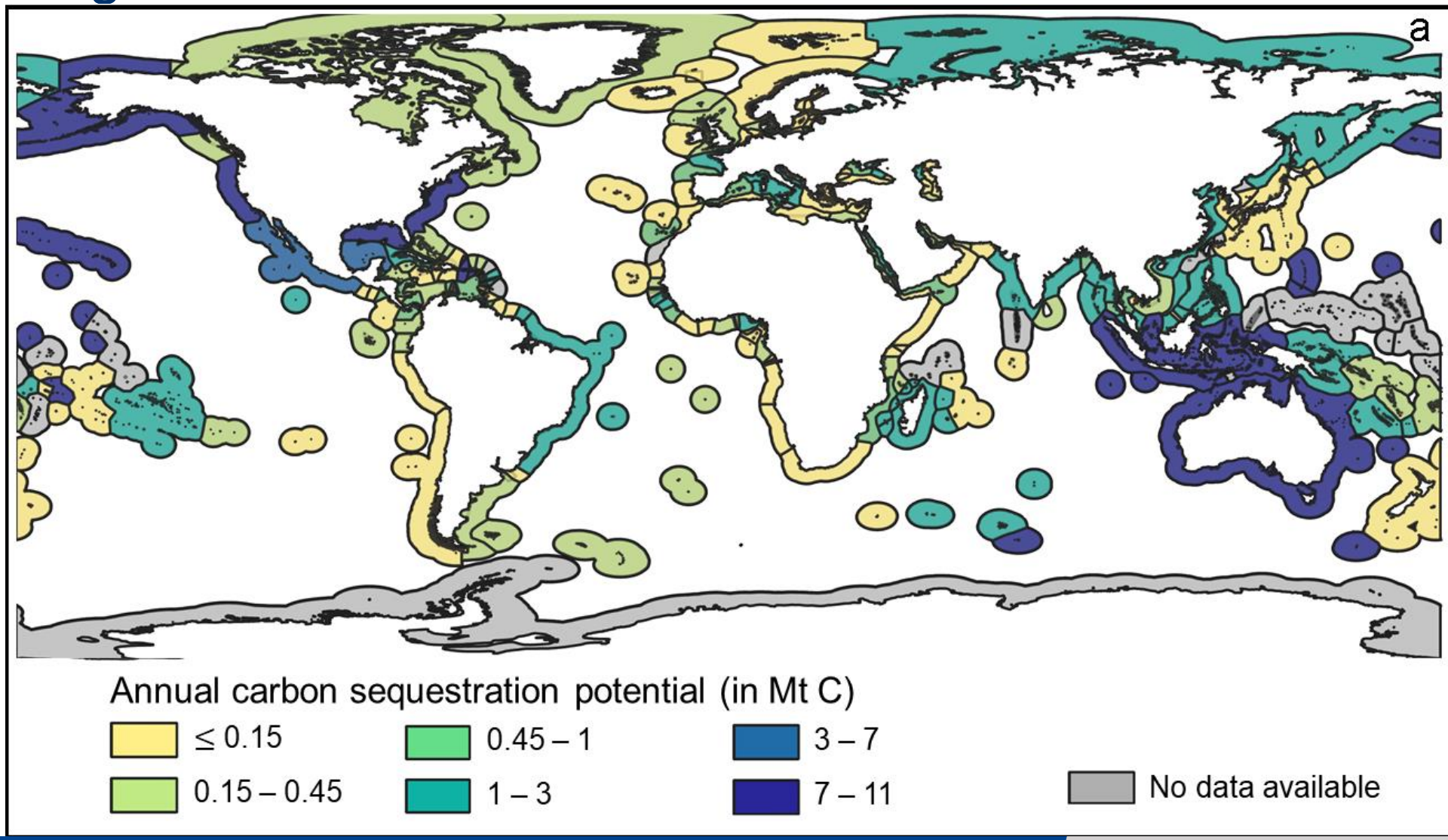
Wilfried Rickels

Resettlement of seagrass meadows as a contribution to climate protection and marine biodiversity – Analysis of costs and benefits

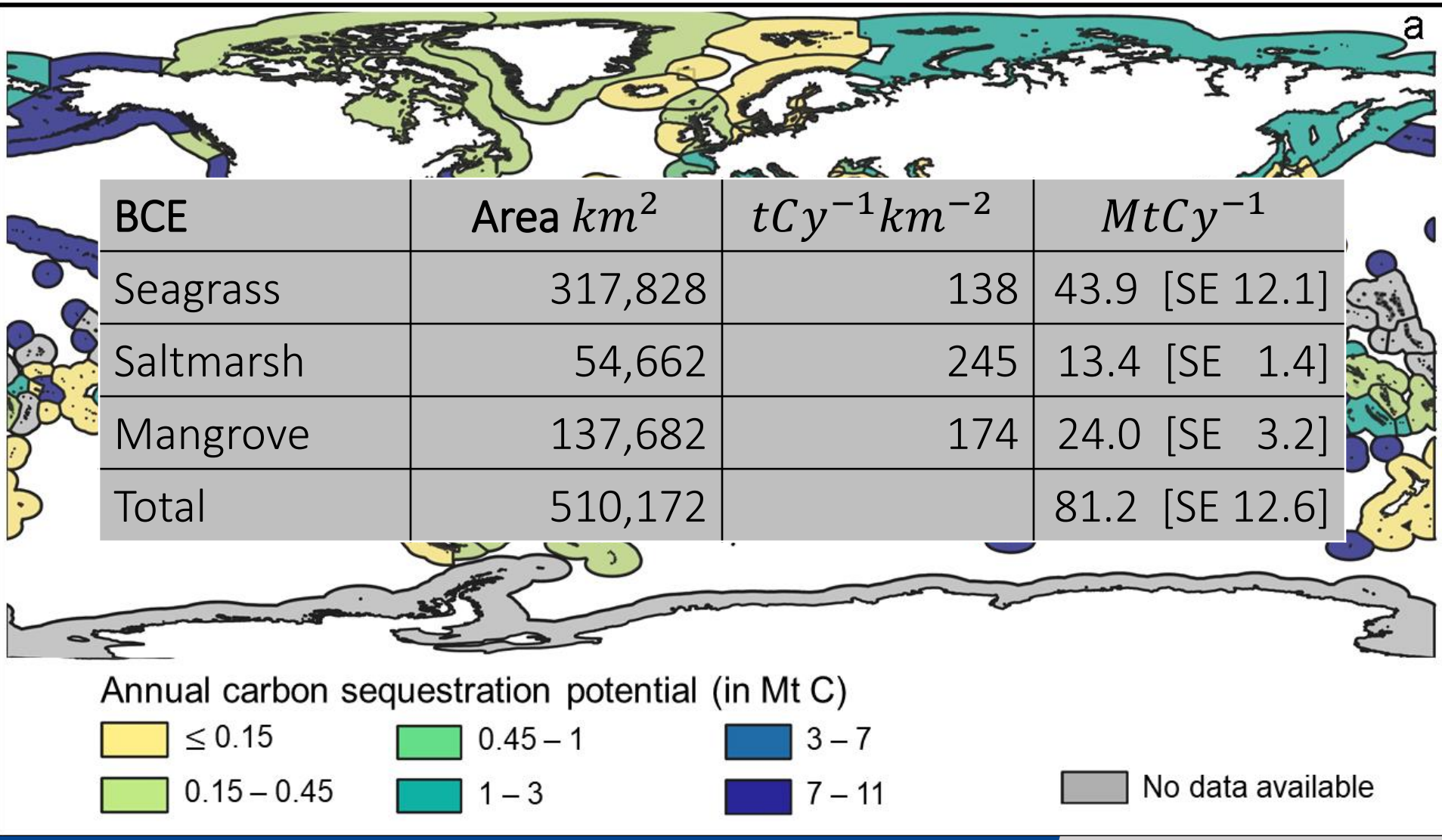
Digital Meeting of the Working Group of the Baltic Sea Parliamentary Conference on Climate Protection and Biodiversity

October, 4th, 2021

Global distribution of blue carbon sequestration: mangroves, salt marshes, and seagrass meadows



Aggregated blue carbon sequestration



BCE	Area km^2	$tCy^{-1}km^{-2}$	$MtCy^{-1}$
Seagrass	317,828	138	43.9 [SE 12.1]
Saltmarsh	54,662	245	13.4 [SE 1.4]
Mangrove	137,682	174	24.0 [SE 3.2]
Total	510,172		81.2 [SE 12.6]

