

HARNESSING URBAN NATURAL CAPITAL

A TROPICAL CITY CASE STUDY

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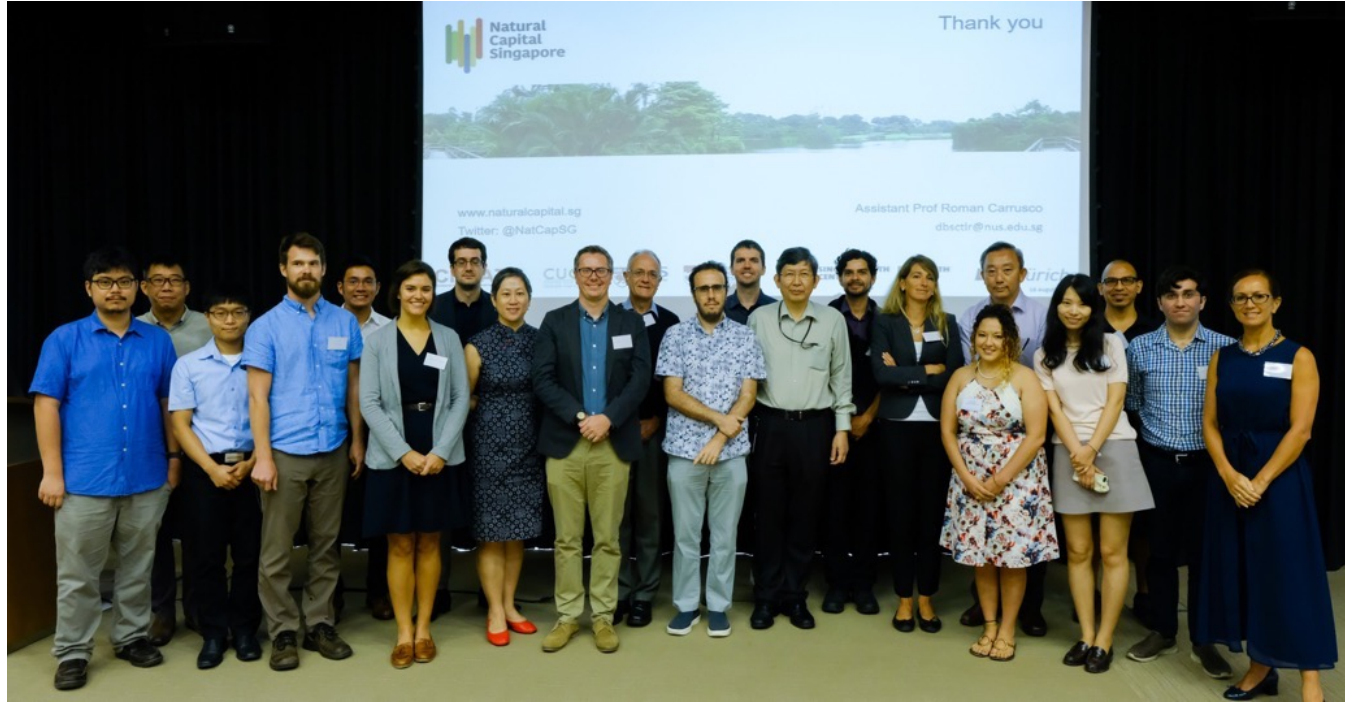
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ACKNOWLEDGEMENTS



Natural Capital Singapore



The Mangrove Lab, Department of Geography, National University of Singapore



(SEC) SINGAPORE-ETH CENTRE

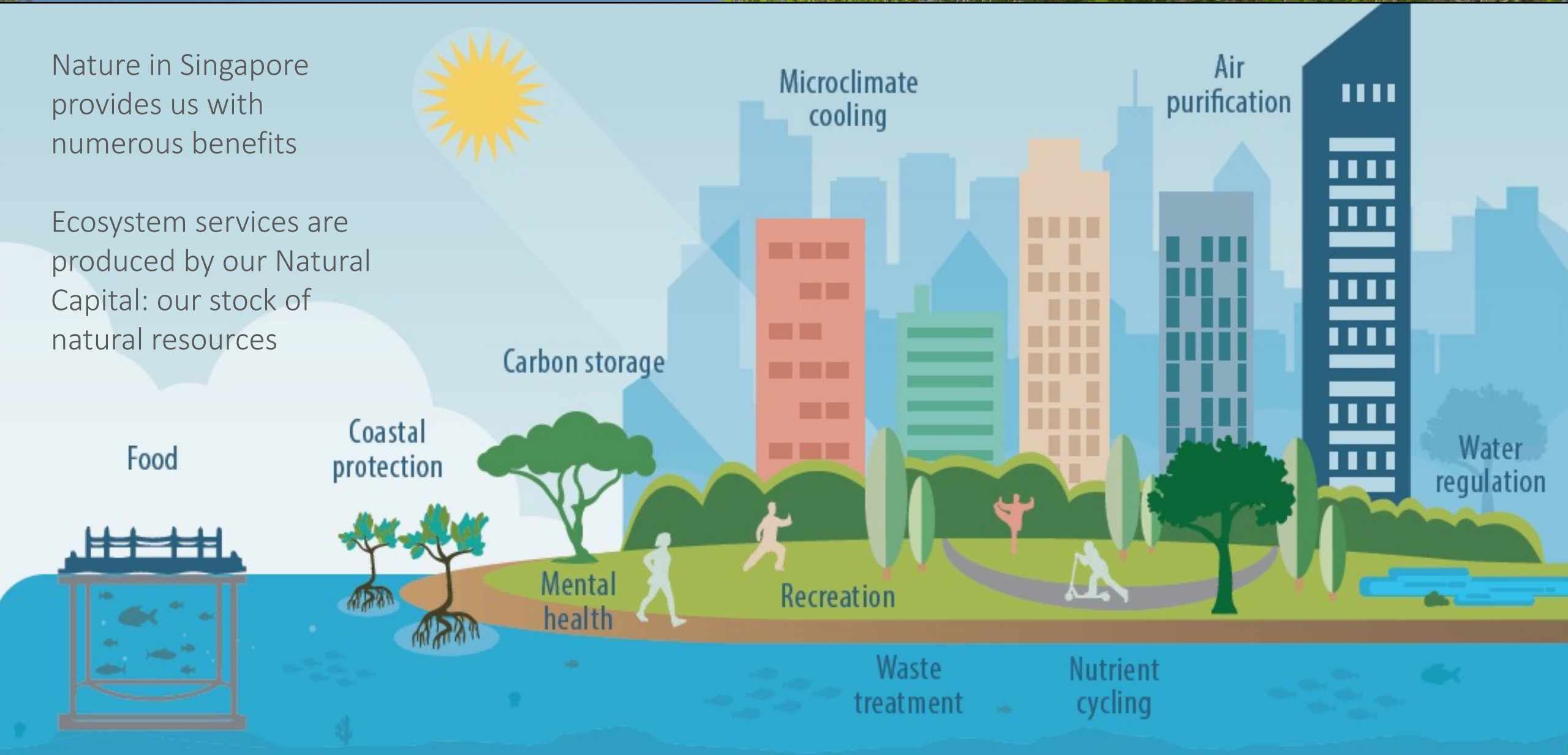
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WHAT IS URBAN NATURAL CAPITAL?

