

Urban Flood Management for Panaji



Corporation of the City of Panaji
Panaji, Goa

Panaji - Understanding the City



Location

15.29° N Latitude & 73.49° E Longitude



State - Goa District - North Goa
Taluka/ Block - Tiswadi
City - Panaji

Connectivity -

National highways - NH4 and NH17
Nearest Railway Station is 14km away

Area + Administration

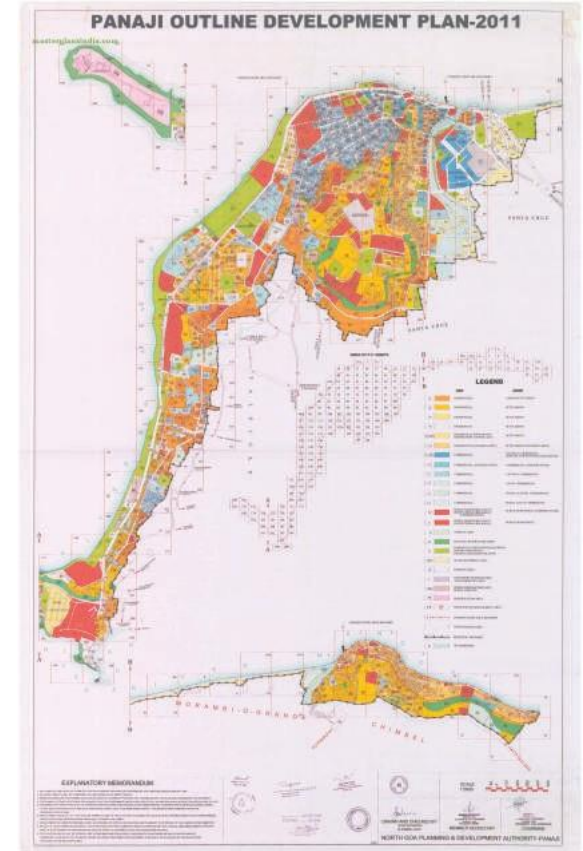
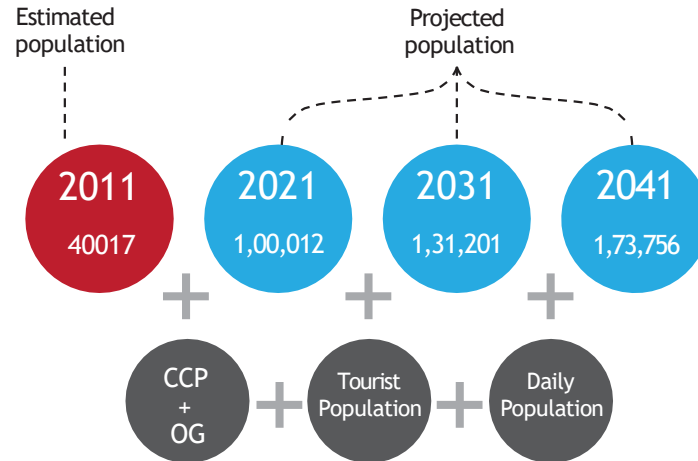


Topography and Geography

I. Coastal plain with marine land forms on the West (Costal Area)



Demographics



Panaji - an estuarine ecosystem



Drainage Characteristics



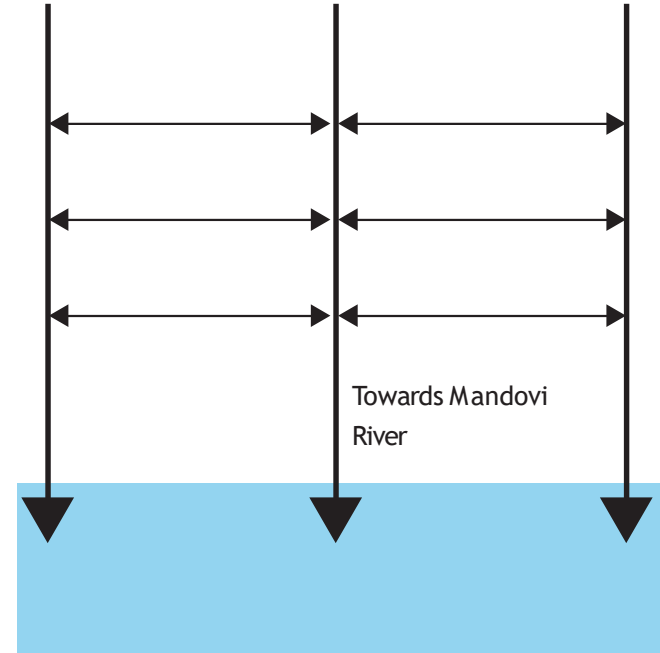
The present storm water drainage network for Panaji city was planned and implemented in the year 1938 under the Portuguese rule.

