CROSSROADS ASIA PACIFIC

PRODUCTION & INTERNATIONAL TRADE

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ifa INTERNATIONAL FERTILIZER ASSOCIATION

Managing Land-based Nutrient Inputs to Coastal Systems in South Asia

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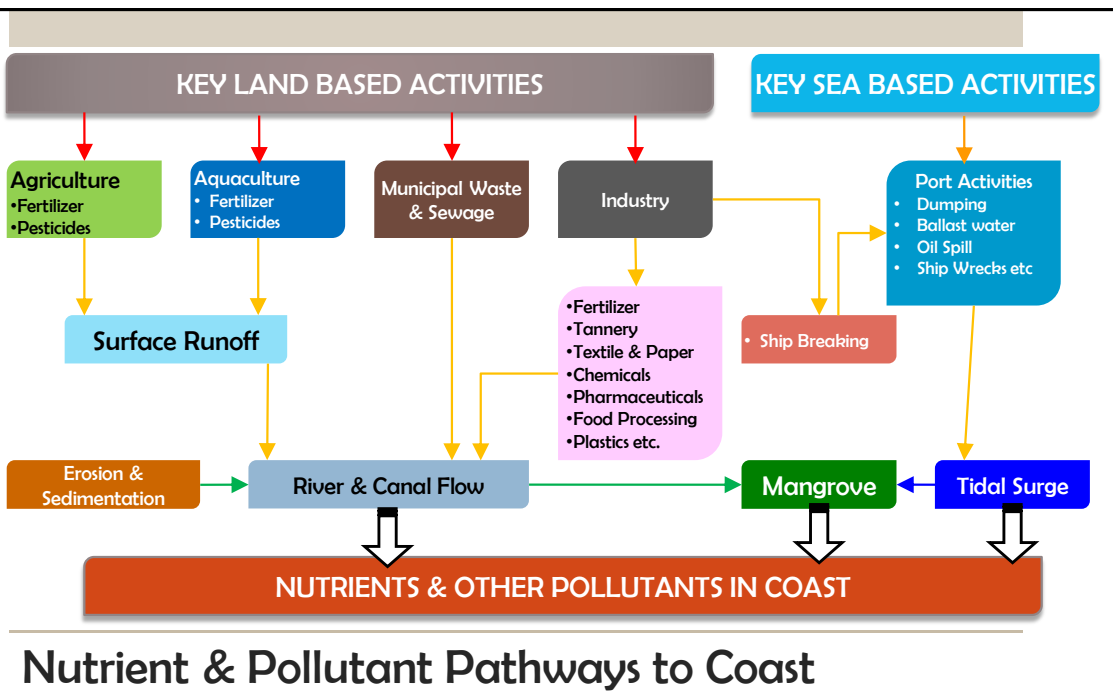
Global Partnership on Nutrient Management (GPNM) and
National Centre for Sustainable Coastal Management, India



Nutrient & Pollutant Pathways to Coast

Coastal Systems: Nutrient Sources & Impacts

SOURCE

- Assess point/non- point sources of nutrients that reach coastal waters
  - *Agriculture*
  - *Aquaculture*
  - *Wastes (industrial & domestic)*

IMPACTS

- Estimating the impact of nutrient enrichment (eutrophication) on coastal waters

REMEDY

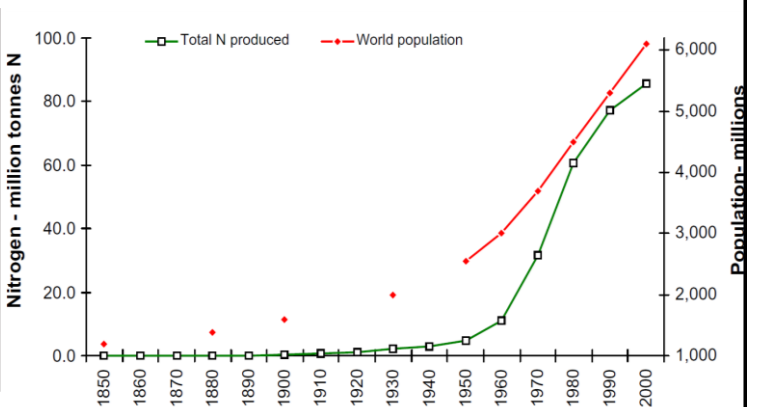
- Undertake actions to reduce nutrient inputs at source
- Remedial measures for eutrophication/ hypoxia
- Development of a regional action plan and establishment of a regional policy forum

