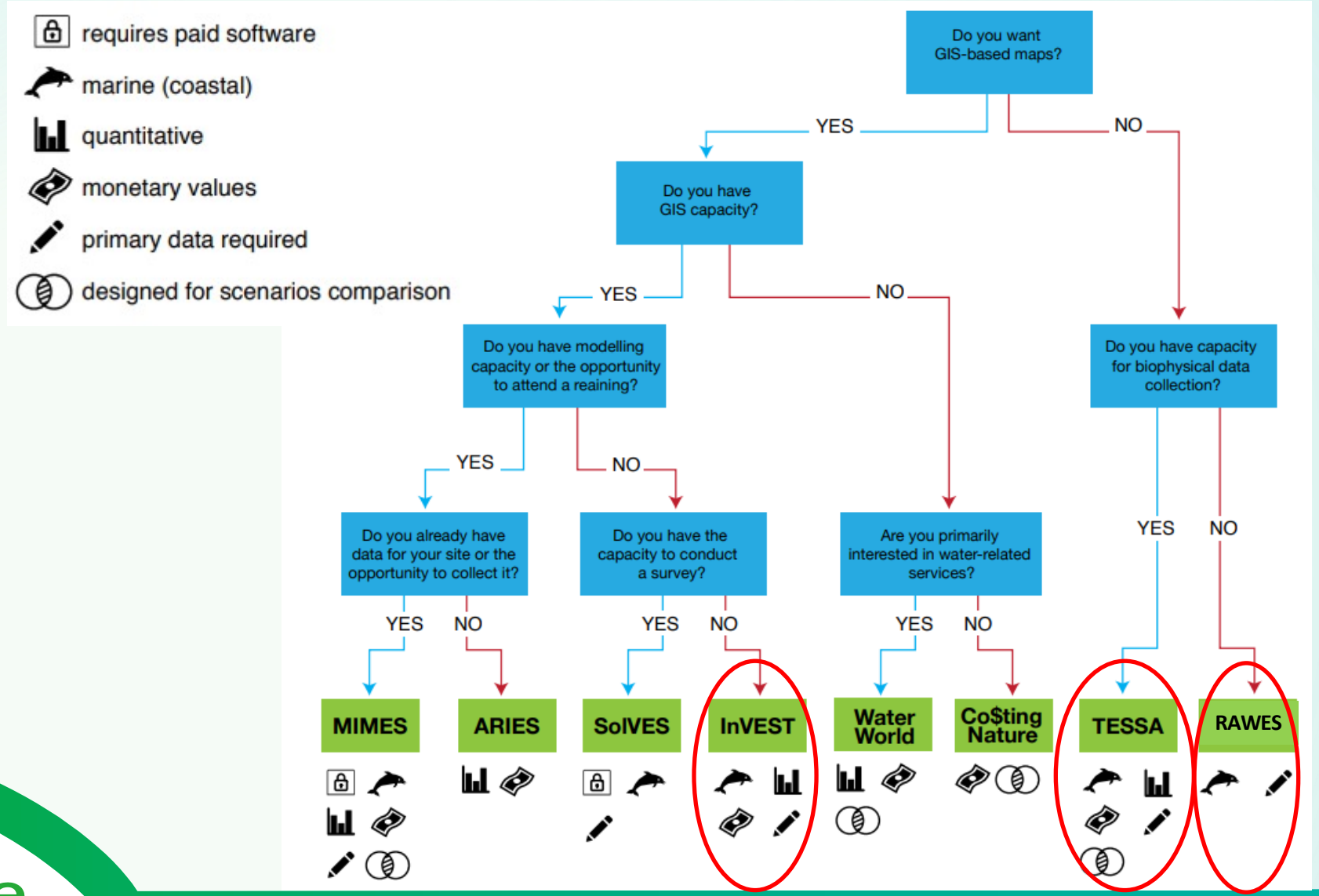
Regional Flyway Initiative:
Understanding Wetland Ecosystem Services and How to Assess Them
Training Series at the EAAFP Meeting of Partners (MOP11)

14-15th March 2023 – Brisbane, Australia

Stefano Barchiesi, Ecosystem Services Officer, BirdLife International

Introduction to
Ecosystem Services Assessment Tools: Part 2

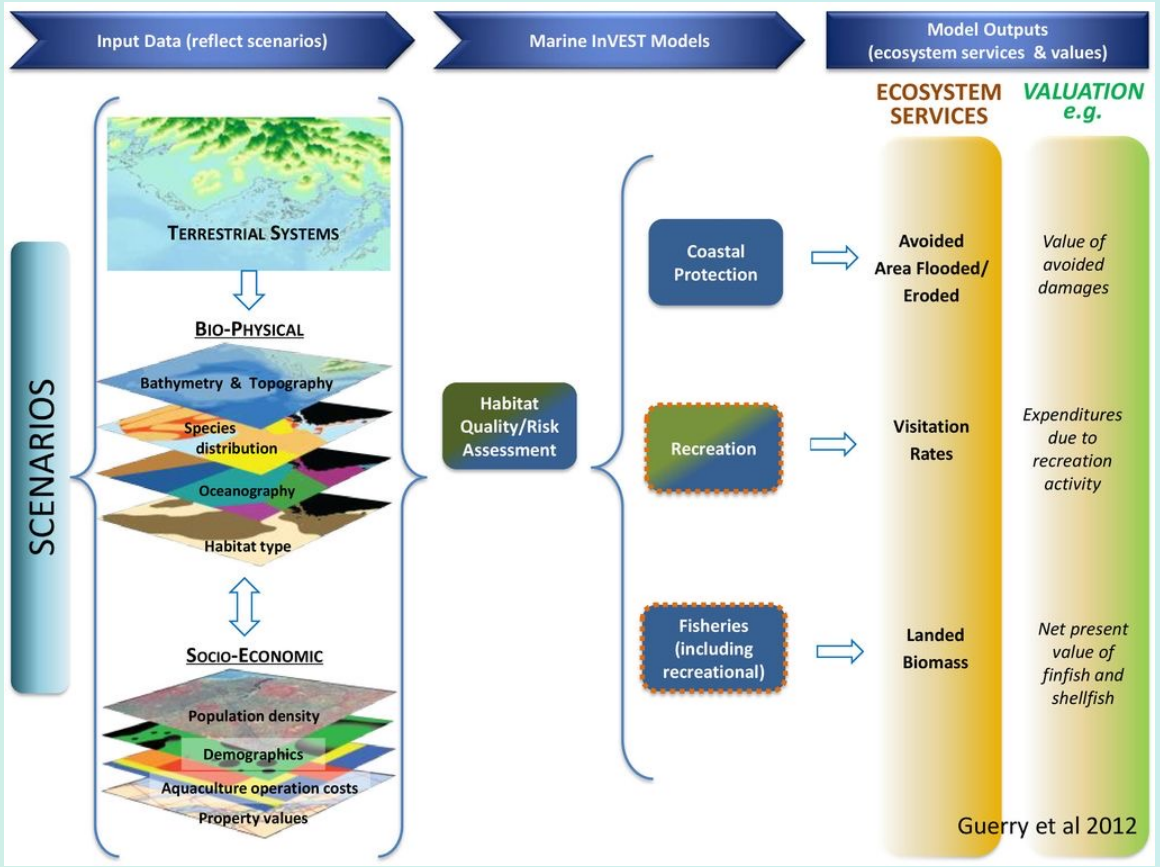
Decision tree for tool selection



Adapted from Neugarten et al., 2018. https://portals.iucn.org/library/node/47778

Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)

- Modular
- Based on complex equations
- Maps in, maps out
- Stand-alone app
  but GIS software still needed



https://naturalcapitalproject.stanford.edu/software/invest

Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)

InVEST models

Carbon | Read more »

Coastal Blue Carbon | Read more »

Coastal Vulnerability | Read more »

Crop Pollination | Read more »

Crop Production | Read more »

Habitat Quality | Read more »

Habitat Risk Assessment | Read more »

Offshore Wind Energy | Read more »

Recreation | Read more »

Reservoir Hydropower Production (Water Yield) | Read more »

Scenic Quality | Read more »

Seasonal Water Yield | Read more »

Sediment Retention | Read more »

Urban Cooling | Read more »

Urban Flood Risk Mitigation | Read more »

Urban Stormwater Retention | Read more »

Water Purification | Read more »

Wave Energy | Read more »

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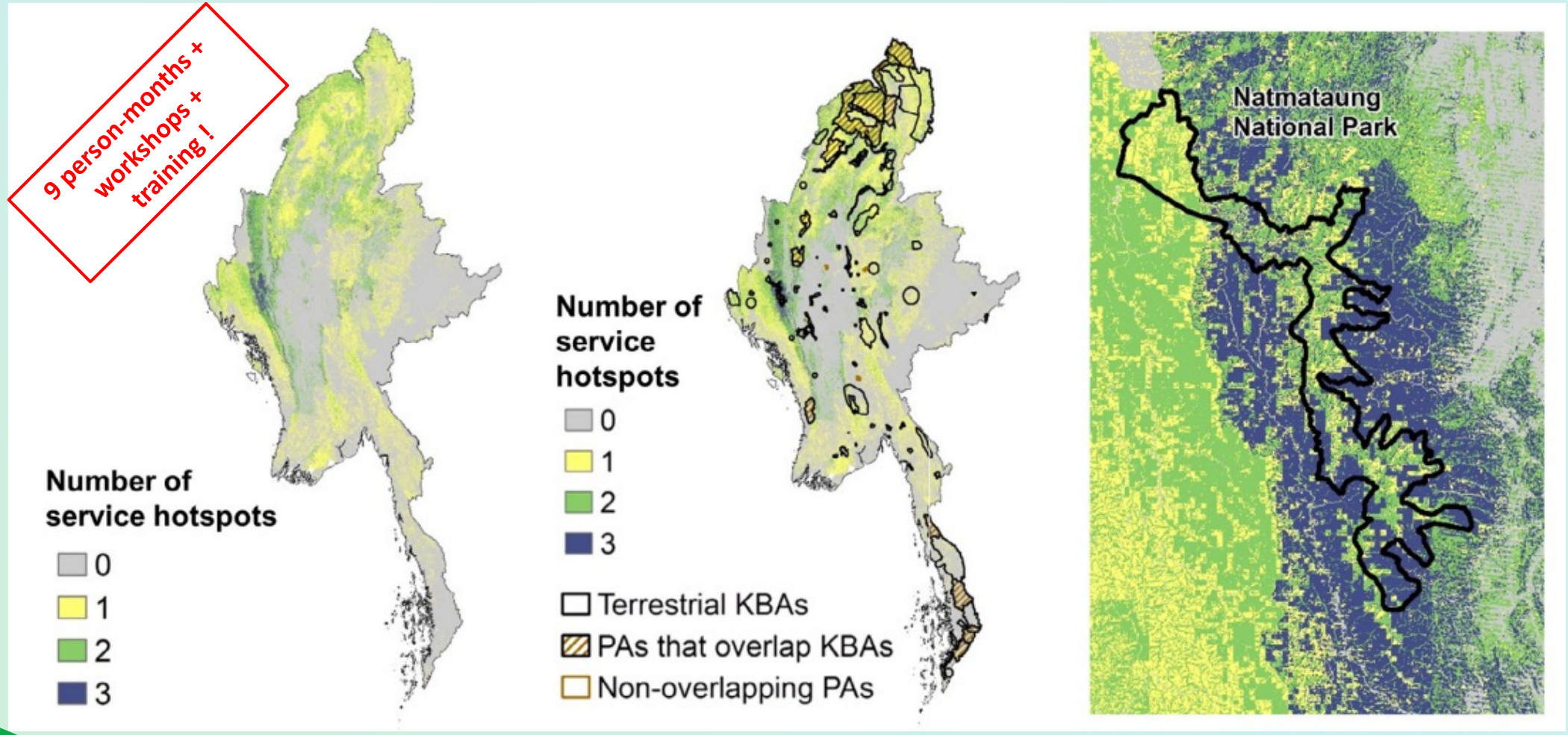
InVEST application: Overlap of ES hotspots and KBAs/PAs



Mandle et al., 2017 in Neugarten et al., 2018.
https://portals.iucn.org/library/node/47778

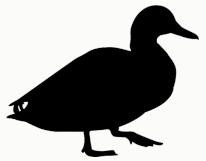
Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)

InVEST models

Carbon | Read more »

Coastal Blue Carbon | Read more »

Coastal Vulnerability | Read more »



Crop Pollination | Read more »

Crop Production | Read more »

Habitat Quality | Read more »

Habitat Risk Assessment | Read more »

Offshore Wind Energy | Read more »

Recreation | Read more »

Reservoir Hydropower Production (Water Yield) | Read more »

Scenic Quality | Read more »

Seasonal Water Yield | Read more »

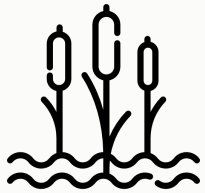
Sediment Retention | Read more »

Urban Cooling | Read more »

Urban Flood Risk Mitigation | Read more »

Urban Stormwater Retention | Read more »

Water Purification | Read more »



Wave Energy | Read more »

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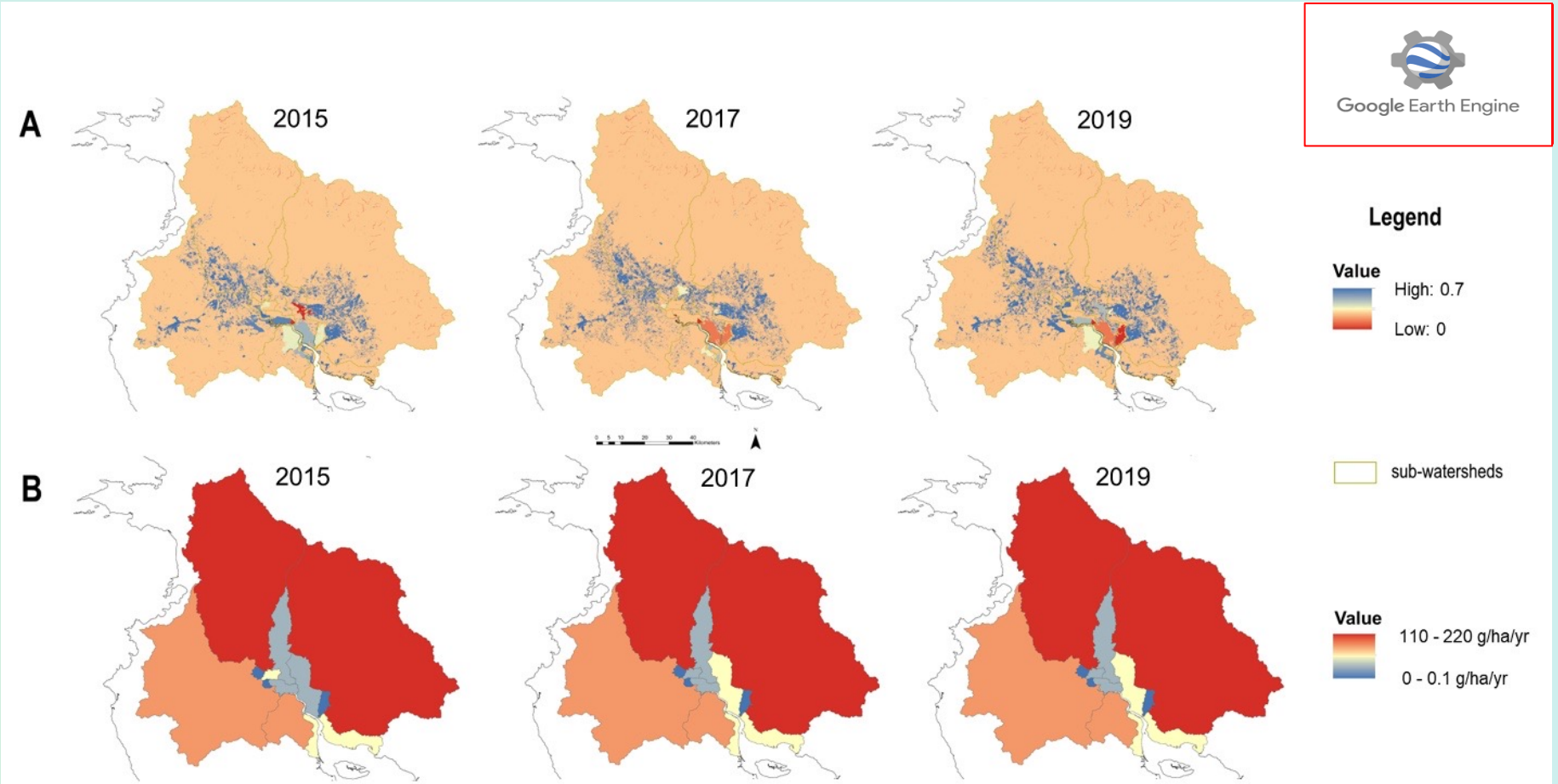
InVEST application: Overlap of ES hotspots and hydrological units



Water Purification (nitrogen retention)

Barchiesi et al., (forthcoming)

Rapid Assessment of Wetland Ecosystem Services (RAWES)

