



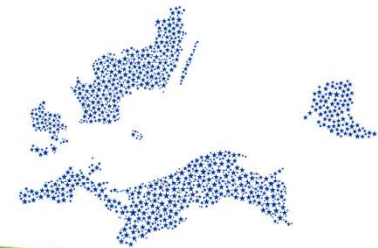
Cluster On Anaerobic digestion environmental Services and nuTrients removal

Potential and policy frameworks

(Diana Šarauskienė, Vytautas Akstinas, Aldona Jurgelėnaitė and Diana Meilutytė-Lukauskienė)

<https://www.coastal-biogas.eu/publications/>

Vytautas Akstinas
Lithuanian Energy Institute
4TH CONFERENCE,
9 December, 2020



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Study area

Baltic Sea

Surface area

375,000 - 420,000 km²

Catchment area

1.7 millions km²

Average depth

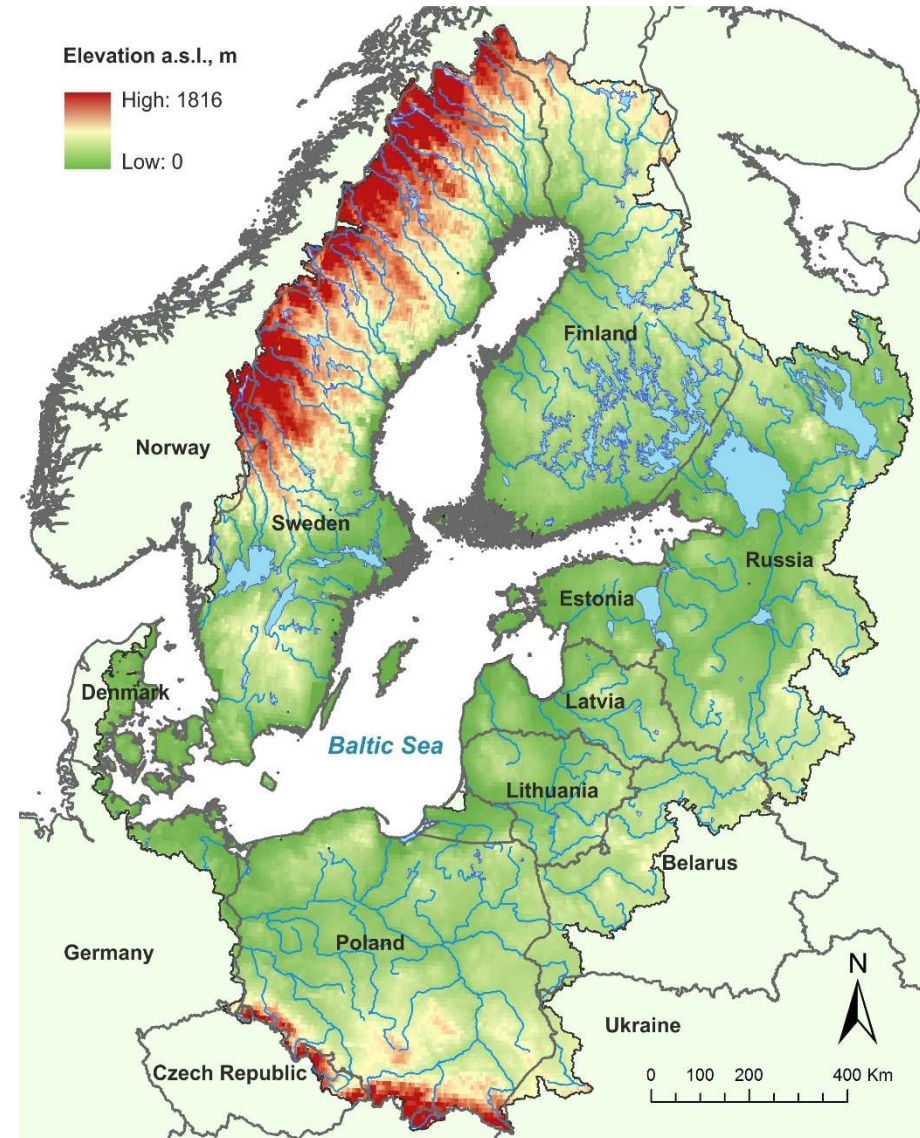
55 m

Max depth

459 m

Five biggest rivers

Neva, Vistula, Oder,
Nemunas, Daugava



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Research issue

Eutrophication in the Baltic Sea

- 75% of N and 95-99% of P enter from rivers and direct point sources
- At least 97% of the sea area was assessed as eutrophied in 2011–2016

