

GIS analysis for city-wide FSM optimization and decision making

Narsapur, India

Dr. Y. Malini Reddy

Prof. V. Srinivas Chary



Administrative Staff College of India

About Narsapur

- River front town
- Spread over 11.2 sq.km.
- Population of **58,901** (census 2011)
No underground drainage system
- **HHs with access to on-site toilets was reported as 95%**
 - Septic tanks: 56%
 - Pit latrines: 32%
 - Insanitary toilets: 12%.
- Percentage of population residing in 48 urban poor settlements: **61%**

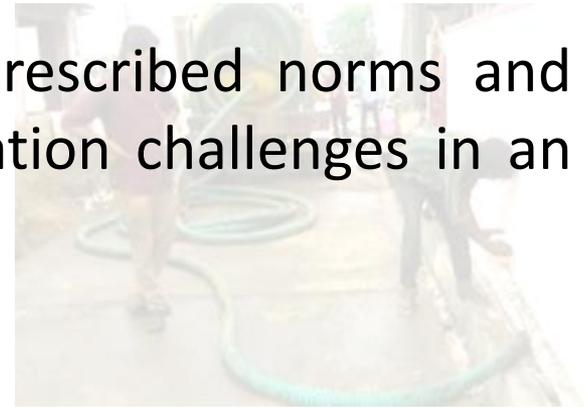




Sanitation service levels fall below the prescribed norms and there is a dire need to address the sanitation challenges in an integrated comprehensive manner.

Key Sanitation Challenges:

- Inadequate access to toilets
- Poor containment systems - insanitary toilets
- Unsafe management of faecal waste
- Unsafe management of waste water
- Weak institutional capacity
- Weak stakeholder engagement
- Lack of monitoring systems in place
- Lack of Gender Integrated Sanitation





Key Achievements

- ✓ Declared ODF in October 2016 and sustained
- ✓ State FSSM policy and guidelines operationalised in April 2017
- ✓ Licenced all desludging oepartors and trained them
- ✓ Implemented a Faecal Sludge Treatment Plant (FSTP)
- ✓ School sanitation improved
- ✓ Operations and maintenance contracts for 19 community toilets and 5 public toilets issued. SLAs developed.
- ✓ Sanitation vulnerability assessment completed and gender integration activities initiated

Key Pain Point : Lack of credible data to support informed decision making

Geographical Information System

- GIS is an surely an **incremental system** which improves upon the existing tools and imparts a **spatial perspective** for more informed and transparent decision making. The study aims to support decision making for bringing comprehensive decentralised sanitation solutions.



GIS based Sanitation Survey - Objectives

- To gain an in-depth understanding of the sanitation infrastructure situation of the town
- To gain insights into the sanitation awareness, attitude and behaviour among the citizens.

Methodology

Preparation of
ToR



Developing
Questionnaire



Selection of
Vendor



APP
Development



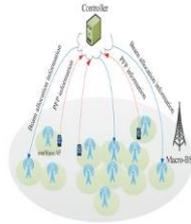
Training of
Surveyors



Situation
Assessment Report



Data Compilation,
Dashboard



Survey



Quality Check



Work Allocation to Surveyors



Integration of GPS Coordinate into FSM Tracker App

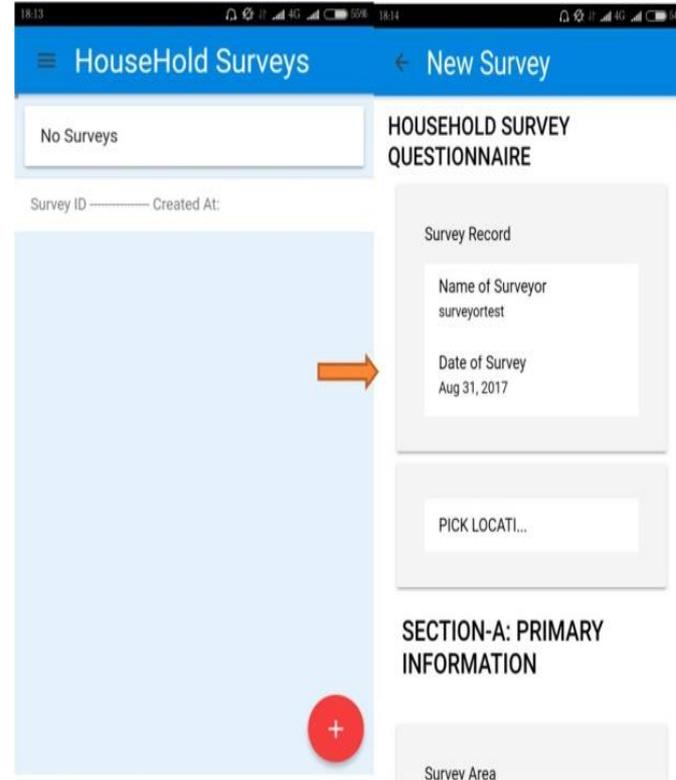
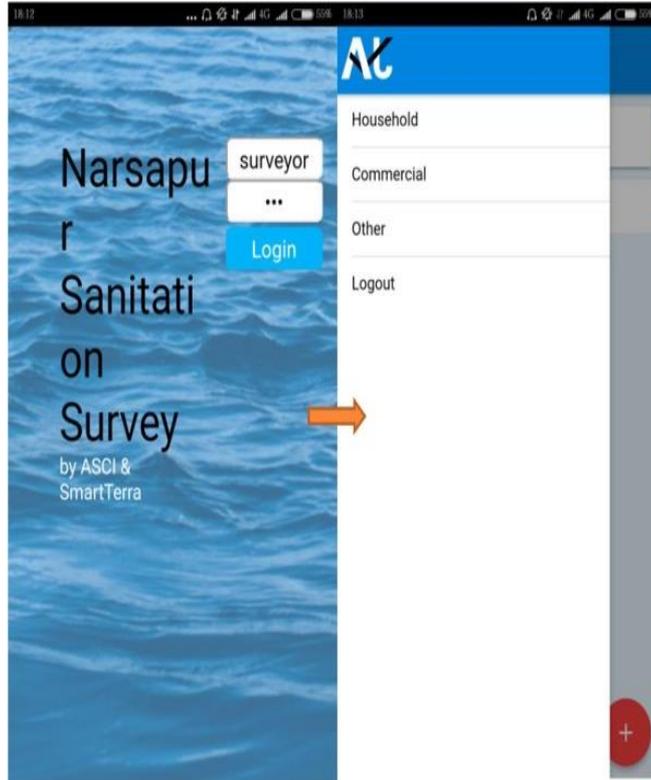
Methodology

- 100% property survey (14,595)
- 6 weeks involving over 30 field and supervisory staff
- Detailed questionnaires (separate for Households, commercial, institutions)
- Data was collected using a mobile app on tablets for higher speed and quality of data collection and real time data analysis.

