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Baltic Sea Maritime Spatial Planning  
for Sustainable Ecosystem Services

# **A framework for sustainability impact assessment of plan proposals or scenarios**

**BASMATI final conference**

**Frederiksen, von Thenen, Armoskaite et al.**



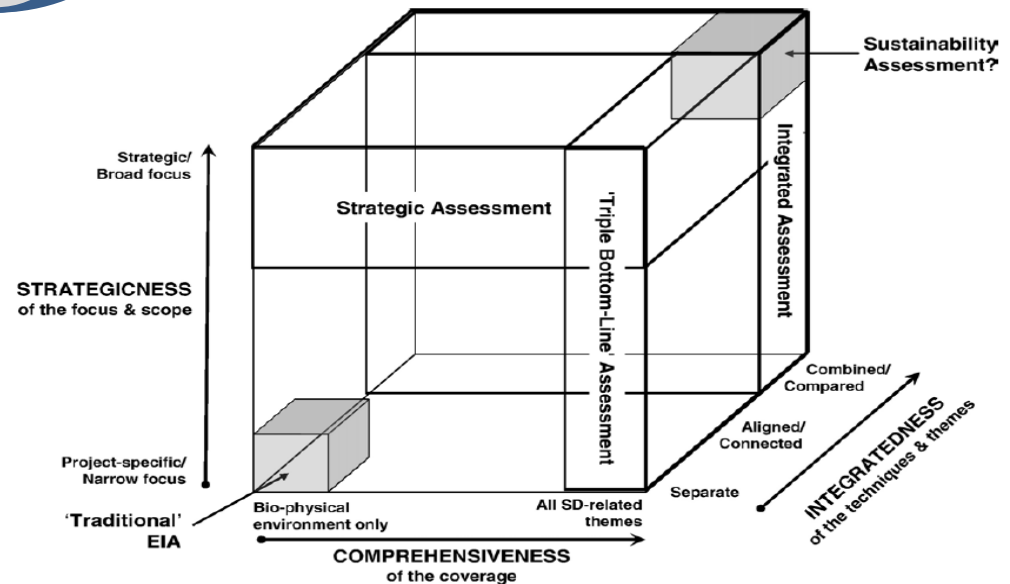
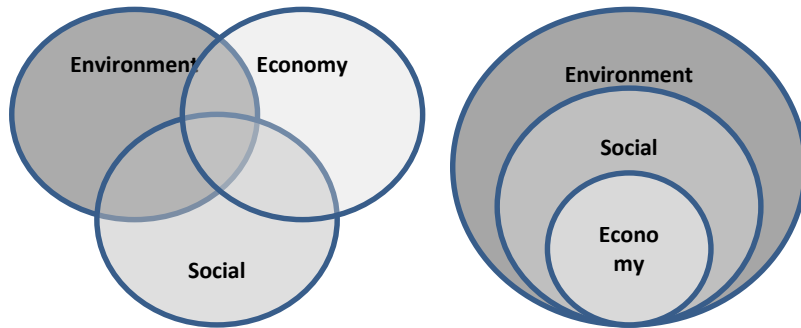
## Article 5 - objectives:

- When establishing and implementing maritime spatial planning, Member States shall consider economic, social and environmental aspects to support sustainable development and growth in the maritime sector, applying an ecosystem-based approach, and to promote the coexistence of relevant activities and uses

# Thinking about sustainability assessment



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Source: Hacking and Guthrie, 2008