There are two type of drains - Major Drains/ primary and road side drains/ secondary. Primary drains work as arterial drains in channelizing water from the streets drains towards the river (Mandovi)

The present system of storm water drains discharge is planned on the basis of gravity formed by the topography of the place and they flow towards western part of the city.

Saline soil in the region occurs in the flood plains of River Mandovi where the soil is deep, poorly drained and less permeable.

Drain Network



Flooding potential - Panaji

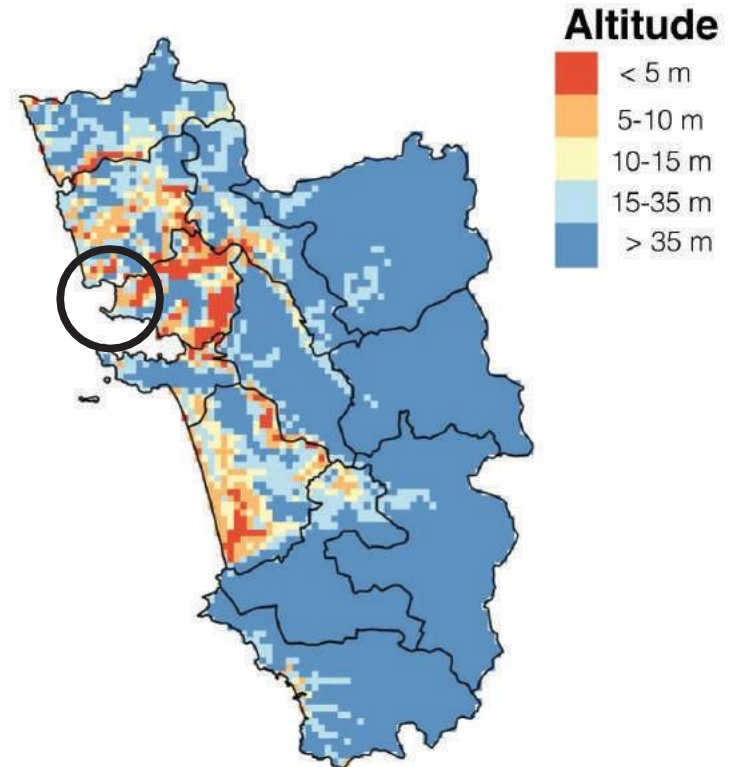


Panaji Elevation Zone - 0-5 m and 5-10 m

0 - 5m - most vulnerable to flooding from multiple hazards including sea level rise, and extreme precipitation events.

The taluks of Salcete, Tiswadi, and Bardez most vulnerable/
prone to flooding related hazards.

Panaji - Prone to flooding events





Existing flooding scenario - Core city of Panaji

Impacts of flooding



Socio - Economic



Water enters into the shops and restaurants. Limited accessibility to shops and other establishments due to waterlogging on the streets and footpaths - Financial burden on the commercial establishment owners.

Water enters into the houses which are situated in the low lying areas of Panaji - Financial burden on the households

Infrastructure

Vehicles cannot be parked on the waterlogged streets - Puts additional burden on the other streets and causes severe traffic congestion

Waterlogging puts additional burden on the Solid Waste Management system of the city