Addressing Nutrient Pollution…

Assessing the Sources

AGRICULTURE

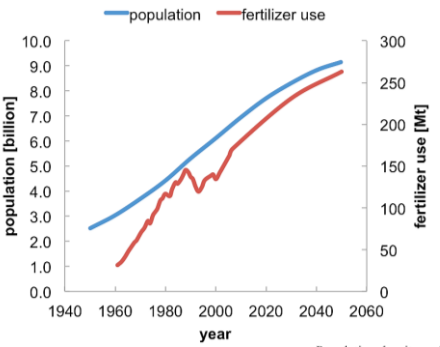
- Without the input of N-fertilizer, only about half of the current global population can be supplied with sufficient food energy and protein
- to feed 100% of today's population would require:
  - 167% of the current land, and would require
  - 225% of the current land **to feed 9.2 billion by 2050**
  - **This is clearly unrealistic**



Source: Dawson & Hilton, 2011

Total N Fertilizer Production & World Population

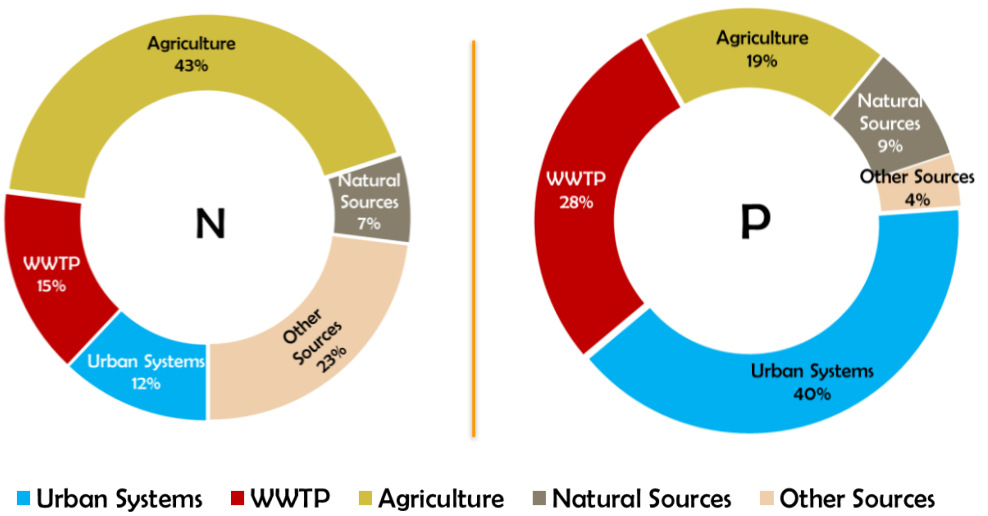
- Between 1950 and 2000-
  - world population grew by 135% from 2.6 billion to 6.1 billion and
  - N production rose steeply
- Demand for fertilizer production, particularly of N in the context of energy, correlates closely to population growth
- **The Nutrient Challenge**: to produce more food and energy with less pollution



