

## Installing requirements

This toolpackage contains the ArcMap-based toolbox called 'SEANERGY Preprocessing'. The toolbox can be accessed from ArcMap after download. It contains the tools:

- 'Preprocessing Step 1': Can be used to calculate a binary marine use raster from a marine use GIS input dataset.
- 'Preprocessing Step 2': Can be used to combine two or three binary marine sub use rasters into one binary overall marine use raster.

Further metadata describing the purpose of each tool and how to use that tool is included for each tool in the toolbox when opening that specific tool from ArcMap after installation.

Requirements for the toolbox to succeed in running is the following:

- having an ArcMap installed with a basic and Spatial Analyst license ('SEANERGY Preprocessing' has been tested for ArcMap version 10.7.1 with Python version 2.7.16).
- having installed all the Python modules in the ArcGIS environment (Python27\ArcGIS[versionnumber]\Lib\site-packages) that are mentioned in the python scripts (.py) in this main folder. The python modules that are mentioned are: arcpy + os + time + datetime
- In this main folder in the default installation will be and should be:
  - the two python scripts (preprocessing\_step1.py, preprocessing\_step2.py)
  - an inputfolder called "rawinputdatafinal" with all the marine uses as raw data that need to be converted into binary raster datasets (binary implying present vs. not-present in cell). This can be changed with own data.
  - a raster template called basearea\_final.tif in the default installation located in the folder "other\_inputs". This can be changed with own data.

## Marine use GIS-data documentation

**Marine use data table.** The first three columns contain marine use inputs from the Marine Strategy Framework Directive (MSFD): MSFD theme, MSFD use category, and how the MSFD use category has been interpreted into a matrix use category. The four last columns match the MSFD-matrix-inputs with marine use data from HELCOM. The threshold value column describes whether a threshold has been used to convert the HELCOM origin dataset (metadata provided in the metadata column) into a pre-processed, binary marine use raster dataset inputted in the Seanergy toolbox as example data. The user can choose to use own marine use data instead of this marine use data.

MSFD theme	MSFD use category	Matrix use category	HELCOM origin dataset	Metadata of HELCOM origin dataset	Threshold value	Pre-processed dataset
Physical restructuring of rivers, coastline or seabed (water management)	Land claim	Land claim	Land_claim.shp [lines].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/79f6cb3c-b7f4-4ea7-8b36-59945602a221">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/79f6cb3c-b7f4-4ea7-8b36-59945602a221</a>	None	landclaim.tif
	Canalisation and other watercourse modifications	Coastal landscape protection	Watercourse_modification_trenching.shp [lines].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/c1d21d0b-baf9-4429-86be-9e1570c574ef">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/c1d21d0b-baf9-4429-86be-9e1570c574ef</a>	None	coastprotection.tif
			Watercourse_modifications.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/2d47c5ea-4590-465f-a462-60ef59d3d7d3">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/2d47c5ea-4590-465f-a462-60ef59d3d7d3</a>	None	
	Coastal defence and flood protection*		Coastal_defense.shp [lines].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/2d47c5ea-4590-465f-a462-60ef59d3d7d3">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/2d47c5ea-4590-465f-a462-60ef59d3d7d3</a>	None	
	Offshore structures (other than for oil/gas/renewables)*	Offshore industrial production facilities	No data.	-	-	-
		Bridges	Bridges_and_other_constructions.shp [lines].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/8a4b2ff4-30a1-430a-ba55-dfec57ebd97">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/8a4b2ff4-30a1-430a-ba55-dfec57ebd97</a>	None	bridges.tif
	Restructuring of seabed morphology, including dredging and depositing of materials* Non-compatible uses with neighbourhood synergies and no neighbourhood conflicts.	Dredging including harbour dredging and maintaining shipping routes	Dredging_areas.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/2a0fbdfd-9aef-4d2e-9129-2d1cc3b4943b">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/2a0fbdfd-9aef-4d2e-9129-2d1cc3b4943b</a>	None	dredging.tif
			Dredg_points.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/bb6622b7-e5df-4637-8ebe-c2736e705a70">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/bb6622b7-e5df-4637-8ebe-c2736e705a70</a>	None	
			Mussel_and_scallop_dredging.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/e57dfe9f-">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/e57dfe9f-</a>	Minimum 0.1 % (= 331936.1) of the total	

