

Capacity Building in MEBM: sea-enclosing and land-reclamation in developing countries

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**Expert Group Meeting on Oceans, Seas and Sustainable Development:
implementation and follow-up to Rio+20**

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IOC Criteria and Guidelines on the Transfer of **Marine Technology**

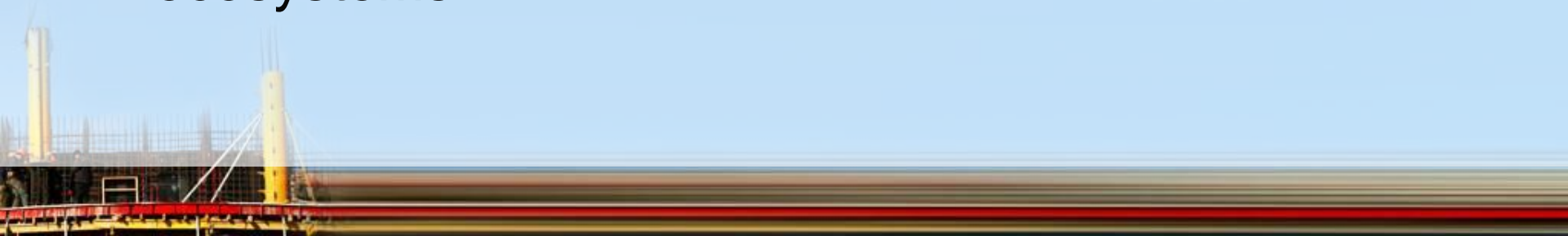
Refers to instruments, equipment, vessels, processes and methodologies required to produce and use knowledge to improve the **study and understanding** of the **nature and resources** of the ocean and coastal areas, including:

- Information and data, in a user-friendly format, on marine sciences and related marine operations and services;
- Manuals, guidelines, criteria, standards, reference materials;
- Etc.

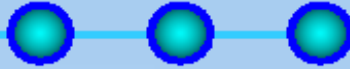


Bullet points

- In rapid large-scale coastal development, alarming degradation of coastal and ocean ecosystems can result because of inadequate governance and insufficient science-based planning on, e.g.
sea-enclosing & land-reclamation
- Call on the UN to prepare the developing countries to face the impending rapid expansion of their coastal economy by building up knowledge on the value and fragility of their coastal and marine ecosystems.

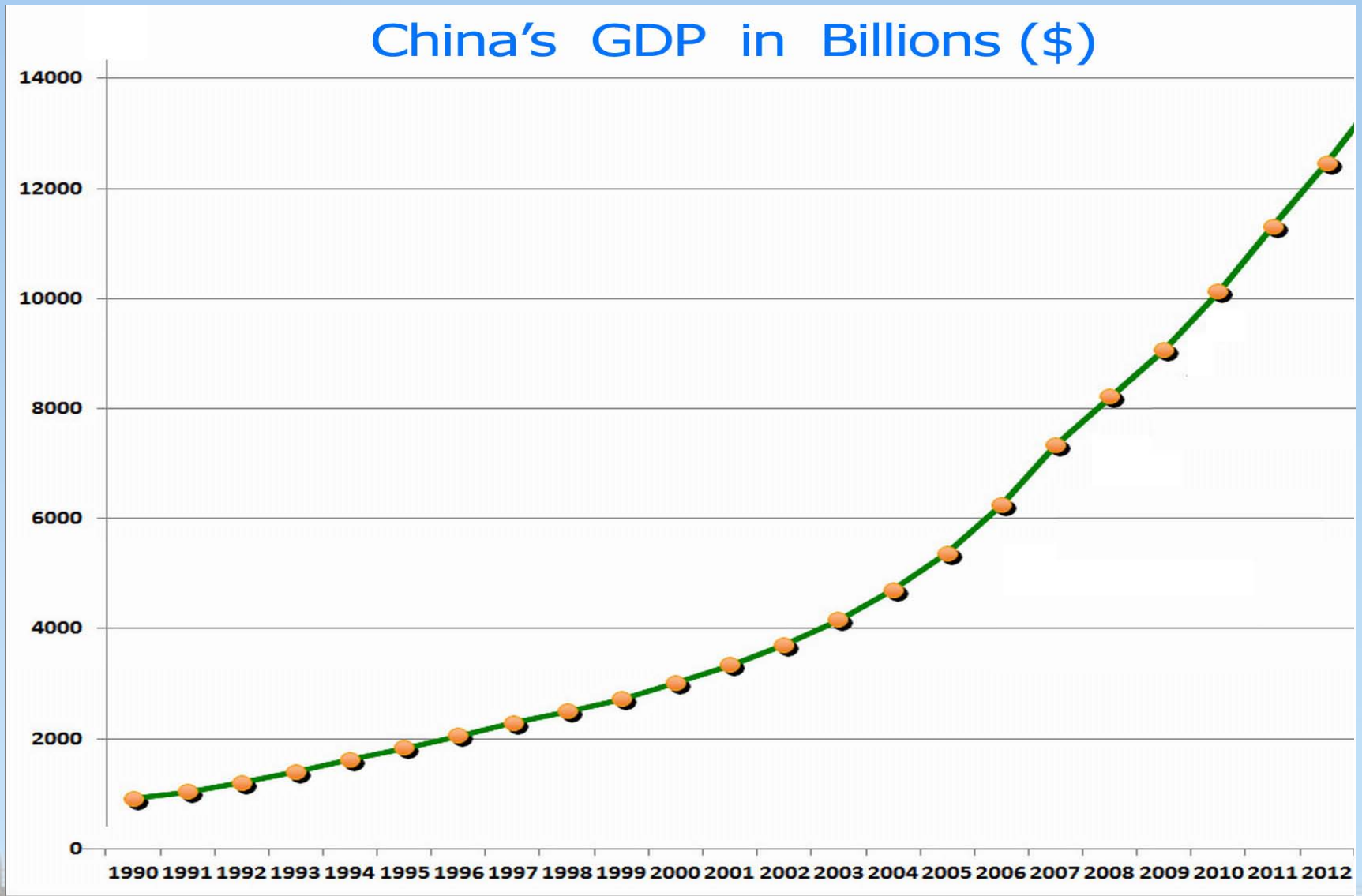


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2. **Sea-enclosure and land reclamation - last straw?**
3. **MEBM - what China has and how it works**
4. **Foundation for MEBM - capacity building needs**

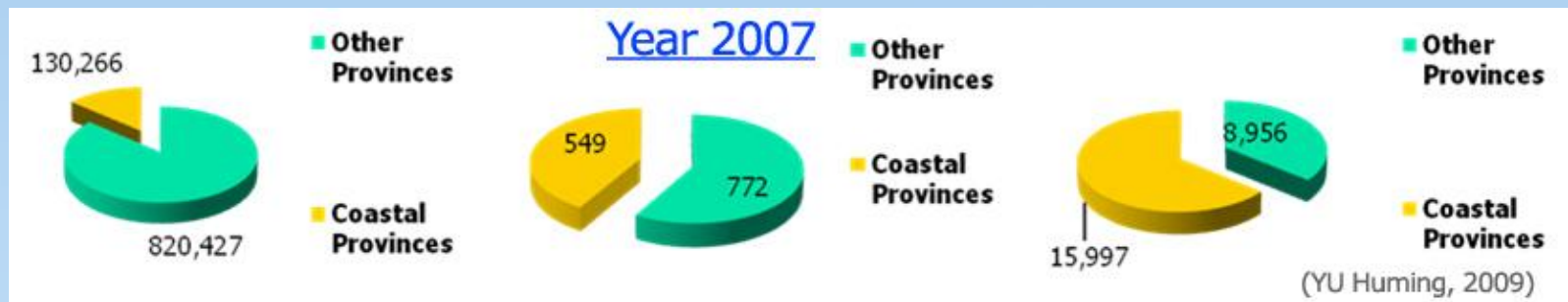
China's phenomenal economic growth



Significance of ocean & coastal economy

- Development in **coastal areas** (urbanization & industries)
---- **main driver** of China's rapid growth

Contribution from coastal provinces (including metropolis)



14% of area

42% of population

62% of GDP

- Among the **ocean sectors**, marine transportation, port construction, offshore oil & gas, and shipbuilding
---- **important direct role** in China's economy

