Department of Environment and Natural Resources
Biodiversity Management Bureau

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U.S. DEPARTMENT OF THE INTERIOR
INTERNATIONAL TECHNICAL ASSISTANCE PROGRAM

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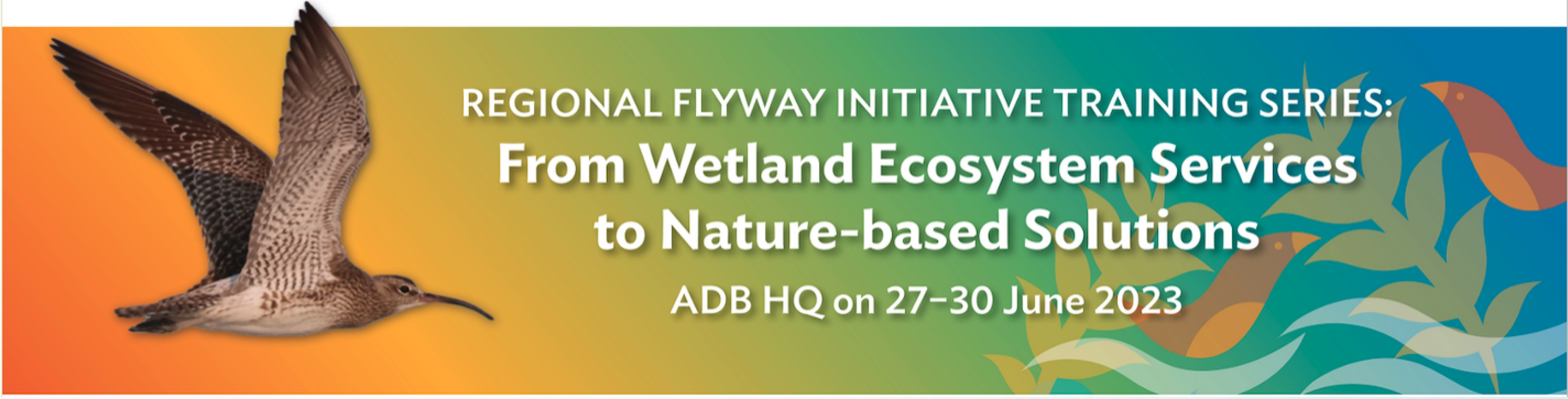
REGIONAL FLYWAY INITIATIVE TRAINING SERIES:

From Wetland Ecosystem Services to Nature-based Solutions

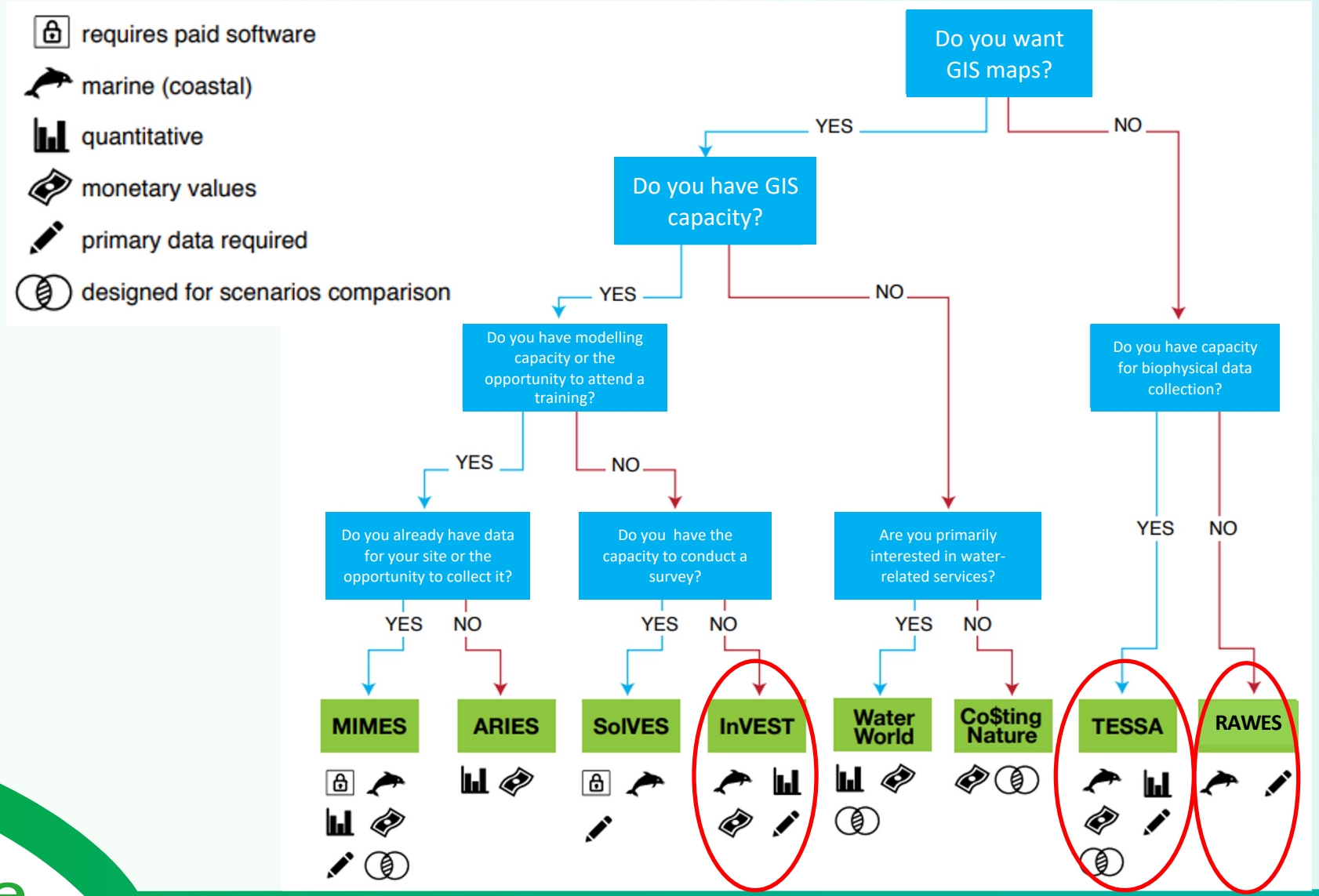
ADB HQ on 27–30 June 2023



Differences in Use and Application between Ecosystem Service Assessment Tools

Stefano Barchiesi, PhD
Ecosystem Services Officer
BirdLife International
stefano.barchiesi@birdlife.org

Decision tree for tool selection



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

Rapid Assessment of Wetland Ecosystem Services (RAWES)

13th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands

"Wetlands for a Sustainable Urban Future"
Dubai, United Arab Emirates, 21-29 October 2018

Resolution XIII.17

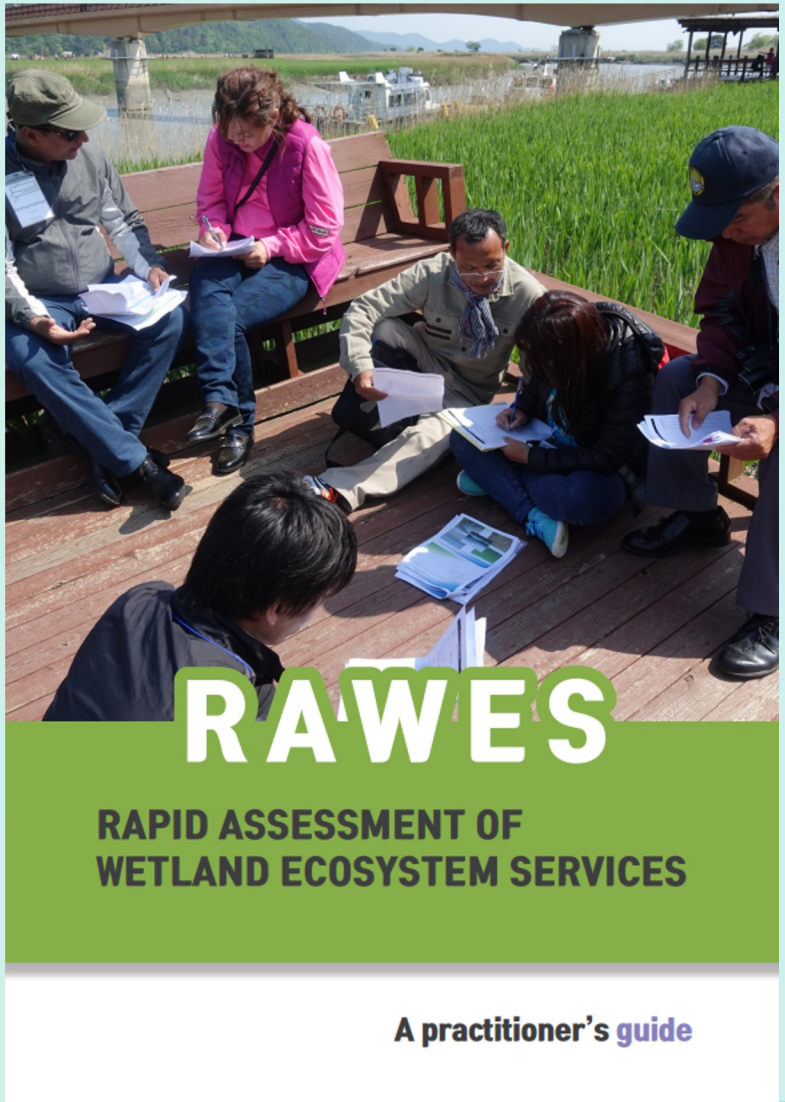
Rapidly assessing wetland ecosystem services

1. RECOGNIZING that, to achieve the Mission of the Ramsar Convention as described in the Strategic Plan 2016-2024, it is essential that vital ecosystem functions and the ecosystem services that wetlands provide to people and nature are fully recognized, maintained, restored and wisely used and that the need to develop approaches for assessing both ecosystem functions and ecosystem services is recognized;

2. RECALLING that Annex A to Resolution IX.1 on *Additional scientific and technical guidance for implementing the Ramsar wise use concept* defines the ecological character of wetlands as "the combination of the ecosystem components, processes and benefits/services that characterize the wetland at a given point in time"; ALSO RECALLING that the *Guidance for valuing the benefits derived from wetland ecosystem services* (Ramsar Technical Report No.3 / Technical Series No.27 of the Convention on Biological Diversity) provides guidance for valuing wetlands and advice on when and why wetland valuation should be undertaken and sets out a framework for the integrated assessment and valuation of wetland services;

3. NOTING that a priority area of focus for the Convention under the Ramsar Strategic Plan 2016-2024 (Resolution XII.2) is to enhance the information about ecosystem functions and the ecosystem services that wetlands provide to people and nature; ALSO RECALLING Target 11 of the Ramsar Strategic Plan 2016-2024, "Wetland functions, services and benefits are widely demonstrated, documented and disseminated", and that the assessment of ecosystem services of Wetlands of International Importance (Ramsar Sites) is a key indicator of progress against this target;

4. FURTHER recognizing that, under Resolution XII. 3[1], on *Enhancing the languages of the Convention and its visibility and stature, and increasing synergies with other multilateral environmental agreements and other international institutions*, Contracting Parties and other stakeholders are encouraged "to increase their efforts to communicate on the values of ecosystem services of wetlands in other sectors' strategies, plans and regulations, and integrate them into a basin approach to land-use plans and other relevant local, national and global decisions";



Rapid Assessment of Wetland Ecosystem Services (RAWES)

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

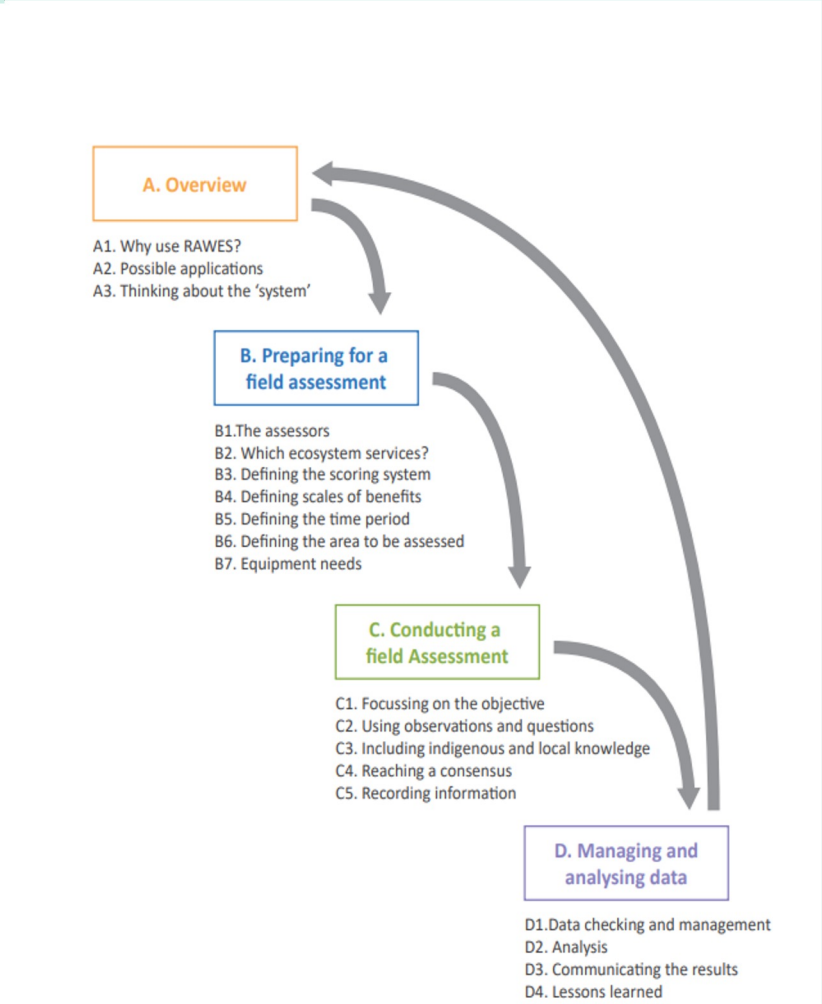
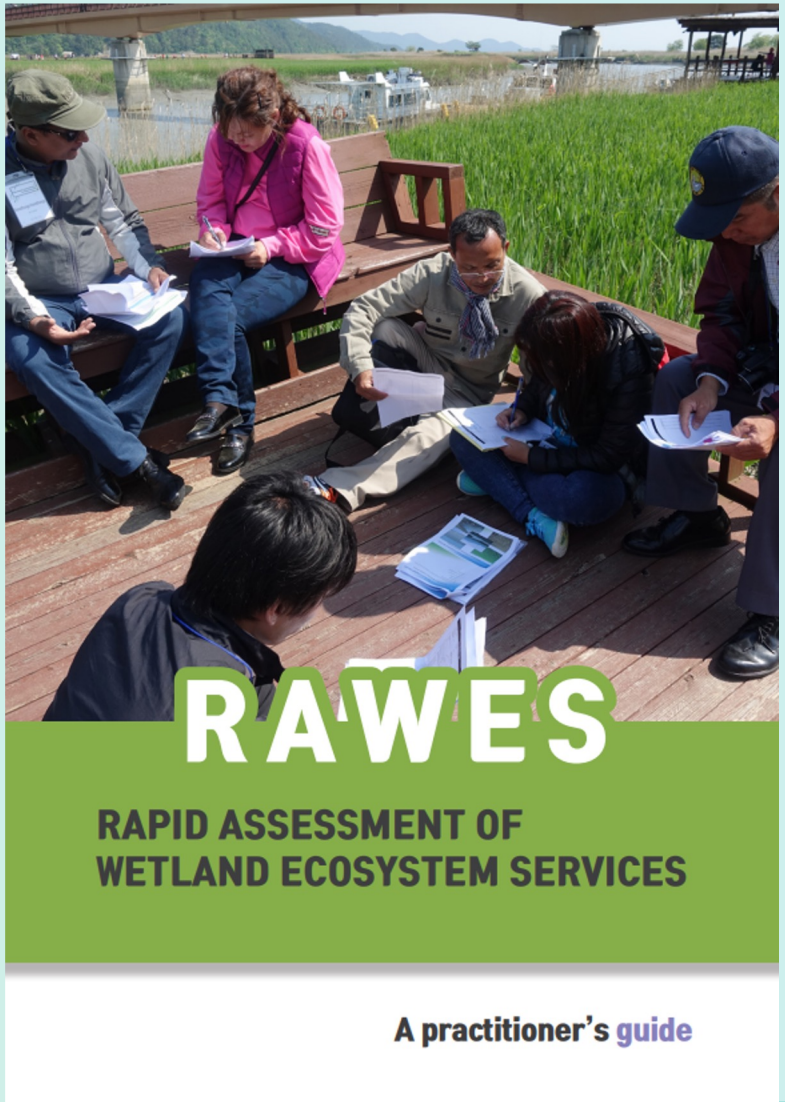


Figure 1 The four steps in applying the RAWES approach.



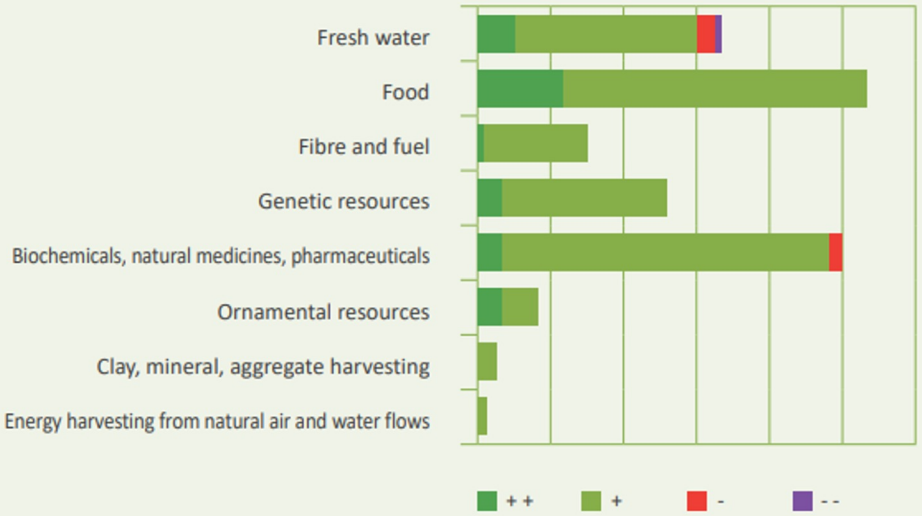
Rapid Assessment of Wetland Ecosystem Services (RAWES)

Box 10 **UNDERSTANDING THE DIFFERENT ECOSYSTEM SERVICES FROM MULTIPLE WETLAND SITES**
WETLANDS OF METROPOLITAN COLOMBO, SRI LANKA

Assessments were conducted on 62 different wetland sites across Metropolitan Colombo. Upon completion of the field assessments, the total number of each of the different scores assigned to each ecosystem service was counted. From the count data it is possible to understand which ecosystem services are the most common and widespread across the city, and therefore the main benefits that are being derived from the wetlands.

The graph below shows the results for the provisioning services. The most frequently occurring and most important provisioning service is the production of food, closely followed by natural medicines. For some wetlands, the provision of fresh water was considered a 'disbenefit' due to high levels of pollution.

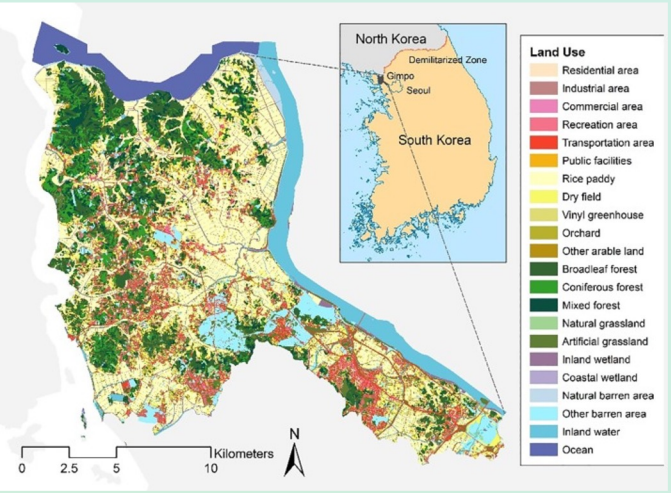
Rice production in the city of Colombo's wetlands

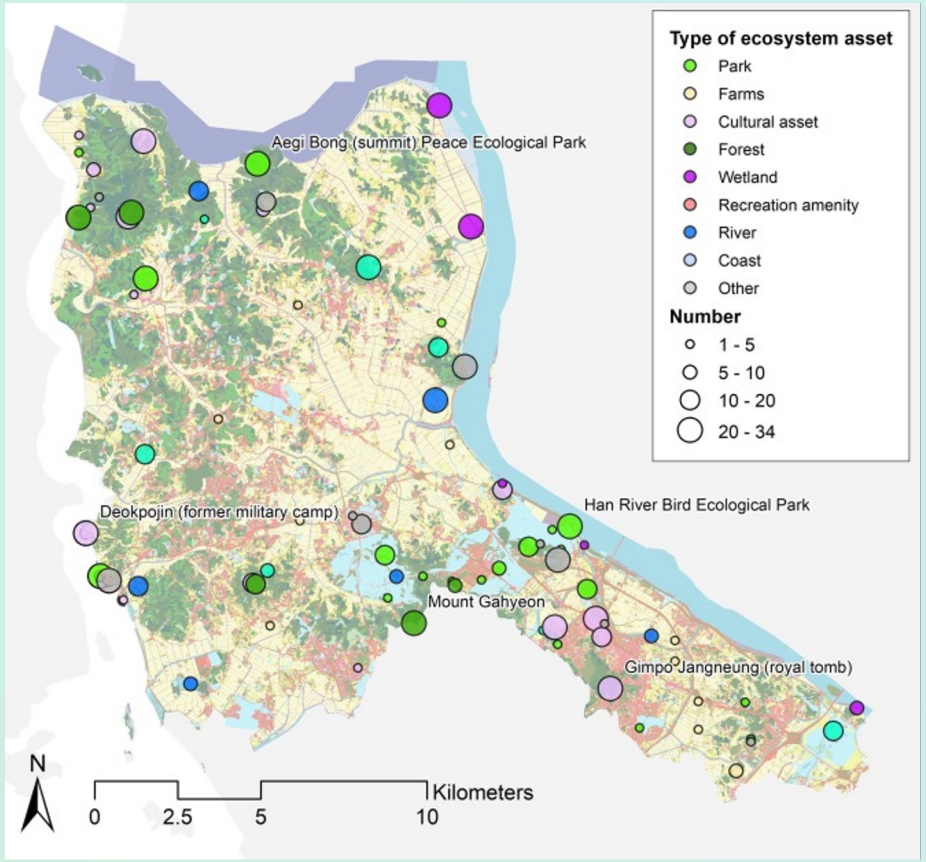


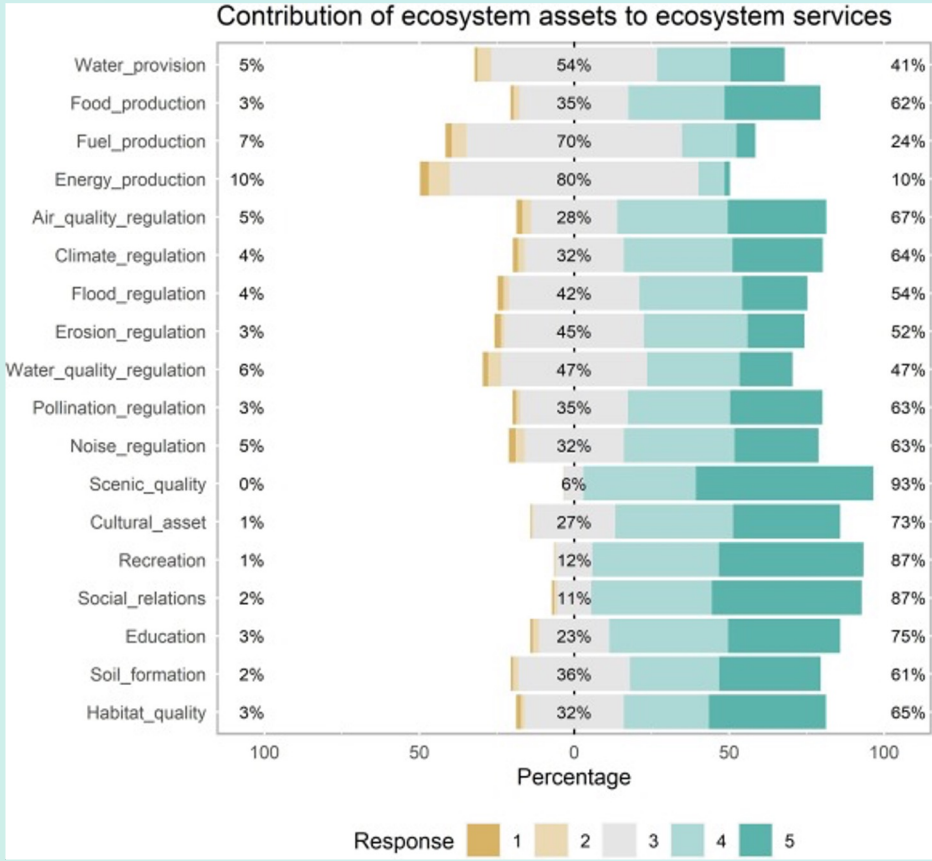
McInnes & Everard, 2017
https://doi.org/10.1016/j.ecoser.2017.03.024

