



# Decentralised Sanitation Systems for a City

Case Study, 2019

**Port Blair | Andaman & Nicobar Islands**

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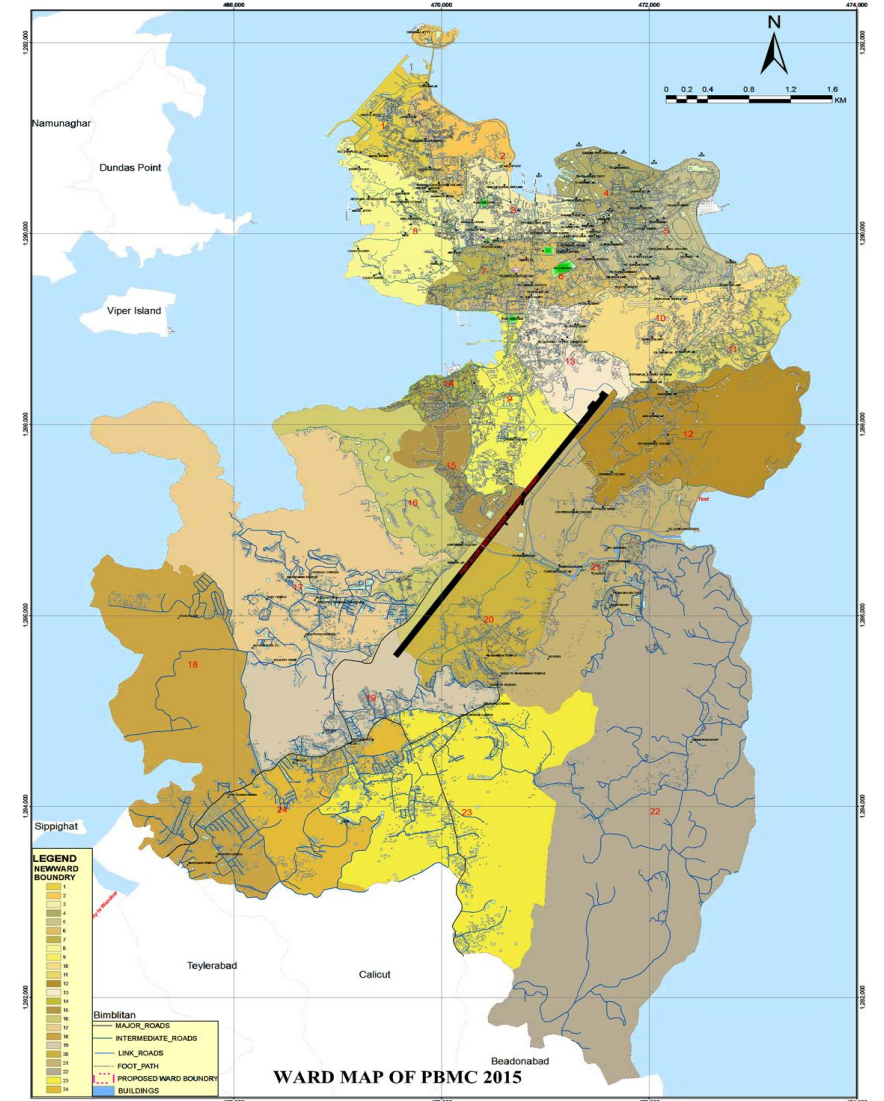
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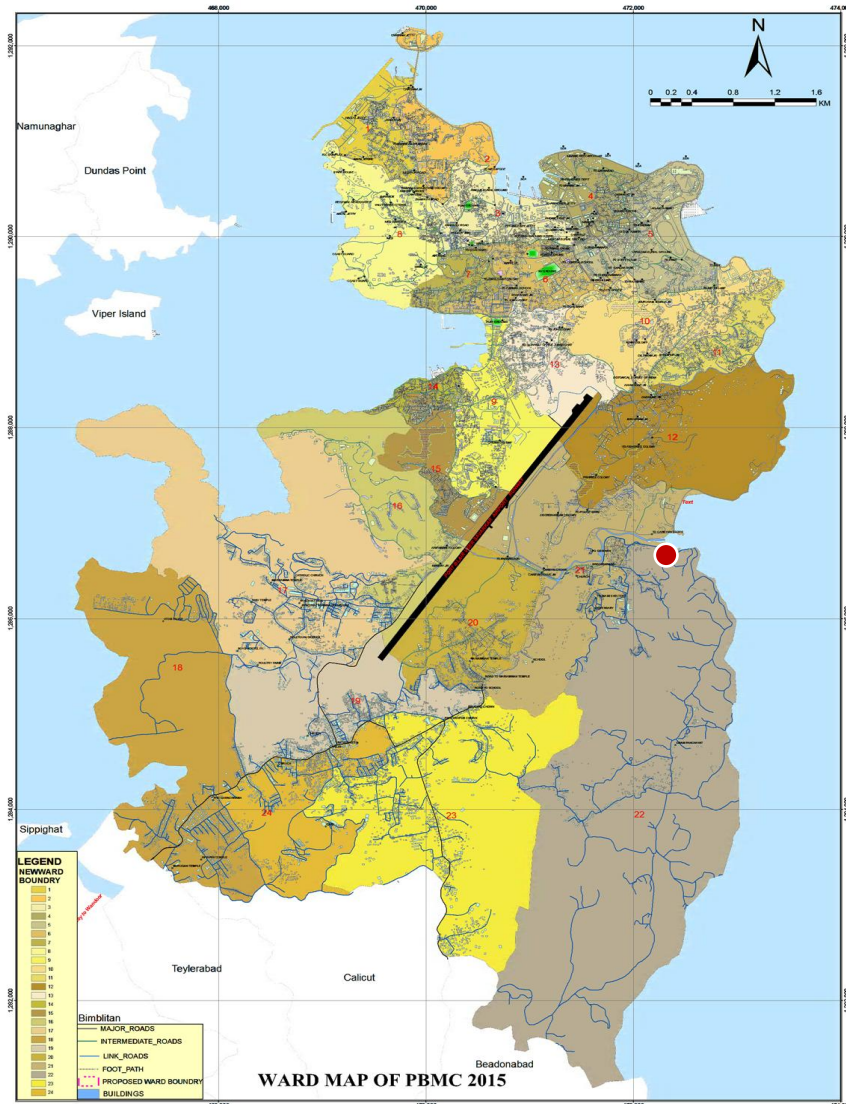
# City Profile