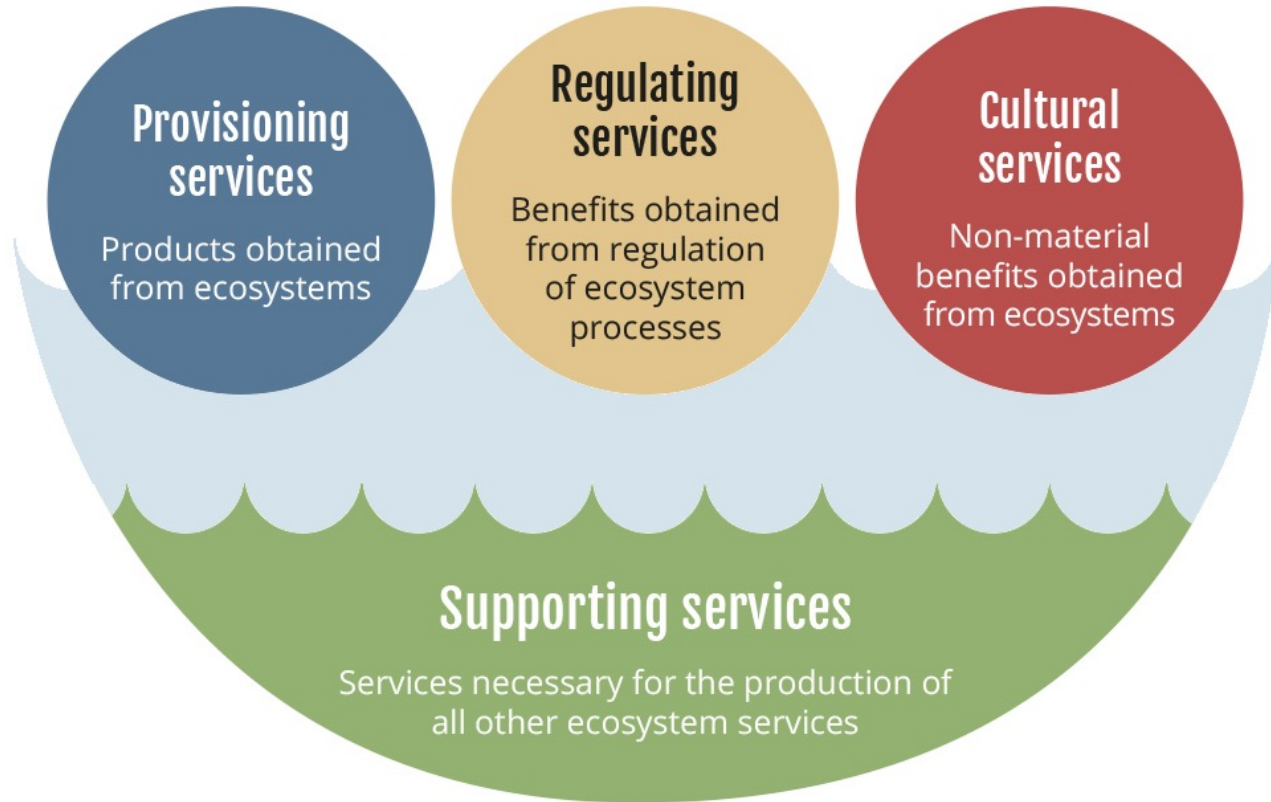
Nature in Singapore provides us with numerous benefits

Ecosystem services are produced by our Natural Capital: our stock of natural resources



