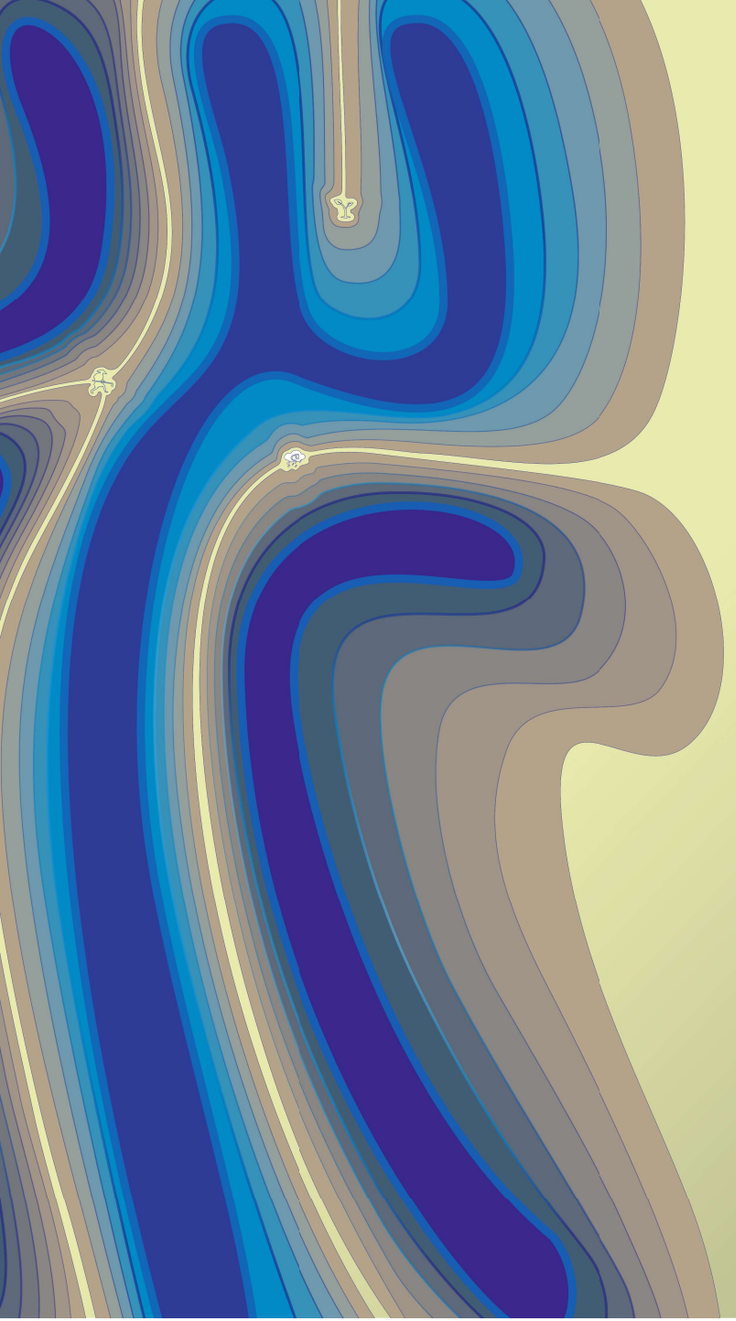

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Climate Resilient Infrastructure In Indian Cities - Development & Water in Chennai

Saman Jain

CEPT University

XVIII
WORLD WATER
CONGRESS
Water for All
Harmony between
Humans and Nature

第18届
世界水资源大会
水与万物:
人与自然和谐共生

AIM:

To study the climate resilience & water security of the fishermen residing along the coast of Chennai with a focus on the communities residing in the Foreshore Area.

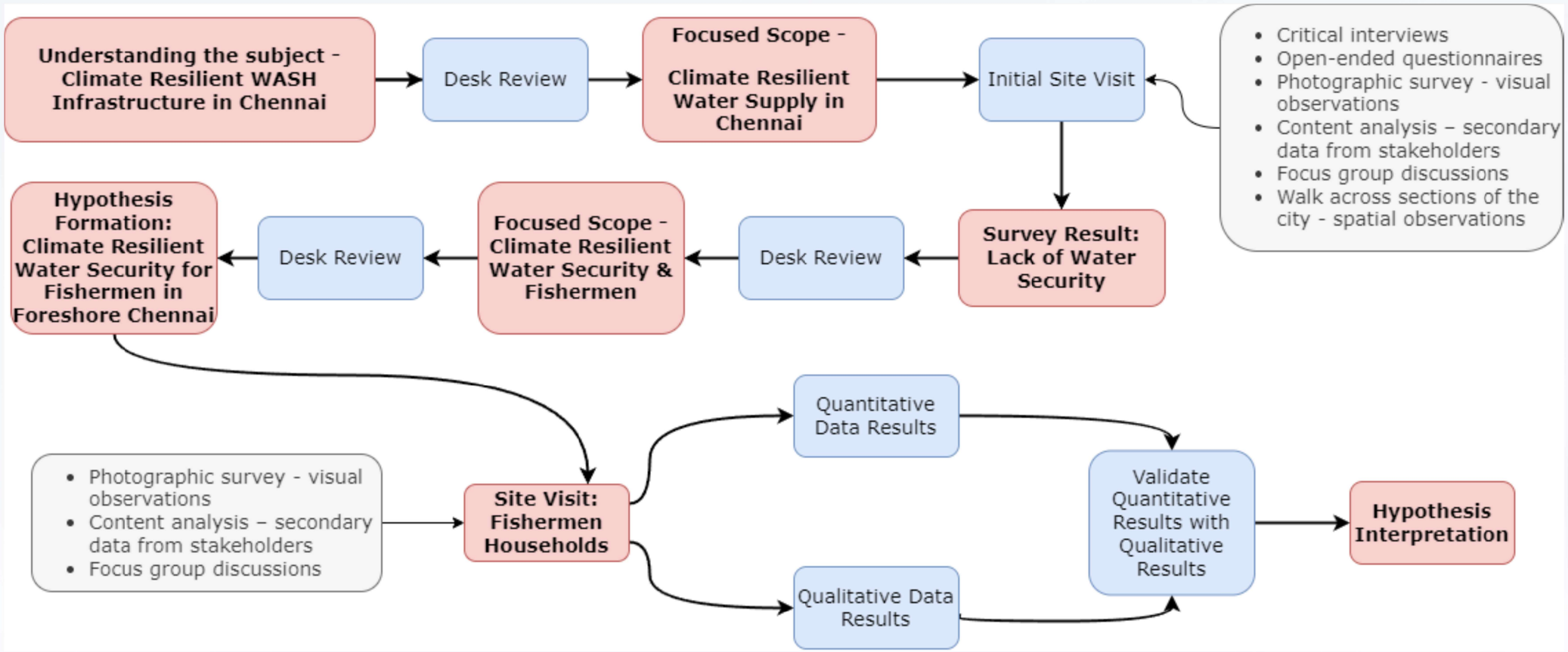
- To understand the water footprint, source dependency and quality of water consumed by the fishermen residing in the area of interest, their resilient practices and the effect of water security on public health.
- To understand the underlying cause of the reduced water security with respect to the development in the city.

The Scope is to understand the water security for front-line communities with respect to land development and water resources depletion. Assessment of water supply is based on Access, Quality, Quantity, Reliability and Resilience.

