

Marine Assessments:

Sharing Results and Experience in a Global Indicator-based Assessment of International Marine Waters

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Outline



1. Goals of TWAP
2. Marine indicators with relevance to RSP and SDG
3. Result highlights
4. Web-based resource:
<http://onesharedocean.org/data>
5. Input data and data sources

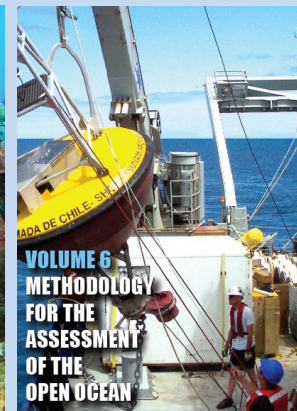
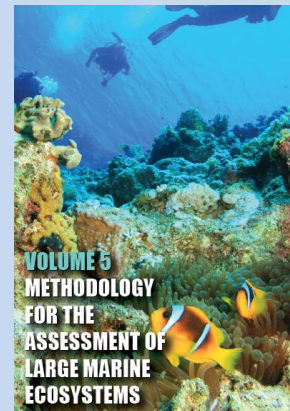
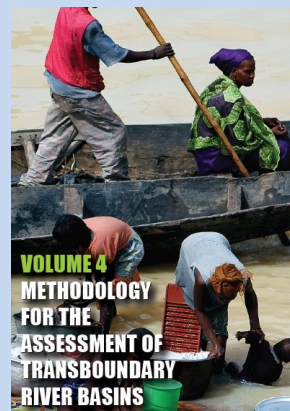
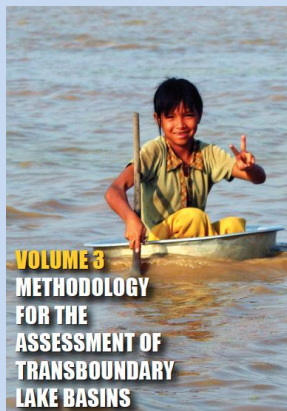
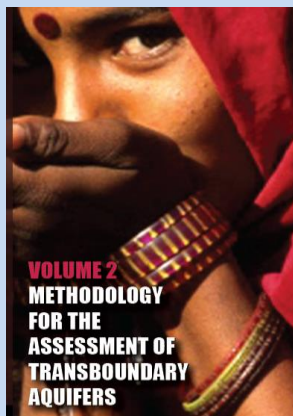


TWAP Medium-Sized Project (2009-10)



<http://www.geftwap.org>

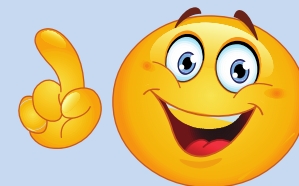
Indicator-Based Assessment Methods



Lead Organizations



Implementing Agency



TWAP Full Size Project (2013-15): Global Indicator-Based Assessment



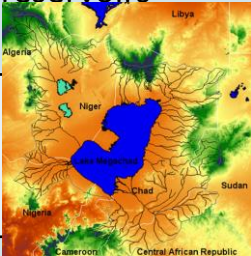

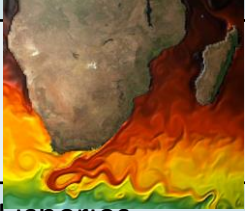
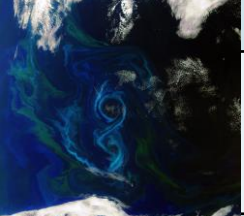

- Conduct **first global assessment** to assist GEF and other donors to improve the setting of funding priorities;
- Formalize **partnerships with key institutions** aimed at incorporating transboundary considerations into regular assessment programs, & resulting in periodic assessments of transboundary water systems

