Interreg
Baltic Sea Region

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SMART GREEN MOBILITY
HyTruck

Breakfast briefing
Spatial Planning Toolkit

Date: 01.10.2025

Speaker: Alexander Kmoch (PP5 University of Tartu)

interreg-baltic.eu/project/HyTruck

Spatial Planning Toolkit

Overview

- Context: support the planning of HRS
- Work package main work period 2 years: 2023-2024 (2025 preparation for one-stop-shop)
- Iterative process:
    - tool capabilities vs stakeholder needs
    - Tool to help stakeholders find good / needed locations for HRS
    - Stakeholders input (relevant criteria)
    - started with research component, literature review (criteria, methods)

- Implementation to support HRS planning and iterative stakeholder feedback, and to visualise and present project outcomes

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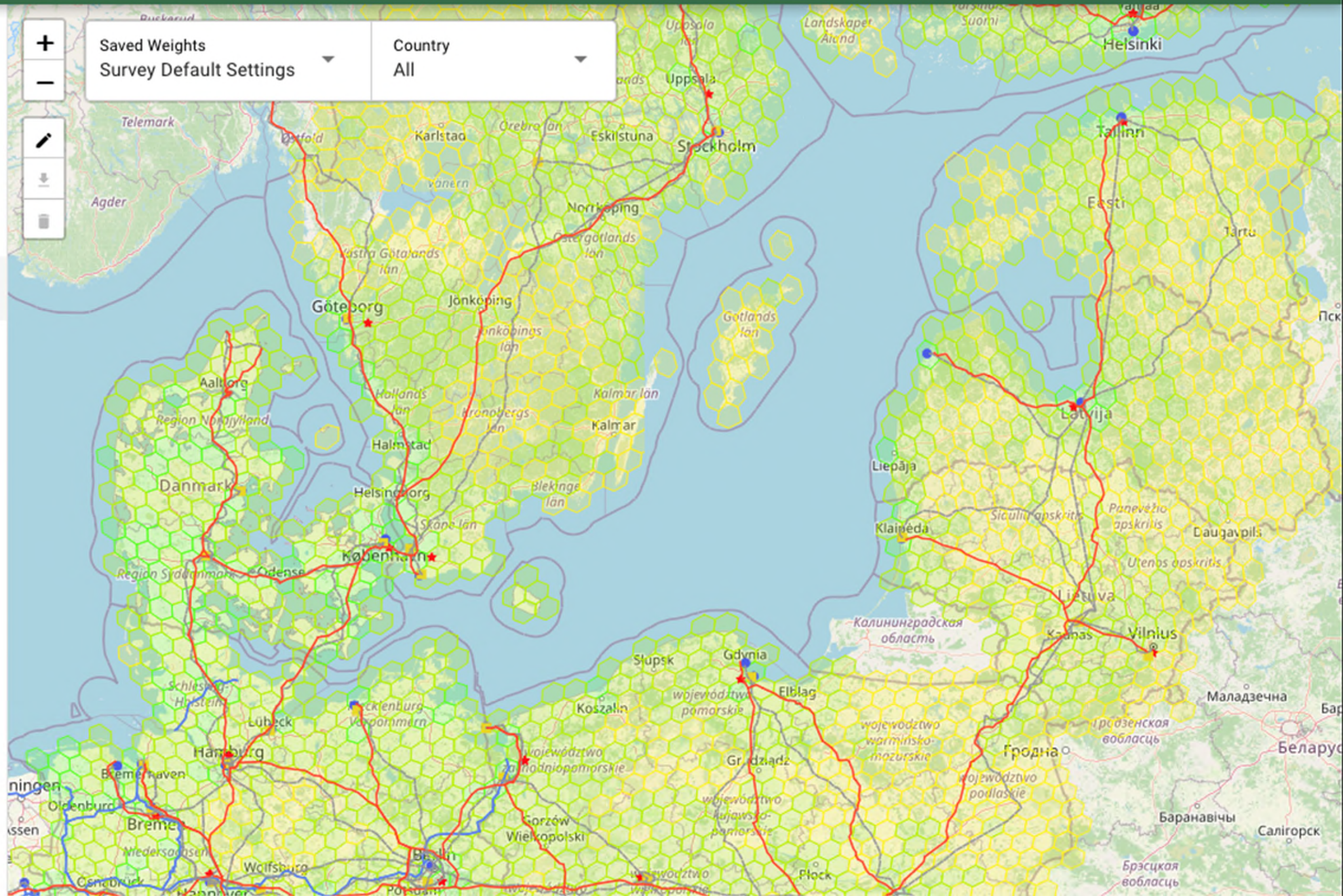