Severe stress on ocean/coastal ecosystems

Climate Change

Land-based pollution

Sea-enclosure and land reclamation

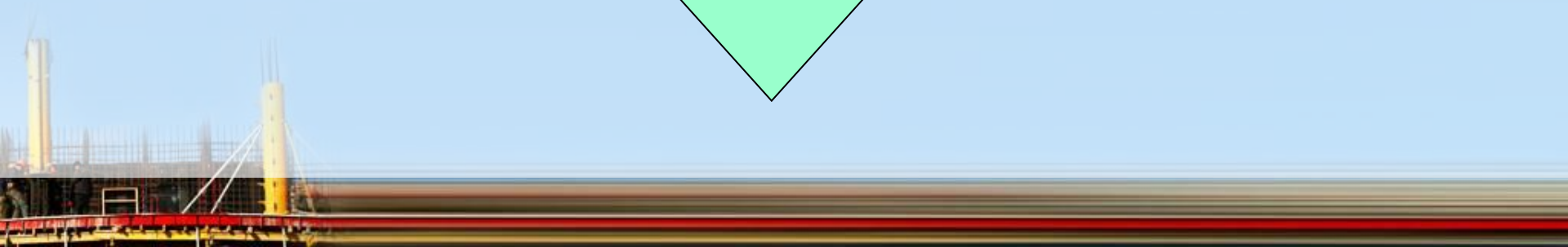
Sea-enclosure and land reclamation

Urbanization & industrial development

Ocean and coastal engineering

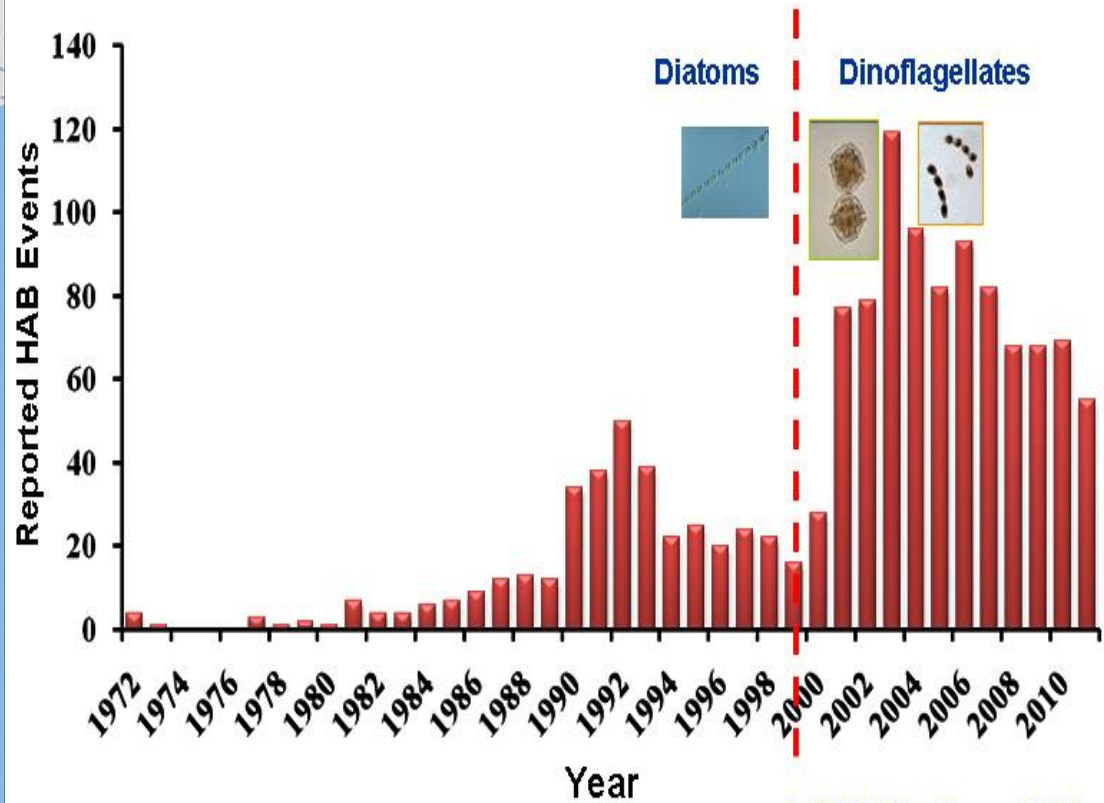
Marine transportation

Mariculture
Overfishing



Serious eutrophication and frequent HABs

Coastal Water Quality, 2011



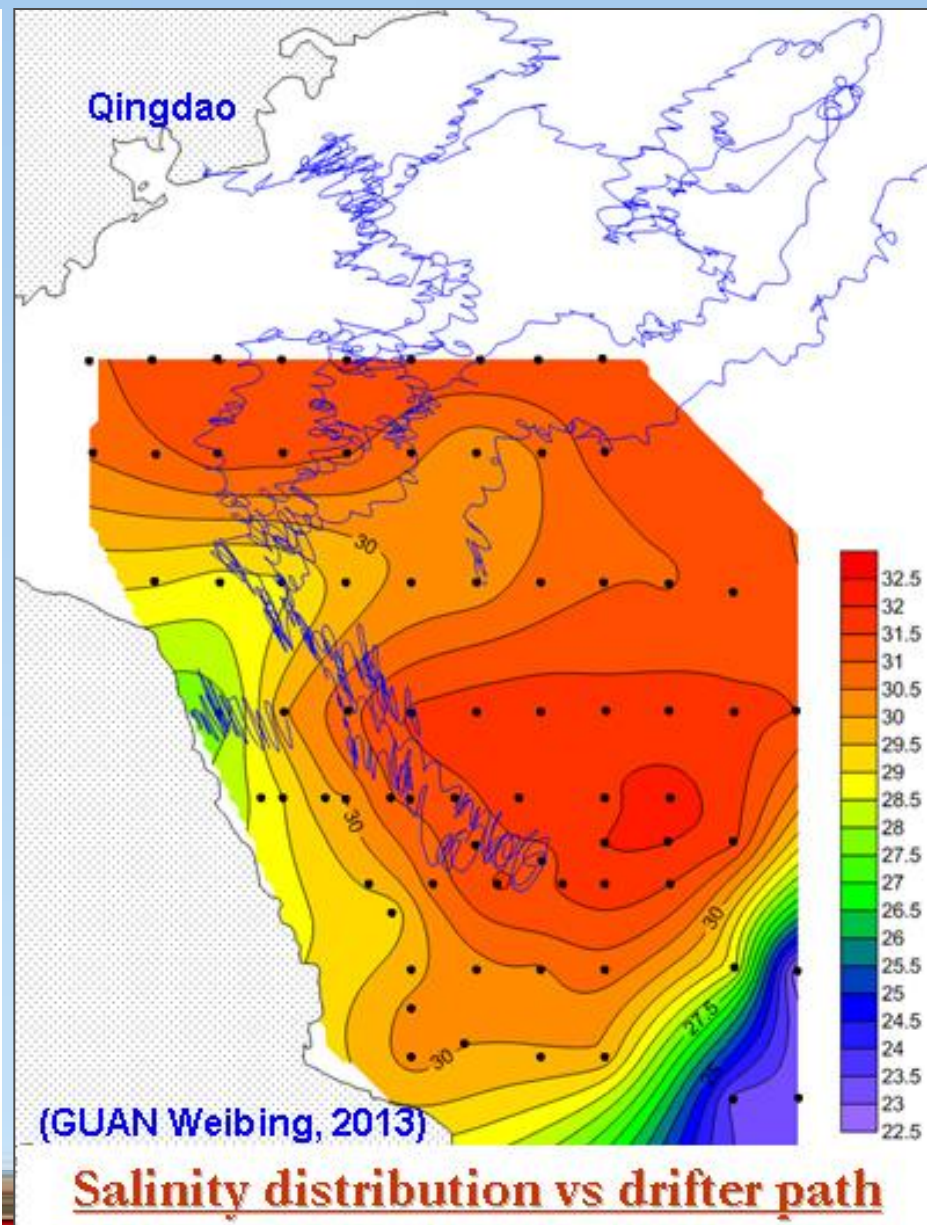
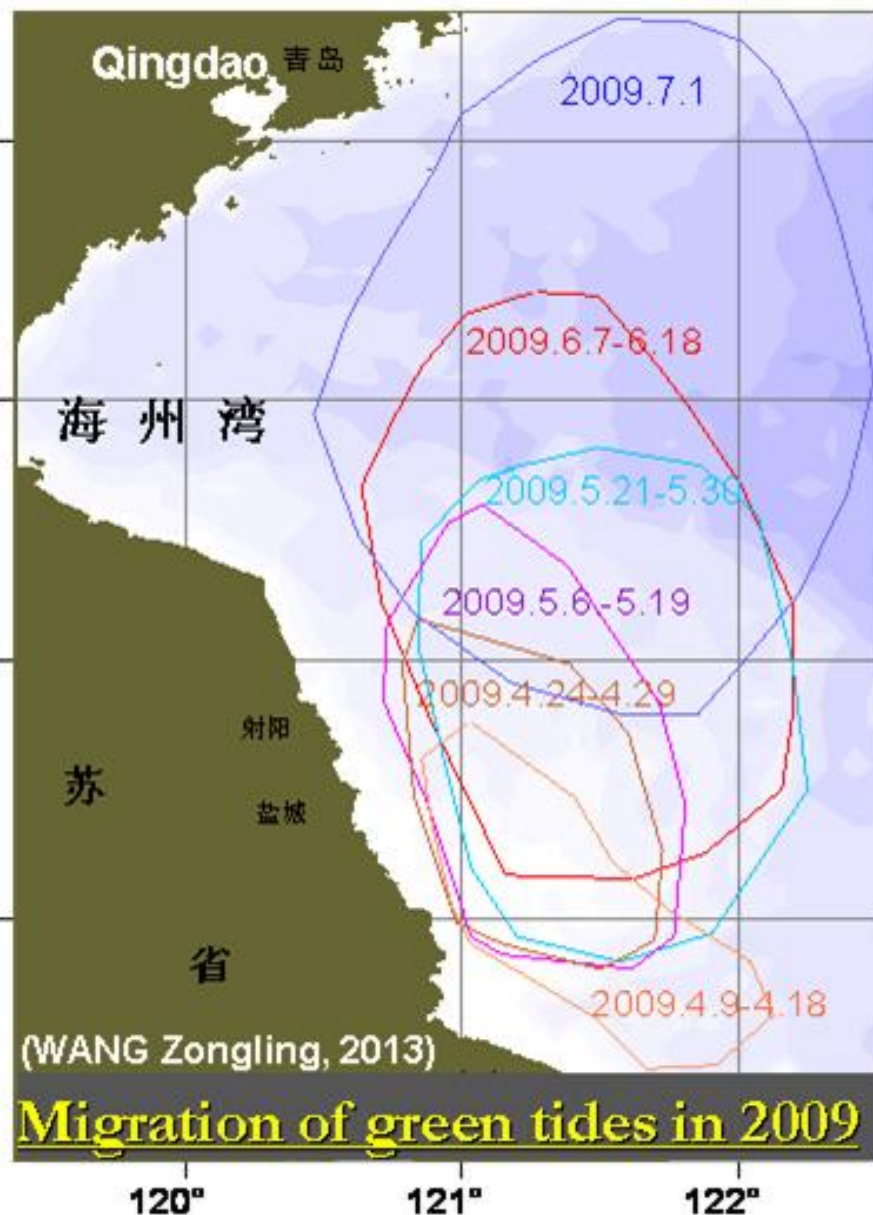
(ZHOU Mingjiang, 2013)