Global Indicator-based Transboundary Waters Assessment Programme



Comparative within a water system

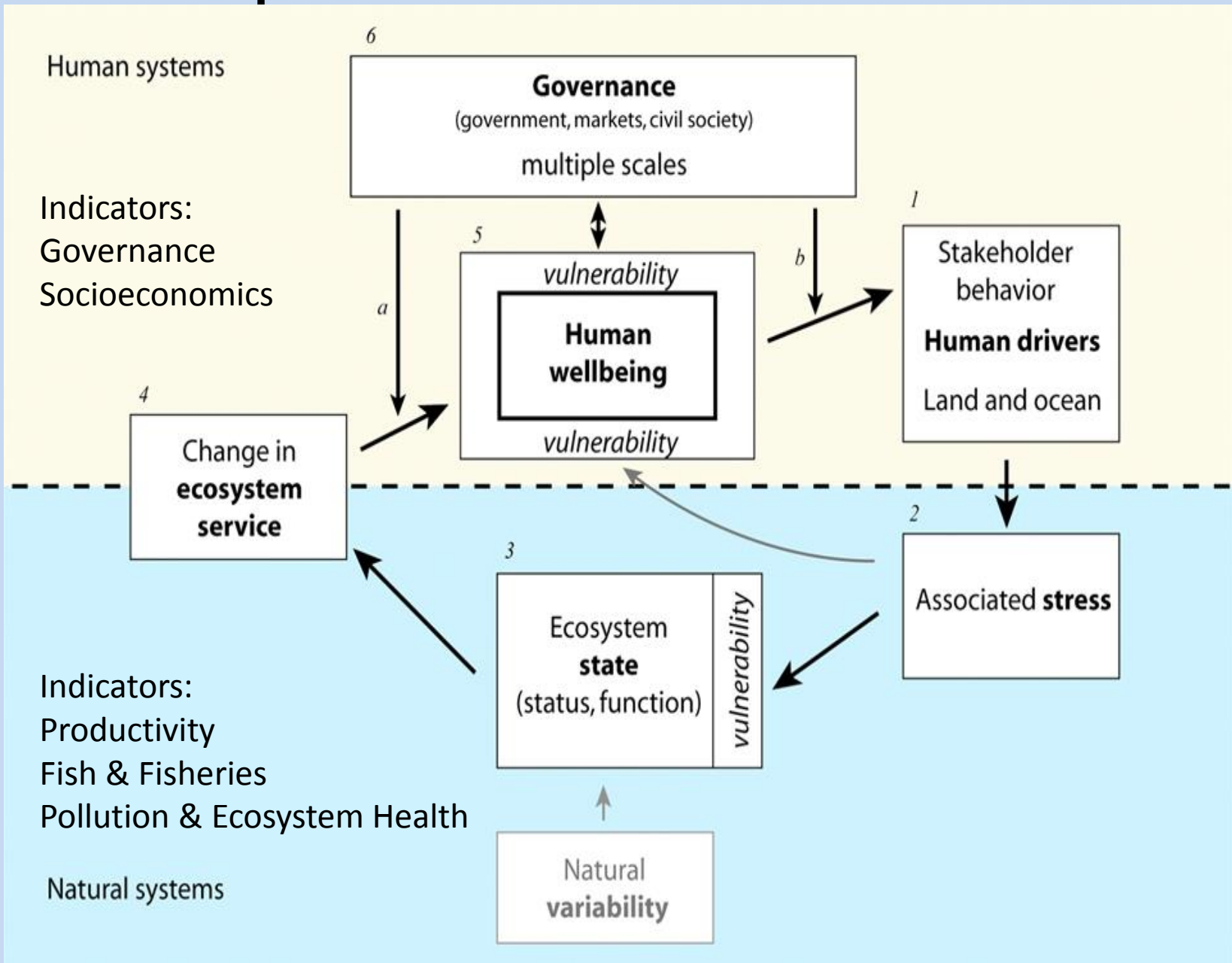
Thematic

Elements	Transboundary Aquifers:	Transboundary Lakes Basins & Reservoirs	Transboundary River Basins	Large Marine Ecosystems	The Open Ocean
Spatial coverage, 2010, 2030, 2050	166 aquifers 43 groundwater systems in SIDS	200 lakes/ reservoirs 	276 river basins 	66 LMEs, of which 55 are transboundary 	Global Open Ocean 
Biophysical indicators		Water stress	Access to water Access to sanitation	Fisheries revenues Tourism revenues	Vulnerability to sea level rise
Socioeconomic Indicators (e.g.)	Water demand by economic sector				
Governance architecture/ arrangement (e.g.)	For Water Quantity	For Water Distribution	For Habitat Destruction	For Fisheries	For Biodiversity
Data & Information Management	(next slide)				



Assessment of LMEs

Conceptual framework



Questions for the assessment



- What are the current trends (& projections) in LME state?
- Which LMEs are at highest relative risk?
- What are the implications for humans
 - Where is human dependency greatest on ecosystem services of LMEs?
 - Where are humans most vulnerable to changes in LME condition?
- What is the status of the governance arrangements in transboundary LMEs?

Productivity	Fish & Fisheries	Pollution & Ecosystem Health	Socio-economics	Governance
<ul style="list-style-type: none"> •Chlorophyll •Primary productivity •SST 	<ul style="list-style-type: none"> •Fishing subsidies •Catch from bottom gear •Fishing effort •MTI & FIB •Ecological footprint •Stock status •Catch potential under global warming 	<ul style="list-style-type: none"> •Nutrient loads •Index of Coastal Eutrophication*** •POPs in plastic pellets •Micro & macro-plastics*** •Change in MPA coverage •Reefs at Risk Index •Mangrove extent •Cumulative human impacts •Ocean Health Index 	<ul style="list-style-type: none"> •% fish protein •% GDP tourism •Coastal population •Rural/ Urban population •Coastal Poor •Human Development Index •Night light Development index •Climate risk Index •Contemporary threat index 	<ul style="list-style-type: none"> •Governance architecture- Completeness, Engagement, Integration (multi-country LMEs only) ***IOC proposed SDG indicators Relevant to Proposed RSP Coordinated Indicators