Aggregated blue carbon sequestration

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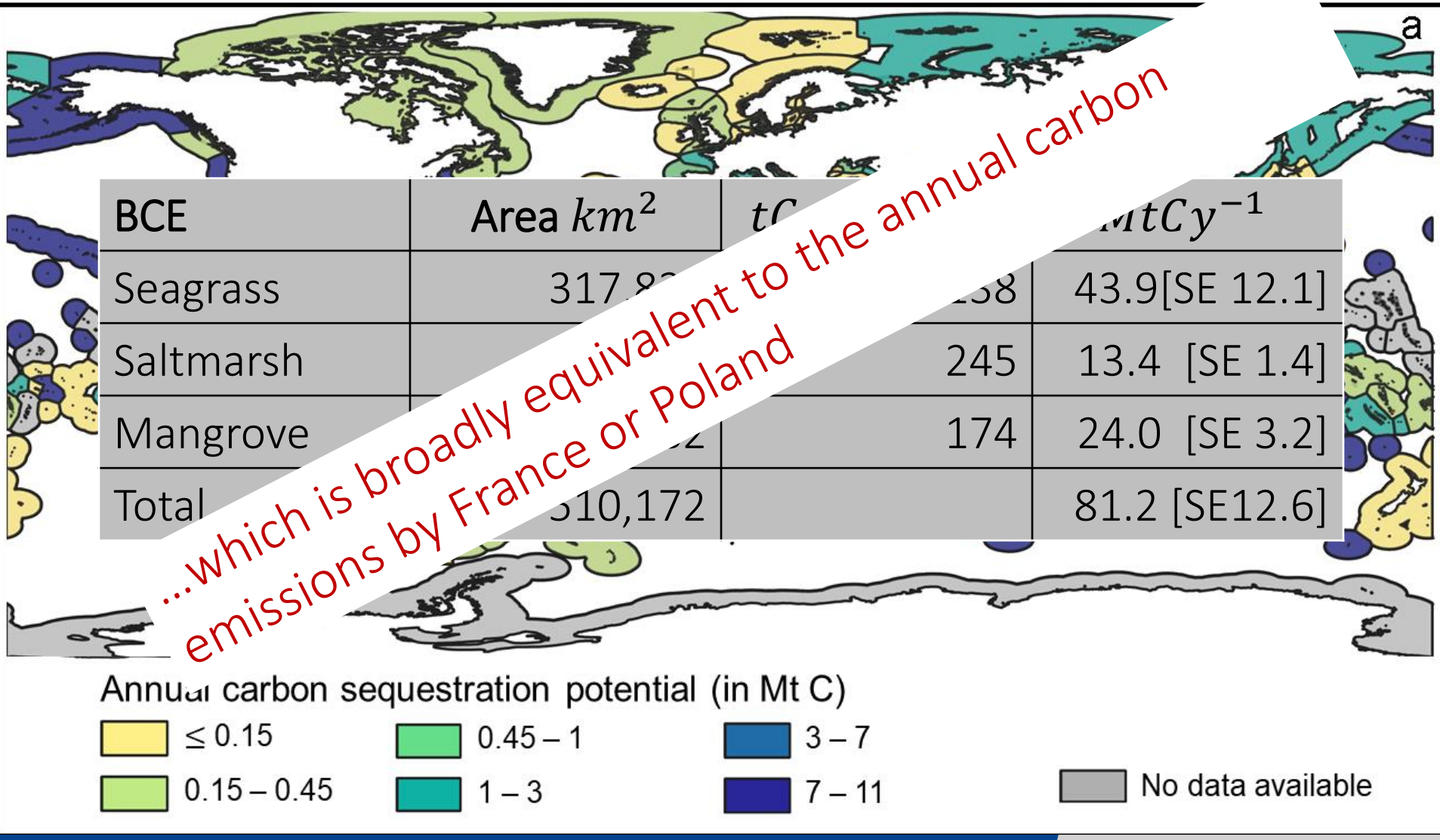
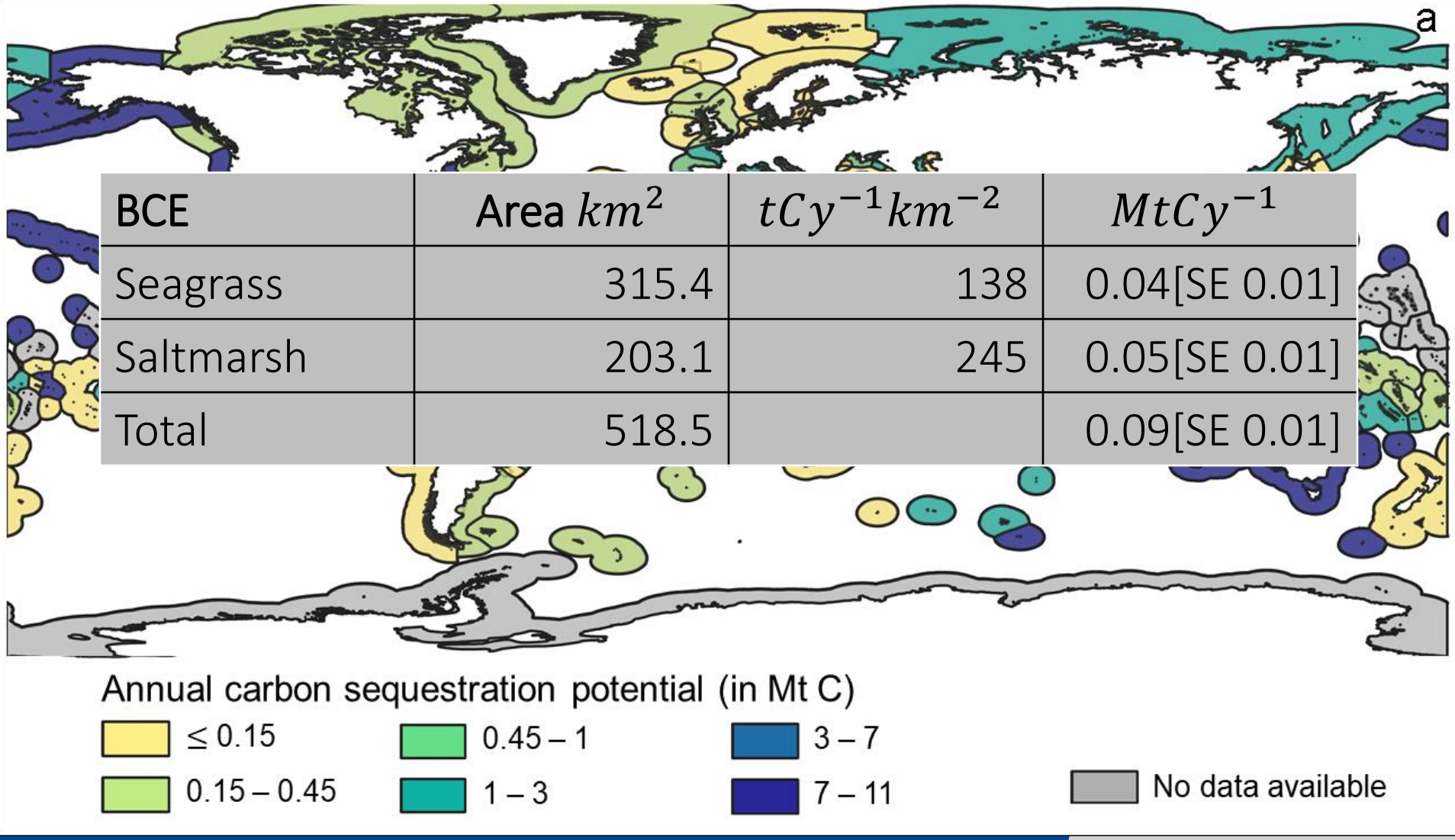
Seagrass	317,8	138	43.9[SE 12.1]
Saltmarsh		245	13.4 [SE 1.4]
Mangrove		174	24.0 [SE 3.2]
Total	510,172		81.2 [SE12.6]

…which is broadly equivalent to the annual carbon emissions by France or Poland



Blue carbon sequestration in Germany (Baltic and North Sea)

BCE	Area km^2	$tCy^{-1}km^{-2}$	$MtCy^{-1}$
Seagrass	315.4	138	0.04[SE 0.01]
Saltmarsh	203.1	245	0.05[SE 0.01]
Total	518.5		0.09[SE 0.01]