- Location - latitude of 11° 37' 45" N and longitude of 92° 43' 33" E
- Administrative Area - 41.22 km<sup>2</sup>
- Population:
  - 2011 - 1,08,058 (as per census)
  - 2015 - 1,40,572
- Gross density – 5,636 persons/sq.km
- Average annual rainfall – 300 to 350 cm

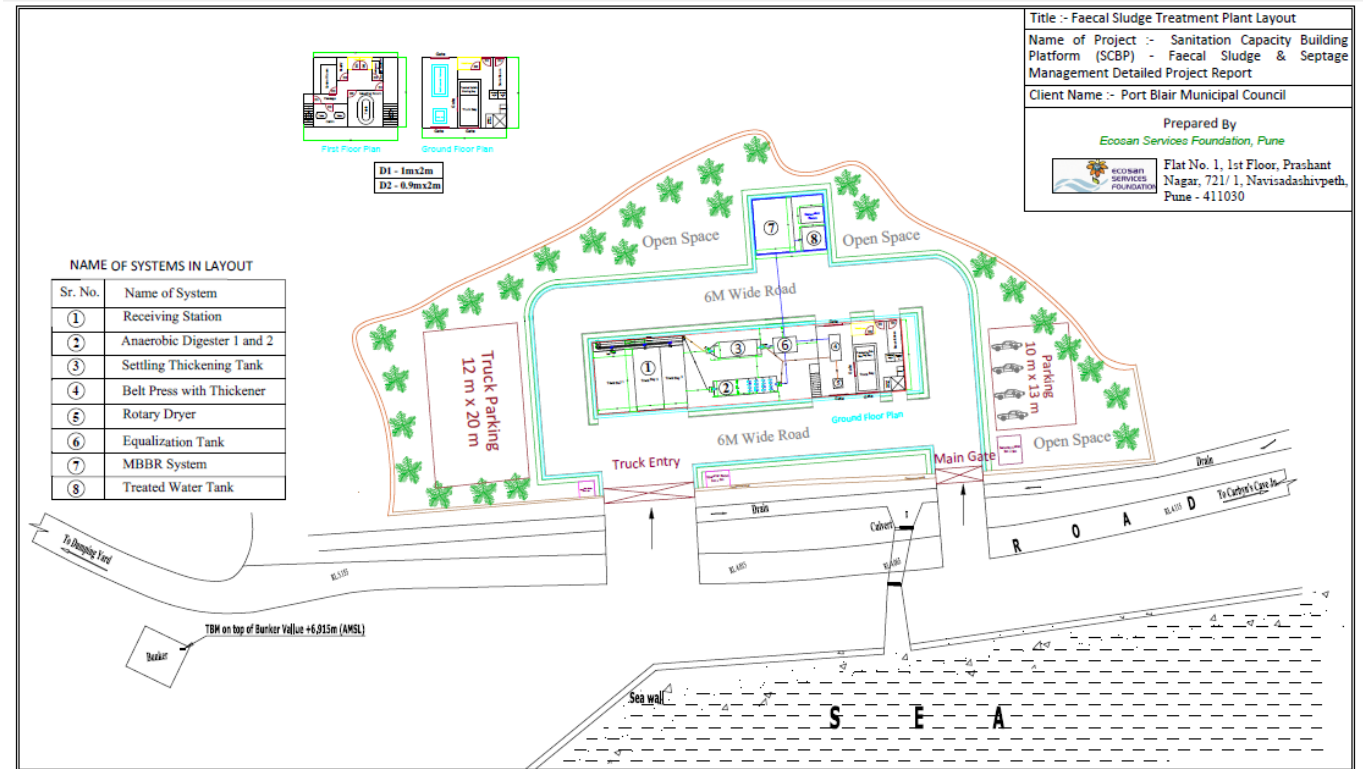