Rapid Assessment of Wetland Ecosystem Services (RAWES)

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

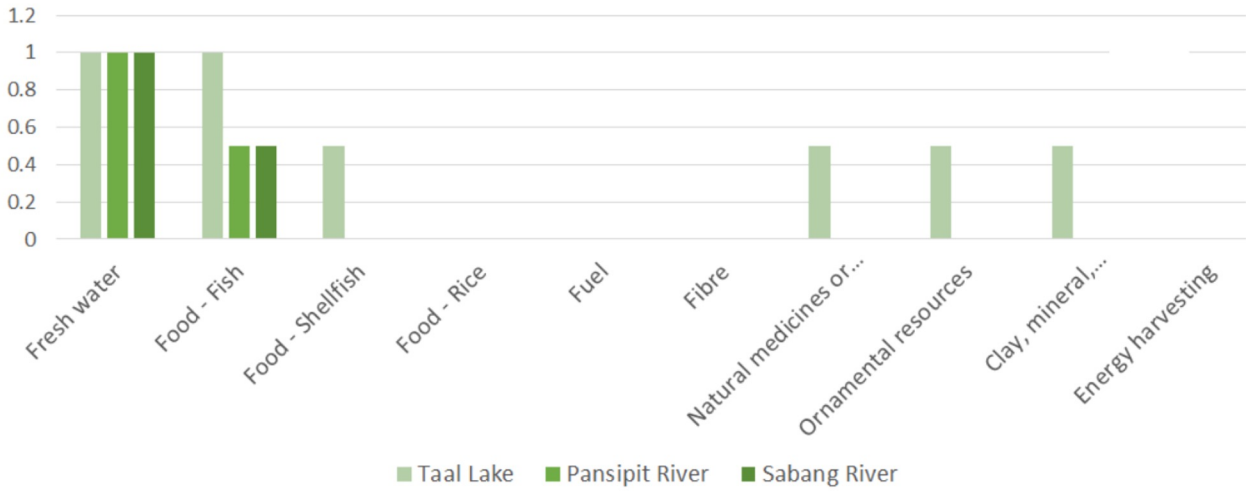


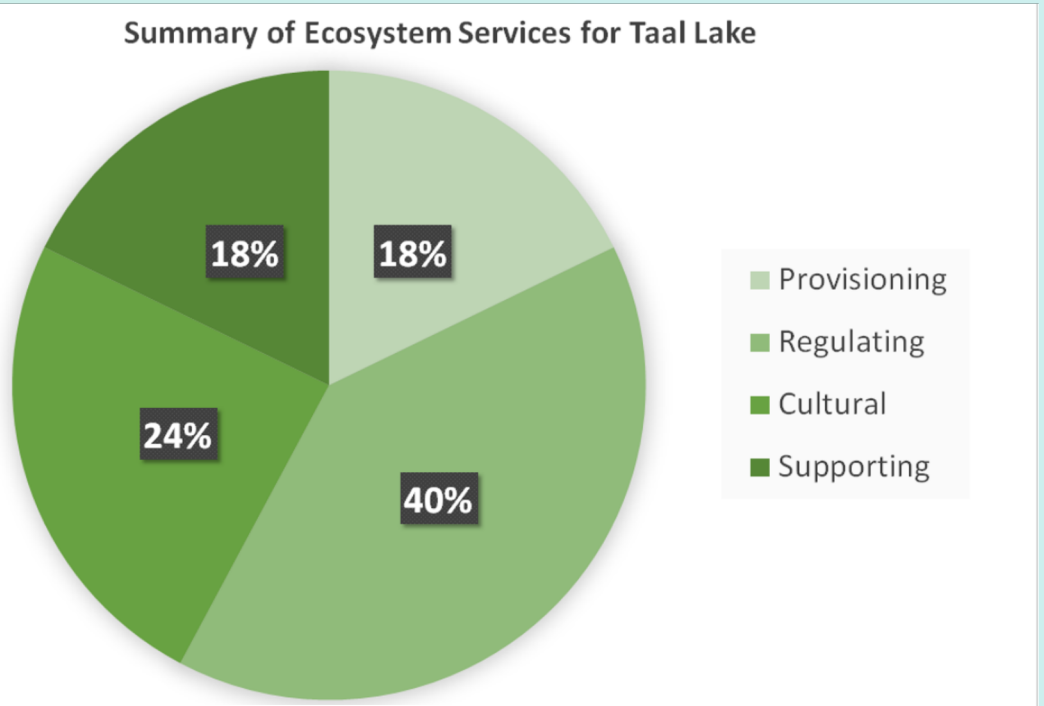




Relevance of RAWES in a Ramsar Convention context

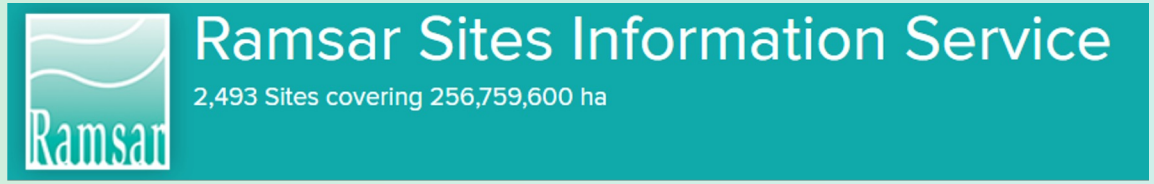
Importance score	++	+	0	-	--	?
Numerical value	1.0	0.5	0.0	-0.5	-1.0	Remove from analysis

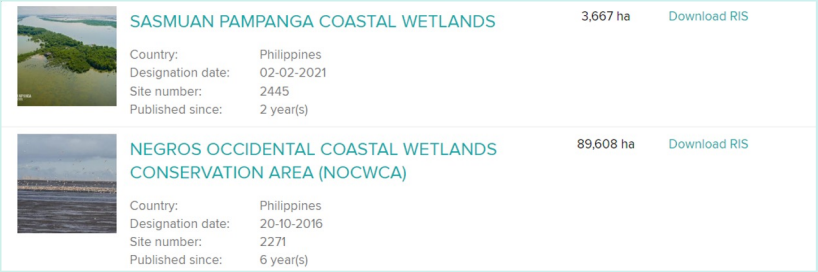




Communication, Capacity Building, Education and Public Awareness (CEPA) for all wetlands!

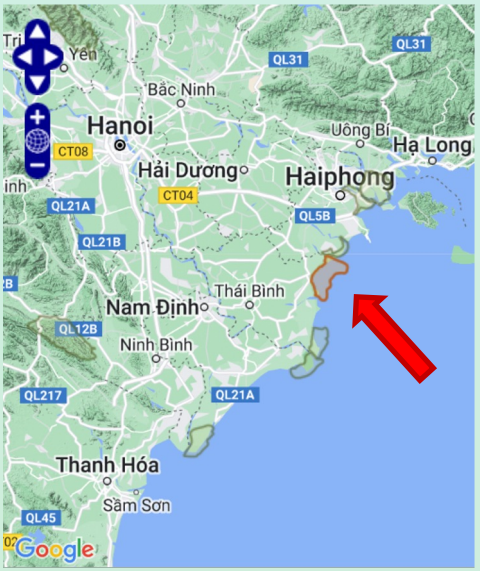
Republic of the Philippines
Department of Environment and Natural Resources
Biodiversity Management Bureau

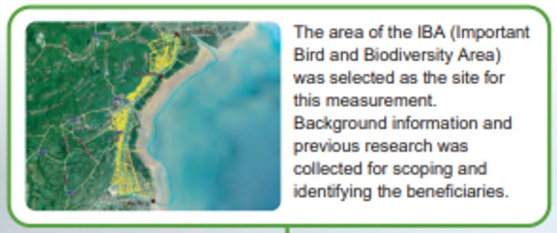




The experiences of Myanmar and Vietnam with TESSA

The experience of Thai Thuy in Vietnam





The area of the IBA (Important Bird and Biodiversity Area) was selected as the site for this measurement. Background information and previous research was collected for scoping and identifying the beneficiaries.

All data collected during the survey were analyzed with the existing data and literature. For the climate regulation and disaster prevention, desk top analyses were conducted.

Preliminary work & Rapid appraisal

- Define site, based on biological importance and perceived threats
- Explore policy context
- Identify the stakeholders
- Identify habitat, services and beneficiaries

Methods selection

- Select relevant services to assess
- Select appropriate methods for each service

Data acquisition

- Collect/collate data for site

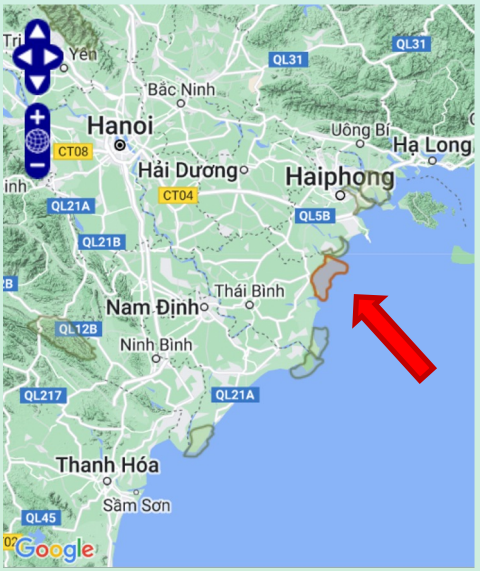
Analysis and communication

- Analyse data
- Communicate messages

In this survey, four ecosystem services were identified and methods for each service were selected
- Harvested wild goods
- Cultivated goods
- Disaster risk reduction
- Global climate regulation

Data was collected from existing data and simple interviews. In order to identify missing services and collect information, a stakeholder meeting was conducted with the representatives of the area.

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.

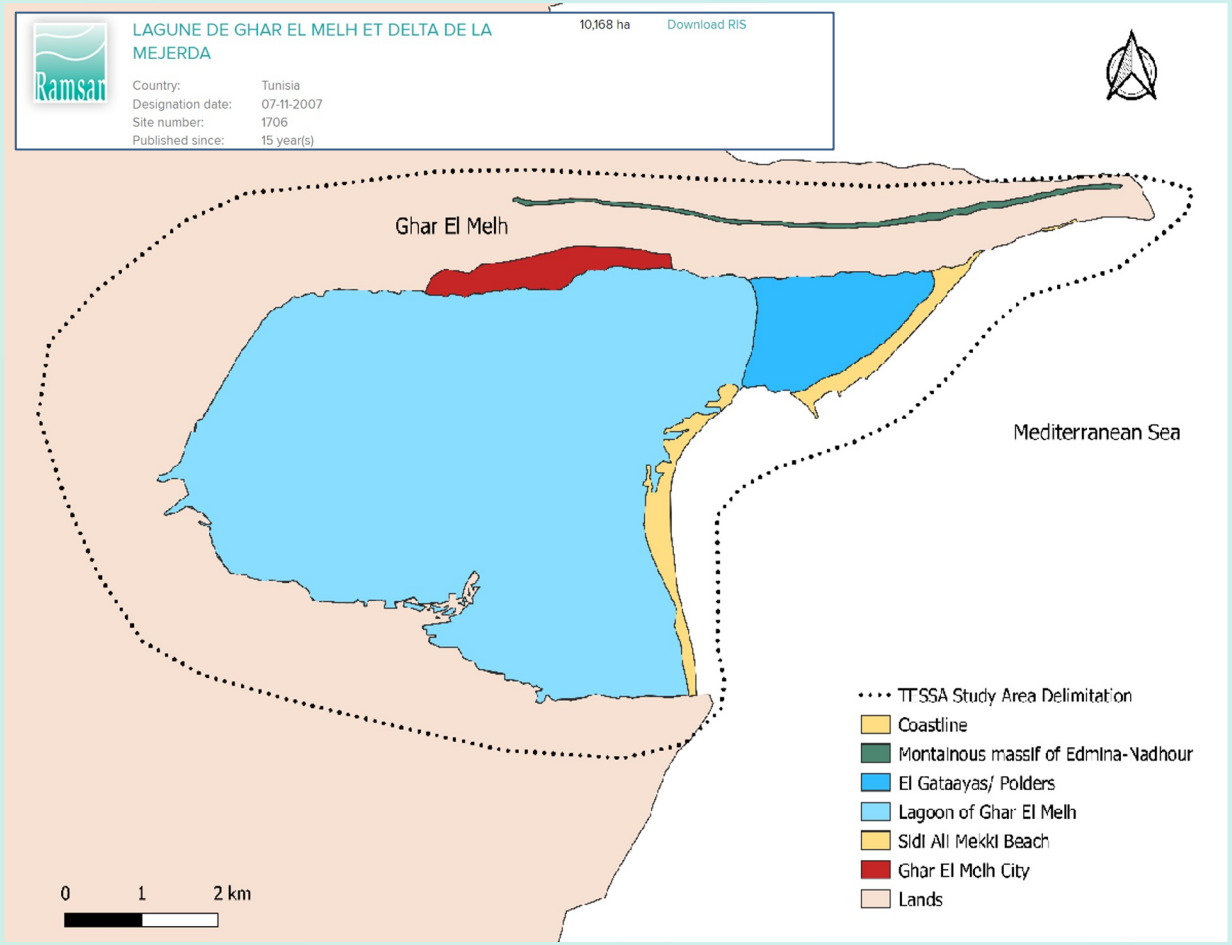
Eco-tourism

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.

Relevance of TESSA in a Ramsar Convention context

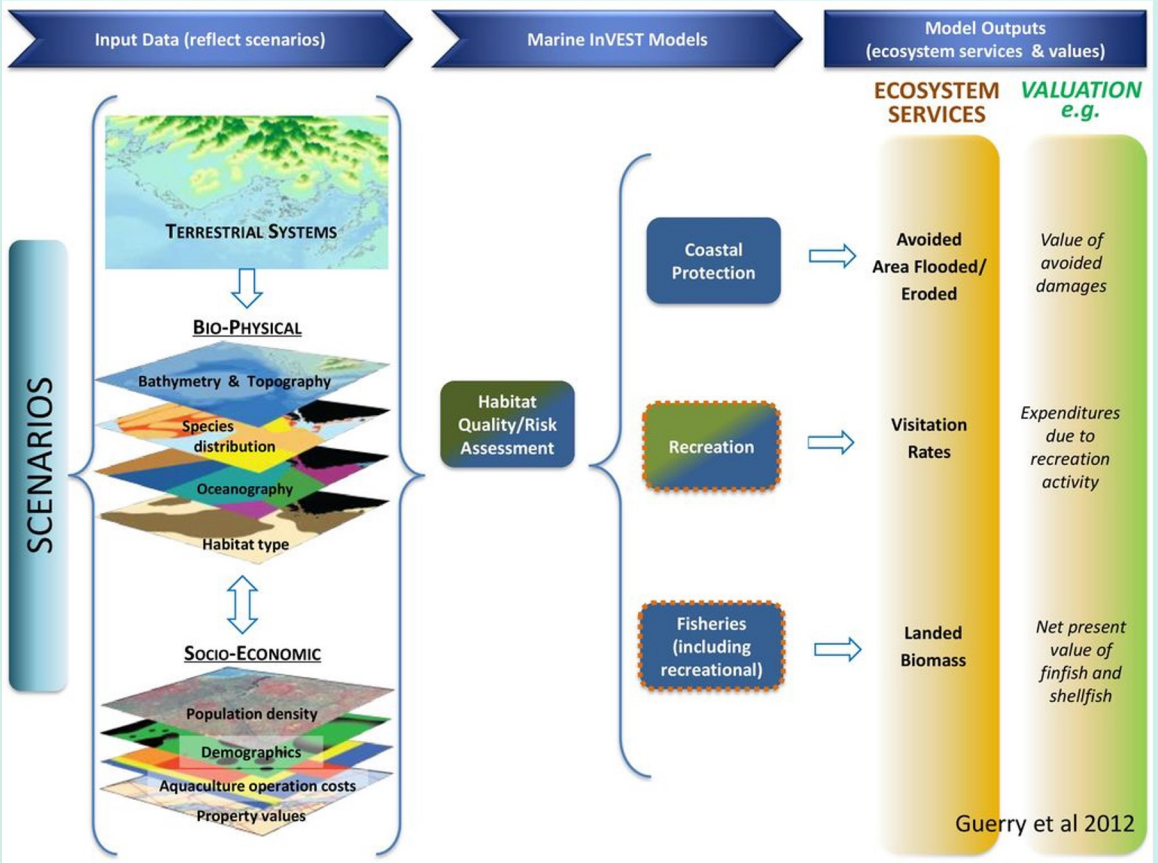
Ghar El Melh, Tunisia:

- 10,168 ha
- 9,402 inhabitants
- Ramsar Site (2007)
- KBA (2016)
- Ramsar City (2018)



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 »

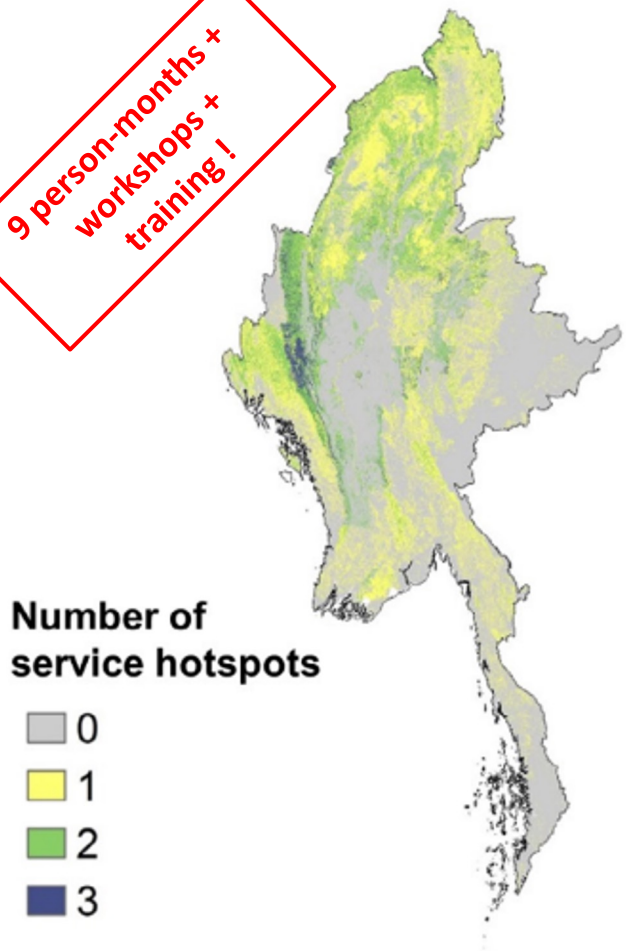
Water Purification | Read more »

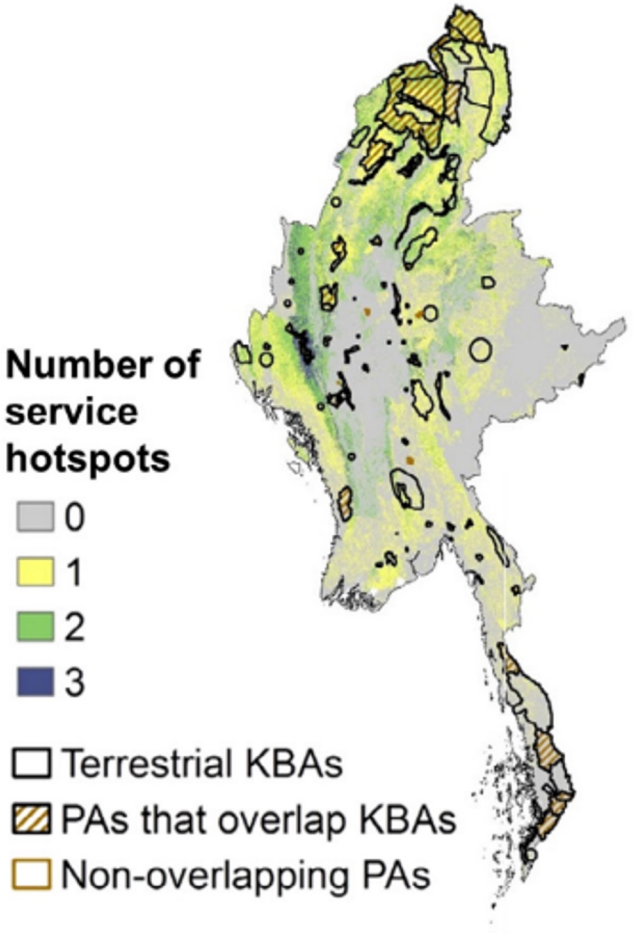
Wave Energy | Read more »

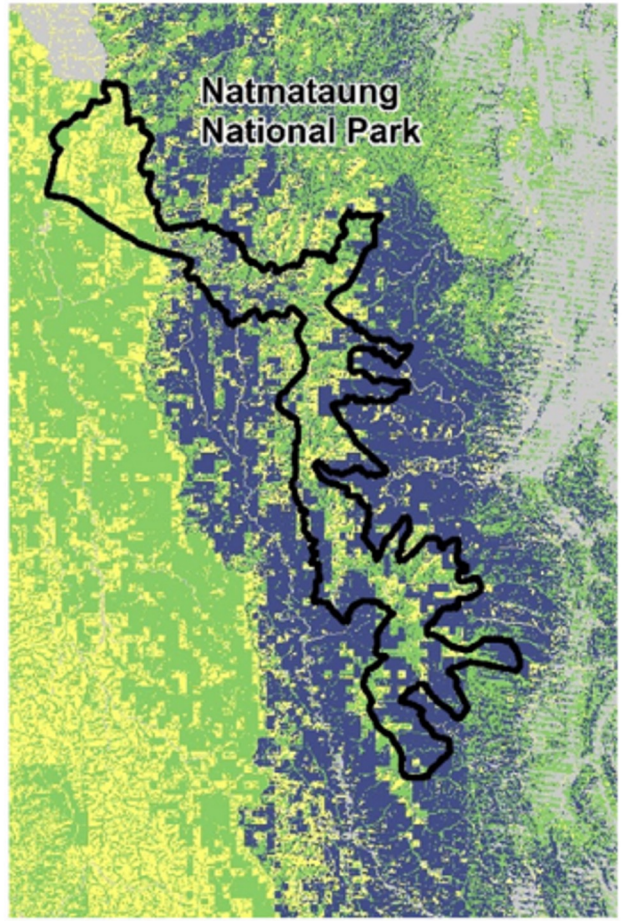
https://naturalcapitalproject.stanford.edu/software/invest

InVEST application: Overlap of ES hotspots and KBAs/PAs

9 person-months + workshops + training !