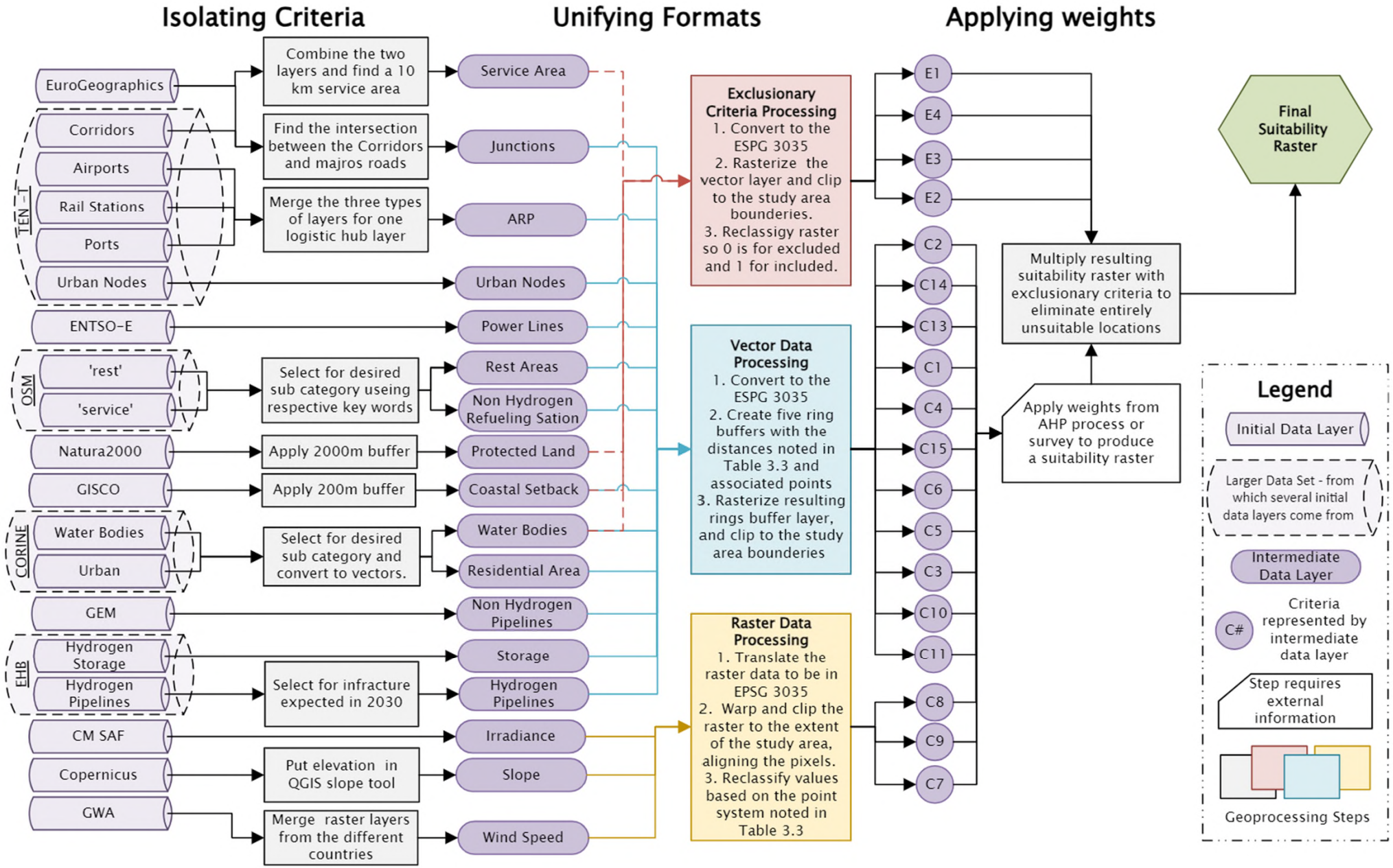
Concepts 1 (3)