# FSSM



Location of the FSTP



Layout of FSTP



Desludging vehicles



# Wastewater Management



Discharge of septic tank effluent and grey water in storm water drains



Concrete roads



Solid waste disposal



Discharge



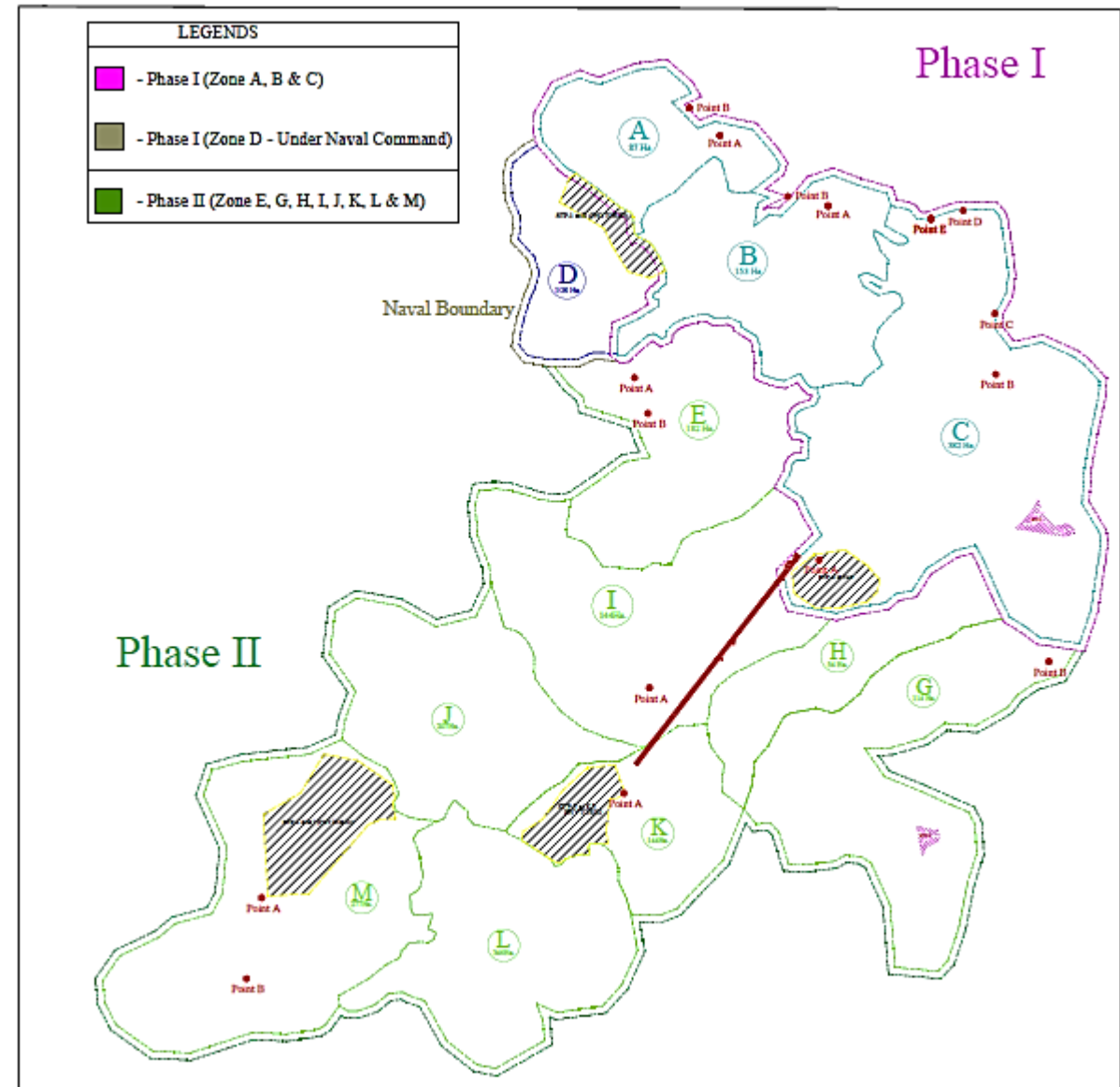
Stormwater drains