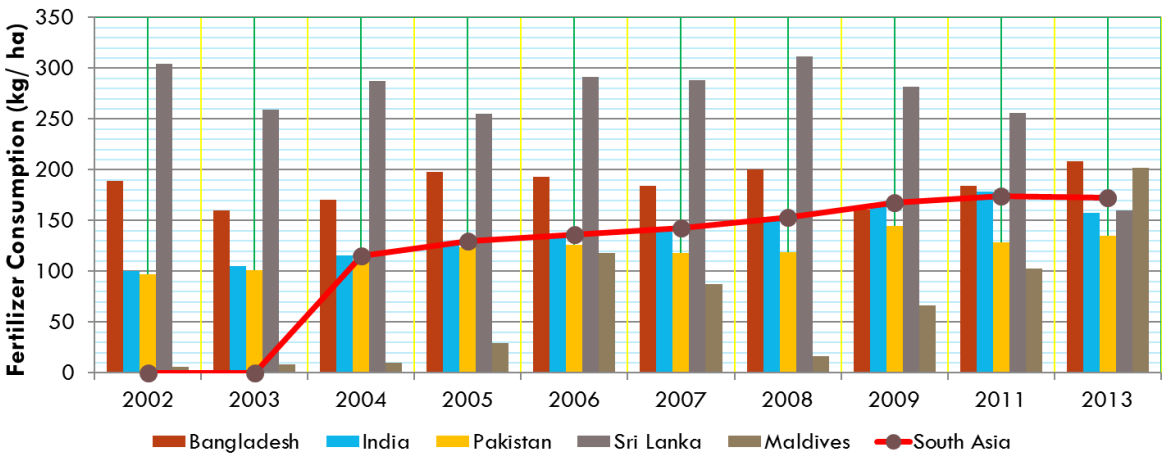
Population density and human N consumption in India.

Basin	Population density (persons km^{-2})	Human N consumption (kg-N km^{-2} yr^{-1})
India	328	1131
Brahmaputra	178	613
Cauvery	414	1426
Ganges	520	1792
Godavari	227	782
Krishna	287	989
Mahanadi	213	734
Narmada	195	672
Periyar	668	2302
Tapi	279	961

