

Presentation from the

Workshop on Innovations for Scaling up to Citywide Sanitation

October 16-17, 2012, Ahmedabad



Organised by PAS Project, CEPT University



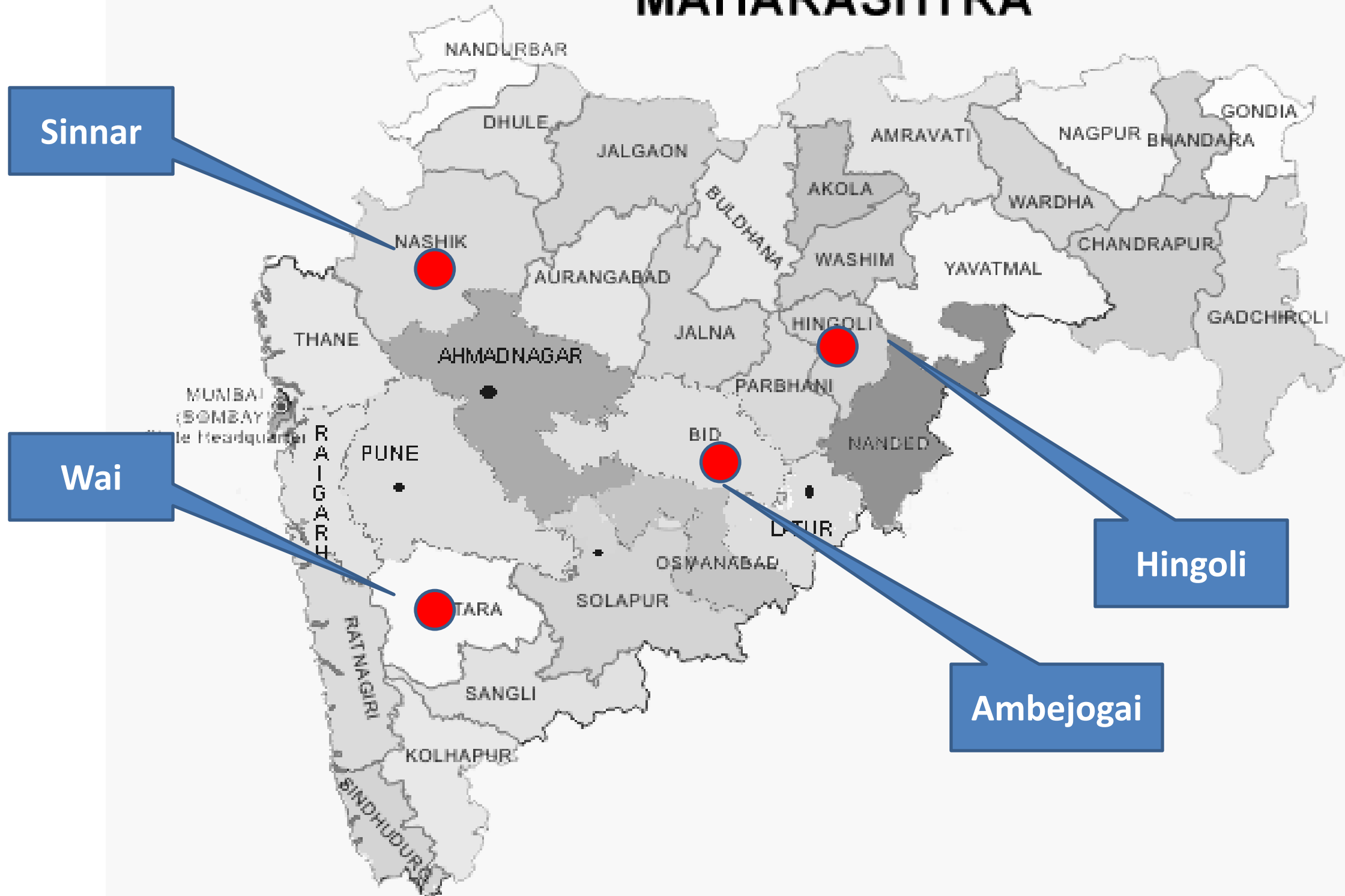
**CITY
SANITATION
PLAN**

The Process:

**WAI
SINNAR
AMBAJOGAI
HINGOLI**

**Partners :
Maharashtra Jeevan Pradhikaran (MJP)
Urban local Bodies,
CEPT, Ahmedabad
&
Team at Micro Cloud Computing (MCC)**

MAHARASHTRA



Sinnar

Wai

Hingoli

Ambejogai

Learned through Experience

- **City Sanitation Planning for**
Ashta, Khajuraho, Raisen in association with Water Aid (Madhya Pradesh)
- **City Sanitation Planning for**
Gwalior in association with UN-Habitat

Innovative Approach

Key Aspects in Approach

- **Cluster Formations.**
- **Extensive Use of GIS for Analysis.**
- **In-depth Study of entire Value Chain**
- **Identification of Pilots while Developing the CSP with the ULBs**
- **Conducting Exposure visits for Demonstrative Effects.**
- **Supporting ULB's to initiate the Pilots while developing the CSPs including soft components.**
- **Promoting Innovative ICT/GIS Applications**
 - **Sanitation Management and Amenities System – An online GIS based system for each of the CSP city.**
 - **Ward level participatory mapping through mapper using local language.**
 - **Mobile / GPS/Photo interface to collect data on key indicators and generating report online through SAMS.**
- **Phase wise Planning**

Governance and Accountability

- Governance and Accountability needs front seat in CSP specially from its implementation perspective.
- Governance involves initiatives from ULB towards better service delivery beyond creating physical infrastructure.
- Accountability has dual aspects .
- From ULB side it would involve : Benchmarking, Citizens Charter, Transparency, Grievance redress , public disclosures.
- From Users perspective it would involve : Better Utilization, Participation, Abiding to the Laws etc.

National Urban Sanitation Policy (NUSP)

**NUSP
IN PERSPECTIVE**



**Eradication of open
defecation**

100% HOUSEHOLD
SANITATION FACILITY

**Safe disposal of solid and
liquid waste**

COLLECTION – TREATMENT –
DISPOSAL MECHANISM

**Sustainable Approach
towards O& M**

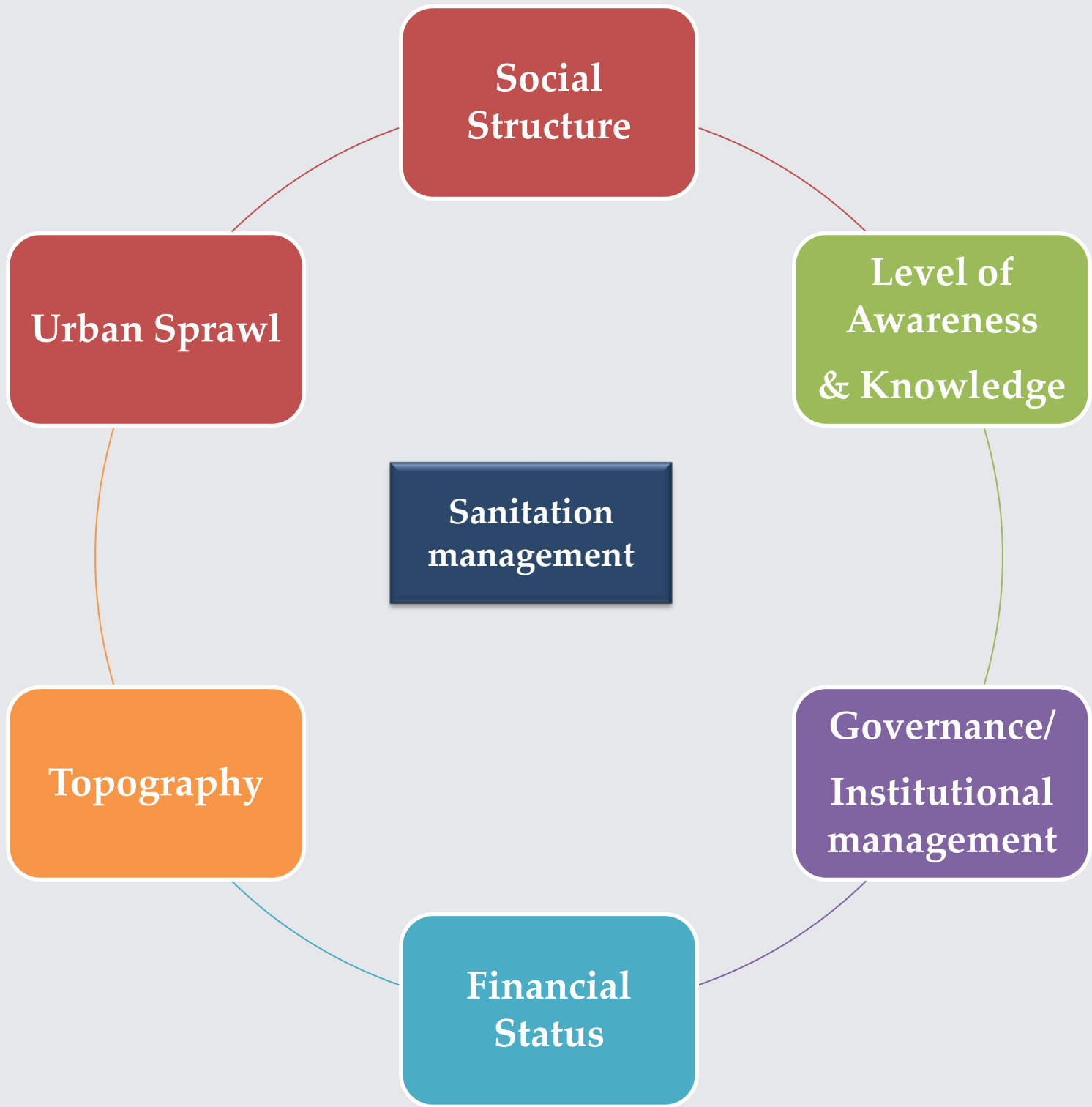
AWARENESS RAISING
STRATEGIES

ACTIVE INVOLVEMENT OF
LOCAL COMMUNITIES

INSTITUTIONAL
STRENGTHENING

RESOURCE MOBILIZATION &
REFORMS

Factors affecting Sanitation management



Scope of study

HOUSEHOLD SANITATION

COMMUNITY LEVEL SANITATION

PUBLIC SANITATION FACILITY

GREY AND BLACK WATER MANAGEMENT

STORM WATER MANAGEMENT

SOLID WASTE MANAGEMENT

Availability , Access and coverage

Existing infrastructure arrangements and status/ condition assessment

Current management practices

Supporting institutional arrangements for O & M

Ongoing/proposed interventions

Future strategies and Phasing Plan

Assessment of Waste management options in city context

Financial Operational Plan

Initiating Pilot implementation

Activity Listing

Activity 1

- Kick off Workshop

Activity 2

- General Baseline study and generation of digital maps

Activity 3

- Technical situation analysis and review of management practices

Activity 4

- Stakeholder engagement, awareness raising and communication strategy

Activity 5

- Waste management options

Activity 6

- Financing plans and Institutional capacity

Activity 7

- Draft City Sanitation Plan summarizing all previous results

Activity 8

- Participatory Planning

Mapping & Database Creation

**Review of sanitation practices/
Infrastructure Assessments**

Demand Supply Gap Analysis

Waste management Options

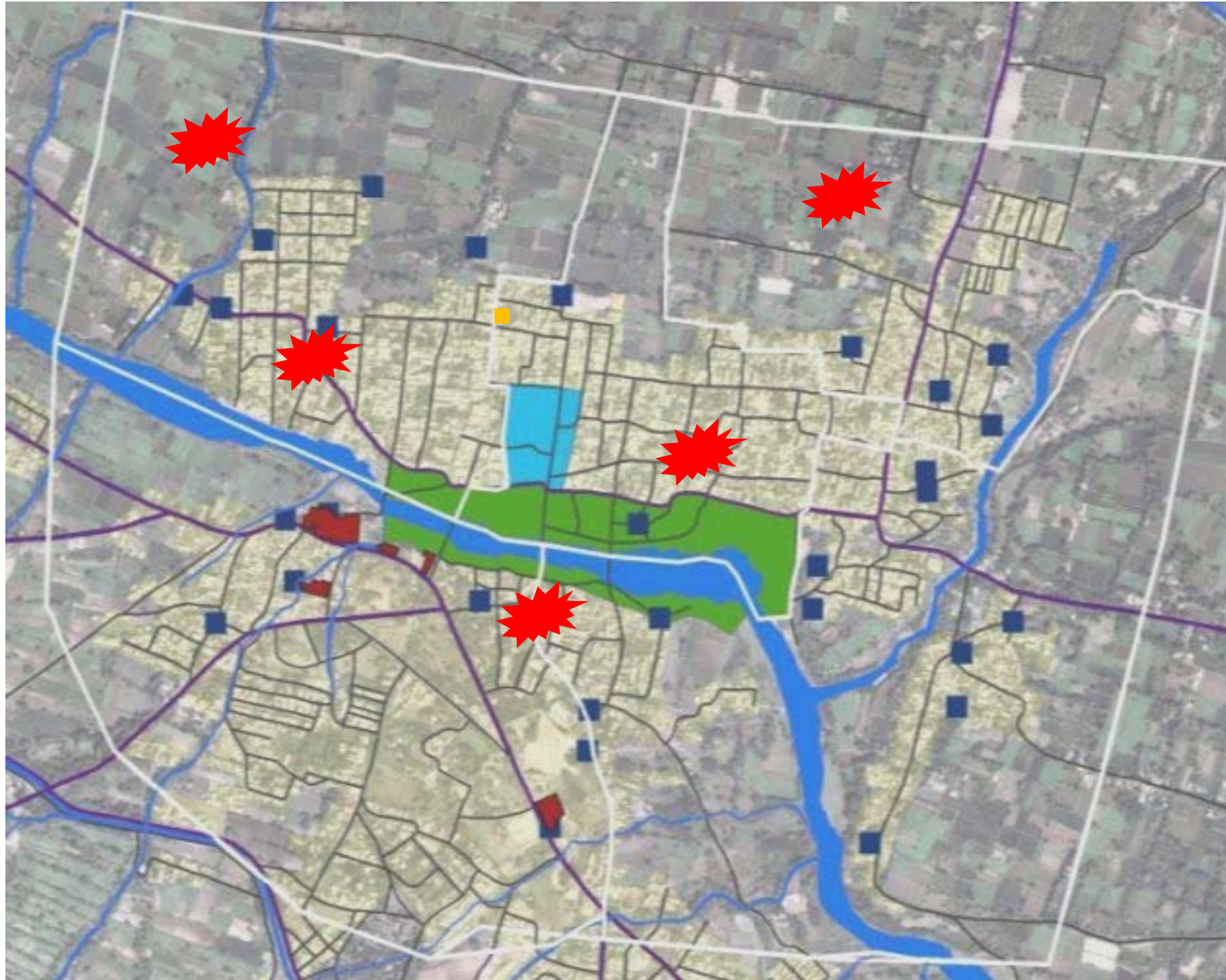
Strategies & Action Plan



Case studies:

Wai

Wai




Population = 35053
Households = 9657
Slum population share = 6%

Present sanitation scenario:
Number of individual toilets = 6975

**Number of functional community
toilet seats = 243**

**Ongoing/ sanctioned/ proposed
projects = NRAP for wastewater
management,
IHSDP scheme for slum rehabilitation**

-  Slum areas
-  Location of Public Toilets
-  Location of Community Toilets
-  Market Area
-  Ghat Precinct

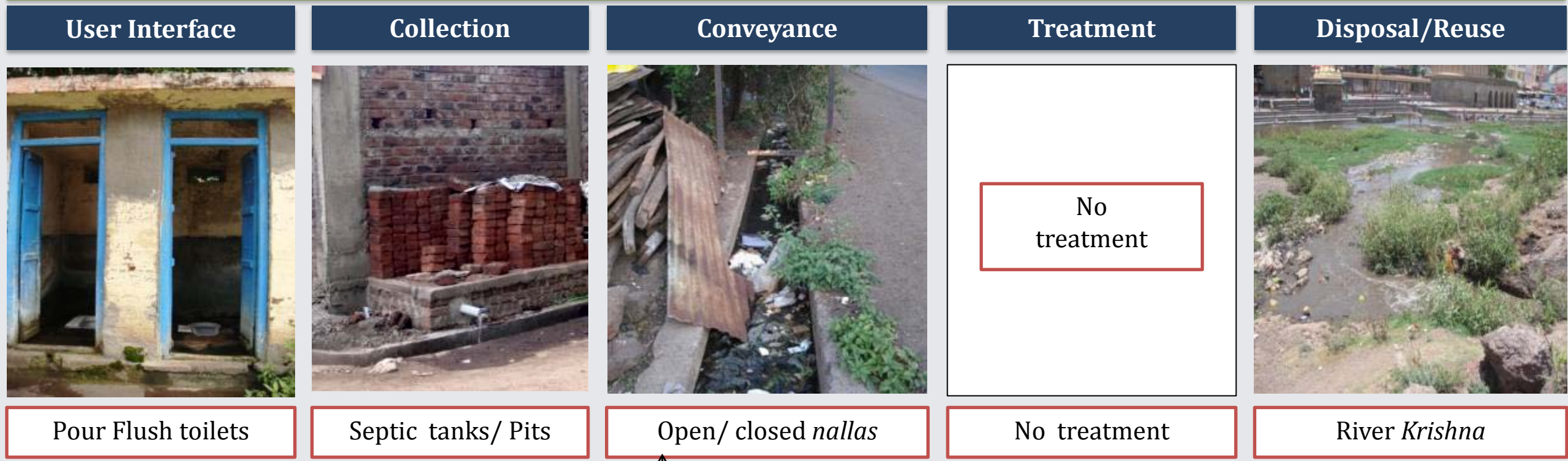
 OD spots

Number of persons resorting to open defecation – 675 (2%)

Number of persons relying on Community Toilets– 2280(30%)

Sanitation value Chain

Wastewater Management



Grey water from kitchen, bathrooms and other domestic usages

↑

Solid Waste Management



Cluster Approach based on existing sanitation practices

Parameters for delineating zones of wastewater generation and conveyance

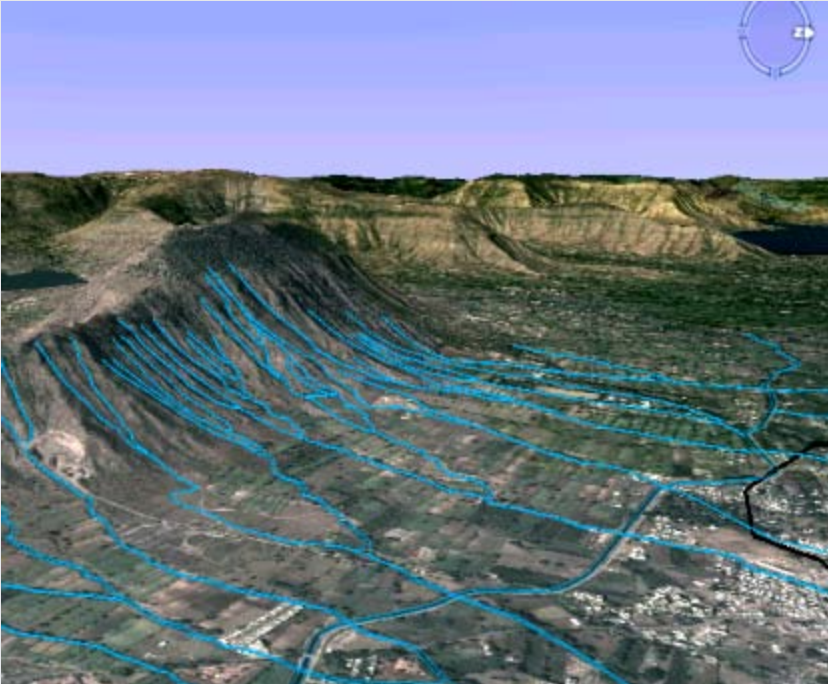
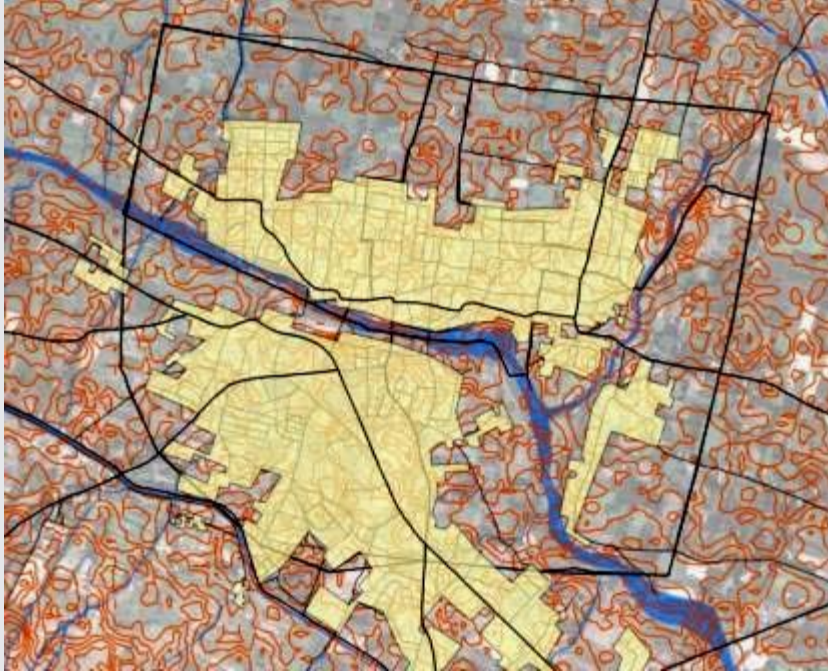
Topography