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

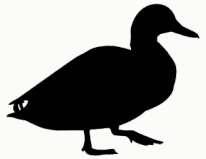
Carbon | Read more »

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 »

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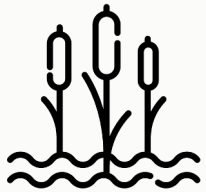
Urban Stormwater Retention | Read more »

Water Purification | Read more »



Wave Energy | Read more »

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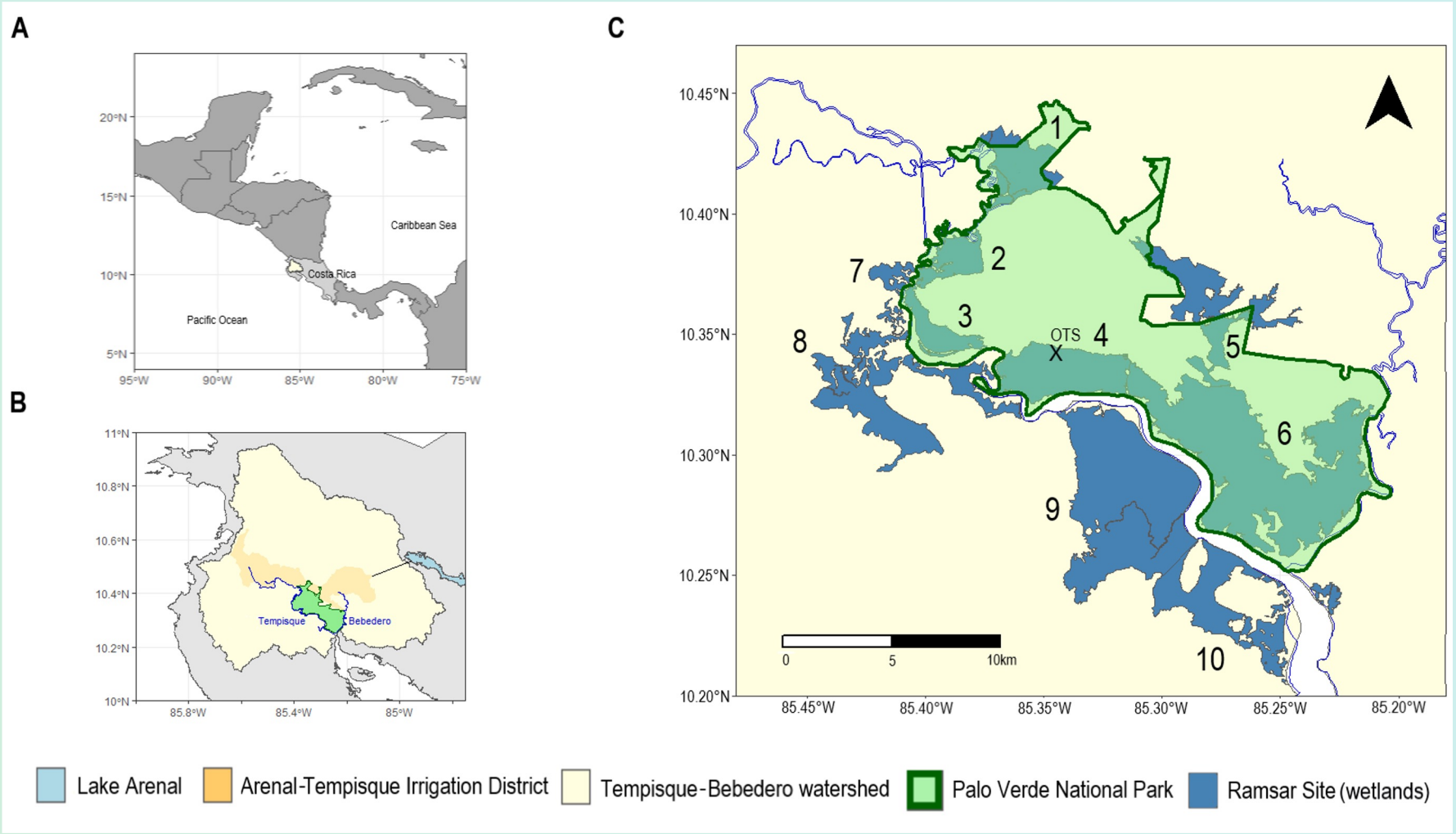
InVEST application: Overlap of ES hotspots and hydrological units

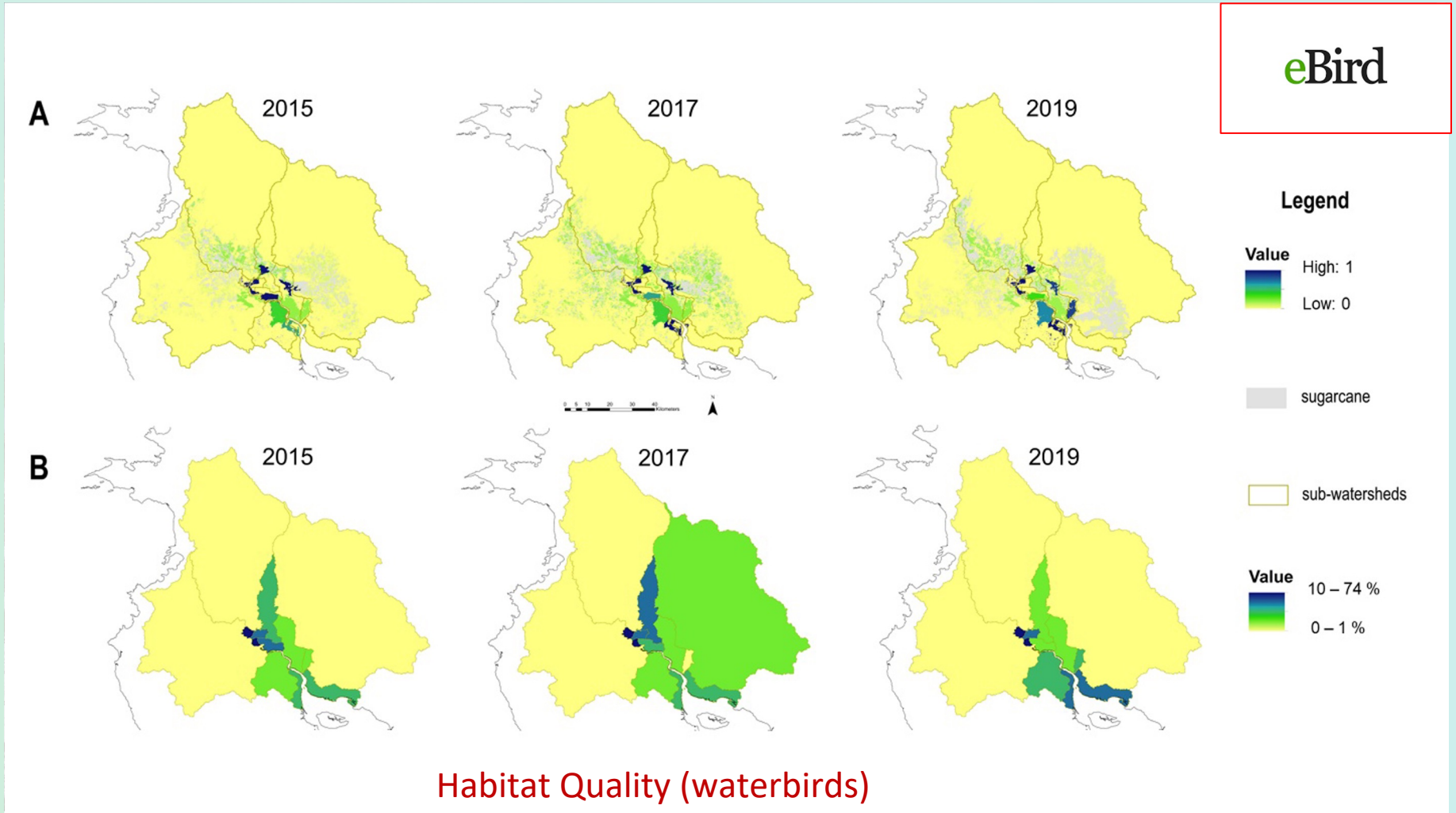


Barchiesi et al., 2022: Wetland hydropattern and vegetation greenness predict avian populations in Palo Verde, Costa Rica

InVEST application: Overlap of ES hotspots and hydrological units

Palo Verde, Costa Rica © S. Barchiesi

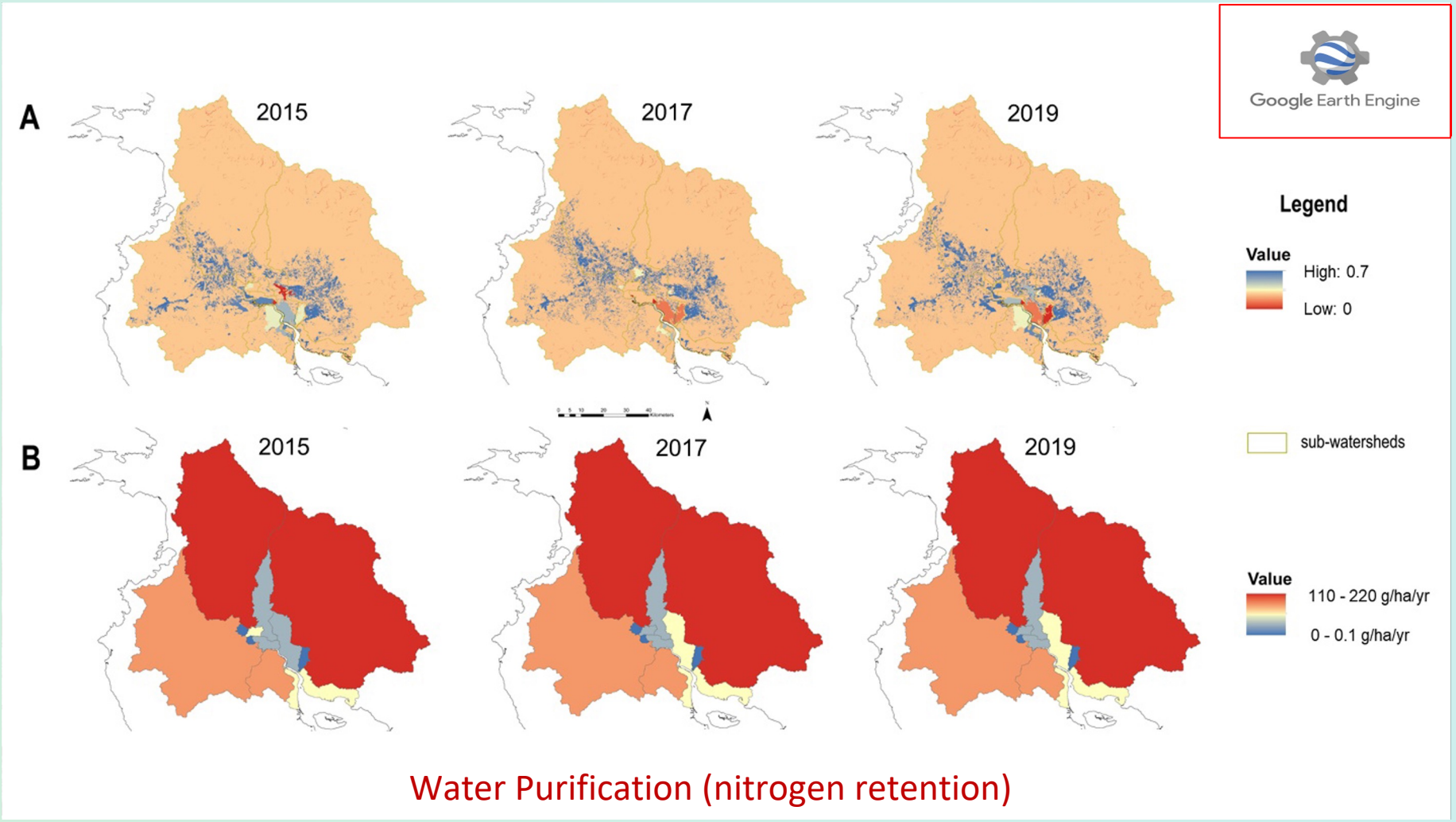
InVEST application: Overlap of ES hotspots and hydrological units



Habitat Quality (waterbirds)

Barchiesi et al., 2022: Wetland hydropattern and vegetation greenness predict avian populations in Palo Verde, Costa Rica

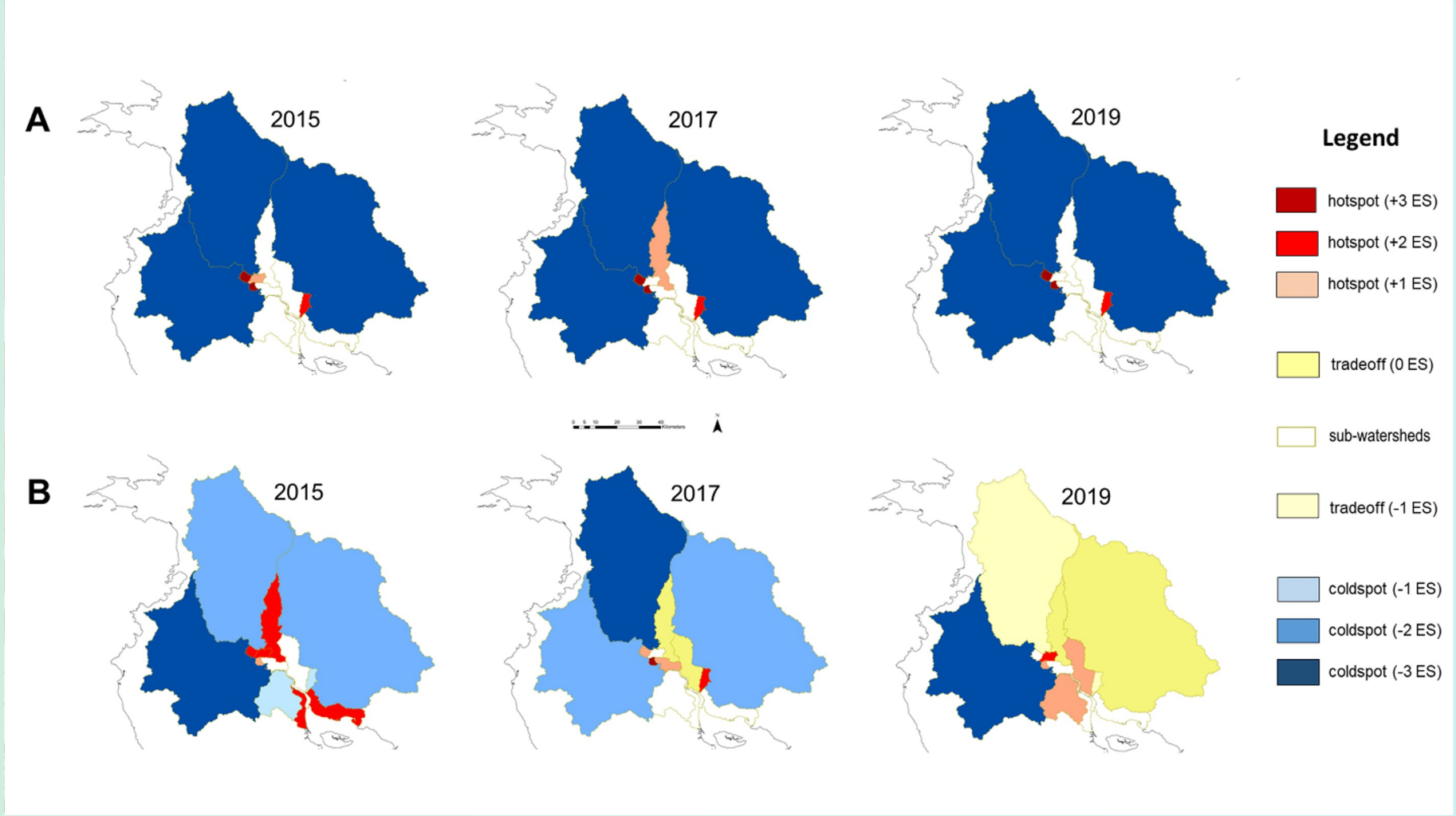
InVEST application: Overlap of ES hotspots and hydrological units



Water Purification (nitrogen retention)

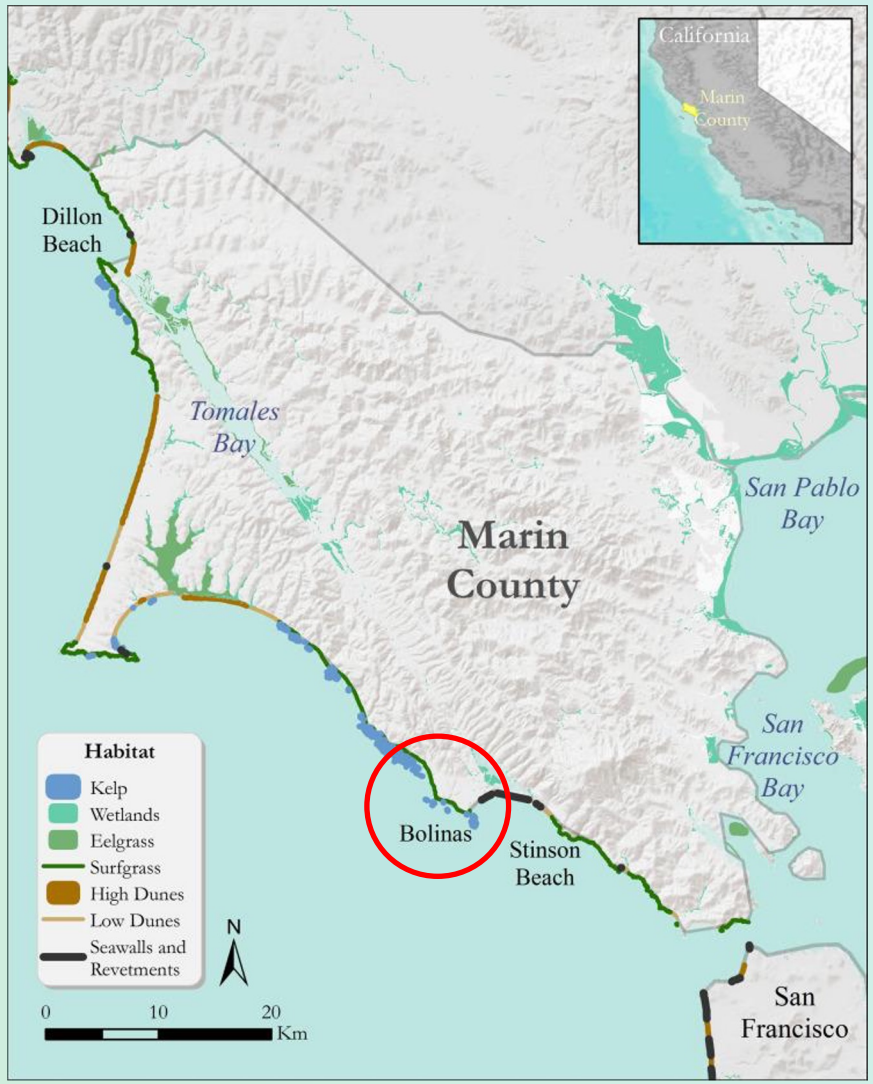
Barchiesi et al., (forthcoming)

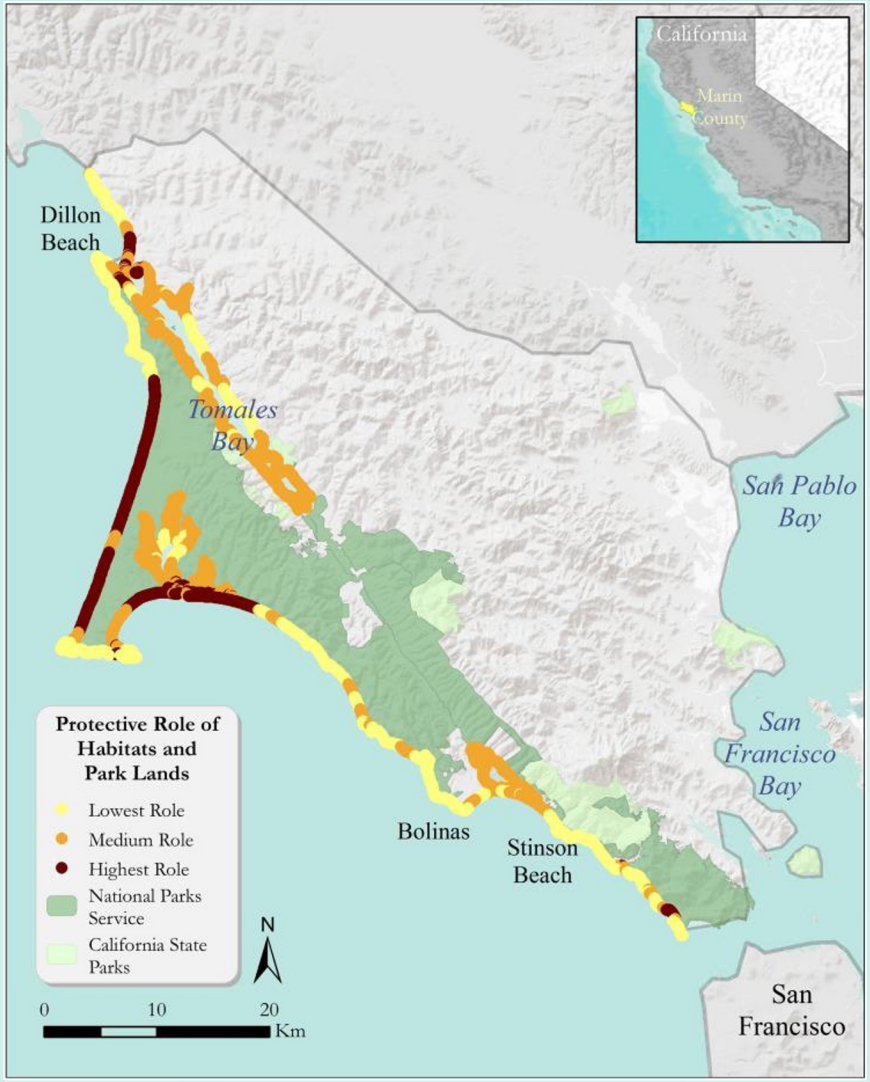
InVEST application: Overlap of ES hotspots and hydrological units



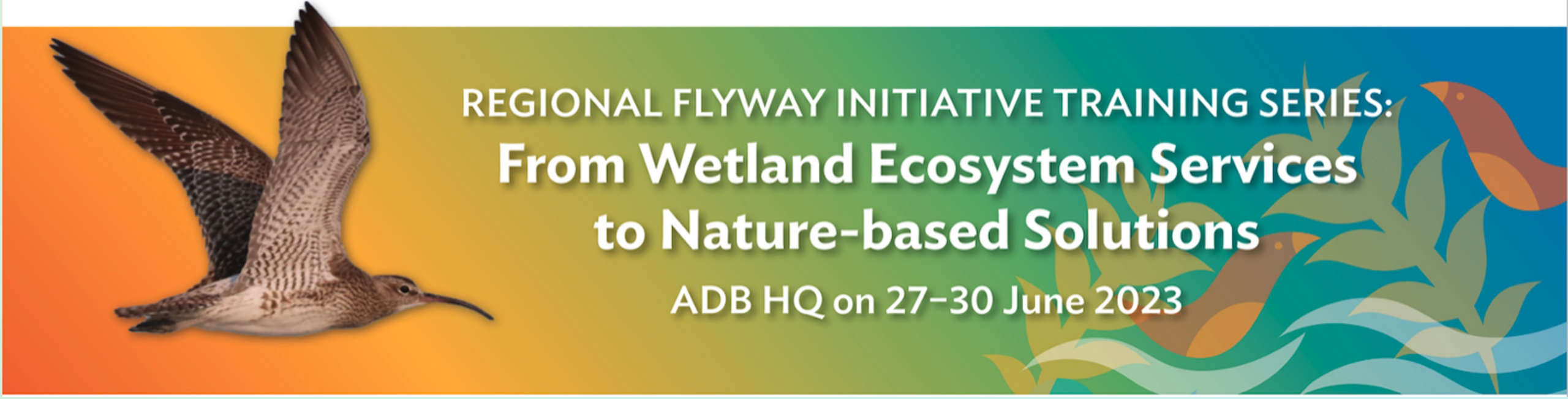
Barchiesi et al., (forthcoming)