- Ramsar-specific
- Systemic
- Rapid
- Qualitative
- Comprehensive

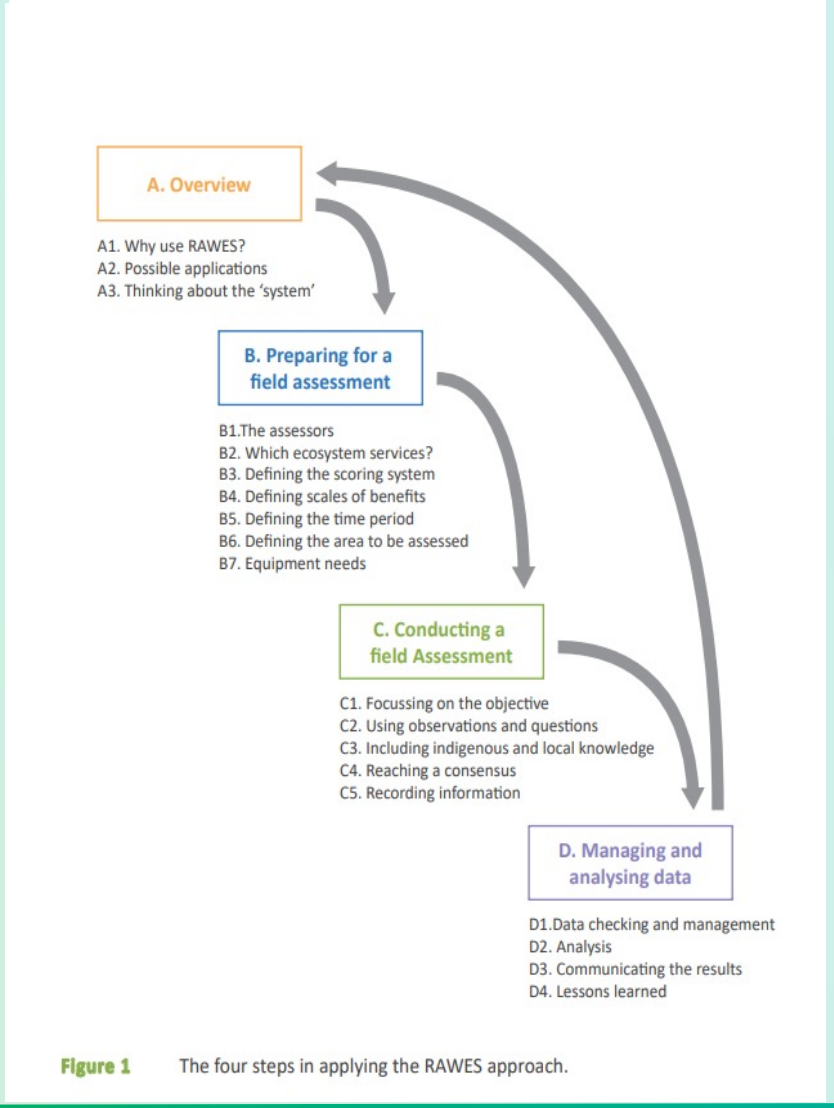
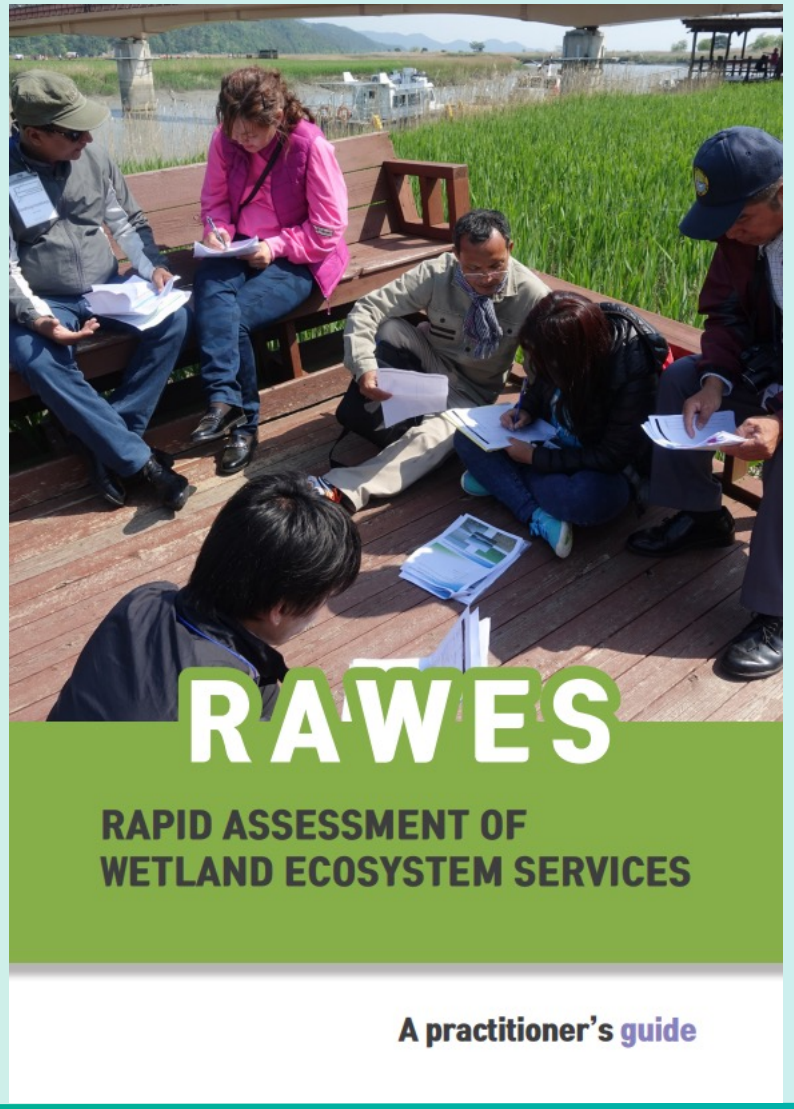
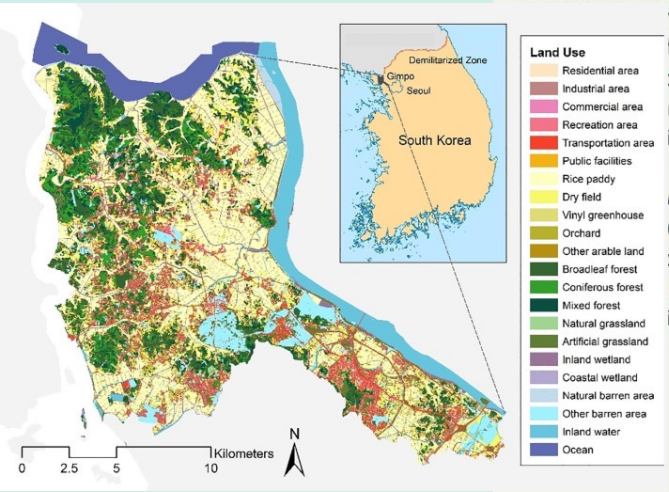


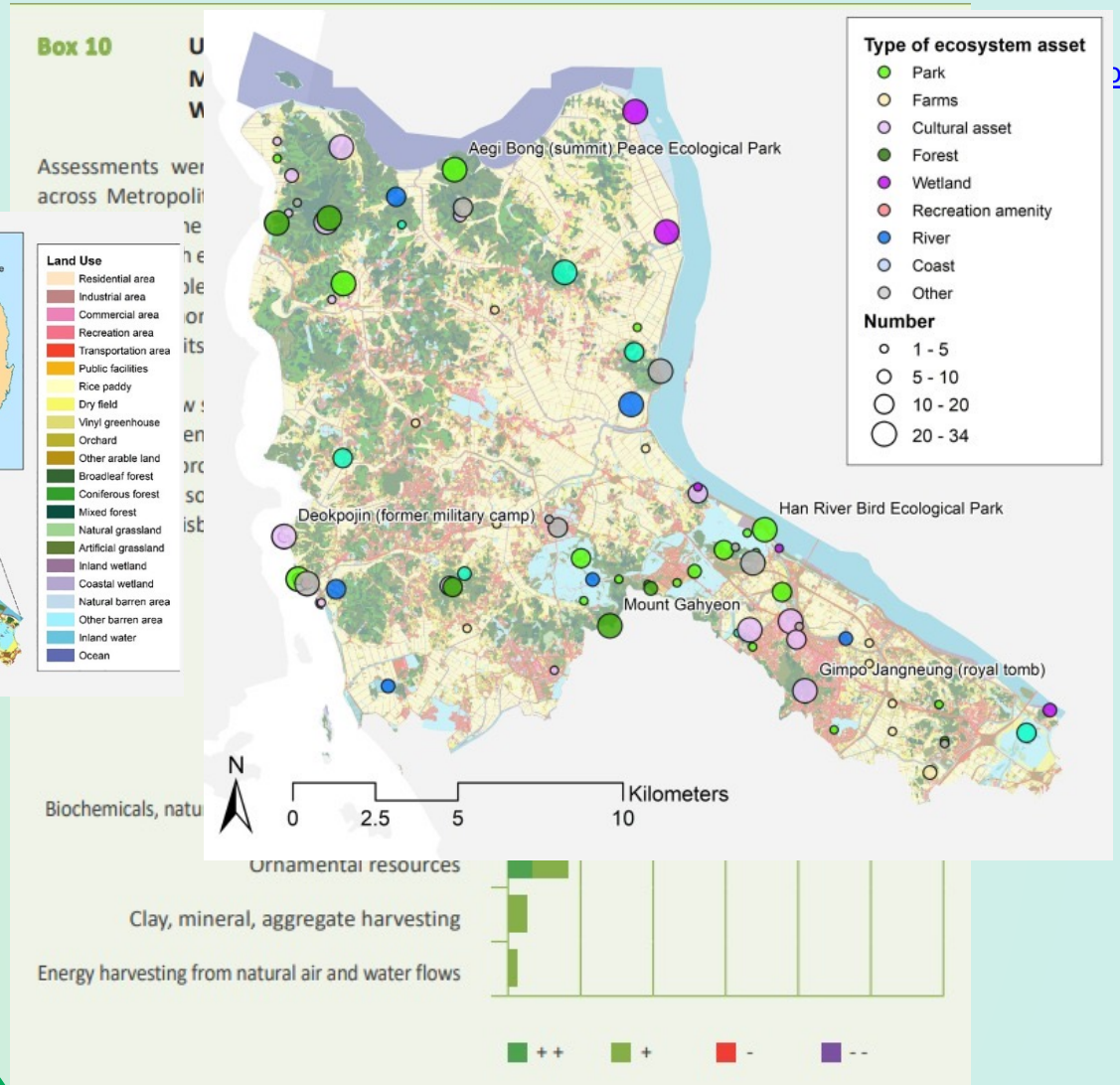
Figure 1 The four steps in applying the RAWES approach.

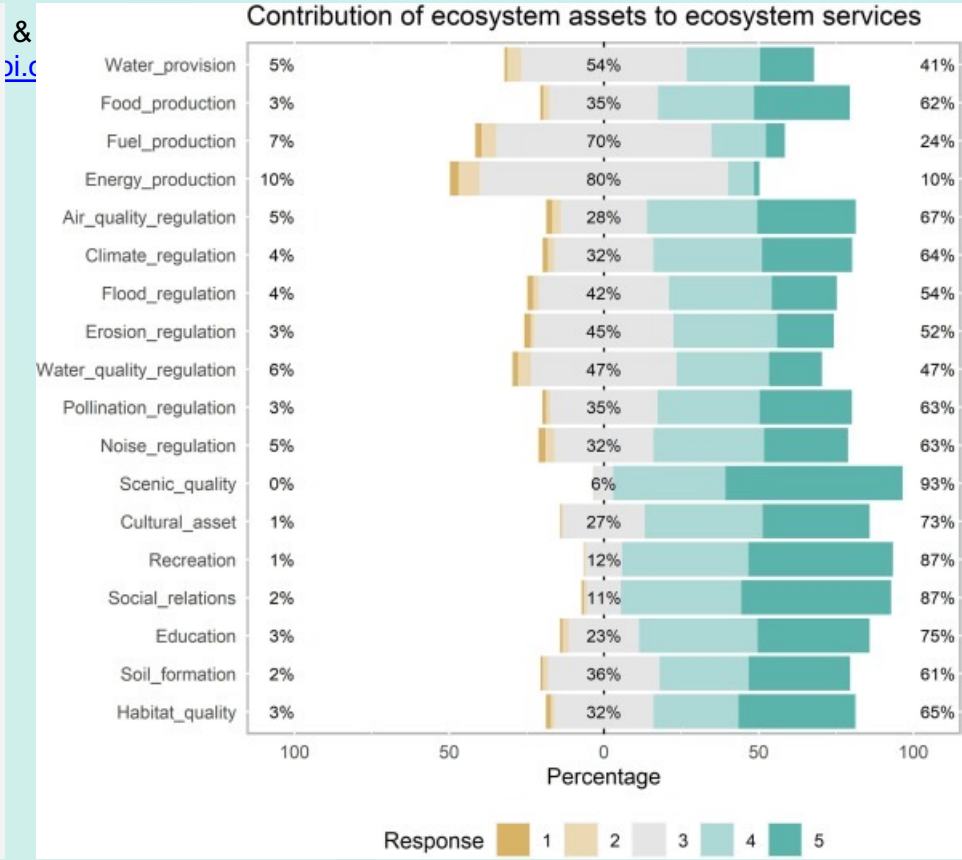


Rapid Assessment of Wetland Ecosystem Services (RAWES)

Kim et al., 2021
https://doi.org/10.1016/j.ecoser.2021.101337







Guided Question (Open Forum)

What are your challenges in measuring and monitoring these ecosystem services?

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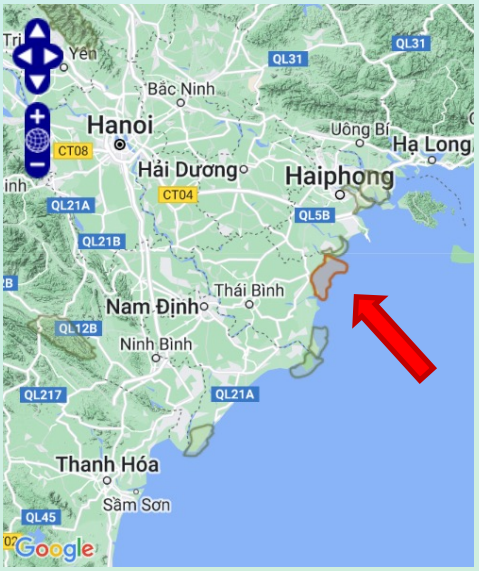
Adapting ecosystem service assessment tools:
experiences and lessons learned

The experiences of Myanmar and Vietnam with TESSA

The experience of Thai Thuy in Vietnam



Exchange rate: 22,300VND/USD

Benefit

Harvested Wild Goods $2.2 million/year

Fish harvested in Thai Thuy district $1.37 million/year [1]
Shellfish collected in the mudflat $0.87 million/year

Cultivated Goods $ 11.7 million/year

Fish and Shrimp harvested from semi natural aquaculture $0.58 million/year ($2,524/ha/year) [2]
Fish harvested from intensive aquaculture $8.93 million/year ($7,558/ha/year) [2]
Clam harvested from clam culture in mudflat $ 1.93 m/year
Salt production in the salt farm $0.22 million/year [3]

Disaster Risk Reduction $ 1.1 million/year

Protective benefits of mangrove forest $1.05 million/year [4]

Climate Regulation $60.3 million

The benefit of global climate regulation from the carbon stored in the wetland is $ 60.26 million. This is an one-off stored value, i.e. not an annual value. [5]

Net Benefit : $ 15.0 million / year
Plus $ 60.3 million of carbon storage function

Water Purification

The mudflat conducts water purification through the activities of living organisms such as clams, microalgae and bacteria in the mud. Mangroves also have a waste treatment function and these functions are vital to maintain seawater quality.

Eco-tourism

Eco-tourism such as bird watching and walking in the mudflat has not been developed at Thai Thuy but there is potential to attract tourists. Well managed eco-tourism can provide benefits not only for tourists, but also for local people as an income source.