Survey questions to capture:

- socio-economic condition
- access to water and sanitation services
- health impact of sanitation services
- access to sanitation infrastructure
- toilet typologies
- desludging practices,
- awareness, attitude and behaviours related to sanitation.

Mobile app



<https://play.google.com/store/apps/details?id=io.ionic.survey&hl=en>

Dashboard <http://13.126.57.44/>

Zimbra: Search results x Narsapur FSM Dashboard x Vector Spatial Analysis (Buffers) x New Tab

← → ↻ ⓘ Not secure | narsapur.smartterra.io ☆ 👤 ⋮

Narsapur FSM Dashboard ASCI - SMARTERRA - CivicFulcrum

[🏠 Survey Summary](#)

HOUSEHOLDS

- 📊 Toilet Distribution
- 📁 Toilet Typology
- 📅 De-sludging
- 📄 Action Plans

COMMERCIALS

- 📊 Toilet Distribution, Typology and Desludging

INSTITUTIONS

- 📊 Toilet Distribution, Typology and Desludging

Details of the GIS-based survey of toilets and de-sludging

Summary of Household Survey

Summary of Commercial Survey

Summary of Institutions Survey

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- Survey Summary
- HOUSEHOLDS
 - Toilet Distribution
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- INSTITUTIONS
 - Toilet Distribution, Typology and Desludging



HHs with Toilet

11,231

Highest Coverage of Toilets

A Ward Number	% HHs with Toilet	No. of HHs with Toilet
13	99.60%	249
7	99.15%	351
18	98.70%	380
5	97.89%	372
10	97.80%	311
17	97.45%	268

Highest coverage wards in central area

HHs without Toilet

1,152

Lowest Coverage of Toilets

A Ward Number	% of HHs without Toilet	No. of HHs without Toilet
29	32.90%	201
1	31.87%	87
28	25.95%	82
3	25.48%	147
21	16.25%	59
30	12.72%	65

Lowest coverage in wards with agricultural land

🏠 Survey Summary

HOUSEHOLDS

📊 Toilet Distribution

📁 Toilet Typology

📅 De-sludging

📄 Action Plans

COMMERCIALS

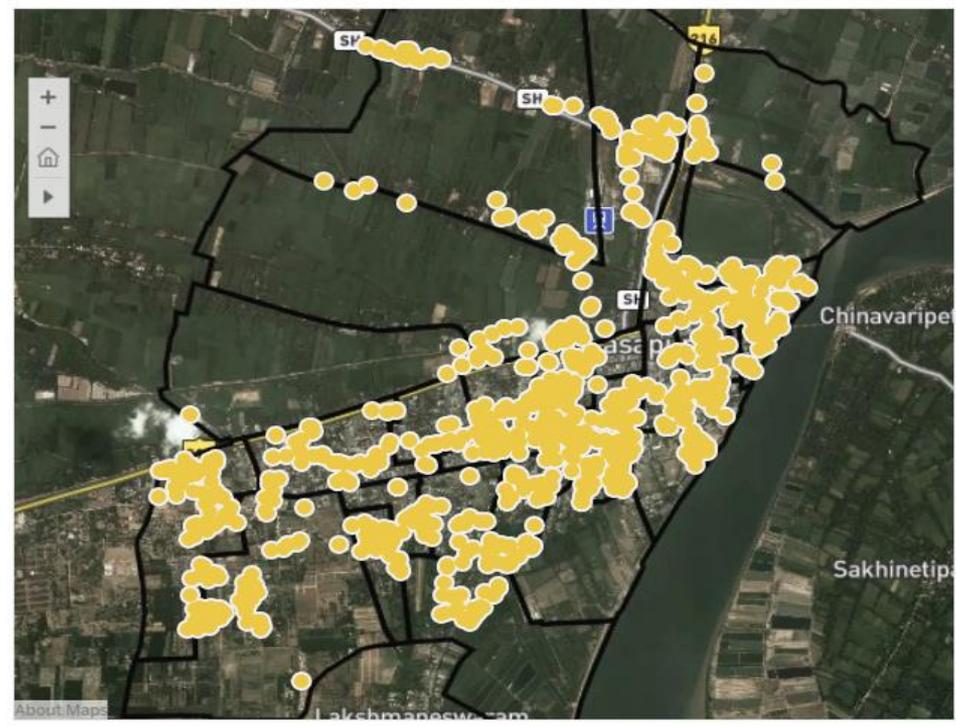
📊 Toilet Distribution, Typology and Desludging

INSTITUTIONS

📊 Toilet Distribution, Typology and Desludging

Location based on emptying frequency

C3A 63 EmptyingFreq
■ Not emptied since co...