Existing natural drainage system



Urban development and human interventions



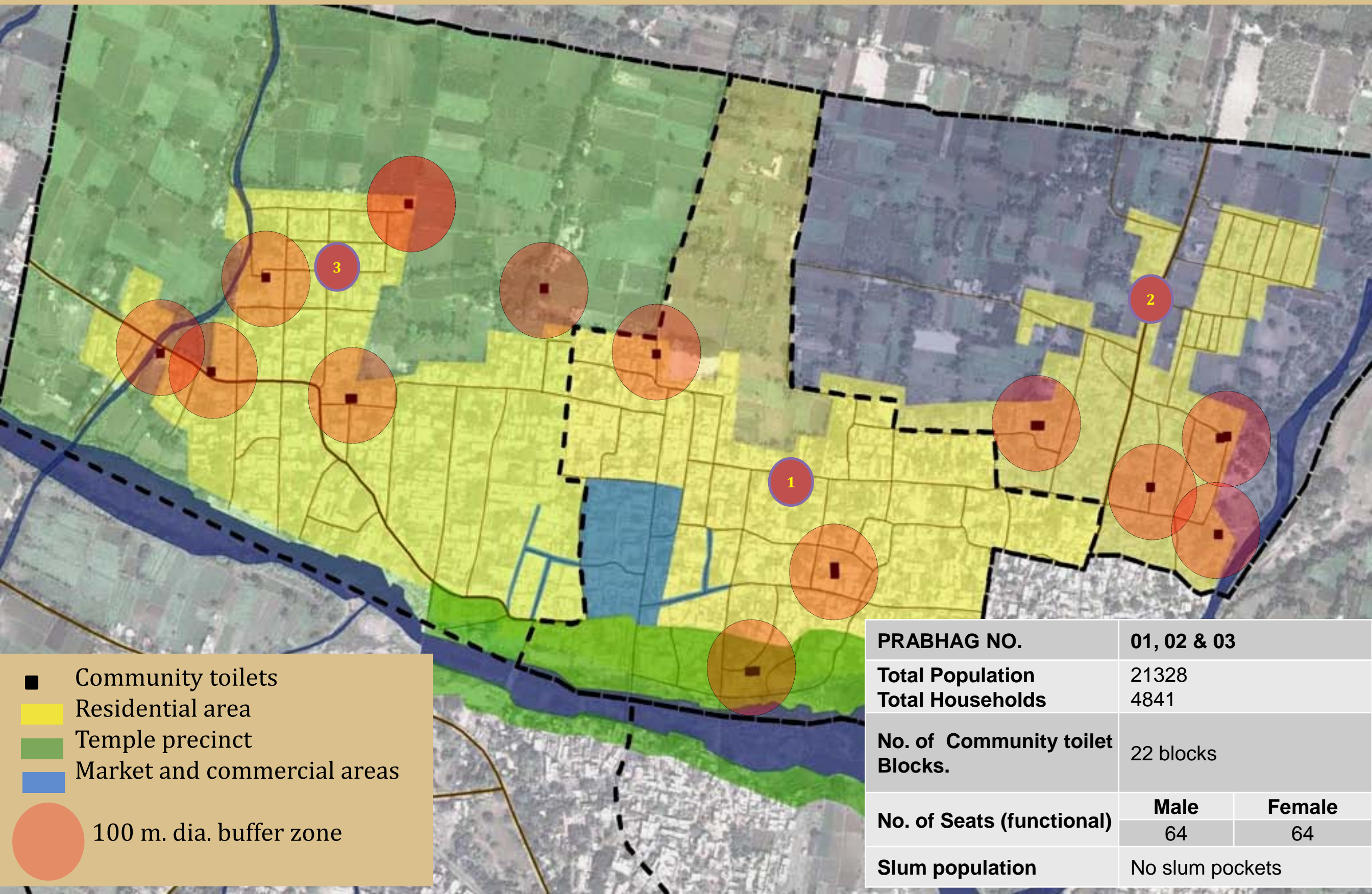
Terrain, slope directions, land cover

Natural drain pattern and river

Construction activities

Assessment of Community level Sanitation

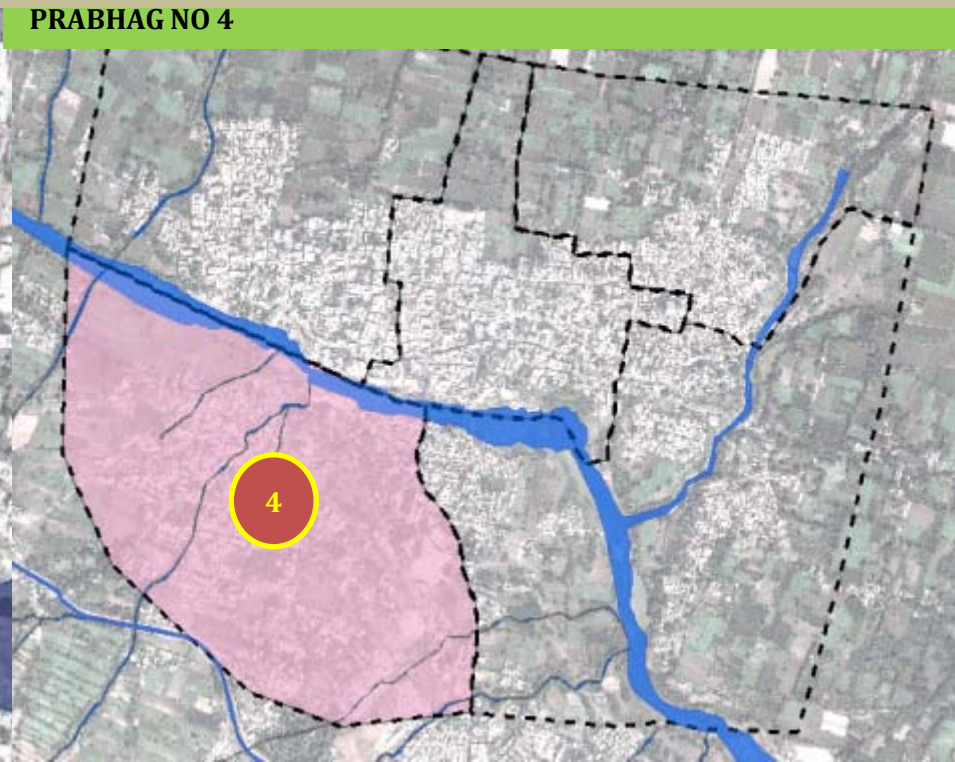
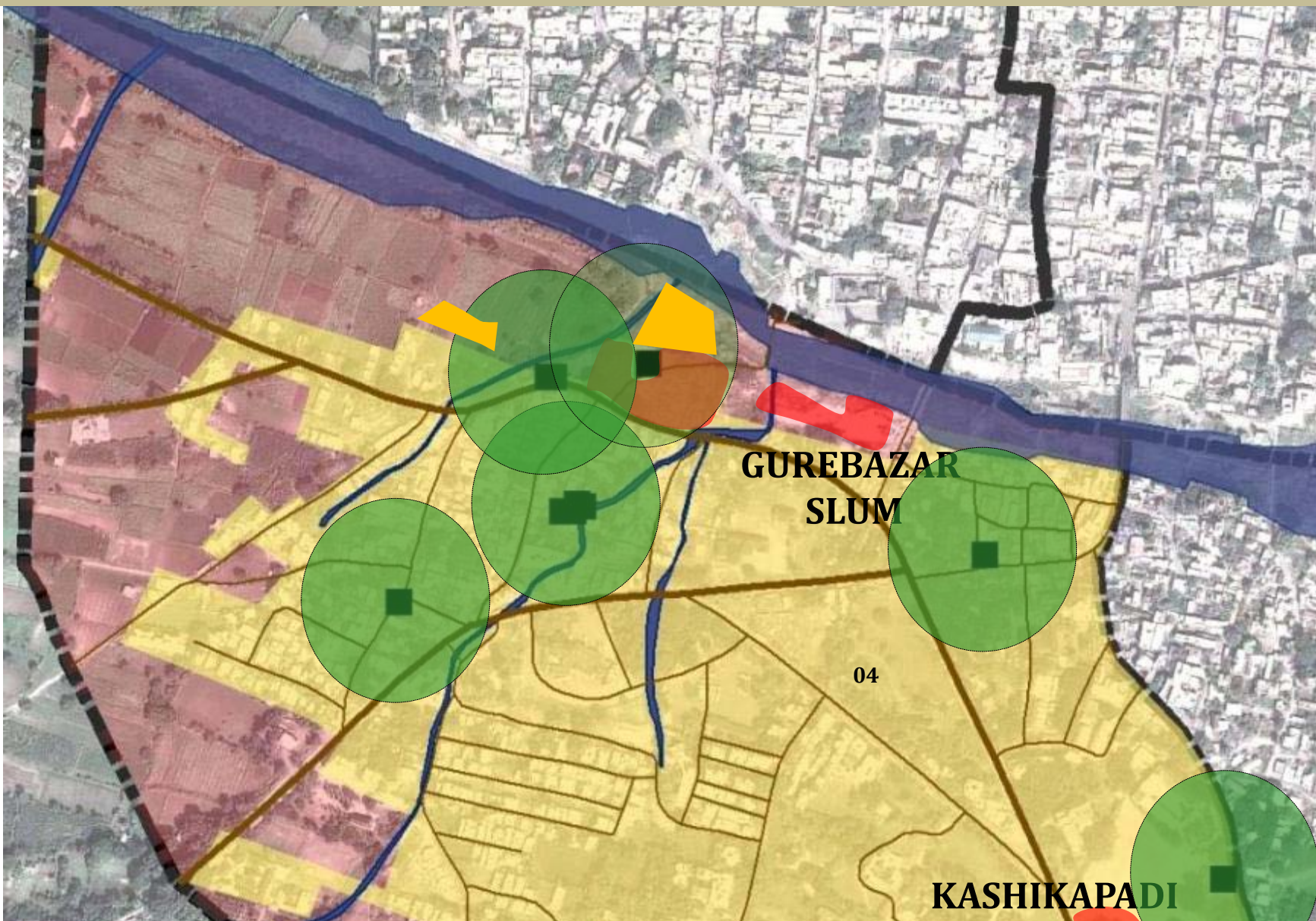
Uneven distribution of community level toilet blocks in residential areas



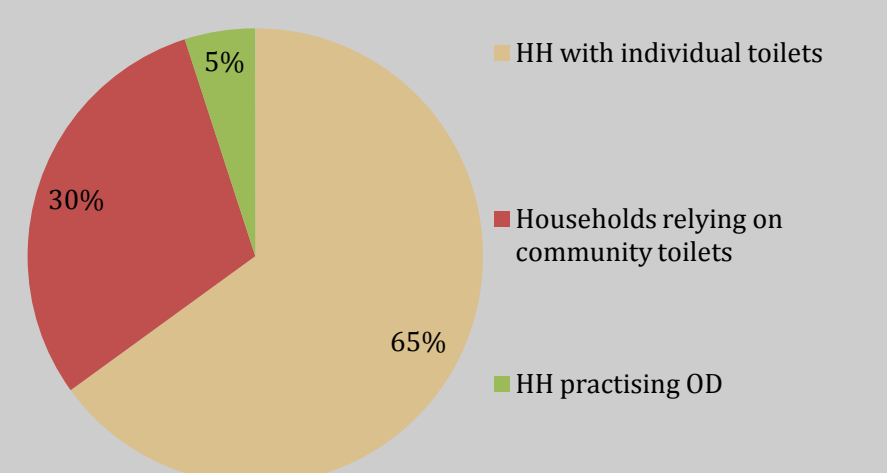
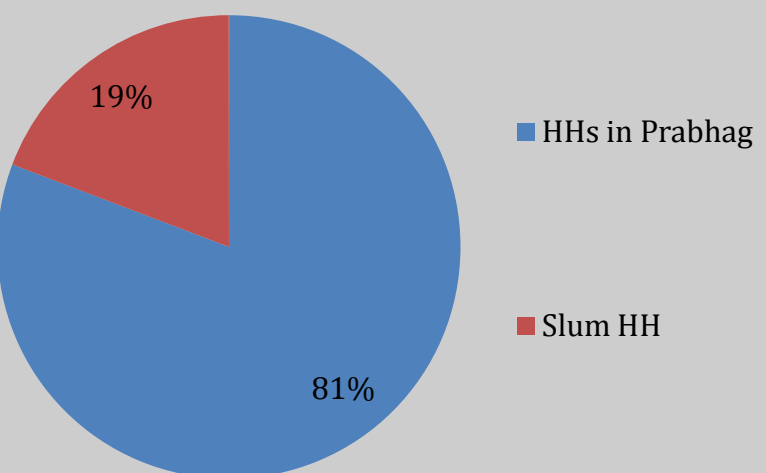
Assessment of Community level Sanitation

The only prabhag in city having slums

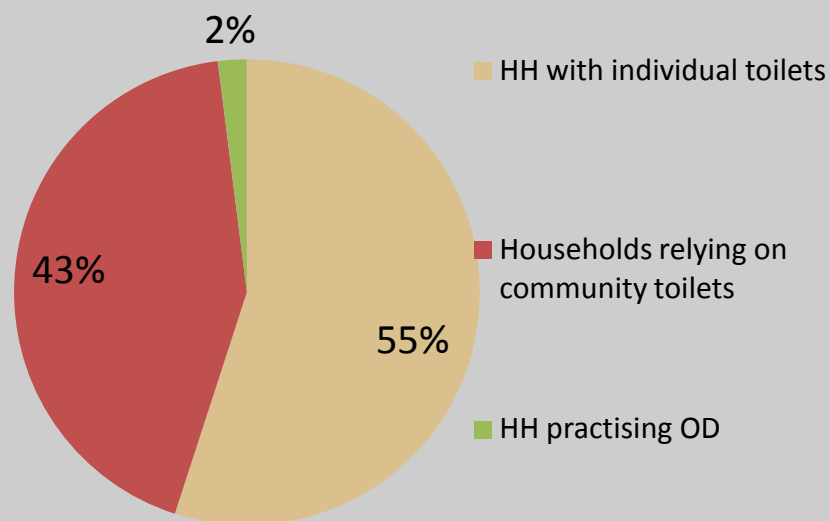
19% of the prabhag population is residing in slum



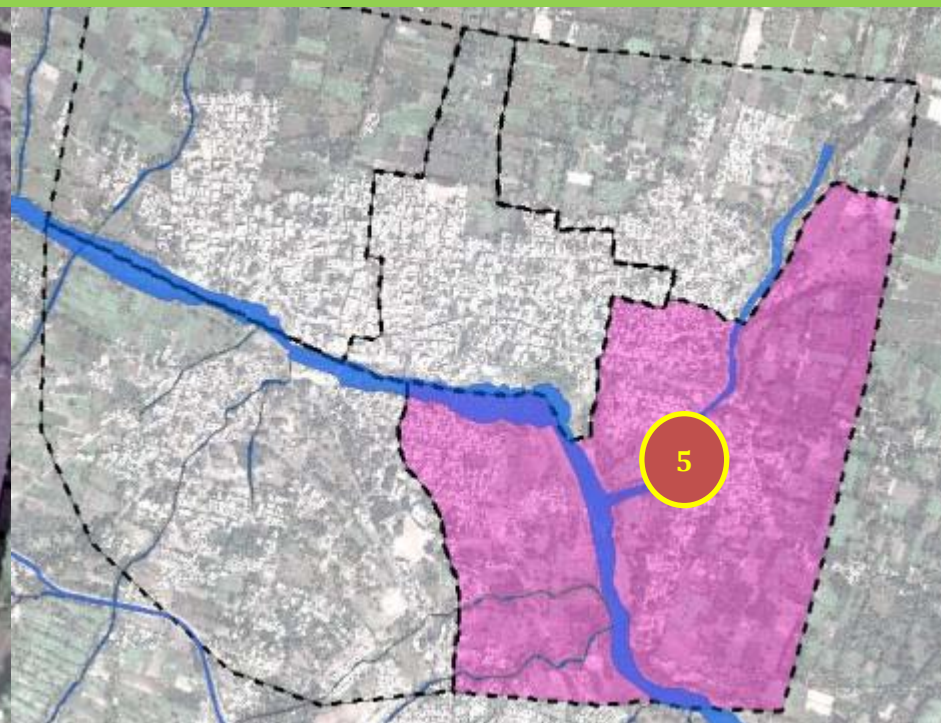
Total Population	8023	
Total Households	1438	
No. of Community toilet Blocks.	11 blocks	
No. of Seats (functional)	Male	Female
	34	38
Slum population	2140 (1328+800)	



Assessment of Community level Sanitation



PRABHAG NO 5



Total Population
Total households

6702
 1464

No. of Community toilet Blocks.

12 blocks

No. of Seats (functional)

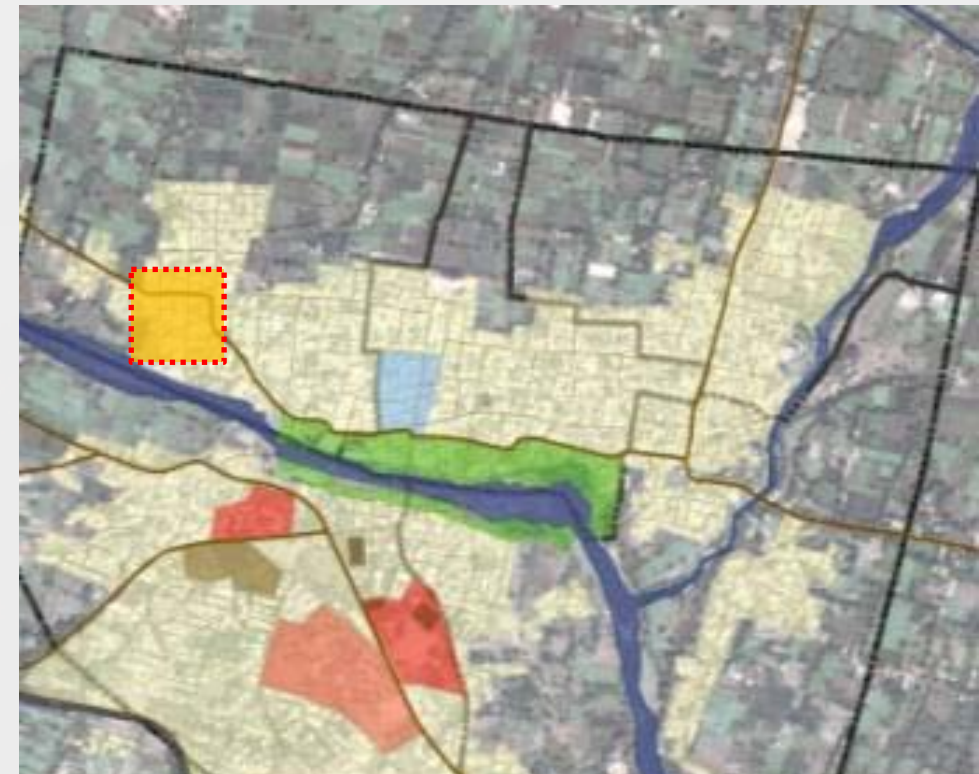
	Male	Female
	25	26

Slum population

No slum pockets

Case study 04 -Community toilet facility

Key Plan

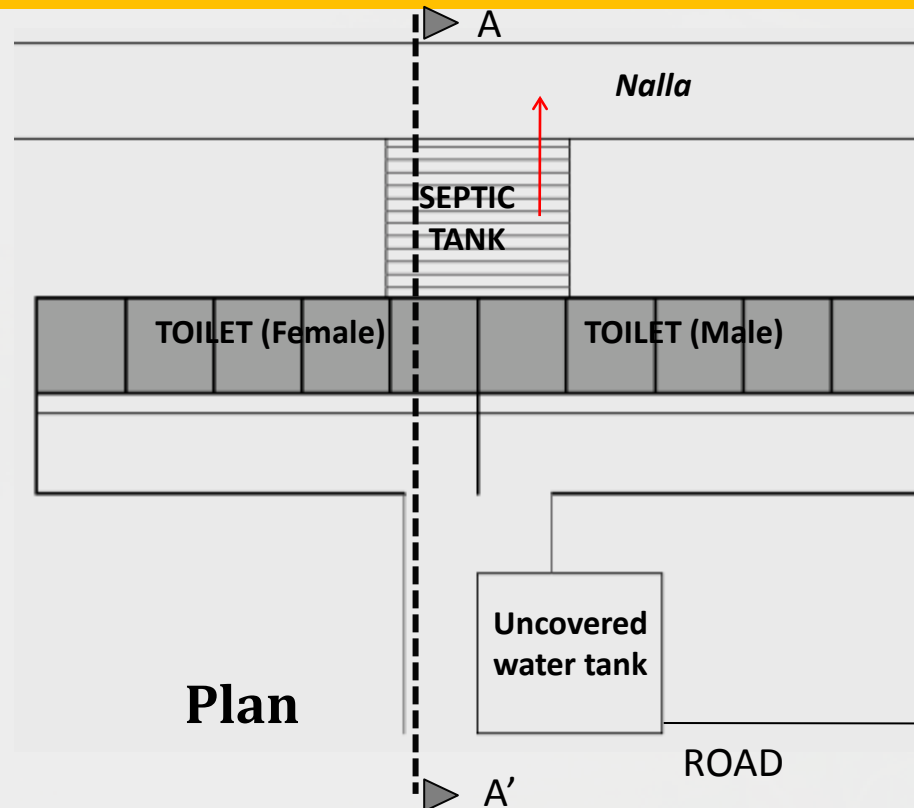
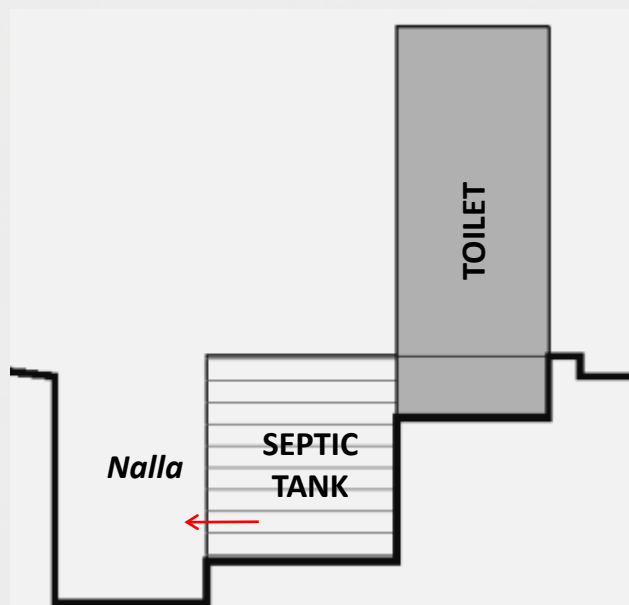


