URBAN reSOURCES

Banking on cities for secondary resources to release the pressure on natural environment and progress towards Environmentally Sustainable urban integrated systems

P5 Presentation | 05-07-2019

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PROBLEM ANALYSIS

RESEARCH QUESTION

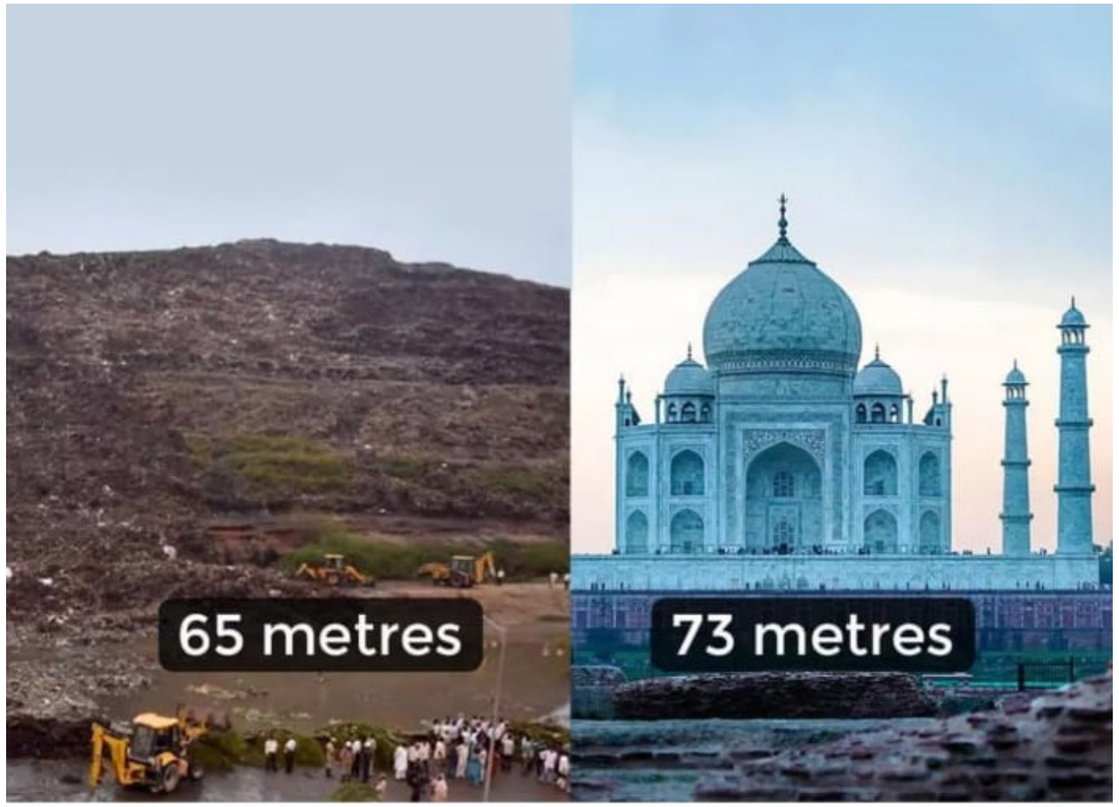
ANALYSIS

VISION

STRATEGY

PROJECTS

CONCLUSION



India's tallest garbage mountain to be higher than Taj Mahal in 2020

Chennai
Population - 7.08 million

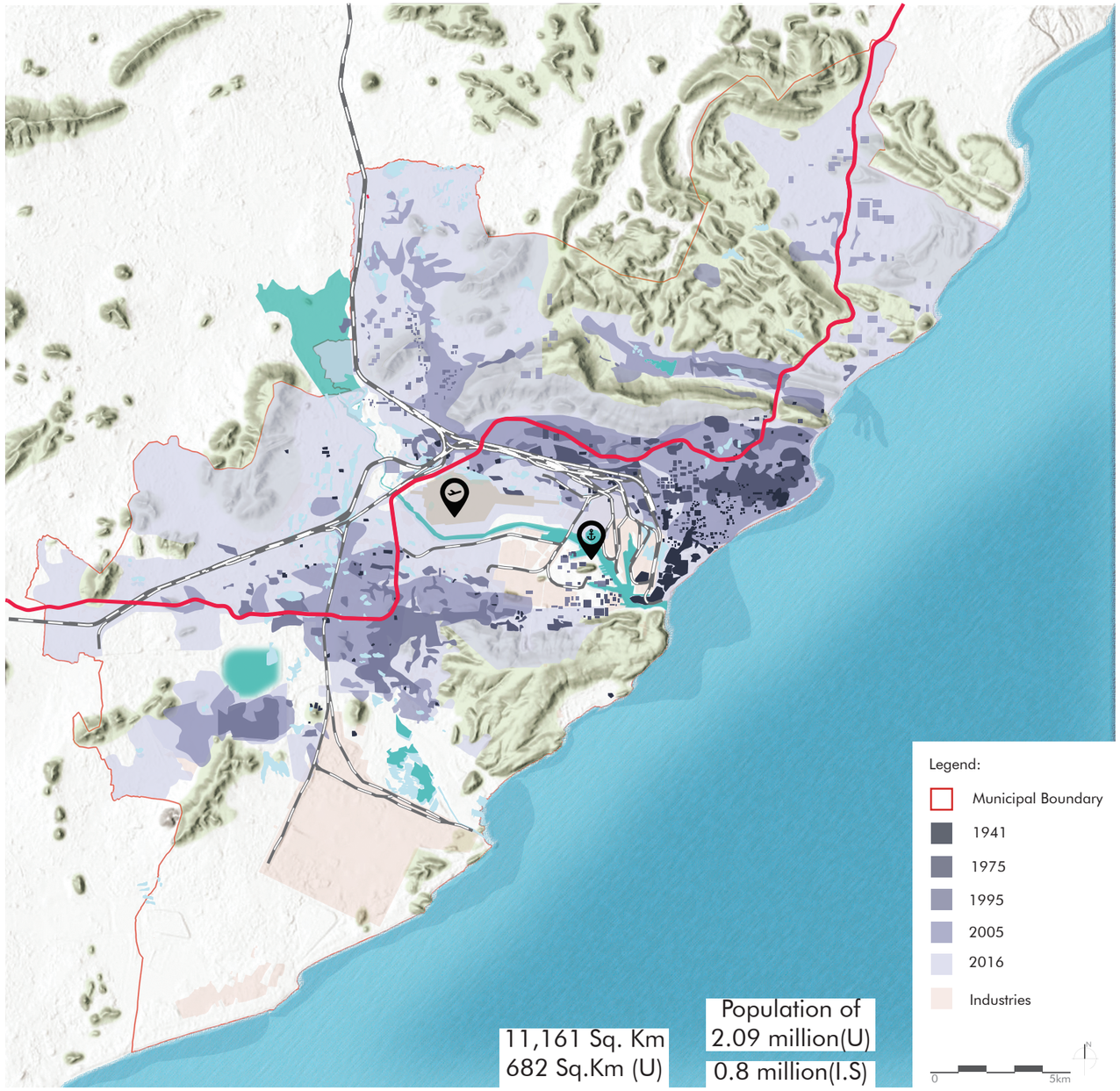
Delhi
Population - 18.98 million

https://www.forbes.com/sites/marshallshepherd/2019/07/01/why-chennai-is-running-out-of-water-in-2-satellite-images-and-an-explanation/#6509271a29b4

https://www.thehindu.com/news/cities/Delhi/ghazipur-landfill-mountain-will-be-taller-than-the-taj-mahal/article27520156.ece

Visakhapatnam
Population - 2.09 million

VISAKHAPATNAM



Port City

Industrial City

Naval Headquarters

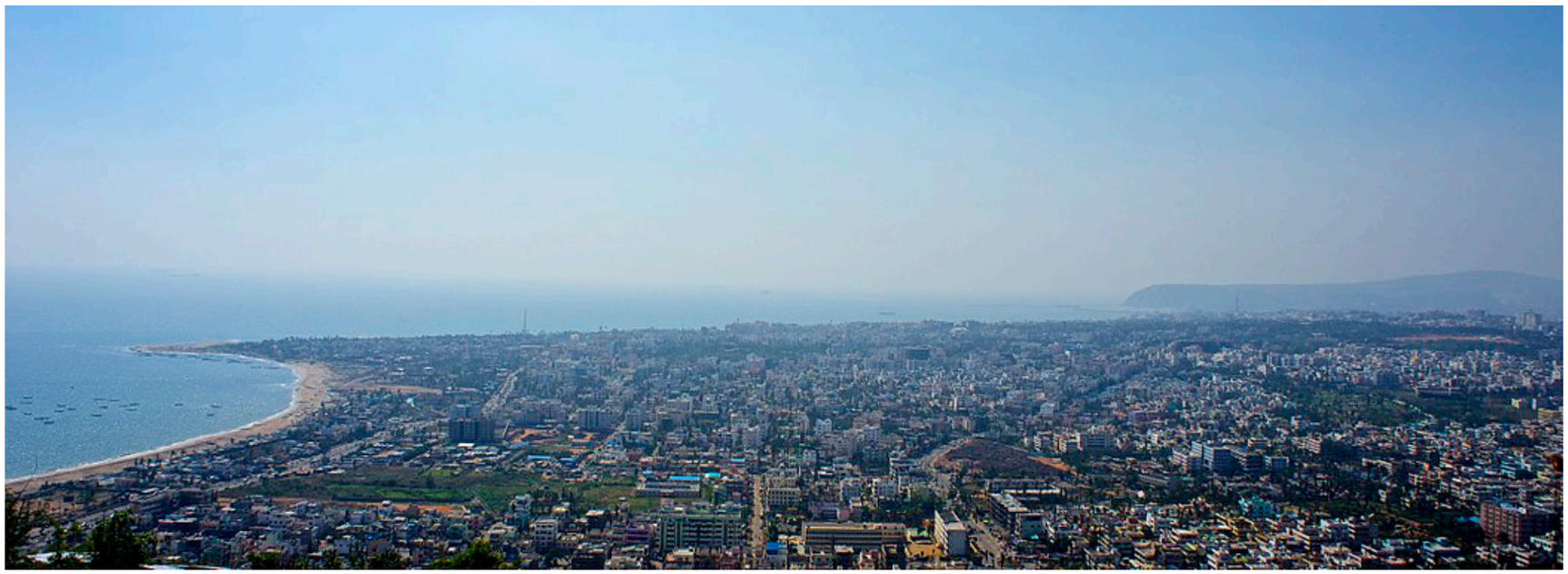
Education center

Tourism

Pilgrimage City

Landmarks in the city

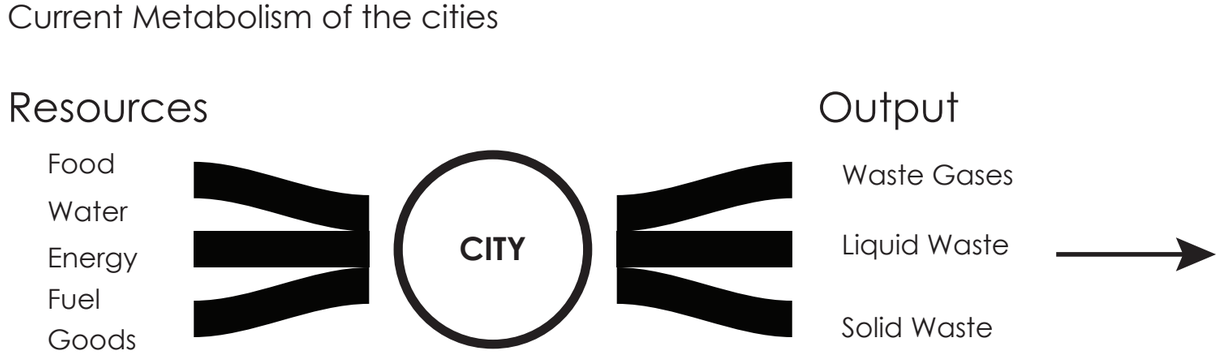
VISAKHAPATNAM

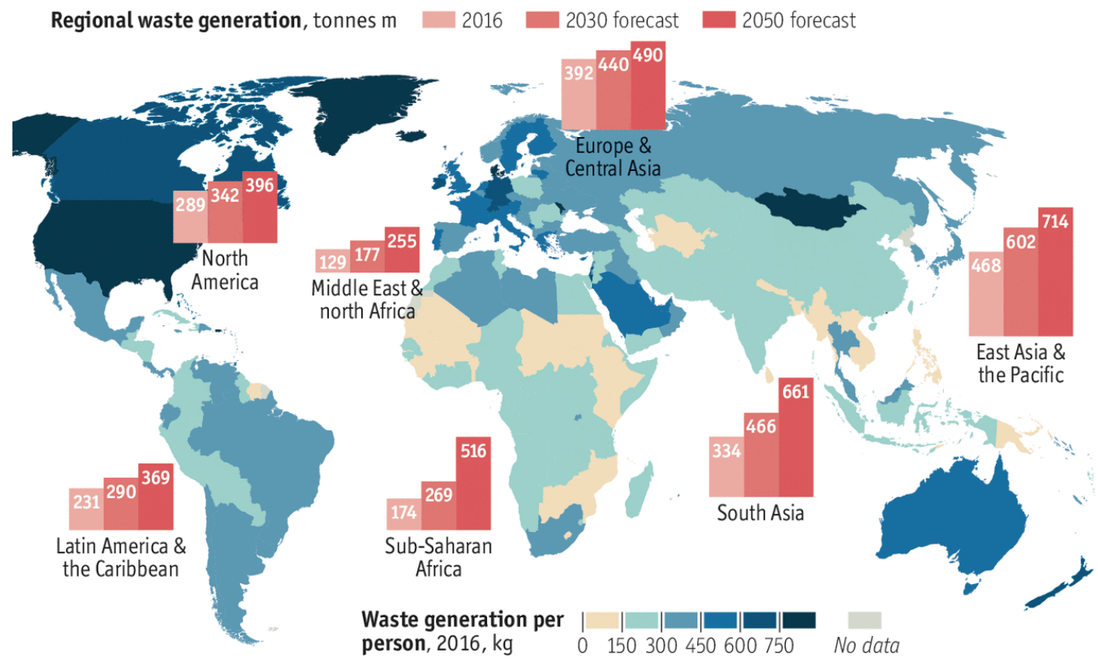


PROBLEM ANALYSIS

LINEAR METABOLISM

Current Metabolism of the cities





Source:World map showing projected increase in the amount of waste generated

The linear process of disposing the outputs

Solid Waste - Municipal Solid Waste

Liquid Waste - Sewage water

Linear Flow of Municipal Solid Waste Disposal

At sources of waste generation

Waste Collection Centers

Temporary Storage Site

Dumping in the landfill site

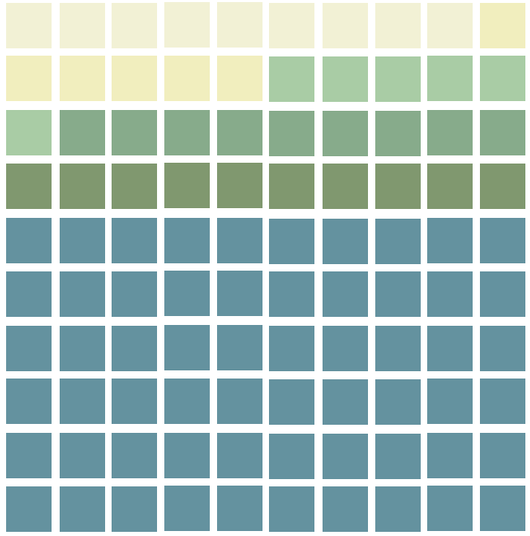
Source: https://www.deccanchronicle.com/151118/nation-current-affairs/article/shortage-dustbins-hits-clean-visakhapatnam-image

Source: https://www.thehindu.com/news/cities/Visakhapatnam/overflowing-garbage-bins-raise-a-stink/article2860990.ece

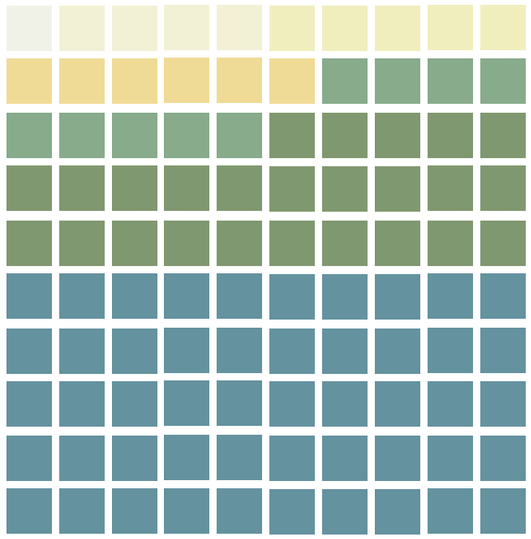
Source: https://www.thehindu.com/news/cities/Visakhapatnam/closed-garbage-transfer-stations-for-one-town-gajuwaka/article24542585.ece

Source: https://www.thehindu.com/news/cities/Visakhapatnam/move-to-shift-dump-yard-makes-no-headway/article7254156.ece

Analysis of Municipal Solid Waste



a) Waste generated at different sources



b) Composition of domestic waste

DOMESTIC WASTE - 60%

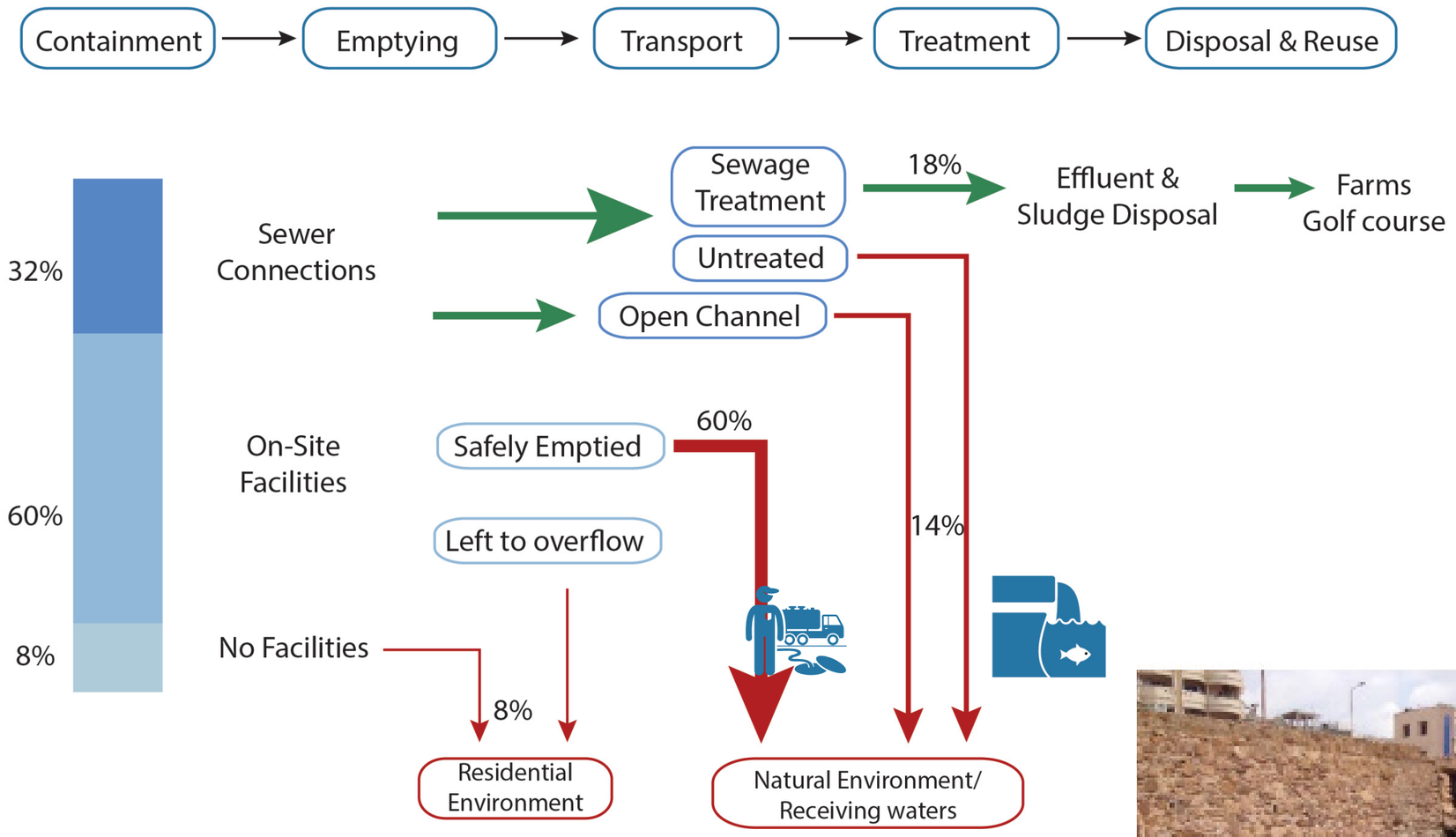
of total waste

ORGANIC WASTE - 47%

of domestic waste

FOOD WASTE

Linear Flow of Wastewater Disposal

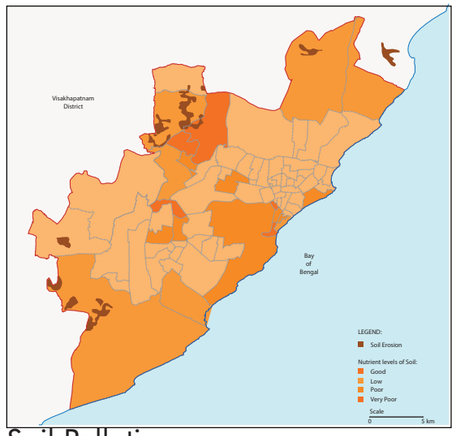


Source: GVMC, INDIA CENSUS 2011

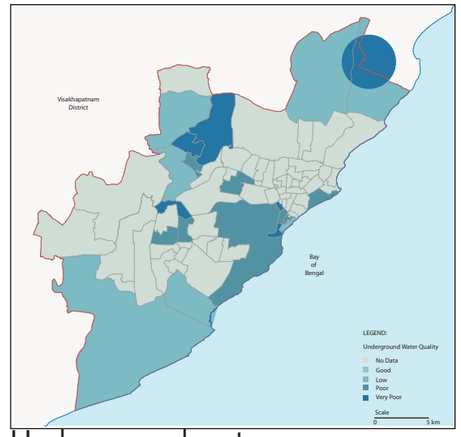
Source: https://www.deccanchronicle.com/nation/current-affairs/270717/visakhapatnam-capacity-of-sewage-treatment-plants-to-be-increased.html

Environmental Impacts due to improper waste disposal

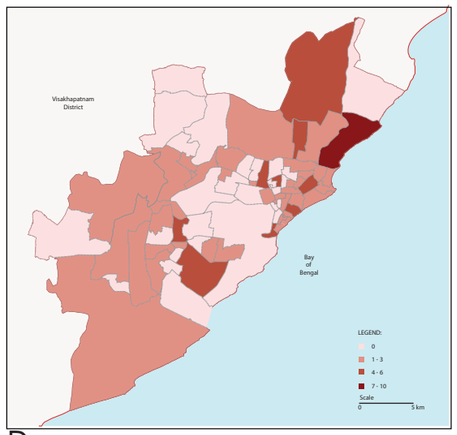
- Pollution
- Vector borne diseases
- Environmental risks & vulnerability