Fertilizer Use & World Population

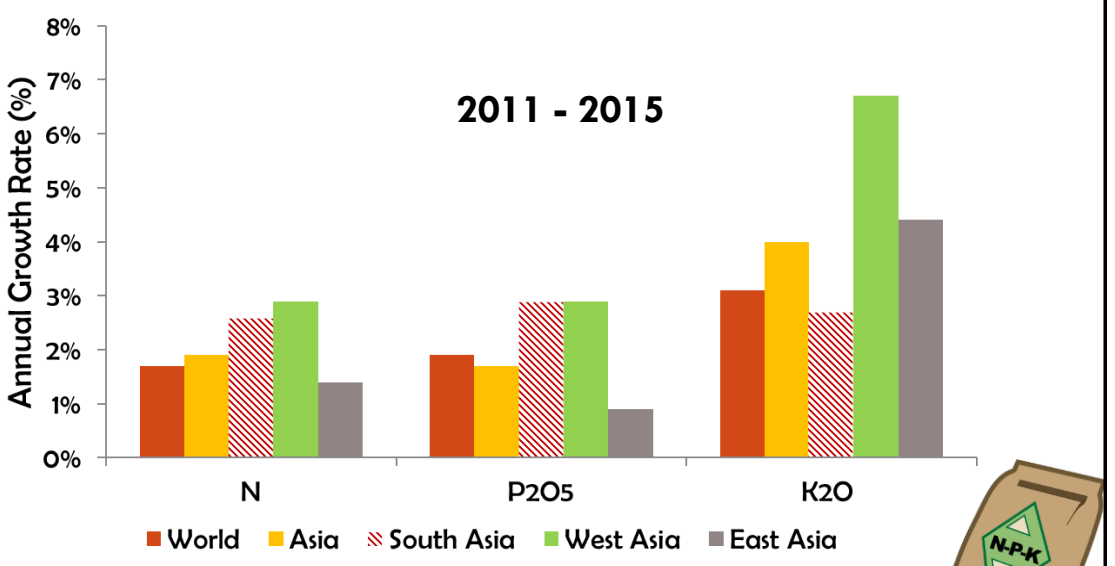


Nutrient Sources in Surface Waters – Global Scenarios



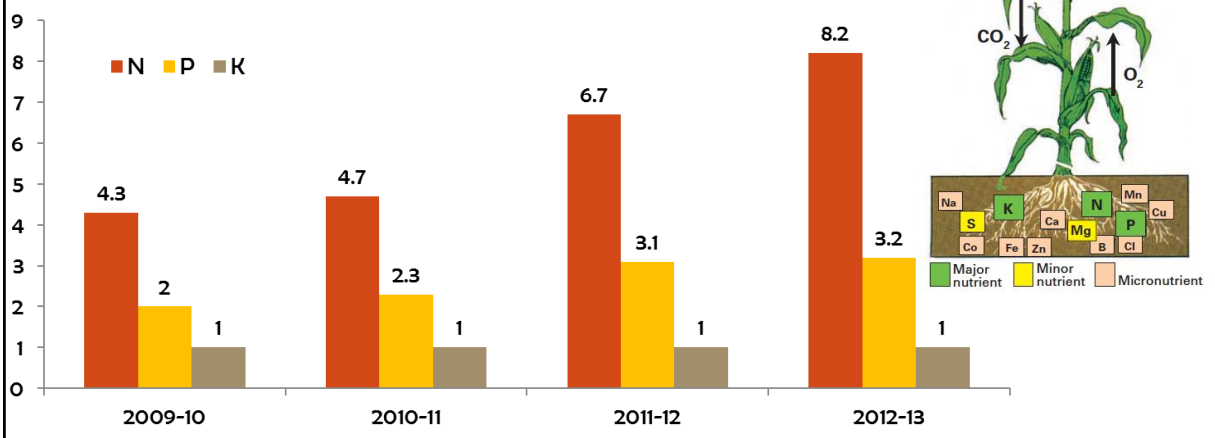
Source: http://data.worldbank.org/indicator/AG.CON.FERT.ZS/countries

Fertilizer consumption (kg nutrient per hectare of arable land)



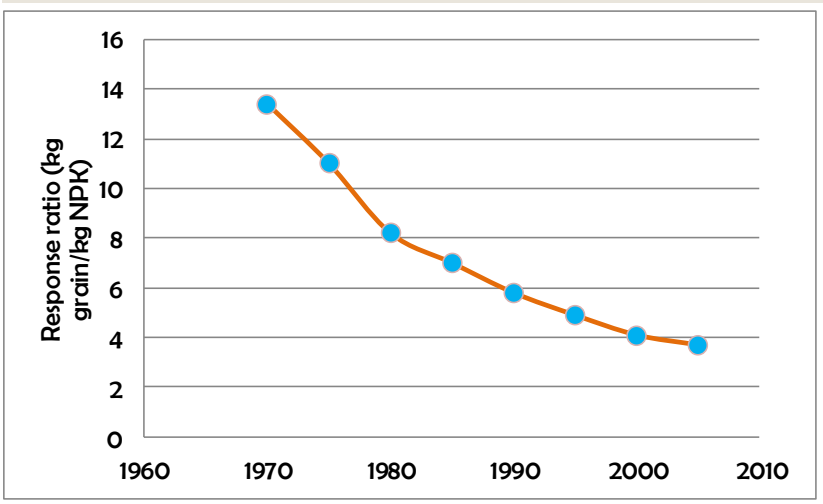
Annual growth rate in fertilizer demand

Deteriorating balance in NPK



Are threats from N fertilizers increasing?