Large-scale seaweed (*Enteromorpha* sp.) outbursts

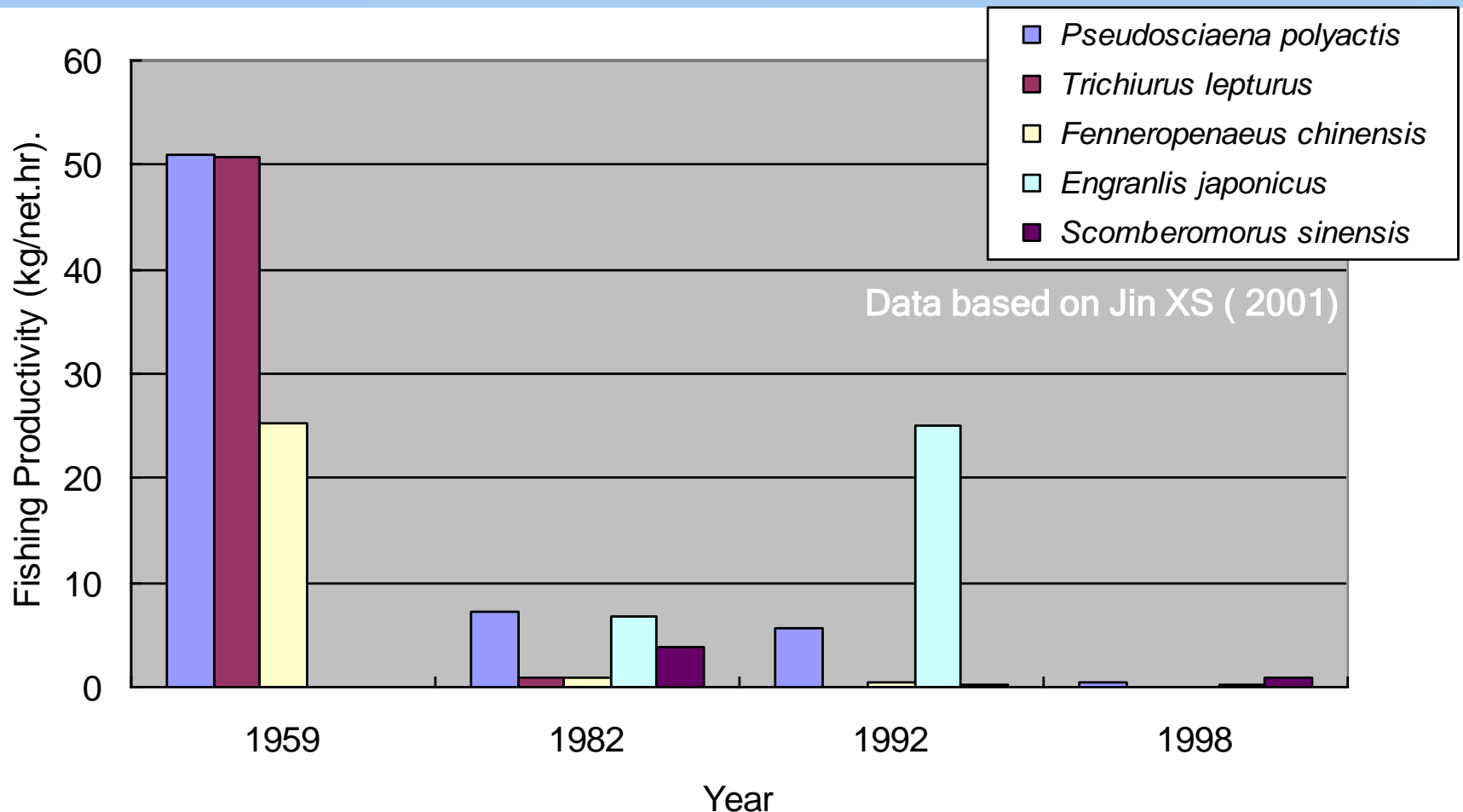
1.3 billion RMB direct loss



Large-scale seaweed (*Enteromorpha* sp.) outbursts



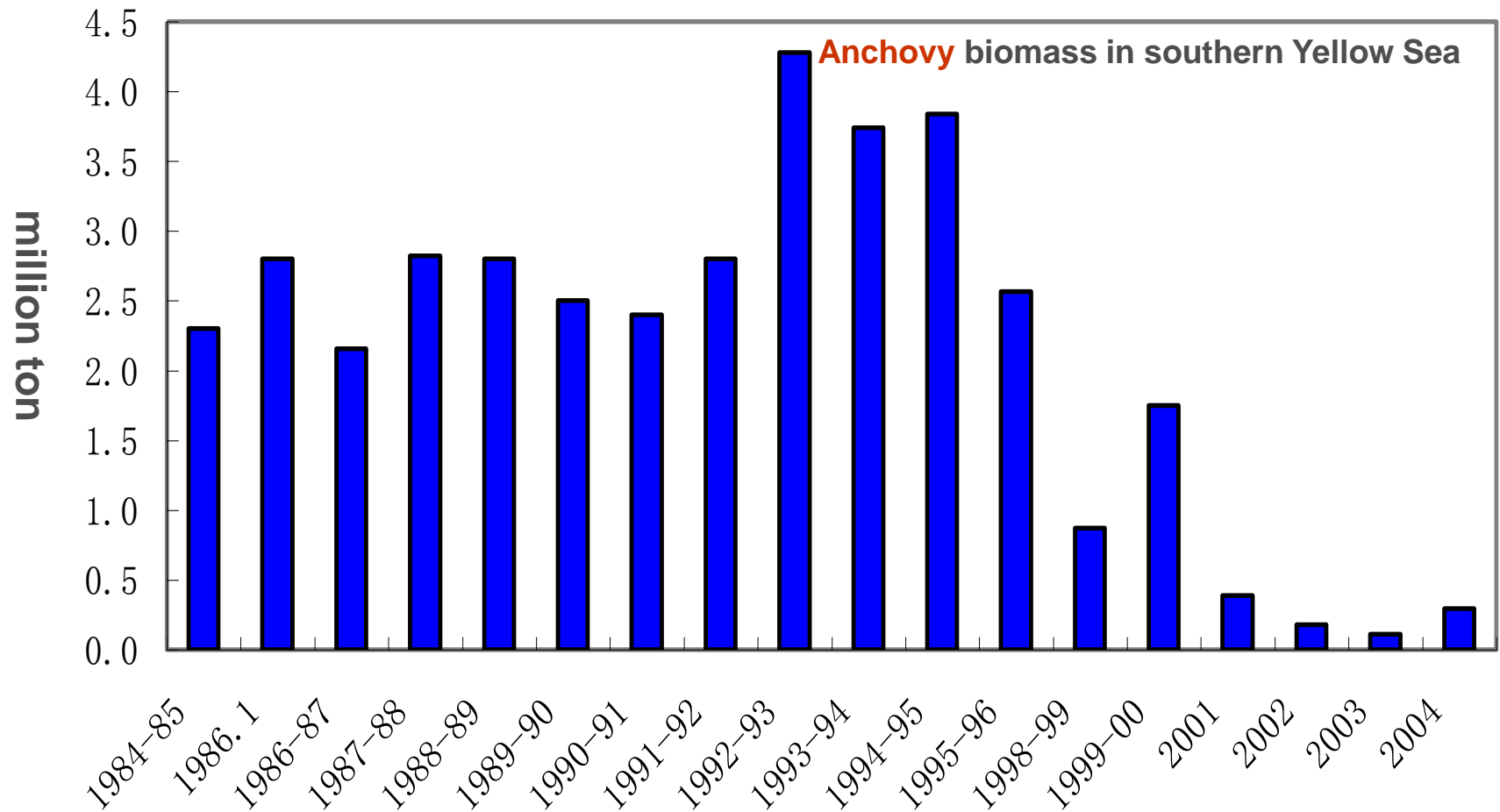
Dwindling important fishery stock



Yield of important species (e.g. hairtail and yellow croaker) from Bohai dropped below 1% between 1998 and 1959

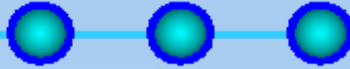
Dwindling important fishery stock

Even prey fish biomass declined sharply



(Jin XS, 2010)

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Coast/Sea use boosting China's economy

- With strict laws prohibiting conversion of agricultural lands for other uses, the **dilemma of shortage in land-resource** facing the need for continuing growth in economy/population in coastal areas
- Fueled by both the low cost in land reclamation and a lack of appreciation of the eco-function value of marine ecosystems, **sea-enclosure and land reclamation** widely adopted by local governments as an effective measure to address this dilemma