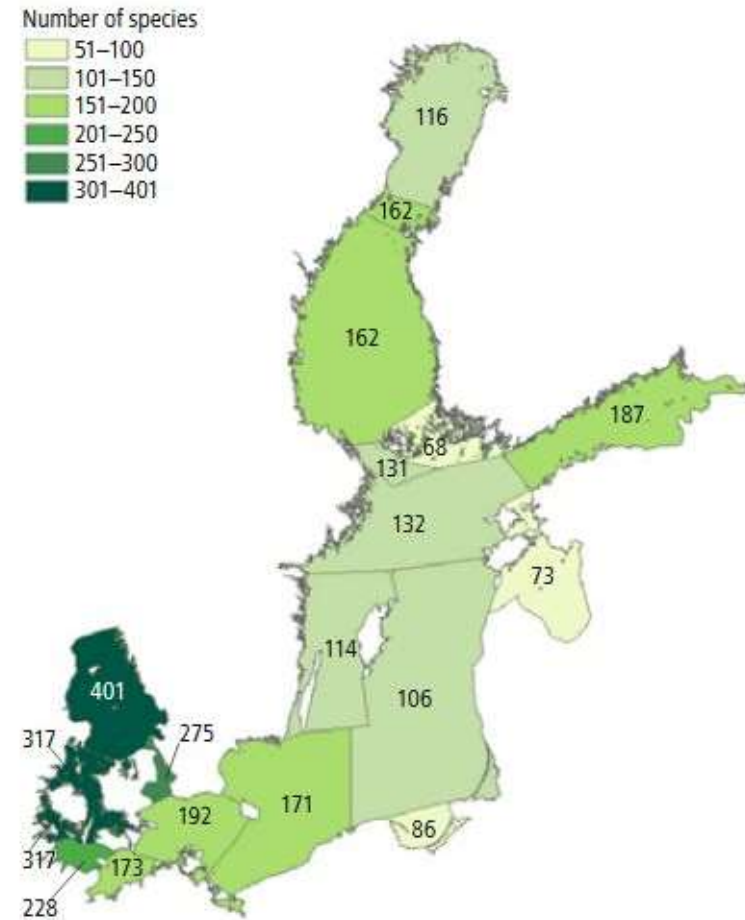
Nutrient loads

N

- Poland (34%)
- Sweden (13%)
- Russia (12%)
- Latvia (10%)

P

- Poland (41%)
- Russia (17%)
- Sweden (10%)
- Latvia (9%)



Number of macrophyte species per Baltic Sea ^[1]

^[1] HELCOM 2012: Checklist of Baltic Sea Macro-species. Baltic Sea Environment. Baltic Sea Environmental Proceedings No. 130: <http://www.helcom.fi/Lists/Publications/BSEP130.pdf>

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Research interest

Macroalgae

a)



b)



c)



d)



a) *Fucus vesiculosus* (brown algae) [2];
c) *Furcellaria lumbricalis* (red algae) [4];

b) *Cladophora glomerata* (green algae) [3];
d) *Zostera marina* (eelgrass) [2]

[2] Blinova E. I. Seaweeds and seagrasses of the European part of Russia (flora, distribution, biology, resources, mariculture). Moscow: VNIRO Publishing, 2007. ISBN 978-5-85382-331-0.

[3] Peerapornpisal Y., Amornleedpison D., Rujjanawate C., Ruangrita K. and Kanjanapothi D. (2006) Two Endemic Species of Macroalgae in Nan River, Northern Thailand, as Therapeutic Agents. ScienceAsia, 32(1), 71-76. DOI:10.2306/scienceasia1513-1874.2006.32(s1).071.