				<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/0eebe008-aed9-461a-8c85-e7b32bdab822">2bb1-4c30-9033-8d45e30672ee</a>	amount of dredged blue mussels OR minimum 0.1 % (= 19654.0) of the total amount of dredged common cockle.	
	Deposit areas for dumping	deposit_areas_11_16.shp [polygons].		<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/0eebe008-aed9-461a-8c85-e7b32bdab822">http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/0eebe008-aed9-461a-8c85-e7b32bdab822</a>	None	dumping.tif
		deposit_points_11_16.shp [points].		<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/34bf84a1-1f04-40c7-99dd-9b9aff4523ea">http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/34bf84a1-1f04-40c7-99dd-9b9aff4523ea</a>	Dumped amount more than 0 in 2011, 2012, 2013, 2014, 2015 OR 2016.	
Extraction of non-living resources	Extraction of minerals (rock, metal ores, gravel, sand, shell)*	Extraction/mining of sand and gravel	Extraction_of_sand_and_gravel.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/683224c3-2fb9-4f2f-b748-bf5ad712d708">http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/683224c3-2fb9-4f2f-b748-bf5ad712d708</a>	None	sandextract.tif
	Extraction of oil and gas, including infrastructure*	Exploration of hydrocarbons including oil, gas and petroleum	No data.	-	-	-
		Offshore oil and gas development including oil platforms and oil loading/unloading terminals	OilTerminals.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/47120944-1b8e-4d47-832a-7f502d22ad88">http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/47120944-1b8e-4d47-832a-7f502d22ad88</a>	None	oilgasdev.tif
			OilGasRefineries.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/58e115bd-2f98-49f5-a65e-720b95e8d536">http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/58e115bd-2f98-49f5-a65e-720b95e8d536</a>	None	
			Oil_platforms.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/fddc27ec-">http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/fddc27ec-</a>	None	

				<a href="#">b6ae-407b-9dd8-f31a42d75412</a>		
		Offshore liquified natural gas terminals	No data.	-	-	-
	Extraction of salt*	No matrix input	No data.	-	-	-
	Extraction of water*	Ocean desalination plants	No data.	-	-	-
Product ion of energy	Renewable energy generation (wind, wave and tidal power), including infrastructure*	Wind farms	wind_turbines.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/80de3bc3-e3ec-474e-8ae8-4b29c205eb0a">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/80de3bc3-e3ec-474e-8ae8-4b29c205eb0a</a>	None	windfarms.tif
		Hydropower (wave parks and tidal energy production)	hydropower_dams.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/585a20d9-125f-4ac0-b515-699f28422a36">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/585a20d9-125f-4ac0-b515-699f28422a36</a>	None	hydropower.tif
	Non-renewable energy generation	Fossil fuel energy production including power stations, gas and petroleum production and treatment, and coal unloading piers	Fossil_fuel_energy_production.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/3e587c54-8cc8-48a2-82f0-ffd71bf679e6">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/3e587c54-8cc8-48a2-82f0-ffd71bf679e6</a>	None	fossilprod.tif
	Transmission of electricity and communications (cables)*	Cables and pipelines for gas, petroleum, communication etc.	Cables.shp [lines].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/c0e73e71-cafb-4422-a3a3-115687fd5c49">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/c0e73e71-cafb-4422-a3a3-115687fd5c49</a>	None	cablesPipelines.tif
			Pipelines.shp [lines].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/5260249e-5850-431a-b130-3a096abac852">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/5260249e-5850-431a-b130-3a096abac852</a>	None	
Extraction of living resources	Fish and shellfish harvesting (professional, recreational)*	Commercial fishing (not trawling)	Fish_extraction_commercial_fisheries_cod.shp [polygons].  Fishextraction_herring.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/7a1389b3-382a-487f-8888-ac45c94c5a97">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/7a1389b3-382a-487f-8888-ac45c94c5a97</a>  <a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/a3b67a55-7c1e-469e-b692-58c4e7b79279">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/a3b67a55-7c1e-469e-b692-58c4e7b79279</a>	Minimum 0.05 % (=164.8) of the total tonne value of fished cod (= 329664). Minimum 0.05 % (= 699.0) of	comFish.tif