Current trend of coast/sea use in China



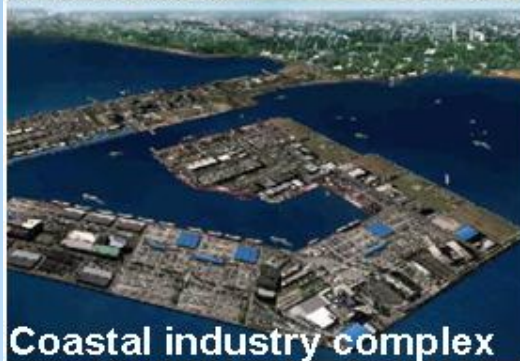
Urbanization



Port



Shipbuilding



Coastal industry complex



Cross-bay bridge



Mariculture



Offshore oil



Cross-bay tunnel



Airport

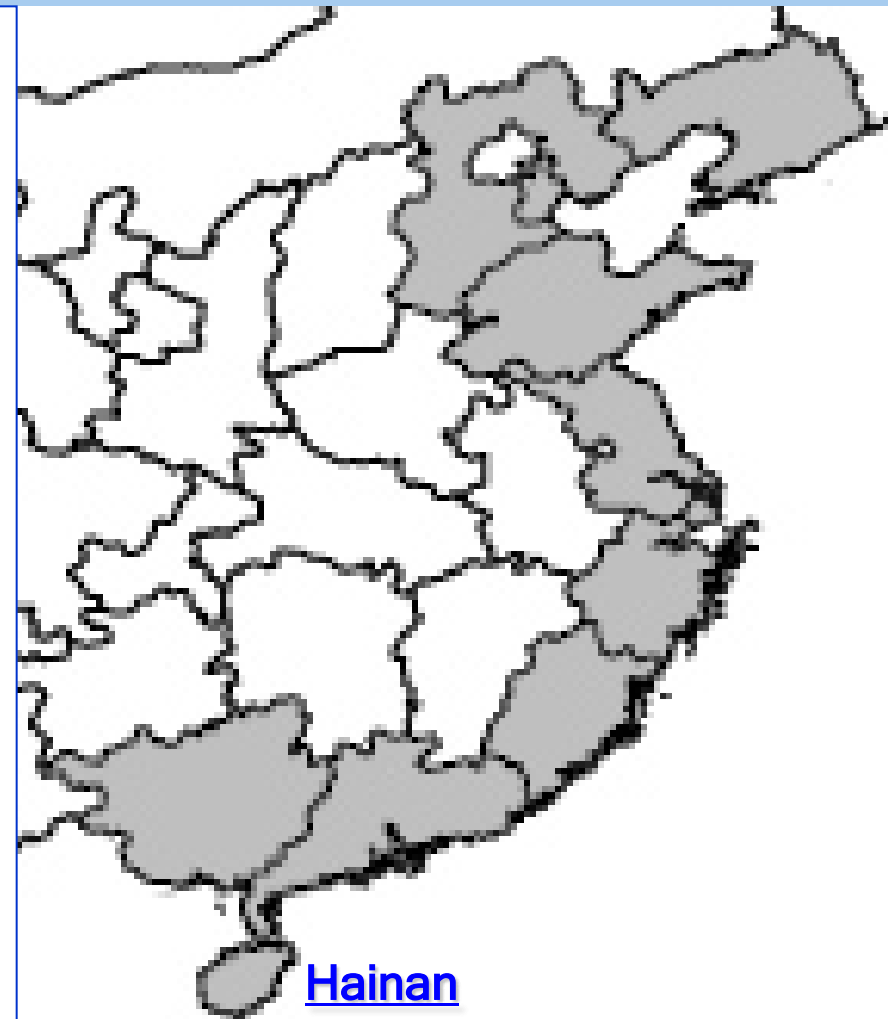
Evolution of sea-enclosure & land reclamation

Four stages since 1950:

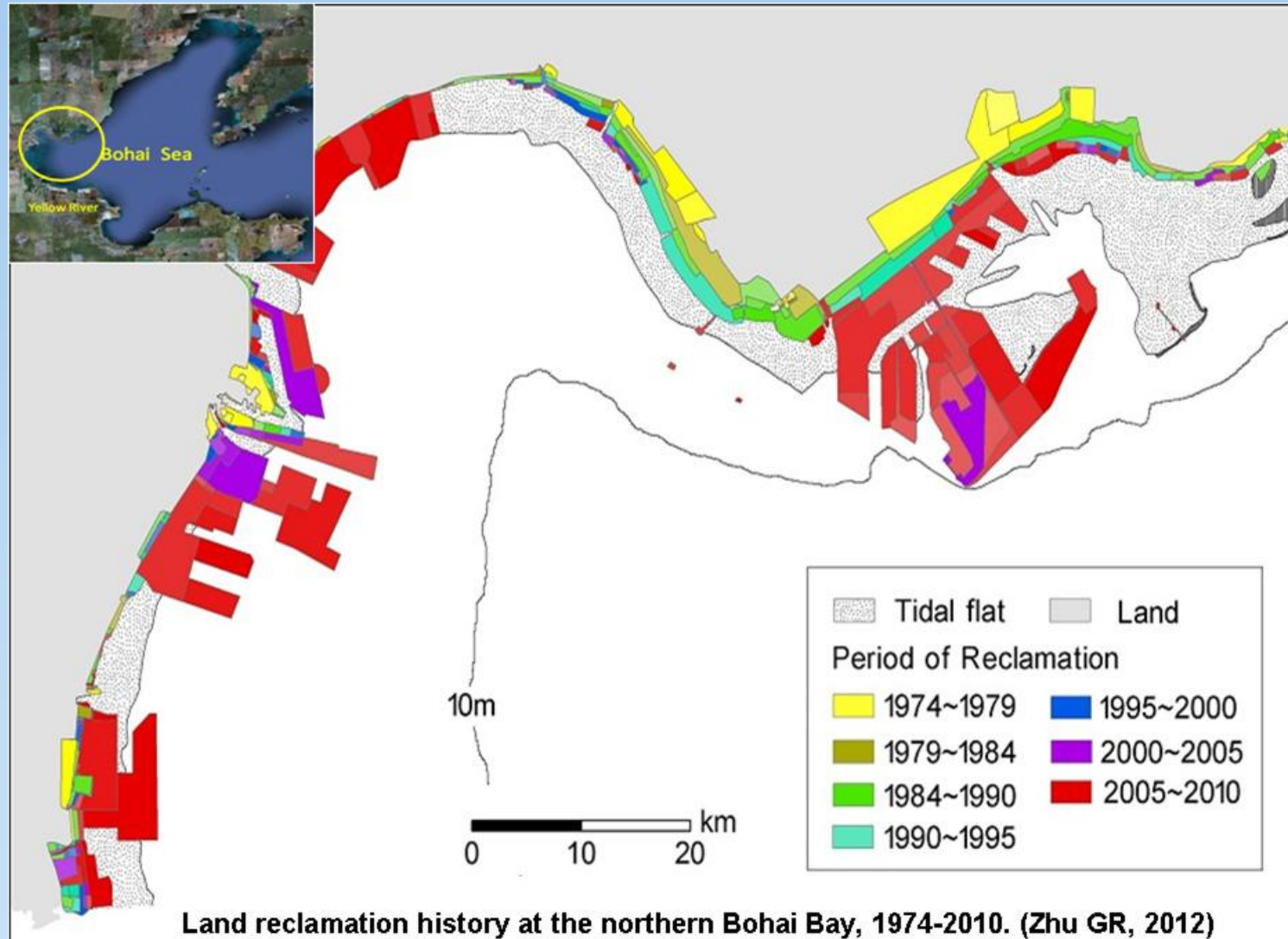


Evolution of sea-enclosure & land reclamation

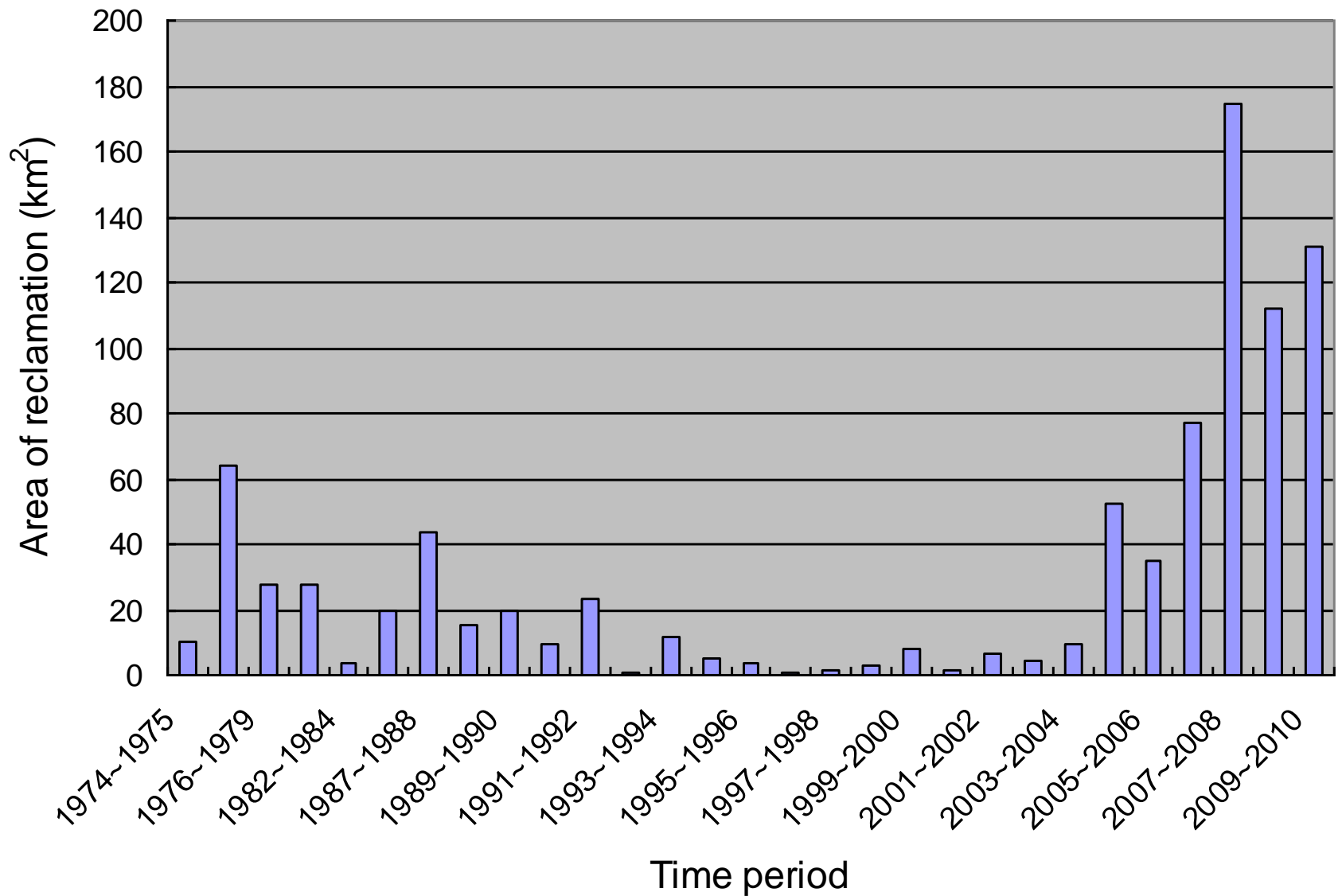
- 2008 statistics: a total area of 13,380 km² reclaimed since 1949 (over 50% of the coastal wetlands or about 40% the size of Hainan Province);
- Recent technology advances accelerated the reclamation pace: insufficient time for the marine ecosystems to adapt to the changes, leading to serious deterioration



