

Technical Assistance for Cadastre Integration, Natural Resources Valuation and Resilient Planning in Cities

International Workshop
Oct 2024

Singapore:

Valuation of Marine & Coastal Ecosystems in Urban Areas

在城市地区的海洋和沿海生态系统估值

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International Workshop

基于综合地籍的城市自然资源评价与韧性评估国际研讨会

Technical Assistance for Cadastre Integration,
Natural Resources Valuation And Resilient Planning In Cities

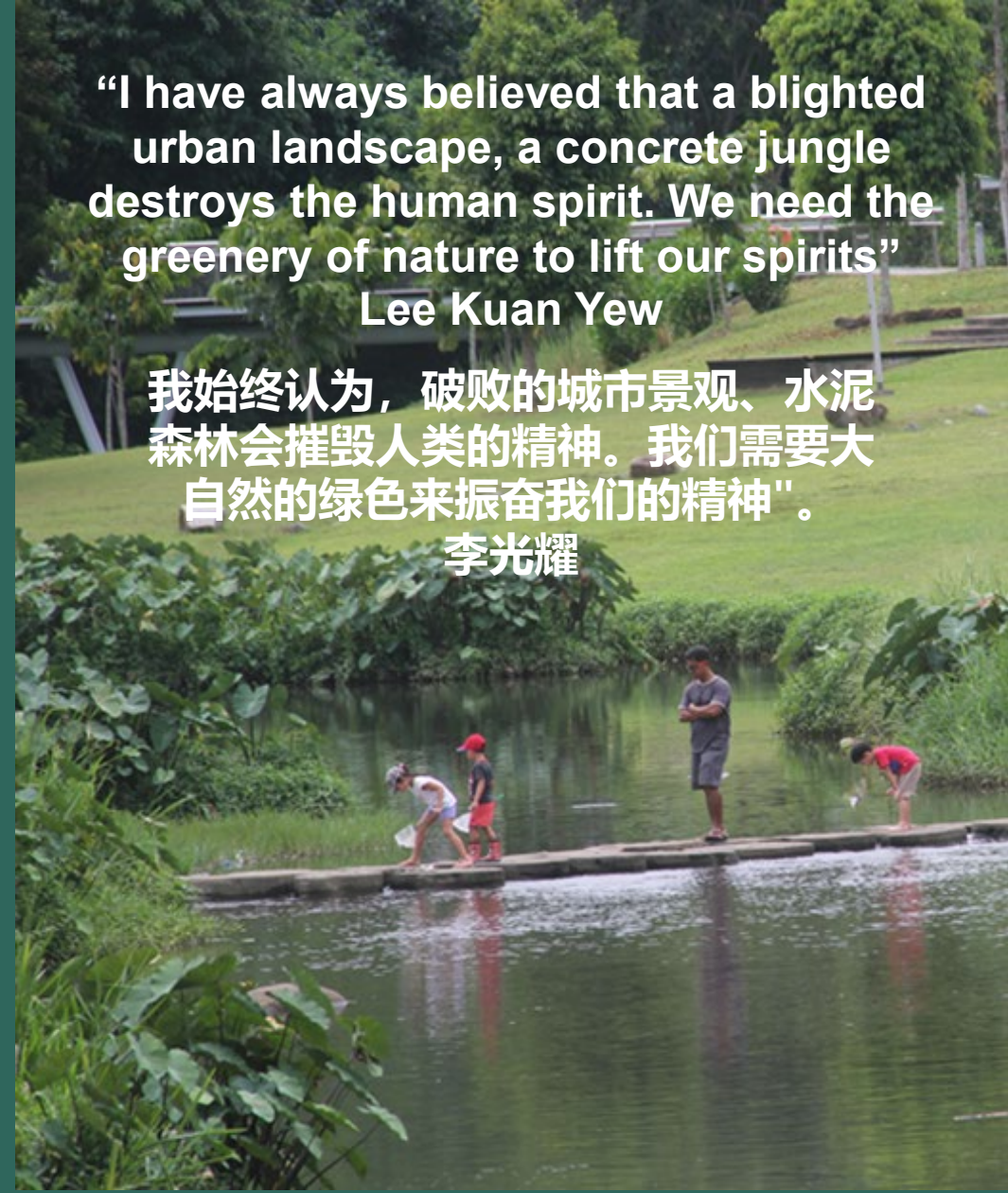
Oct 2024

“I have always believed that a blighted urban landscape, a concrete jungle destroys the human spirit. We need the greenery of nature to lift our spirits”