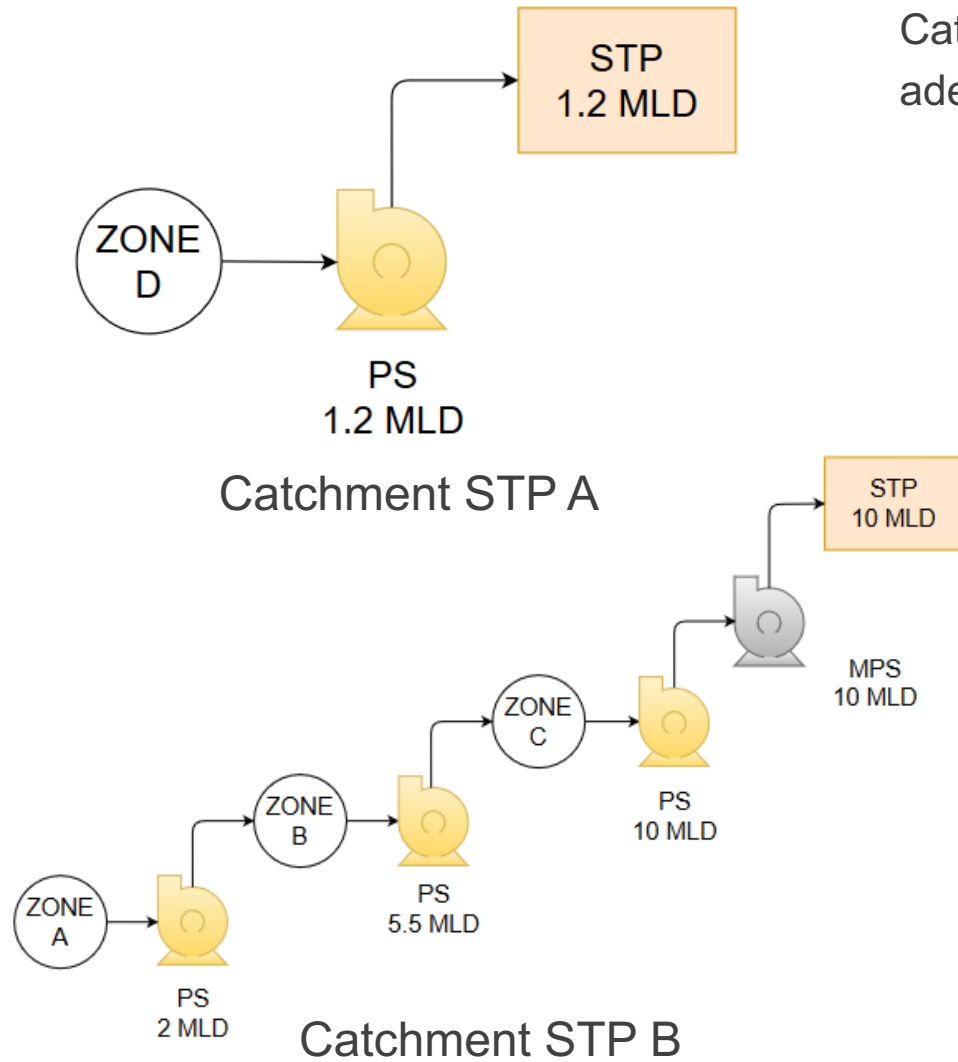
Discharge

# Proposed Sewerage Scheme

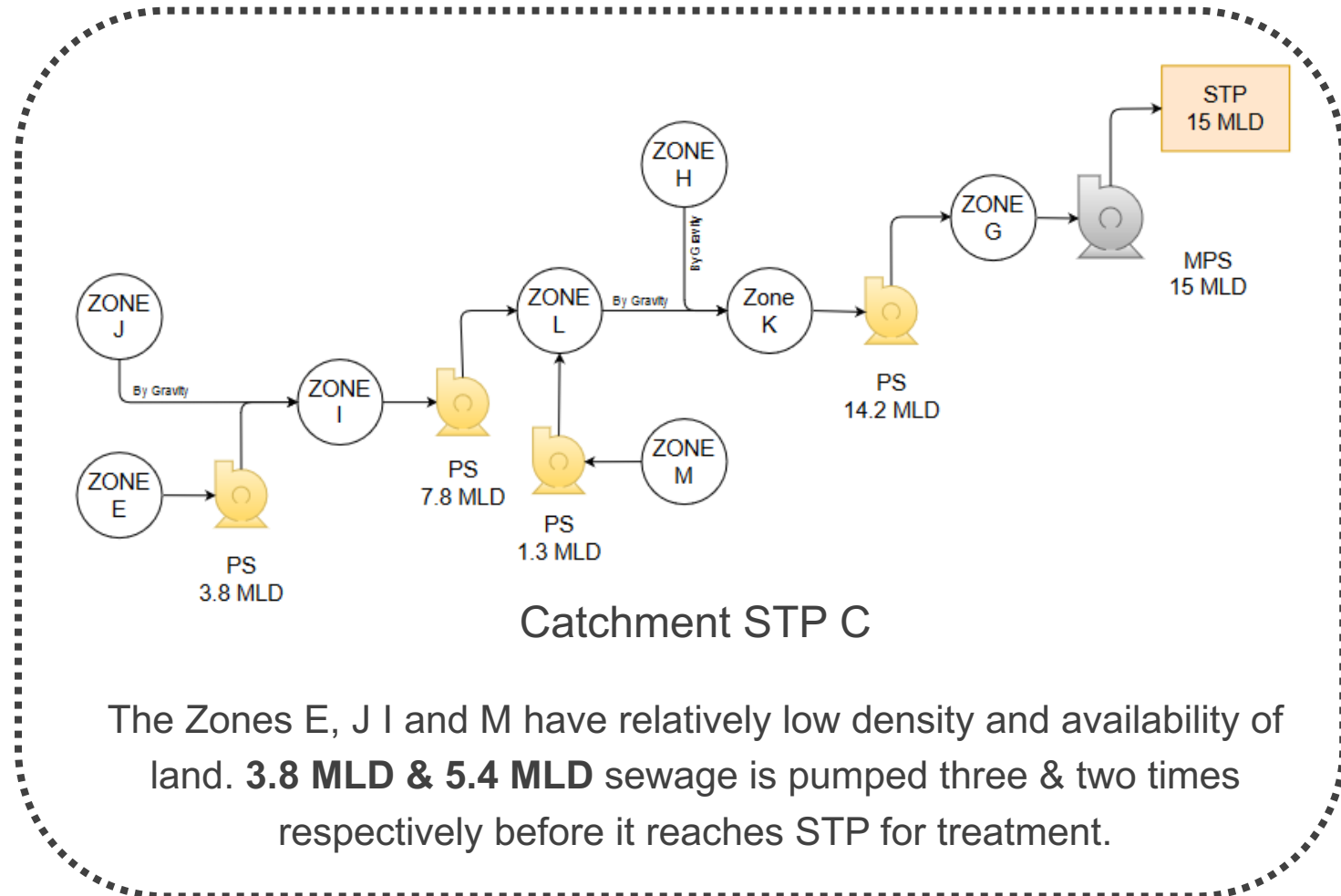
- Sewerage zones: 12
- Lift stations: 7
- Sewage pumping stations: 7
- Main pumping station: 2
- CAPEX
  - Sewerage network: 152 cr.
  - Lift & Pumping stations: 15 cr.
- OPEX (5 years): 62 cr.