E.g. Recent reclamation at northern Bohai Bay



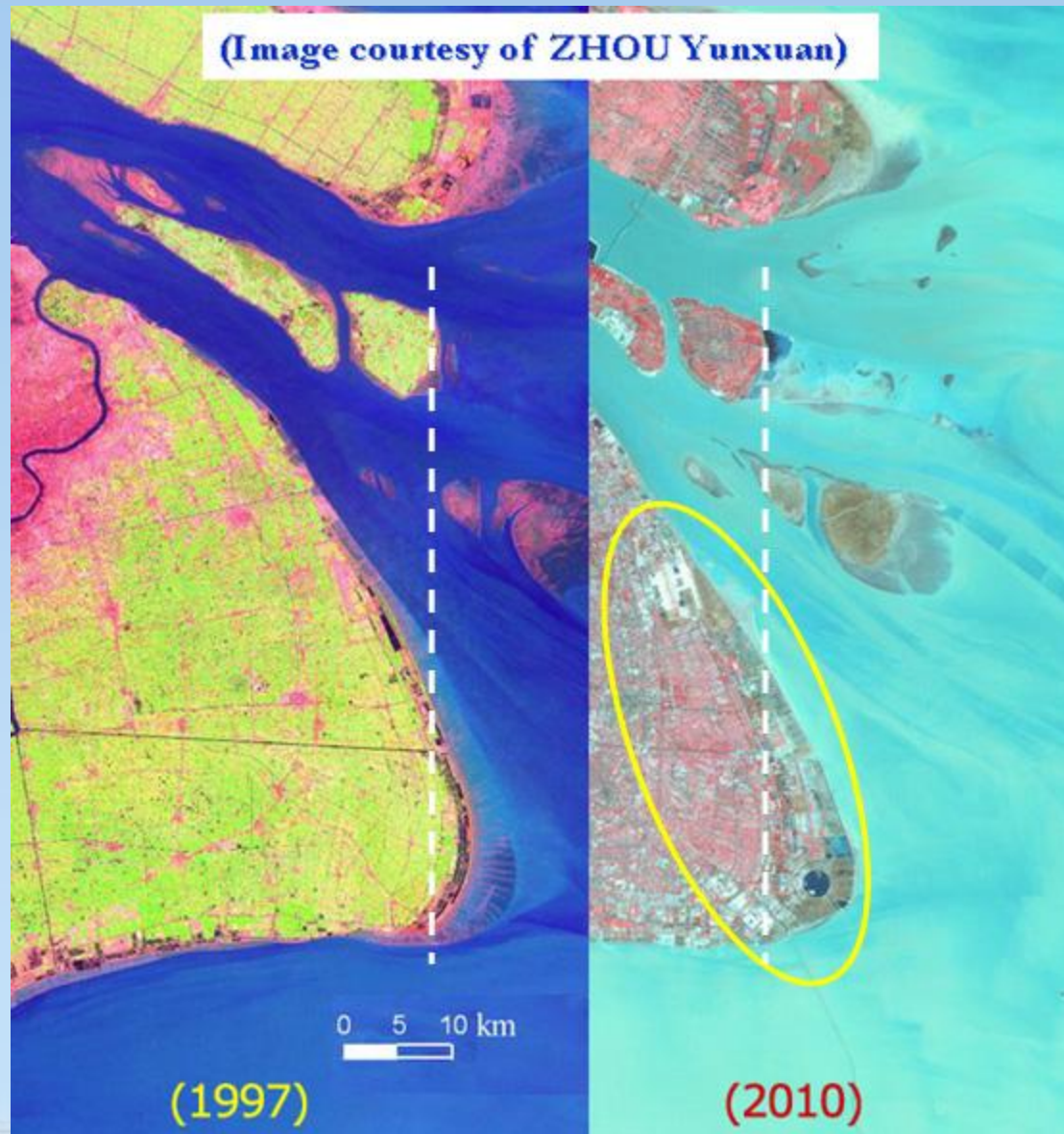
E.g. Recent reclamation at northern Bohai Bay



E.g. Sea-enclosure in Laizhou Bay

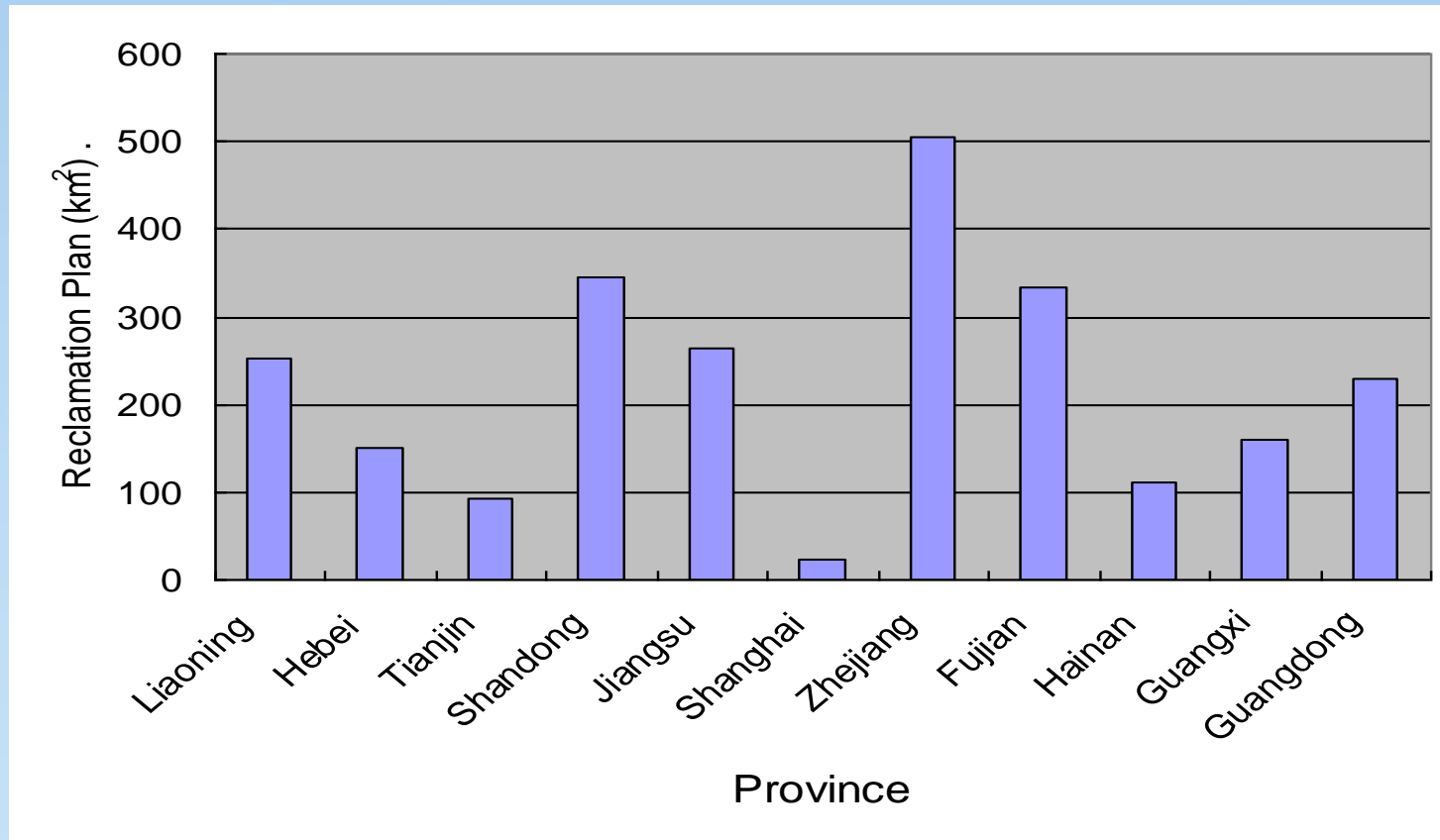


E.g. Land reclamation at Cape Nanhui, Shanghai

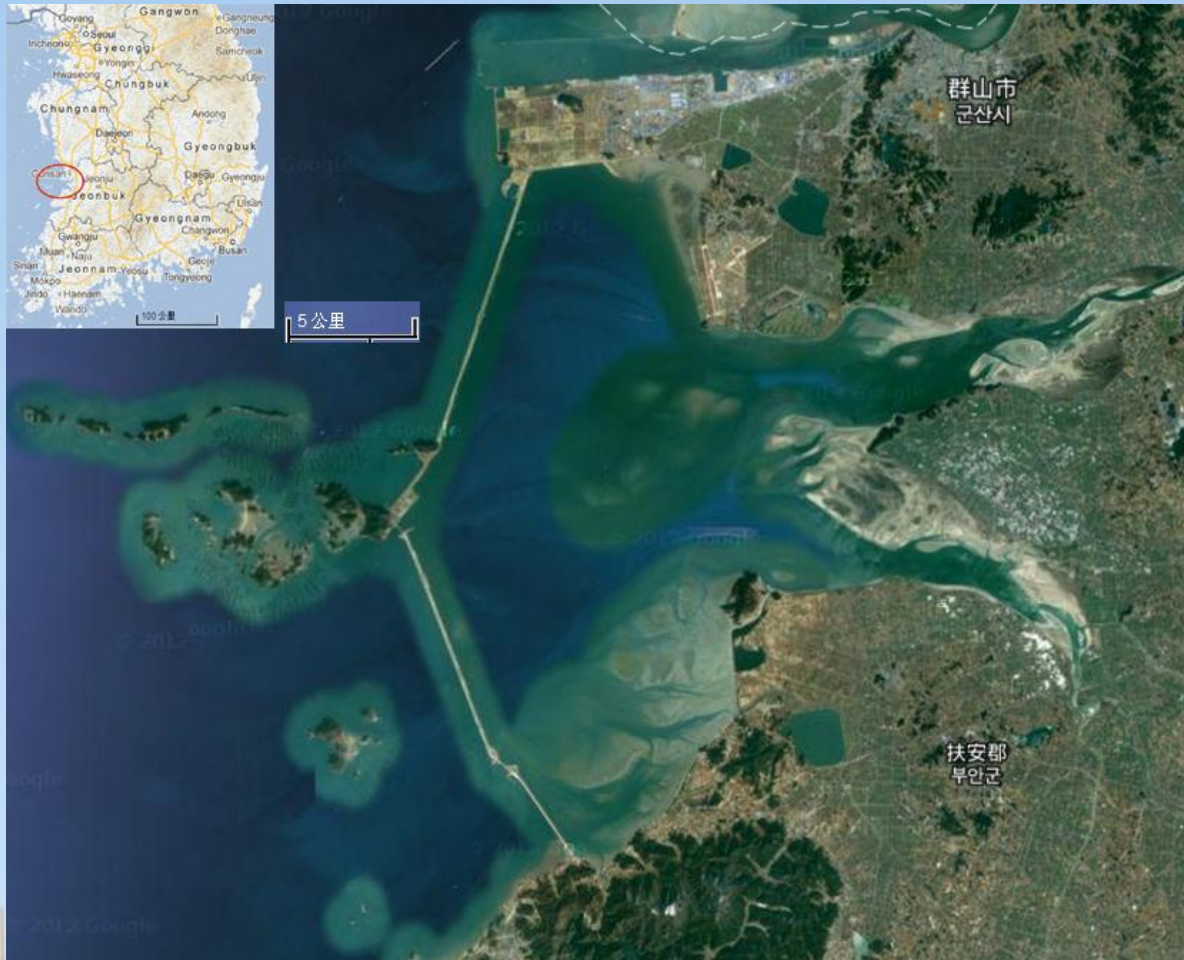


Another 2500 km² reclamation for next 10 years

Though aware of the detrimental effects of rapid large-scale reclamation, the State Council, under the pressure for development, recently approved a coastal reclamation plan of 2469 km² over the next ten years



E.g. China is not alone!



