# LEVERAGING SOCIO-CULTURAL NETWORKS

*Local adaptation strategies to bring about flood resilience in Chennai Metropolitan Area, India*

*Nilofer Afza Tajuddin*

First Mentor: - Marcin Dabrowski
Second Mentor: Taneha Kuzniecow Bacchin
Third Mentor: Diego Sepulveda Carmona, D.A.

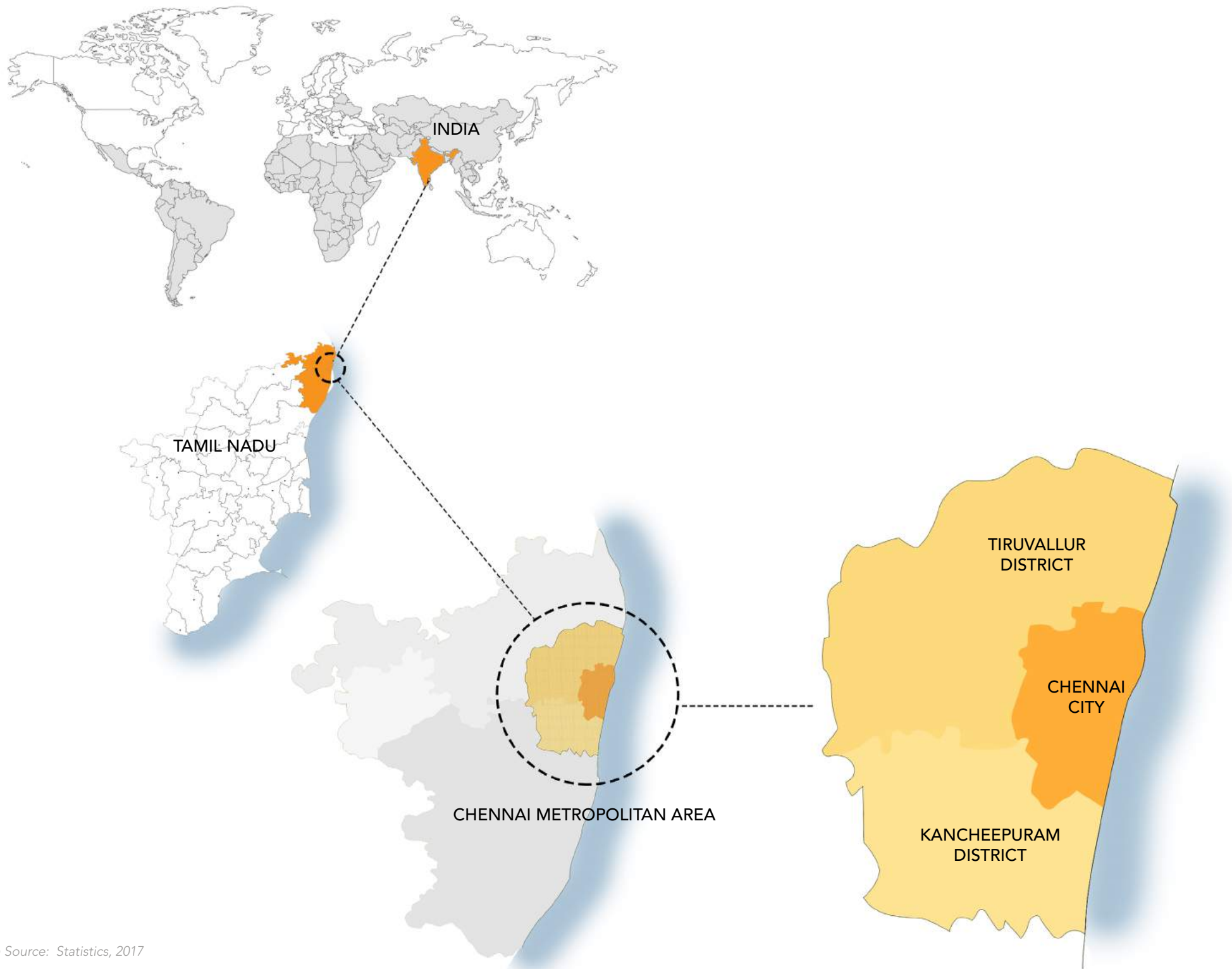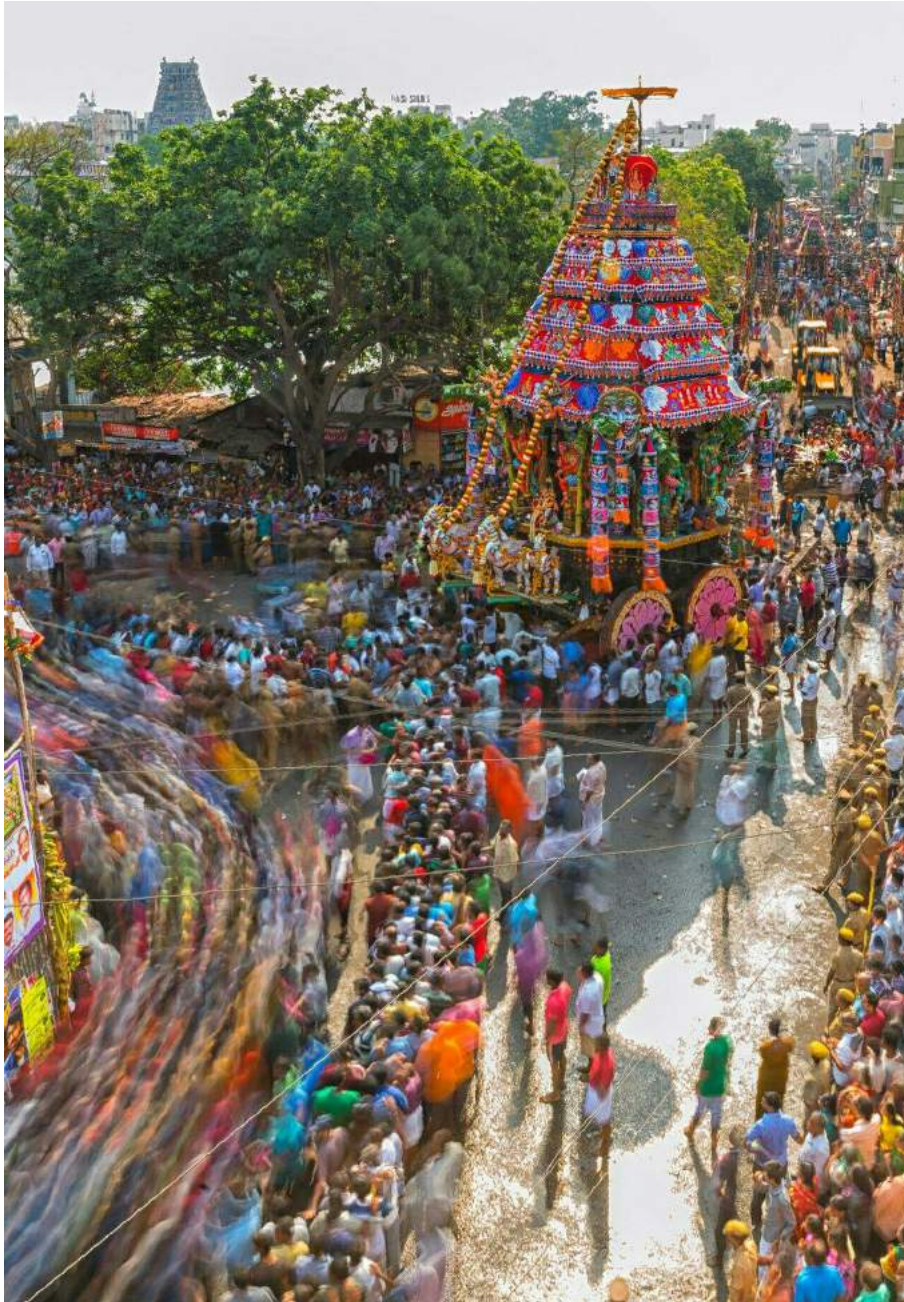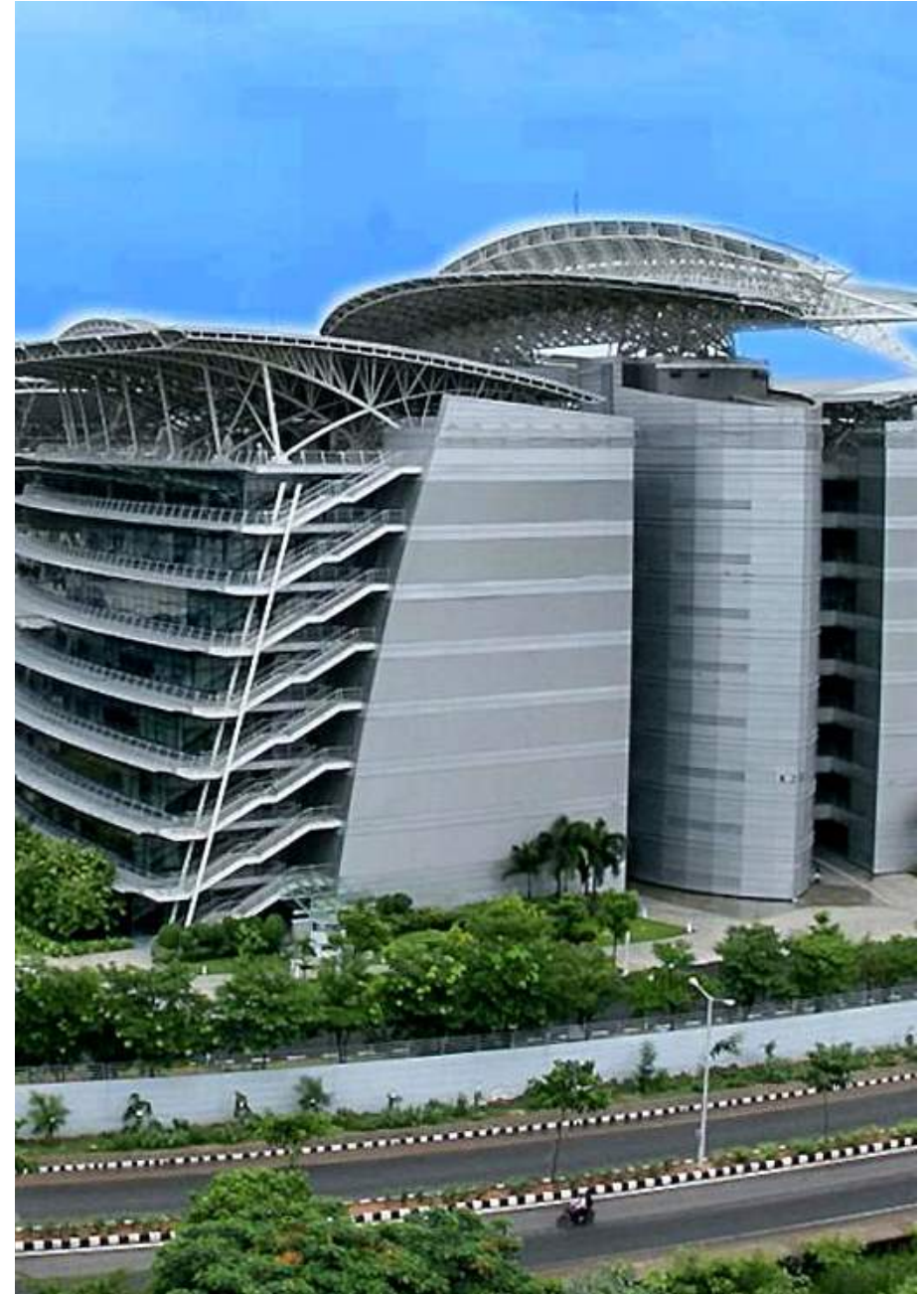| | | |
|---|---|---|
| *1*<br><br>Introducing Chennai and the problem | *2*<br><br>Framing the Research Focus | *3*<br><br>Building up the Approach |
| *4*<br><br>The Strategy and proposals | *5*<br><br>Implementation | *6*<br><br>Conclusions and Reflections |