Lee Kuan Yew

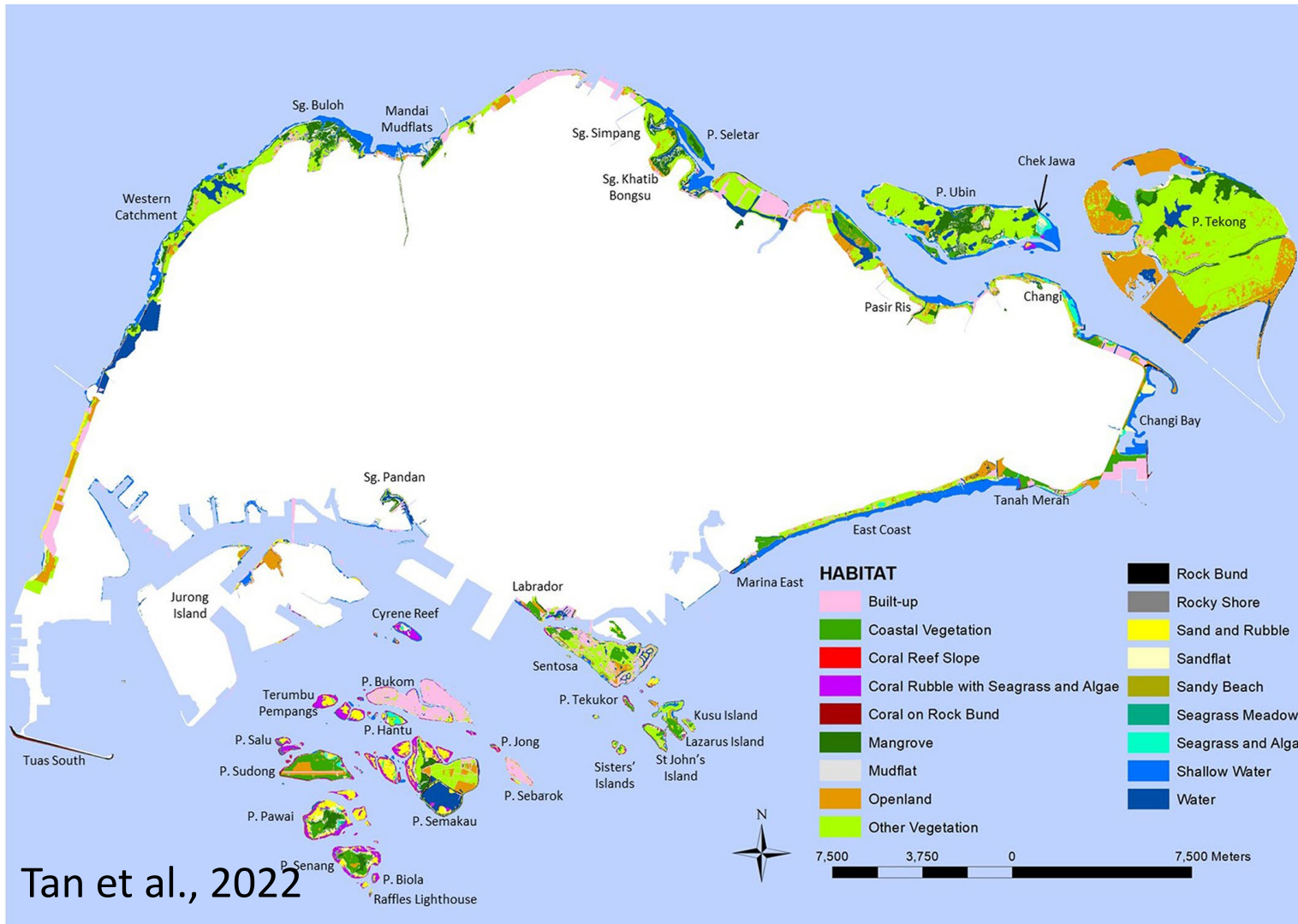
我始终认为，破败的城市景观、水泥森林会摧毁人类的精神。我们需要大自然的绿色来振奋我们的精神”。