Declining Fertilizer Response - Irrigated Areas

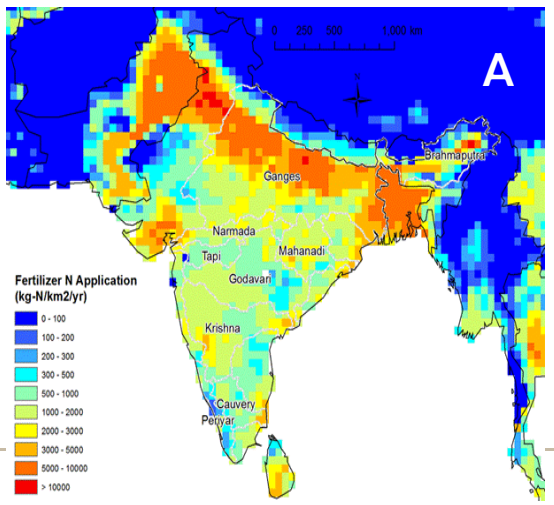


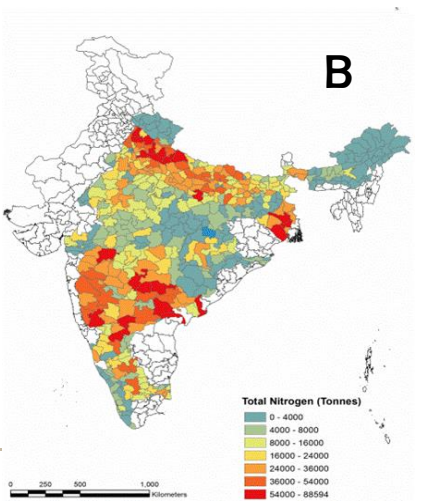
Reasons:

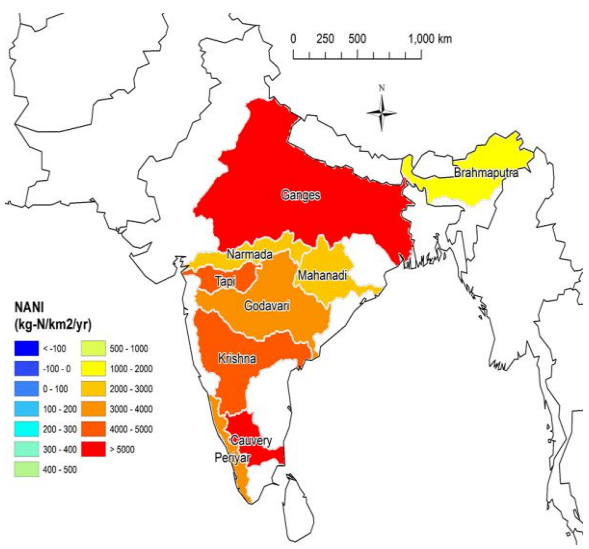
- ❑ imbalanced fertilizer use
- ❑ Increasing multi-nutrient deficiency
- ❑ Lack of awareness of farmers on balanced plant nutrition
- ❑ Poor crop management (Excess fertilizer dose – poor nutrient management)

Major concerns in Indian agriculture

A. Fertilizer N application in Indian Subcontinent and B. Total N consumption in India





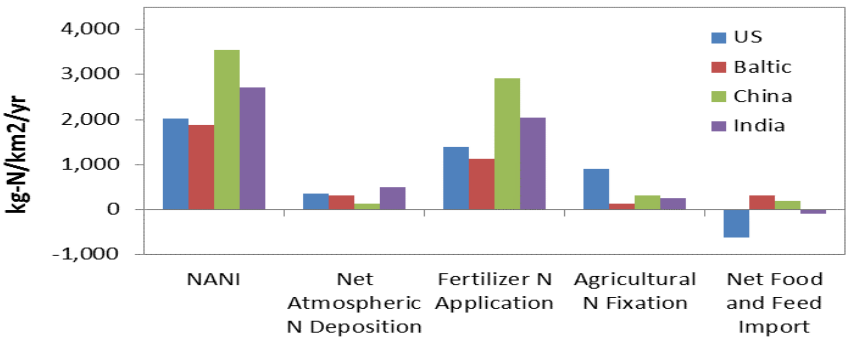


- Ganges catchment area shows the highest NANI value driven primarily by high agricultural fertilizer inputs.
- Fertilizer inputs dominate anthropogenic N inputs of India
- NANI is calculated as the sum of four major components:

a) oxidized N deposition
b) fertilizer N application
c) agricultural N fixation, and
d) N in net food and feed imports

Net Anthropogenic Nitrogen Inputs (NANI) in Indian Catchments

NANI and its components in India, China, the US and Northern Europe



- **At the national scale, China and India exhibit higher values of NANI than the US or northern Europe**
  - **This is largely driven by N fertilizer application which is highest in China and India**
  - **The US and India are net food/feed exporters; China and northern Europe import food/feed to meet demands**