[4] <https://botany.natur.cuni.cz/algo/images/Hiddensee2012/macro/furcellarialumbricalis.html>

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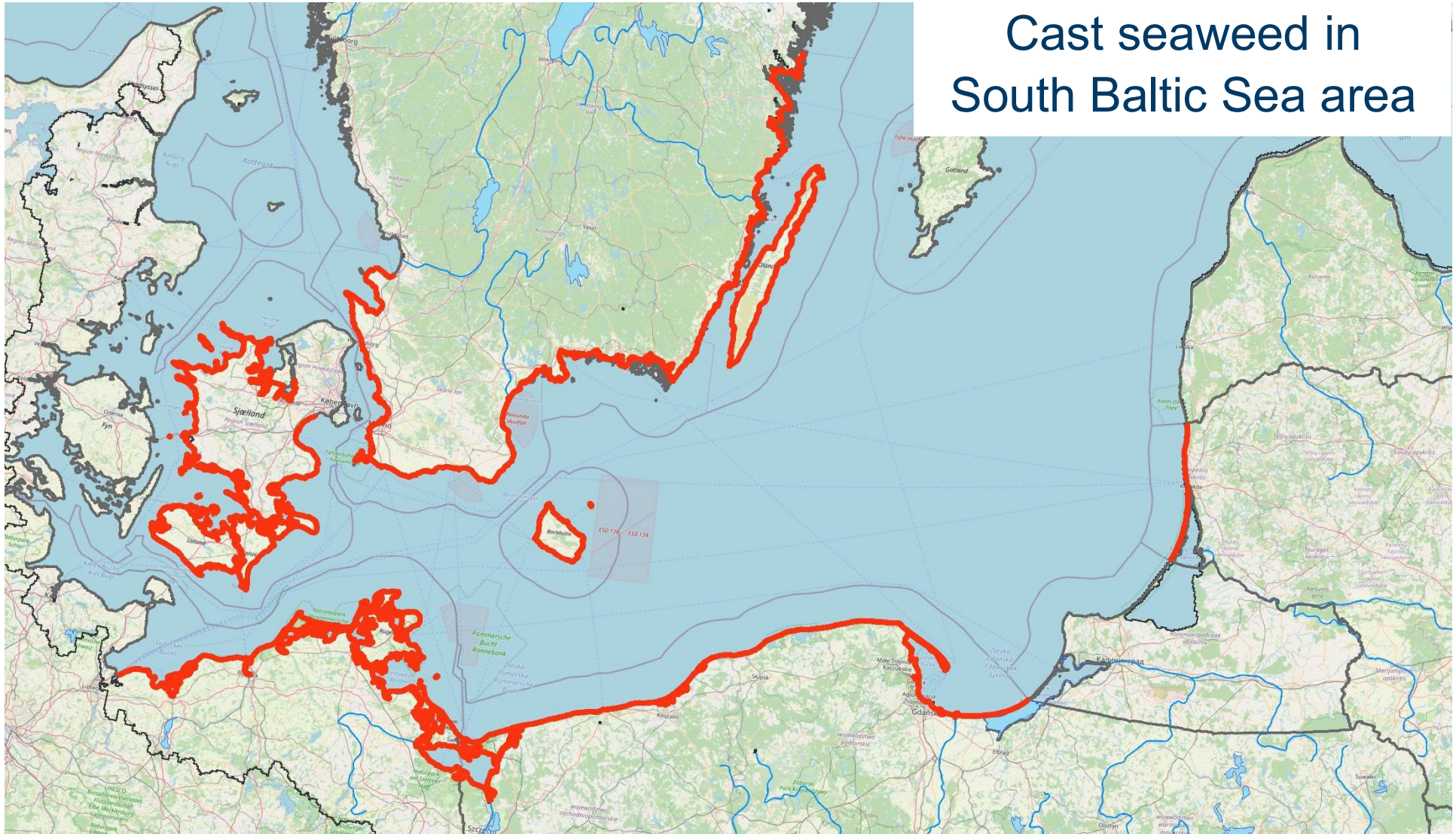
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Research object

Cast seaweed in
South Baltic Sea area



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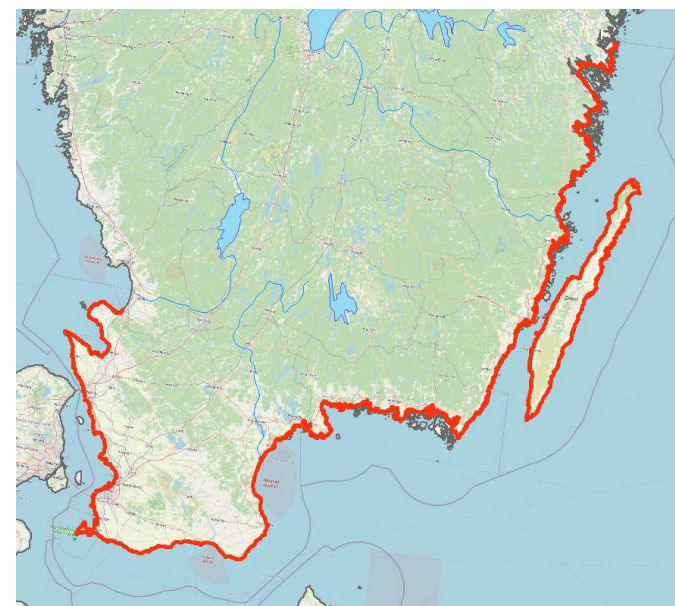
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Cast seaweed potential in Sweden