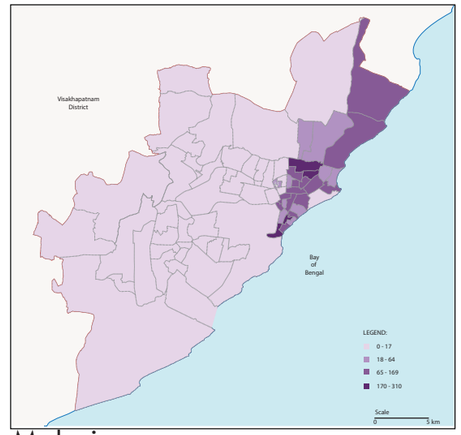
Soil Pollution



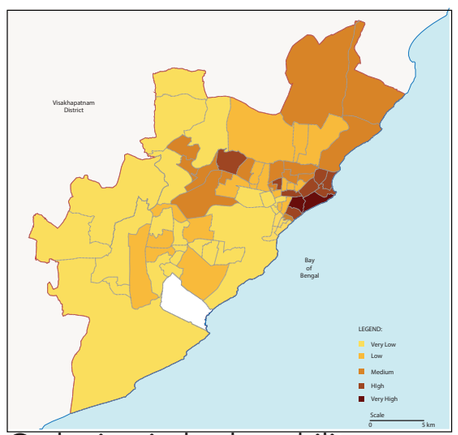
Underground water contamination



Dengue



Malaria



Cyclonic wind vulnerability

Storm surge areas - flooding

Tsunami

Overlay map of the negative **environmental impacts**

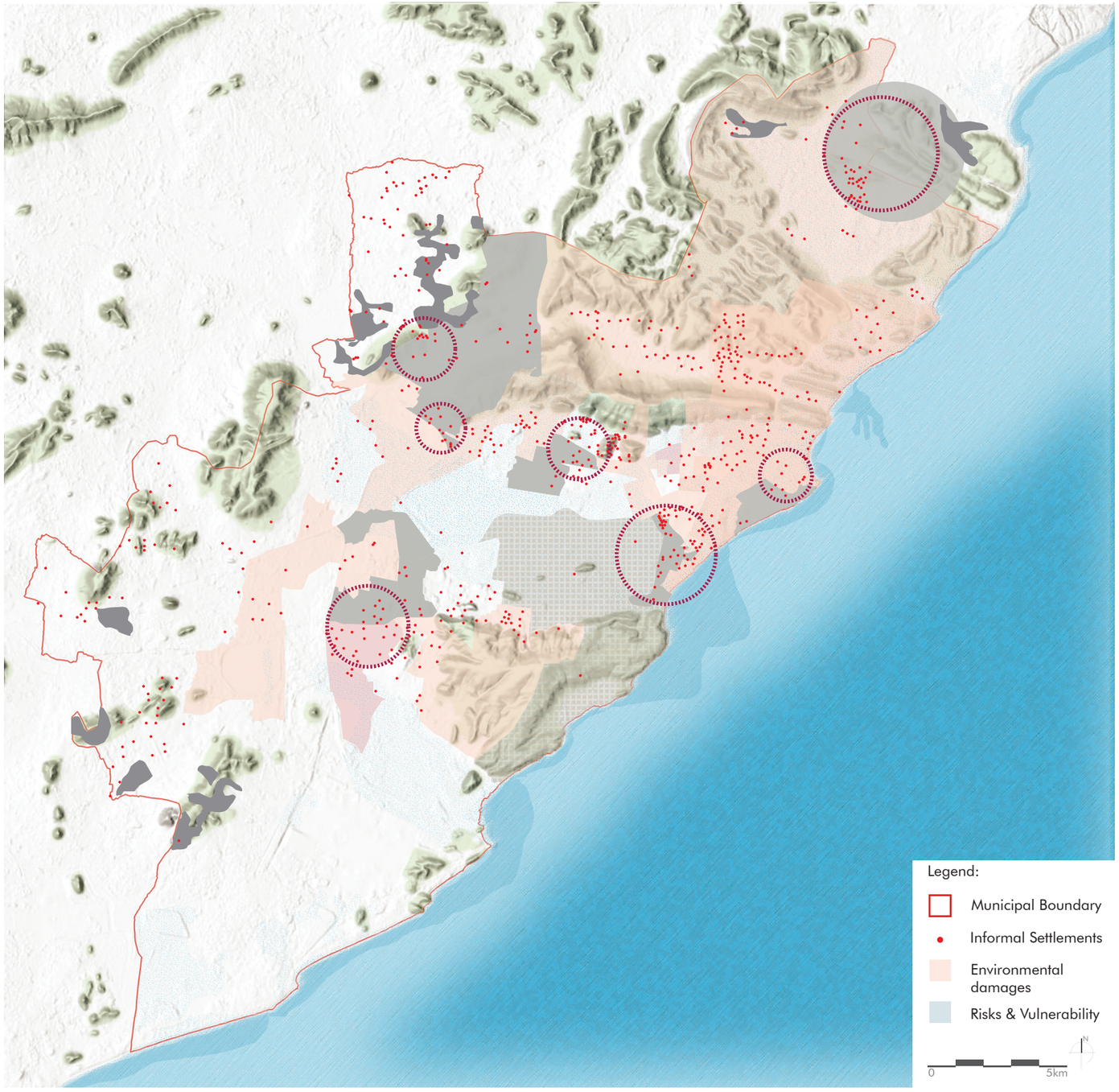


Fig: Overlapping all the layers of above listed problems

Identifying the regions vulnerable to the environmental impacts

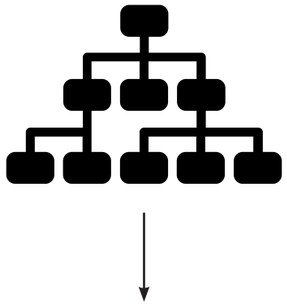
Analysing the current approaches in practice

a) Drawbacks in the existing system

b) Drawbacks in Clean India Mission

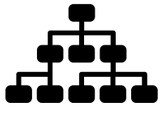
Sectoral planning system

National Level

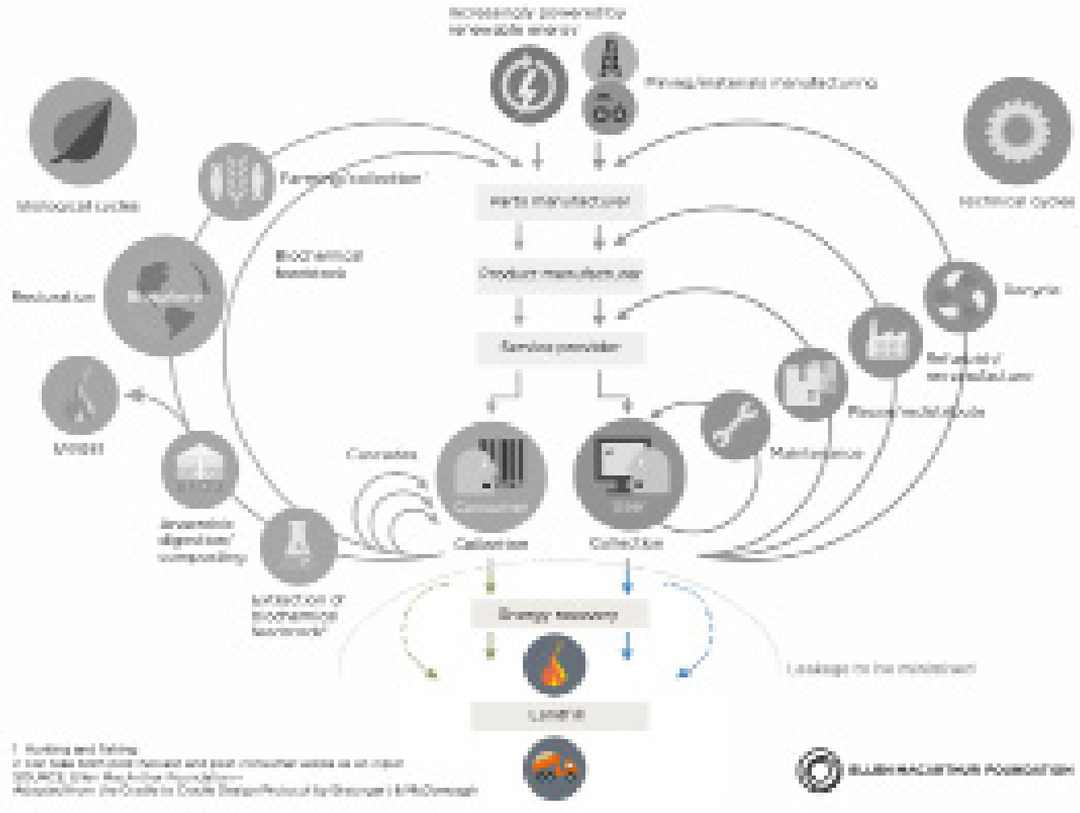


State Level

District Level - ULB



Swacchh Bharat - Clean India Mission



Comparing the steps developed in CIM to circular model of Ellen Mc Arthur

RESEARCH QUESTION

using resources efficiently and reusing the waste streams as secondary resources by circular principles

integrative approach of governance, socio-ecological systems and socio technical sytems

How to integrate **resource management** into **urban planning** by developing *local scale spatial strategies* for an *environmentally sustainable* Visakhapatnam?

"meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them," (Morelli, John (2011))

CONCEPTUAL FRAMEWORK

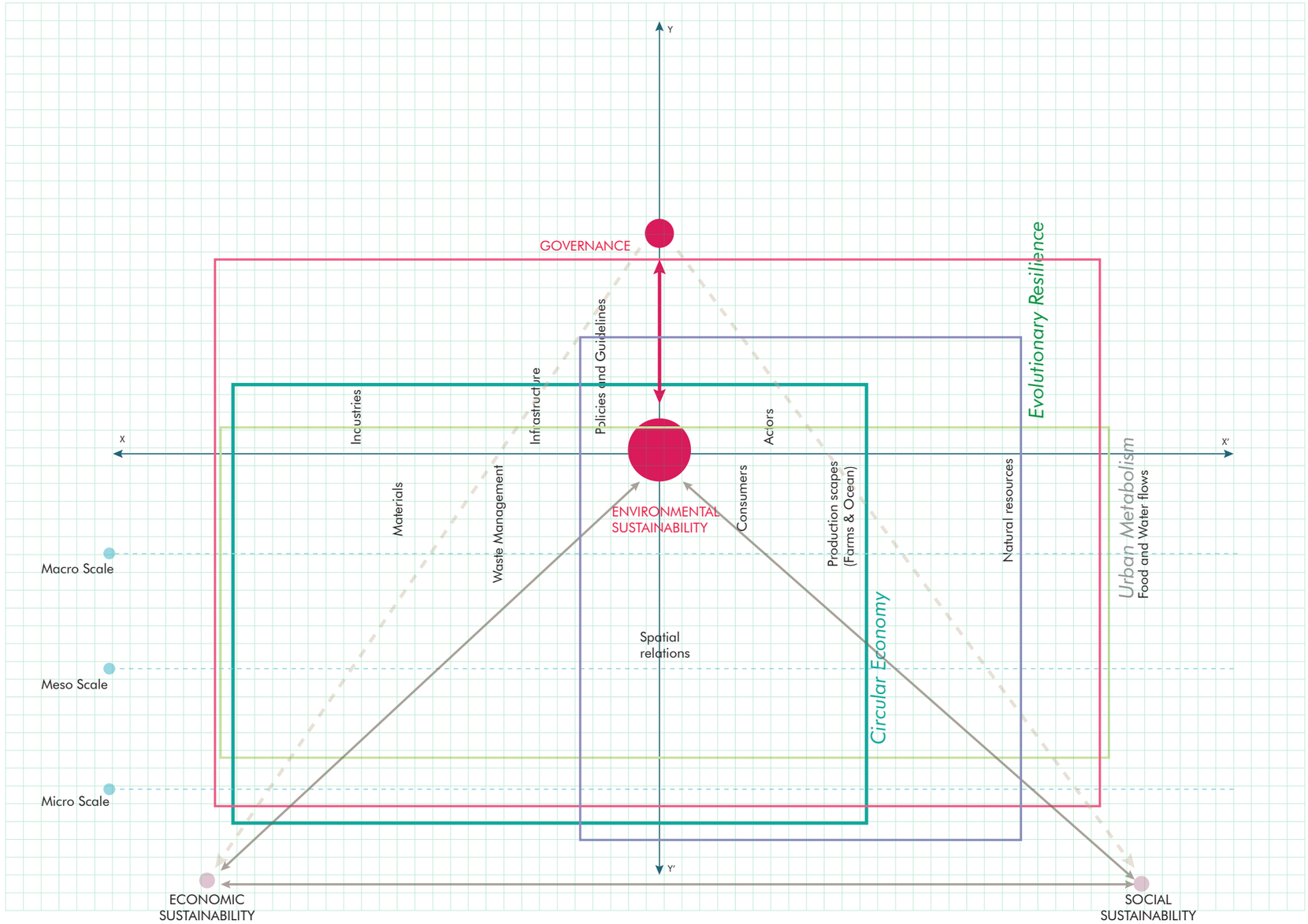
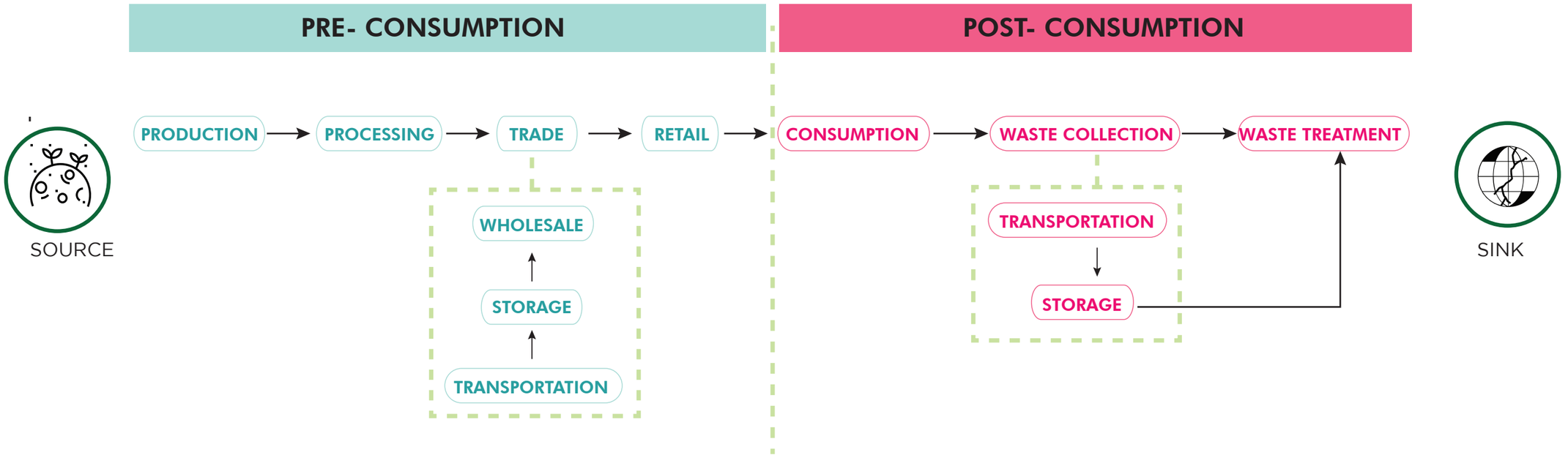


Fig 4.1: Conceptual Framework

RESOURCE FLOW ANALYSIS

SYSTEMIC DIAGRAM OF RESOURCE FLOWS



MAPPING THE FOOD FLOWS

PRODUCTION OF FOOD

(Source)

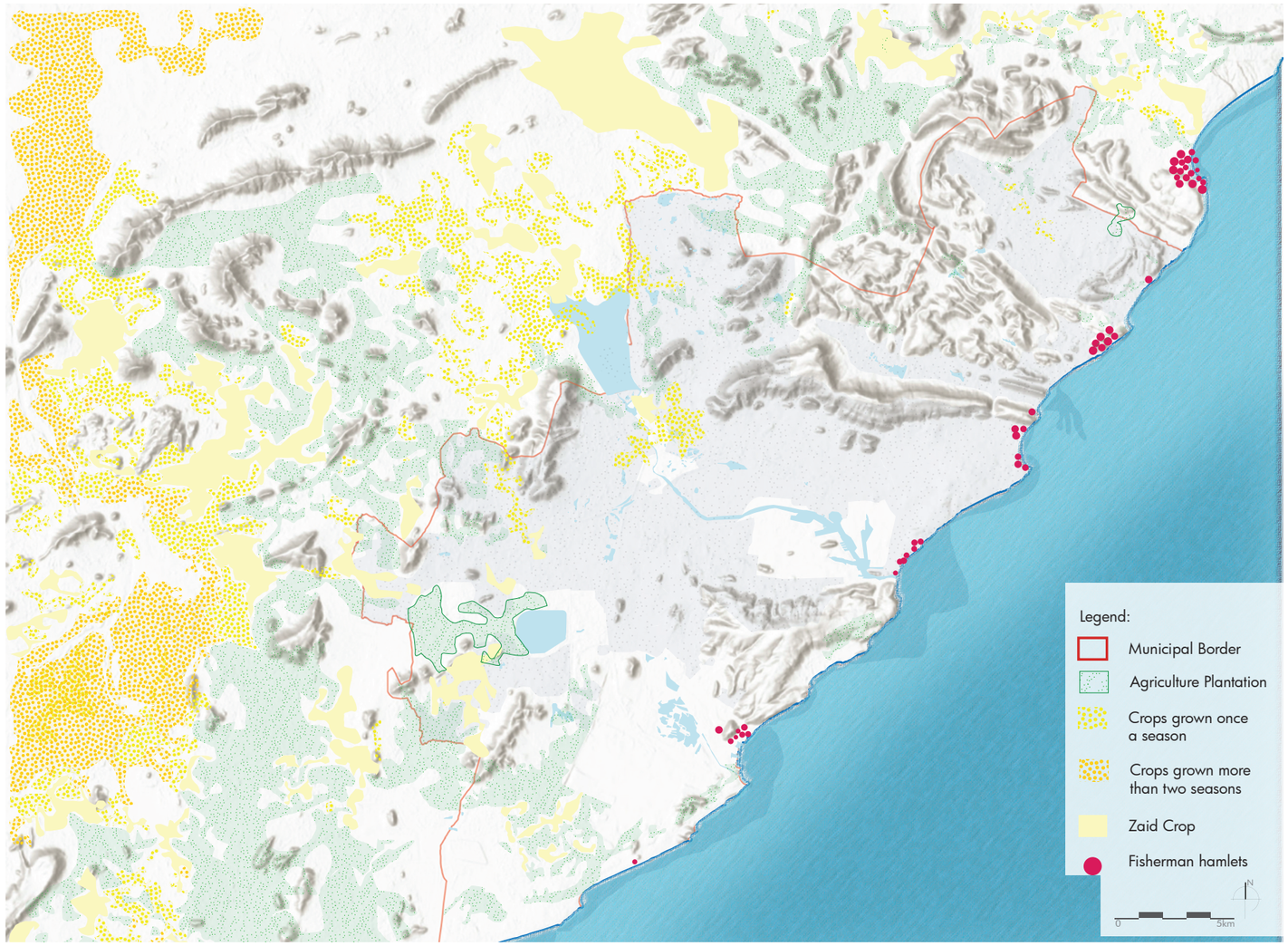


Fig: Food production on the arable land in and around the city

Fig: Pictures of farms in and around the city

https://bhuvan-app1.nrsc.gov.in/state/AP

PROCESSING AND RETAIL

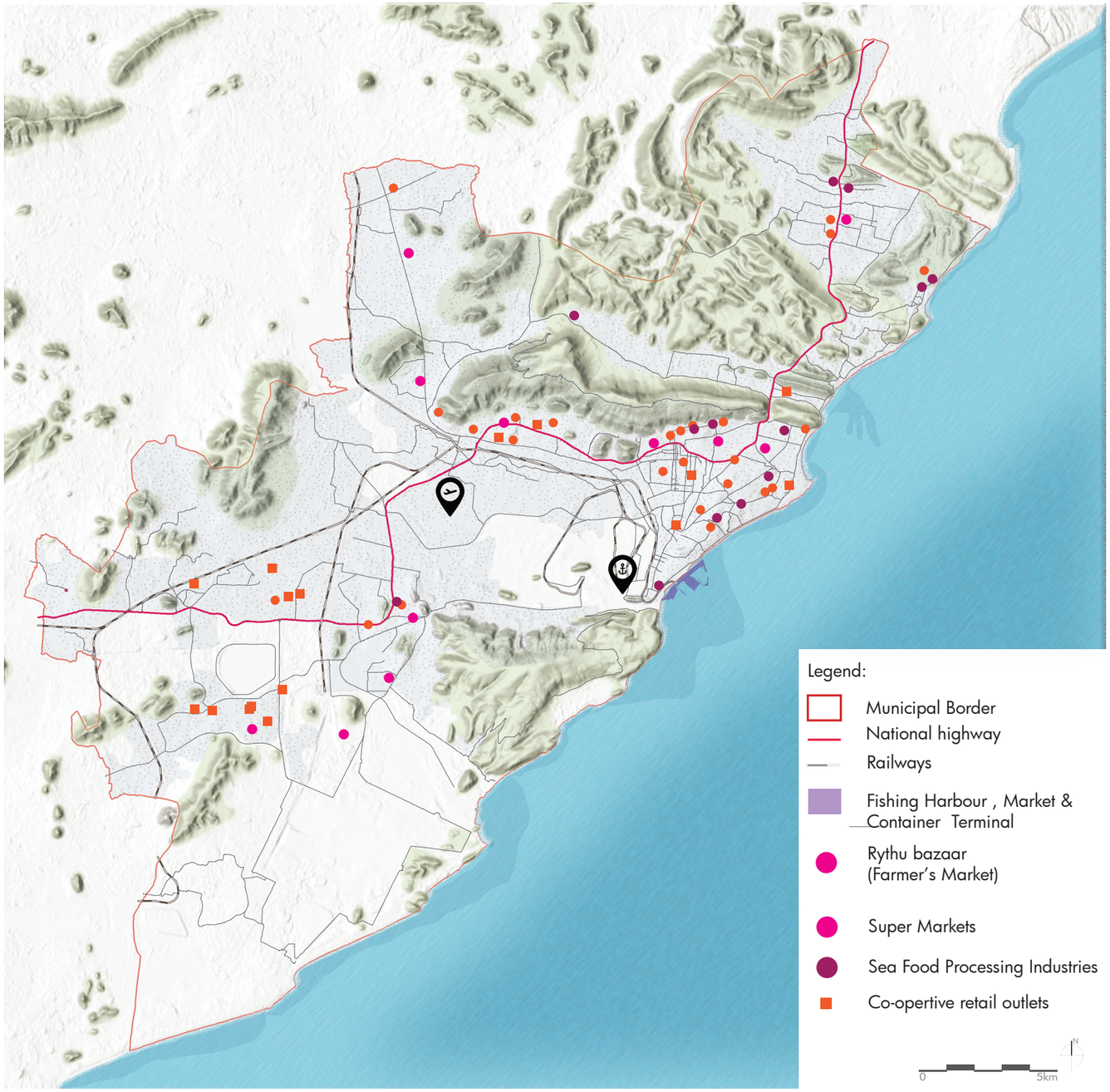


Fig: Map showing food processing industries, markets and the larger chains of retail outlets