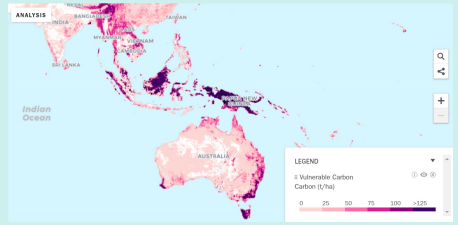
The two-pronged approach of the Regional Flyway Initiative

regulating ES

provisioning ES

site

High-level, modelling-based assessment



Site-level, participatory assessment

tessa

Source: East Asian-Australasian Flyway Partnership & Asian Development Bank

Modelling-based assessments of the Regional Flyway Initiative

InVEST models

Carbon | Read more »

Crop Pollination | Read more »

Habitat Risk Assessment | Read more »

Reservoir Hydropower Production (Water Yield) | Read more »

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Wave Energy | Read more »

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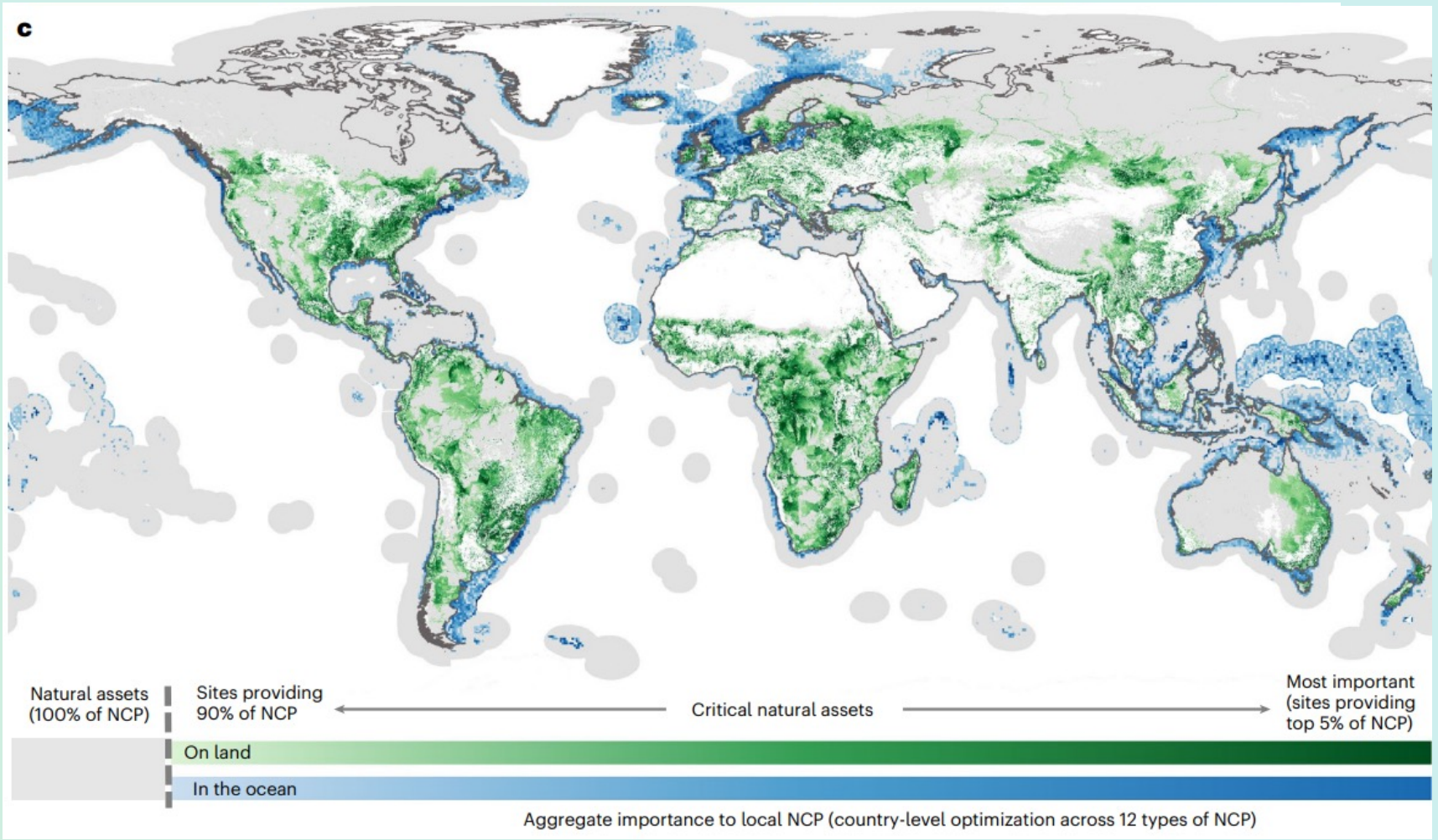
Modelling-based assessment: Coastal protection (biophysical)

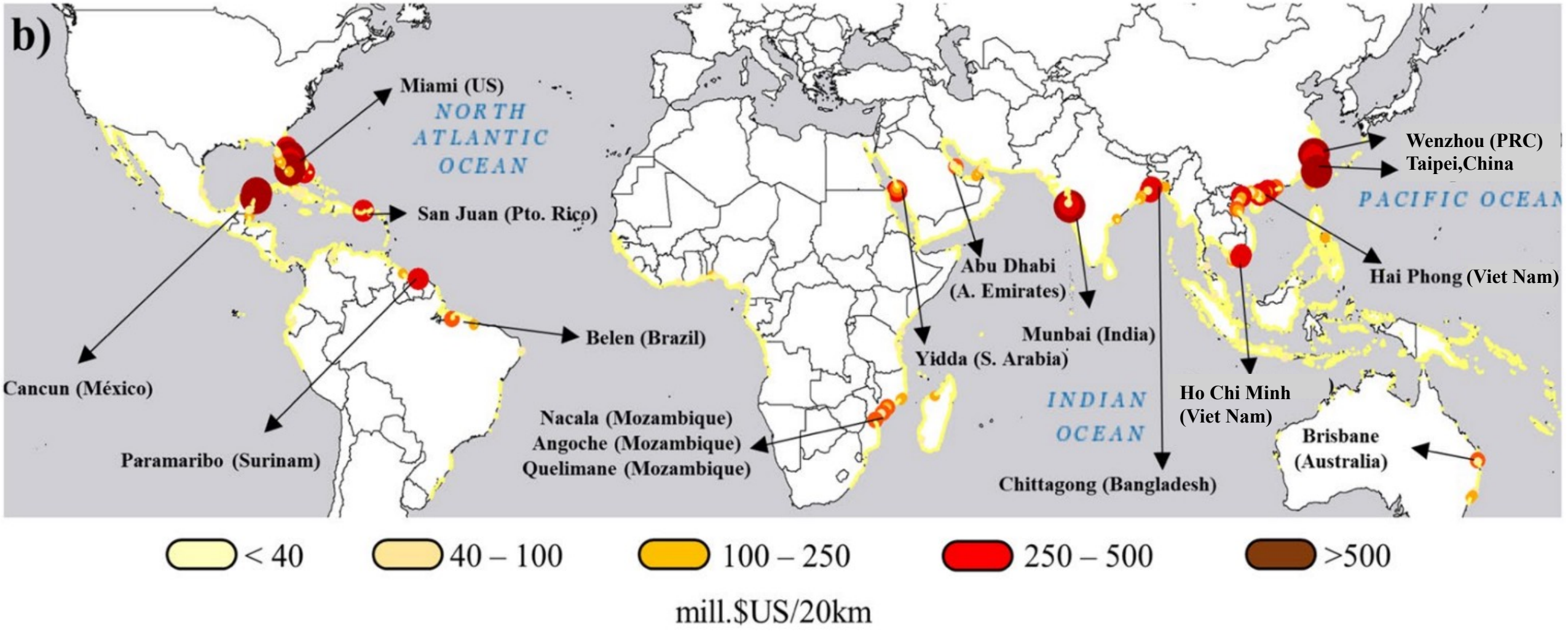
a

List of local NCP modelled
Nitrogen retention for water quality regulation
Sediment retention for water quality regulation
Pollinator habitat sufficiency for pollination-dependent crops
Fodder for livestock
Timber production
Fuelwood production
Flood regulation
Riverine fish harvest
Access to terrestrial nature (for local recreation and gathering)
Coastal risk reduction (terrestrial and marine)
Marine fish harvest
Marine recreation (coral-reef tourism and associated livelihoods)



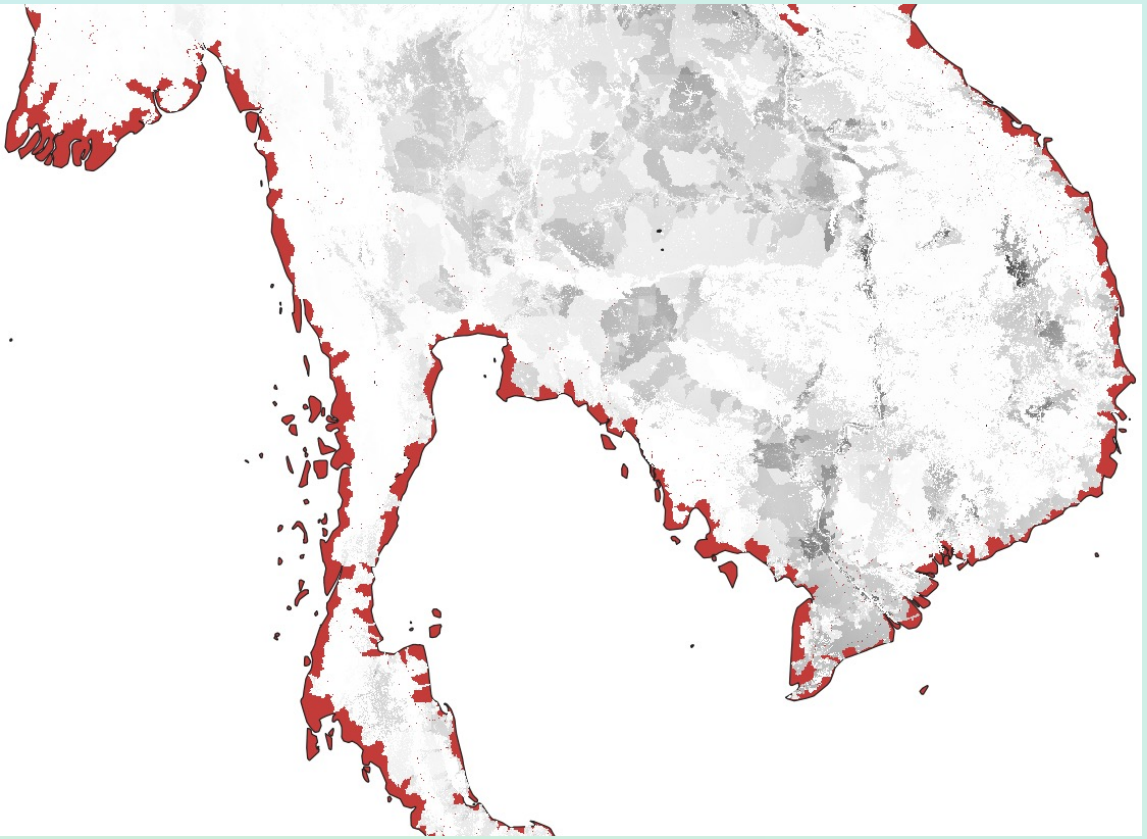
Chaplin-Kramer et al., 2022: Mapping the planet's critical natural assets

Modelling-based assessment: Coastal protection (economic)

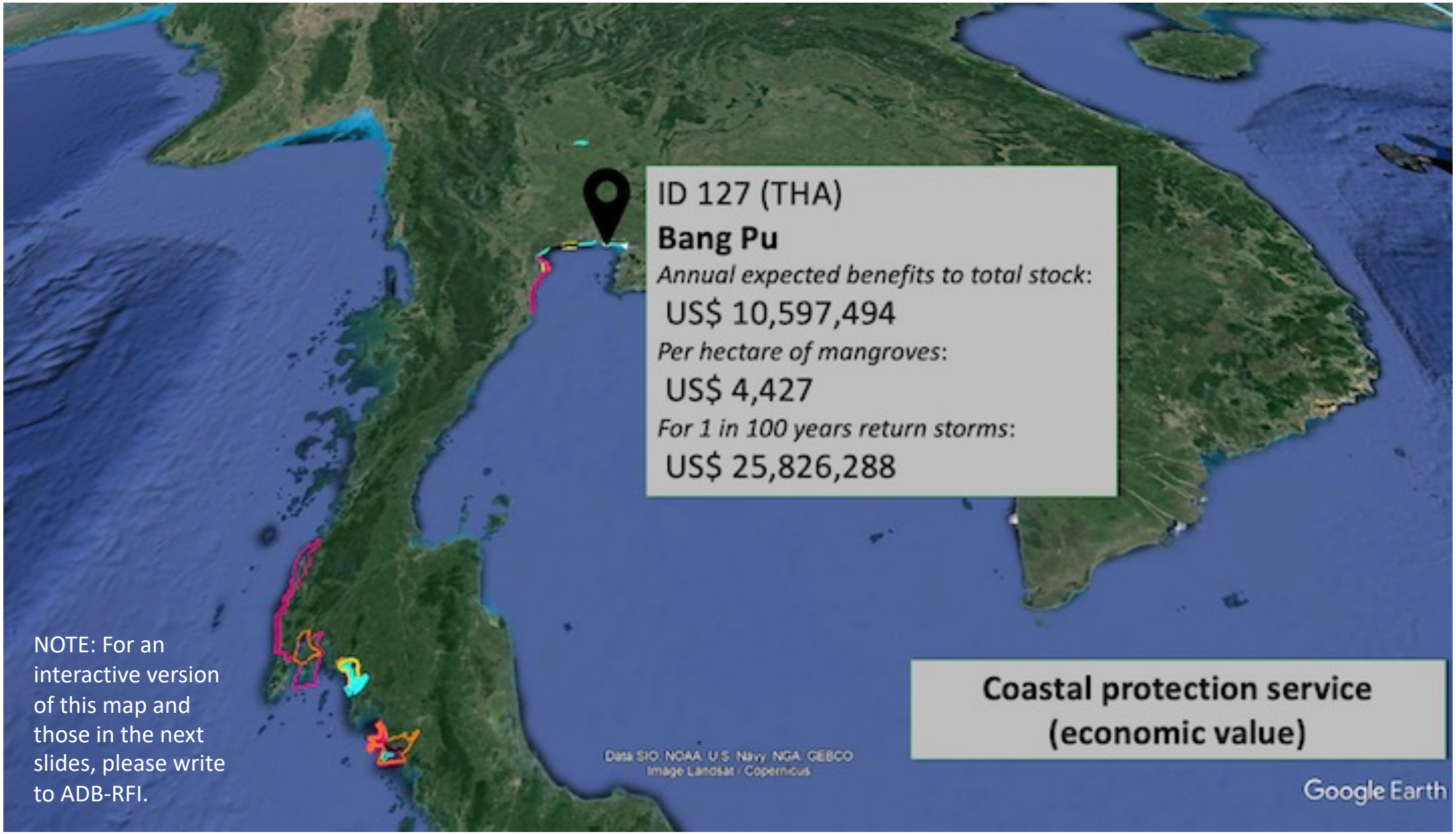


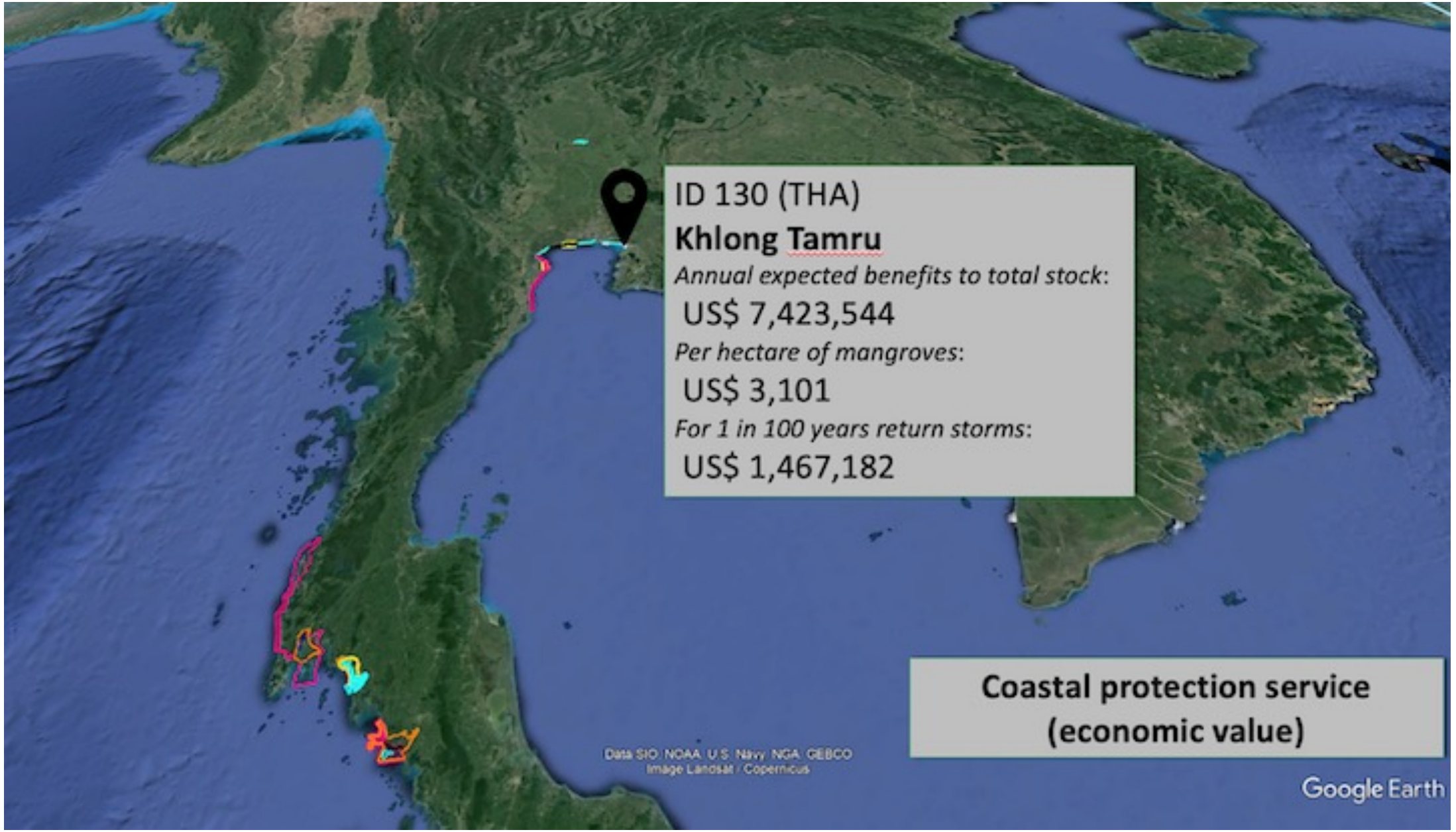
Menendez et al., 2020: The Global Benefits of Mangroves