		Fish_extraction_sprat.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/1fb1bd2d-8dff-493a-9ed3-a278aec8f371">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/1fb1bd2d-8dff-493a-9ed3-a278aec8f371</a>	the total tonne value of fished sprat (= 1398030). Minimum 0.05 % (=764.1) of the total tonne value of fished herring (= 1528298).	
	Benthic trawling (including trawling in general)	HELCOM_effort_year_MBCG_VMS_2013.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/6902f0eb-9fc3-4bf7-904e-6203524de57d">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/6902f0eb-9fc3-4bf7-904e-6203524de57d</a>	At least three full days and nights = 72 hours of trawling.	benthicTrawling.tif
	Pelagic trawling	HELCOM_effort_year_Midwater_trawl_VMS_2013.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/49fe4828-be70-4108-9098-381690afa0cd">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/49fe4828-be70-4108-9098-381690afa0cd</a>	At least three full days and nights = 72 hours of trawling.	pelagicTrawling.tif
	Recreational, small scale, and sport fishing	Recreational_fishing.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/debeafcd-948b-4455-88ae-7a3d1618f5a8">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/debeafcd-948b-4455-88ae-7a3d1618f5a8</a>	Minimum 5 tons of yearly recreational cod catch.	recFish.tif
Fish and shellfish processing*	No matrix input	No data.	-	-	-
Marine plant harvesting*	No matrix input	furcellaria_harvesting.xlsx	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/e72b634a-e4ca-4c1d-a3af-99a24aa10be8">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/e72b634a-e4ca-4c1d-a3af-99a24aa10be8</a>	-	-
Hunting and collecting for other purposes*	Game hunting of seabirds	game_hunting_of_seabirds.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/81c917ea-492d-48e2-9f00-e1bb7fe3e4fc">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/81c917ea-492d-48e2-9f00-e1bb7fe3e4fc</a>	Minimum 0.1 % (=1719.18 765577) of the total amount of hunted eiders OR minimum 0.1 %	gamehuntingSeabirds.tif

					(=557.66800858) of the total amount of hunted long tailed duck OR minimum 0.1 % (=105.00) of the total amount of hunted velvet scoters OR minimum 0.1 % (=278.77691672) of the total amount of hunted scoters.	
	No matrix input		Hunting of seals: Grey seals: GS.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/3ccc8a4c-4988-4380-afdd-d9bd7752c3fb">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/3ccc8a4c-4988-4380-afdd-d9bd7752c3fb</a>	-	-
			Harbour seals: HS.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/7695c830-db56-4322-98d2-8af607ca48e4">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/7695c830-db56-4322-98d2-8af607ca48e4</a>		
			Ringed seals: RS.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/609dbe11-b466-4dc7-bcfa-c68485dd72ec">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/609dbe11-b466-4dc7-bcfa-c68485dd72ec</a>		
Cultivation of living resources	Aquaculture — marine, including infrastructure*	Finfish and shellfish mariculture	Finfish_mariculture.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/3cfa469a-6a78-4913-b82f-57fd0e7f4dc0">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/3cfa469a-6a78-4913-b82f-57fd0e7f4dc0</a>	None	fishAquaculture.tif
			Shellfish_mariculture_areas.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/8fbf946a-18d2-4b24-98ad-1327ba2820a8">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/8fbf946a-18d2-4b24-98ad-1327ba2820a8</a>	None	
					None	

			Shellfish_mariculture_points.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/21efdecc-2fd7-4bfb-9832-68c995291bf7">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/21efdecc-2fd7-4bfb-9832-68c995291bf7</a>		
	Algae and mussel aquaculture		musselfarms_app_areas.shp [polygons] - not HELCOM data. Locations are approximated by the author of this article based on musselfarm map information from the EU SUBMARINER network.	<a href="https://www.submariner-network.eu/42-projects/baltic-blue-growth/mussel-farms">https://www.submariner-network.eu/42-projects/baltic-blue-growth/mussel-farms</a>	Buffers used (the size is not due to farm size but due to difficulties reading farm locations from maps): Coast of Kurzeme: 2850 meters. Kalmarsund: 500 meters. Vormsi island: 1190 meters. Sankt Anna: 535 meters. Musholm Bay: 208 meters. Kiel Bay: 1190 meters.	musselfarm.tif
Transport	Transport infrastructure*	Offshore airports	No data.	-	-	-
		Anchorage	No data.	-	-	-
	Transport — shipping*	Shipping	2011-2015_all_ship_types_SUM.tif	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/1fd5298f-d3be-4c5f-bb05-3dc66a8eea6b">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/1fd5298f-d3be-4c5f-bb05-3dc66a8eea6b</a>	Minimum 1 % of maximum shipping route overlap (=160829)	shipping.tif
Urban and industrial uses	Industrial uses	Harbours/ports including operations	Harbours.shp [points]. Harbour_polygons.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/e2a3a104-a7aa-49c9-bc2c-47845b3a322f">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/e2a3a104-a7aa-49c9-bc2c-47845b3a322f</a>	For all harbours: Buffer = 3000 meters.	harbours.tif