# STP Catchments



Catchment of STP A and STP B is high density area and do not have adequate area of land available for setting up decentralized STPs.

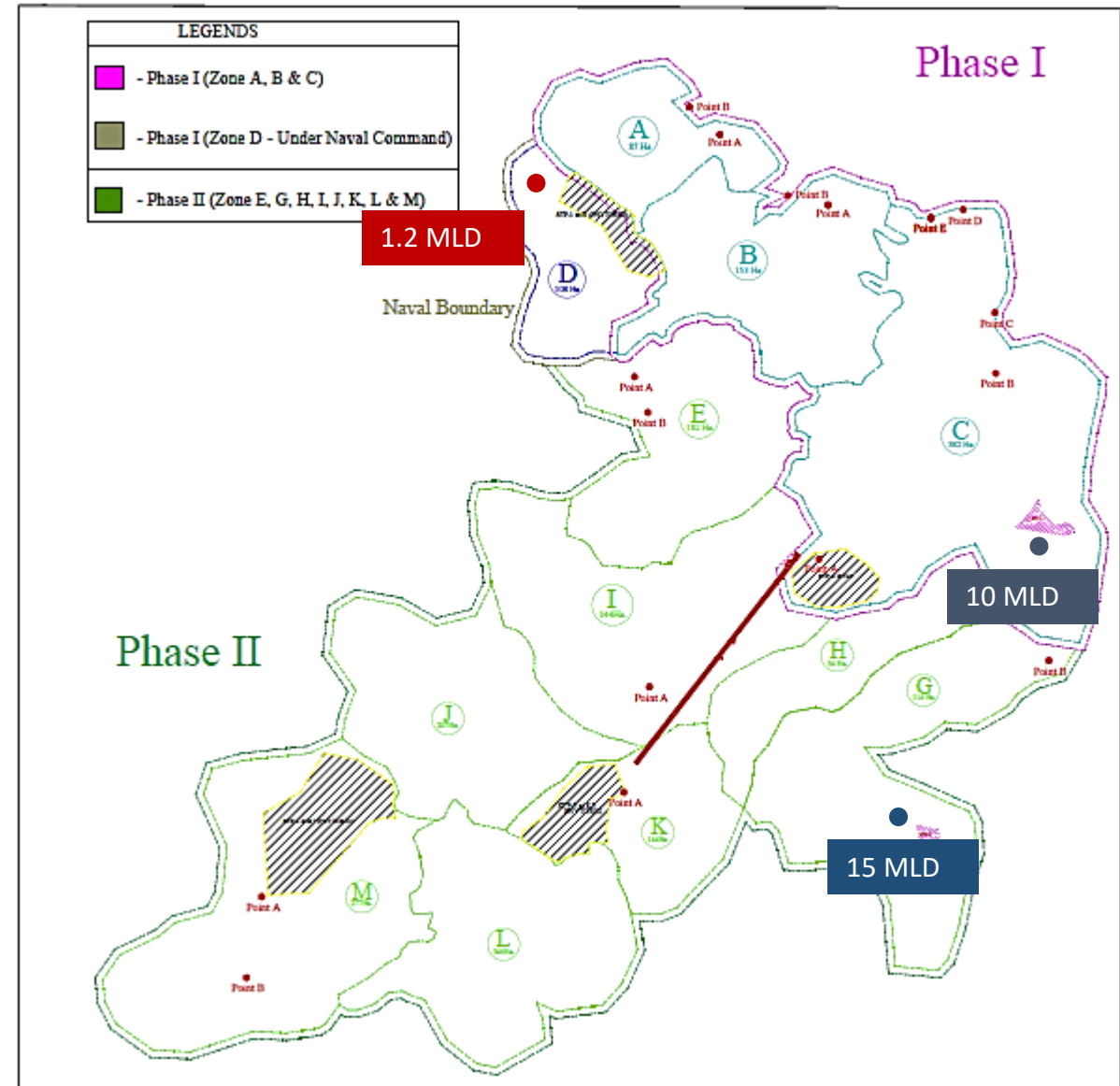


The Zones E, J I and M have relatively low density and availability of land. **3.8 MLD & 5.4 MLD** sewage is pumped three & two times respectively before it reaches STP for treatment.



# Proposed Sewage Treatment Plants

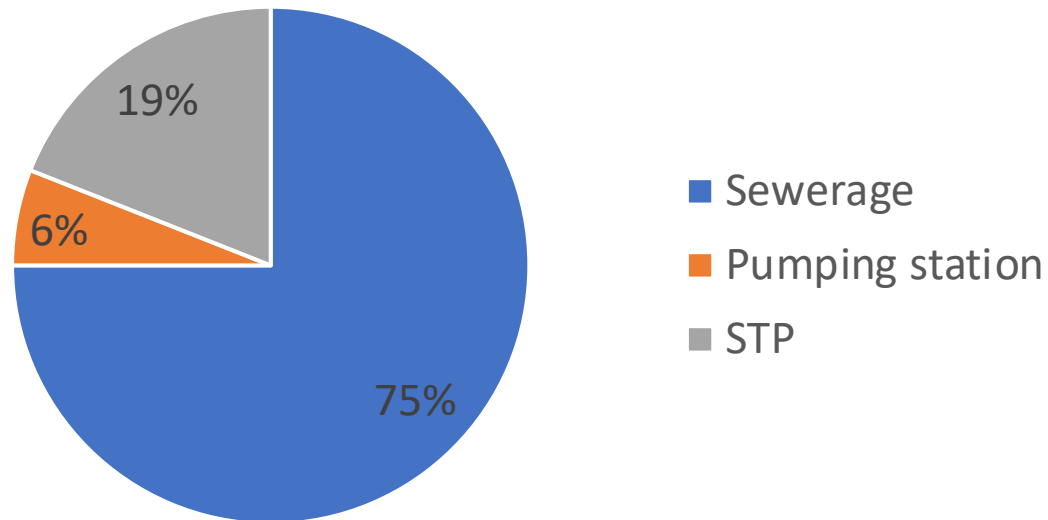
- Sewage Treatment Plants: 3
  - Phase I: 1.2 MLD & 10 MLD
