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Linking Estonia and Latvia
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KIK
KESKKONNAINVESTEERINGUTE KESKUS

GORWIND Advisory Board meeting

WP4 results – planning tool

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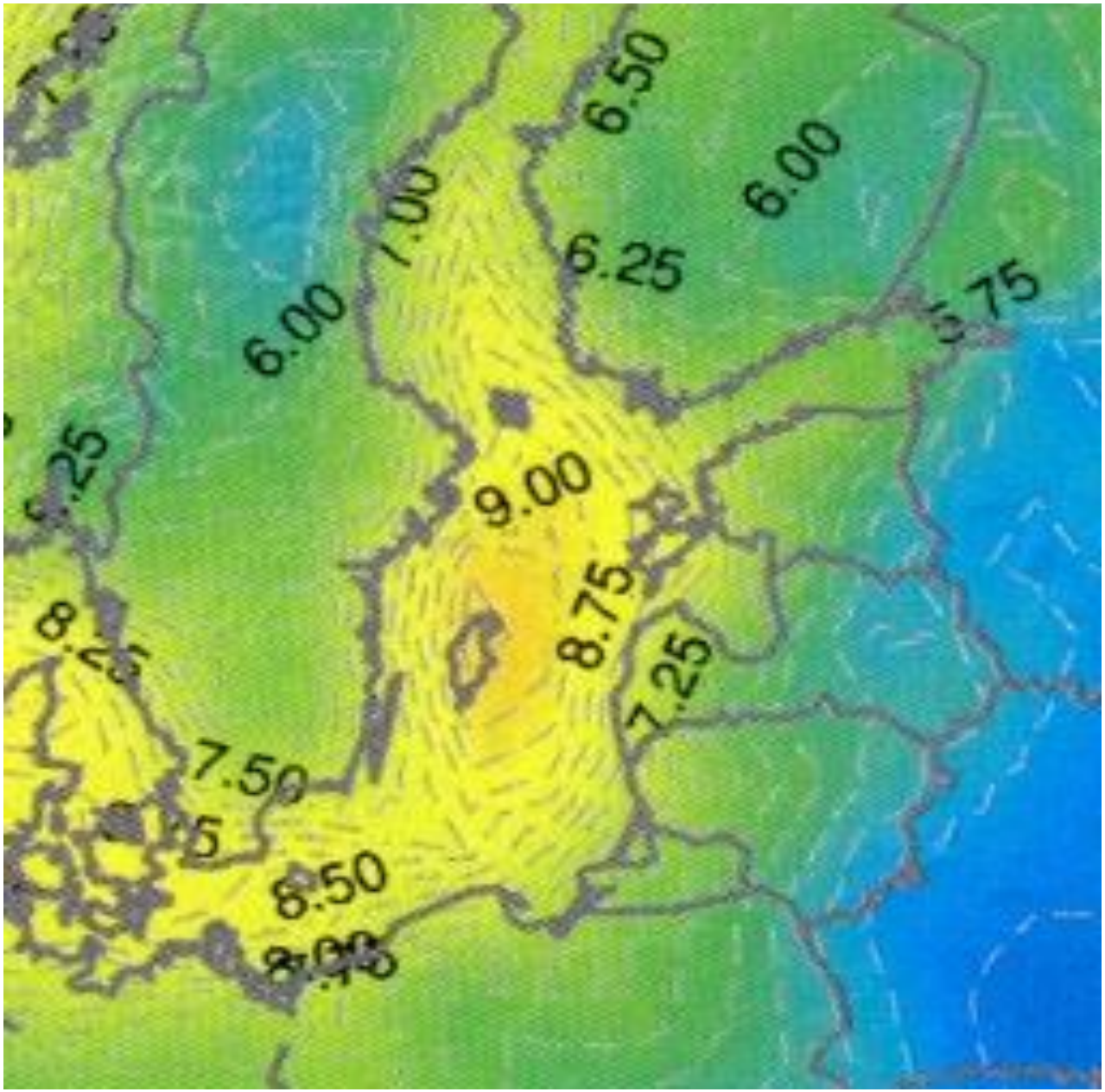
LATVIJAS HIDROEKOLOĢIJAS INSTITŪTS

Wind resource ...



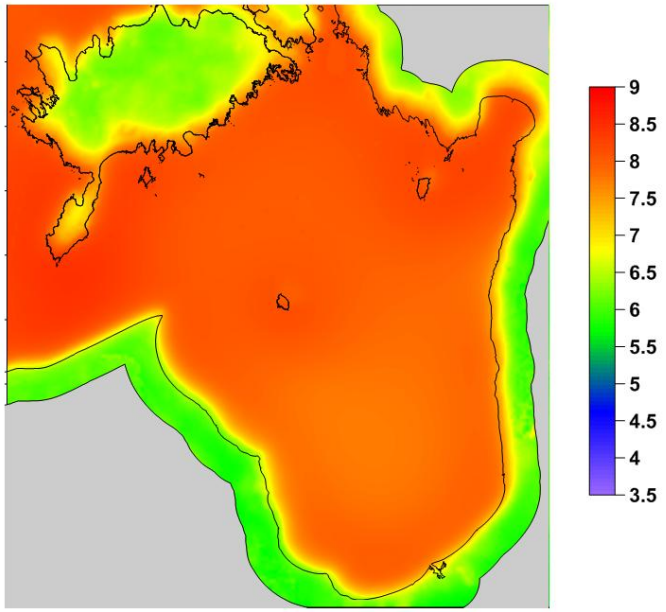
+ Physical limitations

+ Nature / Wildlife

+ Legal restrictions

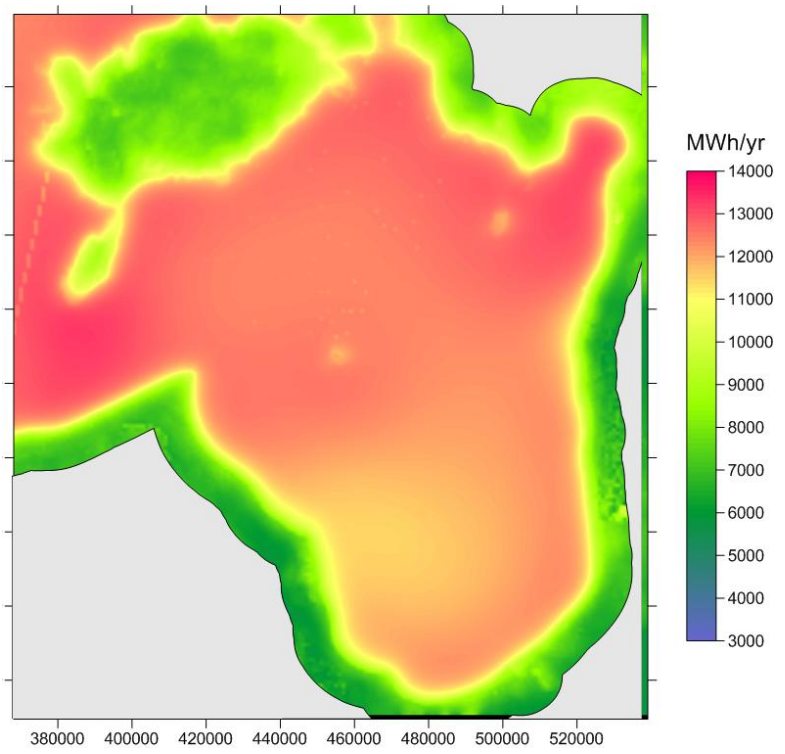
+ Socio-economical limitations

= Suitability rate



Mean annual wind speed m/s

Mean annual energy production by SWT-3.6-107



Wind energy in off-shore is nearly 40% higher than on coast but...