Country	Scale	Available annual data (t/a)	Seaweed amount (t/km/a)	Coastline with/ without protected areas (km)	Theoretical potential of seaweed (with protected areas) (t/a)	Theoretical potential of seaweed (without protected areas) (t/a)
Sweden	Trelleborg coast (Stavsten-Skateholm) (17 km) ^[5]	10,500 ^[5]	617			
	Scania 35.6 km ^[6]	21,902 (2014) ^[6]	615		83,100 ^[6]	63,600 ^[6]
	Country ^[8]		615	1,590/960 ^[7]	978,000 ^[8]	590,000 ^[8]



^[5] Tatarchenko O. Assessment of macroalgae harvesting from the Baltic sea from an energy balance perspective. Master of Science Thesis. Stockholm, 2011: <https://www.diva-portal.org/smash/get/diva2:579473/FULLTEXT01.pdf>

^[6] BUCEFALOS Project: https://utveckling.skane.se/siteassets/publikationer_dokument/biogaspotential-fran-akvatiska-substrat-i-skane_del1.pdf

^[7] GIS data

^[8] Cluster On Anaerobic digestion, environmental Services and nuTrients removal (COSATAL Biogas). Project. <https://www.coastal-biogas.eu/publications/>

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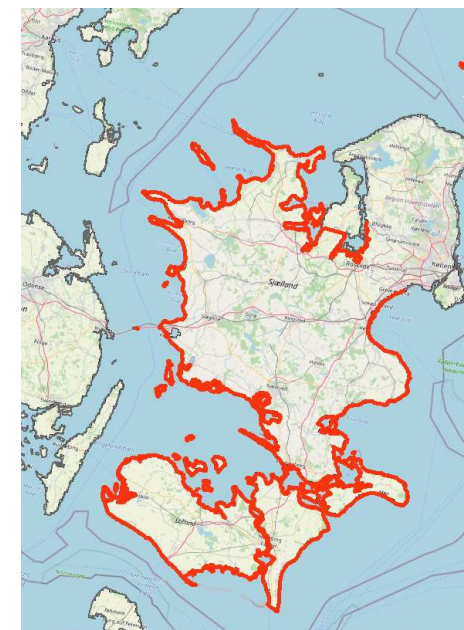
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Cast seaweed potential in Denmark

Country	Scale	Available annual data (t/a)	Seaweed amount (t/km/a)	Coastline with/without protected areas (km)	Theoretical potential of seaweed (with protected areas) (t/a)	Theoretical potential of seaweed (without protected areas) (t/a)
Denmark	Solrød municipality (3.7 km) ^[9]	1,500 ^[9] Up to 4,000 (2009) ^[9]	405 1081			
	Køge Bay (38.6 km) ^[9]	7,000 ^[10]	181			
	Country ^[10]		4-500 ^[10]		1,200,000 ^[10]	420,000 ^[10]
	Country ^[8]		405	1,962/1,611 ^[10]	795,000 ^[8]	652,000 ^[8]



^[8] Cluster On Anaerobic digestion, environmental Services and nuTrients removal. Project. <https://www.coastal-biogas.eu/publications/>

^[9] Anaerobic Co-digestion of Cast Seaweed and Organic. Project. <https://energiforskning.dk/sites/energiteknologi.dk/files/slutrapporter/12097slutrapport-12097.pdf>

^[10] Project partner data (Roskilde University)

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Cast seaweed potential in Germany

Country	Scale	Available annual data (t/a)	Seaweed amount (t/km/a)	Coastline with/ without protected areas (km)	Theoretical potential of seaweed (with protected areas) (t/a)	Theoretical potential of seaweed (without protected areas) (t/a)
Germany	Managed beaches (350 km) ^[11]	17,500 ^[11]	50 ^[11]			
	Country ^[8]		50 ^[11]	377/306 ^[11]	19,000 ^[8]	15,300 ^[8]