Comparing LMEs- Risk categories

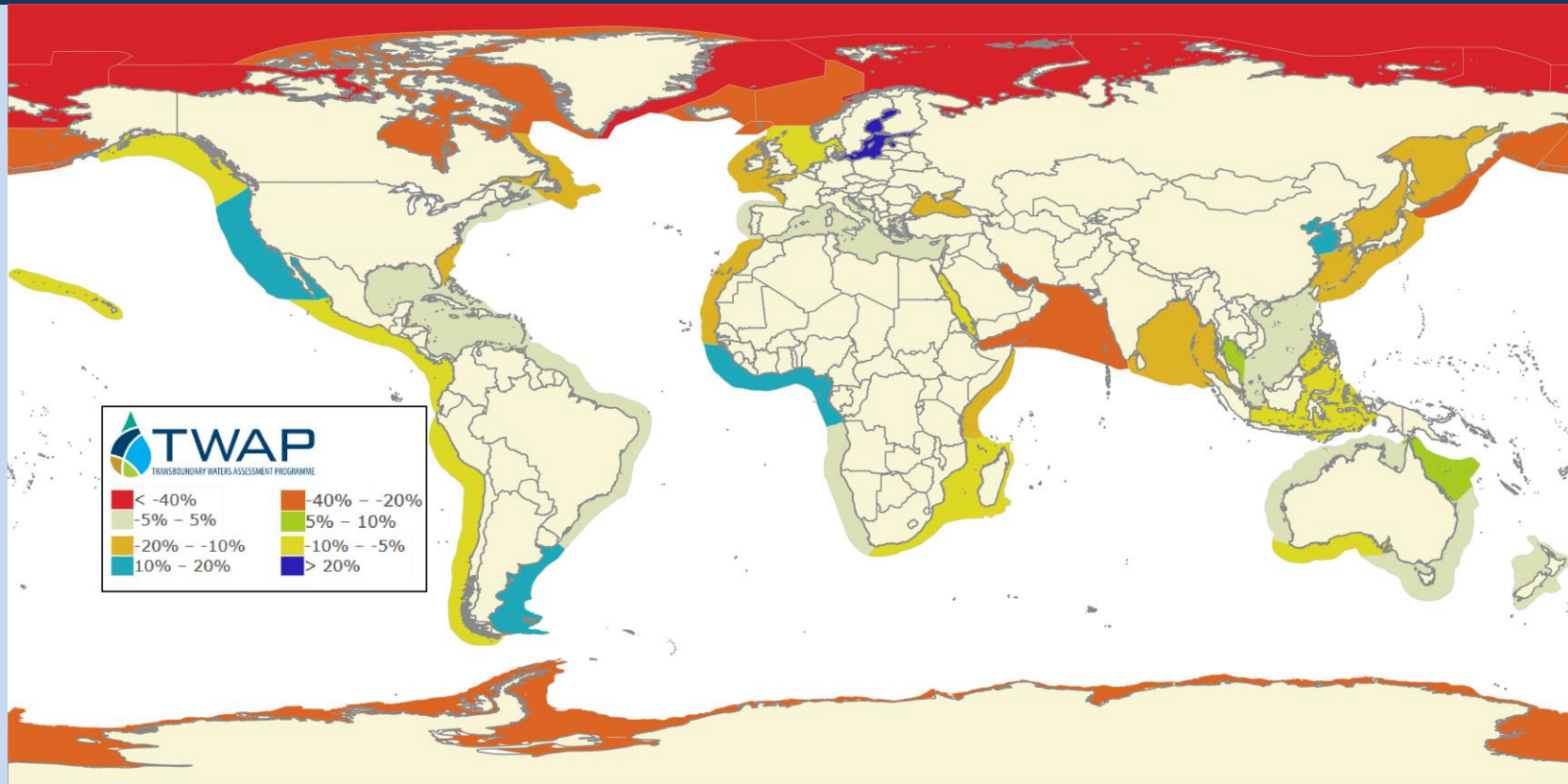


- Assessment required an approach to summarize indicator results and compare LMEs
- Grouping of LMEs into 5 categories of relative risk (colour coded)

lowest	low	medium	high	highest

- Level does not necessarily relate to actual state of the LME
- Ideally, the cut-off points for the five categories should be based on set targets or reference points, but globally these do not exist for the selected indicators
- Experts decided on the cut off points
- Results do not reflect on any particular country- values are averages at the LME scale

Chlorophyll a (1998-2013)

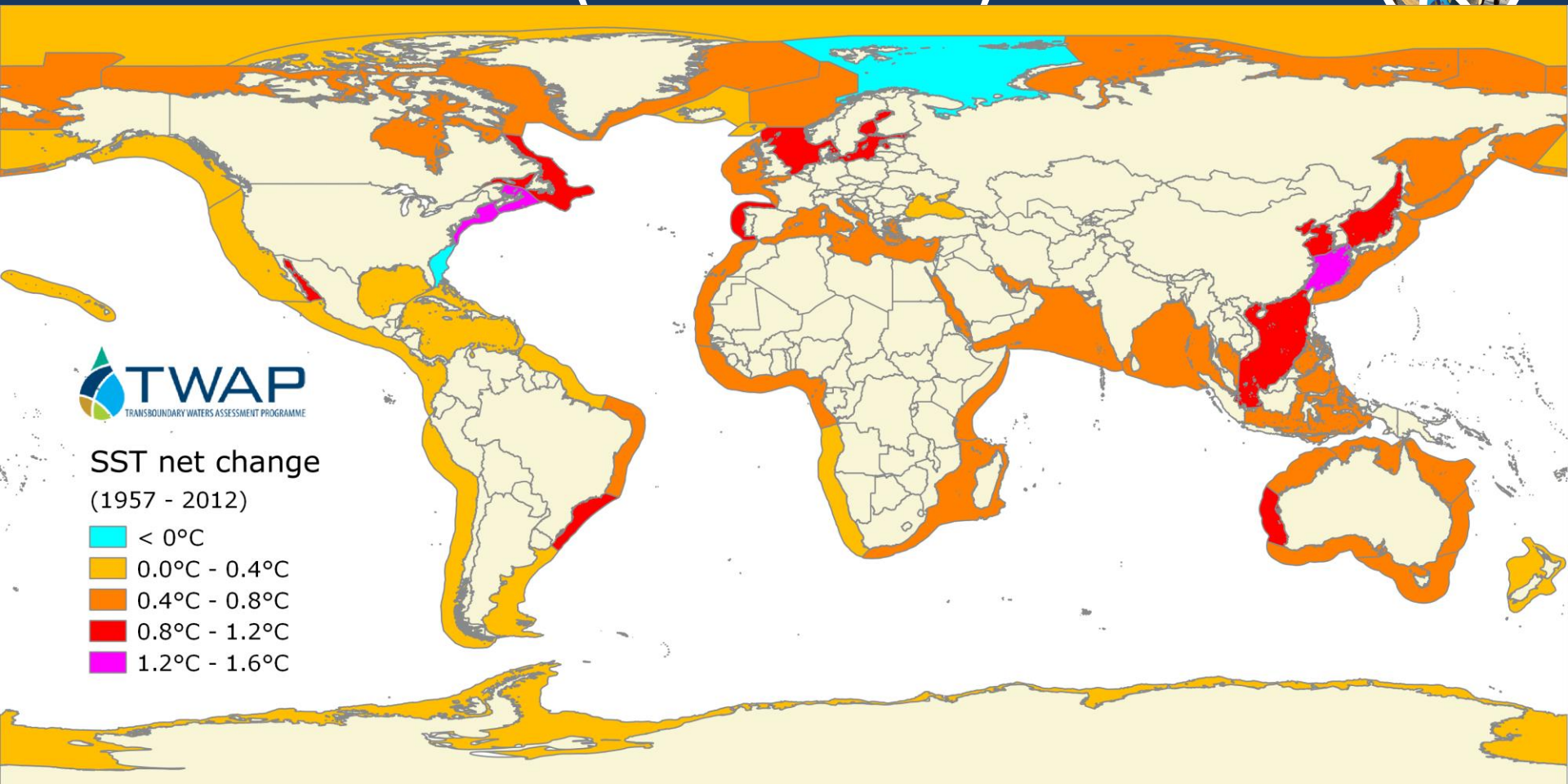


Significant increasing trends: Scotian Shelf, Patagonian Shelf, Labrador Newfoundland, Southeast Australian Shelf LMEs.