1. Introducing Chennai

INDIA

TAMIL NADU

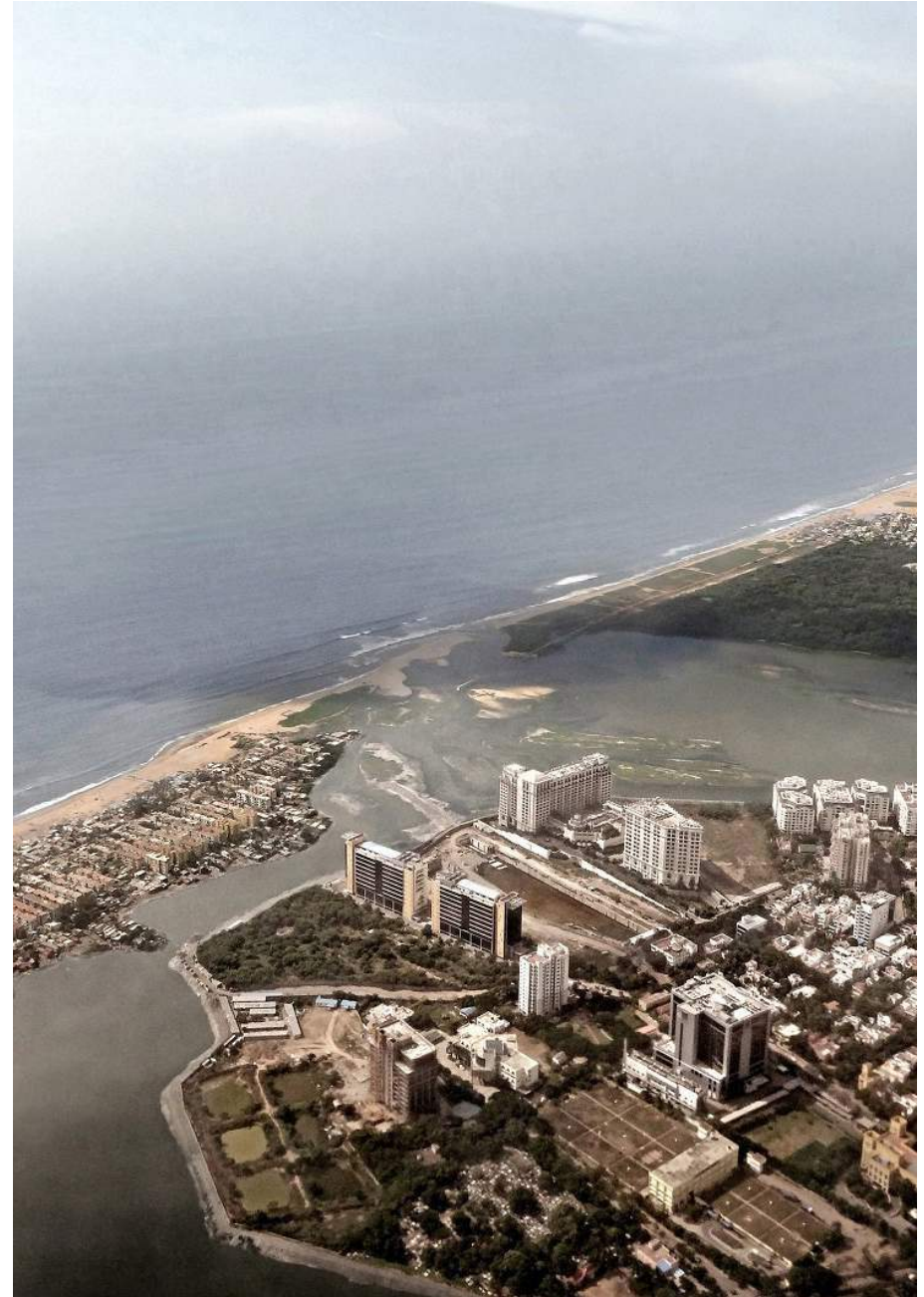CHENNAI METROPOLITAN AREA

TIRUVALLUR DISTRICT

CHENNAI CITY

KANCHEEPURAM DISTRICT

The Culture



Information Technology and Automobile Industry

City of Three Rivers



Deltaic in Nature

# Hydrological system



Koshashthalaiyar River

Puzhal Lake

Coovum River

Chemberambakkam Lake

Adyar River

Pallikaranai Wetlands

Buckingham Canal

Okkiyam Maduvu

THE PROBLEM

Source: Google Earth
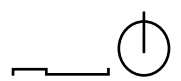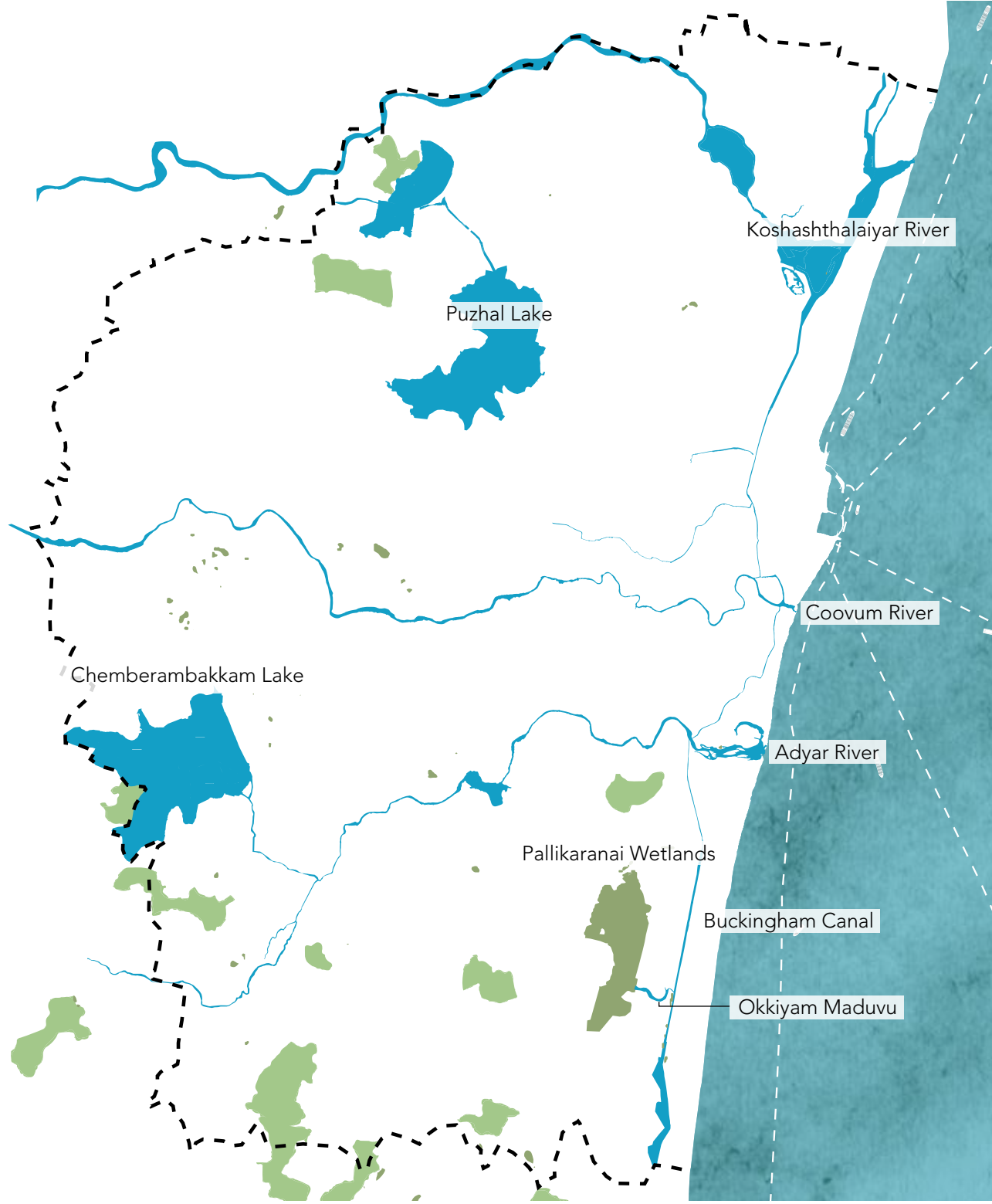
# FLOODS, AN ANNUAL OCCURRENCE

*i. Conflict: Economic growth versus Nature's values*


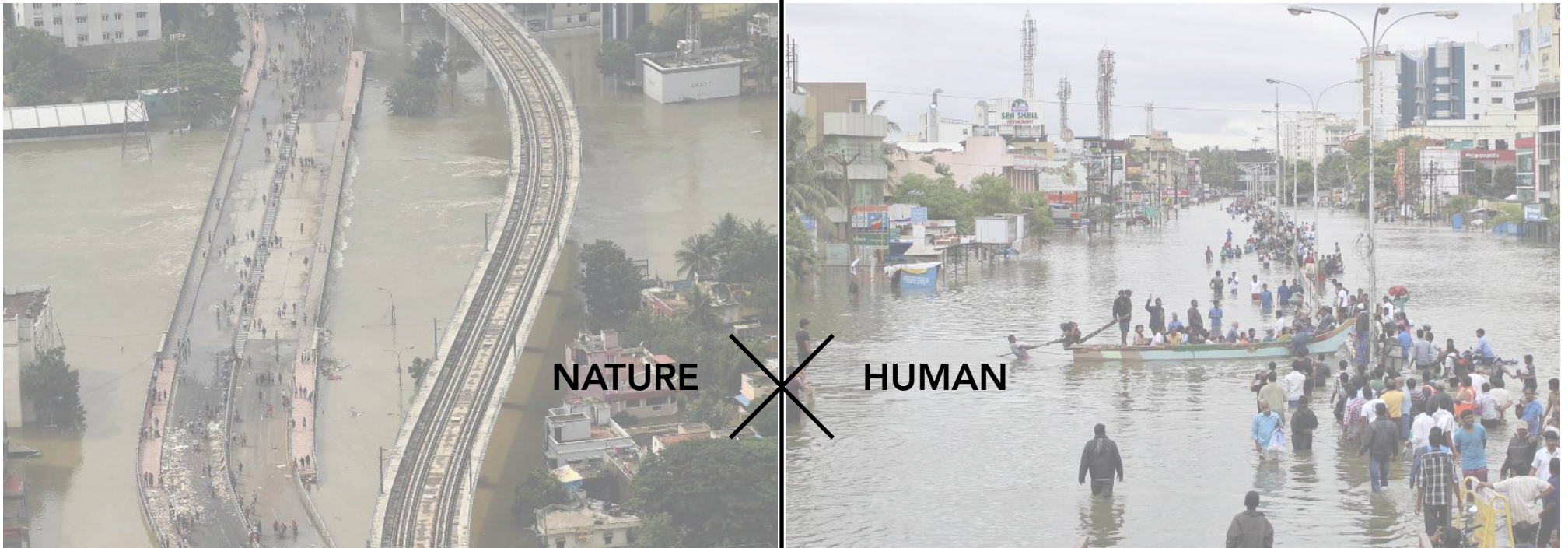*ii. Conflict: Fast development versus varied vulnerability*


*iii. Implication: Loss of water bodies and traditional networks*


*iv. Response: Inefficient urban drainage*

CLIMATE ADAPTATION
AND RESILIENCE

REGIONAL GROWTH
AND URBAN PLANNING

NATURE ✕ HUMAN

FLOOD RISK

2. Framing the Research Focus

Region



Region

Sub-basin

Macro

Watershed

Meso

Sub-watershed

Micro

NANO / LOCAL
THE MOST OPERABLE

Neighbourhood

*Social and Ecological Conflict*

*to*

*Socio-Ecological harmony*

*at the Local level*

## Evolutionary resilience (Davoudi, 2012)

The inevitability of flood risk highlights the need for a continuous adaptation approach - through resilience.

**Focus on socio-ecological resilience and relevance of local adaptation capacity as a way to influence interactions between human and environment (socio-ecological).** This is relevant to the context of Chennai where local strategies can bring about change in the existing system.

# Research Question

How can **local adaptation strategies** be planned in order to **reinforce socio-ecological resilience towards floods** in the Chennai Metropolitan Area?