Sea Food processing industry Source: Google Images

Famers Market

https://bhuvan-app1.nrsc.gov.in/state/AP

CONSUMPTION

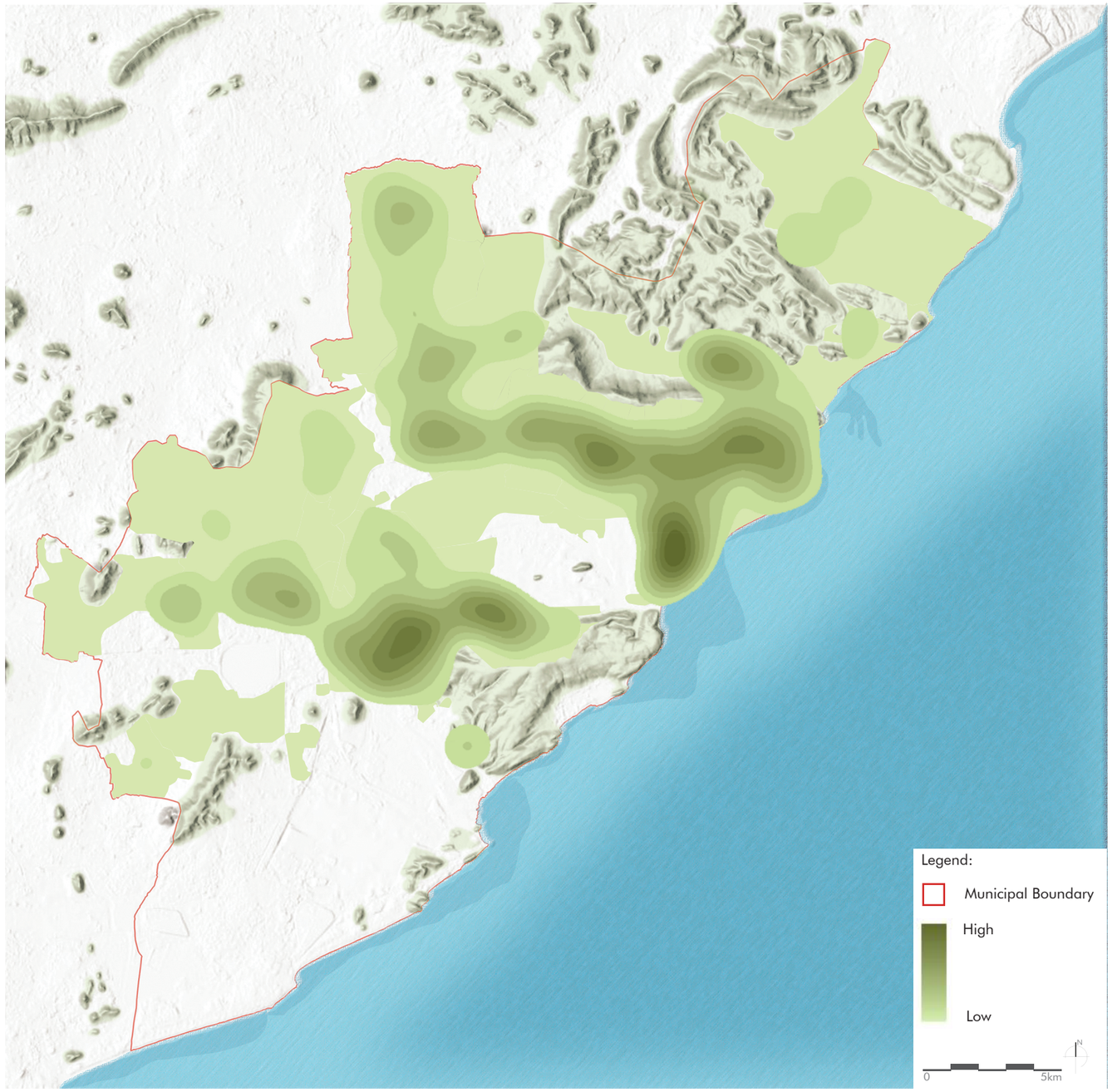


Fig: Map showing the number of consumers in each ward

Food waste at household

Unsegregated waste at neighborhood

Source: Urban observatory Data, 2016

Source: Google Images

WASTE COLLECTION AND DISPOSAL (SINK)

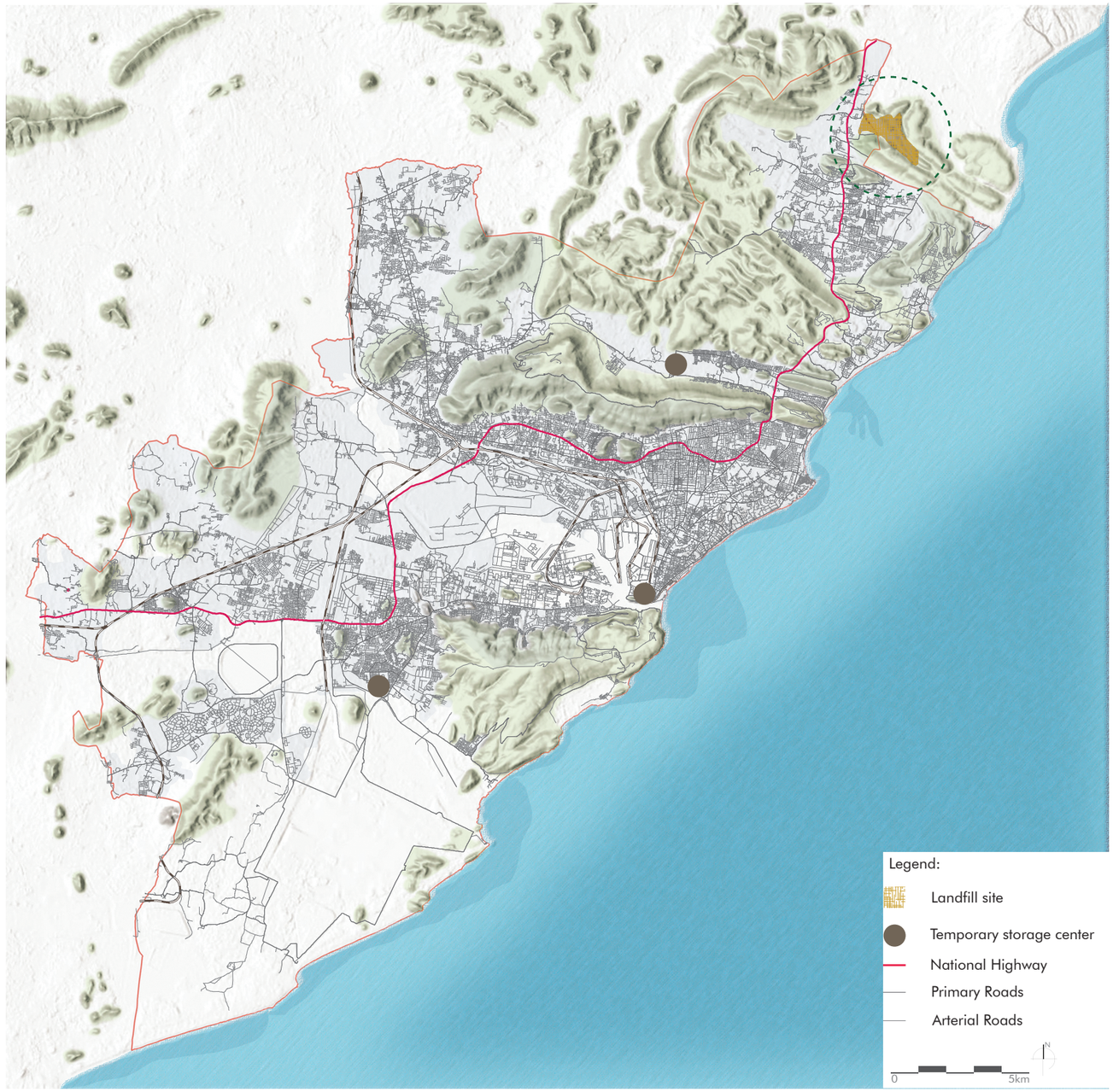


Fig: Map showing the current temporary storage sites and landfill site

MSW Temporary storage site

MSW Landfill site

Source: gvmc.gov.in

MAPPING THE FOOD FLOWS

SOURCES OF WATER IN THE REGION

(Source)

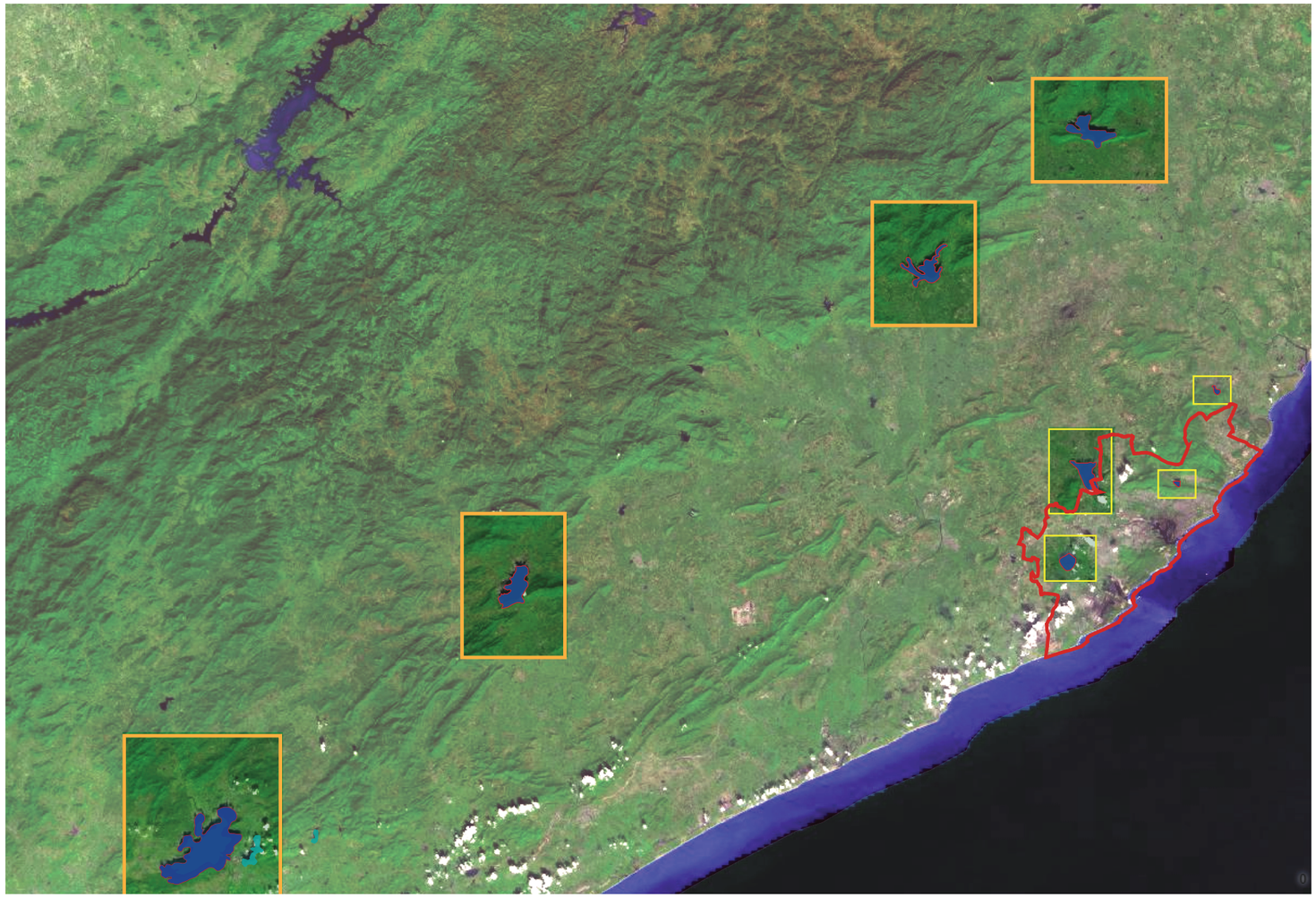


Fig: Map showing the sources of water in the region supplying to the city

Reservoir

Reservoir

https://bhuvan-app1.nrsc.gov.in/state/AP

Source: Google Images

SOURCES OF WATER IN THE CITY

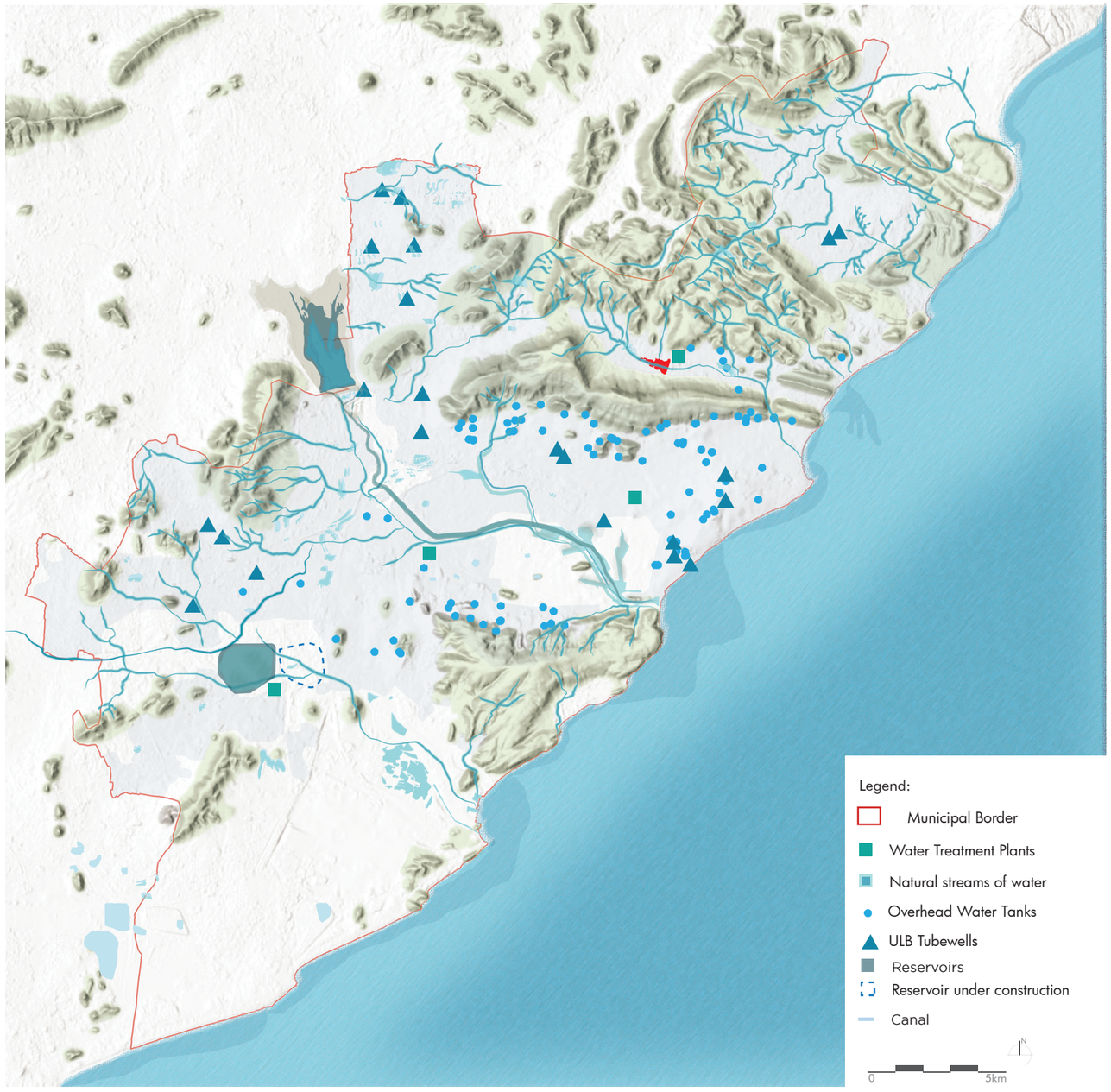


Fig: Map showing the overhead water tanks and drainages in the city

Dried reservoir in the city

Overhead water tank in the city

HOUSEHOLDS DEPEND ON UNDERGROUND WATER

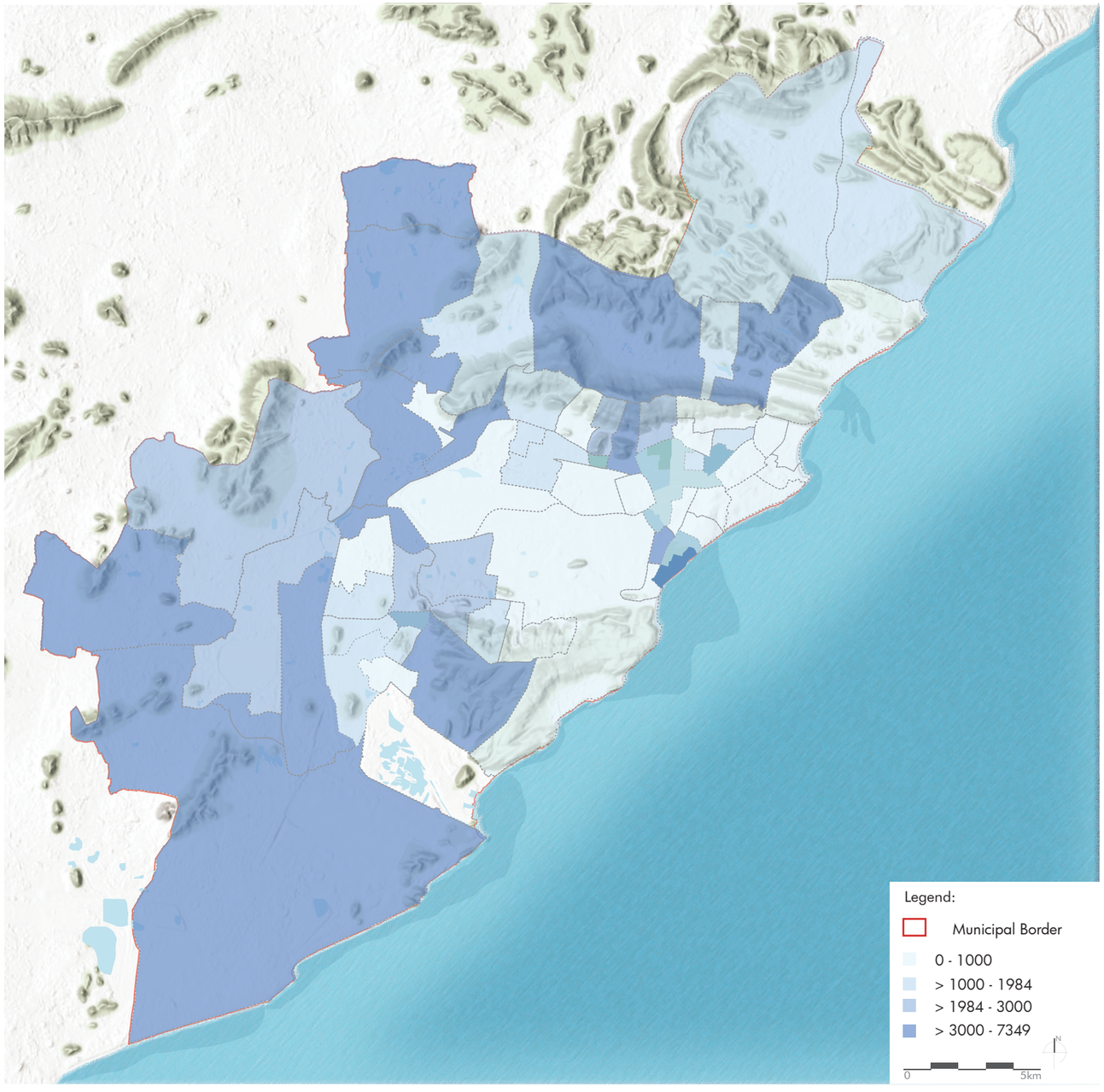


Fig: Map showing the number of houses depending on underground water sources

Underground water borewell

Water Tankers - water supply

Urban observatory Data, 2016

Source: Google Images

HOUSEHOLDS WITH SEWAGE ACCESS

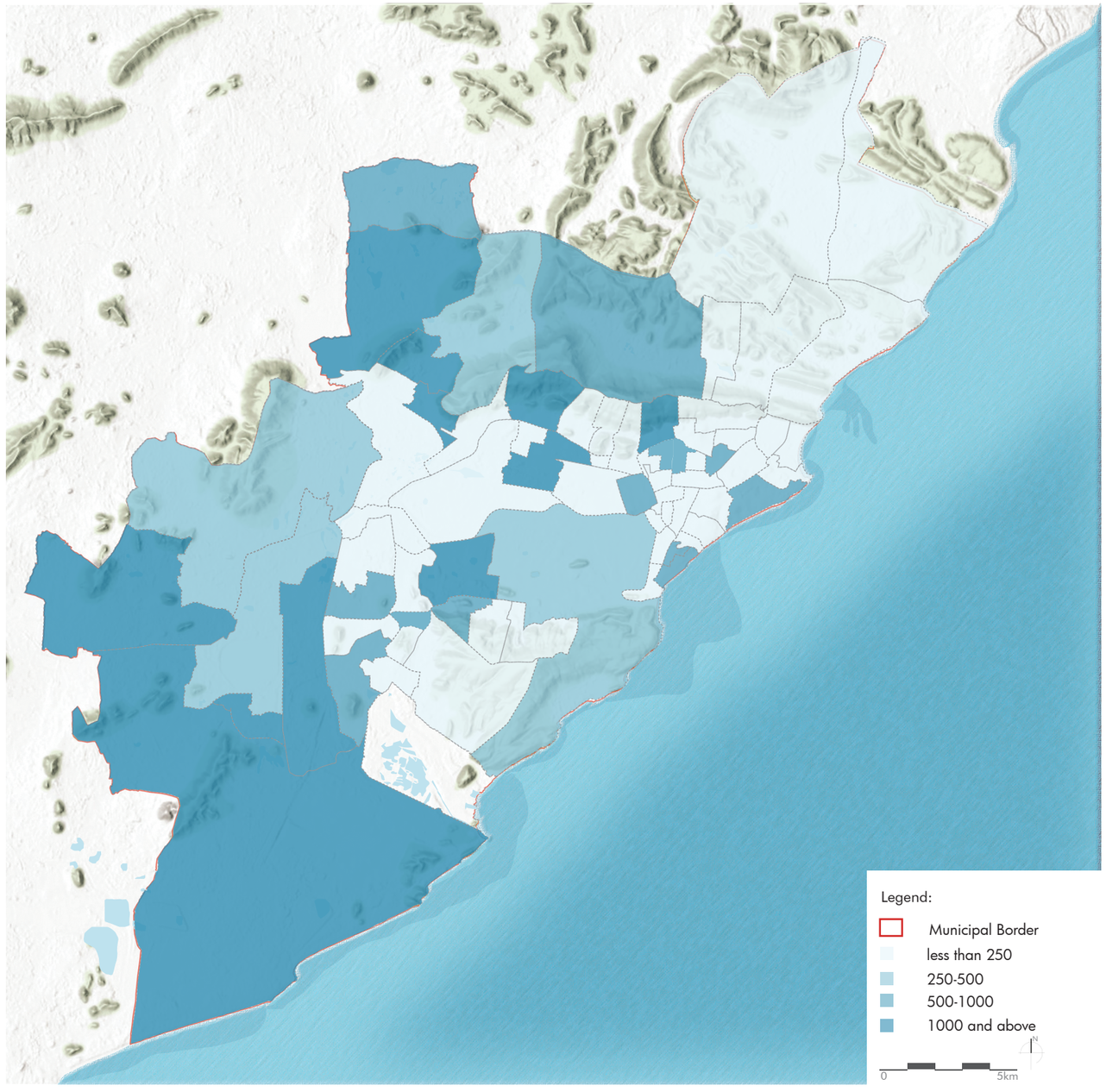


Fig: Map showing the number of houses that have connections to the sewage

Urban observatory Data, 2016

Sewage

Septic Tank collection

Source: Google Images

SEWAGE TREATMENT PLANTS (SINK)

