Coastal Vulnerability Mapping

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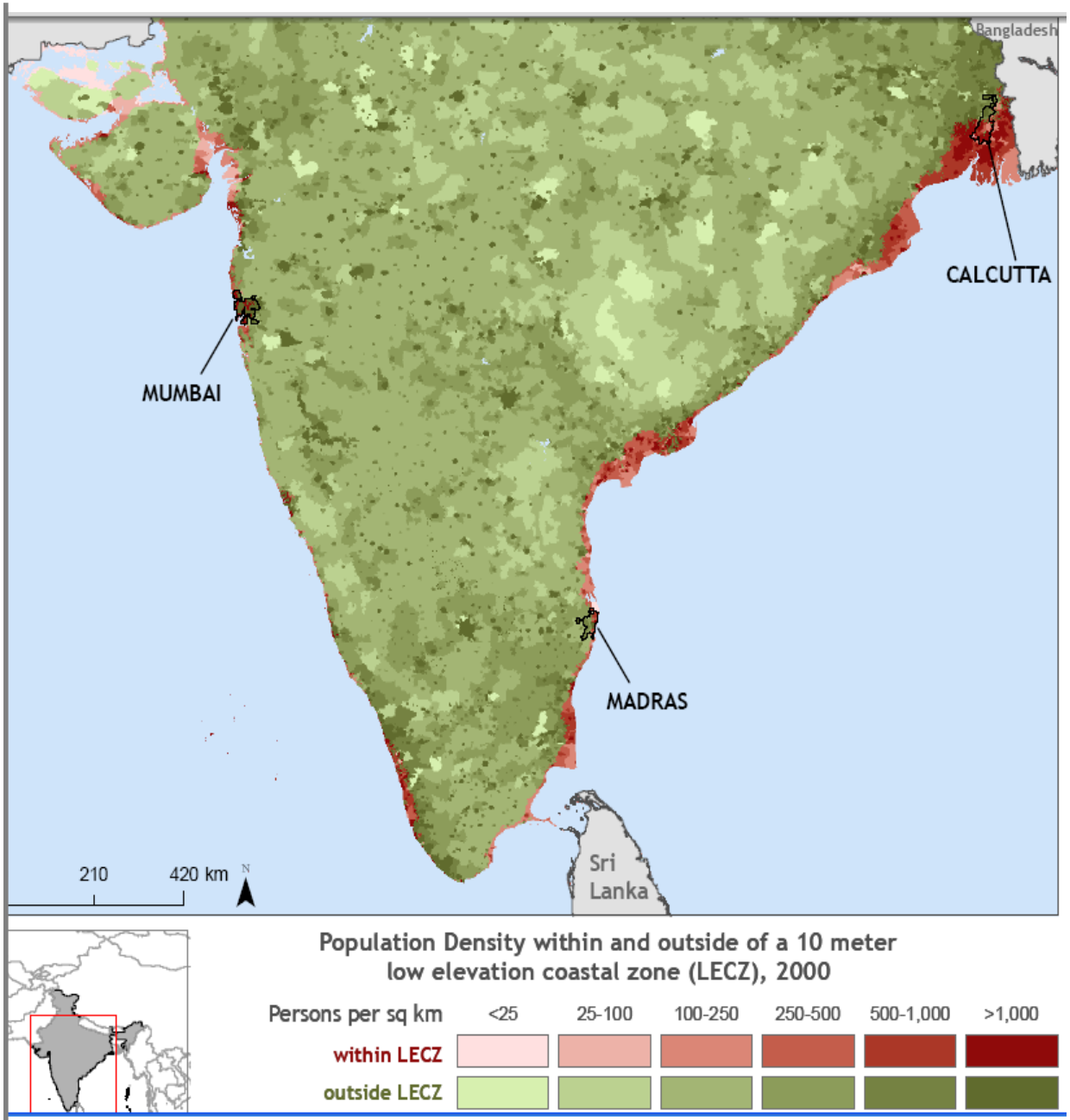
Vulnerability of the Indian Coastline