Physical limitations

- Bathymetry → “water depth suitability”
- Bottom substrate
- Ice cover

  = Ice cover spatial probability

  = Number of days with ice cover

Water depth is one of the most critical limitations:

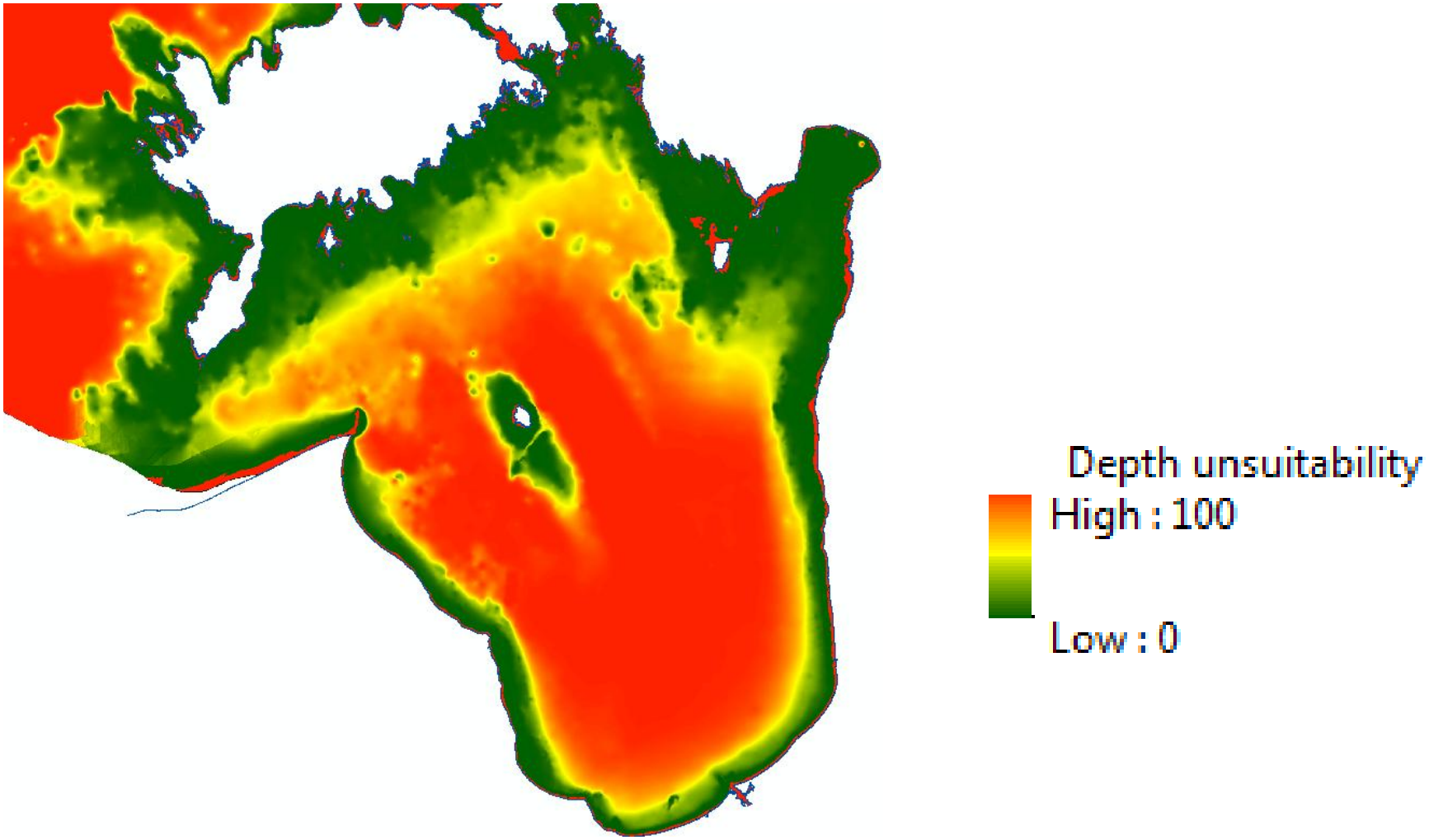
very shallow water <1.5 m is not accessible for installation ships and barges;

deeper than 35 m water is too costly to develop, especially in ice-covered waterbodies.

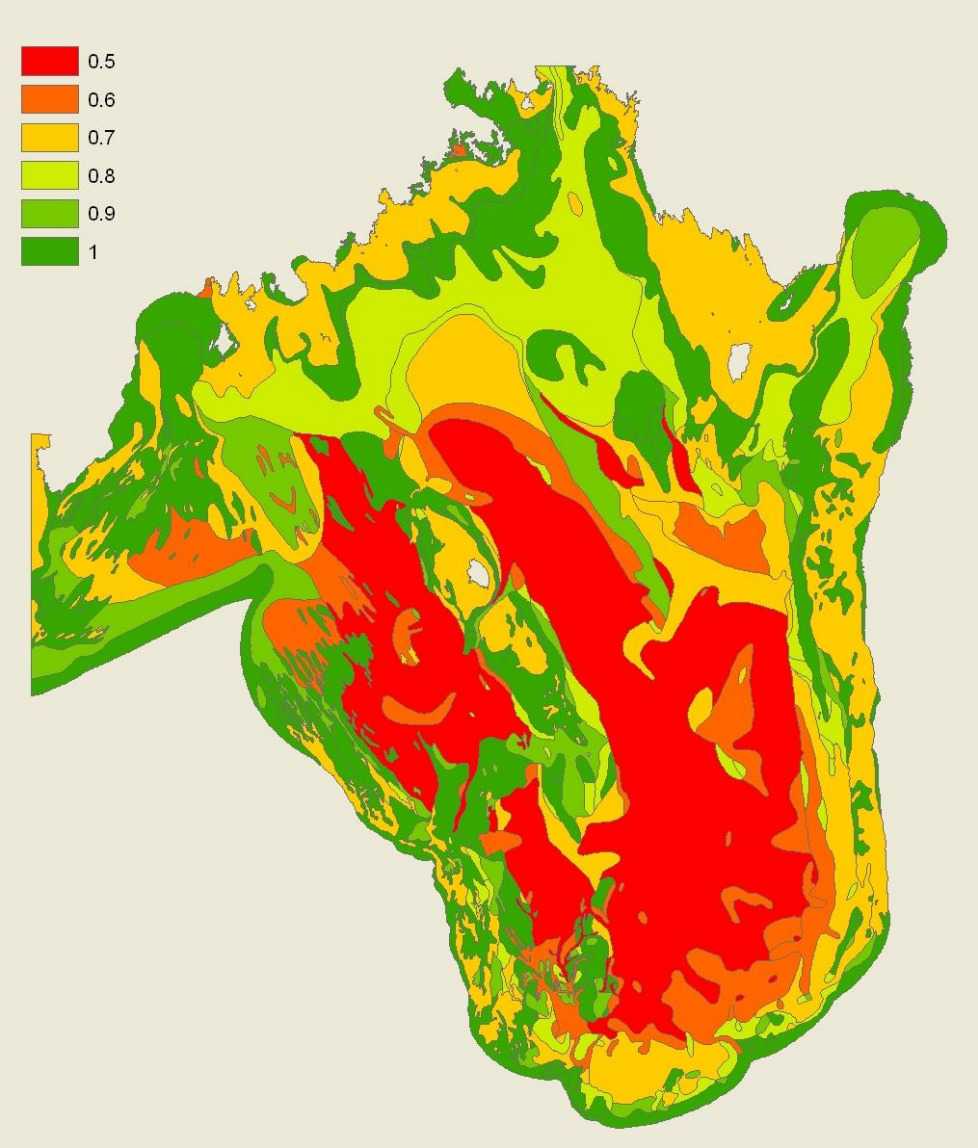
Normally developed at depth between 8-16 m.

