Human pressures

Coastal Ecology II - 2020

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Aim

- Why? Is this important?
- What? Definitions, clarifications
- How? Analyse manage

Photo by Antoine GIRET on Unsplash

CE II – what are we working on?

3 similar courses ongoing, is it confusing?
The baseline assessment?
Human pressures?

What human pressures?

Any thoughts?
In your home region, give examples

Human pressures from a bird perspective

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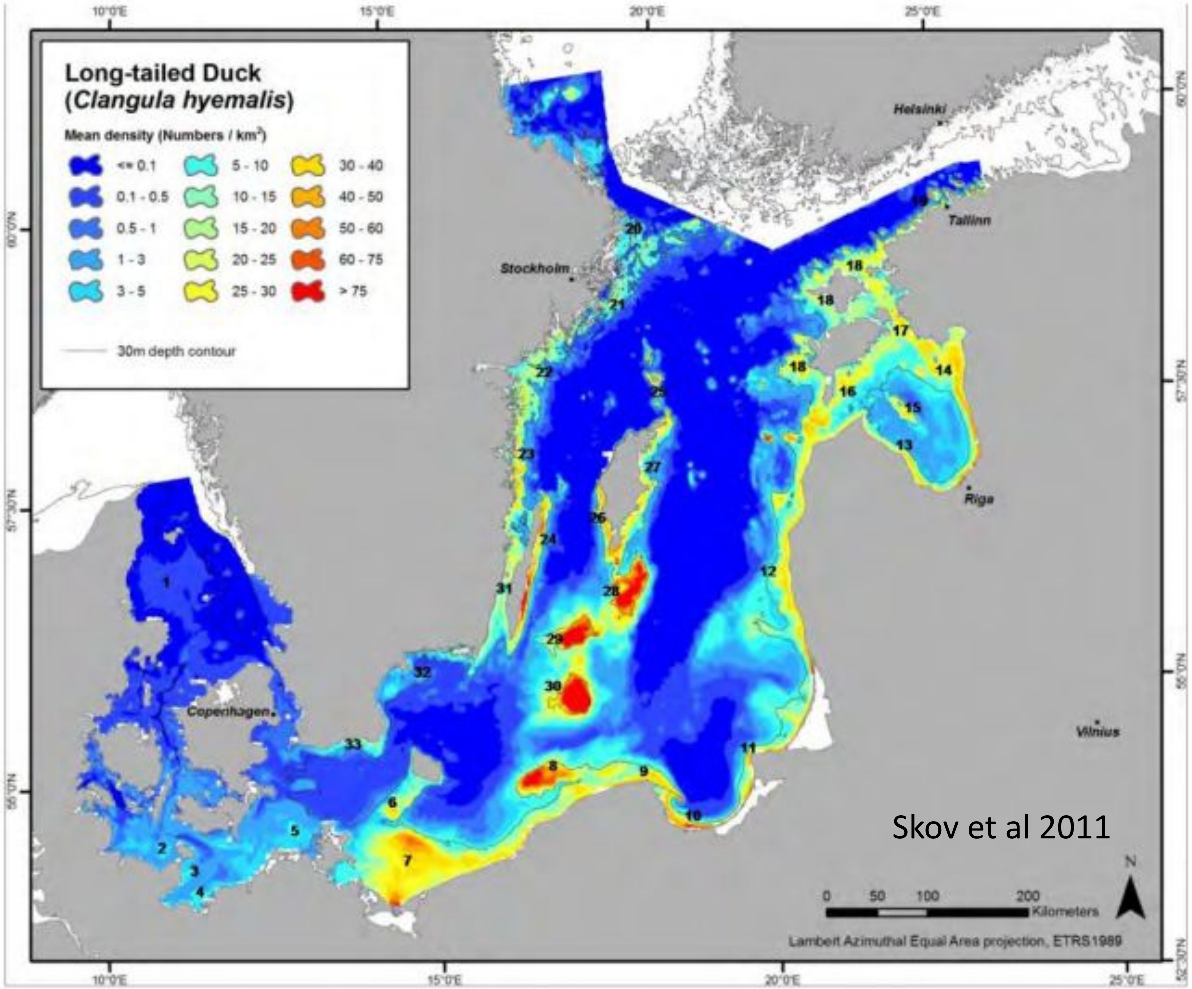
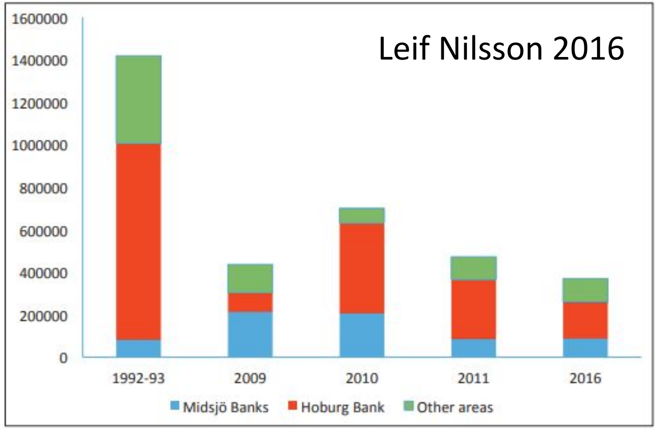