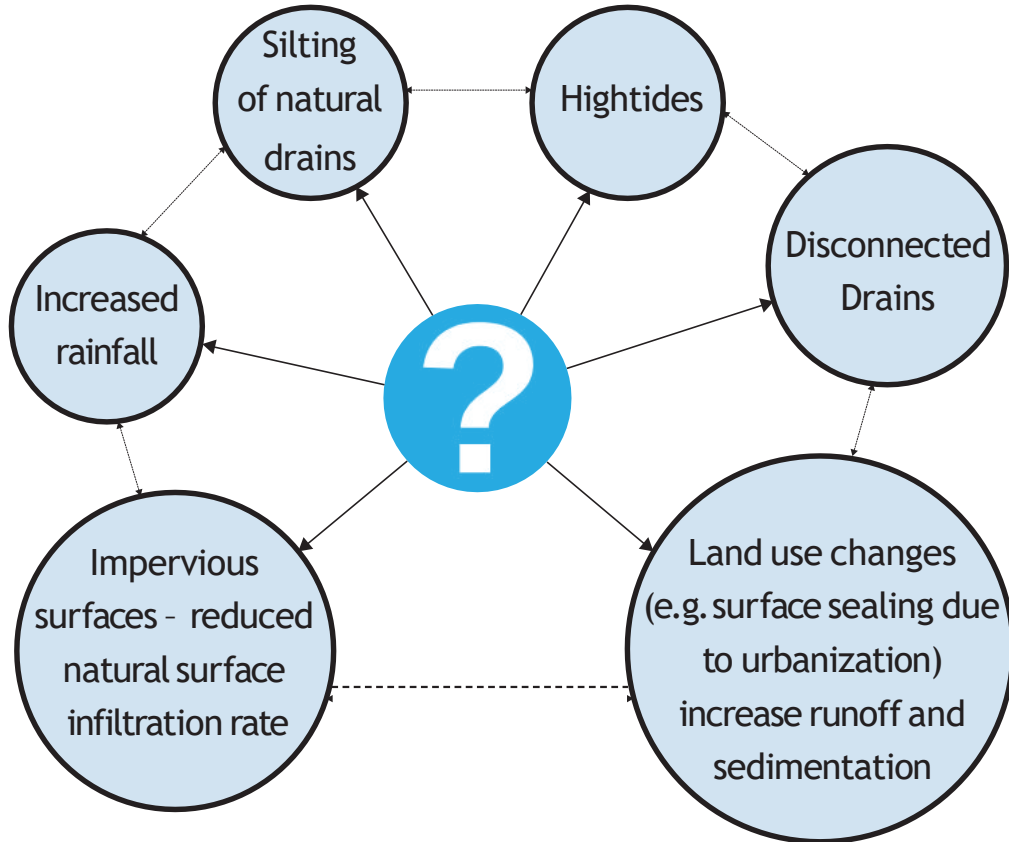
Environmental

Erosion of soil, disturbances to the local landscape, Land slides in hilly areas, contaminated water enters in the city



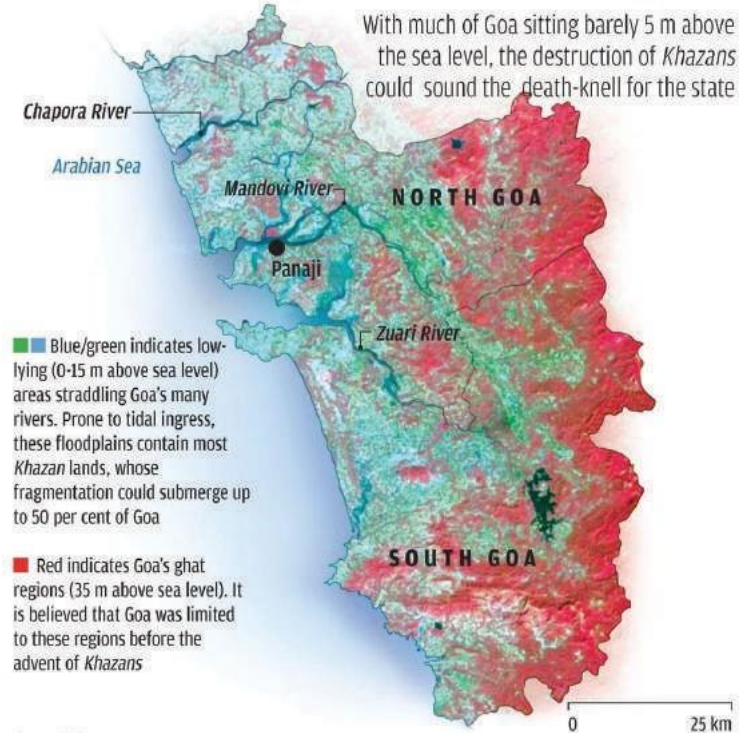
Existing flooding scenario - Campal

Identification of Issues



Approaching a state of submergence

With much of Goa sitting barely 5 m above the sea level, the destruction of *Khazans* could sound the death-knell for the state