^[8] Cluster On Anaerobic digestion, environmental Services and nuTrients removal. Project. <https://www.coastal-biogas.eu/publications/>

^[11] Landtag Mecklenburg-Vorpommern, Wahlperiode 7, Drucksache 7/191, 13.02.2017: Kleine Anfrage des Abgeordneten Dr. Wolfgang Weiß, Fraktion DIE LINKE, Entsorgung oder Verwertung von Seegrass und anderem Treibgut. <http://www.dokumentation.landtag-mv.de/Parldok/dokument/38809/entsorgung-oder-verwertung-von-seegrass-und-anderem-strandgut.pdf>

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Cast seaweed potential in Poland

Country	Scale	Available annual data (t/a)	Seaweed amount (t/km/a)	Coastline with/ without protected areas (km)	Theoretical potential of seaweed (with protected areas) (t/a)	Theoretical potential of seaweed (without protected areas) (t/a)
Poland	Sopot (4.5 km) [12]	400 (2011) [12]	88			
	Gulf of Gdansk (~150 km) [12]	800-1000 [13]				
	Country [14]		22 [14]	770/440 [14]	17,000 [14]	9,500 [14]



[12] Bucholc K., Szymczak-Żyła M., Lubecki L., Zamojska A., Hapter P., Tjernström E., Kowalewska G. Nutrient content in macrophyta collected from southern Baltic Sea beaches in relation to eutrophication and biogas production. *Science of the Total Environment* 473–474 (2014) 298–307. <https://doi.org/10.1016/j.scitotenv.2013.12.044>

[13] WAB (Wetlands, Algae and Biogas – a southern Baltic Sea Eutrophication Counteract Project, 2010 – 2012). Technological solutions for the collection and removal of algae from the beach, sea and coastal strip in Trelleborg Municipality. <http://wabproject.pl>

[14] Project partner data (Gdansk University of Technology)

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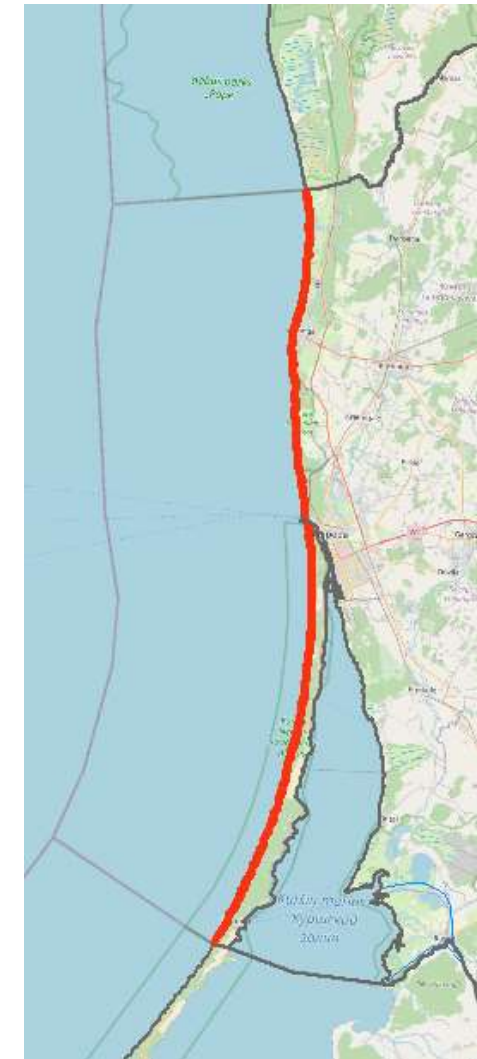
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Cast seaweed potential in Lithuania

Country	Scale	Available annual data (t/a)	Seaweed amount (t/km/a)	Coastline with/without protected areas (km)	Theoretical potential of seaweed (with protected areas) (t/a)	Theoretical potential of seaweed (without protected areas) (t/a)
Lithuania	Palanga municipality (25 km) [15]	50 (2018) [15]	2 [15] Up to 400 (2010) [16]			
	Country [8]		2	95/27 [17]	190 [8]	54 [8]



[8] Cluster On Anaerobic digestion, environmental Services and nuTrients removal. Project. <https://www.coastal-biogas.eu/publications/>

[15] Data from Palanga City municipality

[16] Unseen abundance of algae in Palanga beach: <https://www.delfi.lt/grynas/gamta/palangos-papludimyje-neregeta-gausybe-dumbliu.d?id=36065449>