Prabhag 02 -Parakandi road, Raviwarpeth

No. of Seats	5 Male and 5 Female.
Approximate users	About 500 users / day.
Doors	Doors in good condition.
Water	1 tank
Electricity	Not Available
Hygiene level	Neat and clean.
User perception/ comments	Usable toilet, cleaned regularly by WNP



Schematic sketch of Community level facility



Section at A-A'

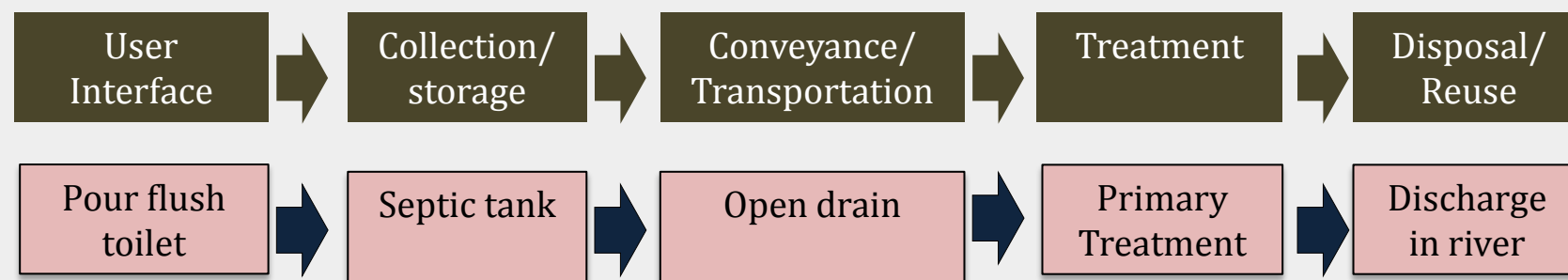
Plan

Case study 05 -Community toilet facility

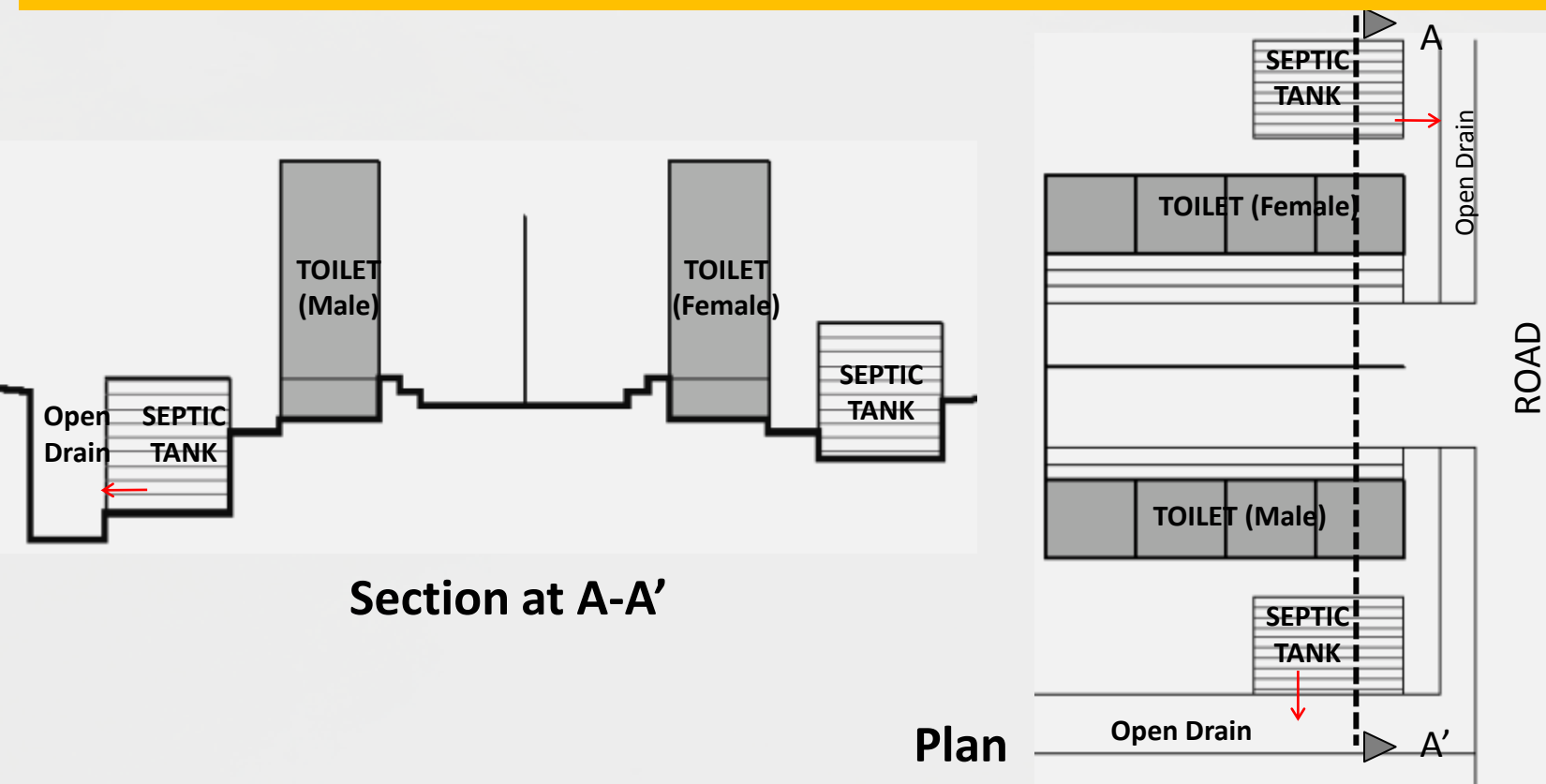
Key Plan



Prabhag 02 – Mungshe Ali, Raviwarpeth



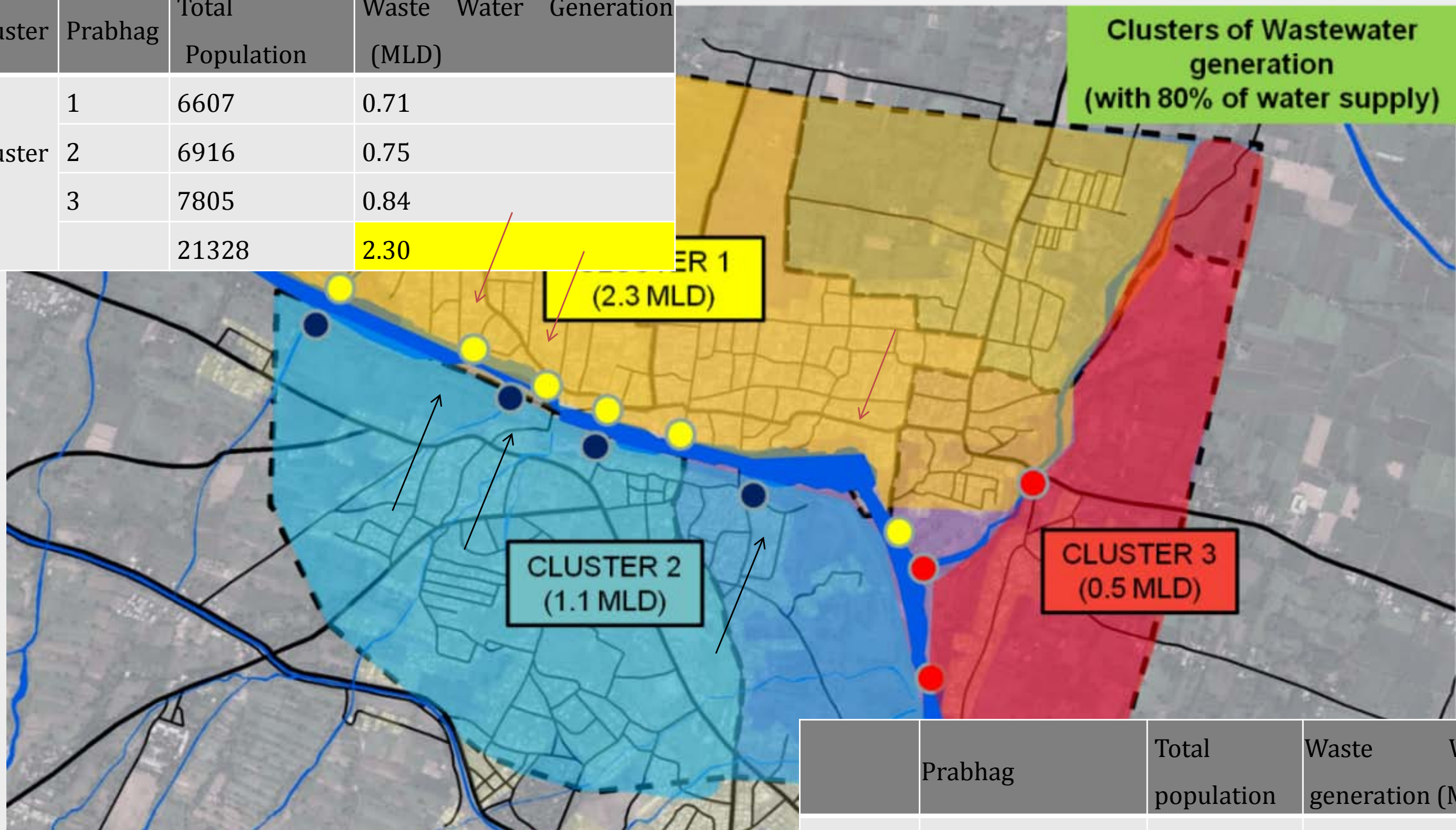
Schematic sketch of Community level facility



No. of Seats	4 Male and 4 Female
Approximate users	500-1000 users / day
Doors	Doors in good condition.
Water	2 tanks
Electricity	Not Available
Hygiene level	Neat and clean
User perception/ comments	Usable toilet, cleaned by WMC every 2 days

Liquid Waste Management: Sanitation clusters

Cluster	Prabhag	Total Population	Waste Water Generation (MLD)
Cluster 1	1	6607	0.71
	2	6916	0.75
	3	7805	0.84
		21328	2.30



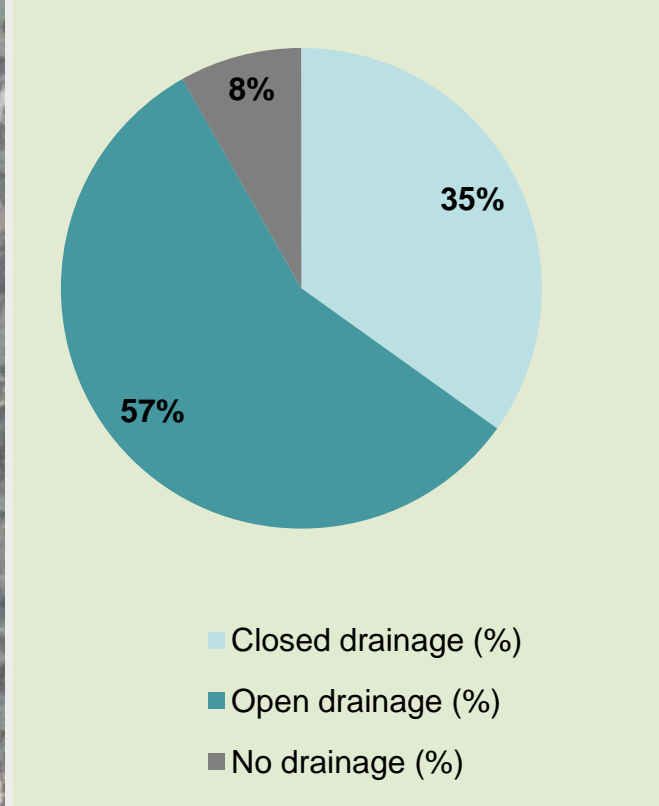
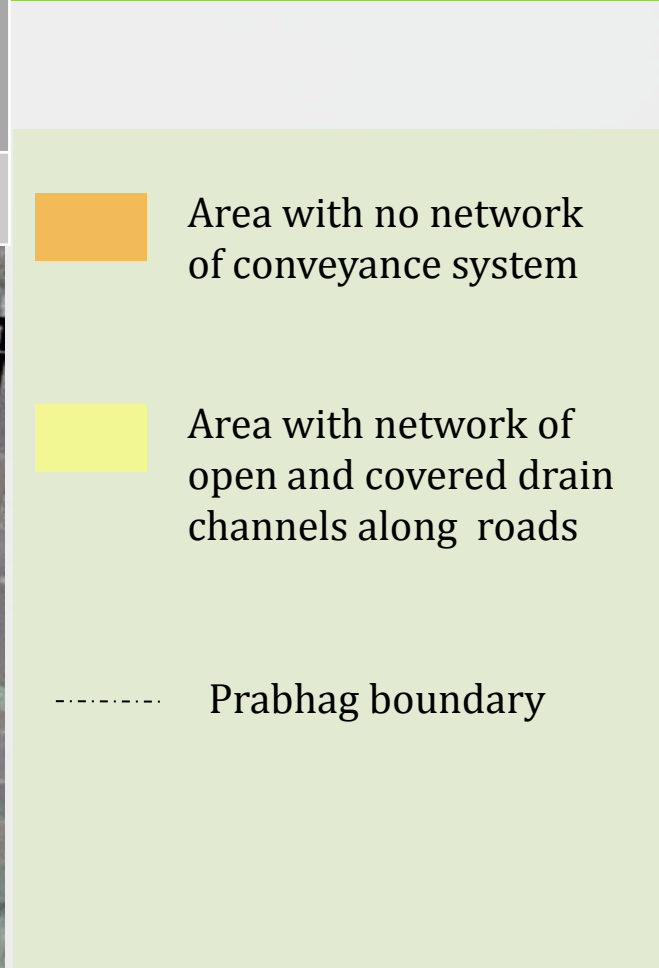
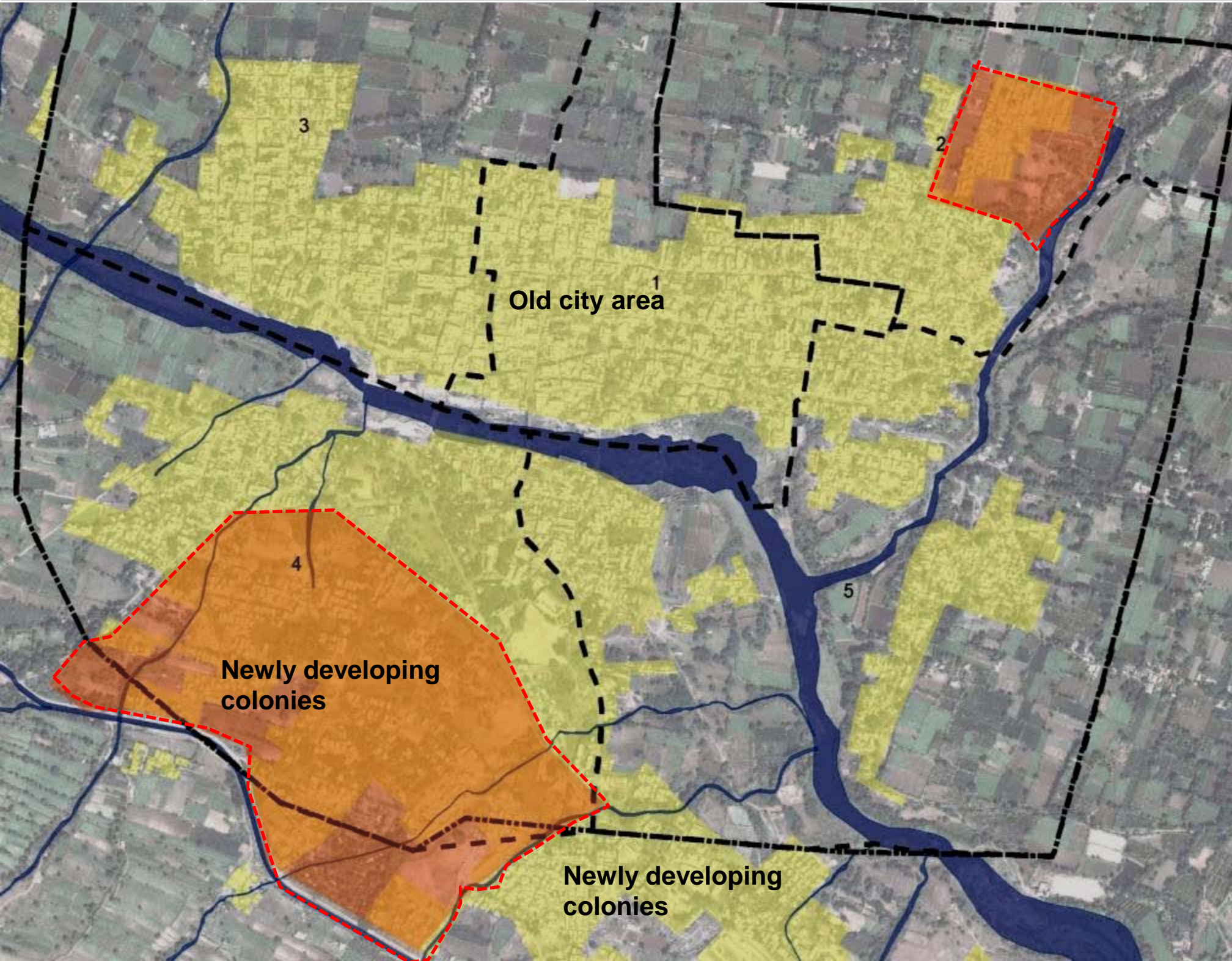
Cluster	Prabhag	Total population	Waste Water generation (MLD)
Cluster 2	4	8023	0.9
	Ward 17 of Prabhag 5	2443	0.3
		10466	1.1

	Prabhag	Total population	Waste Water generation (MLD)
Cluster 3	Ward 18 of Prabhag 5	2491	0.3
	Ward 5 of Prabhag 5	1768	0.2
		4259	0.5

Existing Conveyance System

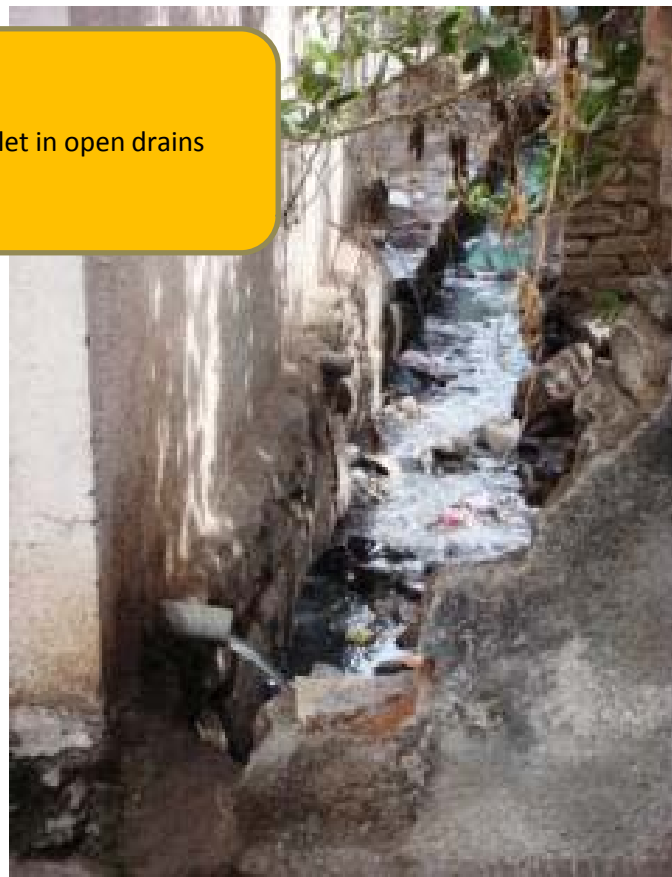
No. of Households	Waste outlet connected to Closed drains.	Waste outlet connected to Open drains.	Waste outlet connected to No drains.
7580	2644	4312	624

Existing coverage of Conveyance system





Grey water let in open drains



RIVER POLLUTION DUE TO DISCHARGE OF UNTREATED WASTEWATER IS A PRIME CONCERN!!!