Skov et al 2011

Ca 65% reduction in population size from early 1990s until recently



Operationaloil
spills from ships

Invasive species

By-catch

Pollution – hazardeous
substances

Habitat destruction

Eutrophication

Displacement

Climate change

Hunting

Changes in breeding areas

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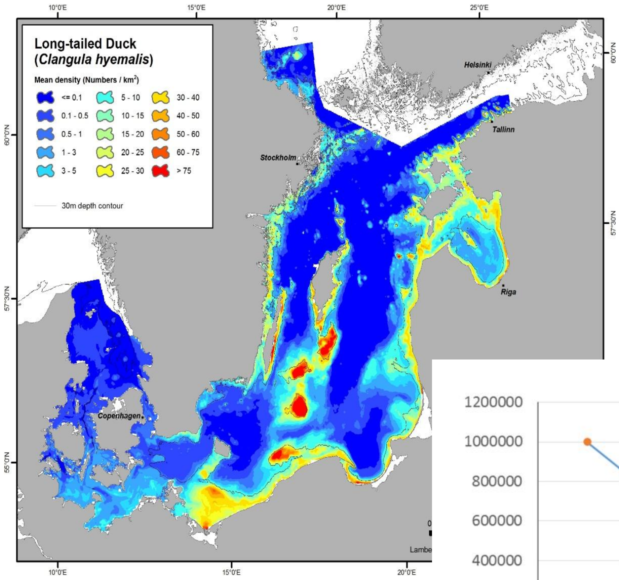
Case study – shipping & LTDs



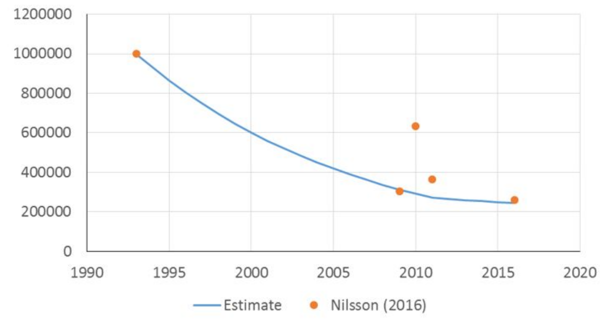
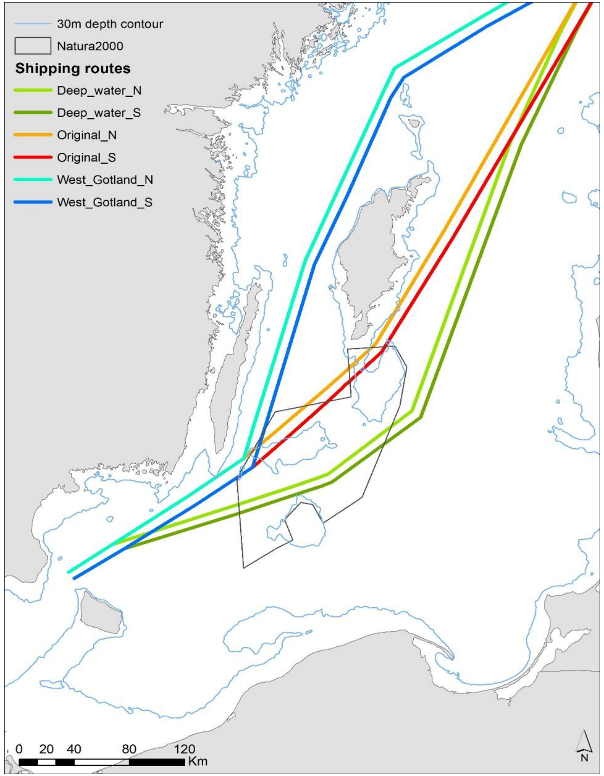


Figure 4.2 Counted birds on the Swedish offshore banks as reported by Nilsson (2016). The observed patterns fits a yearly population decline of 7% until 2012 and about 2% decline since 2012.



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Age structured population model

A population model (also called population viability analysis, PVA) is useful for predicting the growth rate and trend of a population over time based on a set of population parameters. Mortality and productivity are the fundamental components of the model and the balance between these two are summarised in the statistical term lambda (λ).

Lambda (rate of population change), λ =1-mortality rate + recruitment rate.

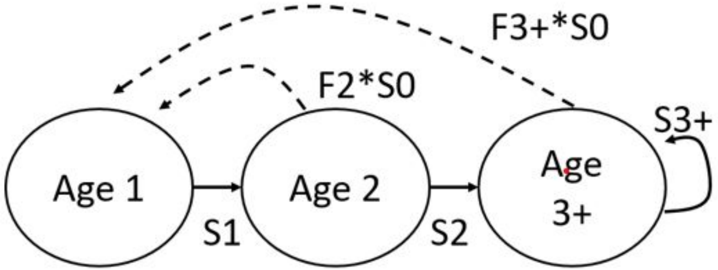


Figure 5.1 Flowchart of the age structured matrix model. S stand for survival and F for fecundity, because the model is a pre-breeding census model the survival of Age class 0 (which is never counted is inserted as a fecundity parameter, modified from Flint (2015).

$$\begin{array}{cc} & \begin{array}{cccc} \text{Age class 1} & \text{Age class 2} & \text{Age class 3} & \text{Age class 4} \end{array} \\ \boldsymbol{A} = & \begin{bmatrix} 0 & 1 & 1.5 & 1.2 \\ 0.8 & 0 & 0 & 0 \\ 0 & 0.5 & 0 & 0 \\ 0 & 0 & 0.25 & 0 \end{bmatrix} \end{array} \begin{array}{l} F \\ \times \\ \\ \\ \end{array}$$