Across the Yellow Sea,
ROK's Saemangeum project
reclaiming 7 times the size of
Manhattan by a 33-km sea
dyke to convert 400 km² of
wetlands for development

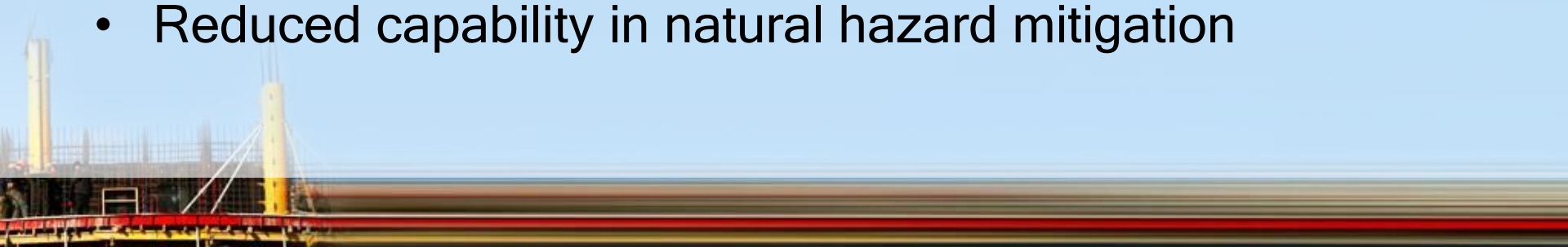
E.g. China is not alone!



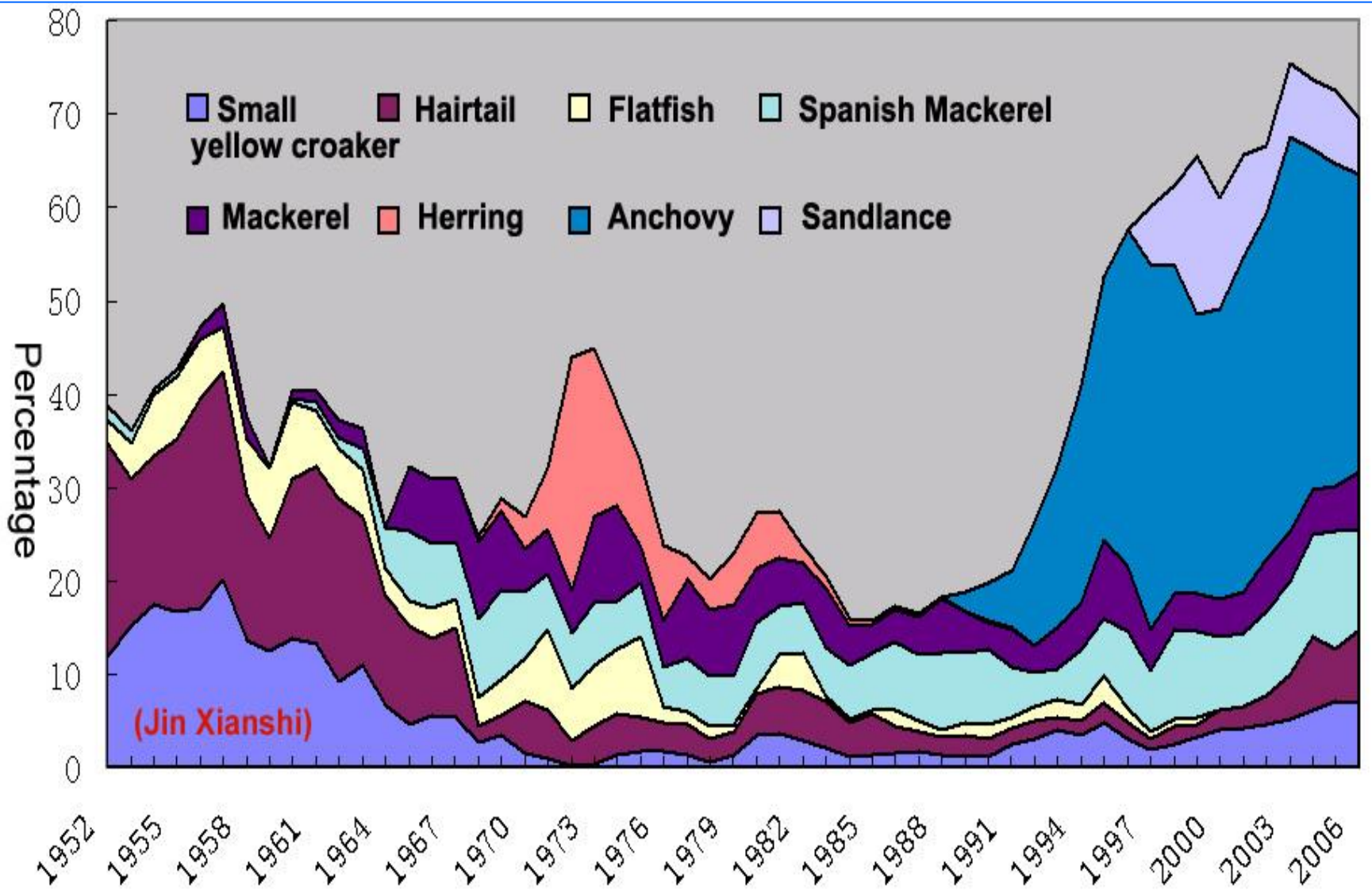
Impact of reclamation on wetland ecosystems

Ecosystem services severely compromised

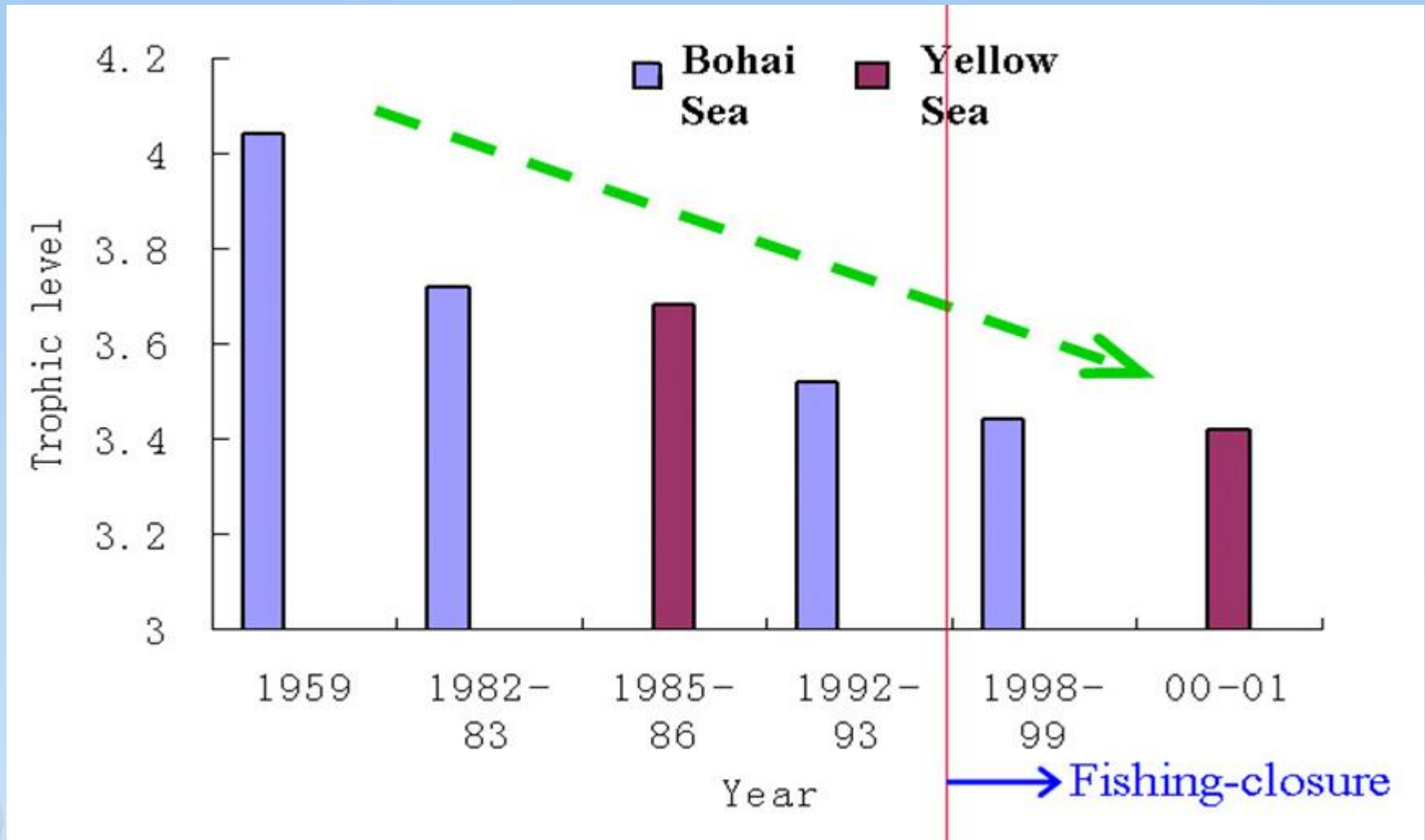
- Destruction of habitats and nursery grounds for fish
- Benthic organisms biomass and diversity reduced
- Shrinking habitat and feeding ground for shorebirds
- Water purification ability compromised
- Destruction of coastal landscape diversity
- Hydrodynamic changes leading to changes in ecosystems in the bay or coastal sea
- Decline of carbon storage
- Reduced capability in natural hazard mitigation