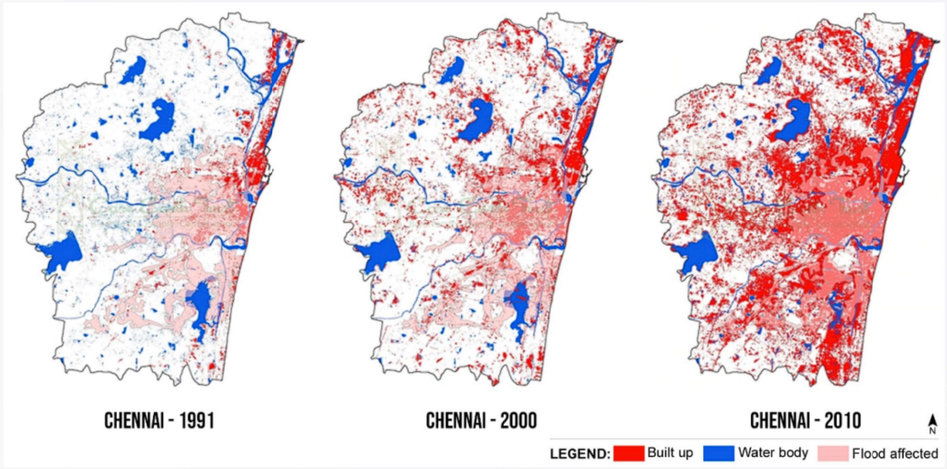
The geographical limitations of this research will be on the fishermen residing along the coast of the city, namely in Foreshore Estate, Srinivasa Puram & Nochikuppam.

Methodology

The research follows a mixed method design which allows for the convergence of qualitative, quantitative and spatial information, strengthening the validity of conclusions.



Chennai and The Research

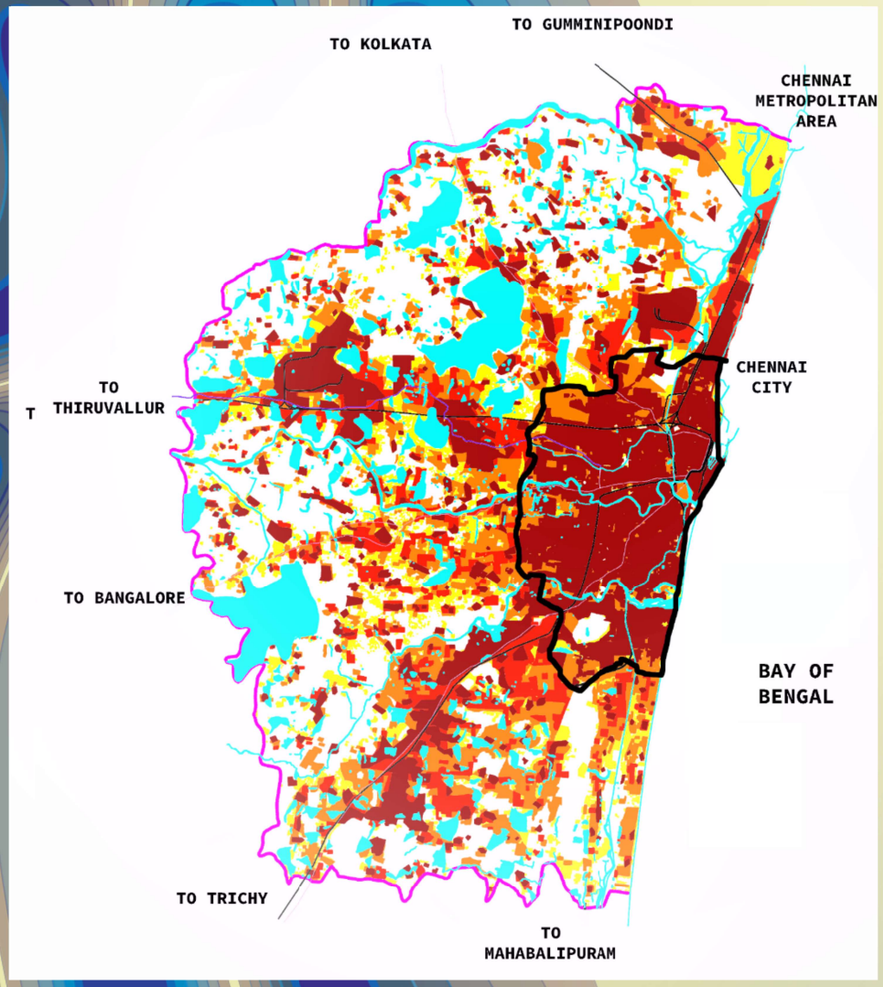


- The city is continuously growing, recently the Chennai Metropolitan Area was extended from **1,189 sq km to 5,904 sq km.**
- The city has faced water scarcity & inundation almost every year since 2012.
- The research focuses on the parched situation of front-line communities in Chennai and maps their water cycle and resilience practices.

WATER & BUILT-UP AREA

Image Source: Care Earth Trust

- Today, wetlands comprise **only 15%** of the city's total area, down from **80% in the 1980s**.
- A projected **30% population increase** in Chennai by 2030 will put further pressure on the city's already insufficient drinking water supply.



6

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25.6 km
along the Bay of Bengal

3 DISTRICTS
Chennai & parts of Kanchipuram and Tiruvallur districts

1189 SQ. KM.
Chennai Metropolitan Area

5,904 km SQ. KM.
Chennai Metropolitan Area – New Expanded Area

426 SQ. KM. [1]
Chennai City

426 SQ. KM.
CMWSSB & GCC Operational

3rd
Master Plan in Process

26%
Slum Population

85 Lakhs
Chennai City Population

3.9 [5]
Avg. HH Size

6 [3]
Water Reservoirs

2 [3]
Active Desalination Plants

5 [3]
Water Treatment Plants

8,24,275
Water Supply Connections

1000 MLD
Water Supply

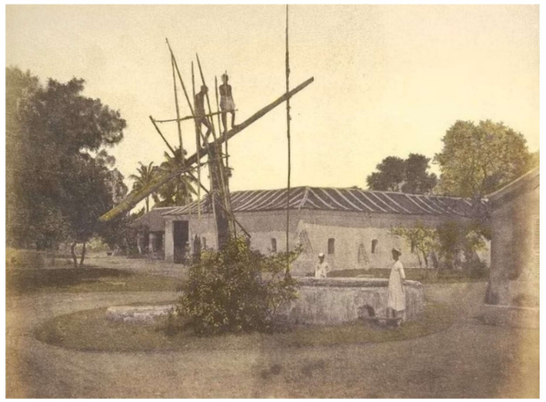
108 LPCD
Water Supply

Data Source: 1 (Water Sustainability Assessment – Mahindra Lifespaces), 2 (CMDA), 3 (CMWSSB), 4(TN Census Director) & 5 (Times of India), 6(CMDA)

1

1639 - Water sourced from Temple Wells

Groundwater dependence



1

1750s - Seven Wells & Cast Iron Piping

Groundwater dependence

2

1818 - 27 Wells dug & Cast Iron Piping

Groundwater dependence

1

1860' s - Kosasthaliyar river Dam to Redhills

Surface-water dependence – 20kms

3

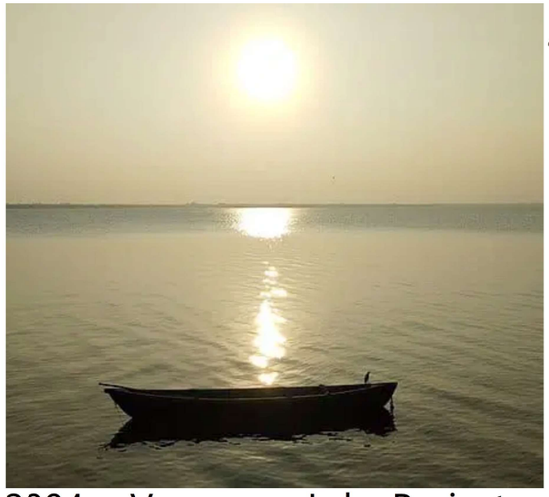
1920' s - Long Tank drained to form T. Nagar

