



Implementing the Strategic Action Programme for the South China Sea and Gulf of Thailand (SCS SAP Project)

Third Meeting of the Regional Working Group on Land-Based Pollution

26-28 November 2025, Batam, Indonesia

STATUS OF TDA/SAP PROCESS AND PROGRESS AND SUMMARY OF DRAFT OUTLINE OF NATIONAL AND REGIONAL TDA ON POLLUTION





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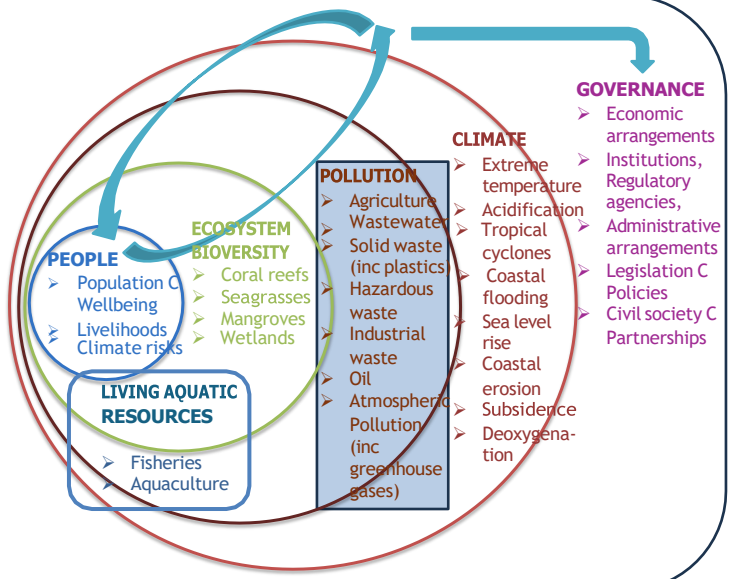
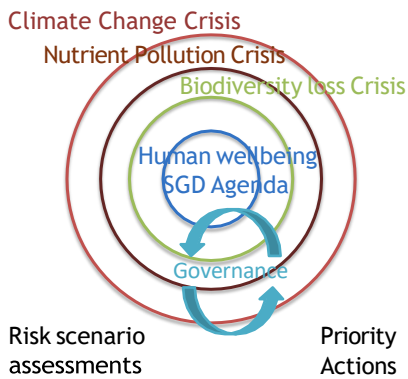
Status of the TDA/SAP Process and Summary of the Draft Outline of the National and Regional TDA Pollution Report

Gil Jacinto, Land-based Pollution Consultant

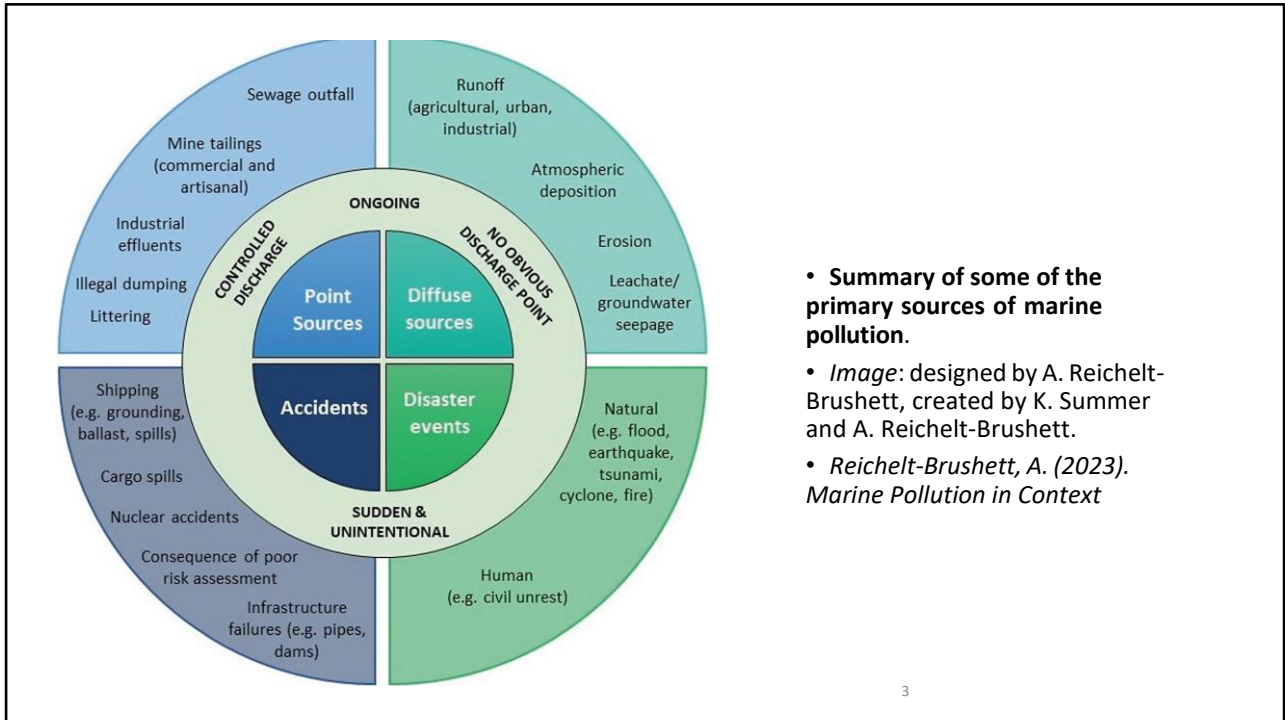


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TDA-SAP, 2024-2026



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Table 3.48 Ranked sources of pollution among participating countries in the South China Sea¹

Source	Rank & Data base	Contribution to pollution of national aquatic environments (L=Low, M= Moderate, H= High)						
		Ca	Ch	Indo	Mal	Phil	Tha	Viet
• Domestic waste	1-Fair	H	H	H	M	H	H	H
• Agricultural waste	2-Poor	M	H	H	M	H	H	H
• Industrial waste	2-Poor	M	H	H	H	H	H	H
• Sediments	3-Poor	M	H	H	M	H	H	H
• Solid waste	4-Fair	H	H	H	M	H	H	H
• Hydrocarbons	5-Poor	L	M	H	M	M	M	M
• Ship-based sources	6-Poor	M	M	M	M	M	M	M
• Atmospheric	7-Poor	M	M	M	M	M	M	M

¹Ranking of pollution sources was done during the Second Meeting of National Coordinators (June 1998).

Table 3.65 Transboundary issues associated with pollution in TDA participating countries

Transboundary Issue – Quality of Information	Ca	Ch	In	Ma	Ph	Th	Vi
1. Pollution of transboundary rivers							
• Mekong River – Poor to Fair	✓	✓				✓	✓
• Red River – Fair (Viet Nam)		✓					✓
• Sai Gon-Dong Nai–Fair (Viet Nam)	✓						✓
2. Transport of polluted coastal waters along the Sunda Shelf–Poor	✓	✓		✓		✓	✓
3. Haze from forest fires – Poor			✓	✓	✓		
4. Acid precipitation – Poor		✓				✓	✓
5. Transport of waste for trade and recycling – Poor	No data	✓	✓	✓	✓	✓	No data
6. Coastal tourism – Fair	✓	✓	✓	✓	✓	✓	✓

4

Table 22 Monitoring Stations and Pollution Hot Spots in the Participating Countries, and Potential Targets to be Included in the SAP.

Monitoring stations	Cambodia	China	Indonesia	Malaysia	Philippines	Thailand	Viet Nam
PRESENT							
Water	8	102	100	128	9 (Manila Bay)	170	22
Sediment	3	>9	n/a	n/a	15 (Manila Bay)	50	22
Biota	3	No routine monitoring	n/a	n/a	3	15 (fish/shellfish)	22
Hot Spots	3	3	3	n/a	3	2	3
TARGETS 2012							
Total contaminant loads to SCS be estimated	All countries						
Criteria for contaminants in sediment and biota be adopted in the region	All countries						
All hot spots in SCS Sea be characterised and prioritised	All countries						
National legislation in support of targets be reviewed and amended	All countries						
TARGETS 2017							
90% of hot spots meet water quality criteria	3	3	3	n/a	3	2	3
80% of water monitoring stns meet water quality criteria	6	80	80	104	7	136	17

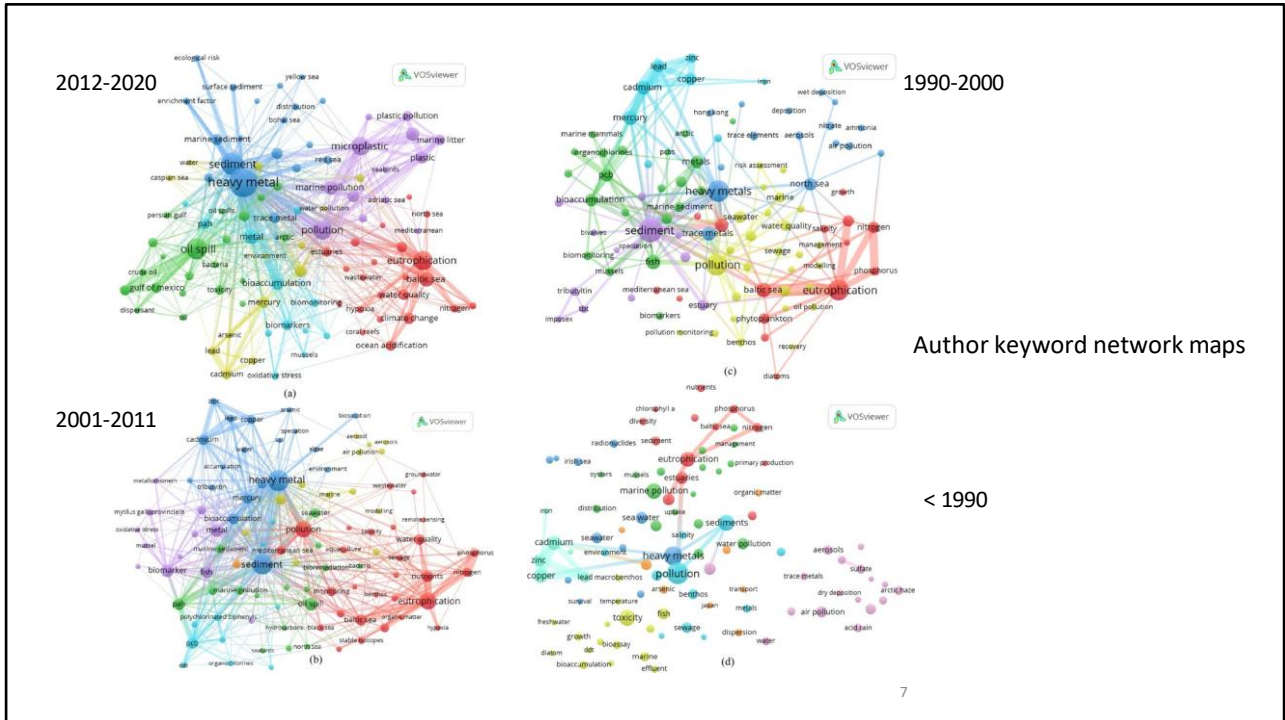
n/a = not available.

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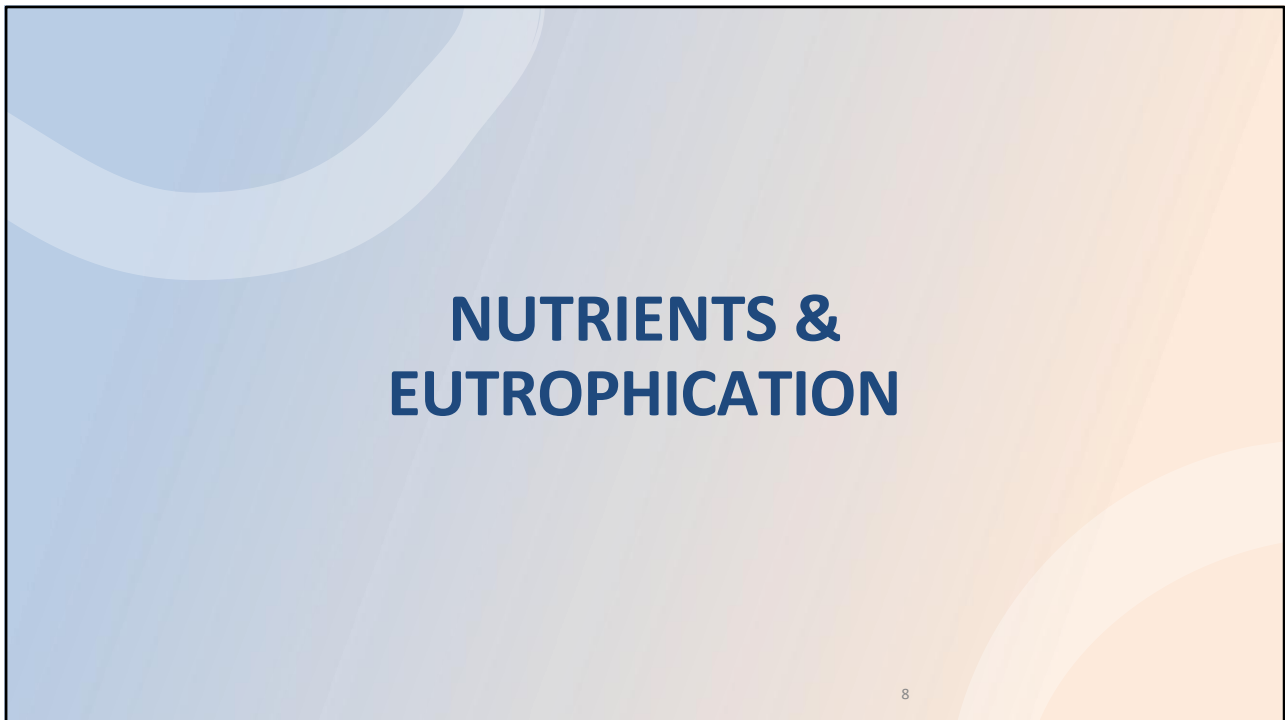
A	B	C
OUTLINE FOR THE NATIONAL TDA REPORT		
1. Introduction	2. Socioeconomics and Climate-related threats	3. Pollution
1.1 Aims of national report	2.1 Key Findings	3.1 Key findings/ Key Pollution concerns/ Significance in national and regional contexts
1.1.1 Inputs to the SCS-GOT TDA	2.2 Current Status by Indicator Group	3.2 Current Status by indicator group
1.1.2 Analysis to help national reporting to SDG and other international commitments	2.2.1 Demographics	3.2.1 Pollution sources and magnitude
1.2 Major water related environmental problems - Comparative table showing year 2000 vs year 2025 listing, indicating priorities if known	2.2.2 Human Wellbeing	3.2.2 Pollution hotspots and sensitive areas
1.2.1 Geomorphology and geological history	2.2.3 Economic Activities	
1.2.2 Climatology, present and projected	2.2.4 Climate-related Threats	
1.2.3 Biogeography, endemic and unique marine species		
1.3 Biogeophysical setting	2.3 Discussion and conclusions	3.3 Discussion and conclusions
1.3.1 Geomorphology and geological history	2.3.1 Risk assessment from socioeconomic trends	3.3.1 Priority Transboundary Pollution Issues
1.3.2 Climatology, present and projected	2.3.2 Risk assessment from climate- and environment-related threats	3.3.2 Interactions (Impacts on Environment and Society)
1.3.3 Biogeography, endemic and unique marine species	2.3.3 Mitigating socioeconomic vulnerability from climate-mediated environmental change- current actions and gaps	3.3.3 Risk Assessment
1.4 Assessment methodology	2.3.4 Recommended priority actions, including regional cooperation	3.3.4 Interactions (Current Management and Institutions)
1.4.1 Conceptual framework - The concentric circles framework may be modified by national teams to reflect how the assessed components relate to risks on ecosystems, people, and livelihoods; scale and scope of assessment		3.3.5 Gaps and Priority Challenges
1.4.2 Subnational geographic divisions used in the analysis		3.3.6 Recommended priority actions, emphasizing regional cooperation
1.4.3 List of indicators by component (may be compared with components/ indicators assessed in 2000 National TDA Report)		
1.4.4 Assessing risks to ecosystems, people and livelihoods, including those that are related to climate warming, as bases for integrated governance – a synthetic view of indicators, data support, and comparative assessment across subnational divisions to determine levels of risk		
	2.4 Methodology and analysis (use guidance document and modifications as relevant)	3.4 Methodology and analysis (use guidance document and modifications as relevant)
Chapter References	Chapter References	Chapter References
	Chapter Annexes: Data sources by indicator	Chapter Annexes: Data sources by indicator