李光耀



Singapore's marine and coastal ecosystems

新加坡的海洋和沿海生态系统



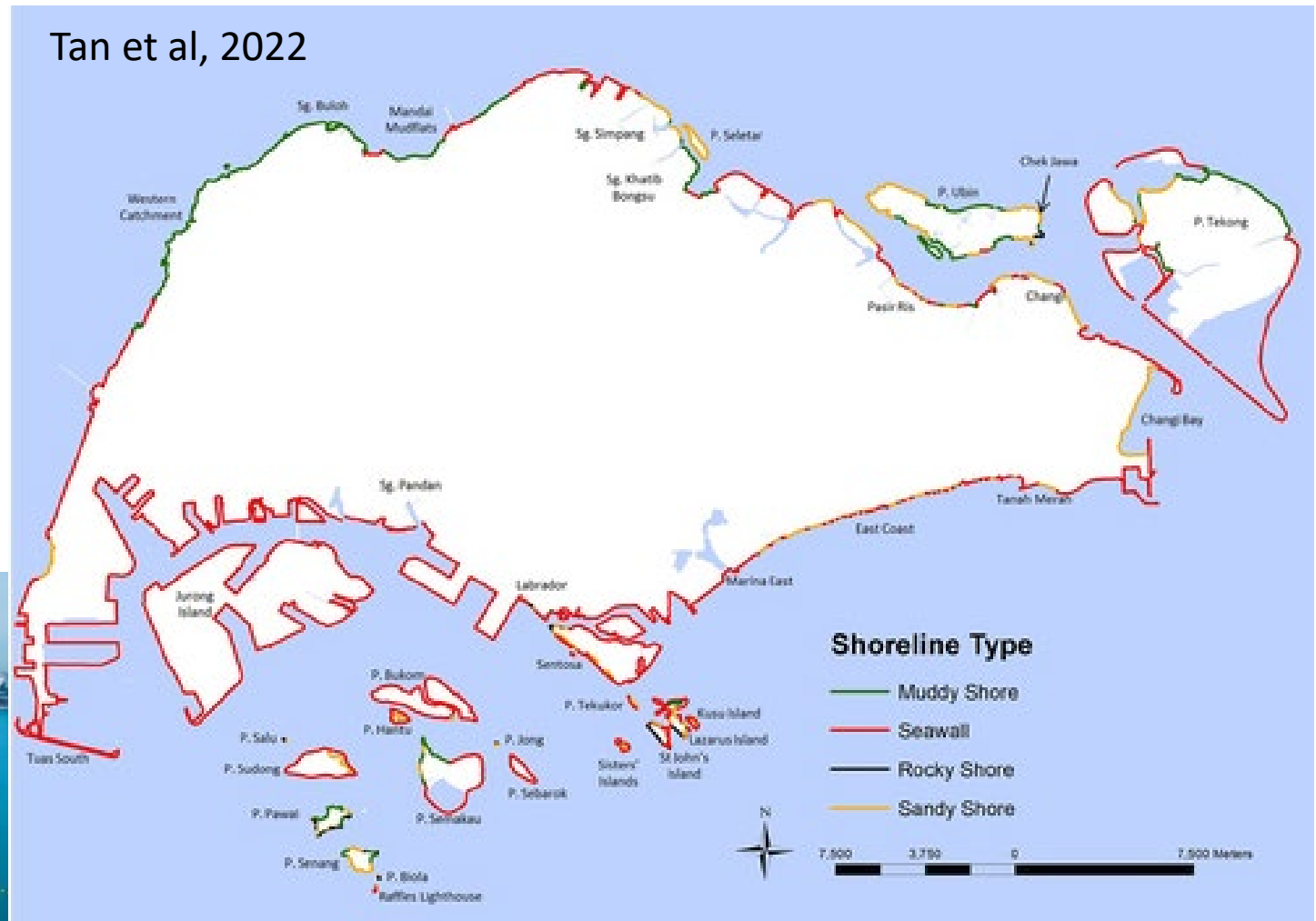
Tan et al., 2022

- Singapore highly values what resources it does have, such as biodiversity and natural capital, water resources, and urban green and blue spaces.
新加坡高度重视其所拥有的资源，如生物多样性和自然资本、水资源以及城市绿色和蓝色空间。
