



国家海洋局第一海洋研究所
THE FIRST INSTITUTE OF OCEANOGRAPHY, SOA.

Marine Ecological Capital:

Assessment, Management and Investment

Shang CHEN

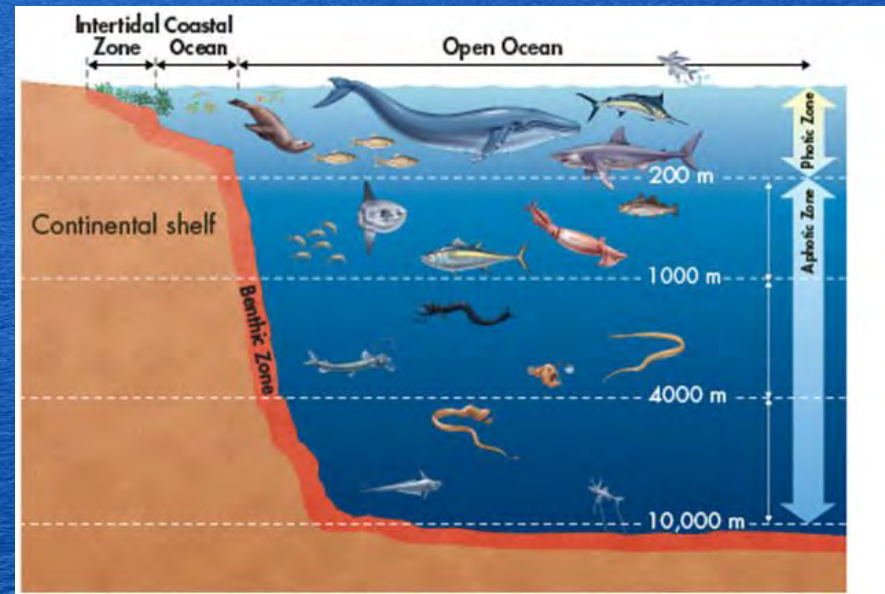
First Inst of Oceanography, SOA

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1. What is Marine Ecological Capital (MEC) ?

- **Capital: natural capital, man-made capital, human capital and social capital. (Serageldin, former president, World Bank)**
- **Marine ecological capital is the important component of natural capital.**
- **MEC is defined as marine ecological resources which have direct or indirect contributions to humans' social and economic production and provide benefits for humans.**

- Marine ecological resources (MER): marine living resources and their habitats (i.e. seawater, surface seabed), as well as the marine ecosystem that they act as a whole.



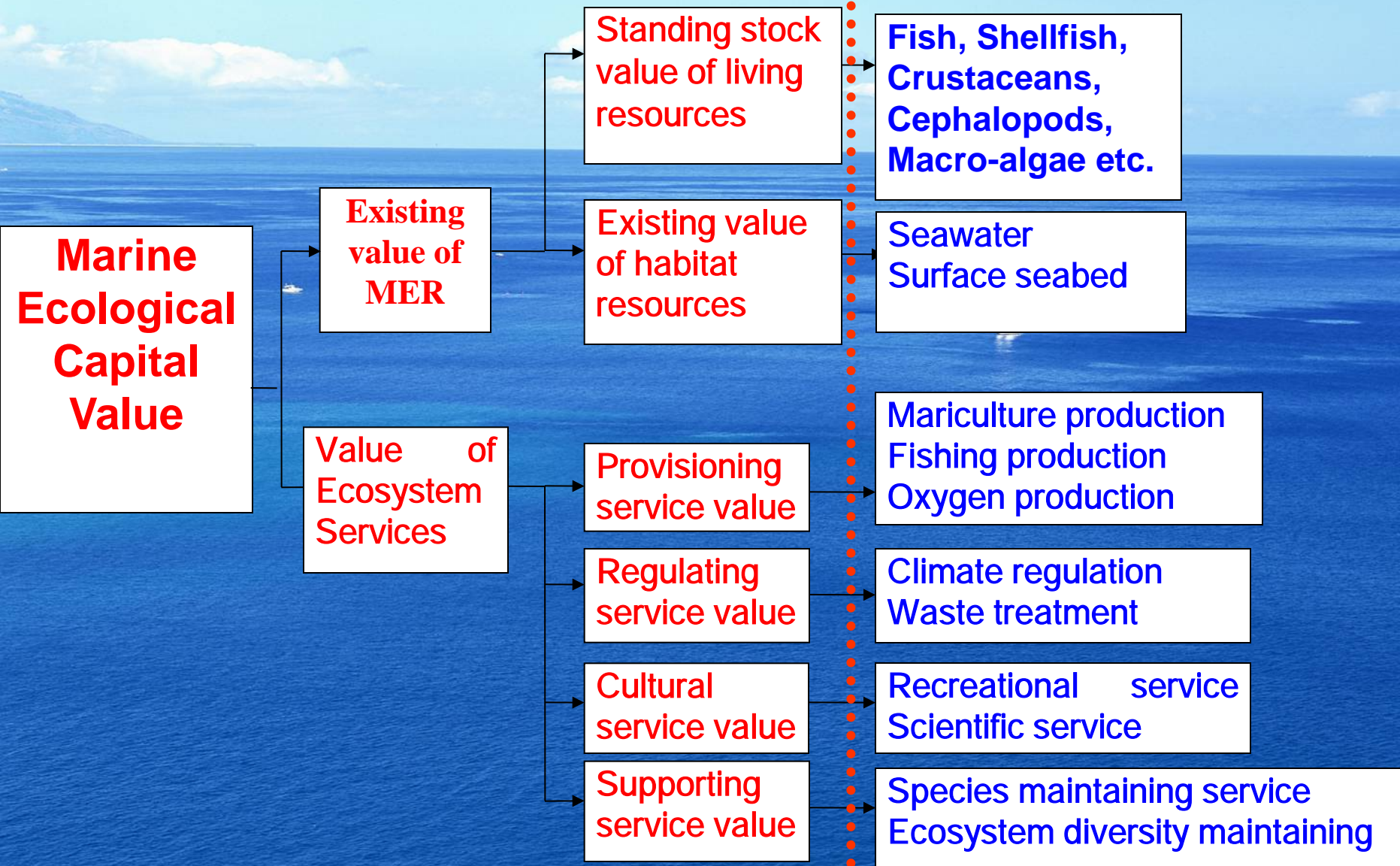
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- **MEC value: the monetized benefits for humans from marine ecological capital,**
 - **Standing stock value of marine ecological resources**
 - **and marine ecosystem service value (flow value).**

Supporting	Regulating	Provisioning	Cultural
Biochemical cycling	Climate and atmosphere regulation	Genetic resources	Recreation
Primary production		Inedible resources	Scenery
Diversity	Sediment retention	Chemical resources	Science
Habitat	Mitigation of eutrophication	Energy	Education
Food web dynamics	Biological regulation	Space and waterways	Cultural heritage
Resilience	Regulation of hazardous substances	Food fit for consumption	Inspiration
		Ornamental resources	Legacy of the sea