Suitability analyis *1)

- selected criteria are amalgamated into a global grid system IGEO7 *2)
- evenly sized grid cells at ca 1km resolution
- classified based on literature review (and stakeholder inputs)
- assign basic suitability values ranging from 0 (not suitable) to 10 (very suitable) to each criterion within each grid cell
- base suitability score for each grid cell is then calculated as average

*1) Bratic, A. (2024, August). Hydrogen truck refueling stations for heavy duty vehicles - A case study of the Baltic Sea Region (Master's thesis). Faculty of Geo-information Science and Earth Observation, University of Twente, Enschede, Netherlands. Supervisors: Dr. Alexander Kmoch, Ir. Mark Brussel.

*2) Kmoch, A., Sahr, K., Chan, W. T., and Uuemaa, E. (2025). IGEO7: A new hierarchically indexed hexagonal equal-area discrete global grid system, AGILE GIScience Ser., 6, 32, https://doi.org/10.5194/agile-giss-6-32-2025


Isolating Criteria
Unifying Formats
Applying weights
EuroGeographics
Corridors
Airports
Rail Stations
Ports
TEN -T
Urban Nodes
ENTSO-E
'rest'
'service'
OSM
Natura2000
GISCO
Water Bodies
Urban
CORINE
GEM
Hydrogen Storage
Hydrogen Pipelines
EHB
CM SAF
Copernicus
GWA
Combine the two layers and find a 10 km service area
Find the intersection between the Corridors and majros roads
Merge the three types of layers for one logistic hub layer
Select for desired sub category useing respective key words
Apply 2000m buffer
Apply 200m buffer
Select for desired sub category and convert to vectors.
Select for infracture expected in 2030
Put elevation in QGIS slope tool
Merge raster layers from the different countries
Service Area
Junctions
ARP
Urban Nodes
Power Lines
Rest Areas
Non Hydrogen Refueling Sation
Protected Land
Coastal Setback
Water Bodies
Residential Area
Non Hydrogen Pipelines
Storage
Hydrogen Pipelines
Irradiance
Slope
Wind Speed
Exclusionary Criteria Processing
1. Convert to the ESPG 3035
2. Rasterize the vector layer and clip to the study area bounderies.
3. Reclassigy raster so 0 is for excluded and 1 for included.
Vector Data Processing
1. Convert to the ESPG 3035
2. Create five ring buffers with the distances noted in Table 3.3 and associated points
3. Rasterize resulting rings buffer layer, and clip to the study area bounderies
Raster Data Processing
1. Translate the raster data to be in EPSG 3035
2. Warp and clip the raster to the extent of the study area, aligning the pixels.
3. Reclassify values based on the point system noted in Table 3.3
E1
E4
E3
E2
C2
C14
C13
C1
C4
C15
C6
C5
C3
C10
C11
C8
C9
C7
Multiply resulting suitability raster with exclusionary criteria to eliminate entirely unsuitable locations
Apply weights from AHP process or survey to produce a suitability raster
Final Suitability Raster
Legend
Initial Data Layer
Larger Data Set - from which several initial data layers come from
Intermediate Data Layer
C#
Criteria represented by intermediate data layer
Step requires external information
Geoprocessing Steps

Concepts 2 (3)

Spatial suitability weighting (AHP and survey)

- The HRS construction suitability is informed by various spatial input criteria, and then weighted

- AHP-derived weights are informed by scientific literature, objectivity and consistency
- Survey weights were created from stakeholder interviews and their expert knowledge

Concepts 2 (3)

Layer name	Weight
Modelled fuel stations	0.059
Modelled seashore	0.041
Modelled solar wind	0.057
Modelled urban nodes	0.093
Modelled water bodies	0.048
Modelled gas pipelines	0.050
Modelled hydrogen pipelines	0.080
Modelled corridor points	0.085
Modelled powerlines	0.076
Modelled transport nodes	0.086
Modelled residential areas	0.068
Modelled rest areas	0.061
Modelled slope	0.062