3. Building up the Approach

FOUR STEPS TO THE APPROACH

I. Socio Spatial Analysis

II. Theoretical and Analytical Framework

III. Ecosystem Services

IV. Identifying the Edges as a transitional + conflict zone

# I. Socio Spatial Analysis

*Madras - A Brief History*

*Post Independence in 1947*

*Liberalisation and Economic growth*

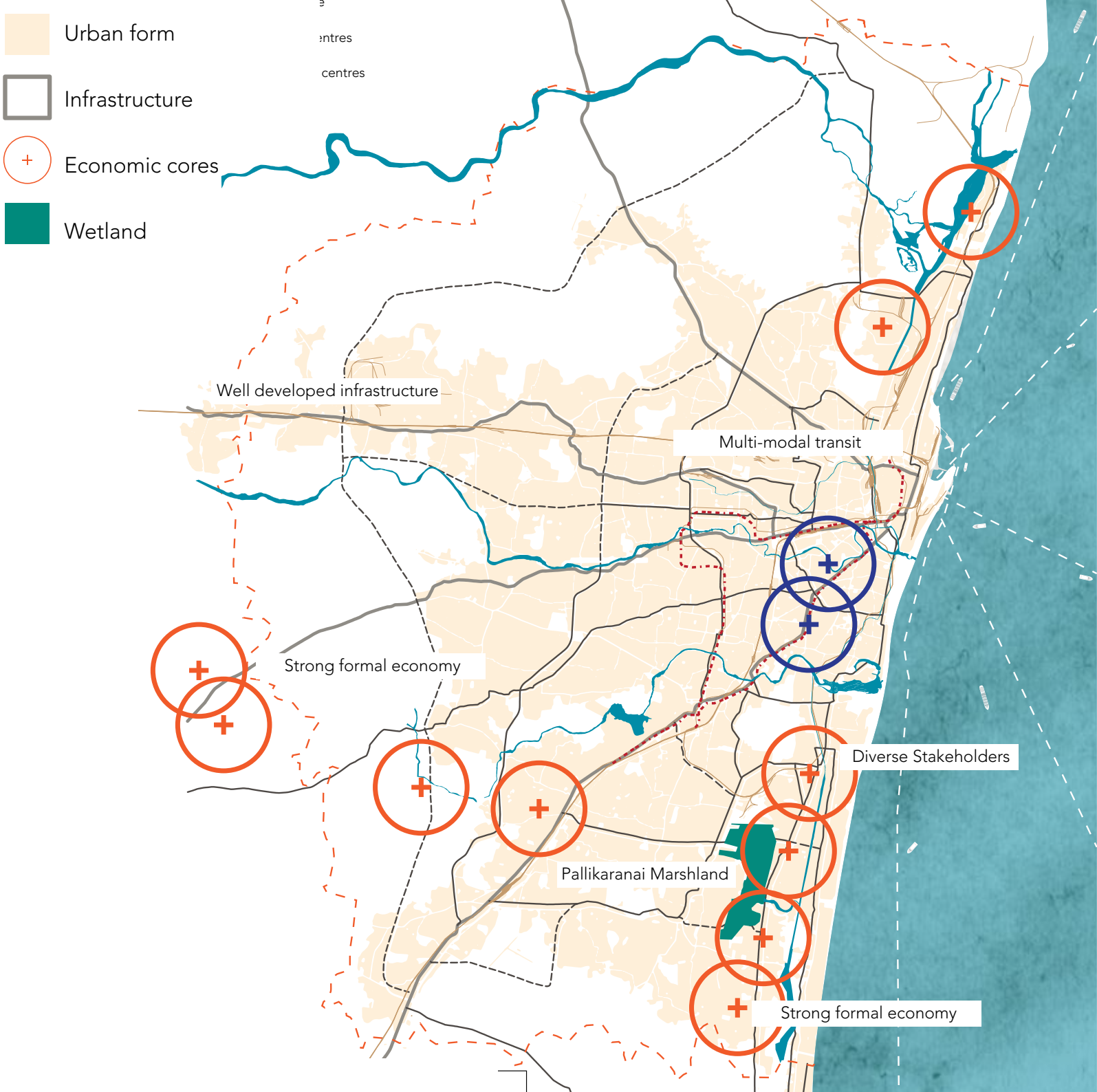*Analysis of urban form- Infrastructure led growth model*

*Urban Sprawl and density analysis*
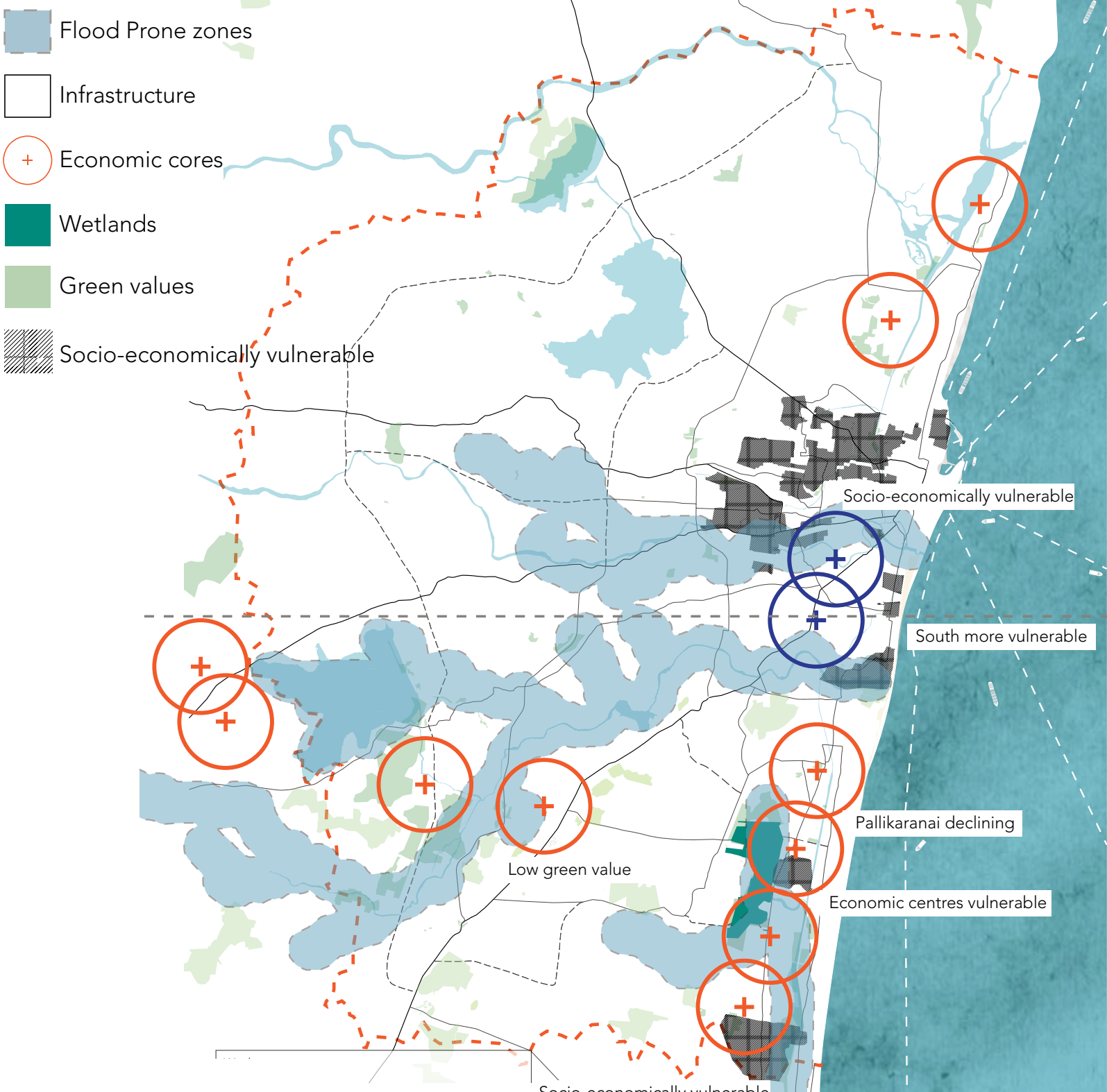
*Socio-economically vulnerable groups*

*Governance structure and existing strategies*

*Watersheds in the region*

*Loss of green and recreation values*

## Legend

- Urban form
- Infrastructure
- Economic cores
- Wetland

Well developed infrastructure

Multi-modal transit

Strong formal economy

Diverse Stakeholders

Pallikaranai Marshland

Strong formal economy

**Strengths:**

- Well developed infrastructure
- Strong and diverse stakeholders
- Strong formal economic centres

**Opportunities:**

- Integrate small businesses and informal economy
- Design of recreation and public spaces
- Need for an integrated strategy for water management and restoration of water networks
- Involvement of multiple and diverse stakeholders

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## Legend

- Flood Prone zones
- Infrastructure
- ⊕ Economic cores
- Wetlands
- Green values
- Socio-economically vulnerable

## Map Labels

- Socio-economically vulnerable
- South more vulnerable
- Pallikaranai declining
- Economic centres vulnerable
- Low green value
- Socio-economically vulnerable

## Side Panel

Weakness:

-Low green-blue values
-Fragmented governance structure
-Lack of long term plans

Threats

-Major economic hotspots in flood vulnerable zones
-Major infrastructural elements in vulnerable zones
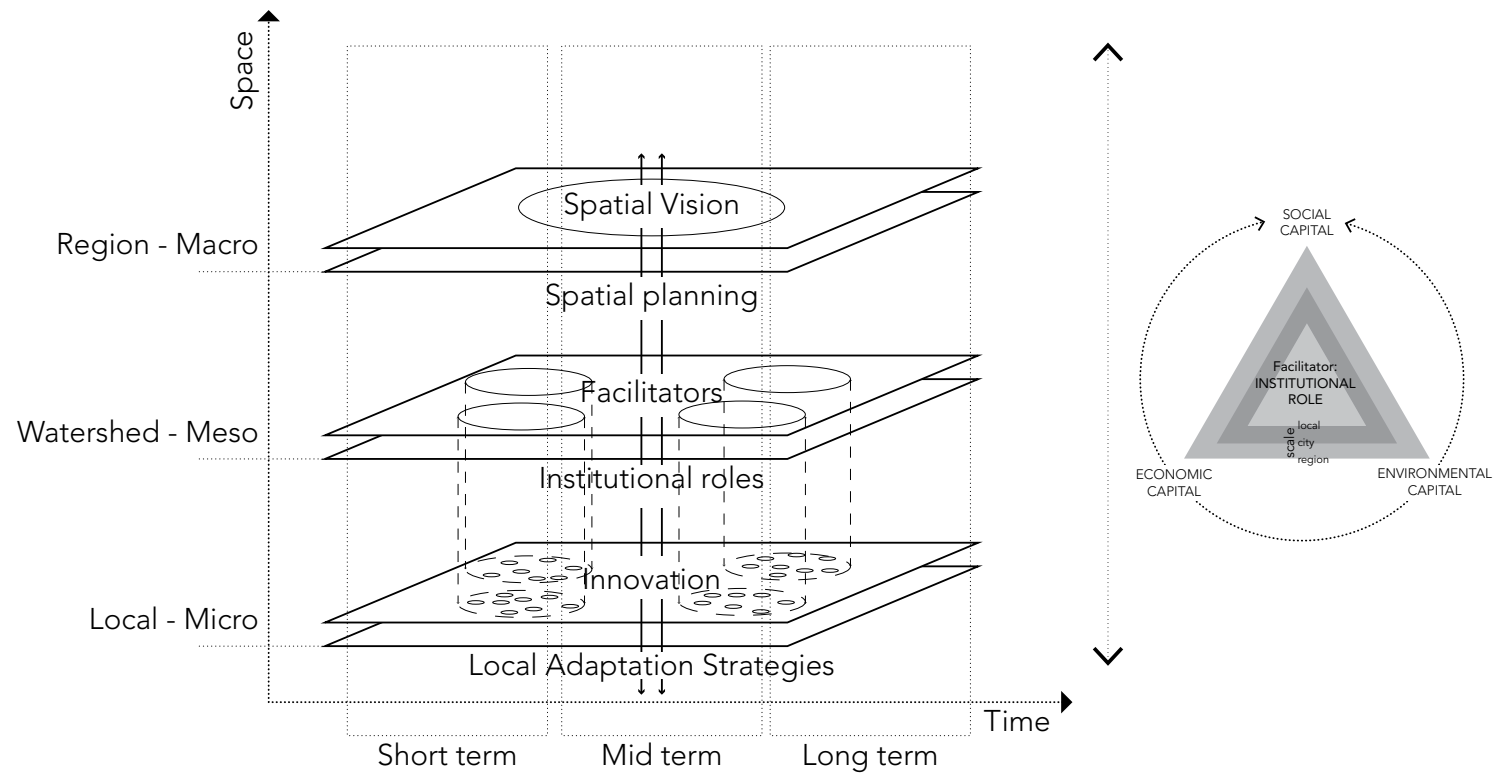-Sprawl and informal settlements in flood zones

