**Name:** Silas Christian Wilhelm-Leth

**Keywords:** Bathymetry (rasters, sf, terra), offshore wind turbines, energy, environment,

**Identifying suitable areas for construction of future offshore wind turbines**

As of April 2025, the Danish government agency *Energistyrelsen* and a broader academic-governmental commission (advised by interest groups) is in the middle of a screening process lasting from Q2 2023 till Q2 2025, reevaluating areas of interest for construction of new offshore wind turbines. In this process, the commission collects, accesses and creates data, which until Q2 2025 will stay within Energistyrelsen and the responsible commission. My project seeks to identify and map, then narrow down possible areas of interest for future projects – using currently and publicly available data and serving mainly as a proof of concept of what the commission will be able to do (with new data and higher precision). As a broad stroke, analyzing construction depth of existing offshore turbines through the use of a bathymetry raster proved useful. An important part of the commission’s work is assessing zones where construction would be harmful to marine life – without knowing the results, we can at the very least be fairly certain that the EU-protected Natura 2000 areas will be left out. Masking these zones from our area narrows our possible placement area down further, and the same should be achievable for shipping lanes, archeological sites, hydrodynamic concerns, ocean floor makeup and distance to established wind farms in order to avoid the wake effect. The most important result of this project is this method of exclusion itself, which is easily replicable in other countries and should prove very useful in order to better decide which areas meet all demands best, ensuring less destructive placement of wind farms in the future. Putting science, data and careful cross-referencing of all obstacle types first will prove essential, if we want to ensure a largely non-harmful implementation of the green transition.

**Data:**

**Dataforsyningen:**

Danmarks dybdemodel <https://dataforsyningen.dk/data/4817#data>

(download GEOTIFF)

Vindkraftanlæg <https://dataforsyningen.dk/data/3814>

(download GPKG)

**Miljø- og Ligestillingsministeriet:**

Natura 2000-planer 2022-27 <https://mst.dk/erhverv/tilskud-miljoeviden-og-data/data-og-databaser/miljoegis-data-om-natur-og-miljoe-paa-webkort/hent-data-udstillet-paa-miljoegis>

(download ESRI)

Global Wind Atlas: <https://globalwindatlas.info/en/>

Open Infrastructure Map: <https://openinframap.org/#6.47/55.725/10.771> (grid)

Det Marine Danmarkskort: <https://geodatastyrelsen.maps.arcgis.com/apps/mapviewer/index.html?webmap=e5495e2f2f674b528c5e74feb3635410> (ferry routes)

**Bibliography:**

**Energistyrelsen:** <https://ens.dk/energikilder/planlaegning-af-fremtidens-havvindmoelleparker>

* Screening af havvindpotentialet i Danmark Overordnet opgavebeskrivelse (forkortet) Energistyrelsen Dato: 13. september 2023
* Dataoversigt og behov for nye data, indre danske farvande og Østersøen Bedre geologiske data til havvindudbygning, Energistyrelsen Lis Allaart, Thomas Vangkilde-Pedersen, Niels Nørgaard-Pedersen, Nicklas Christensen & Jørgen O. Leth
* Dataoversigt og behov for nye data, Nordsøen Bedre geologiske data til havvindudbygning, Energistyrelsen Lis Allaart, Thomas Vangkilde-Pedersen, Niels Nørgaard-Pedersen & Jørgen O. Leth
* Etablerede havvindmølleparker: <https://ens.dk/energikilder/etablerede-havvindmoelleparker>

**Geus:**

* Flere havvindmølleparker: Vi har vinden, men hvad med havbunden? 11-05-2023

<https://www.geus.dk/om-geus/nyheder/nyhedsarkiv/2023/maj/havvindmoelleparker-i-nordsoeen>

Wind Turbines: the Bigger, the Better: <https://www.energy.gov/eere/articles/wind-turbines-bigger-better>

How a Wind Turbine Works: <https://www.energy.gov/eere/wind/how-wind-turbine-works-text-version>

A map of the world

AI-generated content may be incorrect.A green graph with black text

AI-generated content may be incorrect. Early results

A map of the world

AI-generated content may be incorrect.

**Feedback on abstract:**

What about most favorable (powerful) winds and location accessibility to make construction / maintenance not cost an arm and a leg? ALso the connection to existing grid must matter, as it costs $$$ to lay cables on sea floor (and is a sensitive issue these days)

Looking fewd to the results! Even if you cannot address all the points I raise, make sure you mention them and others that matter and clarify why you chose yours to limit the scope...

**Feedback on presentation:**

Be very clear about limitations – fx. the depth, it *cannot* be arbitrary. What I’m doing now is okay, but just disclose that the current range is based on current norms, and that I don’t actually know what depth would be best. The best thing would be researching more on depths.

A good method could be doing *segmented* / *categorized* zones (hypothetic example: 5-10 meters, cheapest, 10-20 meters, second cheapest and …, 20-30 meters …).

Visual and noise as factors – hypothetical examples: line of sight, noise radius, populated onshore areas mapped as well (this could be done by synchronizing some Denmark polygon or raster, to my CRS. Stig also sent over a possible solution for this, check it).

**-\_\_\_\_\_\_**

Remember to include a data/methodology criticism chapter in the project text

**»Process of elimination«** (godt begreb)

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**Distance to other wind turbines**

**Shipping lanes**

**Military areas**