National TDA Report Outline – Pollution Component

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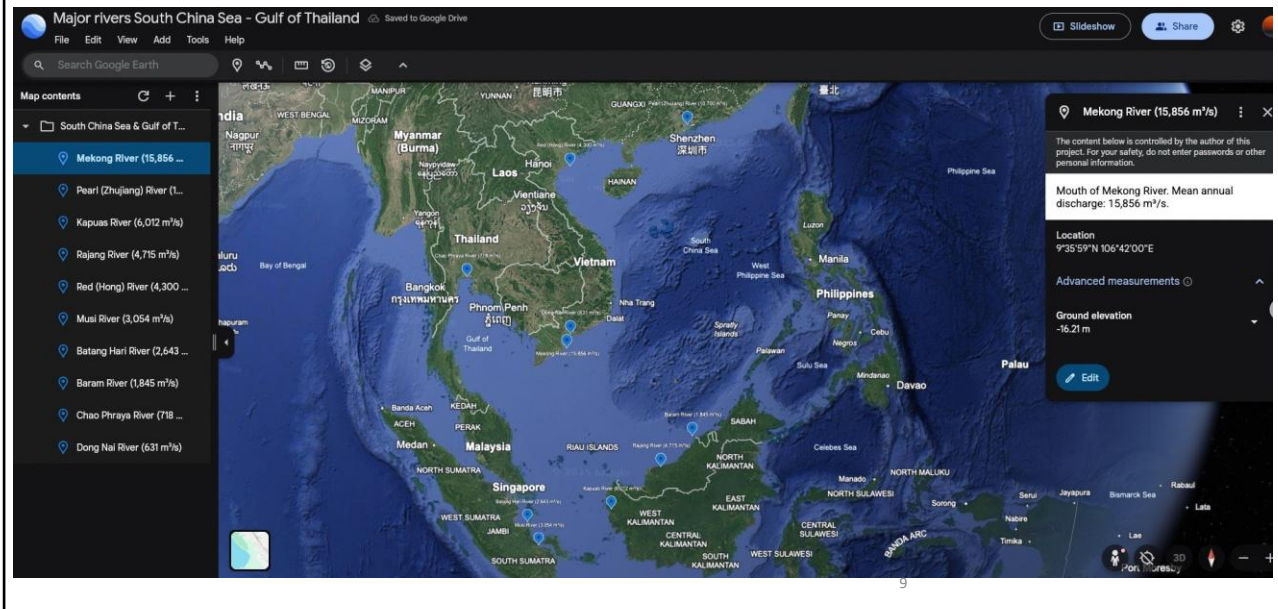


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Major Rivers in SCS & GoT by Discharge Volume



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Column1	Column2	Published estimates of nitrogen (N) and phosphorus (P) load	Column3	Column4
(metric-kiloton = 10 ³ t yr ⁻¹ at, or very close to, the river mouth)				
River (flows to SCS / GoT)	Total-N (kt yr ⁻¹)	Total-P (kt yr ⁻¹)	Principal peer-reviewed source(s)*	
1 Mekong	288	55.5	IPEN case-study synthesis for the Lower Mekong (2000-2015 mean) (IPEN, Astrophysics Data System)	
2 Pearl (Zhujiang)	574†	23.9†	Annual fluxes 4.1 × 10 ¹⁰ mol N and 7.7 × 10 ⁹ mol P (2005-06 outlet survey) – Lu et al., 2009 (ResearchGate)	
3 Red (Hong)	136	51.7	Specific deliveries 855 kg N km ⁻² yr ⁻¹ & 325 kg P km ⁻² yr ⁻¹ × 159,000 km ² basin – Le et al., 2004 (AgUpubs)	
4 Dong Nai	31	1.65	2012-16 flux budgets – Nguyen et al., 2020 (ResearchGate)	
5 Rajang	32.6‡	n.a.	Daily DIN export 77–102 t day ⁻¹ – Jiang et al., 2019 (BG)	
6 Chao Phraya	61.3‡	(≈ 3–4)§	Basin mass-balance – Xue et al., 2020 (inorg-N 26 kt yr ⁻¹ , org-N 35 kt yr ⁻¹) (epg.science.cmu.ac.th)	
7 Kapuas	≈ 15 ± 5	≈ 2 ± 1	Modeled NEWS-2 loads – Suwarno et al., 2013 (ResearchGate)	
8 Musi	≈ 18 ± 6	≈ 2 ± 1	Modeled NEWS-2 loads – Suwarno et al., 2013 (ResearchGate)	
9 Batang Hari	≈ 12 ± 4	≈ 1.5 ± 0.5	Modeled NEWS-2 loads – Suwarno et al., 2013 (ResearchGate)	
10 Baram	≈ 15 ± 5	≈ 2 ± 1	No direct study; scaled from Kapuas/Borneo peat-draining rivers (NEWS-2) (ResearchGate)	

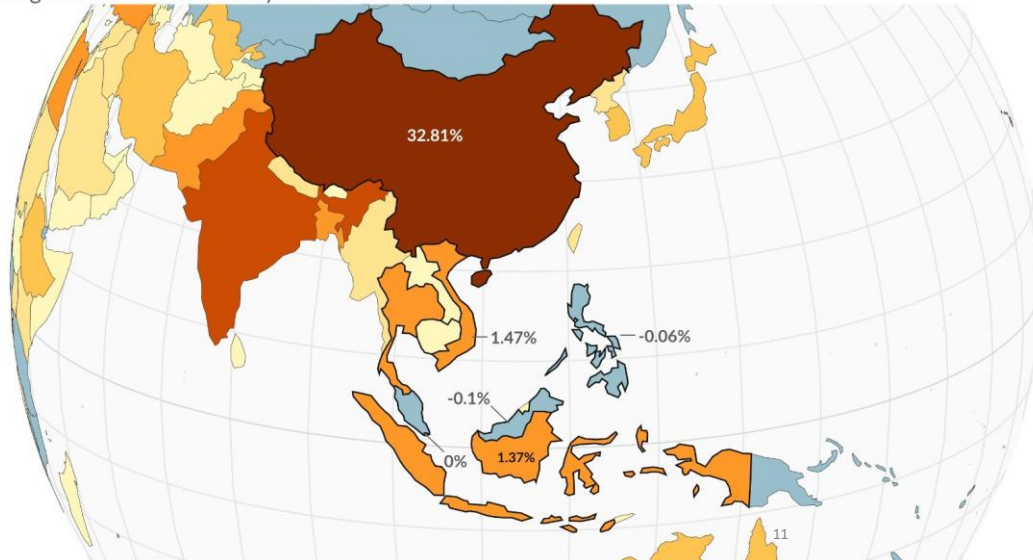
* All cited papers are peer-reviewed unless noted; values harmonised to metric tonnes of elemental N or P per year.
 † Converted from mol yr⁻¹ using 14 g N mol⁻¹ and 31 g P mol⁻¹.
 ‡ Rajang figure is DIN only; the cited study reports negligible organic-N. Chao Phraya figure sums inorganic and organic N.
 § No whole-basin TP load has been published; Thai Pollution Control Department monitoring (1980-2020) shows TP export of 2–4 kt yr⁻¹ at the estuary.

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Share of global excess nitrogen from croplands

Our World in Data

"Excess nitrogen" is the difference between nutrient inputs (from fertilizers, manure, and fixation from legumes) and the amount harvested in crop material. This represents nitrogen that is lost to the environment and can create ecological imbalances in ecosystems and water bodies.

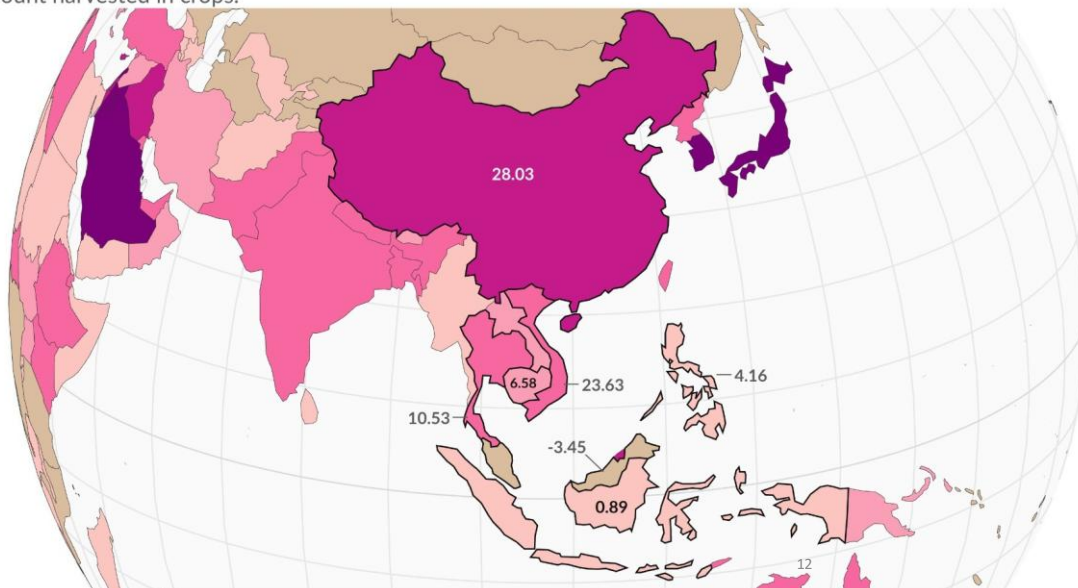


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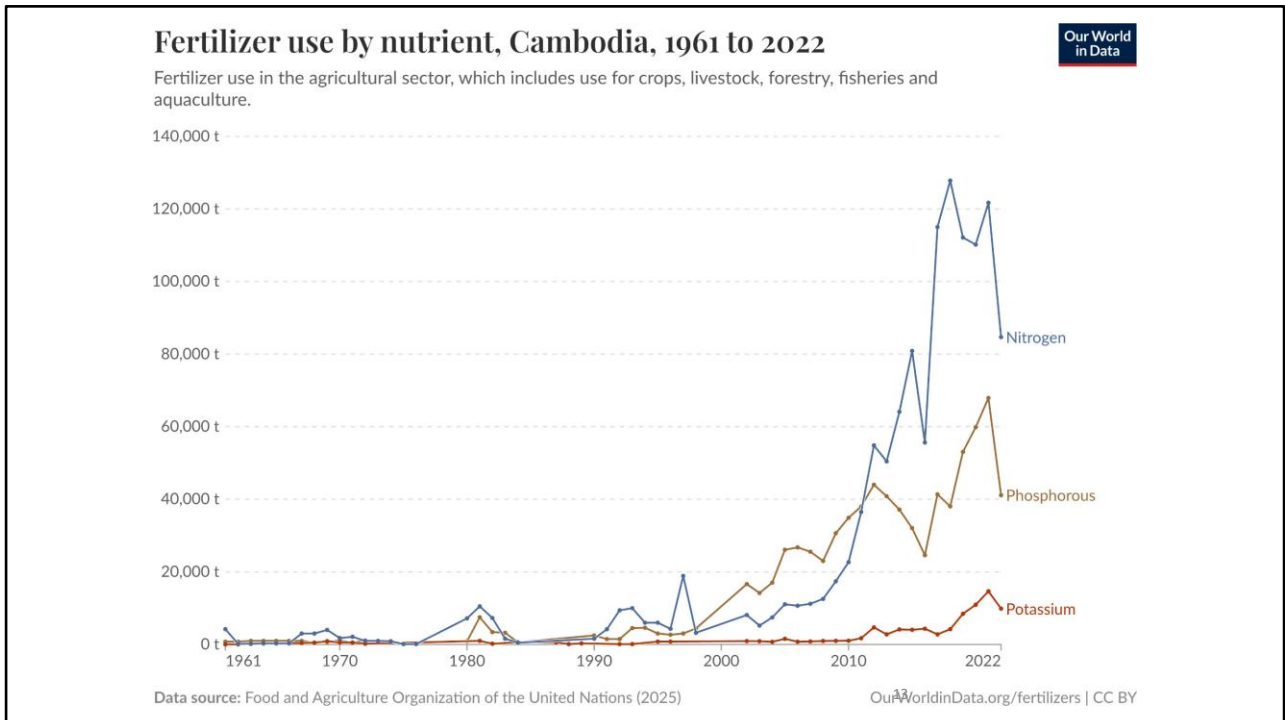
Excess phosphorus per hectare of cropland

Our World in Data

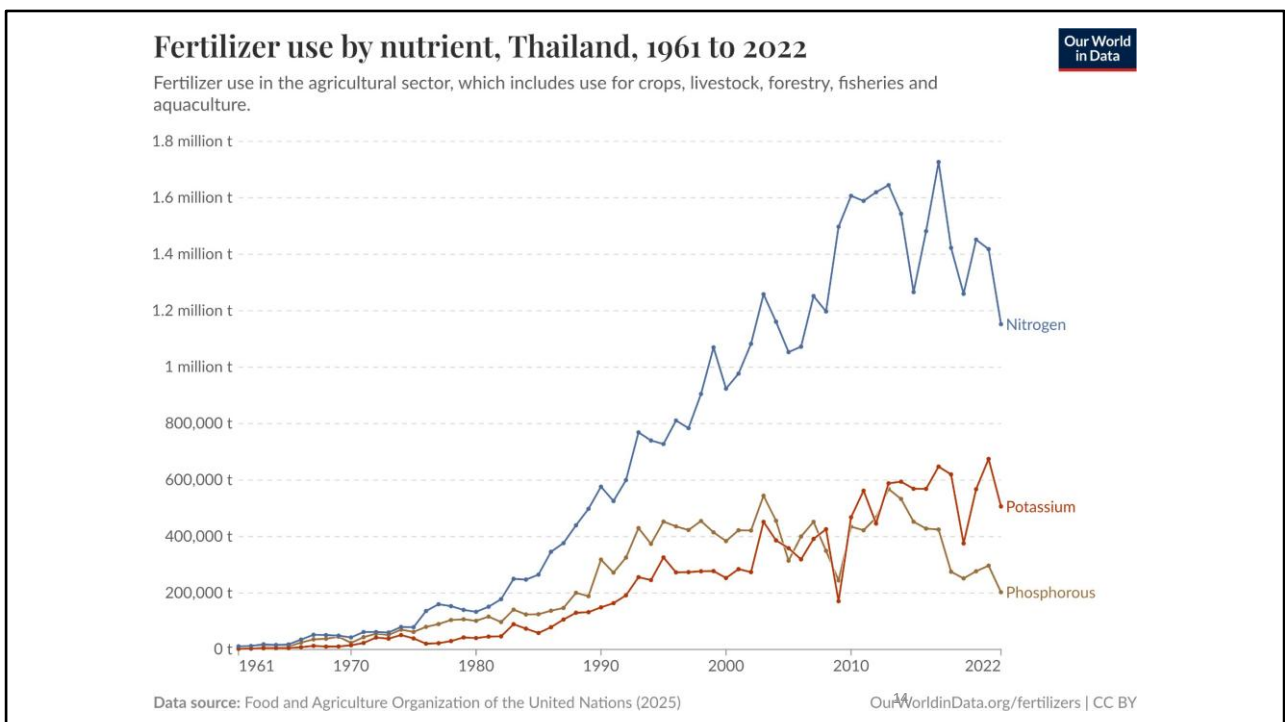
Amount of excess phosphorus per hectare of cropland. This is the difference between phosphorus inputs, and the amount harvested in crops.