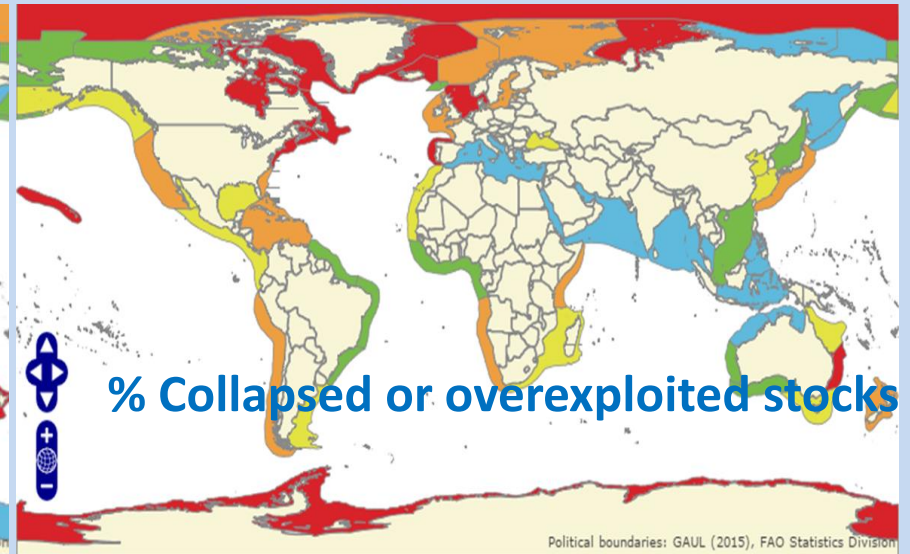
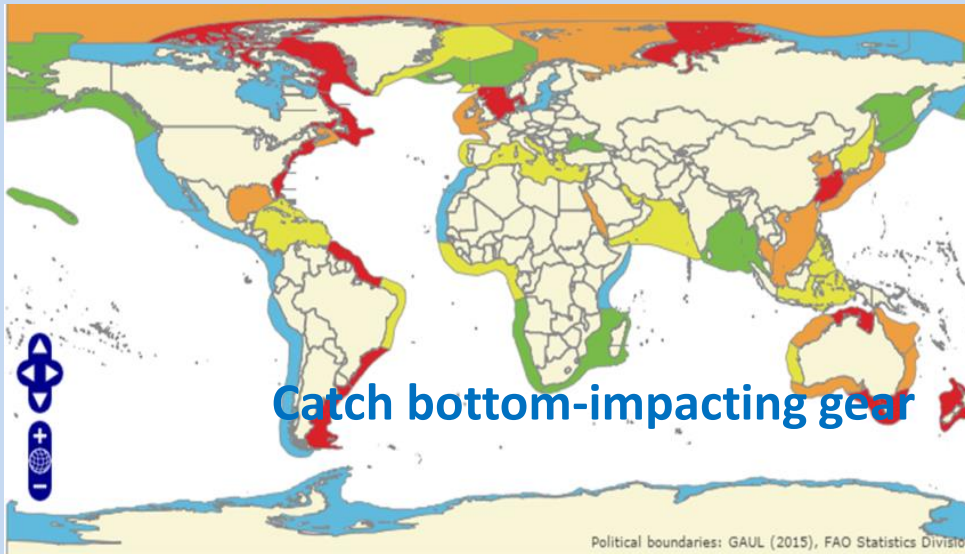
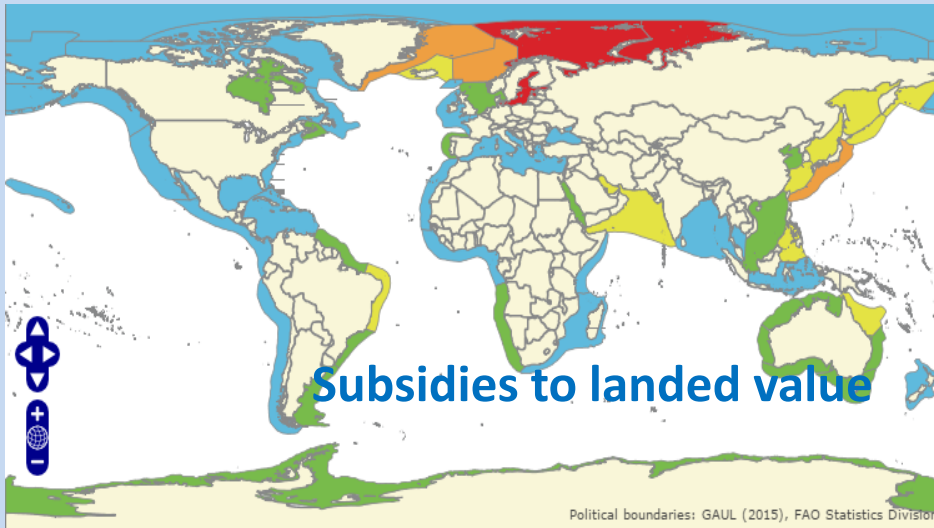
Significant decreasing trends: Indonesian Sea, Oyashio Current, Celtic-Biscay Shelf LMEs.

Trends weakly correlated with latitude (O'Reilly and Sherman 2015).

SST (Sea Surface Temperature) (1957-2012)