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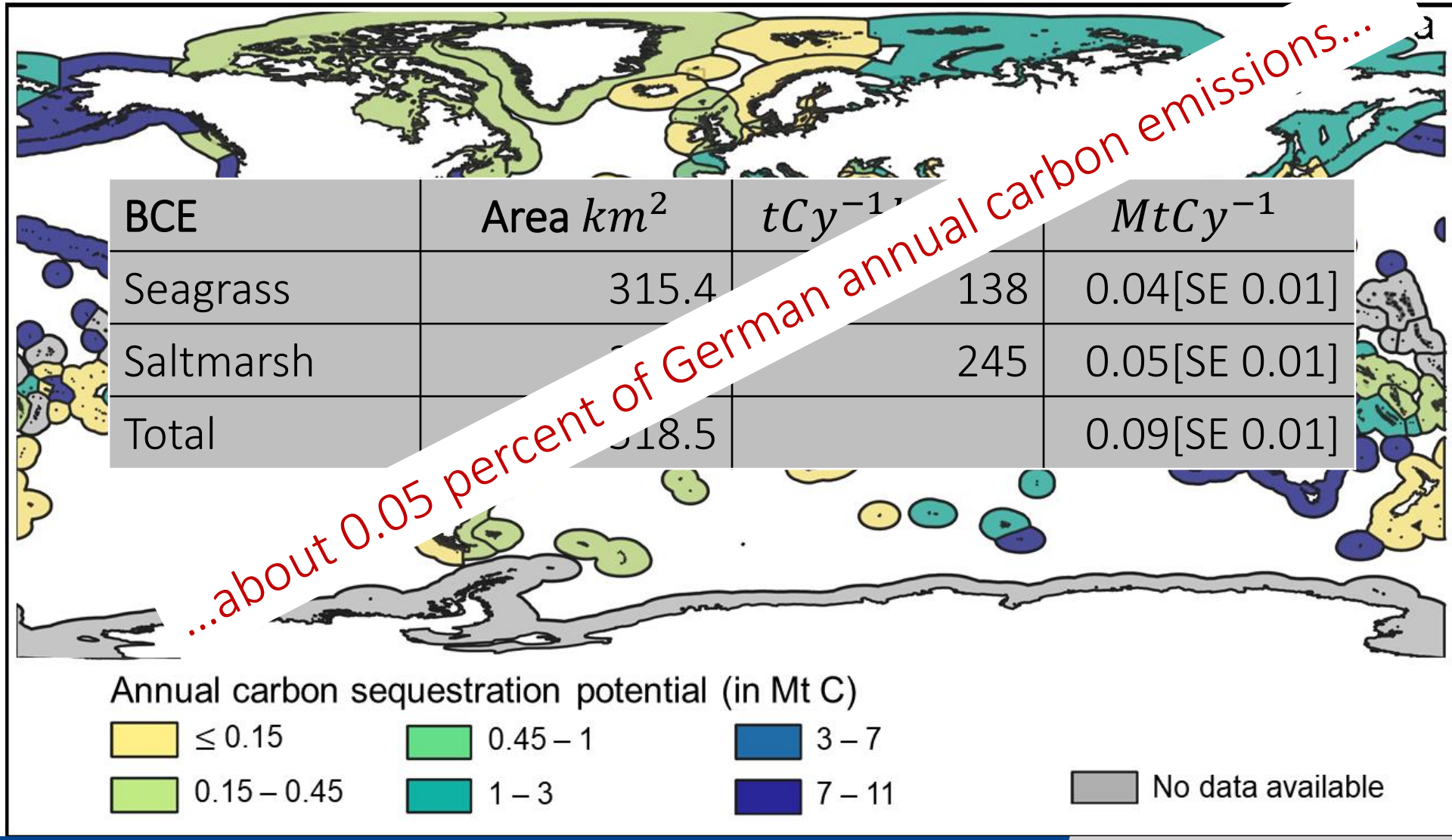

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Seagrass	315.4	138	0.04[SE 0.01]
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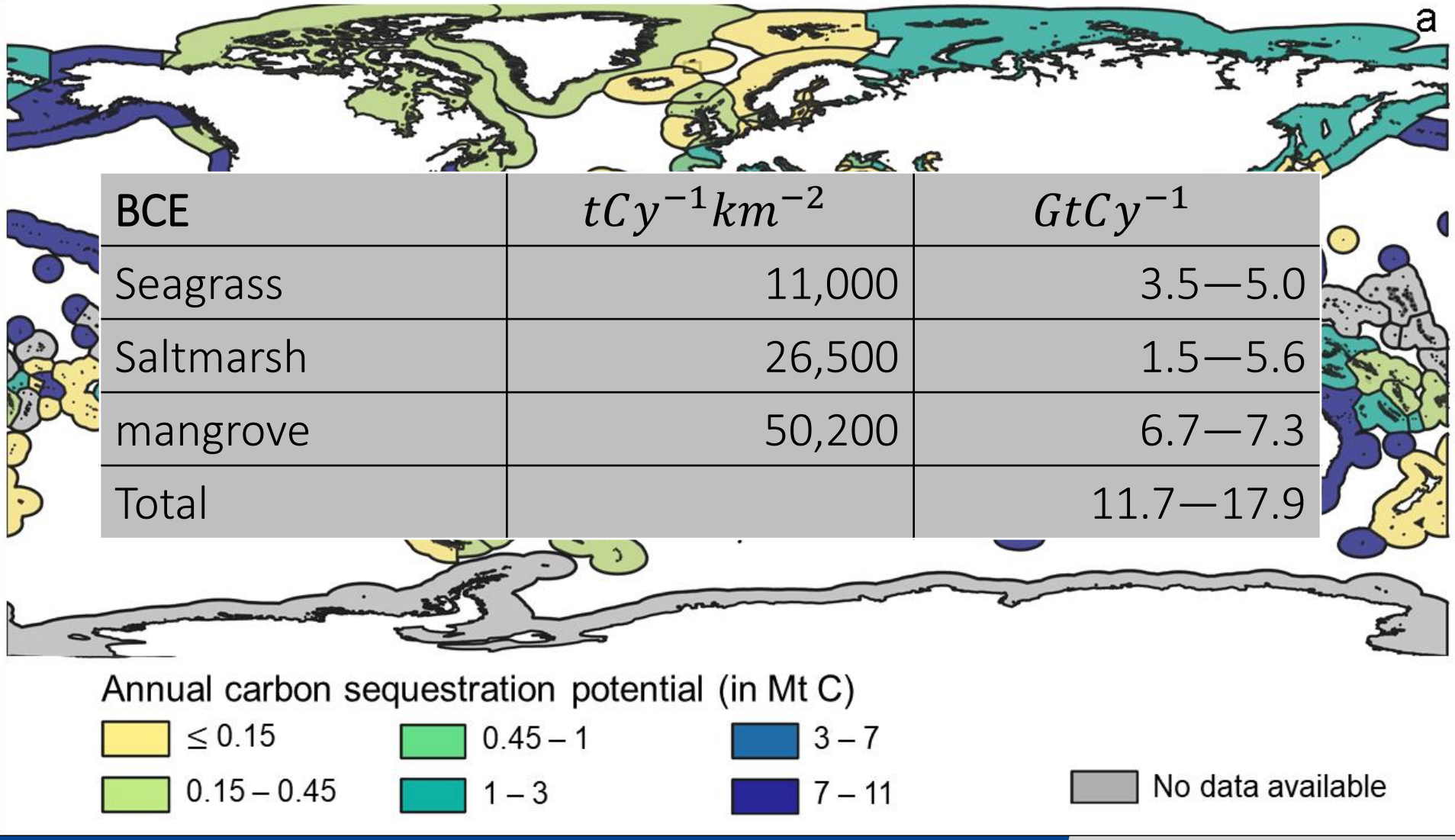
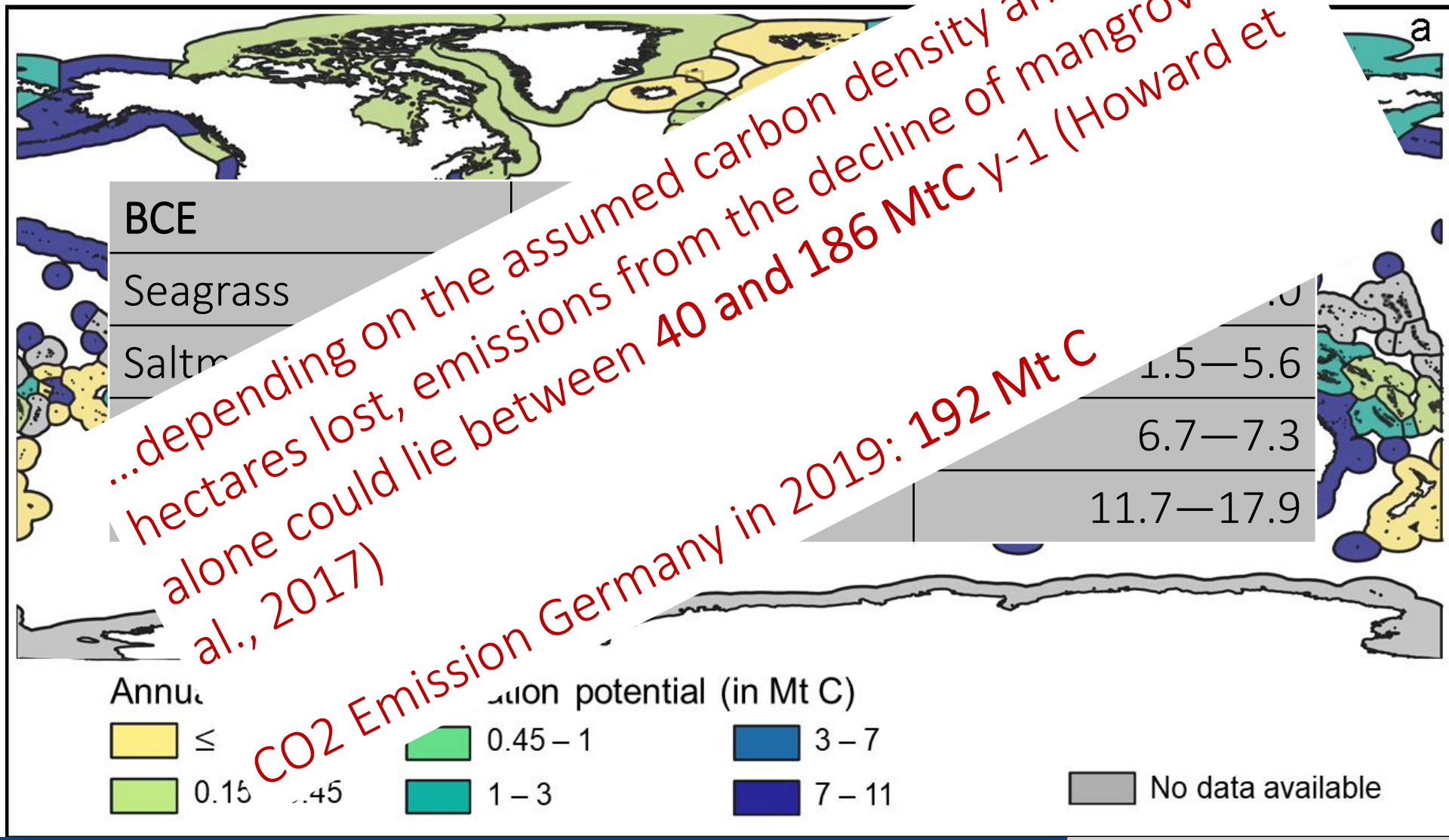
Total	318.5		0.09[SE 0.01]