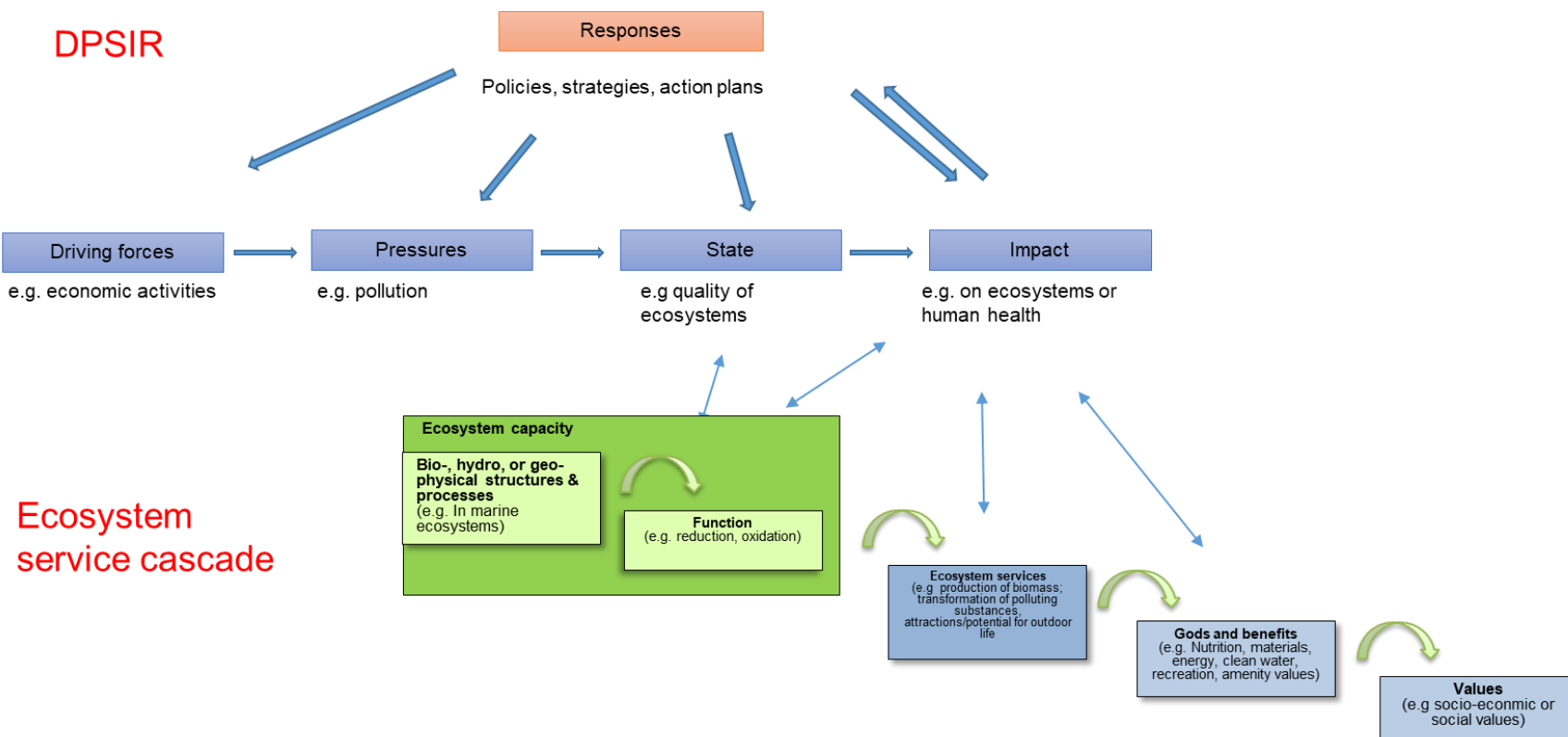


- Social justice: assessing distributional aspects of sea-based benefits and well-being
- Empowerment: including smaller and less organised stakeholders of sea use (physical interaction/recreation, identity/feeling of belonging, amenity, education/knowledge)