Waste treatment and disposal*	Carbon sequestration	No data.	-	-	-	
	Former mined areas	No data.	-	-	-	
	Waste disposal/outlets of e.g. waste water	Discharge_of_warm_water_from_nuclear_power_plants_points.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/60f5e958-328e-4cae-9719-64b7911c92c0">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/60f5e958-328e-4cae-9719-64b7911c92c0</a>	For all waste disposal: Buffer = 3000 meters.	wastedisposal.tif	
		radioact_discharge_active.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/ee036b10-1045-430a-a9fa-b37fbb23d744">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/ee036b10-1045-430a-a9fa-b37fbb23d744</a>			
		Illegal_oil_2011_2016.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/6ed3a23f-8019-4959-ac1e-34c27070feab">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/6ed3a23f-8019-4959-ac1e-34c27070feab</a>			
	Areas of dumped explosives	Chemical_Munition_Dumpsites.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/b55b508d-3c40-484c-8c7f-38869a8df368">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/b55b508d-3c40-484c-8c7f-38869a8df368</a>	None	explosives.tif	
		Areas where sea dumped chemical warfare materials have been encountered.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/5724455d-4589-4b00-b255-c1989742a4ed">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/5724455d-4589-4b00-b255-c1989742a4ed</a>	None		
Tourism and leisure	Tourism and leisure infrastructure*	Bathing sites	Bathing_sites2011_2014.shp [points].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/28f8019f-66f1-4fa5-87e0-d6e34f0ff695">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/28f8019f-66f1-4fa5-87e0-d6e34f0ff695</a>	None	bathing.tif
	Tourism and leisure activities*	Diving	potential_marinepark_sites2014.shp [points] - not HELCOM data. Data is created by the author of this article based on marine park information from the Nordic Blue Parks project.	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>	Buffer = 1500 meters.	diving.tif
		Recreational sailing including boating and personal watercraft	Recreational_boating_2018.tif.	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/8c30e828-1340-4162-b7f9-254586ae32b6">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/8c30e828-1340-4162-b7f9-254586ae32b6</a>	minimum 0.25 out of a maximum of 1 (normaliz	boating.tif