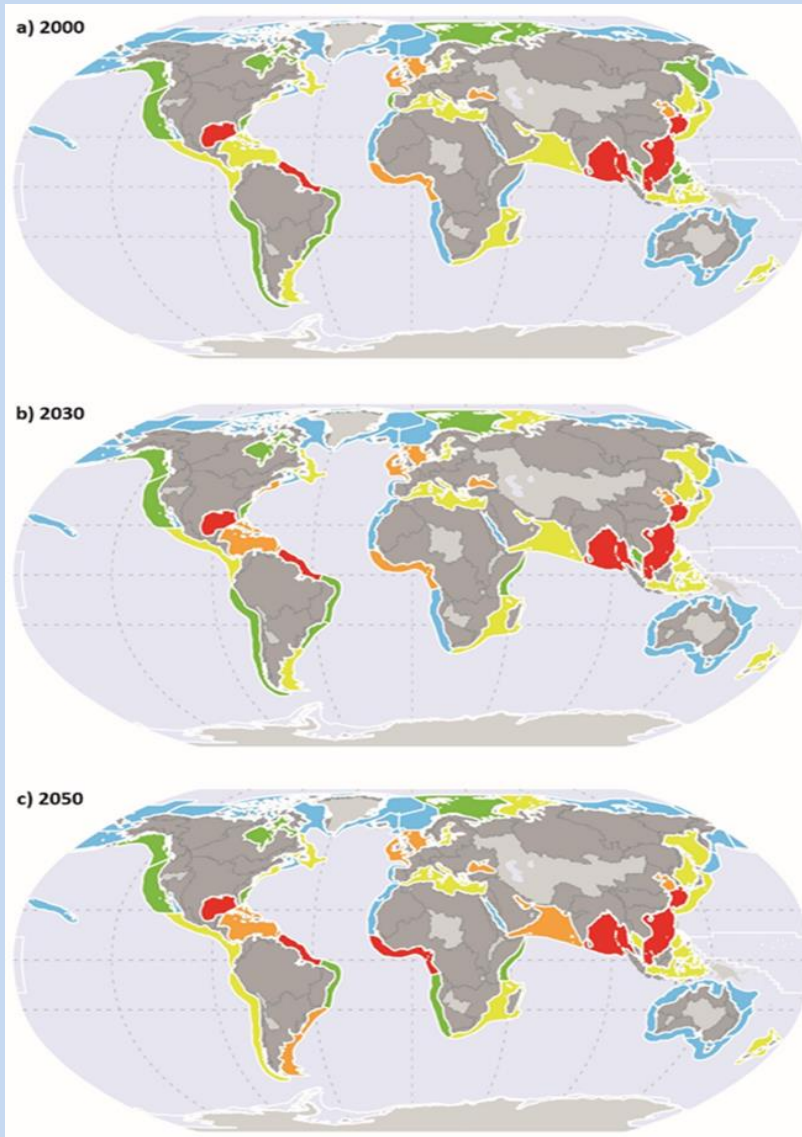


All but two (SE USA and Barents Sea LMEs) exhibited warming; no consistent link between LME waters warming and environmental risk; greatest increase in East China Sea (Belkin 2015)



Data coverage: 1950-2010 (D. Pauly & V. Lam)

Nutrient inputs & Coastal eutrophication potential



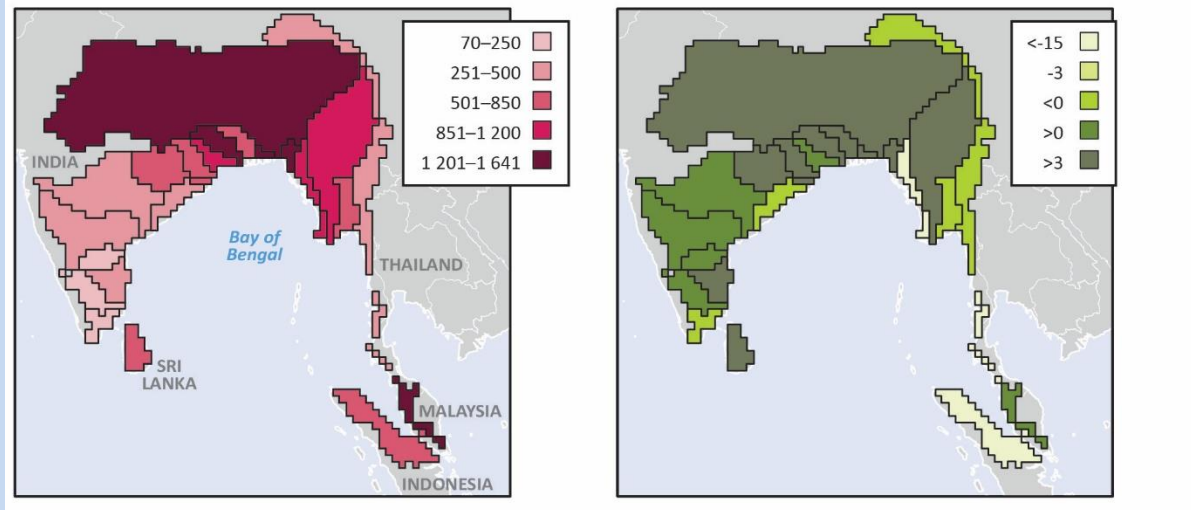
- Global NEWS model- overall indicator of coastal eutrophication developed for 63 LMEs, based on the amount of nitrogen input by rivers as they enter the land–sea boundary of the LME, and nutrient ratios (dissolved Si to N or P).
- Based on current trends, coastal eutrophication risk will increase in 21% of LMEs by 2050- mainly in southern and eastern Asia, South America and Africa.
- Iberian Coastal & Northeast US Continental Shelf are projected to lower their eutrophication risk by 2050.