[17] GIS data

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Total cast seaweed potential in South Baltic Sea region

Country	Seaweed amount (t/km/a)	Coastline with/ without protected areas (km)	Theoretical potential of seaweed (with protected areas) (t/a)	Theoretical potential of seaweed (without protected areas) (t/a)
Sweden	615 ^{[5], [6]}	1,590/960 ^[7]	978,000 ^[8]	590,000 ^[8]
Denmark	4-500 ^[10]		1,200,000 ^[10]	420,000 ^[10]
	405 ^[9]	1,962/1,611	795,000 ^[8]	652,000 ^[8]
Germany	50 ^[11]	377/306	19,000 ^[8]	15,300 ^[8]
Poland	22 ^[14]	770/440	17,000 ^[14]	9,500 ^[14]
Lithuania	2 ^[15]	95/27 ^[7]	190 ^[8]	54 ^[8]
Total		4,794/3,344	1,809,190 ^[8]	1,266,854 ^[8]

^[5] Tatarchenko O. Assessment of macroalgae harvesting from the Baltic sea from an energy balance perspective.

Master of Science Thesis. Stockholm, 2011: <https://www.diva-portal.org/smash/get/diva2:579473/FULLTEXT01.pdf>

^[6] BUCEFALOS Project: https://utveckling.skane.se/siteassets/publikationer_dokument/biogaspotential-fran-akvatiska-substrat-i-skane_del1.pdf

^[7] GIS data

^[8] Cluster On Anaerobic digestion, environmental Services and nuTrients removal. Project. <https://www.coastal-biogas.eu/publications/>

^[9] Anaerobic Co-digestion of Cast Seaweed and Organic. Project. <https://energiforskning.dk/sites/energiteknologi.dk/files/slutrappporter/12097slutrapport-12097.pdf>

^[10] Project partner data (Roskilde University)

^[11] Landtag Mecklenburg-Vorpommern, Wahlperiode 7, Drucksache 7/191, 13.02.2017: Kleine Anfrage des Abgeordneten Dr. Wolfgang Weiß, Fraktion DIE LINKE, Entsorgung oder Verwertung von Seegras und anderem Treibgut. <http://www.dokumentation.landtag-mv.de/Parldok/dokument/38809/entsorgung-oder-verwertung-von-seegras-und-anderem-strandgut.pdf>

^[14] Project partner data (Gdansk University of Technology)

^[15] Data from Palanga City municipality

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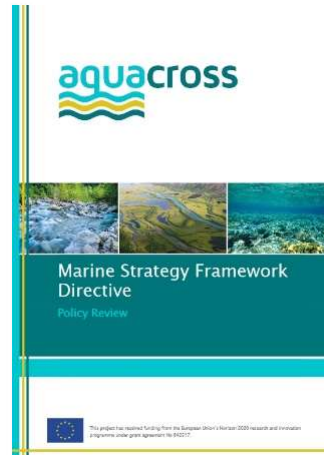


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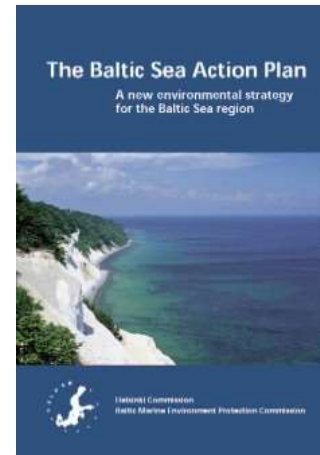
Policy frameworks regarding coastal protection



[16]



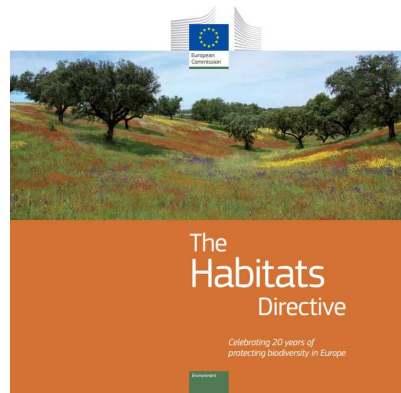
[17]



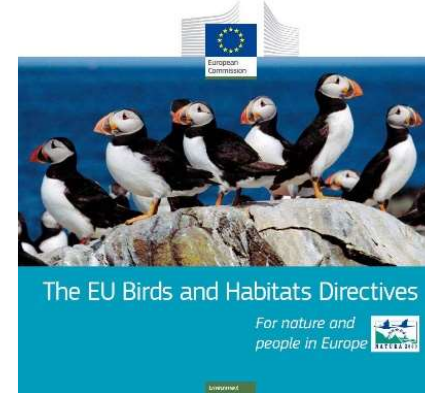
[18]