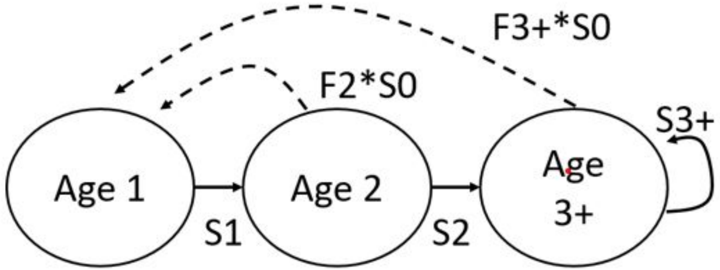
S

vector of population size

Age structured population model

A population model (also called population viability analysis, PVA) is useful for predicting the growth rate and trend of a population over time based on a set of population parameters. Mortality and productivity are the fundamental components of the model and the balance between these two are summarised in the statistical term lambda (λ).

Lambda (rate of population change), $\lambda = 1 - \text{mortality rate} + \text{recruitment rate}$.



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	Parameter	M1	M2	M3	Description	References
Mortality	Recurrent operational oil spills	0.035	as M1	0.02	0.11 on the Swedish offshore Banks, based on proportion in fishing nets.	M1: Larsson and Tydén 2005, M3: HaV rapport 2017
	Fishing bycatch	0.02	as M1	as M1	Assumed to be 2%, based on literature	Zydelis 2009, Bellebaum et al. 2013, Hearn et al. 2015
	Hunting	0.01	as M1	as M1	Based on hunting statistics	Hearn et al. 2015.
	Other mortality	0.095	as M1	as M1	"Estimated/assumed" to fit trend	Reviewed in Hearn et al. 2015
Survival	**Sub-adult survival**	0.74	as M1	0.755	10% less than adult survival	same ratio to adult as in Koneff et al. 2017
	Adult survival (1-mortaility)	0.84	as M1	0.855		Based on the mortality prop. listed

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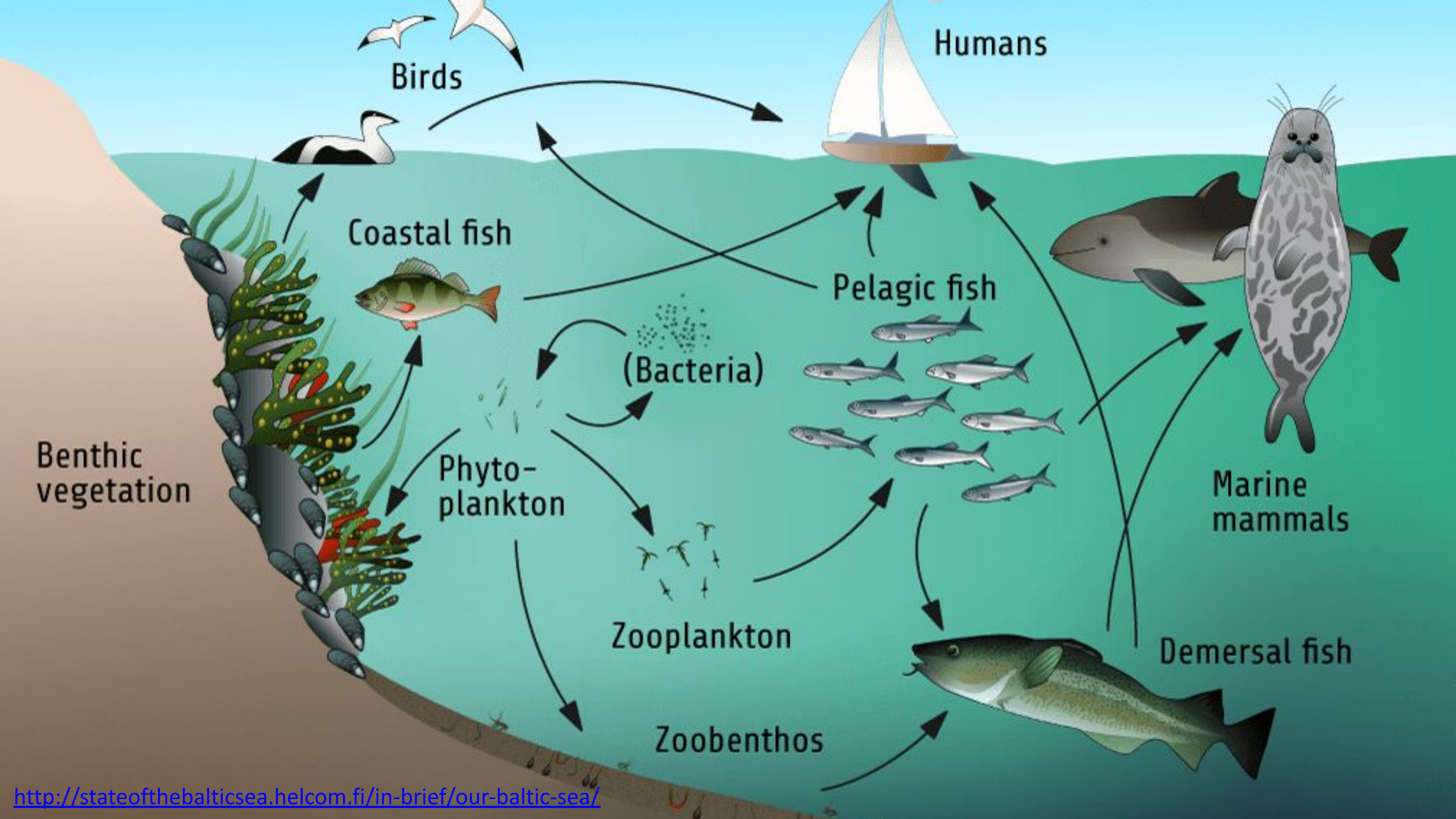
Results

Table 6.2 Estimated growth rate (Lambda) and predicted female population size in 2026, for each sub-model.