Spatial variation in nutrient inputs

Example from Bay of Bengal LME

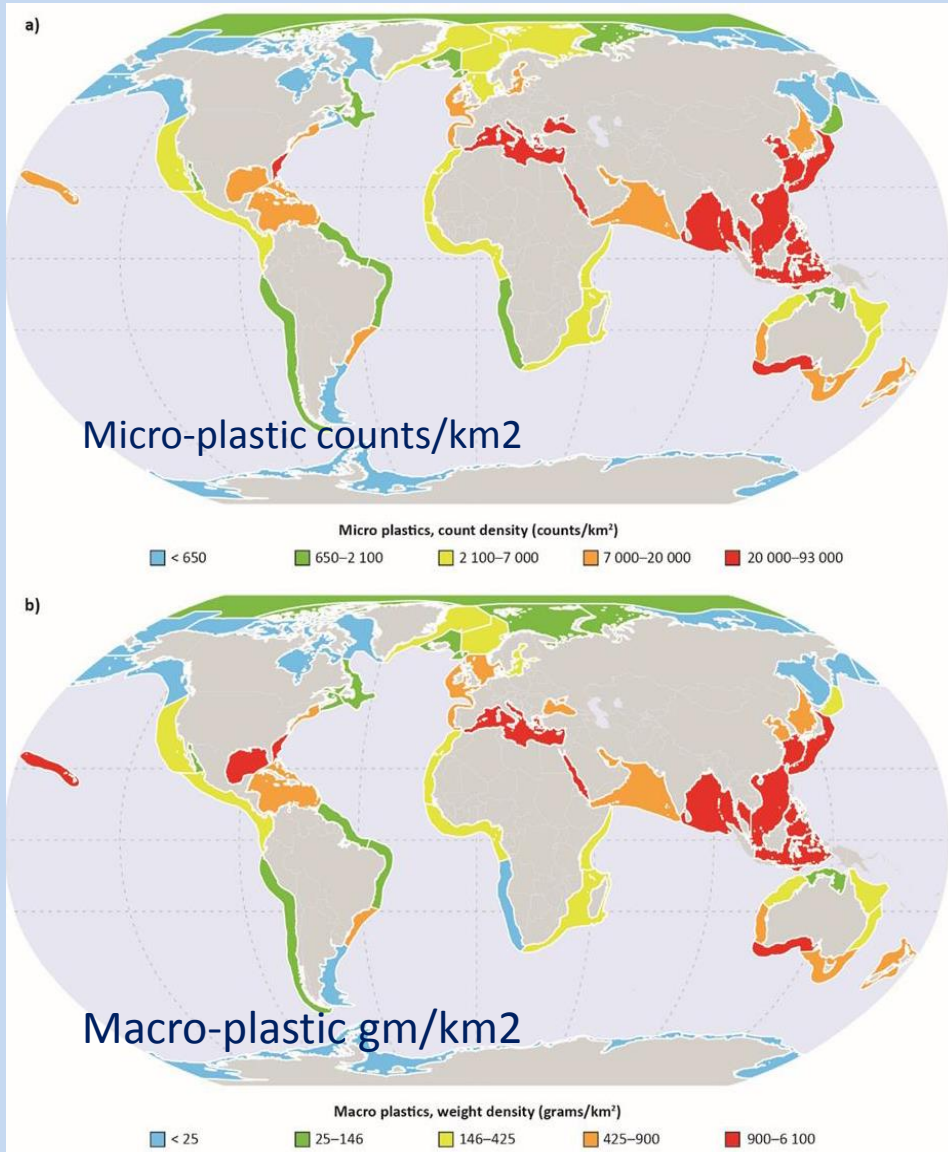
DIN kg/km²/yr

Index coastal eutrophication



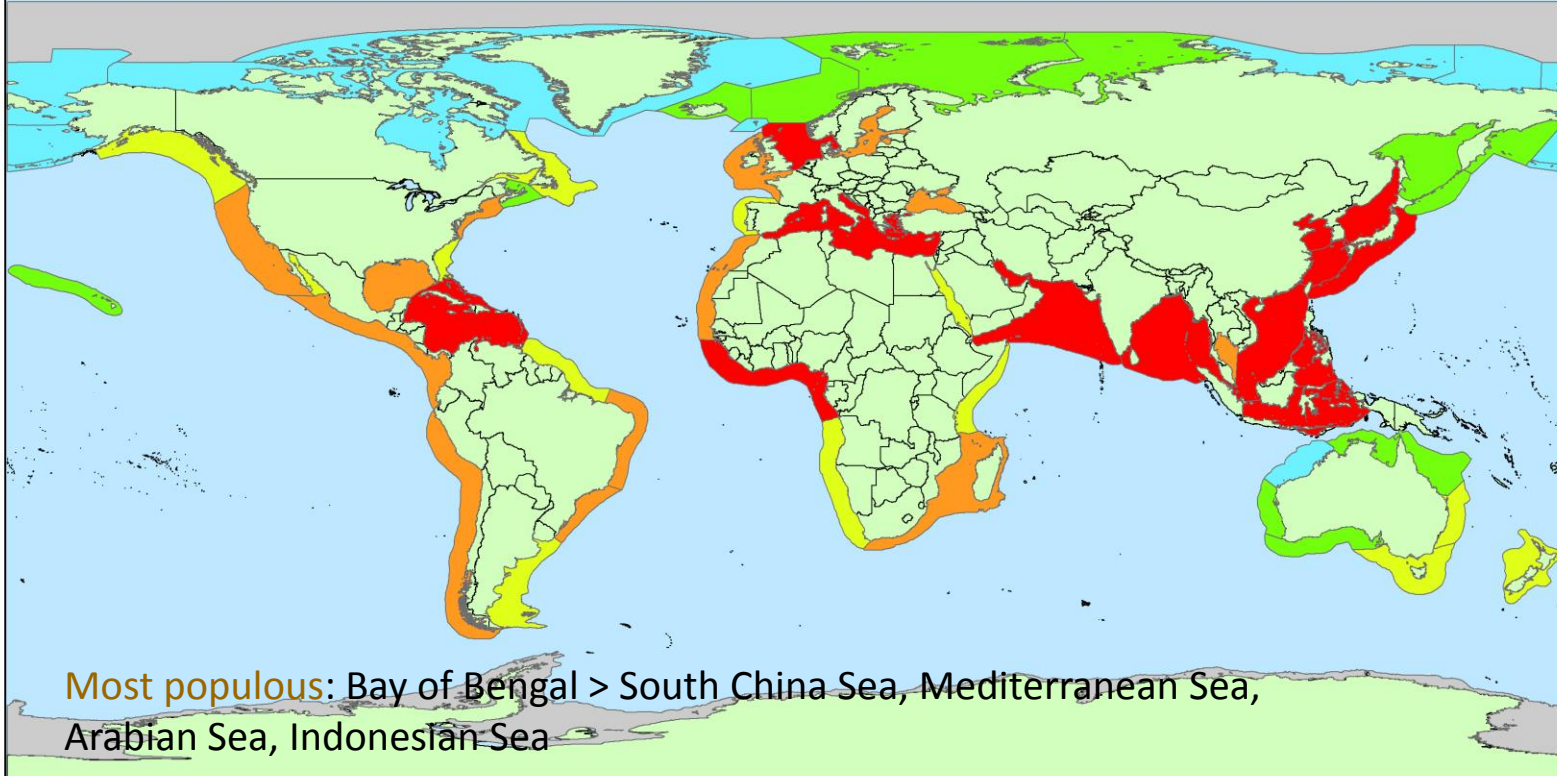
- Nutrient yields, eutrophication potential, and sources of nitrogen can vary considerably among the river basins that drain into an LME.
- Such information is important in identifying the spatial variation of nutrient effects and their sources in order to achieve reductions within LMEs.

Floating micro & macro-plastic debris



- Model - simulated movements of floating plastic in the ocean
- Proxy sources of plastics - coastal population density, shipping density, & level of urbanization
- Results consistent with observational data from shipboard measurements and shoreline surveys
- Highest (both types of plastics) in E-SE Asia, Gulf of Thailand highest globally
- Others with high plastics: Include Southeast US Continental Shelf, Mediterranean, Red Sea LMEs

Coastal Population

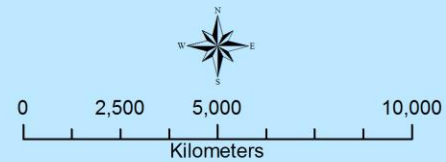


Most populous: Bay of Bengal > South China Sea, Mediterranean Sea, Arabian Sea, Indonesian Sea