But blue carbon ecosystems are not only about annual sequestration, but carbon storage

BCE	$tCy^{-1}km^{-2}$	$GtCy^{-1}$
Seagrass	11,000	3.5—5.0
Saltmarsh	26,500	1.5—5.6
mangrove	50,200	6.7—7.3
Total		11.7—17.9



But blue carbon ecosystems are not only about annual sequestration, but carbon storage



…depending on the assumed carbon density and annual hectares lost, emissions from the decline of mangroves alone could lie between **40 and 186 MtC** y-1 (Howard et al., 2017)

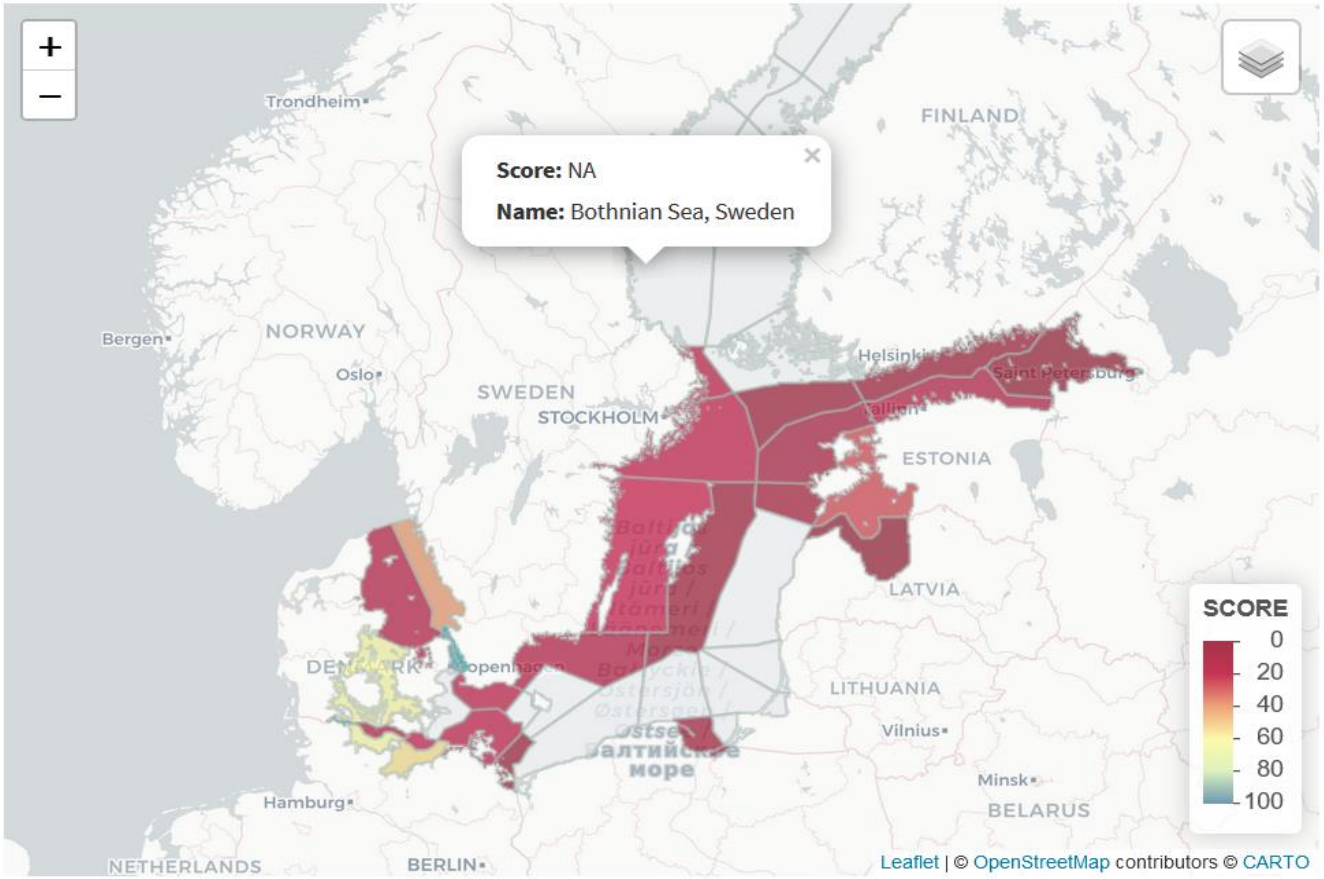
CO2 Emission Germany in 2019: **192 Mt C**

Baltic Health Index: Carbon Storage Goal

Ocean Health Index for the Baltic Sea, 2019 Assessment

- WELCOME
- INDEX CALCULATION
- EXPLORE THE GOALS
  - Artisanal Fishing Opportunity
  - Biodiversity
  - Carbon Storage
  - Clean Water
  - Food Provision
  - Livelihoods & Economies
  - Sense of Place
  - Natural Products
  - Tourism
- VIEW OPTIONS
- LEARN MORE
- SHARE FEEDBACK

failure to reach the 'acceptable' level.