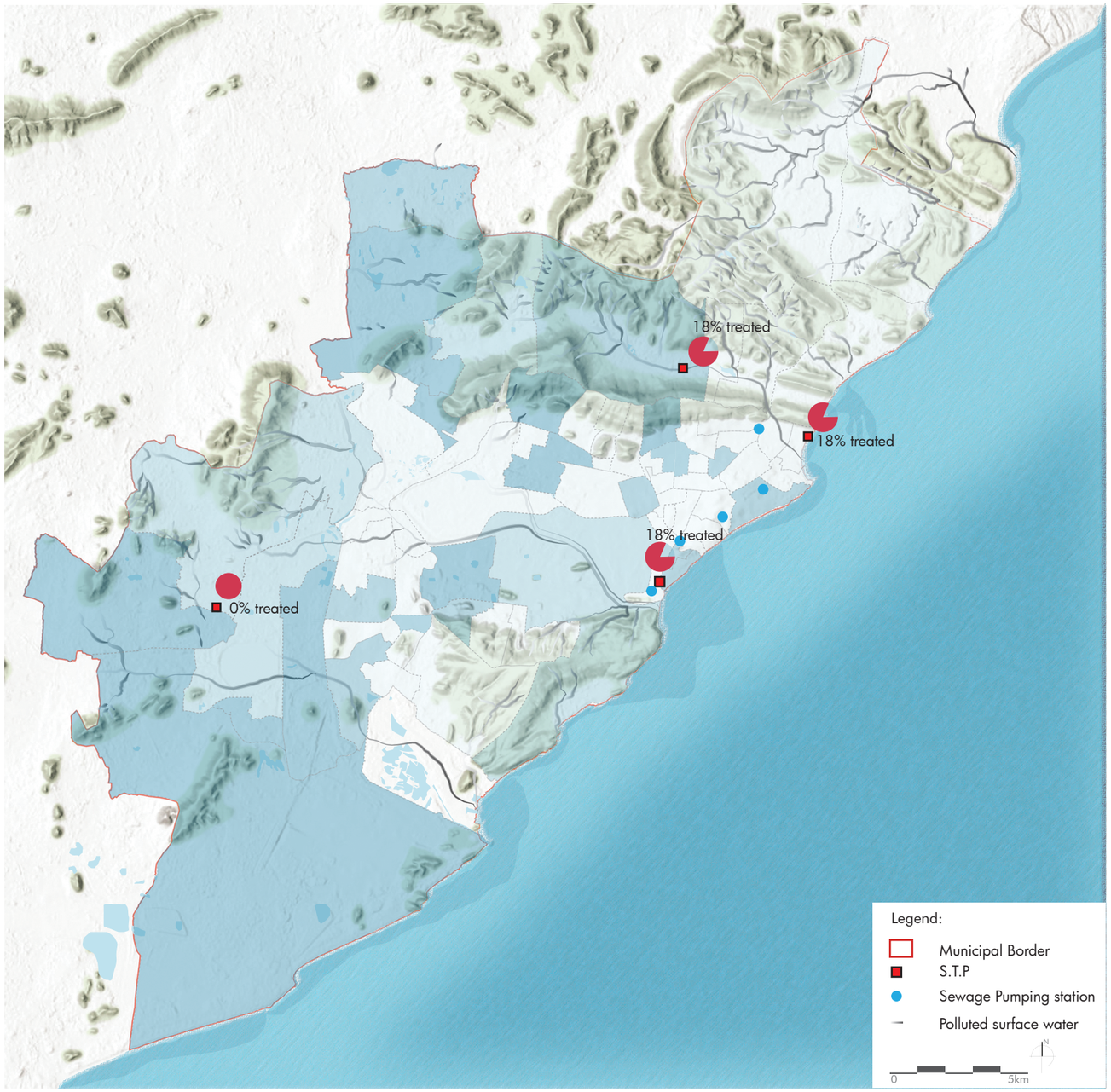


Fig: Map showing the Sewage Treatment plants and the canals polluted due to discahrge of sewage water

Sewage Treatment Plant

STP located next to the sea

Source: www.gvmc.gov.in

OVERLAY MAP OF FLOWS ANALYSIS & THE ENVIRONMENTAL IMPACT ANALYSIS

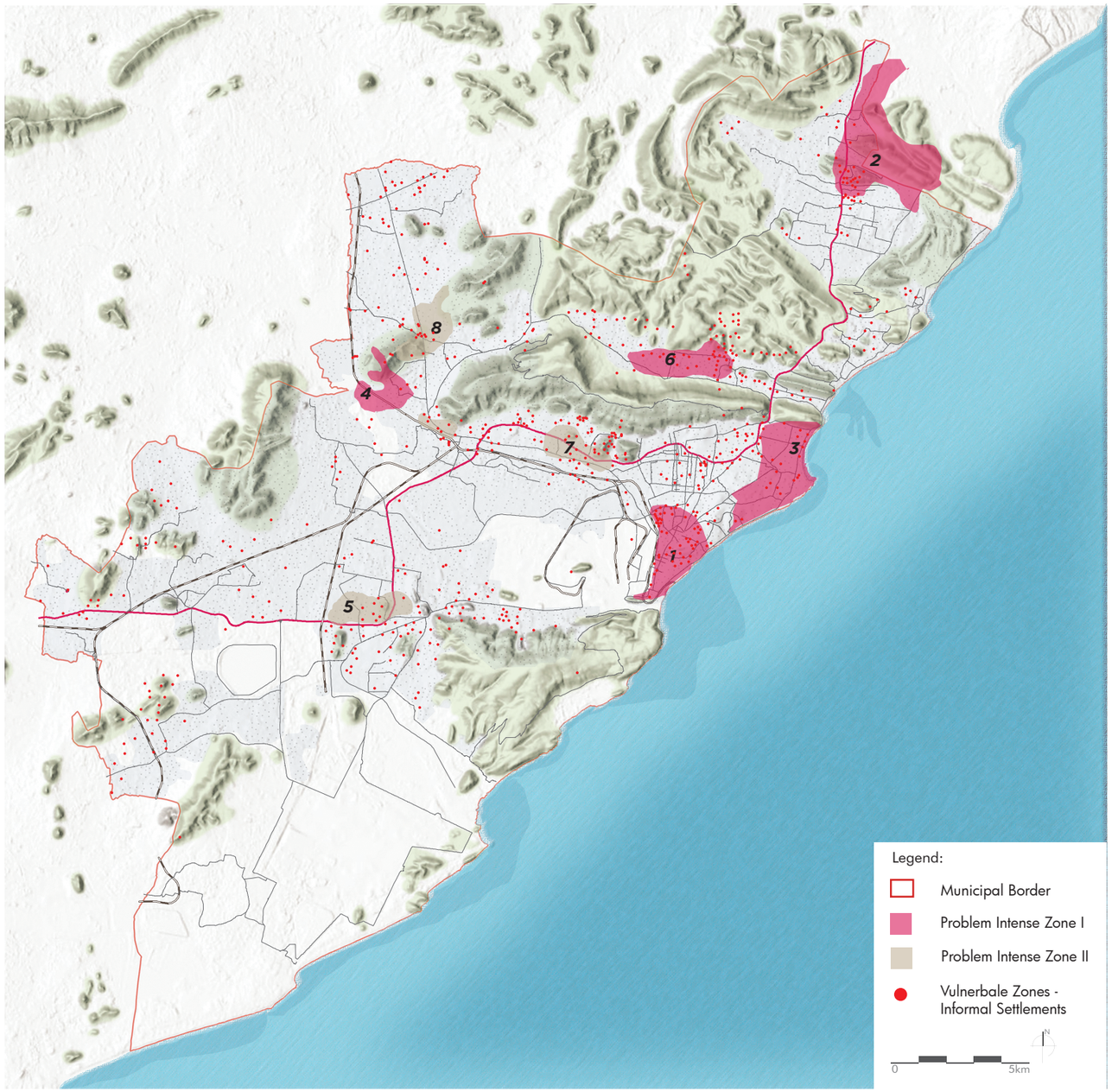


Fig: Map showing identified problem locations

SYNTHESIS

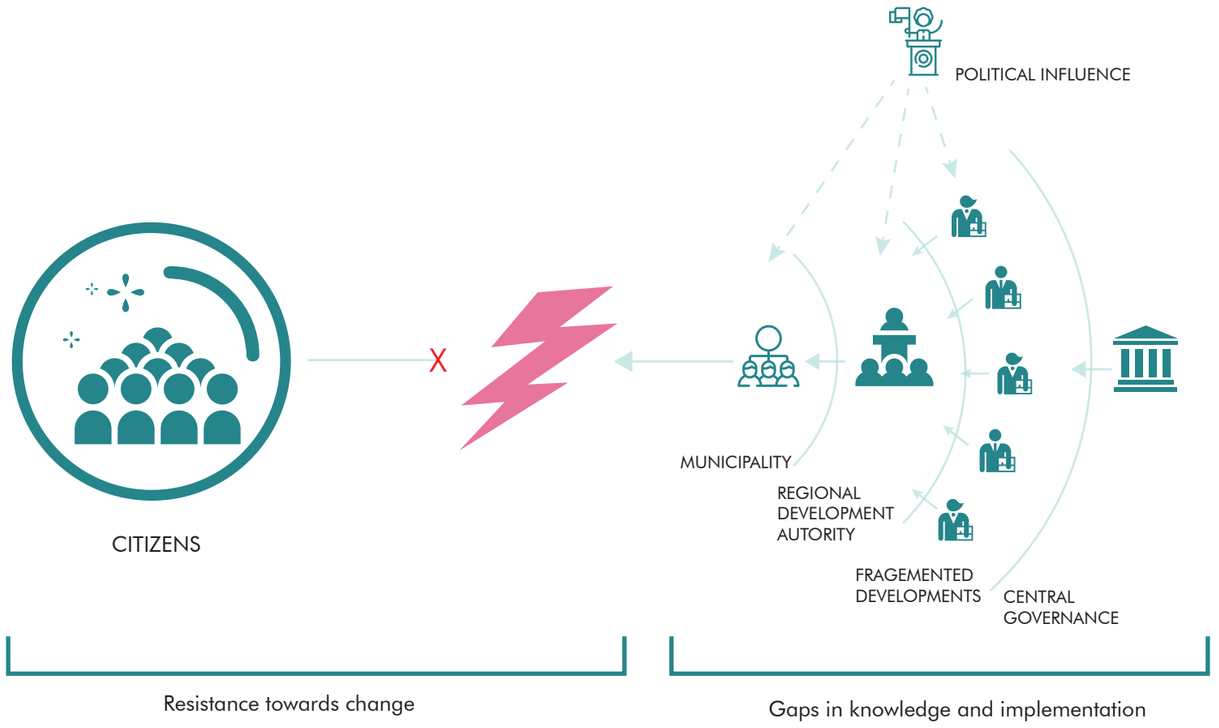
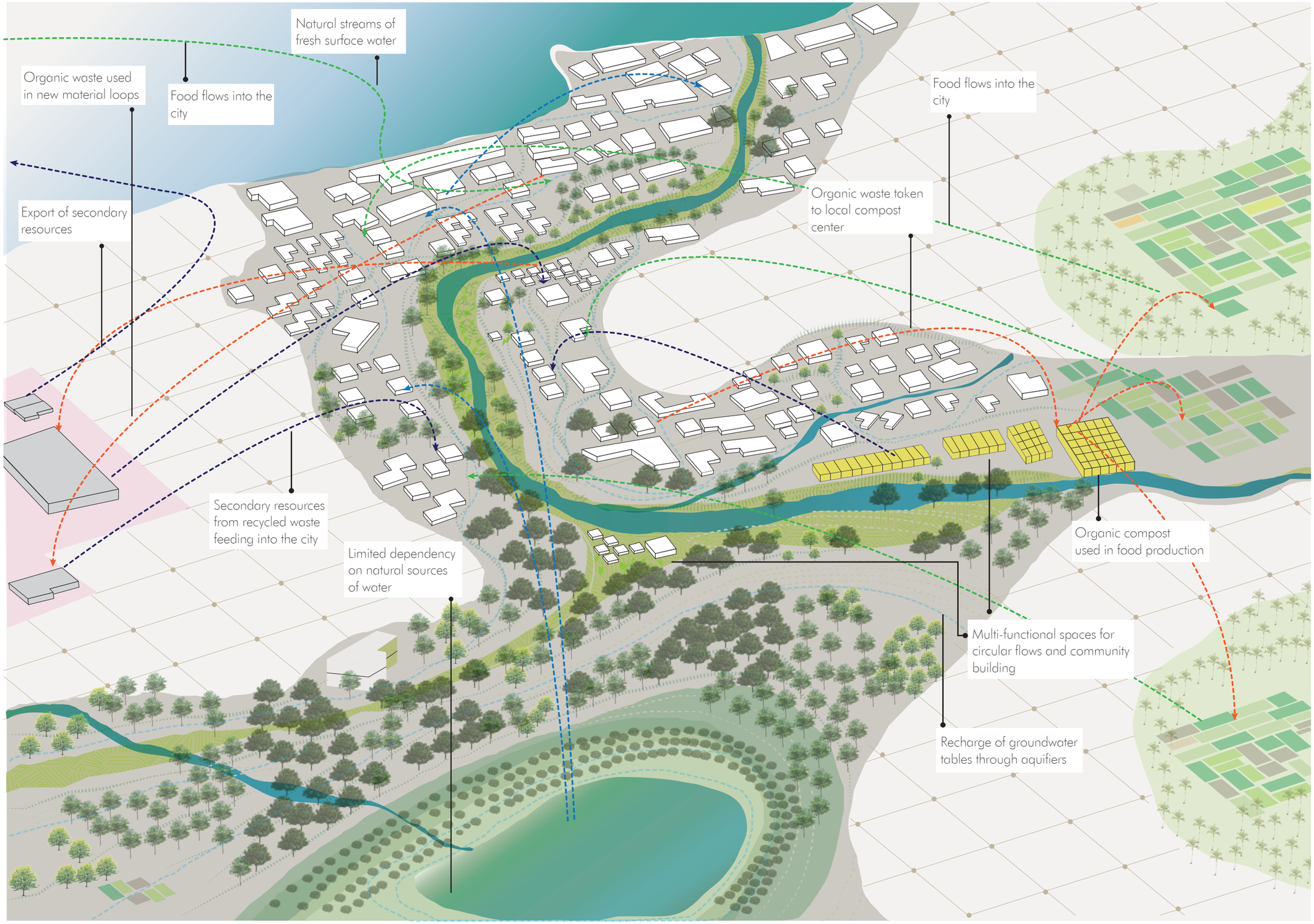


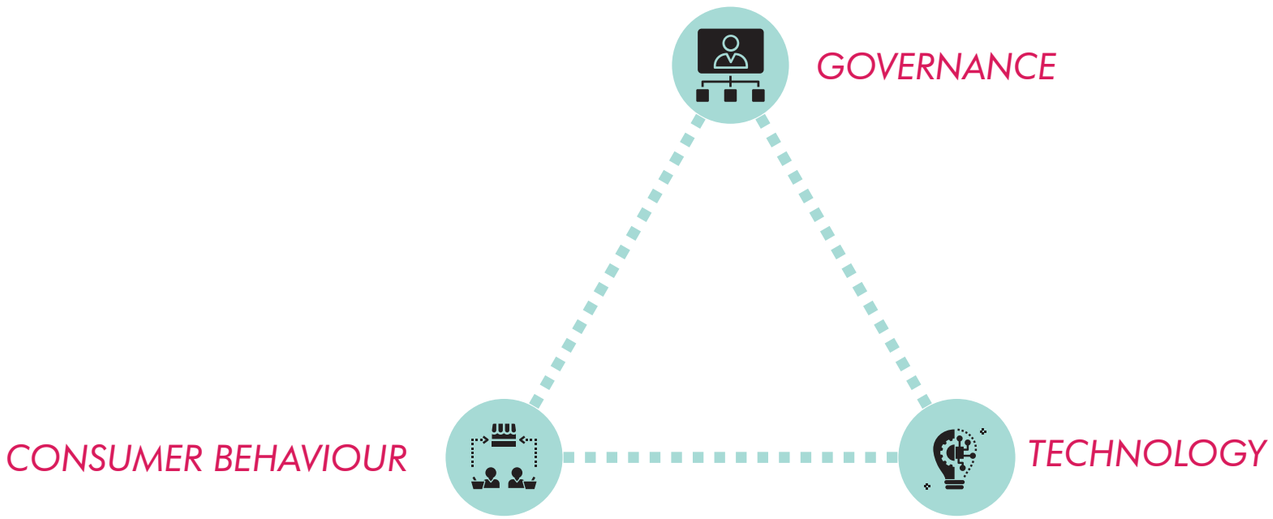
Fig:Image showing the current scenario towards waste and using it as a resource

VISION

“LOCAL - ADAPTABLE CITY”



VISION TO STRATGIES



Strategies for food and water flows

Local City

Looping City

LOCAL CITY

Local city focuses on developing local scale solutions for resource reuse and developing secondary resources. It emphasises on developing decntralised solutions for both food and water flows.

LOOPING CITY

Looping city focuses on linking the existing centralised systems in place to bring circularity to the resources. The resources are looped within the city and byproducts in the circular processess are exported for economic benefits.

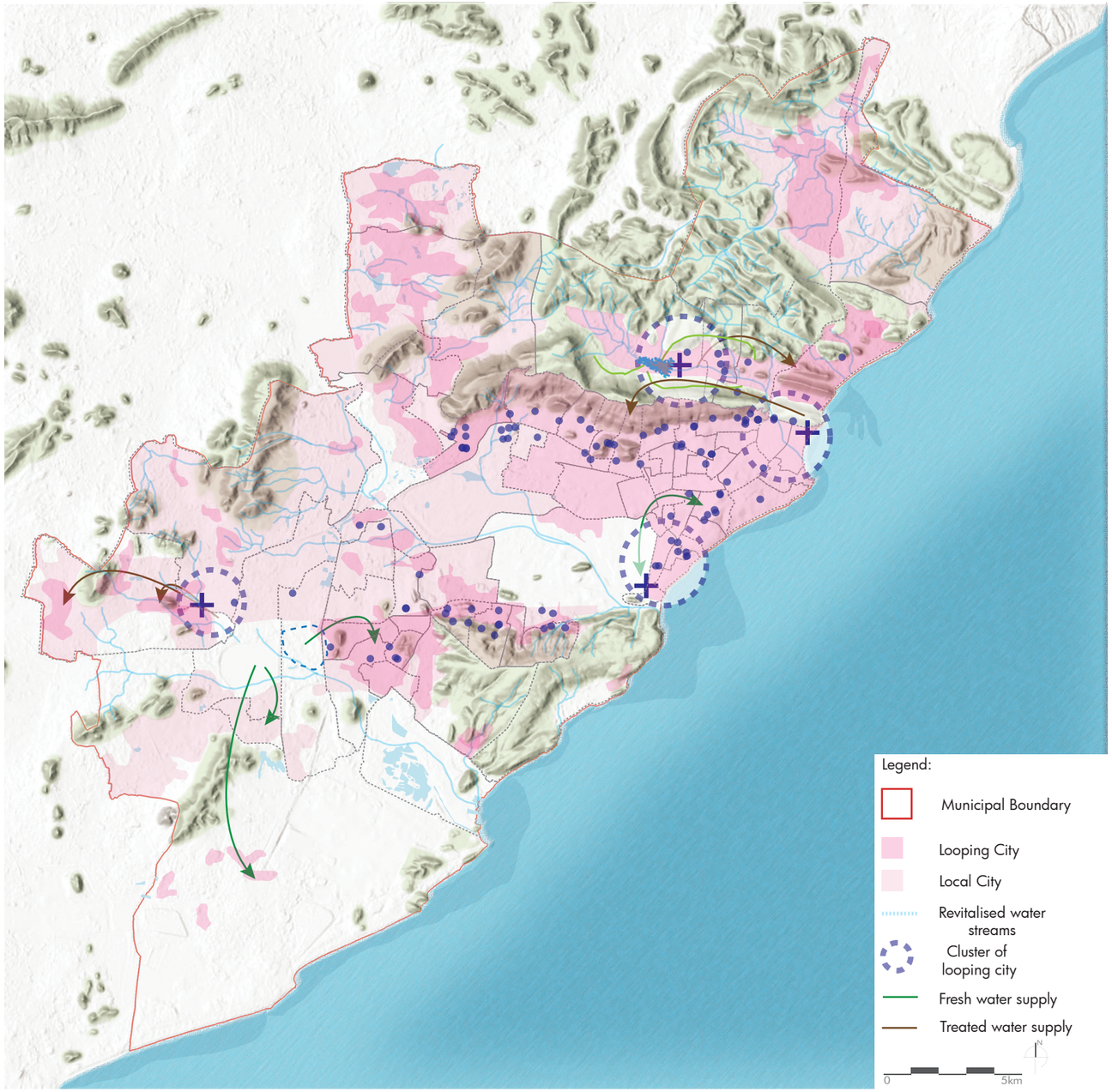


Fig: Map showing the clusters of local and looping city

Strategies for water flows

LOCAL CITY

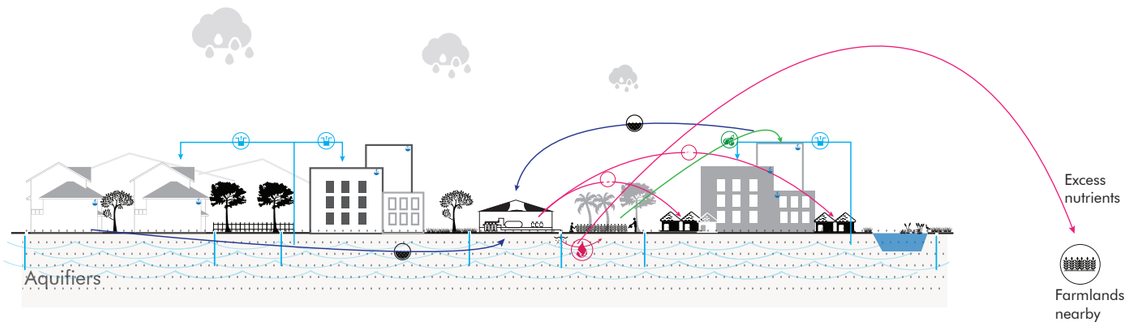


Fig: Systemic section of local city

Legend:
- Wastewater
- Treated water & nutrients
- Biogas
- Vegetables
- Food production
- Tubewell water
- Floating wetlands
- Rainwater harvesting
- Treated water & nutrients
- Ground water flow
- Food flow
- Wastewater Flow