Source: ISRO

Indicators - Rainfall and Hightide Characteristics



GOA RECEIVED

122%

ABOVE AVERAGE RAINS FROM

July 10-23, 2021

Indian Metrological Department

AVERAGE ANNUAL RAINFALL IN
GOA IS APPROX - 3000MM
ABOUT THREE TIMES HIGHER
THAN THE NATIONAL AVERAGE

GOA STATE ACTION PLAN ON CLIMATE CHANGE

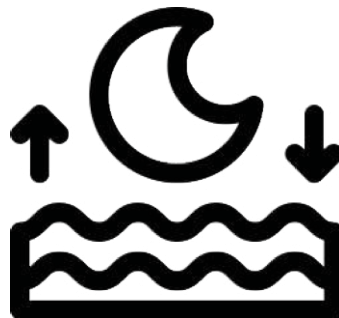


VERY HEAVY RAINFALL EVENTS WILL INCREASE
IN GOA IN THE 21ST CENTUARY

67% INCREASE

IN THE MEAN ANNUAL RAINFALL
IN THE NORTH GOA DISTRICT
FROM 3000MM IN 1901
TO 5000MM IN 2015

GOA STATE ACTION PLAN ON CLIMATE CHANGE

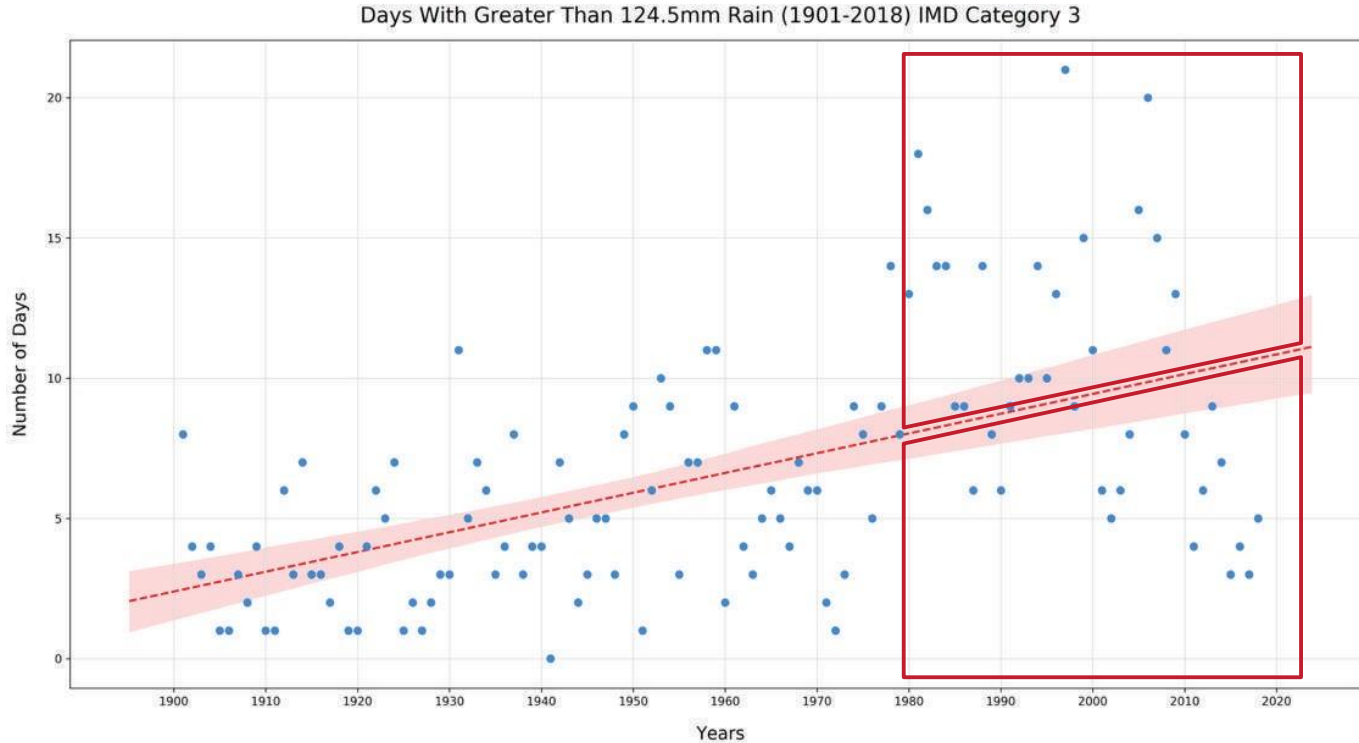


GENERAL LEVEL OF THE CITY IS LOWER THAN THE HIGH
TIDE LEVEL, WHEN THE LEVEL OF MANDOVI RIVER RISES,
REVERSE FLOW TAKES PLACE WHICH GETS ABSORBED BY
THE CREEKS/ NALLAHS/ MARSHY LAND/ PONDS