Relevance of InVEST in a Ramsar Convention context





Wedding et al., 2022: Embedding the value of coastal ecosystem services into climate change adaptation planning



Assessment of the Coastal Protection Service

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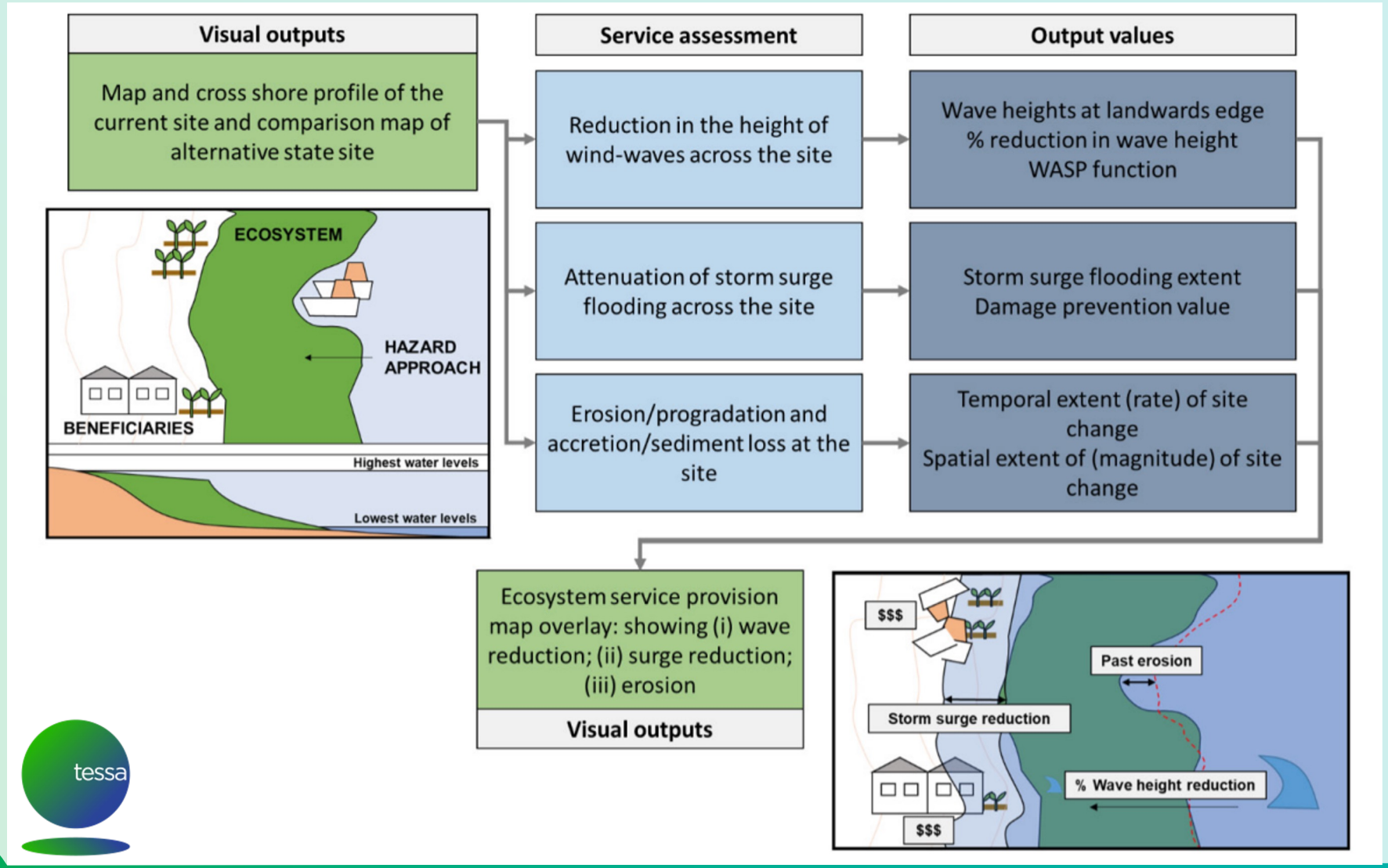
University of Southampton

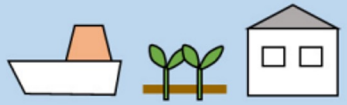
Site-based assessment: Coastal protection in TESSA



Site-based assessment: Coastal protection in TESSA

Datasets required:

- Topographic information
- Details of the surrounding area
- Any existing data on wave and tidal heights
- Any existing data on wind records
- Information about how the site has changed over time

Coastal Hazard 	Coastal Ecosystem 	Beneficiaries (people/assets affected by hazard) 
• Type of hazard (waves, storm surge, erosion • Magnitude (e.g. wave height, peak water level) • Frequency of the hazard • Direction of approach of hazard	• Type (mangrove, salt marsh, tidal flat) • Location relative to hazards and beneficiaries • Area (width and length) • Characteristics of the ecosystem (e.g. elevation, vegetation cover) • Likely alternative state if ecosystem not present	• Types of land use/assets (e.g. buildings, roads, agriculture, aquaculture) • Number of people within the zone likely to be affected • Location and elevation of people and assets • Loss of value that would occur if hazard affects beneficiaries

Site-based assessment: Coastal protection in TESSA

Coastal M1	Coastal M2	Coastal M3	Coastal M4
Obtaining information on hazards, ecosystems and beneficiaries/assets affected through stakeholder meetings	Creating maps of your sites	Drawing a cross-sectional profile of your site	Estimating the tidal limits and % inundation frequency
Coastal M5	**Coastal M6**	**Coastal M7**	**Coastal M8**
Estimating water depth	Estimating incident wave conditions	Estimating topographic variability and percentage reduction of waves through saltmarshes and mudflats during inundations with onshore directed waves	Estimating percentage reduction of waves through mangroves
Coastal M9	**Coastal M10**	**Coastal M11**	**Coastal M12**
Calculating the wave attenuation service provision by your site	Working out whether storm surges occur at the site	Estimating storm surge reduction with distance through wetlands using average rates of reduction from the literature	Using numerical storm surge models to estimate surge reduction through wetlands
Coastal M13	**Coastal M14**	**Coastal M15**	**Coastal M16**
Estimating the value of storm surge reduction benefits	Conducting a visual inspection to assess if the site is changing	Estimating the rate of lateral erosion/progradation	Estimating the extent to which sediment is being conserved within the site/system or is entering the sit

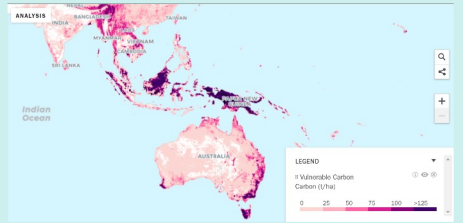
The two-pronged approach of the Regional Flyway Initiative

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 »

Sediment Retention | Read more »

Urban Stormwater Retention | Read more »

Coastal Blue Carbon | Read more »

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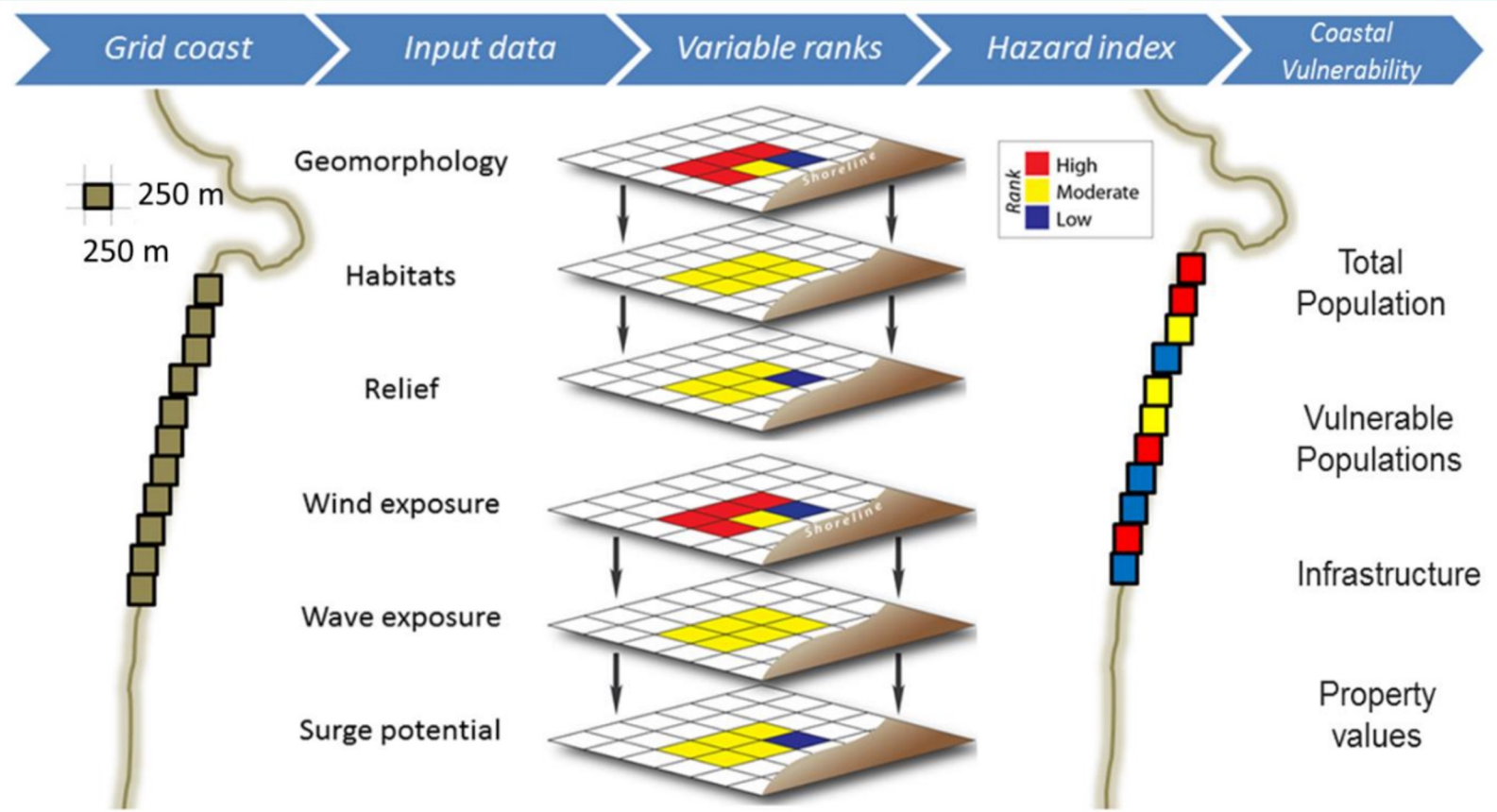
Seasonal Water Yield | Read more »

Urban Flood Risk Mitigation | Read more »

Wave Energy | Read more »

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

Modelling-based assessment: Coastal protection (biophysical)



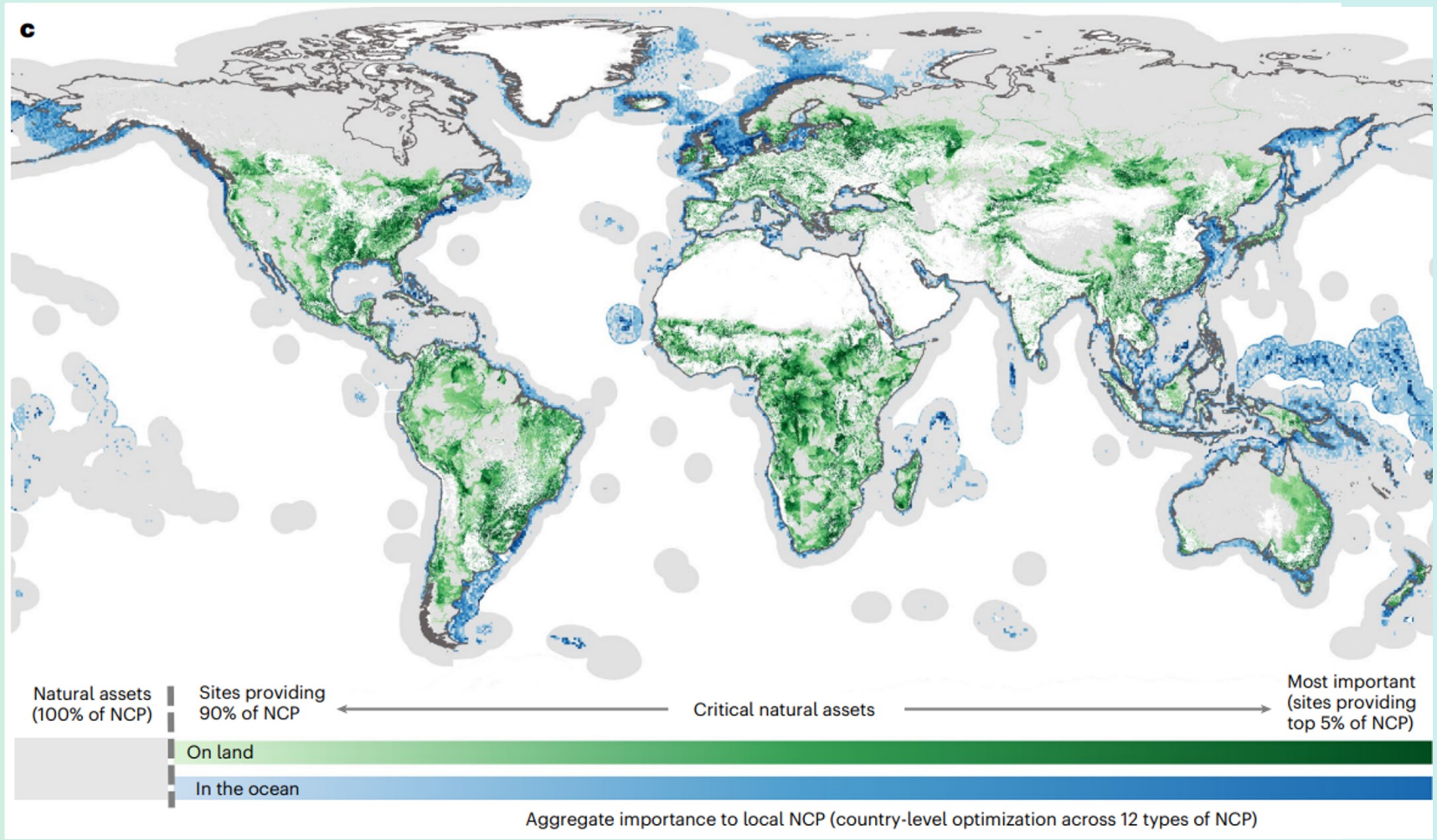
$$EI = (R_{Geomorphology} R_{Relief} R_{Habitats} R_{SLR} R_{WindExposure} R_{WaveExposure} R_{Surge})^{1/7}$$

Silver et al., 2019: A National Coastal Hazard and Social Vulnerability Analysis for The Bahamas

Modelling-based assessment: Coastal protection (biophysical)

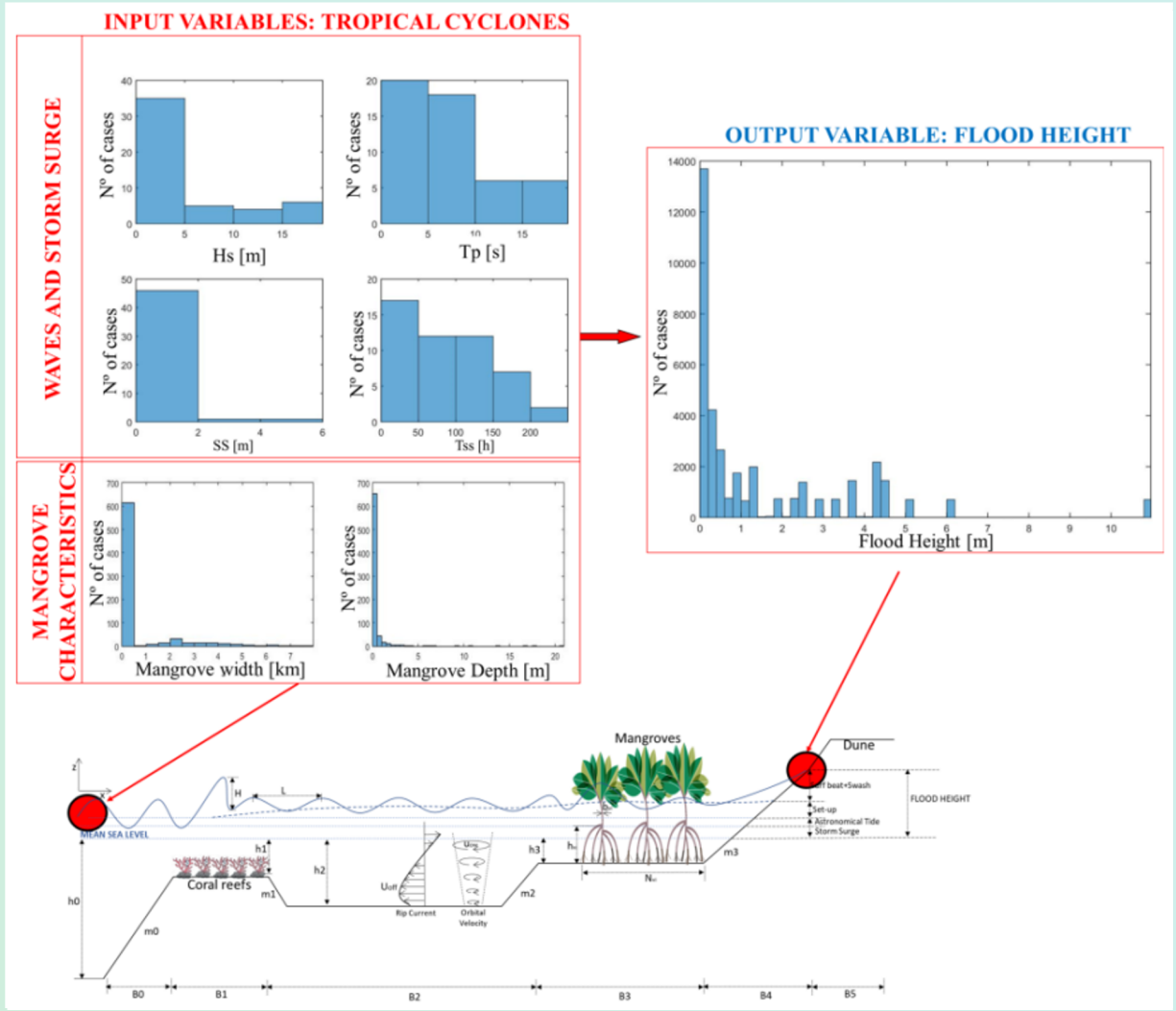
a

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)



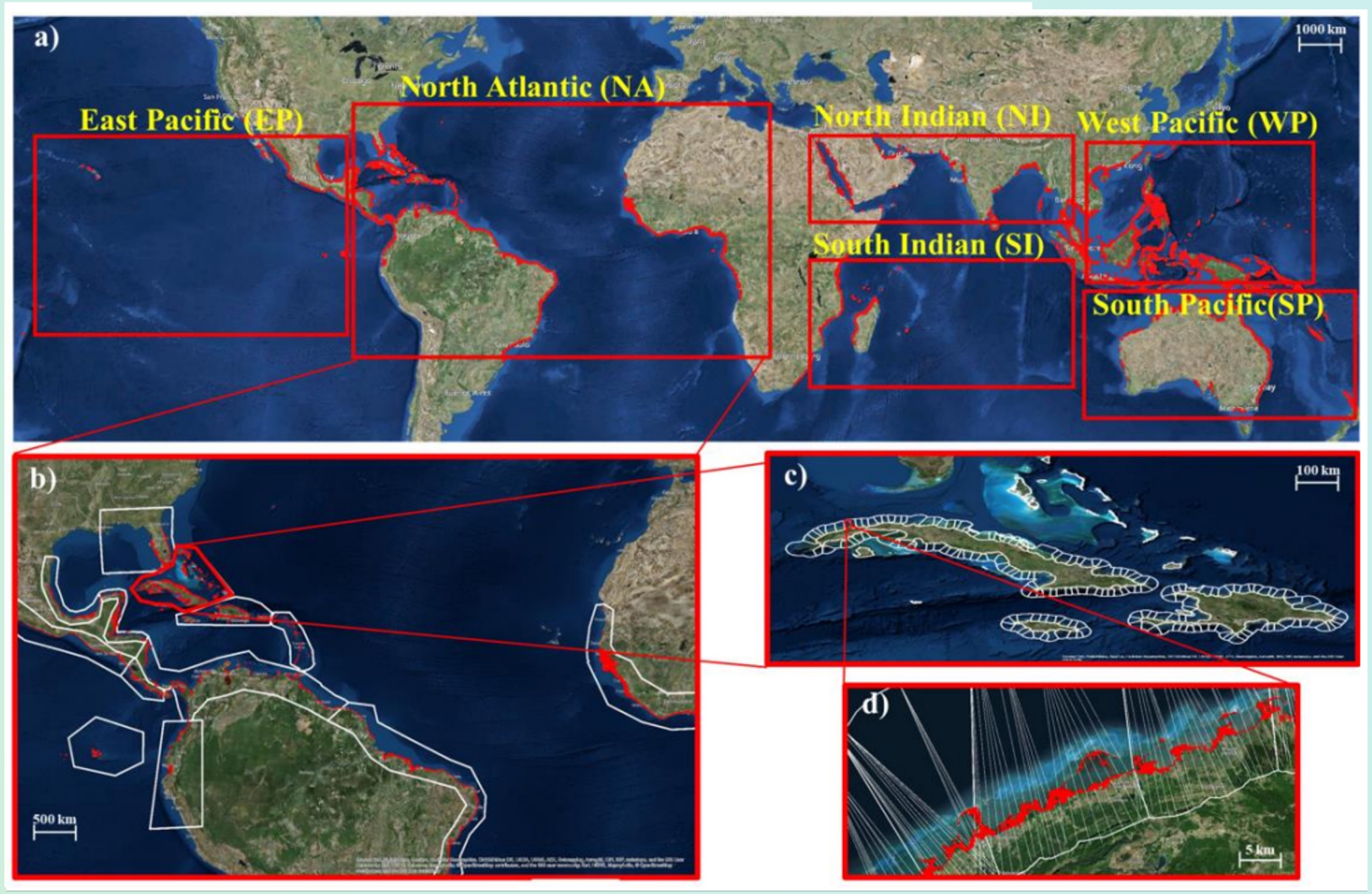
Chaplin-Kramer et al., 2022: Mapping the planet's critical natural assets

Modelling-based assessment: Coastal protection (economic)