LOOPING CITY

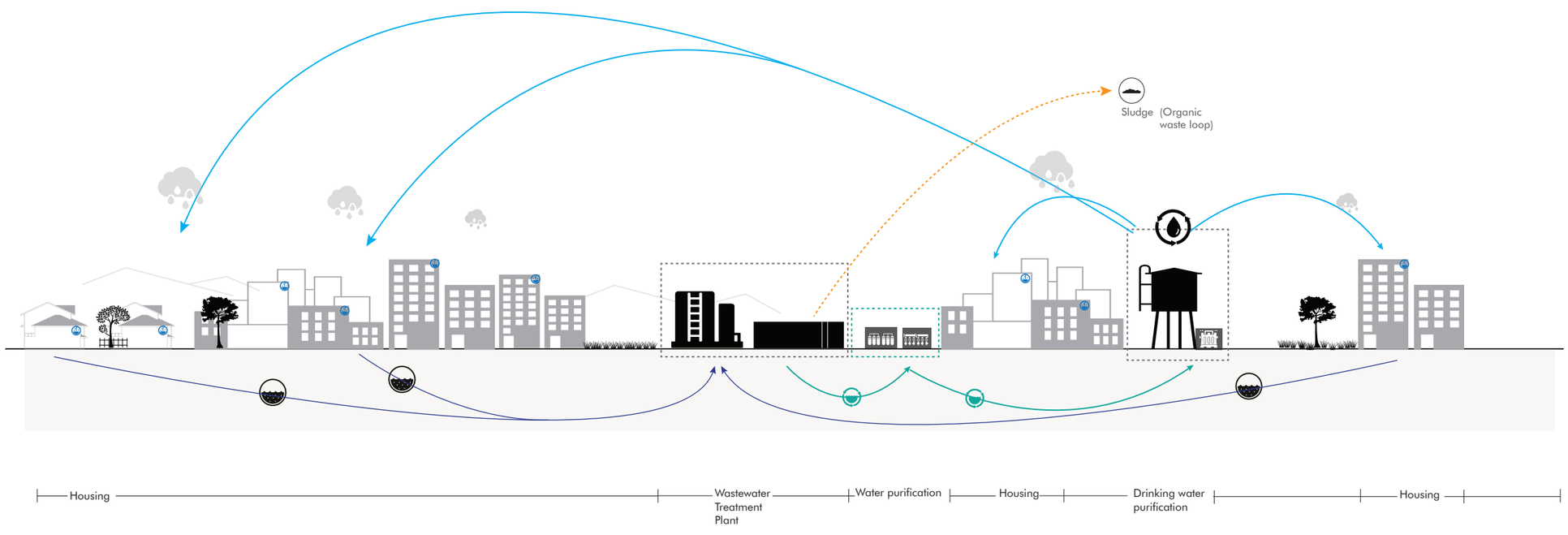


Fig: Systemic section of looping city

Legend:
- Wastewater
- Treated water
- Drinkingwater purification
- Sludge
- Rainwater harvesting
- Food Flow
- Drinking water flow
- Wastewater Flow

STAKEHOLDER INTEGRATION

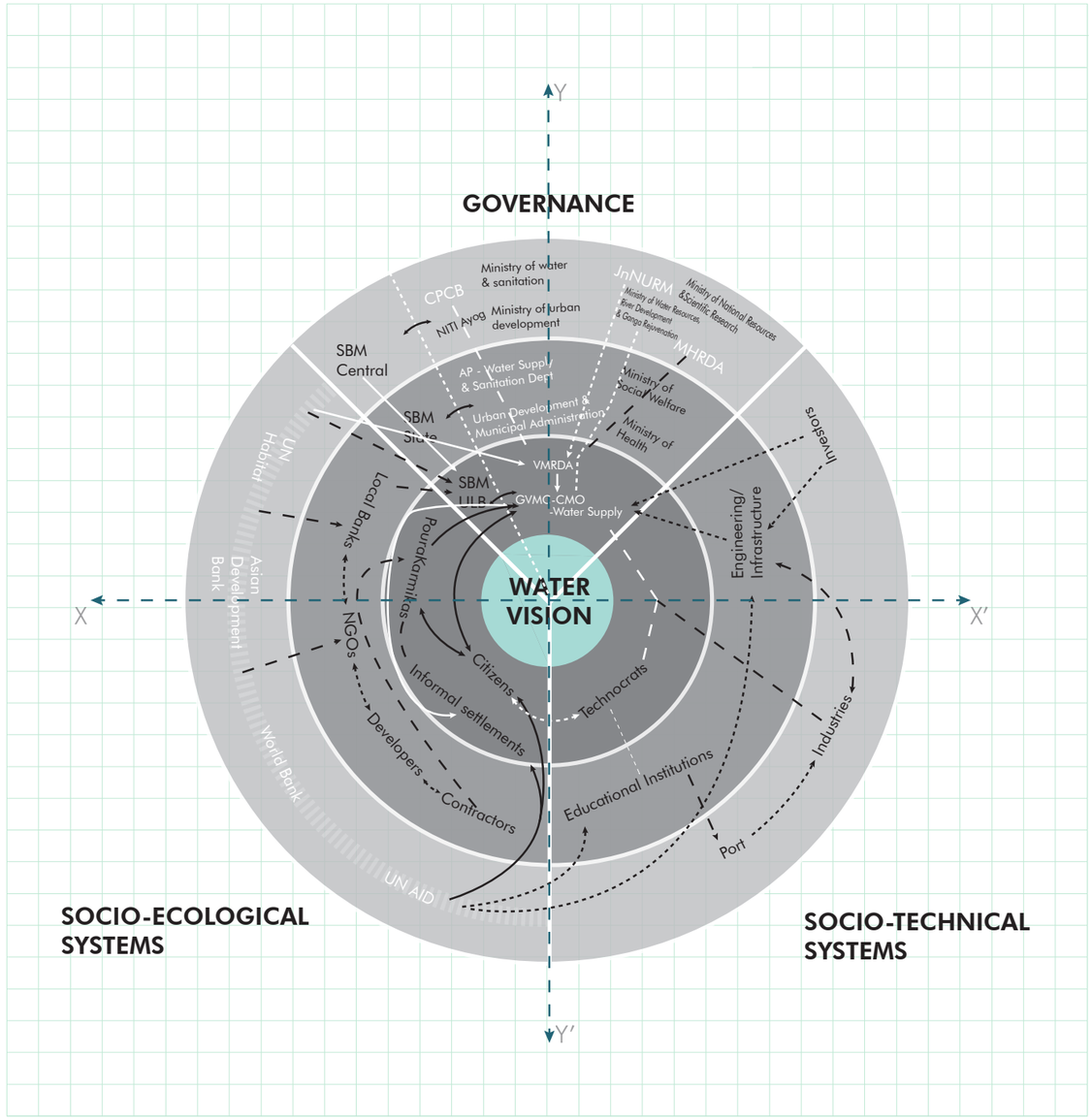


Fig: Stakeholder diagram for water strategy

Legend:

- Macro scale
- Micro scale
- Micro scale

XX' Horizontal Integration - collaboration, coordination and the building of working relationships

YY' Vertical Integration - linkages between different tiers of government

- Strong Based on high frequency and high interdependence of resour
- Ad-hoc Low frequency and low interdependence (e.g. service provisic
- Indirect Contextual relation (e.g. related to legal framework or public
- Aid and support from International organisations

Note: The text highlighted in white represents the current roles and relationships w in black is the proposed synchronicity

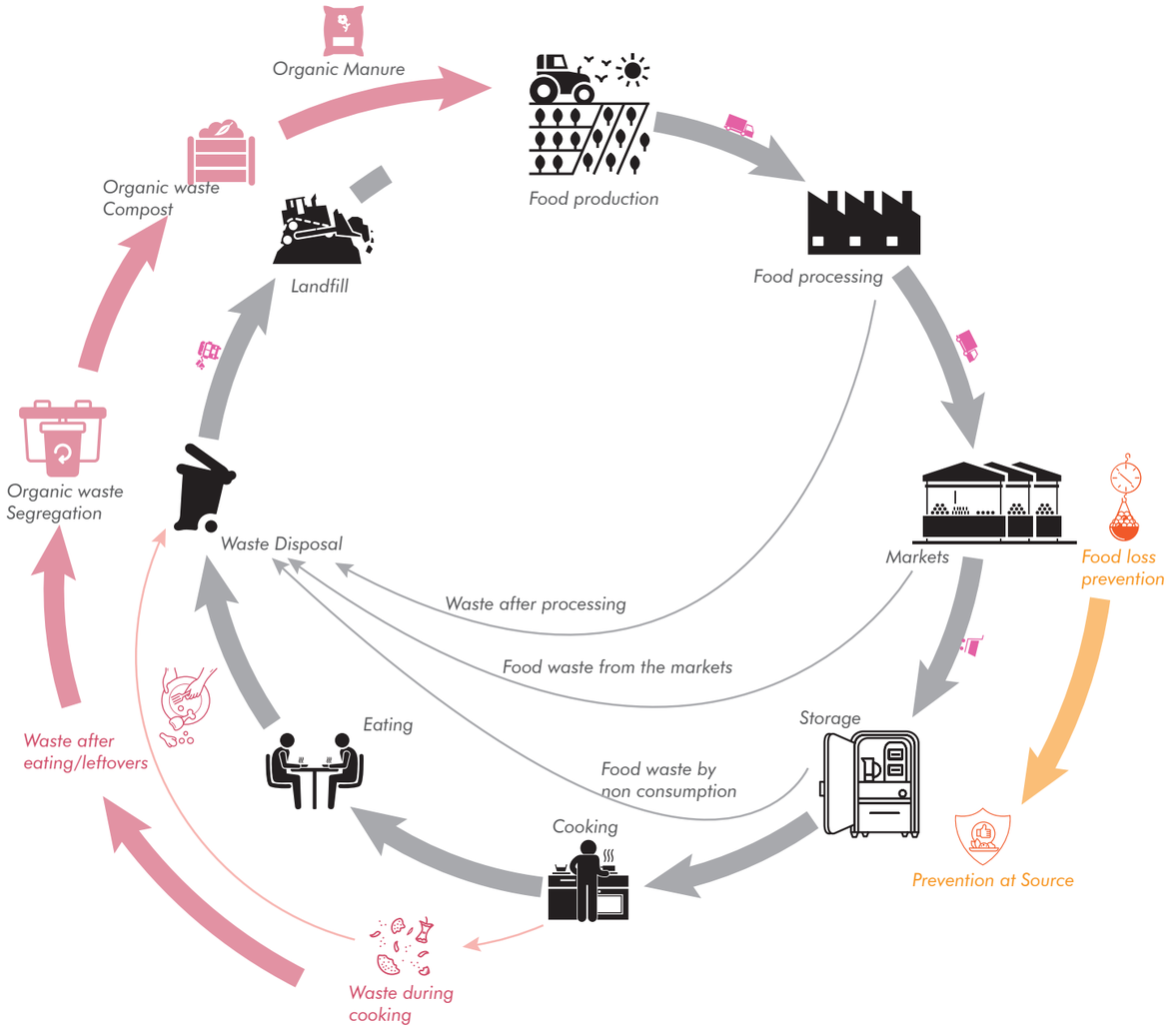


Fig: Stages of food waste generation and new strategy

Strategies for Food flows

Strategies for Food flows

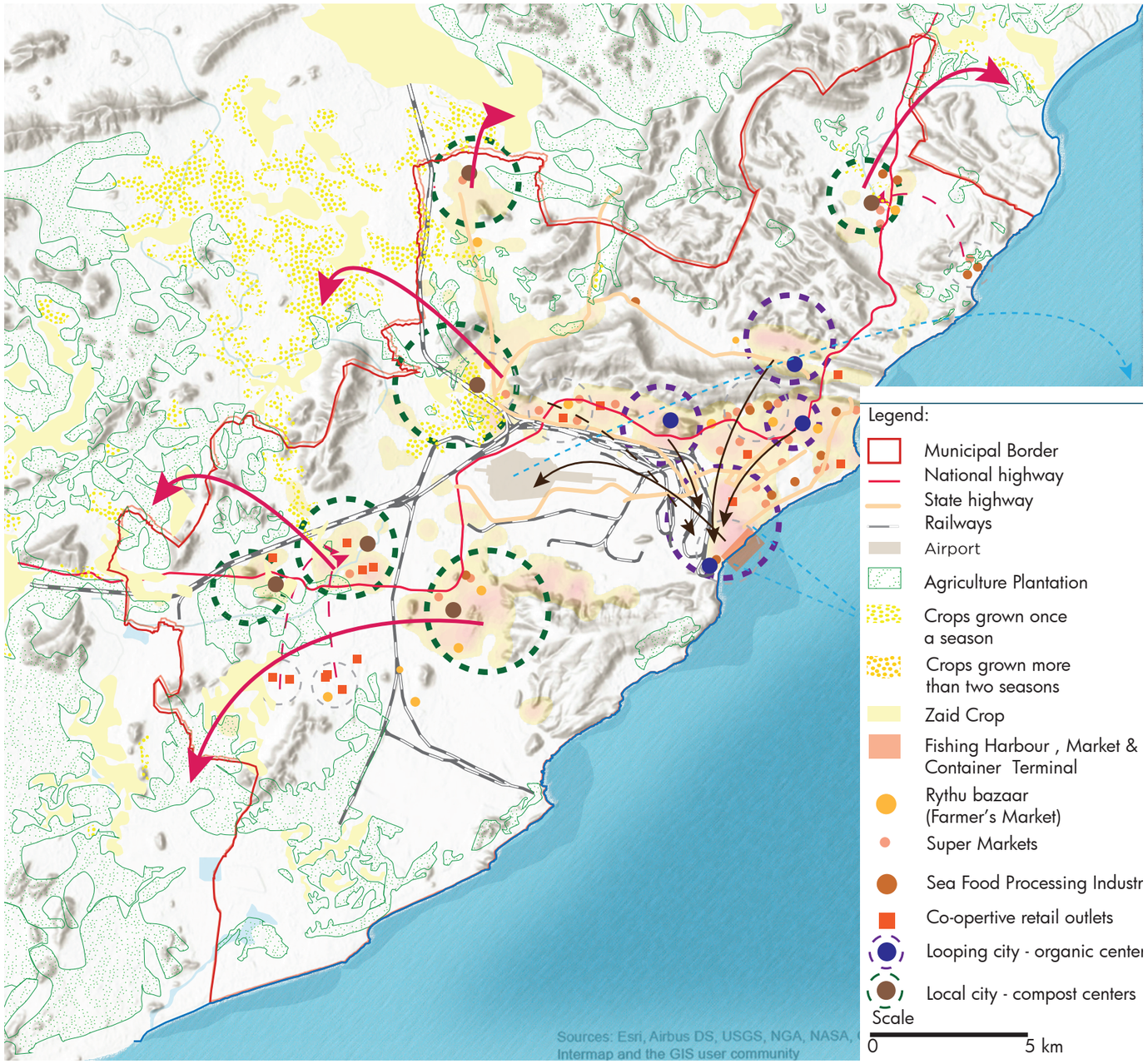


Fig: Map showing the clusters of local city and looping city for the food flows

LOCAL CITY

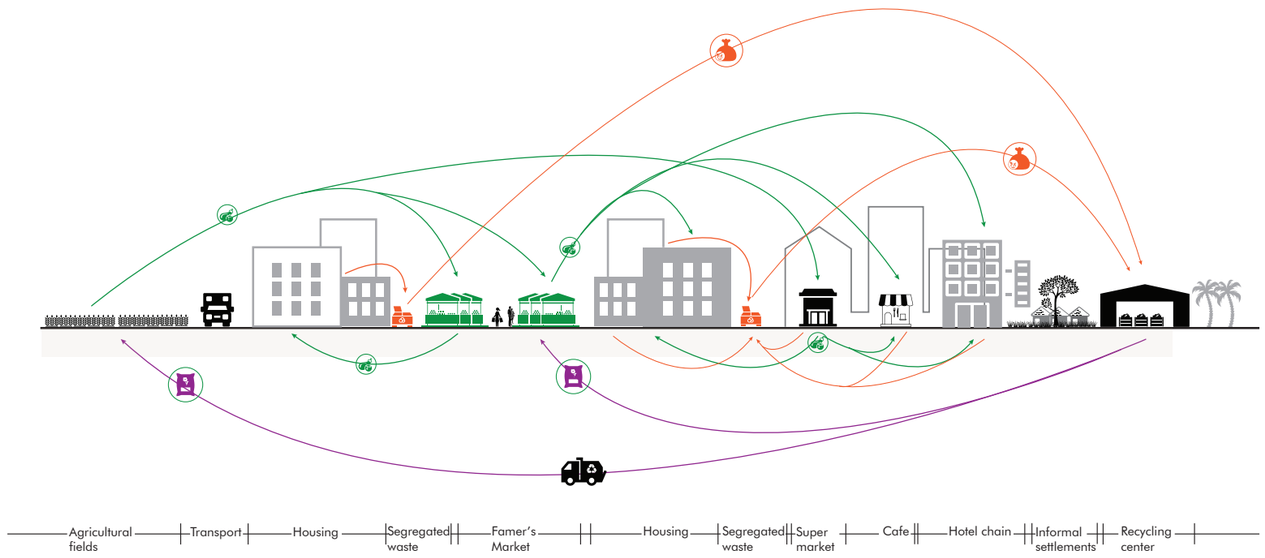


Fig: Systemic section of local city

LOOPING CITY

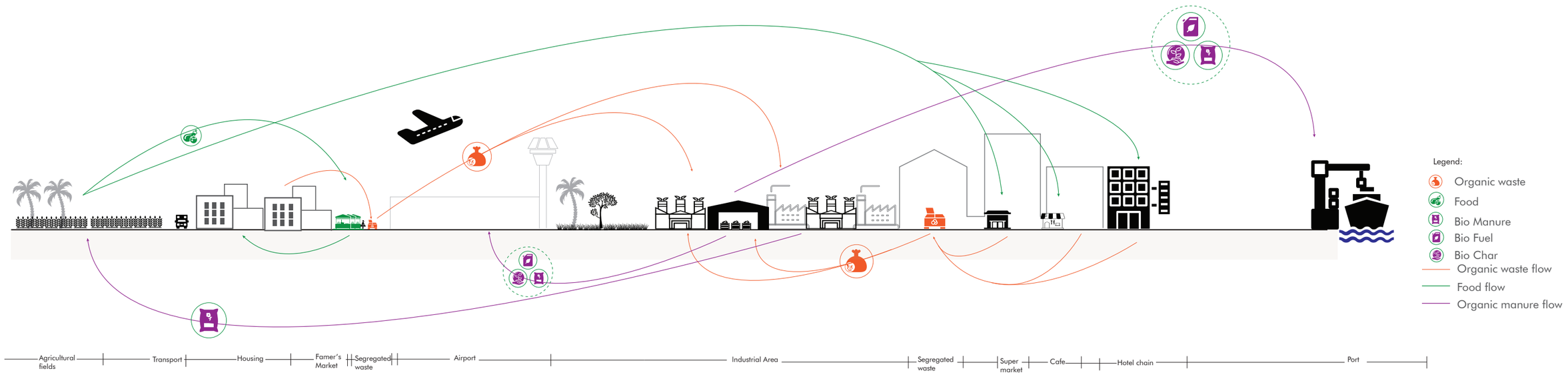
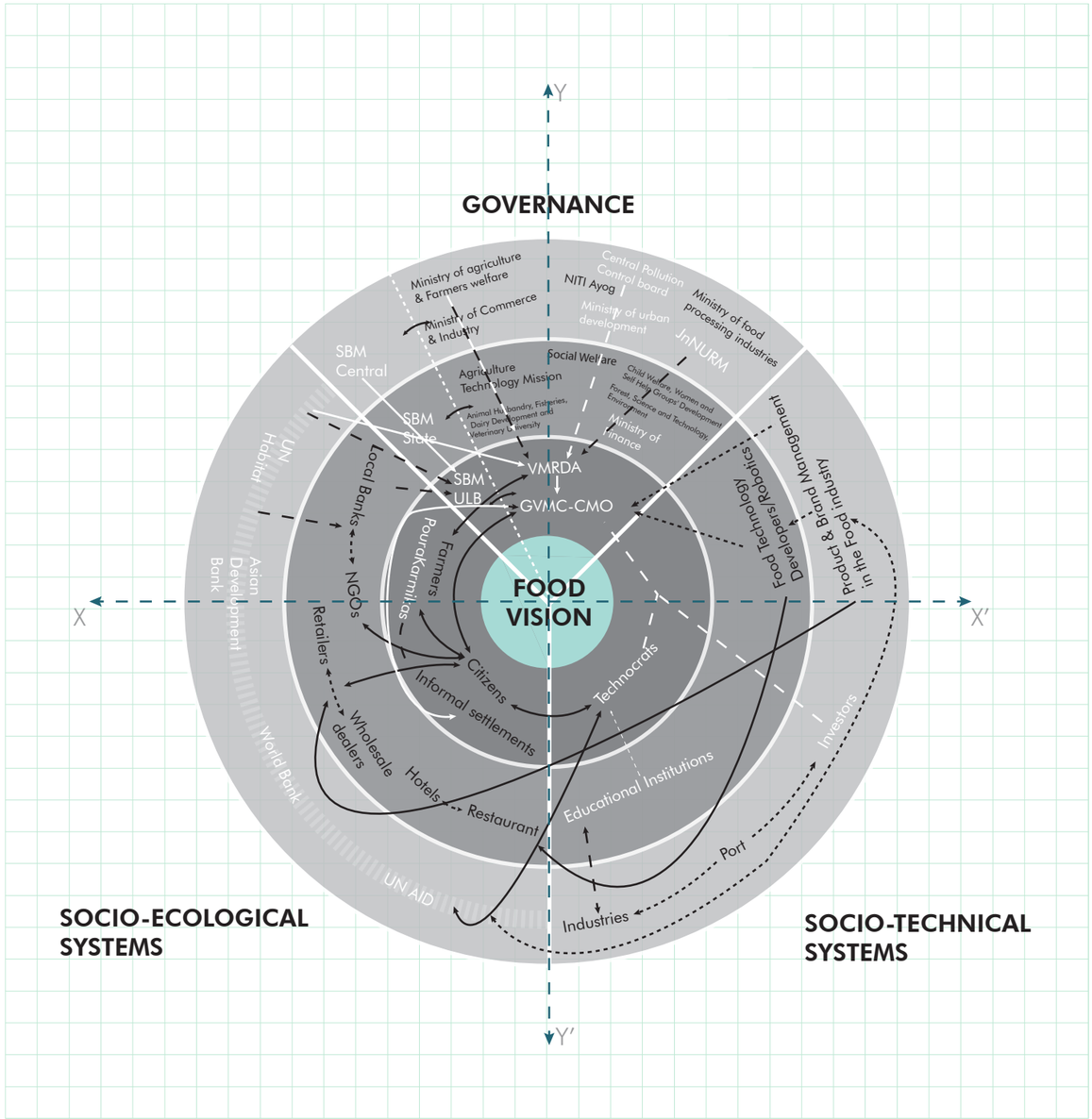