Visualizing more Data Behind the Scores

Change in European seagrass cover and restoration costs

Region	Total net change 1896—2016 (in ha)
Mediterran Sea	-9,388
Atlantic Ocean	-19,696
Baltic Sea	-6,600
Total	-35,684

de los Santos et al. (2019) Recent trend reversal for declining Europeanseagrass meadows, Nature Communications, doi: 10.1038/s41467-019-11340-4

Rapid global losses are largely attributable to anthropogenic impacts,

- mainly loss of water quality and coastal development and,
- more recently, to extreme events, such as storms and marine heat waves

Change in European seagrass cover and restoration costs

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de los Santos et 1340-4

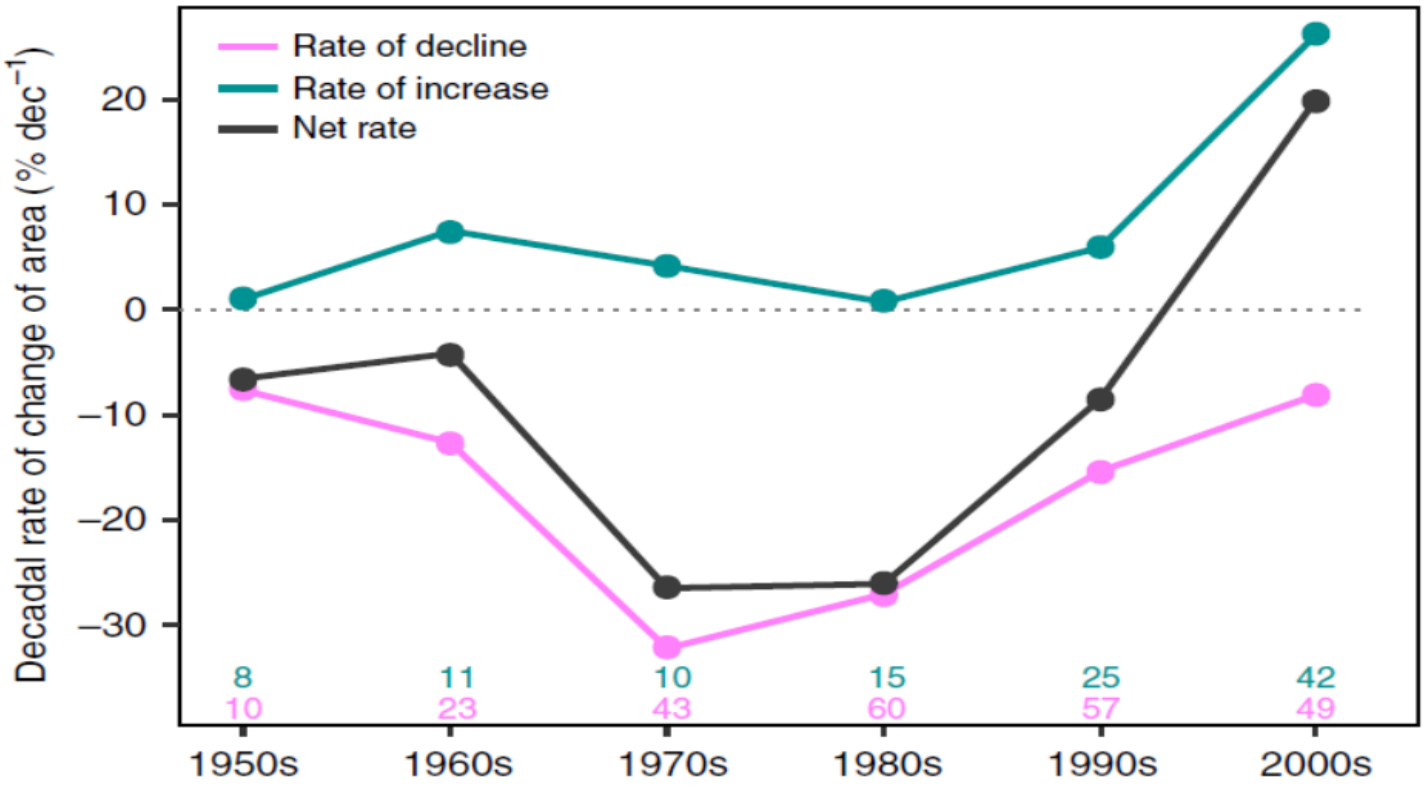

Fig. 3 Decadal rate of change of area of European seagrasses

Change in European seagrass cover and restoration costs

Region	Total net change 1896—2016 (in ha)
Mediterran Sea	-9,388
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Transplanting seagrass (cores or plugs) : a cost range of 12,000-1,020,000 EUR/ha

Bayraktarov et al. (2016) The cost and feasibility of marine coastal restoration, Ecological Applications 26(4): 1055-1074

Restoring about 40 percent of loss in Baltic: 2640h => 32 Mio –2700 Mio EUR

(the latter figure would be 0.08% of German GDP)

Carbon Benefits of Restoration

Market-based versus wealth-based assessment

- market-based, e.g., EU-ETS > 60 EUR/tCO2
- wealth-based assessment, using the social cost of carbon (SCC) to measure avoided damage

Carbon Wealth

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nature climate change

ARTICLES

https://doi.org/10.1038/s41558-021-01089-4

Check for updates

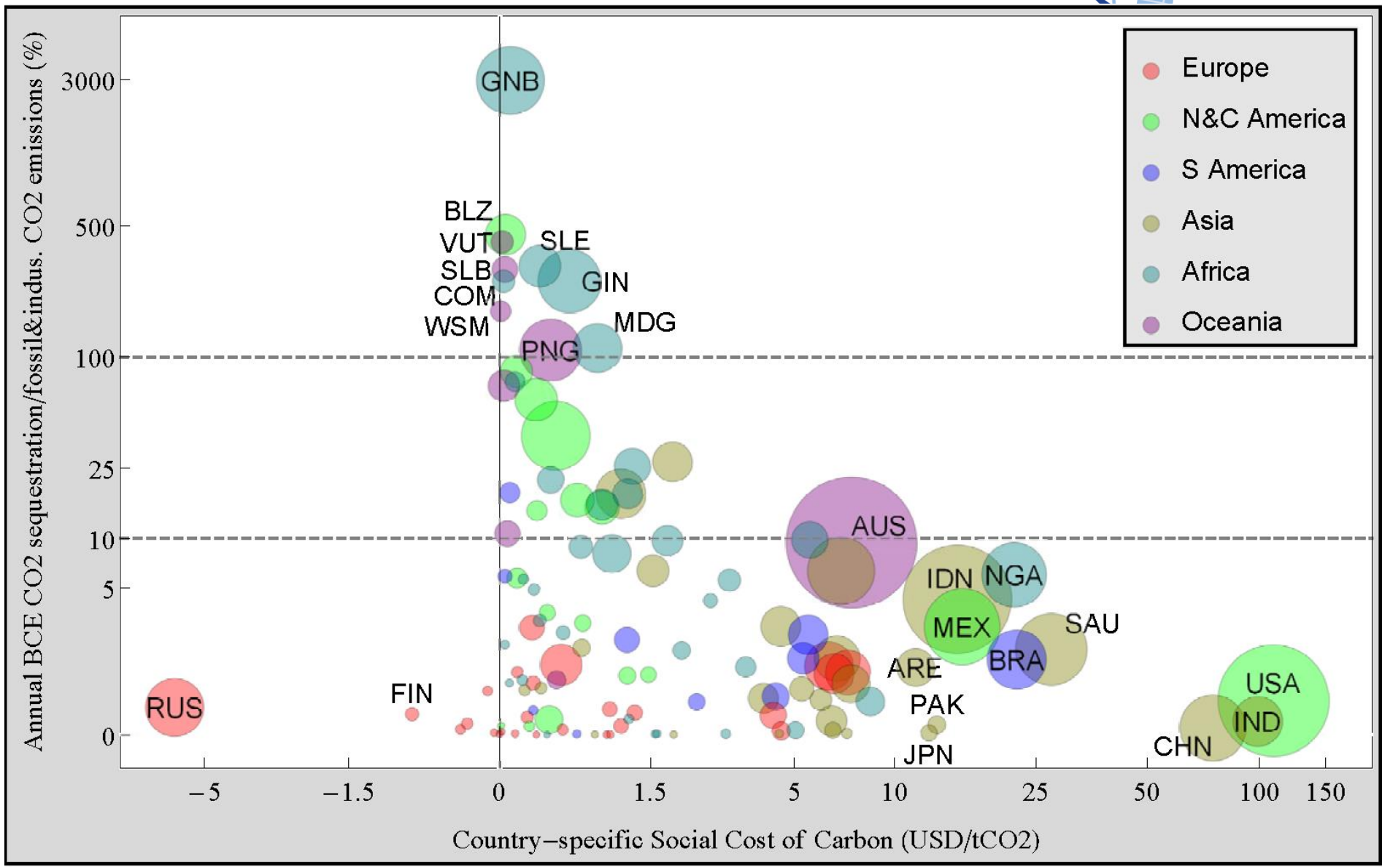
OPEN

The blue carbon wealth of nations

Christine Bertram[1], Martin Quaas[2], Thorsten B. H. Reusch[3], Athanasios T. Vafeidis[4], Claudia Wolff[4] and Wilfried Rickels[1]✉