Indicators - Rainfall Characteristics



Gradual Decline in moderate rainfall days and increase very heavy and exceptionally heavy rainfall days in Goa



Panaji - Change in Landuse



Proposed Stormwater Management Plan for Panaji



Proposed Integrated Stormwater Management Plan for Panaji

Issue	Effect	Causes	Study areas	Detail data collection required	Analysis
<p>Waterlogging / Flash floods</p> <p>Flooding distorts environmental, social and economic framework of the city.</p>	<p>Specific issues -</p> <p>Many shops and restaurants cannot remain open as water come into the shops. Also, people cannot access the shops and other establishments due to water logging on the streets and footpaths. This puts financial burden on the commercial establishment owners.</p> <p>Vehicles cannot be parked on the waterlogged streets which puts additional burden on the other streets and causes severe traffic congestion. Flooding water enters into the houses which</p>	<p>Increase in impervious surfaces</p> <p>Stormwater drainage network unable to carry the volume of Stormwater</p> <p>Damage and change to the natural drainage basin</p> <p>Improper road slopes</p> <p>Hightide</p> <p>Decreased green spaces</p>	Rainfall	<p>Rainfall data for last 30 years or more</p> <p>Rainfall data collection comprising of annual average daily and monthly rainfall and no of rainy days</p> <p>Data on historical flood events</p>	<p>Integrated analysis of the collected data</p>
			Physical characteristics	<p>Slope of catchment and outfall point</p> <p>Land use identification</p> <p>Mapping urban forest, wetlands, marshy lands, flood plains, water bodies etc.</p> <p>Groundwater table data, mapping groundwater recharge areas</p>	
			Waterway characteristics	<p>Capacity of water receiving body and its HFL and other relevant details</p> <p>Physical condition and characteristics of the existing (size, slope and material) storm</p>	

Recommendations from the SECAP under EU funded project



Sustainable Energy and Climate Action Plan Panaji (SECAP)

In 2019, the total GHG emissions are estimated at 2,26,600 tonnes of CO₂e. In 2030, they are expected to increase by 36% to 3,08,200 tonnes of CO₂e. In 2019 - electricity - 48% share and transport - 43% share in GHG emissions

Suggested key actions under SECAP

Status - Actions taken

Replace all existing MSW vehicles with electric vehicles.

Partial conversion to CNG and electric - In process

Setup bio-methanation plants

4 installed - rest in process

Strengthen the public transport system

Introduction of 48 electric buses for Panaji - In process

Introduction of E- vehicles with charging stations

Introduction of freight EV's under EcoLogistics project

Implement Non- Motorized Vehicle Zone

NMT zones approved by the City Council

Panaji - Almada Collaboration with support from IURC



In 2021, the Corporation of the City of Panaji has collaborated with the Municipality of Almada, Portugal on the topic of Urban Flooding with technical support from the International Urban and Regional Cooperation (IURC) under EU funded project



Funded by the European Union

IURC Asia & Australasia (India) @iurc_aa_india · Mar 14
7 Indian and European cities were represented in the #floodmanagement breakout session at the IURC Launch Event in India where causes and solutions were discussed. The common interests that emerged warrants a strong #cooperation between the cities/regions. @EU_in_India @iurc_aa



