

Banking on the city for secondary resources that can release the pressure on natural environment and progress towards Environmental Sustainable urban integrated systems

## CONTEXT

Urbanisation in the developing countries, especially in India is growing at an unprecedented rate. The metropolitan cities are expanding beyond their hinterlands with increasing urban population and affluence. The increasing demand for resources is creating pressure on the environment. The linear process of extraction of resources is affecting the environment. Due to India's sustained economic growth, increasing living standards and changing production and consumption patterns, there is an increase in the amount of waste that is being generated. This can be attributed to the linear approach towards resource consumption, usage and disposal. This thesis analysed this problem in the city of Visakhapatnam, India which is already facing the challenges of environmental degradation. In this thesis, the resource flows of food and water have been analysed as they are the major share of waste that is being produced. The resource flows are analysed from their source to sink and the streams of waste that is being produced in each stage causing environmental damage. The thesis has proposed the transition into circular metabolism of these two resource flows to better the environmental sustainability.

### Problem Statement:

The growing affluence and linear model of resource consumption, production and disposal are causing environmental damage in the city of Visakhapatnam. However, the city's approach towards increasing volumes of waste is limited to optimizing the existing waste disposal systems and develop end of pipe solutions, though there is a potential in utilizing the waste streams as secondary resources and promote thoughtful consumption. This is due to the lack of awareness about the benefits of resource reuse for both the citizens and administrative sectors.

Hence, there is an urgent need to evolve this linear metabolic process into a circular process. Implementing the new system to an already existing system is the main challenge. It has to be implemented at multiple scales, with both top-down and bottom-up strategies.

### Research Question:

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

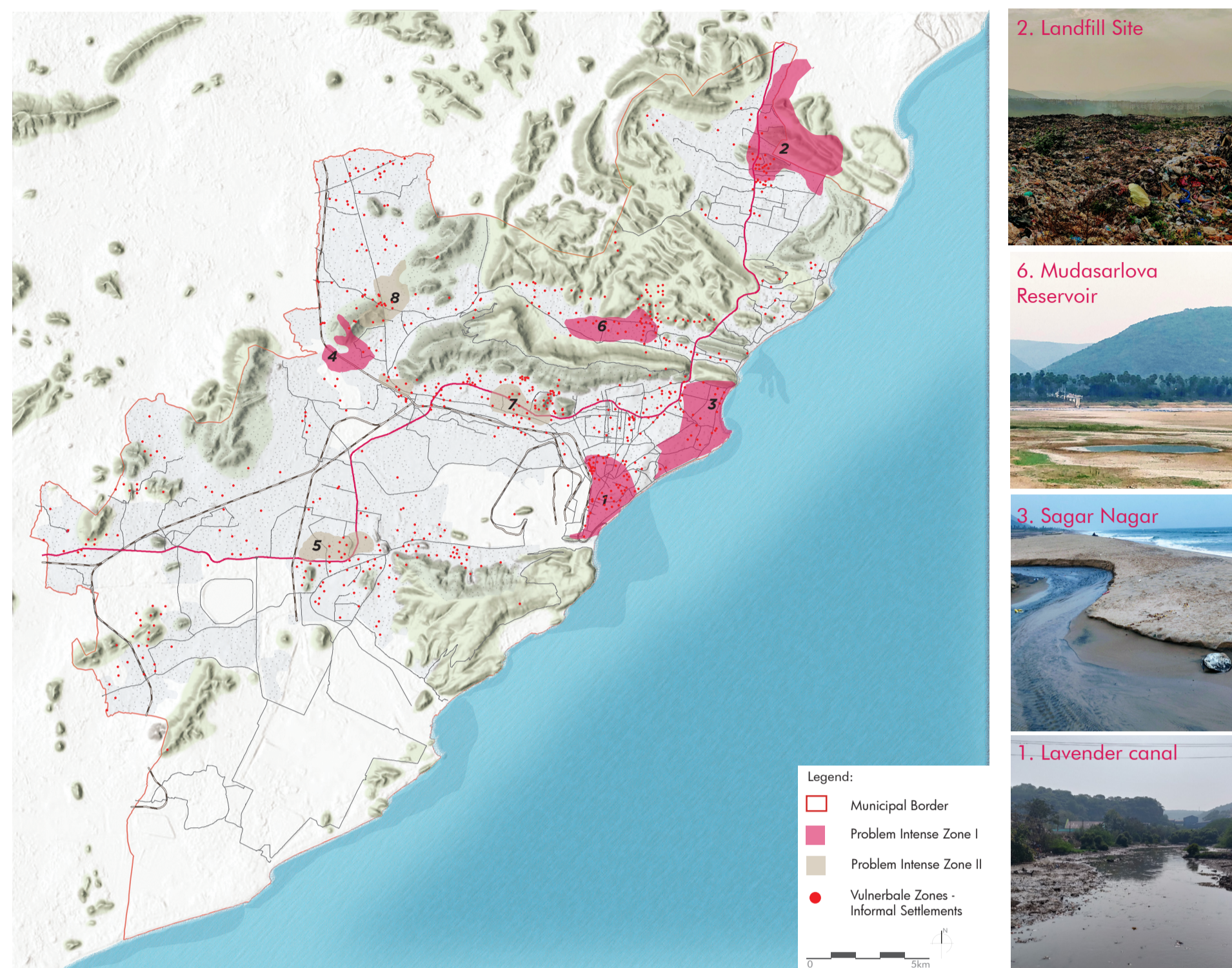
integrative approach of governance, socio-ecological systems and socio technical systems