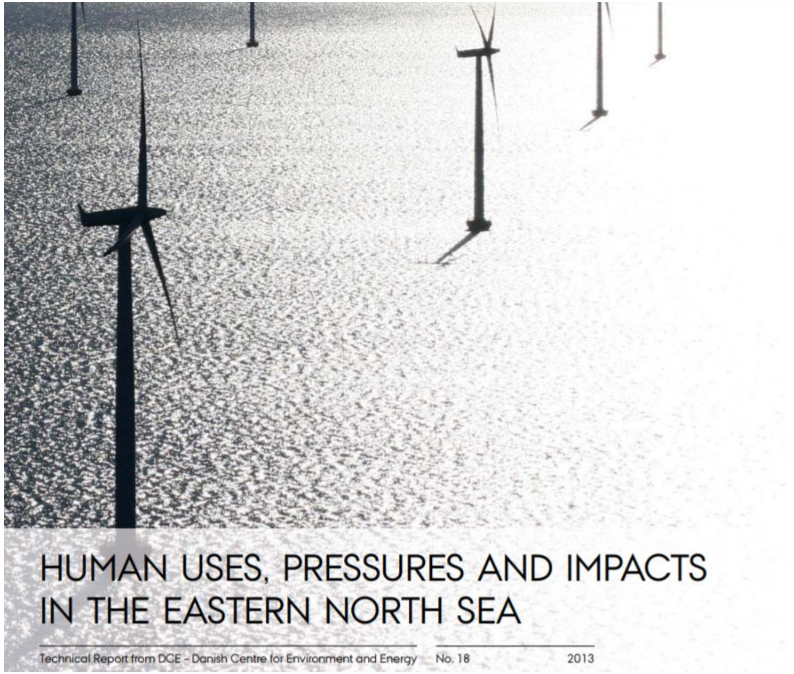
Model	Lambda	Estimated pop. size in 2026
M1: population parameters 1993-2012	0.928	155,836
M2: 2012->, increased fecund.	0.980	361,644
M3: 2012->, increased fecund. + lower oiling mortality	0.996	458,972
M2 + rerouted shipping	1.006	470,523
M3 + rerouted shipping	1.008	514,784



http://stateofthebalticsea.helcom.fi/in-brief/our-baltic-sea/

Holistic approach in “Harmony”

https://helcom.fi/media/publications/BSEP155.pdf



https://www.dmu.dk/Pub/TR18.pdf

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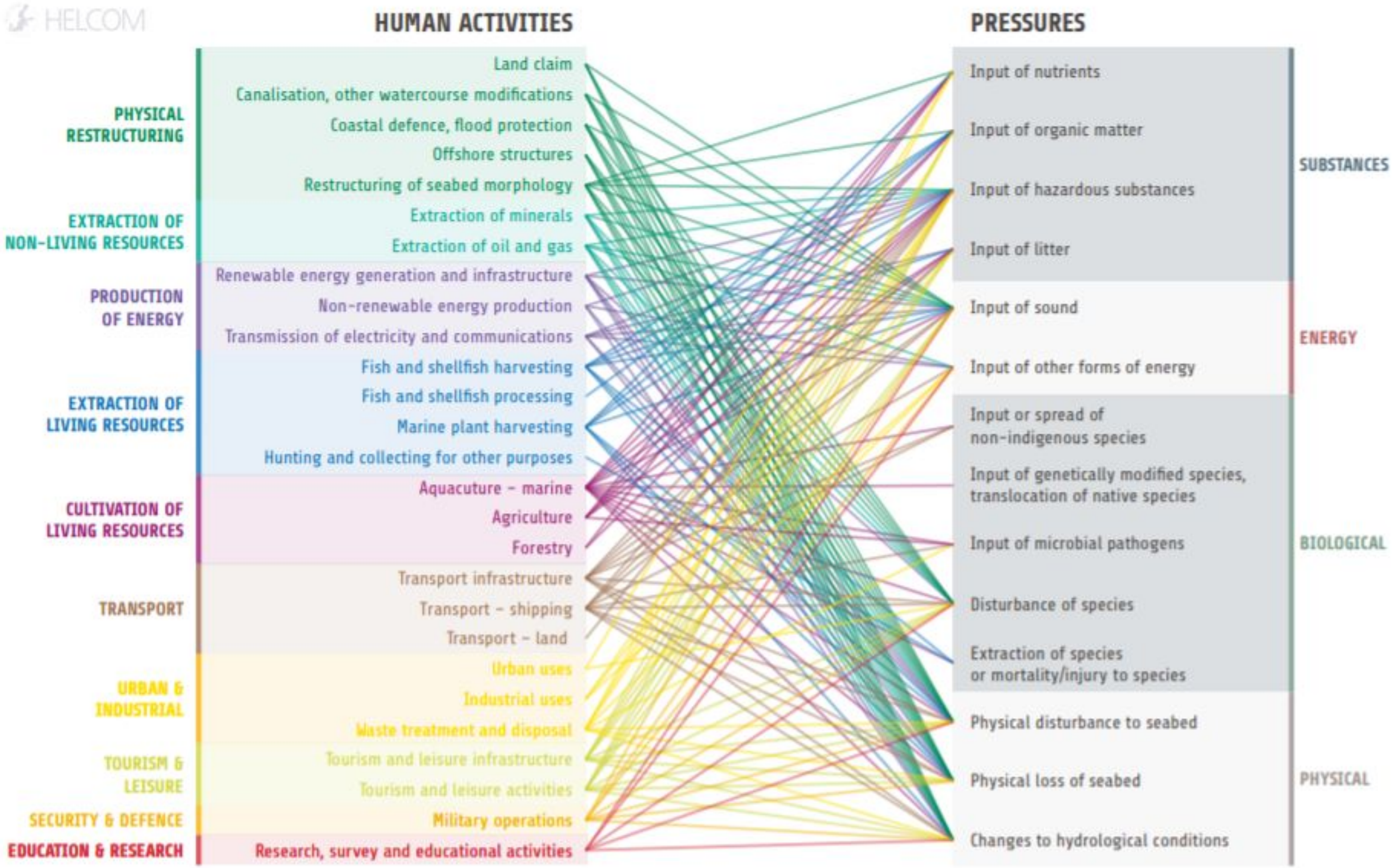