Untreated wastewater polluting the built heritage and environment

USER INTERFACE

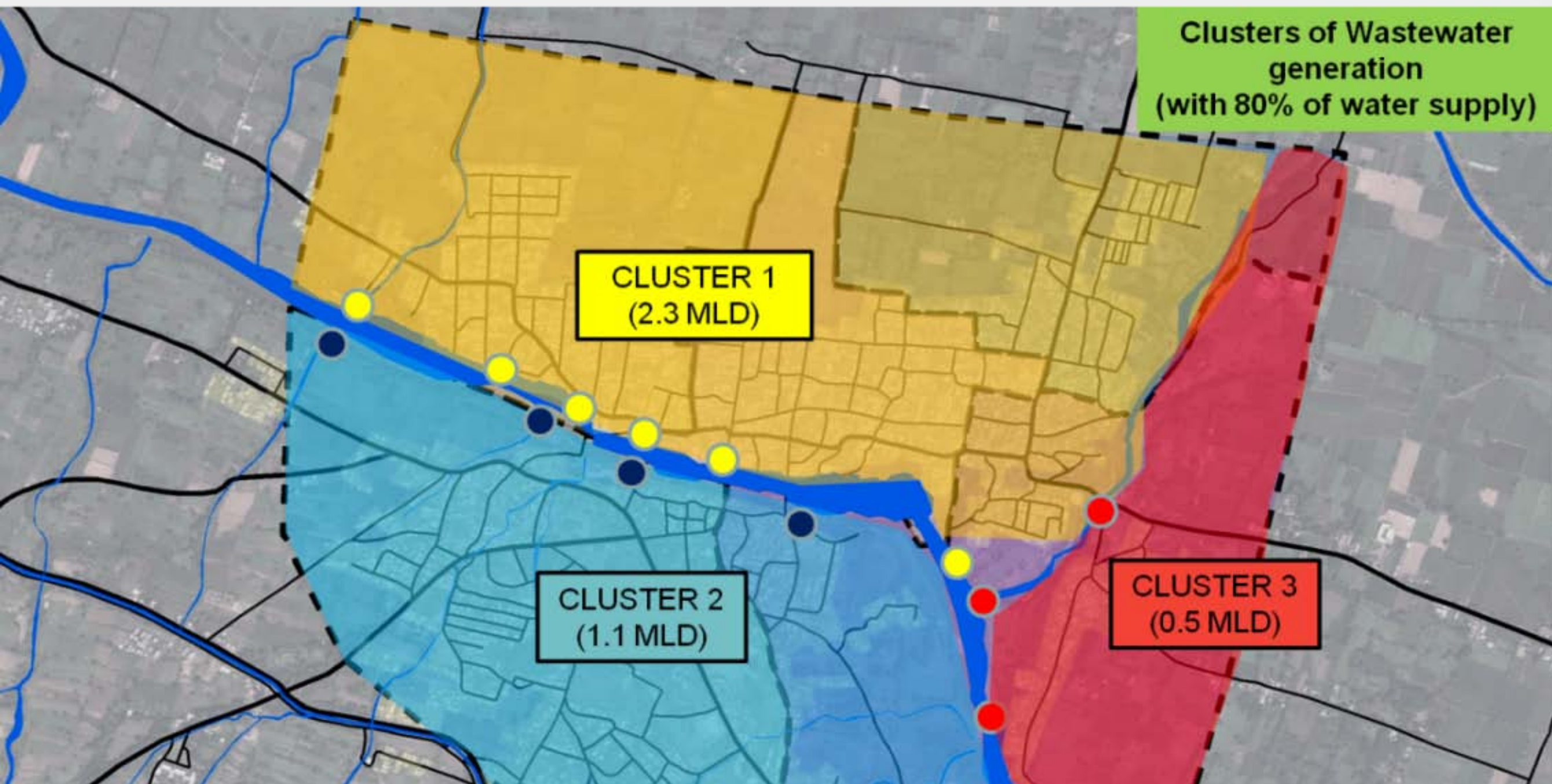
**COLLECTION/
STORAGE**

CONVEYANCE

TREATMENT/ DISPOSAL

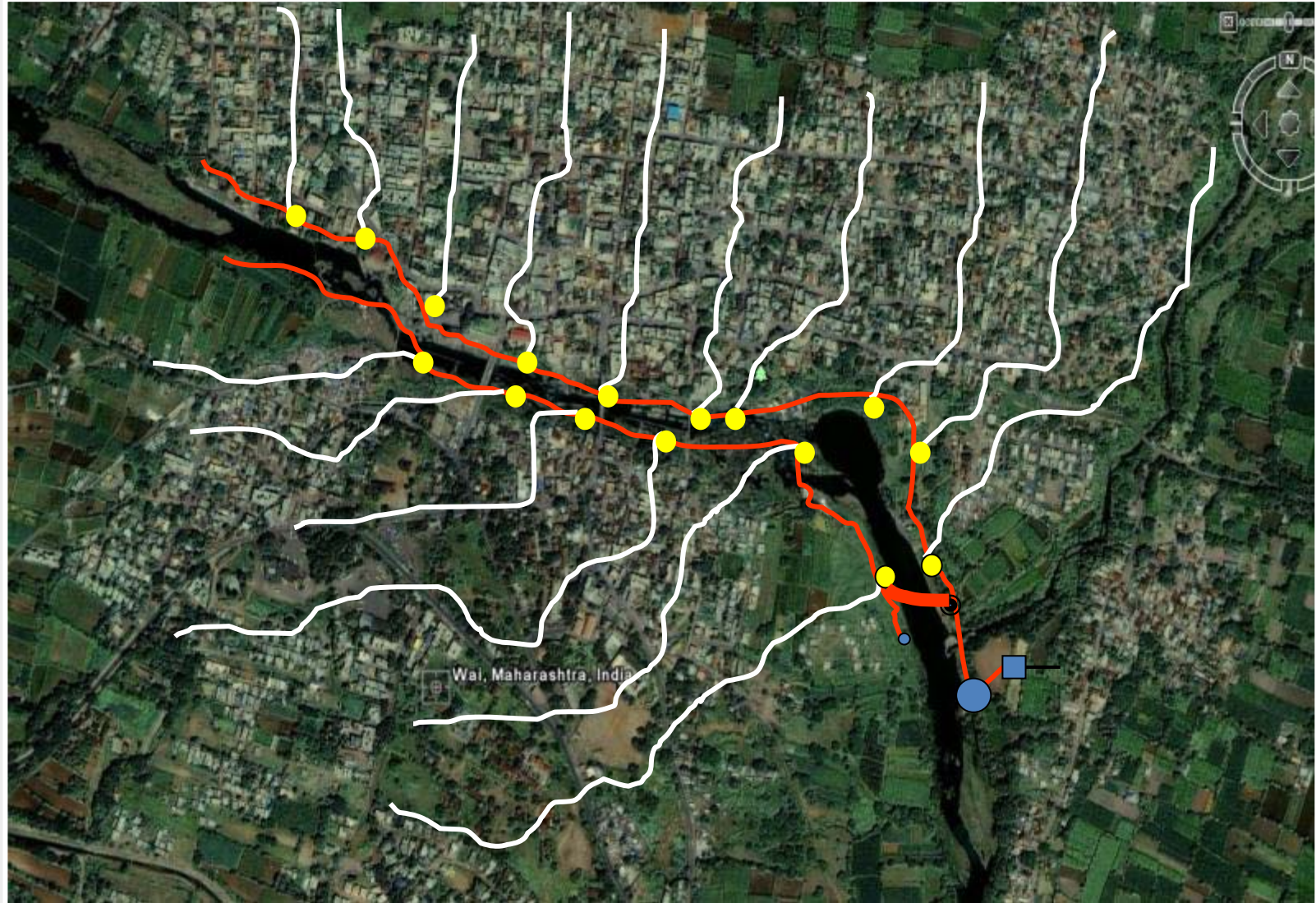


Future generation of wastewater



Zone	Wastewater generation in MLD					
	Year 2013		Year 2028		Year 2043	
	Population	MLD	Population	MLD	Population	MLD
Zone 1	21951	2.37	25551	2.76	31975	3.45
Zone 2	10772	1.16	12539	1.35	15690	1.69
Zone 3	4383	0.47	5102	0.55	6385	0.69
Total	37106	4.01	43193	4.66	54050	5.84

PROPOSED SCHEME FOR TREATMENT of WASTEWATER



National River Action Plan. **POLLUTION ABATEMENT WORKS FOR KRISHNA RIVER** **UNDER NRAP**

User interface

Onsite Collection

Conveyance

Treatment

Reuse /Disposal

No consideration

No consideration

Trapping open
drains
discharged into
river

MMBR
technology

For Agricultural
use

Waste management Options

Technology

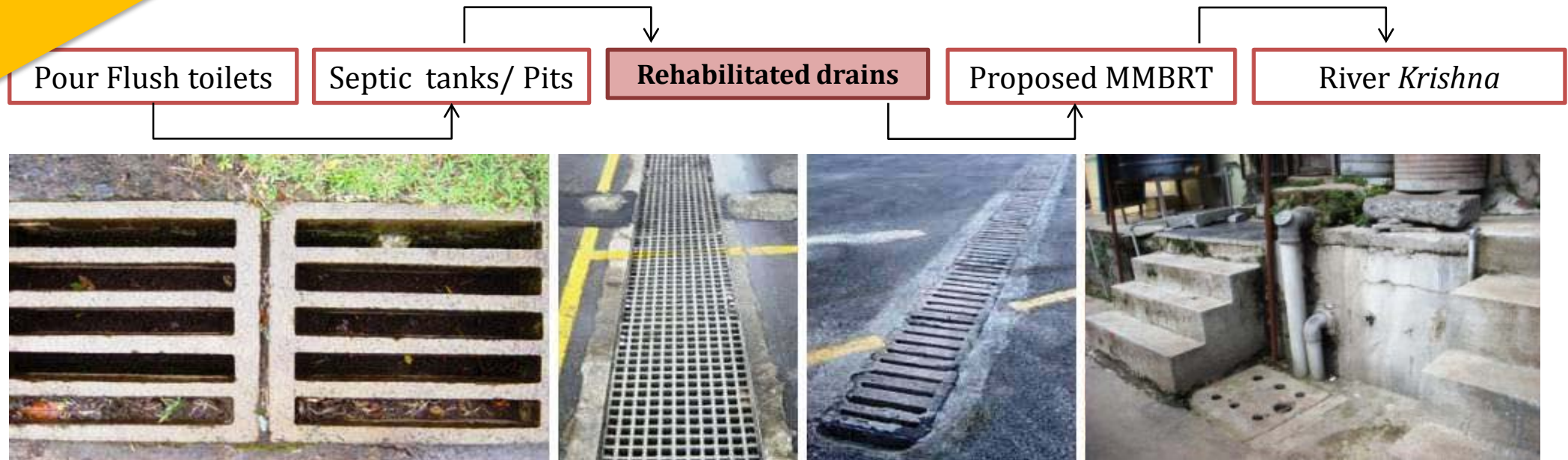
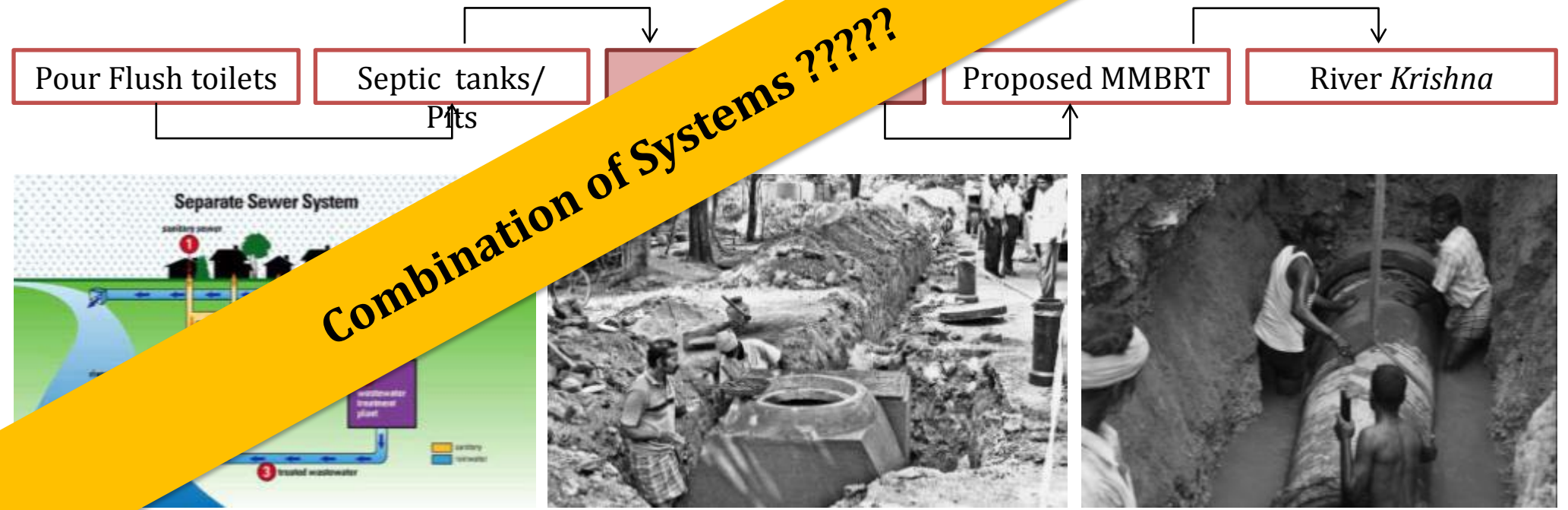
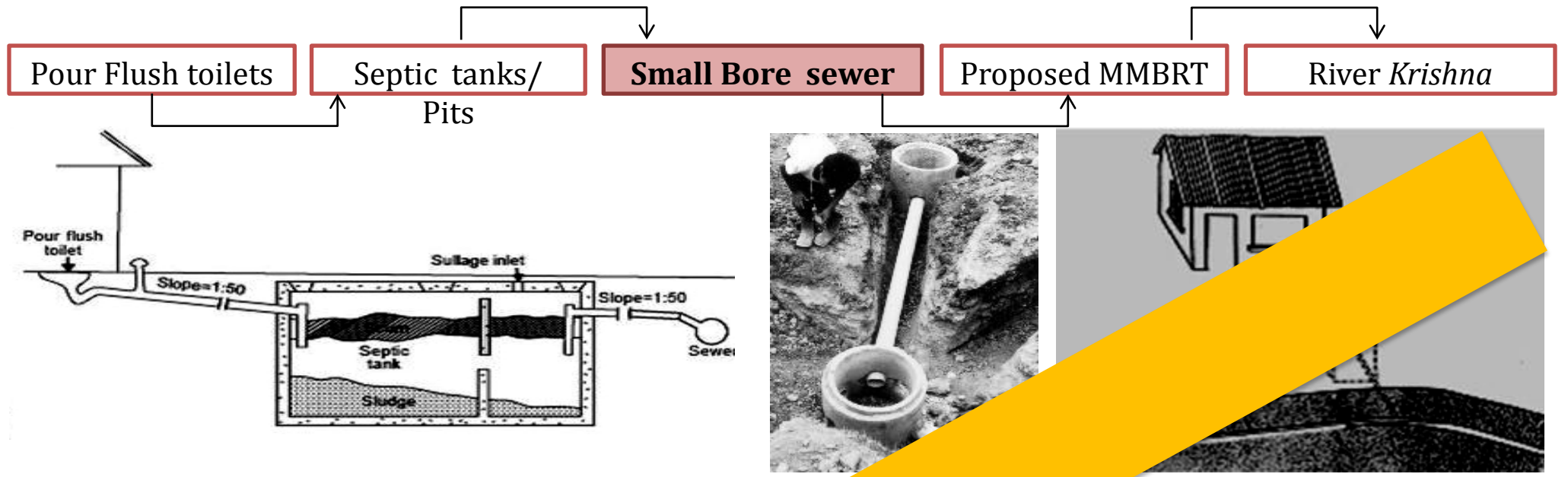
Capital & Operational Costs

Land requirement & Availability

Synchronization with proposed schemes

Overall suitability in city context

Conveyance System



Combination of Systems ?????

Waste management Options

User interface

Onsite Collection

Conveyance

Treatment

Reuse /Disposal

Sanitation Options -- Matrix

City	Wai	Sinnar	Hingoli	Ambajogai
Sanitation Options	NRAP Project	Closed Drains + settled sewer + Inteceptor+ DEWATs		Closed Drains + Settled Sewer + Small bore Interceptor + DEWATs
	Closed Drains + Settled Sewer + NRAP	Closed Drains + Settled Sewer + Interceptor + STP & DEWATs		Closed Drains + Settled Sewer + Small bore Interceptor + DEWATs & STP
	Settled Sewer + NRAP	Settled Sewer + Interceptor + DEWATs		Settled Sewer + Small bore interceptor + DEWATs
	Closed Drains + Settled Sewer + DEWATs	Settled Sewer + Interceptor + STP & DEWATs		Settled Sewer + Small bore interceptor + DEWATs & STP
	Settled Sewer + DEWATS	Simlified Sewer + DEWATs / STP		
	Simplified Sewer + NRAP	Conventional Sewer + STP		Simlified Sewer + DEWATs / STP
	Conventional Sewer + NRAP	Proposed Developing area : Settled Sewer & Simplified Sewer + DEWATs / STP		Conventional Sewer + STP