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))

In 2050, The city of Visakhapatnam will be known as "Local - Adaptable City", owing to its long term vision of cohesive food and water resource management systems. The looping within existing infrastructure, mesoscale localised strategies for water management and the network of organic waste compost centers across the city are the key steps for the transformation. Reinforcing the blue and green infrastructure for regenerative purposes translates into the enhancement of the local living quality. The proposed circular solutions not only improve the ecological systems in the city but also bring in more economic and social welfare opportunities. Apart from the changing policies and subsidies by the ULB, the change in consumer attitude and engagement of local actors/institutions in the delivery of secondary resources, infrastructure and services will increase local autonomy. Thus, the city is a hub for eco-innovative solutions in the food and water resource cycles. The integrated planning system is employed to reach these goals.

## ANALYSIS



1. Map showing the identified locations facing environmental challenges in the resource flows

## ANALYSIS

### FOOD FLOWS

Excessive usage of fertilisers

Waste from processing and storage

Waste from households - 1.2kg/day/household

CO2 and methane emissions from waste transportation and incineration respectively

### WATER FLOWS

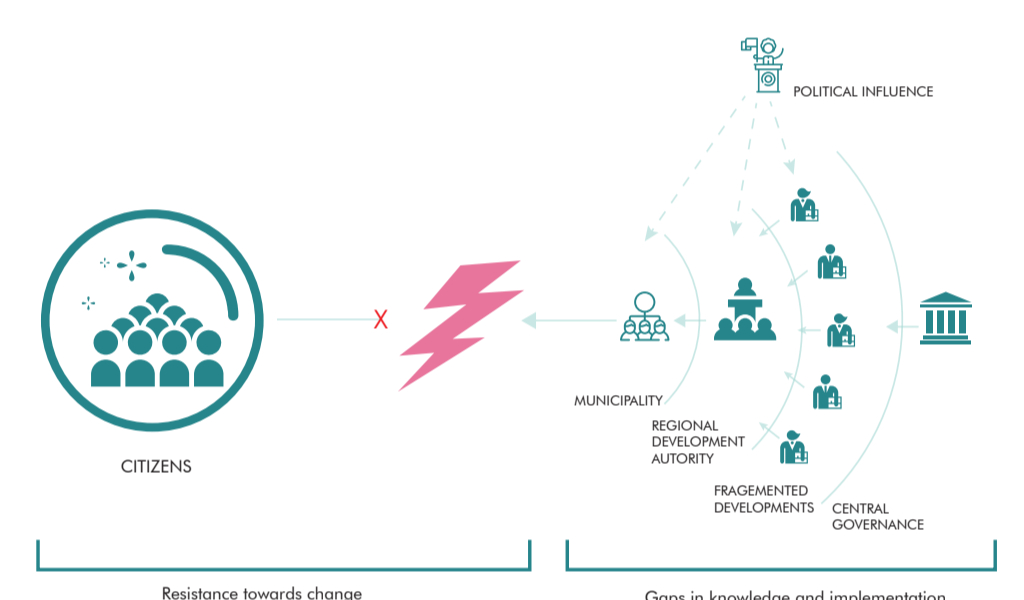
Depleting sources of water

Pollution of surface water

Decreasing underground water levels

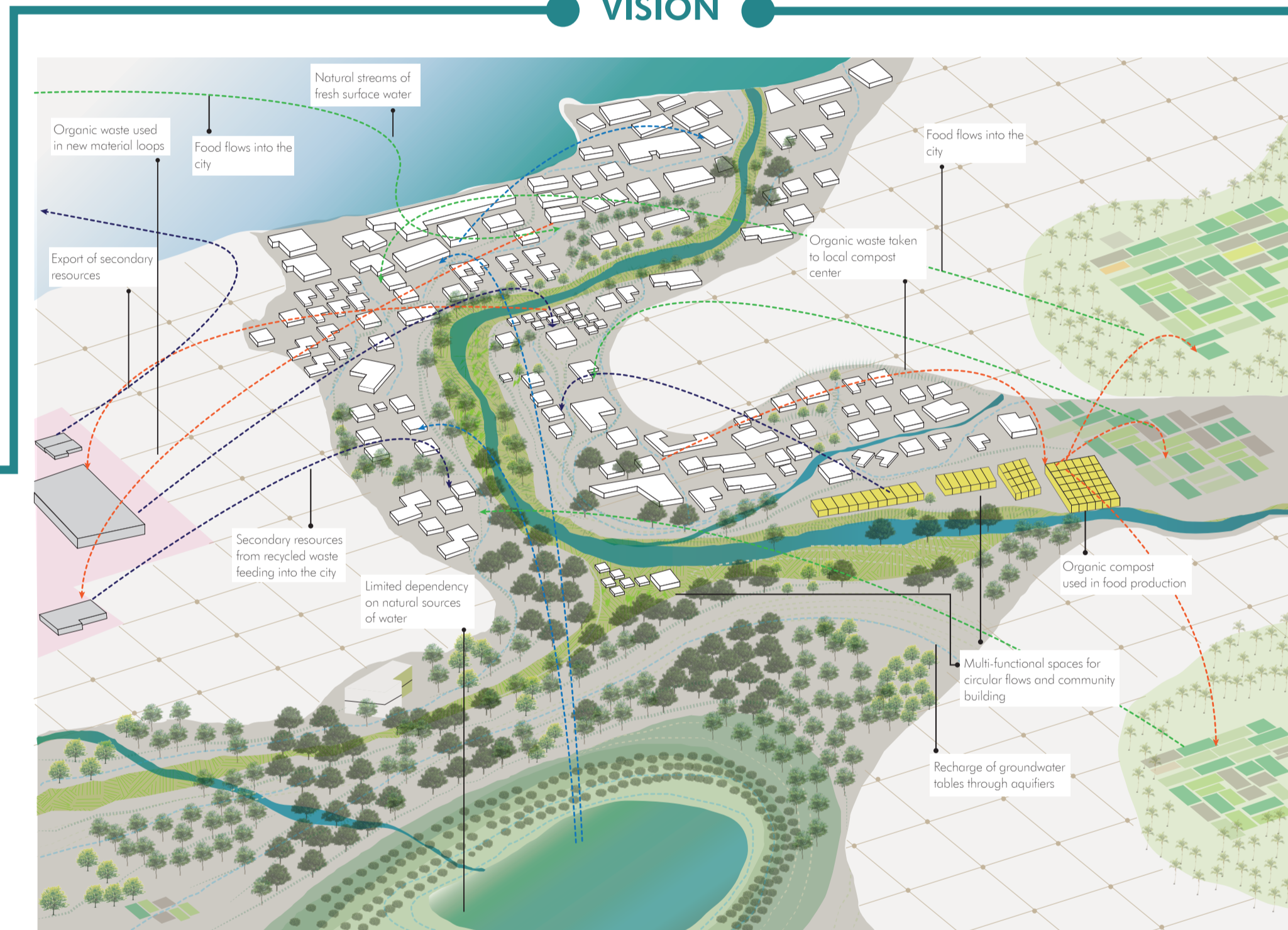
Lack of sewage connections and under capacity STP, discharge of wastewater into natural water sources

The above flow chart represents the findings of the resource flow analysis of food and water from pre consumption phase i.e., production (source), processing, trade/distribution and retail to post consumption phase of consumption, waste collection and waste treatment. The actor analysis during the field trip has helped in identifying the gaps and their effects on the flows. The diagram below represents the current scenario of the actors.