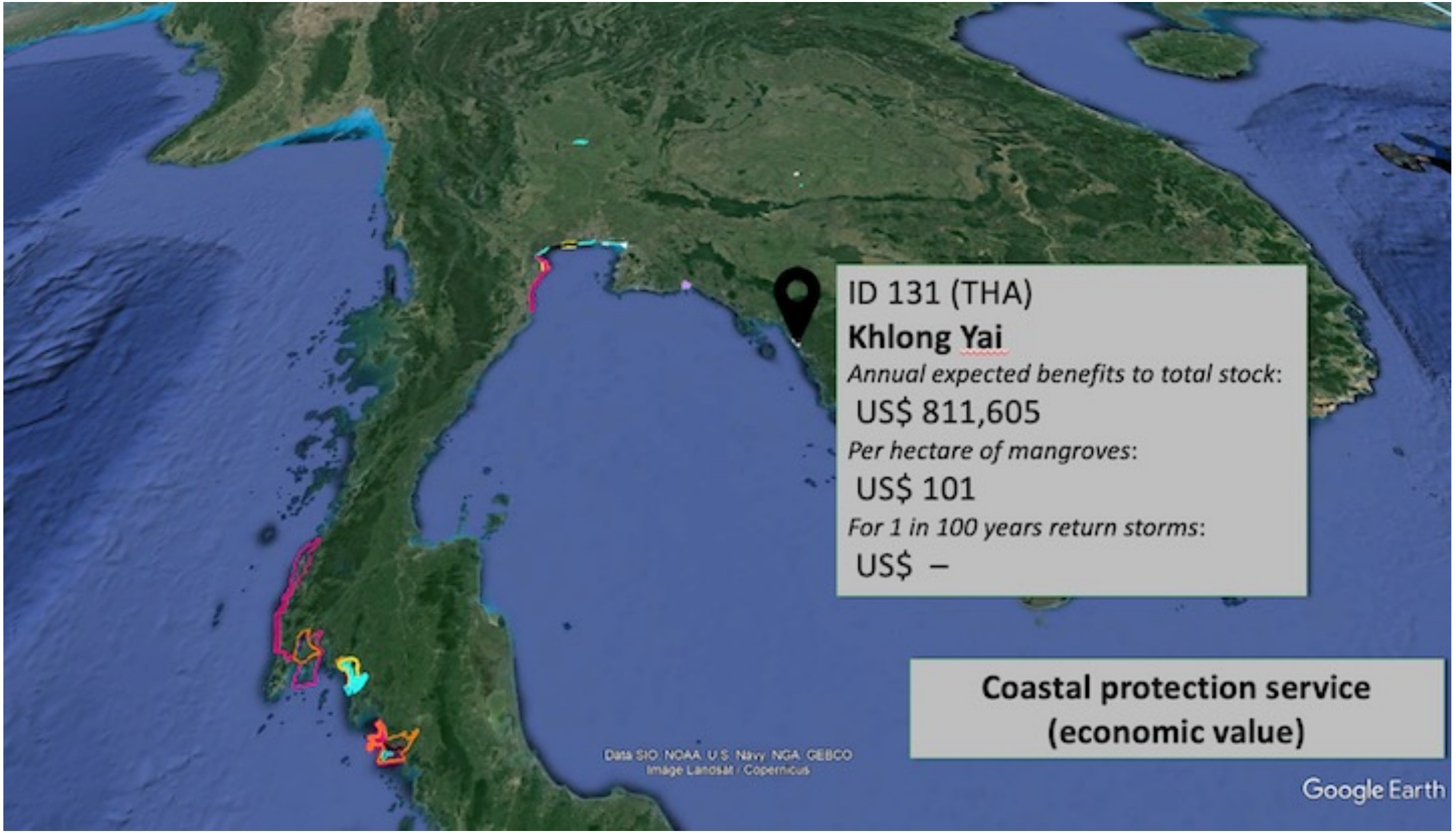
Modelling-based assessment: Flood Mitigation (biophysical)

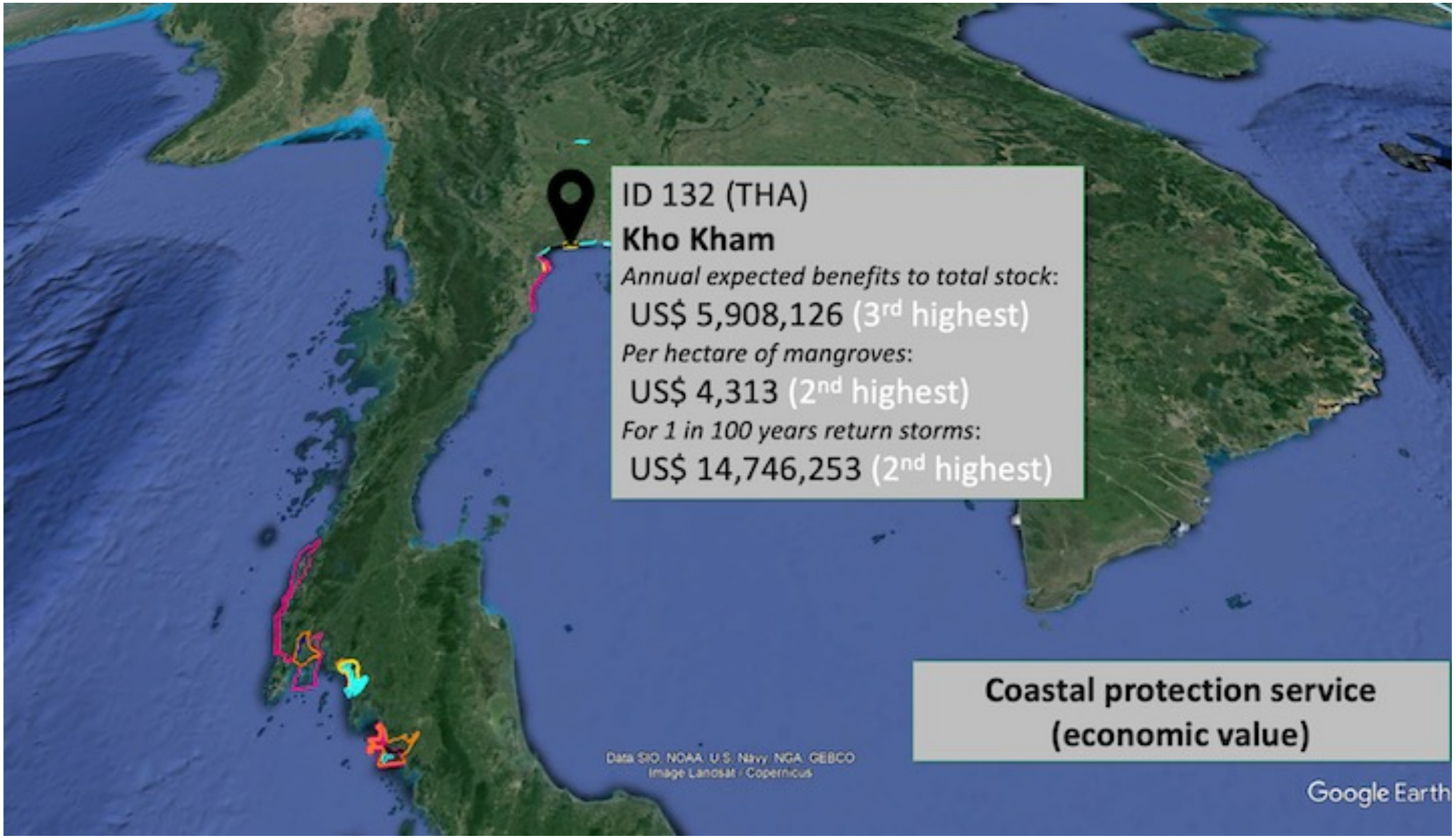


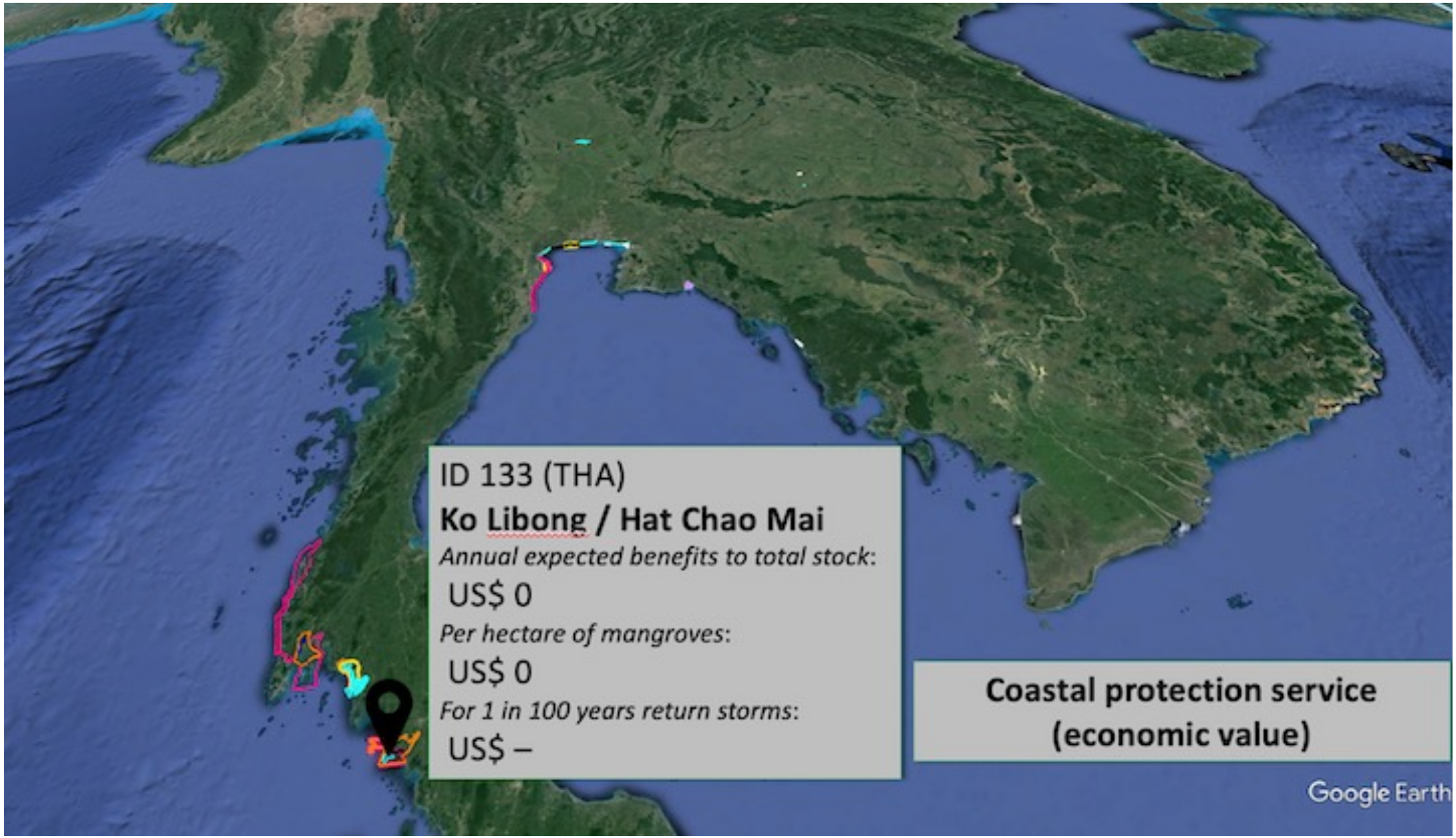
Mulligan, M. 2021: Co$tingNatureMap: a visualisation tool

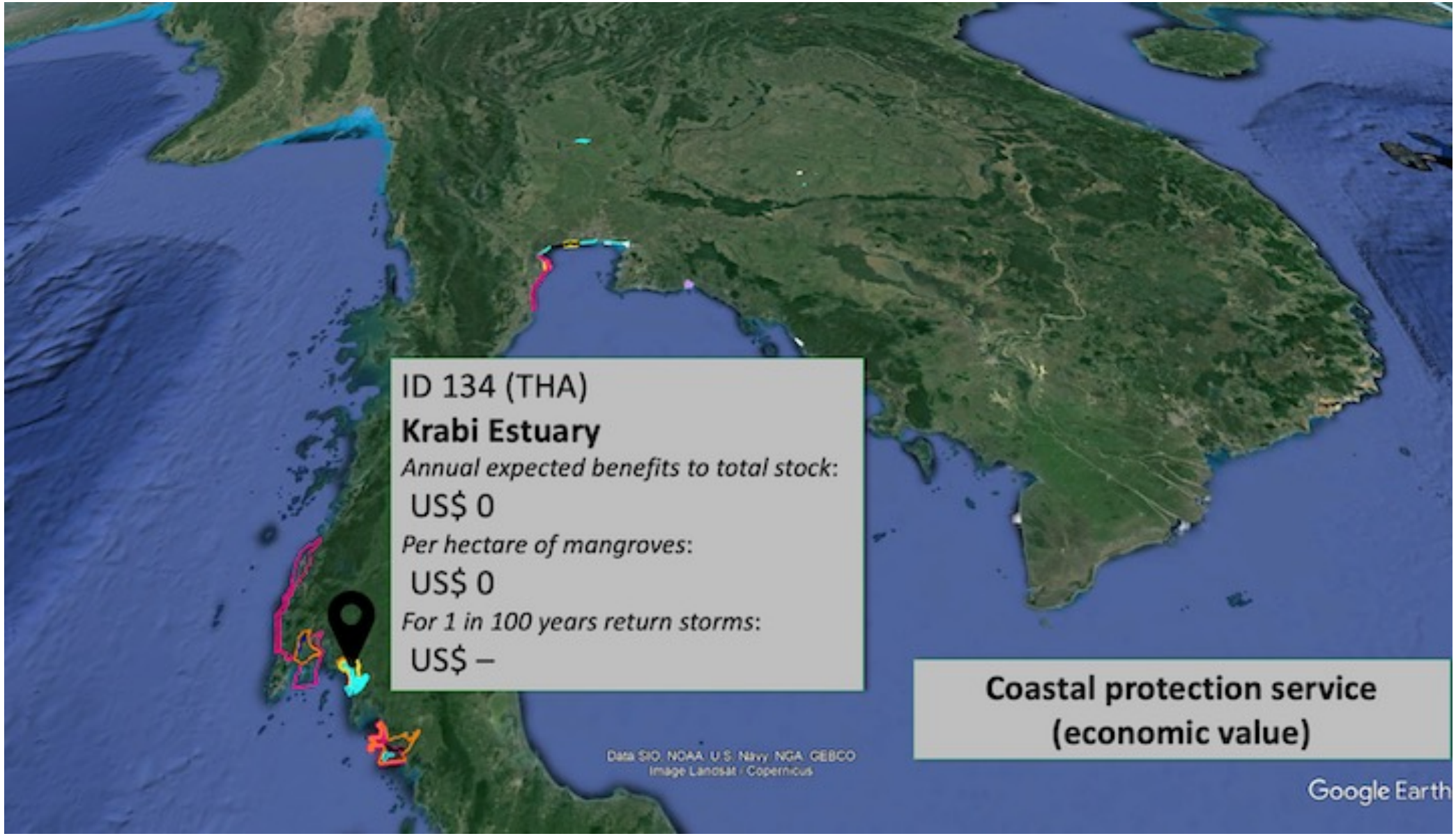

ID 127 (THA)
Bang Pu
Annual expected benefits to total stock:
US$ 10,597,494
Per hectare of mangroves:
US$ 4,427
For 1 in 100 years return storms:
US$ 25,826,288
NOTE: For an interactive version of this map and those in the next slides, please write to ADB-RFI.
Coastal protection service (economic value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