The latest achievement – wind turbines installed at the depth of 45 m (Beatrice, UK).

Water depth suitability/unsuitability in the Gulf

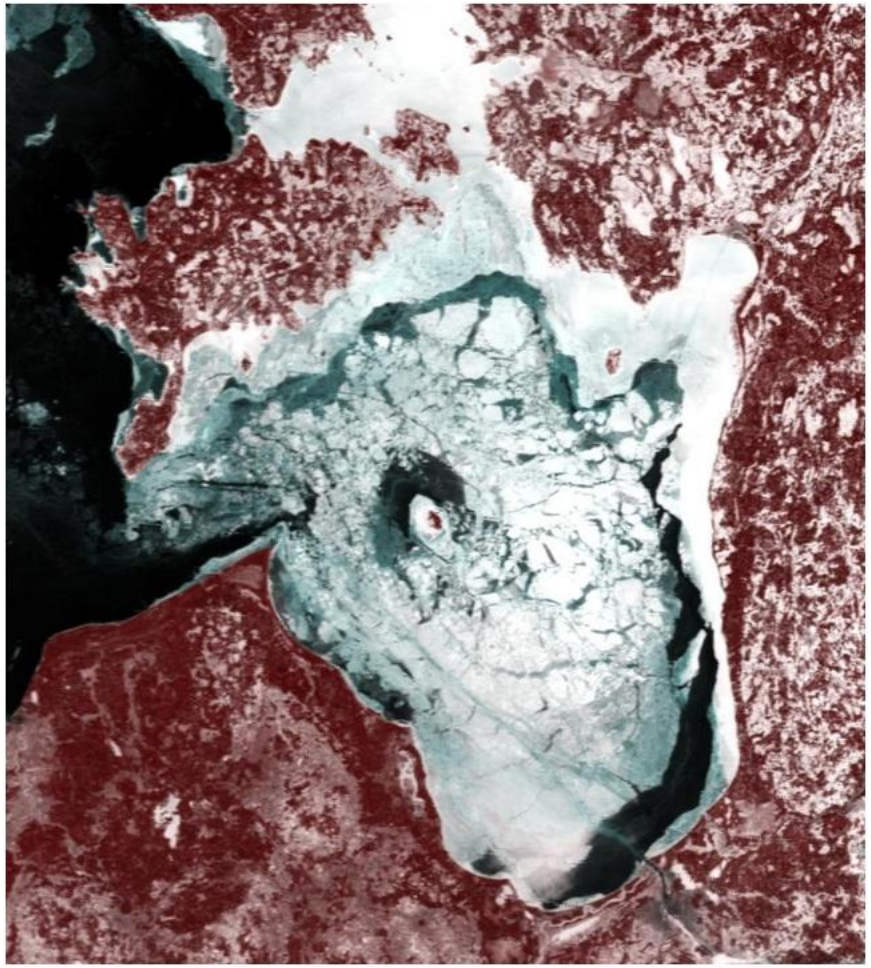


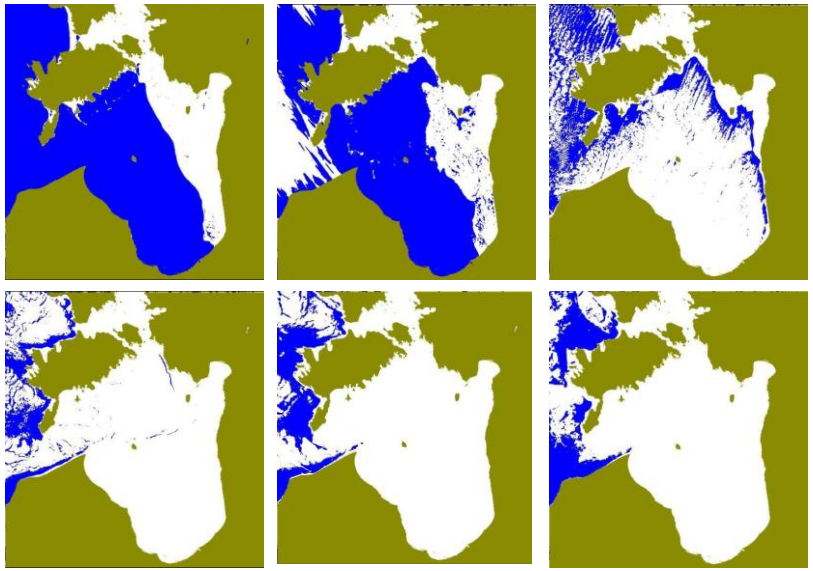
Bottom substrate suitability



bedrock	1
mixed sediments	0.8
mud	0.5
muddy sand	0.7
muddy silt	0.6
sand	1
sand medium grained	1
sand variable grained	1
sandy gravel and gravel vith pebbles and boulder	0.7
sandy gravel vith pebbles	1
sandy mud	0.7
sandy silt	0.9
silt	0.7
silty sand	0.8
silty mud	0.6
silty sand	0.9
variable grained sand with gravel	1