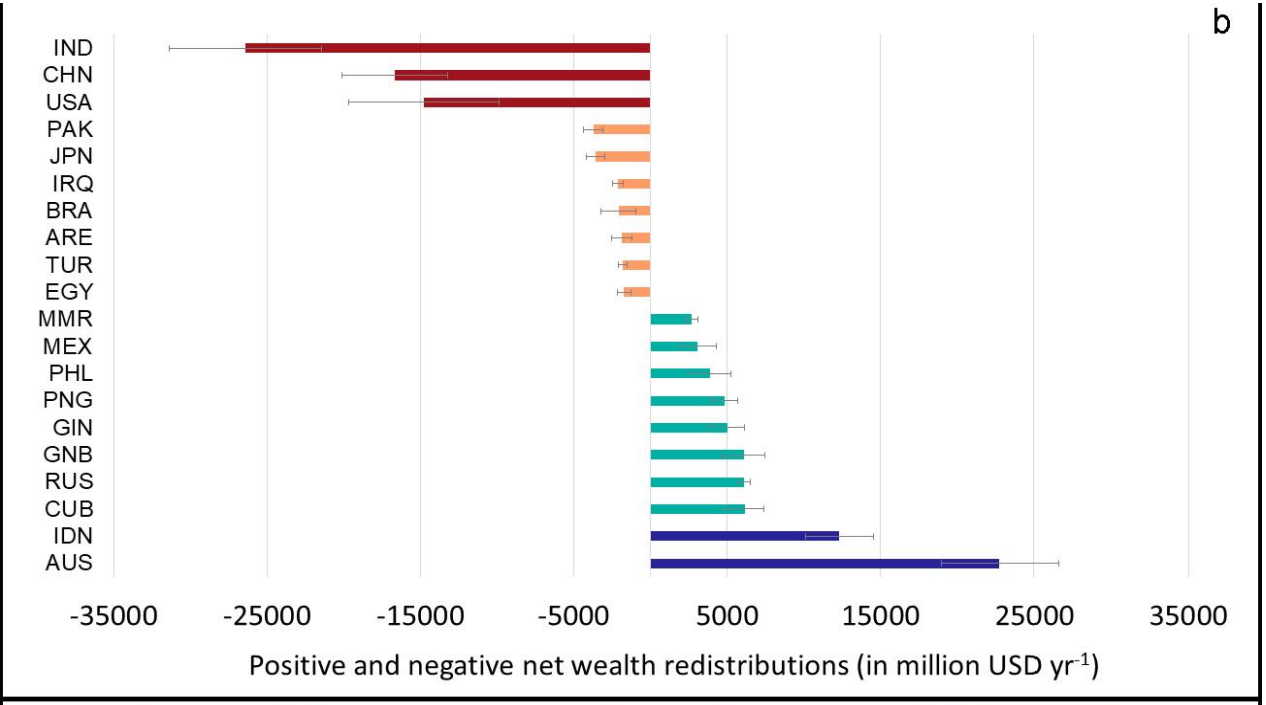
Carbon sequestration and storage in mangroves, salt marshes and seagrass meadows is an essential coastal 'blue carbon' ecosystem service for climate change mitigation. Here we offer a comprehensive, global and spatially explicit economic assessment of carbon sequestration and storage in three coastal ecosystem types at the global and national levels. We propose a new approach based on the country-specific social cost of carbon that allows us to calculate each country's contribution to, and redistribution of, global blue carbon wealth. Globally, coastal ecosystems contribute a mean ± s.e.m. of US$190.67 ± 30 bn yr^{-1} to blue carbon wealth. The three countries generating the largest positive net blue wealth contribution for other countries are Australia, Indonesia and Cuba, with Australia alone generating a positive net benefit of US$22.8 ± 3.8 bn yr^{-1} for the rest of the world through coastal ecosystem carbon sequestration and storage in its territory.

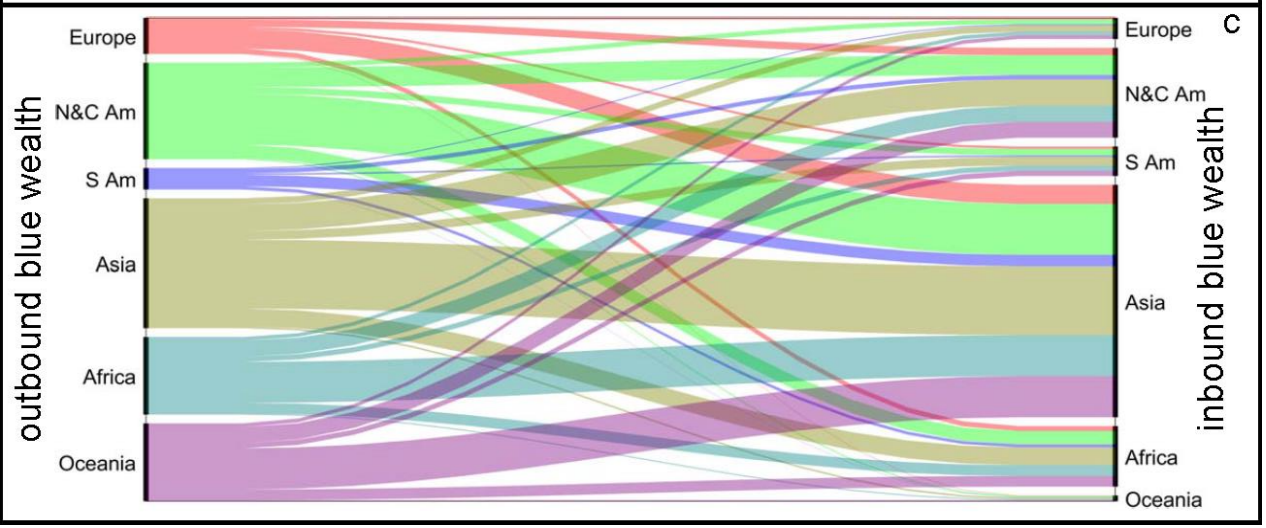
Carbon Wealth



Bertram, Quaas, Reusch, Vafeidis, Wolff, Rickels (2021) The blue carbon wealth of nations, Nature Climate Change 11: 704–709.

Carbon Wealth Redistribution





Germany „receives“ net blue carbon wealth from abroad:
1.13 bn USD

Bertram, Quaas, Reusch, Vafeidis, Wolff, Rickels (2021) The blue carbon wealth of nations, Nature Climate Change 11: 704–709.

Global Carbon Wealth

- coastal ecosystems contribute a mean of US$190.67 (± 30) bn yr−1 to blue carbon wealth via carbon sequestration (Bertram et al. 2021).
- However, the carbon sequestration is only responsible for less than 1 percent of coastal ecosystem wealth contribution (Constanza et al. 2014)
  - Biodiversity contribution
  - Coastal protection
  - …

Bertram, Quaas, Reusch, Vafeidis, Wolff, Rickels (2021) The blue carbon wealth of nations, Nature Climate Change 11: 704–709.
Costanza, R. et al. Changes in the global value of ecosystem services. Globel Environmental Change 26, 152–158 (2014). (2021).

Implications for restoration costs

... in BCE restoration projects implemented for other purposes than carbon sequestration, carbon removal cost are restricted to the cost of monitoring carbon removal, implying that costs could be as low as **0.75 and 4 USD/tCO2,** for tidal wetlands and seagrass meadows, respectively (National Academies of Sciences, Engineering, and Medicine 2019).

…however, BCE restoration targeting at carbon sequestration only, and accounting for associated non-CO2-emissions, in particular CH4, are estimated to have cost of **491 USD/tCO2 and 560 USD/tCO2** for coastal wetlands and mangrove restoration, respectively (Taillardat et al. 2020).

National Academies of Sciences, Engineering, and Medicine (2019). Negative Emissions Technologies and Reliable Sequestration: A Research Agenda. Washington, D.C.: The National Academies Press. doi:10.17226/25259

Taillardat et al. (2020) Climate change mitigation potential of wetlands and the cost-effectiveness of their restoration, Interface Focus, doi: 10.1098/rsfs.2019.0129.10201901292019012 9.