AQUACULTURE

Indian Marine Fisheries

S. No.	Details of fisheries	West Bengal	Odisha	Andhra Pradesh	Tamil Nadu	Puducherry
1.	Average Landings (2005) thousand tones	168.20	77.97	174.14	355.45	15.14
2.	Landing centres	44	57	271	352	26
3.	Fishing villages	346	641	498	581	28
4.	Fisherfolk families	53,816	86,352	129,246	192,152	11,541
5.	Fisherfolk population	269,565	450,391	509,991	790,408	43,028

- India utilizes ~40 % of the available 2.36 million hectares of ponds and tanks for freshwater aquaculture and
- 13 % of a total potential brackish water resource of 1.2 million hectares
- Proliferation of aquafarms since 2000
- Pollution loads due to shrimp aquaculture especially after harvest resulted in
  - *problems of algal overgrowth in receiving waters indicative of nutrients sourced from aquaculture wastes*

Aquaculture & Farms

Indian Marine Fisheries & Aquaculture

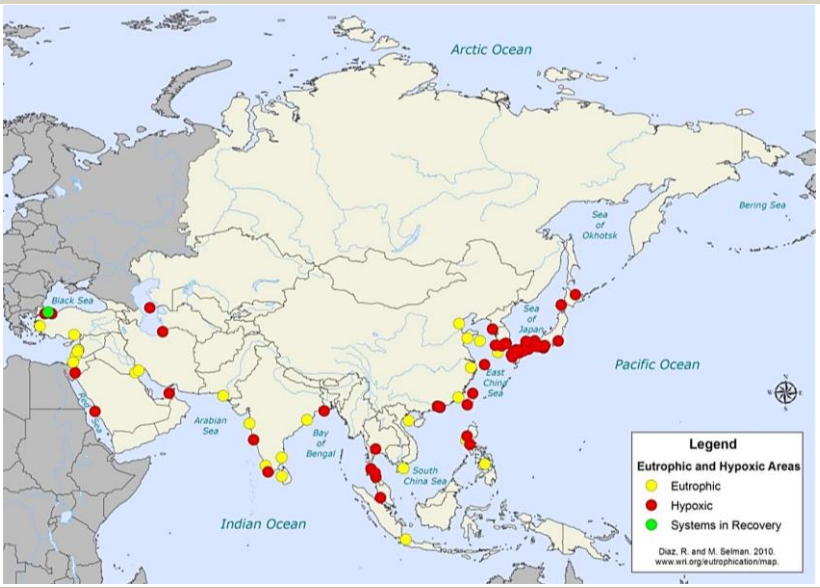
WASTE WATER & INDUSTRY

S. No.	Input/pollutant	Quantum (annual)
1.	Sediments	1600 million tons
2.	Industrial effluents	50 x $10^6 m^3$
3.	Sewage – largely untreated	0.41 x 10^9 m^3
4.	Garbage and other solids	34 x 10^6 tons
5.	Fertilizer – residue	5 x 10^6 tons
6.	Synthetic detergents – residue	1,30,000 tons
7.	Pesticides – residue	65,000 tons
8.	Petroleum hydrocarbons (tar balls residue)	3500 tons
9.	Mining rejects, dredged spoils and sand extractions	0.2 x 10^6tons