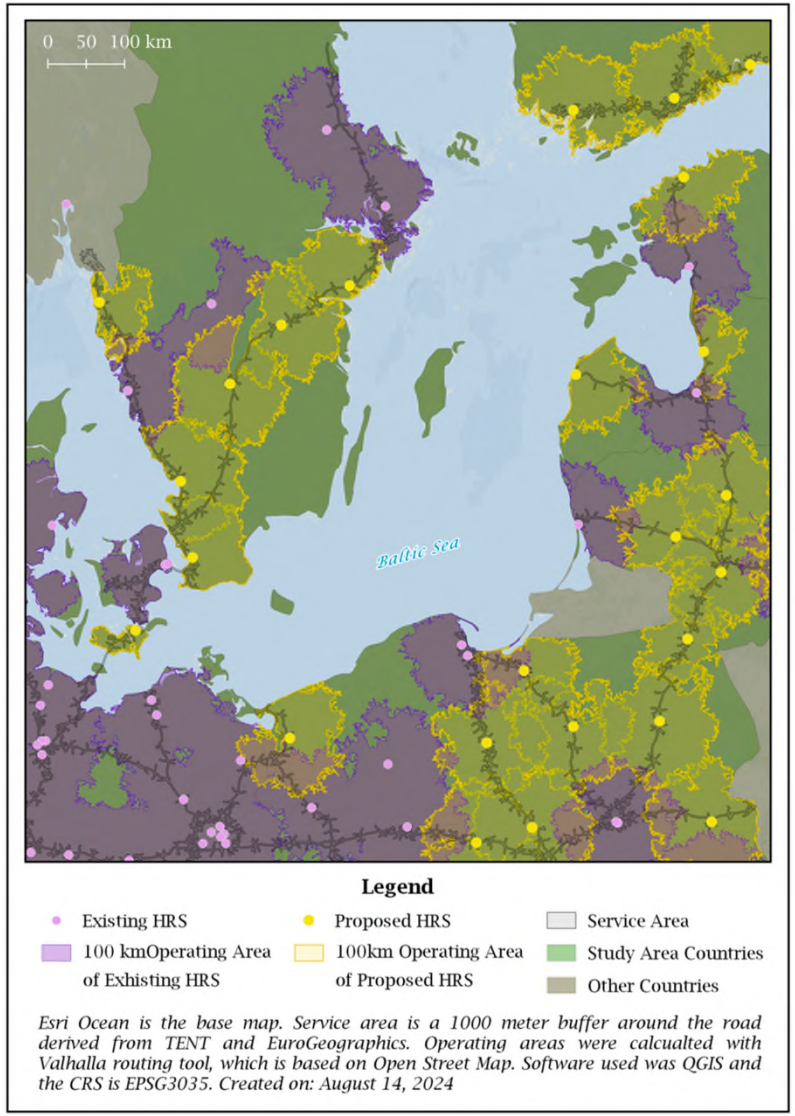
cellid	354653
modelled_fuel_stations	4
modelled_seashore	2
modelled_solar_wind	2
modelled_urban_nodes	2
modelled_water_bodies	10
modelled_gas_pipelines	4
modelled_hydrogen_pipelines	4
modelled_corridor_points	0
modelled_powerlines	6
modelled_transport_nodes	4
modelled_residential_areas	6
modelled_rest_areas	2
modelled_slope	8
suitability	3.97690529959836

Survey-based weights

Concepts 3 (3)

Spatial Allocation of HRS Placement

- Use planned/envisioned and existing HRS
- distribute potential minimal number stations (200 km) along Ten-T core roads
- Calculate service areas, i.e. reach from
- Prefer locations with higher suitability



Functionalities

- Web map, zoom, pan, legend
- Limit view to a country / partner region
- Suitability grid, different weights for suitability visualisation
- Informative layers
- Feature info, activate/deactivate layers
- Service area function, export, delete
- Documentation link
- Login / account
- Create, edit, delete own suitability weights based
- Submit and review/edit submitted feedback

Final outcomes

- Maintenance and documentation („polishing“)
- „Serverless“ data query and API access
- Public deposit of data and code as open-source
- Transition into One-stop-shop for post-project extended availability

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Research and technical documents references:

Bratic, A. (2024, August). Hydrogen truck refueling stations for heavy duty vehicles - A case study of the Baltic Sea Region (Master's thesis). Faculty of Geo-information Science and Earth Observation, University of Twente, Enschede, Netherlands. Supervisors: Dr. Alexander Kmoch, Ir. Mark Brussel.

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Thank you!

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