Ice cover probability, number of days with ice cover

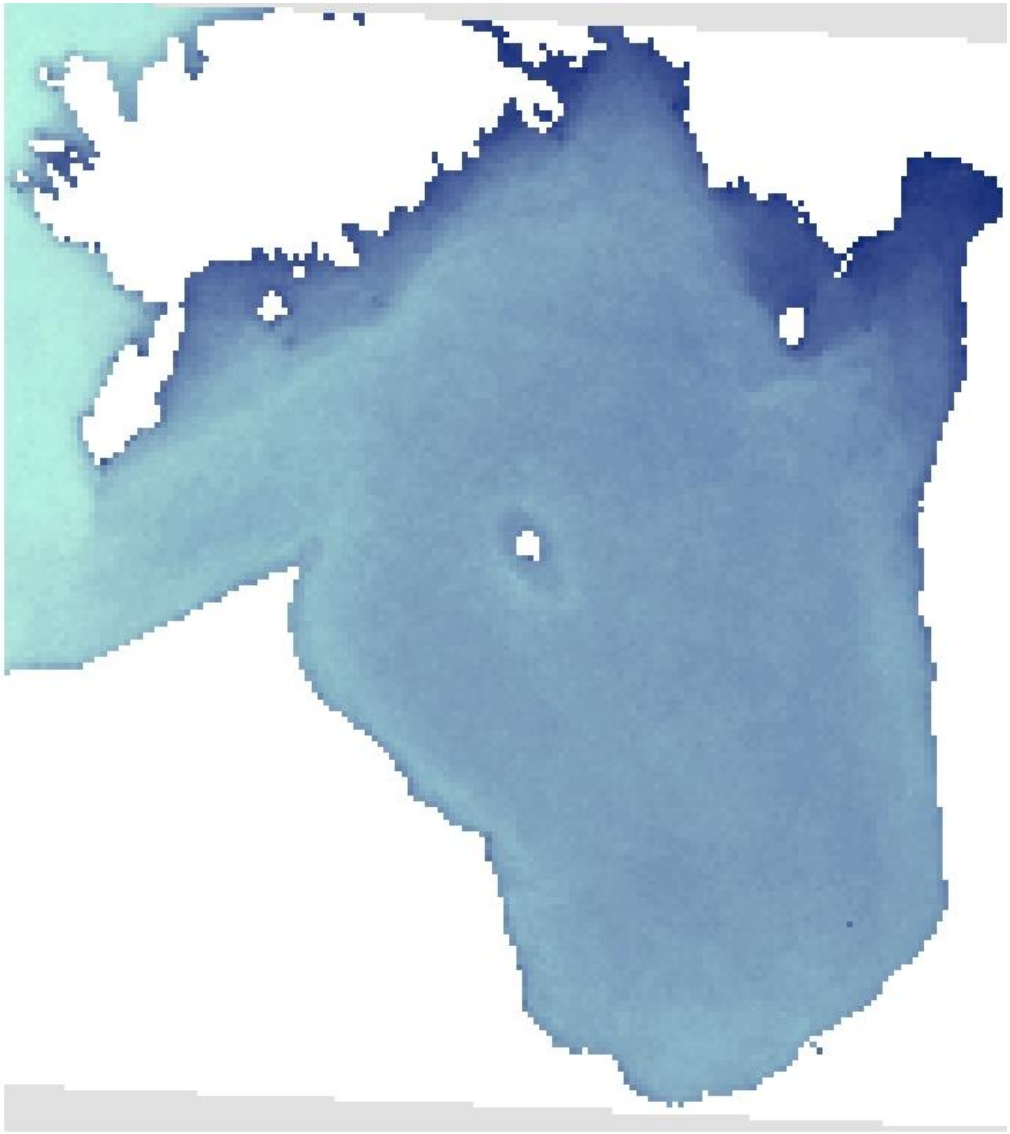




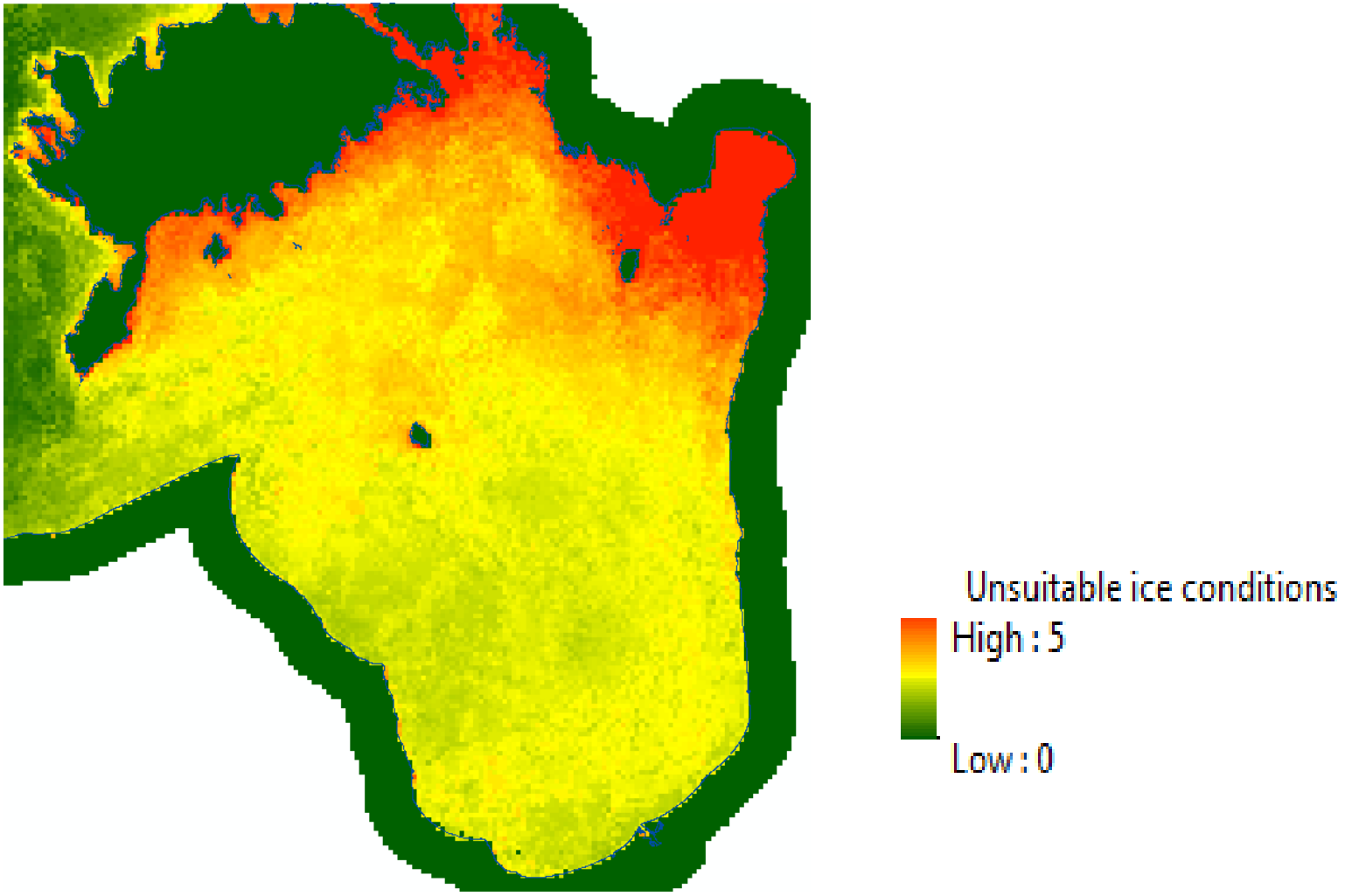
(source: MSI)