Development over Blue Infrastructure

4

1940s - Poondi Lake Reservoir

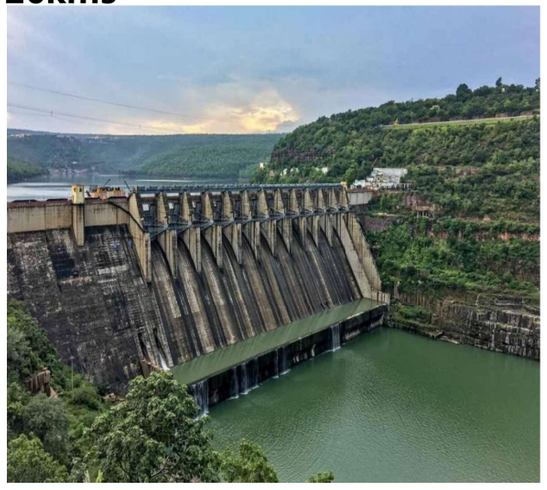
Surface Water Dependence – 60kms



4

2004 - Veeranam Lake Project

Surface Water Dependence – 235kms



4

1860' s - Telugu Ganga Project - Krishna

Surface-water dependence – 406kms

Source: 1 (Swarajya - 2019), 2 (MediaCentre.Org), 3 (Madras Musings) & 4(Flickr Images)

Chennai & Its Water

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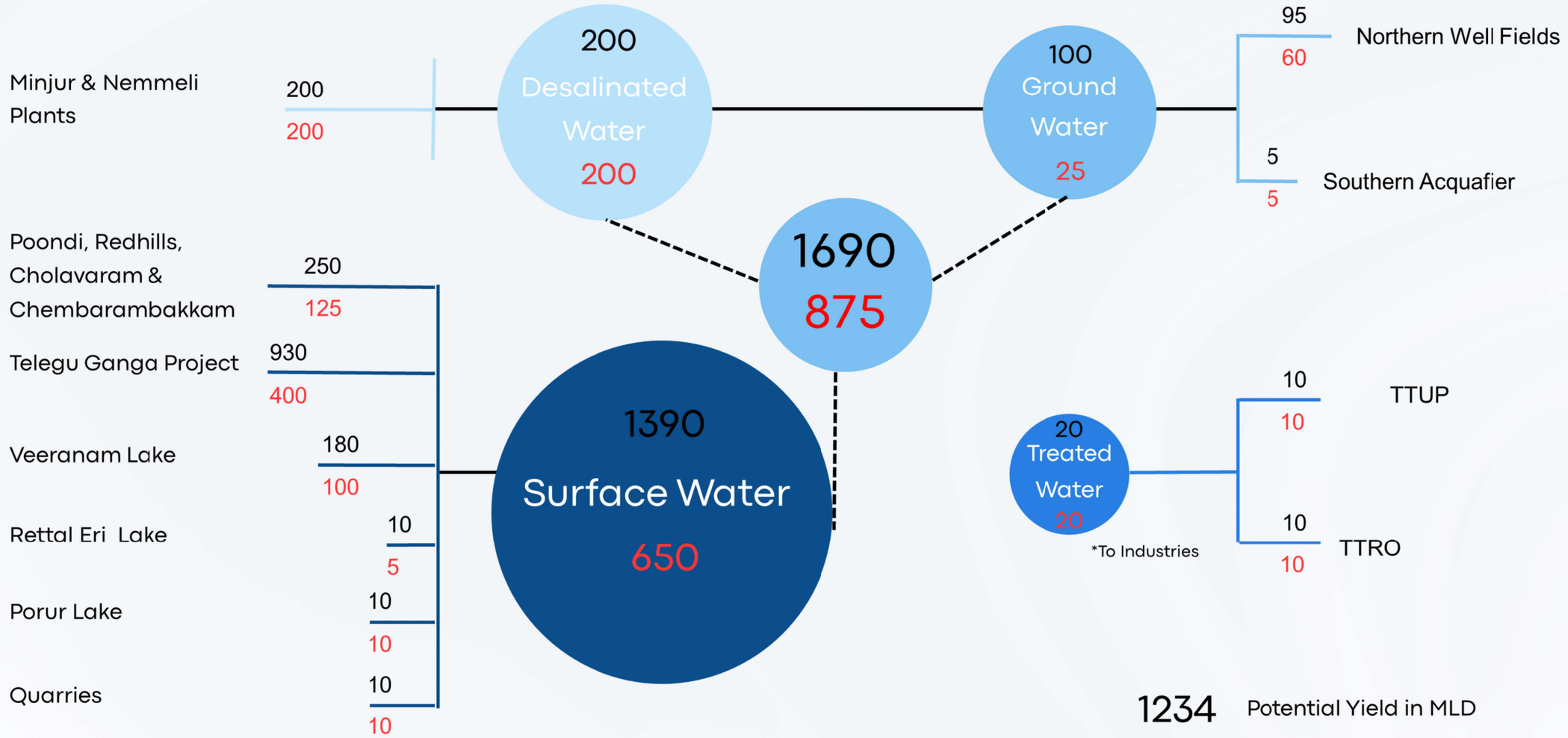

1234 Potential Yield in MLD

1234 Available in good years in MLD

Source: CMWSSB (IWA Webinar – Mr. Jaishankar EE), CMWSSB (Chennai Citizen Matters)

Chennai & Its Water

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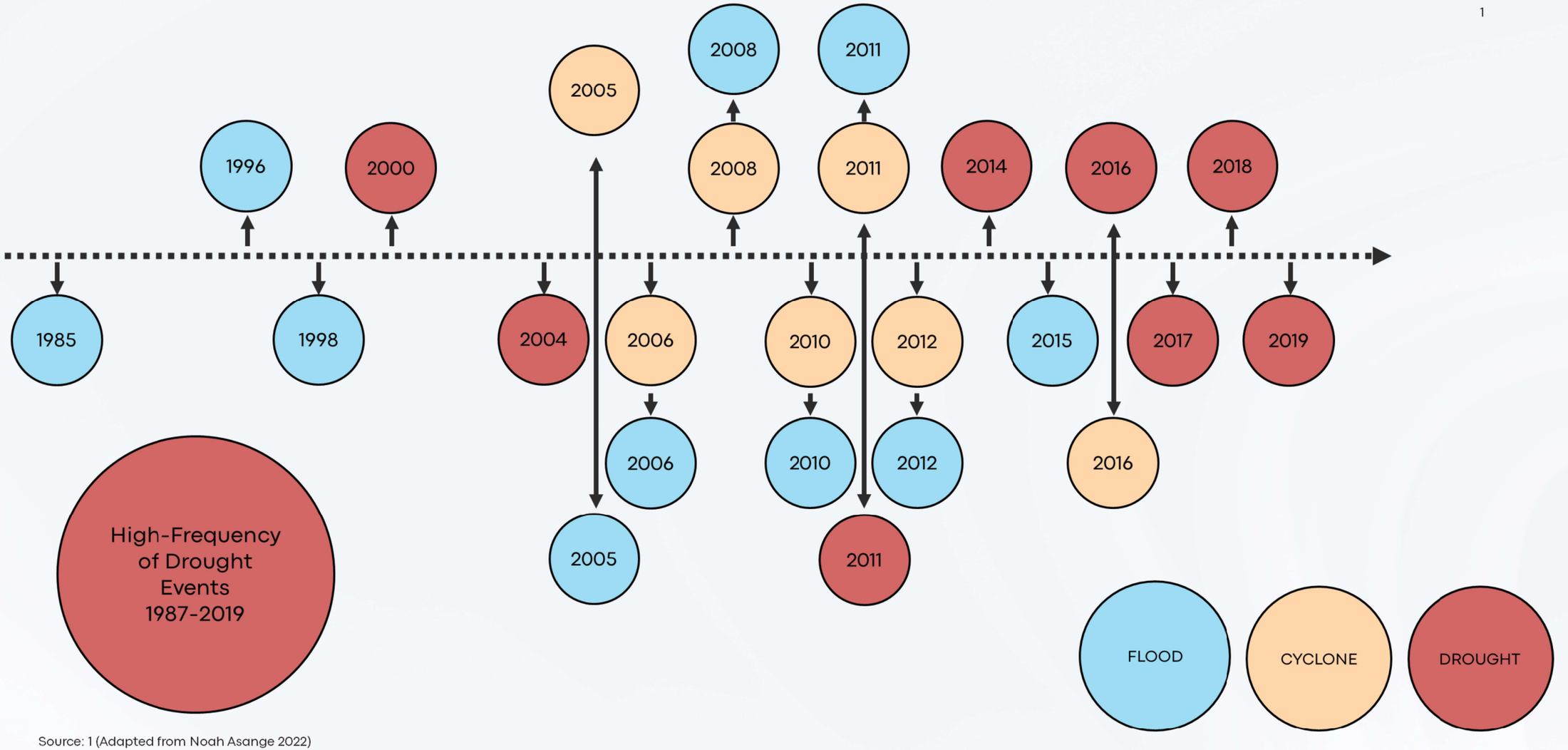