- 26 % of Indian Population live within 100 Km from the shoreline
- Most of the coastal areas are low lying and vulnerable to oceanogenic disasters such as Tsunamis, Storm Surges, Sea-level rise
- Dec 26, 2004 Tsunami resulted in a loss of 18, 045 deaths and 6,47,599 persons displaced
- Increased frequency and intensity of the disasters (Uttarkhand flood-2013, Phailin Cyclone -2013 (helen , Lehar)



Oceanogenic Disasters

Tsunami, Cyclones, Storm surge, Sea level rise, Coastal erosion, High Waves, etc.

- 13% of World's cyclones in the Seas around India
- Annual; Frequent phenomenon
- Inundation of Coastal areas

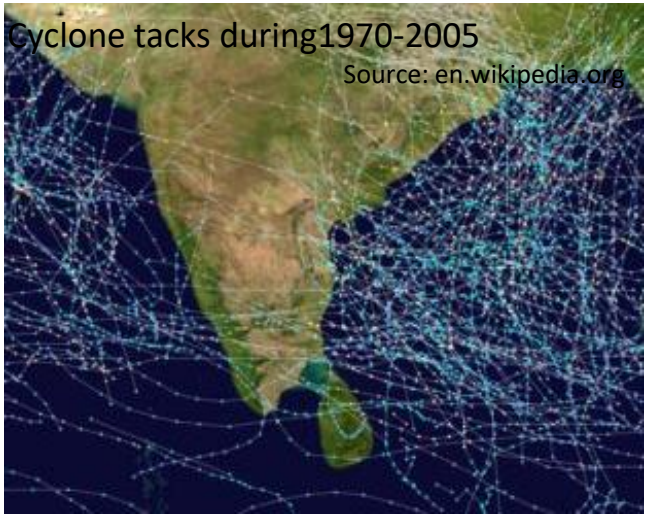
Coastal Inundation

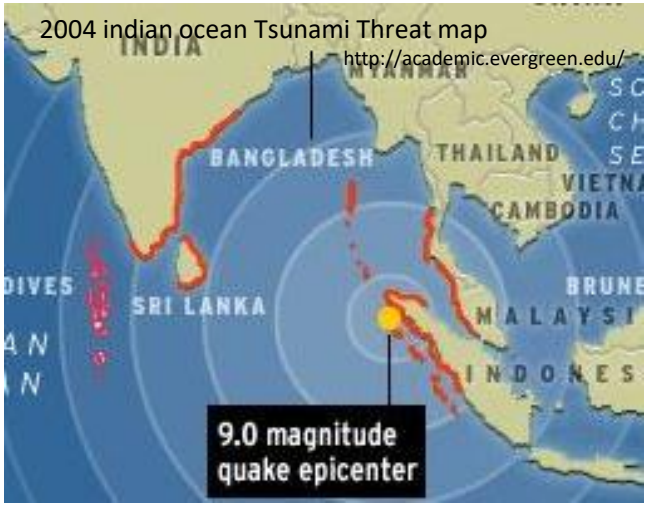
Damage

- Tsunami in Indian Ocean
- A few events in the past
- Inundation of Coastal areas (Large stretches)
- Highly devastative Tsunami on December 26, 2004

Oceanogenic Disasters

History





Cyclones

- 13% of World's cyclones in the Seas around India
- Annual; Frequent phenomenon
- Inundation of Coastal areas

Tsunamis

- A few events in the past
- Inundation of Coastal areas (Large stretches)
- Highly devastative Tsunami on Dec 26, 2004