2. Current Scenario of the actors involved

## VISION



## DESIGN

### CONTRAST CITIES

## LOOPING CITY

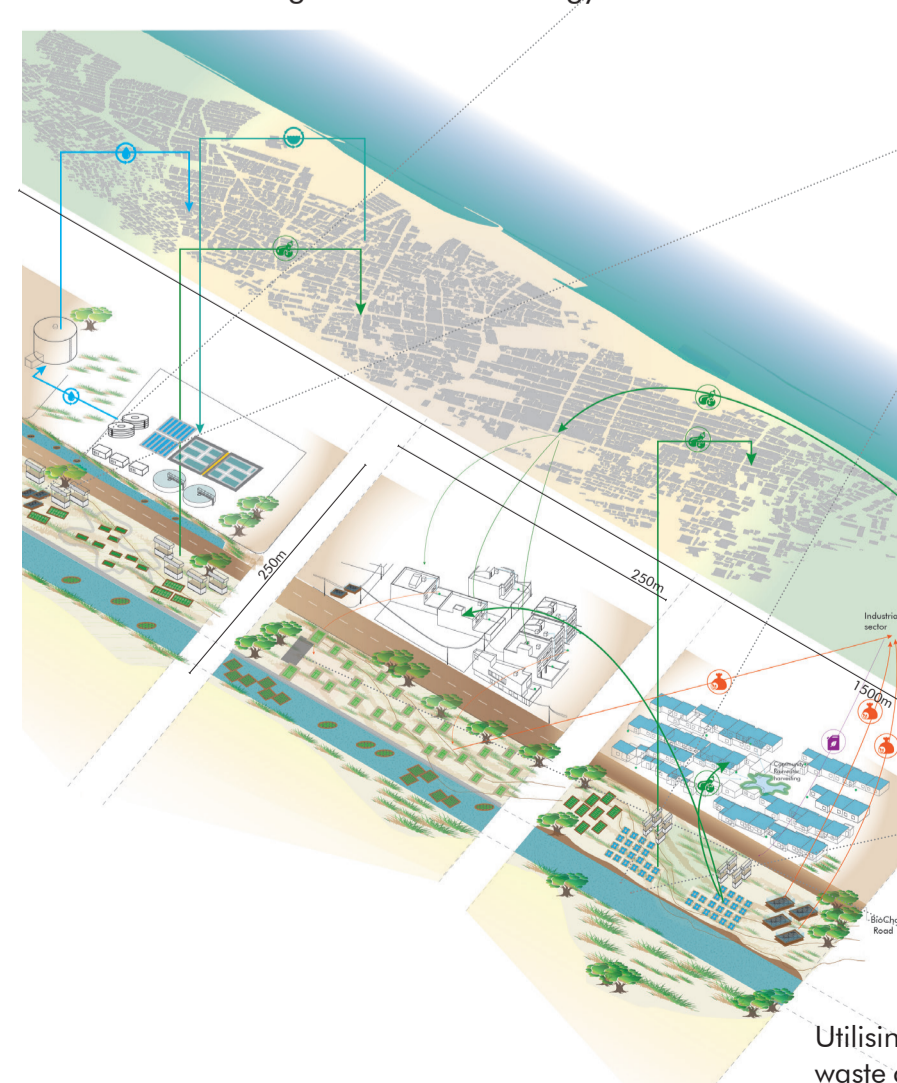
Looping city functions as a centralised system. This city focuses on looping the resource flows in large meso/macro scale infrastructure.

Location: Lavender Canal

Challenges: Pollution due to discharge of untreated wastewater into the canal

Proposals: Solutions are proposed on three points:

- Policy/guidelines: No discharge of wastewater into surface water streams; mandatory segregation of waste
- Consumer Behavior: Responsible consumption and change in attitude towards waste and utilisation of recycled materials
- Technology: Upgradation of existing sewage treatment plant and connecting to water distribution center post tertiary treatment; refurbishing the canal and repurposing the open spaces along the canal into regenerative landscapes and tourist attractions with eco-innovative solutions; local actor participation in the development of the canal and vertical integration of all the actors; community scale organic compost pits; food waste prevention strategies and purification of polluted water streams with floating wetlands technology



Utilising the space of community organic waste compost center and farming center as a space for cultural significance and community building