Impact on wind farm development costs, stability, operation and habitat of seals

Ice cover probability



The probability of wind turbine faults due to ice conditions

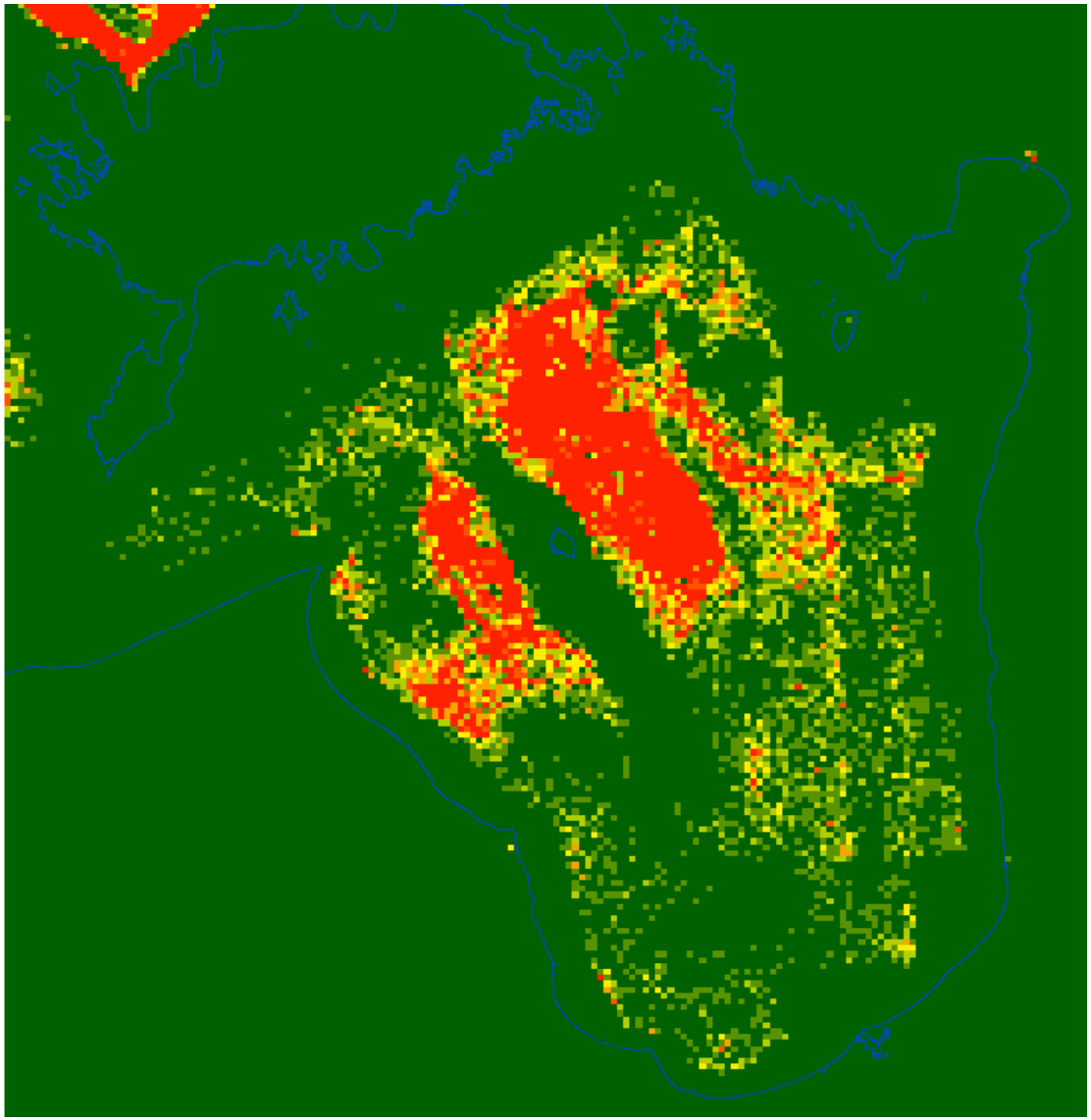


Nature / wildlife

- Commercial fishing intensity
- Vulnerable areas for seals:
  - = migration routes
  - = feeding areas
  - = breeding areas
- Vulnerable areas for birds