Characteristics

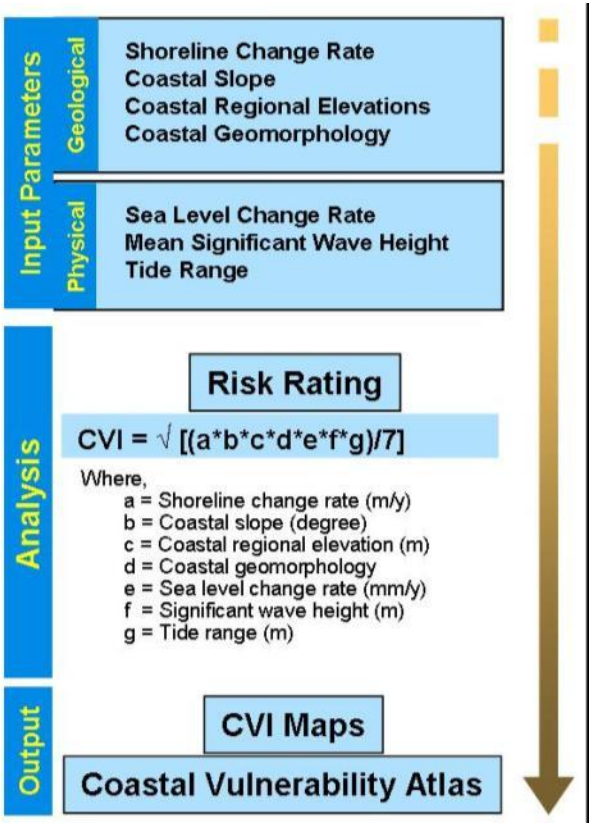
Marine Hazard	Tsunami*	Storm Surge*	Long-term Sea Level*	Coastal Erosion
Likely Frequency	Decade to Millennia depending on regional tectonic regime	Months to decade, depending on the regional climate regime	Ongoing, a consequence of global warming and local factors	Ongoing due to natural coastal processes and anthropogenic intervention
Limits are Likely to be affected	Local run-up limit for specified wave amplitude predicted by modelling	Flood limit for specified surge level predicted by terrain modelling	Mean high waterline mark predicted by terrain modelling with allowance of extreme events	Shoreline position marked based on the temporal satellite observations and coastal modelling

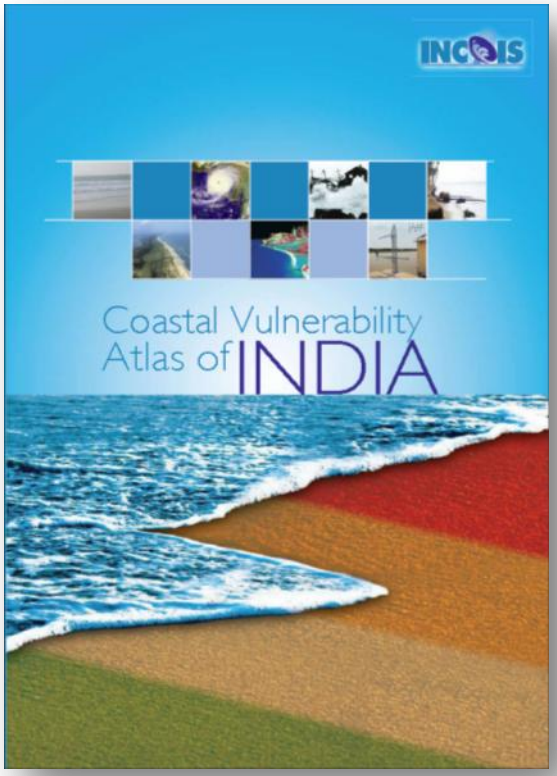
*Source: UNESCO/IOC Report on Coastal Vulnerability