- Despite its small land area, Singapore's diverse coastal and marine habitats support a rich diversity of species
尽管陆地面积小，但新加坡多样的沿海和海洋栖息地支持着丰富的物种多样性
- Includes 50% of global mangrove species, 20% of global seagrass species, and 30% of global scleractinian species
包括全球 50% 的红树林物种、全球 20% 的海草物种和全球 30% 的硬骨鱼类物种

Coastline under threat?

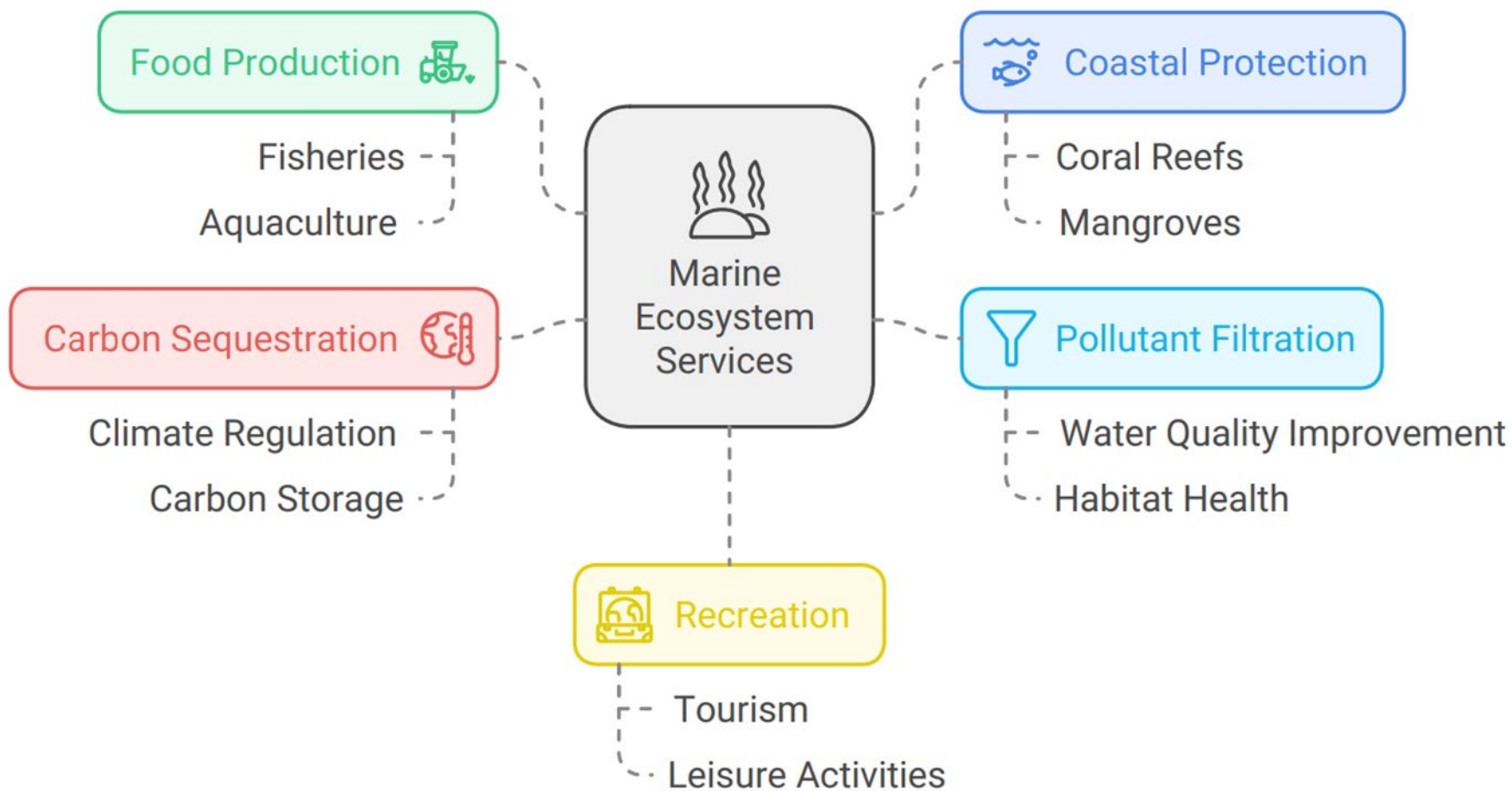
海岸线受到威胁?