Source: 1 (Adapted from Noah Asange 2022)

Chennai & Climate Risks – Foreshore Area

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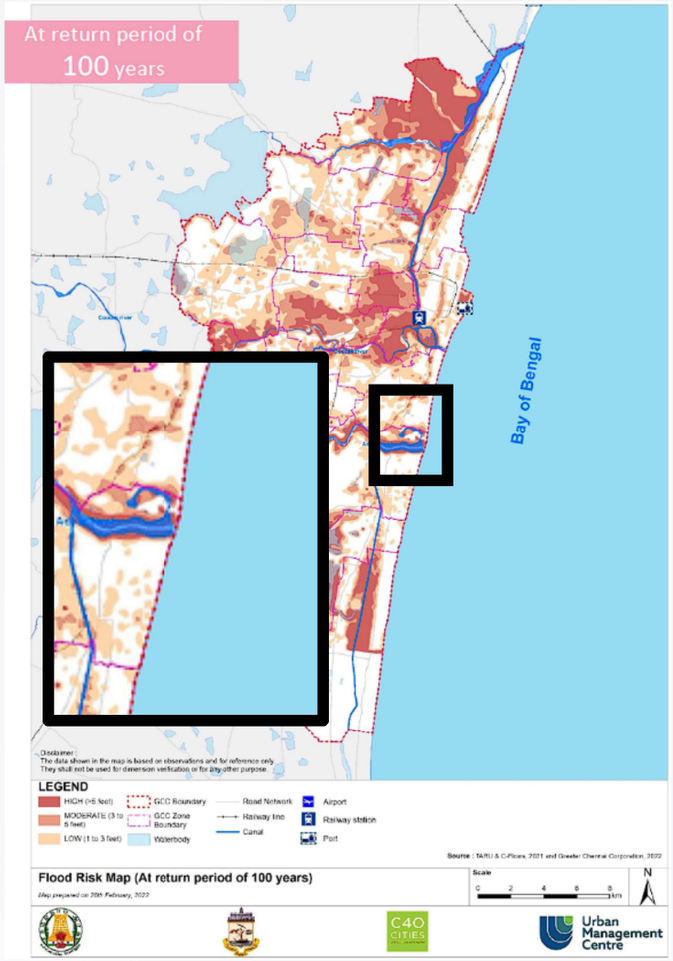
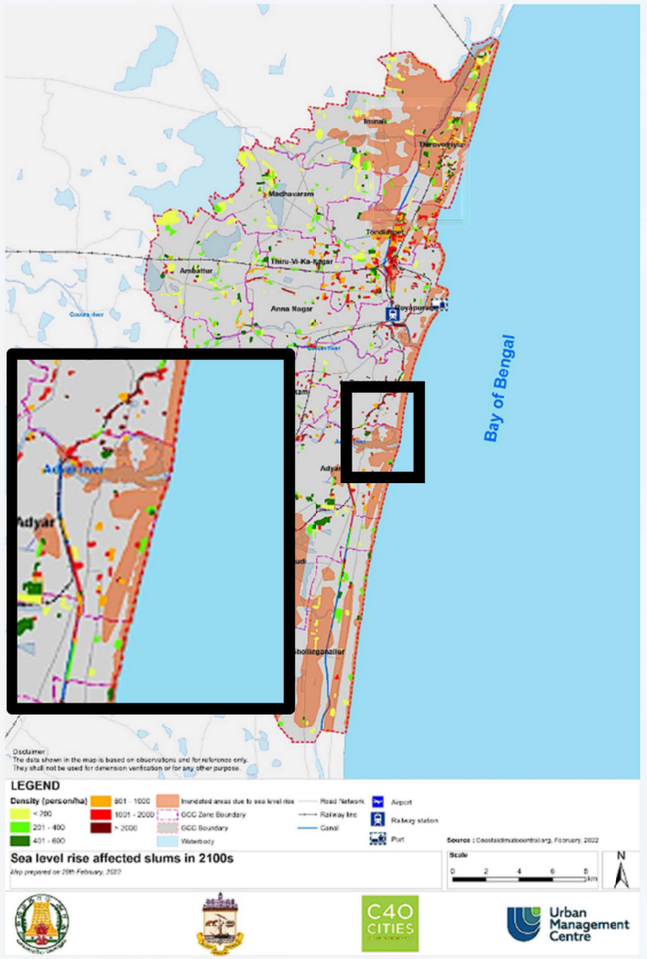