Legend

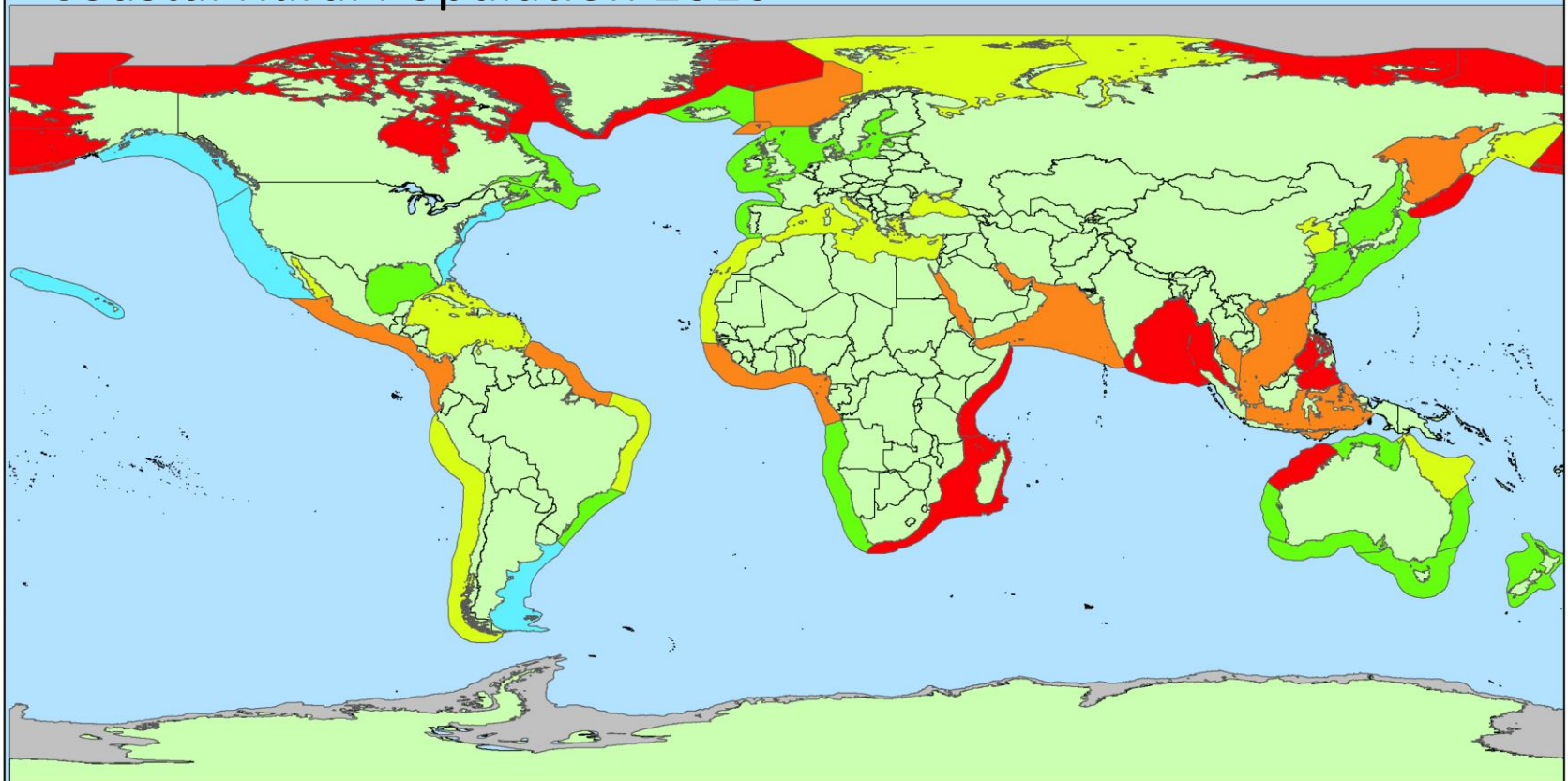
Population in 100 km coast (2010)

1-99,000	Very Small
99,000 - 2.4 million	Small
2.4 - 28 million	Moderately Large
29 - 69 million	Large
70+ million	Very large
No resident population	



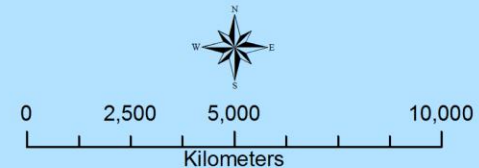
In 100 km coast, 2.5 billion in 2010 (40% of global population).
60% live in urban coastal areas. (Talaue McManus & Estevanez)

Coastal Rural Population 2010



Legend

Percent rural population living
within 100 km of LMEs in 2010



Global coast is urbanizing with almost 60% of coastal population residing in Urban centers.

Governance Arrangements

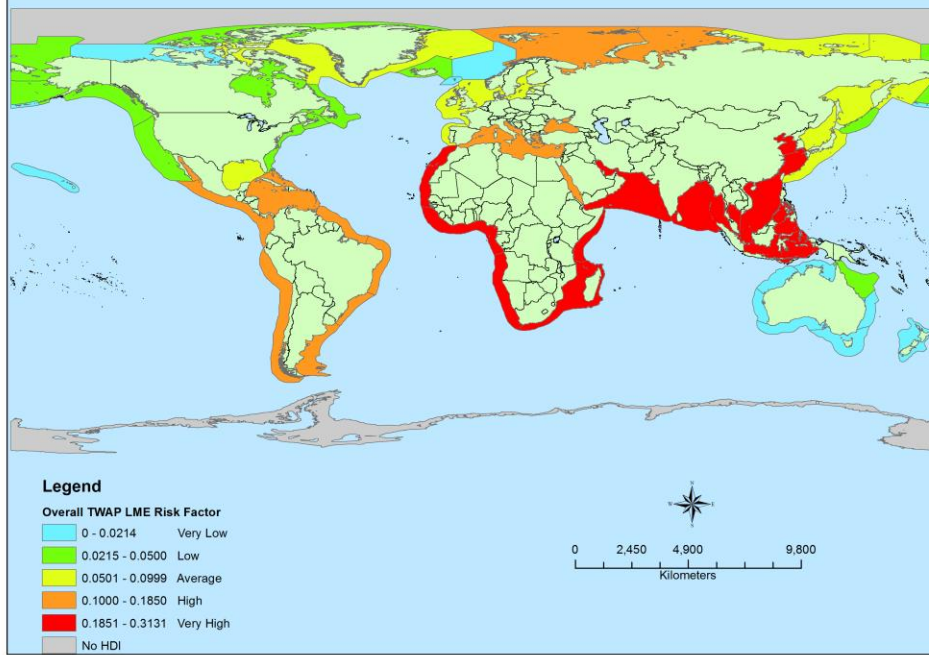
- Evaluated the formally-established transboundary governance arrangements relevant to fisheries, pollution, and biodiversity and habitat destruction in the 50 multi-country LMEs and the WPWP.
- 3 indicators:
 - (i) level of completeness of the structure of arrangements to address a given issue(s);
 - (ii) level of integration of institutions involved in addressing the suite of identified transboundary issues within a given LME; and
 - (iii) level of engagement of countries participating in arrangements that address the identified transboundary issues within the LME.