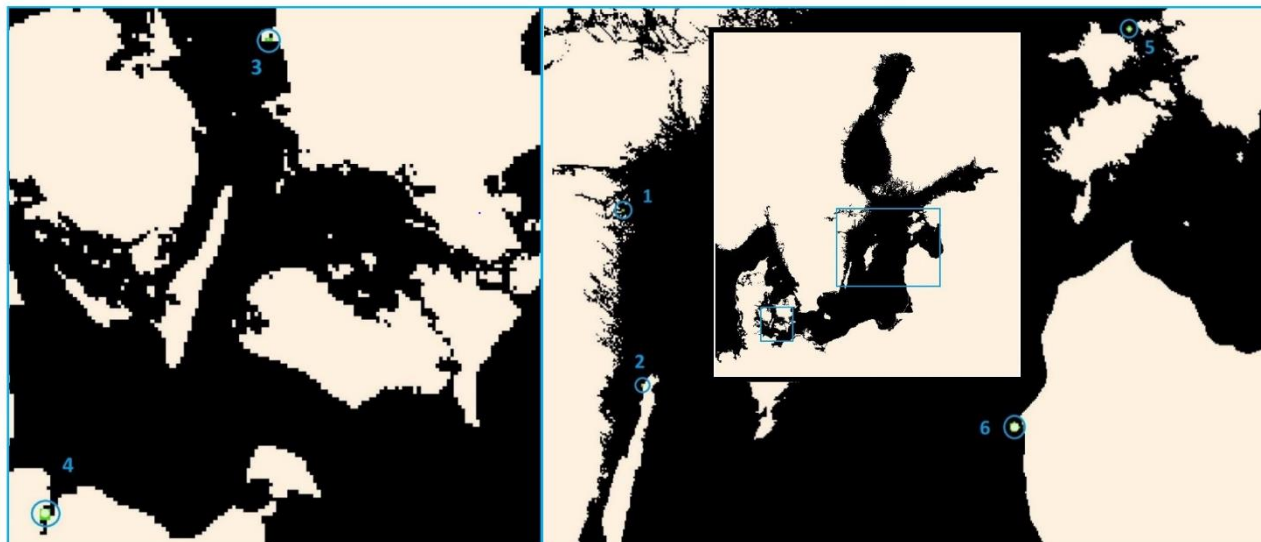


		ed intensity).				
		Recreational wildlife watching	No data.	-	-	-
		Tourism and recreation	No data.	-	-	-
Security/defence	Military operations (subject to Article 2(2))	Military training and activities	No data.	-	-	-
Education and research	Research, survey and educational activities*	Scientific research	No data.	-	-	-
		Coastal observation system	No data.	-	-	-
		Marine protected areas	HELCOM_MPAs.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/d27df8c0-de86-4d13-a06d-35a8f50b16fa">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/d27df8c0-de86-4d13-a06d-35a8f50b16fa</a>	None	MPAs.tif
		Nature protection including Natura2000	Natura 2000 sites.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/47a94309-c72b-4a1a-8982-ed24ae829220">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/47a94309-c72b-4a1a-8982-ed24ae829220</a>	None	natureProtection.tif
			UNESCO sites.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/78e50e17-0049-4212-8288-922ba6f32e4f">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/78e50e17-0049-4212-8288-922ba6f32e4f</a>	Type='Biosphere reserve' OR 'World heritage sites, natural'.	
			Baltic_Sea_EBSA.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/828468c6-dd88-408c-97d3-ce9c926681f0">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/828468c6-dd88-408c-97d3-ce9c926681f0</a>	None	
		Areas for fish regeneration: Artificial reefs/ islands - concrete, shipwreck. etc.	Baltic Sea fisheries closure.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/b046f761-b6f5-44cd-a079-6d94d25a8f63">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/b046f761-b6f5-44cd-a079-6d94d25a8f63</a>	None	fishClosure.tif
			Cod fisheries closures.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/42f9583a-505b-411e-8ade-b2f10e03610b">http://metadata.helcom.fi/geonetwork/srv/eng/catalog.search#/metadata/42f9583a-505b-411e-8ade-b2f10e03610b</a>	None	
		Protection of benthic habitats	No data.	-	-	-
		Protection of birds / RAMSAR	Ramsarsites.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv">http://metadata.helcom.fi/geonetwork/srv</a>	None	birdProtection.tif

		<a href="#">/eng/catalog.search#/metadata/91bfbaea-c586-4178-8c2d-16fbb5aea8b</a>		
Protection of cultural heritage including shipwrecks and sites	UNESCO sites.shp [polygons].	<a href="http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/78e50e17-0049-4212-8288-922ba6f32e4f">http://metadata.helcom.fi/geonetwork/srv/en/catalog.search#/metadata/78e50e17-0049-4212-8288-922ba6f32e4f</a>	Type='World heritage sites, cultural'.	cultHeritage.tif
	Base raster for the Baltic Sea Region with raster values = 0. It is not HELCOM data, but adjusted from the base raster in the MYTILUS toolbox. Cellsize: 1 km2 (1624 rows * 1430 columns cells).	Contact Henning Sten Hansen, Aalborg University Copenhagen, for access to MYTILUS.		basearea_final.tif
	Base raster for the Baltic Sea with ocean cells = 1 in value. It is not HELCOM data. European Environment Agency's Europe coastline shapefile has been converted to raster based on basearea_final.tif as raster template.	<a href="https://www.eea.europa.eu/data-and-maps/data/eea-coastline-for-analysis-1/gis-data/europe-coastline-shapefile">https://www.eea.europa.eu/data-and-maps/data/eea-coastline-for-analysis-1/gis-data/europe-coastline-shapefile</a>		final_baltic_ocean.tif

### Musselfarm data from EU Submariner network

Musselfarm data from the EU Submariner network have manually been digitalized based on the online musselfarm location maps from the project (<https://www.submariner-network.eu/42-projects/baltic-blue-growth/mussel-farms>). The location of the digitalized musselfarm data used in SEANERGY is shown in the musselfarm figure below, and they are listed in the musselfarm table below.