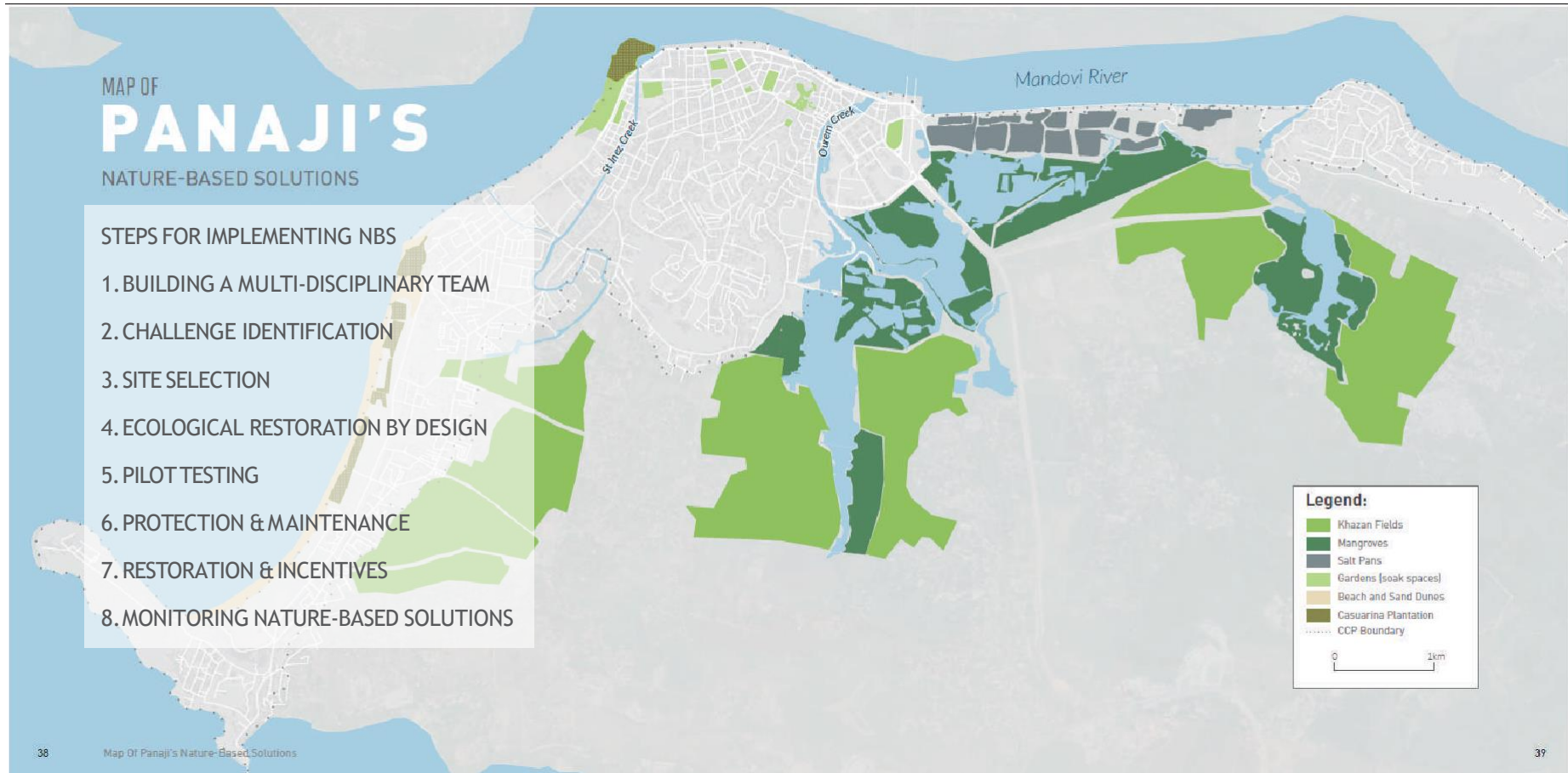
IURC Asia & Australasia @iurc_aa · Oct 15, 2021
Our expert Panagiotis Karamanos & Urban Development Manager Ashish Verma (@ashugr) recently visited #Panaji to learn about #wastemanagement practices carried out in the city. Thank you Dylan Fernandes, Manager at Corporation of the City of Panaji, for receiving us.



Restoration of St. Inez Creek under Project Urban Living Lab (PULL)



Nature Based Solutions under Project Urban Living Lab (PULL)



Mitigation Actions - Provision of shelter home under NCRMP



Project - National Cyclone Risk Mitigation Project

Provision of Shelter home -

Total accommodation at normal time- 550 people

During eventuality- 1100 people



To disseminate about cyclones and tunamis,
3 towers will be erected in the Corporation's
jurisdiction under Early Warning Dissemination
System (EWDS)

Important studies and projects focusing on climate change



Sustainable Energy and Climate Action Plan Panaji (SECAP) - Prepared by the Corporation of the City of Panaji in collaboration with IURC with support from the European Union

Urban Flood Management and Water Body Management projects under Project Urban Living Lab (PULL)

EcoLogistics - Low Carbon Freight for Sustainable Cities - Implementation in process - Corporation of the City of Panaji in collaboration with ICLEI south Asia with support from the German Federal Ministry of Environment, Nature Conservation and Nuclear Safety

Urban Vulnerability Assessment Report - Corporation of the City of Panaji in collaboration with ICLEI South Asia and GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit)

Low Emissions strategies for Panaji - Corporation of the City of Panaji in collaboration with ICLEI South Asia under UN Habitat



Supported by:



based on a decision of the German Bundestag





Thank you.. Lets build a greener future!