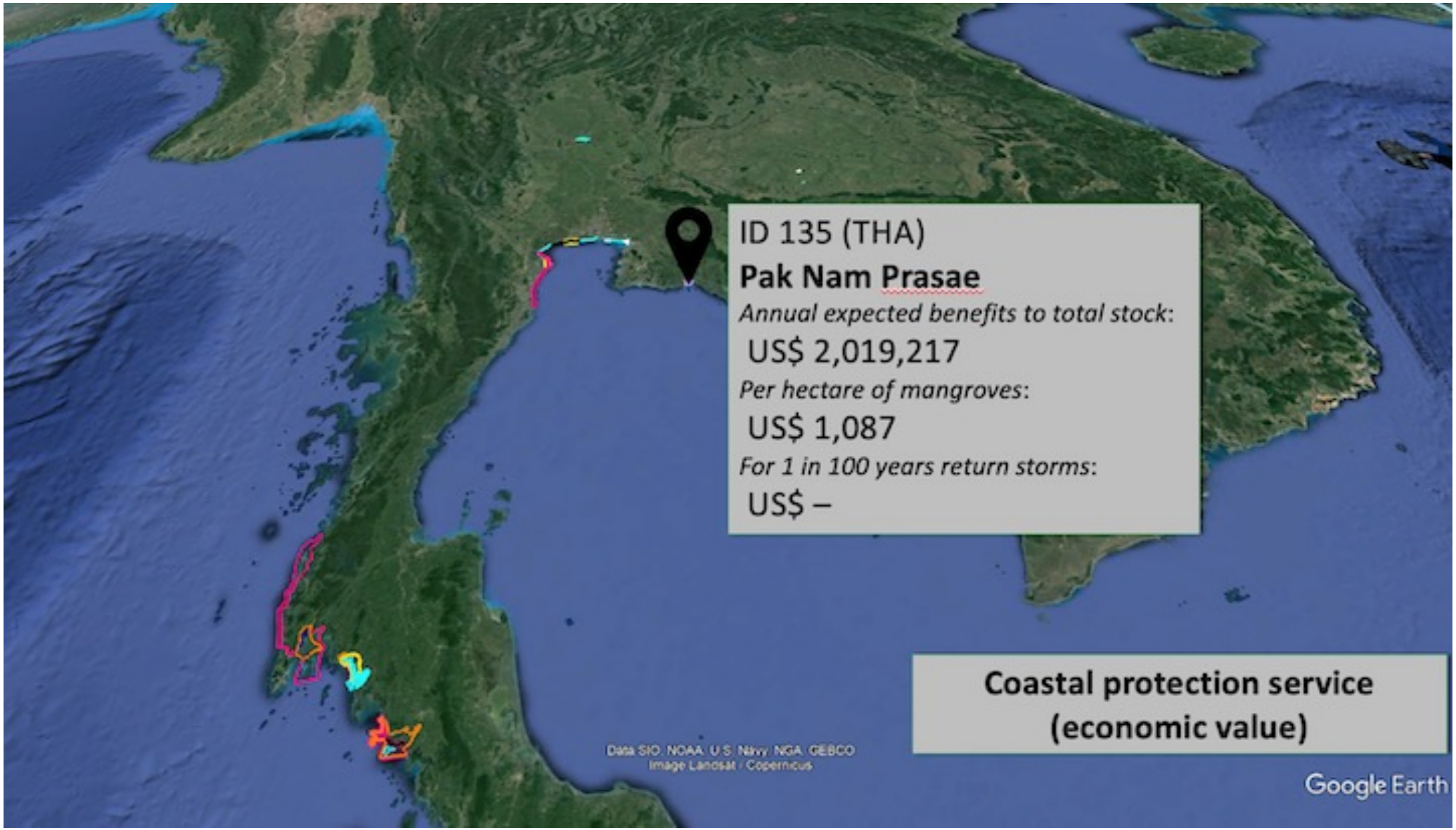

ID 130 (THA)
Khlong Tamru
Annual expected benefits to total stock:
US$ 7,423,544
Per hectare of mangroves:
US$ 3,101
For 1 in 100 years return storms:
US$ 1,467,182
Coastal protection service
(economic value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

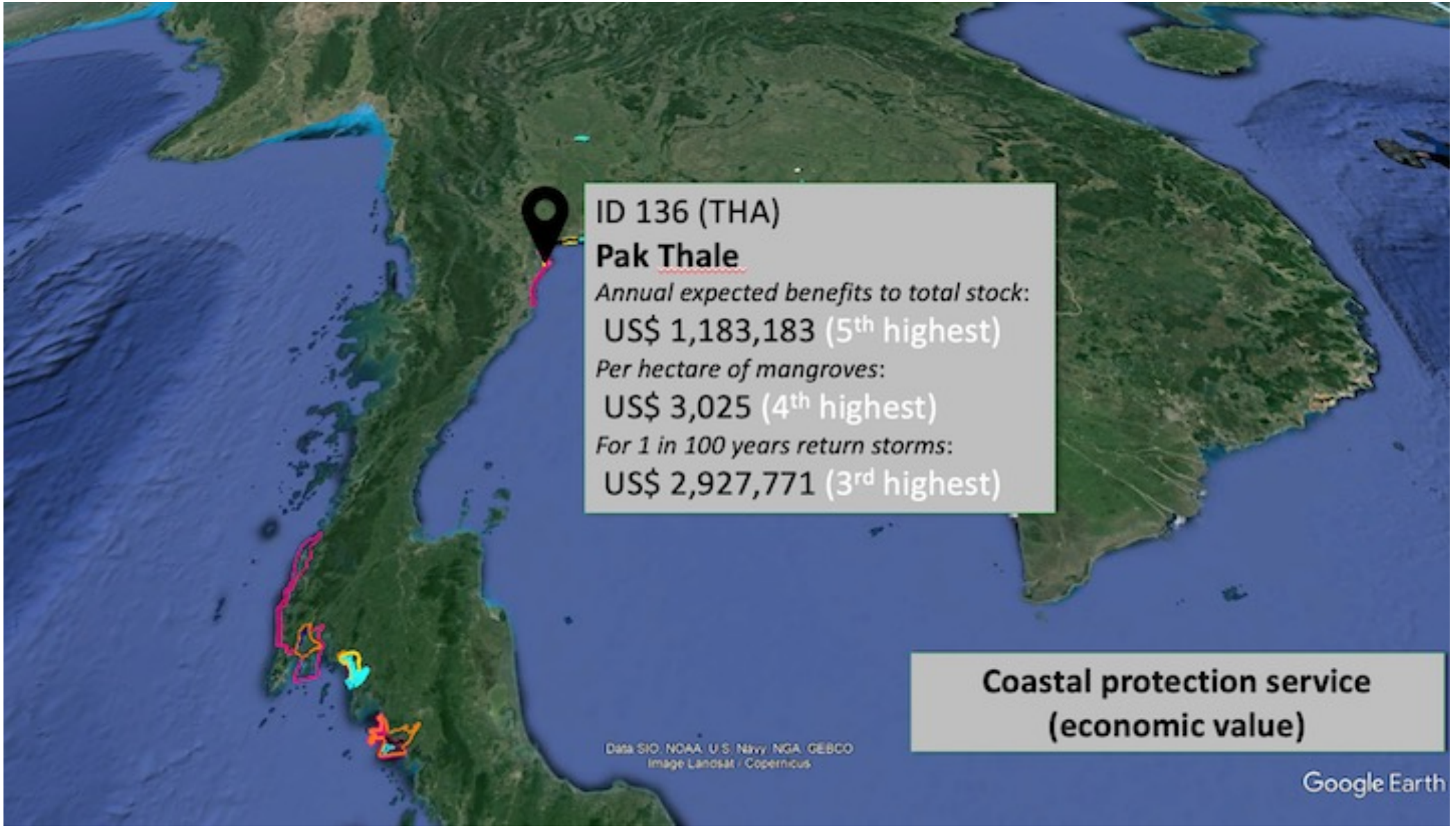

ID 131 (THA)
Khlong Yai
Annual expected benefits to total stock:
US$ 811,605
Per hectare of mangroves:
US$ 101
For 1 in 100 years return storms:
US$ –
Coastal protection service
(economic value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

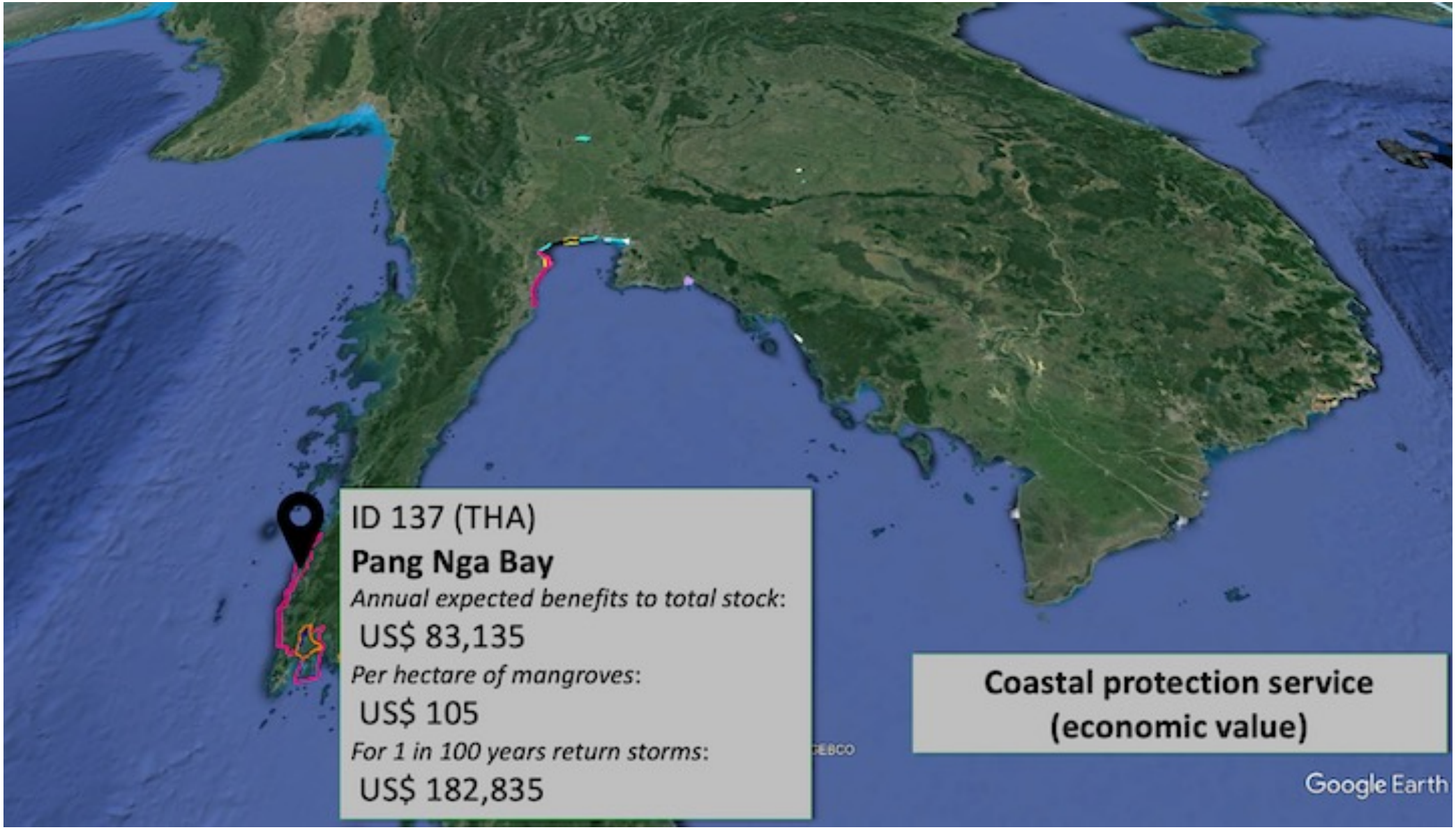

ID 132 (THA)
Kho Kham
Annual expected benefits to total stock:
US$ 5,908,126 (3rd highest)
Per hectare of mangroves:
US$ 4,313 (2nd highest)
For 1 in 100 years return storms:
US$ 14,746,253 (2nd highest)
Coastal protection service (economic value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

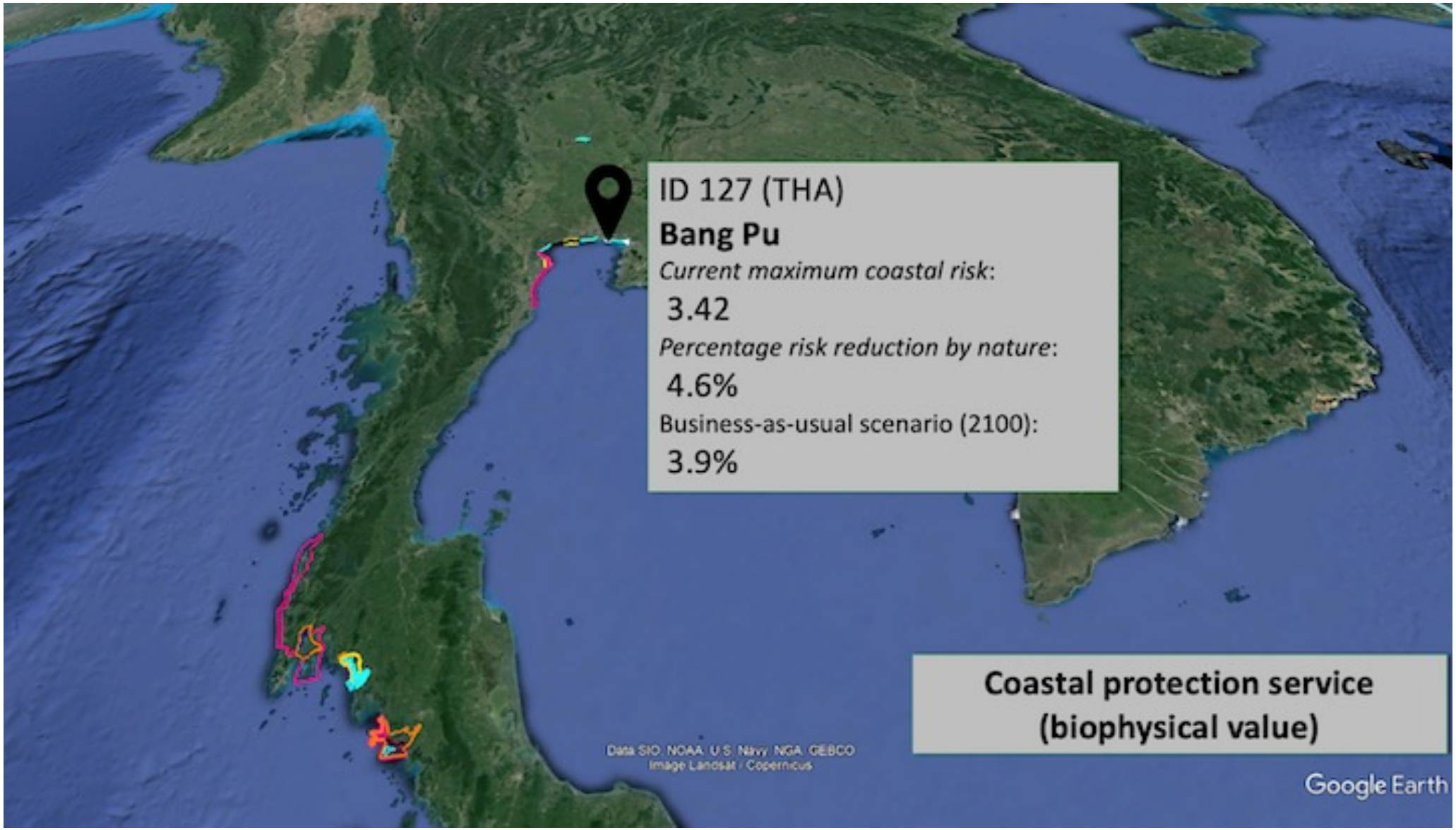

ID 133 (THA)
Ko Libong / Hat Chao Mai
Annual expected benefits to total stock:
US$ 0
Per hectare of mangroves:
US$ 0
For 1 in 100 years return storms:
US$ –
Coastal protection service (economic value)
Google Earth

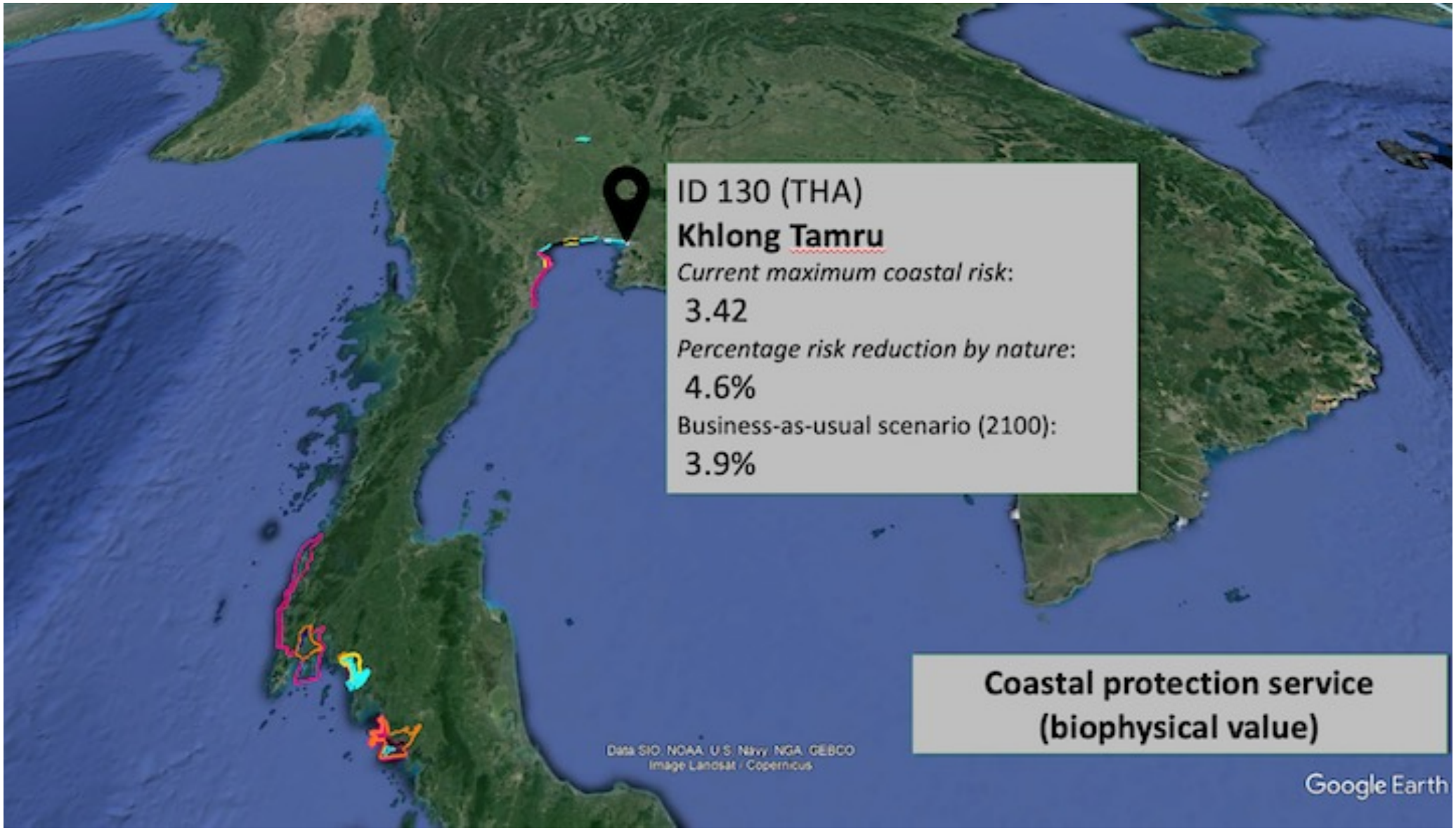

ID 134 (THA)
Krabi Estuary
Annual expected benefits to total stock:
US$ 0
Per hectare of mangroves:
US$ 0
For 1 in 100 years return storms:
US$ –
Coastal protection service
(economic value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