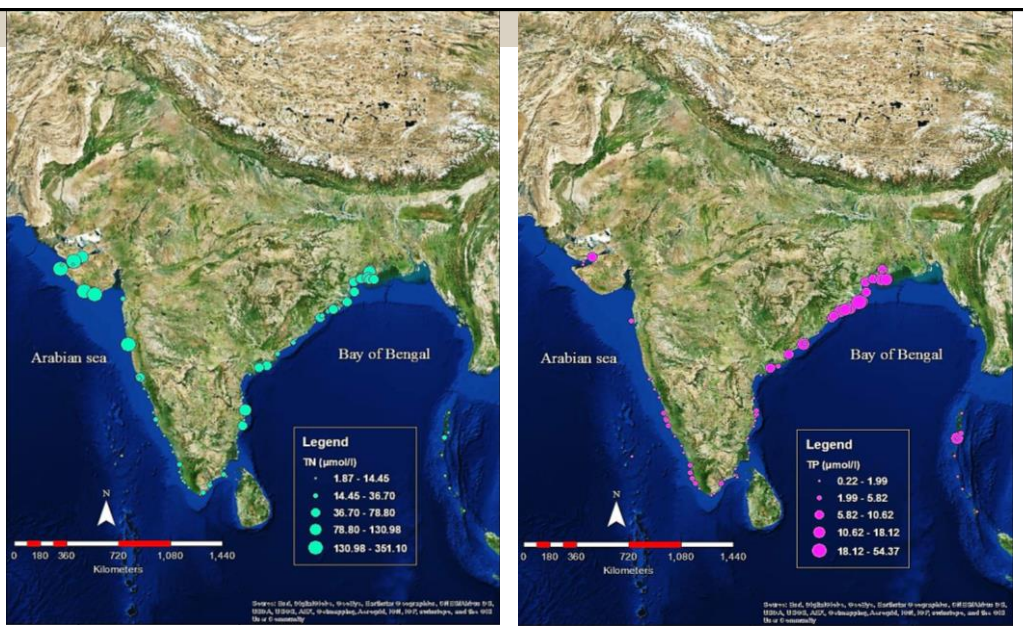
A conservative figure for the quantum of sewage currently reaching the coast is 1.95 x $10^9 m^3$ per year