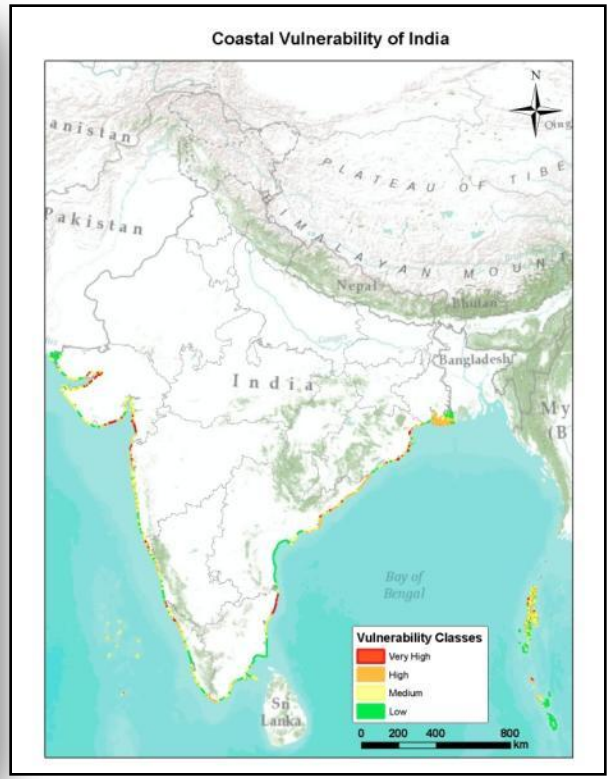
Mapping of Coastal Vulnerability Indices

"Vulnerability is an internal risk factor of the subject or system that is exposed to a hazard and corresponds to its intrinsic predisposition to be affected, or to be susceptible to damage"