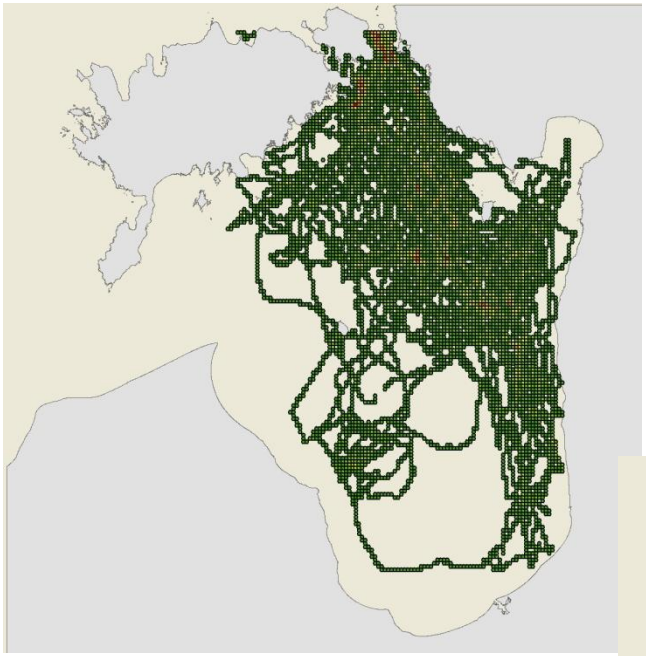
Commercial fishing

Intensity of offshore trawling in 2009-2012

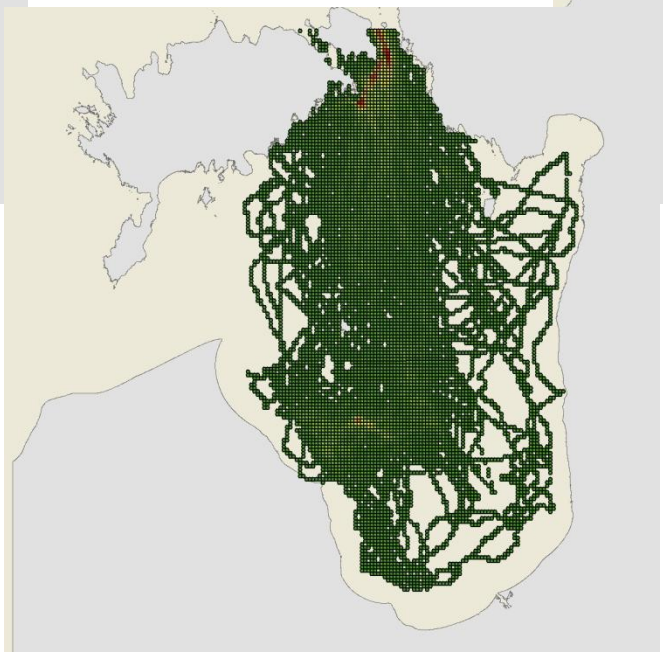


Importance of fishing
High : 5
Low : 0

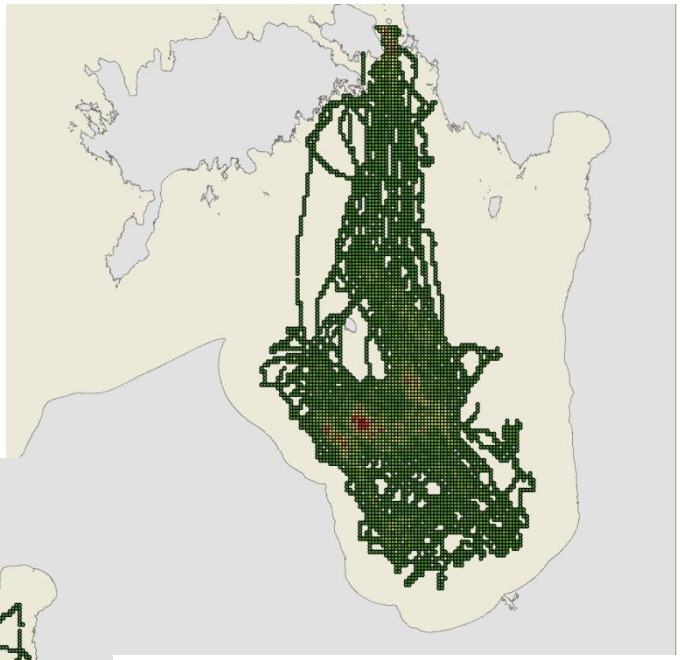
Seasons in the life of seals



Seals in winter

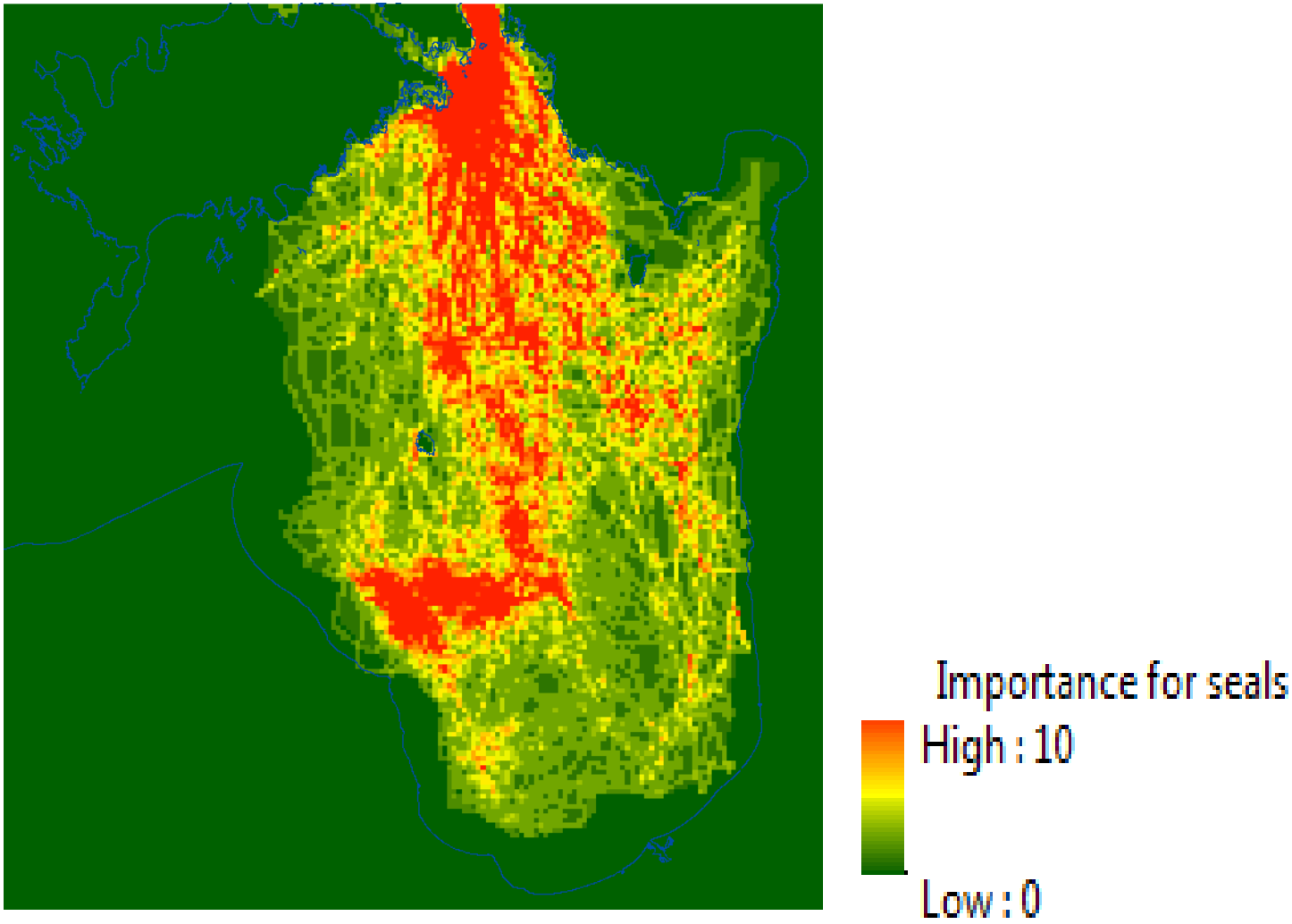


Seals in autumn

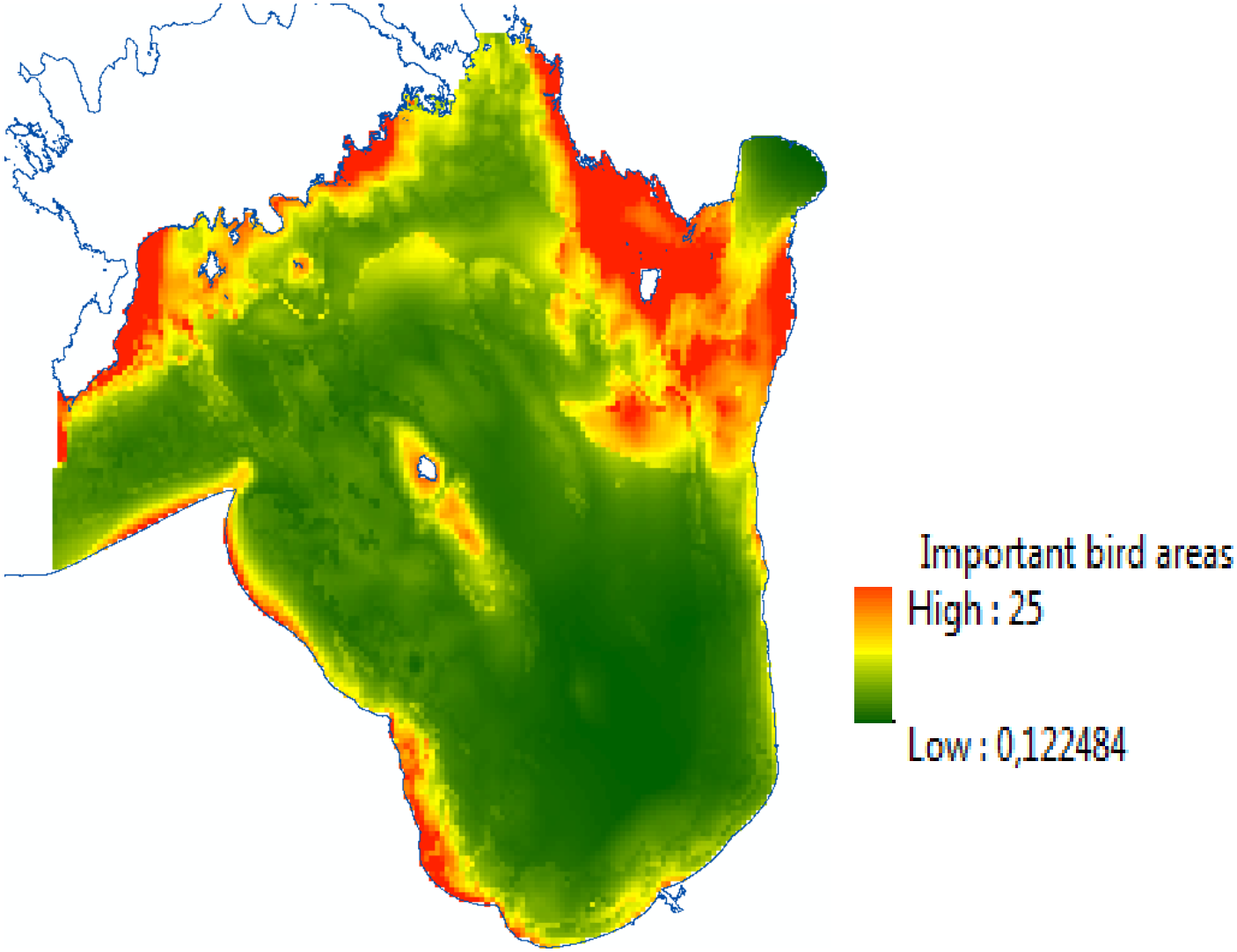