- [Survey Summary](#)
- HOUSEHOLDS
 - [Toilet Distribution](#)
 - [Toilet Typology](#)
 - [De-sludging](#)
 - [Action Plans](#)
- COMMERCIALS
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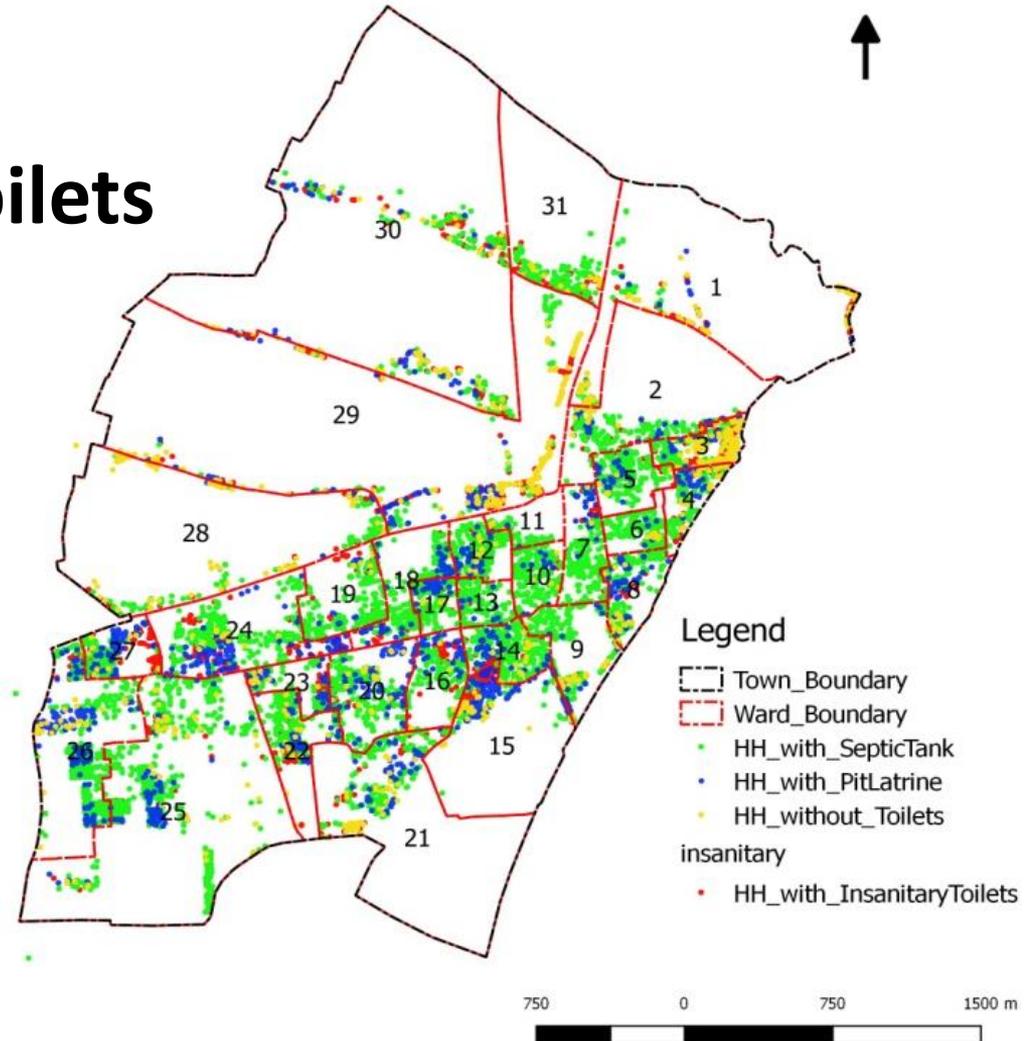
[Wardwise Action Plan](#)

The municipality can look at the below dashboard for formulating an action plan for focussed desludging operations, upgradation of toilets with or within the Swach Bharat Mission (SBM) and for follow up on SBM applications.

Wardwise Action Plan				
Ward No.	Application to SBM	Desludging on Priority	Prioritised (to be brought under SBM)	Upgradation of Toilet
1	80.0	133.0	18.0	51.0
2	22.0	194.0	8.0	60.0
3	116.0	250.0	19.0	117.0
4	31.0	80.0	8.0	67.0
5	5.0	187.0	0.0	21.0
6	14.0	118.0	0.0	7.0
7	2.0	112.0	0.0	20.0
8	21.0	103.0	1.0	43.0
9	20.0	193.0	0.0	25.0
10	4.0	176.0	0.0	19.0
11	6.0	43.0	0.0	1.0
12	9.0	167.0	0.0	25.0
13	0.0	60.0	0.0	2.0
14	22.0	226.0	4.0	24.0
15	19.0	1.0	8.0	94.0
16	7.0	97.0	2.0	50.0
17	3.0	103.0	0.0	12.0
18	1.0	116.0	0.0	28.0
19	6.0	150.0	4.0	33.0
20	23.0	93.0	5.0	15.0
21	43.0	117.0	4.0	35.0
22	19.0	201.0	5.0	50.0