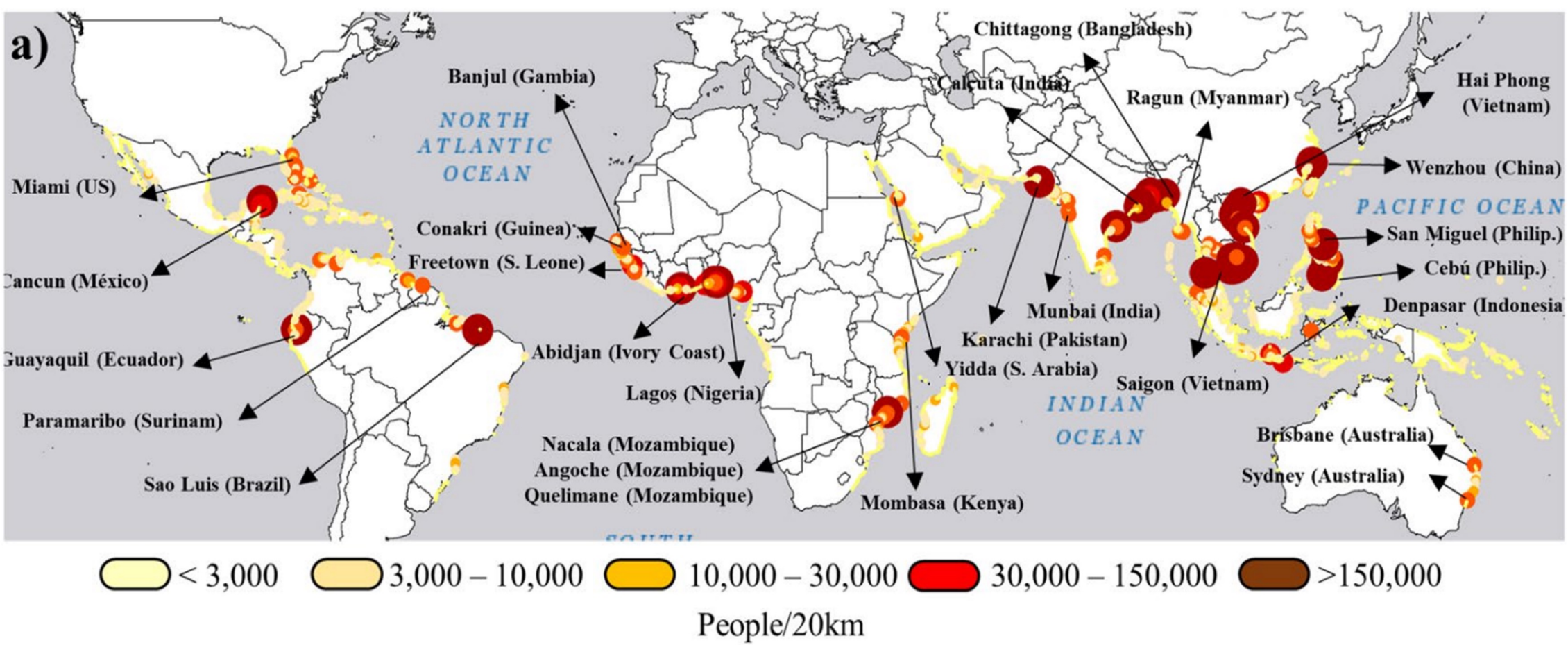
Menendez et al., 2020: The Global Benefits of Mangroves

Modelling-based assessment: Coastal protection (economic)



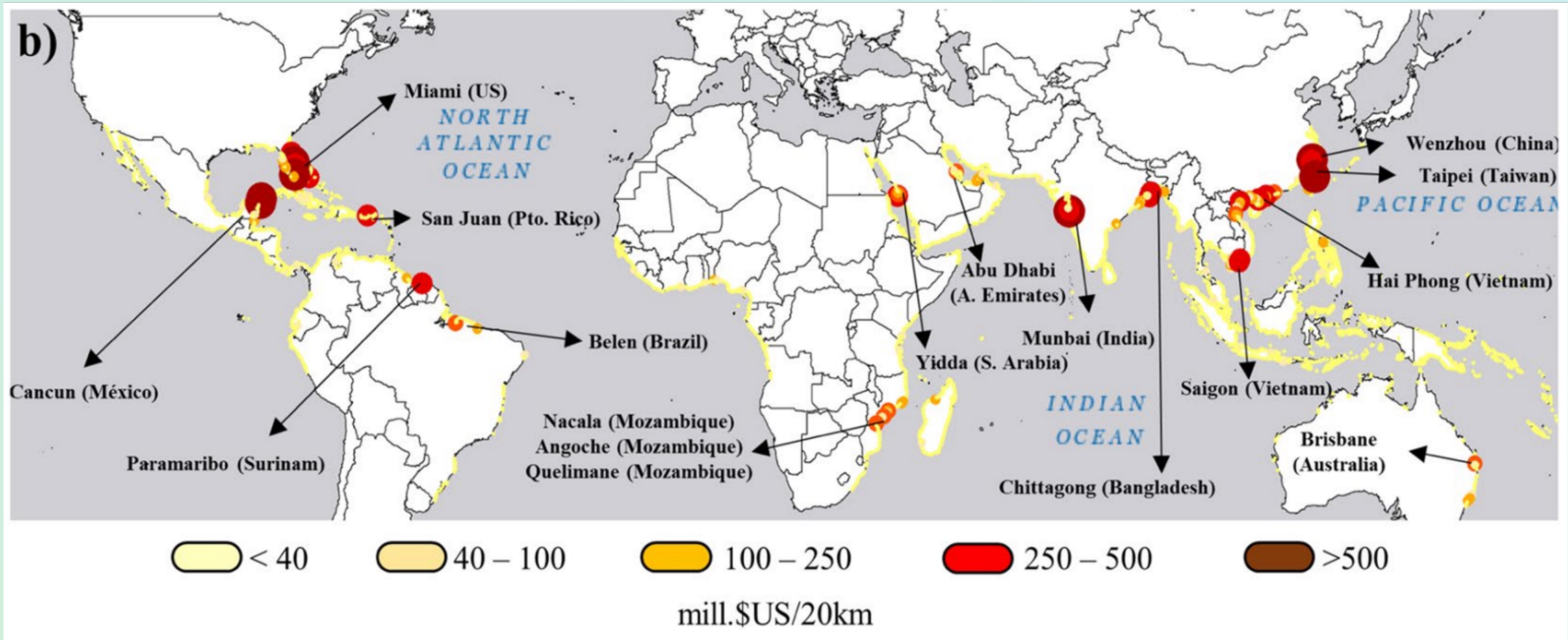
Menendez et al., 2020: The Global Benefits of Mangroves

Modelling-based assessment: Coastal protection (economic)



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

Modelling-based assessment: Coastal protection (economic)



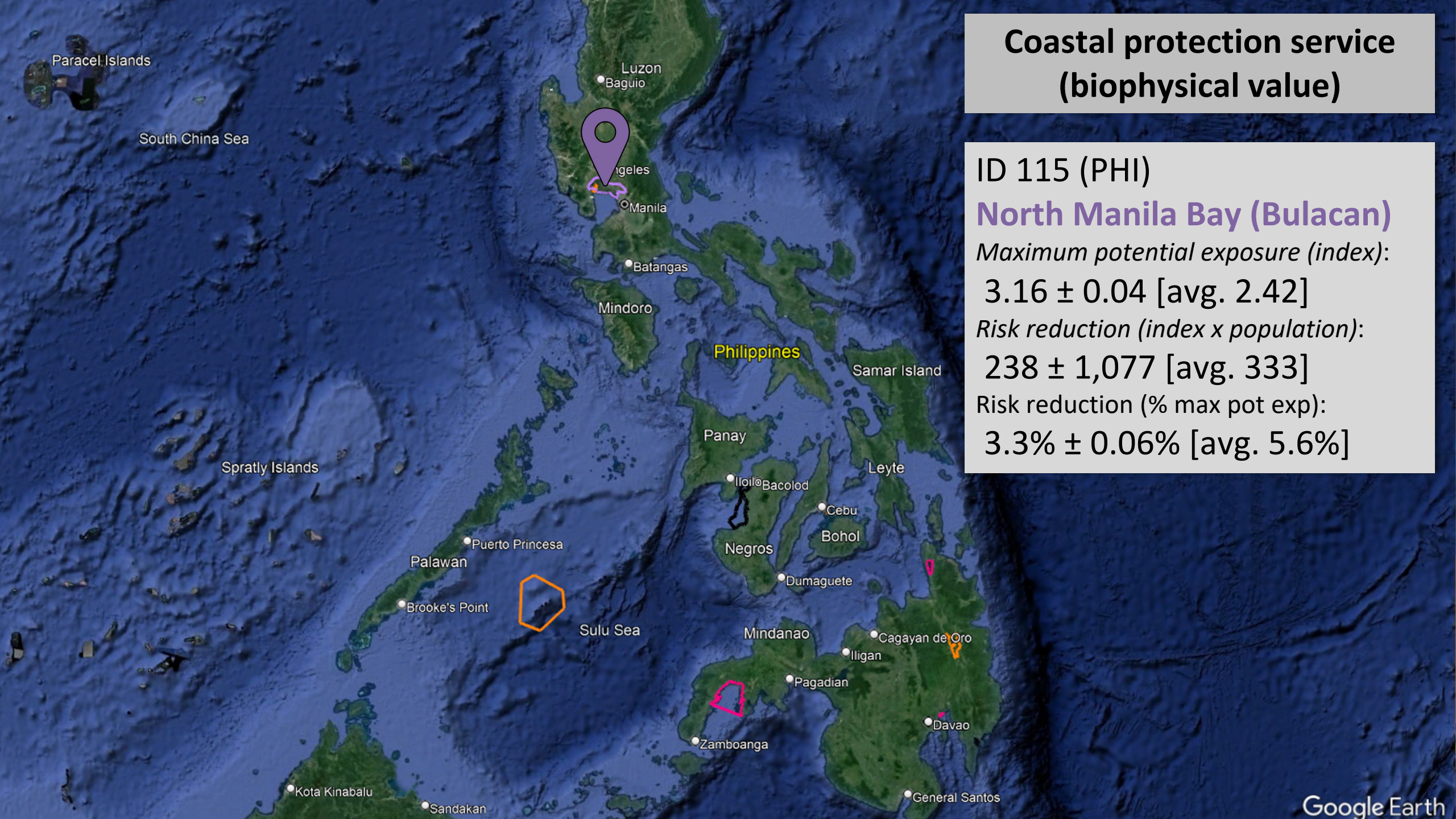
Menendez et al., 2020: The Global Benefits of Mangroves

Modelling-based assessment: Nutrient Retention (biophysical)

Nitrogen retention

Nitrogen export

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



Coastal protection service (biophysical value)

ID 115 (PHI)

North Manila Bay (Bulacan)

Maximum potential exposure (index):

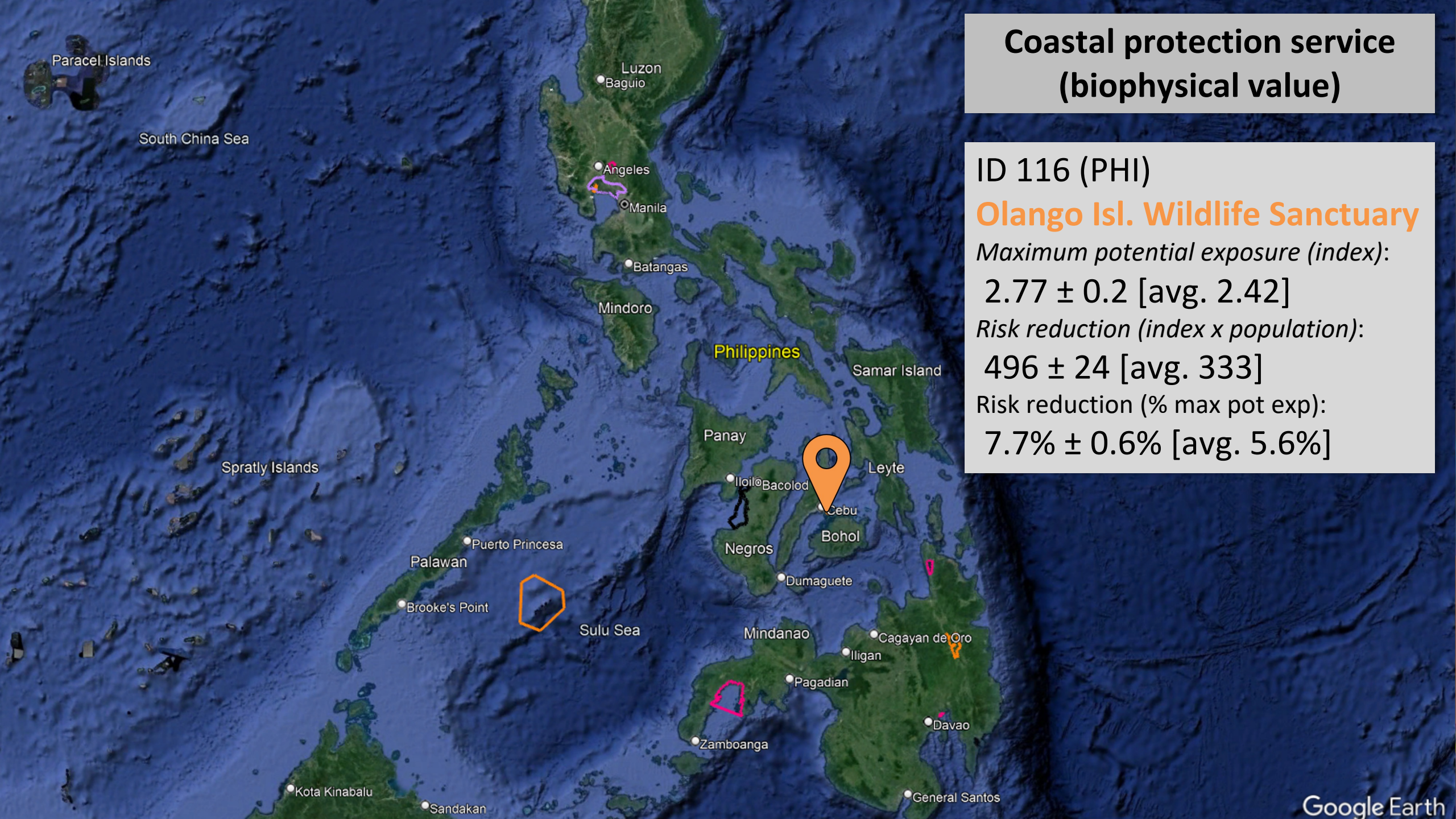
3.16 ± 0.04 [avg. 2.42]

Risk reduction (index x population):

238 ± 1,077 [avg. 333]

Risk reduction (% max pot exp):

3.3% ± 0.06% [avg. 5.6%]



Coastal protection service (biophysical value)

ID 116 (PHI)

Olango Isl. Wildlife Sanctuary

Maximum potential exposure (index):

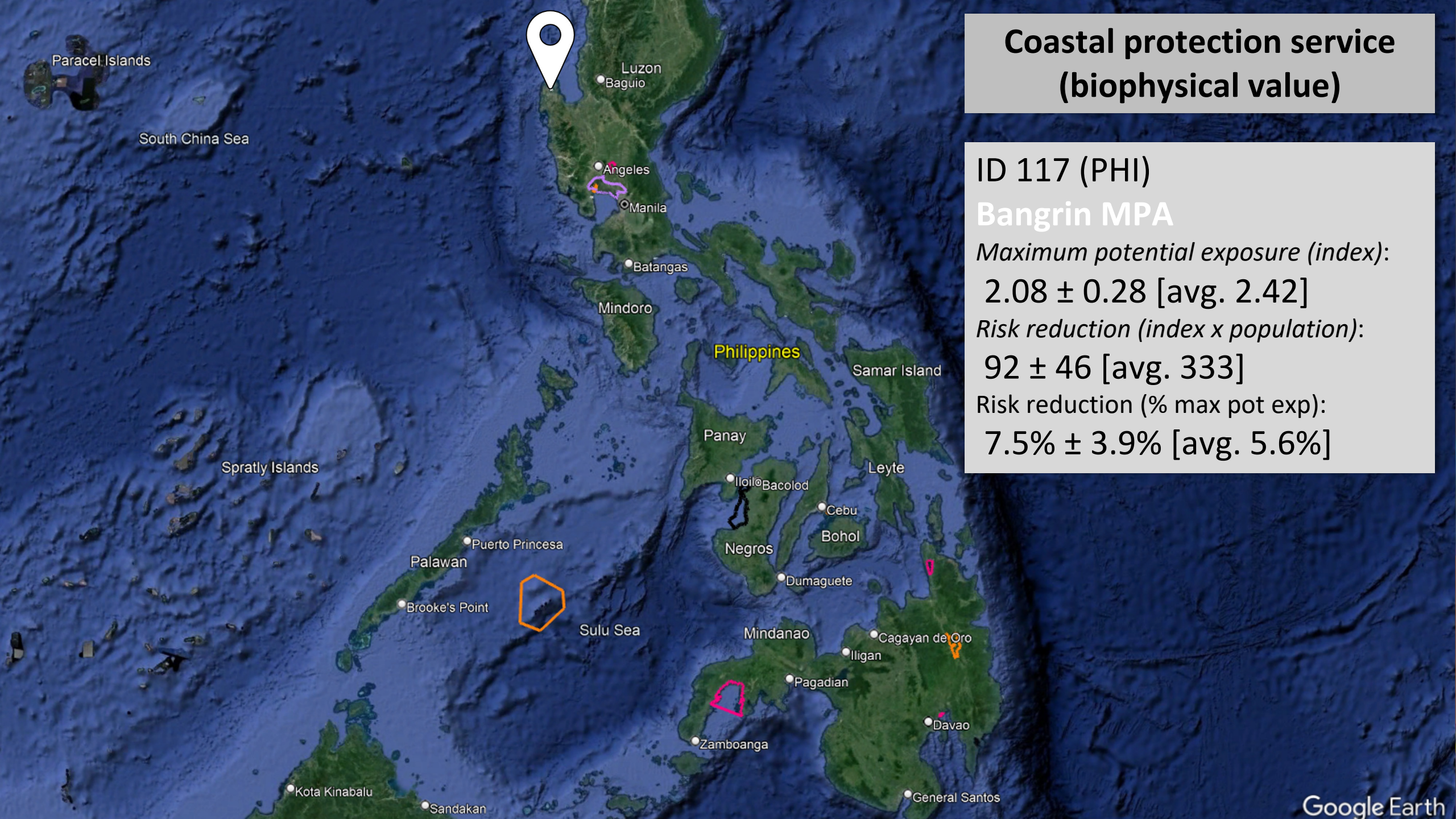
2.77 ± 0.2 [avg. 2.42]

Risk reduction (index x population):

496 ± 24 [avg. 333]

Risk reduction (% max pot exp):

7.7% ± 0.6% [avg. 5.6%]



Coastal protection service (biophysical value)

ID 117 (PHI)

Bangrin MPA

Maximum potential exposure (index):

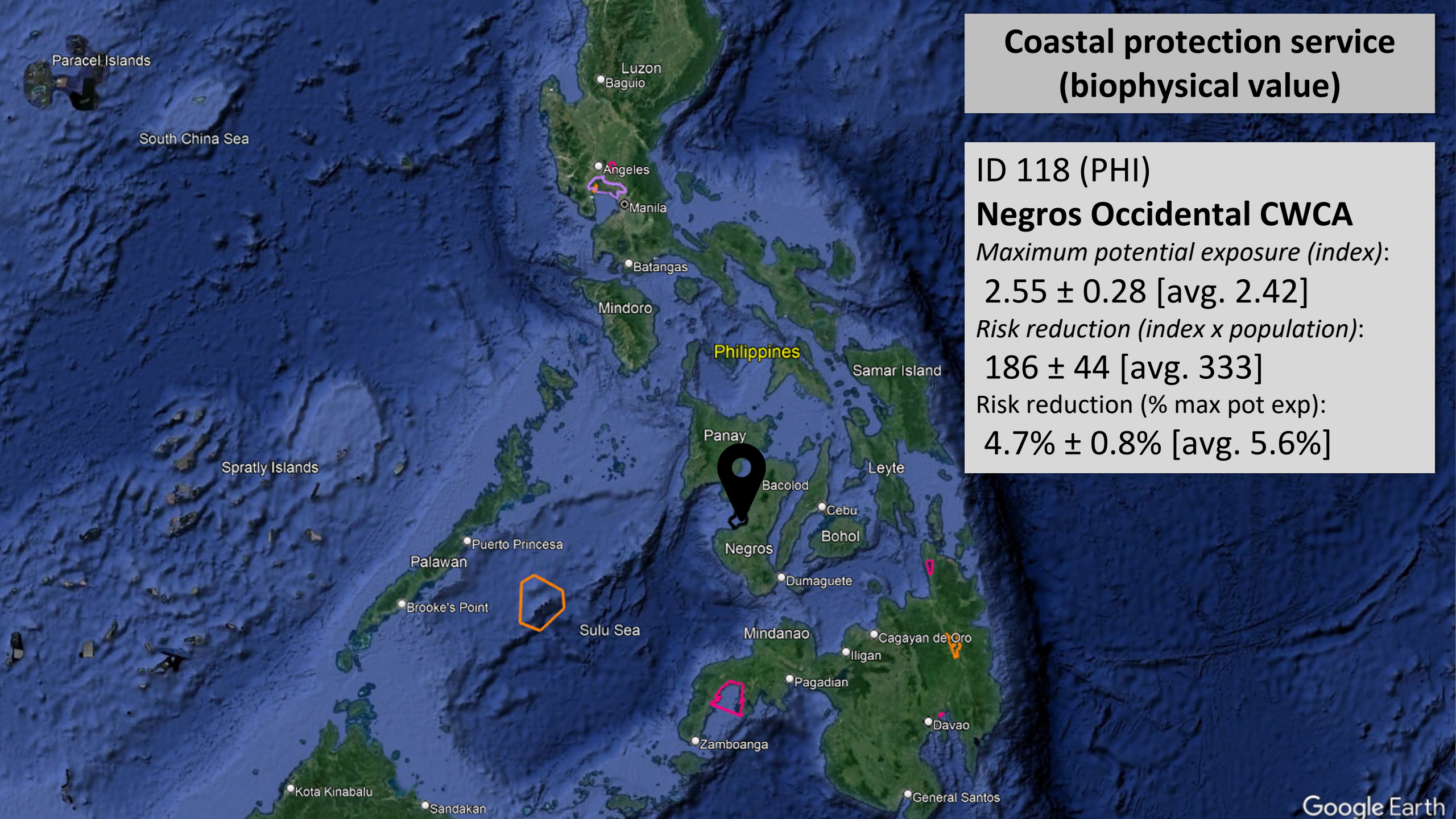
2.08 ± 0.28 [avg. 2.42]

Risk reduction (index x population):

92 ± 46 [avg. 333]

Risk reduction (% max pot exp):

7.5% ± 3.9% [avg. 5.6%]



Coastal protection service (biophysical value)

ID 118 (PHI)

Negros Occidental CWCA

Maximum potential exposure (index):

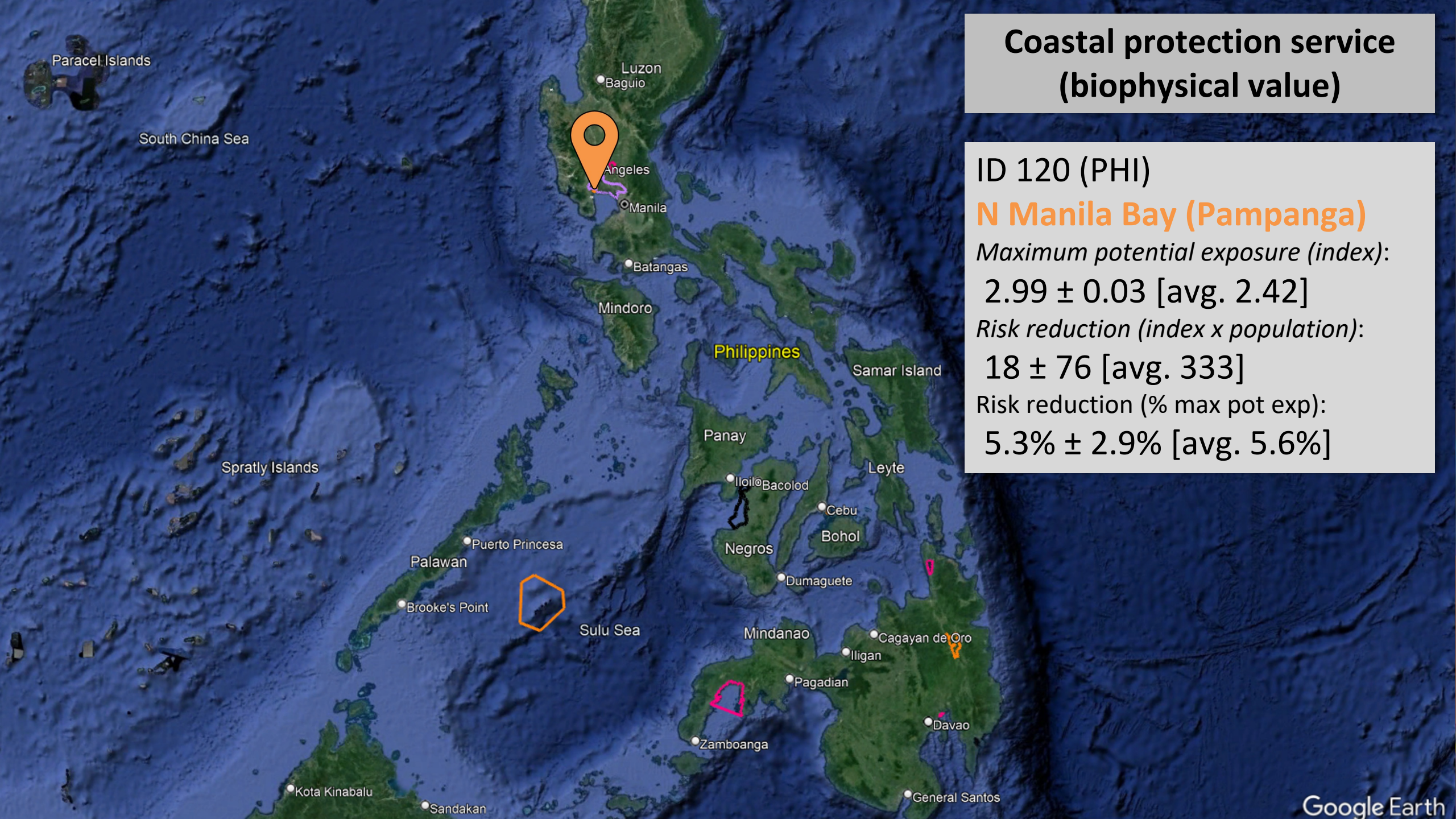
2.55 ± 0.28 [avg. 2.42]