MEC value: constituent elements

Selected Assessment index



2. Why this issue

- Available & high-quality ecological resources has become more short in supply. (non-polluted seawater, seafood & freshwater, comfortable weather etc.)
- Ecological capital is the emerging issue in both scientific, economic & political communities
 - China's President: Lucid waters and lush mountains are invaluable assets
 - IPBES, TEEB, Blue Carbon project, 8th Sino-US Strategic and Economic Dialogue

2. Why this issue

- Ocean play the most important role to address global CC. 1/3 of CO₂ emission is sequestrated by ocean(from JGOFS). Global ocean C uptake: 2×10^9 ton C/yr, 12 trillion USD/yr (Wanninkhof 2013)
- The signed parties of Paris Agreement to CC pay a big budget to reduce the CO₂ emission. May the budget be allocated to ocean ecosystems for their contribution against CC?
- Carbon sequestration is one of major MEC and valuation of its stock and flow should be one of issue in PICES.

3 Assessment of Marine Ecological Capital

- **Development of methodology**
 - **Identification**
 - **Quantification**
 - **Monetization: pricing tag**
- **Form regional technical guidelines**
 - **Ecological, economical & Social Values**
- **Case studies: PICES countries**

Assessment methods China national directives

Technical Directives for Marine Ecological Capital Assessment

ICS 07.060
A 45



中华人民共和国国家标准

GB/T 28058—2011

海洋生态资本评估技术导则

Technical directives for marine ecological capital assessment

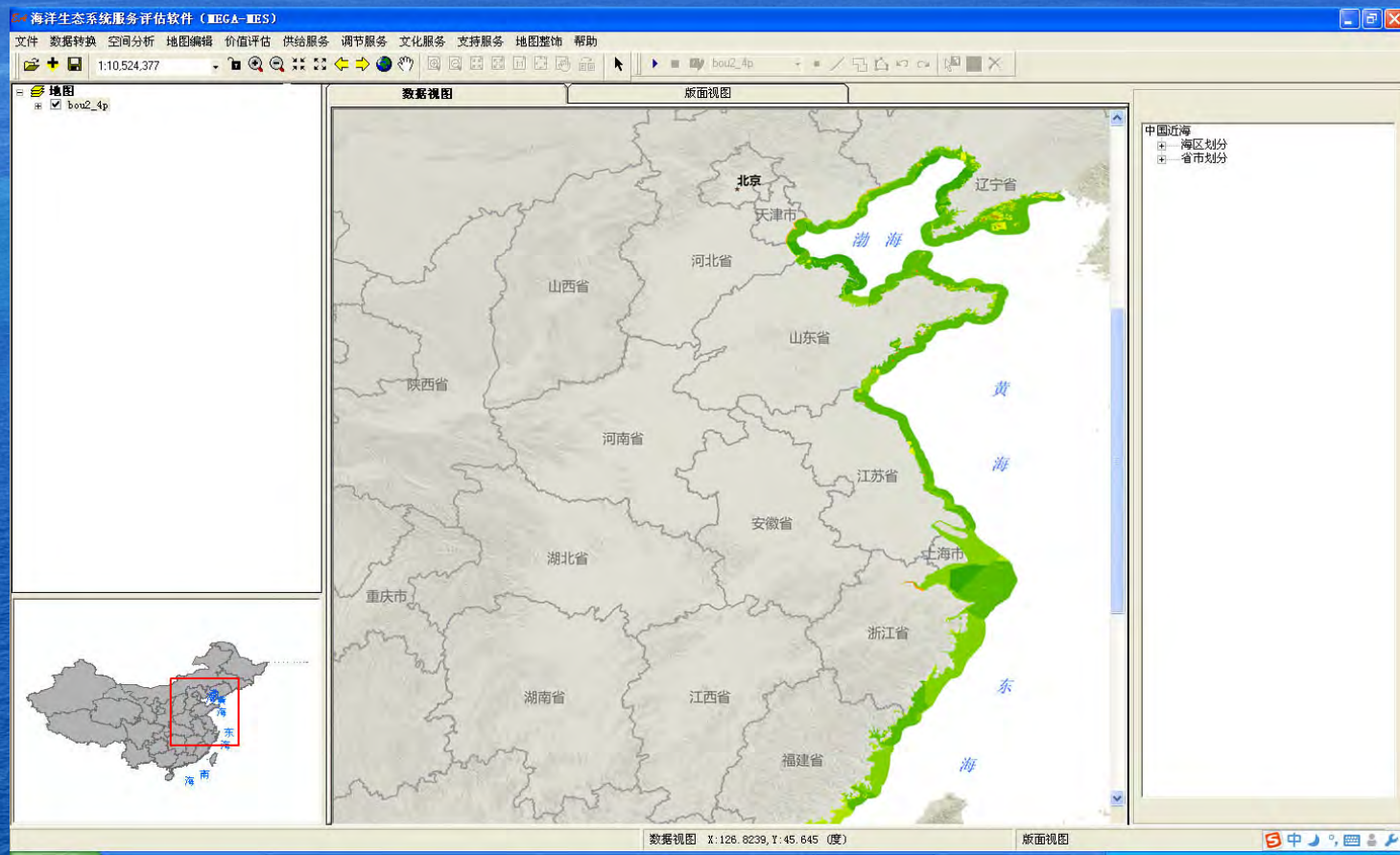
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中华人民共和国国家质量监督检验检疫总局 发布
中国国家标准化管理委员会