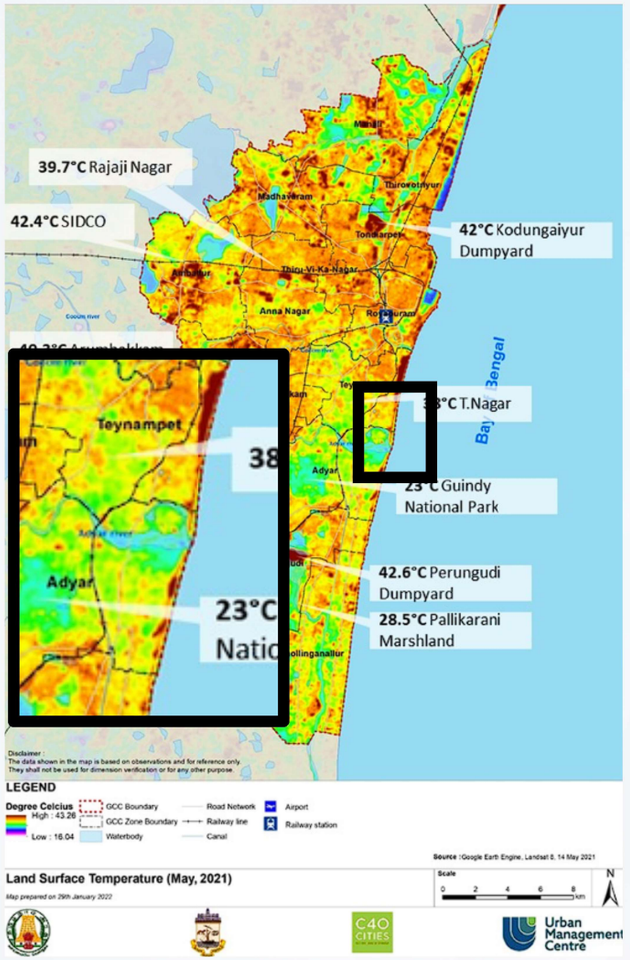
1

100 Year Flood Return Period



1

Impact of Sea Level Rise

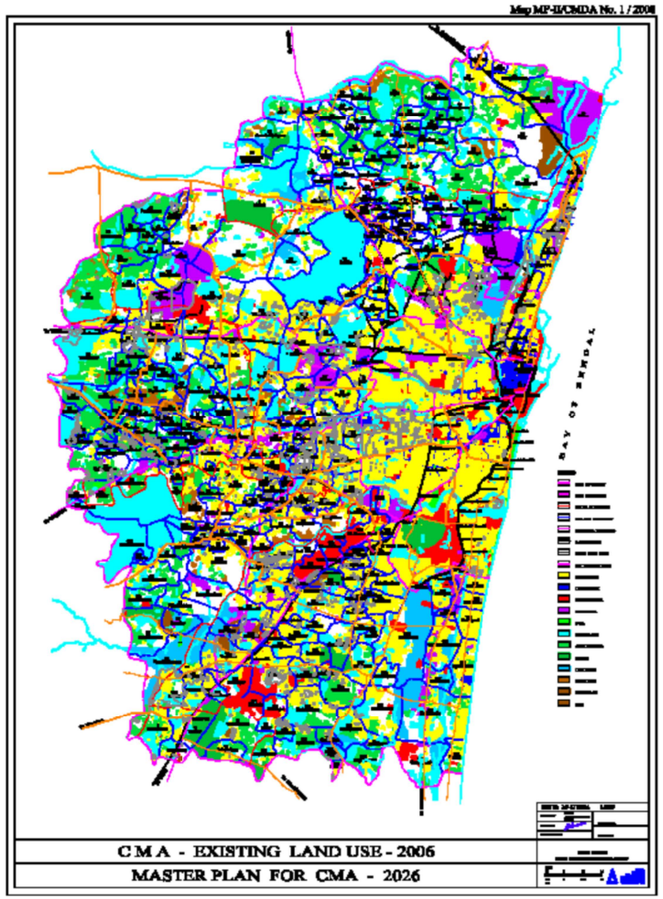


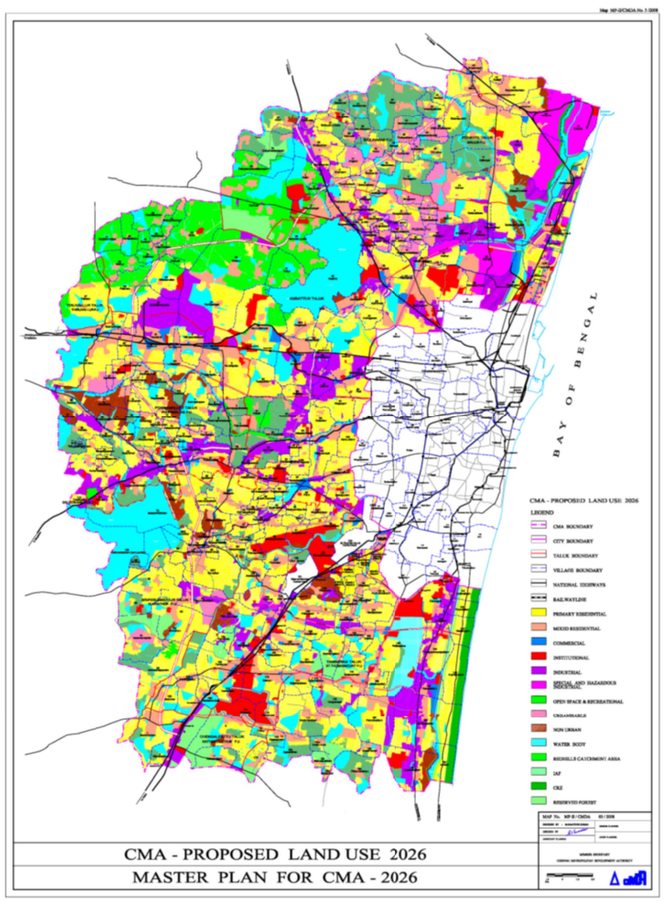
1

Impact of Heat Stress

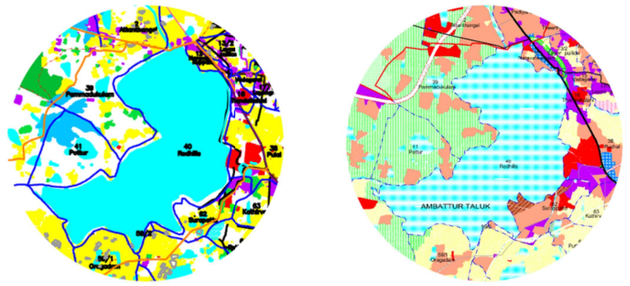
Source: 1 (Chennai Draft Climate Action Plan – C40 & UMC)

Water & Development in Chennai

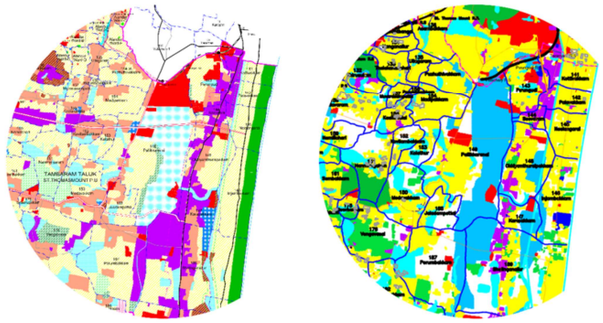




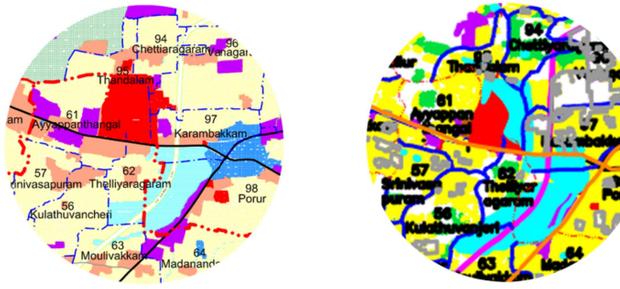
Source: 1 (CMDA, 2008)



Existing Edges redefined – Redhills Lake



Marshland spread redefined – Palikarnikai



Kodambakkam Catchment Area redefined

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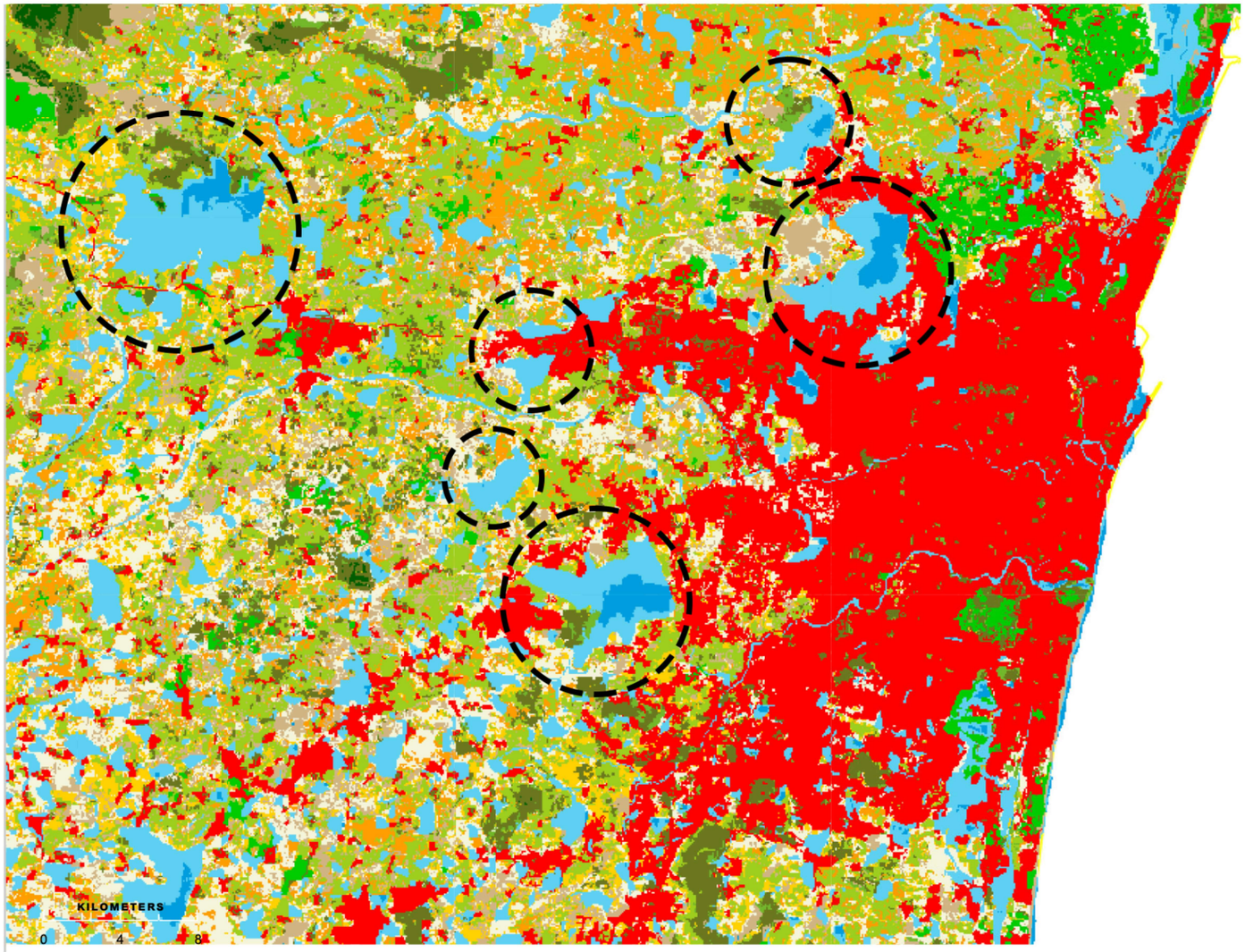