Figure 3.1.
Human activities in the Baltic Sea and their connection to pressure types. The lines show which pressures are potentially connected to a certain human activity, without inferring the pressure intensity nor potential impacts in each case. The figure illustrates the level of complexity involved in the management of environmental pressures.

https://helcom.fi/media/publications/BSEP155.pdf

Eutrophication

Baltic Sea unaffected by eutrophication

- Clear water
- Natural level of algal blooms
- Natural distribution and occurrence of plants and animals
- Natural oxygen levels

Biodiversity

Favourable status of Baltic Sea biodiversity

- Natural marine and coastal landscapes
- Thriving and balanced communities of plants and animals
- Viable populations of species

Hazardous substances

Baltic Sea undisturbed by hazardous substances

- Concentrations of hazardous substances close to natural levels
- All fish are safe to eat
- Healthy wildlife
- Radioactivity at the pre-Chernobyl level

Maritime activities

Enviromentally friendly maritime activities

- Enforcement of international regulations – no illegal discharges
- Safe maritime traffic without accidental pollution
- Efficient emergency and response capabilities
- Minimum sewage pollution from ships
- No introductions of alien species from ships
- Minimum air pollution from ships
- Zero discharges from offshore platforms
- Minimum threats from offshore installations

Figure 1.11.
The environmental objectives for the Baltic Sea Action Plan are structured around the segments eutrophication, hazardous substances, biodiversity, and maritime activities.

REVIEW ARTICLE
Front. Mar. Sci., 01 March 2016 | https://doi.org/10.3389/fmars.2016.00020