Results – Access to Individual Household Toilets

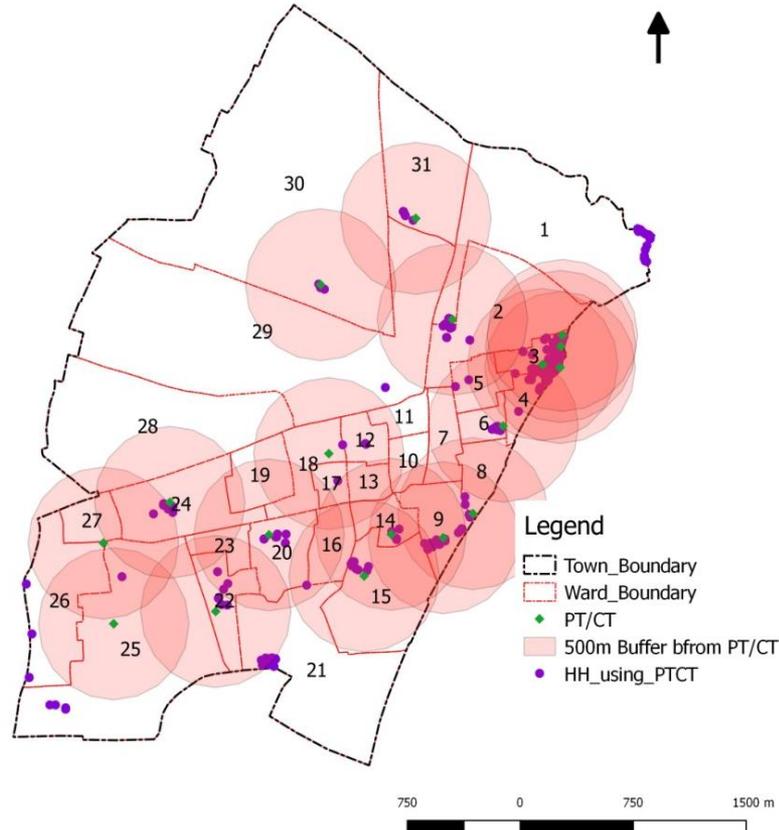
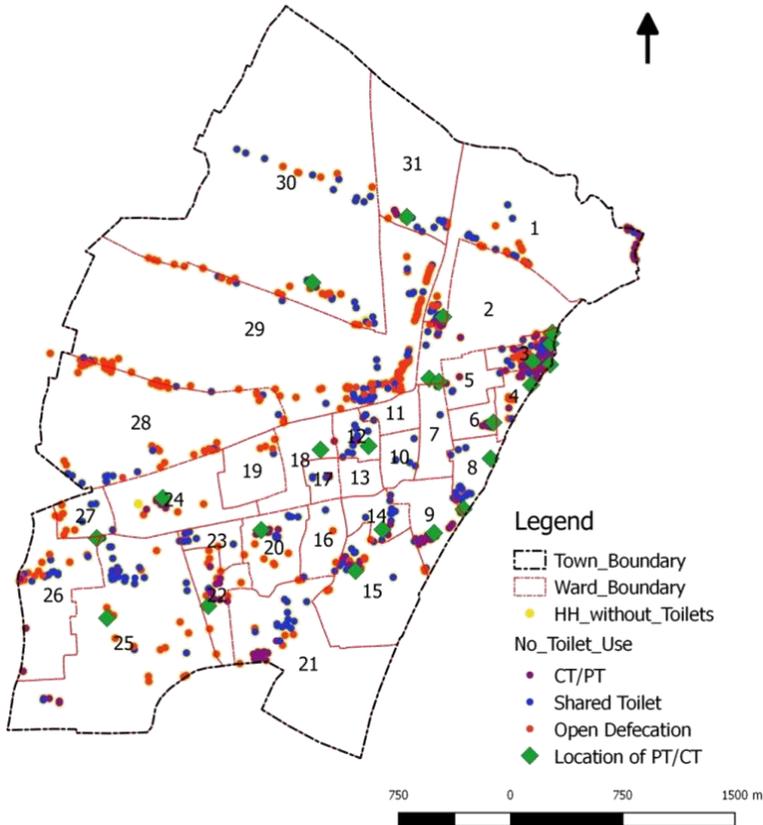
Survey showed that **92%** of the HHs (11241) have access to individual household toilet while **8% (1039)** of HHs do not have access to individual household toilet.



Results – Access to Public / Community Toilets

35 HHs are located beyond 500 m distance from PT/CT

Decisions:
Number of PT/CT and specific locations for the same identified

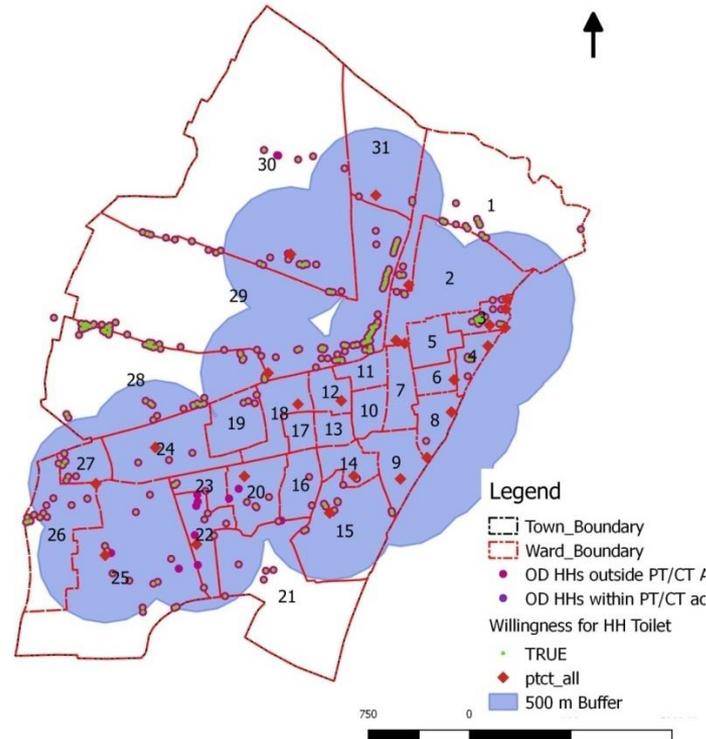
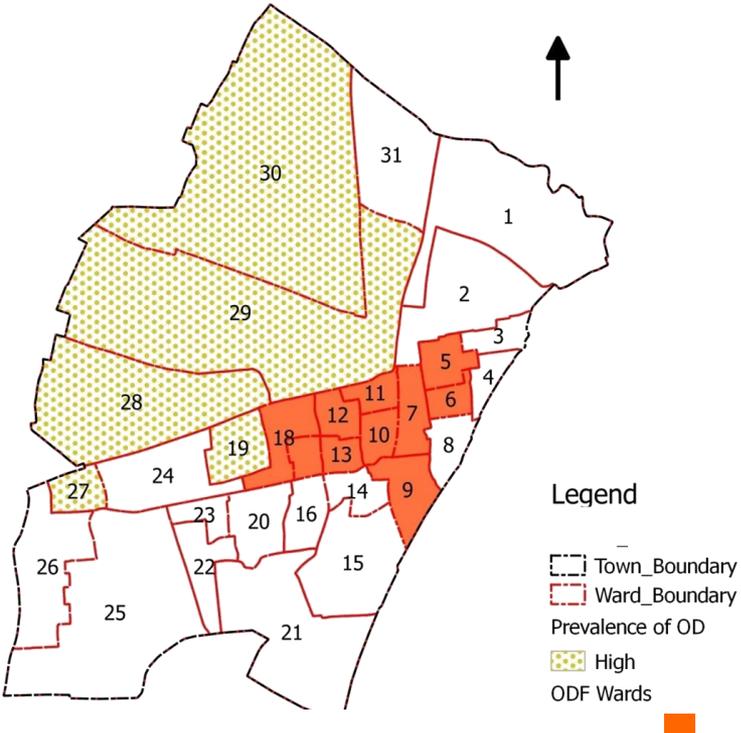