# Combination of frameworks



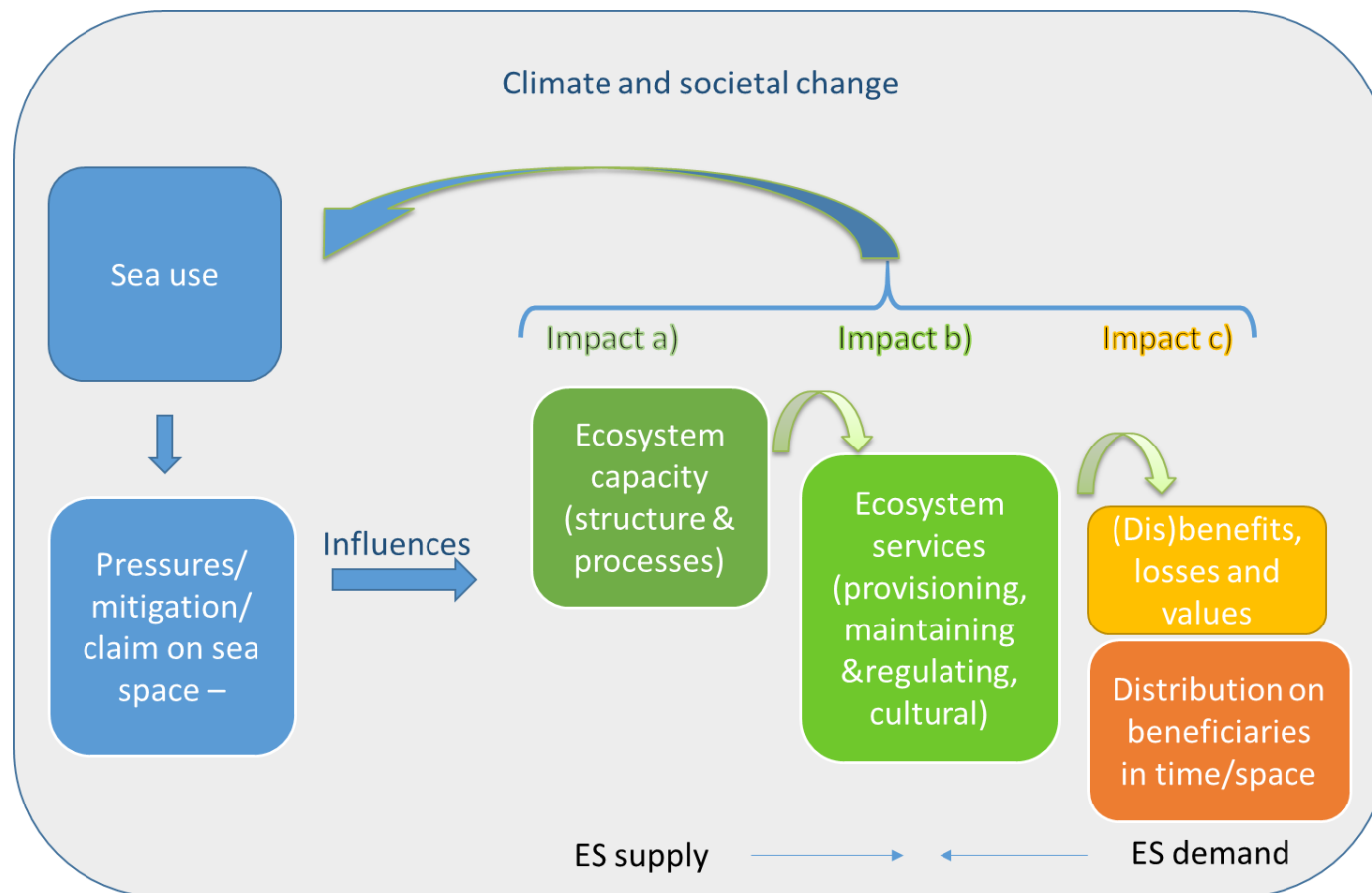
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# Proposed framework: the MSP-SA