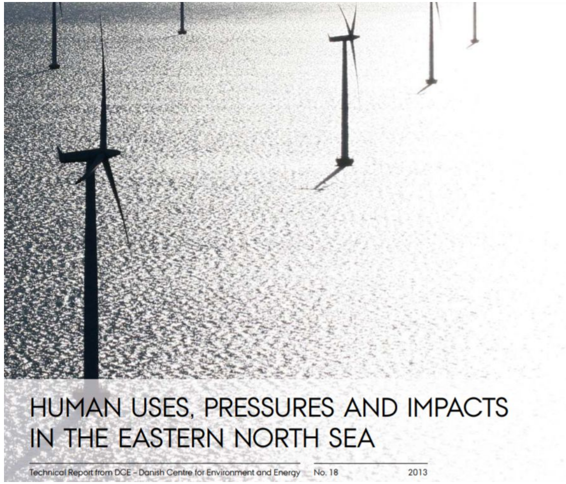
Check for updates

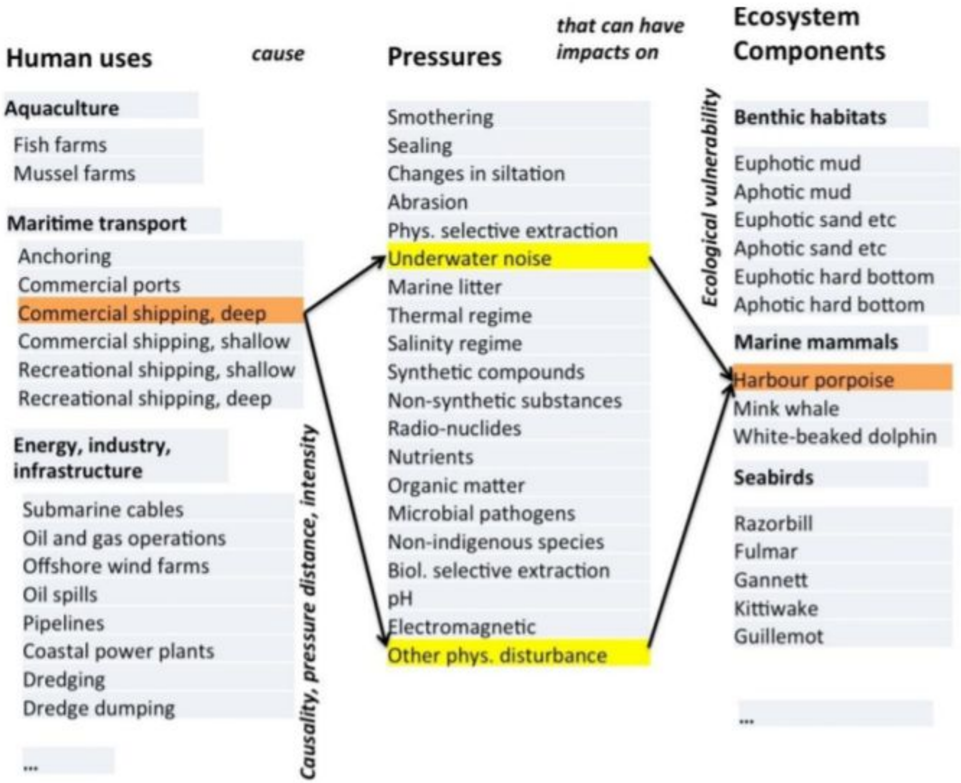
Overview of Integrative Assessment of Marine Systems: The Ecosystem Approach in Practice

Angel Borja[1*], Michael Elliott[2], Jesper H. Andersen[3], Torsten Berg[4], Jacob Carstensen[5], Benjamin S. Halpern[6,7,8], Anna-Stiina Heiskanen[9], Samuli Korpinen[9], Julia S. Stewart Lowndes[7], Georg Martin[10] and Naiara Rodriguez-Ezpeleta[1]

“To evaluate the health status of marine ecosystems we need a science-based, integrated Ecosystem Approach, that incorporates knowledge of ecosystem function and services provided that can be used to track how management decisions change the health of marine ecosystems”

“To undertake such an integrative assessment, it is necessary to understand the response of marine systems to human pressures”





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https://www.dmu.dk/Pub/TR18.pdf

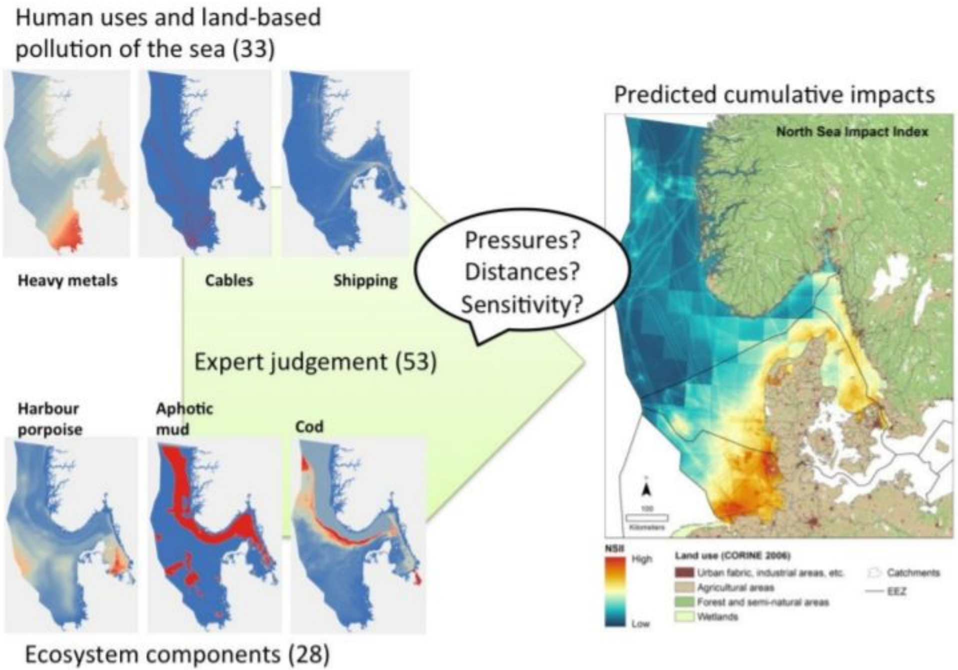
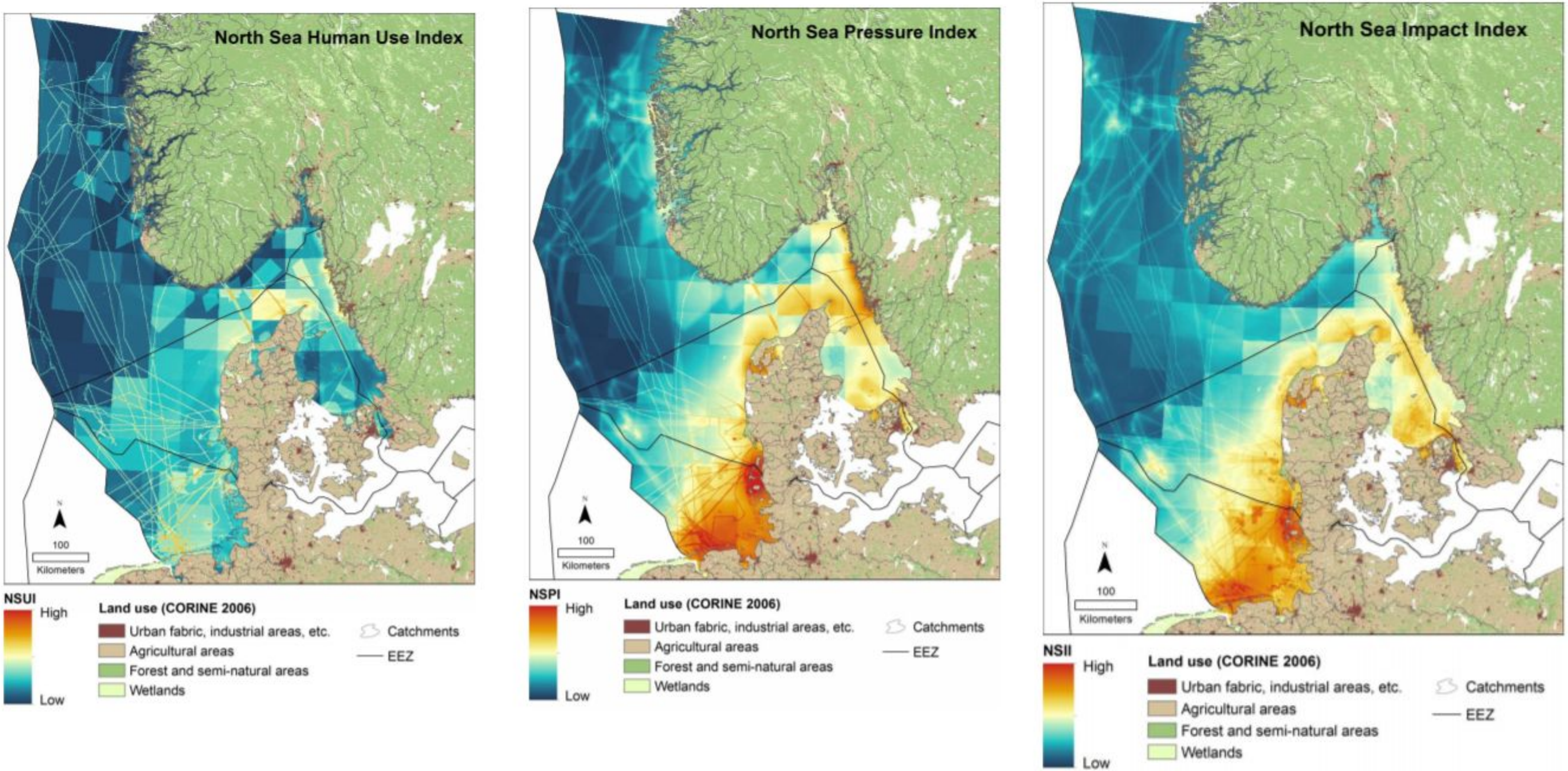