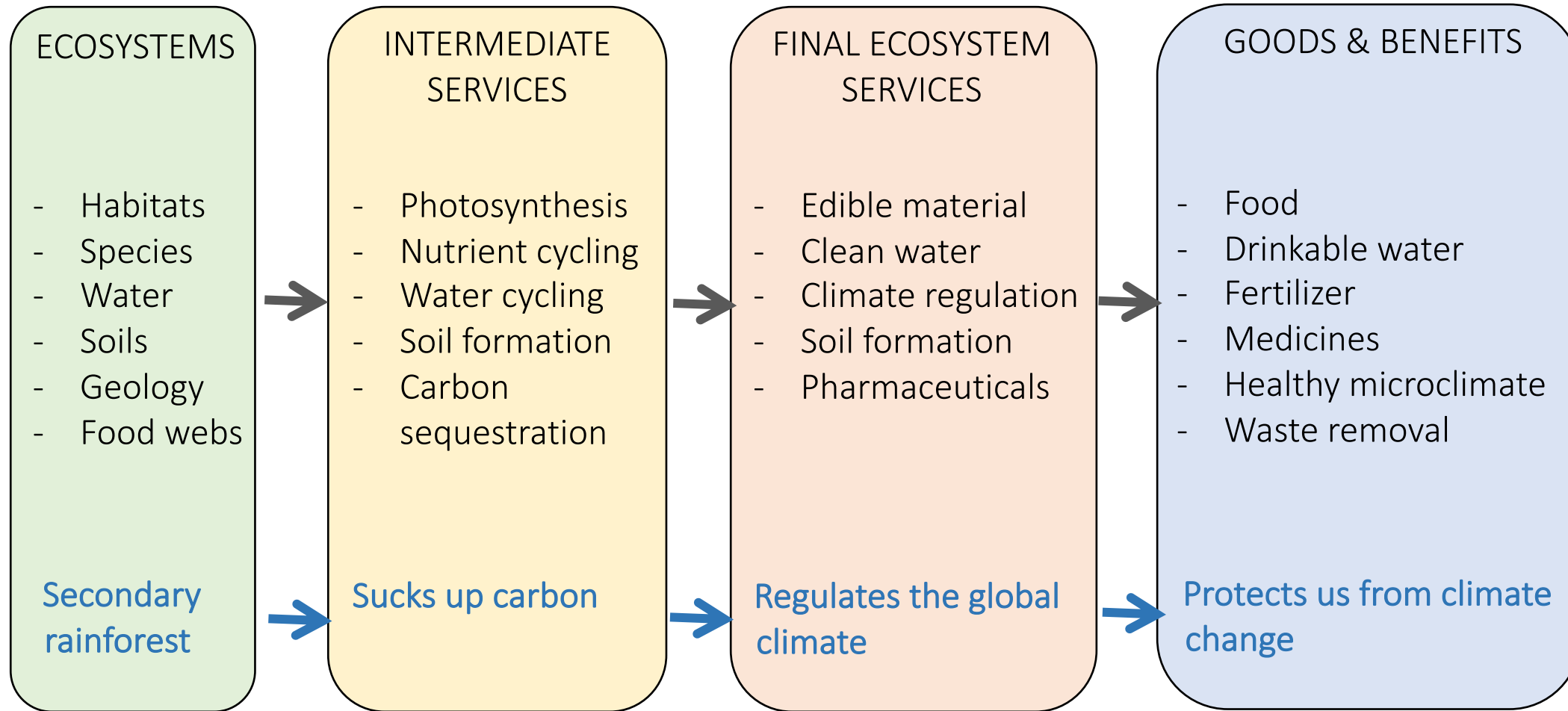
WHAT IS AN ECOSYSTEM SERVICE?

ECOSYSTEM SERVICES



An ecosystem service is a direct or indirect benefit that the environment provides to people

WHAT IS AN ECOSYSTEM SERVICE?



WHAT IS AN ECOSYSTEM SERVICE?



'a reserve is kept round the principal hill [of Bukit Timah] for climatic purposes' J.F.A. McNair, Engineer, 1879



Friess 2017. *Urban Ecosystems* 20, 277-291.