Methodology







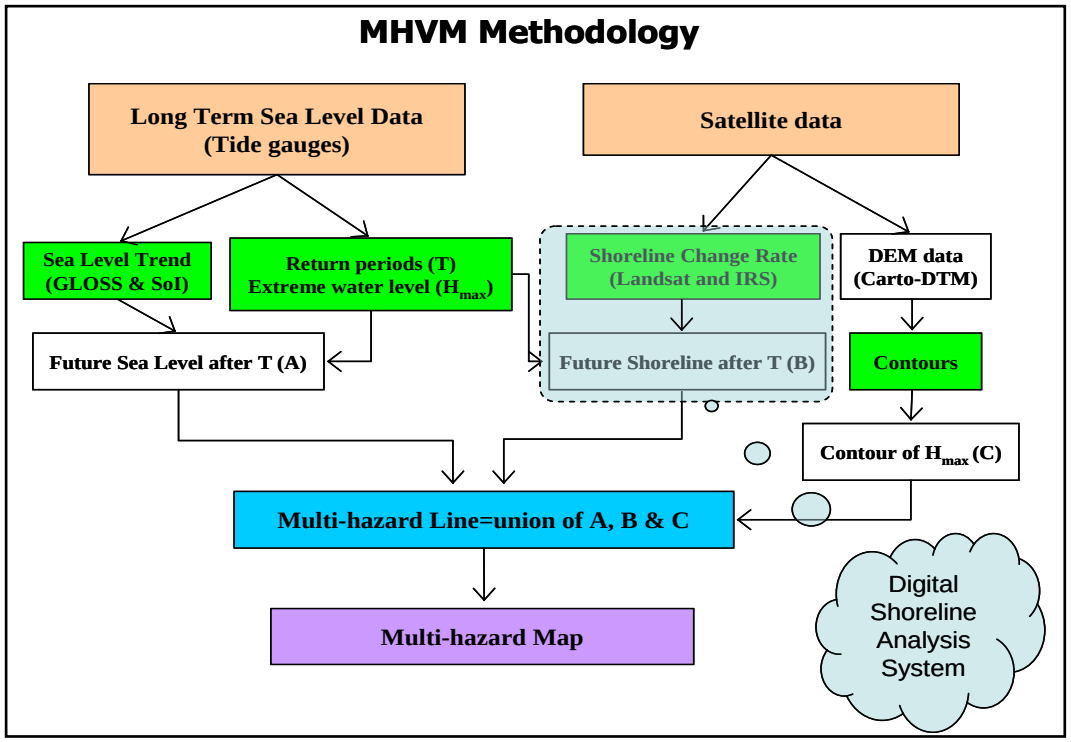
Data Used

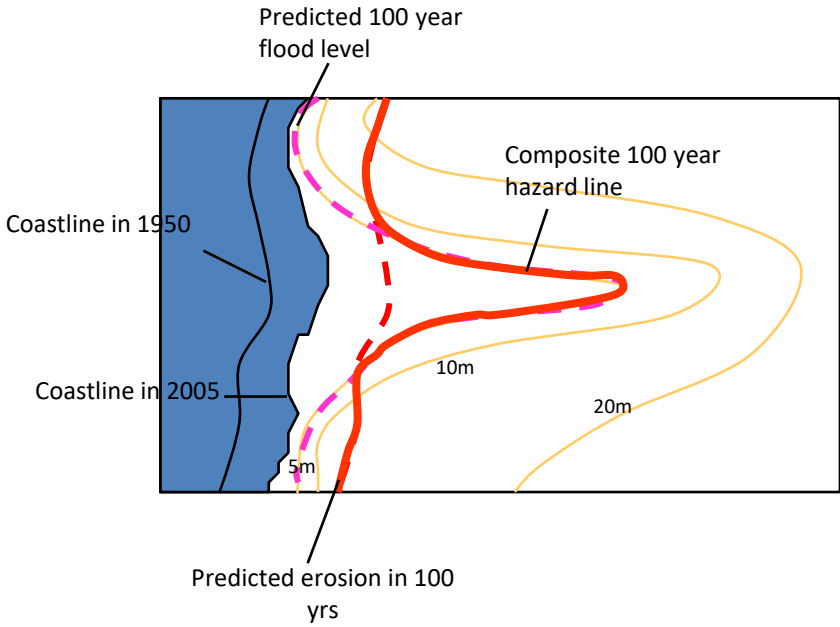
Parameter	Data
Geomorphology	IRS LISS-IV
Slope	GEBCO
Elevation	SRTM
Tidal Range	Astronomical tides
Shoreline Change Rate	Landsat data (1972-2000)
Historical Sea Level	PSMSL data from GLOSS
Significant Wave Height	Simulated data from Mike model

INCOIS, (2012). Coastal Vulnerability Atlas of India. INCOIS-ASG-CGAM-CV-2012-01, Pages 212, Maps 156, INCOIS, Hyderabad, India. ISBN 978-81-923474-0-0.

Coastal Multi-hazard Vulnerability Assessment

"The Multi-Hazard Map is a "composite, synthesized and overlay of multiple hazards"