Conclusions for seagrass restoration

... assessment of seagrass restoration with the only focus on carbon sequestrating will probably **not satisfy a cost-benefit test**

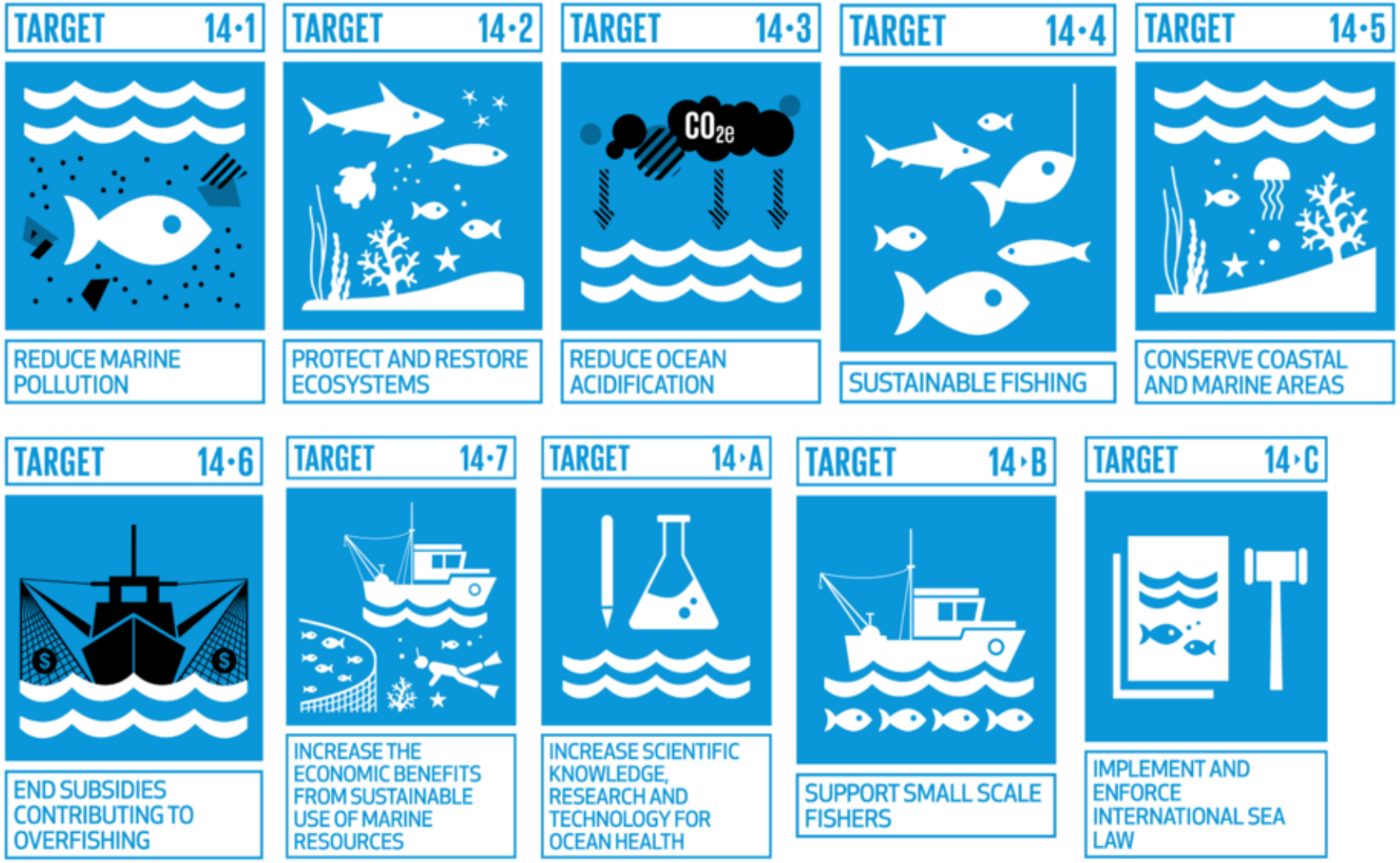
… if decision-makers consider the full range of services provided by seagrass beds, including cleaner water, coastal protection, increased biodiversity, and secure fisheries yields, seagrass bed restoration **will be a beneficial investment.**

…incentives for seagrass restoration should not be based on the marginal carbon sequestration (which is suitable for other removal options, Rickels et al. 2021), but be based on good environmental status of seagrass meadows

…however, needs to be embedded into marine and maritime strategy to mitigate also other stressors (e.g., eutrophication).

Rickels et al. (2021) Integrating Carbon Dioxide Removal Into European Emissions Trading, Frontiers in Climate 3, doi:10.3389/fclim.2021.690023

Comprehensive assessment of ocean health



Comprehensive assessment of EU SDG14

Marine Policy 106 (2019) 103515

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Does the European Union achieve comprehensive blue growth? Progress of EU coastal states in the Baltic and North Sea, and the Atlantic Ocean against sustainable development goal 14

Wilfried Rickels[a,*], Christian Weigand[a], Patricia Grasse[b], Jörn Schmidt[c], Rüdiger Voss[c]

[a] Kiel Institute for the World Economy, Kiel, Germany
[b] GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany
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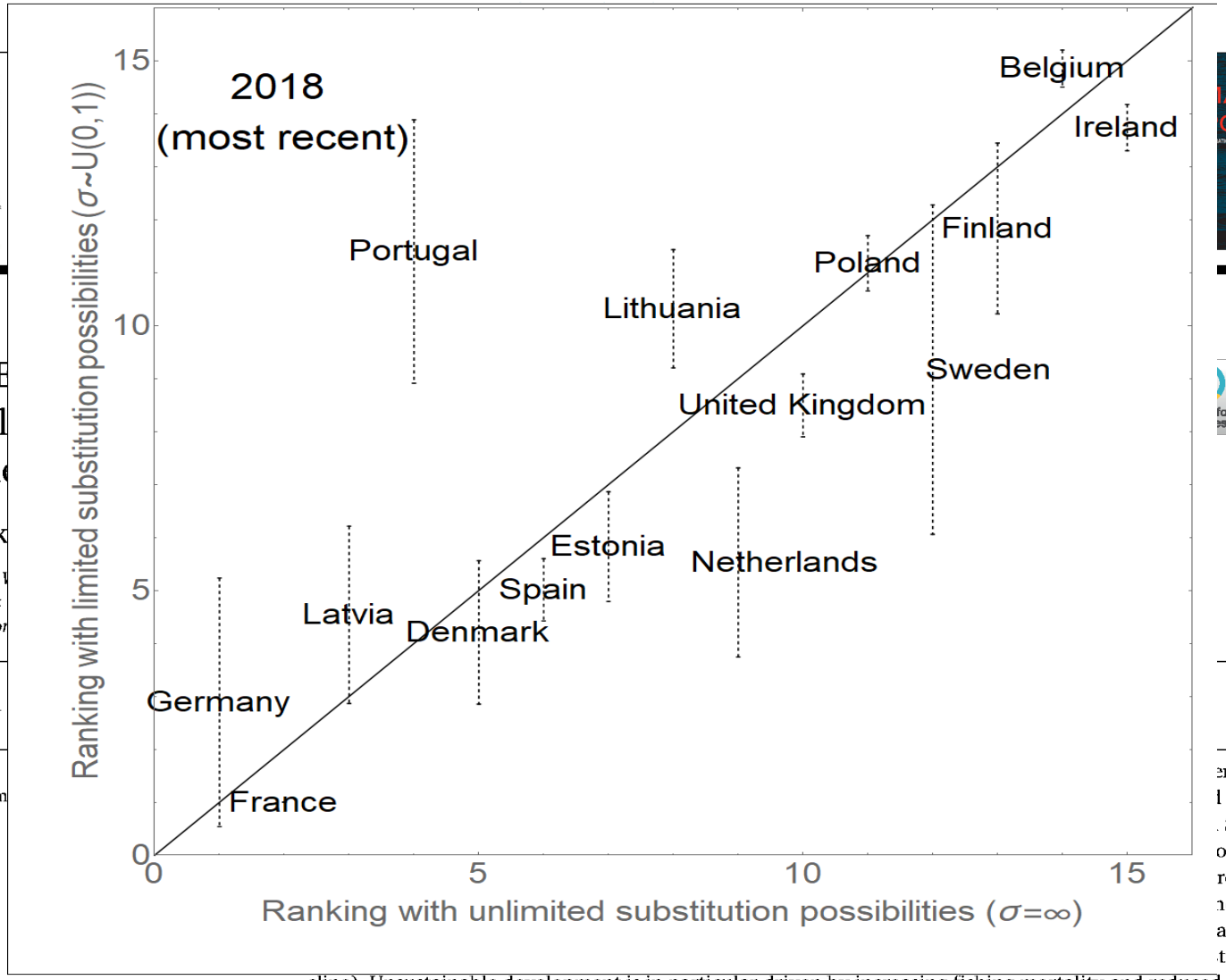
ARTICLE INFO

Keywords:
Sustainable development goals
Blue growth
European Union
Fisheries

ABSTRACT

The Sustainable Development Goal for the oceans and coasts (SDG 14) as part of the 2030 Agenda can be considered as an important step towards achieving comprehensive blue growth. Here, we selected a set of 18 indicators to measure progress against SDG 14 for 15 EU coastal countries in the Baltic and the North Sea and the Atlantic Ocean since 2012. In our assessment we distinguish between a concept of weak and strong sustainability, assuming high and low substitution possibilities, respectively. Our results indicate that there are countries which managed to achieve sustainable development under both concepts of sustainability (most notably Estonia, achieving the strongest improvement), but that there are also countries which failed to achieve sustainable development under both concepts (most notably Ireland and Belgium, experiencing the strongest decline). Unsustainable development is in particular driven by increasing fishing mortality and reduced willingness to set total allowable catch in accordance with scientific advice.