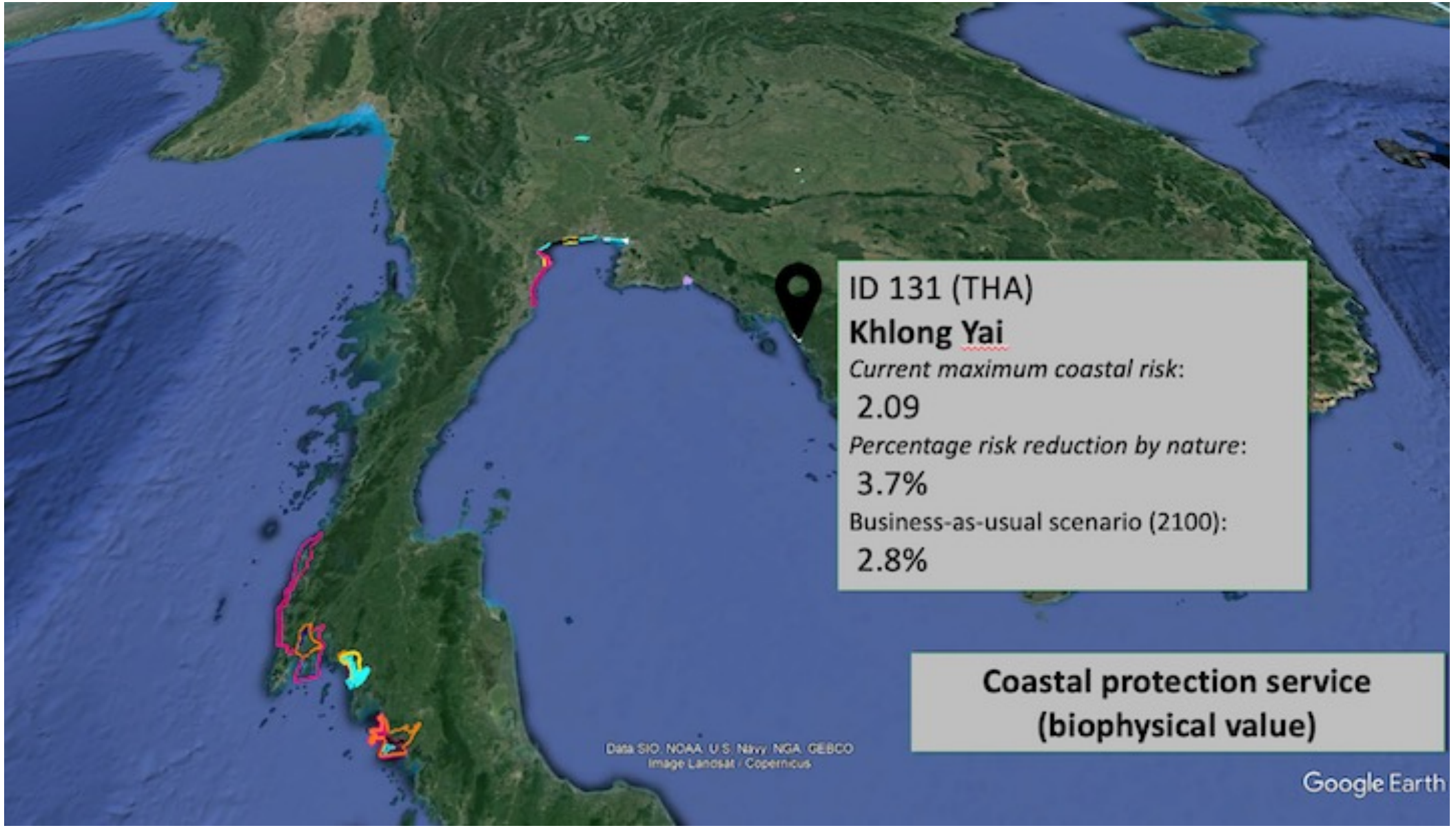

ID 135 (THA)
Pak Nam Prasae
Annual expected benefits to total stock:
US$ 2,019,217
Per hectare of mangroves:
US$ 1,087
For 1 in 100 years return storms:
US$ –
Coastal protection service
(economic value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

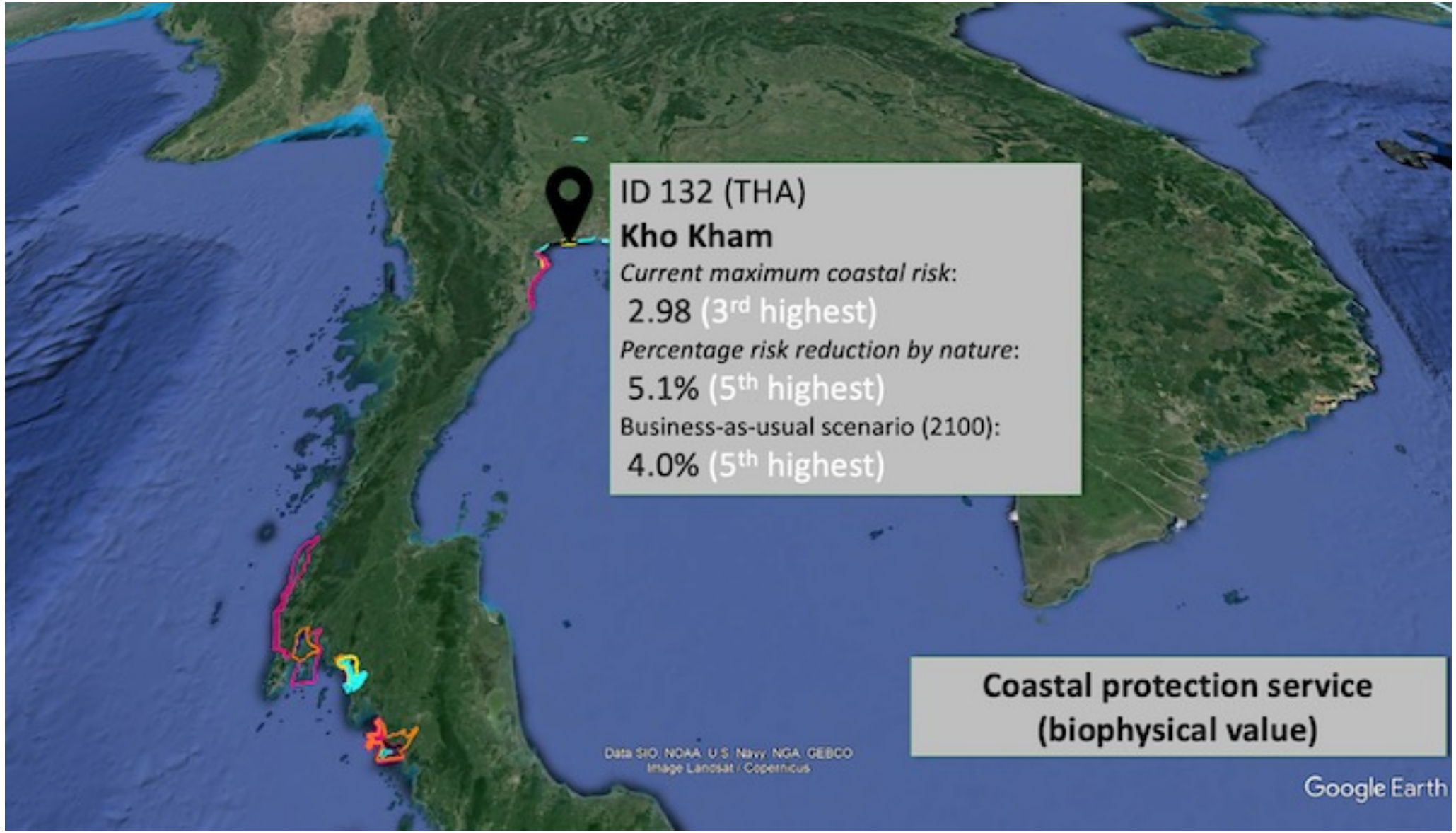

ID 136 (THA)
Pak Thale
Annual expected benefits to total stock:
US$ 1,183,183 (5th highest)
Per hectare of mangroves:
US$ 3,025 (4th highest)
For 1 in 100 years return storms:
US$ 2,927,771 (3rd highest)
Coastal protection service
(economic value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

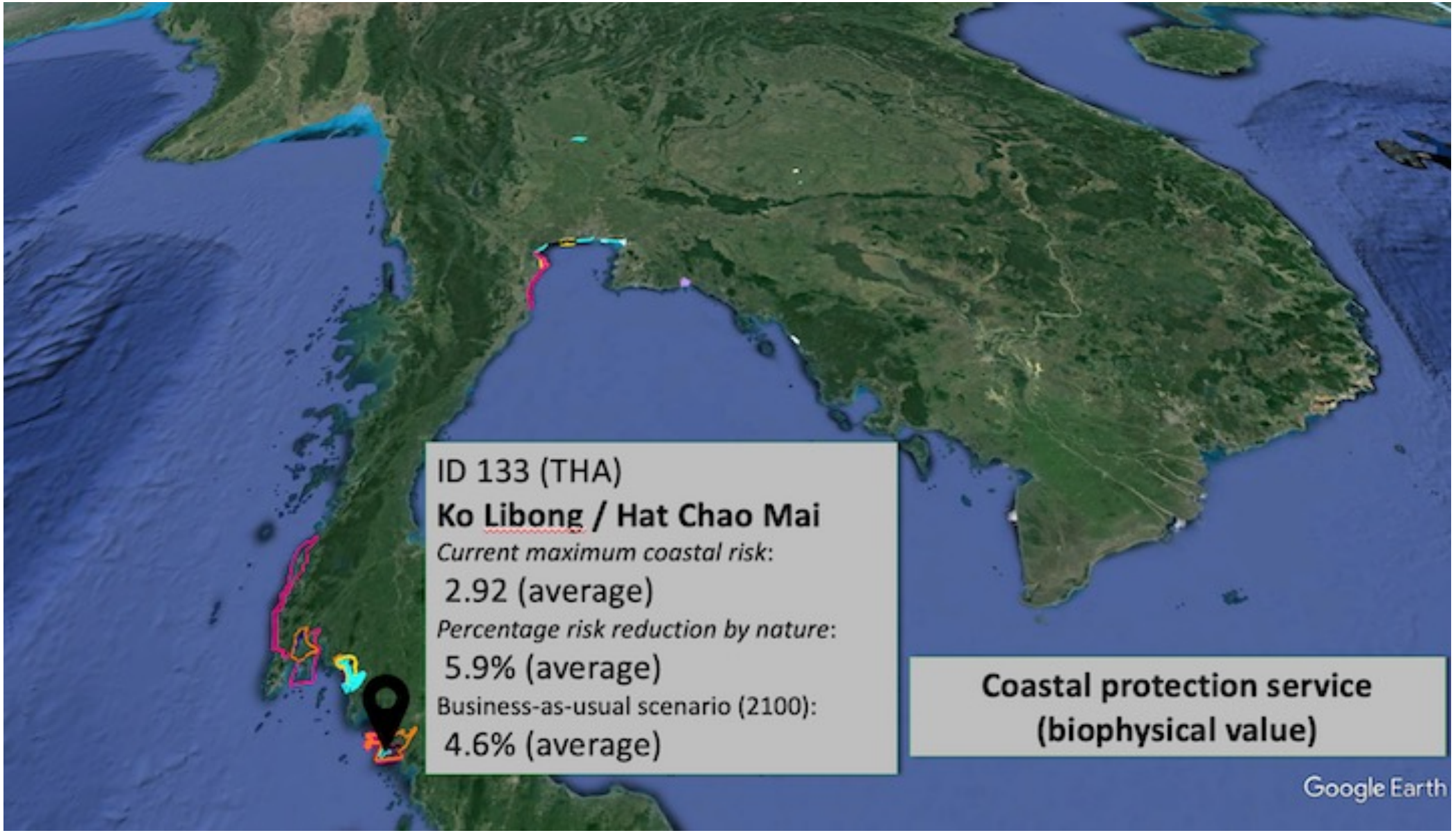

ID 137 (THA)
Pang Nga Bay
Annual expected benefits to total stock:
US$ 83,135
Per hectare of mangroves:
US$ 105
For 1 in 100 years return storms:
US$ 182,835
Coastal protection service
(economic value)
Google Earth

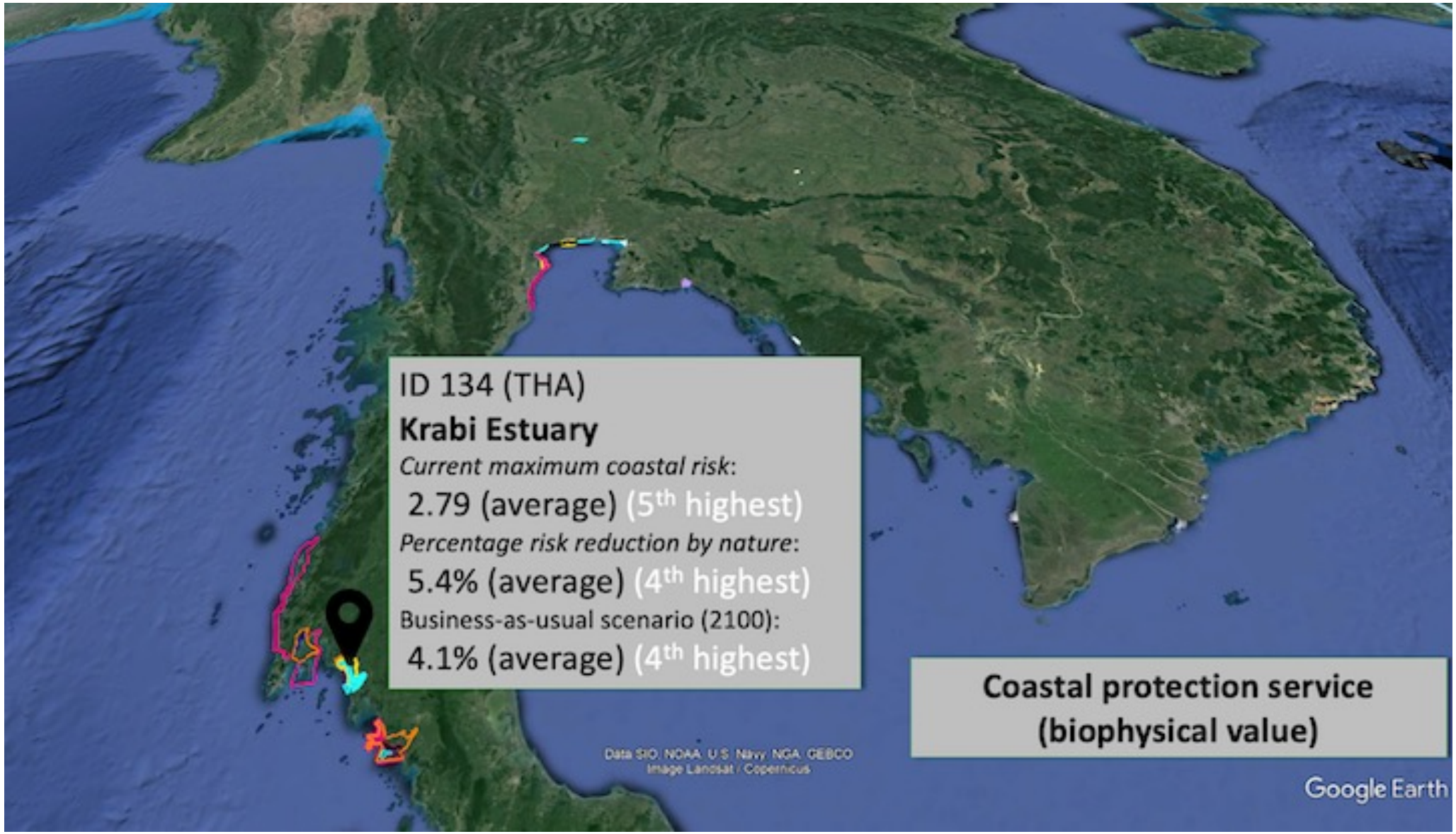

ID 127 (THA)
Bang Pu
Current maximum coastal risk:
3.42
Percentage risk reduction by nature:
4.6%
Business-as-usual scenario (2100):
3.9%
Coastal protection service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

