as an indication of water quality.
7. For collection & transportation of Faecal/ Septage 01 No. 4m³ capacity vacuum truck is proposed, in which PBMC is accepted and suggested to incorporate the cost of same in the DPR.
8. The Executive Engineer-III (Works & SWM), PBMC is asked to incorporate the enhanced rate of compost, Tipping fee and the water charges, so that the Plant will be self-sustainable with CAPEX & OPEX.
9. The Executive Engineer-III (Works & SWM), PBMC desired to have a common check post for SWM & FSSM with its desired location. The infrastructure which is proposed for the FSSM will be same.
10. For tracking/ monitoring the vehicle carrying FSSM will be fitted with a GPS system with necessary monitoring infrastructure.
11. For the Treated Water utilization, a Tanker fitted Vehicle of 10KL liters capacity is proposed to incorporate in the DPR for transport of treated water to gardens and other use.
12. The NIUA and ECOSAN Services Foundation, has assured to incorporate the suggestions and modifications in the DPR and final DPR will be submitted at the earliest.

The meeting ends with the vote of thanks to the chair.

Executive Engineer-III (Workers & SWM)
Municipal Council

F. No.: 1-13/ SWM (FSTP)/ JE (CIVIL)/SWM/ MC/ 2017-18/ 97

Dated 16.07.2018

Copy to:

1. PA to Secretary, PBMC for kind information of Secretary, PBMC.
2. Member Secretary, A&N Pollution Control Committee, Dept. of Science & Technology, A&N Administration for kind information.
3. Sr. Scientific Officer-II, Dept. of Science & Technology, A&N Administration for kind information.
4. The Sanitary Officer, PBMC for information.
5. The Programme Officer, NIUA for kind information & necessary action.
6. The Representing Officers, ECOSAN Services Foundation for kind information & necessary action.

Executive Engineer-III (Workers & SWM)
Municipal Council

Minutes of Meeting : Second Consultation meeting for FSTP DPR, Port Blair

Date: 27 September 2018

Time & Venue :

- 16:30-17:30 : Port Blair Municipal Corporation
- 18:00-19:30 : Secretariat Office, Port Blair

Following persons were present during the meeting:

1. Shri Chetan B. Sanghi, Chief Secretary, A&N Administration
2. Shri Suneel Anchipaka, IAS (Secretary), Port Blair Municipal Council
3. Shri Sumit Chaudhary, Superintendent Engineer, PBMC
4. Shri Avinash Kumar Singh, Executive Engineer-III (SWM and Works), PBMC
5. Shri Abdul Wahab, Assistant Engineer, PBMC
6. Shri Doab Singh, Programme Officer, NIUA, New Delhi
7. Shri Mohit Kapoor, Programme Office, NIUA, New Delhi
8. Shri Dhawal Patil, General Manager, Ecosan Services Foundation, Pune
9. Shri Saurabh Kale, Sr. Project Manager, Ecosan Services Foundation, Pune

Minutes of meeting with Superintendent Engineer, PBMC

The meeting started at Port Blair Municipal Corporation with introduction to Sanitation Capacity Building Platform (SCBP) by Shri Doab Singh (NIUA) and support provided by NIUA to PBMC for preparation of DPR for Faecal Sludge Treatment Plant (FSTP). A detailed presentation by Shri Dhawal Patil (ESF) for the proposed FSTP was given. He explained all components of DPR - existing situation of collection and transportation for the faecal sludge in Port Blair city and also the Quantification process and Technology selection criteria for the FSTP. He also explained the financial estimates - CapEx, OpEx and Life Cycle Cost for the treatment plant, and, cost recovery options for PBMC to generate revenue for OpEx of FSTP.

Shri Sumit Chaudhary, SE, PBMC was overall satisfied with the technology selection criteria and financial estimates. He suggested some points to be added in the proposed FSTP DPR as follows:

1. Installation of Solar Panel of upto 1KW that shall be utilized for electricity requirement for operator room and other purpose on site.
2. Provision for Rain Water Harvesting in the FSTP premises and collecting water using existing sump structures.
3. Instead of purchasing one 10KL water tanker, DPR must indicate purchase of two water tankers of 5KL capacity to transport treated water from FSTP site.

Minutes of meeting with Shri Chetan B. Sanghi, Chief Secretary, A&N Administration

The meeting was chaired by Chief Secretary Office, Secretariat, Port Blair. Shri Suneel Anchipaka, IAS, Secretary introduced NIUA and ESF team to Chief Secretary, A&N Administration and briefed him about support provided by NIUA to PBMC for preparation of DPR for FSTP. A brief presentation by Shri Dhawal Patil (ESF) for the proposed FSTP was given to Chief Secretary explaining all components of DPR - Technology selection criteria for FSTP, Financial estimates and cost recovery options for PBMC to generate revenue for OpEx of FSTP.