Waste Water & Other Sources

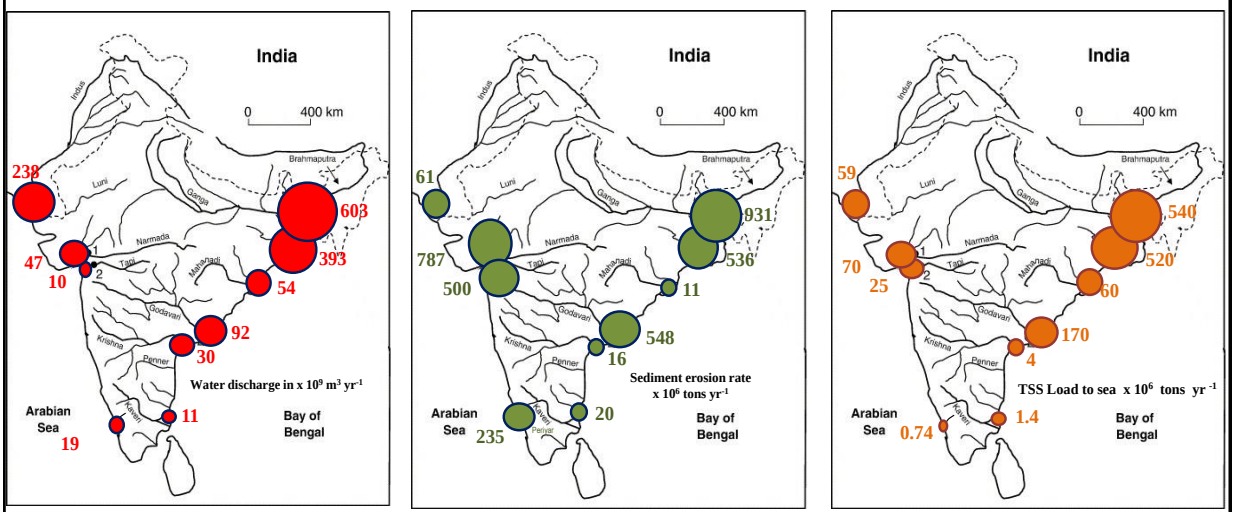
EUTROPHICATION



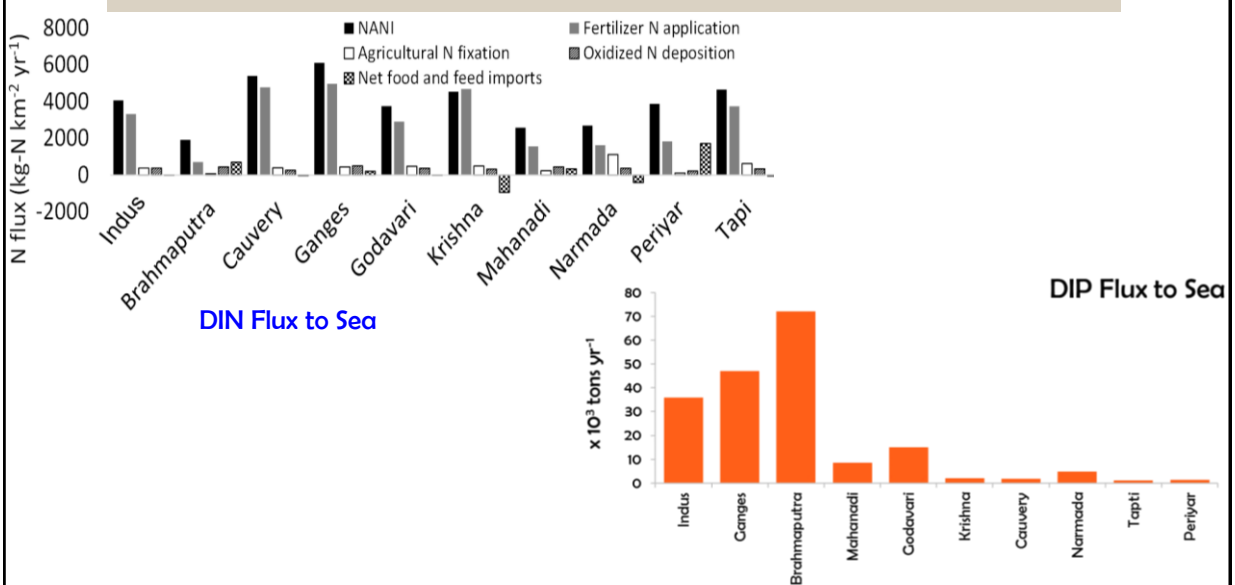
Eutrophic & Hypoxic Coastal Areas of India



Nutrients in coastal Waters



Major Rivers: Discharge/ Sediments/ Suspended Load



Fluxes of N & P from Rivers of South Asia to coastal waters

Management: many different systems

- Policy attention
- Consumers perception and behavior
- Industries for waste (water) treatment
  - re-use,
  - management of nutrients in Rivers, etc.
- Information and best practice opportunities: mainstreamed:
  - from wastewater treatment to tourism
  - from farmers to fishermen
- Management options that work and are cost-effective
- Toolboxes to support policy development and implementation

Effective Nutrient Management

Coastal Nutrient Management

- Strategies for management of nutrient enrichment in coastal waters include:
  - Reduction of point and non-point source of pollution
  - Sustainable management of aquaculture farms
  - Increase Blue carbon ecosystems along the coastal regions
  - Adopt scientific methods for dredging & dumping of sediments on land

A new global effort is needed to reduce nutrient losses and improve overall nutrient use efficiency in all sectors

The foundation for a Greener Economy to produce more food and energy, while reducing environmental pollution

- The Global Partnership on Nutrient Management (GPNM) was launched in 2009 by UNEP to answer this challenge
- The GPNM - a global partnership of governments, scientists, policy makers, private sector, NGOs and international organisations
- UNEP is the Secretariat, while the Members are
  - Government
  - Industry
  - Science
  - UN agencies
  - NGOs

G P N M

GPNM Highlights:

- GPNM is part of UNEP Programme of Work, 2014-15
- Regional Platforms established in Asia and the Caribbean
- Task Teams established:
  - Policies
  - Toolbox
  - NUE
  - Partnerships

Nutrients - For Food or Pollution? The Choice is Ours!

Society hardly knows of the nutrient challenge
– we must highlight the urgency and the benefit of achievable actions

THANK YOU