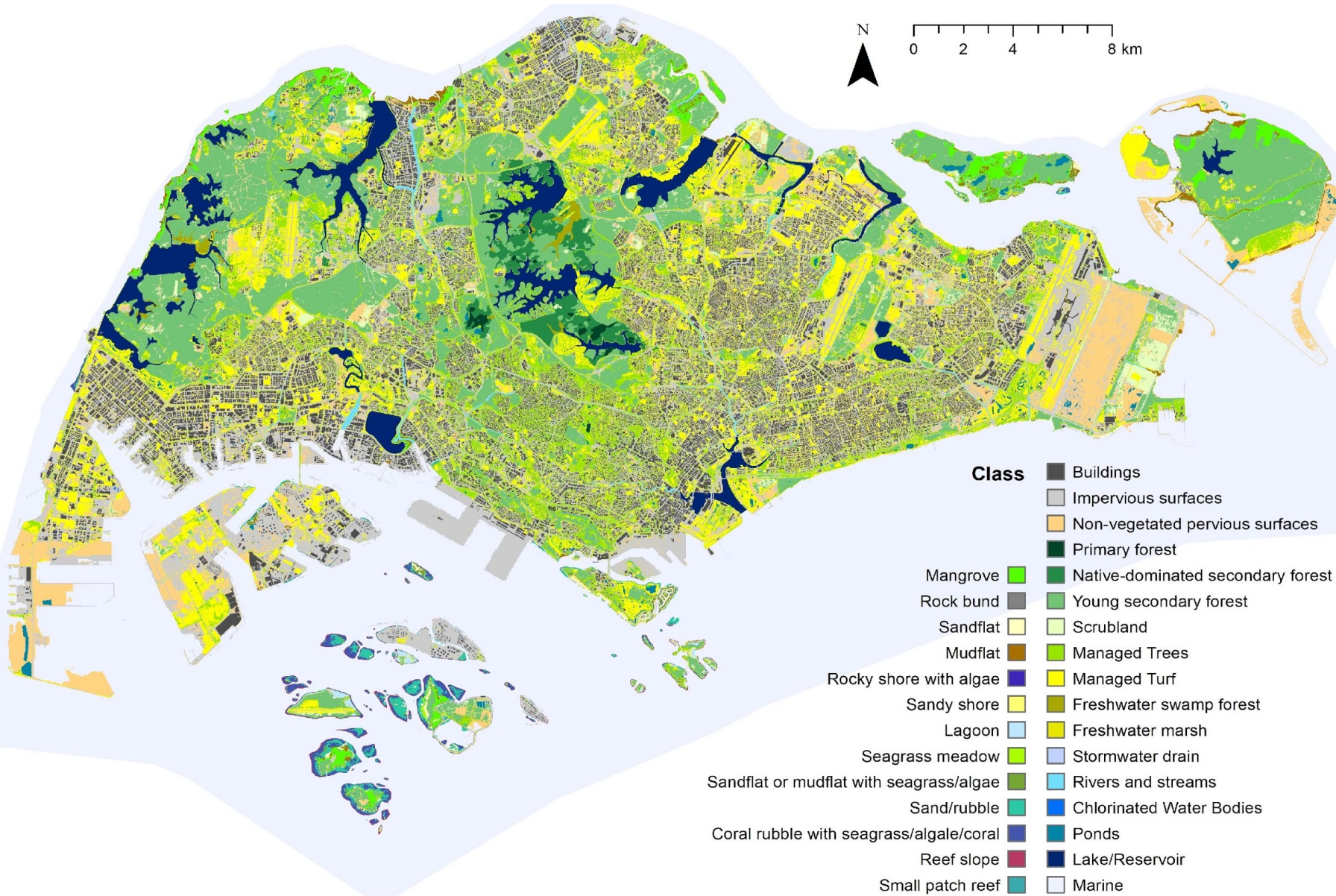
Watershed protection



Tourism

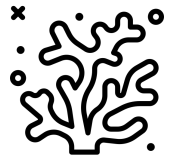
How can we measure and value the benefits of Singapore's natural capital and ecosystem services today?

Q1 – WHERE IS OUR NATURAL CAPITAL?

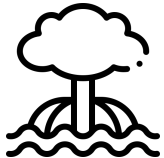


Marine data from National Parks Board
 Terrestrial data from Gaw et al. 2019 Data 4, 116.

Q2 - WHAT IS OUR NATURAL CAPITAL PROVIDING?



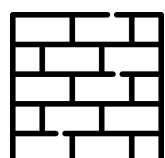
Coral reefs



Mangroves



Beaches



Sea walls



Seagrasses



Tidal flats



Open water



Secondary forest



Primary forest



Shrubland



Green buildings



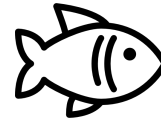
Rivers



Lakes and reservoirs

ECOSYSTEMS

ECOSYSTEM SERVICES



Food provision



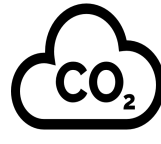
Transport space



Energy



Temperature regulation



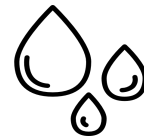
Climate regulation



Noise abatement



Air quality regulation



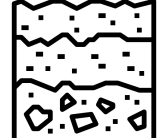
Water quality regulation



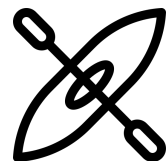
Runoff retention



Coastal protection



Erosion control



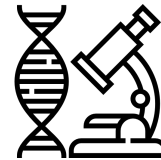
Recreation



Health & wellbeing



Education



Scientific value



Cultural heritage



Artistic inspiration

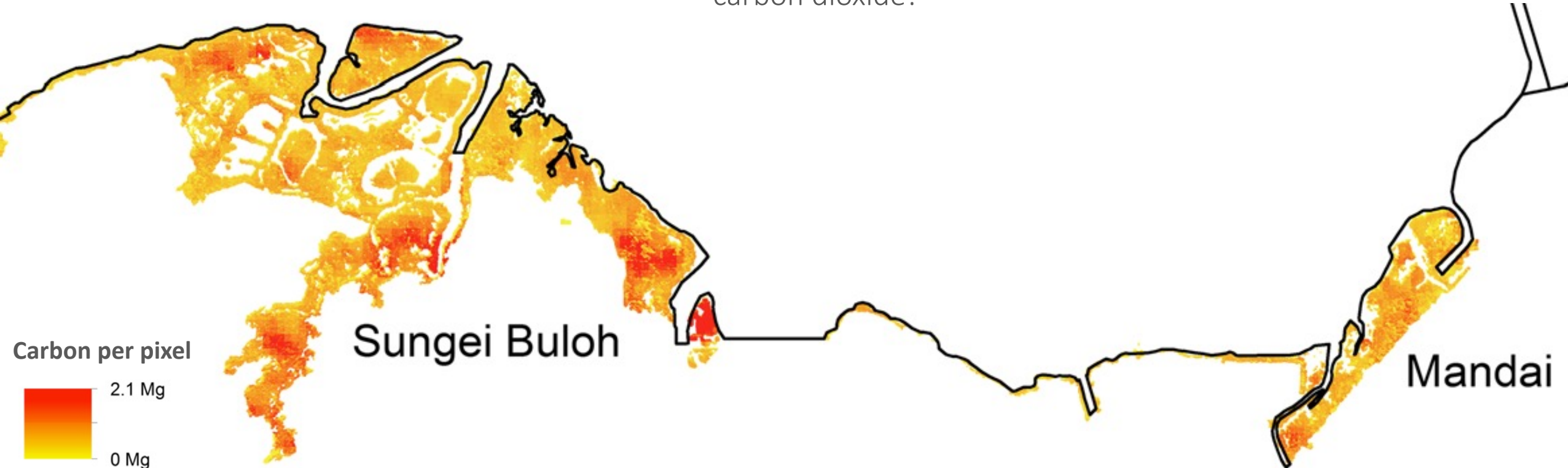
GLOBAL CLIMATE REGULATION

Why important?