Risk reduction (index x population):

186 ± 44 [avg. 333]

Risk reduction (% max pot exp):

4.7% ± 0.8% [avg. 5.6%]



Coastal protection service (biophysical value)

ID 120 (PHI)

N Manila Bay (Pampanga)

Maximum potential exposure (index):

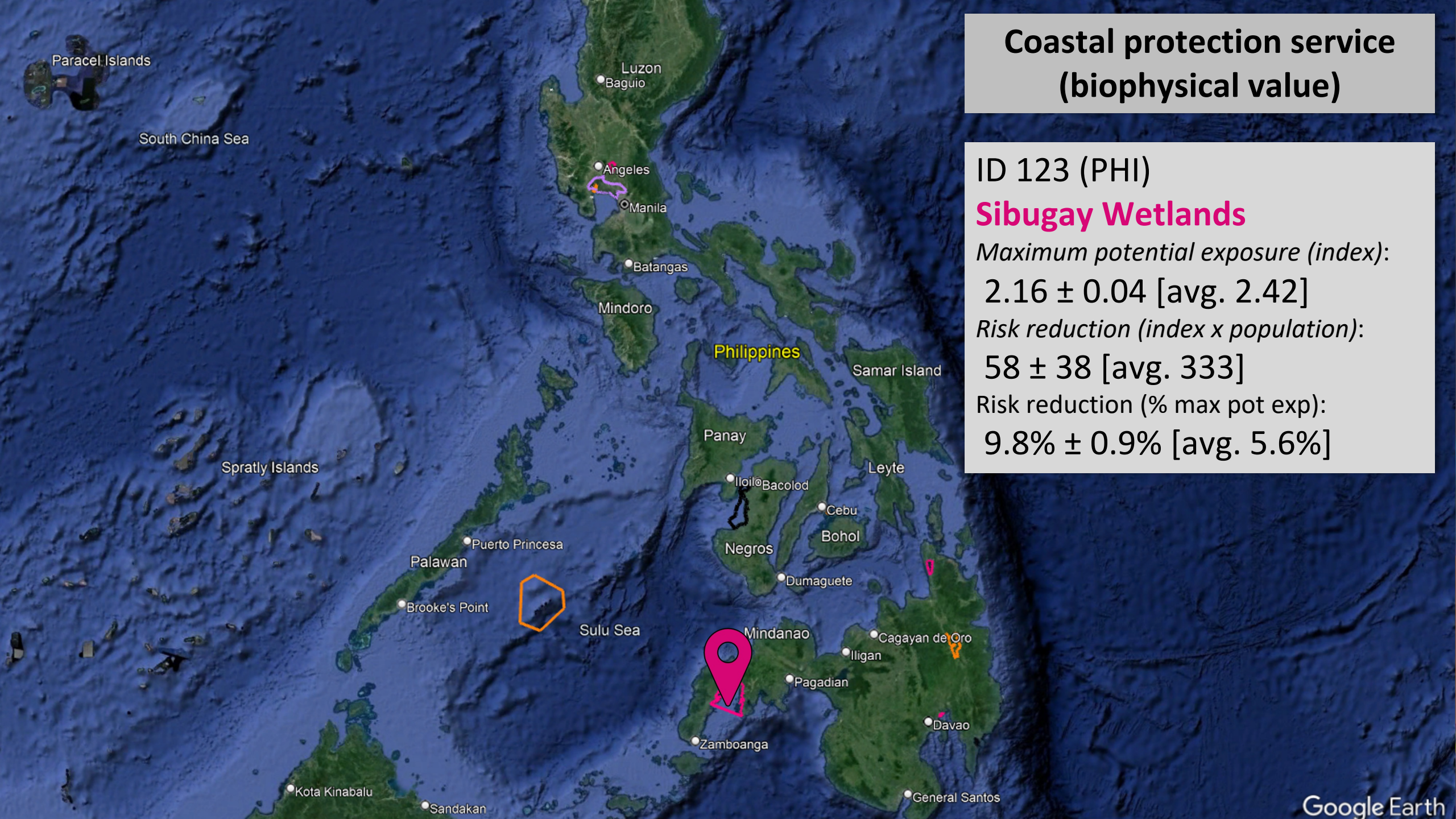
2.99 ± 0.03 [avg. 2.42]

Risk reduction (index x population):

18 ± 76 [avg. 333]

Risk reduction (% max pot exp):

5.3% ± 2.9% [avg. 5.6%]



Coastal protection service (biophysical value)

ID 123 (PHI)

Sibugay Wetlands

Maximum potential exposure (index):

2.16 ± 0.04 [avg. 2.42]

Risk reduction (index x population):

58 ± 38 [avg. 333]

Risk reduction (% max pot exp):

9.8% ± 0.9% [avg. 5.6%]

Coastal protection service (biophysical value)

ID 124 (PHI)

Panabo Coast

Maximum potential exposure (index):

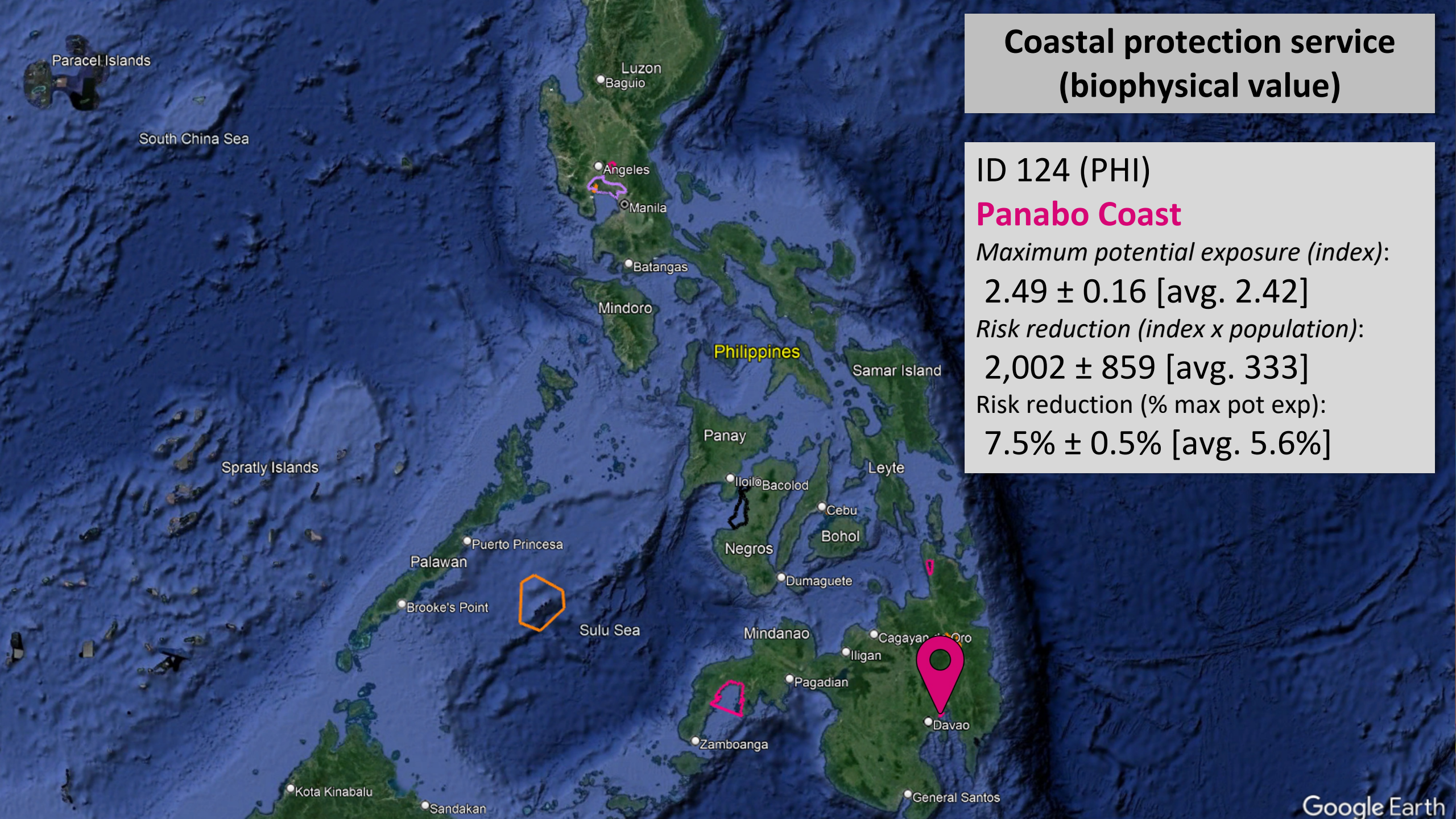
2.49 ± 0.16 [avg. 2.42]

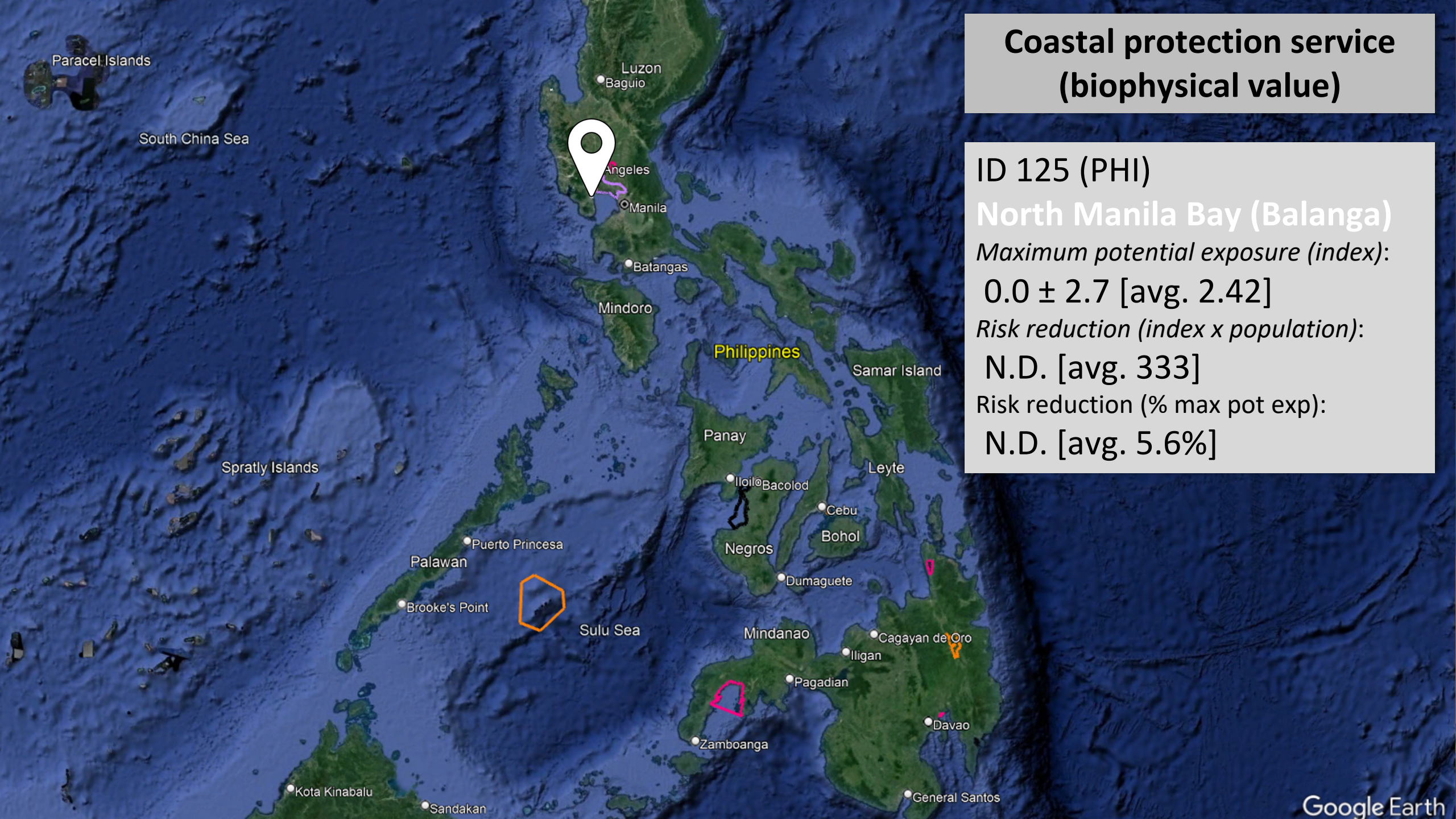
Risk reduction (index x population):

2,002 ± 859 [avg. 333]

Risk reduction (% max pot exp):

7.5% ± 0.5% [avg. 5.6%]





Coastal protection service (biophysical value)

ID 125 (PHI)

North Manila Bay (Balanga)

Maximum potential exposure (index):

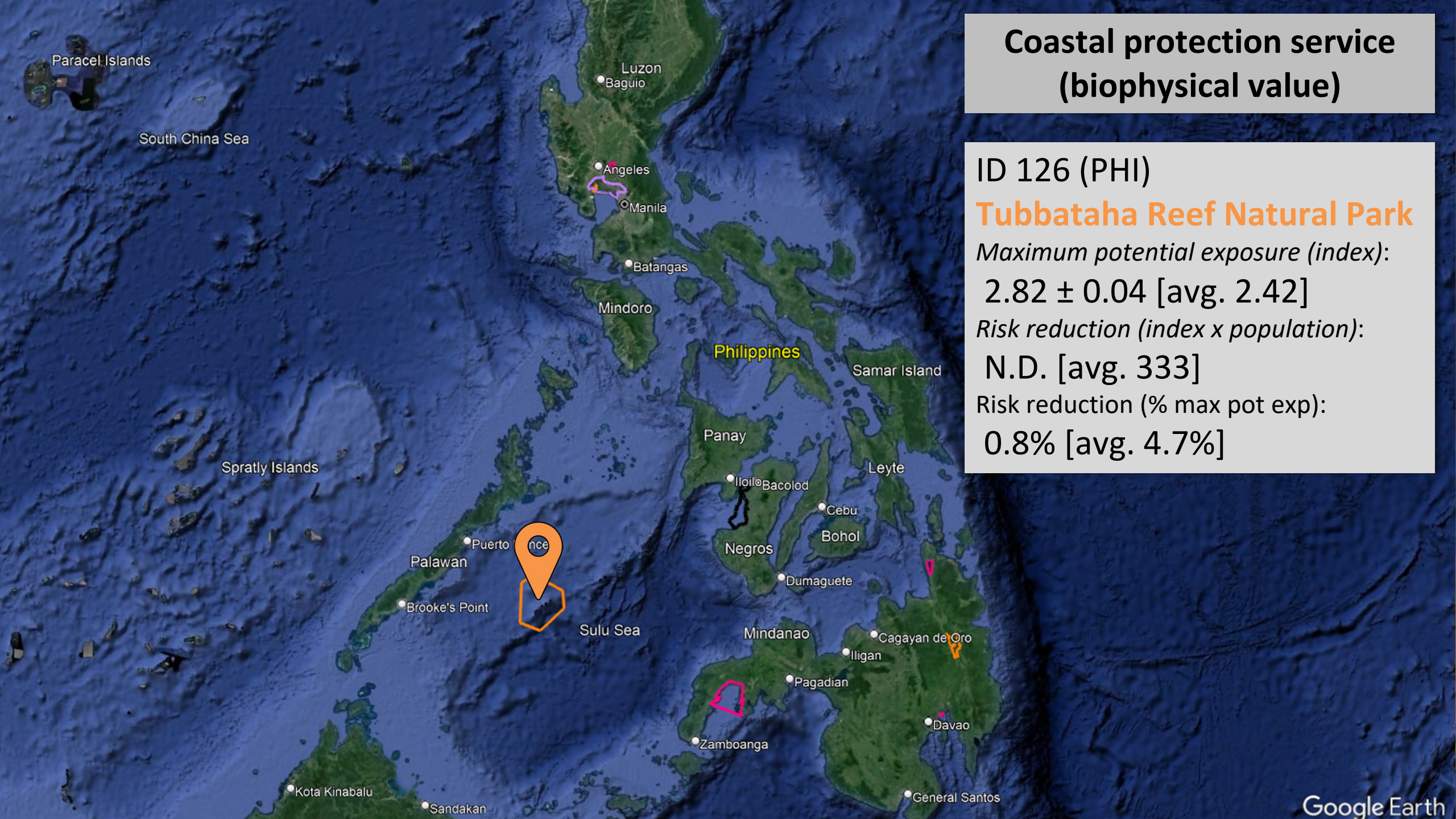
0.0 ± 2.7 [avg. 2.42]

Risk reduction (index x population):

N.D. [avg. 333]

Risk reduction (% max pot exp):

N.D. [avg. 5.6%]



Coastal protection service (biophysical value)

ID 126 (PHI)

Tubbataha Reef Natural Park

Maximum potential exposure (index):

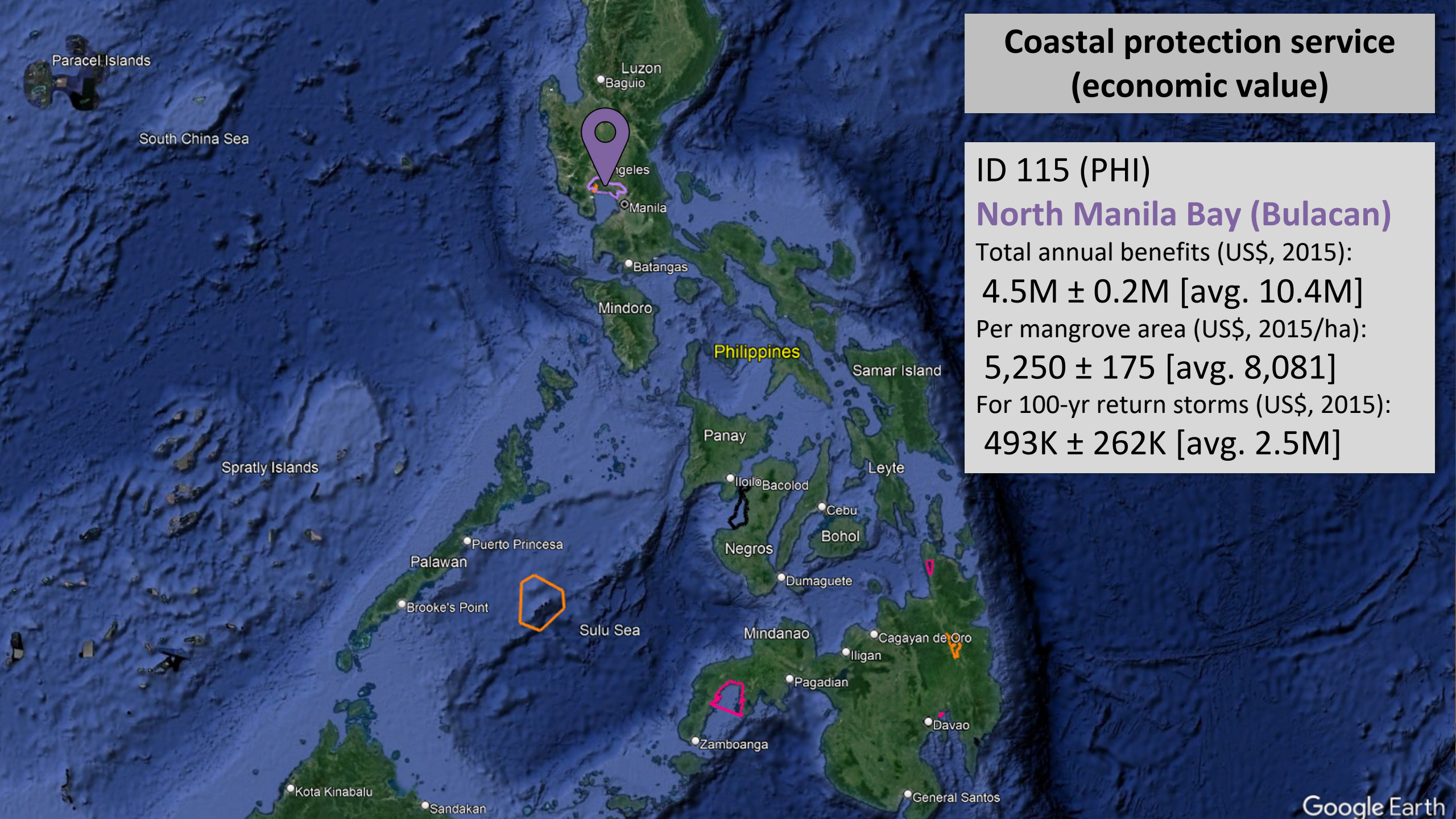
2.82 ± 0.04 [avg. 2.42]

Risk reduction (index x population):

N.D. [avg. 333]

Risk reduction (% max pot exp):

0.8% [avg. 4.7%]



Coastal protection service (economic value)

ID 115 (PHI)

North Manila Bay (Bulacan)

Total annual benefits (US$, 2015):

4.5M ± 0.2M [avg. 10.4M]

Per mangrove area (US$, 2015/ha):

5,250 ± 175 [avg. 8,081]

For 100-yr return storms (US$, 2015):

493K ± 262K [avg. 2.5M]

Coastal protection service (economic value)

ID 116 (PHI)

Olango Isl. Wildlife Sanctuary

Total annual benefits (US$, 2015):