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# The indicator pool



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A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
CICES filter						Indicator filter			Cascade filter				Quality criteria filter						
Filter	Section	Division	Group	Class	Code	Indicator theme	Indicator	Unit	Capacity	Service	Benefit	Value	Comment	Precision	Sensitivity	Specificity	Scalability	Transferability	Author
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Biomass/abundance	Seaweed stock (area, biomass)	km2, tonnes km-2	0	1	0	0		1	1	1	1	1	1 Hattam et al. 2015 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Quality of the bioma	Quality of seaweed stock	% affected by di	0	1	0	0		1	1	1	1	1	1 Hattam et al. 2015 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Biomass/abundance	No. of species (plants, algae from aq	No. km-2	0	1	0	0		1	1	1	1	1	1 Inácio et al. 2018 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Biomass/abundance	Cultured seaweed abundance		0	1	0	0		1	1	1	1	1	1 MAES (capacity)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Harvest/catch/landin	Harvest (plants, algae from aquacult	tonnes year-1 km	0	0	1	0		1	1	1	1	1	1 Inácio et al. 2018 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Harvest/catch/landin	Harvested cultured seaweed	tonnes year-1	0	0	1	0		1	1	1	1	1	1 MAES (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Economic value	Mariculture	mill US\$ year-1	0	0	0	1	Only an indica	1	1	1	1	1	1 Ghermandi et al. 2019 (E
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Sales/earnings/incom	Cultured seaweed sales	EUR year-1	0	0	0	1		1	1	1	1	1	1 MAES (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Sales/earnings/incom	Value of total aquaculture sales		0	0	0	1		1	1	1	1	1	1 Liqueite (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Economic value	Value of mangroves used for aquacu	USD ha-1 year-1	0	0	0	1		1	1	1	1	1	0 Liqueite (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.1	Biomass/abundance	Plants from in situ aquaculture	tonnes ha-1	0	1	0	0		1	1	1	1	1	1 Lillebo et al. 2017 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Biomass/abundance	Abundance/biomass	tonnes year-1	0	1	0	0		1	1	1	1	1	1 MAES (capacity)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Amount of patents/a	Active compounds for nutraceuticals; p	No. of licenced p	0	0	1	0		1	1	1	1	1	1 Lillebo et al. 2017 (bene
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Harvest/catch/landin	Commercial and/or artisanal landings	tonnes year-1	0	0	1	0		1	1	1	1	1	1 MAES (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Harvest/catch/landin	Harvest of materials from plants, and	tonnes year-1 km	0	0	1	0		1	1	1	1	1	1 Inácio et al. 2018 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Harvest/catch/landin	Harvest of materials from plants, and	tonnes year-1 km	0	0	1	0		1	1	1	1	1	1 Inácio et al. 2018 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Economic value	Net present values of drugs from ma	EUR year-1	0	0	0	1		1	1	1	1	1	1 MAES (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Economic value	Market value of seaweed	EUR year-1	0	0	0	1		1	1	1	1	1	1 MAES (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Economic value	Total value of seaweeds	GBP	0	0	0	1		1	1	1	1	1	1 Liqueite (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Economic value	Net value added of raw materials: se	EUR	0	0	0	1		1	1	1	1	1	1 Liqueite (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Sales/earnings/incom	Income related to seaweed farming	USD	0	0	0	1		1	1	1	1	1	1 Liqueite (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Employment/jobs	Employment linked to seaweed farming		0	0	1	0		1	1	1	1	1	1 Liqueite (benefit)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Fibres and other	1.1.2.2	Biomass/abundance	Fibbers and other materials from all t	tonnes ha-1	0	1	0	0		1	1	1	1	1	1 Lillebo et al. 2017 (ES)
CICES	Provisioning (Biotic)	Biomass	Cultivated m	Plants cultivated	1.1.2.3	Importance of the re	Social perception of energy provision	% respondents c	0	0	0	1		1	1	0	1	1	1 Liqueite (benefit)
CICES	Provisioning (Biotic)	Biomass	Reared marit	Animals reared t	1.1.4.1	Biomass/abundance	Fish and shellfish populations (bioma	tonnes km-2, no.	0	1	0	0		1	1	1	1	1	1 Hattam et al. 2015 (ES)
CICES	Provisioning (Biotic)	Biomass	Reared marit	Animals reared t	1.1.4.1	Quality of the bioma	Quality of the fish, shellfish	% affected by di	0	1	0	0		1	1	1	1	1	1 Hattam et al. 2015 (ES)
CICES	Provisioning (Biotic)	Biomass	Reared marit	Animals reared t	1.1.4.1	Biomass/abundance	No. of species (animals from aquacu	No. km-2	0	1	0	0		1	1	1	1	1	1 Inácio et al. 2018 (ES)
CICES	Provisioning (Biotic)	Biomass	Reared marit	Animals reared t	1.1.4.1	Harvest/catch/landin	Harvested fish and shellfish	tonnes year-1	0	0	1	0		1	1	1	1	1	1 MAES (ES)
CICES	Provisioning (Biotic)	Biomass	Reared marit	Animals reared t	1.1.4.1	Harvest/catch/landin	Harvest (animals from aquaculture)	tonnes year-1 km	0	0	1	0		1	1	1	1	1	1 Inácio et al. 2018 (ES)
CICES	Provisioning (Biotic)	Biomass	Reared marit	Animals reared t	1.1.4.1	Economic value	Mariculture	mill US\$ year-1	0	0	0	1	Only an indica	1	1	1	1	1	1 Ghermandi et al. 2019 (E