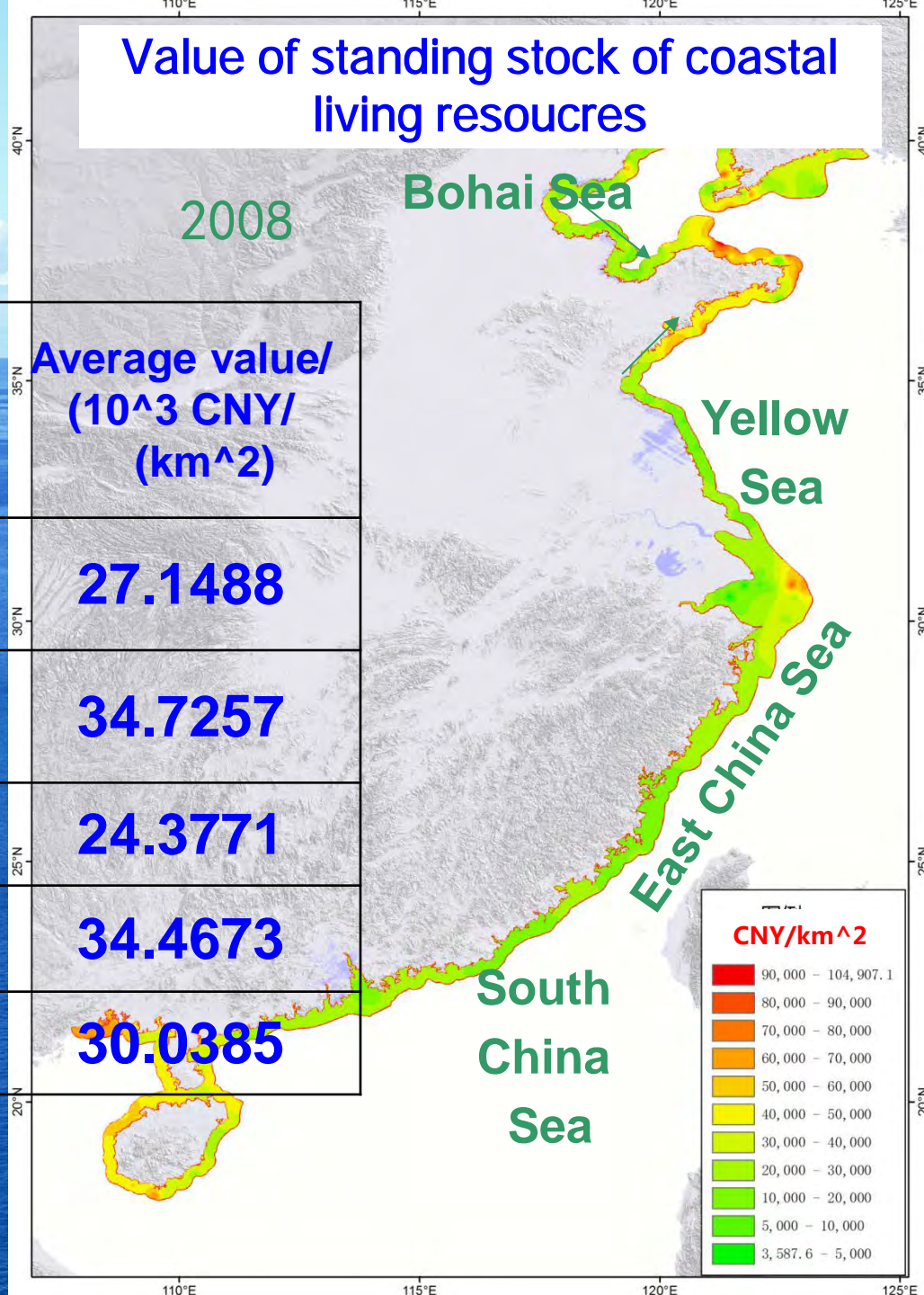
Mapping tools for MEC

Arc GIS + MEGA-MES V1.0



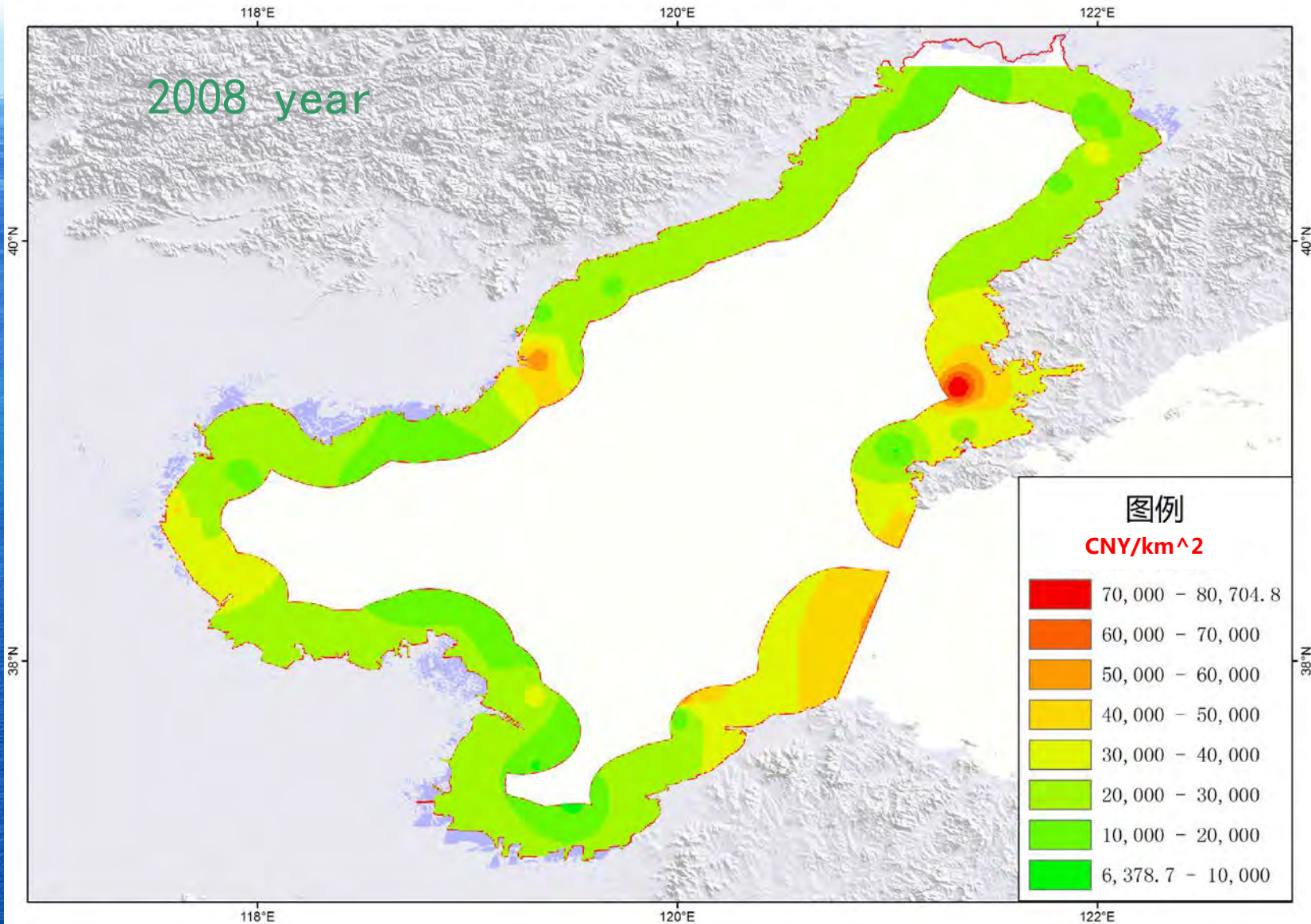
National assessment (2005-2011)

	Assessed area (km ²)	Total value/ (Billion CNY)	Average value/ (10 ³ CNY/ (km ²))
Bohai Sea	34 359	0.9328	27.1488
Yellow Sea	43 541	1.4982	34.7257
ECS	56 719	1.5882	24.3771
SCS	58 498	2.0696	34.4673
Total	193 119	6.0888	30.0385