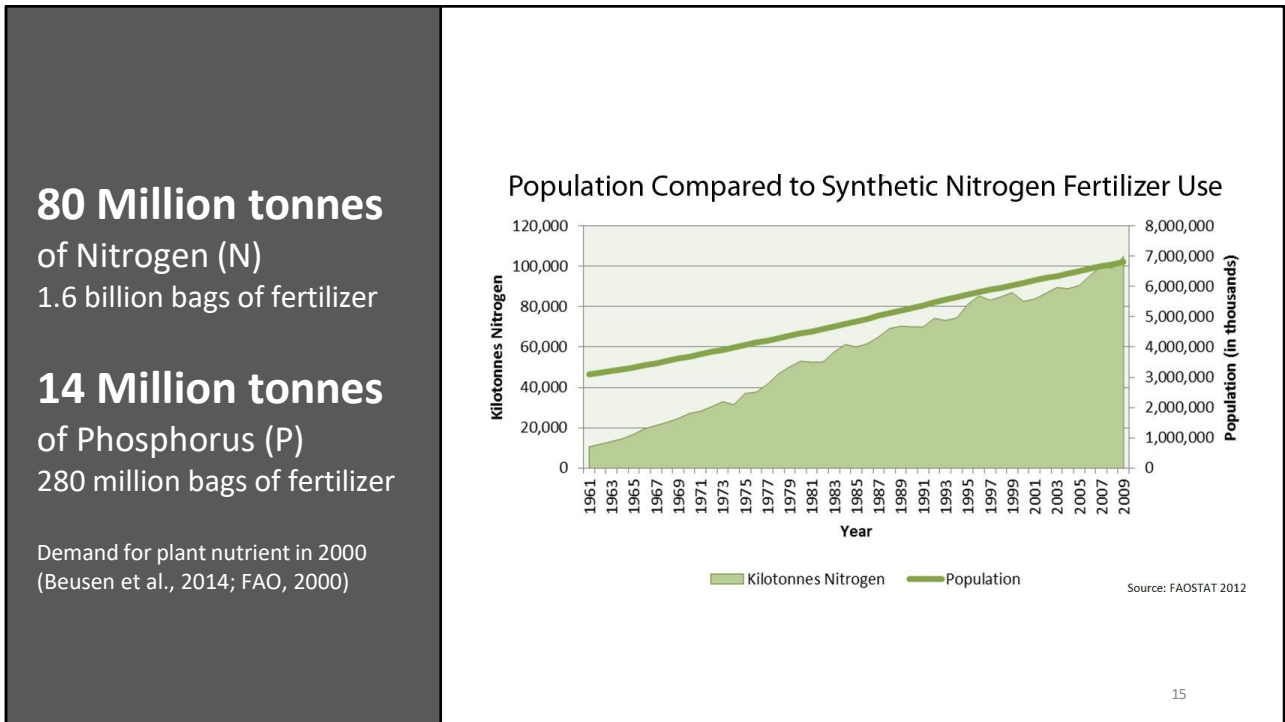
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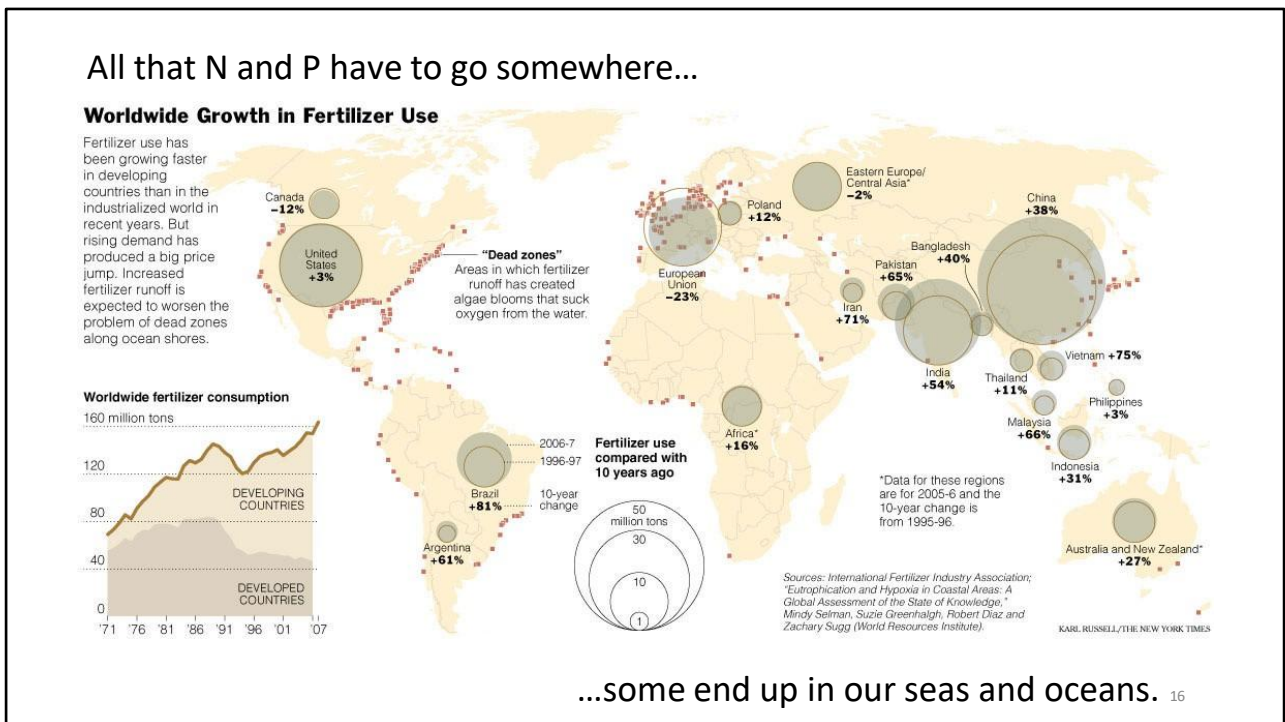
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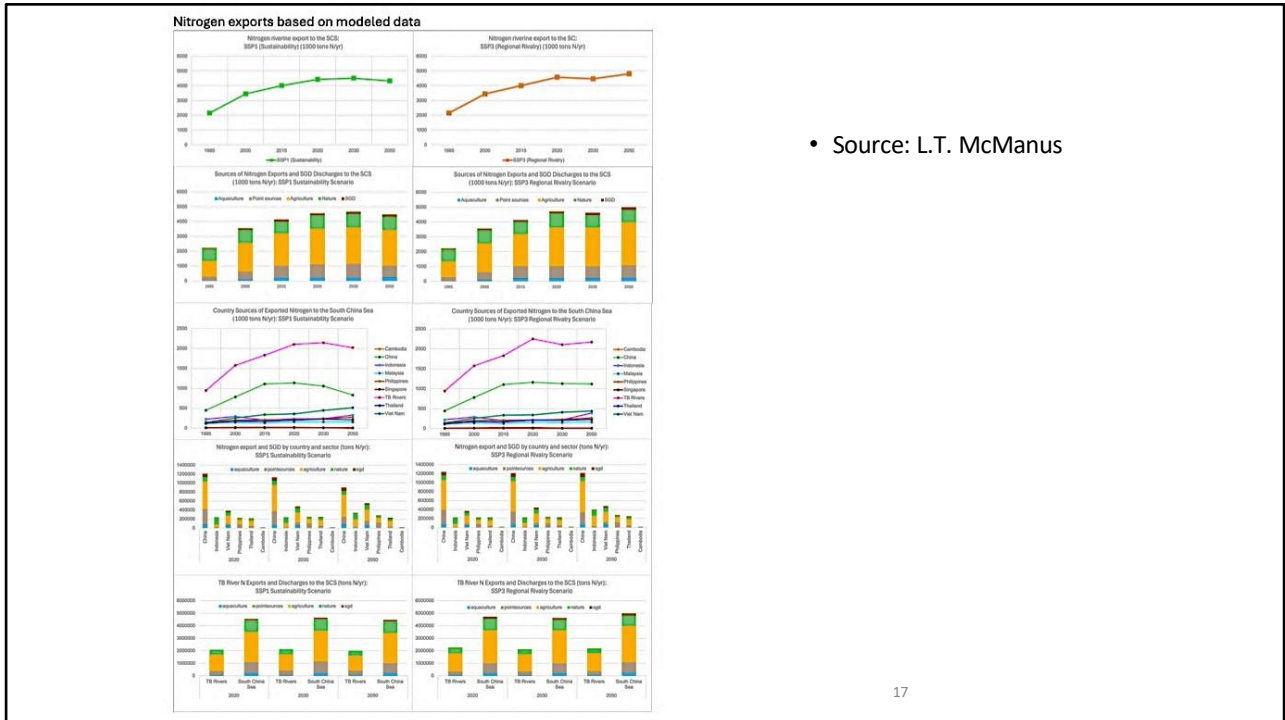
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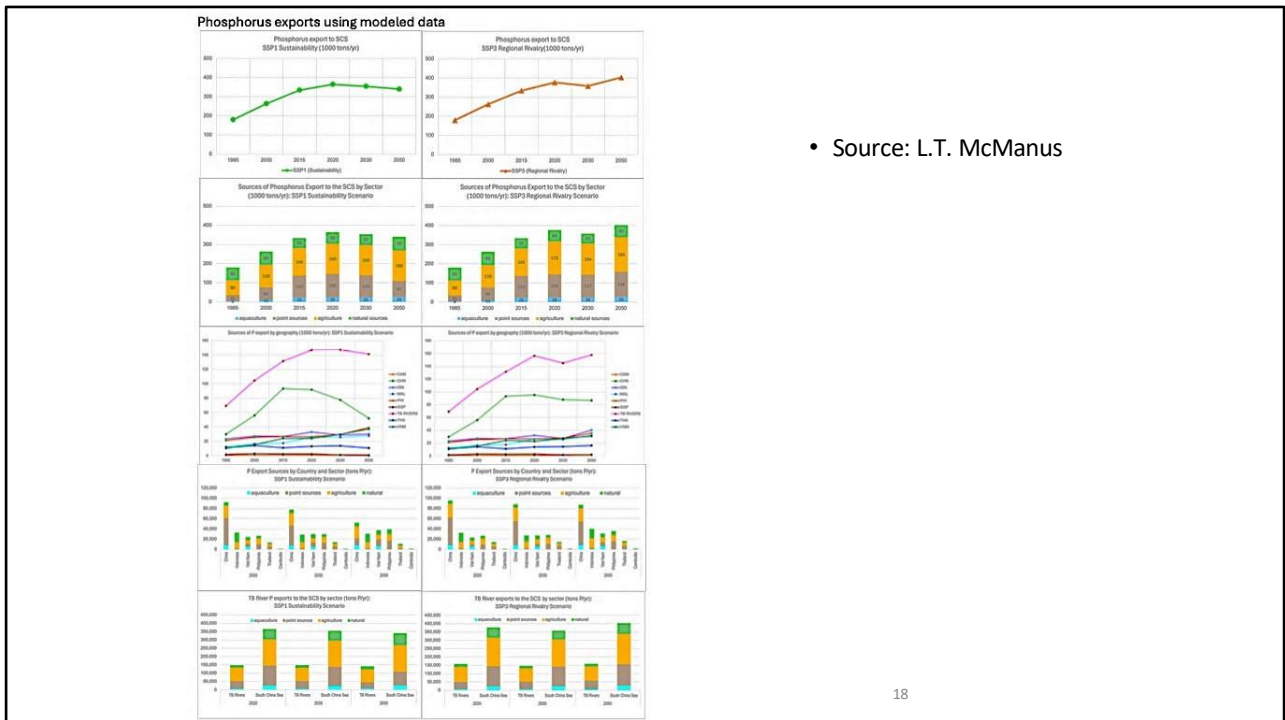