Results – Open Defecation

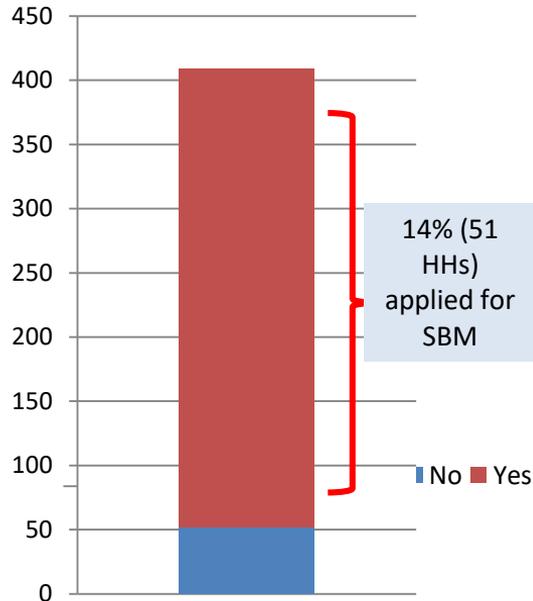
Of the 1039 HHs without toilets, 409 HHs are practicing OD

ODF Wards- 5,6,7,9,10,11,12,13,17,18

Accessibility to PT/CT by HHs practicing OD



Results – Interest in constructing toilets by HHs practicing OD



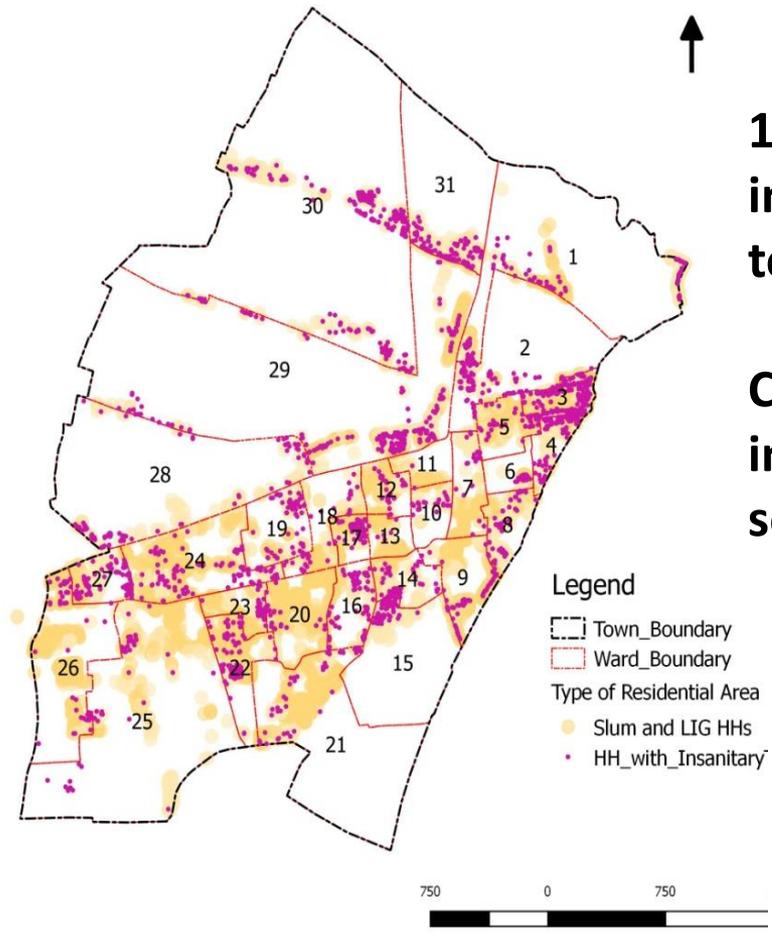
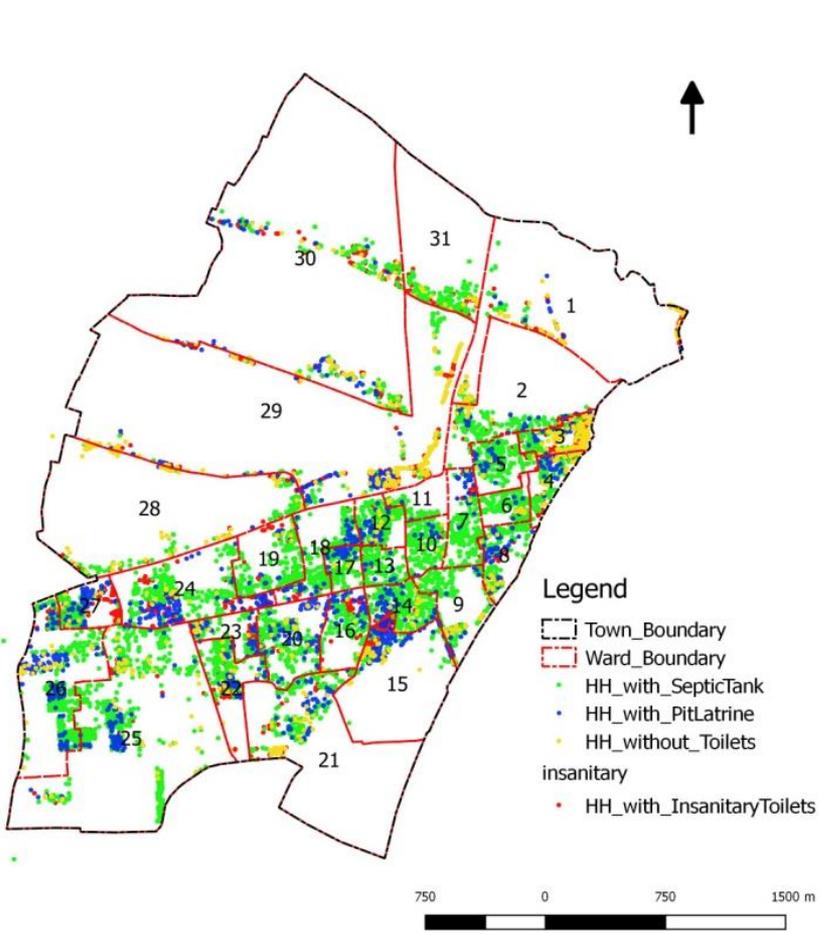
Of the 409 HHs practicing OD, 51 HHs have applied for Government subsidy for toilet construction.