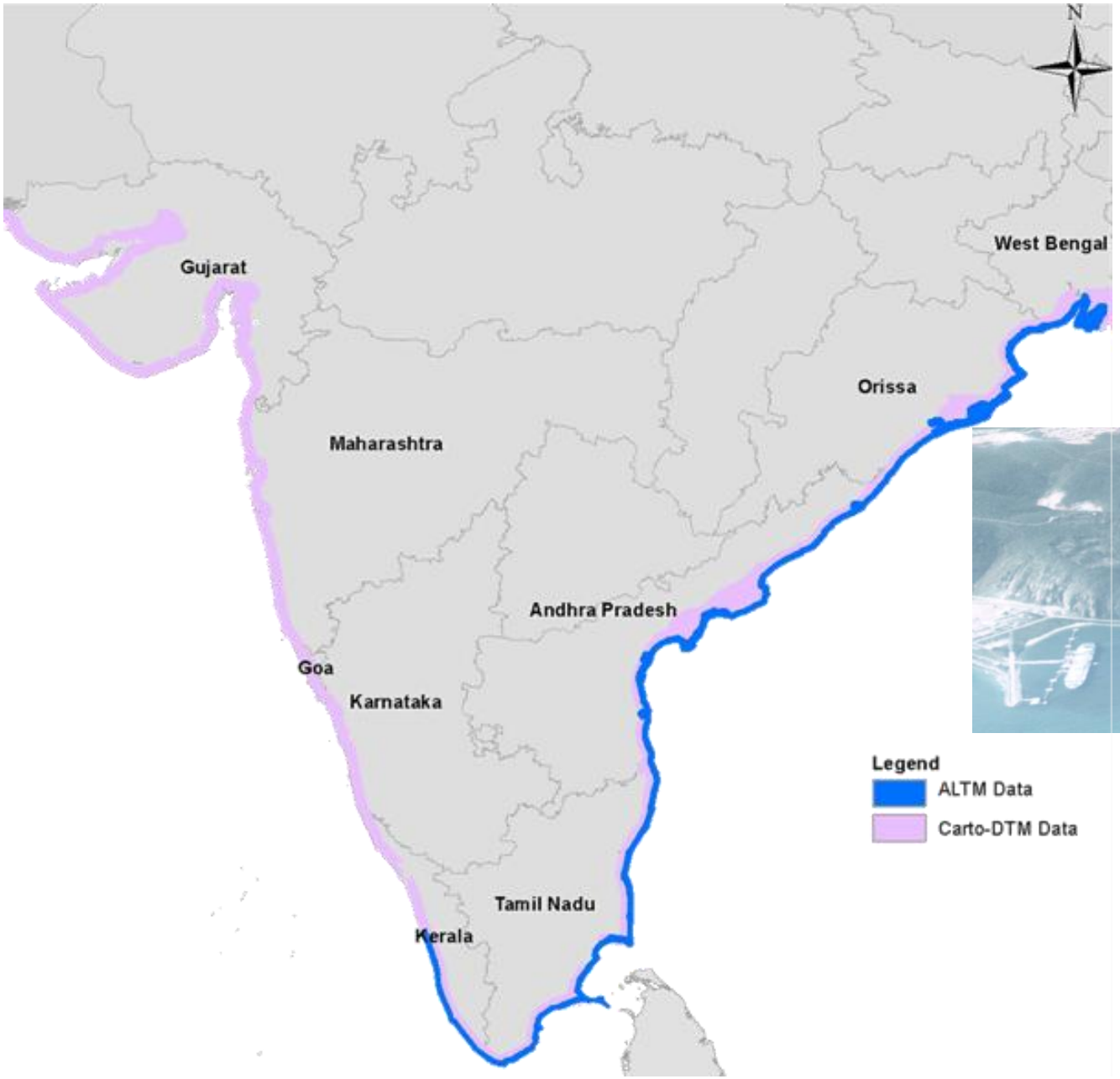




Data Used

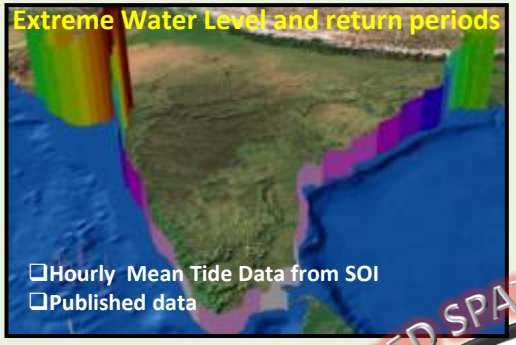
Inputs	Source
Extreme Water level	Hourly Mean SOI Tide Data and events from published data sources
Sea-level Change	Monthly Mean from PSMSL
Shoreline Change	Landsat/IRS
Topography	ALTM/Carto DTM