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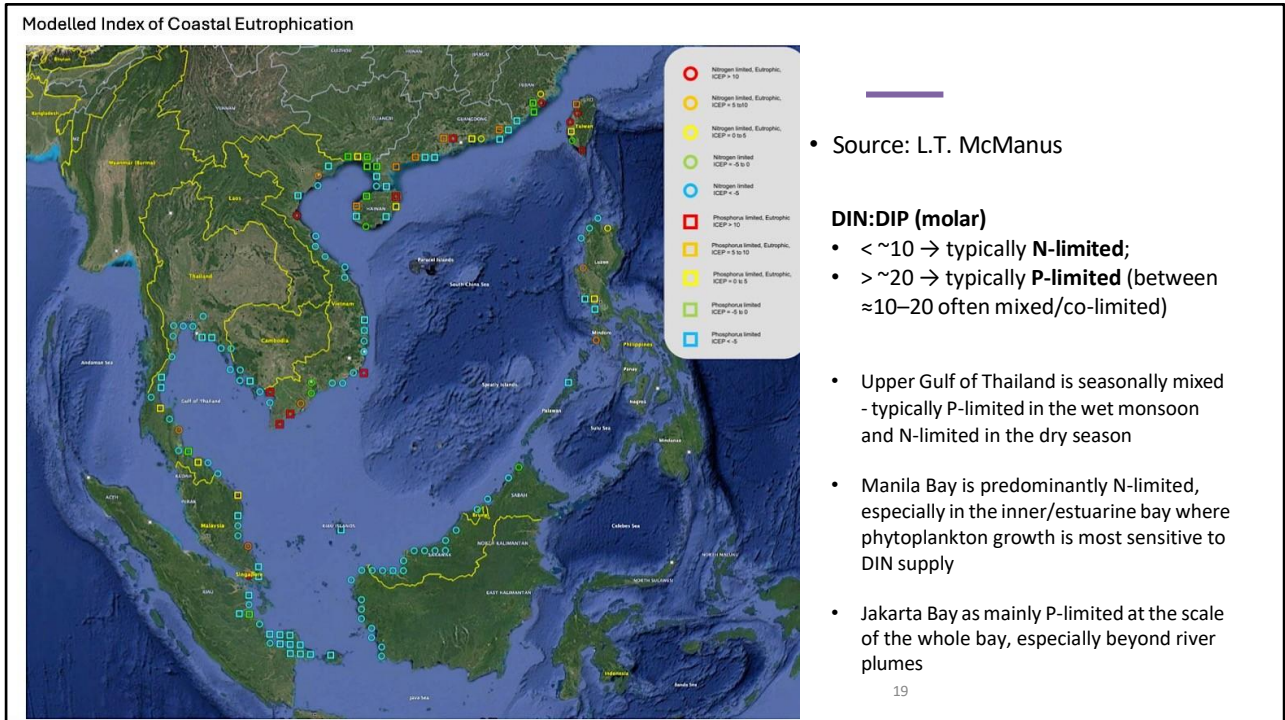
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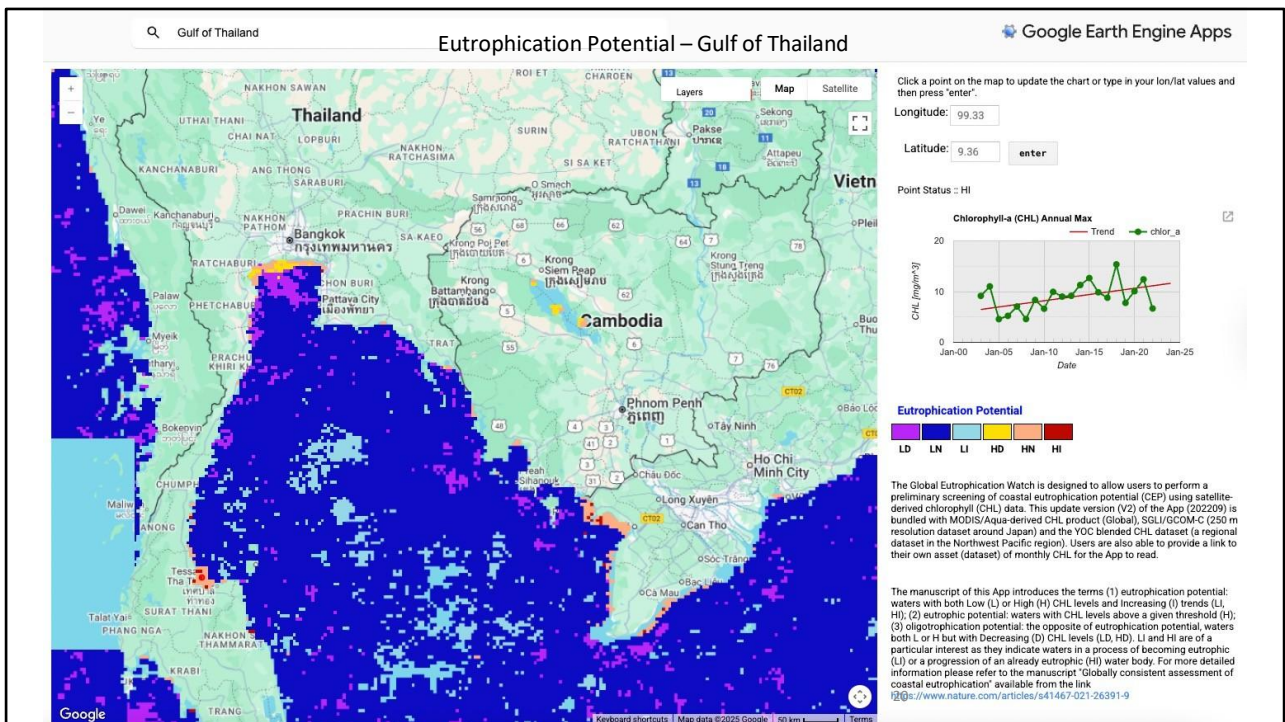


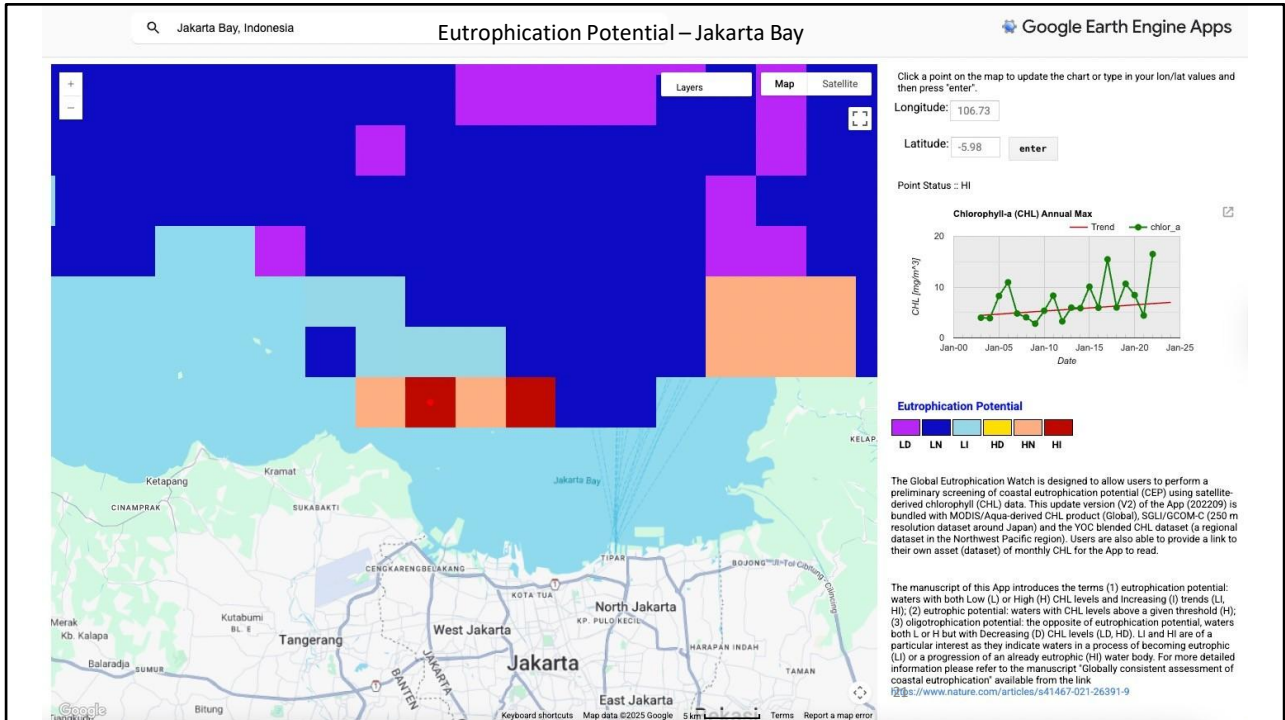
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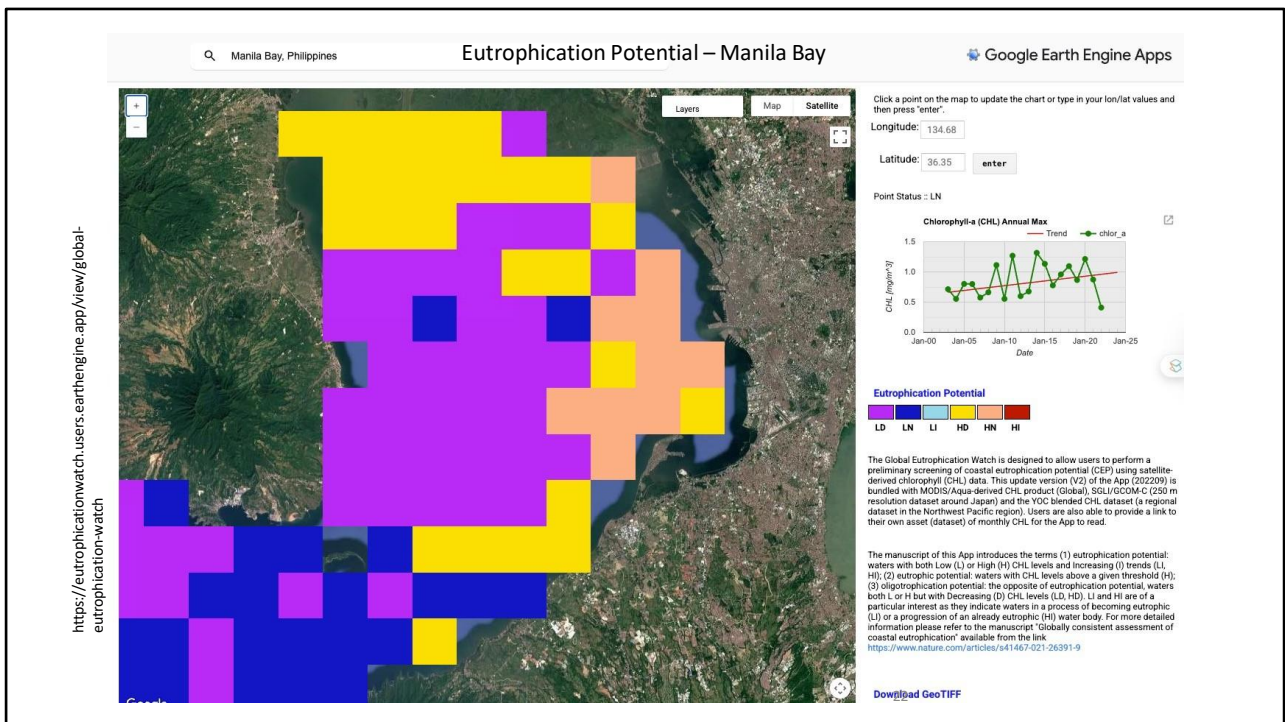


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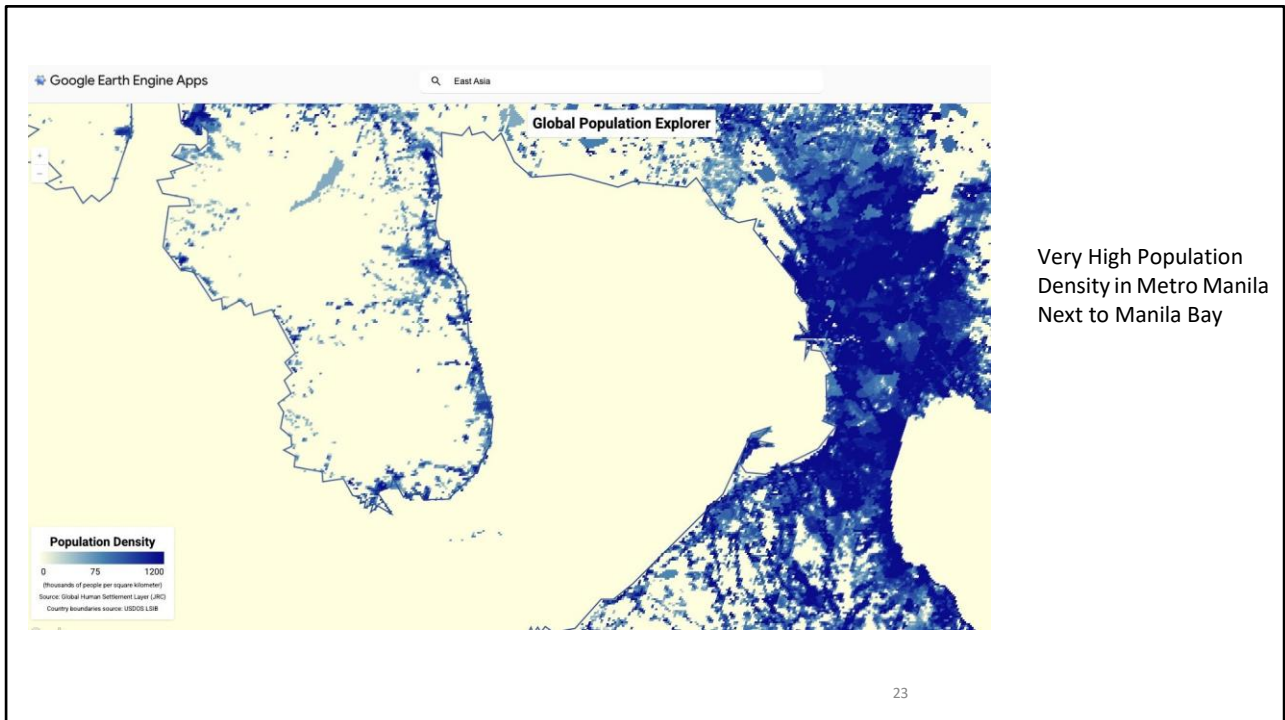




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Characteristics of some coastal systems – nutrients and attendant impacts
Dai et al. (2022)

	GDP ($\times 10^{12}$ USD)	Total fertilizer use ⁺ ($\times 10^6$ tons)	N load ⁺⁺ ($\times 10^3$ tons yr ⁻¹)	Regional characteristics	Water residence time (days)	DIN ⁺⁺⁺ ($\mu\text{mol L}^{-1}$)	Chl-a ⁺⁺⁺ ($\mu\text{g L}^{-1}$)	Months of hypoxia occurrences	Maximum hypoxic area/volume ⁺⁺⁺⁺ (km^2/km^3)	Frequency of HABs (yr ⁻¹)
Baltic Sea	1.81 ^a	3.2 ^b	806 ^c	Almost enclosed system	3,100 ^d	1.4 ^e	4.6 ^f	Whole year	84,623 ^g	11 ^h
Chesapeake Bay	1.41 ⁱ	0.2 ^j	106 ^k	Semi-enclosed system	180 ^l	16.1 ^m	28.7 ⁿ	May-Sept.	14.1 ^o	6 ^p
Changjiang Estuary	5.09 ^q	18.3 ^r	1,738 ^s	River-dominated open system	20-65 ^t	34.4 ^u	2.1 ^v	Jun.-Oct.	22,800 ^w	30 ^x
Pearl River Estuary	3.52 ^{y, n}	11.7 ^o	1,374 ^u	River-dominated open system	15-20 ^v	59.2 ^w	5.1 ^w	Jun.-Sept.	660 ^x	2.4 ^{y, z}
Upper Gulf of Thailand	0.48 ^b	1.9 ^b	13 ^b	River-dominated open system	14-39 ^b	11.1 ^b	8.6 ^c	Jun.-Nov.	2,640 ^b	27 ^c
Xiamen Bay	0.14 ^d	0.3 ^d	54 ^d	Semi-enclosed system	5-35 ^c	34.6 ⁿ	1.1 ⁱ	None	None	0.6 ^g