Waste management Options

User interface

Onsite Collection

Conveyance

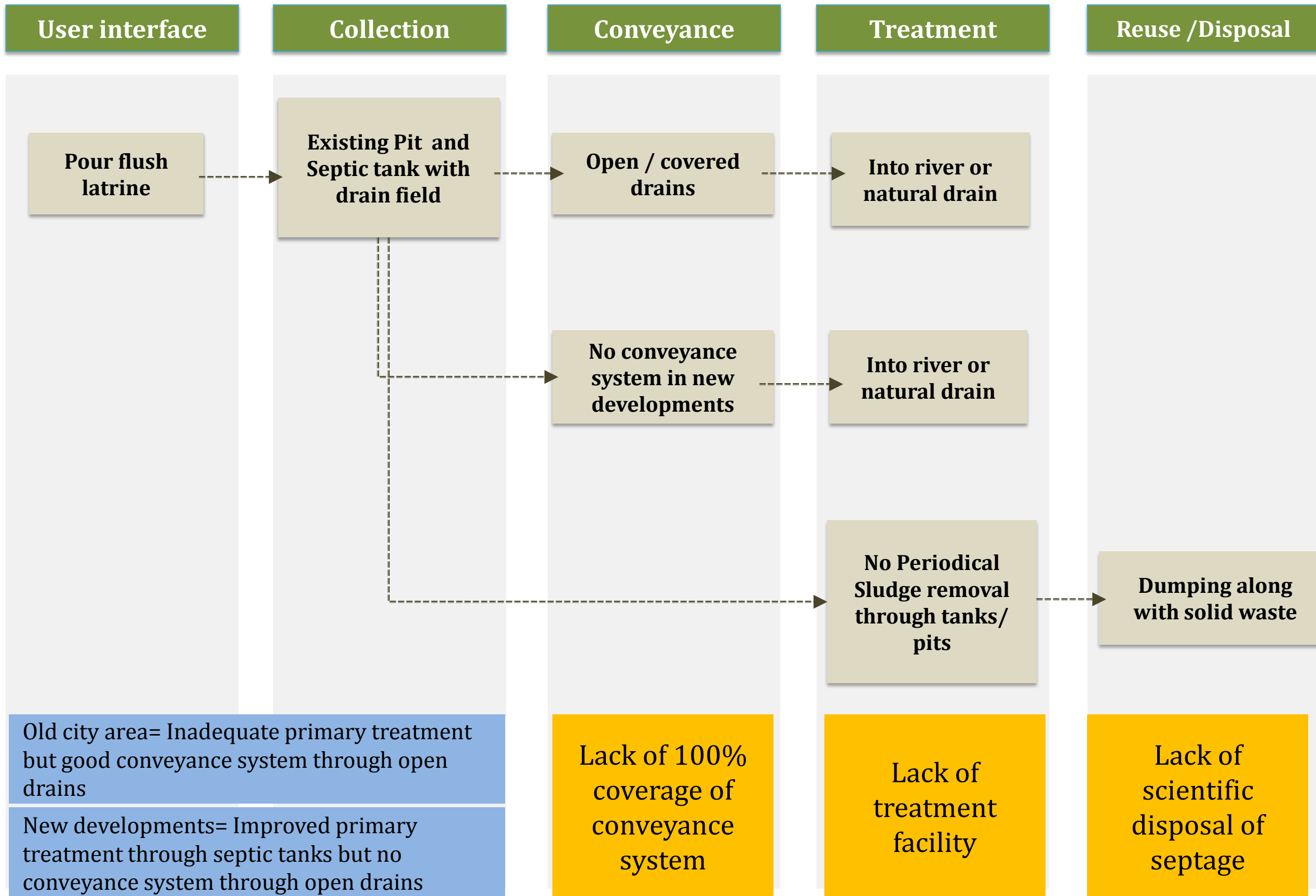
Treatment

Reuse /Disposal

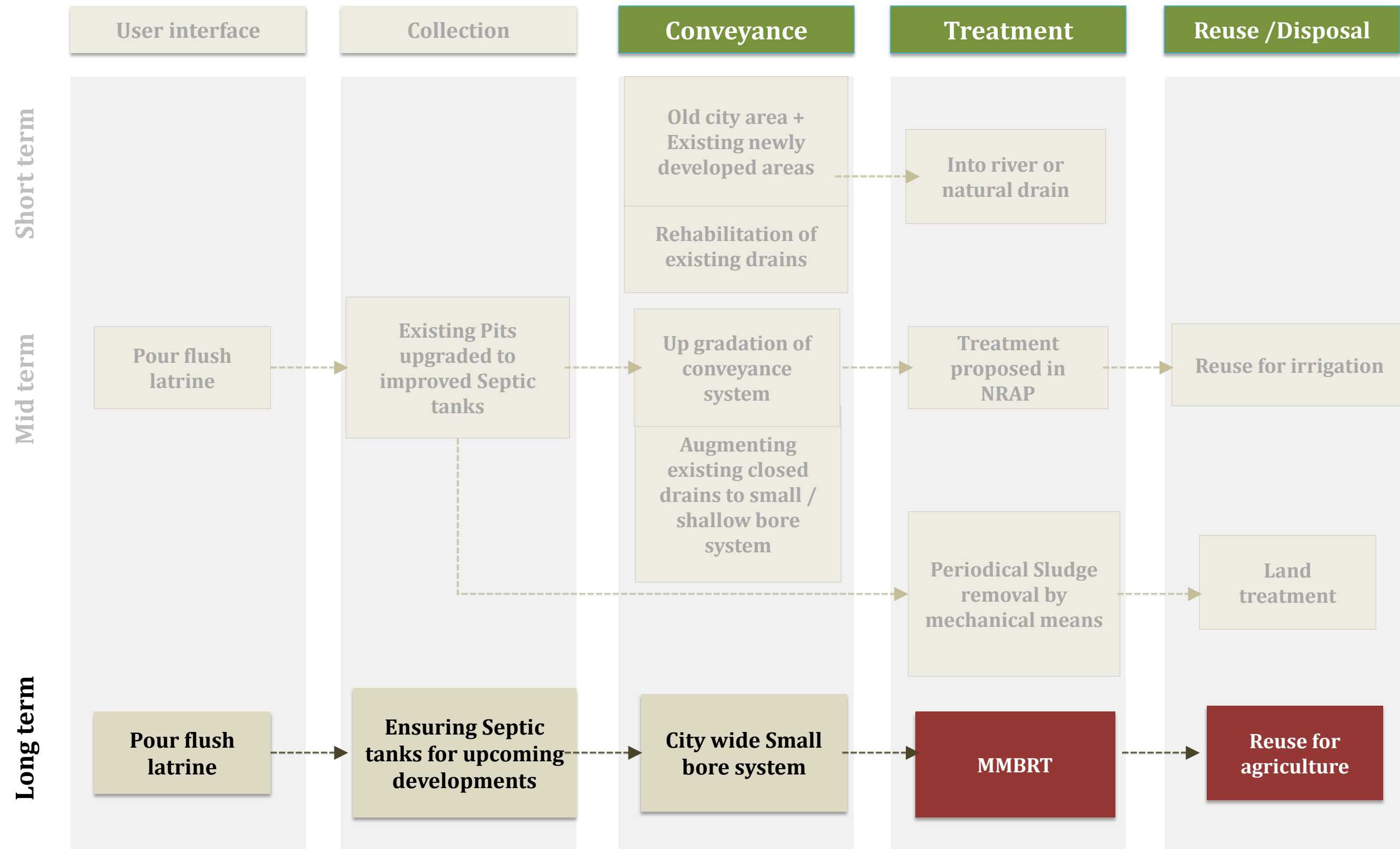
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	Closed Drains + Settled Sewer + NRAP	Closed Drains + Settled Sewer + Interceptor + STP & DEWATs		Closed Drains + Settled Sewer + Small bore Interceptor + DEWATs & STP
	Settled Sewer + NRAP	Settled Sewer + Interceptor + DEWATs		Settled Sewer + Small bore interceptor + DEWATs
	Closed Drains + Settled Sewer + DEWATs	Settled Sewer + Interceptor + STP & DEWATs		Settled Sewer + Small bore interceptor + DEWATs & STP
	Settled Sewer + DEWATS	Simlified Sewer + DEWATs / STP		
	Simplified Sewer + NRAP	Conventional Sewer + STP		Simlified Sewer + DEWATs / STP
	Conventional Sewer + NRAP	Proposed Developing area : Settled Sewer & Simplified Sewer + DEWATs / STP		Conventional Sewer + STP

Existing Liquid Waste Management



Long term Strategies for liquid waste management



Developing need based conveyance system in new areas and connecting to STP

User interface

Onsite
Collection

Conveyance

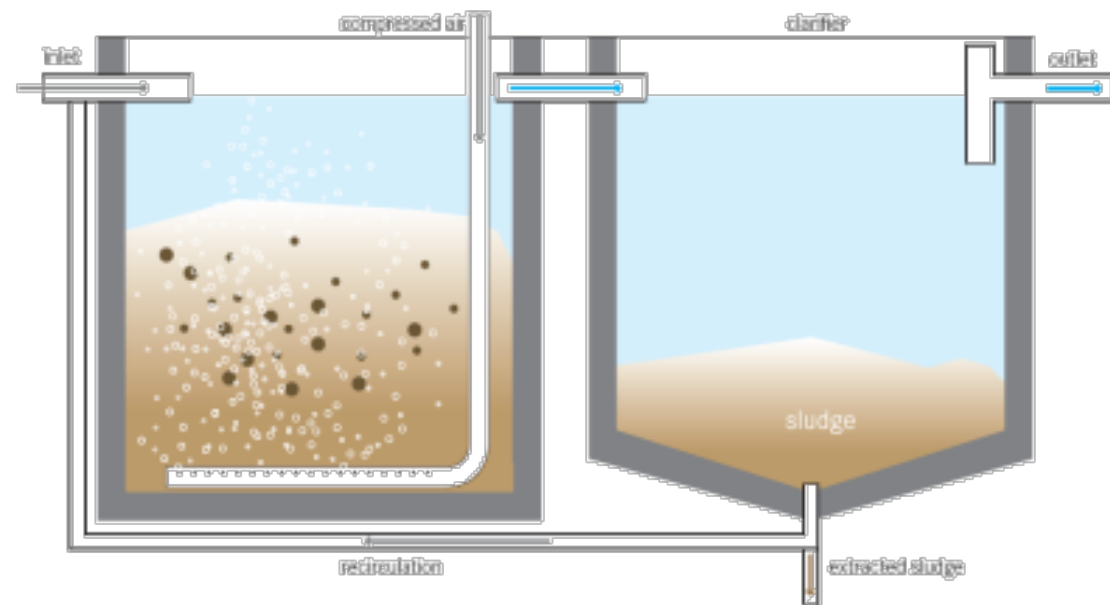
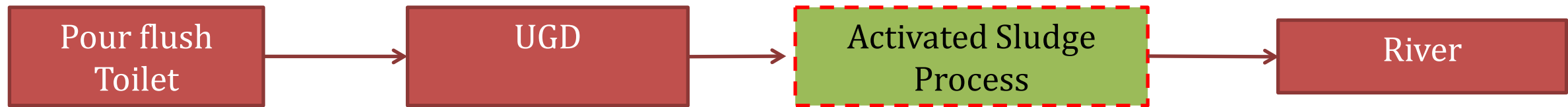
Treatment

Reuse
/Disposal

WASTE MANAGEMENT OPTIONS FOR TREATMENT SYSTEM

Year	Population	Requirement of water supply@135 (MLD)	sewage generation @ 80% of water supply-(MLD)
Census 2011	36053	4.87	3.896
2012	36450	4.92	3.936
Initial Design year 2013	37106	5.00	4.00
Intermediate Design year 2028	43192	5.83	4.66
Ultimate Design Year 2043	54050	7.30	5.84

Option 1- Activated Sludge Process



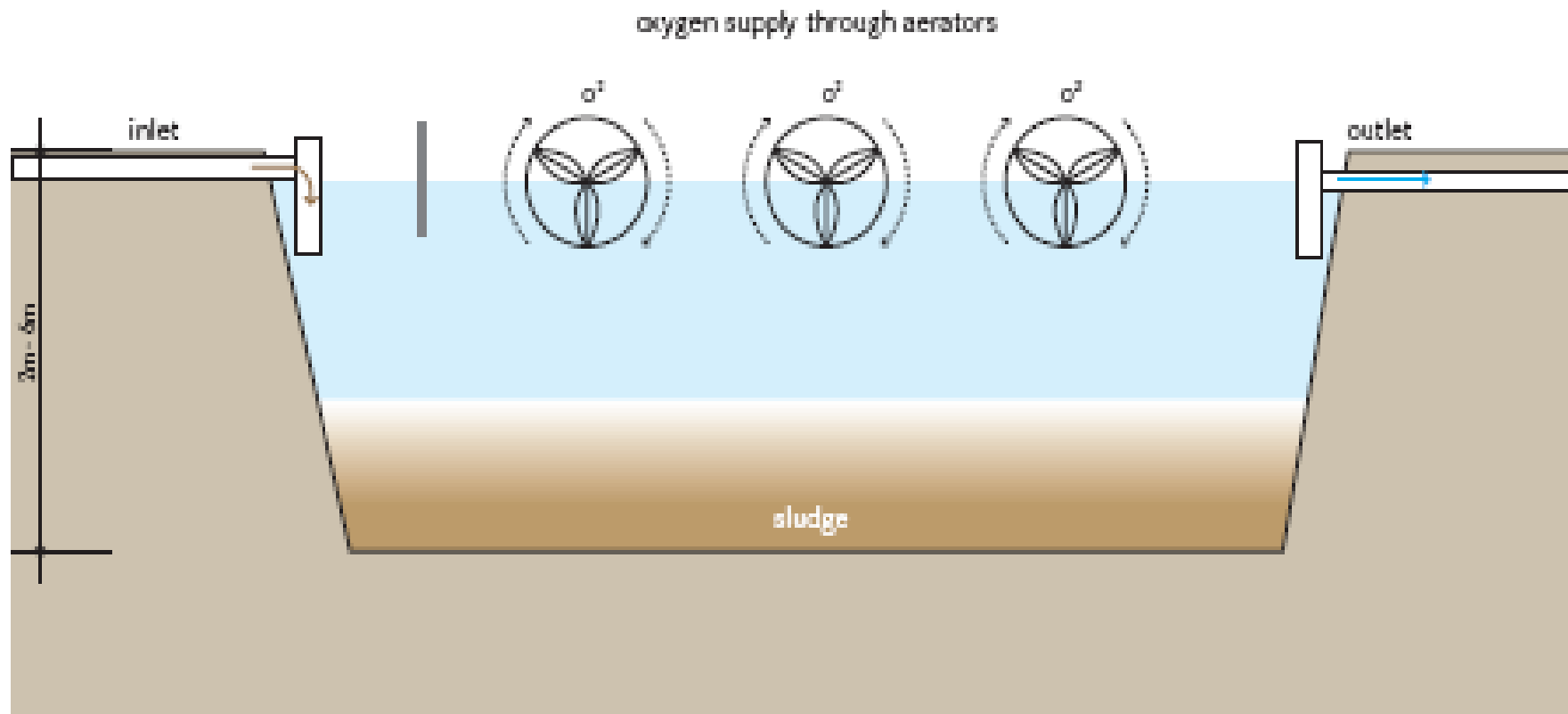
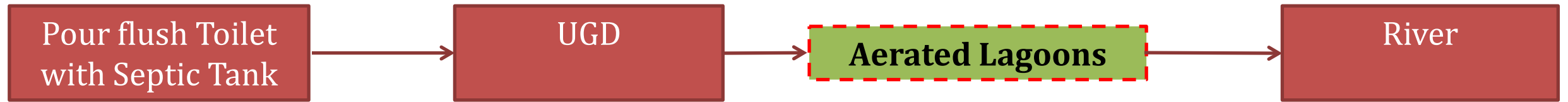
- Requires highly skilled manpower for O&M
- Expensive technology
- Power input is required @ 12-17 (KWH/Capita/Year)
- Equalization of strength of sewage is required to be maintained for efficient functioning of the plant.

PROS AND CONS

- Good resistance against shock loading
- High reduction of BOD and pathogens
- Requires expert design and supervision
- High Capital cost; high operation cost
- Constant source of electricity is required

Because of techno-economic reasons given above this technology is not proposed.

Option 2- Aerated lagoons

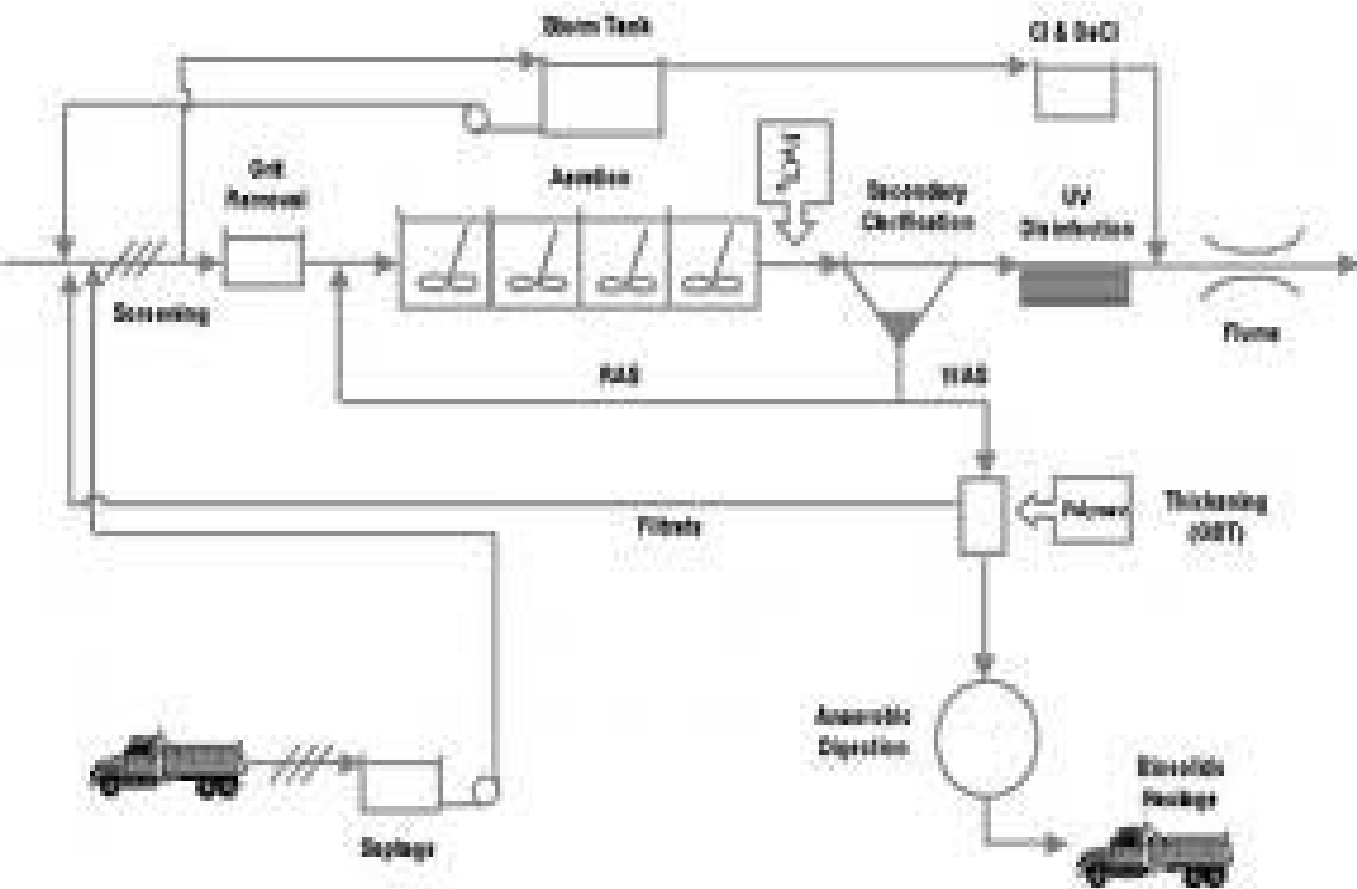
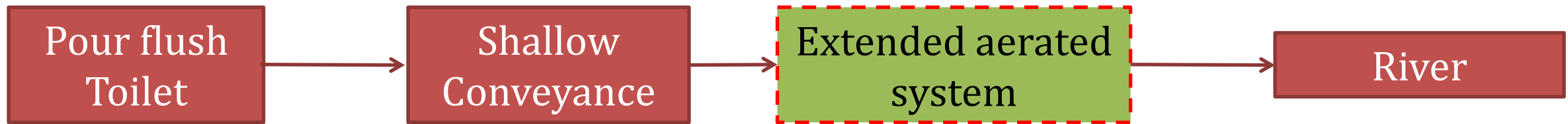


- Implementation will be done in phases as per demand
- Less land requirement as compared to WSP
- Feasible due to availability of land near river side
- Minimal power is required.

Based on the above mentioned points this technology is considered for Wai.



