Climate Change, Oceans and Coastal Regions: Overview

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Delhi Science Forum/

All India Peoples Science Network

AIPSN Coastal Regions Convention

Ennore: 8 Feb 2020

PA

- PA does not correspond to the science
  - does not achieve 2°C goal
  - Emissions Gap of 12-15 GtCO2-eq (by 2030)
  - ∑INDC will likely result in ≈3-3.5°C!
- PA is deeply iniquitous
  - no deep cuts by ICs as req'd by IPCC, CBDR
  - ignores historical emissions (≈75% by ICs)
  - deals only with future emissions
  - thus puts greater burden on Developing Countries (DC cuts > 2 x IC cuts)…
  - especially on India
- closely follows US script and design
- voluntary mitigation pledges drives race to bottom

India's Role in Negotiations*

- India's role, except in the early years of UNFCCC, KP, has been problematic and defensive
  - moved towards US position in pursuit of Indo-US "strategic partnership" esp. during G8+5, MEF
  - MEF formulations reflected in C'hagen/Cancun
  - lost trad. LDC/Island allies
- India's positions driven by foreign policy
  - not based on science revealing impending crisis
  - ignores serious climate impacts, India's vital national interests
- India's necessary but late paradigm shift in Copenhagen (accepting some mitigation obligations) unilateral, without extracting IC concessions

* *D.Raghunandan, Science & Culture, Special Issue Jan-Feb 2020*

India's NDC

- moderate (but ok given inadequate IC targets)
- 3 main sectoral quantitative targets for 2030
  - 33-35% reduction in Emissions Intensity
  - 175 GW RE, 35% RE generation capacity
  - 33% forest/green cover
- many imp sectors left out, not transformational
- very weak on Adaptation
- rated moderate, 2°C Compatible (*Climate Tracker*)

Spurious 1.5°C goal

- 1.5 deg goal (Cancun) due pressure from Small Island States (with some LDCs breaking from G77) together forming Most Vulnerable Nations Group
- …cynically manipulated by US despite their own low emission cut pledges and failure on 2°C
- temp rise already ≈ 1°C; will cross 1.5°C in 2022-2030
- In fact 1.5°C “already in rearview mirror”

Carbon Budgets: 2°C and 1.5°C

	Total* (2100)	Used (2011)	Balance
2°C	3630	2441	1200
PA/NDC (2030)		750	250
1.5°C	2723	2441	300
		750	???

*1870-2100

* Remaining budget may be +300 $GtCO_2$ compared to AR5

• all units in $GtCO_2$ for 67% probability

• Source: from IPCC/AR5 & SR1.5; see also Tejal Kanitkar, Review of Agrarian Studies, July-Dec 2016; *http://ras.org.in/what_should_the_climate_goal_be*

Major Impacts on Oceans

(mostly from SROCC 2018)

- oceans have absorbed 90% of excess heat from the atmosphere since 1970
- ocean warming and heat uptake doubled since 1993
- marine heat waves have doubled since 1982; frequency and intensity set to increase further
- oceans have absorbed 20-30% CO2 since 1980, so surface acidification up (pH lower by 0.025/decade)
- Oxygen levels have decreased esp. nr surface
- density stratification has increased (surface<<deep) so mixing of levels inhibited affecting marine species
- increase in frequency and intensity of cyclones and storms especially in tropics (India exception 1960-2000 but likely to worsen later: *INCCA 4x4*)