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Global Sources of Anthropogenic Nitrogen and Phosphorus Dai et al. (2022)

Nutrient source	Global magnitude ^a	Regional contribution (%)						
		Asia	Europe	North America	Oceania	South America	Africa	
N sources (Tg N yr ⁻¹)	Synthetic N fertilizer use ^a	113	58.0	13.6	13.0	1.6	8.1	3.9
	Emission of NO _x ^b	34.2	44.4	16.5	18.8	2.0	4.4	12.2
	Manure-N ^c	23.4	34.2	11.6	9.1	13.3	14.2	17.6
	N ₂ fixation ^d	45				—		
	Emission of ammonia ^e	41				—		
	Sewage ^f	9.3	50.3	12.6	12.9	1.1	14.3	8.9
	Aquaculture ^g	1.5				—		
P source (Tg P yr ⁻¹)	Synthetic P fertilizer use ^a	48	53.7	8.9	10.7	2.6	19.0	3.6

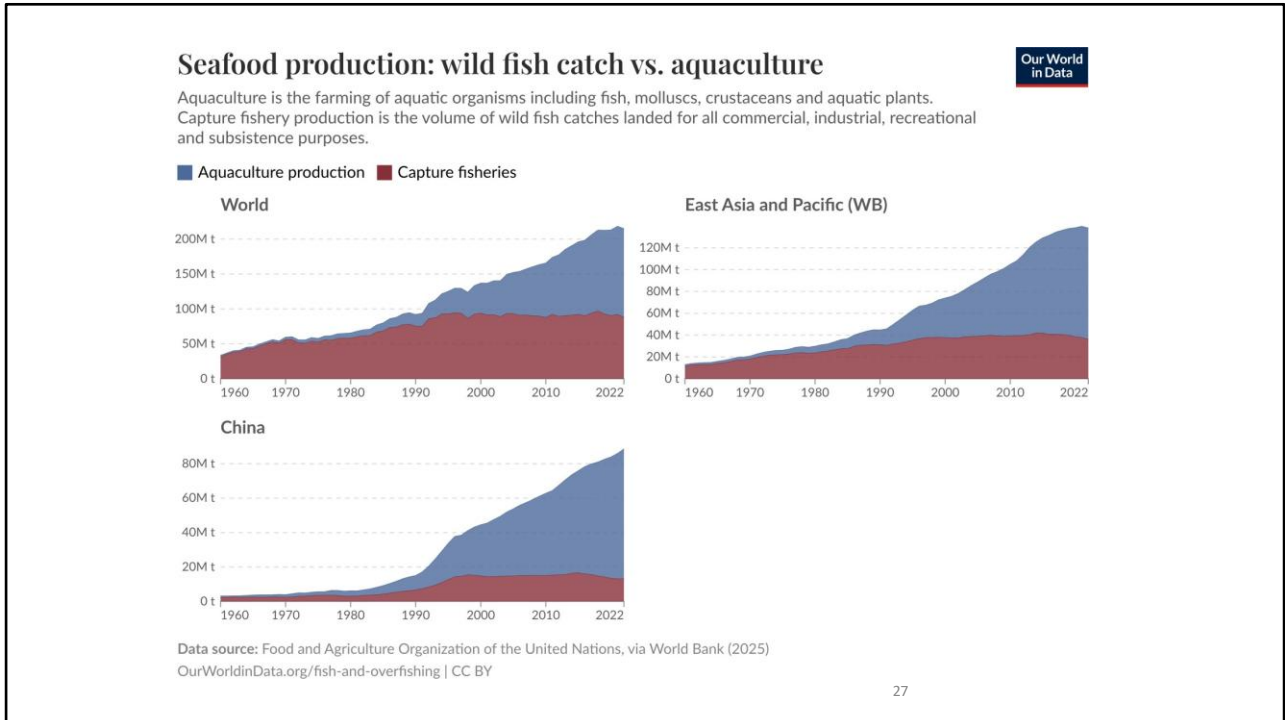
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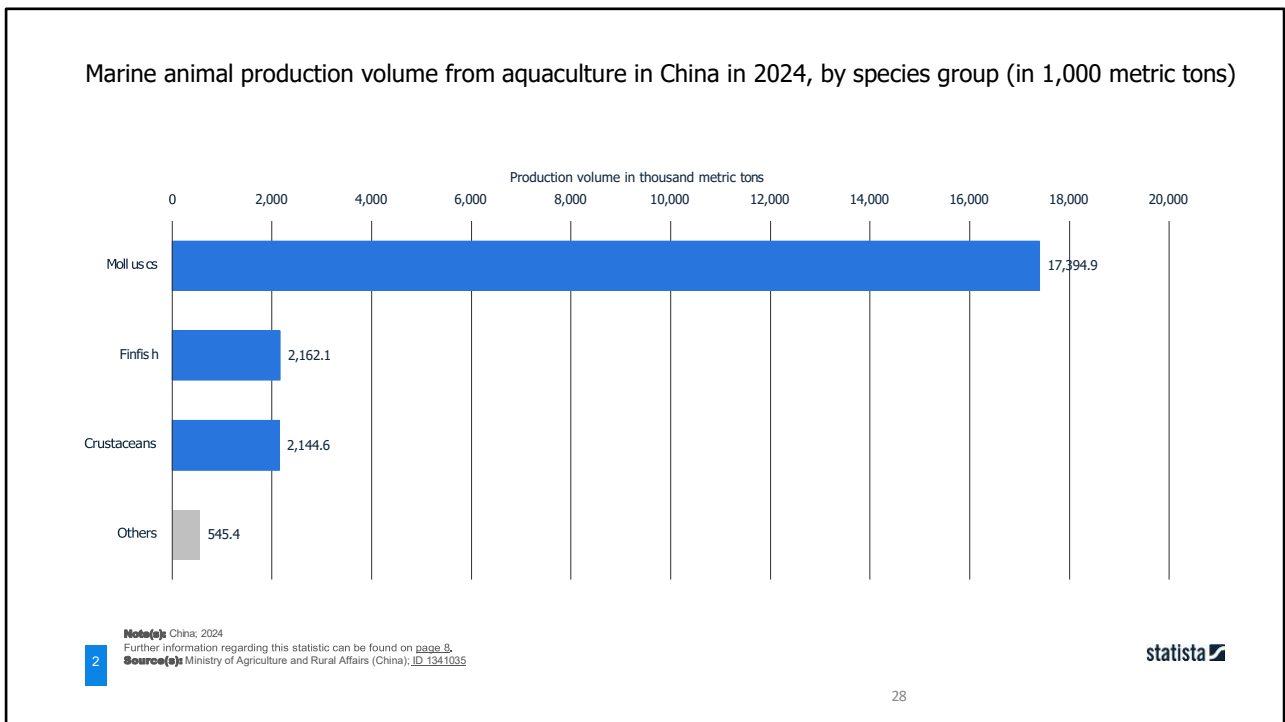
IMPACT OF AQUACULTURE

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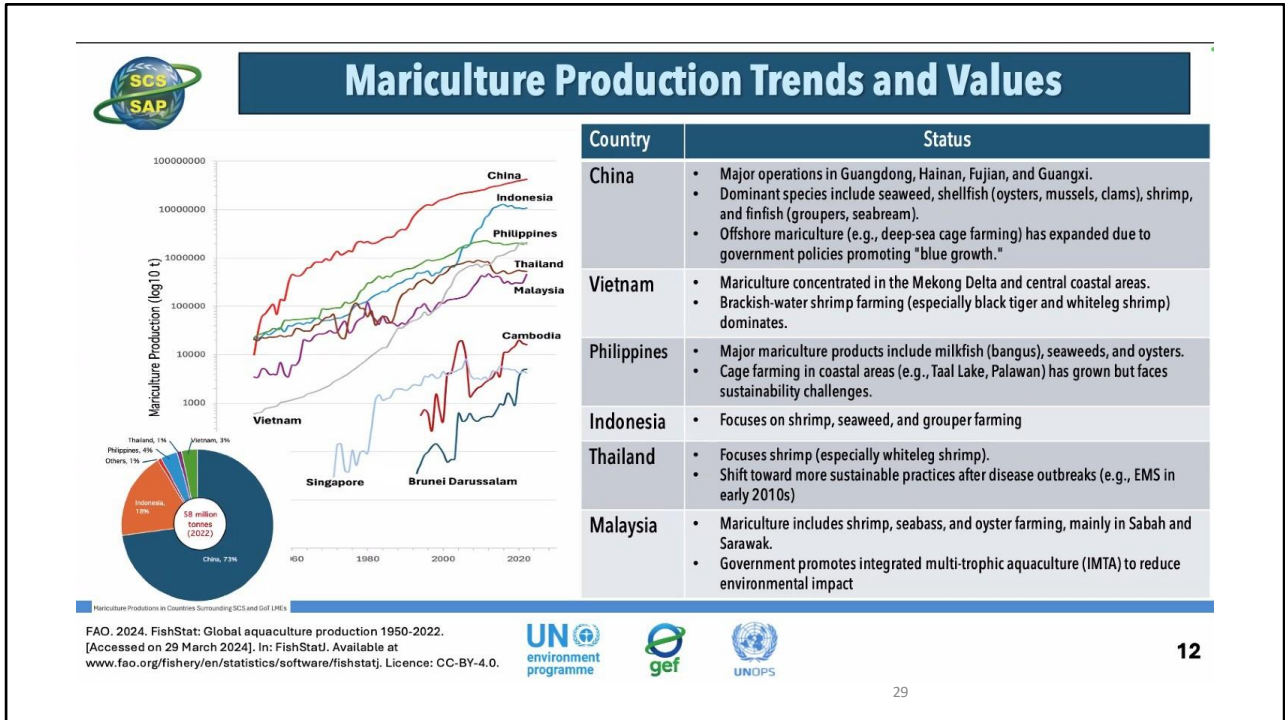
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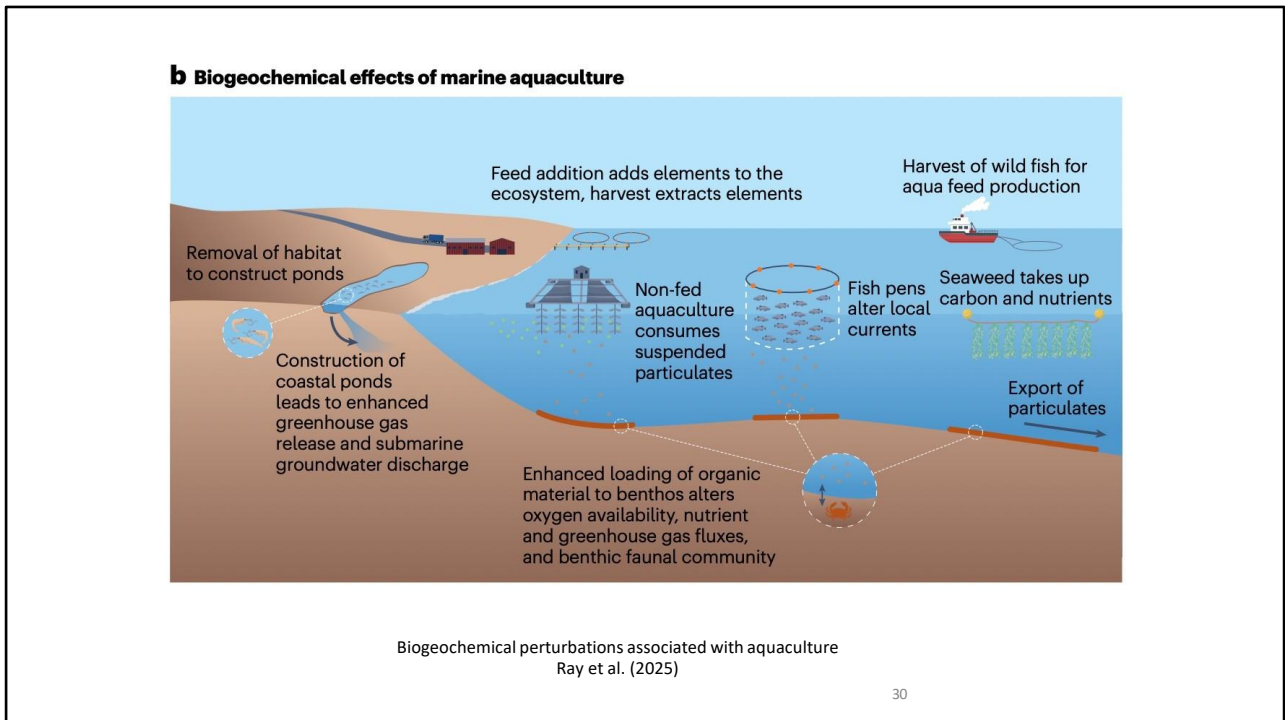
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Dongshan county, Fujian Province, China

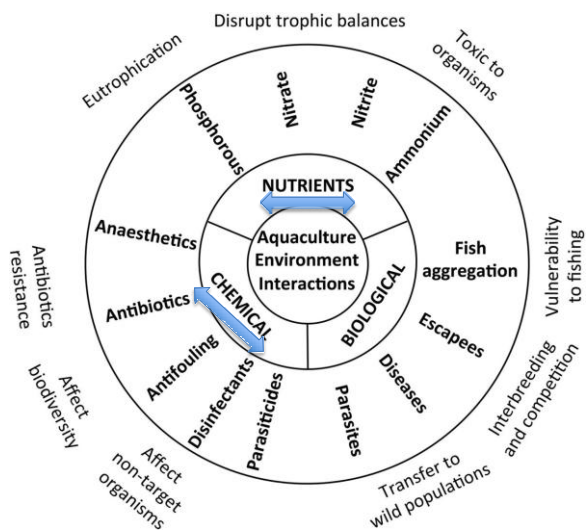


Bolinao, Pangasinan, Philippines

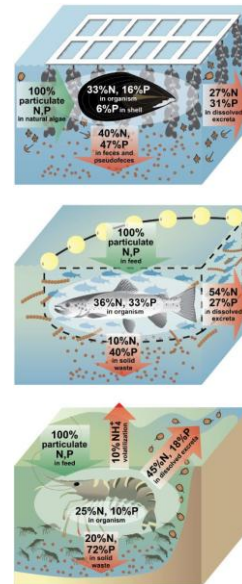
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Mariculture Environmental Impacts