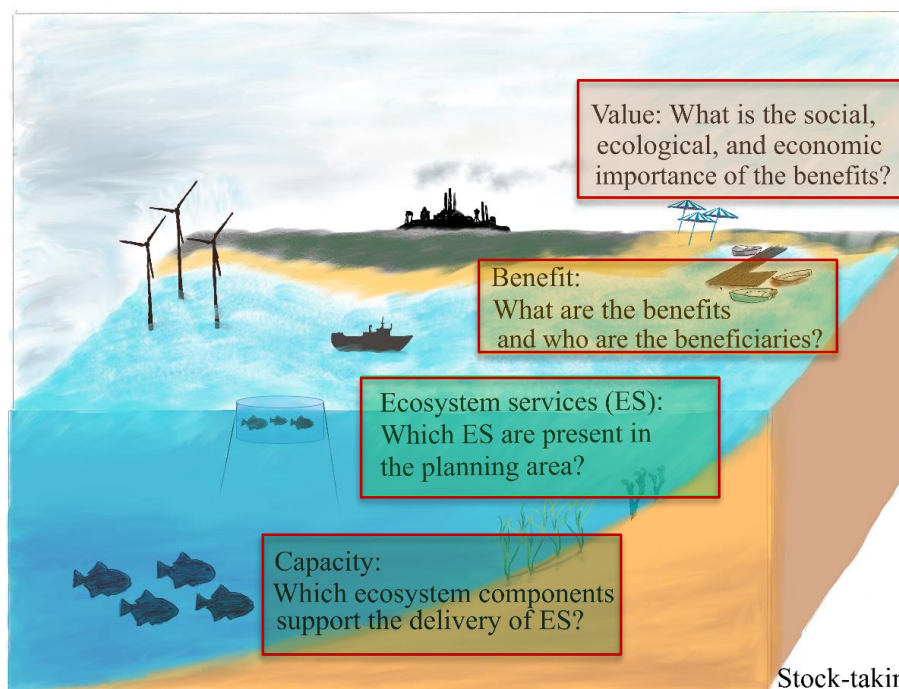


# The indicator pool



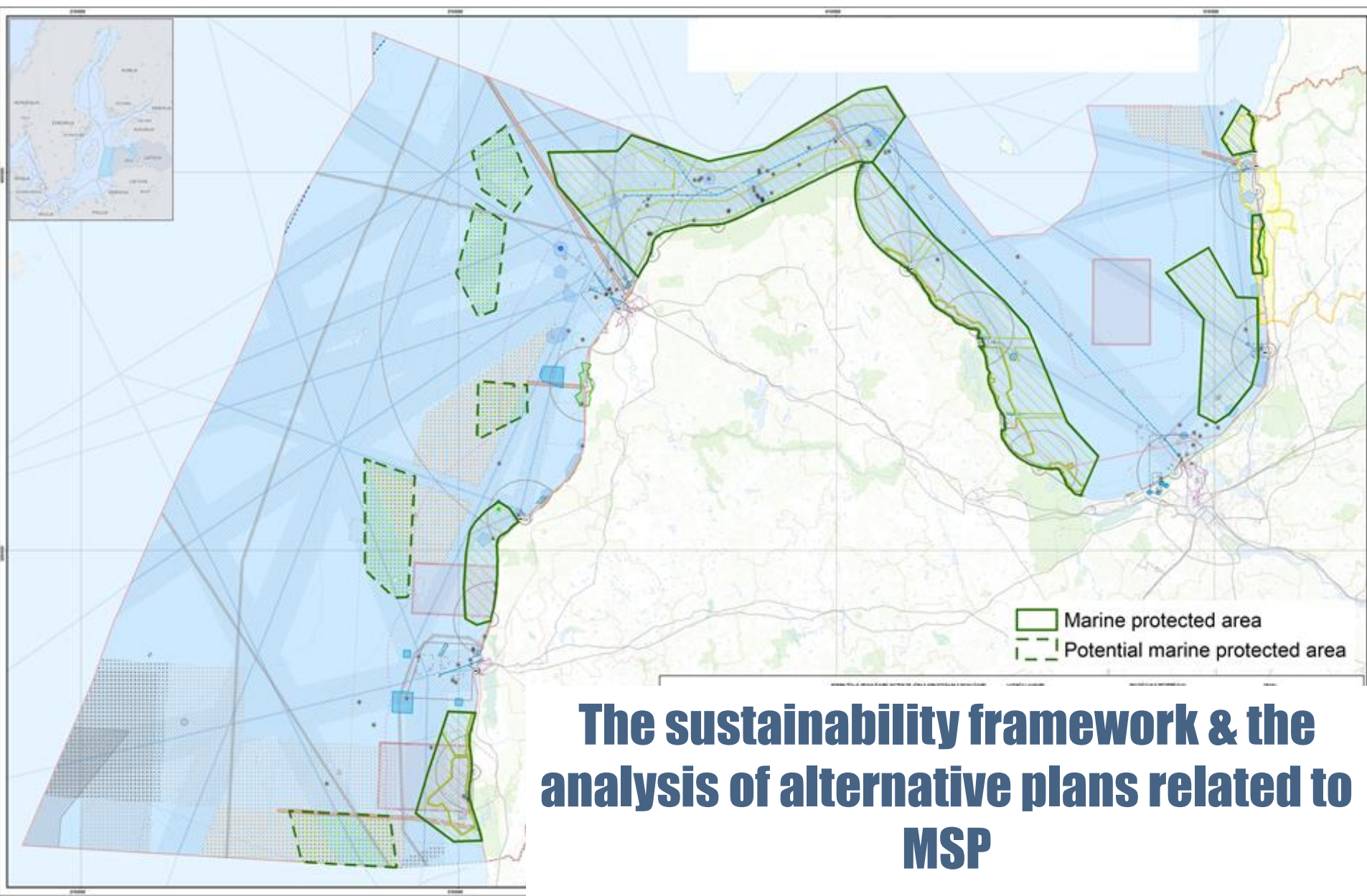
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CICES filter							Indicator filter			Cascade filter			
Section	Division	Group	Class	Code	Indicator	Unit	Capacity	Service	Benefit	Value			
Provisioning (Biotic)	Biomass	Cultivated ma	Plants cultivated b	1.1.2.1	Seaweed stock (area, biomass)	km2, tonnes km-2	0	1	0	0			
Provisioning (Biotic)	Biomass	Cultivated ma	Plants cultivated b	1.1.2.1	Quality of seaweed stock	% affected by dise	0	1	0	0			
Provisioning (Biotic)	Biomass	Cultivated ma	Plants cultivated b	1.1.2.1	No. of species (plants, algae from aqua	No. km-2	0	1	0	0			
Provisioning (Biotic)	Biomass	Cultivated ma	Plants cultivated b	1.1.2.1	Cultured seaweed abundance		0	1	0	0			
Provisioning (Biotic)	Biomass	Cultivated ma	Plants cultivated b	1.1.2.1	Harvest (plants, algae from aquaculture)	tonnes year-1 km-	0	0	1	0			
Provisioning (Biotic)	Biomass	Cultivated ma	Plants cultivated b	1.1.2.1	Harvested cultured seaweed	tonnes year-1	0	0	1	0			