Seals in summer

Most important areas for seals



Most important sites for birds



Categorical limitations

- All legally binding limitations, e.g.

  noise prevention zone

  safety zone around infrastructure

  coastal building restriction zone etc.

  (total appr. 60 legal restrictions)

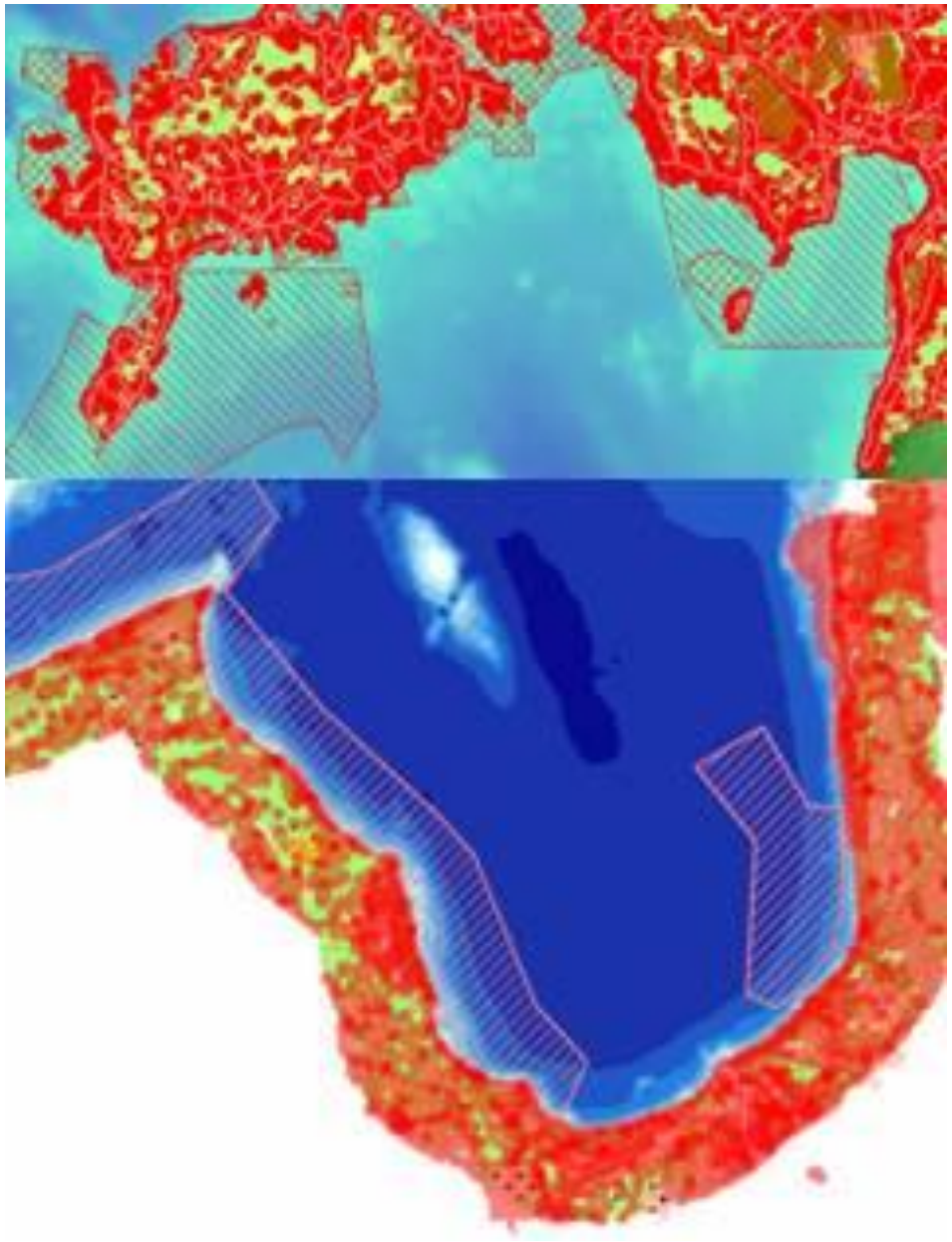
- Exclusive use areas, e.g.