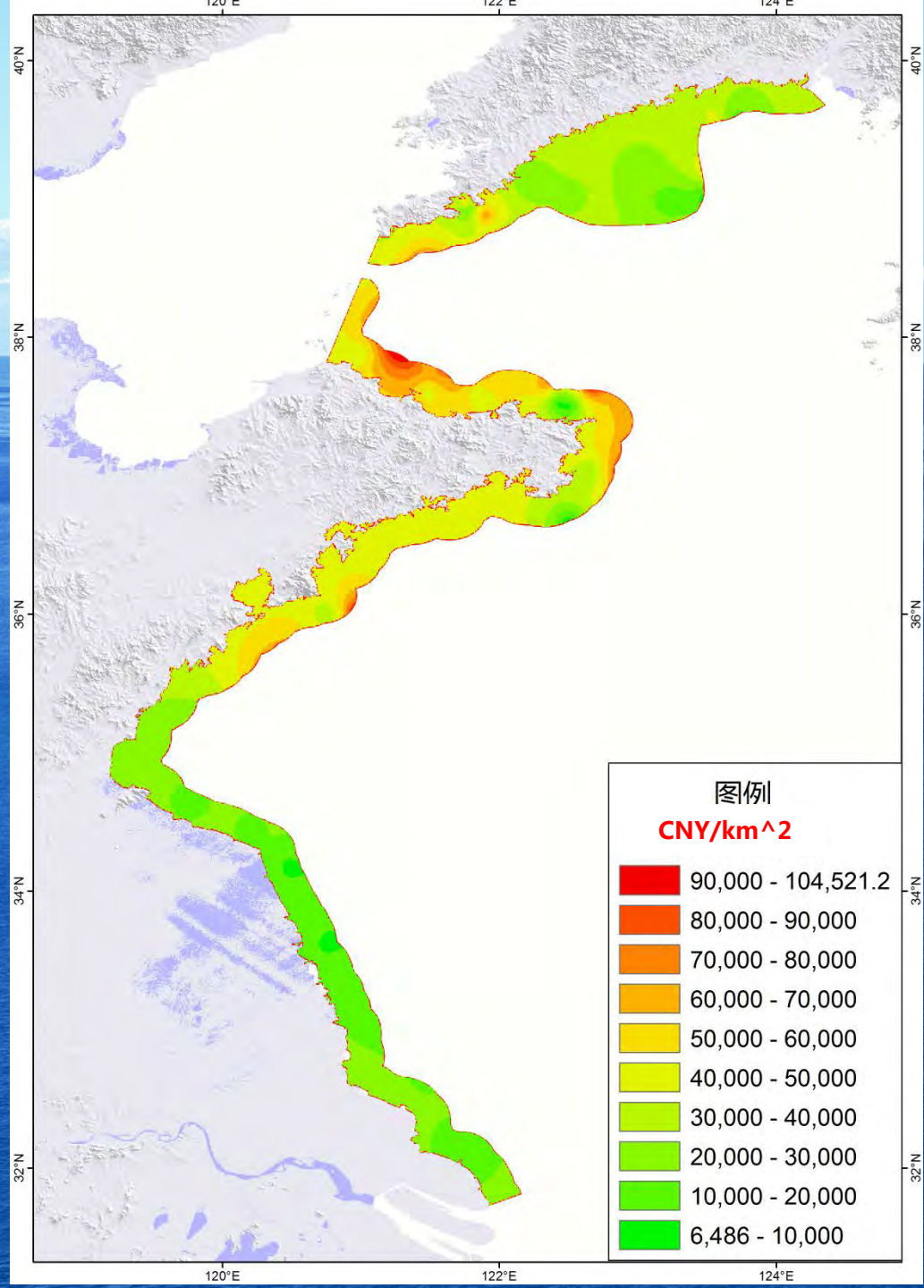
National assessment (2005-2011)

Value of standing stock of coastal living resources



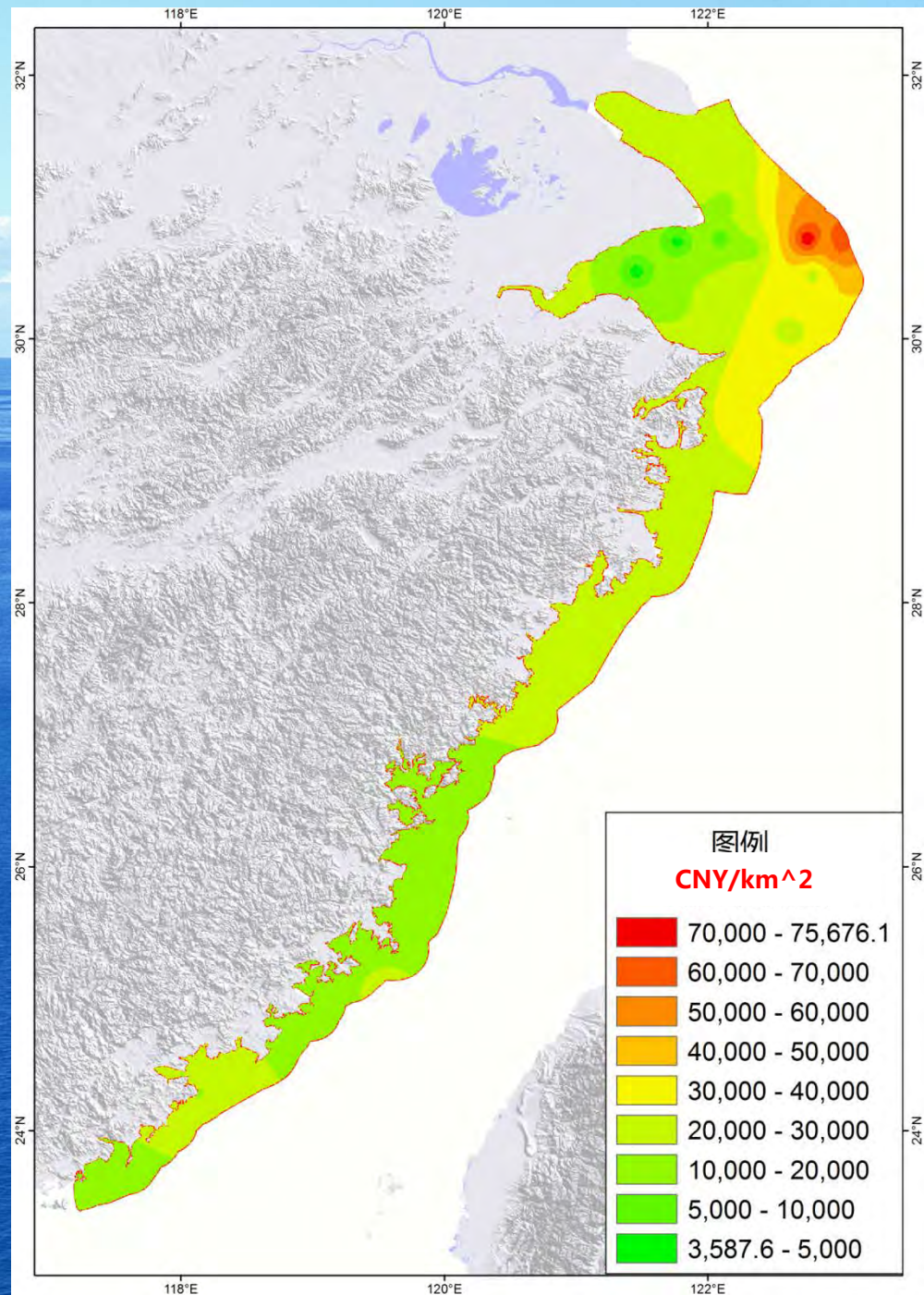
National assessment (2005-2011)