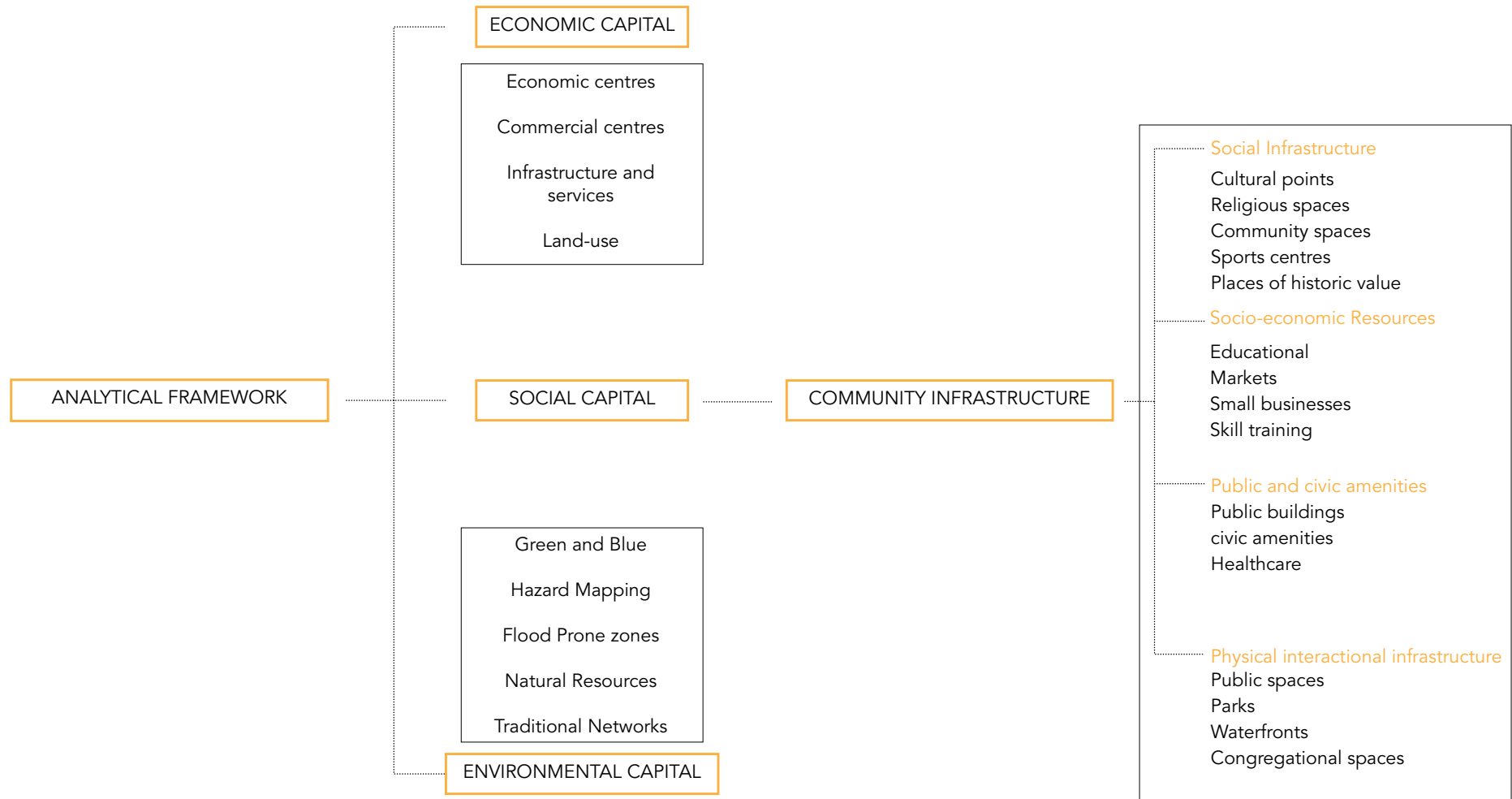20

II. Theoretical and Analytical Frameworks
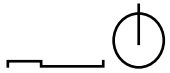
Theoretical Framework
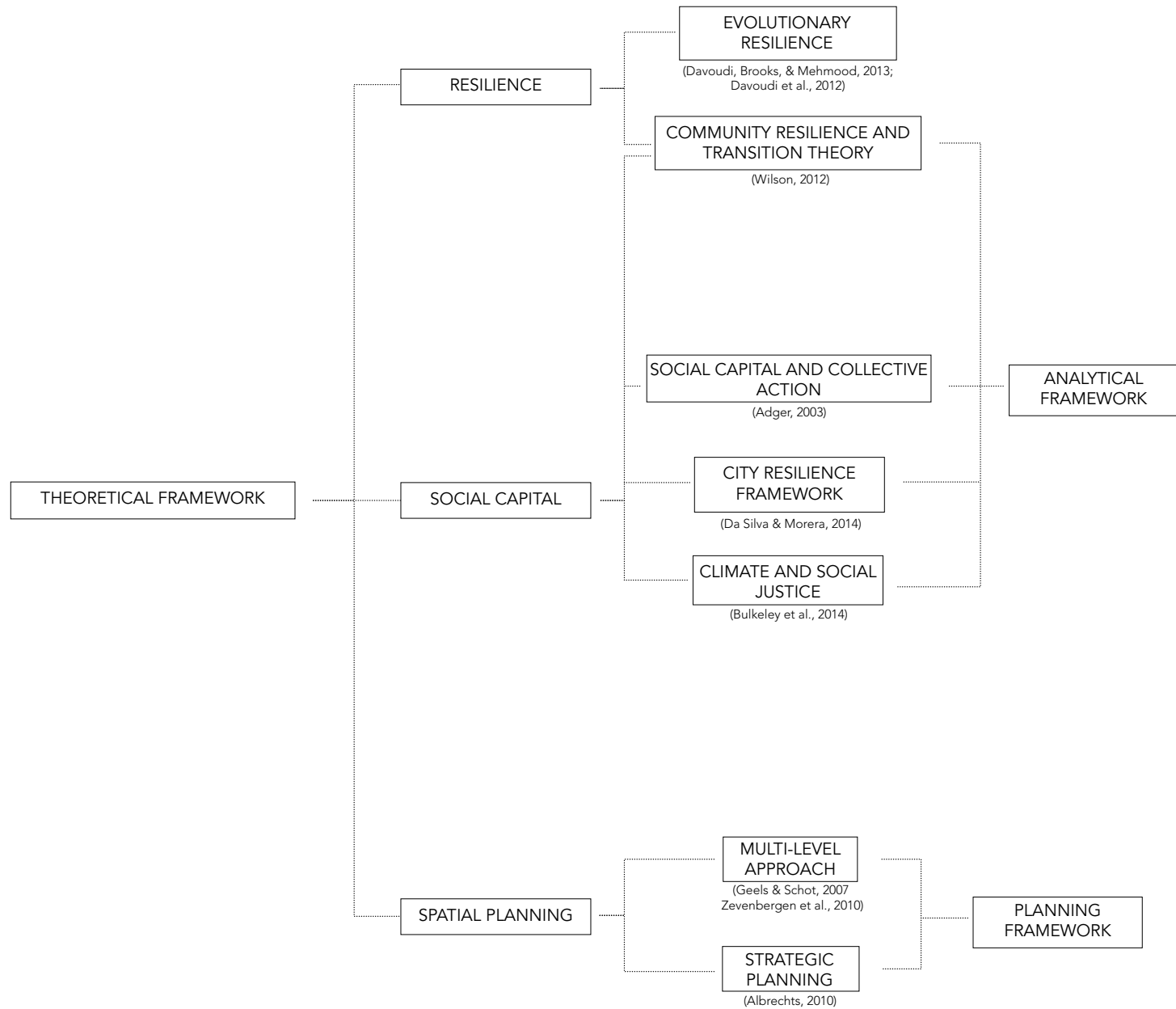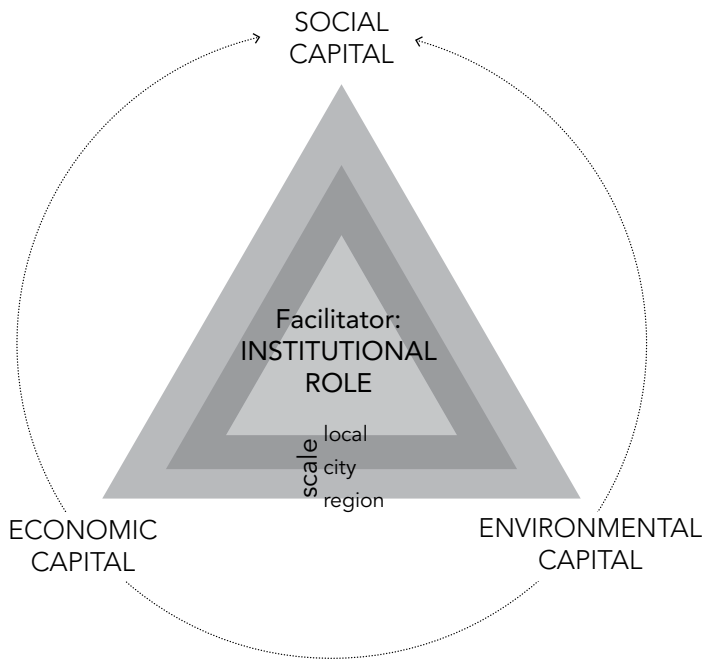
MULTI-LEVEL THEORY

(Zevenbergen et al., 2010)

STRATEGIC PLANNING - FOUR TRACK APPROACH

(Albrechts, 2010)

PLANNING FRAMEWORK

Space

Spatial Vision

Region - Macro

Spatial planning

Facilitators

Watershed - Meso

Institutional roles

Innovation

Local - Micro

Local Adaptation Strategies

Time

Short term    Mid term    Long term

SOCIAL CAPITAL

Facilitator: INSTITUTIONAL ROLE

scale  local city region

ECONOMIC CAPITAL    ENVIRONMENTAL CAPITAL

Theoretical Framework

**ECONOMIC CAPITAL**

Economic centres

Commercial centres

Infrastructure and services

Land-use

**ANALYTICAL FRAMEWORK**

**SOCIAL CAPITAL**

**COMMUNITY INFRASTRUCTURE**

Social Infrastructure
Cultural points
Religious spaces
Community spaces
Sports centres
Places of historic value

Socio-economic Resources

Educational
Markets
Small businesses
Skill training

Public and civic amenities
Public buildings
civic amenities
Healthcare

Physical interactional infrastructure
Public spaces
Parks
Waterfronts
Congregational spaces

Green and Blue

Hazard Mapping

Flood Prone zones

Natural Resources

Traditional Networks

**ENVIRONMENTAL CAPITAL**

Analytical Framework

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III. Ecosystem Services

CULTURE


RECREATION


BIO-DIVERSITY


RIVER FRONTS
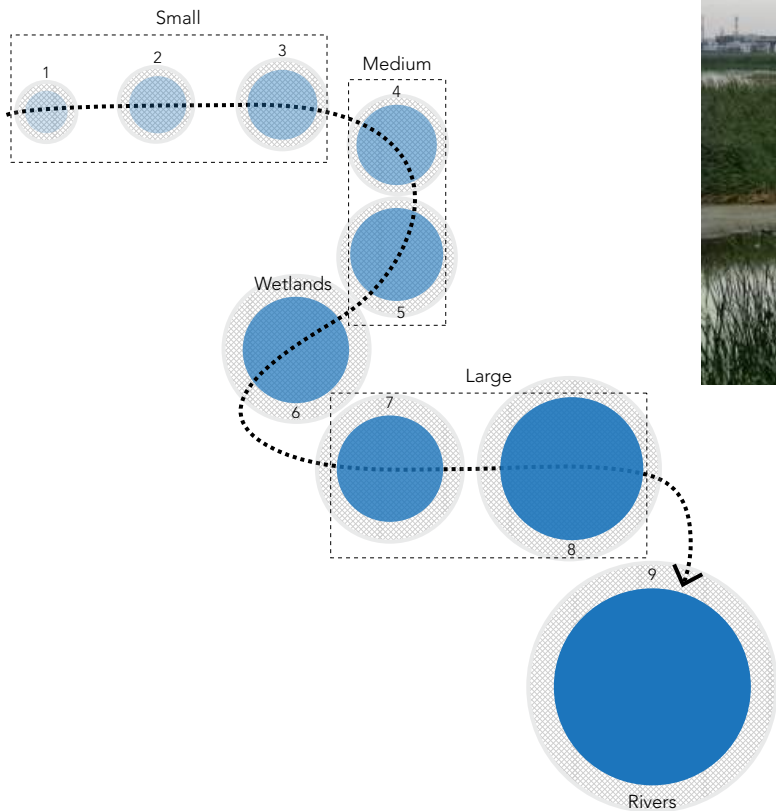
VALUE - ADDED   GREEN-BLUE NETWORKS



Small
1  2  3
Medium
4
5
Wetlands
6  7
Large
8
9
Rivers

IV. The Edges

Buckingham Canal

Unmaintained. Forgotten. Misused.