  - Phase II: 15 MLD
- CAPEX: 39 cr.
- OPEX (5 years): 56 cr.
- Project cost: 324 cr.
  - CAPEX: 206 cr.
  - OPEX: 118 cr.



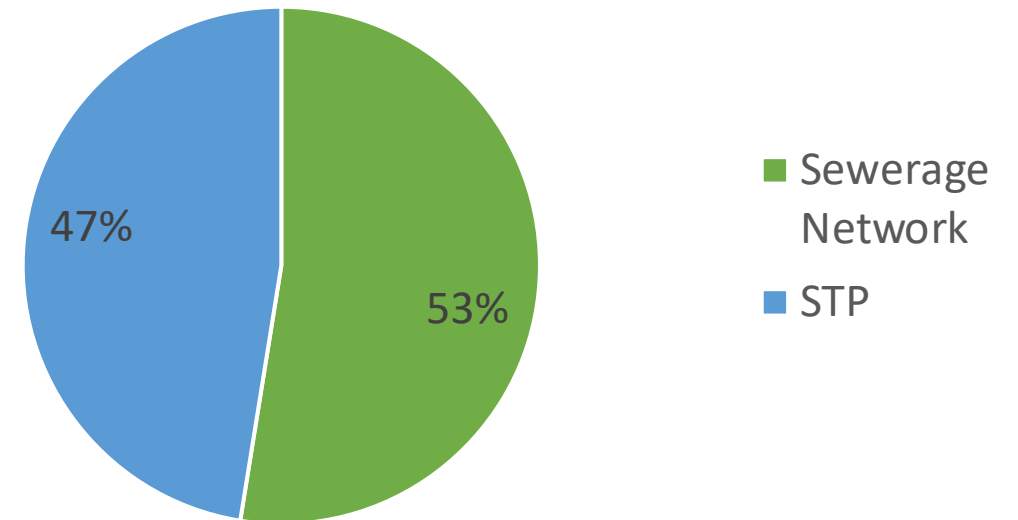


# Key observations

CAPEX



OPEX



- Sewerage system including the pumping stations contribute to 81% of the CAPEX.
- 53% of the OPEX is contributed by pumping of sewage multiple times in the catchment of STP B and C.
- Collection system in the proposed centralized scheme is not economical for design period of 15 years