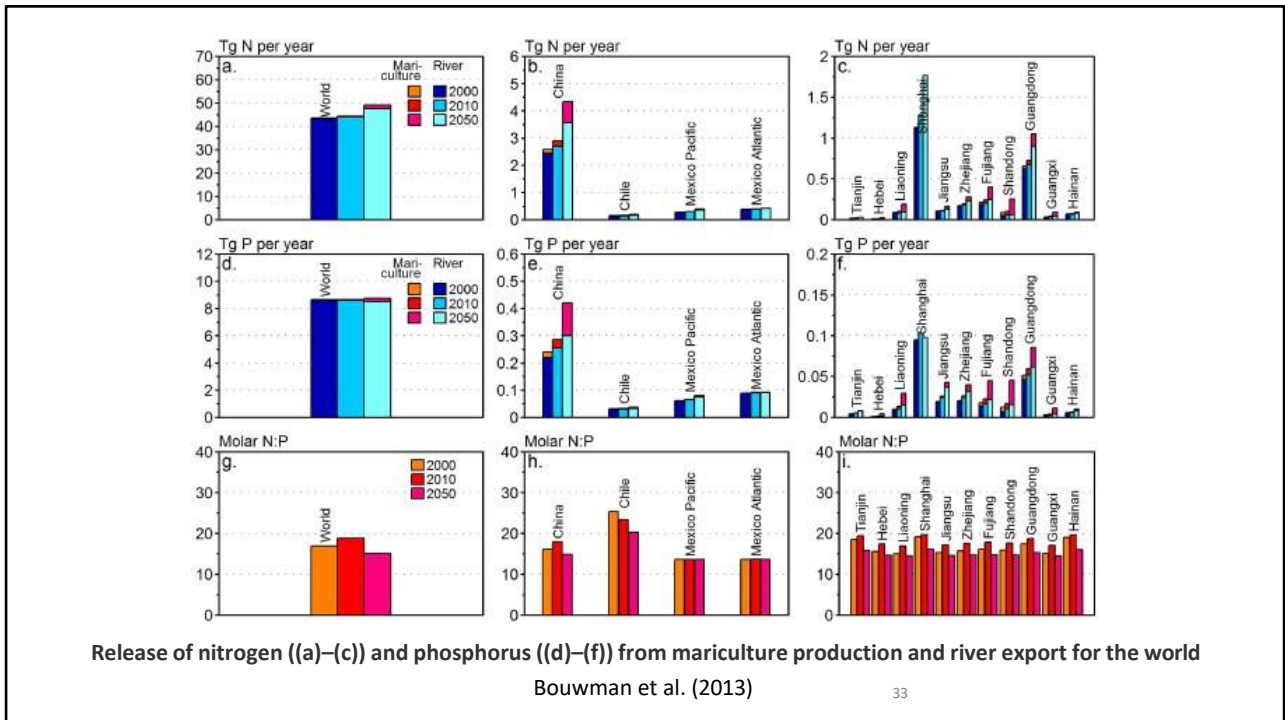


Brana et al. (2021)

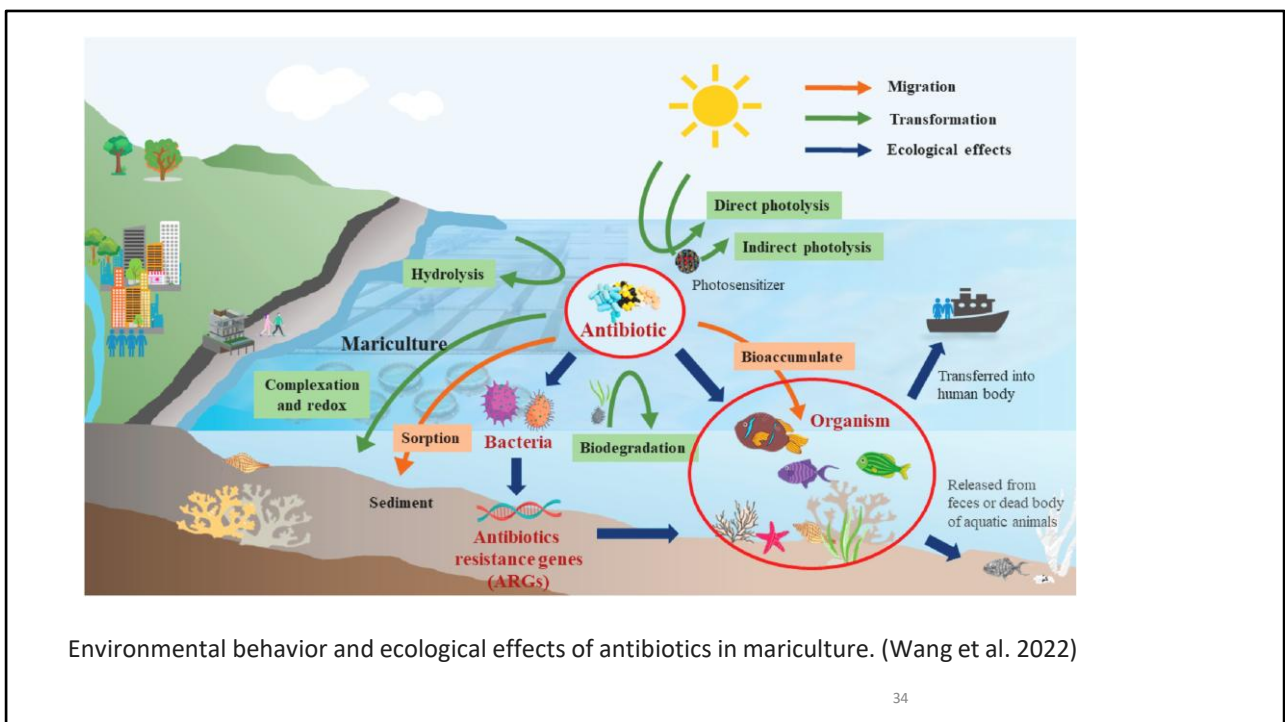


Bouwman et al. (2013)