Figure 1. General approach: Expert judgement (involving individual replies by 53 experts) was used to combine data sets on the spatial distribution of 33 human maritime activities and types of land-based pollution (e.g. offshore oil and gas extraction, commercial fisheries using different gear types, and heavy metal pollution from land) with data on the spatial distribution of 28 ecosystem components, for example selected broad-scale seabed habitats, fish and marine mammal species.



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Global

IPBES is an independent intergovernmental body comprising over 130 member Governments. Established by Governments in 2012, IPBES provides policymakers with objective scientific assessments about the state of knowledge regarding the planet's biodiversity, ecosystems and the contributions they make to people, as well as options and actions to protect and sustainably use these vital natural assets.

https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf

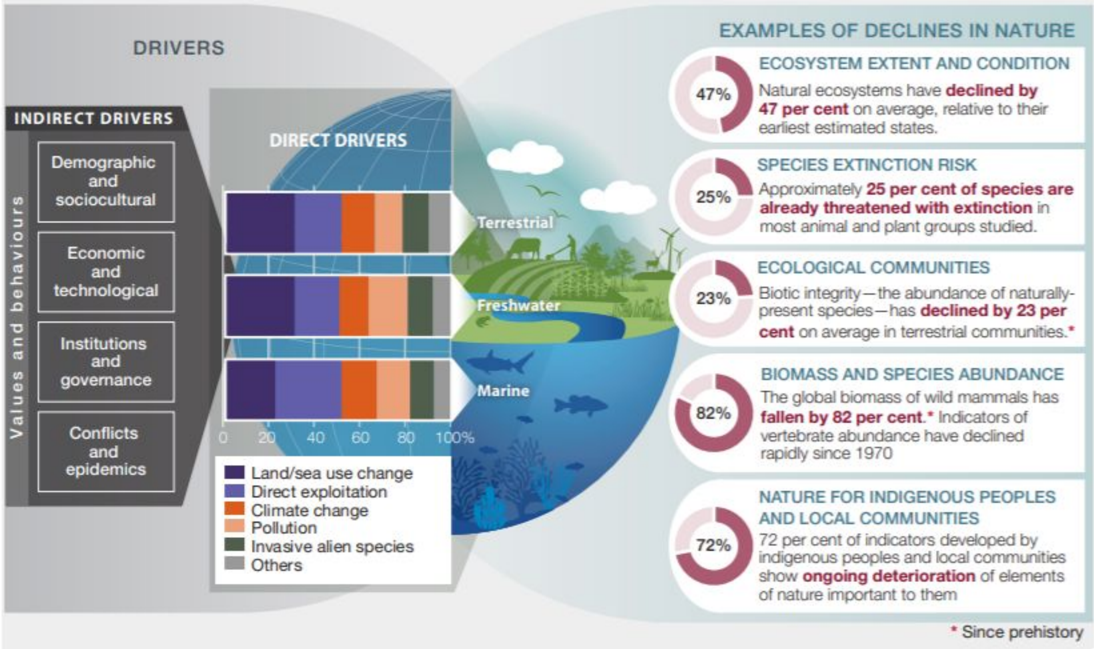

Figure SPM 2 **Examples of global declines in nature, emphasizing declines in biodiversity, that have been and are being caused by direct and indirect drivers of change.**