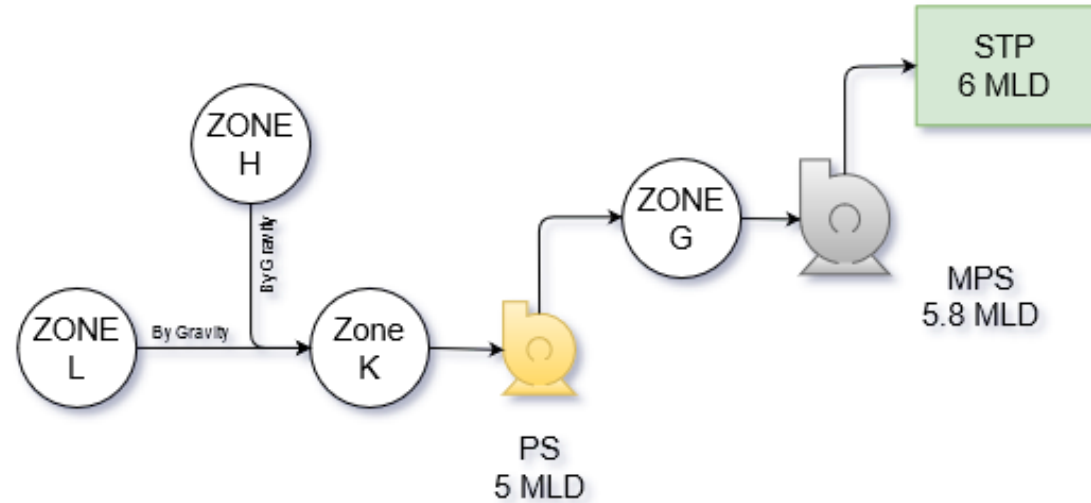
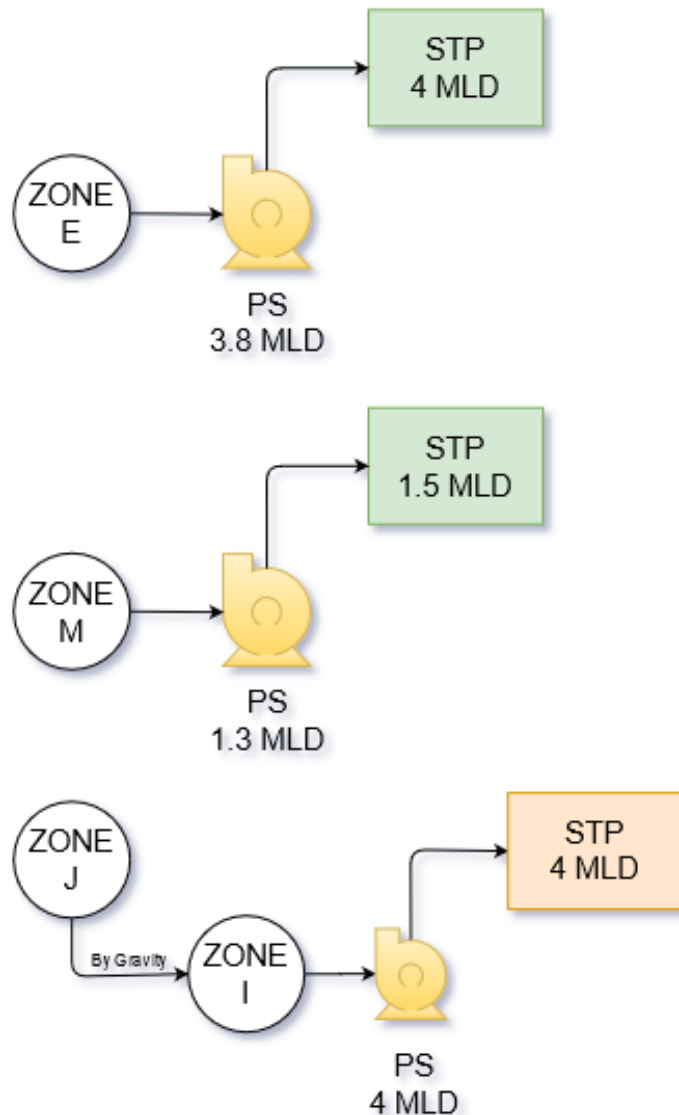
# Decentralized Approach

- Shifting from gravity sewers to solid free sewers
  - Reduces requirement of lift stations
  - Reduction in CAPEX of the sewerage system
  - Reduction in OPEX of the sewerage system
- Design of the decentralized STPs to include co treatment of Faecal Sludge and Septage
  - Reduces the OPEX of FSSM
  - Increases the design life of FSTP

For operation of solid free sewers, regular desludging needs to be practiced under FSSM.