Shri Chetan B. Sanghi, IAS, Chief Secretary, A&N Administration decided that PBMC will take responsibility of the O&M of the plant for the coming years instead of levying additional taxes on local citizens and tourists. All members present in the meeting were satisfied with the components of DPR and Chief Secretary in-principle approved the DPR for FSTP in Port Blair and directed PBMC to proceed further with approval and tendering process.

PBMC requested NIUA and ESF team to submit revised DPR to them incorporating the suggestions received during the meetings. NIUA and ESF shall submit revised Final DPR to PBMC latest by 15th October 2018 and submit bid-documents for FSTP tender process latest by 26th October 2018. After NIUA and ESF shall submit the final revised DPR of FSTP, PBMC shall put up file under Smart City Port Blair project for CRZ clearance and land-use change. PBMC will float the tender for construction of FSTP in end of October and after 15 days will hold a pre-bid meeting for the same.

The meeting concluded with a Vote of Thanks by Shri Avinash Kumar Singh, Executive Engineer-III, PBMC to all members and Chief Secretary.

Goal

To build the capacity of cities and other stakeholders working in urban sanitation to ensure improved delivery of sanitation services through decentralized approaches

Thematic Areas

Awareness and Advocacy

Policy Advise

Technical Support

Developing Training Content and Modules

Delivering Trainings

Knowledge Building through Research and Learning events

What is SCBP

Sanitation Capacity Building Platform (SCBP) is an initiative of the National Institute of Urban Affairs(NIUA) for addressing urban sanitation challenges in India. The 3 year programme(starting 2016) is supported by a Gates Foundation grant. It is aimed at promoting decentralised urban sanitation solutions for septage and waste water management.

The Platform is an organic and growing collaboration of universities, training centres, resource centres, non-governmental organizations, consultants and experts. The Platform currently has on board CEPT University, CDD Society and BORDA, ASCI, AIILSG, UMC, ESF, CSE, WaterAid, CPR, iDECK, CSTEP and WASHi. The Platform works in close collaboration with the National Faecal Sludge and Septage Management Alliance(NFSSMA).

What we do

The Platform lends support to the Ministry of Housing and Urban Affairs (MoHUA), Government of India, by focussing on urban sanitation and supporting states and cities to move beyond the open defecation free (ODF) status by addressing safe disposal and treatment of faecal sludge and septage.

The Platform supports National Urban Sanitation Missions, States and Towns, by developing and sourcing the best Capacity Building, Policy Guidance, Technological, Institutional, Financial and Behaviour Change advise in favour of decentralised sanitation solutions.

How does the Platform work

NIUA initiates and facilitates engagement of the SCBP Platform Partners at the State government level, for advocating and awareness generation for Faecal Sludge and Septage Management(FSSM). Followed by on demand support for capacity building and implementation of decentralised sanitation solutions at state and city level. SCBP promotes a four-module based Capacity Building support.

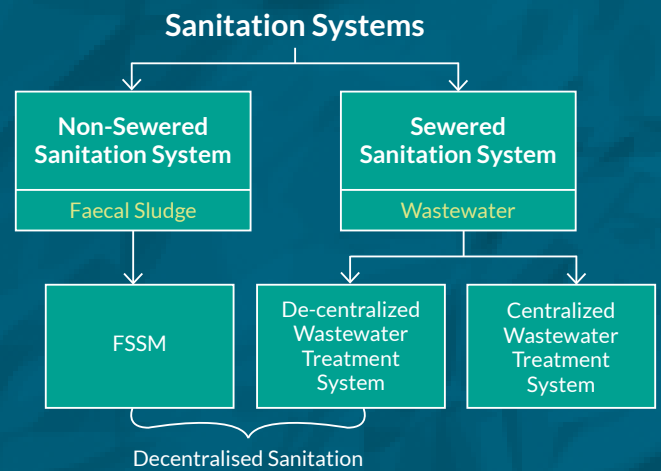
Publications and Reports



Why Decentralised Sanitation Solutions

Given that 49% of the urban population in India relies on on-site sanitation, such as septic tanks and pits, decentralized sanitation options, such as Faecal Sludge and Septage Management (FSSM) and Decentralized Wastewater Treatment Systems (DEWATS) are critical for achieving the goals for urban sanitation under various national missions. Decentralized sanitation options are scientifically proven solutions to complement centralized systems, serving the underserved, particularly in peri-urban areas and informal settlements.

FSSM is the collection and transportation of faecal sludge from the containment system, treatment of the sludge at a designated site, followed by safe disposal or reuse of the treated sludge. DEWATS uses sewers to convey domestic wastewater from a neighbourhood or local catchment to a small, local treatment plant where it is treated through natural processes without any requirement for external energy to operate the system.