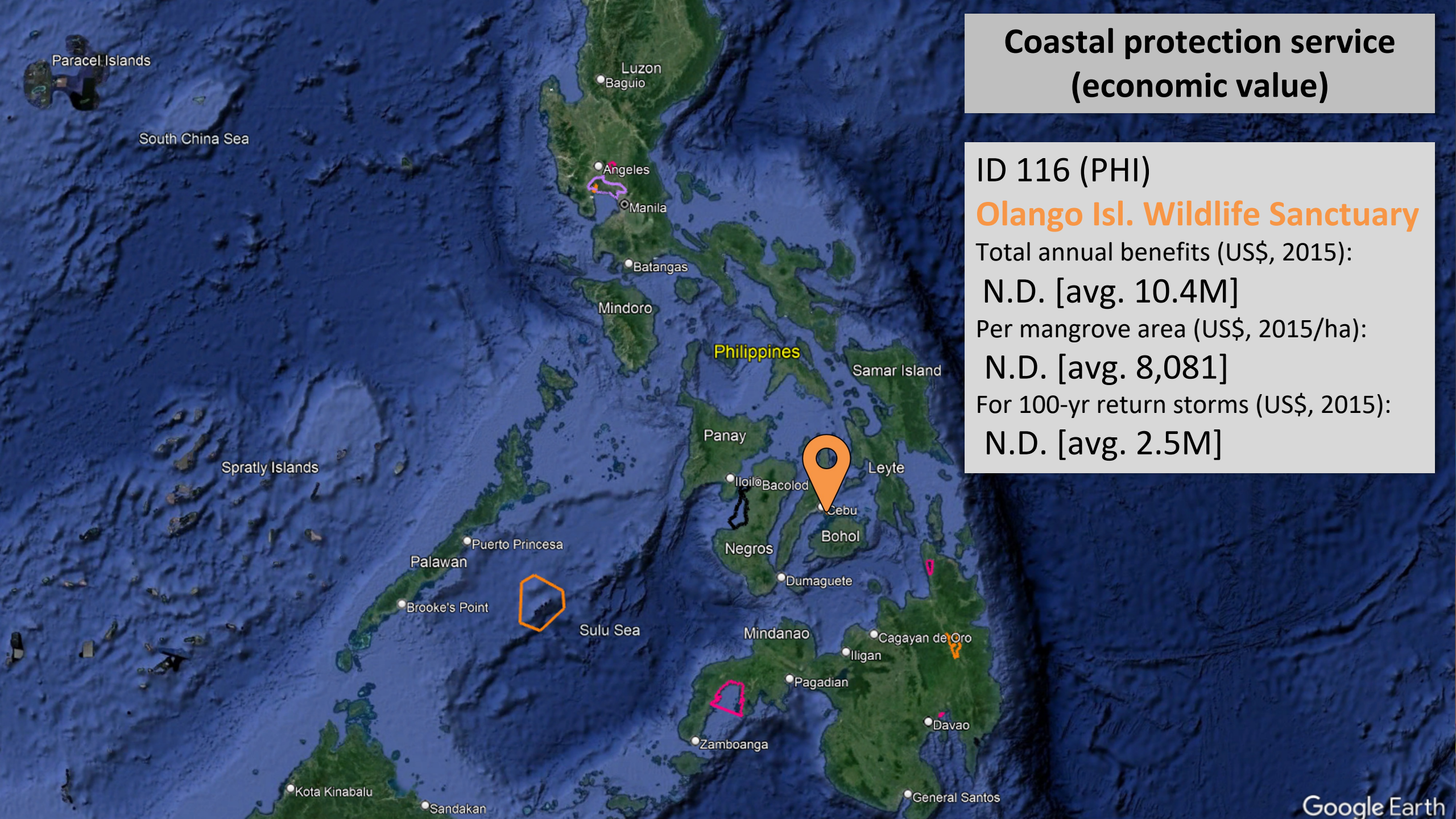
N.D. [avg. 10.4M]

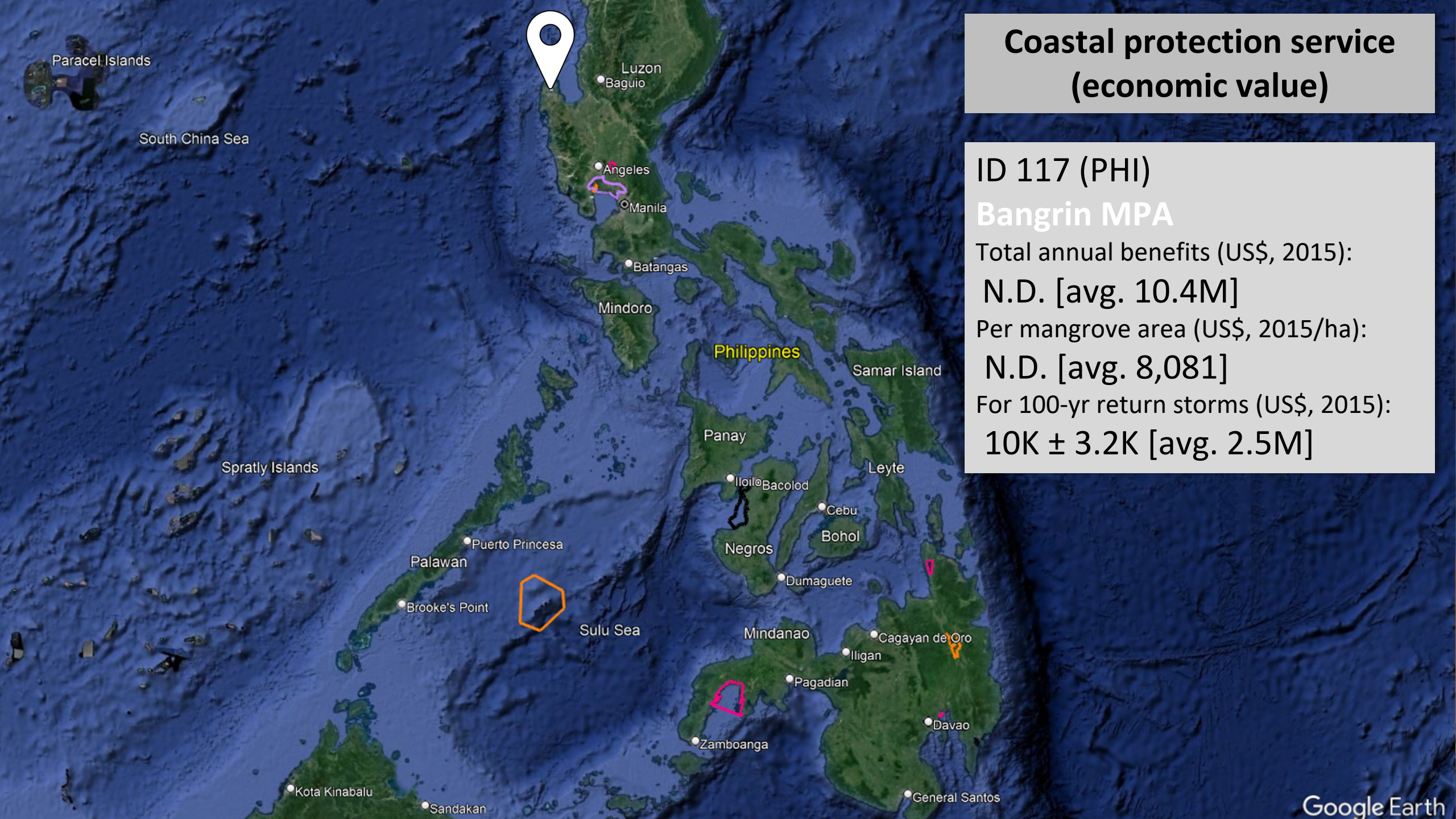
Per mangrove area (US$, 2015/ha):

N.D. [avg. 8,081]

For 100-yr return storms (US$, 2015):

N.D. [avg. 2.5M]





Coastal protection service (economic value)

ID 117 (PHI)

Bangrin MPA

Total annual benefits (US$, 2015):

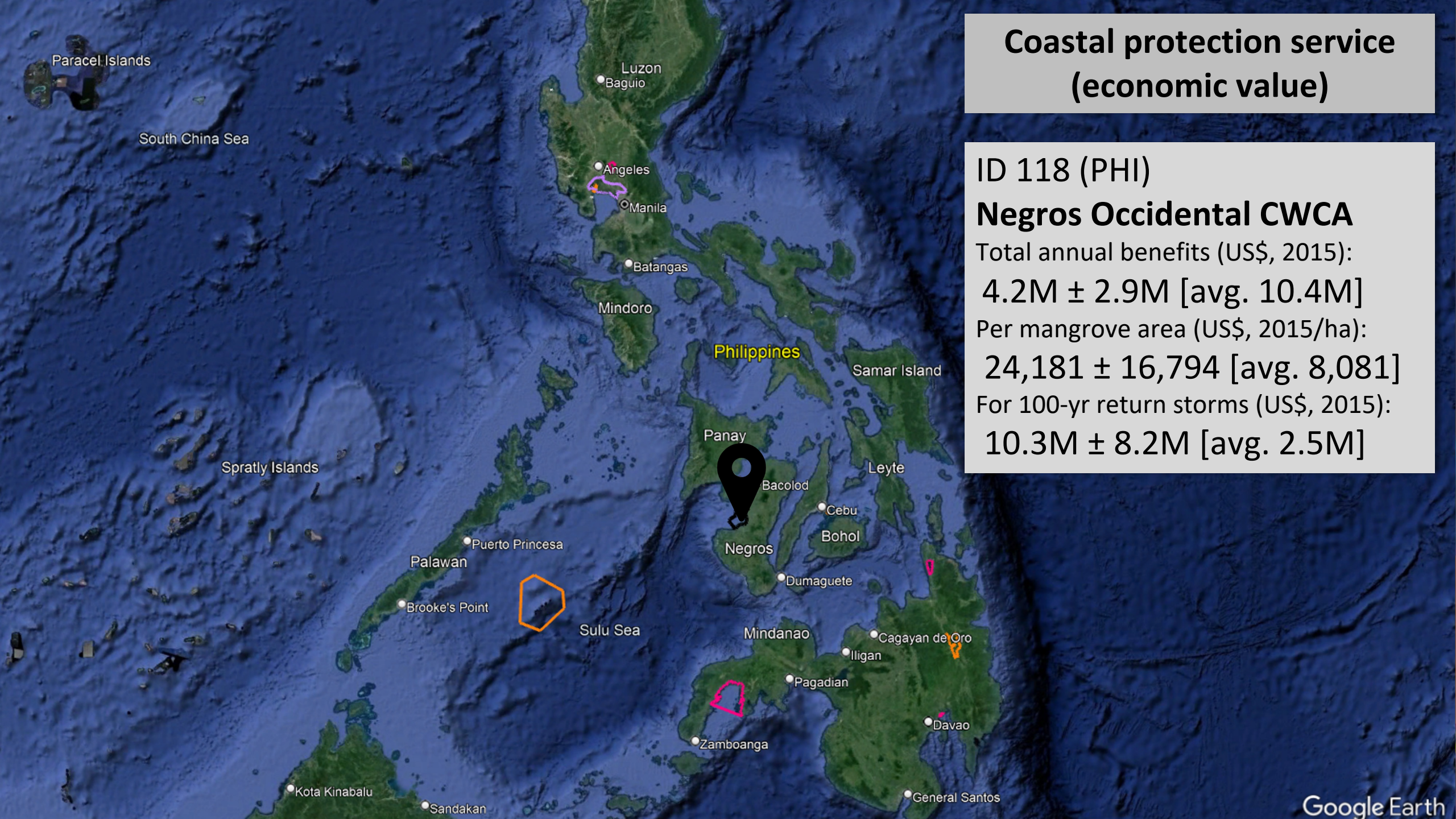
N.D. [avg. 10.4M]

Per mangrove area (US$, 2015/ha):

N.D. [avg. 8,081]

For 100-yr return storms (US$, 2015):

10K ± 3.2K [avg. 2.5M]



Coastal protection service (economic value)

ID 118 (PHI)

Negros Occidental CWCA

Total annual benefits (US$, 2015):

4.2M ± 2.9M [avg. 10.4M]

Per mangrove area (US$, 2015/ha):

24,181 ± 16,794 [avg. 8,081]

For 100-yr return storms (US$, 2015):

10.3M ± 8.2M [avg. 2.5M]

Coastal protection service (economic value)

ID 120 (PHI)

N Manila Bay (Pampanga)

Total annual benefits (US$, 2015):

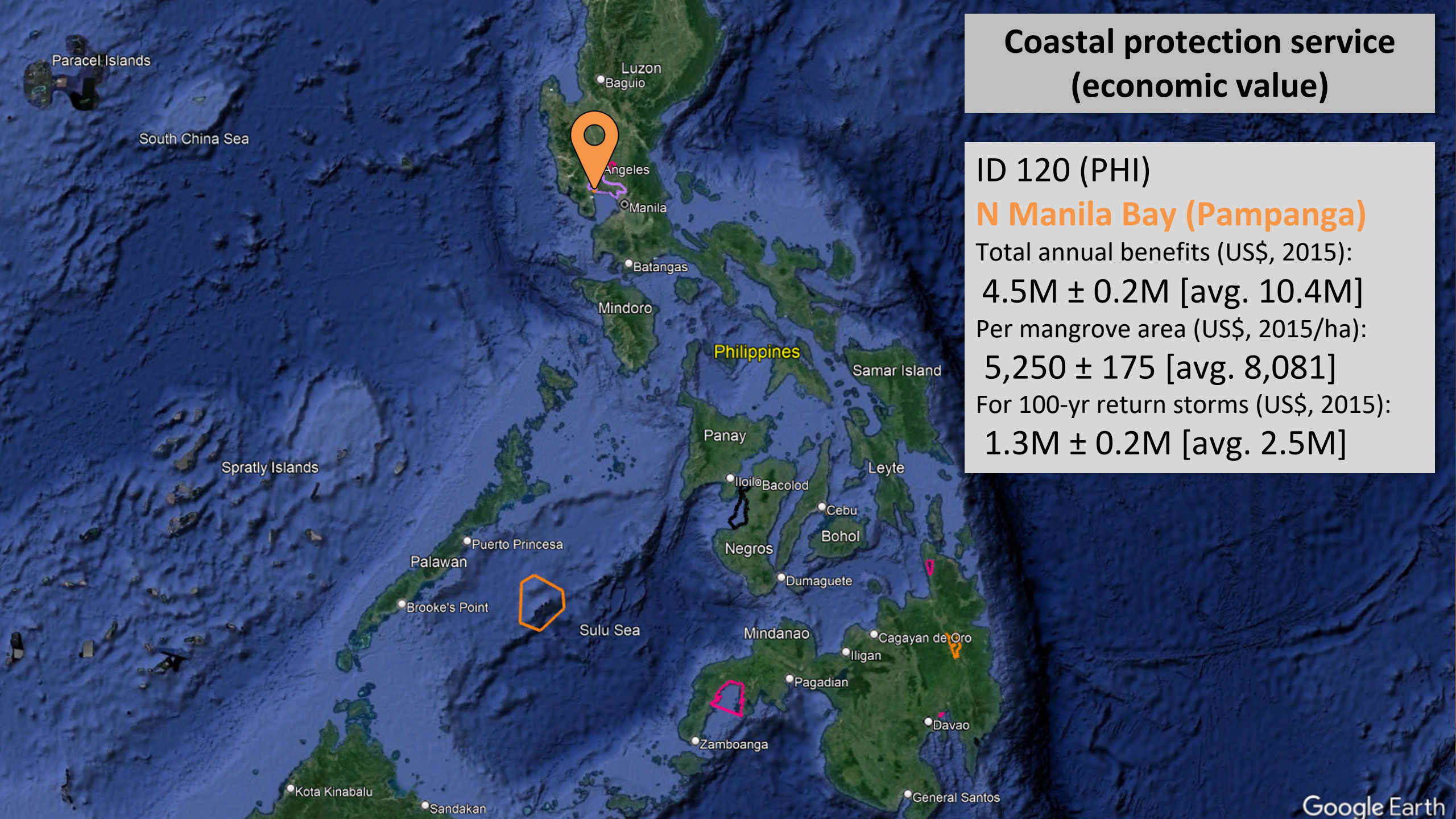
4.5M ± 0.2M [avg. 10.4M]

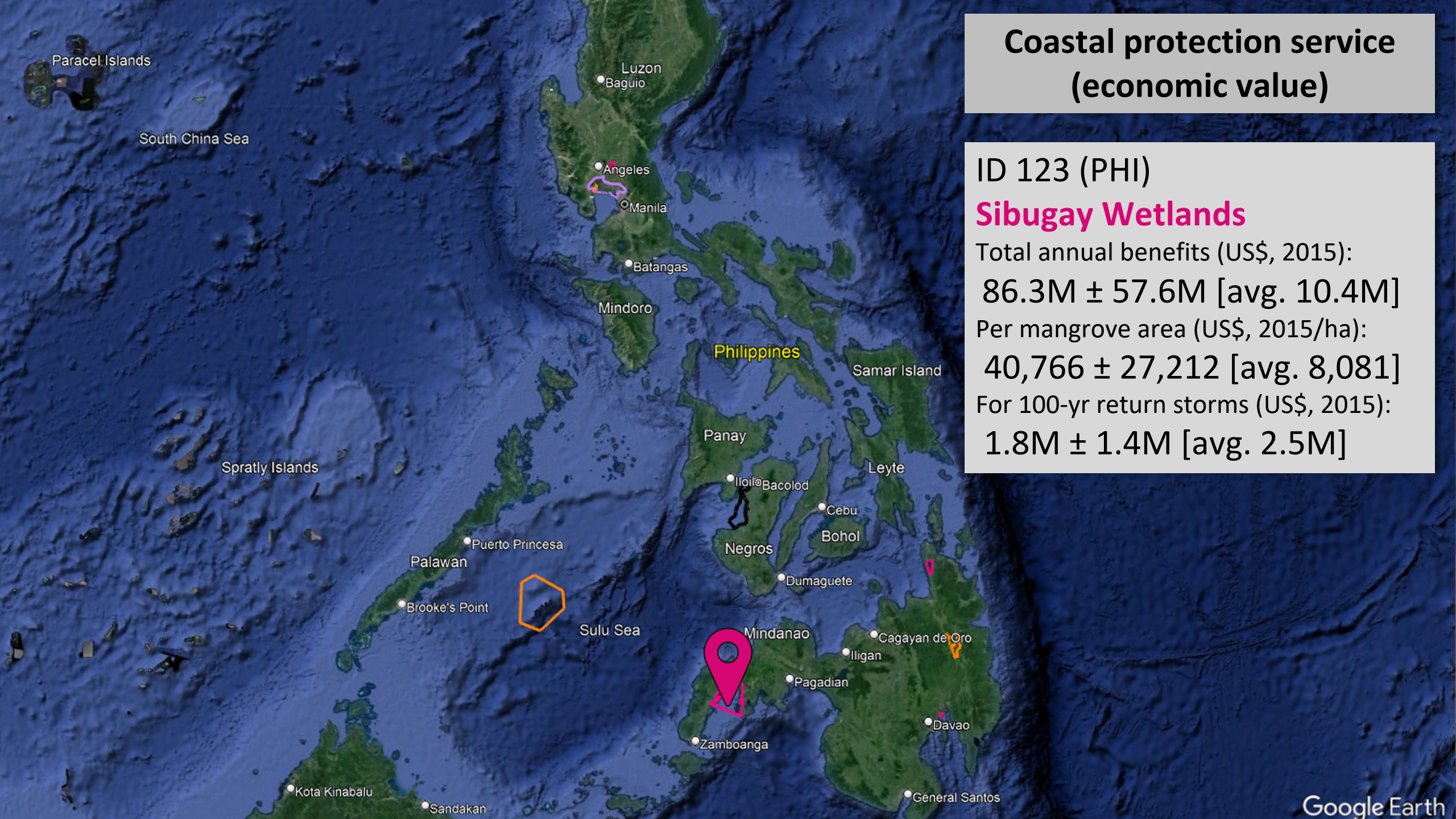
Per mangrove area (US$, 2015/ha):

5,250 ± 175 [avg. 8,081]

For 100-yr return storms (US$, 2015):

1.3M ± 0.2M [avg. 2.5M]





Coastal protection service (economic value)

ID 123 (PHI)

Sibugay Wetlands

Total annual benefits (US$, 2015):

86.3M ± 57.6M [avg. 10.4M]

Per mangrove area (US$, 2015/ha):

40,766 ± 27,212 [avg. 8,081]

For 100-yr return storms (US$, 2015):

1.8M ± 1.4M [avg. 2.5M]

Coastal protection service (economic value)

ID 124 (PHI)

Panabo Coast

Total annual benefits (US$, 2015):

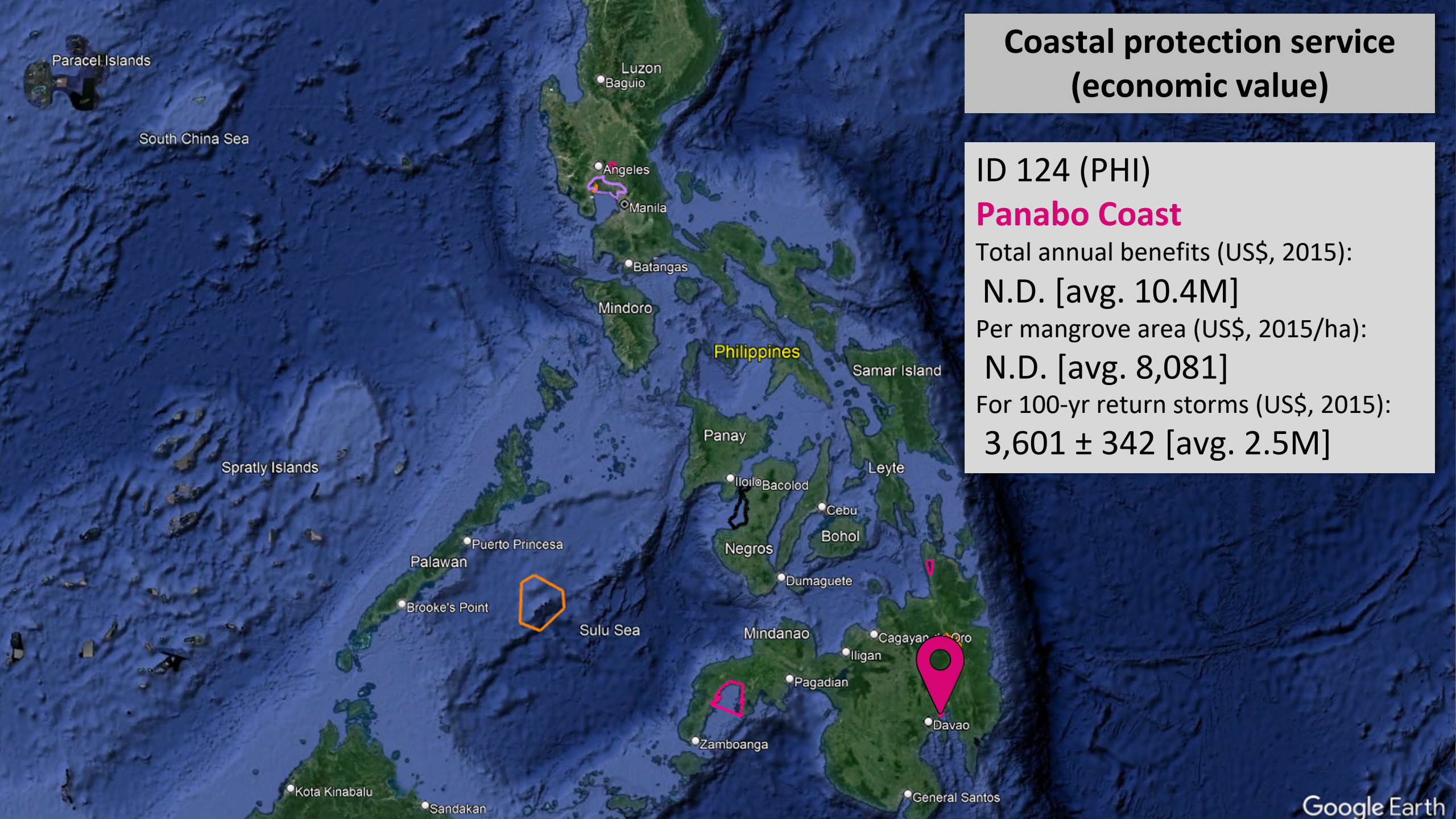
N.D. [avg. 10.4M]