[19]



[20]



[21]

[16] <https://www.iwapublishing.com/books/9781900222129/eu-water-framework-directive>

[17] <https://www.ecologic.eu/15765>

[18] http://archive.iwlearn.net/helcom.fi/press_office/news_helcom/en_GB/BSAPbrochureRelease/indexa351.html?u4.highlight=action%20plan

[19] <https://ec.europa.eu/environment/pubs/pdf/factsheets/nitrates.pdf>

[20] <https://ec.europa.eu/environment/nature/info/pubs/docs/brochures/20years/en.pdf>

[21] <https://verde.ie/blog-post/conserving-europes-nature-the-eu-birds-and-habitats-directives/>

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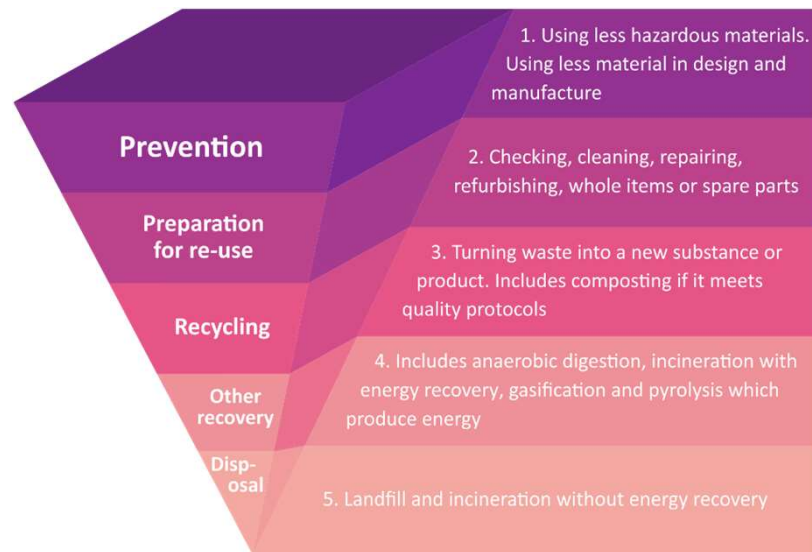


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Policy frameworks regarding use of seaweed as a potential feedstock for 'green energy' production



The hierarchy of waste prevention and management in EU legislation and policy of Waste Framework Directive

- Waste Framework Directive (2008/98/EC)
- Landfill Directive (1999/31/EC)
- Danish Waste to Soil Regulation
- Germany Bio-waste Ordinance
- Germany Fertiliser Ordinance

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Regulations on biogas plant establishment

Documents	
Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources	
Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing:	Directives 2001/77/EC and 2003/30/EC
Directive (EU) 2018/2002 amending:	Directive 2012/27/EU on energy efficiency amending: a) and repealing: b)
	a) Directives 2009/125/EC and 2010/30/EU b) Directives 2004/8/EC and 2006/32/EC
Directive (EU) 2018/851 amending:	Directive 2008/98/EC on wastes
Directive (EU) 2018/850 amending:	Directive 1999/31/EC on the landfill of waste
Directive (EU) 2019/692 amending:	Directive 2009/73/EC concerning common rules for the internal market in natural gas
Directive 2008/1/EC concerning integrated pollution prevention and control Repealed by:	Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)
Directive 2014/101/EU amending	Directive 2000/60/EC establishing a framework for Community action in the field of water policy

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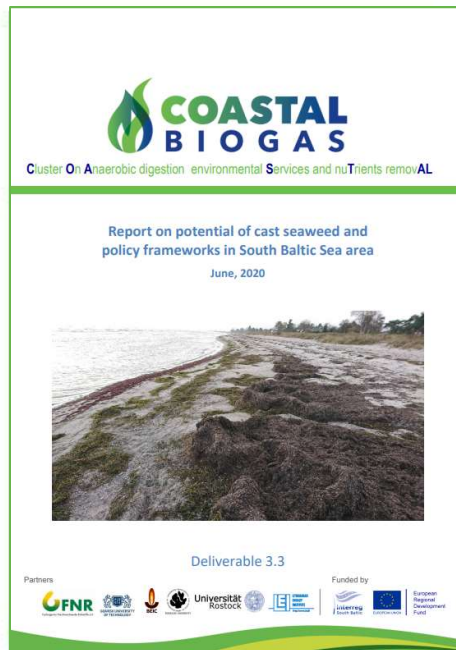
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For more information

<https://www.coastal-biogas.eu/publications/>



Deliverable 3.3. Report on potential of cast seaweed and policy frameworks.