Lake

Untreated. Misplaced. Blurred.



Temple Tank

Well treated. Imageable. Interactive.



Pallikaranai Wetlands

Taken for granted.

Coovum River

'Coovum' now synonymous to filthy.



Buckingham Canal

Restricted. Amorphous. Mismanaged.
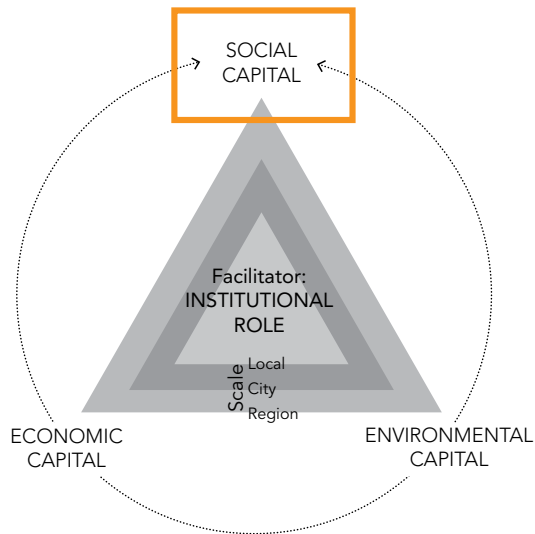


Drainage Channel

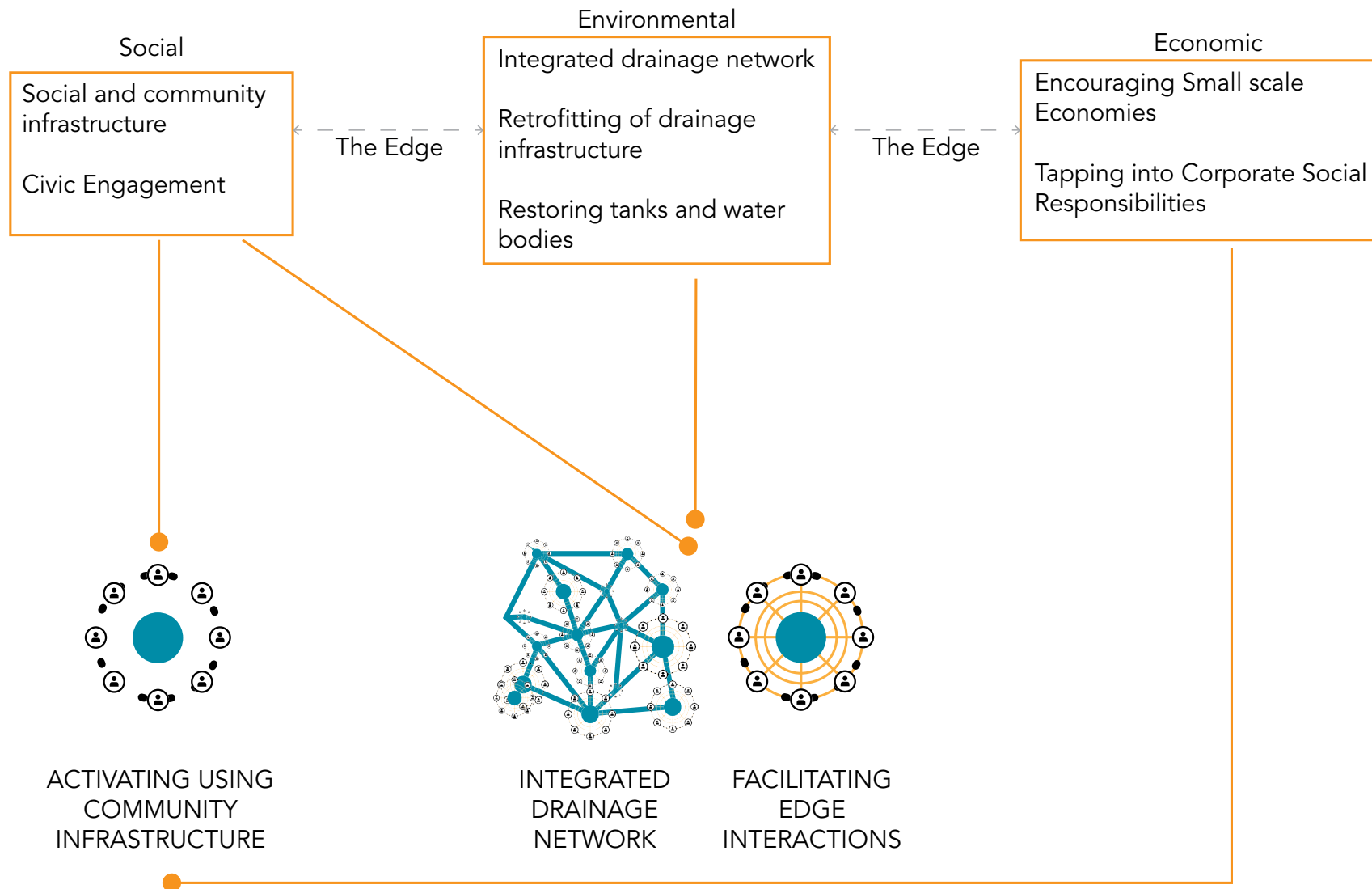Redundant. Missed opportunity. Shunned.
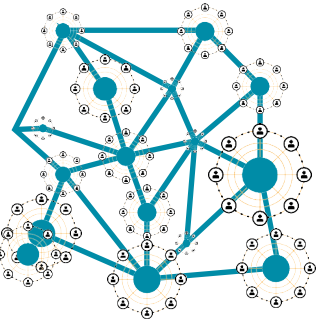


Pond

Defined yet non-engaging.

Strong social and cultural networks can act as a leverage for
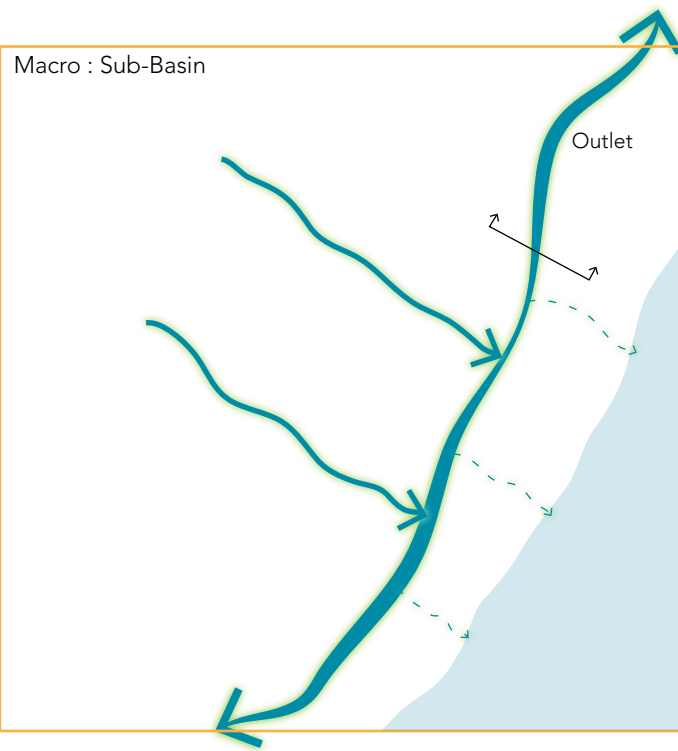environmental transformation and restoration



Social capital is seen as the link in this case where economic
aspirations are in conflict with environmental capacities

## Social

Social and community infrastructure

Civic Engagement

← The Edge →

## Environmental

Integrated drainage network

Retrofitting of drainage infrastructure

Restoring tanks and water bodies

← The Edge →

## Economic

Encouraging Small scale Economies

Tapping into Corporate Social Responsibilities



ACTIVATING USING COMMUNITY INFRASTRUCTURE

INTEGRATED DRAINAGE NETWORK

FACILITATING EDGE INTERACTIONS

## I
### Integrated Drainage Network



**Legend:**
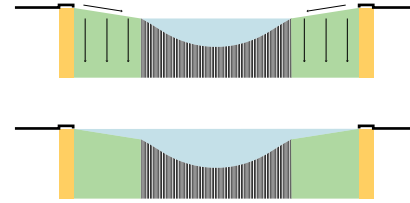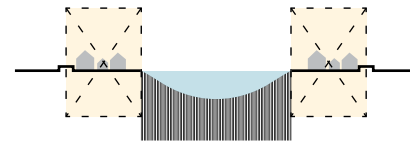- Blue Corridor
- Outlet (proposed)
- Bay of Bengal (Sea)
- Primary infrastructure
- Secondary infrastructure
- Tertiary infrastructure
- Edge demarcation (bund)
- Public green
- Permeable surfaces
- Bioswales