Target Audience

All stakeholders ranging from National Missions, State and Town Officials(Public Health, Engineering and Administration), Elected Representatives, Private Sector Consultants and Vendors, NGOs, Academia, Masons and the Citizens at large.

The Platform provides a sharing and cross learning opportunity for SCBP Partners. To pool in their knowledge resources on all aspects of urban sanitation capacity building. Facilitates joint development of training modules, learning and advocacy material including developing Key Messages and Content. And a platform for sharing and dissemination of FSSM Research, Advocacy and outreach to State governments and Urban Local Bodies.

FSSM Capacity Building Focus

1 State Level Capacity Building for FSSM

2 Institutional Capacity Building for FSSM at National Level

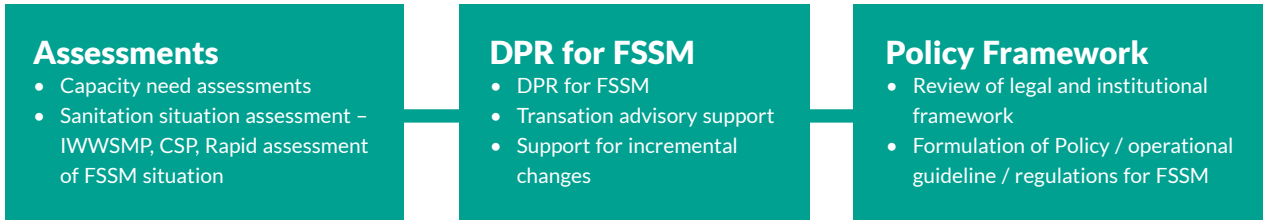
3 Evidence Based Advocacy for FSSM

Training Modules Development under SCBP

- FSSM Training of Trainer Module
- Integrated waste Water and Septage Management Module
- FSSM Orientation Module and Handbook
- Orientation Module for ULB Elected Representatives
- Specialized Module(3 day Advanced Technical Training Module for FSSM)
- Specialized Module(3 day Advanced Technical Training Module on Integrated Waste Water and Septage Management)
- ODF and FSSM Training Module
- Consultants Training Module on FSSM DPR preparation
- FSSM Training Module for Masons
- Learning Material on International FSSM experience

All Modules and learning materials translated in Hindi

Technical Support



1. State Level Capacity Building for FSSM

Supporting select State governments, their Para state Agencies, Towns and Urban Local Bodies

- Orientation and exposure visits for understanding septage and faecal sludge risks and challenges
- Institutional capacity strengthening through Training of Trainers programmes
- Four Modules Based FSSM Capacity Building Strategy

Capacity building activities are planned to cover all stakeholders involved in the FSSM value chain – government officials, elected representatives, masons, private sector and community



Capacity Building for FSSM : Uttar Pradesh (UP)

- Developing the State FSSM Operations Policy Guideline (Draft)
- Exposure visits and Orientation on FSSM for SBM Director and ULBs
- Planning support.** Submission of Faecal Sludge Treatment Budget for 61 AMRUT towns for the State Annual Action Plan(SAAP)
- Technical Support.** Development of the first DPR for an FSTP in the state(Unnao town), and adopted for other towns
- State Nodal Agency Capacity Building.** Supporting RCUES Lucknow in conducting FSSM Training for ULBs and conducting independent research in new towns

Capacity Building for ODF and FSSM : Rajasthan

- Division level ODF and ODF++ City Trainings.** Followed by Exposure visits to Maharashtra and Madhya Pradesh(conducted for 90 officials)
- Four Module based FSSM capacity building strategy**
 - Sensitization/ orientation training for 191 ULBs (till date 250 officials trained)
 - First Specialized Training
 - Integrated waste water management and exposure visit to Pune (conducted for 30 officials)
 - Technology option for FSM and exposure visit to Devanhalli (cities where DPR is planned)
 - Second Specialized Training
 - Planning and Financing of FSSM projects (planned for officials from 10-15 towns – for incremental improvements in managing septage and sludge, Assessments)
- International Exposure visit for State officials and ULB officials (planned)

2. Institutional Capacity Building for FSSM at National Level

Nodal AMRUT Agencies Capacity Building Support for FSSM Trainings

- Training of Trainers on FSSM Planning : Eight AMRUT Institutes faculty
- Training of Trainers on Integrated Waste Water & Septage Management : Ten AMRUT Institutes
- Four AMRUT training agencies supported for integrating Training on FSSM into AMRUT training frame work – covering 200 officials from 12 states
- Exposure visits on Faecal Sludge Treatment Plant(FSTP) visit : 80 officials from 7 states to Devanahalli
- Exposure visit and integrated Waste Water and Septage Management (IWWSM) Training in Pune
- Advanced FSSM Technology Training