The report gives a quantitative potential of cast seaweed in the territory covered by the Interreg South Baltic Programme. The report covers policy frameworks related use of seaweed as a potential feedstock for green energy production and regulations on biogas plant establishment in DE, DK, LT, PL and SE.

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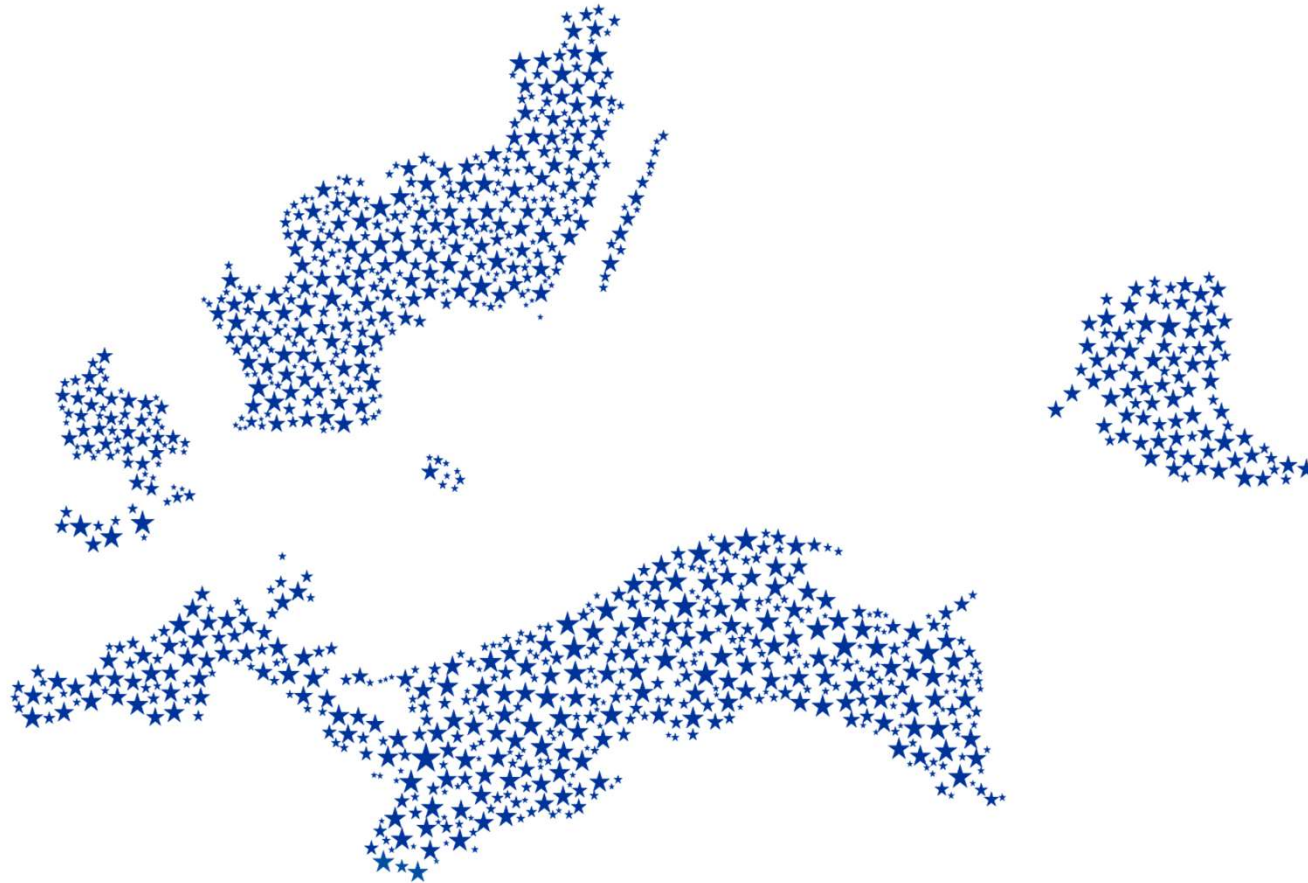


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