Applications to be made by 358, of which 51 HHs are not interested in owning a toilet.

Decisions:

- Targeted communication regarding ill effects of OD and demand generation for applications for toilets

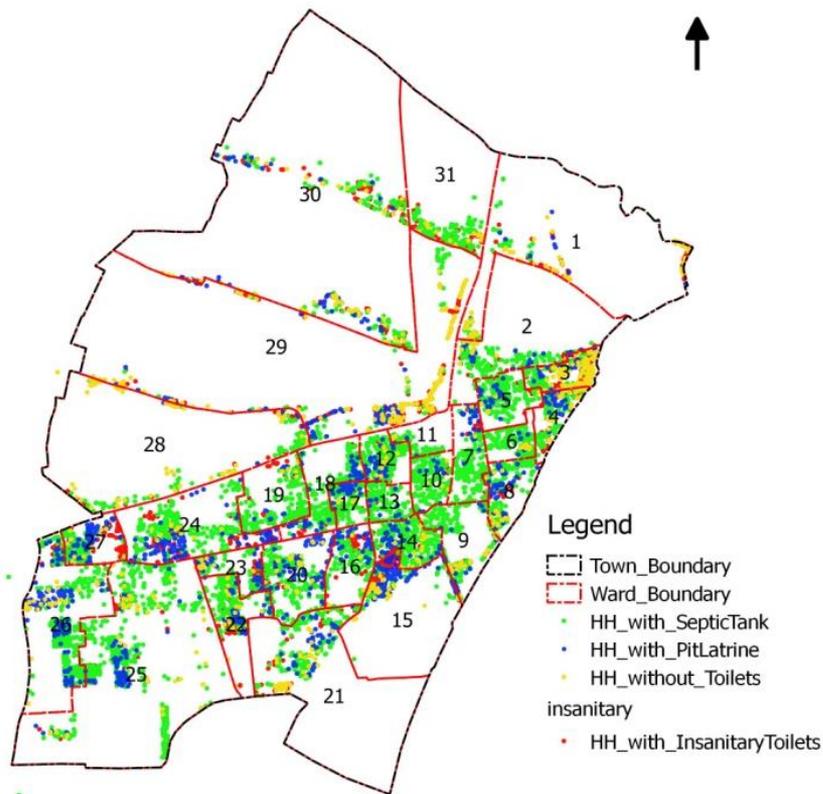
Results – Toilet Typology



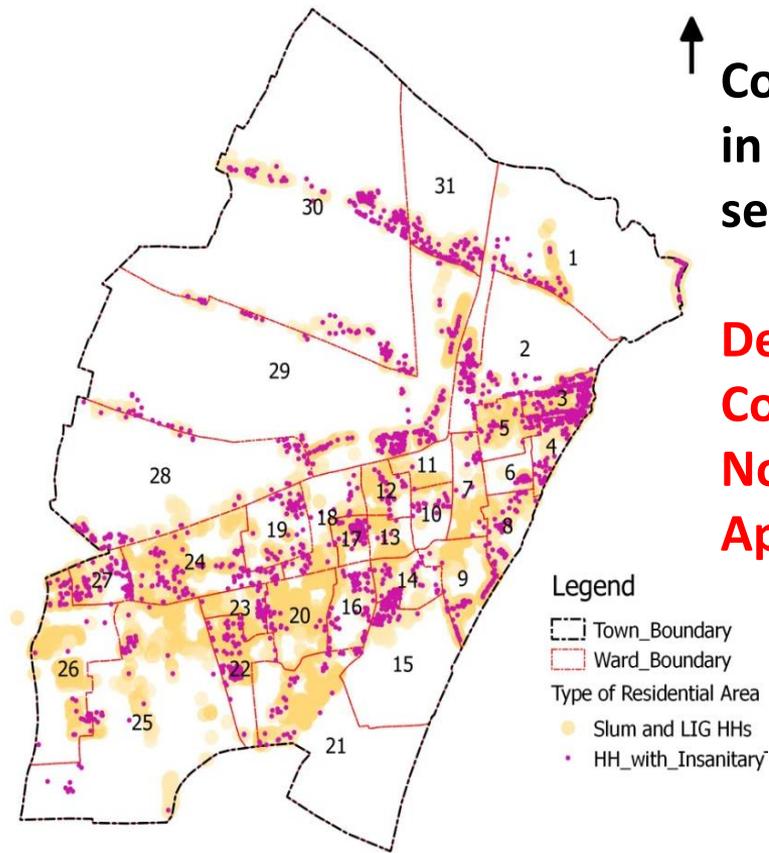
**1400
insanitary
toilets**

**Concentration
in low-income
settlements**

Results – Toilet Typology



750 0 750 1500 m



750 0 750



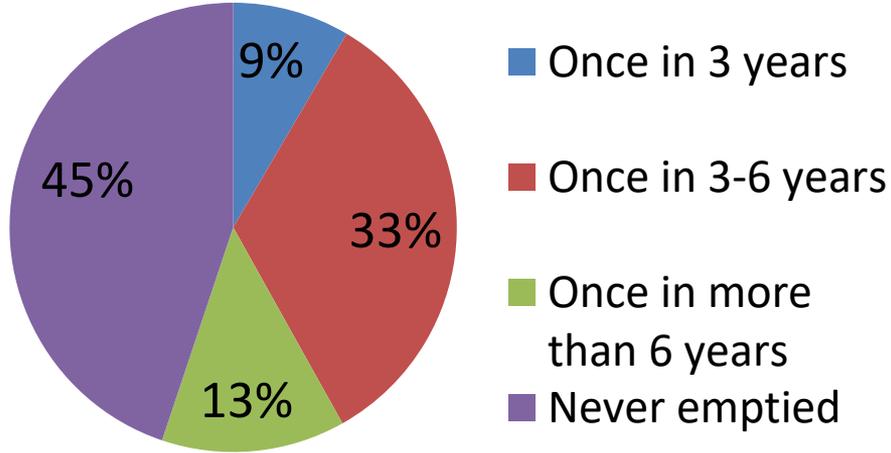
1400 insanitary toilets

↑
Concentration in low-income settlements

Decision:
Communication
Notices
Application

Results – Desludging behaviors

Frequency of Desludging



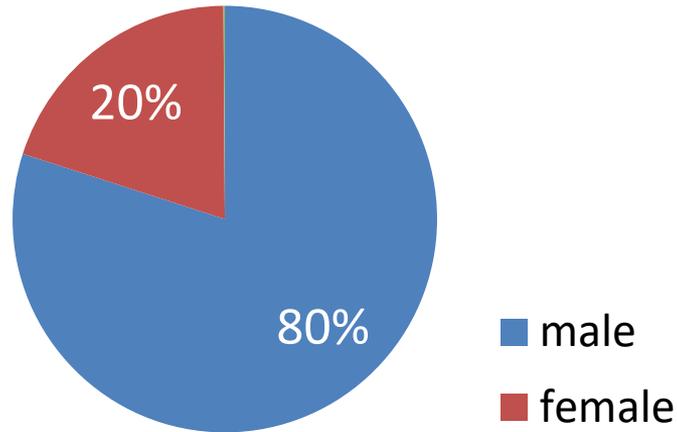
Decision:

1. **Planning for scheduled desludging – prioritization, time (basis information on access), cost (basis information on need for breakage of access cover)**
2. **Tarif (basis willingness to pay)**



Results – Gender Lens

Decision Making with Regard to Toilet Infrastructure and Maintenance

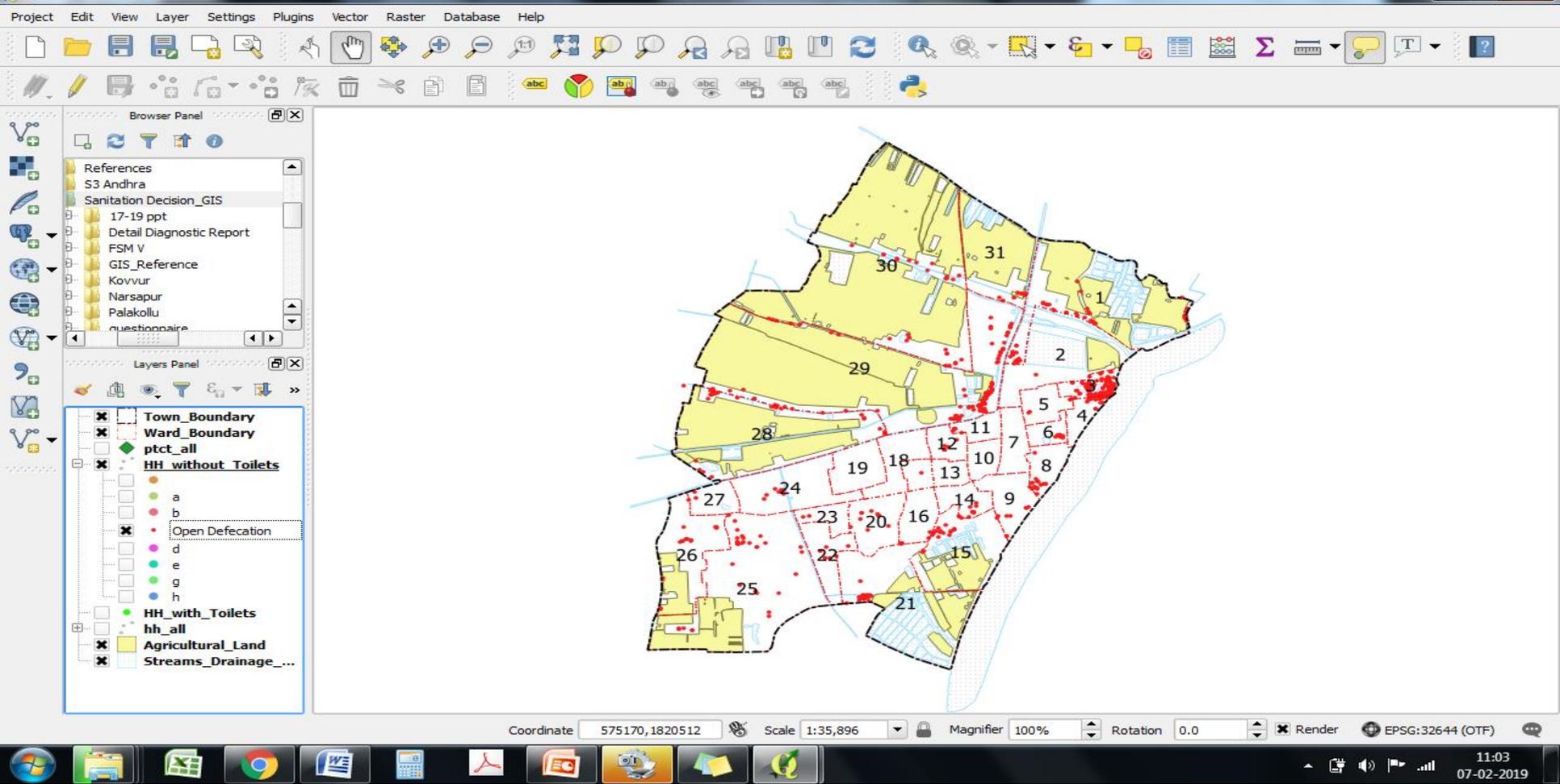


Though women have responsibility of cleaning toilet, decision taking authority lies with male members