Fig: Systemic section of looping city

STAKEHOLDER INTEGRATION



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Looping City - Lavender Canal

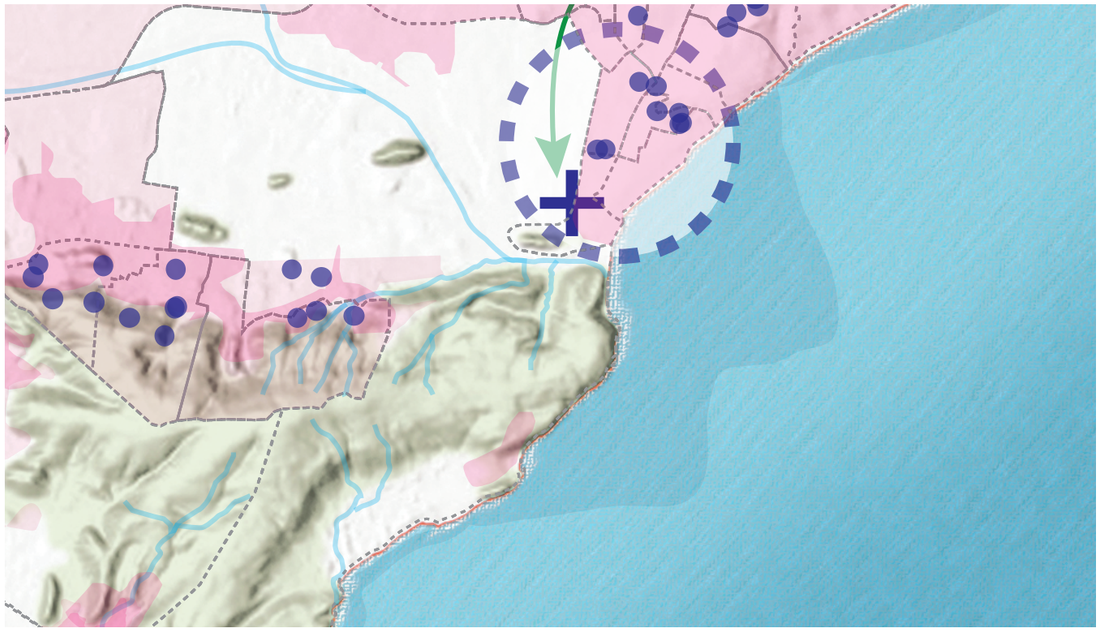


Fig: Location of the problematc Zone

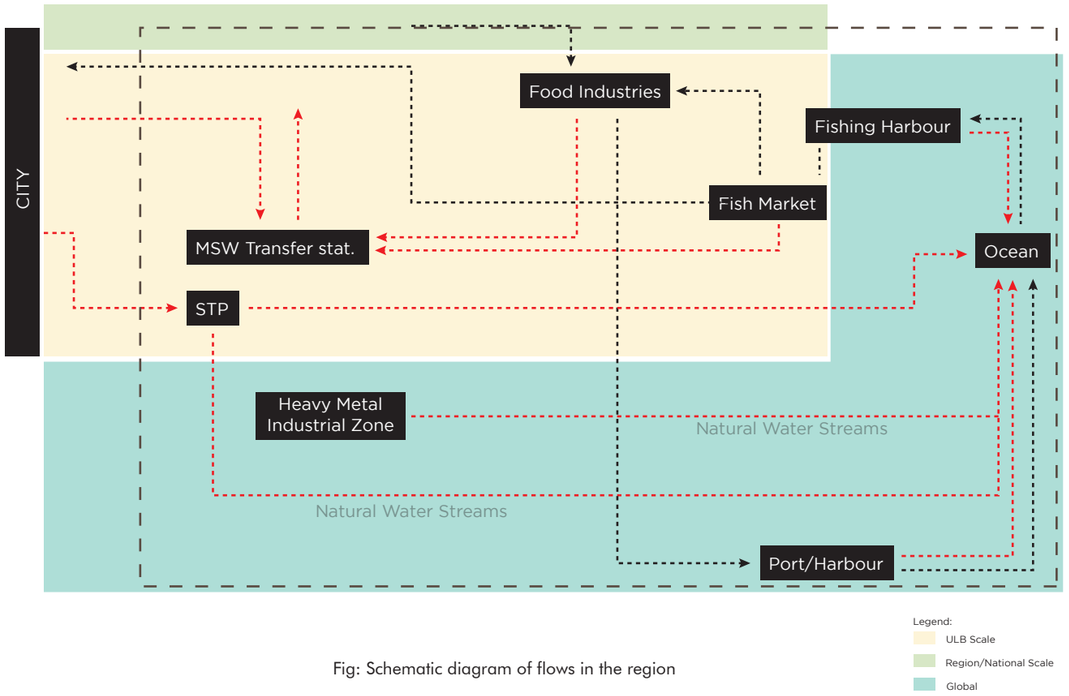
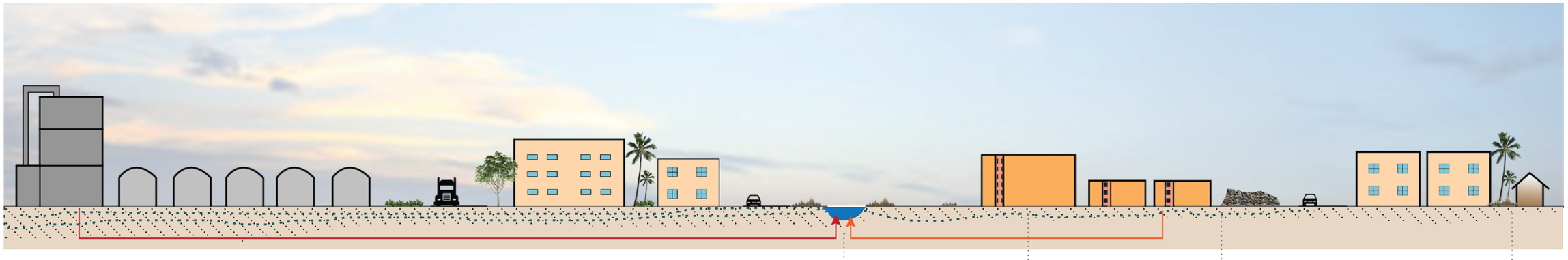


Fig: Schematic diagram of flows in the region

Legend:

- Municipal Boundary
- National highway
- Secondary roads
- Ocean
- Inner Harbour
- Lavendar Canal
- Open area canal
- Hill/Tourist spot
- Open areas
- Informal Settlements
- Residential
- Commercial
- Industrial

Scale - 1:8000



Industries/ Port | Road | Commercial Street | Road | Drainage | Sewage Treatment Plant Temporary MSW storage | Road | Residential | Slum

Fig: Systemic section of location

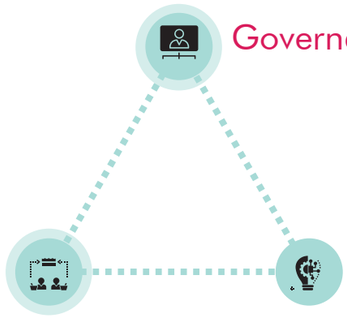
STP in the location

Polluted lavender canal in the location

Open sewage drain in the location

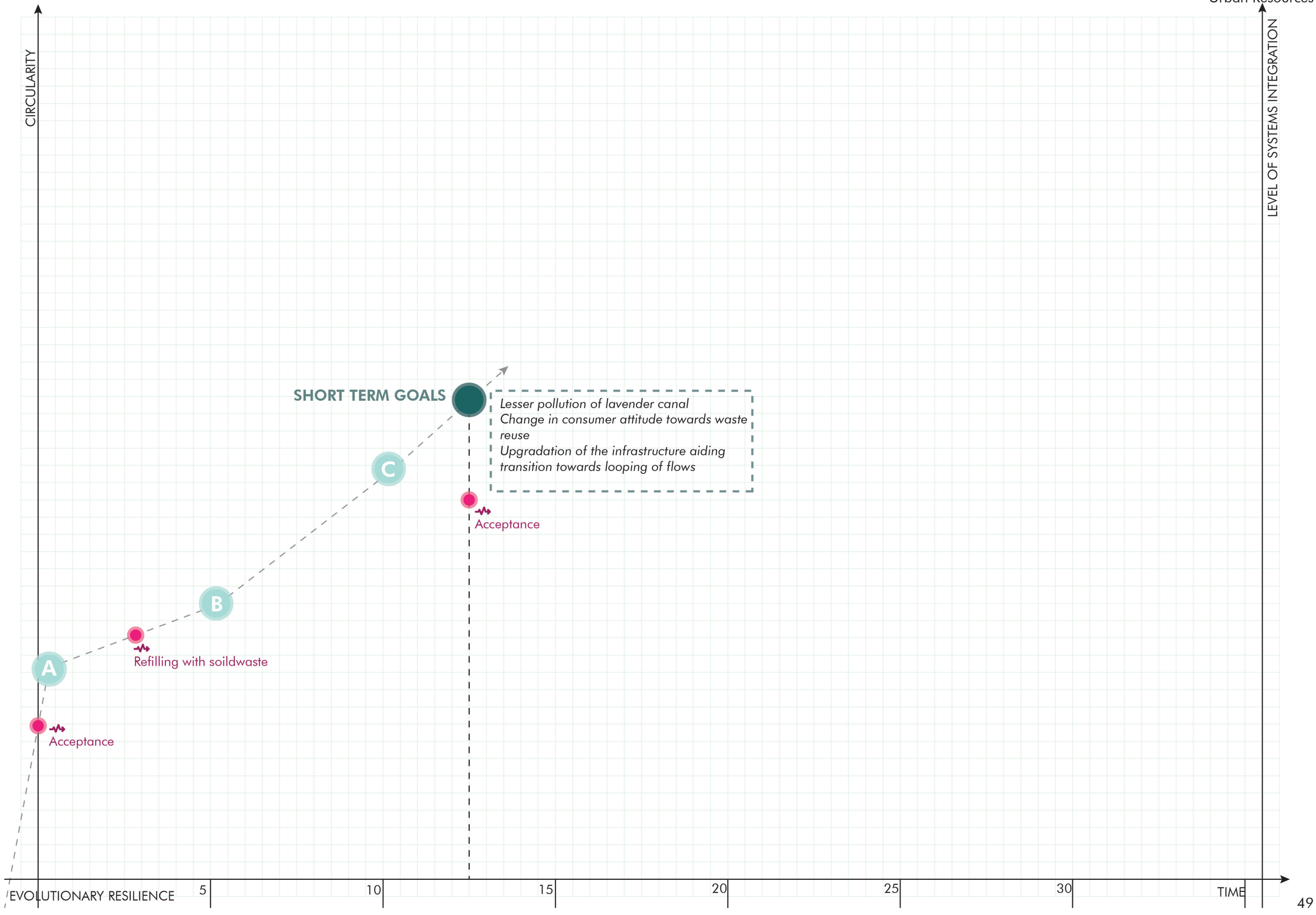
Informal settlements in the location

- Prohibition of discharge of waste water
- Storage of rainwater at household
- Lesser taxes for using recycled water
- Zoning the canal belt under public/recreational zone in the master plan
- Mandatory organic waste segregation

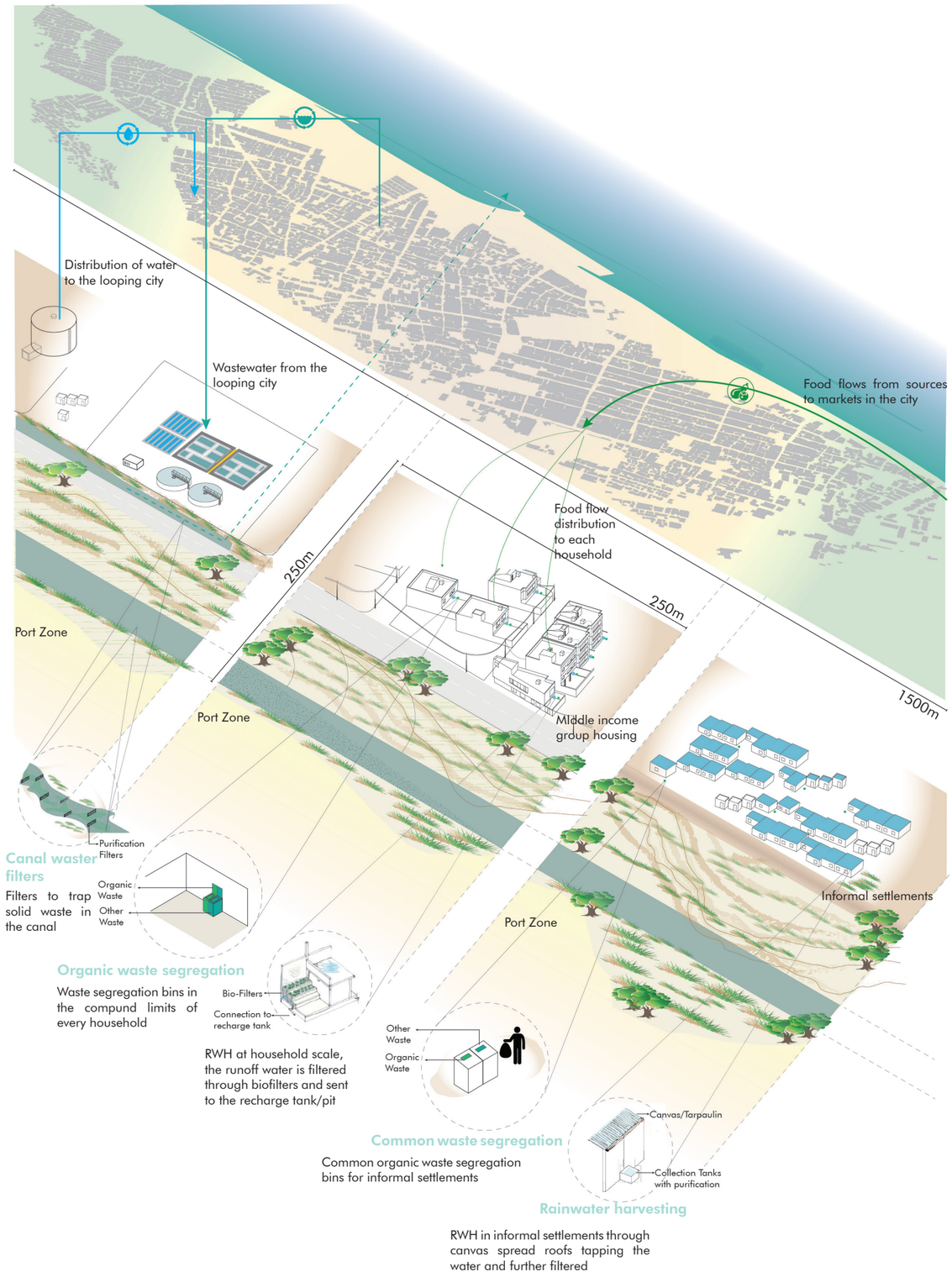


- Public awareness and education by demonstration of sustainable practices led by NGOs, educational institutions, technocrats and other local actors.
- Lowering the consumption of water from natural sources and using recycled water.
- Responsible consumption of food

- Improving the cuurent technologies of STP and linking with drinking water facilities
- Revitalising the lavender canal into productive recreational space


Urban Resources
CIRCULARITY
LEVEL OF SYSTEMS INTEGRATION
SHORT TERM GOALS
Lesser pollution of lavender canal
Change in consumer attitude towards waste reuse
Upgradation of the infrastructure aiding transition towards looping of flows
C
Acceptance
B
Refilling with soildwaste
A
Acceptance
EVOLUTIONARY RESILIENCE
5
10
15
20
25
30
TIME

Phase - A:



Rainwater Harvesting

ULB + NGO + Tax Rebate

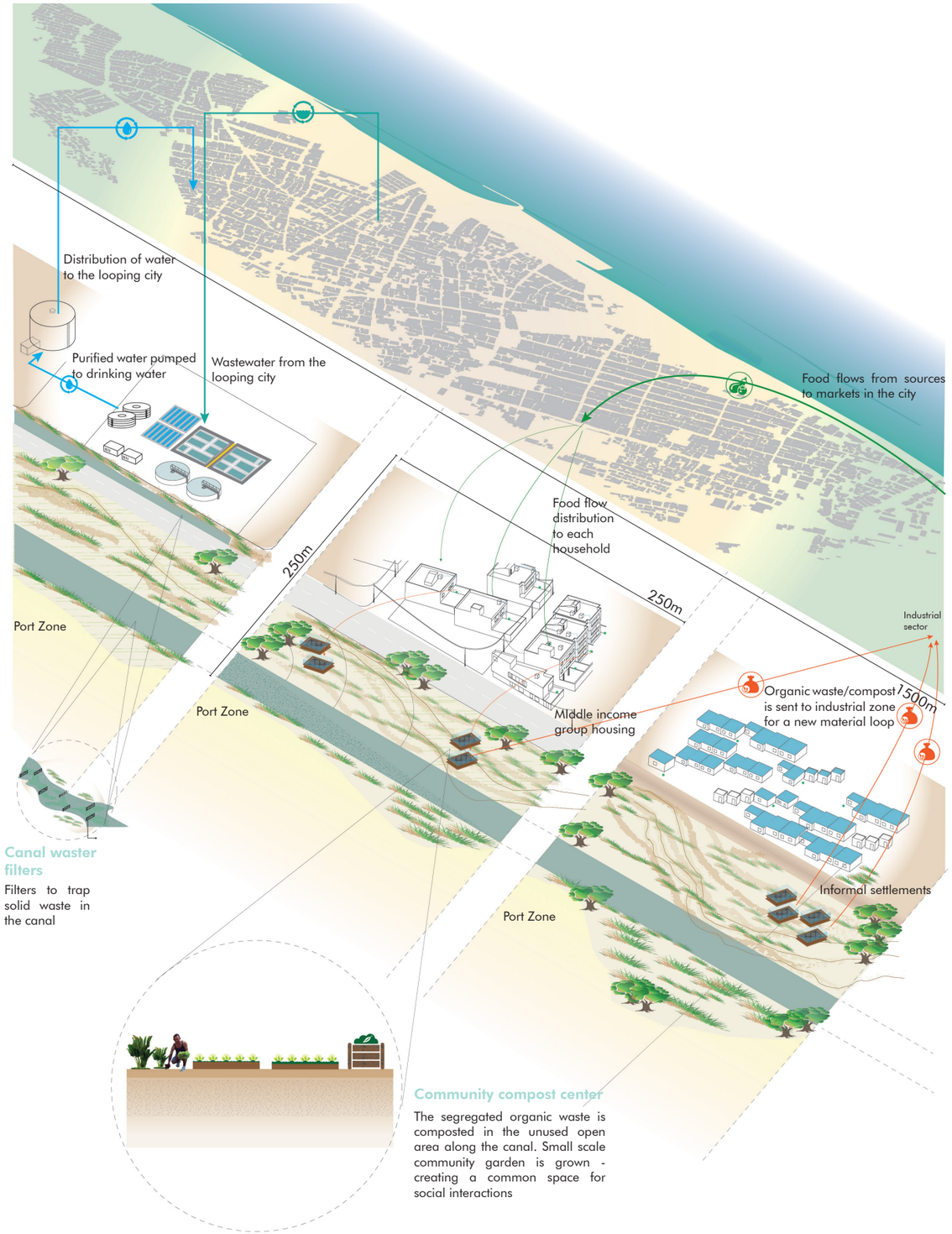
Cleaning of Canal

ULB

Segregation & Re-routing of waste

Media + ULB + Private Investors/ Contractors

Phase - B:



Connecting STP to Water board

National. Regional. ULB

Environmental policies

Ministries and research institutes at National Scale

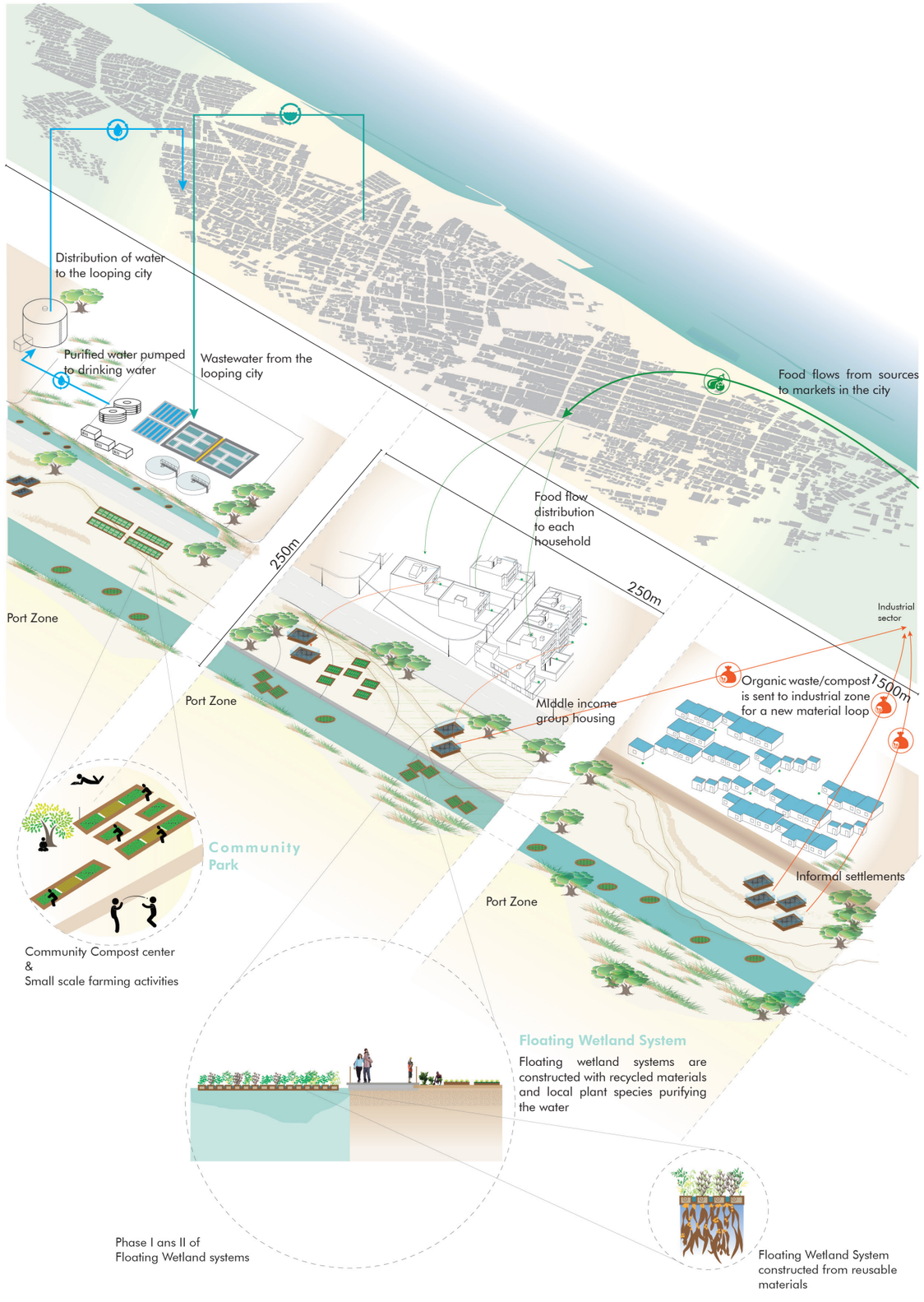
Community compost centers

ULB + Crowd Funding + Local Community + Social Media

Food Waste Prevention

Private Investors + NGO + Media + Local Community

Phase - C:



Canal Purification

National Gov + Research institutes local & national

Local Community + Private Investors + NGO

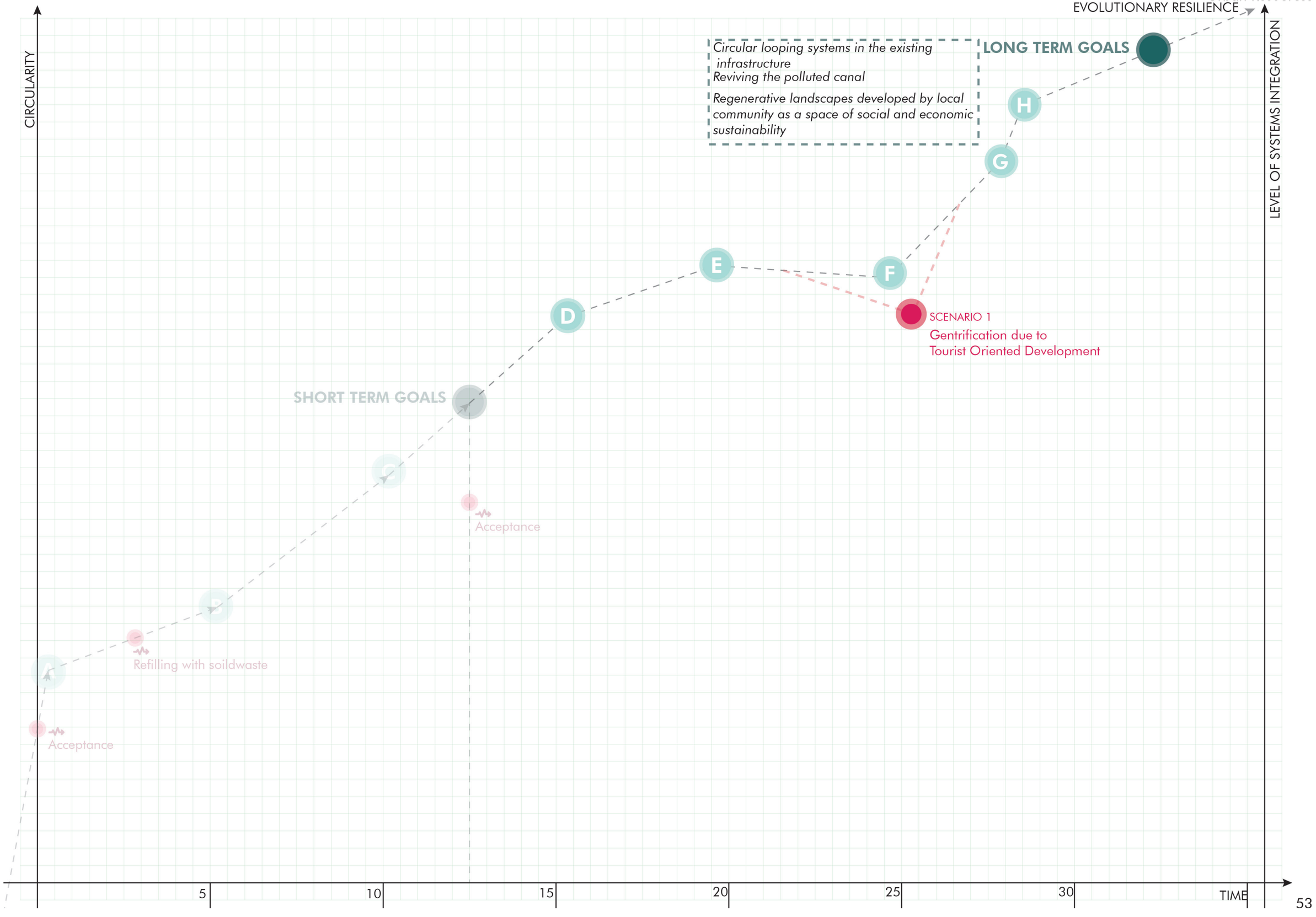
ULB

Community Scale Farming

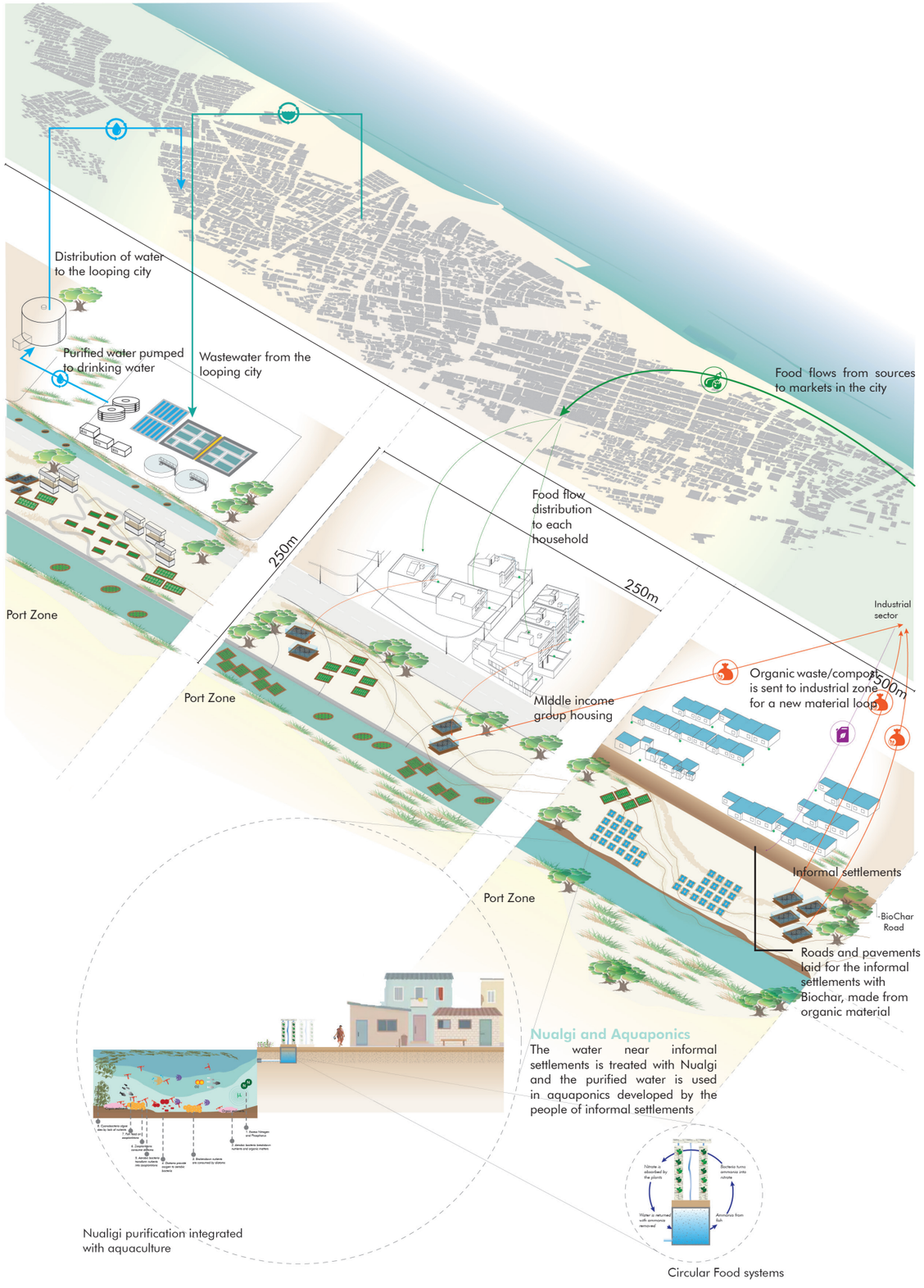
Private Investors + Local Community + Crowd Funding

Segregation & Re-routing of waste

Private Investors + NGO + Media + Local Community


Urban Resources
EVOLUTIONARY RESILIENCE
CIRCULARITY
LEVEL OF SYSTEMS INTEGRATION
Circular looping systems in the existing infrastructure
Reviving the polluted canal
Regenerative landscapes developed by local community as a space of social and economic sustainability
LONG TERM GOALS
H
G
E
F
D
SCENARIO 1
Gentrification due to
Tourist Oriented Development
SHORT TERM GOALS
C
B
A
Acceptance
Refilling with soildwaste
Acceptance
5
10
15
20
25
30
TIME

Phase - D:



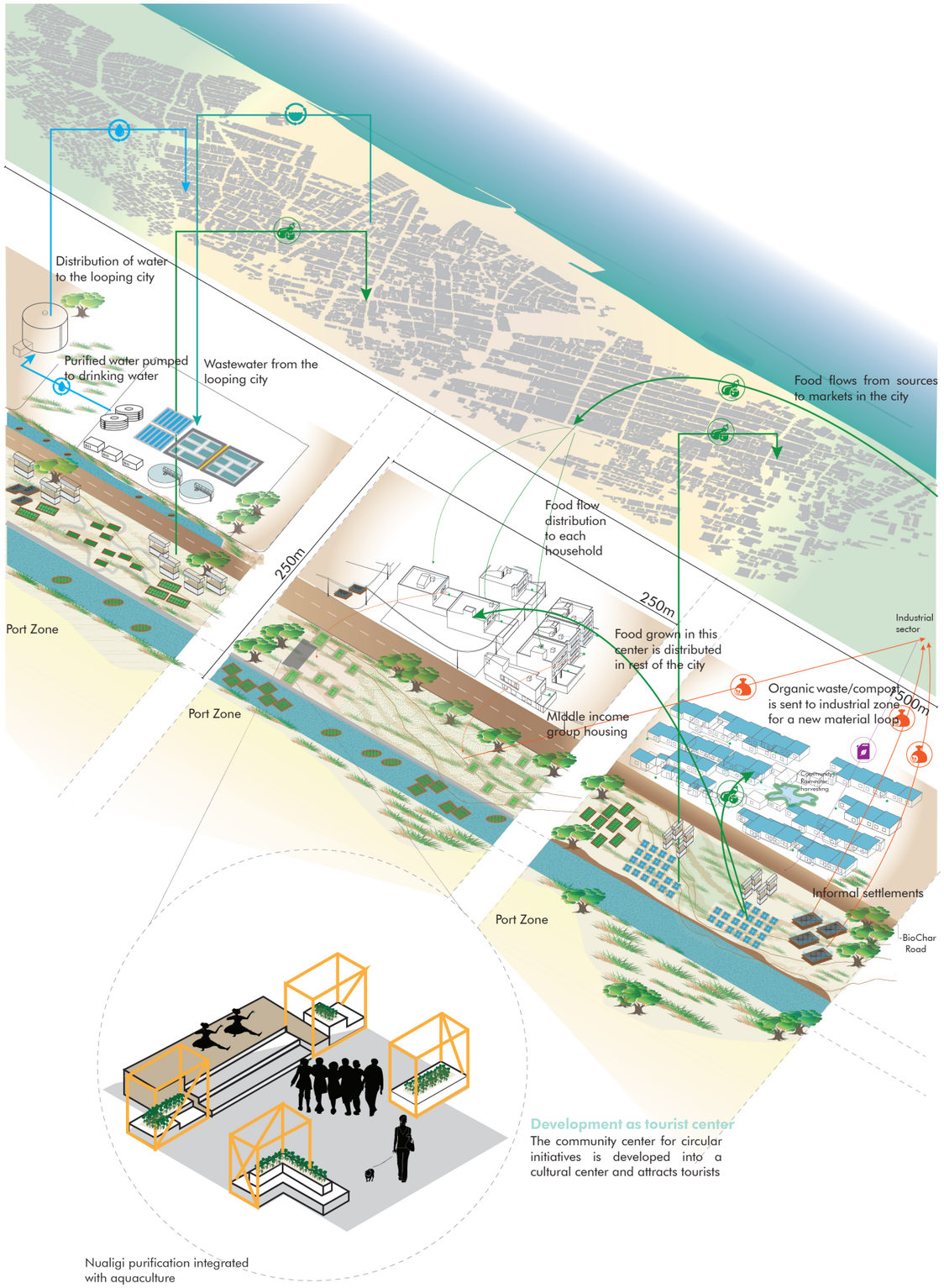
Canal Purification & Aquaponics

ULB + Crowd Funding + NGO

Building Social Capital

Local Community + Crowd Funding + ULB

Phase - E:



Center for eco-innovative solutions & Tourism

ULB + Crowd Funding + Private Investors + Local Communi

Research Institutes + + +


COMMUNITY
CENTE

Local City - Sagar Nagar

Local City - Sagar Nagar

Fig: Location of the problematc Zone

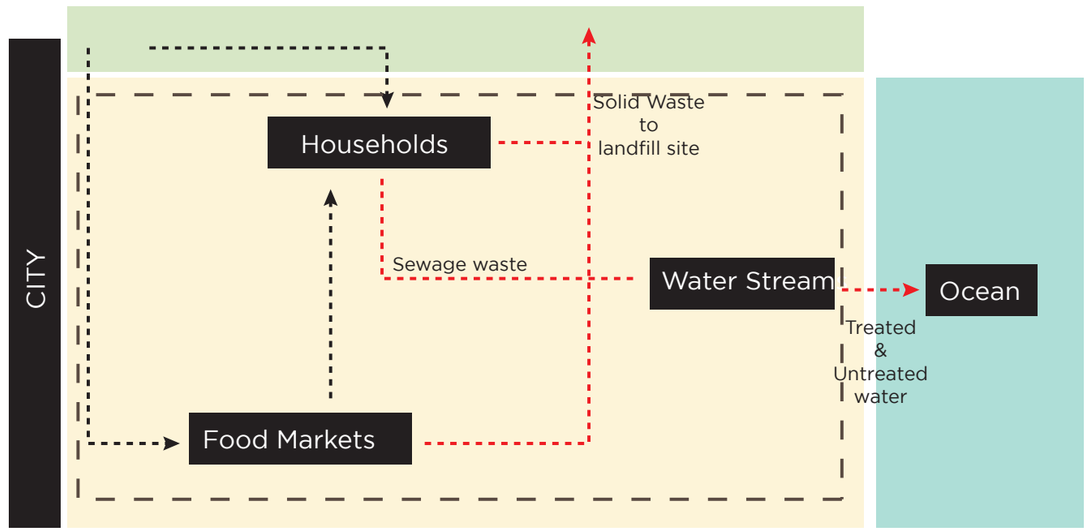


Fig: Schematic diagram of flows in the region

Fig: Map showing the existing landuse of the location

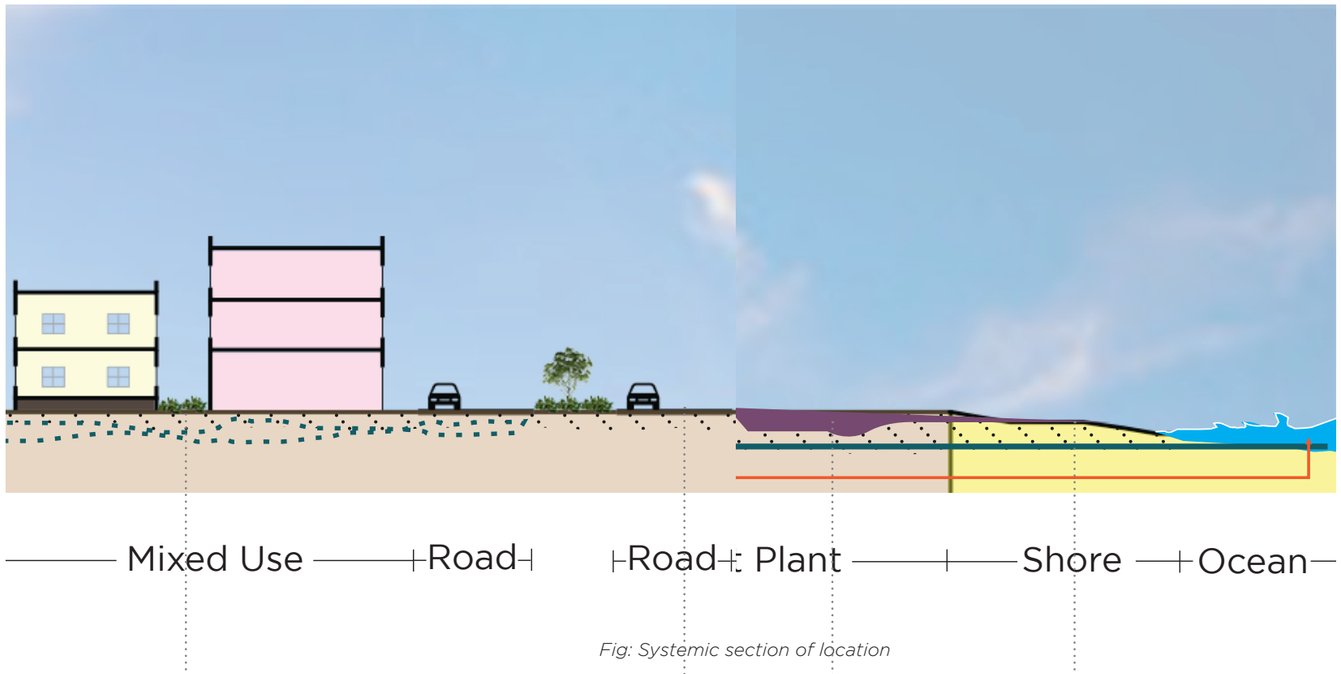


Fig: Systemic section of location

Legend:

- Poor Soil Quality
- Poor underground water quality
- Pollution due to STP/MSW
- Pollution due to Industries
- Damage due to excessive fertiliser usage
- Nutrients Run-off

Organic waste in the location

Waste water being released into the sea without any treatment

Stream of waste water eroding the coast

The images above show the amount of environmental degradation in the location

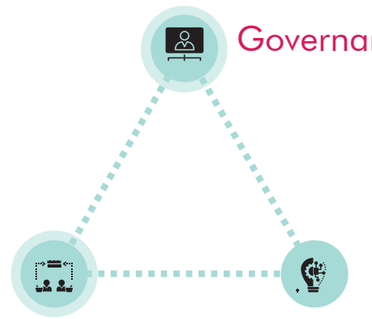
Prohibition of discharge of waste water into the canals/ natural water sources.

Storage of stormwater runoff at household and community scale

Using the recycled water for non-potable usage

Lower water taxes and guidance from the municipality to install the decentralised systems.

Depending on the soil quality, the guidelines for installation of decentralized wastewater system should be determined by the urban local body



Public awareness and education by demonstration of sustainable practices.