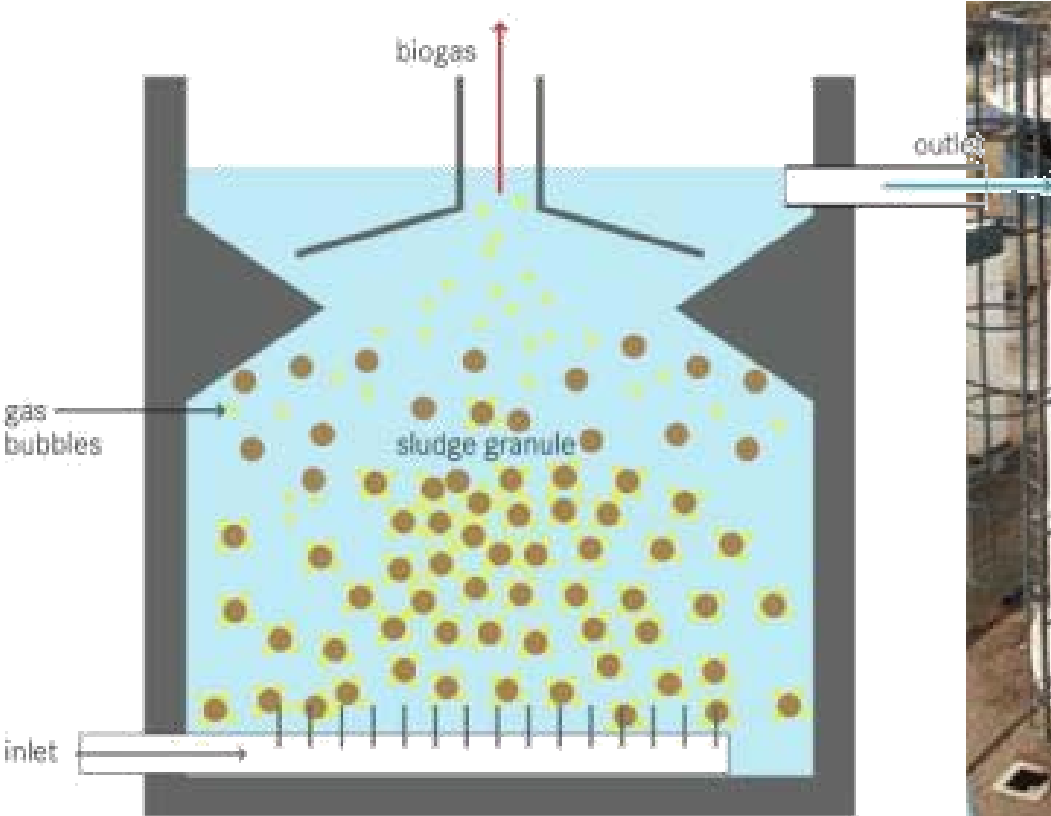
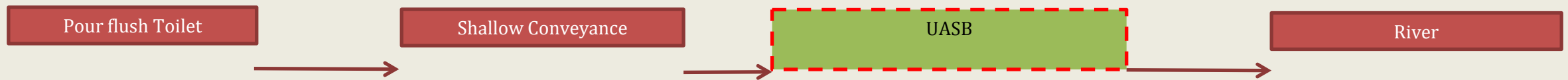
Option 3- Extended aerated system



- Recirculation of return sludge need to be considered and maintained during running
- High capital investment, high O&M cost
- High Process Power requirement about 16-20 KWH/Capita/Year



Option 4- UASB

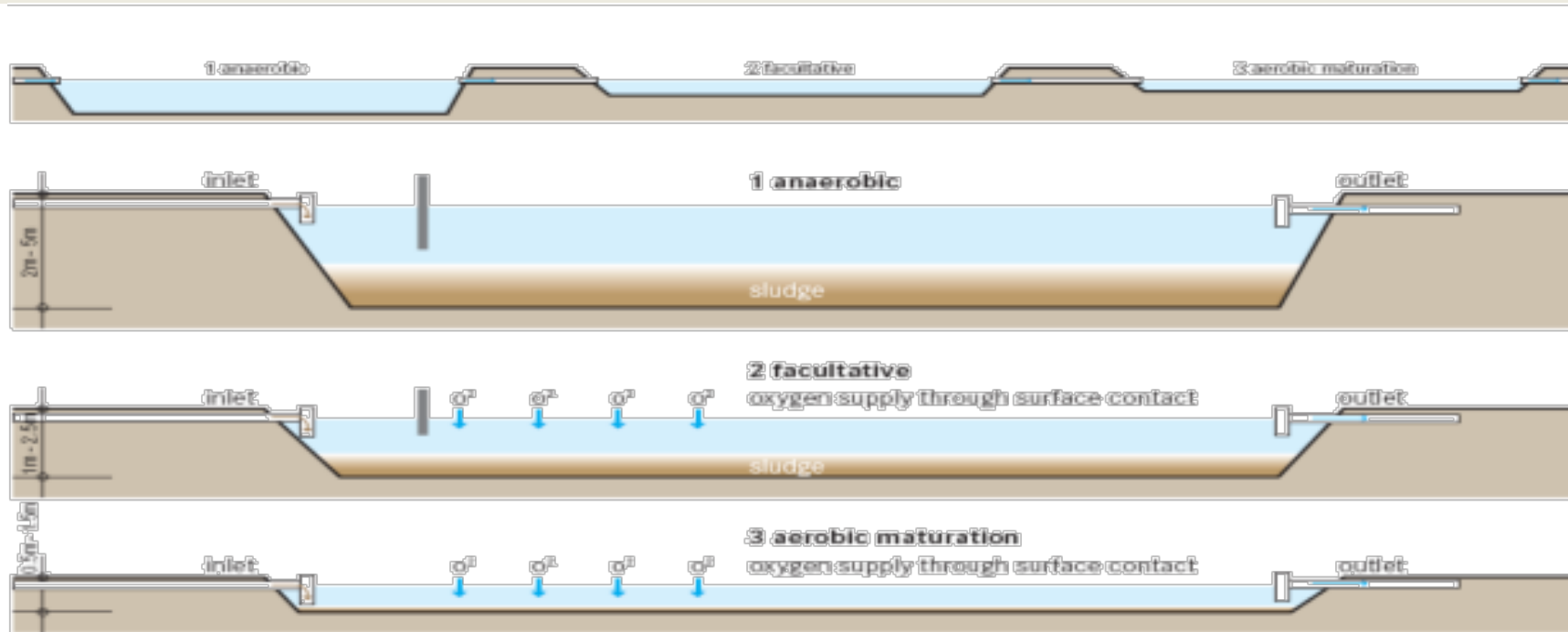
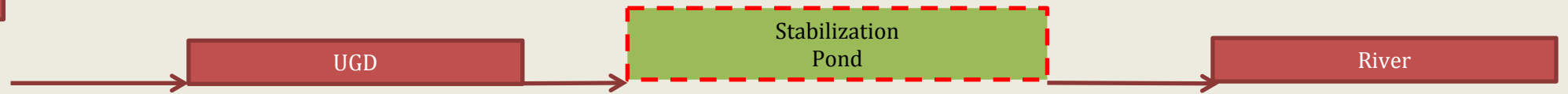


- Used only in case of high BOD (high strength of sewerage like, industrial sewage)
- Once the functioning spots it take long time to get restart
- **High capital investment, high O&M cost**



Option 5- Stabilization pond

Pour flush Toilet with Septic Tank

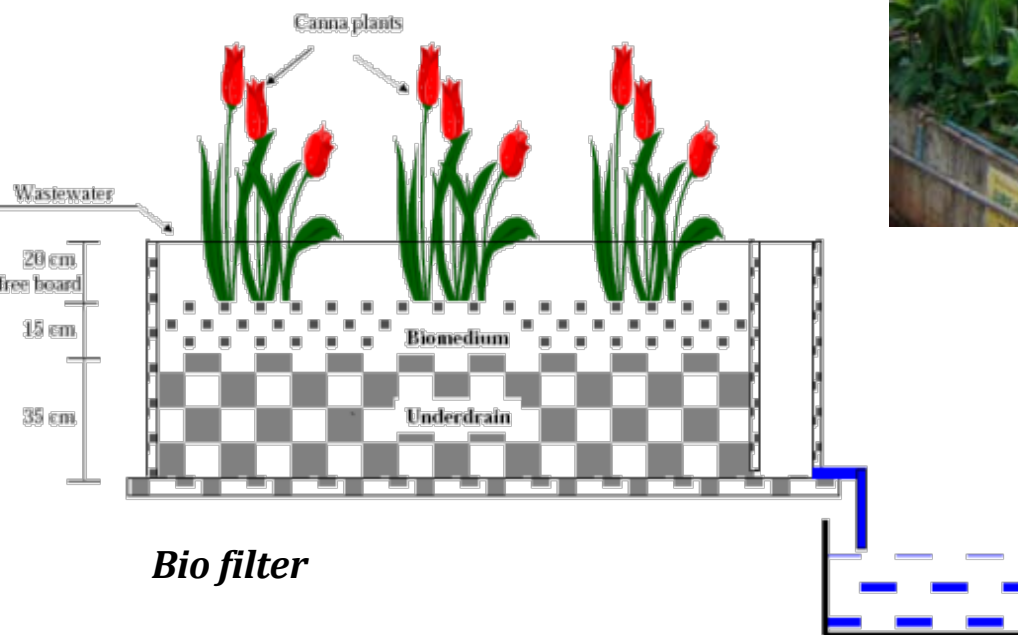
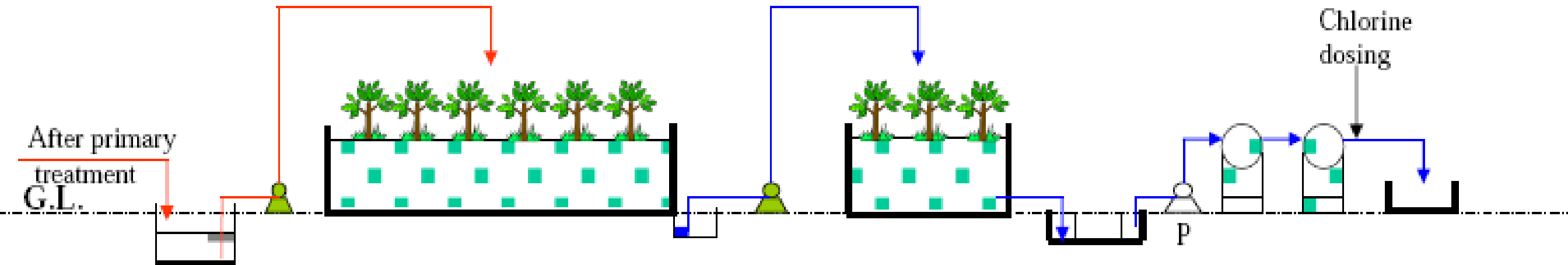
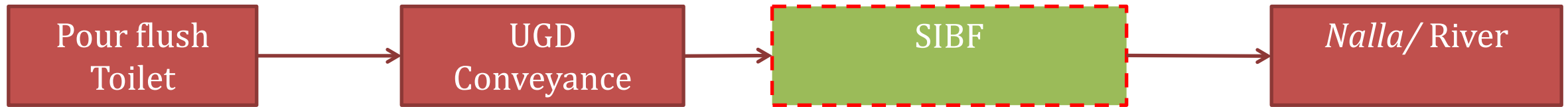


- Most appropriate technology for tropical areas like in India
- Low capital investment
- **No power requirement**
- **Negligible O&M cost, easy maintenance**
- **Huge area required**

Huge land areas required compared to conventional STPs



Option 6- (Solid Immobilized Bio filter) SIBF

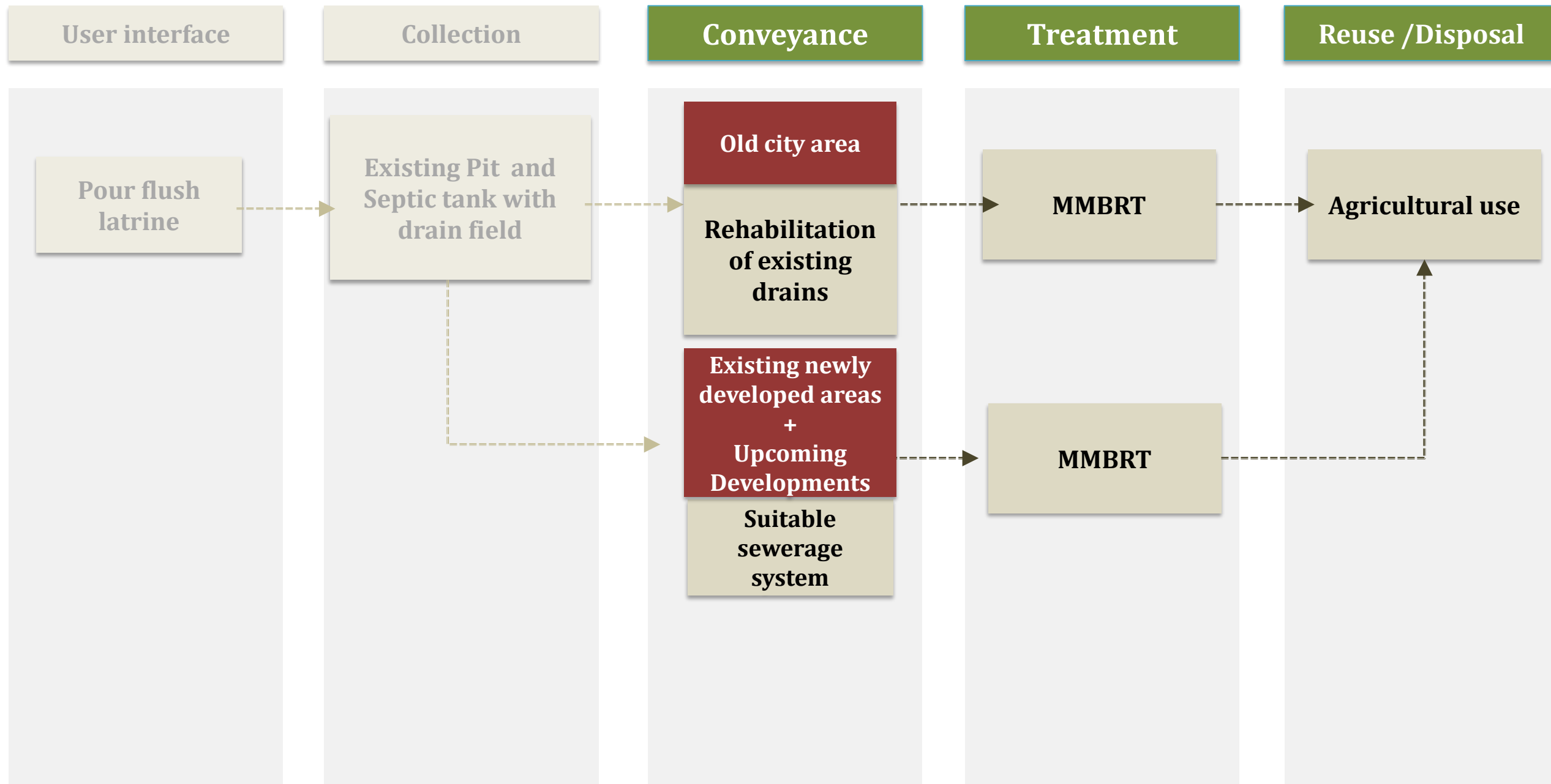


PROS AND CONS

- Does not require continuous electricity
- Low maintenance Cost
- Easy Operation
- Power consumption= 25kwh/ day
- O & M= Rs. 1 lac per annum
- High stabilization time
- Cannot Handle increased organic loads.

Short term Strategies for liquid waste management

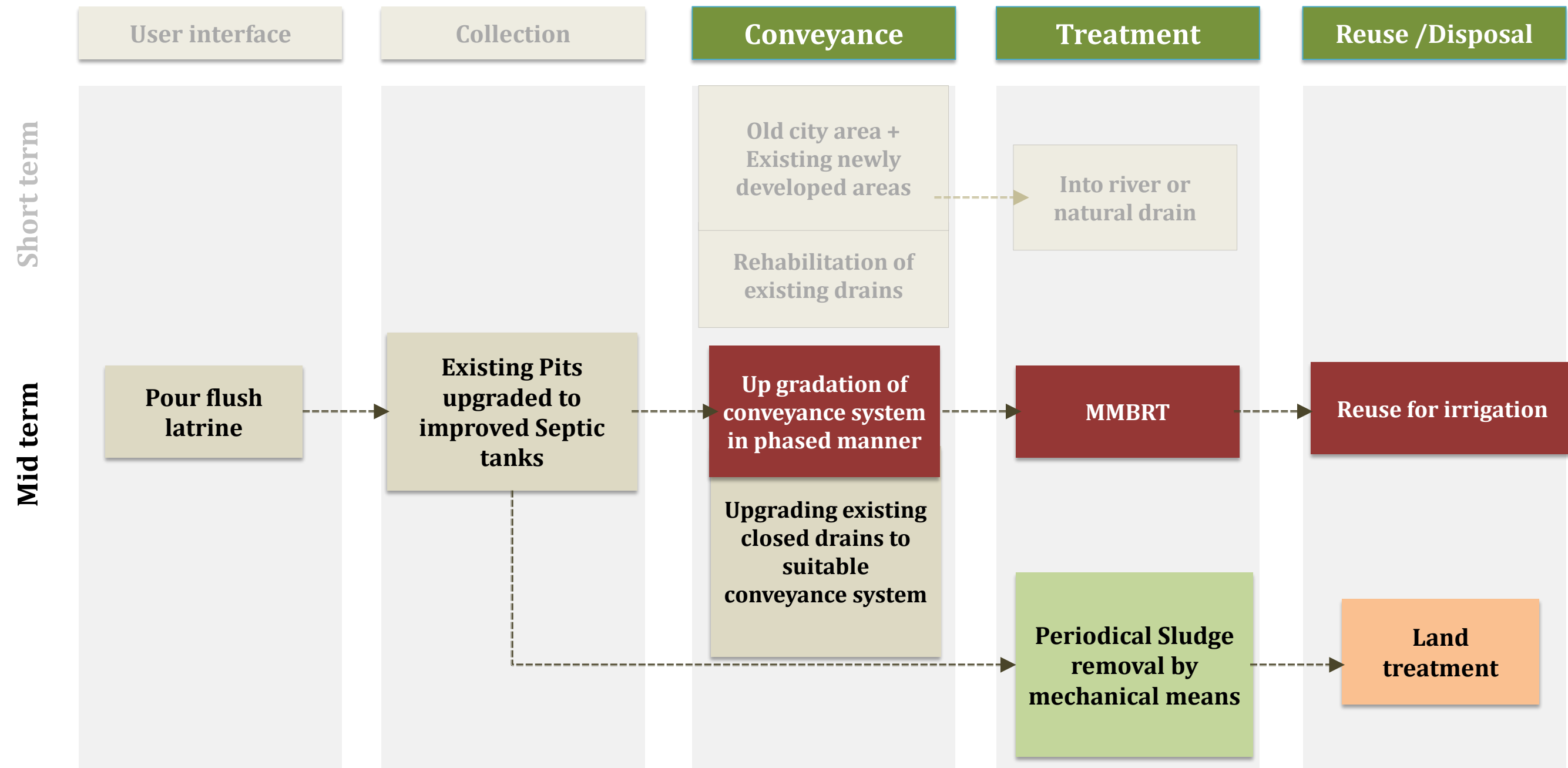
Short term



Augmenting coverage of existing conveyance system

Initiating Pilot demonstration of shallow bore sewer as improved conveyance system in particular area

Mid term Strategies for liquid waste management

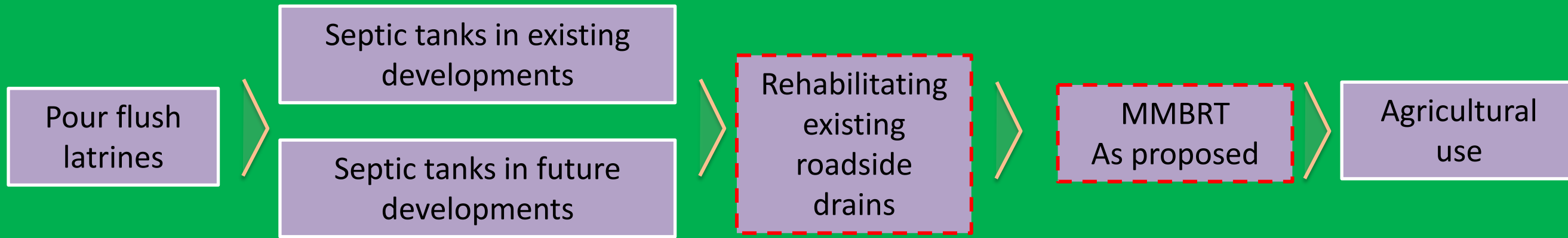


Upgrading existing conveyance system and connecting it to treatment plant proposed under NRAP scheme