Value of standing stock of
coastal living resources



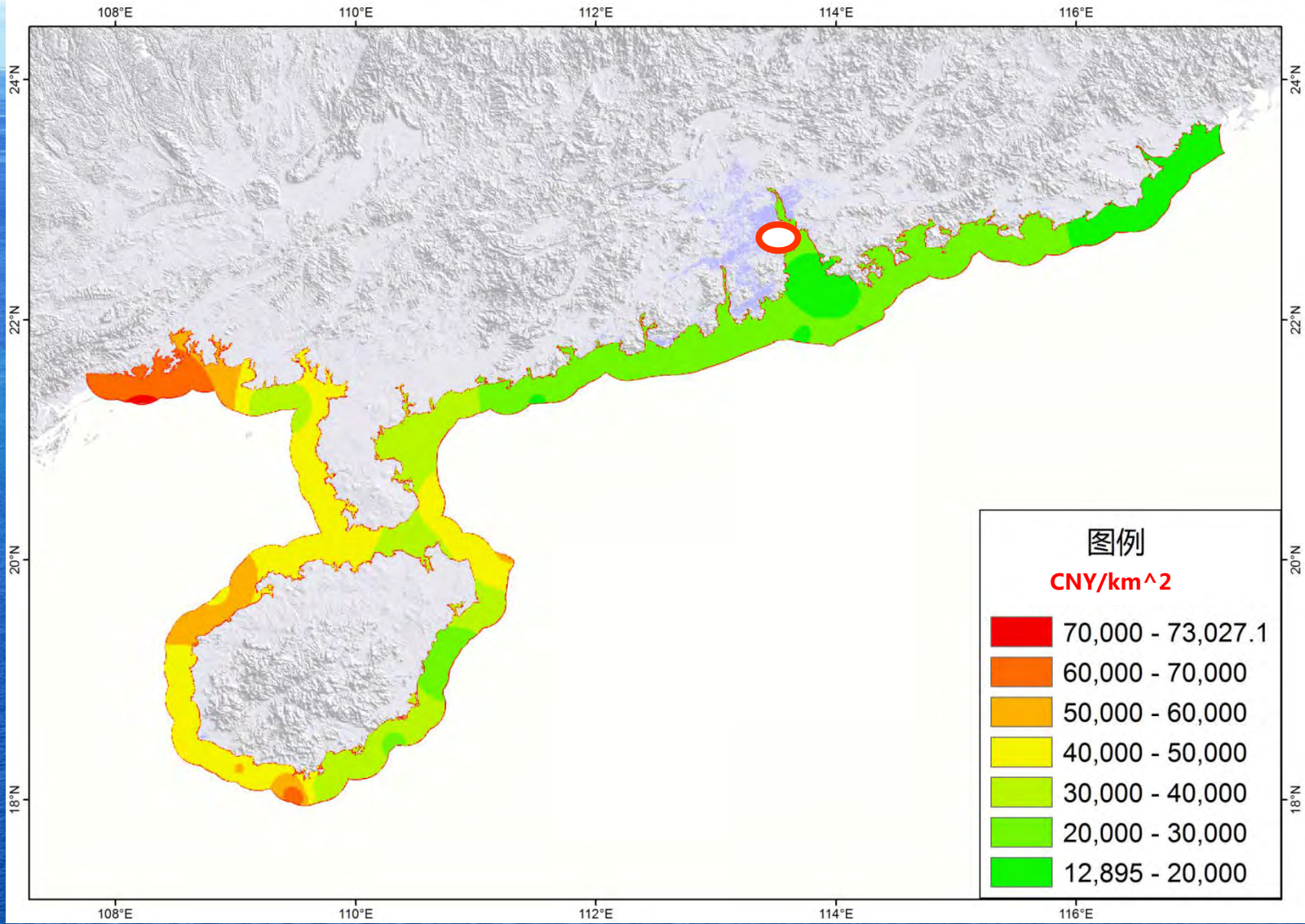
National assessment (2005-2011)

Value of standing stock of
coastal living resources



National assessment (2005-2011)