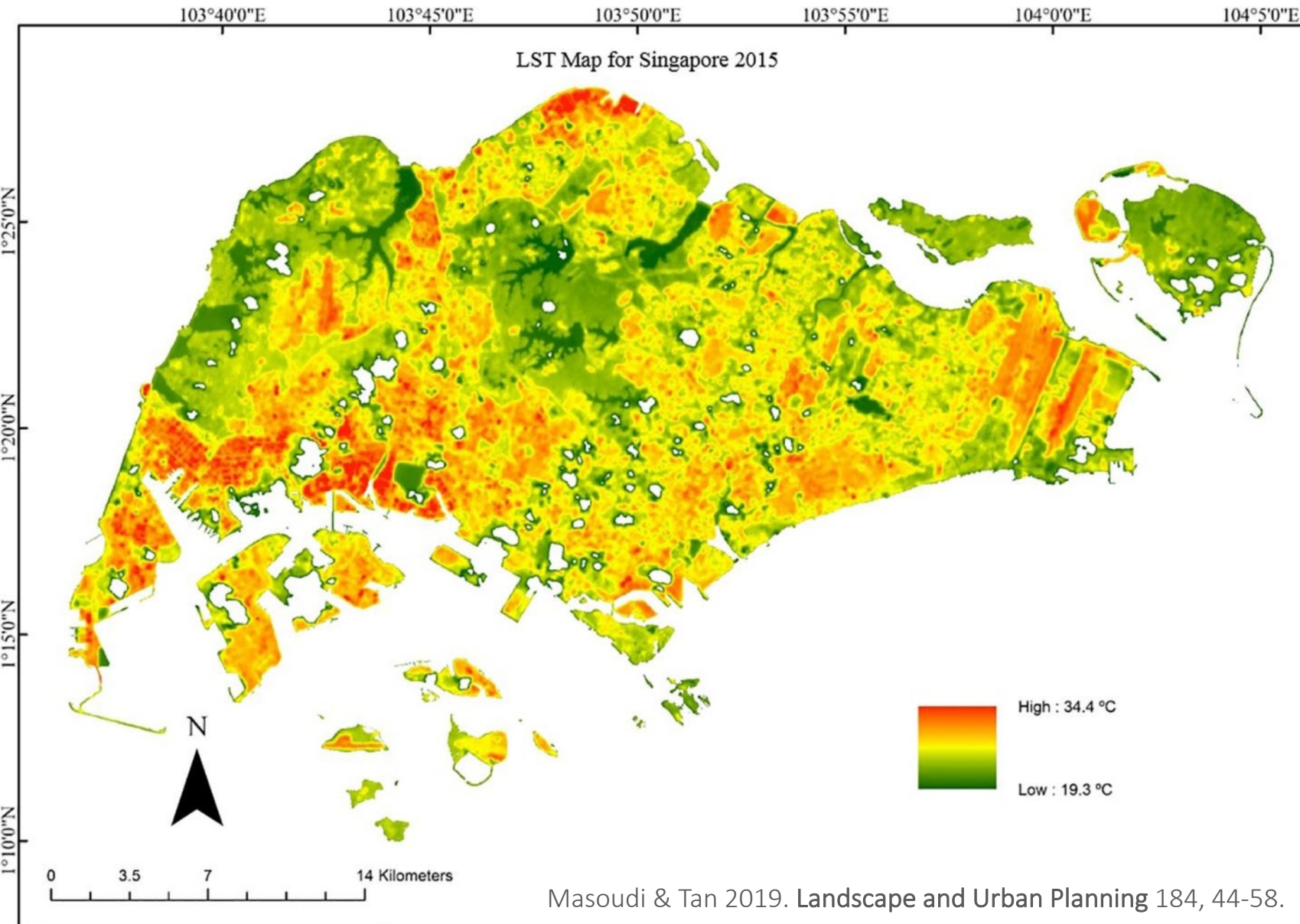
Vegetation sucks up CO₂ from the atmosphere, mitigates our greenhouse gas emissions

Some key results

Carbon sequestration worth ~\$2 million per year
Our mangroves alone store >1.6 million tonnes of carbon dioxide!



MICROCLIMATE REGULATION



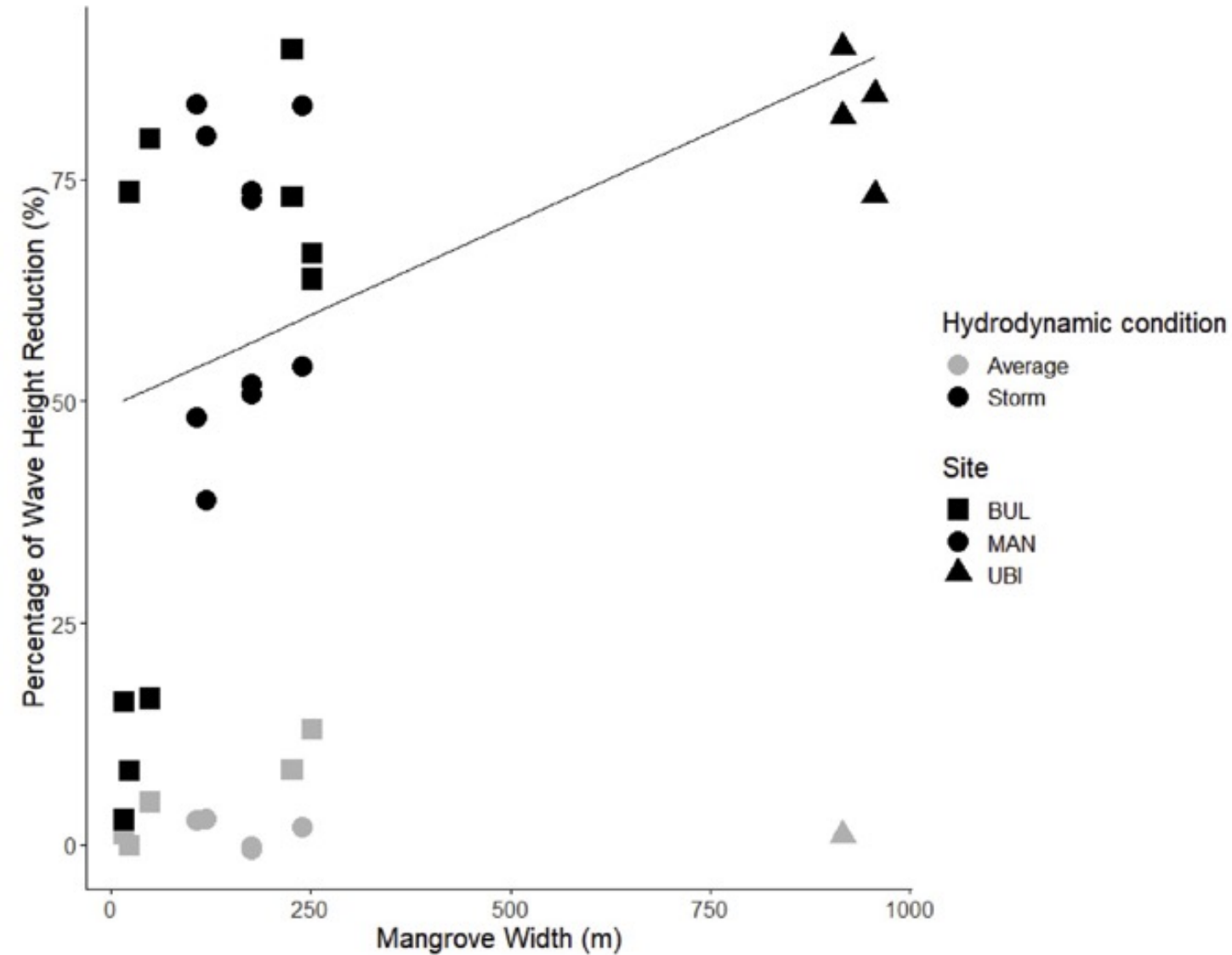
Why important?