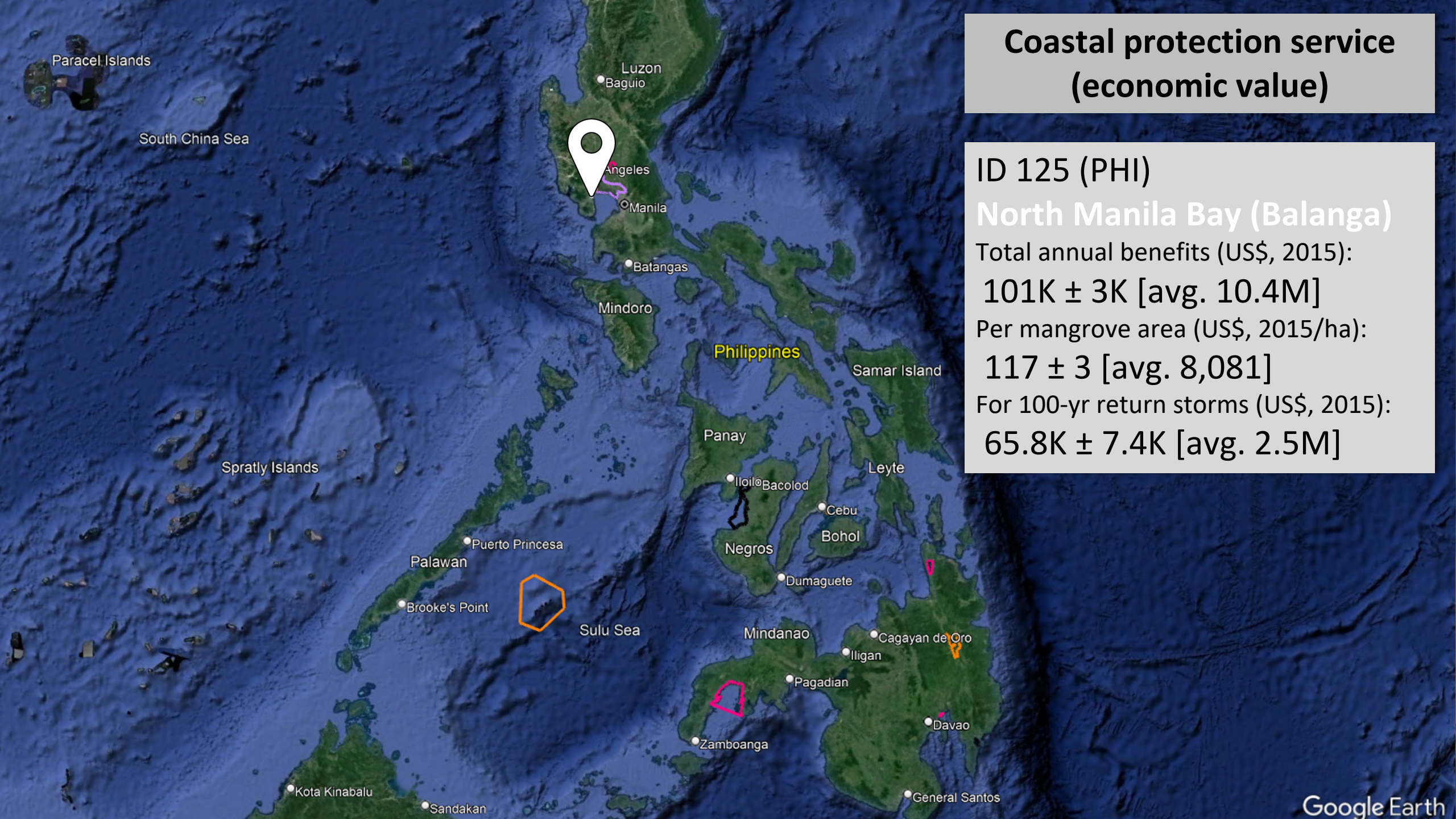
Per mangrove area (US$, 2015/ha):

N.D. [avg. 8,081]

For 100-yr return storms (US$, 2015):

3,601 ± 342 [avg. 2.5M]





Coastal protection service (economic value)

ID 125 (PHI)

North Manila Bay (Balanga)

Total annual benefits (US$, 2015):

101K ± 3K [avg. 10.4M]

Per mangrove area (US$, 2015/ha):

117 ± 3 [avg. 8,081]

For 100-yr return storms (US$, 2015):

65.8K ± 7.4K [avg. 2.5M]

Coastal protection service (economic value)

ID 126 (PHI)

Tubbataha Reef Natural Park

Total annual benefits (US$, 2015):

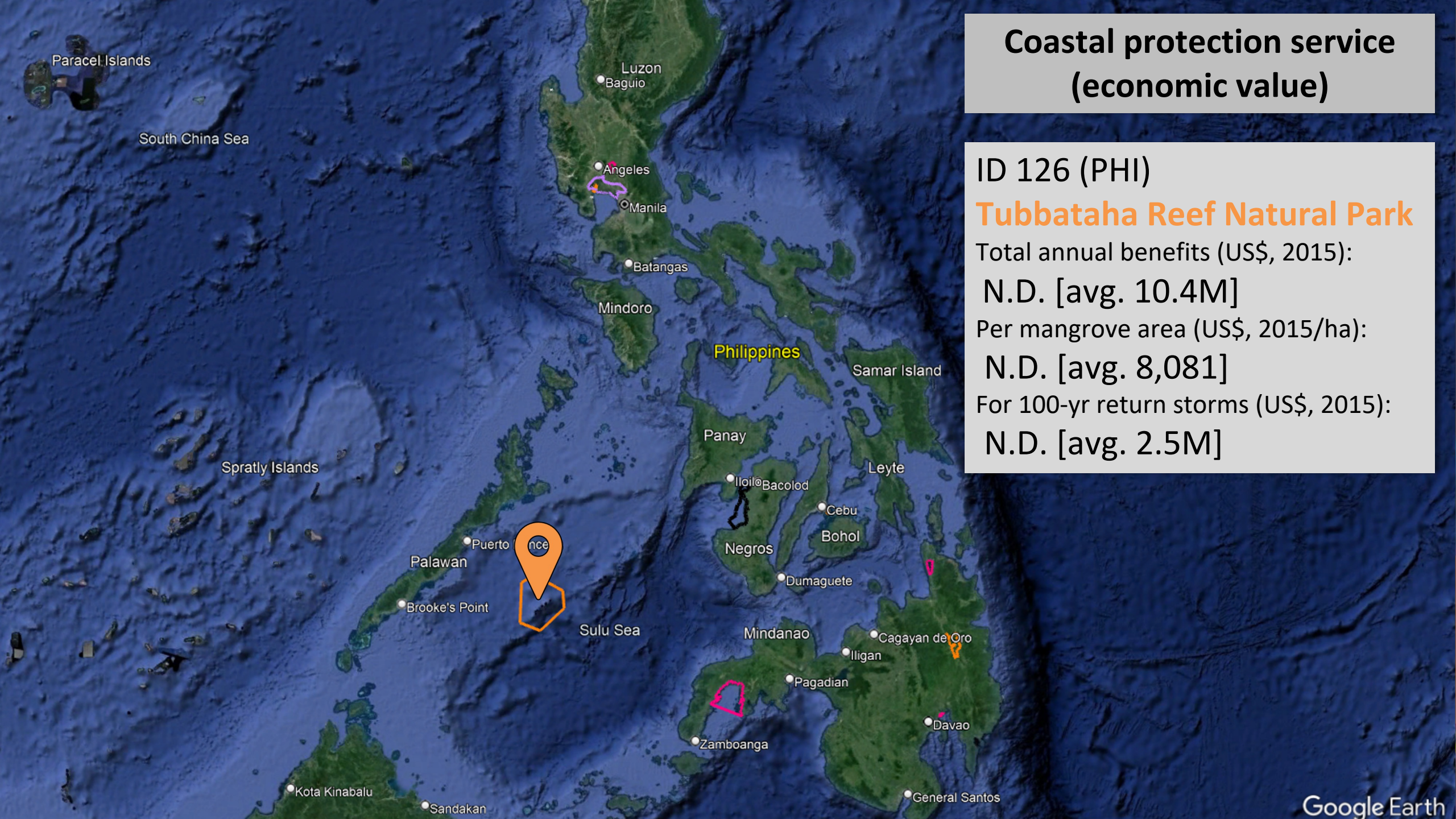
N.D. [avg. 10.4M]

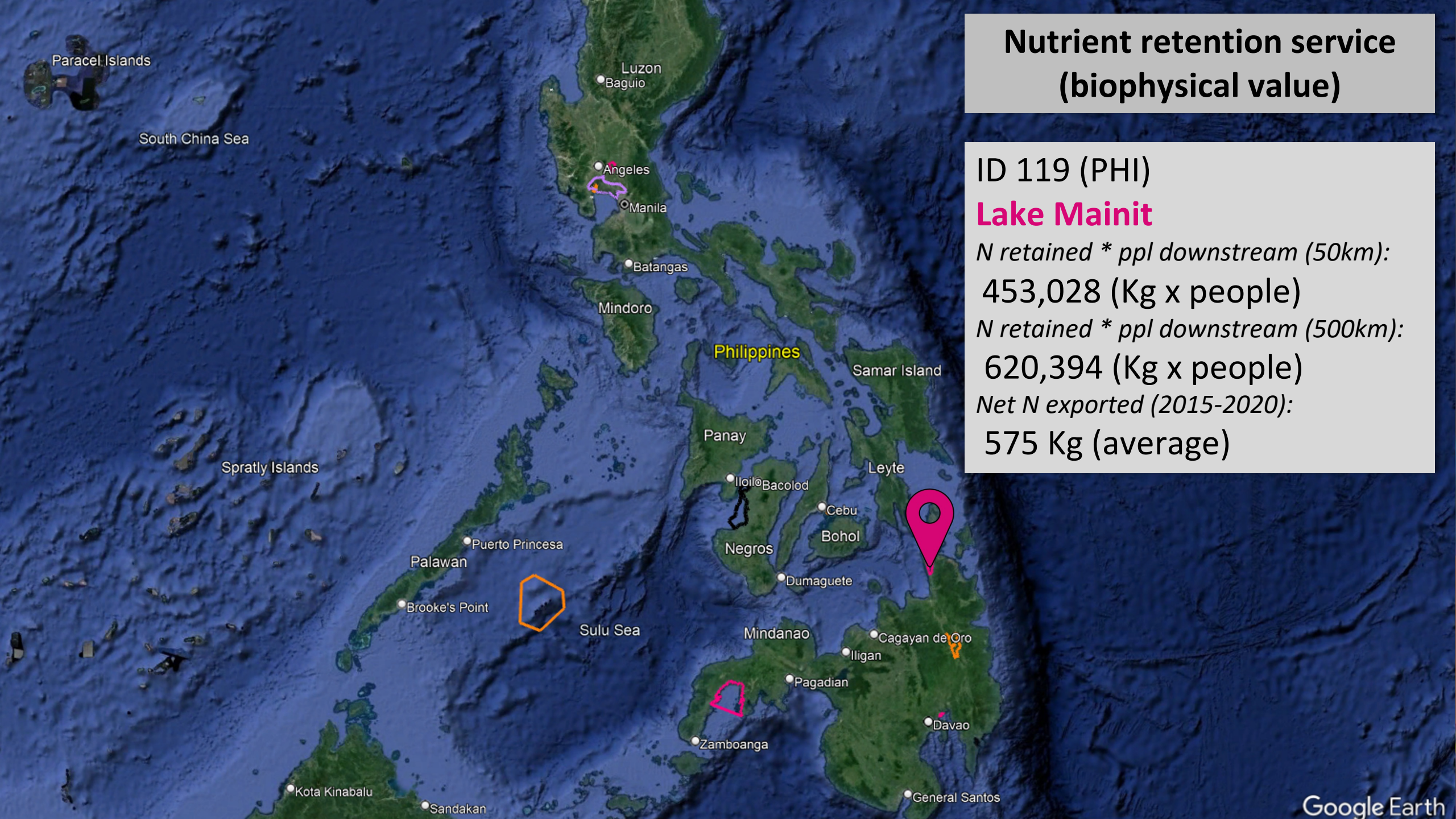
Per mangrove area (US$, 2015/ha):

N.D. [avg. 8,081]

For 100-yr return storms (US$, 2015):

N.D. [avg. 2.5M]





Nutrient retention service (biophysical value)

ID 119 (PHI)

Lake Mainit

*N retained * ppl downstream (50km):*

453,028 (Kg x people)

*N retained * ppl downstream (500km):*

620,394 (Kg x people)

Net N exported (2015-2020):

575 Kg (average)

Nutrient retention service (biophysical value)

ID 121 (PHI)

Agusan Marsh Wildlife Sanct.

*N retained * ppl downstream (50km):*

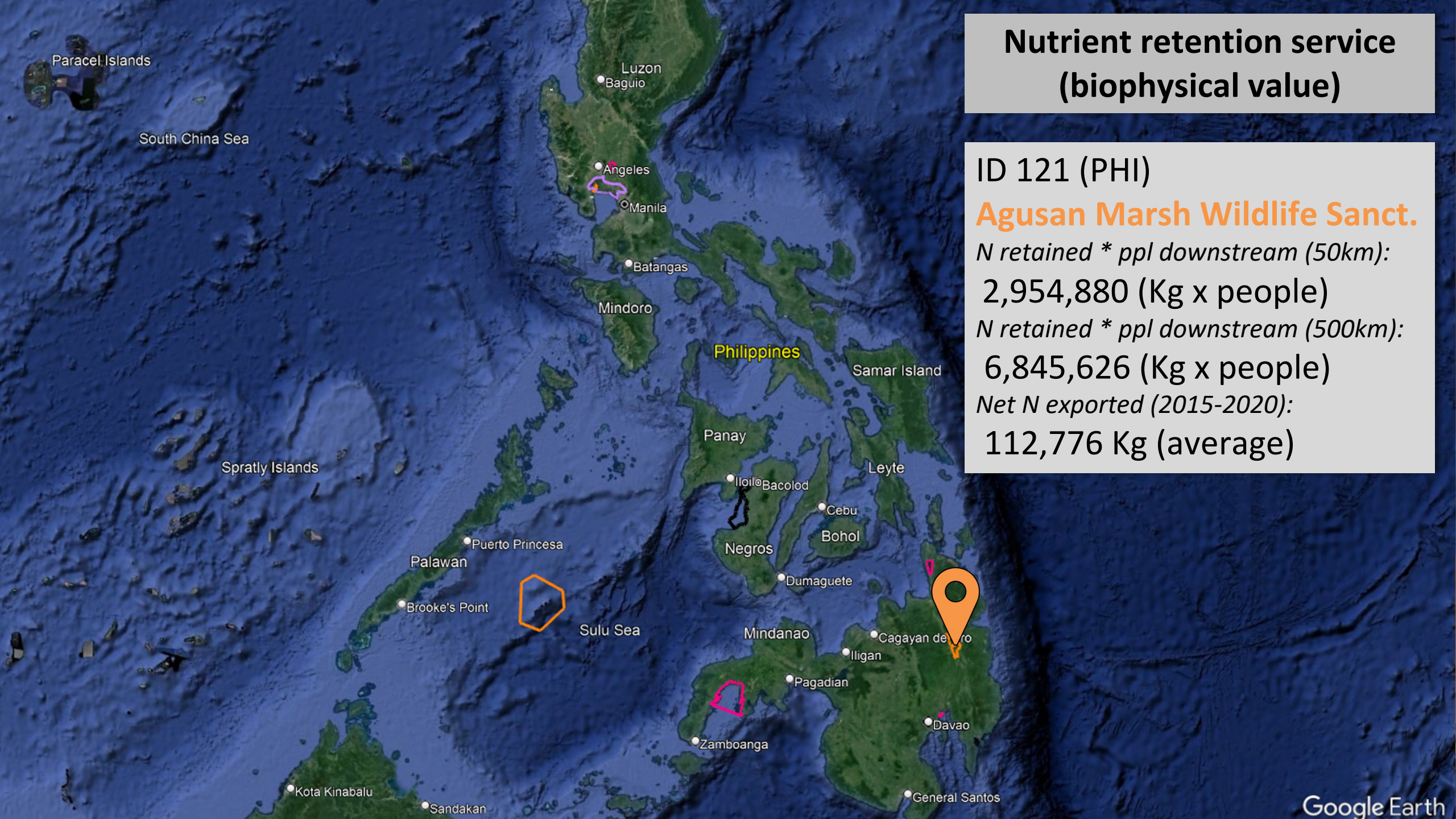
2,954,880 (Kg x people)

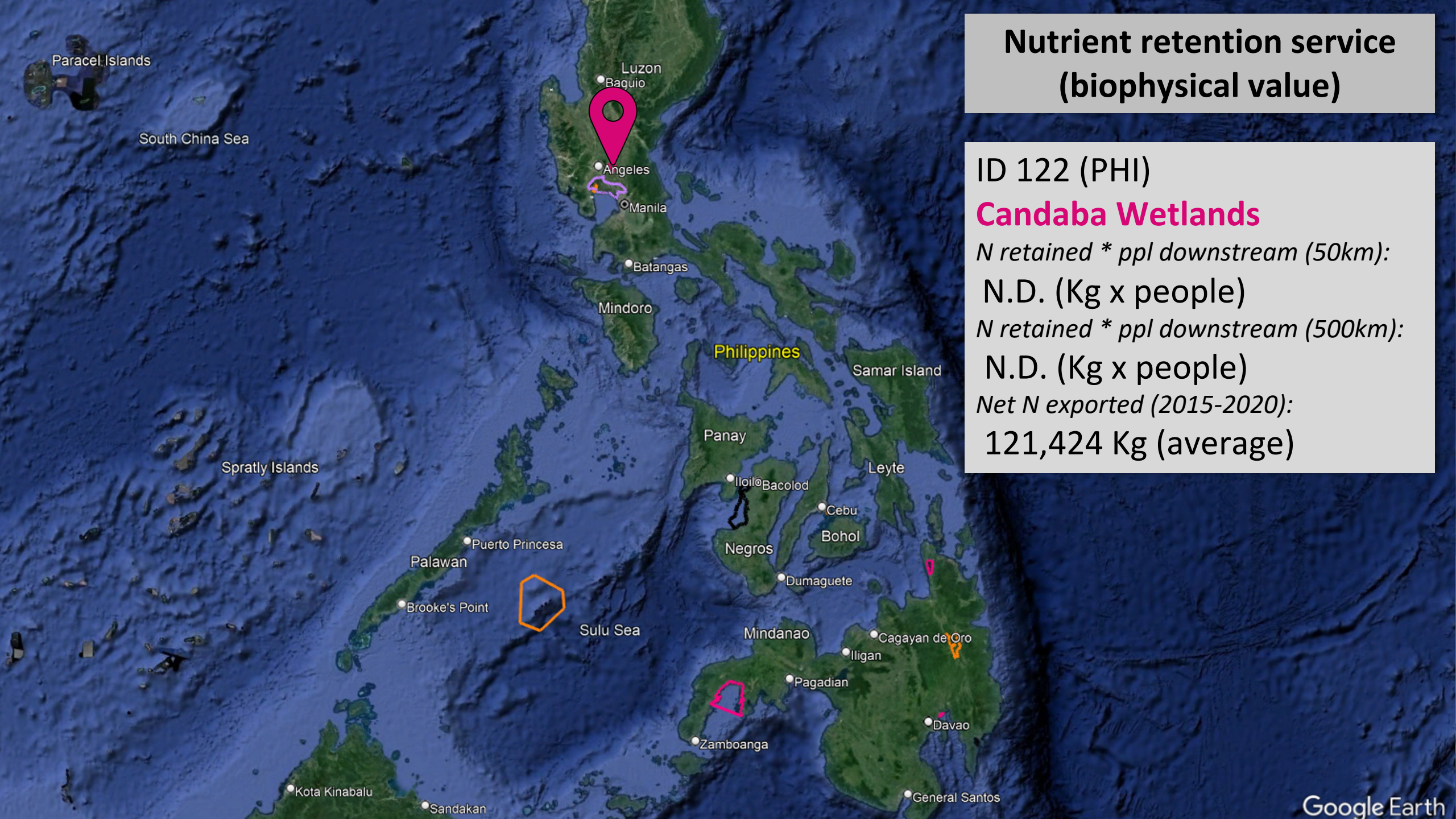
*N retained * ppl downstream (500km):*

6,845,626 (Kg x people)

Net N exported (2015-2020):

112,776 Kg (average)





Nutrient retention service (biophysical value)

ID 122 (PHI)

Candaba Wetlands

*N retained * ppl downstream (50km):*

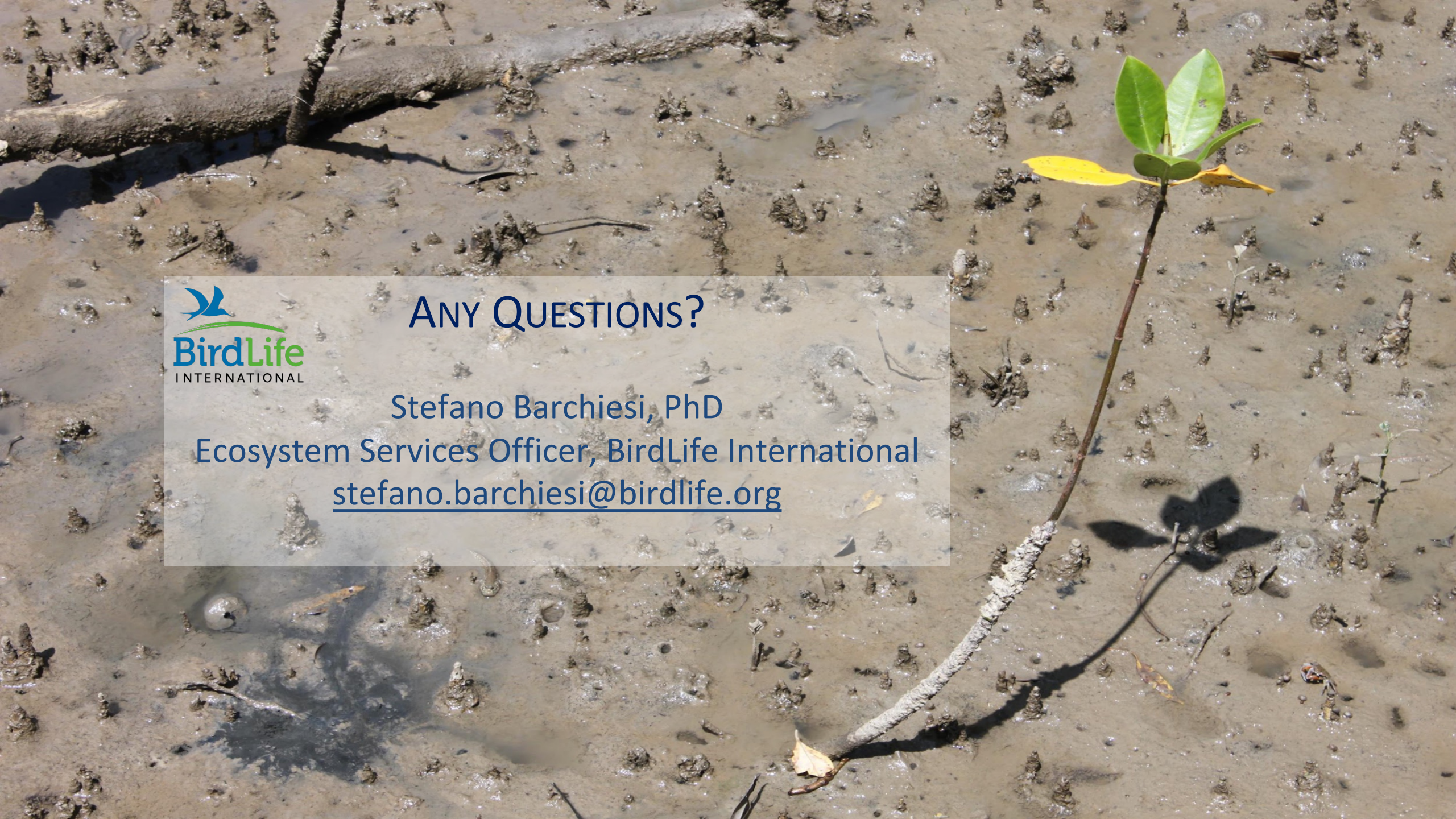
N.D. (Kg x people)

*N retained * ppl downstream (500km):*

N.D. (Kg x people)

Net N exported (2015-2020):

121,424 Kg (average)



Any Questions?

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stefano.barchiesi@birdlife.org