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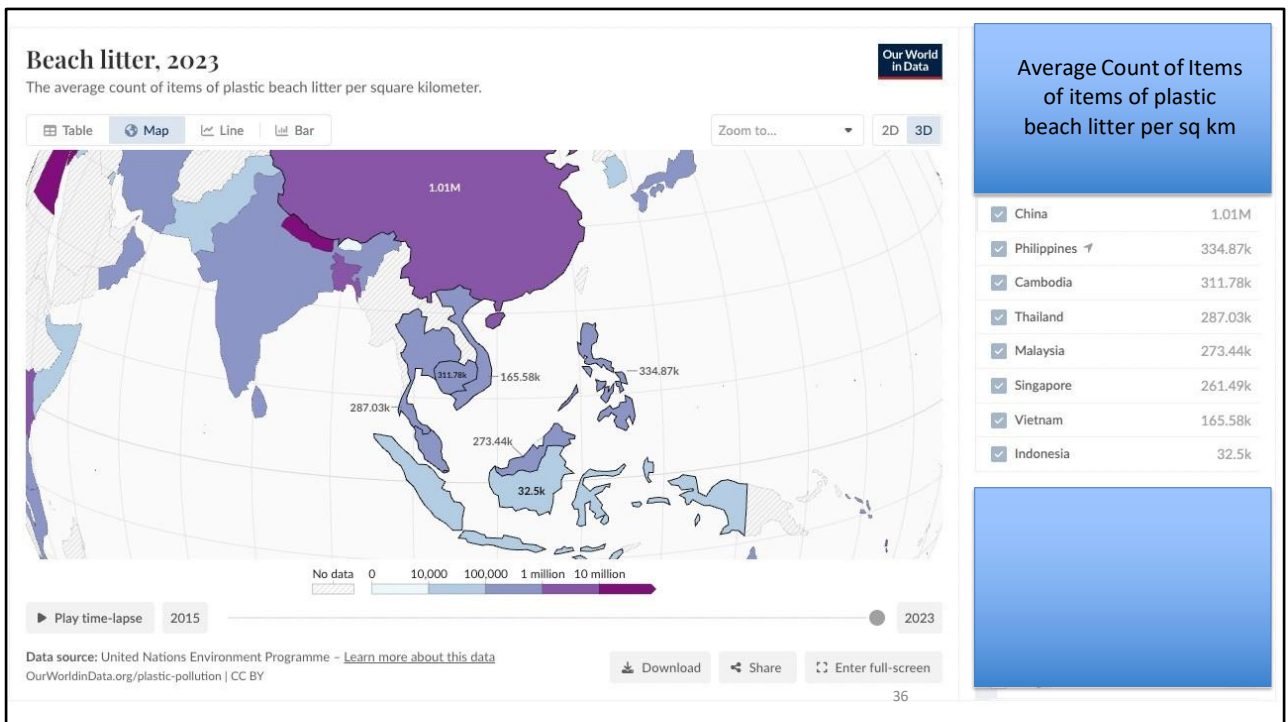
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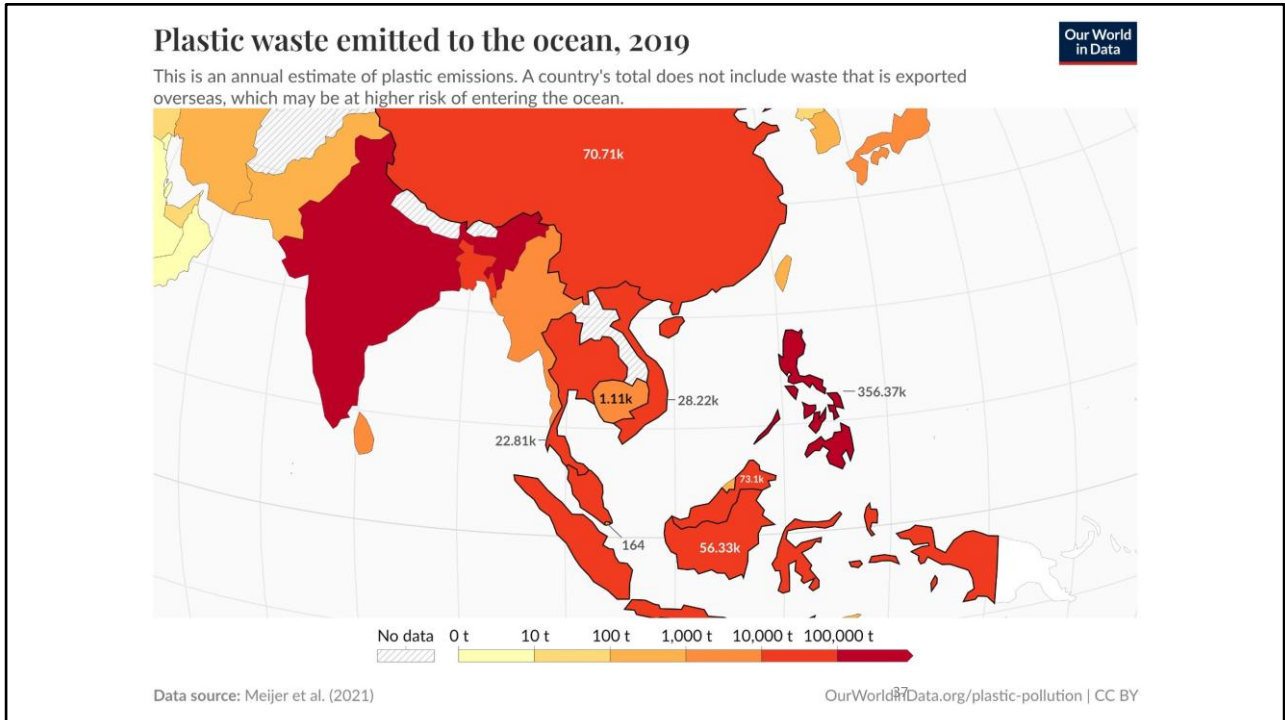
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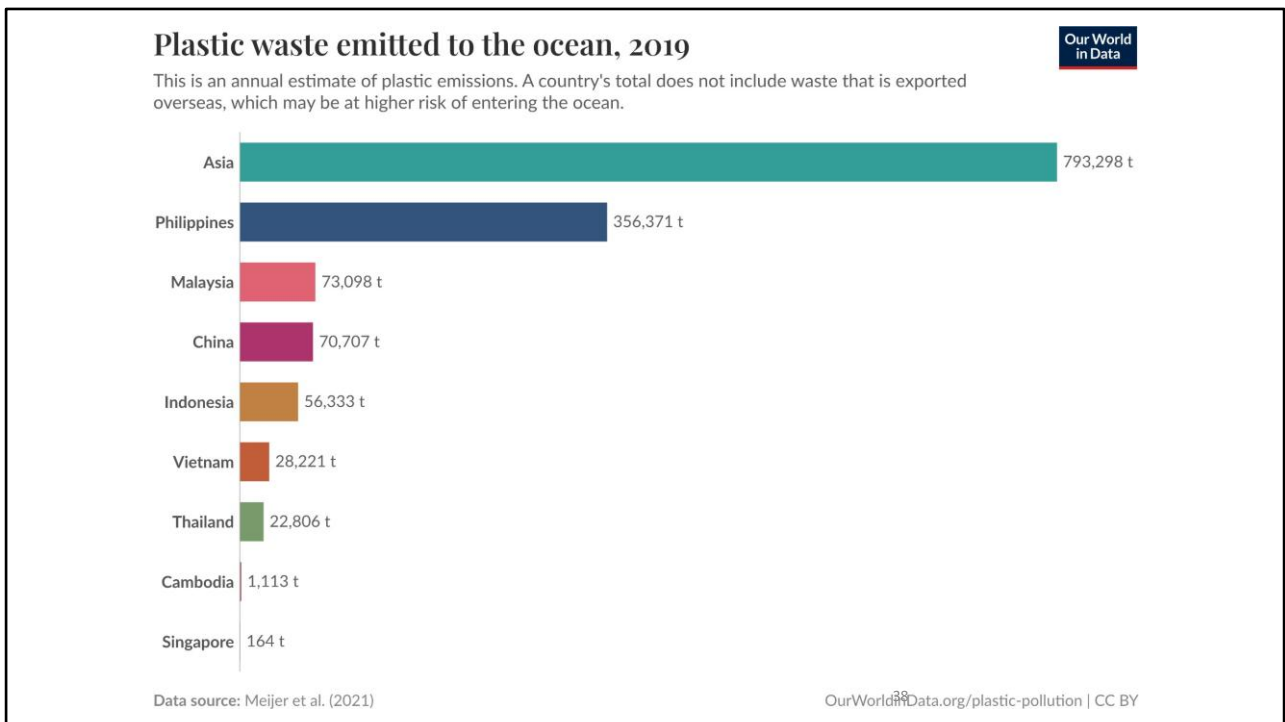
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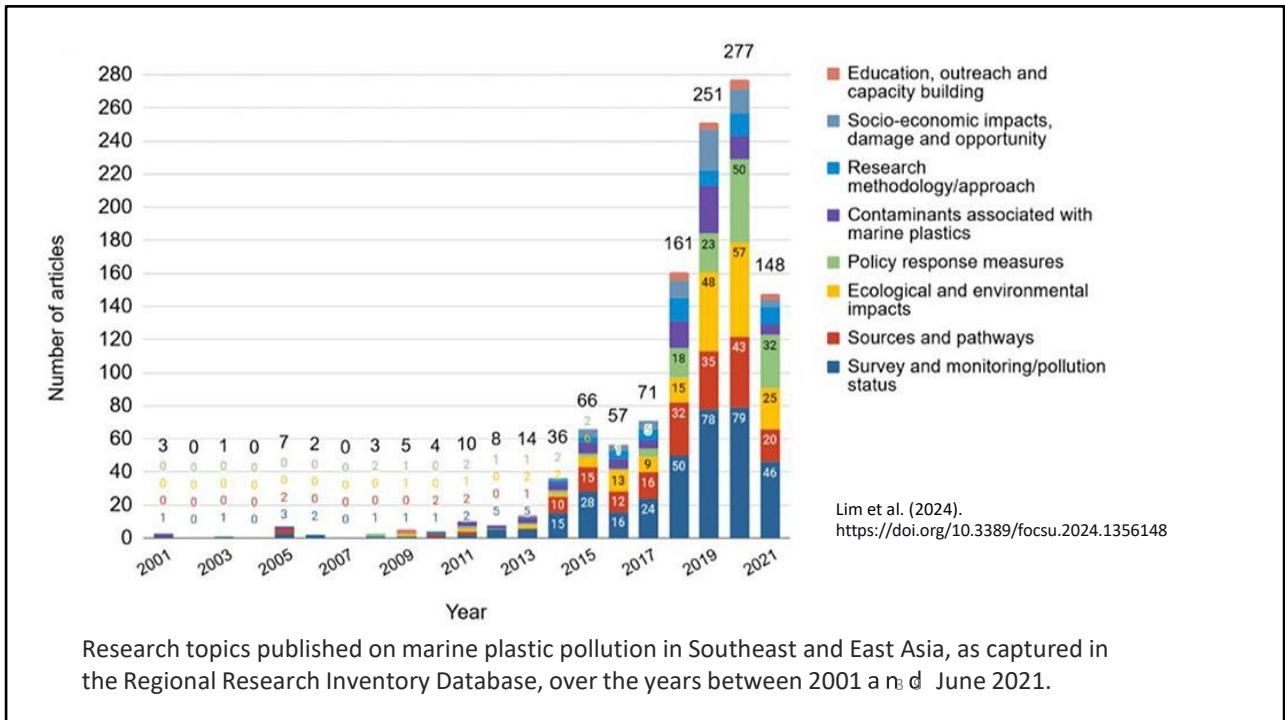
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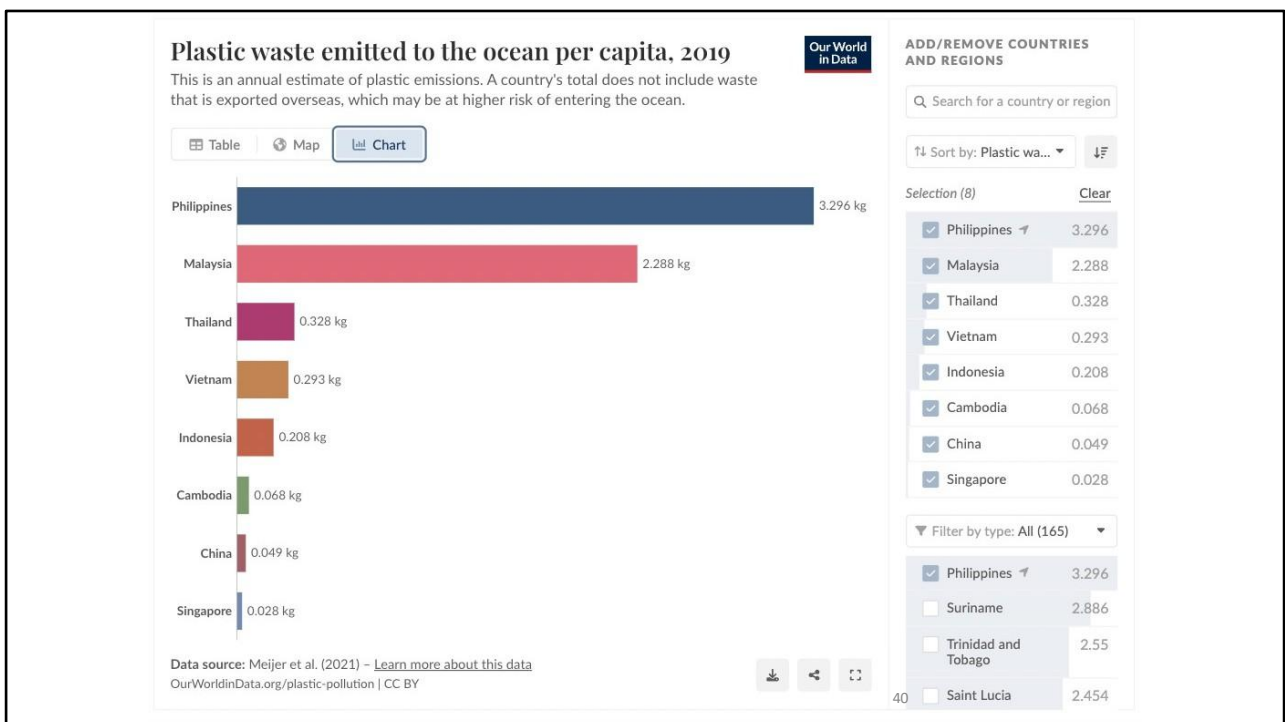
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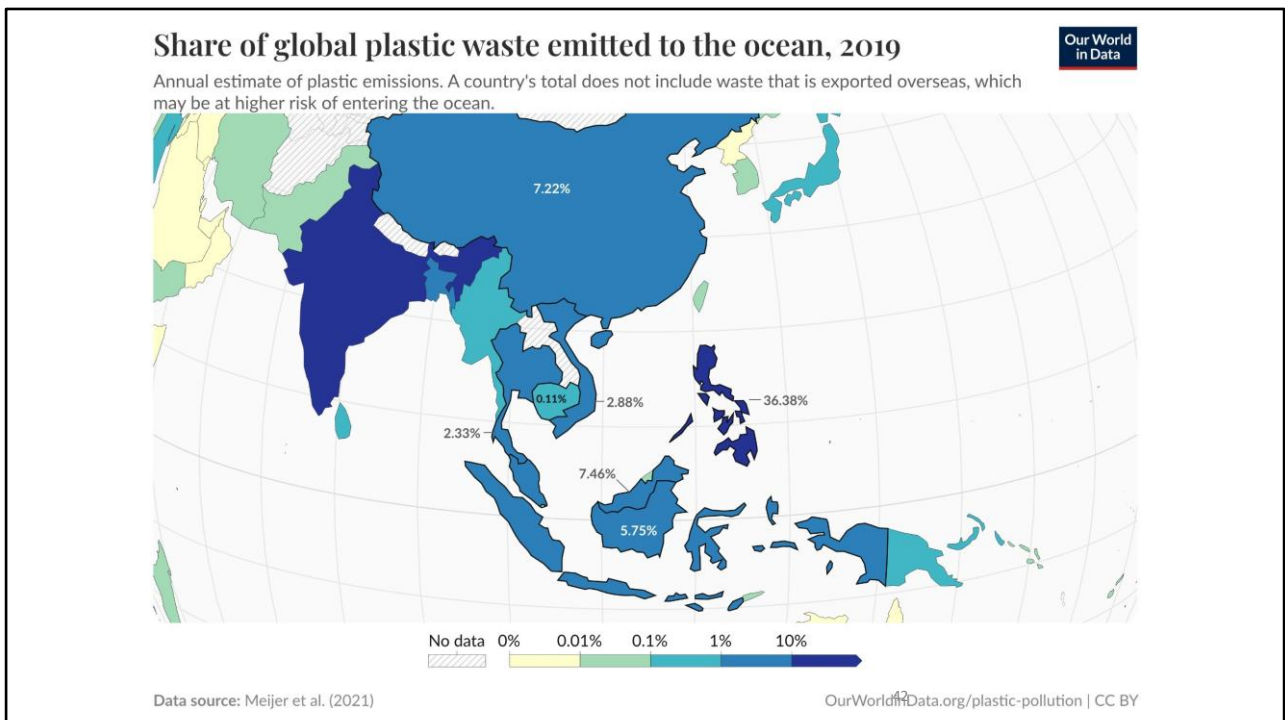
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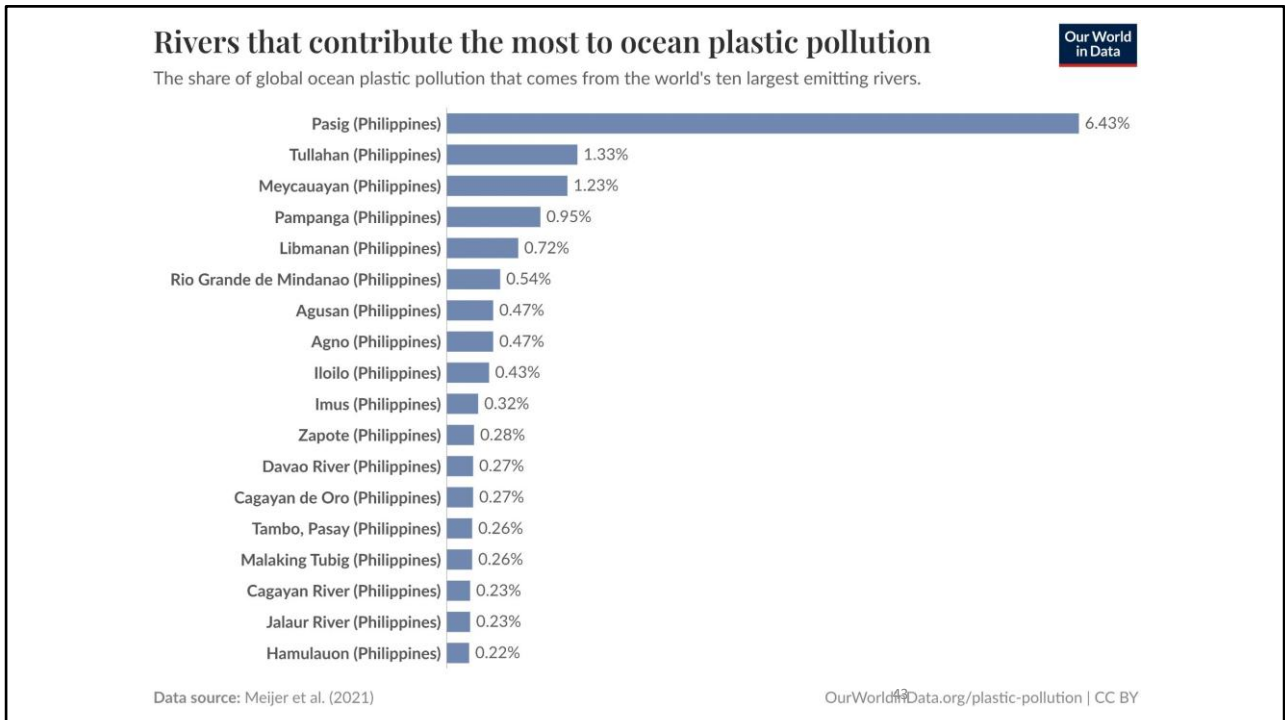
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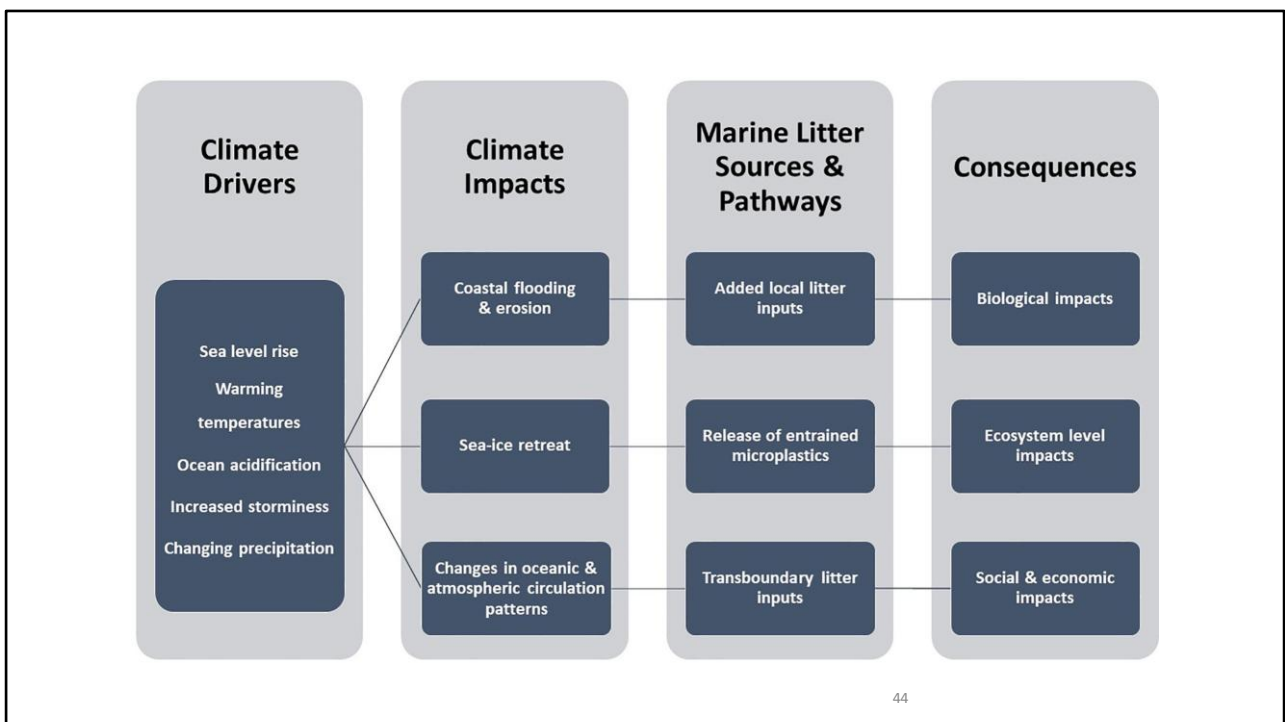
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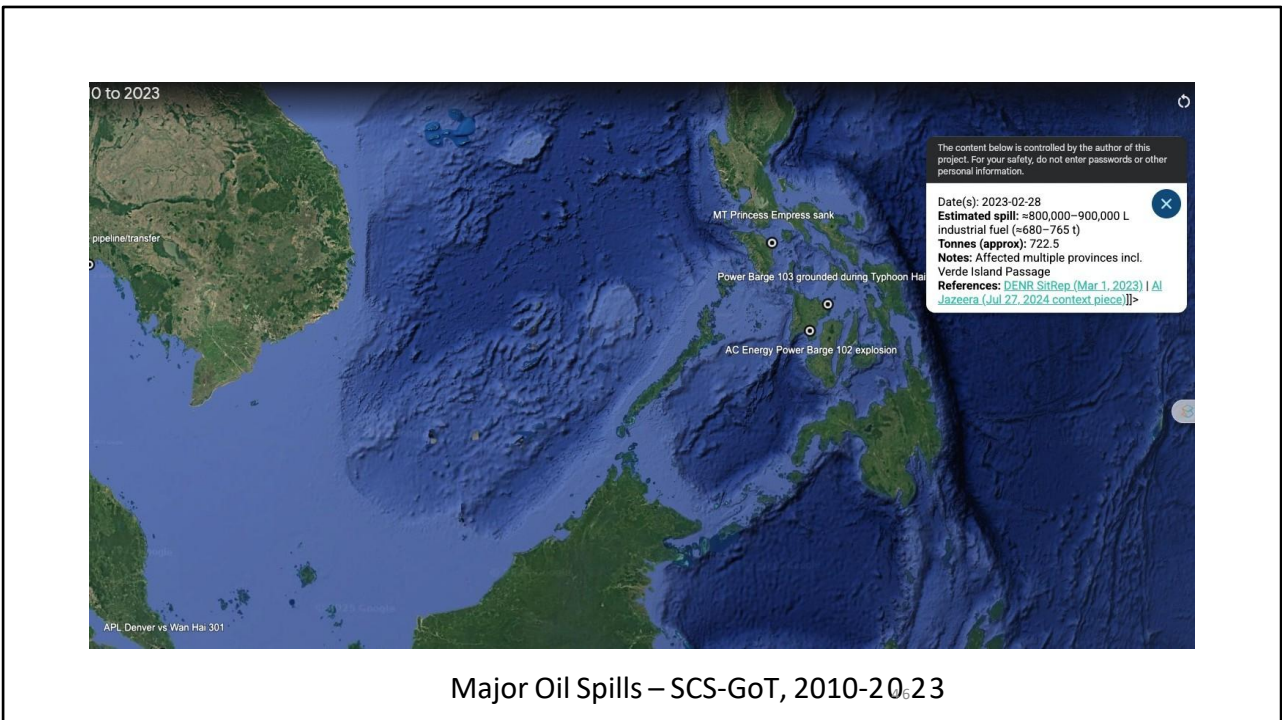
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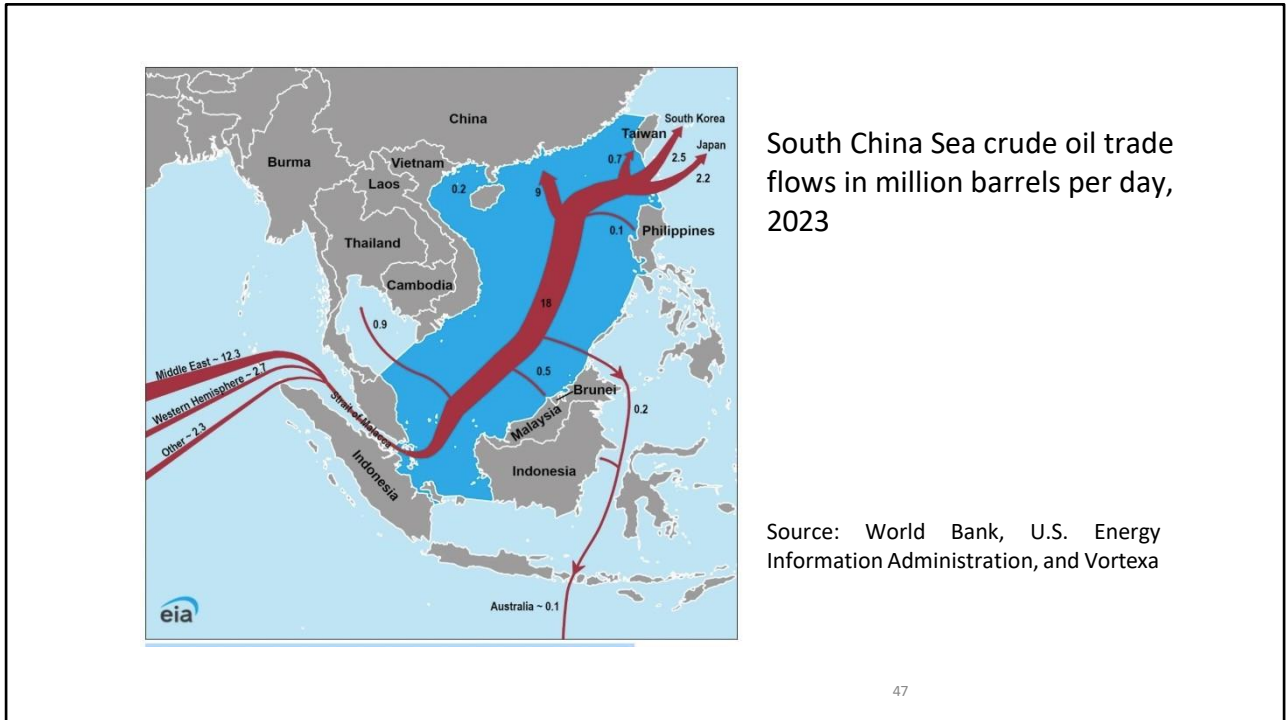