- Rapid urbanisation 快速城市化
- Changing coastline over time
随时间变化的海岸线
- Economic activities such as a busy port
繁忙港口等经济活动
- 62% engineered seawall 62% 人工海堤



Marine and coastal ecosystem services

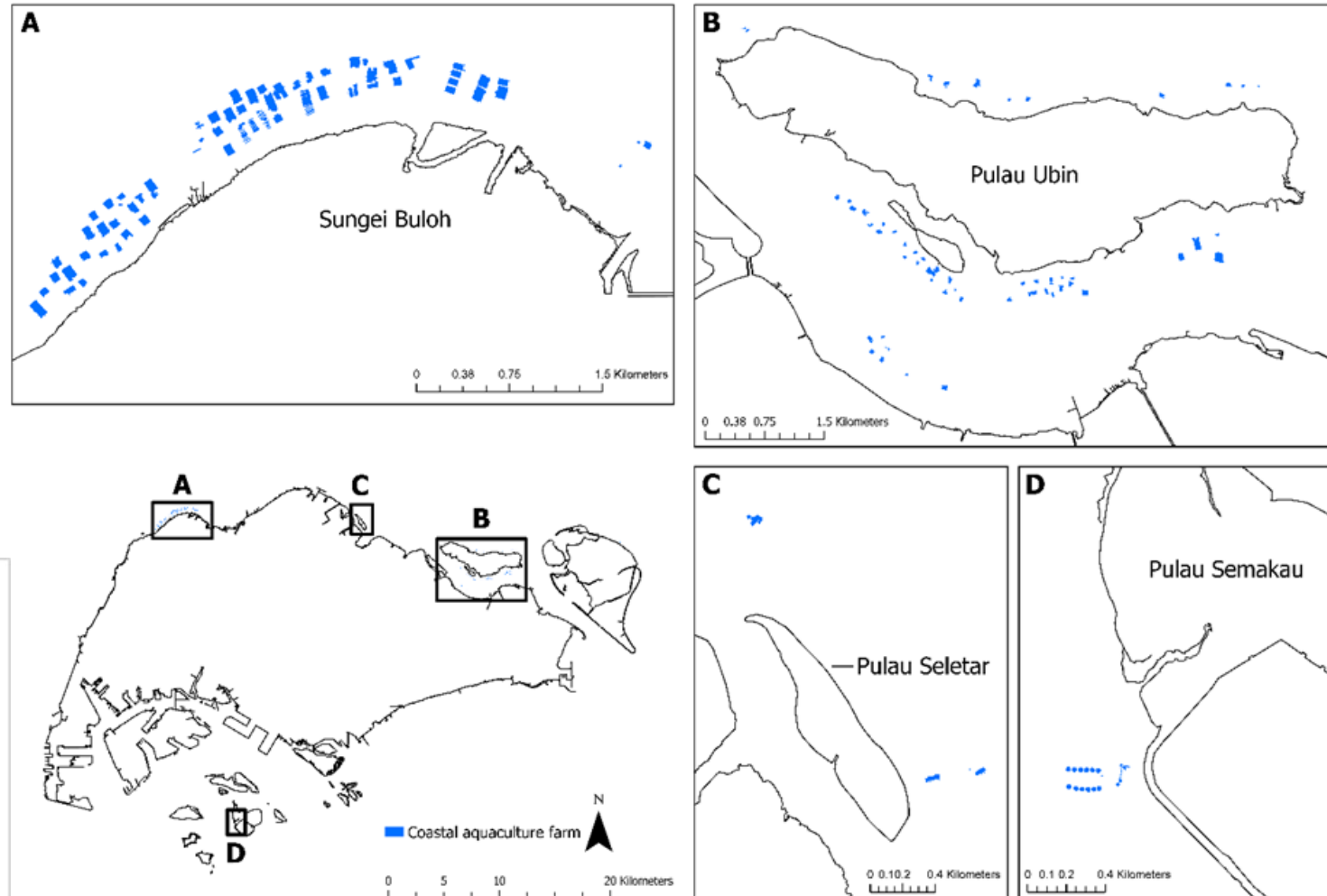
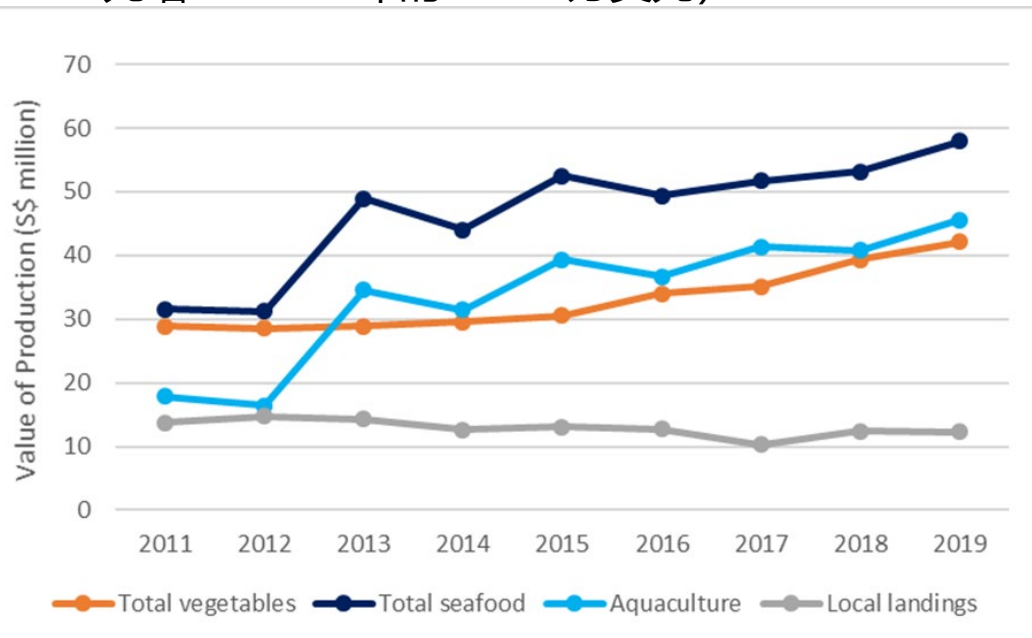
海洋和沿海生态系统服务