- **Responsibility of Cleaning Toilet -98% of the HH toilets are maintained by women**
- **OD in HHs with toilets is by men**

Results

- Relationship between practice of OD by households with toilet facilities and access to water
- Relationship between insanitary toilet and annual income of Household
- Relationship between ill health and monthly expenditure on soap
-



overlaying land use layer to understand proximity of OD HHs to agricultural land

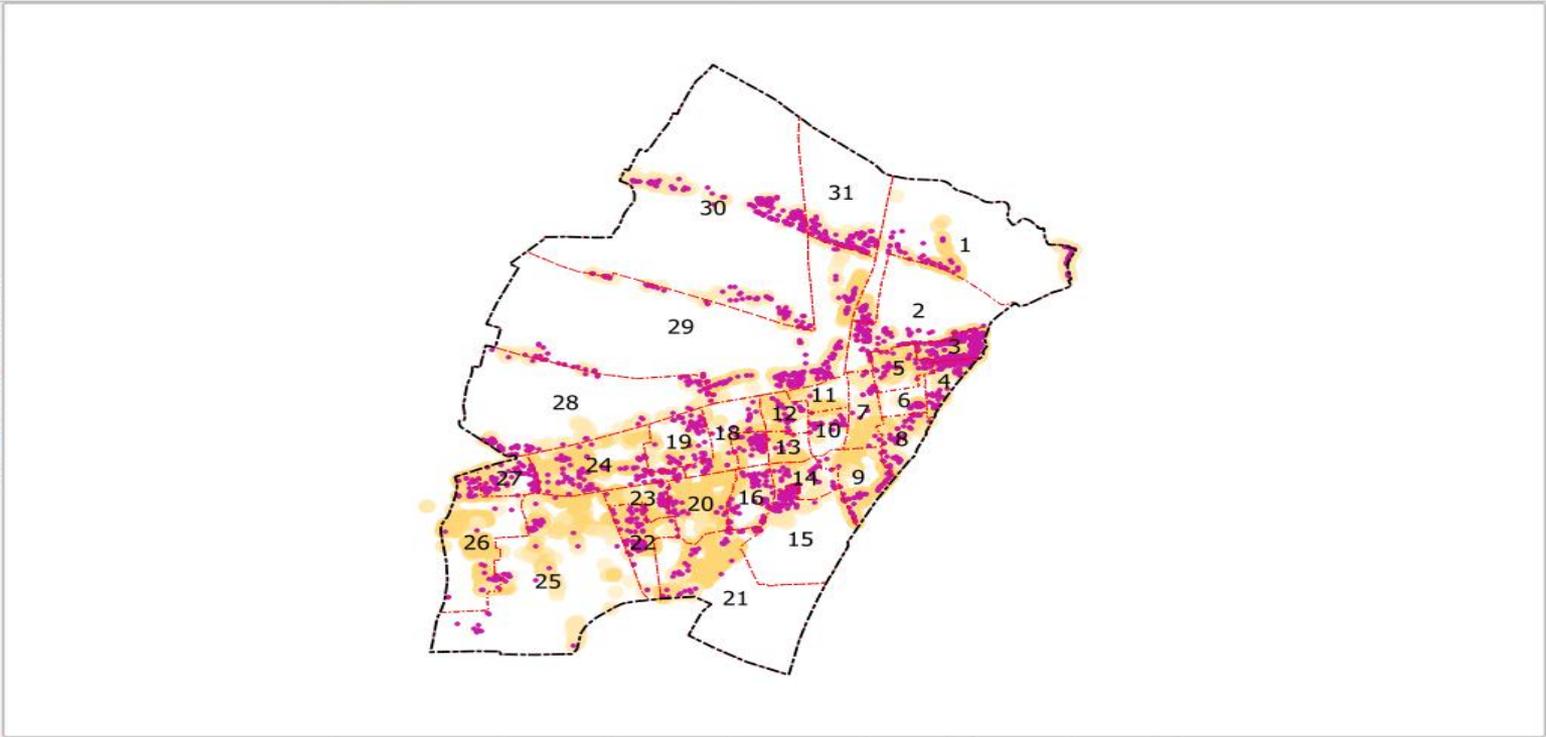


Browser Panel

- References
- S3 Andhra
- Sanitation Decision_GIS
 - 17-19 ppt
 - Detail Diagnostic Report
 - FSM V
 - GIS_Reference
 - Kovvur
 - Narsapur
 - Palakollu
 - questionnaire

Layers Panel

- Town_Boundary
- Ward_Boundary
- HH_with_Insanitary...
- Type of Property
 - Slum
 - LIG
 - LIG
 - d
 - e



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overlaying type of property to understand relation between insanitary toilet with socio-economic condition

Key Benefits

GIS supported visualised decision making related to the following and more in the city of Narsapur:

- **Addressing OD** (OD spots, potential reasons for slippage)
- **Enhancing Access** (applications for HH toilets, toilets in commercial establishments, locations for PT/CTs)
- **Improved containment systems** (retrofitting of insanitary toilets)

Conclusion

- **FSTP capacity revisit** (basis size of septic tanks)
- **Targeted Communication campaigns** (handwash with soap, linkage between health and sanitation, importance of regular desludging, ill effects of OD, schemes by government, etc)
- **Vulnerability and Gender studies** (to give voice, agency and access to sanitation participation in service delivery to women)

Conclusion

- **Scheduled desludging planning** (CR taken,
- **Desludging route planning** (linkage with GPS on desludging trucks)
- **User charge collection system** (basis willingness to pay for sanitation services and linkage with property tax data, a differential tariff structure to benefit the poor evolved)
- **FSSM budget with gender budget introduced**