Strategies for Wastewater management

Wastewater Conveyance

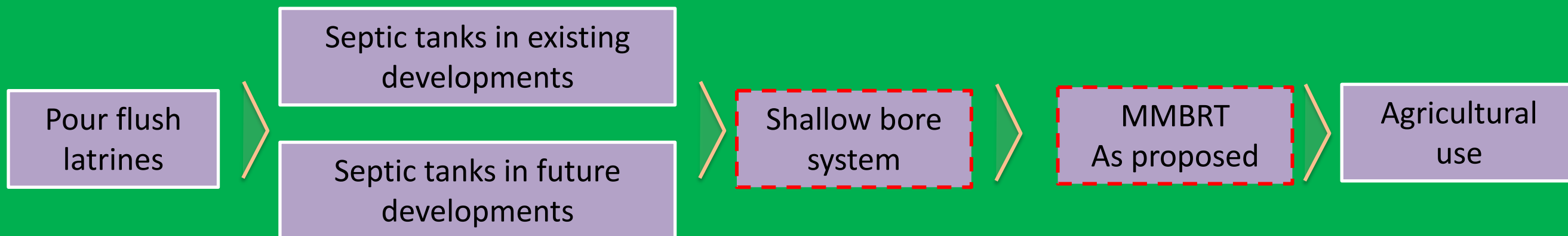
Short Term



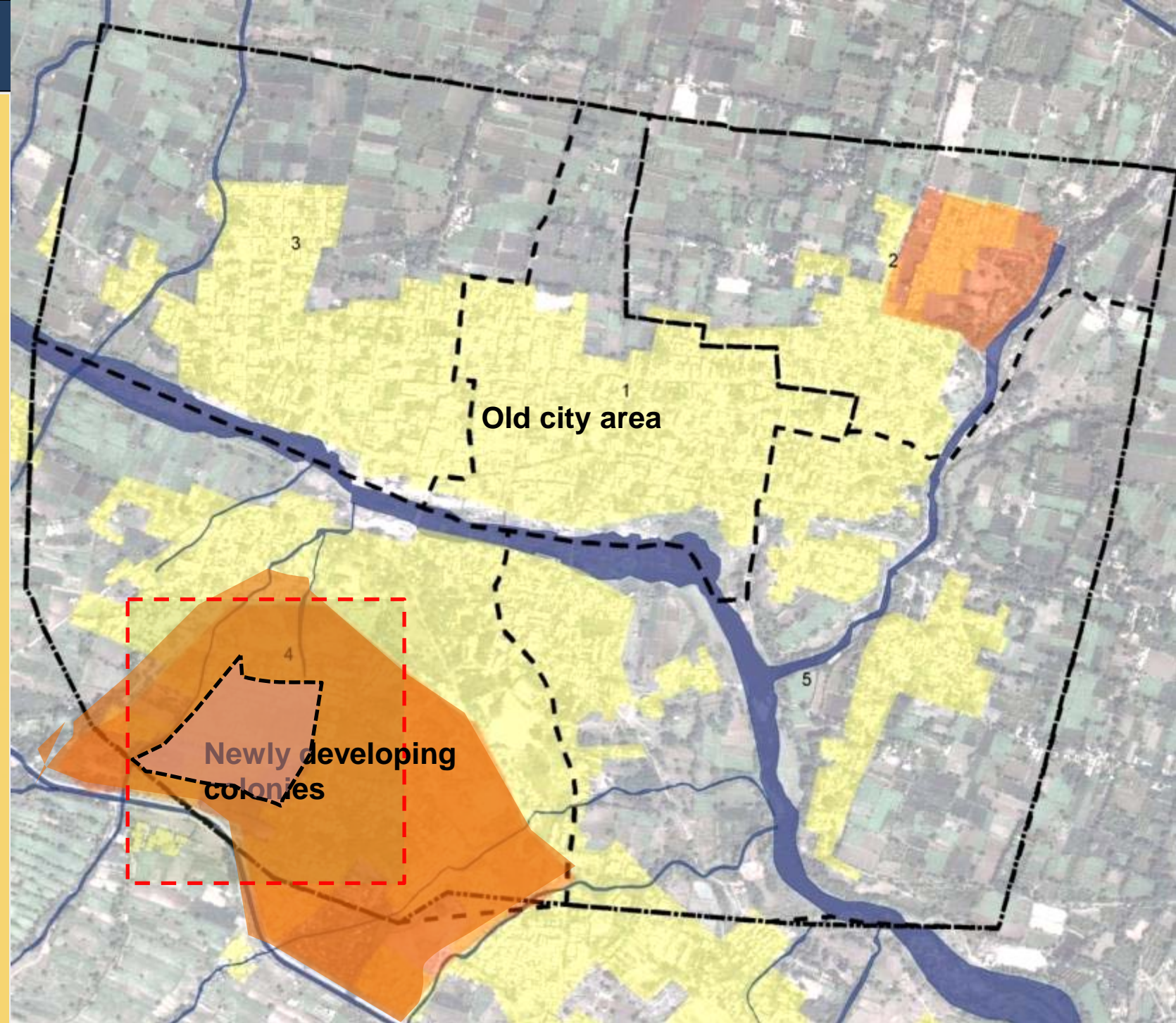
Short/ Mid Term

Initiating Pilot for Implementing shallow bore system in the area which totally lacks any conveyance system

Mid / Long term



Suggested Pilot for Wastewater conveyance system



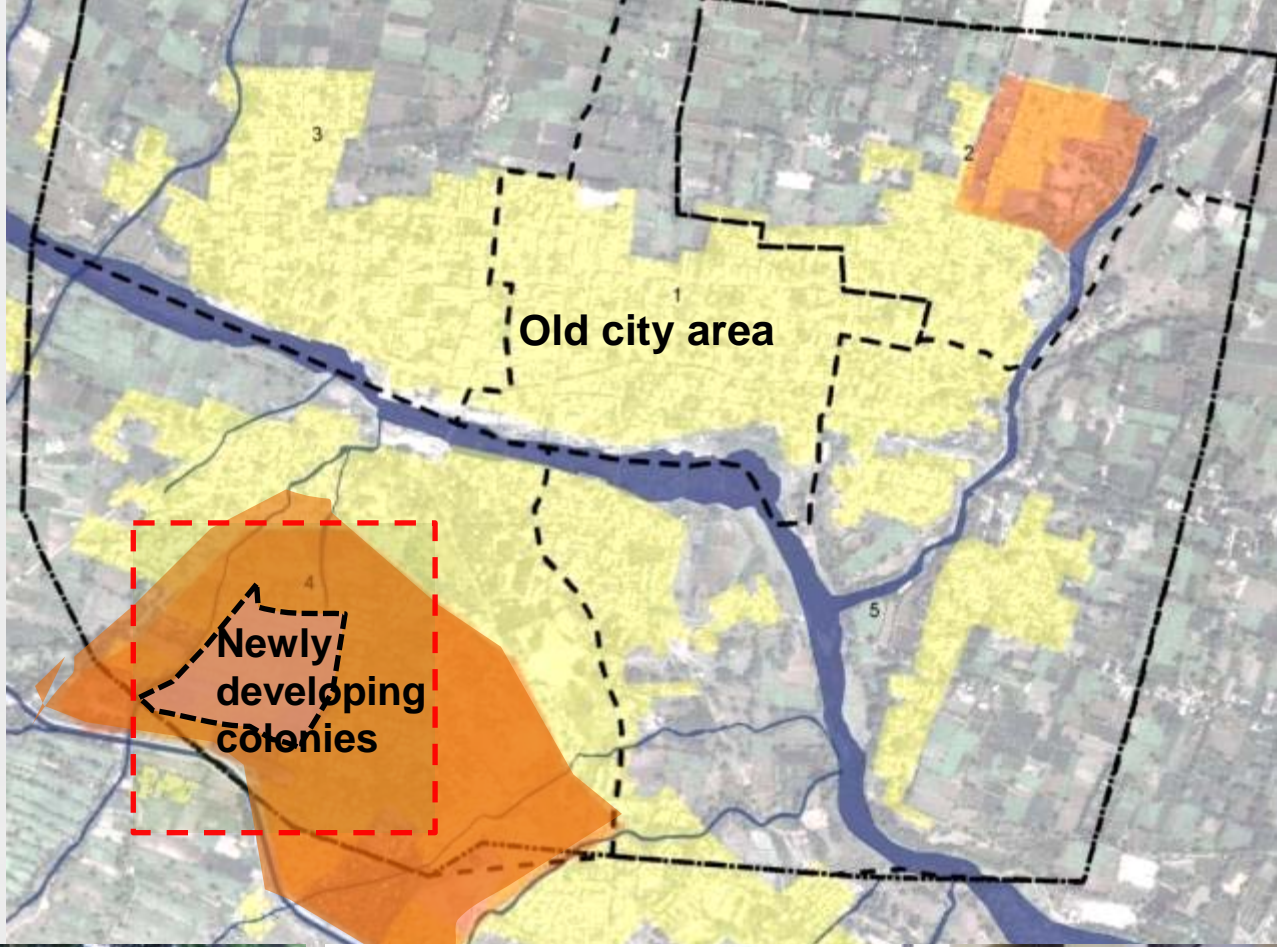
Salient features:

Lack of conveyance network

Onsite treatment through improved septic tanks in new constructions

Connecting to proposed NRAP scheme for treatment

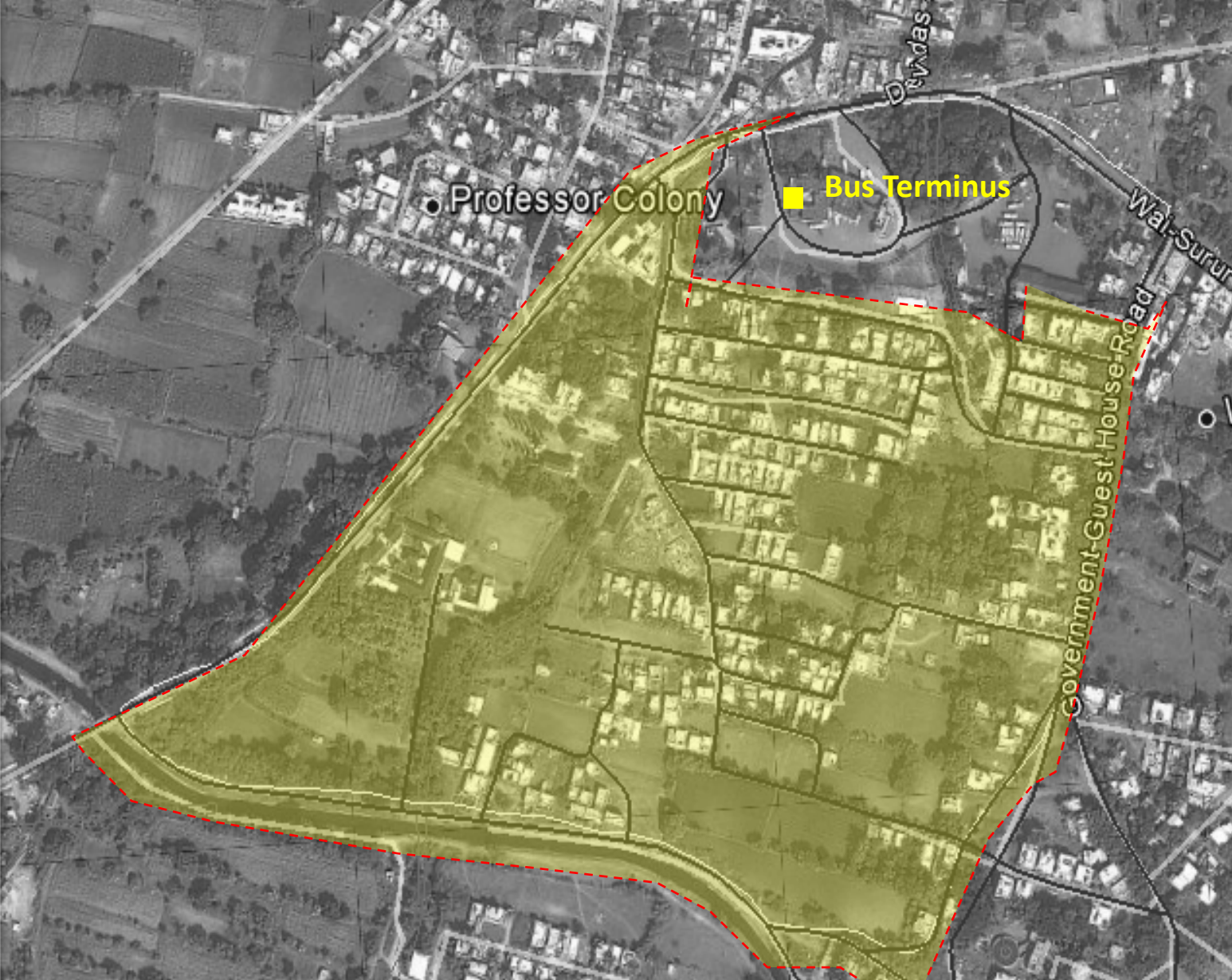
Glimpses of Pilot area



Pilot for developing waste water conveyance system

Specifications	
Newly developing area in	Prabhag 04
Population	1025 approx.
Households	205 approx.
Road length (m)	3500
Existing length of drain (m)	5500
Estimated waste generation (considering 80% of 135 lpcd)	0.13 MLD
Existing conveyance system	No drains
Coverage of Existing	0%

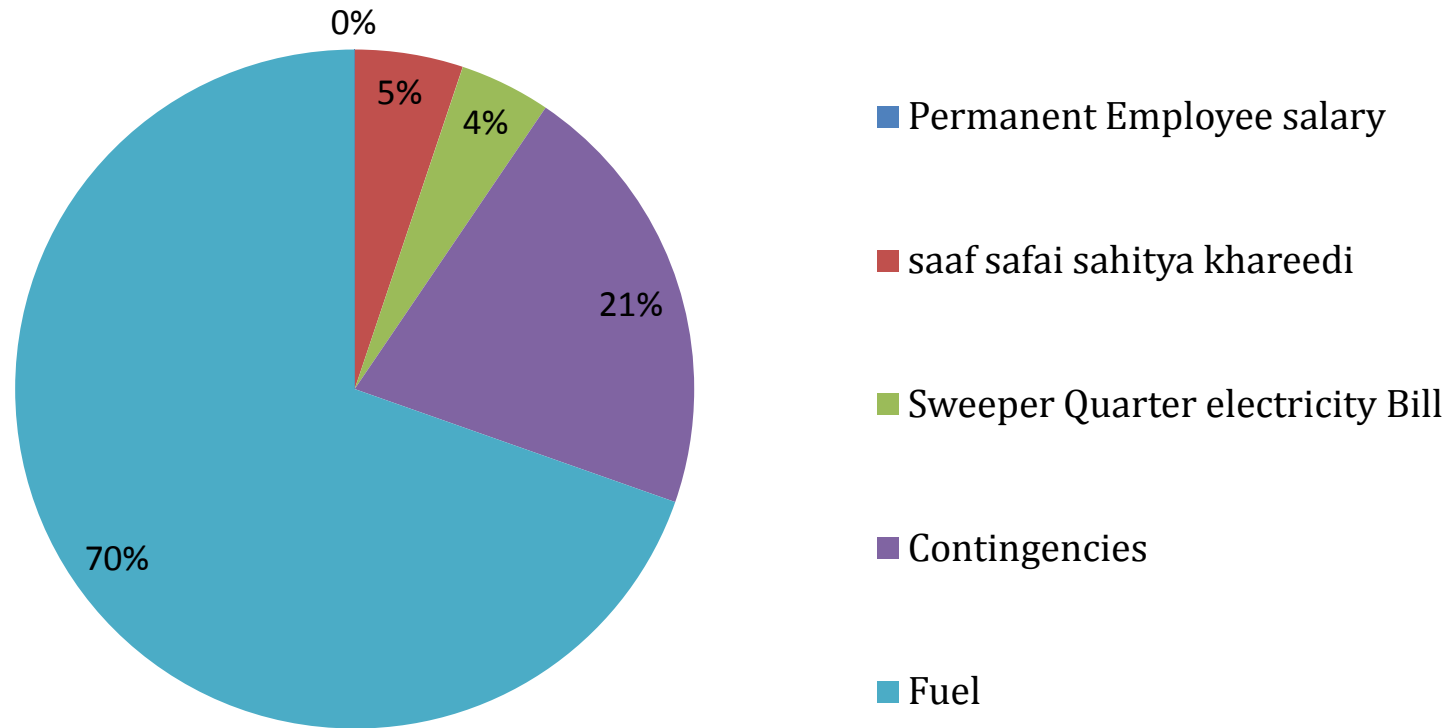
Area delineated for pilot implementation of small bore



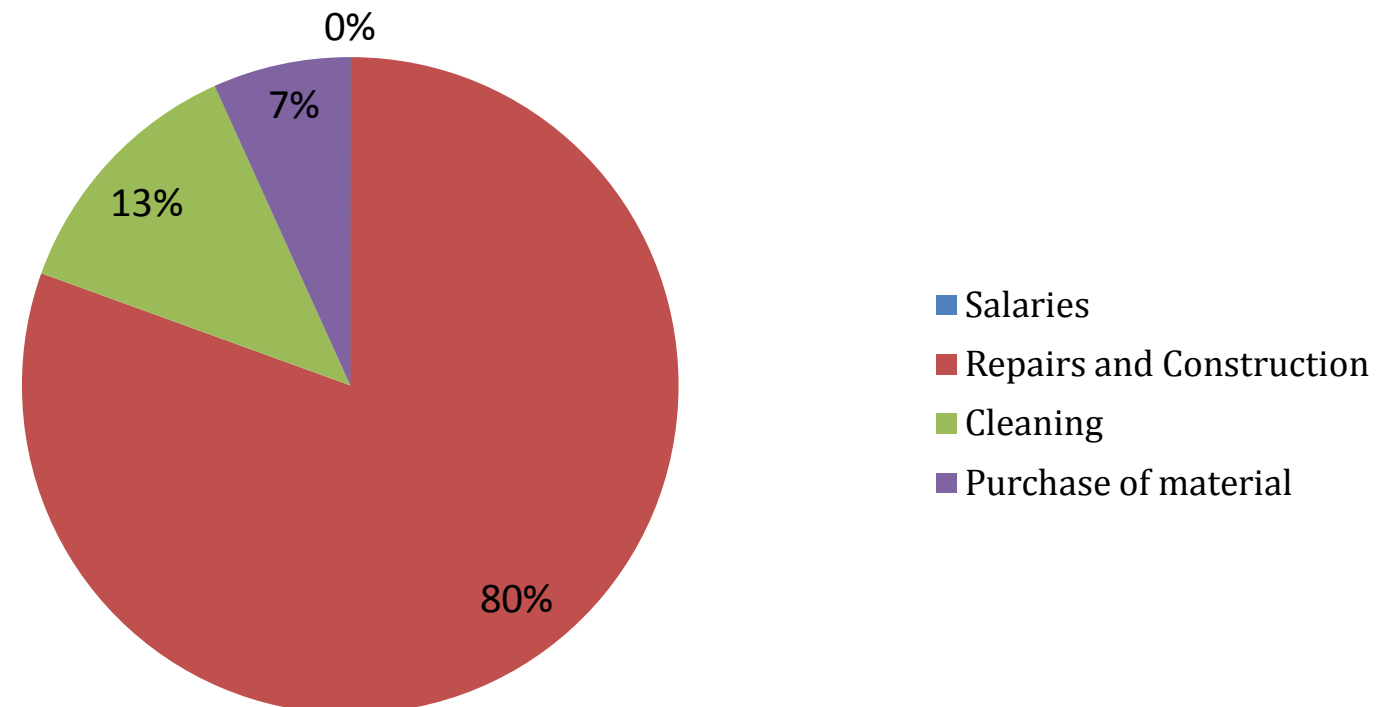
Specifications	Length (per meter)	Unit cost (per meter)	Total cost (INR)
160 mm dia. RCC NP2 Pipe connecting septic tank and main sewer line (3 meter line for each HH)	600	7000	0.42 Cr.
200 mm dia. RCC NP2 pipe (main sewer) including excavation up to 1.2 m, provision of vents, Provision of clean outs and manholes at intervals	5500	10000	5.50 Cr.
Total			5.92 Cr.

Municipal Finance- Existing Status

Expenditure in General Conservancy

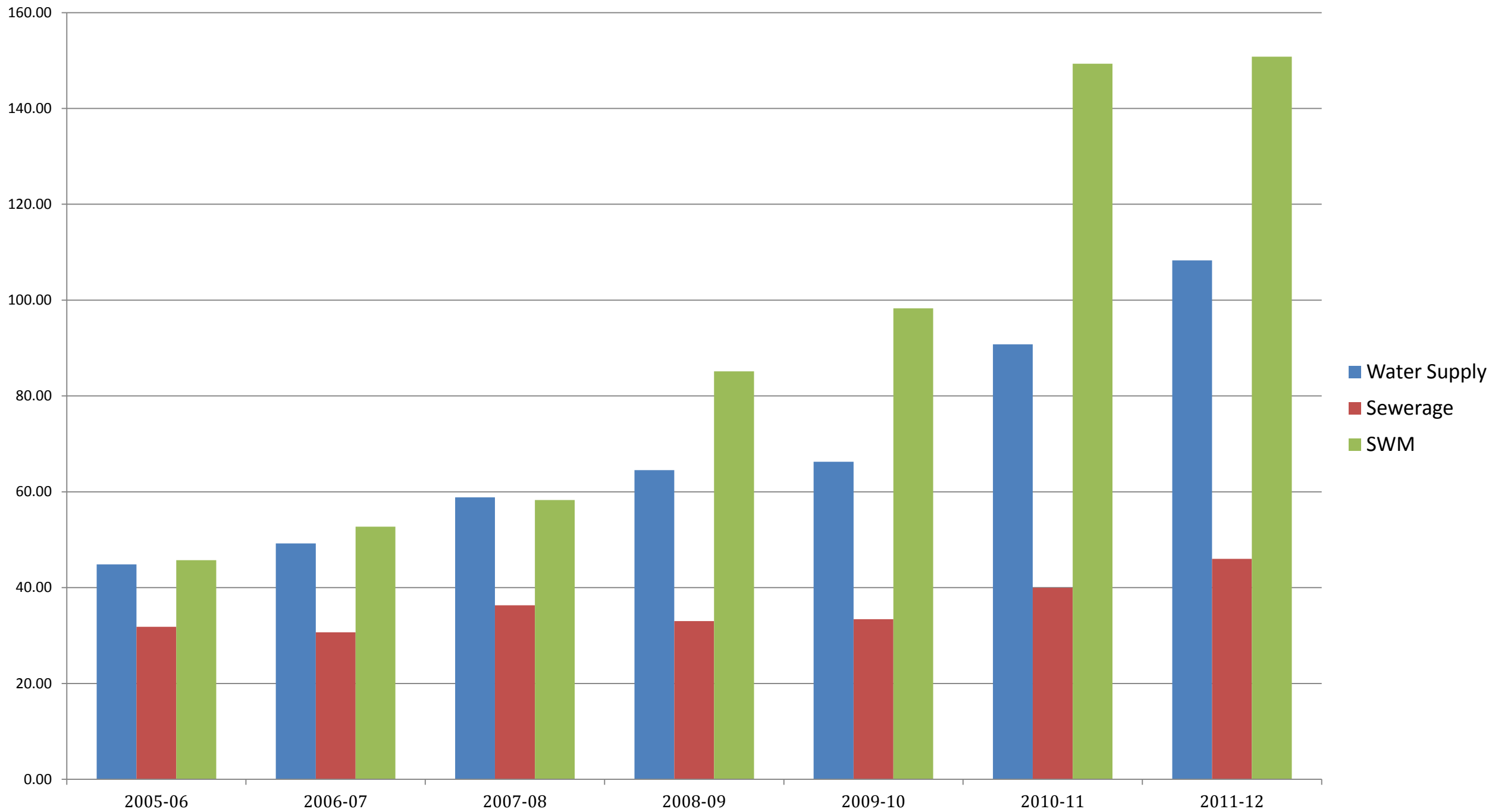


Revenue Expenditure in Drainage sector



Municipal Finance- Existing Status

Expenditure on Water and Sanitation



Scenario-1:Business-as-usual

Assumption

Performance of the ULB remains the same in future.