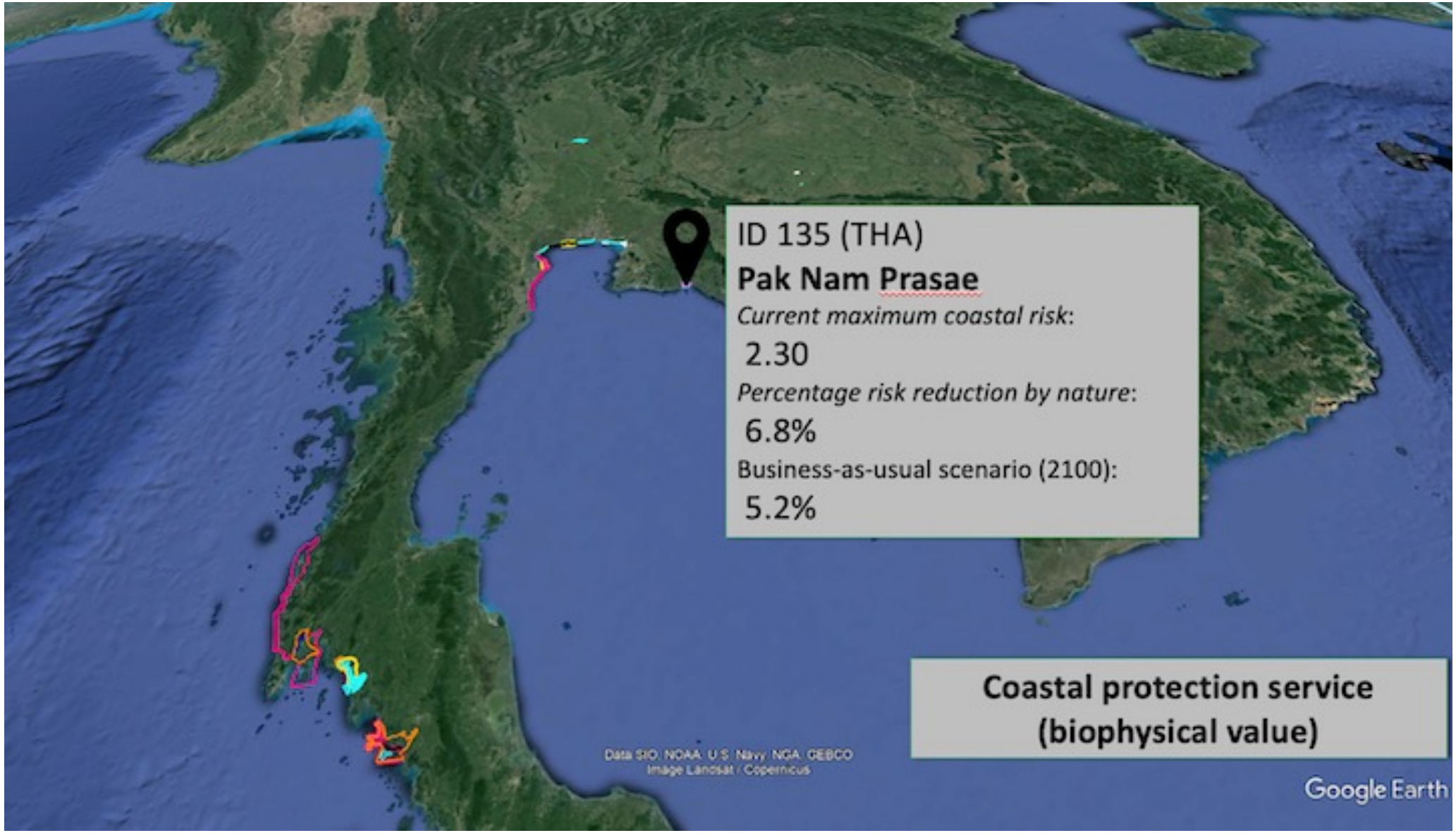

ID 130 (THA)
Khlong Tamru
Current maximum coastal risk:
3.42
Percentage risk reduction by nature:
4.6%
Business-as-usual scenario (2100):
3.9%
Coastal protection service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

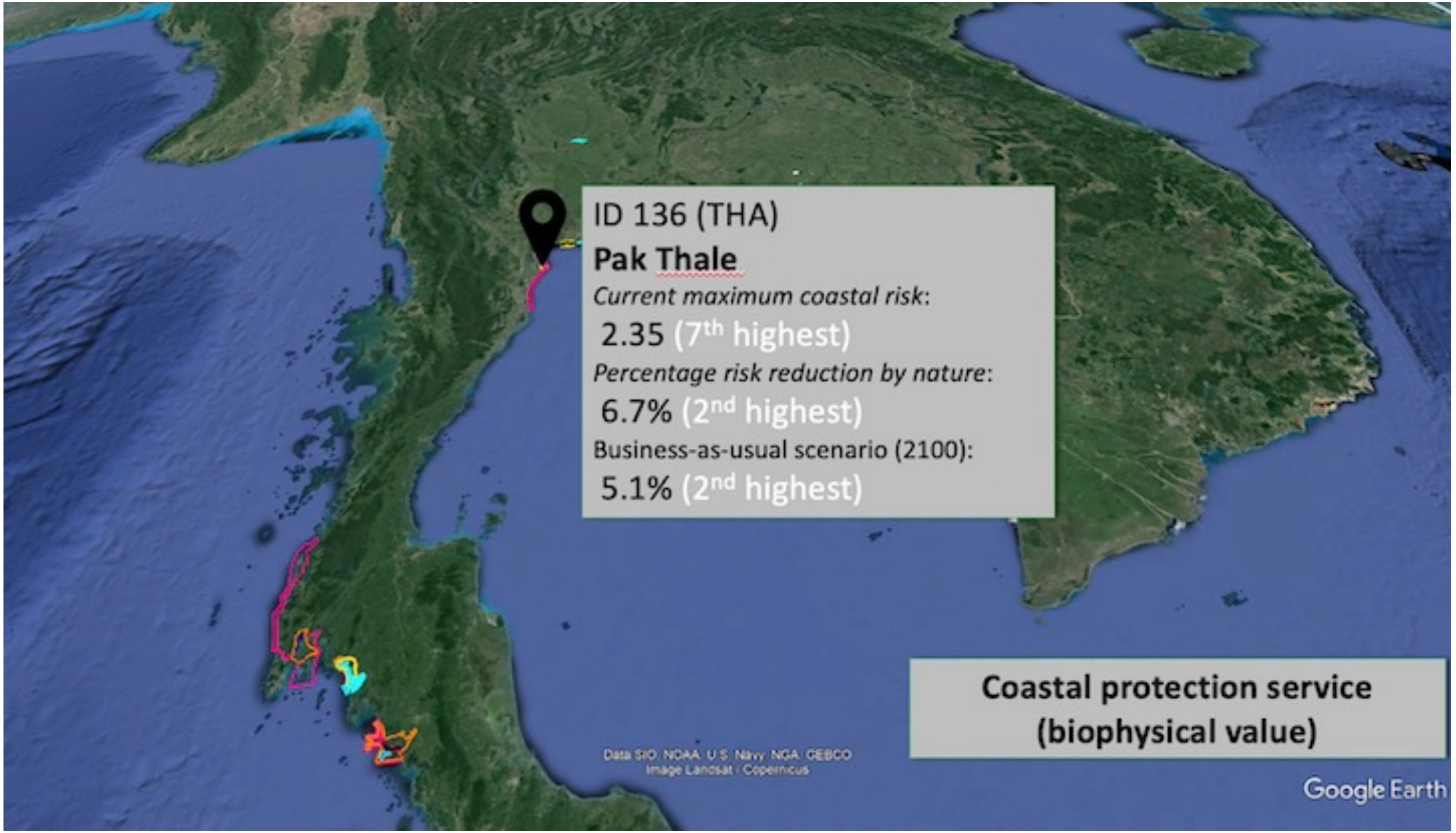

ID 131 (THA)
Khlong Yai
Current maximum coastal risk:
2.09
Percentage risk reduction by nature:
3.7%
Business-as-usual scenario (2100):
2.8%
Coastal protection service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

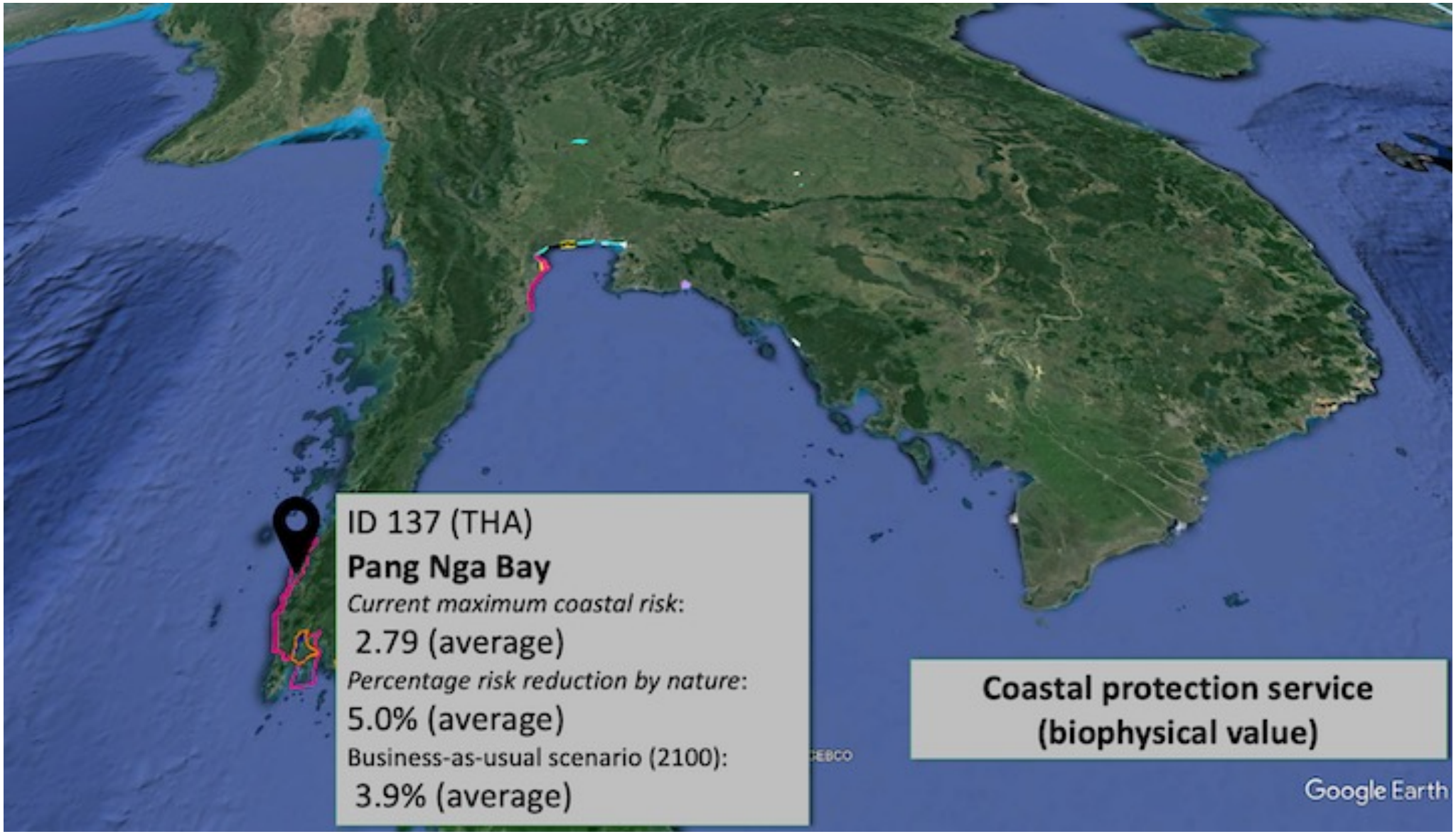

ID 132 (THA)
Kho Kham
Current maximum coastal risk:
2.98 (3rd highest)
Percentage risk reduction by nature:
5.1% (5th highest)
Business-as-usual scenario (2100):
4.0% (5th highest)
Coastal protection service (biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

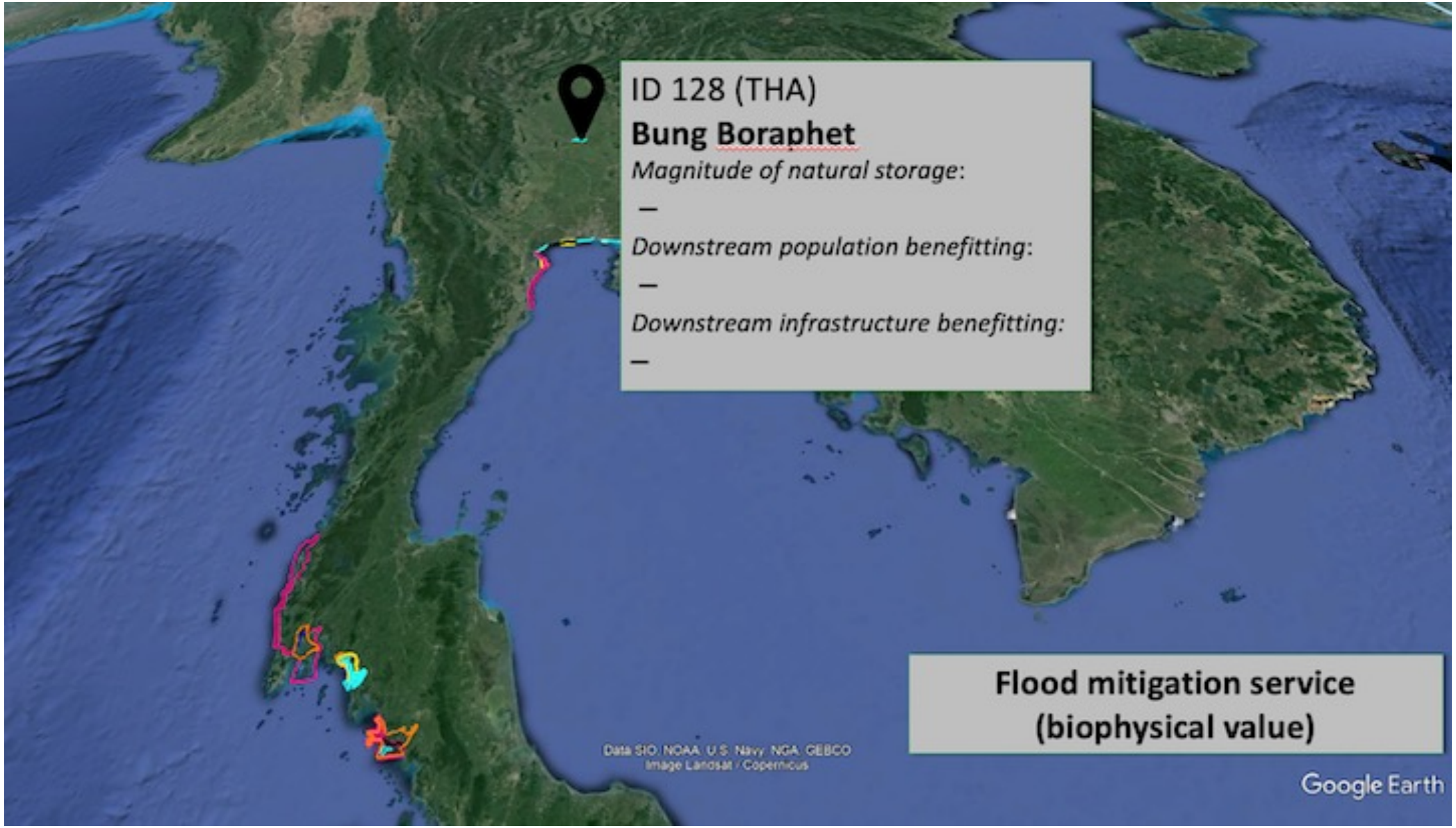

ID 133 (THA)
Ko Libong / Hat Chao Mai
Current maximum coastal risk:
2.92 (average)
Percentage risk reduction by nature:
5.9% (average)
Business-as-usual scenario (2100):
4.6% (average)
Coastal protection service (biophysical value)
Google Earth


ID 134 (THA)
Krabi Estuary
Current maximum coastal risk:
2.79 (average) (5th highest)
Percentage risk reduction by nature:
5.4% (average) (4th highest)
Business-as-usual scenario (2100):
4.1% (average) (4th highest)
Coastal protection service (biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