Circular center with cultural significance

## LOCAL CITY

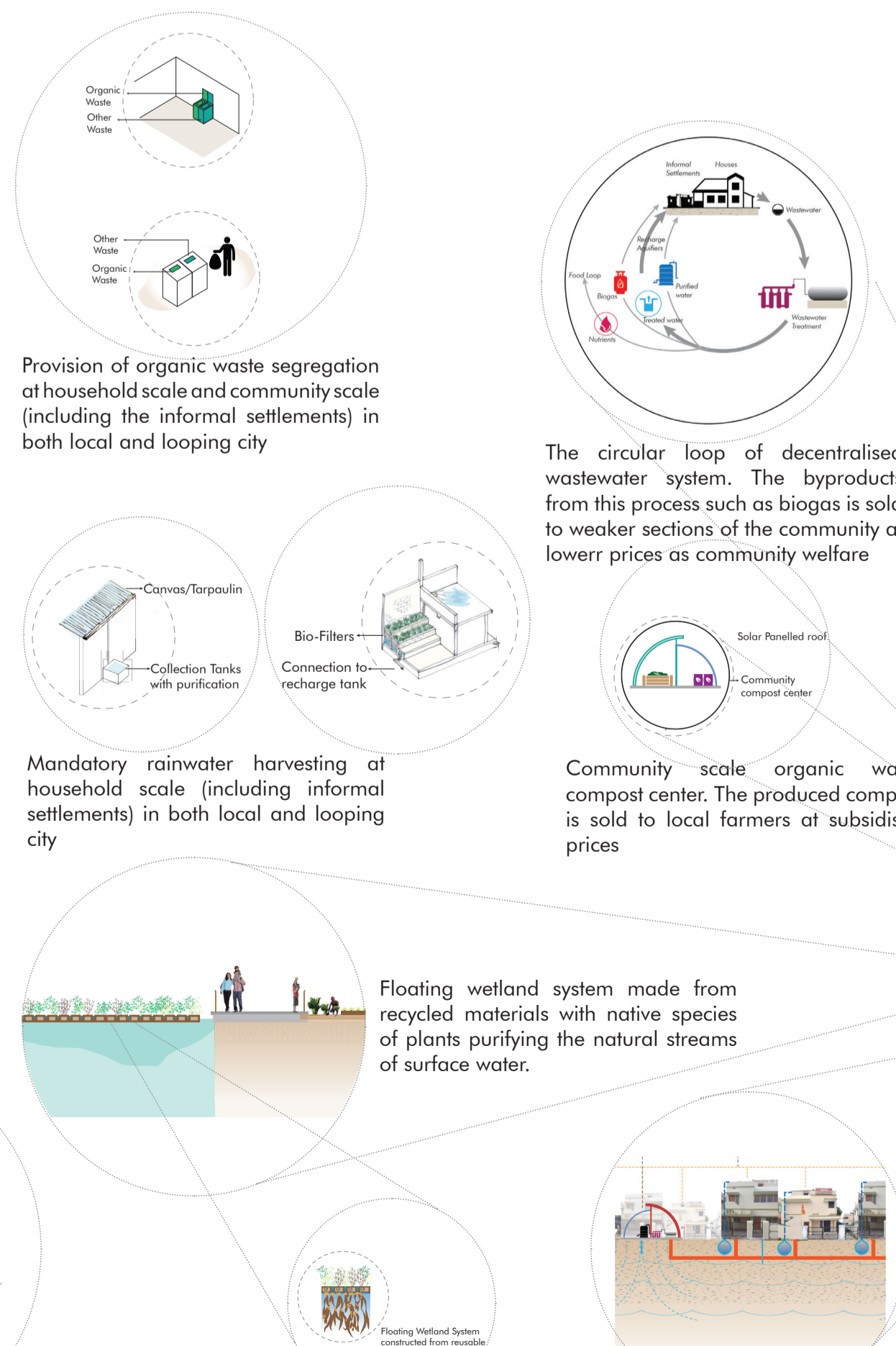
Local city is the city which has its resources localised. This city focuses on building decentralised systems and the circular flows in local/micro scale

Location: Sagar Nagar

Challenges: Pollution of natural sources of water due to discharge of wastewater because of lack of infrastructure for drinking water supply and wastewater treatment

Proposals: Solutions are proposed on three points:

- Policy/guidelines: Rules and Regulations developed at the scale of Urban Local Body for implementing decentralised solutions in the city
- Consumer Behavior: Responsible consumption and change in attitude towards waste and utilisation of recycled materials
- Technology: Implementation of decentralised wastewater treatment at the scale of block/neighborhood; Mandatory rain water harvesting at both household and community scale; recharge of groundwater through aquifers; community scale organic compost pits; food waste prevention and purification of polluted water streams with floating wetlands technology. Integration of local actors in implementing the solutions



mandatory recharge pits for the collected rainwater at household scale and the surface water runoff recharge groundwater level through aquifers at community scale