Macro : Sub-Basin

Outlet
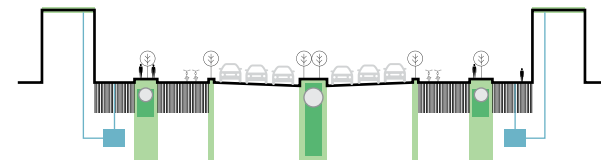
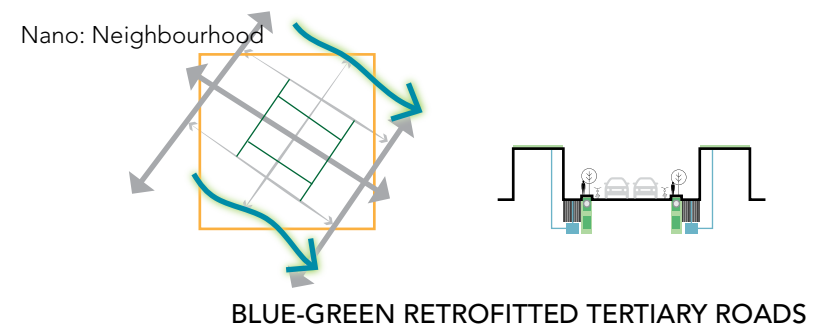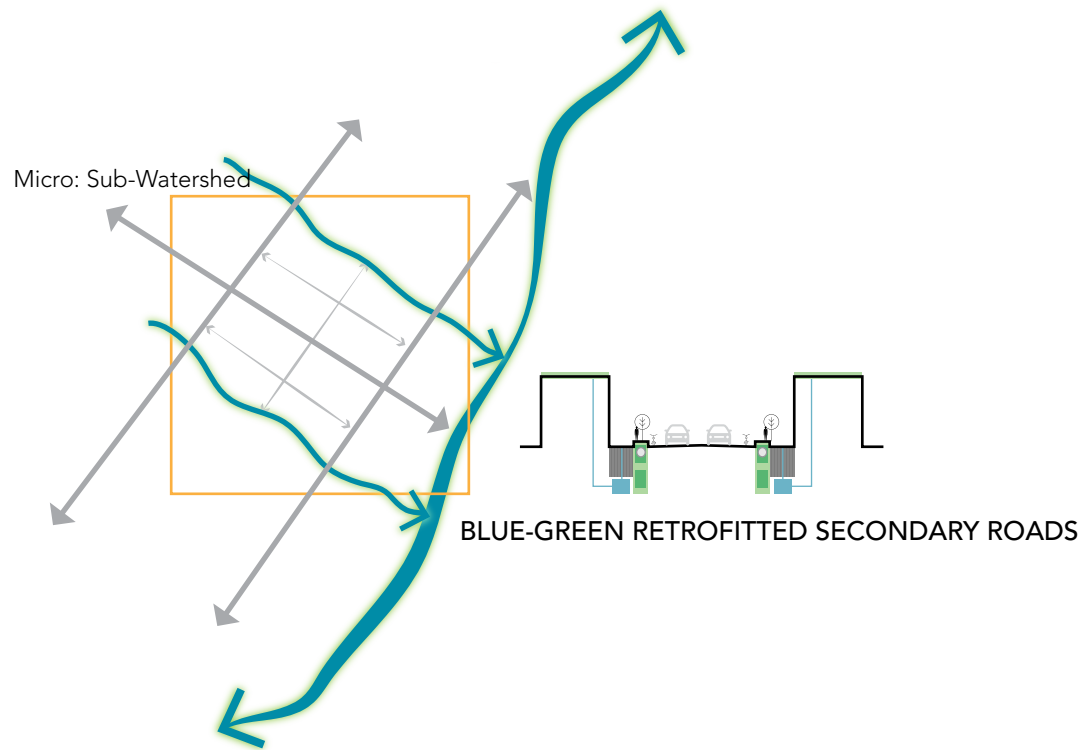Meso : Watershed

## BLUE CORRIDORS

Infiltration and Floodable green areas

All settlements within coastal regulation zone of 100m on both sides will be relocated

## BLUE-GREEN RETROFITTED PRIMARY TRANSIT CORRIDORS

Micro: Sub-Watershed

BLUE-GREEN RETROFITTED SECONDARY ROADS

Nano: Neighbourhood

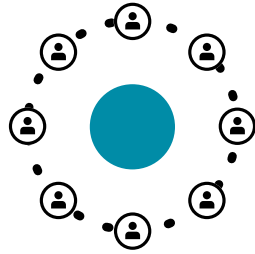BLUE-GREEN RETROFITTED TERTIARY ROADS
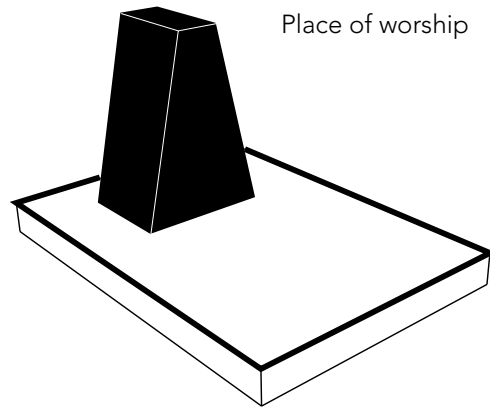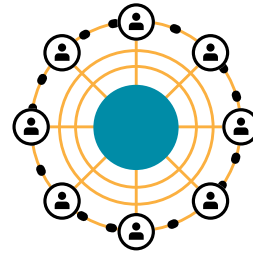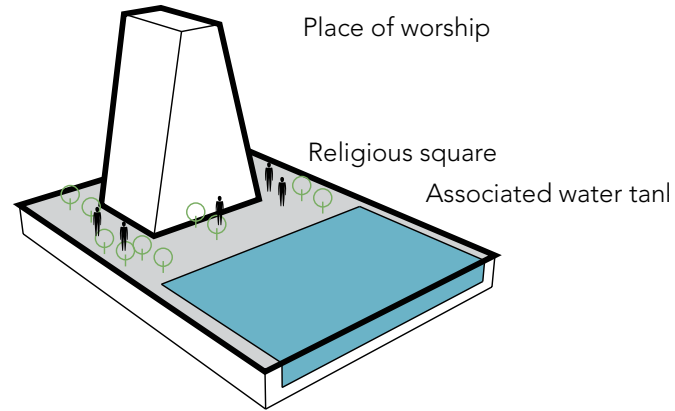
Activating through community
infrastructure

Facilitating edge interactions

Place of worship

Place of worship

Religious square

Associated water tanl
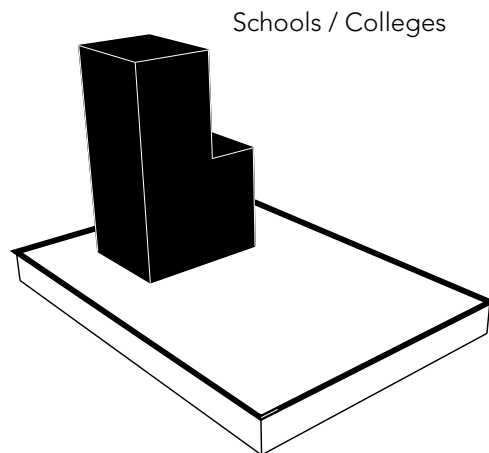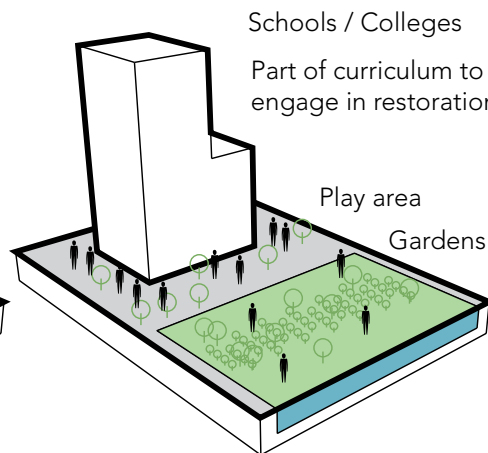
Schools / Colleges

Schools / Colleges

Part of curriculum to
engage in restoration

Play area

Gardens
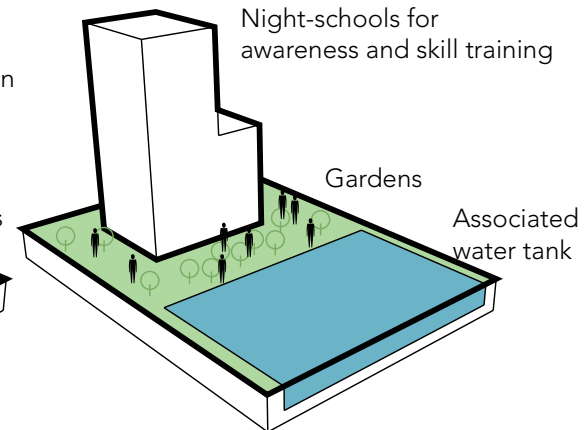
Night-schools for
awareness and skill training

Gardens

Associated
water tank

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## STAKEHOLDER INTERVIEWS

**MADRAS OFFICE OF ARCHITECTURE AND DESIGN (MOAD)**



Architecture and Urban Design



Non-Governmental Organisations

Governmental





Madras Chamber of Commerce and Industry (Private)

Global Climate change agencies (works in collaboration with government)

Indo-German Centre for Sustainability (Research)

Decentralisation of water resources

Civic enagagement

Fragmented Institution structure

Need for long term vision

Designing for water resilience

Diversify stakeholder involvement

How can it be supported?

What if? (What and who?)

Implications? (specific)

Main Challenges



*Social and Community development* ................................................... *Flooding in Chennai*

Let's talk floods!

**Workshop and Presentation**
as part of Master Thesis with TU Delft, titled 'Keeping your feet dry : Rethinking Urban Planning and Flood Resilience in the Chennai Metropolitan Area, India.

Saturday, 10th February 2018
10:30 - 13:30 hrs

Backyard
53/23, 3rd Main road, Gandhi Nagar, Adyar, Chennai

DOORS OPEN
anniversary weekend

TUDelft

Group 1


Group 2


Group 3


Presentation of ideas and discussion

Civic enagagement

Need to build awareness

Decentralisation of water resources

Tapping to the research base

Design of strict building laws

CMA

Focus area:
Pallikaranai Watershed

Pallikaranai
sub-basin

The Pallikaranai watershed is chosen as the focus area for the Meso scale. This watershed is chosen due to the following reasons:

- Presence of IT Corridor
- Diverse and powerful stakeholders
- Flood prone zone overlap with crucial infrastructure

- Pallikaranai wetlands
- Opportunities for green-blue design
- Buckingham canal

- Presence of socio-economically vulnerable groups, working class and middle class groups
- diverse actors

Nano
Neighbourhood

Micro
sub- watershed

Meso
Pallikaranai
watershed

Macro
CMA

Pallikaranai
sub-basin

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4. The Strategy and proposals

Proposed Drainage infrastructure retrofitted transport corridors

Buckingham Canal with revitalised edge

Existing channels revitalised as Proposed Blue Corridors

Pallikaranai Wetlands

Proposed Pallikaranai extension

Neighbourhoods selected

Waterbodies

Drainage lines

1km  0  2km

Macro    CMA

Pallikaranai sub-basin

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1. The main neighbourhood level connector street is recognised as the main street. This main street forms the main pedestrian spine



2. Programmes planned along street to in order to spillover activity onto pedestrian area
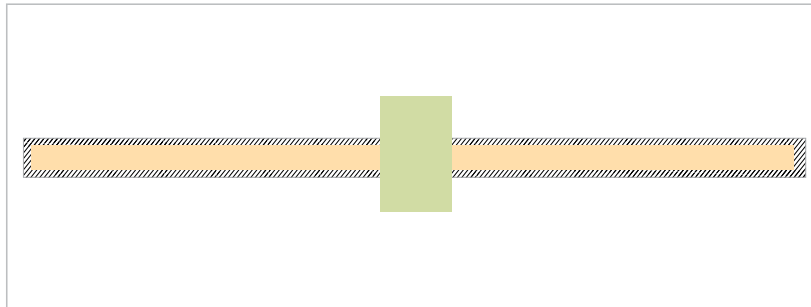


3. Primary public park which houses multiple activities in identified
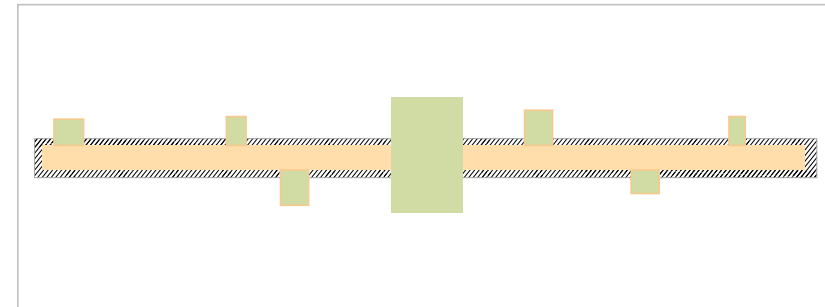


4. Community infrastructure along the connector street identified
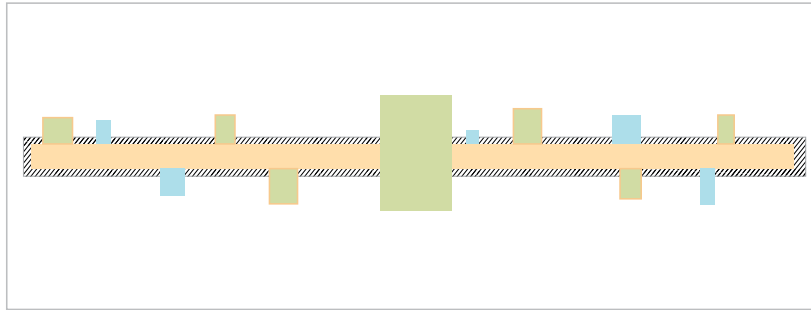
5. Water bodies along the connector street are identified
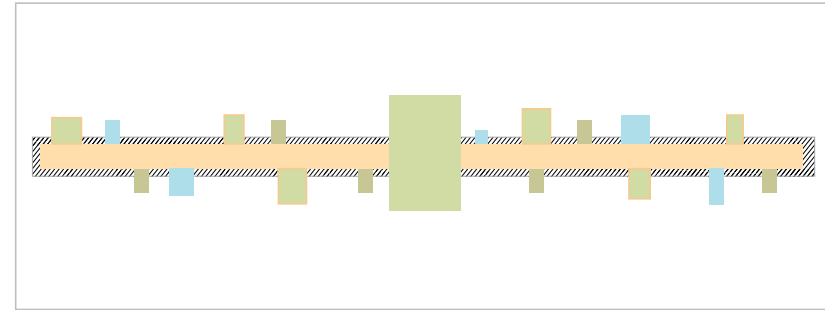