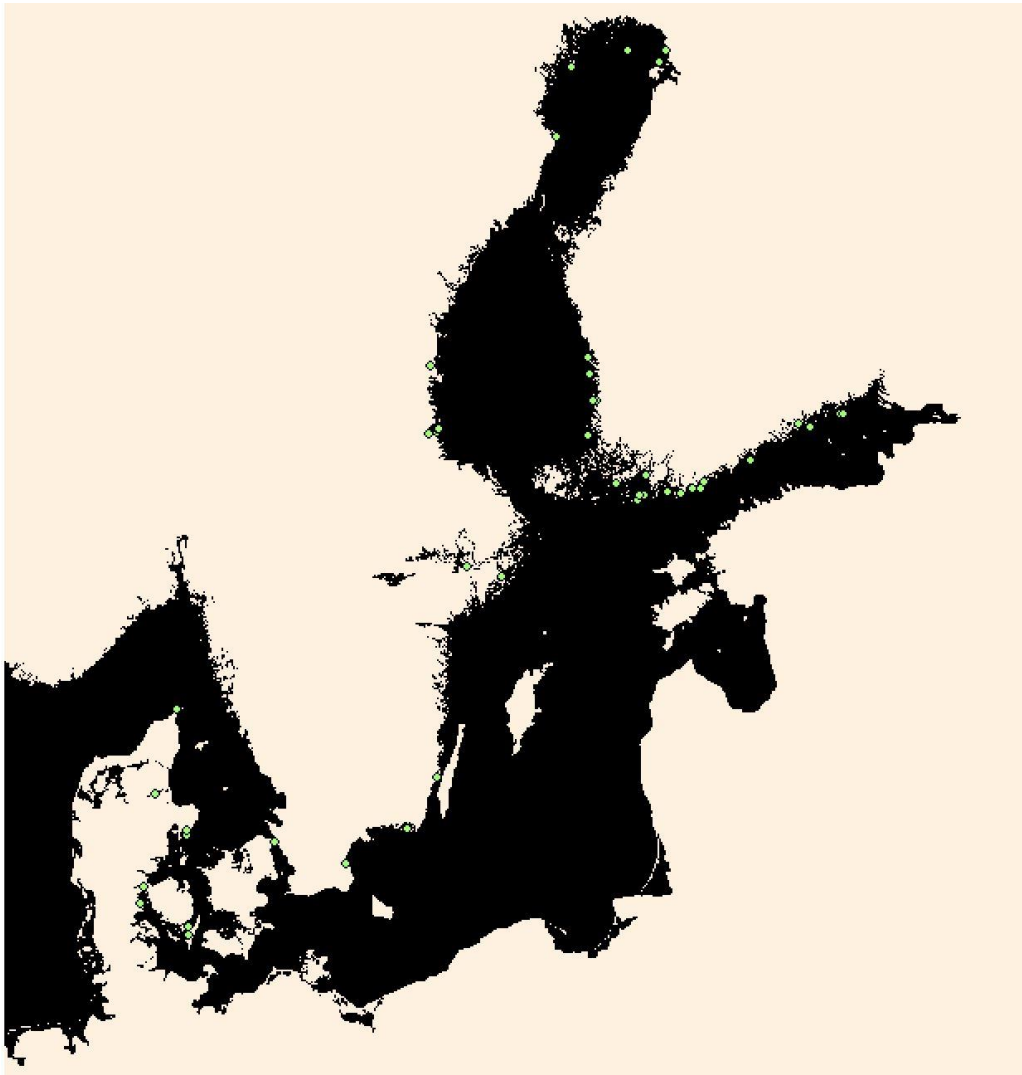
**Musselfarm figure:** Locations of the musselfarm data from the EU Submariner network.

**Musselfarm table.** Musselfarms from the EU SUBMARINER network.

ID	Name	Status	Ownership	Described surface [ha]	Link	Circle size in this analysis [m]
1	Sankt Anna, Sweden	Existing pilot farm		0.5	<a href="https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/sankt-anna-archipelago-sweden">https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/sankt-anna-archipelago-sweden</a>	500
2	Kalmar Sund, Sweden	Existing farm	Bohus Havsbruk	1	<a href="https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/kalmar-sund-sweden">https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/kalmar-sund-sweden</a>	500
3	Musholm Bay, Denmark	Existing farm	Musholm	1	<a href="https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/musholm-bay-denmark">https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/musholm-bay-denmark</a>	200
4	Kiel Bay, Germany	Planned farm	MELUR ministry	0.32	<a href="https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/kiel-bay-germany">https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/kiel-bay-germany</a>	1200
5	Vormsi island, Estonia	Existing pilot farm	Vormsi Agar	0.004	<a href="https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/vormsi-island-estonia">https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/vormsi-island-estonia</a>	1200
6	Coast of Kurzeme, Latvia	Planned pilot farm	Latvian institute of Planned Aquatic Ecology	1	<a href="https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/coast-of-kurzeme-latvia">https://www.submariner-network.eu/projects/balticbluegrowth/mussel-farms/coast-of-kurzeme-latvia</a>	3000

#### Data about marine parks from the Nordic Blue Park project

Based on coordinates provided by the Nordic Blue Park project (2014), potential diving marine parks have been digitized. The location of the digitalized marine park diving data used in SEANERGY is shown in the marine park figure below, and they are listed in the marine park table below.