Reduces the urban heat island effect, improves thermal comfort

Some key results

Green spaces and green buildings substantially lower air temperatures

COASTAL PROTECTION



Why important?

Protect our shorelines from coastal hazards and erosion

Some key results

During storms, Singapore's mangroves can reduce wave height by >75% across only 250 m of mangrove.

RECREATIONAL VALUES

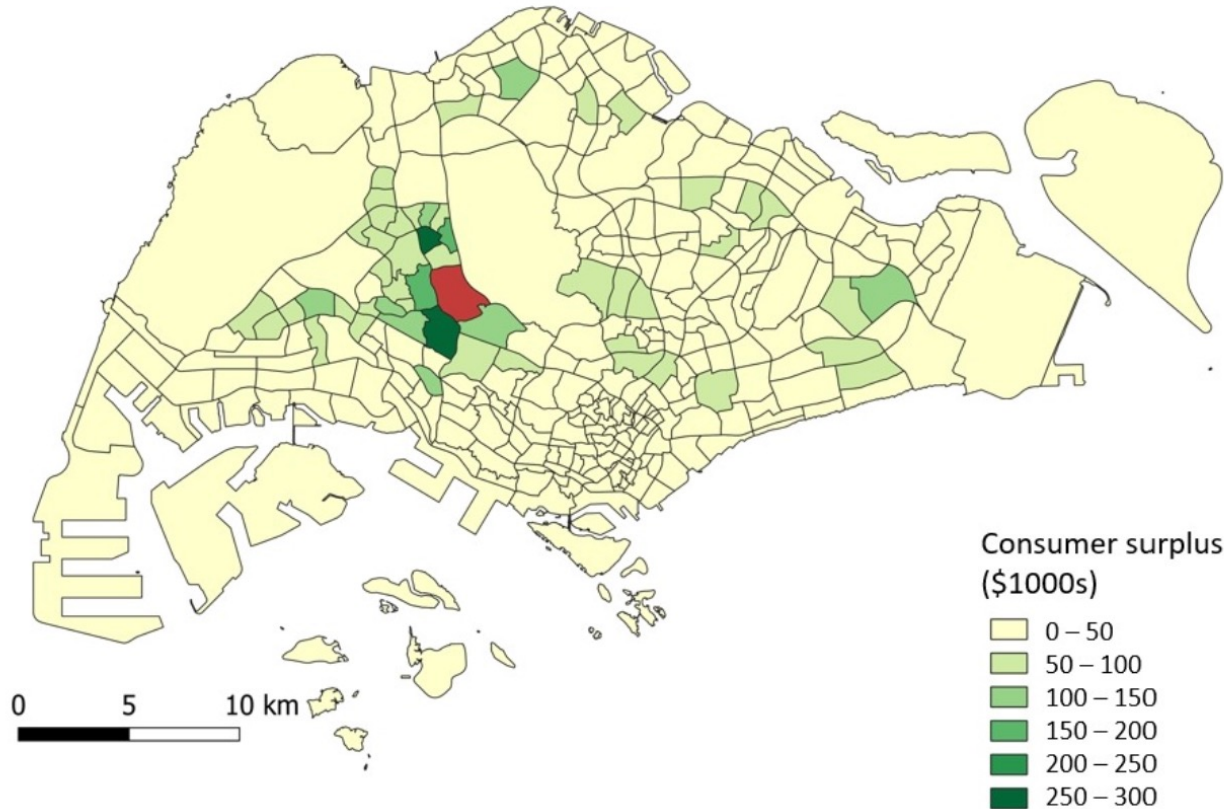
Why important?