While the **minimum spread of the water bodies** has significantly **diminished** from 2005 – 2019, owing to the over-consumption & under-replenishment.

A significant spread of **agricultural land** has also been **diminished due to urbanization**, greatly reducing the infiltration & retention of rainwater.

The **maximum spread** of the water bodies has diminished from 2005 – 2019 owing to the **increase in built up**.

Built-Up

Maximum Water Body spread

Minimum Water Body spread

Water & Development in Chennai

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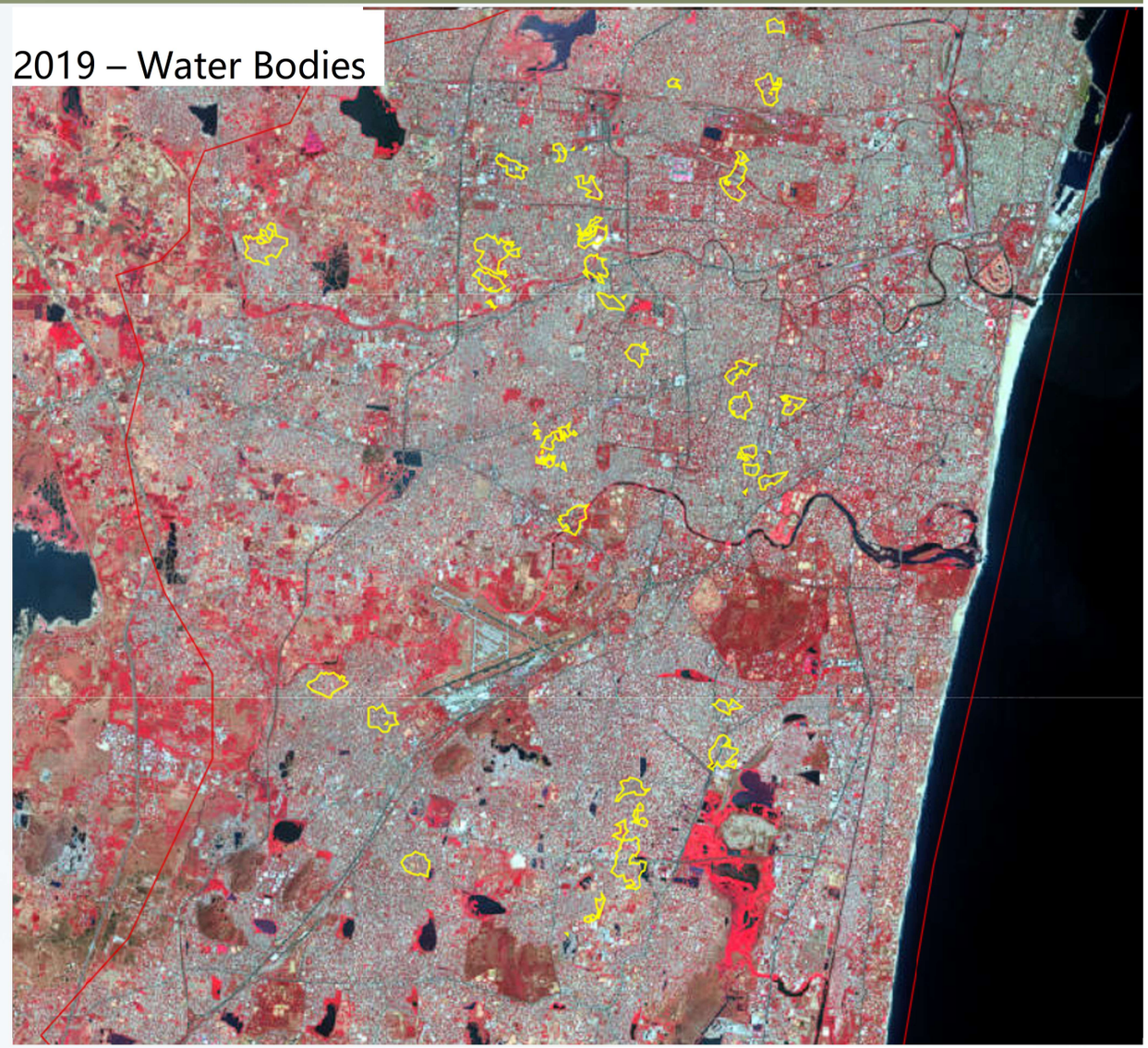
Chennai Metropolitan Area – Water Change 2000-19 [1]

YEAR	WATER AREA (ACRES)	CHANGE IN WATER AREA
2000	1635	0%
2004	5859	113%
2007	1560	-116%
2011	4544	98%
2015	9451	70%
2019	1560	-143%

143% Of water, area was reduced in 2019 Amounting to almost 7,890 Acres

Extents of water bodies under observation

2019 – Water Bodies



Source: 1 (BHUVAN GIS 3D, GOI)

Water & Development in Chennai

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Groundwater yields has reduced over the years in Chennai [1]

Groundwater Source	Yield in 1996 (MLD)	Yield in 2006 (MLD)
Northern well fields	148	100
Southern coastal aquifers	10	5

Current Major sources have already been exploited [1]

Block	Total Area (km^2)	Total Annual Groundwater Recharge (Mm^3)	Net Annual Groundwater Availability (Mm^3)	Existing Gross Groundwater Draft for All Uses (Mm^3)	Stage of Groundwater Development (%)
Minjur	478.30	123.72	111.35	147.31	132
Cholavaram	193.69	98.40	88.56	68.43	77
Puzhal	60.41	34.87	31.38	16.01	51
Villivakkam	175.78	60.65	54.59	28.72	53
Ponnamalle	156.13	72.01	64.81	57.39	89
Sriperumbudur	365.69	134.03	120.62	23.74	20
Kundrathur	270.38	87.66	78.90	45.26	57
St.Thomas Mount	236.51	41.61	37.45	23.85	64
Kattankulathur	361.76	83.40	75.06	45.49	61