**Marine park figure:** Locations of the marine parks for diving from the Nordic Blue Park project.

**Marine park table.** Marine parks for diving from the Nordic Blue Parks project (2014).

ID	Name	Status	Coordinates	Link
1	The wreck of the Osborne & Elizabeth, Finland	potential underwater cultural trail	(WGS84: N59.861232, E22.768964)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
2	The Wreck of the Alfred, Finland	potential underwater cultural trail	(WGS84: N59.873167, E22.167749)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
3	The Wreck of the Sophia Maria, Finland	potential underwater cultural trail	(WGS84: N65.141270, E24.954352)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
4	Jussarö II/Hopeapriki (Graf Nikita 1784 or Constant Trader 1785), Finland	potential underwater cultural trail	(WGS84: N 59.832583, E23.567130)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>

5	The Esselholmen Wreck, Finland	potential underwater cultural trail	(WGS84: N 59.898398, E23.689189)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
6	The Wreck of the Siiwo, Finland	potential underwater cultural trail	(WGS84: N61.139570, E21.400061)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
7	The Wreck of the Nordstiernan, Finland	potential underwater cultural trail	(WGS84: N 59.824212, E21.974566)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
8	The Punapartojen Wreck, Finland	potential underwater cultural trails	(WGS84: N60.360780, E27.396542)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
9	The Wreck of the Fortuna, Finland	potential underwater cultural trail	(WGS84: N60.359303, E26.308932)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
10	The Wreck of the Mulan, Finland	potential underwater cultural trails	(WGS84: N59.807334, E23.065136)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
11	Högländ, NE Archipelago Sea, Finland	potential underwater nature trail	(WGS84: N60.105433, E22.312778)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
12	Trelänningen, Ekenäs National Park, Ekenäs, Finland	potential underwater nature trail	(WGS84: N59.84050, E23.38299)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
13	Ulko-Tammio, National Park of the Eastern Gulf of Finland	potential underwater nature trail	(WGS84: N60.350274, E27.464792)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
14	Mustaviiri/Svartviran, Finland	potential underwater nature trail	(WGS84: N60.274905, E26.598650)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
15	Röyttä, Oulu, Finland	potential underwater nature trail	(WGS84: N65.276230, E25.211940)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
16	Kylmä-Pihlaja, Rauma, Finland <sup>1</sup>	potential underwater nature trail	(WGS84: N61.144407, E21.299670)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
17	Iso-Enskeri, Pori, Finland	potential underwater nature trail	(WGS84: N61.680960, E21.373590)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
18	Säppi, Pori, Finland	potential underwater nature trail	(WGS84: N61.480795, E21.339484)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
19	Yxskär, SE Archipelago Sea, Finland	potential underwater nature trail	(WGS84: N59.875800, E22.052427)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
20	Isokari, Uusikaupunki, Finland	potential underwater nature trail	(WGS84: N60.72241, E21.01782)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
21	Kronprins Gustaf Adolf Dive Park surrounding the Kronprins Gustaf Adolf wreck, Finland	underwater cultural trail since 2000	(WGS84: N60.050, E24.921)	<a href="https://www.museovirasto.fi/en/cultural-environment/archaeological-cultural-heritage/underwater-cultural-heritage-in-finland/helsingin-hylkypuisto2">https://www.museovirasto.fi/en/cultural-environment/archaeological-cultural-heritage/underwater-cultural-heritage-in-finland/helsingin-hylkypuisto2</a>
22	Stora Hästö, Finland's first underwater nature trail	underwater nature trail since 2005	(app. WGS84: N60.066319, E21.532683)	<a href="https://www.nationalparks.fi/arcipelagonp/trails/underwaturnaturetrail">https://www.nationalparks.fi/arcipelagonp/trails/underwaturnaturetrail</a>
23	In the northwestern end of Selkä-Sarvi archipelago, Perämeri National Park, Bay of Bothnia, Finland	underwater nature trail	(app. WGS84: N65,22,12, E24,6,36)	<a href="https://www.luontoon.fi/perameri/reitit">https://www.luontoon.fi/perameri/reitit</a>
24	Axmar, Sweden	potential underwater trail	(WGS84: N61.054931, E17.165483)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
25	Mellersta Kalmarsund, Kalmar strait, Sweden	potential underwater trail	(WGS84: N56.705442, E16.378298)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
26	Djupasund, Sweden	potential underwater trail	(WGS84: N56.105239, E15.635954)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>