Major Impacts on Coastal ecosystems

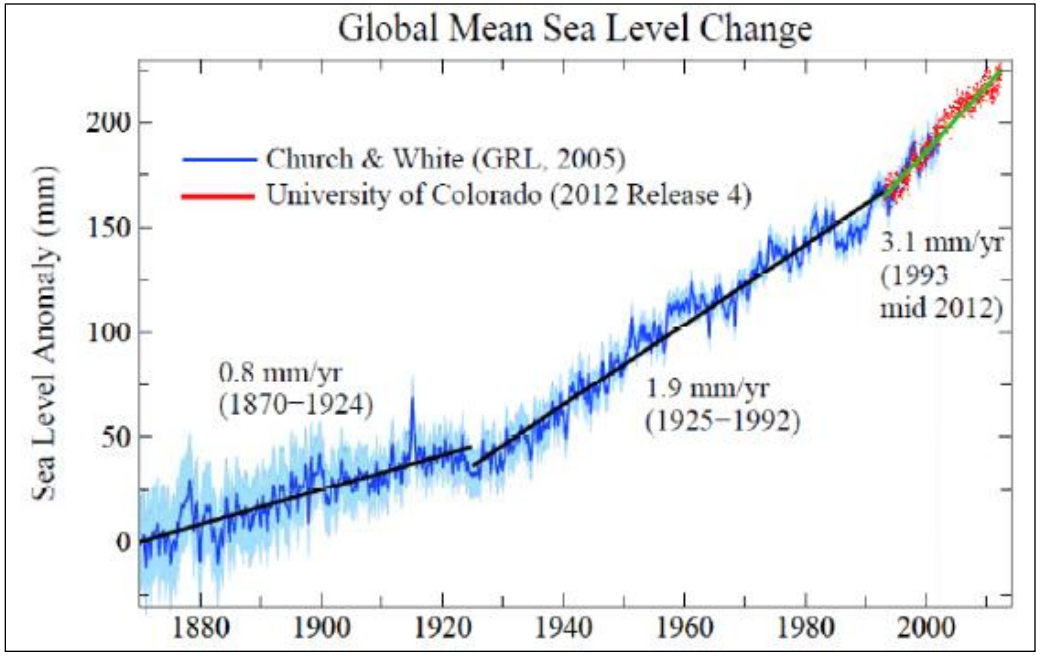
- Coastal ecosystems are affected by ocean warming, saline water intrusion, acidification and loss of O2, and SLR compounded by human activities
- vegetated coastal ecosystems provide buffer; 50% lost globally in 100 yrs due human activity and ocean warming; also important carbon sinks
- large-scale mangrove mortality since 1960s
- Increased sea-water intrusion in estuarine areas has led to upstream redistribution of marine species and reduction of habitat for estuarine communities
- SLR leads to habitat contraction of many species, loss of biodiversity and ecosystem functions; human activity prevents landward retreat (coastal squeeze)

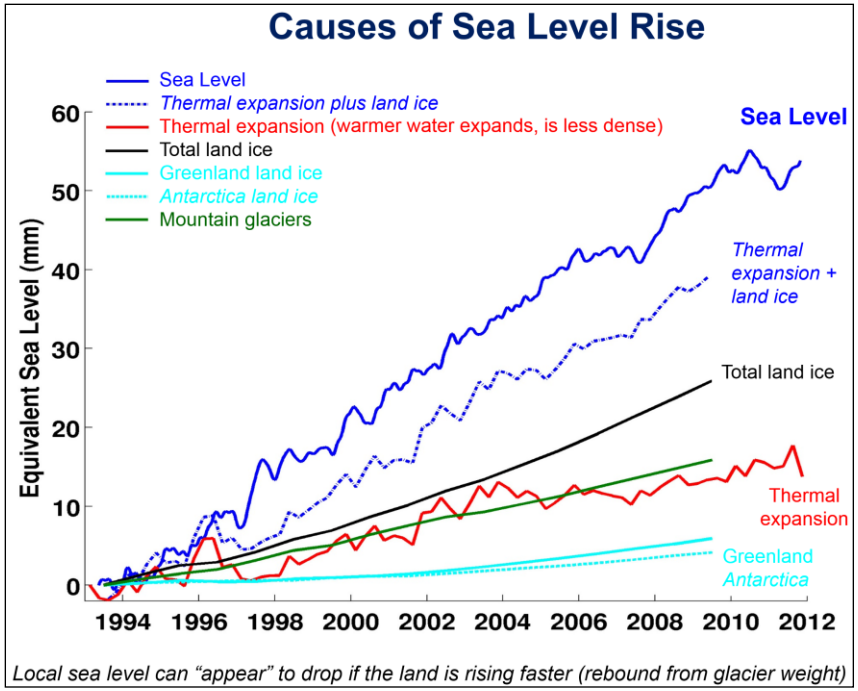
Impact on Marine Species

- since 1950, many species have undergone shifts in geographical range and seasonal activities due ocean warming, sea-ice melt and geo-biochemical changes
- species composition, abundance and biomass production have shifted towards the Poles (52±33 km/decade in upper 200m and 29±16 km/decade along sea floor)
- altered interaction between species have cascading effects on ecosystem structure and functioning
- ocean warming has led to decrease in catch, compounding effects of over-fishing (reverse in some areas)

GMSL Rise

- GMSL is rising at accelerating rates (2006-15 = 2.5x earlier
- rise due to glacier+ polar ice melt + thermal expansion
- acceleration mostly due glacier + polar ice melts
- Greenland ice-sheet melt likely irreversible
- formerly rare extreme sea-level events likely to be annual soon