6. Unmanaged and derelict open spaces along the connector street are identified
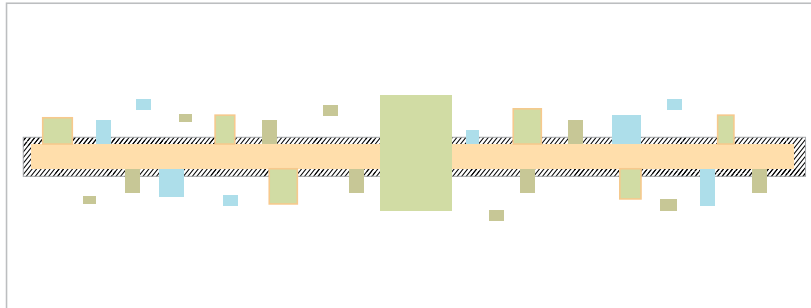


7. Waterbodies and unmanaged open spaces in close proximity to the connector street are identified
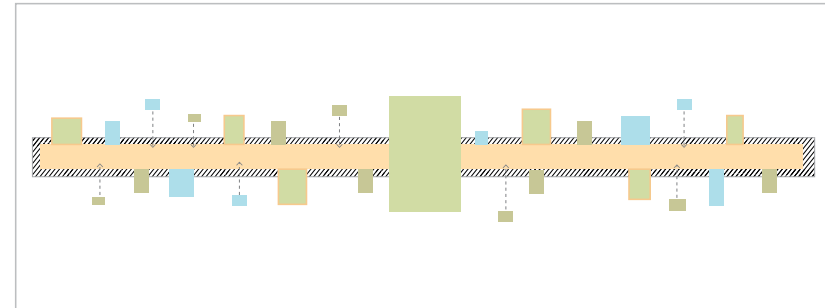


8. Trenches are designed for streets that directly meet the connector street and close-by waterbodies and unmanaged open spaces are also integrated through these trenches
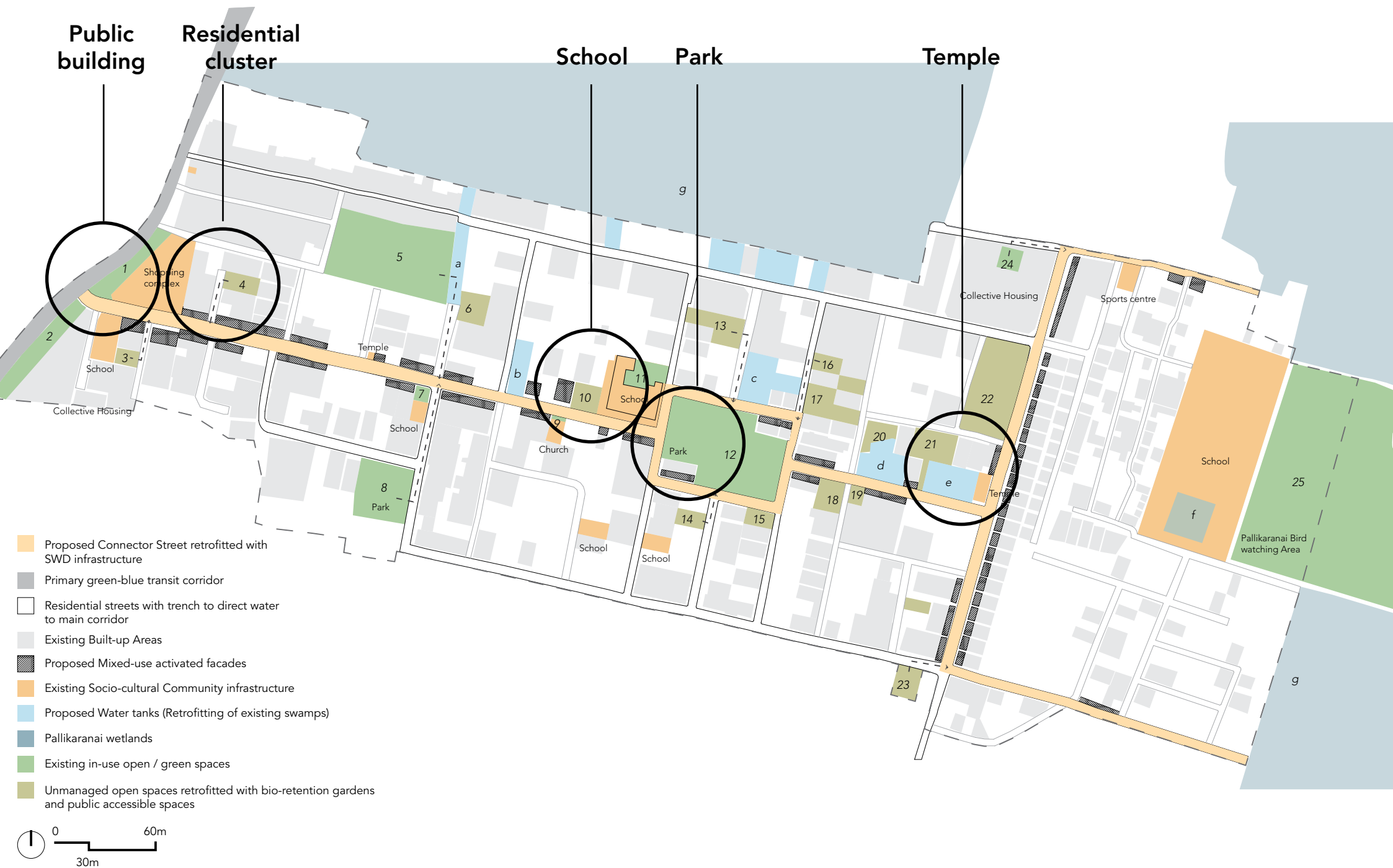
**Public building**

**Residential cluster**

**School**

**Park**

**Temple**

Legend:

- Proposed Connector Street retrofitted with SWD infrastructure
- Primary green-blue transit corridor
- Residential streets with trench to direct water to main corridor
- Existing Built-up Areas
- Proposed Mixed-use activated facades
- Existing Socio-cultural Community infrastructure
- Proposed Water tanks (Retrofitting of existing swamps)
- Pallikaranai wetlands
- Existing in-use open / green spaces
- Unmanaged open spaces retrofitted with bio-retention gardens and public accessible spaces

0   60m

30m

Map labels: Shopping complex, Temple, School, Collective Housing, Church, Park, Collective Housing, Sports centre, School, Pallikaranai Bird watching Area

Numbered areas: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25

Lettered areas: a, b, c, d, e, f, g

*How do we engage the people and build social capital?*

Activated Open spaces    Appropriated Water tank    Temple

Legend:

- Proposed Connector Street retrofitted with SWD infrastructure
- Built up
- Industrial and Corporate
- Existing Socio-cultural Community infrastructure
- Residential
- Commercial and Retail
- Primary Green-Blue Corridor
- Secondary Green-Blue Corridor
- Tertiary Green-Blue Corridor
- Existing Water bodies
- Existing in-use open / green spaces
- Unmanaged open spaces retrofitted with bio-retention gardens and public accessible spaces
- Residential streets with trench to direct water to main corridor
- Landscaped Areas

Map labels:

1, 14, Sports complex, 16, 15, 20, 19, 2, 6, 5, 11, 17, 18, 21, Shared housing, a, e, 7, 10, b, 22, 8, 3, 4, c, 12, 13, 9, d, Temple, Mosque

Scale: 0 — 60m, 30m

## 4. Educate - Spreading awareness about the environment and the importance of the different components of the water network

# Everyday Rainfall

## Neighbourhood 1



☐ Street network - drainage takes place provided the streets are clean and free of blockages

0    30m    60m

## Neighbourhood 2



☐ Street network - drainage takes place provided the streets are clean and free of blockages

0    30m    60m

# 10 Year Rainfall



## Neighbourhood 1

■ Main drainage corridor retrofitted with Storm water drainage infrastructure

0    60m
30m

## Neighbourhood 2

■ Main drainage corridor retrofitted with Storm water drainage infrastructure

0    60m
30m
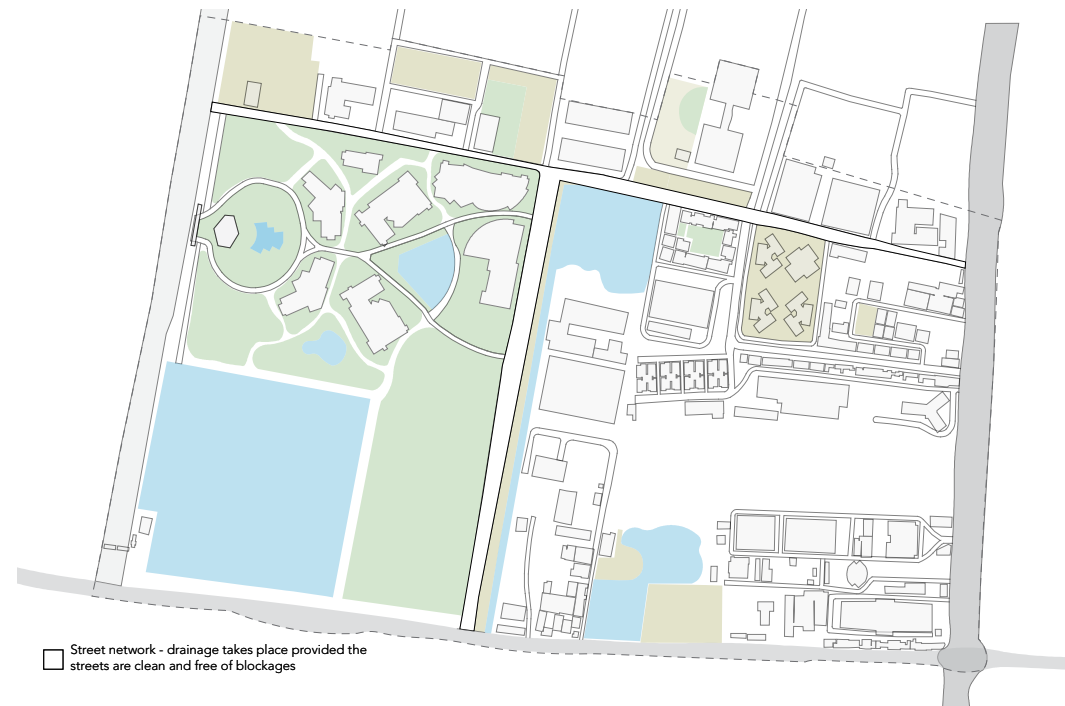
# 100 Year Rainfall

*Neighbourhood 1*

*Neighbourhood 2*

Adjacent open spaces and water tanks that become preferred flooding locations

Main drainage corridor retrofitted with Storm water drainage infrastructure

0   30m   60m

Adjacent open spaces and water tanks that become preferred flooding locations

Main drainage corridor retrofitted with Storm water drainage infrastructure

0   30m   60m

Nano

Neighbourhood

Micro

sub- watershed

Meso

Pallikaranai
watershed

Macro

CMA

Pallikaranai
sub-basin

5. Implementation

**Incentives**

**Expected Outcomes**

**Expected Outcomes**

| **Public Sector** | **Private and Corporate Sector** | **Community** |
| --- | --- | --- |
| Planning Gains | Investing in soft surface landscape | Empowerment |
| Tax abatements | Investing in implementation of Stormwater drainage infrastructure | Community Building |
| Development Rights | Volunteering | Better Quality of Living |
| Awards and Publicity | Corporate Social Responsibility | Safety from Floods |
| Subsidies | Community Service | Ownership and Maintenance |
| Financial Support to Community Infrastructure | | Following Building Regulations |

| | | PHASE I | | PHASE II | | PHASE III | | | | | | PHASE IV | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *2020* | *2021* | *2022* | *2023* | *2024* | *2025* | *2026* | *2027* | *2028* | *2029* | *2030* | *2031* | *2032* | *2033* | *2034* | *2035* |