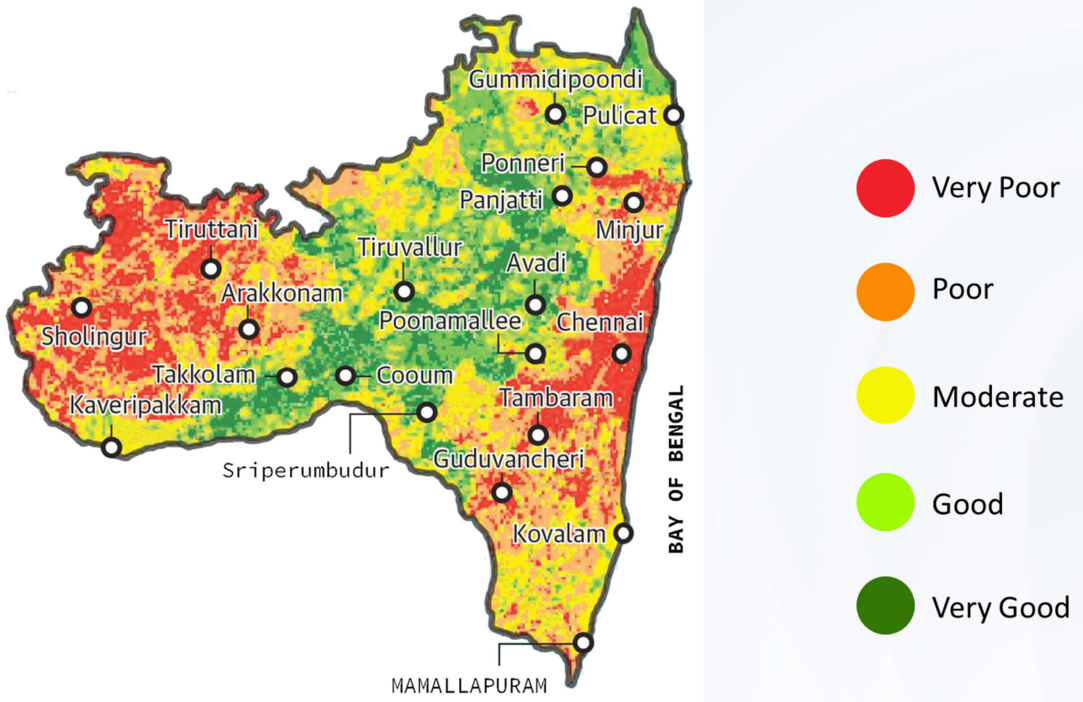
Stage of Development	Category
Greater than 100%	Over exploited
85%–100%	Dark area
65%–85%	Grey area
Less than 65%	White area

From 2011 to 2013 the groundwater availability reduced [1]

District	2011		2013	
	Net Groundwater Availability (ham)	Groundwater Draft (ham)	Net Groundwater Availability (ham)	Groundwater Draft (ham)
Chennai	1707	3780	1497	2768

Major over-exploitation of groundwater in Chennai was carried out

Groundwater Potential – Chennai Basin [2]



Source: 1 (Mahindra Lifespaces – Water Sustainability Assessment Chennai 2020), 2 (SajilKumar,P.J.;Elango,L.;Schneider - M.GIS and AHP Based Groundwater Potential Zones Delineation In Chennai River Basin 22')

Recommendations for a Resilient Chennai

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RECOMMENDATIONS

A path for water security, climate resilience and source sustainability in Foreshore

WATER SECURITY, PUBLIC HEALTH & CLIMATE RESILIENCE
FOR FISHERMEN COMMUNITY IN FORESHORE, CHENNAI

Project Tan Neer

Tanneer is the Tamil word for Water

Tan is the Hindi word for Body

Neer is the Hindi word for Water

Tan Neer is focused of Water Security, Climate Resilience, Community, Development & Public Health

WATER, FORESHORE, CLIMATE, ULB & FISHERMEN

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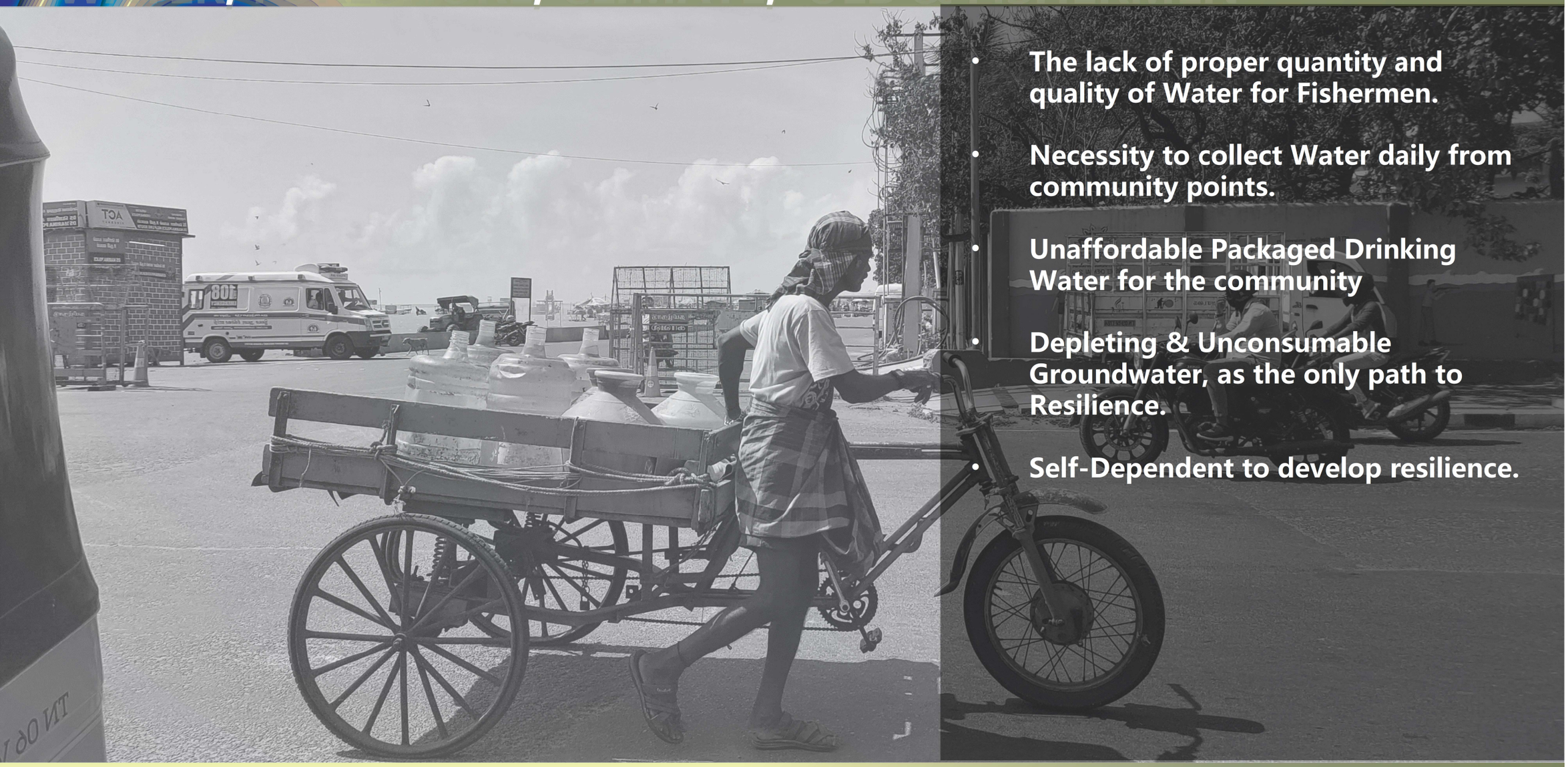

- The lack of proper quantity and quality of Water for Fishermen.
- Necessity to collect Water daily from community points.
- Unaffordable Packaged Drinking Water for the community
- Depleting & Unconsumable Groundwater, as the only path to Resilience.
- Self-Dependent to develop resilience.