The direct drivers (land-/sea-use change; direct exploitation of organisms; climate change; pollution; and invasive alien species)[6] result from an array of underlying societal causes[7]. These causes can be demographic (e.g., human population dynamics), sociocultural (e.g., consumption patterns), economic (e.g., trade), technological, or relating to institutions, governance, conflicts and epidemics. They are called indirect drivers[8] and are underpinned by societal values and behaviours. The colour bands represent the relative global impact of direct drivers, from top to bottom, on terrestrial, freshwater and marine nature, as estimated from a global systematic review of studies published since 2005. Land- and sea-use change and direct exploitation account for more than 50 per cent of the global impact on land, in fresh water and in the sea, but each driver is dominant in certain contexts {2.2.6}. The circles illustrate the magnitude of the negative human impacts on a diverse selection of aspects of nature over a range of different time scales based on a global synthesis of indicators {2.2.5, 2.2.7}.

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Solutions

https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf

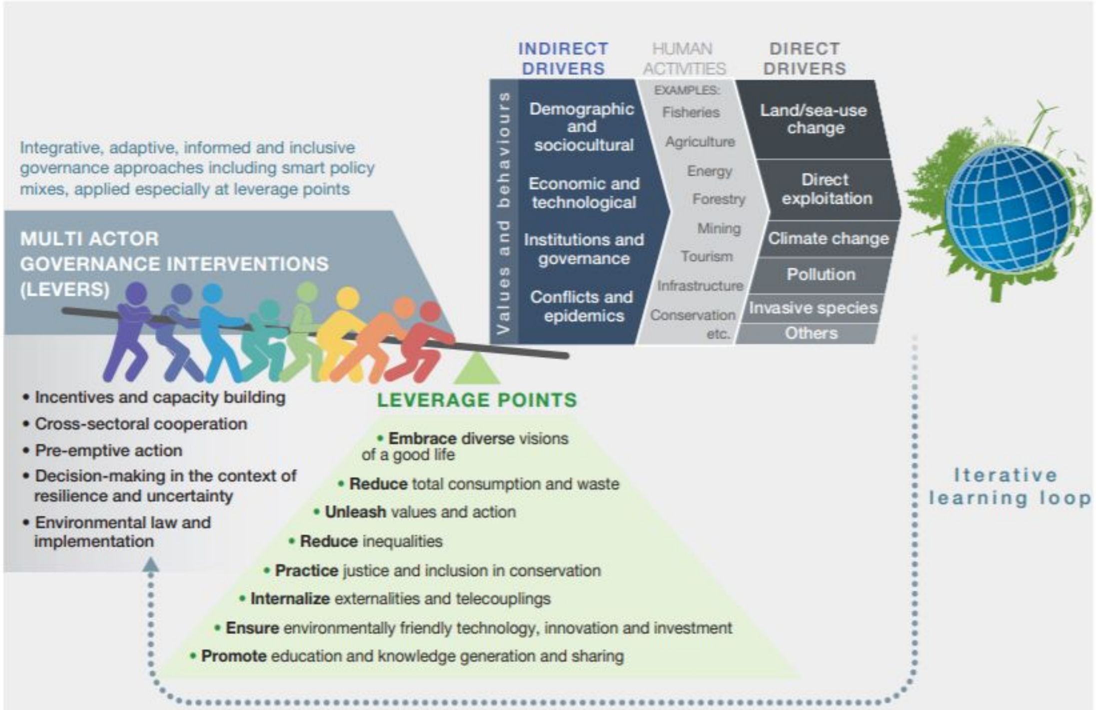

Figure SPM 9 **Transformative change in global sustainability pathways.**

Collaborative implementation of priority governance interventions (levers) targeting key points of intervention (leverage points) could enable transformative change from current trends towards more sustainable ones. Most levers can be applied at multiple leverage points by a range of actors, such as intergovernmental organizations, governments, non-governmental organizations, citizen and community groups, indigenous peoples and local communities, donor agencies, science and educational organizations, and the private sector, depending on the context. Implementing existing and new instruments through place-based governance interventions that are integrative, informed, inclusive and adaptive, using strategic policy mixes and learning from feedback, could enable global transformation.

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Sustainable Development

Figure 1. Sustainable development goals' icons, at https://sustainabledevelopment.un.org/post2015/transformingourworld.

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Solutions and SCM curriculum

- Conservation Biology
- Marine spatial planning
- Integrated coastal zone management (SCM)
    - International forestry & agriculture
- Innovations
- Fisheries resources management

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Human pressures and impacts in Pojo Bay?

Discuss in pairs

https://earth.google.com/web/@15.66051358,102.01424684,-200.01875842a,3777846.3670975d,35y,356.15958168h,0t,0r

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