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Major Oil Spills – SCS-GoT, 2010-2023

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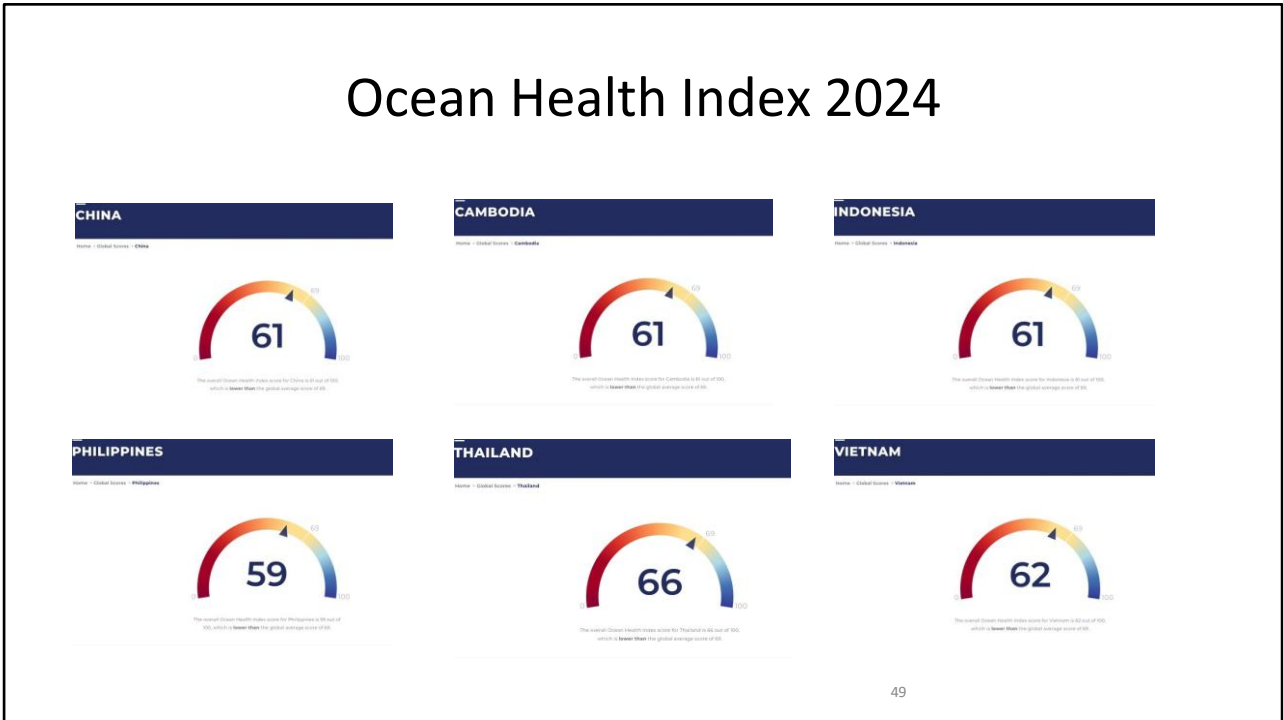


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Ocean Health Index Goals

FOOD PROVISION	ARTISANAL FISHING OPPORTUNITIES	NATURAL PRODUCTS
CARBON STORAGE	COASTAL PROTECTION	LIVELIHOODS AND ECONOMIES
TOURISM AND RECREATION	SENSE OF PLACE	CLEAN WATERS
BIODIVERSITY		


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Environmental Performance Index (EPI)

- Data-driven summary of the state of sustainability around the world
- 58 performance indicators across 11 issue categories
- EPI ranks 180 countries on climate change performance, environmental health, and ecosystem vitality
- provide a way to spot problems, set targets, track trends, understand outcomes, and identify best policy practices

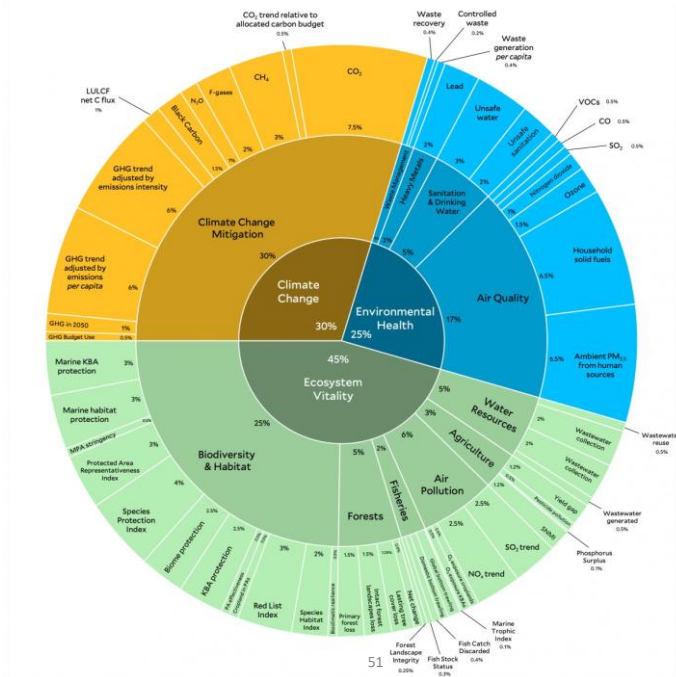


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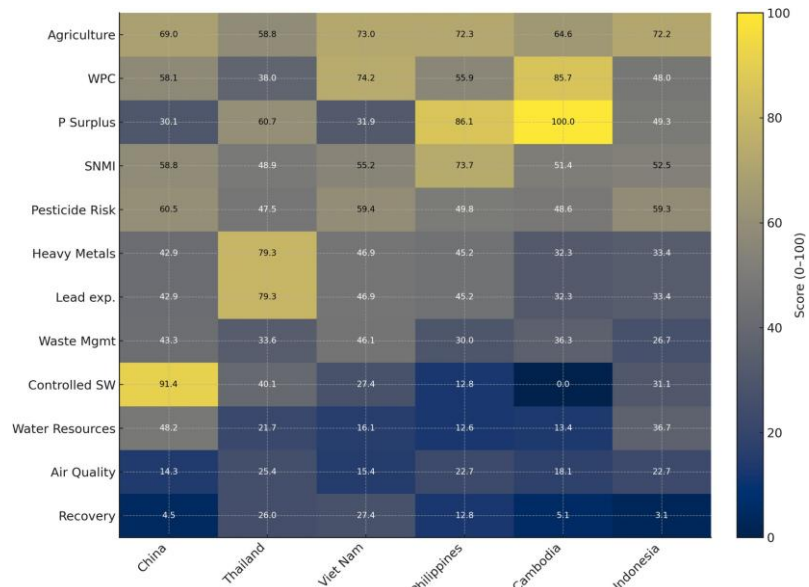
2024 EPI Framework

- Organizes 58 indicators into 11 issue categories and three policy objectives
- With weights shown at each level as a percentage of the total score.



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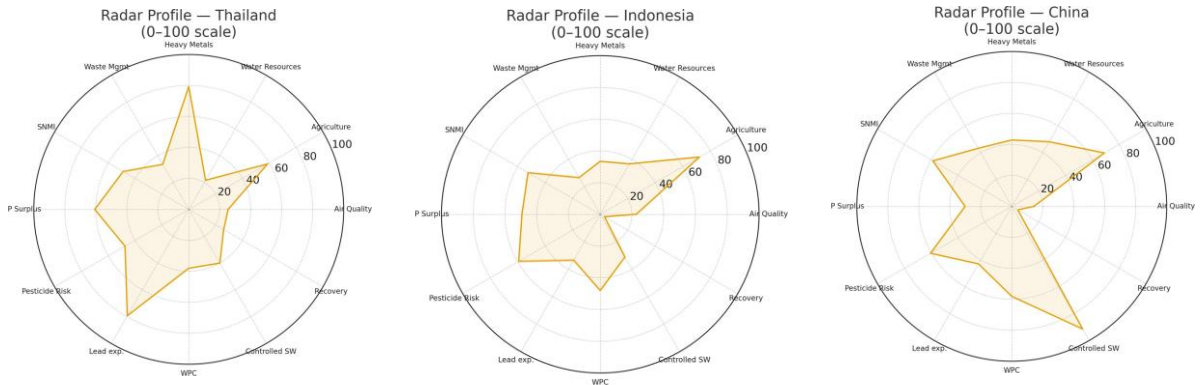
Heat Map of Environmental Indicator Scores among SCS-GoT Countries



2024 EPI scores on a 0-100 scale (higher = better performance). These are normalized index values; not percentages. Each category/indicator aggregates multiple measures on a proximity-to-target basis. Rough guide: 80-100 leading, 50 middle, 0-30 large gap to targets.

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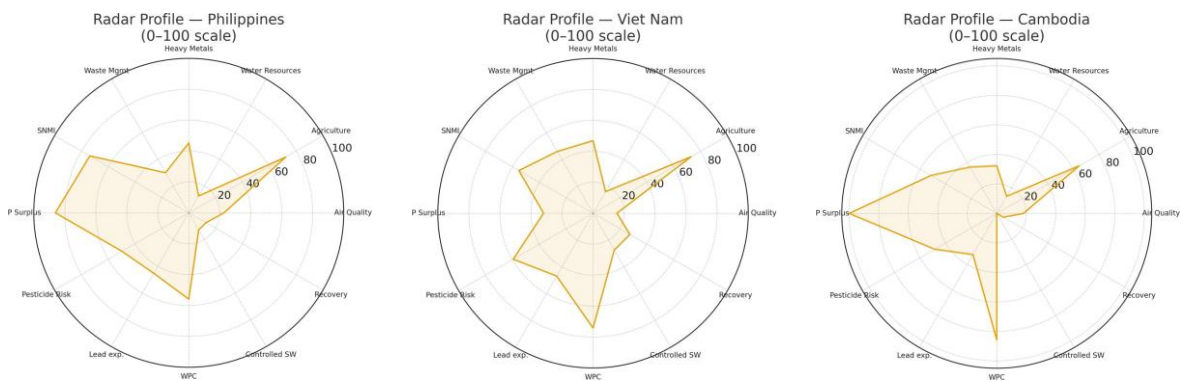
2024 EPI Environmental Indicator Scores



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2024 EPI Environmental Indicator Scores



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Contribution to Pollution of National/Regional Aquatic Environments

1 – Low; 3 – Moderate; 5 - High

PRIORITY TRANSBOUNDARY ISSUE	CAMBODIA	CHINA	INDONESIA	PHILIPPINES	THAILAND	VIETNAM	Score
Agricultural waste							
Domestic waste							
Industrial waste (e.g., metals)							
Solid/Plastic waste							
Oil Pollution							
Atmospheric Pollution							
Aquaculture waste							

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