Valuation- provisioning services 估价 – 提供的服务

Aquaculture 水产养殖

- Production of farmed fish has risen from 3,566 tonnes in 2009 to 5,218 tonnes in 2018.
养殖鱼类产量从 2009 年的 3566 吨增加到 2018 年的 5218 吨
- Aquaculture has seen a shift in focus to cultivation of high-value species which has nearly doubled the revenue (from \$21.5 million in 2009 to \$41.4 million in 2018).
- 水产养殖的重点已转向高价值物种的养殖，这使得收入几乎翻了一番（从 2009 年的 2150 万美元增至 2018 年的 4140 万美元）



Distribution of Singapore's coastal fish farms in 2019
2019 年新加坡沿海养鱼场分布情况

Value of food production in Singapore from 2011 to 2019. (SFA 2020)
2011 至 2019 年新加坡食品生产价值。(SFA 2020)

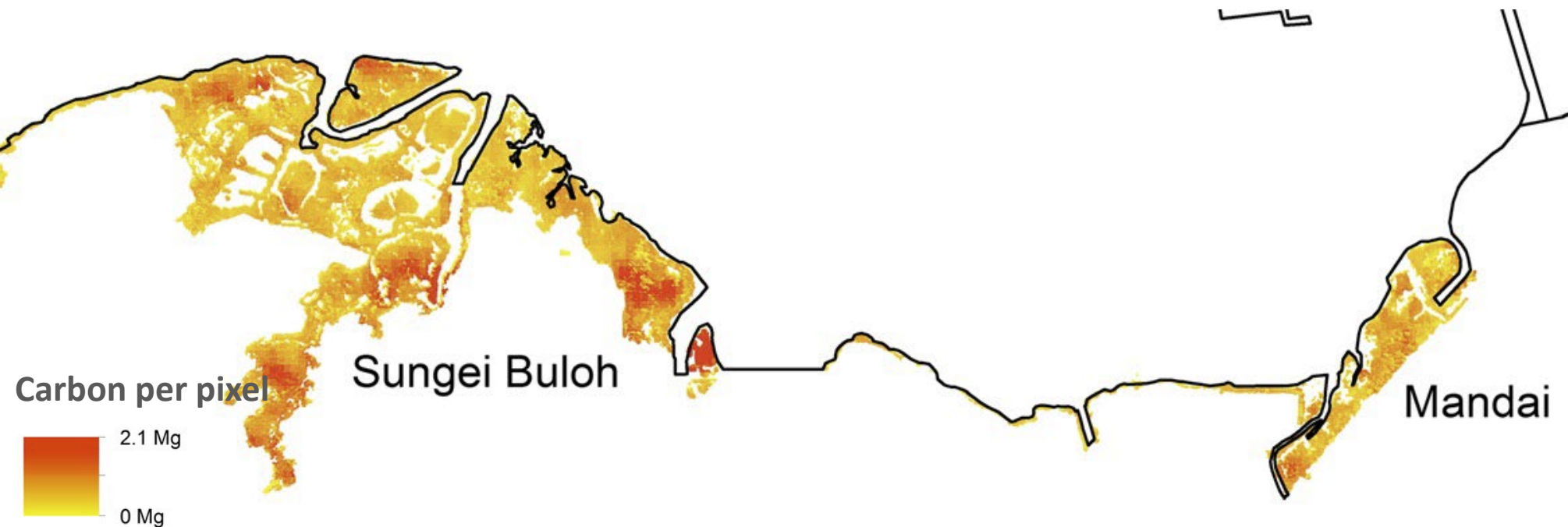
Valuation- regulating services 估价--监管服务

Carbon 碳

- Singapore's total carbon stock is 7923 Gt CO₂e (2158.8 Gt C) across all ecosystems, total sequestration rate across all ecosystems is 377 Gt CO₂e per year. When valued using Singapore's carbon tax mechanism, equates to ~6-9 million per year
新加坡所有生态系统的总碳储量为 7923 Gt CO₂e (2158.8 Gt C) ， 所有生态系统的总固存率为每年 377 Gt CO₂e。如果使用新加坡的碳税机制进行估算，相当于每年约 600-900 万美元