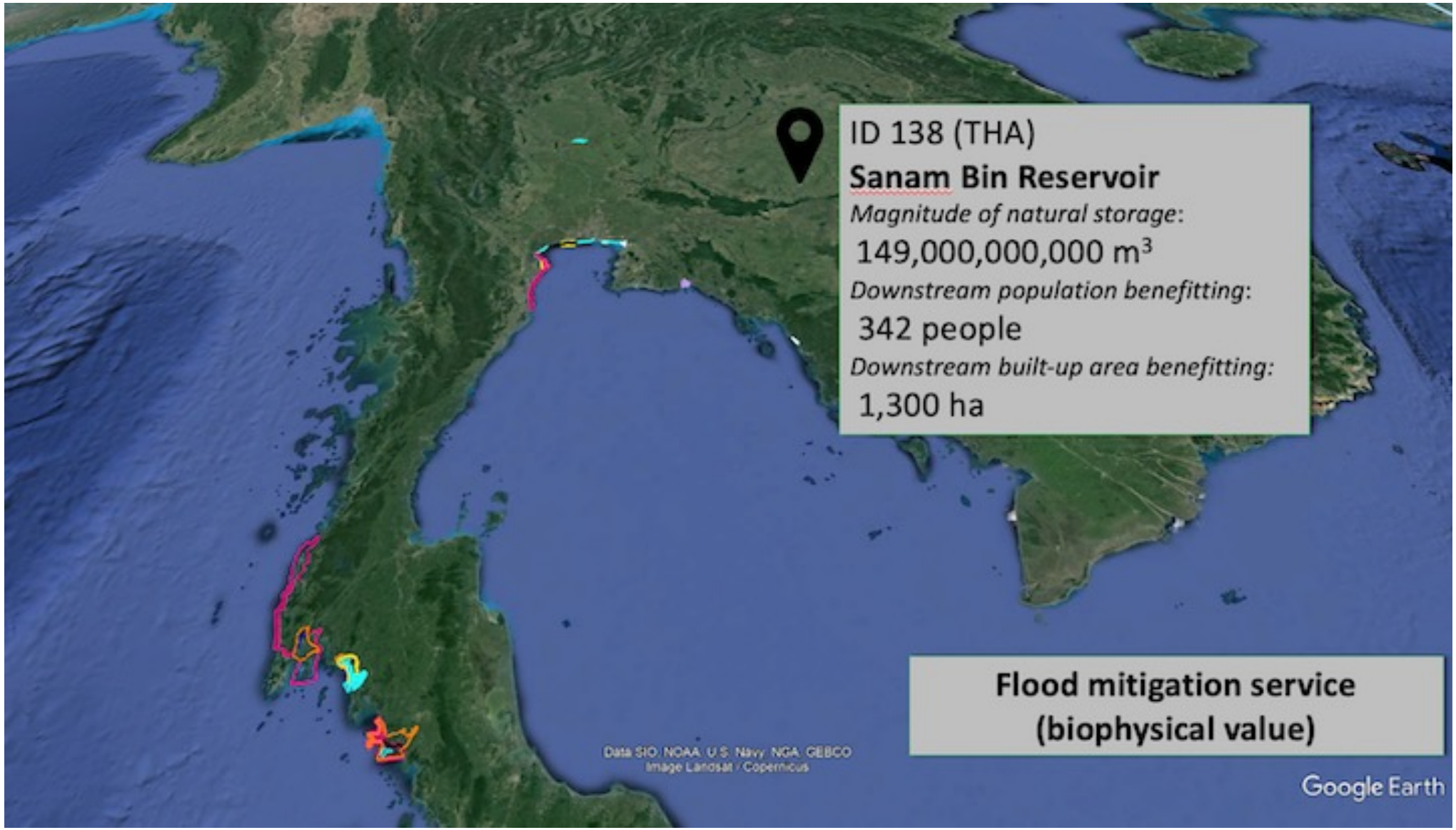

ID 135 (THA)
Pak Nam Prasae
Current maximum coastal risk:
2.30
Percentage risk reduction by nature:
6.8%
Business-as-usual scenario (2100):
5.2%
Coastal protection service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

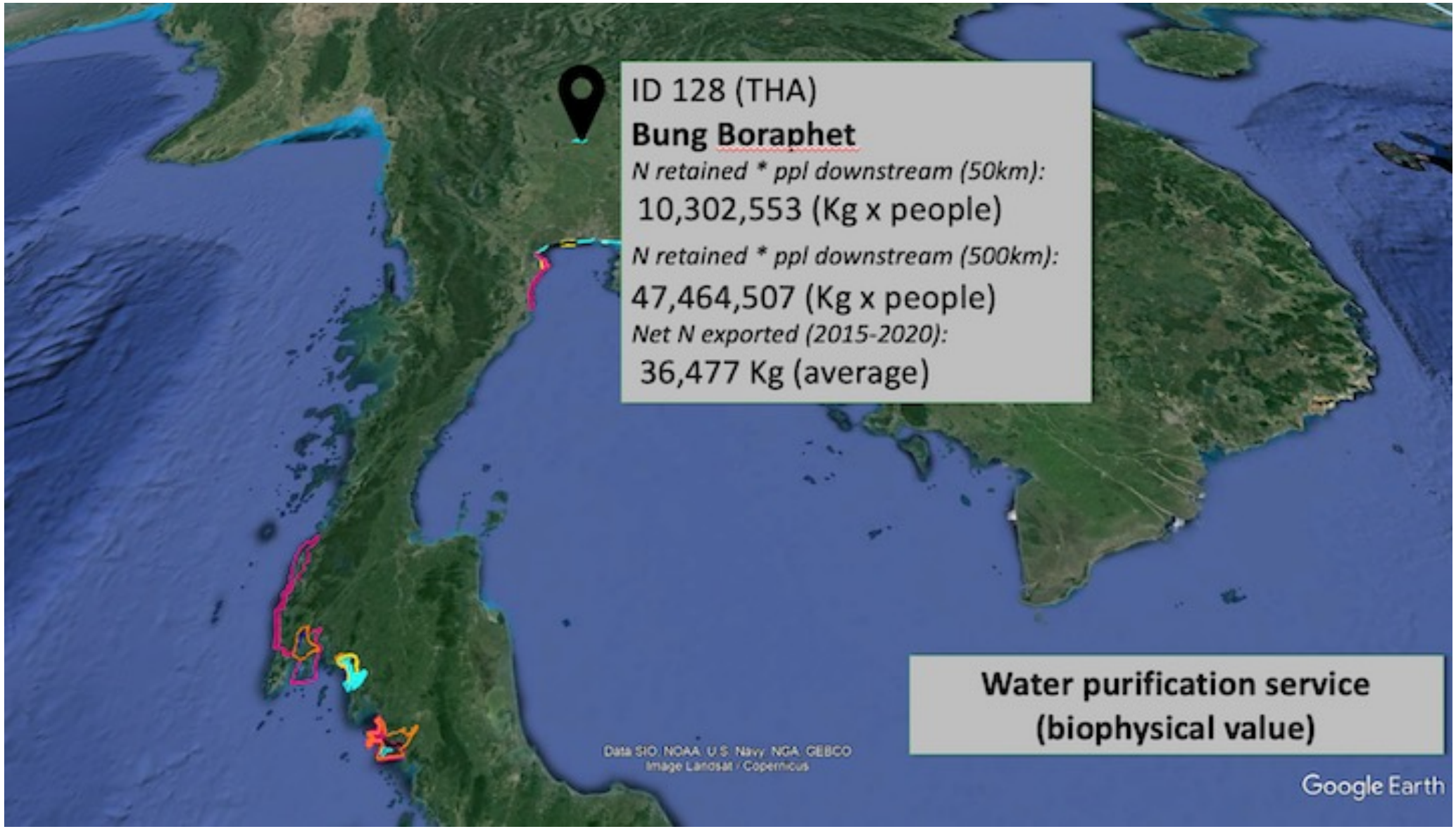

ID 136 (THA)
Pak Thale
Current maximum coastal risk:
2.35 (7th highest)
Percentage risk reduction by nature:
6.7% (2nd highest)
Business-as-usual scenario (2100):
5.1% (2nd highest)
Coastal protection service (biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

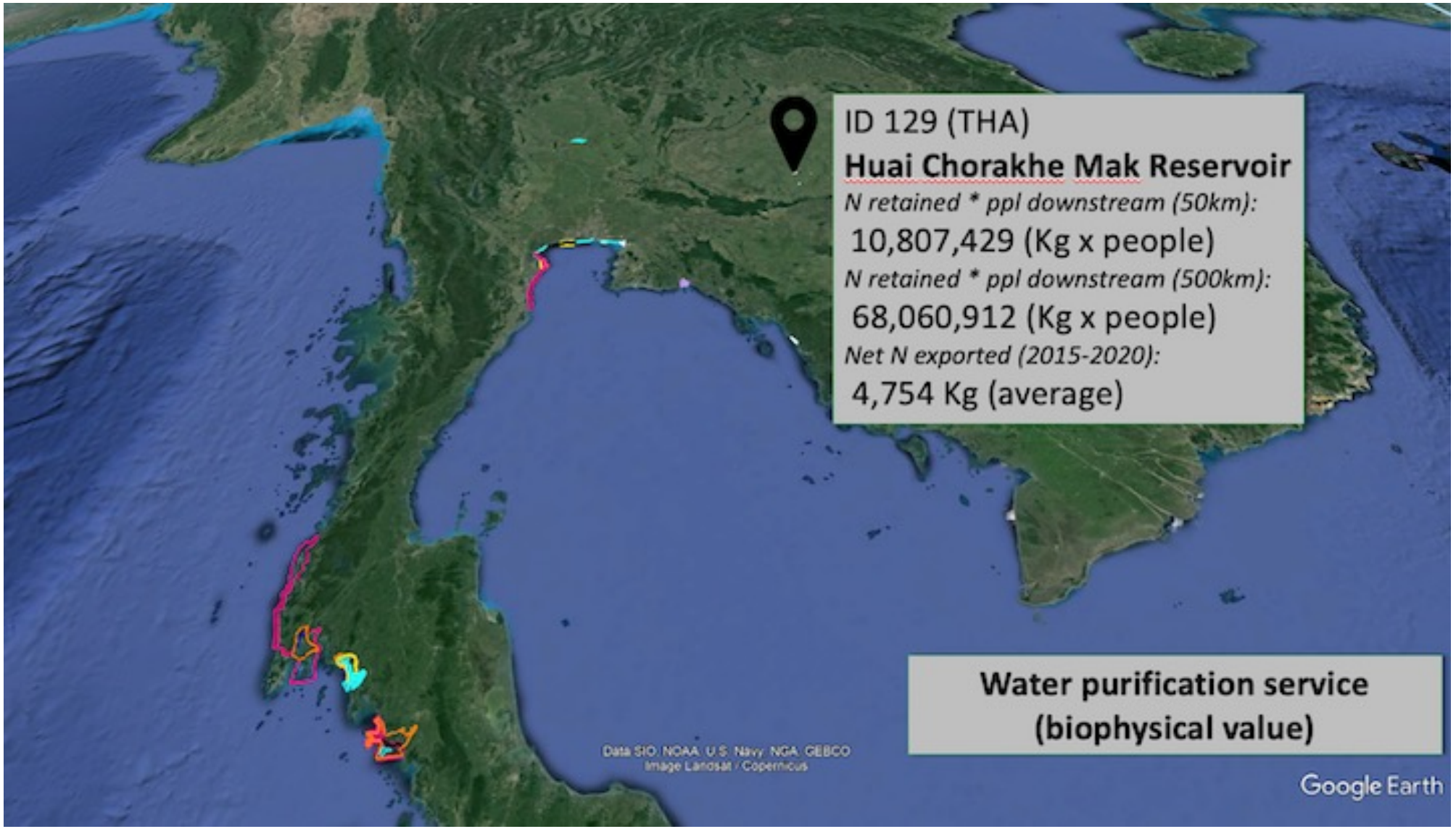

ID 137 (THA)
Pang Nga Bay
Current maximum coastal risk:
2.79 (average)
Percentage risk reduction by nature:
5.0% (average)
Business-as-usual scenario (2100):
3.9% (average)
Coastal protection service
(biophysical value)
Google Earth

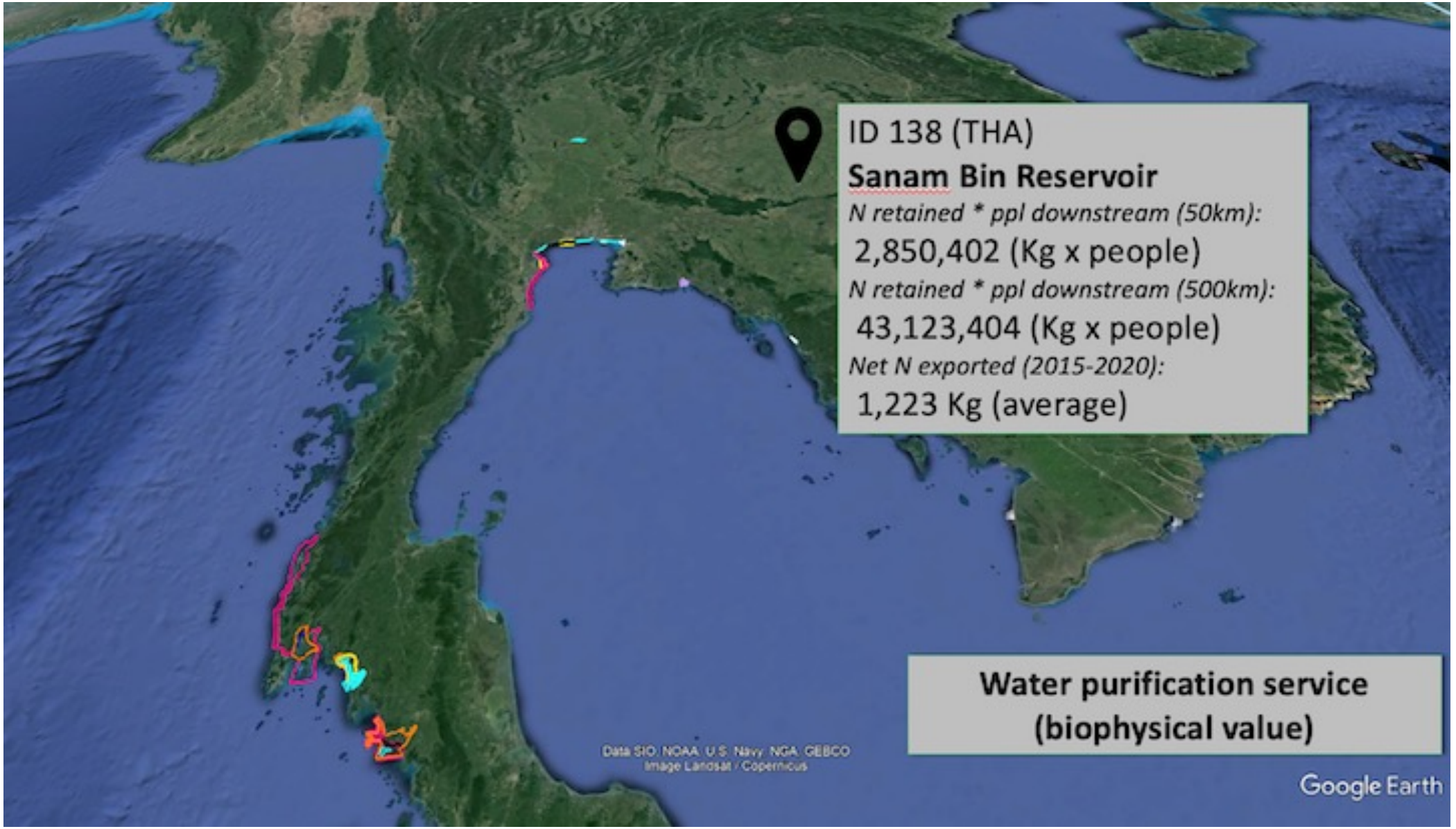

ID 128 (THA)
Bung Boraphet
Magnitude of natural storage:
–
Downstream population benefitting:
–
Downstream infrastructure benefitting:
–
Flood mitigation service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth


ID 129 (THA)
Huai Chorakhe Mak Reservoir
Magnitude of natural storage:
173,000,000,000 m3
Downstream population benefitting:
442 people
Downstream infrastructure benefitting:
1,900 ha
Flood mitigation service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth


ID 138 (THA)
Sanam Bin Reservoir
Magnitude of natural storage:
149,000,000,000 m³
Downstream population benefitting:
342 people
Downstream built-up area benefitting:
1,300 ha
Flood mitigation service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth


ID 128 (THA)
Bung Boraphet
N retained * ppl downstream (50km):
10,302,553 (Kg x people)
N retained * ppl downstream (500km):
47,464,507 (Kg x people)
Net N exported (2015-2020):
36,477 Kg (average)
Water purification service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth


ID 129 (THA)
Huai Chorakhe Mak Reservoir
N retained * ppl downstream (50km):
10,807,429 (Kg x people)
N retained * ppl downstream (500km):
68,060,912 (Kg x people)
Net N exported (2015-2020):
4,754 Kg (average)
Water purification service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth


ID 138 (THA)
Sanam Bin Reservoir
N retained * ppl downstream (50km):
2,850,402 (Kg x people)
N retained * ppl downstream (500km):
43,123,404 (Kg x people)
Net N exported (2015-2020):
1,223 Kg (average)
Water purification service
(biophysical value)
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

THANK YOU

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