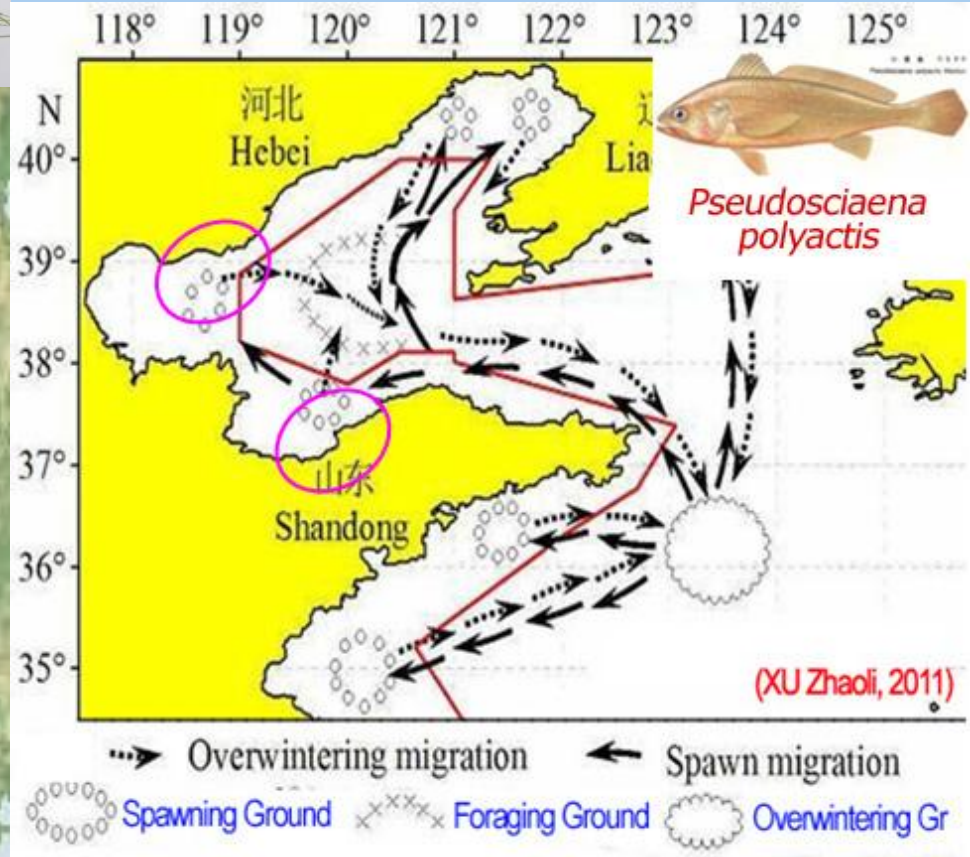
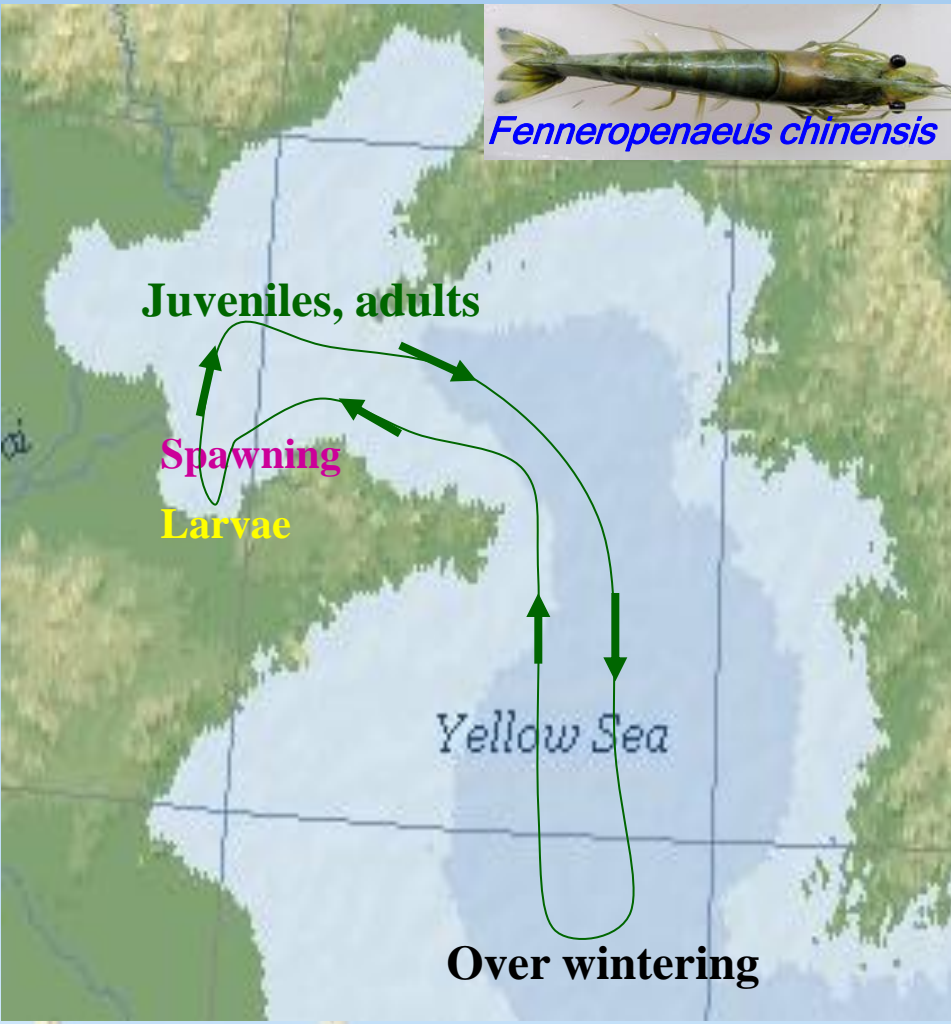
Decline in high-value fishery species in the Yellow Sea



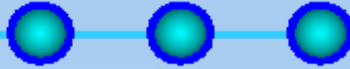
Progressively lower trophic level in yield



One key factor for dwindling fishery stock



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In a way, China does practice MSP



The image shows the cover of a book titled "MARINE SPATIAL PLANNING". The cover features a blue background with a faint map of the world and a grid pattern. At the top, there are logos for UNESCO, the Intergovernmental Oceanographic Commission (IOC), and the World Bank (WB). Below the logos, the title "MARINE SPATIAL PLANNING" is written in large, bold, white letters. Underneath the title, the subtitle "A Step-by-Step Approach toward Ecosystem-based Management in reducing conflicts among user groups" is written in smaller white and yellow letters.

United Nations
Educational, Scientific and
Cultural Organization

Intergovernmental
Oceanographic
Commission

WB

MARINE SPATIAL PLANNING

A Step-by-Step Approach
toward Ecosystem-based Management
in reducing conflicts among user groups

In a way, China does practice MSP

Marine Functional Zoning (MFZ)

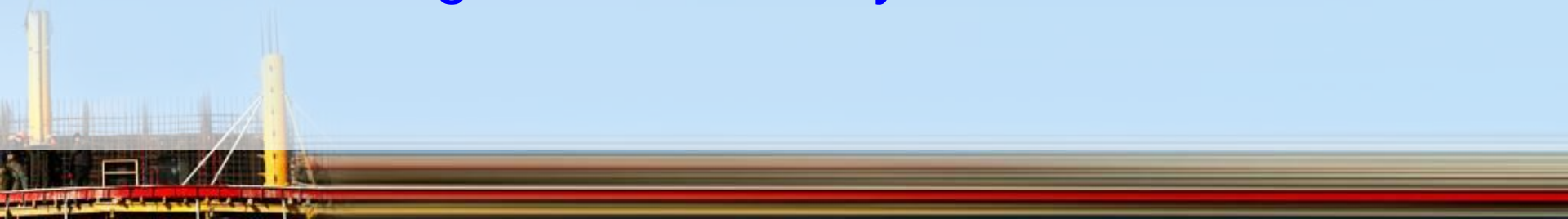
- **Basis for** ocean and coastal management in China
- **Based on** Marine Environmental Protection Law (1999)
& Sea Use Management Law (2001)
- **Consists of 3** Marine Use Management Systems
 - The right to the sea-use authorization system
 - The marine functional zoning system
 - The user-fee system