27	Bjuröklubb, Sweden	potential underwater trail	(WGS84: N64.470551, E21.573736)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
28	Rödkallen, Sweden	potential underwater trail	(WGS84: N65.313502, E22.377423)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
29	Dalarö, Sweden	potential underwater trail	(WGS84: N59.132630, E18.426355)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
30	Vitemöllan – Haväng, Sweden	potential underwater trail	(WGS84: N55.729656, E14.188265)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
31	Södra Björkfjärden, Sweden	potential underwater trail	(WGS84: N59.298473, E17.610355)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
32	Axmar Blue Park: Granskär & Högrabben, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,2,24-75, E17,12,29-68)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3649">http://www.axmarbluepark.se/pages.asp?PageID=3649</a> <a href="http://www.axmarbluepark.se/pages.asp?PageID=3650">http://www.axmarbluepark.se/pages.asp?PageID=3650</a>
33	Axmar Blue Park: Lenängsviken, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,3.12-91, E17,9,36-15)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3651">http://www.axmarbluepark.se/pages.asp?PageID=3651</a>
34	Axmar Blue Park: Malmharen, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,2.58-65, E17,9,58-32)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3652">http://www.axmarbluepark.se/pages.asp?PageID=3652</a>
35	Axmar Blue Park: Oxelharen, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,0.22-21, E17,0,17-42)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3653">http://www.axmarbluepark.se/pages.asp?PageID=3653</a>
36	Axmar Blue Park: Sandbanken, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,3.43-60, E17,14,23-56)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3654">http://www.axmarbluepark.se/pages.asp?PageID=3654</a>
37	Axmar Blue Park: Simpviken, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,3.22-68, E17,10,30-76)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3655">http://www.axmarbluepark.se/pages.asp?PageID=3655</a>
38	Axmar Blue Park: Sundmar, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,0.32-57, E17,12,38-24)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3682">http://www.axmarbluepark.se/pages.asp?PageID=3682</a>
39	Axmar Blue Park: Svartstensudden, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,049.70, E17,13,54-74)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3657">http://www.axmarbluepark.se/pages.asp?PageID=3657</a>
40	Axmar Blue Park: Tokharen, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,2.53-1, E17,13,51-2)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3658">http://www.axmarbluepark.se/pages.asp?PageID=3658</a>
41	Axmar Blue Park: Västerhamn, Sweden	existing underwater cultural trail since 2010	(WGS84: N61,3.34-86, E17,15,59-06)	<a href="http://www.axmarbluepark.se/pages.asp?PageID=3659">http://www.axmarbluepark.se/pages.asp?PageID=3659</a>
42	Stinesminde, Mariager Fjord, Denmark	potential underwater trail	(WGS84: 56.665407, E9.964280)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
43	Margrethes Bro/Æ Lei, Haderslev Fjord, Denmark	potential underwater trail	(WGS84: N55.285075, E9.658892)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
44	Torpedo boats, Lunkebugten Bay, wreck 1, Denmark	potential underwater trail	(WGS84: Wreck 1: N55.013167, E10.694017)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
45	Torpedo boats, Lunkebugten Bay, wreck 2, Denmark	potential underwater trail	(WGS84: Wreck 2: N55.016867, E10.700933)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
46	Torpedo boats, Lunkebugten Bay, wreck 3, Denmark	potential underwater trail	(WGS84: Wreck 3: N55.016083, E10.682650)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
47	Torpedo boats, Lunkebugten Bay, wreck 4, Denmark	potential underwater trail	(WGS84: Wreck 4: N55.001967, E10.685367)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
48	Helligkilde, Fænø Sound, Denmark	potential underwater trail	(WGS84: N55.493299, E9.714009)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
49	The Gåsehage Wreck-Moesgaard, Denmark	potential underwater trail	(WGS84: N56.137646, E10.692405)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
50	The Campsite Wrecks, Ebeltøft Vig, Denmark	potential underwater trail	(WGS84: N56.209491, E10.673205)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>

51	The Spees, North Sea, Tannis Bay, Denmark	potential underwater trail	(WGS84: N57.723167, E10.495250)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
52	The wreck of the Disken, Denmark	potential underwater trail	(WGS84: N56.027962, E12.648271)	<a href="https://www.norden.org/en/publication/nordic-blue-parks">https://www.norden.org/en/publication/nordic-blue-parks</a>
53	Højklint Blue Trail, Denmark	existing underwater cultural trail since 2009	(app. WGS84: N54.892541, E10.709641)	<a href="https://www.langelandsmuseum.dk/dykkerstien-engelsk">https://www.langelandsmuseum.dk/dykkerstien-engelsk</a>