**MACRO SCALE - Sub-Basin**

*Rain Water Harvesting Policy*



*Design Competition* — *Mapping and documentation* — *Land preparation* — *Implementation begins* — *Completion* — *Inauguration*

*Progress and Planning Review* — *Progress Reviews*

**MESO SCALE - Watershed**

*Rain Water Harvesting Policy*



*Design Competition* — *Mapping and documentation* — *Extension of Pallikaranai wetland* — *Optimisation of mid-catchments capacity* — *Macro level Green-blue corridors implementation begins* — *Pallikarnai wetland Implementation begins* — *Completion* — *Mid-catchment Implementation begins* — *Completion* — *Completion*

*Progress and Planning Review* — *Progress Reviews*

**MICRO SCALE - Sub-Watershed**

*Rain Water Harvesting Policy*



*Mapping and documentation* — *Micro level Green-blue corridors implementation begins* — *Completion*

*Progress and Planning Review* — *Progress Reviews*

**NANO SCALE - Neighbourhood**

*Rain Water Harvesting Policy*



*Mapping and documentation* — *Nano level projects implemented* — *Completion* — *Extension to other neighbourhoods planned*

*Community activities and programmes continue and spread to the rest of the region*

*Progress and Planning Review* — *Progress Reviews*

*Replicability and spreading to the rest of the region*
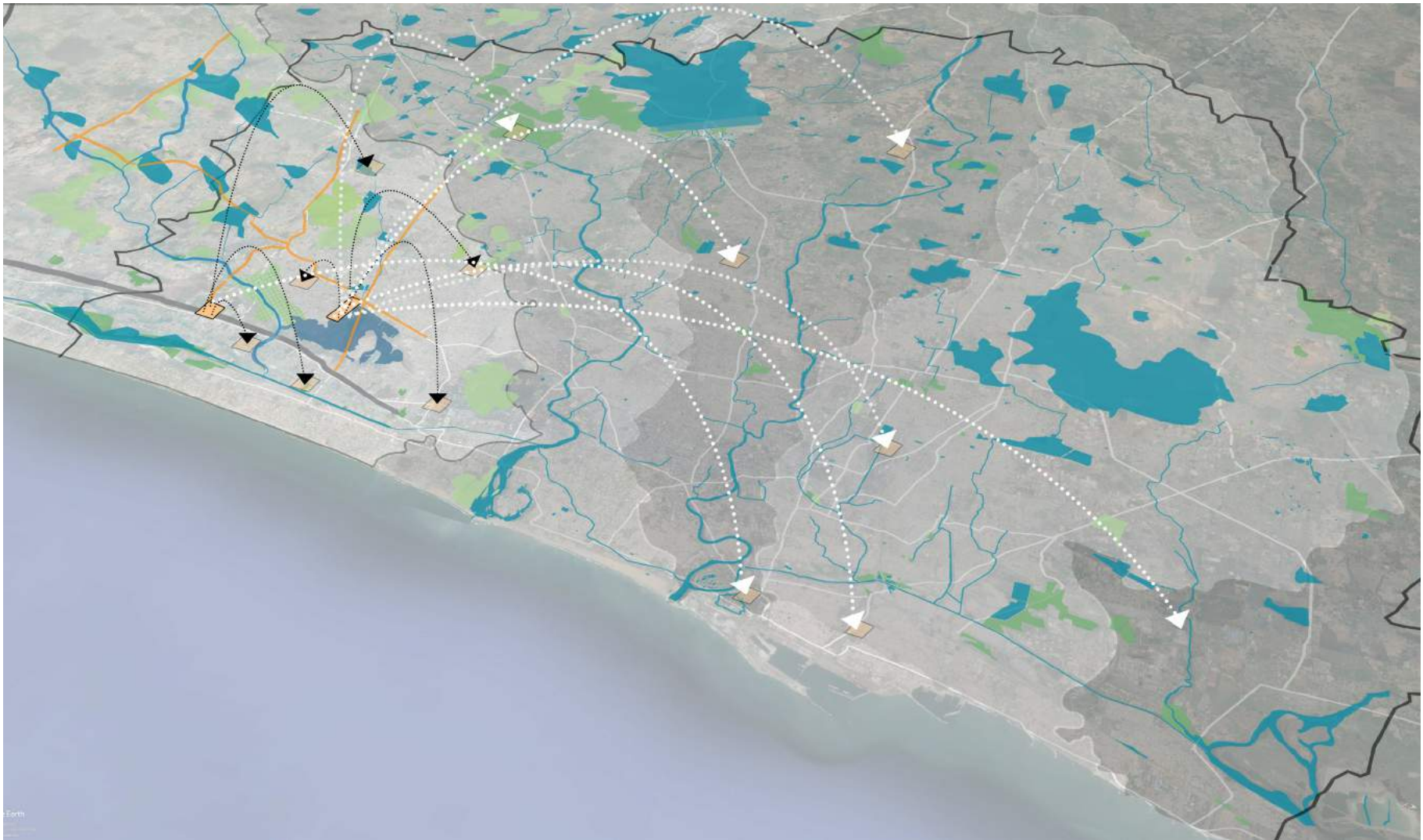
6. Conclusions and Reflections

# Research Question

How can **local adaptation strategies** be planned in order to **reinforce socio-ecological resilience towards floods** in the Chennai Metropolitan Area?

Community building and the building of 'social capital' are used as a method to engage the local community and being about environmental restoration through direct involvement in the maintenance of the hydrological system.

Together, the local community engages with the environment but also maintains it, hence, resolving directly, the current human-nature conflict.

## *Bringing Socio-ecological Resilience to Chennai.*

Socio-cultural networks in the form of community infrastructure can be used as a leverage in order to bring people together, make them aware of their environment and work together across scales and actors  - to stitch the ruptured hydrological system

Community involvement and decentralisation is crucial in order to realise local strategies

Place of worship
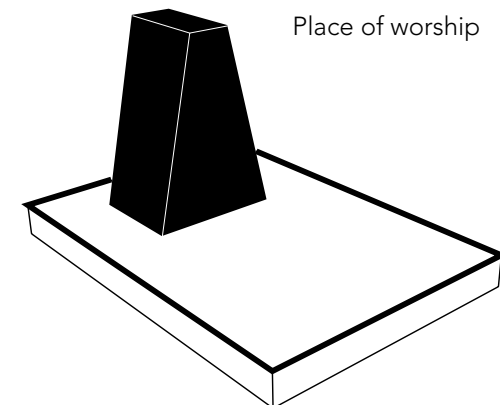
# More than just water and paying attention to the edges

Ecosystem related services are highly relevant for Chennai and can be used a means to restore the ruptured ecosystem

The edge is recognised as the crucial transitional space to directly influence the human-nature conflict
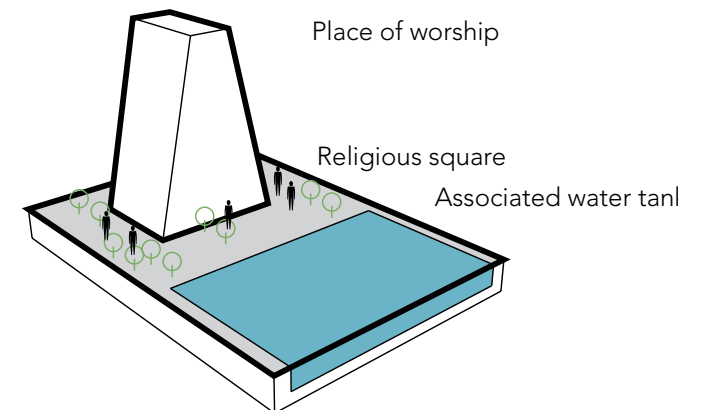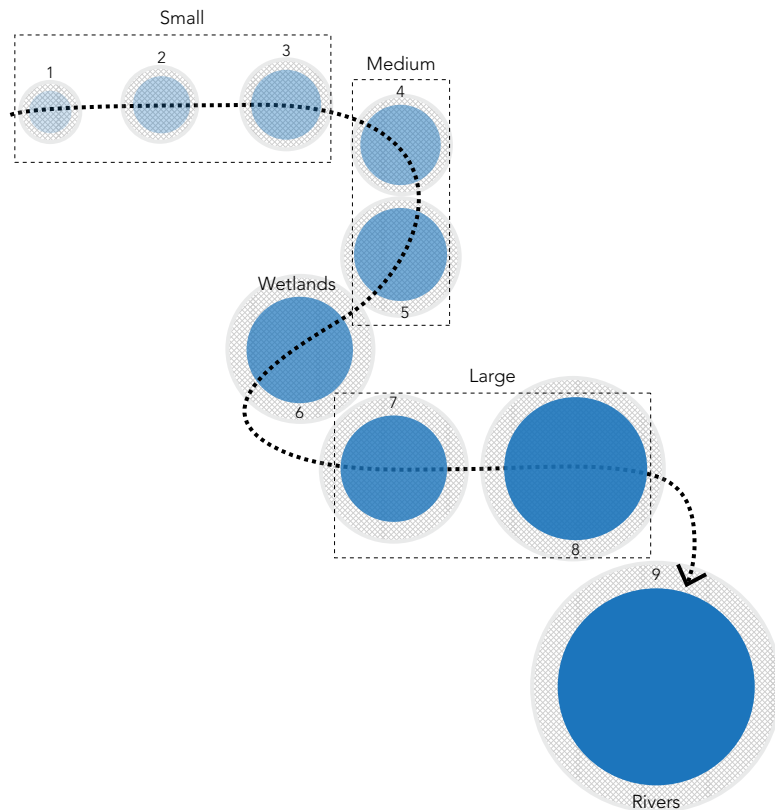
# *Contextual yet transferable.*

The design principles are replicable while still being place specific. The existing theoretical framework can also be extended to other developing contexts and different manifestations of community infrastructure and edge conditions can be explored.
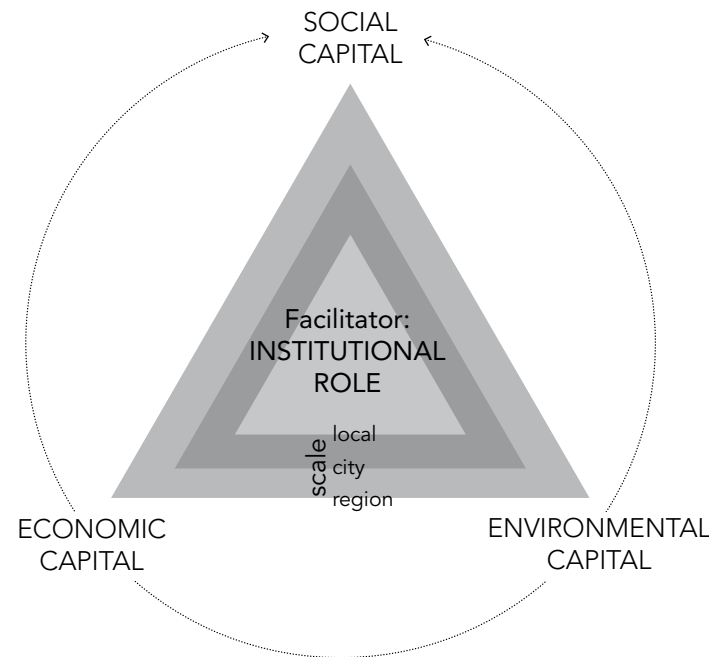
# *Rethinking the role of Institutions in Chennai.*

Resilient Chennai Organisation, Decentralisation, incentives and policies

Planning policies must take into consideration water management and integrate diverse stakeholders across various scales in order to bring about restoration

What next?

More neighbourhoods can be studied and designed for across the Pallikaranai area

Technical aspects of design need to be explored more in detail

Further research needed for emergency and disaster planning