Scenario-1 Cash Flows

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Revenue Income	570.99	552.62	732.53	779.85	830.23	883.86	940.96	1001.75	1066.46	1135.35	1208.70	1286.78	1369.91	1458.40	1552.62
Debt Service	15.26687	14.57334	19.71267	19.01913	18.32558	17.63205	16.93853	14.91529	14.38113	13.84697	13.50515	12.72862	12.24444	8.6989	8.36403
Balance available for investment	(79.88)	(68.63)	(190.00)	(323.00)	(489.24)	(695.80)	(951.19)	(1264.36)	(1650.48)	(2122.92)	(2699.74)	(3401.82)	(4255.72)	(5289.16)	(6545.76)
Capital Surplus/Deficit	8.25	415.25	48.73	21.25	-28.94	-58.22	-73.57	-79.82	-80.28	-77.21	-72.12	-66.02	-59.56	-53.14	-47.03

Conclusion

From the above table, it is clear that if Wai Municipal Council is not able to increase its revenue income, **it would have to depend on external funding just to finance its operations and routine capital expenditure.**

Scenario-2: Improved Case

Key Assumptions

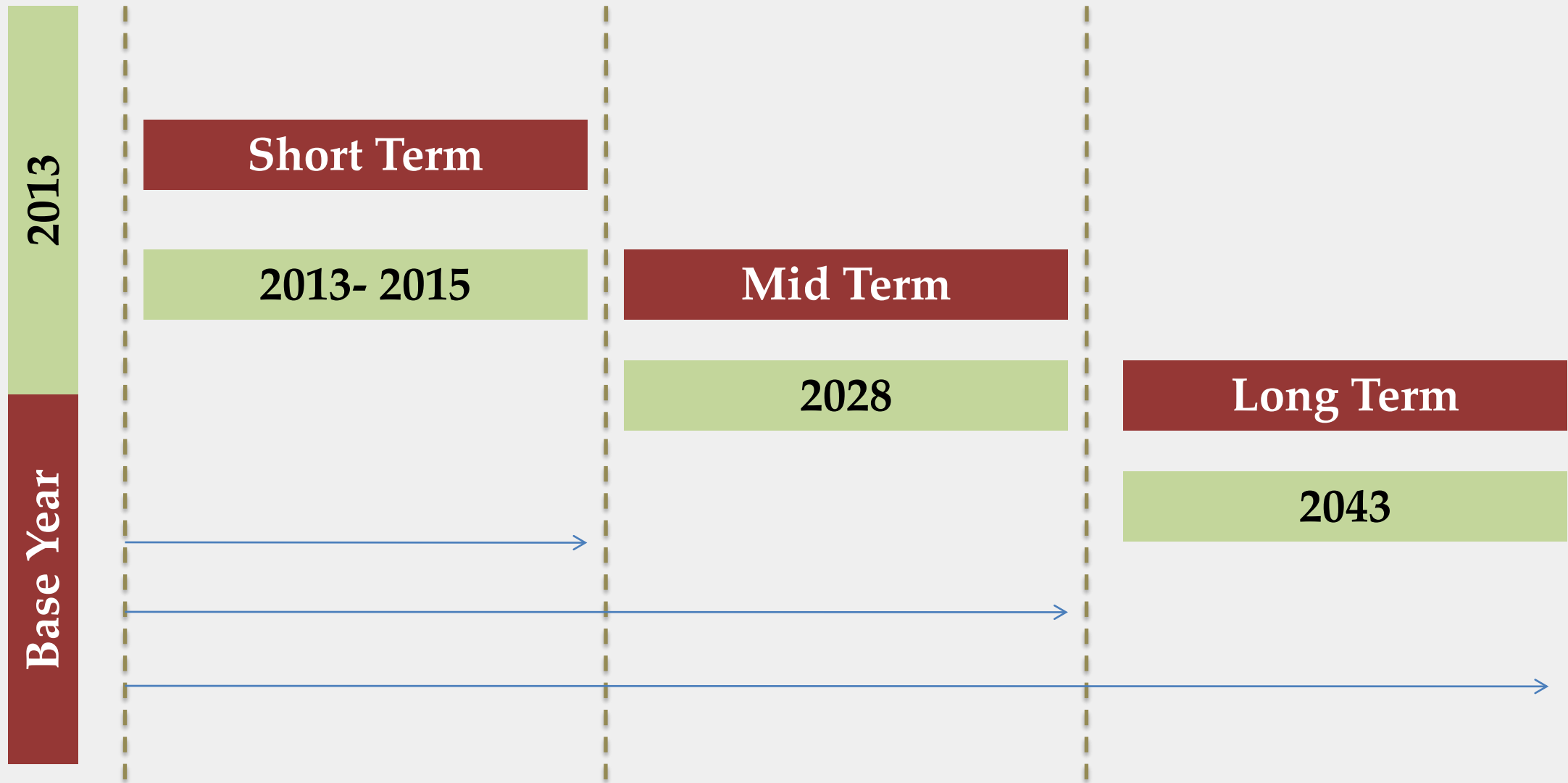
Implications

S. No.	Item	Assumption
1	Property Tax revision in 2011-12	Property rates revised by the council in 2011-12, resulting in 25% increase
2	Introduction of door-to-door collection charge	Rs.30 (willingness to pay survey)
3	Introduction of drainage tax	At 5% the existing property tax rates.

As a contribution of the added d-2-d collection charge and drainage tax, the investible surplus moderately increases from the base.

Year	Investible Surplus (INR lacs)	Door-to-door collection charge(INR lacs)	Drainage Tax at 5%(INR lacs)
2009-10	--	--	3.8
2010-11			4.5
2011-12	(139.27)	45.5	5.3
2012-13	(324.05)	45.9	5.8
2013-14	(516.36)	46.3	6.5
2014-15	(755.92)	46.7	7.3
2015-16	(1032.62)	47	8.1
2016-17	(1594.03)	47.4	9.1
2017-18	(2065.02)	47.8	10.1
2018-19	(2640.27)	48.2	11.8
2019-20	(3340.64)	48.6	12.6
2020-21	(4192.58)	49.1	14.0
2021-22	(5223.99)	49.5	15.7

Phasing Plan



Short Term	Addressing the immediate problems and needs
Mid Term	Augmentation of infrastructure and service delivery
Long Term	A contextual approach based on development pattern

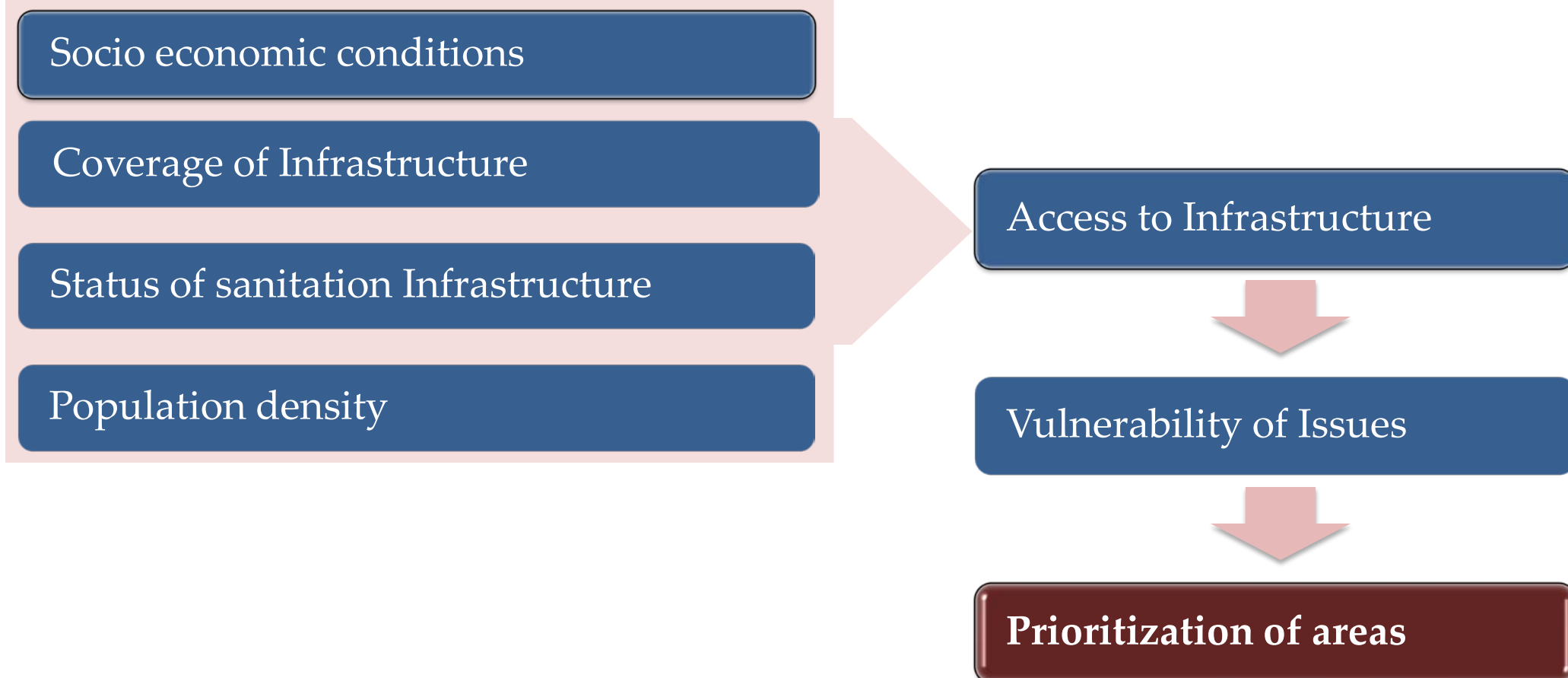
Implementation of plan through piloting & Scaling up

Demonstration of strategies as indicated through CSP

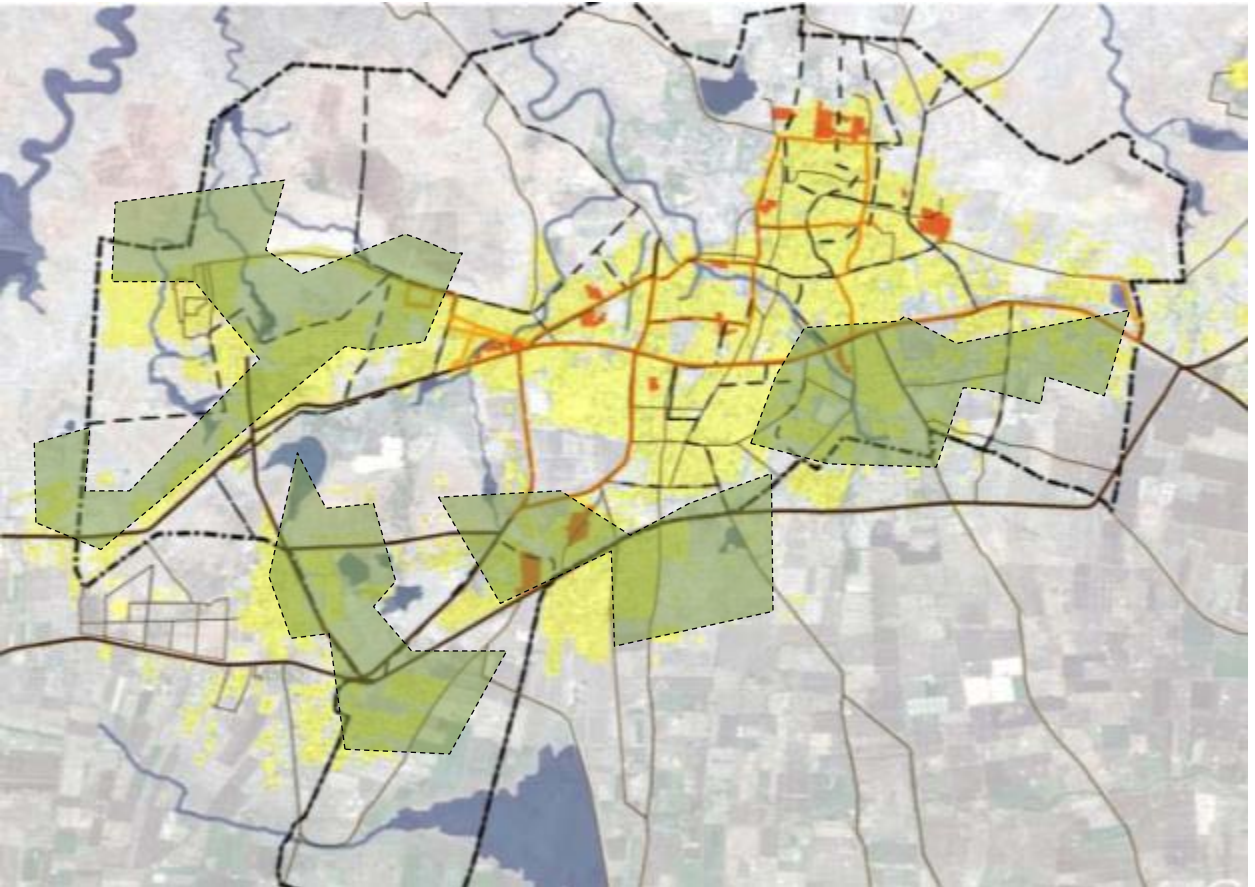
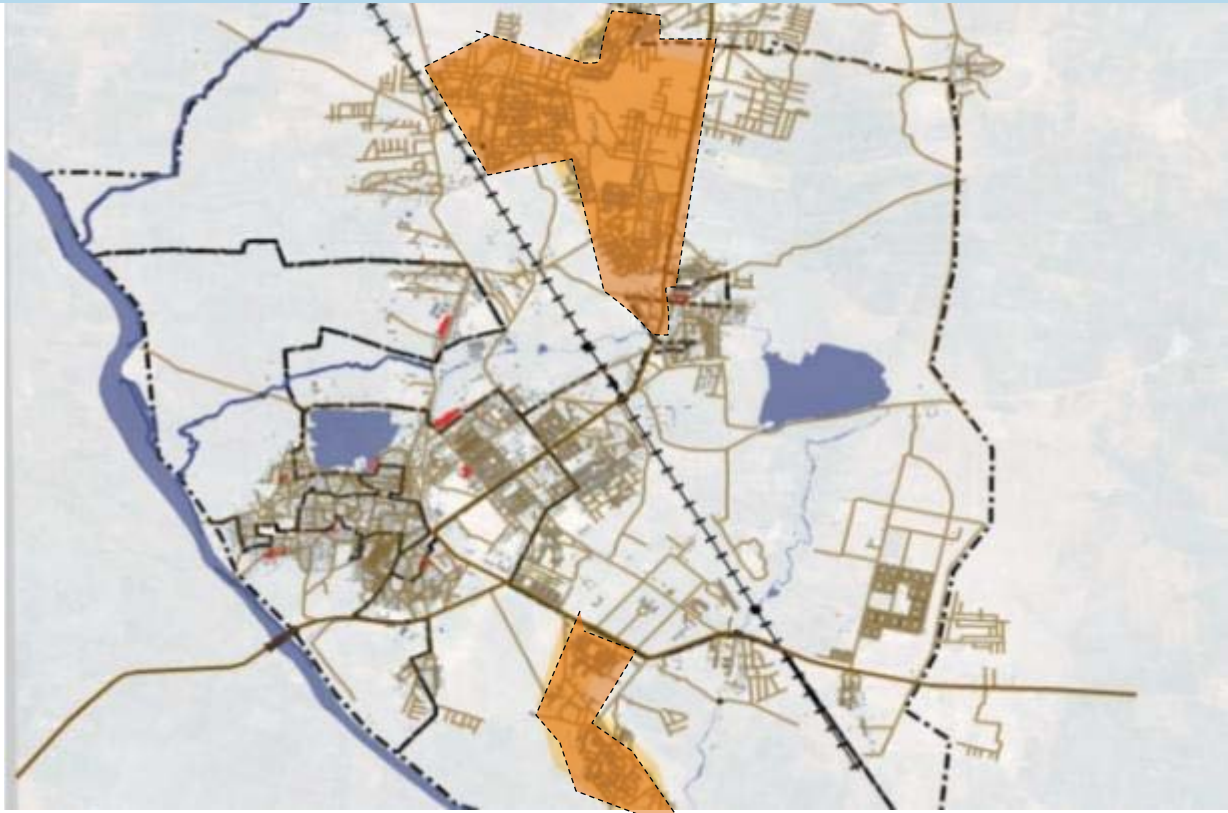
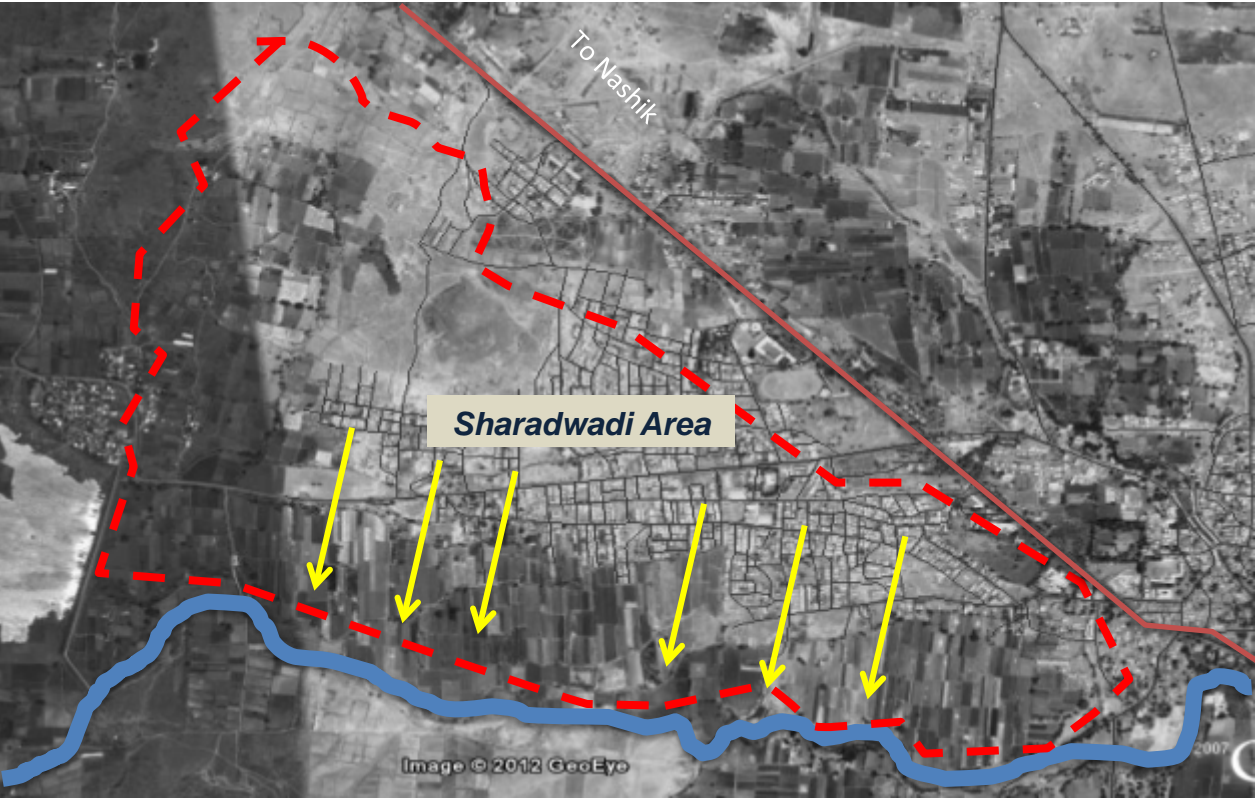
Addressing vulnerable/ sensitive areas and sanitation issues

Develop immediate remedies to deal with the sanitation problem within limited financial resources timeframe

Assess possible scaling options and replication of ideas



Implementation of plan through piloting & Scaling up



Nuggets:

Approach towards Sanitation

Stakeholder involvement needed in developing holistic solutions and not only in addressing the existing issues/ problems

Identifying target areas

More weightage to be given on assessment of existing/ proposed schemes and synchronization of them while drafting sanitation improvements

A mind set development- Service based and not A project based!

Exploration needed to review Possibilities of enhancing own sources and reduce dependency on grants

A critical review of contract management and its outcome in terms of service delivery

Thank You