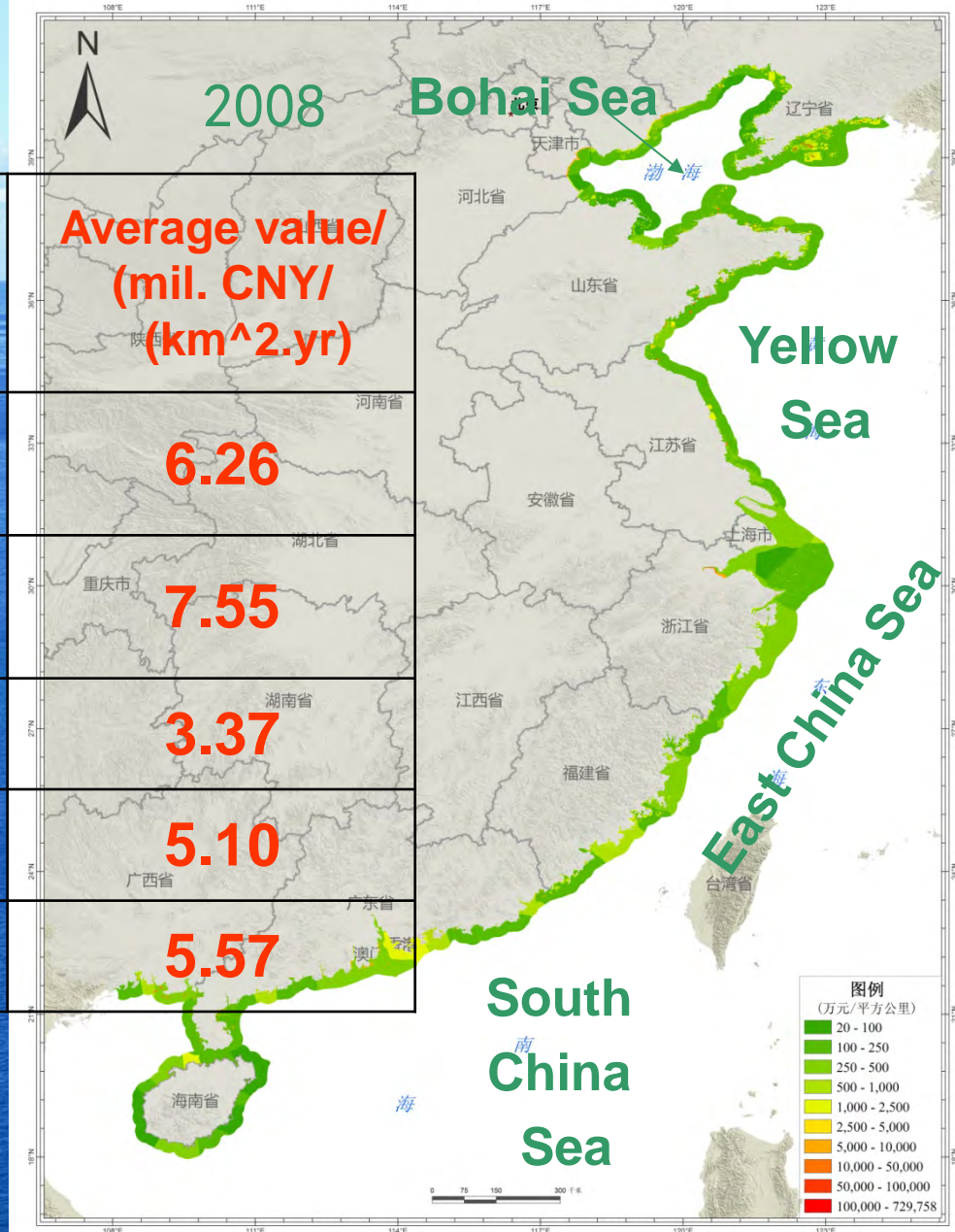
Value of standing stock of coastal living resources



Value of coastal ecosystem services

National assessment (2005-2011)

	Assessed area (km ²)	Total value/ (Billion CNY/yr)
Bohai Sea	34 359	215.2
Yellow Sea	43 541	328.8
ECS	56 719	1 91.4
SCS	58 498	2 98.6
Total	193 119	1 034.1



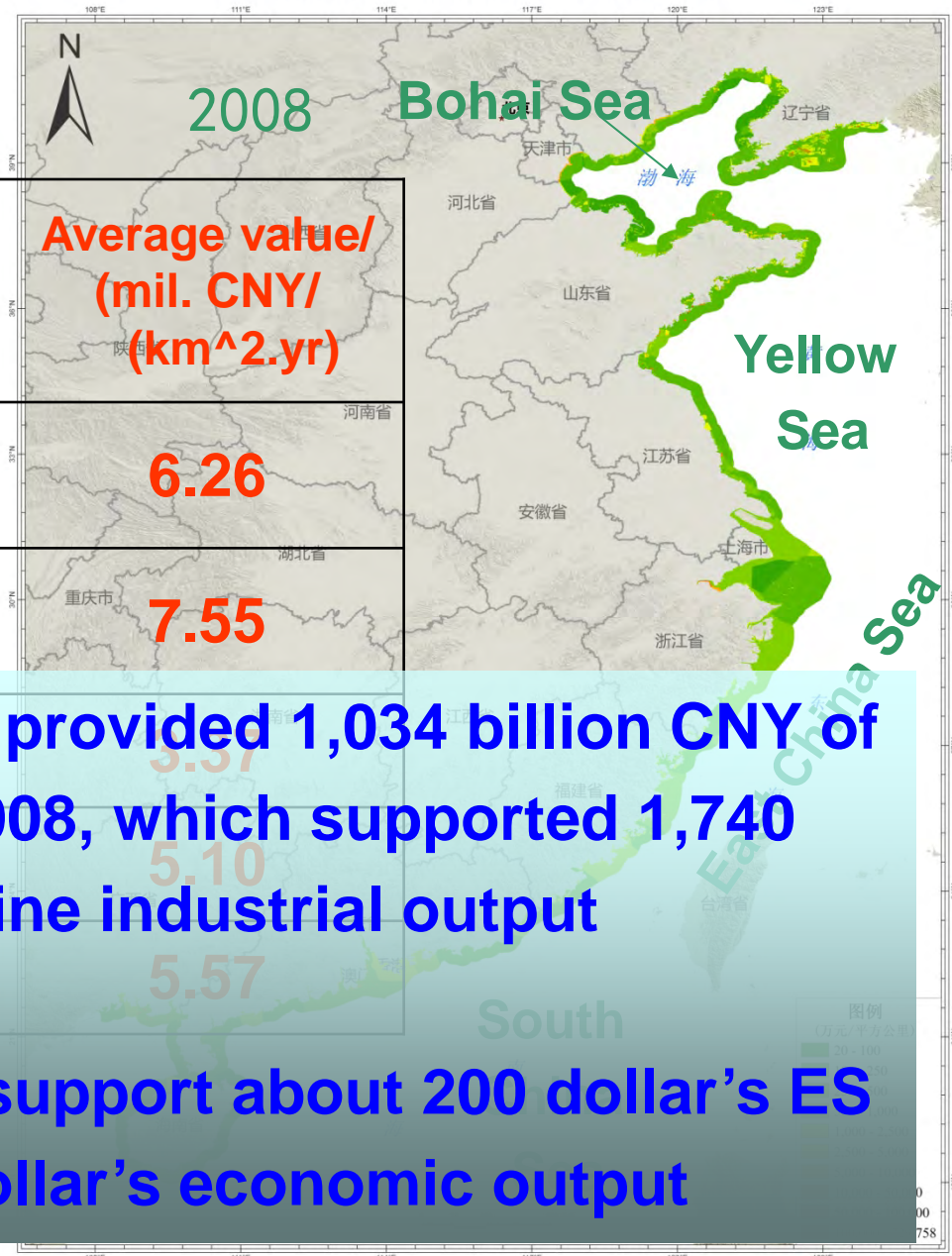
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制图日期: 2011年4月20日

制图单位: 国家海洋局第一海洋研究所
制图人: 夏涛 王敏
审核人: 陈尚

Value of coastal ecosystem services

National assessment (2005-2011)