Responsible consumption of resources

- Developing decentralised rainwater harvesting systems, food compost and wastewater treatment systems

Urban Resources

CIRCULARITY

LEVEL OF SYSTEMS INTEGRATION

SHORT TERM GOALS

Lesser pollution of natural streams of water

Policies and guidelines for implementing decentralised wastewater systems

Household scale rain water harvesting

B

Quality standards of the food distribution to weaker sections

Refilling with soildwaste

A

Acceptance

EVOLUTIONARY RESILIENCE

5 yrs

10 yrs

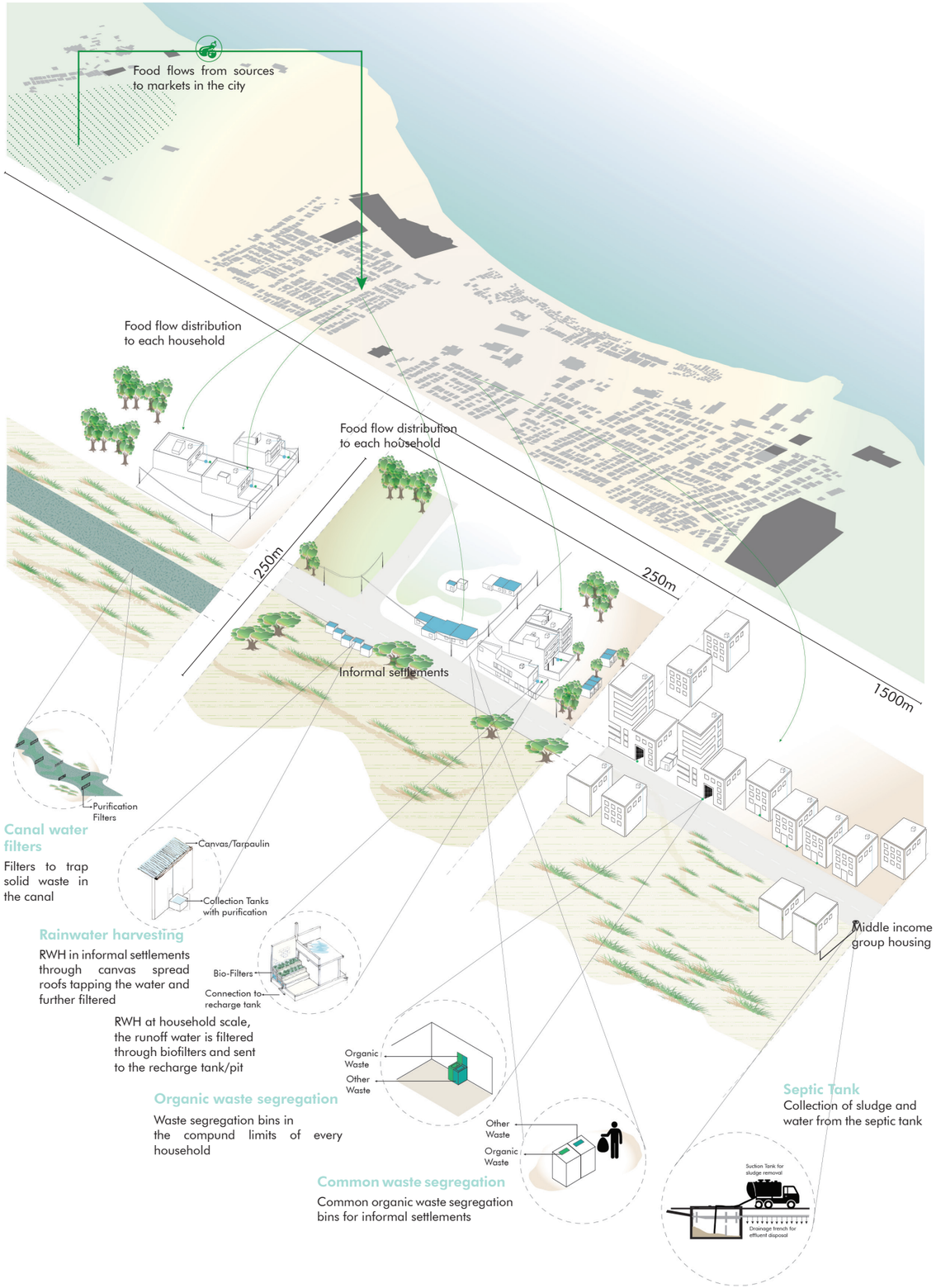
15 yrs

20 yrs

25 yrs

30 yrs

TIME



Phase - A:

Rainwater Harvesting

ULB + NGO + Tax Rebate

Cleaning of Canal

ULB

Segregation & Re-routing of waste

Media + ULB + Private Investors/ Contractors

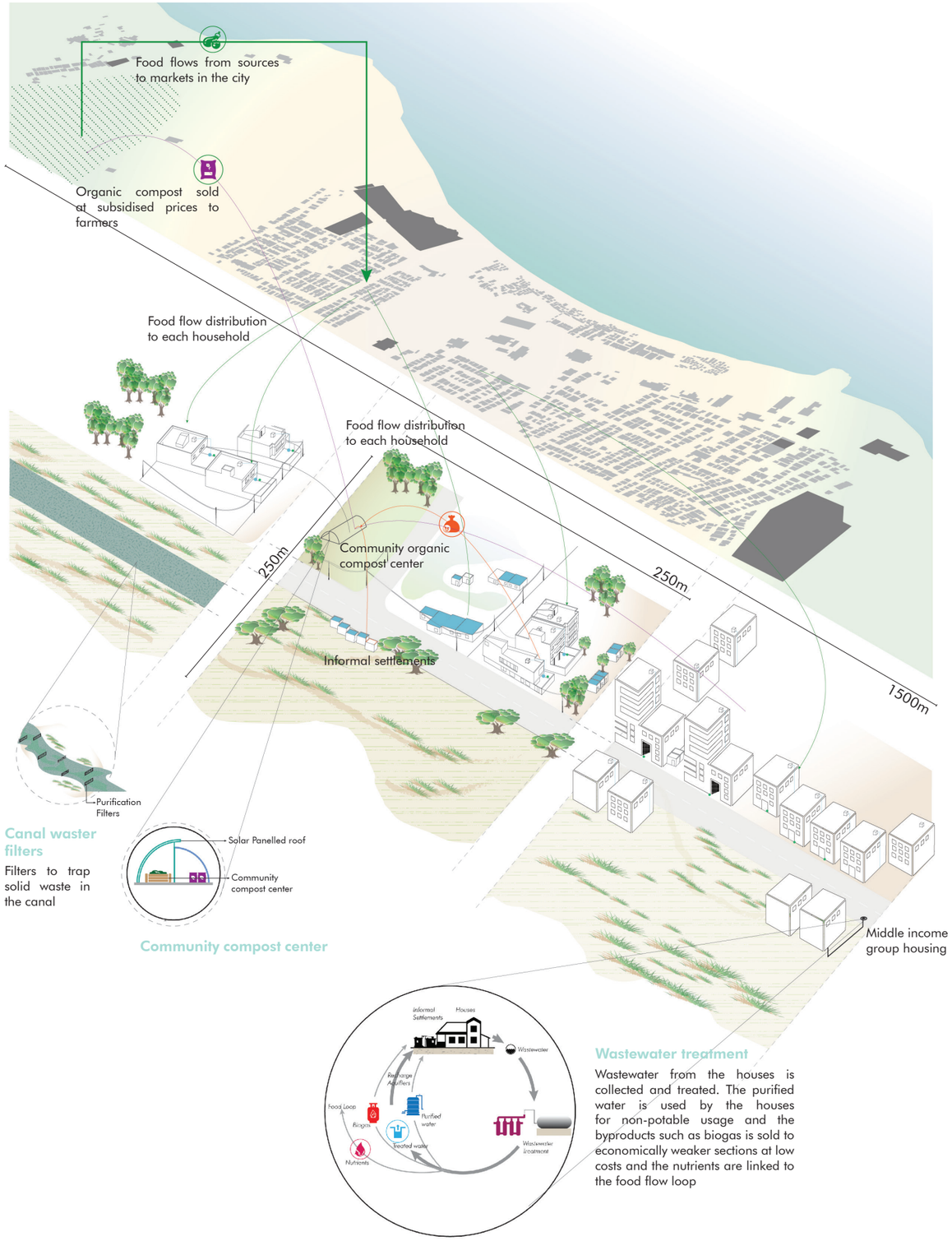
Temporary Septic Tanks

VMRDA + ULB + Funded by ULB

Policies & Guidelines for decentralised wastewater treatment

Levels of governance + Research Institutes

Phase - B:



Wastewater treatment

Wastewater from the houses is collected and treated. The purified water is used by the houses for non-potable usage and the byproducts such as biogas is sold to economically weaker sections at low costs and the nutrients are linked to the food flow loop

Implementation of decentralised wastewater treatment

Local Community + Local Research + Workshops

NGO + Crowd Funding + Tax Rebate

NGO

Environmental policies

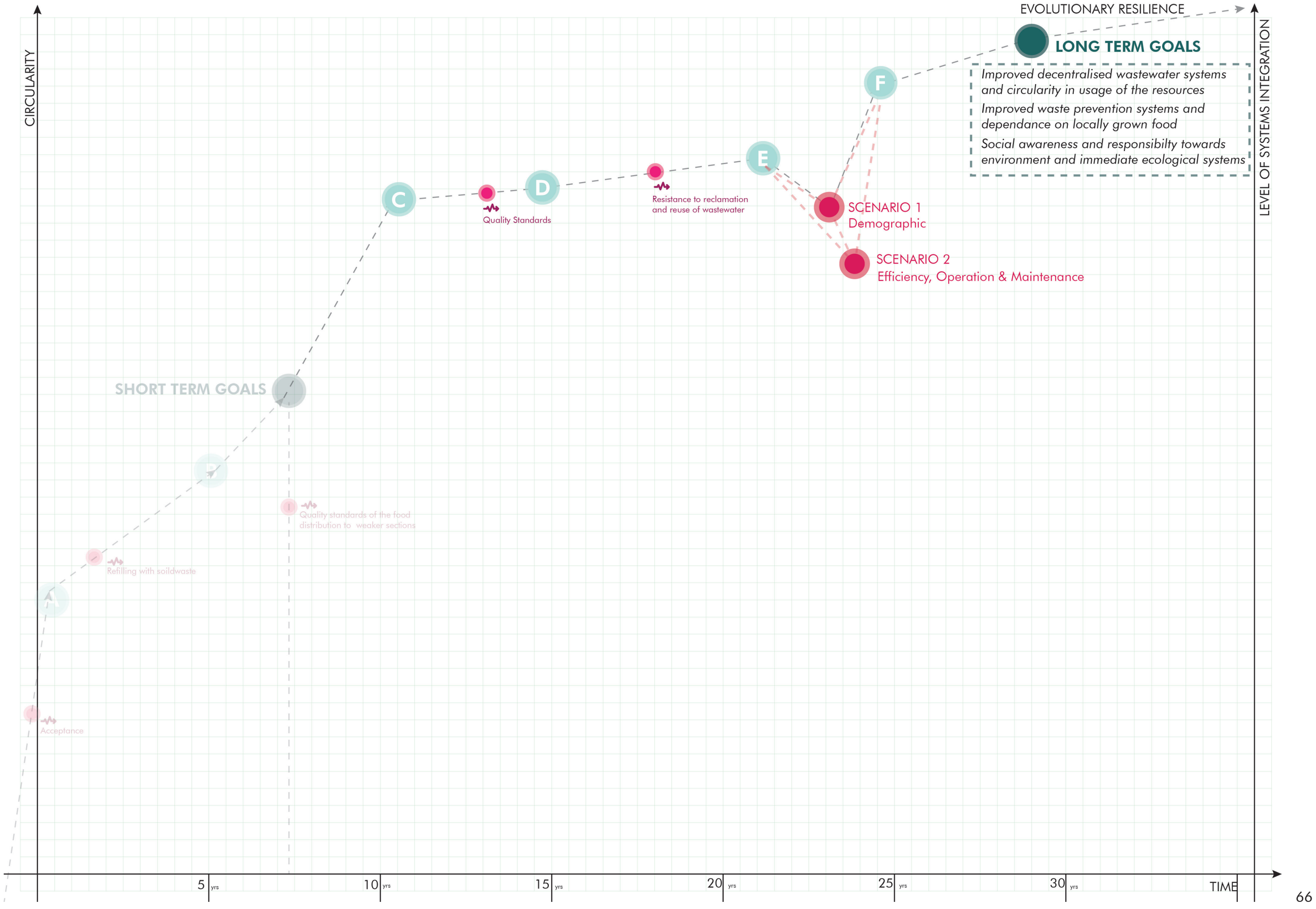
Ministries and research institutes at National Scale

Community compost centers

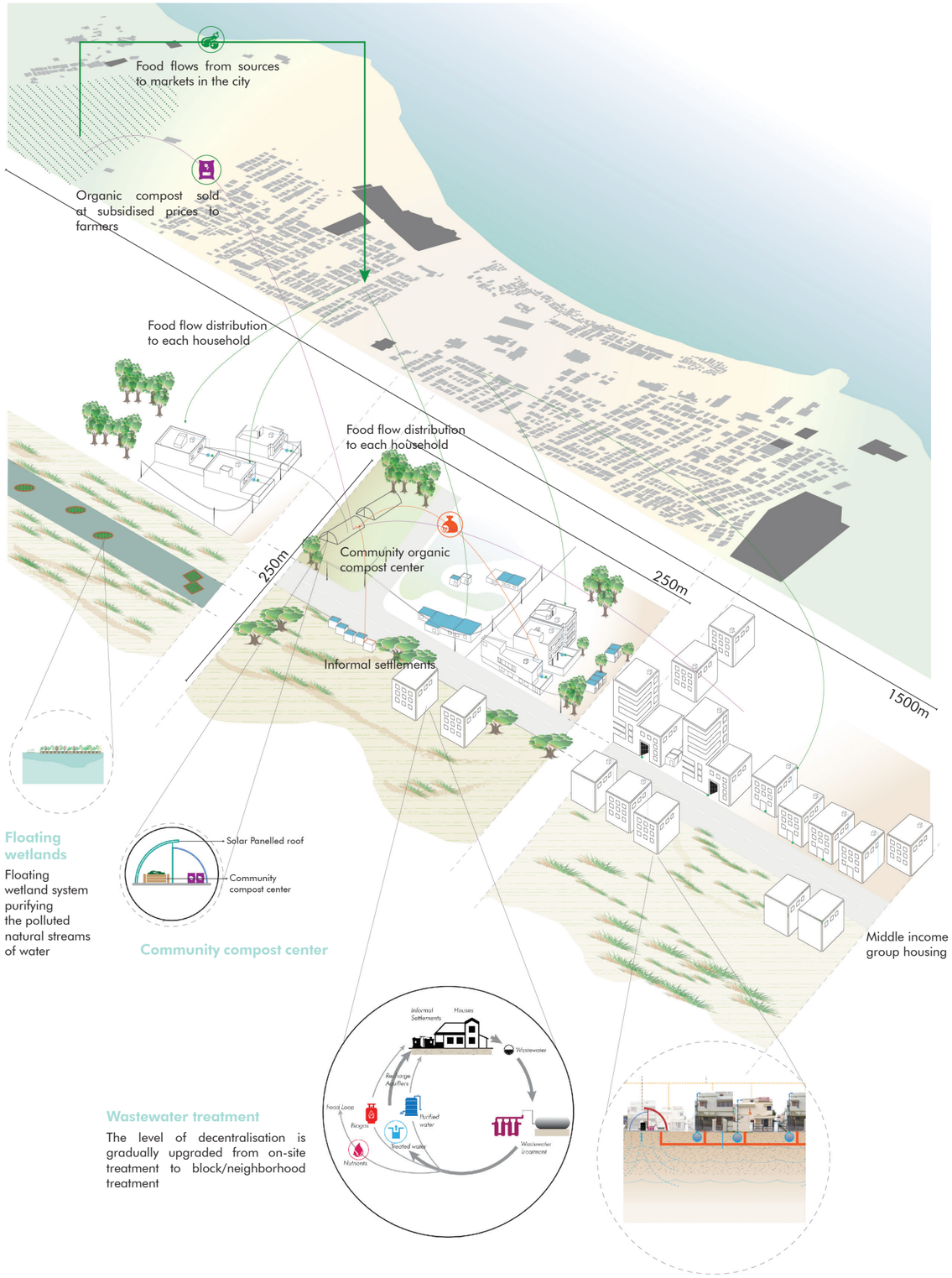
ULB + Crowd Funding + Local Community + Social Media

Food Waste Prevention

Private Investors + NGO + Media + Local Community


EVOLUTIONARY RESILIENCE
CIRCULARITY
LEVEL OF SYSTEMS INTEGRATION
LONG TERM GOALS
Improved decentralised wastewater systems and circularity in usage of the resources
Improved waste prevention systems and dependance on locally grown food
Social awareness and responsibilty towards environment and immediate ecological systems
F
E
D
C
Resistance to reclamation and reuse of wastewater
Quality Standards
SCENARIO 1
Demographic
SCENARIO 2
Efficiency, Operation & Maintenance
SHORT TERM GOALS
B
A
Quality standards of the food distribution to weaker sections
Refilling with soildwaste
Acceptance
5 yrs
10 yrs
15 yrs
20 yrs
25 yrs
30 yrs
TIME

Phase - C:



Water stream purification

ULB + National Gov + Research institutes local & national

Local Community + Private Investors + NGO

Implementation of decentralised wastewater treatment

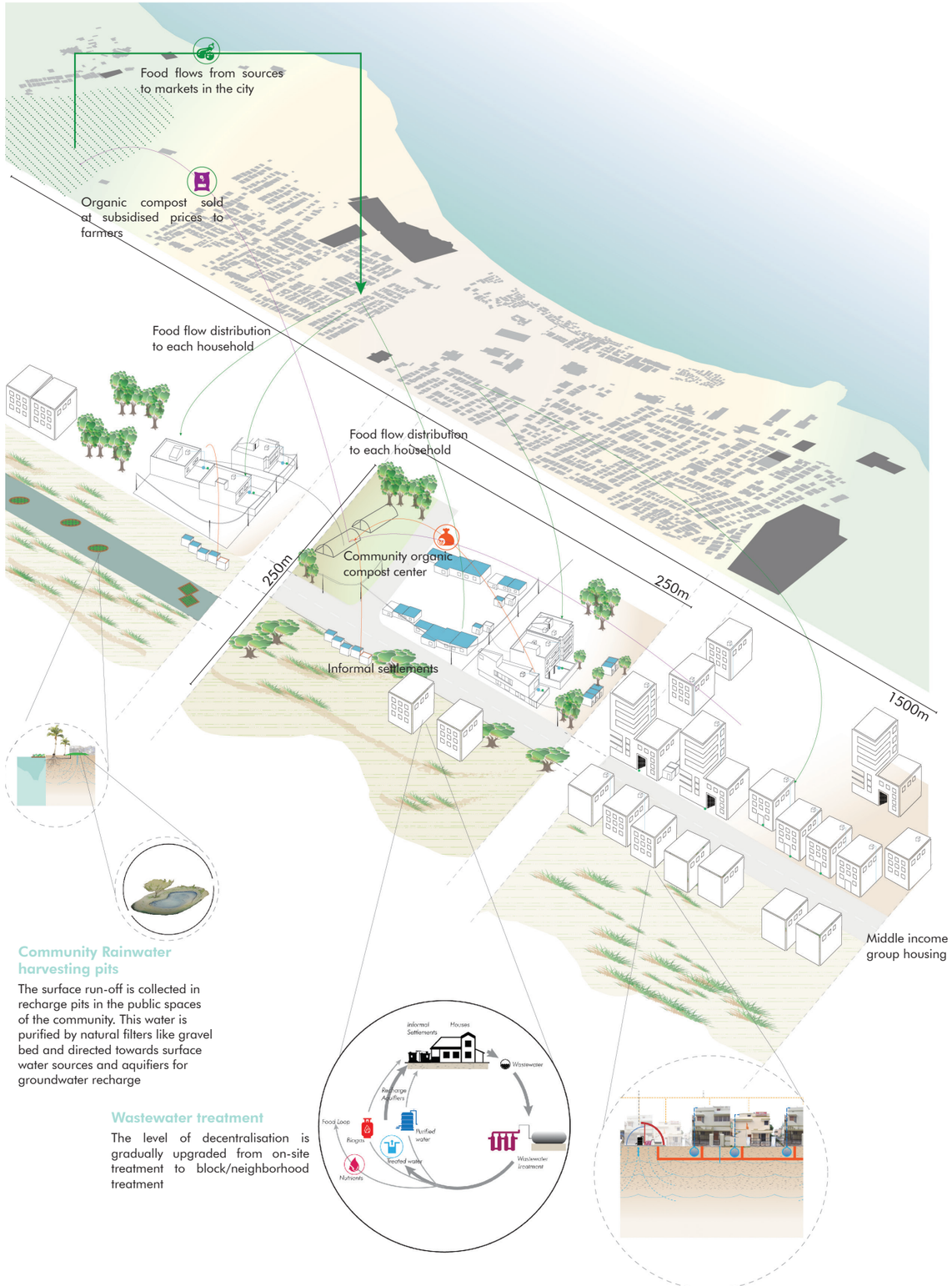
Local Community + Local Research + Workshops

NGO + Crowd Funding + Tax Rebate

Food Waste Prevention

Private Investors + NGO + Media + Local Community

Phase - D:



Community Rainwater harvesting pits

The surface run-off is collected in recharge pits in the public spaces of the community. This water is purified by natural filters like gravel bed and directed towards surface water sources and aquifers for groundwater recharge

Wastewater treatment

The level of decentralisation is gradually upgraded from on-site treatment to block/neighborhood treatment

Upscaling of decentralised wastewater treatment

Local Community + Local Research + Workshops

NGO + Crowd Funding + Tax Rebate

Community scale rainwater harvesting

Local Community + Local Research + Crowd Funding

CONCLUSIONS AND REFLECTIONS

How to integrate **resource management** into **urban planning** by developing *local scale spatial strategies* for an *environmentally sustainable* Visakhapatnam?

Understanding Resource Flows

Contrast Cities

Importance of co-existence of both centralised and decentralised systems

Evolutionary Transformation

SCOPE OF TRANSFERABILITY

The approach of integration can be transferred to other citites in the country facing similar challenges.

While the designed eco-innovative solutions can be replicable with changes according to the requirement

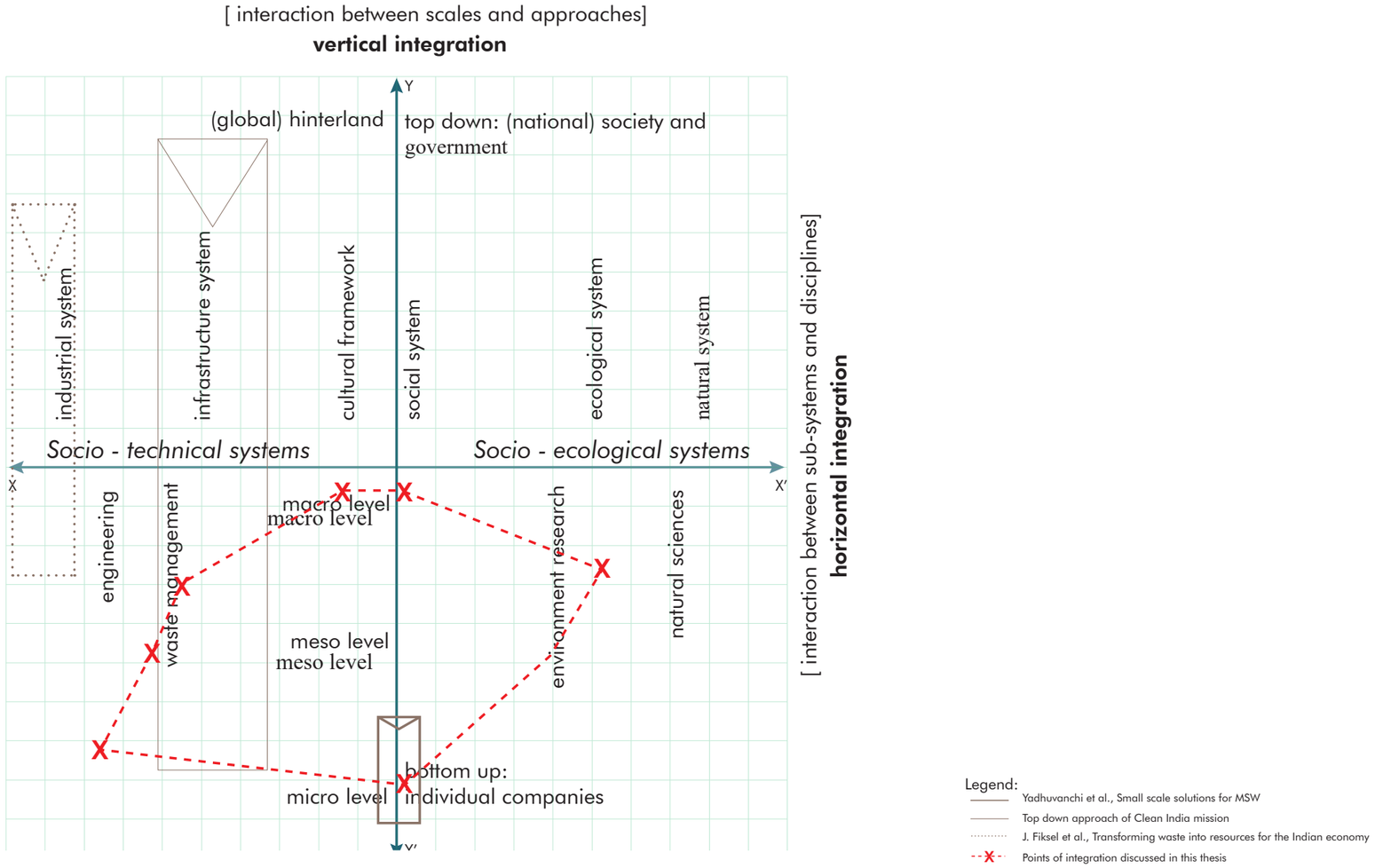
FURTHER STEPS

Identifying solutions for other problematic zones

Further research in spatial design for eco-innovative solutions

Further research in the field of circular economy in India

THESIS CONTRIBUTION



Vertical - Horizontal integration framework of urban planning

THANK YOU

ధన్యవాదాలు