Classification of marine functional zones

8 categories

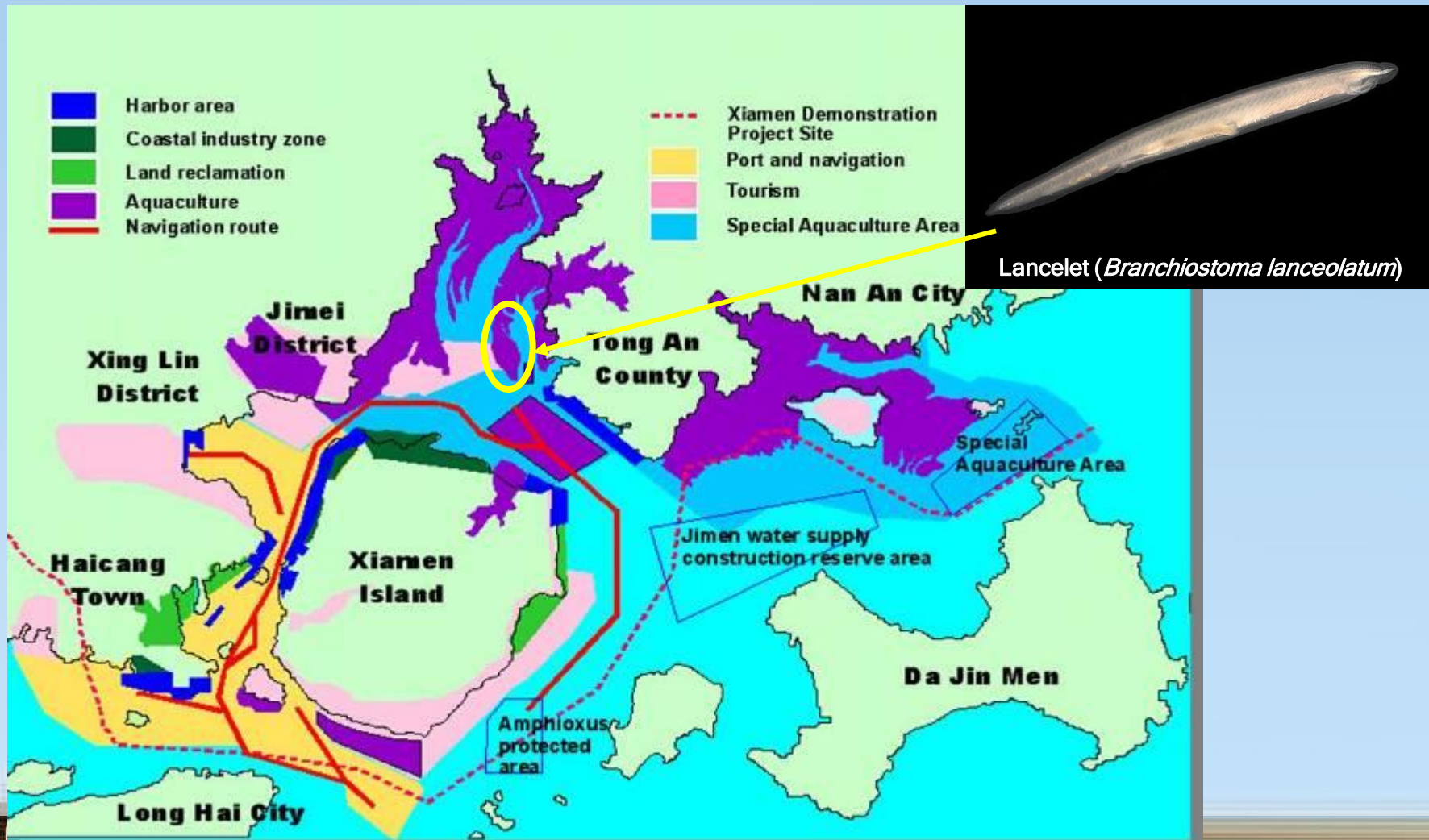
- Agriculture and fishery (including aquatic germplasm resource conservation)
- Port and shipping
- Industry and urbanization
- Mining and energy
- Tourism and recreation
- Marine protected area
- Special use
- Reserved area

Also 5 regions with 29 key areas



Does China's MFZ work?

Xiamen's Integrated Coastal Management
Recognized largely as a successful example



Does China's MFZ work?

**However, from the nationwide perspective,
MFZ is not working properly or
needs strengthening & improvement!**



Shortcomings identified in MFZ

- Zoning **based on resource development** functions of the ocean and coasts, rather than on ecological functions, such as critical habitat
- **Lack of guiding principles** for zoning **allocation** to users, leading to difficulties in implementation
- Priority in zoning often **favors development** instead of protection no matter how urgent conservation is needed
- Additional problems:
 - Enforcement often weak
 - MFZ frequently changed after issuance, e.g. due to coastal reclamation expansion;

Based on FangQH et al (2011)

Shortcomings identified in MFZ

In essence, in China's MFZ

- Science or ecosystems not properly represented
- Ecosystem services and MEBM criteria (including mitigation/restoration measures) only partially reflected in management procedures.



There is also the Yellow Sea LME Program

- **Stressors** on the ecosystem:

Key: overfishing & unsustainable mariculture

Additional: land-based pollutants and loss of coastal wetlands (over 40 percent)

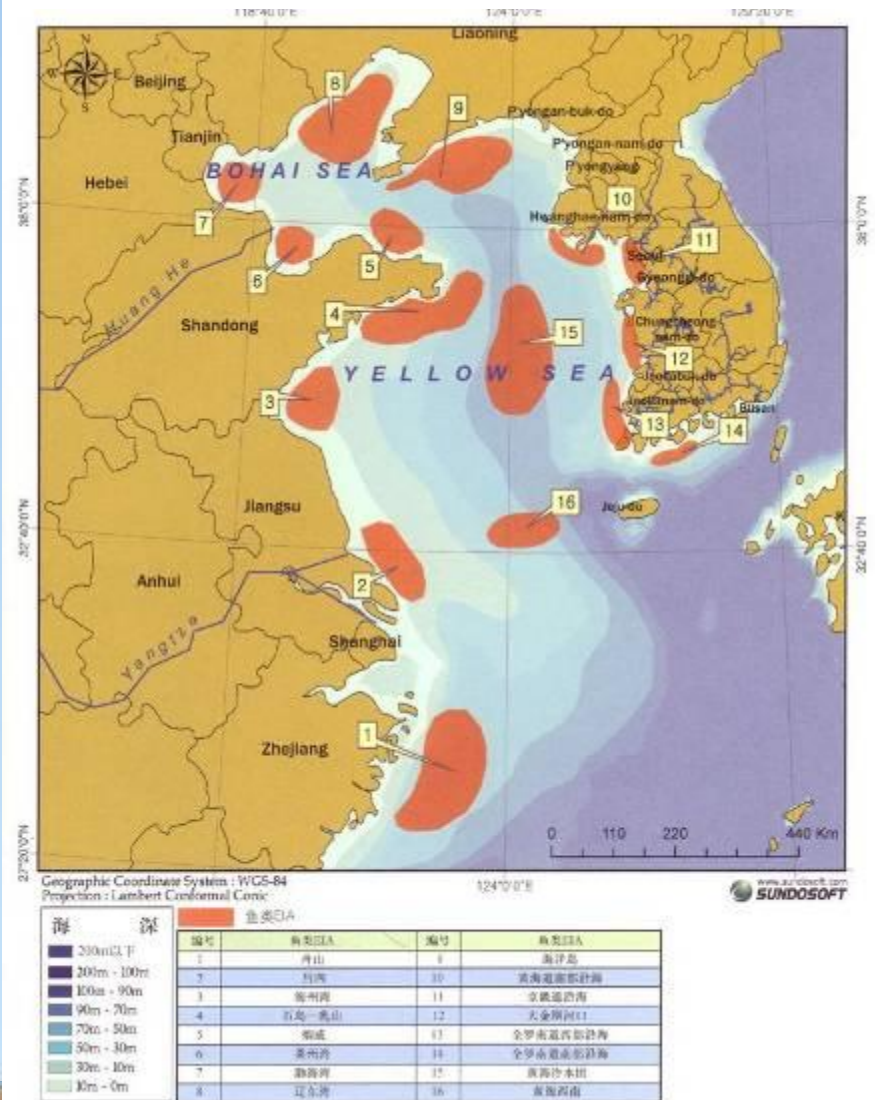
- **Stress indicators** on ecosystem:

Primary - alteration in fishery

Others - HABs & jellyfish bloom

- **Habitats** for important fish: largely identified, **except for their critical habitats like nursery grounds**

Important fish habitats identified



China does have experience in EBM

- During the period of great agriculture expansion,
 - large areas of forests & lakes converted to farmland
 - over-grazing on pastureland
- Frequent disasters resulted from such abuses :



- Now, China has implemented mitigation measures
 - Returning farmland to forests / lakes
 - Limiting or periodic ban of grazing on grasslands
 - etc

China's terrestrial experience not translated to ocean

- Value of marine ecosystem services not fully recognized by the public, including the administration
- Inadequate mitigation/protection measures on marine functions

E.g. an often repeated statement on reclamation is

“Turning wasteland into useful lands”

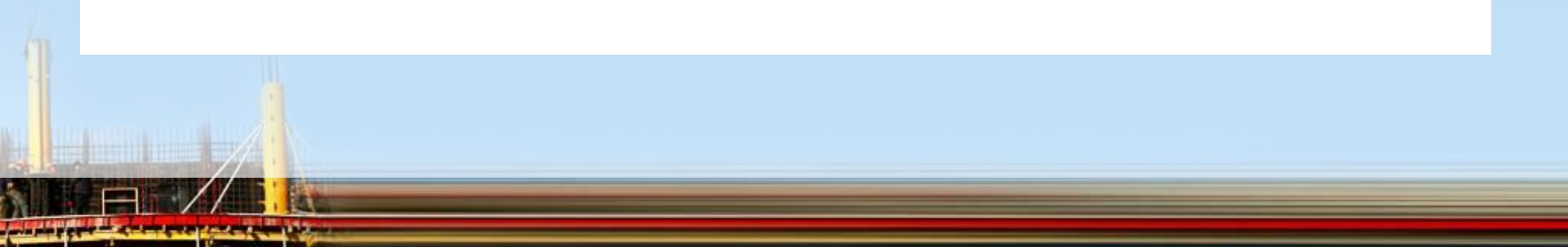


China's terrestrial experience not translated to ocean

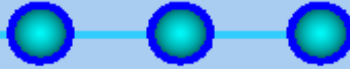
Who is to blame for such a deplorable reality?

No doubt us Chinese scientists share part of the onus

But my appeal today is to the Secretary-General or ICP of UN



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Experience from China demonstrates

- Developing countries will soon face rapid development along their coasts, likely resulting in sea-enclosing and land reclamation. Their coastal and marine ecosystems will then be under tremendous pressure, which will not only endanger the health of their own seas but also the global ocean.
- In essence, this is no different from what SIDS are facing in terms of development in tourism and fishery.



Experience from China demonstrates

MEBM will only work if there is (1) a good understanding by the public and administration of the values of the services provided by the marine ecosystems and (2) some basic information about such ecosystems, including biodiversity and critical habitats



Question for UN Capacity Building Program

Should the policy be

1. to **lend** assistance on MEBM to the developing countries **when problems arise**, ie, when they are encountering eco-safety problems in the process of rapid development along their coasts? or
2. to **prepare** the developing countries to face the impending rapid expansion of their coastal economy by building up **now** their knowledge on the value and fragility of their coastal and marine ecosystems, ie, a more proactive and fundamental way?



THANK YOU