Improve health and wellbeing

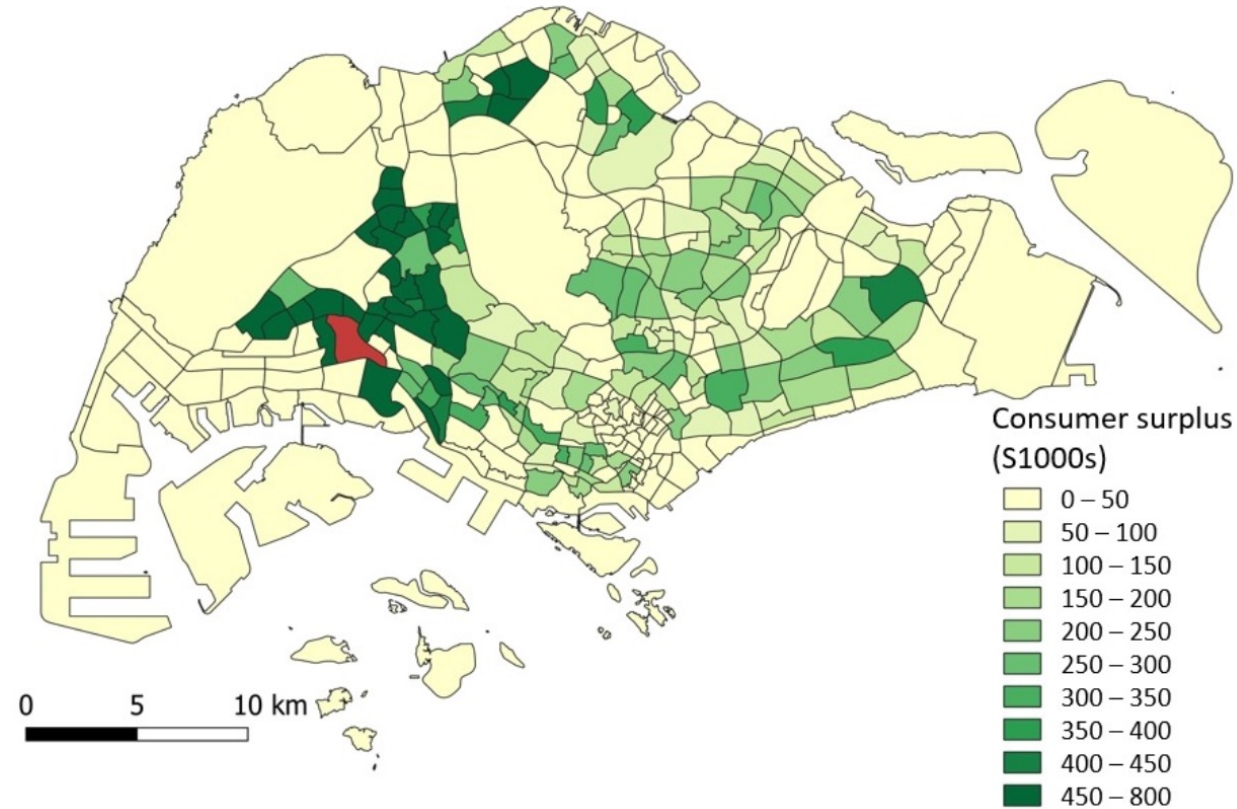
Some key results

Recreation has big financial value

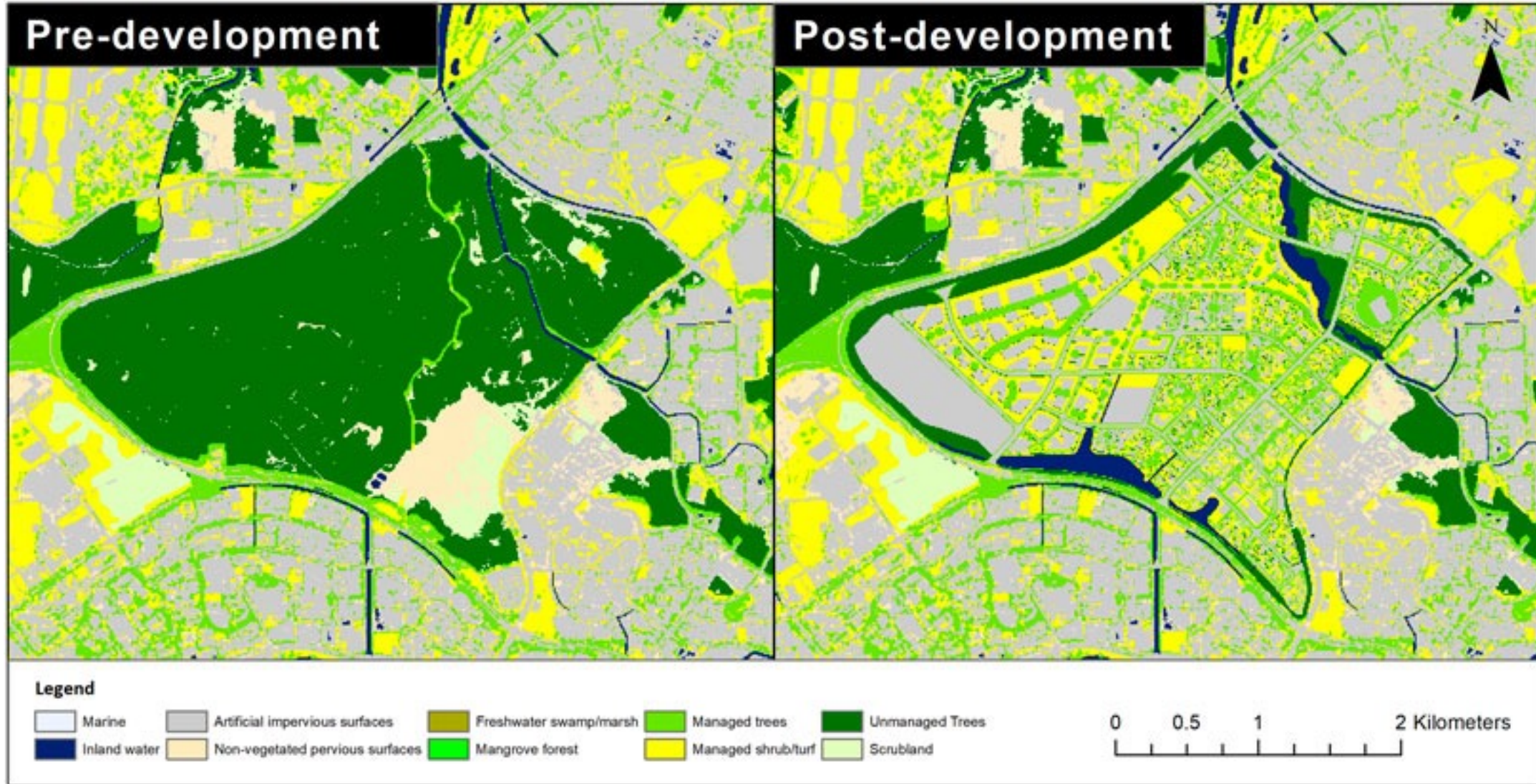
Bukit Timah up to \$9 million per year



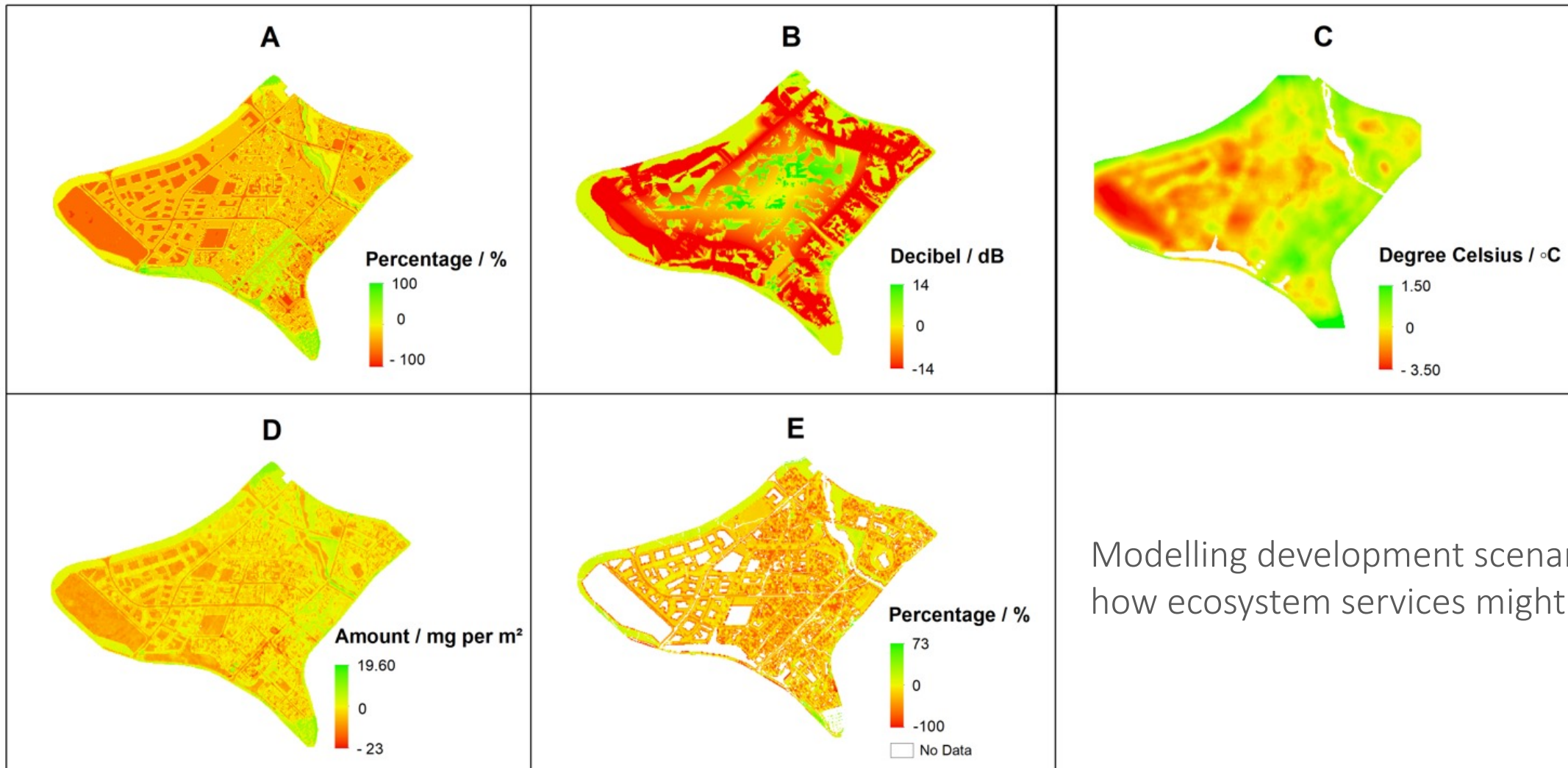
Jurong Lake Gardens up to \$67 million per year



Q3 - WHAT CAN WE DO WITH NATURAL CAPITAL INFORMATION?



SCENARIO MODELLING



Modelling development scenarios and how ecosystem services might change

PEOPLE DO CARE ABOUT ECOSYSTEM SERVICES

change.org

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Petition details Comments Updates

A Campaign to Protect Dover Forest!



50,657 have signed. Let's get to 75,000!



At 75,000 signatures, this petition becomes one of the **top signed on Change.org!**



Fong Zi Xin signed 6 hours ago



wompeten alakazam signed 18 hours ago

1. Help to combat climate change
2. Mitigates urban heat island effect
3. Rich in biodiversity
4. Improves physical and mental wellbeing
5. Aesthetic and recreational value
6. Mitigates flood impacts and soil erosion
7. Absorbs air pollution
8. Supports water catchment supply
9. Reconnects people with nature

ECOSYSTEM SERVICES AS A COMMUNICATION TOOL



Commentary: Singapore could be a model for cooler cities in a world heating up



Tharman Shanmugaratnam

· 4 September 2016 · Edited · 🌐

We still have eleven mangrove forests in Singapore. They transform into forests on water during high tide, and are home to many living species – such as crabs, numerous marine organisms and the rarely seen small-clawed otters, besides 35 mangrove plant species.

What is not well-known about the mangrove forests is that they also soak up a lot of carbon dioxide from the atmosphere. They pack away the carbon in their rich soils, which go as deep as three metres.

Their ability to store carbon is one of the reasons why mangroves have gained recognition internationally, besides their traditional role of protecting coasts from tsunamis, storms and floods. Researchers at NUS' Geography department have found that mangrove forests store more carbon than most other ecosystems globally.

👍❤️👀 1.6K

42 comments

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SUMMARY

1. Singapore is a living laboratory for ecosystem services, and has been for a very long time
2. Today, Singapore's environment is the foundation of our country and provides us with a wide range of benefits
3. Ecosystem services are a great way to connect with stakeholders

Thank you
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