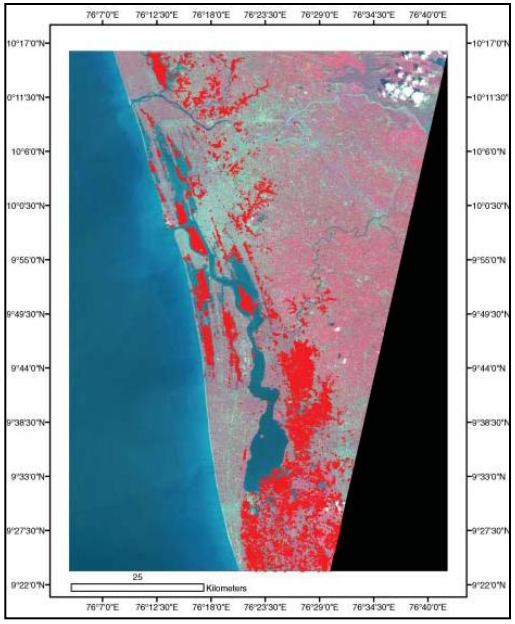
SLR along India's mainland coastline

Impact on Indian Coasts (1): *INCCA 4x4*

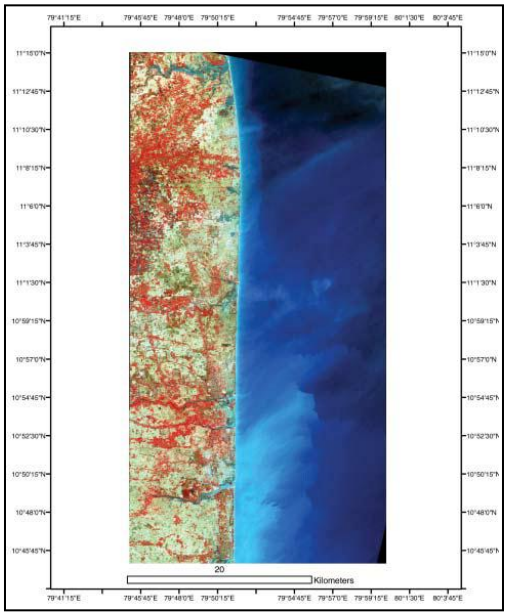
- increased cyclonic activity expected
- violent winds, heavy rainfall and storm surge add to SLR impacts
- coastal regions with gentle topography and estuarine/delta regions worst affected by SLR+
- east coast more vulnerable than west coast except backwater systems of Kerala
- storm surges (causing 80% of casualties, less understood) worse in such regions
    - Nagapattinam: 4 sq.km submergence/inundation
    - Kochi: 160 sq.km inundated due low-lying areas, backwaters
    - Paradip: 478 sq.km due estuaries, creeks 40km inland!

Projected Coastal Inundation
1m SLR: 90m res DEM

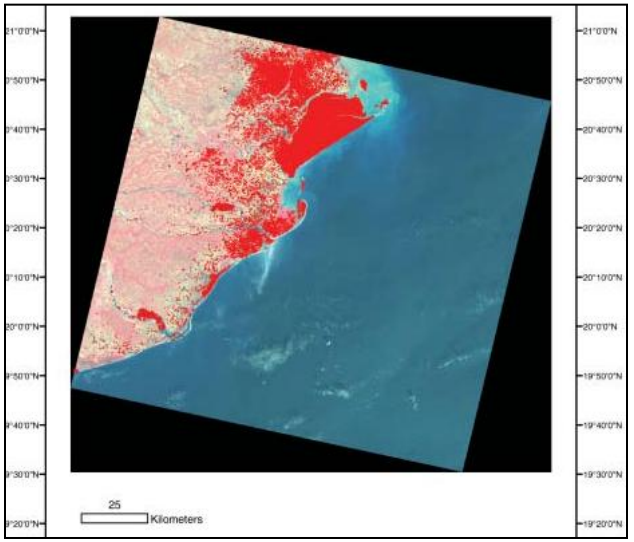
(INCCA 4x4)



Kochi



Nagapattinam



Paradip

Impact on Indian Coasts (2)

- chronic coastal flooding likely to impact 36 million people in India (*Climate Central*): 170m coastal pop.
- infrastructure, tourism, salinity of freshwater, agriculture, habitat, livelihoods impacted
- adds on to other socio-economic vulnerabilities and ecosystem impacts of human activities
- already facing consequences of rampant CZR violations (needs serious thought) eg.
  - Kerala floods 2018;
  - 7 lakh hh 100m from sea; 18,000 within 50m offered relocation @ Rs.10 lakh)
  - Puri after Cyclone Fani 2015; many demolitions since
- "SLR is long-term and irreversible. Adapting to it will be the most expensive and difficult among climatic hazards": *N.H.Ravindranath, IISc*

Possible Response Measures *(SROCC)*

- ecosystem-based resilience measures can reduce risks locally and have many co-benefits: but likely effective only in lower range of warming;
- ditto for accommodation and adaptation measures
- at higher SLR, coastal protection is more challenging due costs and societal barriers
- in coming decades, reduce human pressure from construction, coastal settlements, land subsidence and "hard protections" eg dikes, sea-walls/barriers coastal advance and habitat retreat/relocation
- despite uncertainties about SLR/other CC impacts, many such measures are already being taken due long time-horizons and high future costs

Possible Response Measures *(SROCC)*

Elevated Roads:

Miami USA

Vegetated protection

Oyster reefs: Bangladesh

Thank You!

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