WATER, FORESHORE, CLIMATE, ULB & FISHERMEN

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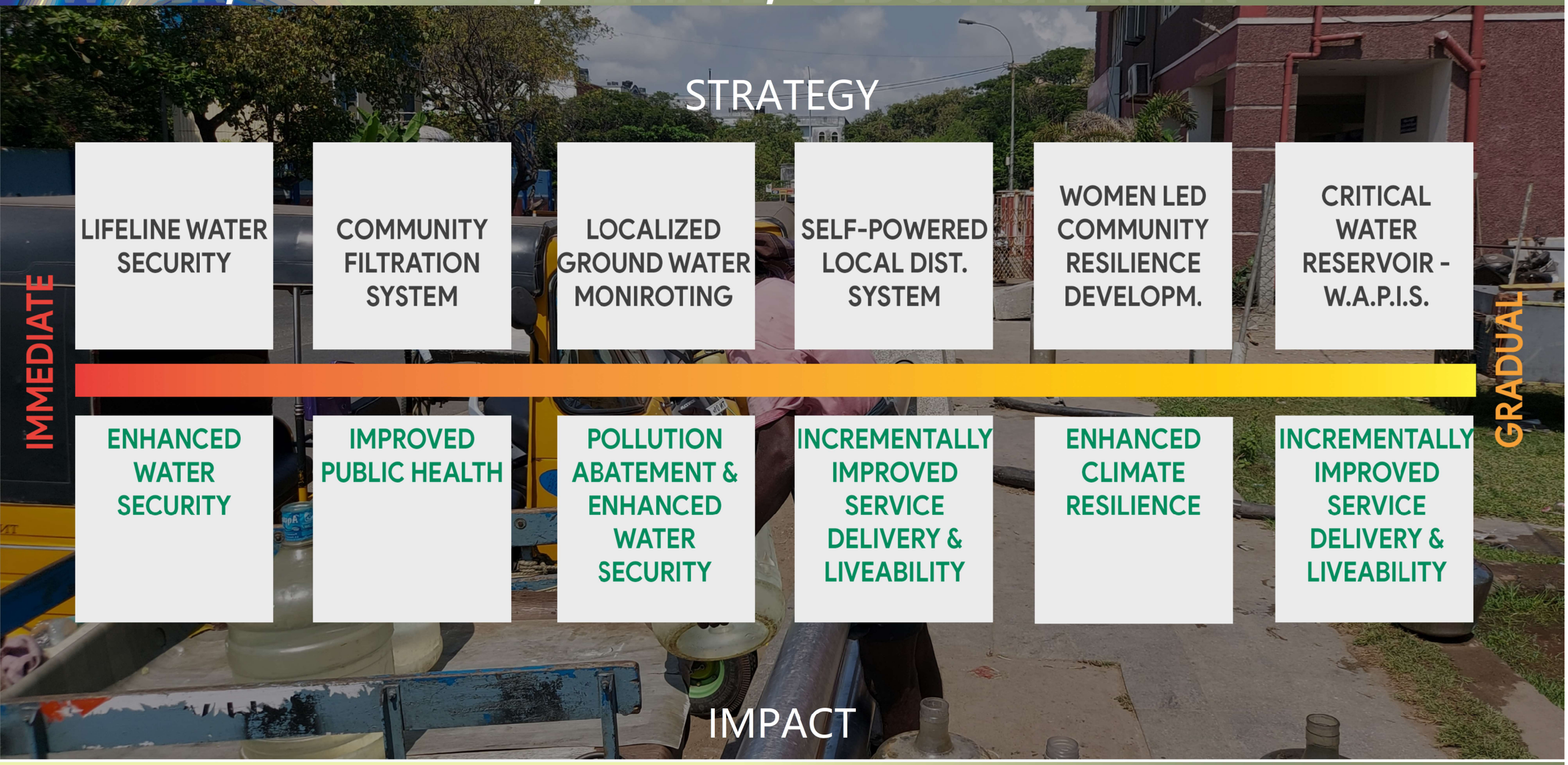

WATER, FORESHORE, CLIMATE, ULB & FISHERMEN

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- Insufficient Water for Supply
- Depleting Water Sources
- Lack of Synergy between Development, Water Resources & Climate Change
- Uncontrolled Land Development

WATER & DEVELOPMENT AUTHORITY

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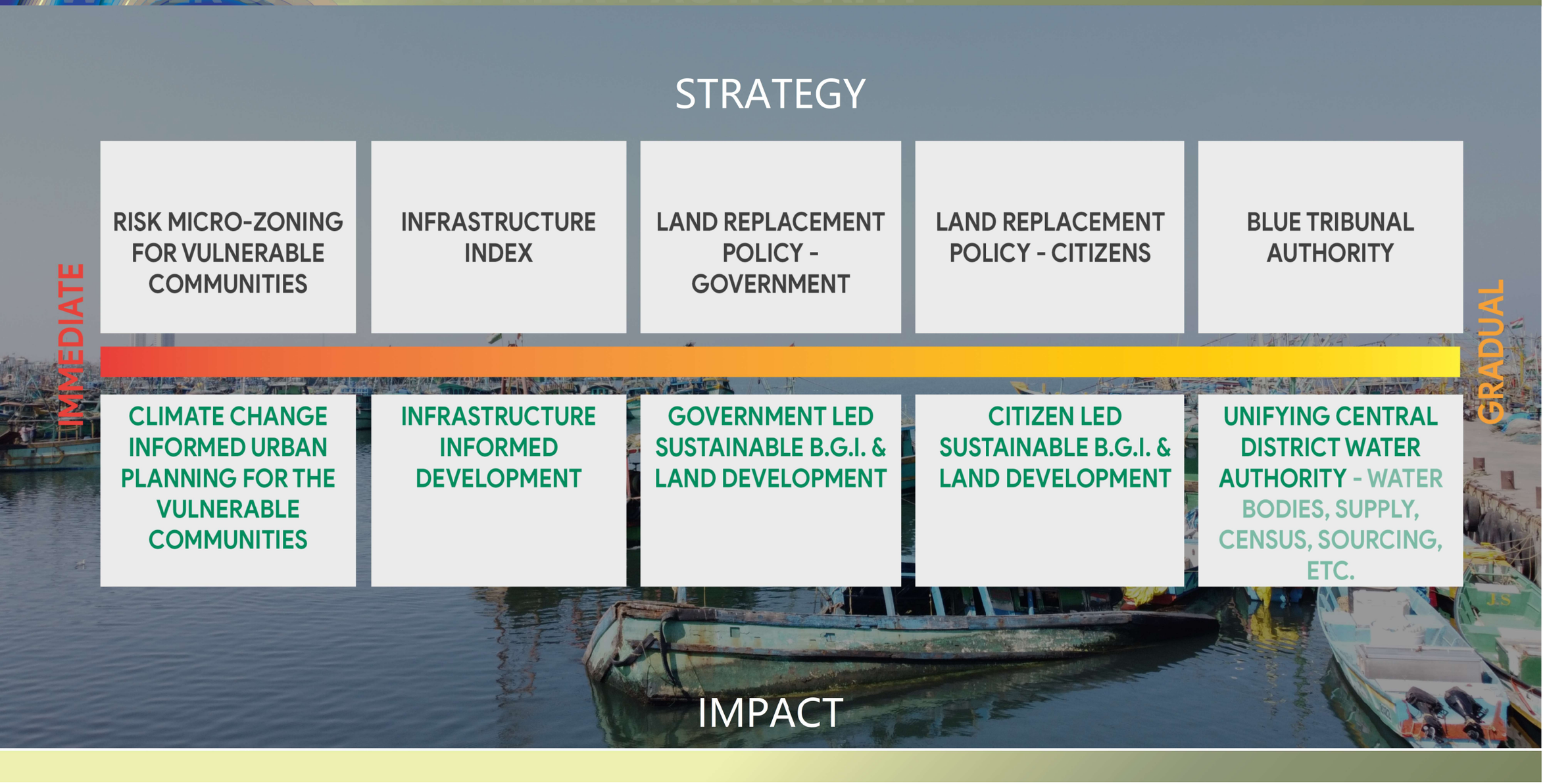

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