Co Treatment will reduce the conveyance distance from household to the FSTP, thereby making it more affordable to the households

# Decentralized Approach



## ADVANTAGES

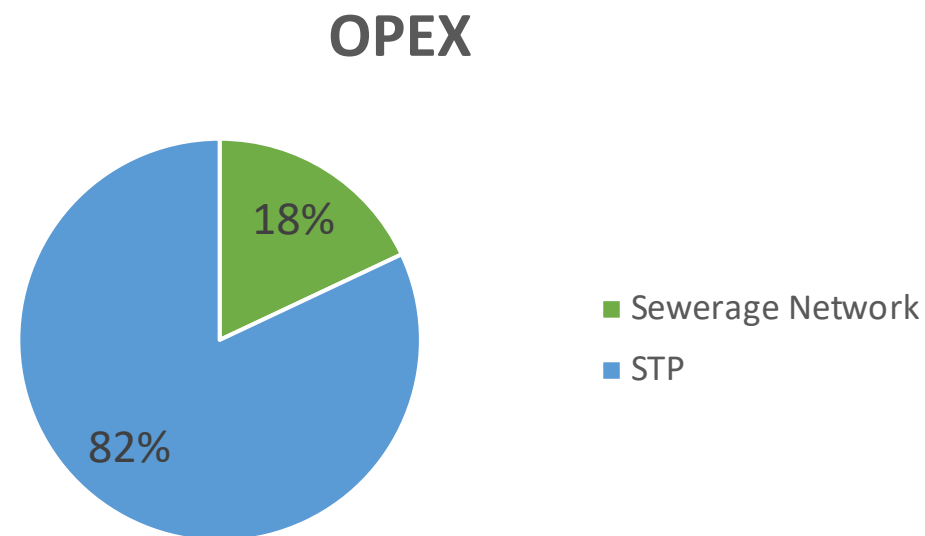
- No change in number of pumping station, but the capacities of pumping station has decreased considerably.
- Multiple times pumping of sewage is avoided reducing the OPEX of the sewerage system.
- STP marked in green will also facilitate co treatment of septage. Thus reducing the load on FSTP and extending it design life.



# Key Advantages

- CAPEX: Sewerage: - 35% | Pumping stations: - 84% | STP: + 2% | Overall: - 32%
- OPEX: Pumping stations: - 81% | STP: + 2% | Overall: - 42%
- Although relatively small decrease is seen in CAPEX, there is significant decrease in OPEX.
- Makes the service more affordable to the ULB and households, sustainability of the project increases!

CAPEX (INR cr.)	Centralized Approach	Decentralized Approach
Sewerage network	₹ 152.00	₹ 98.00
Pumping stations	₹ 15.00	₹ 2.50
STP	₹ 39.00	₹ 40.00
<b>Total</b>	<b>₹ 206.00</b>	<b>₹ 140.50</b>
<b>OPEX (INR cr.) for 5 years</b>		
Pumping stations	₹ 62.00	₹ 12.00
STP	₹ 56.00	₹ 57.00
<b>Total</b>	<b>₹ 118.00</b>	<b>₹ 69.00</b>



# Recommendations

- **A combination of decentralised waste water and sewerage treatment solutions are appropriate for the town of Port Blair**
  - A Non Sewered Faecal Sludge Treatment Plant(42 KLD, already tendered) and
  - Smaller sized STPs that can be connected with shallow sewers(without septic tanks) or small bore sewers(with Septic Tanks).
- The 25 MLD waste water treatment of Port Blair can be done by a combination of **at least SIX decentralized STPs plus a Faecal Sludge Treatment Plant(FSTP)**, to meet current and projected (30 years) needs of waste water treatment of Port Blair.

# Action Points and steps

- A quick decision taken on Decentralised (2 plants) vs Large sized STP(10 MLD) for Zone A, B and C. Time : within 3 months. Tender floated.
- Assessment done for remaining 4 decentralised STPs and their sewerage plans. Tender floated for preparation of DPRs for these plants. Time : 4 months.
- FSTP constructed and operationalised. Time : 6 months
- To improve the water quality at the outfalls of the storm water drains, certain in situ solutions can be implemented. Further investigation for assessing the suitability of the solutions needs to be done.
- Scheduled desludging can then extended to the other zones where shallow sewers and small bore sewers are to be implemented.



# Action Points and steps

- Digitalisation of the data with respect to the topography, natural (forest, surface water bodies, drains etc.) and built environment (road, public utility buildings and prominent places etc) will be done. This base data can be updated with household data after 2021 census. Such data will be helpful for preparation of planning documents and DPRs for developing infrastructure for water, wastewater and solid waste management.
- A vision document detailing out the Decentralized Wastewater Management System should be made for the 8 zones included in the second phase. This document will serve as a feasibility report for choosing appropriate system and an invest plan to develop the required infrastructure.
- The potential delineated zones for Decentralized Wastewater Management will have to be prioritized depending upon the urbanization rate. Individual DPR to be prepared for the individual zones for Decentralised Wastewater Management System (sewerage and treatment plant combined). This activity can be phased out over a period of 3 years.
- Entire town waste water treatment completed over a period of 3-5 years. A systematic, logical approach for achieving 100% sanitation in Port Blair.

# Thank you

For more learning materials on decentralized and onsite sanitation systems :

**Knowledge Portal : <https://scbp.niua.org/>**