Comprehensive assessment of EU SDG14



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Wilfried Rick

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Comprehensive assessment of EU SDG14

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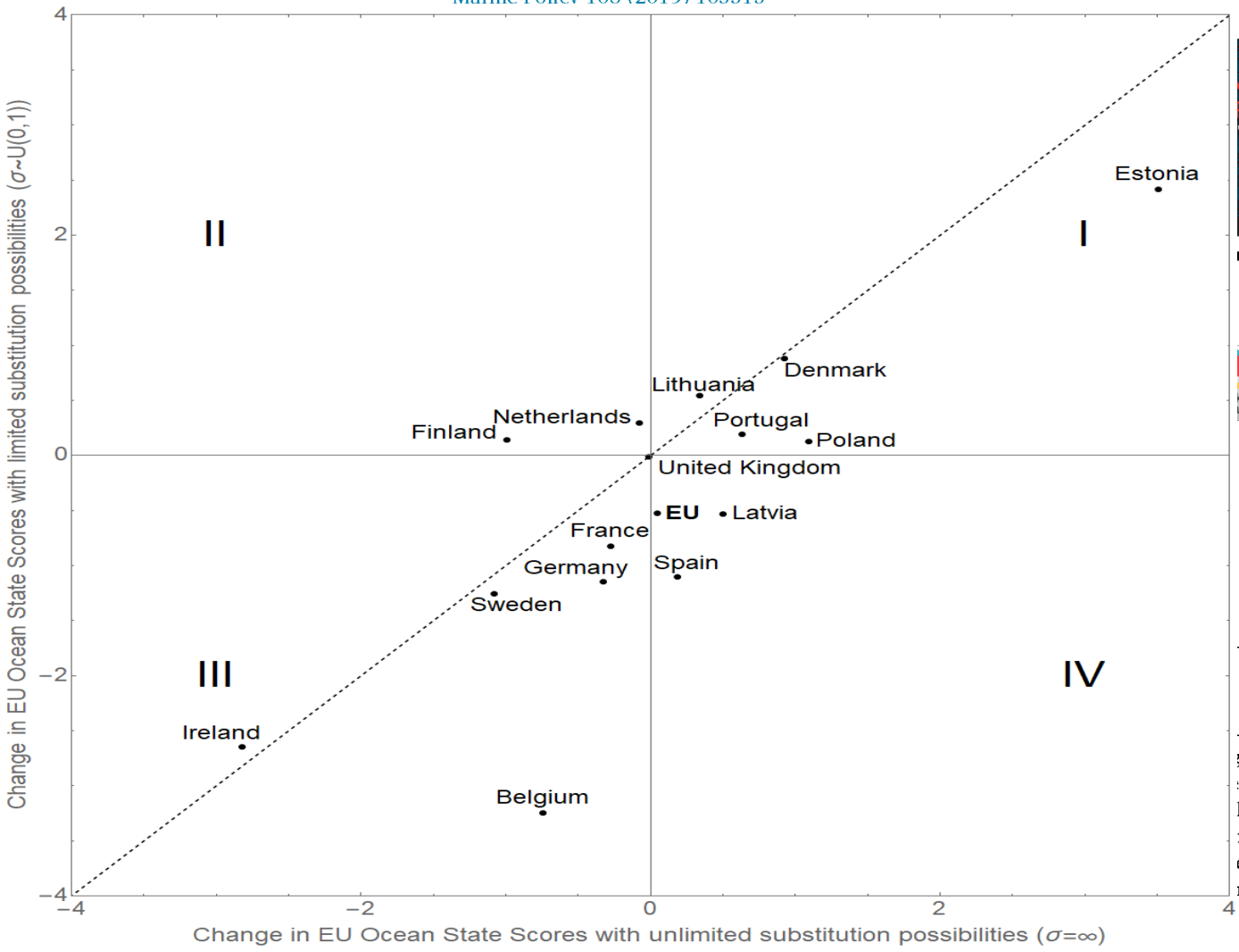

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Comprehensive assessment of Baltic health

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RESEARCH ARTICLE

The Baltic Health Index (BHI): Assessing the social–ecological status of the Baltic Sea

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Future research: SeaStore – Diversity enhancement through seagrass restoration

The Federal Ministry of Education and Research **(BMBF)** is supporting the research and development project **SeaStore**, a pilot project for the restoration of seagrass meadows on the German Baltic coast.

SeaStore would like to create the scientific basis for a robust and scientifically sound restoration of seagrass meadows at two locations on the German Baltic Sea coast.

Contribution of the IfW:

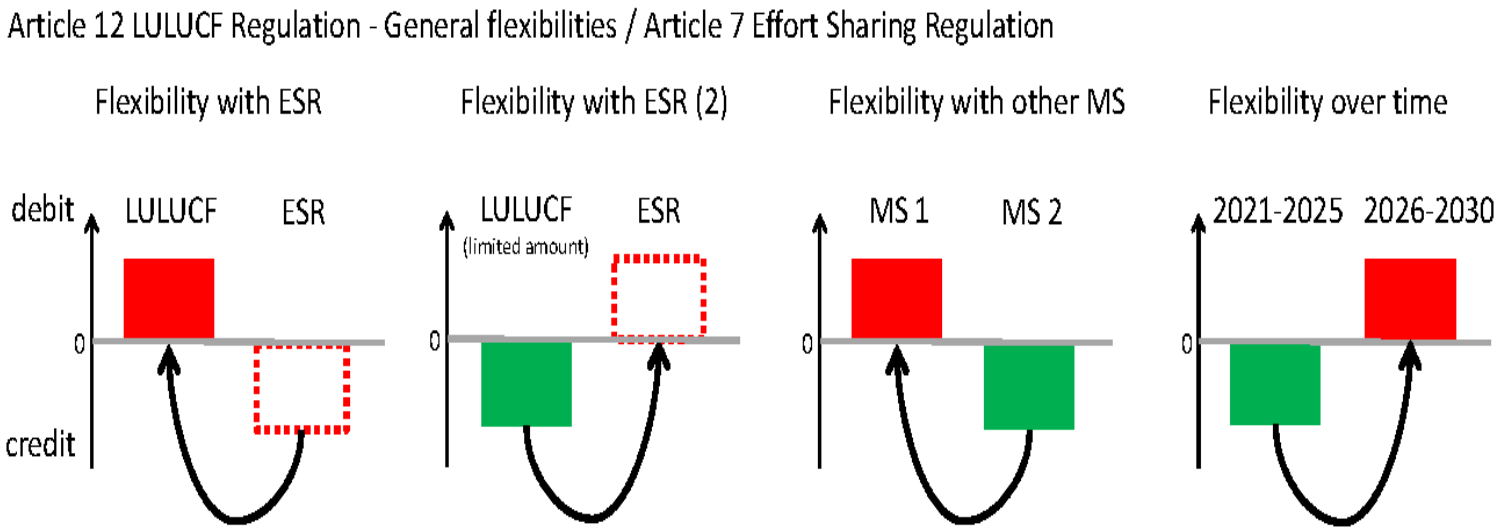
= economic evaluation of the **costs and benefits** of seagrass restoration activities.

= analysis of **acceptance and perception** of seagrass restoration.

Anhang

LULUFCF Sektor

Figure 4-2: Illustration of the general flexibilities offered by Article 12 of the LULUCF Regulation as well as Article 7 of the Effort Sharing Regulation



Böttcher, H, C Zell-Zieger, A Herold, A Siemons (2019) EU LULUCF Regulation explained: Summary of core provisions and expected effects, Öko-Institut e.V., Berlin