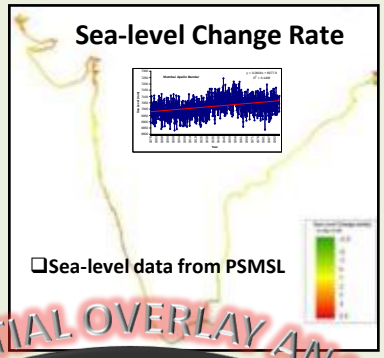
High Resolution Topographic data

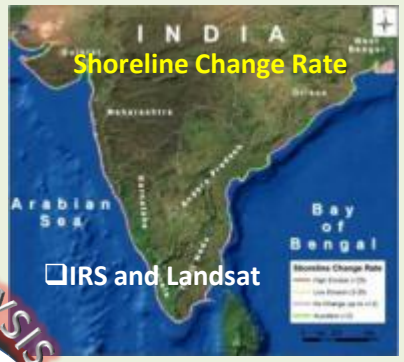


Coastal Multi-hazard Vulnerability Assessment

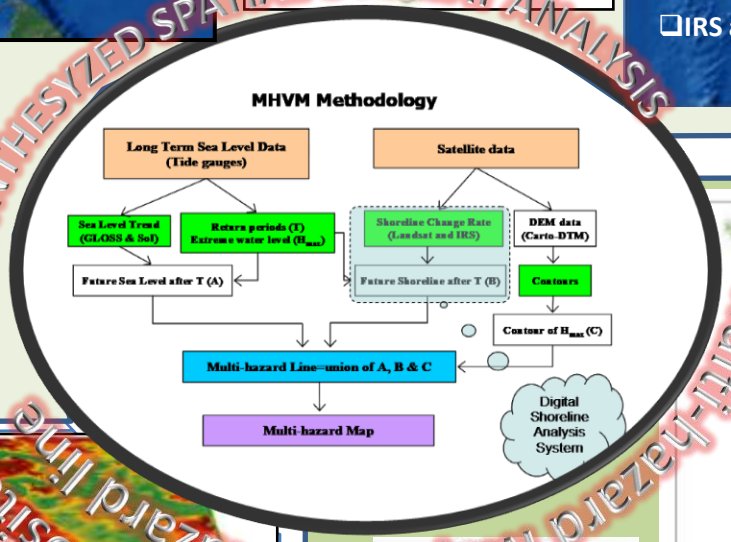
INPUTS



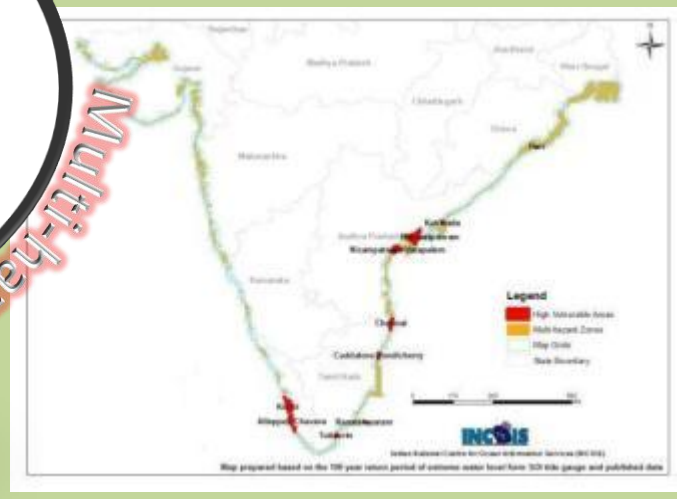