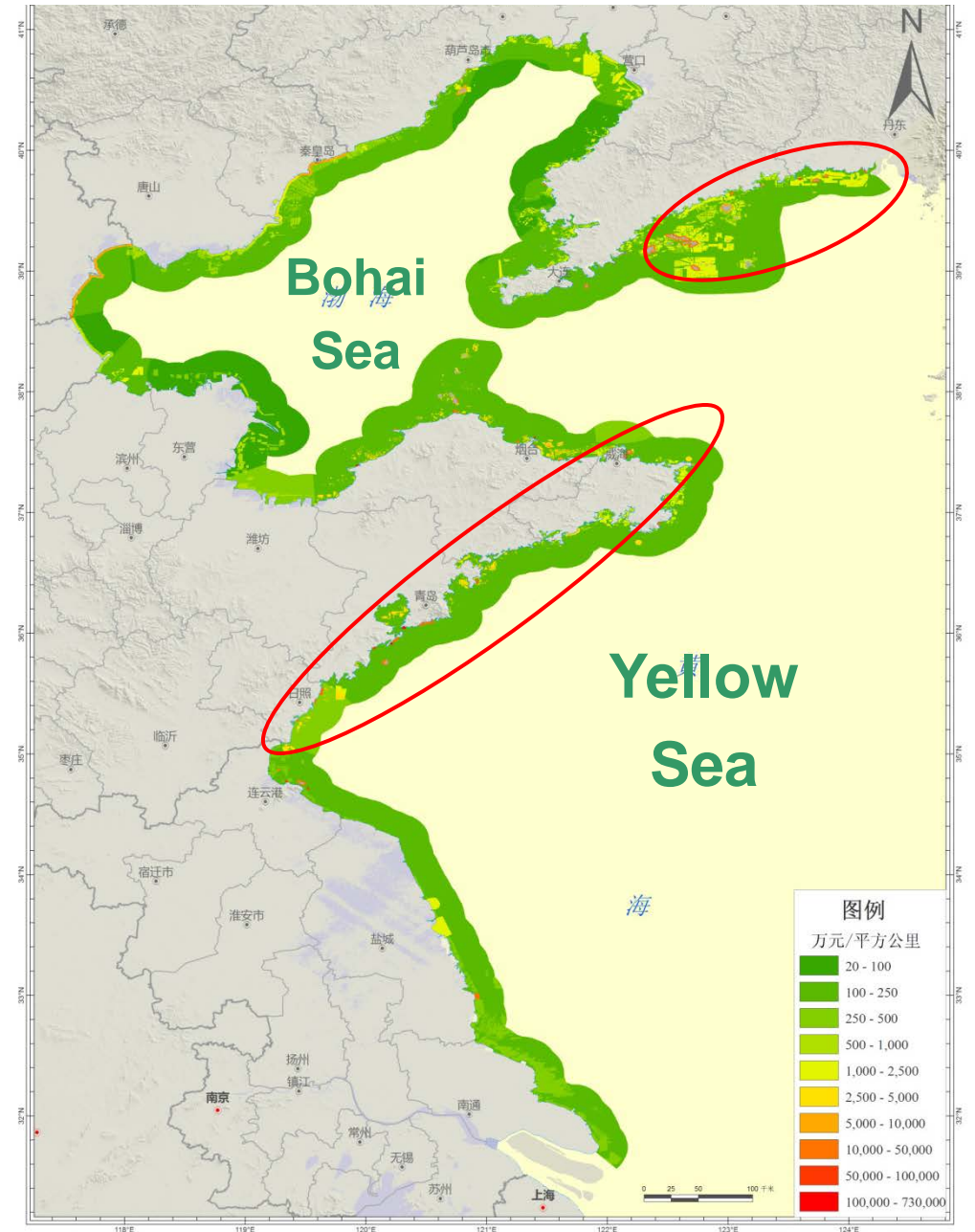
	Assessed area (km ²)	Total value/ (Billion CNY/yr)
Bohai Sea	34 359	215.2
Yellow Sea	43 541	328.8



China's coastal ecosystem provided 1,034 billion CNY of ecosystem services in 2008, which supported 1,740 billion CNY of marine industrial output

One dollar living resources support about 200 dollar's ES
One dollar ES support 1.7 dollar's economic output