Coastal Protection 海岸保护

- Singapore's mangroves can reduce wave height by >75% across only 250m of mangrove. Over 60% of Singaporeans perceive protection from coastal risk to be important
仅 250 米长的红树林可将的波浪高度降低 75% 以上。超过 60% 的新加坡人认为保护海岸免受风险非常重要



Friess et al., 2016

Valuation- cultural services 估价--文化服务

Recreation 娱乐

- A significant ES for Singaporeans- 91% stated it as very or extremely important. On average WTP is \$S17-19 per month for recreational opportunities at coastal parks
新加坡人对ES的重视程度很高—91%的人认为ES非常重要或非常重要。新加坡人平均每月愿意支付17-19新元去沿海公园的休闲活动。
- Artistic inspiration associated with sea view aesthetics. 与海景美学相关的艺术灵感
- Marine biodiversity such as corals and fish were identified as being important
珊瑚和鱼类等海洋生物多样性被认为非常重要



Integration into management and policy 纳入到管理和政策里

- Singapore's Green Plan 2030: Emphasis on coastal protection & carbon sequestration
新加坡 2030 年绿色计划：强调海岸保护和碳封存
- Marine Protected Areas: Sisters' Islands Marine Park
海洋保护区：姊妹岛海洋公园
- Sustainable Singapore Blueprint: Long-term vision to balance development and sustainability
可持续发展的新加坡蓝图：平衡发展与可持续性的长期愿景
- Coastal protection strategies, such as the Coastal and Flood Protection Fund established in 2020 (SGD 5 billion).
海岸保护战略，如 2020 年设立的海岸和洪水保护基金（50 亿新元）
- The URA Masterplan for all development initiatives
市建局为所有发展计划制定的总体规划
- Singapore Blue Plan: Grassroots response to the Green Plan
新加坡蓝色计划：基层对绿色计划的回应
- Integrating biodiversity into land reclamation projects (nature-inclusive designs). 将生物多样性纳入填海造地项目（自然融合设计）



Challenges for valuing urban marine and coastal areas

城市海洋和沿海地区估值面临的挑战

- Data on these ecosystems can be limited, and many services are difficult to quantify
有关这些生态系统的**数据可能有限，许多服务难以量化**
- Managing land use trade-offs between urban development and ecosystem protection
管理城市发展与生态系统保护之间的土地利用权衡
- Successful holistic management requires coordination between government agencies and public buy-in
成功的整体管理需要政府机构之间的协调以及公众的支持

Lessons learned from SG 从新加坡汲取的经验教训

1. It is essential to integrate marine conservation into urban planning. **必须将海洋保护纳入城市规划中**
2. Valuing marine and coastal ecosystem services helps balance development with sustainability.
重视海洋和沿海生态系统服务有助于平衡发展与可持续性
3. Blue carbon strategies are crucial for both carbon sequestration and coastal protection.
蓝碳战略对于碳固存和海岸保护都至关重要

Conclusion 结论

- Marine and coastal ecosystems play a vital role in supporting urban sustainability and resilience.
- Singapore demonstrates that even in highly urbanised settings, it's possible to balance development with conservation.
- By quantifying these resources—whether through economic assessments or policy frameworks—we can ensure they continue providing essential services.
- Citizens appreciate of both use and non-use benefits provided by marine and coastal areas.
- Cities like Zhuhai could apply similar strategies to manage urban growth while protecting the environment
- 海洋和沿海生态系统在支持城市可持续性和复原力方面发挥着至关重要的作用。
- 新加坡的实践证明，即使在高度城市化的环境中，也有可能的发展与保护之间取得平衡。
- 通过量化这些资源（无论是通过经济评估还是政策框架），我们可以确保它们继续提供基本服务。
- 市民对海洋和沿海地区提供的使用和非使用效益都非常感激。
- 珠海等城市可以采用类似的策略，在保护环境的同时管理城市发展。