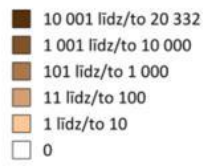
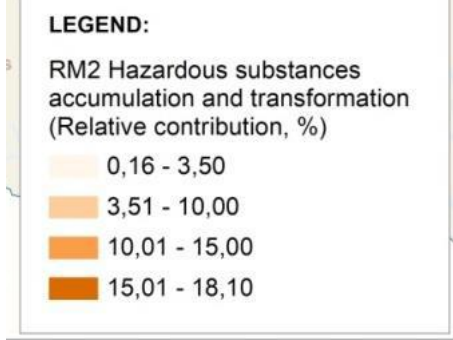
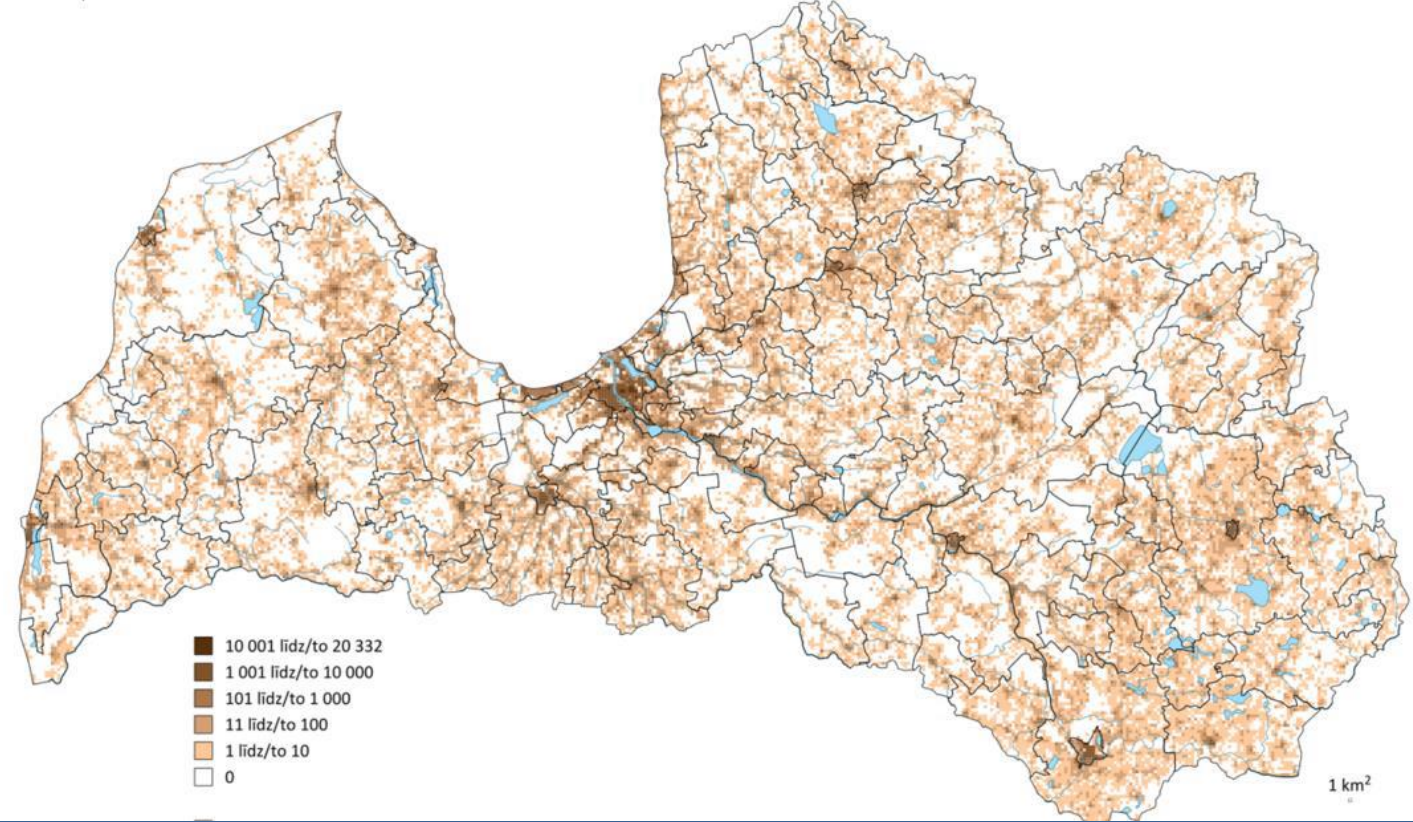
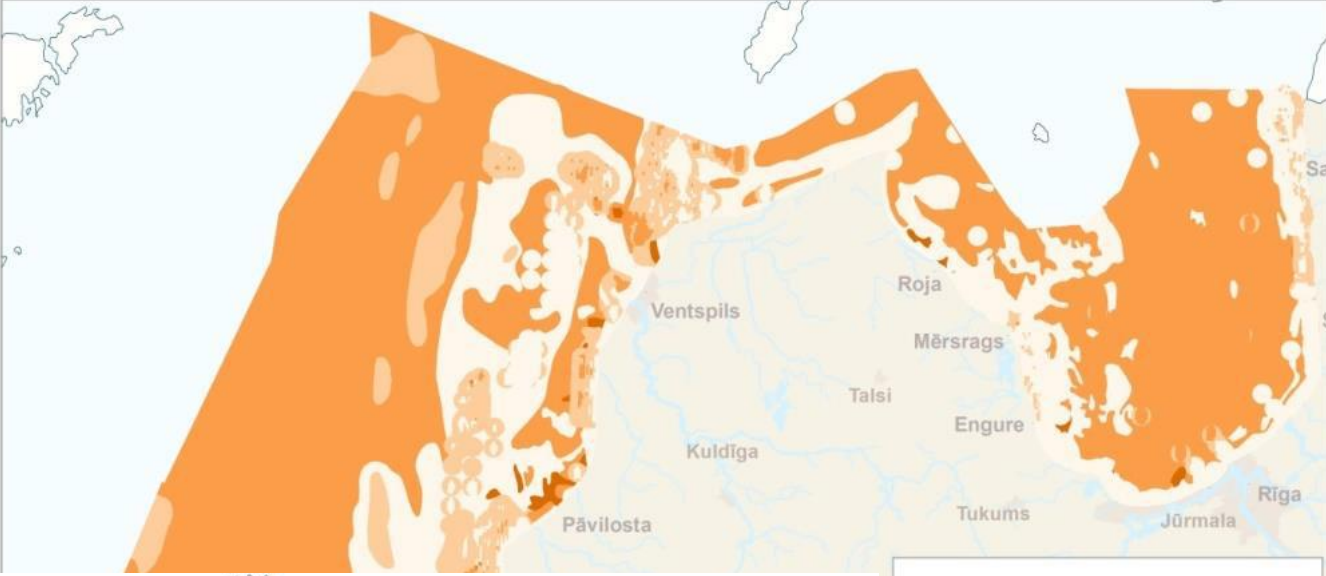
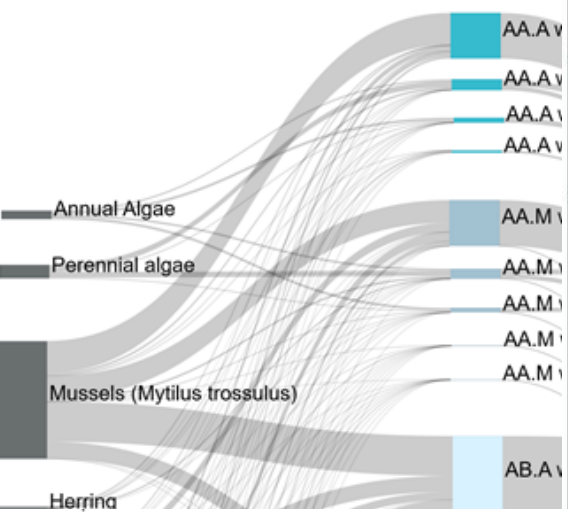
von Thenen et al. 2020





Species

Habitats



- Baltic photic sand
- Baltic aphotic sand
- †- Baltic aphotic muddy sediments
- ∇- Baltic Sea photic pelagic above halocline
- ∇- Baltic Sea aphotic pelagic above halocline



# Read more



1. von Thenen M., Frederiksen, P., Hansen H.S., Schiele K.S., 2020. A structured indicator pool to operationalize expert-based ecosystem service assessments for marine spatial planning. Ocean & Coastal Management.  
<https://doi.org/10.1016/j.ocecoaman.2019.105071>
2. Armoskaite, A., Puriņa, I., Aigars, J., Strāķe, S., Pakalniete, K., Frederiksen, P., Schröder, L., Hansen, H.S. 2020. Establishing the links between marine ecosystem components, functions and services: An ecosystem service assessment tool. Ocean & Coastal Management, 193, 105229, doi.org/10.1016/j.ocecoaman.2020.105229
3. Frederiksen P, Morf A, von Thenen M, Armoškaitė A, Luhtala H, Schiele K, Strāķe S, Hansen HS. (In review). Proposing an ecosystem services-based framework to assess sustainability impacts of maritime spatial plans (MSP-SA). Ocean & Coastal Management.



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