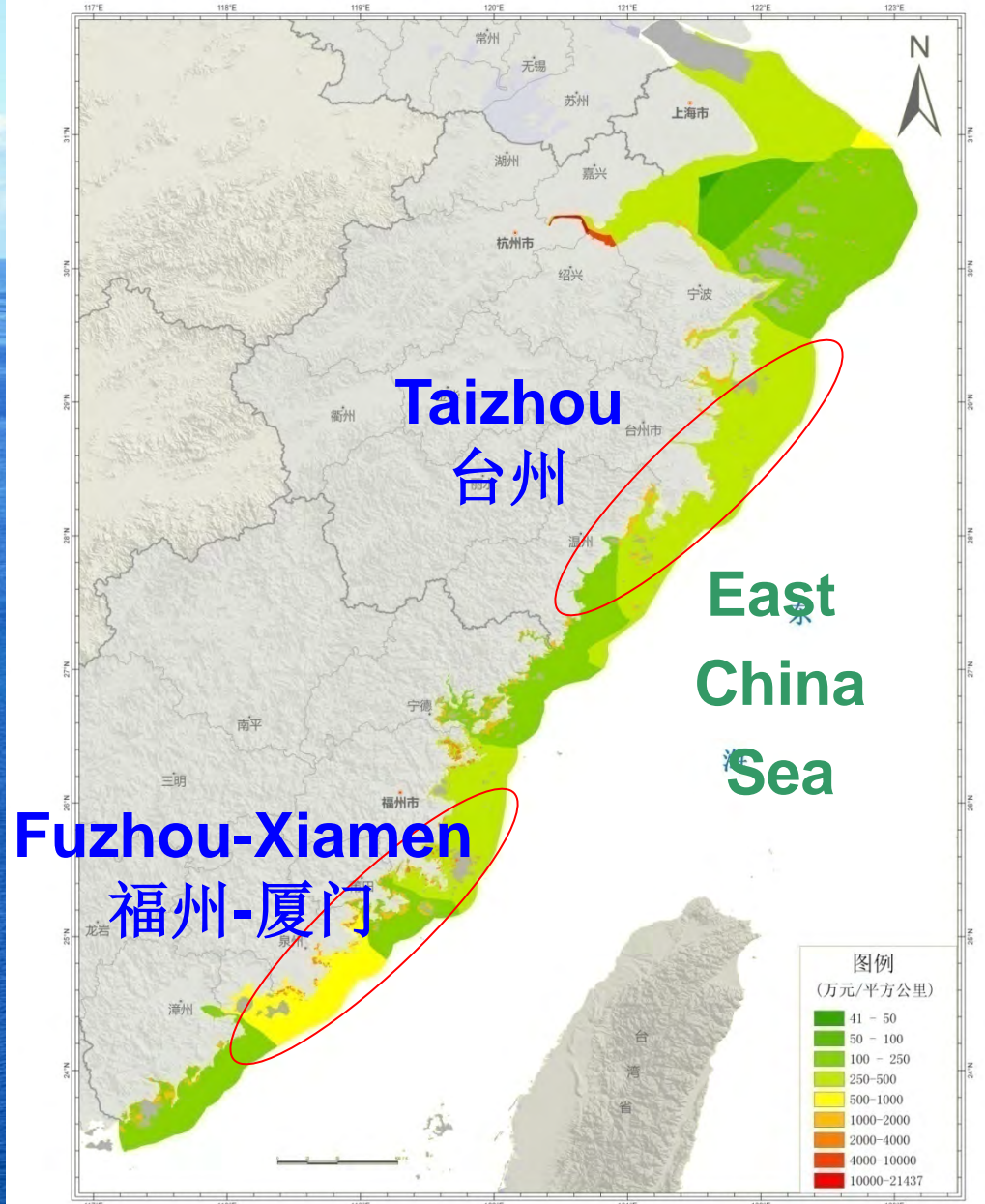
High ecosystem service value zone



坐标系: WGS84坐标系
制图日期: 2011年4月20日

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制图人: 陈尚 夏涛 王敏

High ecosystem service value zone

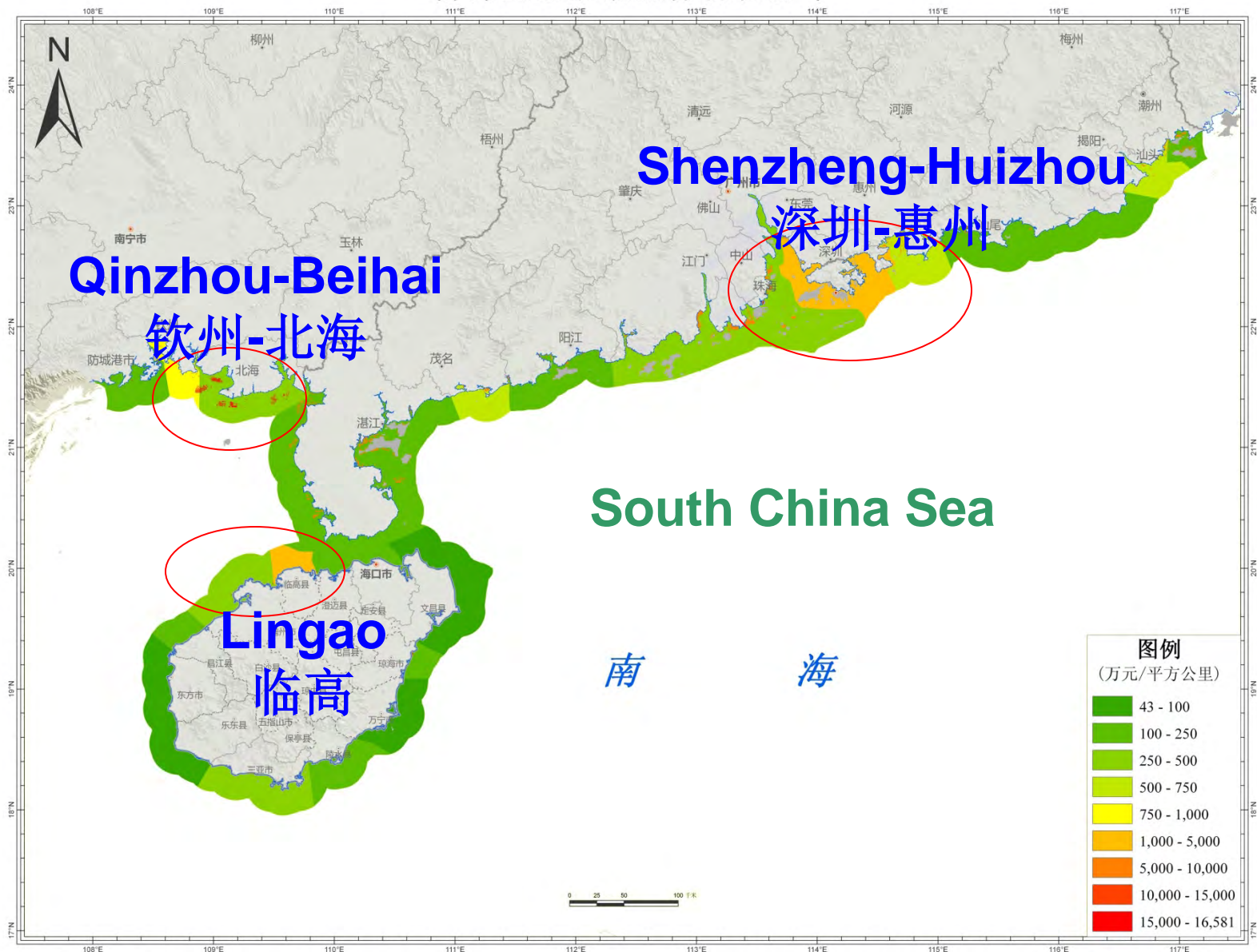


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High ecosystem service value zone

南海生态系统服务价值分布



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制图日期: 2011年4月20日

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制图人: 夏涛 王敏
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4 Management of Marine Ecological Capital

- **Mainstream of MEC into policy-decision**
 - **Payment for ecosystem services in Marine protected Areas & ecological protected red line**
 - paid by upper government to lower government,
 - paid by government in downstream to upstream
 - **Compensation for ecological loss by constructive projects and oil spills etc.**
 - paid by company
 - **Development assessment methodology of marine and fisheries management effectiveness**

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- **Tools development**
 - **InVEST application**
 - **Software for Integrated Ecosystem Services and Trade-offs developed by Stanford Univ. WWF and TNC.**
 - **Management tool for balance the development of natural resources and ecological protection**
 - **Case studies: PICES countries**

5 Investment of Marine Ecological Capital

- **Screening and assessment of current investment model:**
 - **Artificial reef, marine ranching, Integrated Trophic Multiple-Aquaculture (ITMA)**
 - **Stock enhancement of fisheries resources**
 - **Marine Protected Area**
 - **Ecological restoration, pollution treatment**
 - **Coastal and island tourism industry**
 - **Recreational and leisure fishing, diving**
 - **Others**

5 Investment of Marine Ecological Capital

- **Development of new investment model**
 - Carbon-sink industries (by ocean, shellfish aquaculture, mangrove, capture & stored in deep ocean & empty oilfield tunnel)
 - CO₂ emission market
 - REDD+ (Marine forest plan)
 - Financial involvement
 - No-Taxation policy
 - green credit and loan policy

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- **Develop institutions to guarantee for commercial investment of MECI**
 - MEC value accounting
 - MEC property management & transaction
 - MEC compensation
 - MEC insurance
 - MEC investment fund
 - Others

Take-home messages

1. Marine ecological resources is worthy to value in mass and money
2. Marine environmental protection is profitable rather than money-consuming
3. Valuation and management of MEC will become one of the core objectives of science and policy.