Private Sector Capacity Building

- National Consultation on private sector engagement in FSSM held in 2017
- Study initiated for developing a strategy for supporting manufacturers, vendors and project management consulting companies capacity building strategy
- Training Module developed for Consultants capacity building

Supporting Academia

- National consultation held in 2017 for 20 Faculty members from 15 academic institutes, to orient them on FSSM and explore demand for support by the academia
- Specific University level support plans being developed
- Workshops for Training of Trainers (ToT) support for universities and institutes. For integrating FSSM content in existing course work
- Developing dedicated Modules and related support for research and internships for students
- Promoting a platform for learning and exchange, research and advocacy

3. Evidence Based Advocacy for FSSM

Collation of existing knowledge, promoting new research, documentation and dissemination and learning

- Developing Training Modules, appropriate for different contexts (States, FSSM Thematic priorities and Stakeholders)
- Collating and creating Advocacy and Knowledge resources for all stakeholders on different aspects of FSSM service chain
- Urban Sanitation Research on urban sanitation status, pro poor implications of existing and proposed plans : for the states of Madhya Pradesh, Odisha, Karnataka, Telangana, Jharkhand, UP, Rajasthan and Uttarakhand
- FSSM Workshops, Advocacy and Learning events : Financing, Technology and Life Cycle costs of FSSM projects, Monitoring, Behaviour Change, etc
- Landscaping Study of Septage Treatment initiatives. Documentation and dissemination experiences and lessons of setting up and operations of Faecal Sludge Treatment Plants
- Research and advocacy on thematic FSSM challenges : Legal and Institutional, Operations, Financing, etc

SCBP Publications and Reports

- Capacity Need Assessment for FSSM Report
- Assessment of FSSM for 100 small towns of Rajasthan
- City sanitation Plans for four AMRUT cities in Odisha
- Detailed Project Reports(DPRs) for FSSM for UP, Rajasthan and Bihar
- Draft FSSM Operations Policy for UP and Rajasthan
- Assessment of legal and Institutional Frame work for FSSM in Uttar Pradesh
- FSSM Training Modules(7)
- Workshop Reports :
 - Practitioners Meet on Capacity Building for FSSM
 - Private Sector in FSSM
 - Academia engagement for FSSM
 - ToT Workshops for Institutes
 - Exposure Visits to Maharashtra
 - Rajasthan State Workshop
 - Achieving ODF : Recommendations for Rajasthan

Key Results SCBP FSSM Capacity Building

State Level Capacity Building	<ul style="list-style-type: none"> • State FSSM Perspective (Rajasthan) • City Sanitation Plans(4 towns of Odisha) with FSSM perspective • 191 ULBs of Rajasthan supported for ODF and FSSM • 61 AMRUT towns of Uttar Pradesh supported for FSSM • First Detailed Project Reports (DPRs) for setting up Faecal Sludge Treatment Plants in 3 towns (Uttar Pradesh, Bihar & Rajasthan)
Institutional Capacity Building at National Level	<ul style="list-style-type: none"> • Capacity Building of Nodal AMRUT Institutes(5) • State para state agencies supported for Planning and Technology • Private sector engagement in FSSM • Academia engagement and curriculum advise • 200 officials from 12 states provided with FSSM trainings • 80 ULB officials from 7 states taken for exposure visits to the Devanhalli FSTP plant.
Evidence Based Advocacy	<ul style="list-style-type: none"> • Capacity Needs Assessment for FSSM undertaken for 3 states (Uttar Pradesh, Bihar and Andhra Pradesh) • Thematic and Spatial Research on Urban Sanitation • State FSSM Policy Drafts (Uttar Pradesh and Rajasthan) • Training Modules Developed (8) • National and State level Advocacy with NFSSM Alliance • Advocacy Factsheets • Workshops & Learning Events

About NIUA

NIUA is a premier national institute for research, capacity building and dissemination of knowledge in the urban sector, including sanitation. Established in 1976, it is the apex research body for the Ministry of Housing and Urban Affairs (MoHUA), Government of India.

NIUA is also the strategic partner of the MoHUA in capacity building for providing single window services to the MoHUA/states/ULBs.

The Institute includes amongst its present and former clients Housing and Urban Development Corporation, Niti Ayog, City and Industrial Development Corporation of Maharashtra, USAID, World Bank, Asian Development Bank, GIZ, UNICEF, UNEP, UNOPS, Cities Alliance, Bill & Melinda Gates Foundation, Rockefeller Foundation, Global Green Growth Institute, and Bernard van Leer Foundation.

Some of the major areas of work include:

- Provide research support to MoHUA
- Conduct research studies on contemporary urban issues
- Coordinate capacity building and training activities
- Disseminate information through networks and knowledge hubs
- Analyze and promote policy change agenda
- Monitor and evaluate Government of India's urban programmes/schemes

Partners of the Platform



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