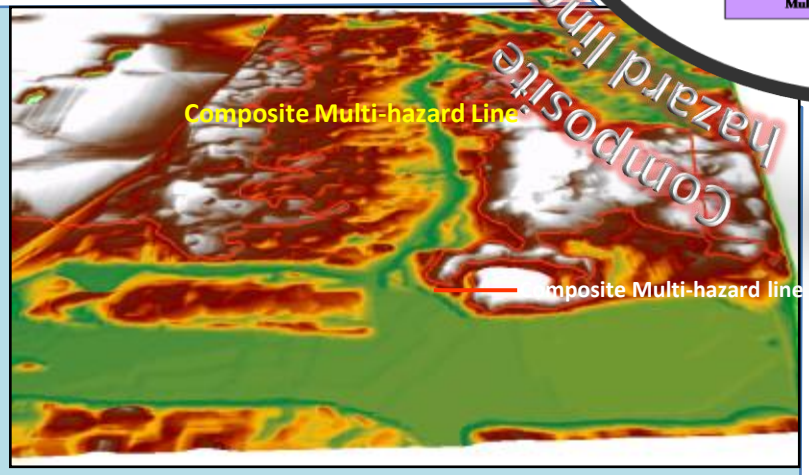
SYNTHESIZED SPATIAL OVERLAY ANALYSIS



Multi-hazard Maps

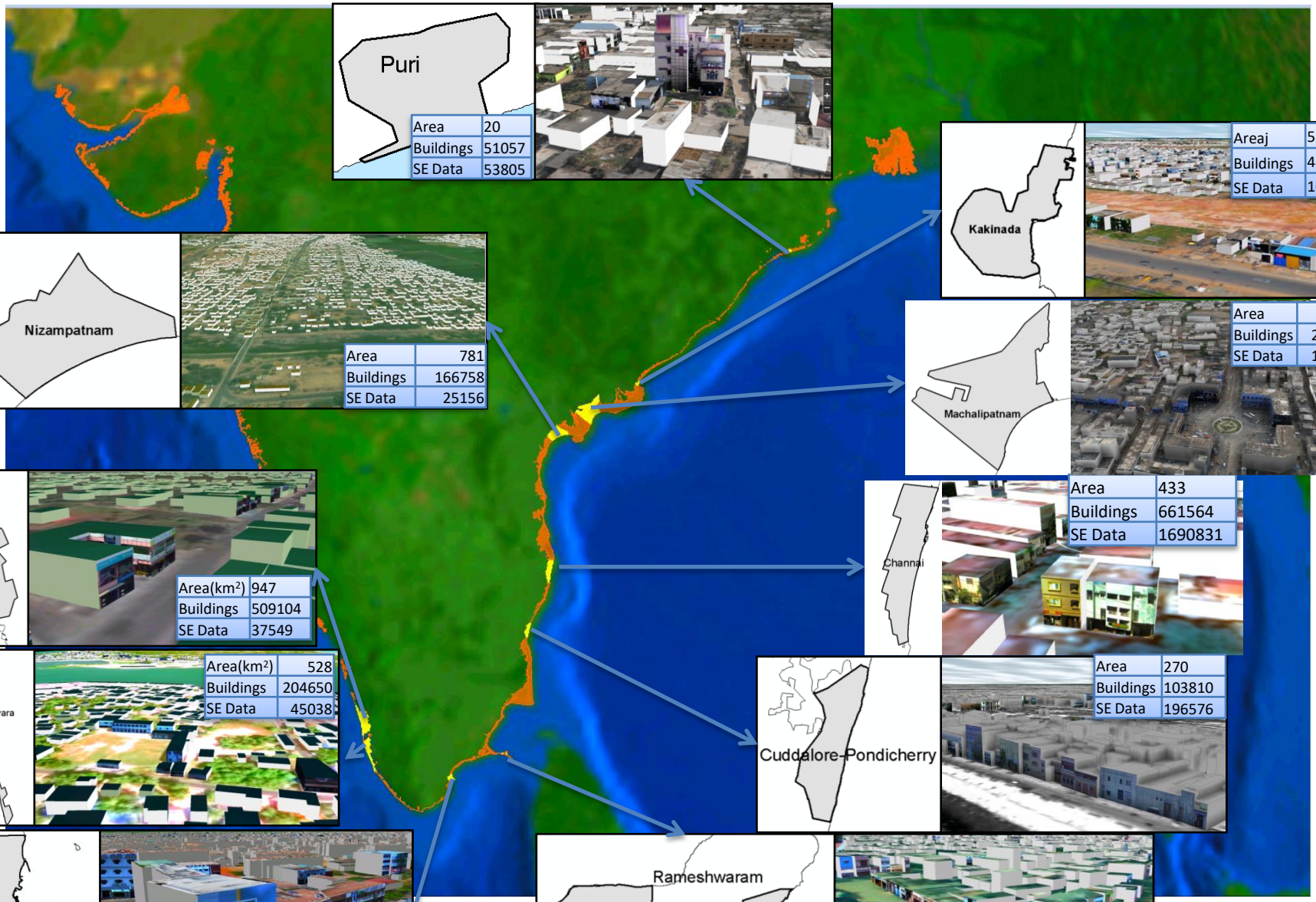


Composite hazard line



3D GIS Mapping

3D GIS Mapping Areas



Coastal Risk Assessment at Building level

Thank you