Governance Arrangements

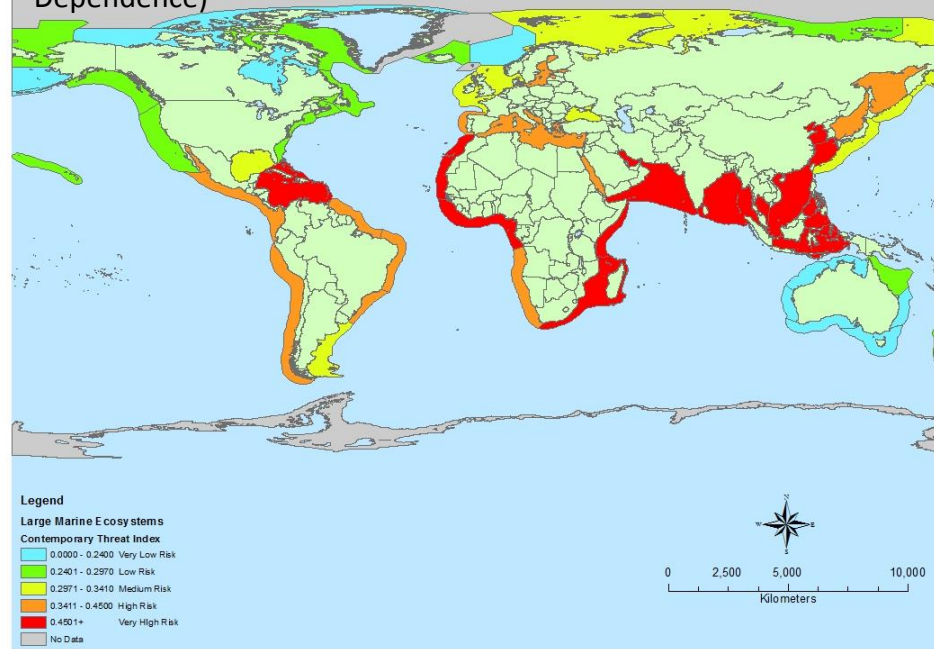


- Fisheries arrangements tend to have high completeness levels but need improvement in institutional collaboration for implementation.
- Few pollution arrangements have repercussions for non-compliance.
- Biodiversity arrangements have the lowest levels of completeness. Accountability is limited and lack of data and information provisions is a serious shortcoming at the LME level.
- Over 50% LMEs have very low levels of institutional integration. Efforts should focus on collaboration among organizations and/or the creation of overarching integrating mechanisms if EBM is to be effectively implemented.
- Countries have high commitment towards participation in agreements addressing transboundary issues. The nature of agreements (binding/non-binding) influences the level of commitment.

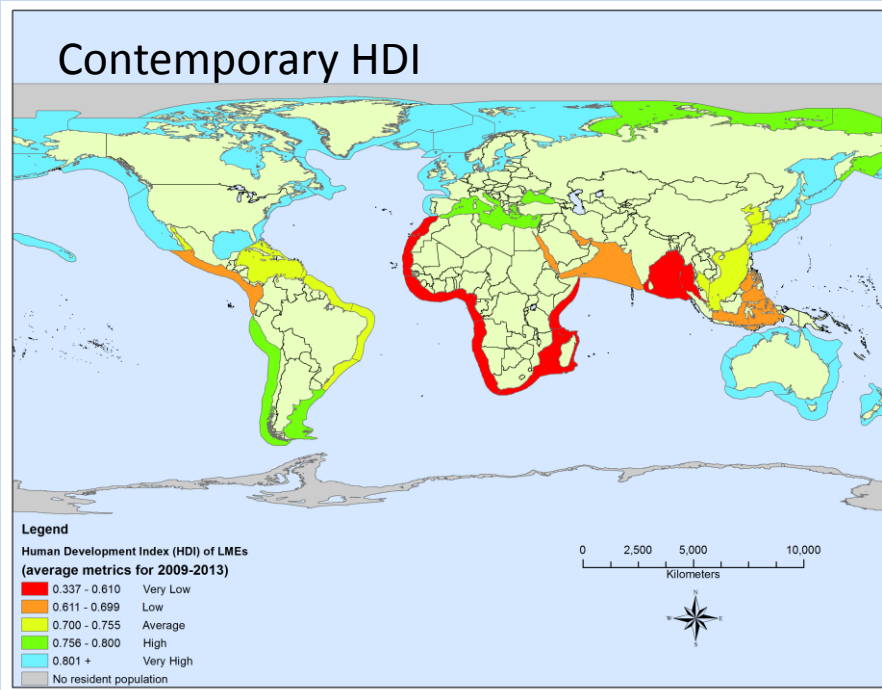
Risk Patterns: LME States & (1-HDI)



Risk Patterns: LME States, Climate-related losses, 1-HDI, Dependence)



Contemporary HDI



Key Messages

- **LME States:**
 - LMEs with developing economies: highest risks due to a combination of **coastal eutrophication** and **plastic litter density**, and moderate to high risks from **collapsed or overexploited fish stocks**
 - LMEs next to developed nations: high risks triggered by a combination of **high shipping frequencies**, high capacity-enhancing fisheries **subsidies**, and high **catches from bottom-impacting gear**
 - All LMEs, except for the Australian shelf LMEs, the Red Sea and Gulf of California, are at risk due to the low percentage of established **recovery zones** such as MPAs.
- Degrading LME conditions and climate related risks as **additional** burdens for socioeconomically compromised coastal populations of mostly tropical LMEs
- Sustainability Targets: Enhanced human wellbeing within limits of healthy ecosystems.



<http://onesharedocean.org/data>



Thank you!