  military training areas

  navigation routes

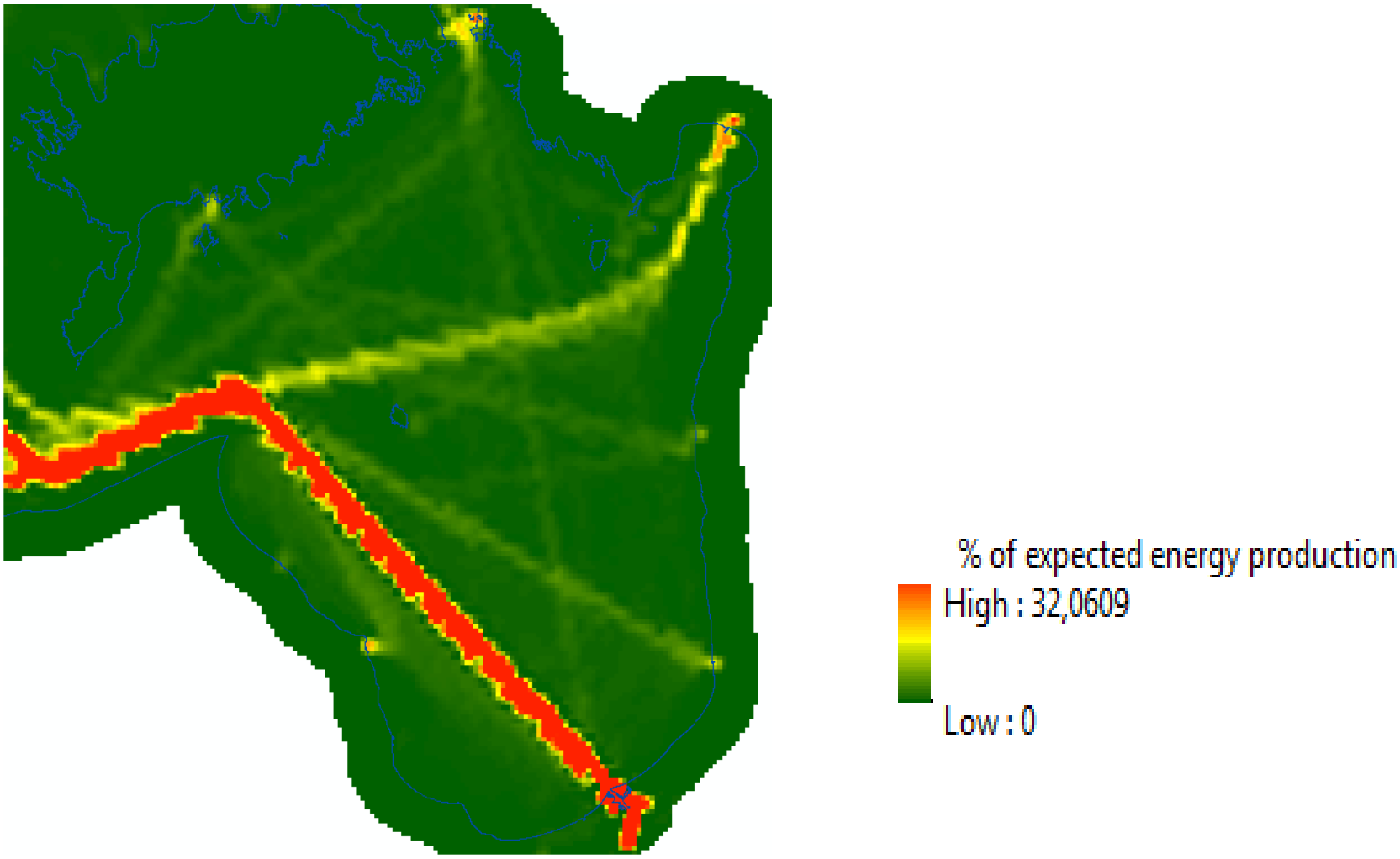
  light sectors of lighthouses etc.

Legal restrictions on land



Almost no space for wind farm development in coastal zone, only few stand-alone wind turbine sites available

Economic aspects: Marine traffic



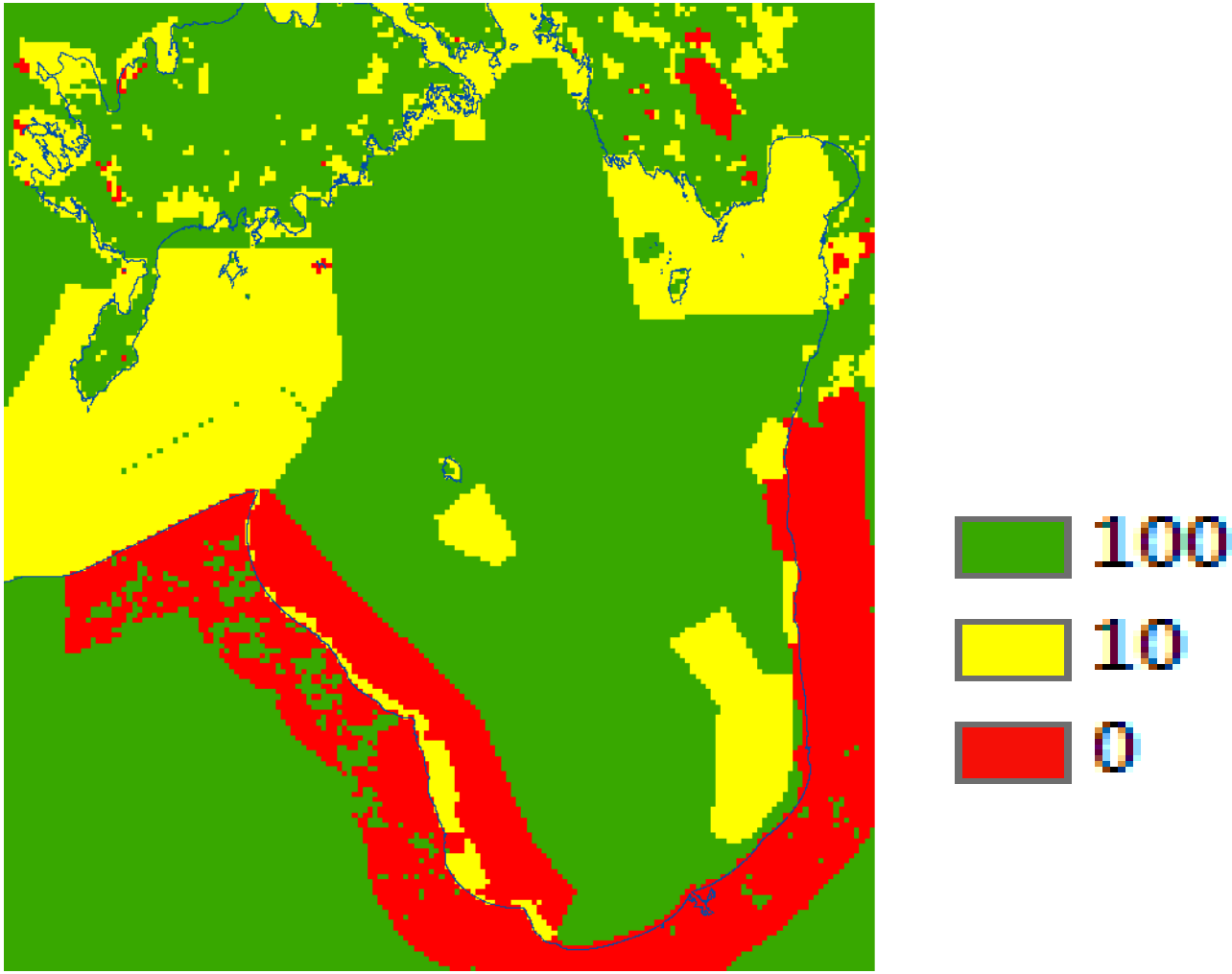
Source: HELCOM marine traffic intensity data

Socio-economic limitations
(soft restrictions/suggestions)

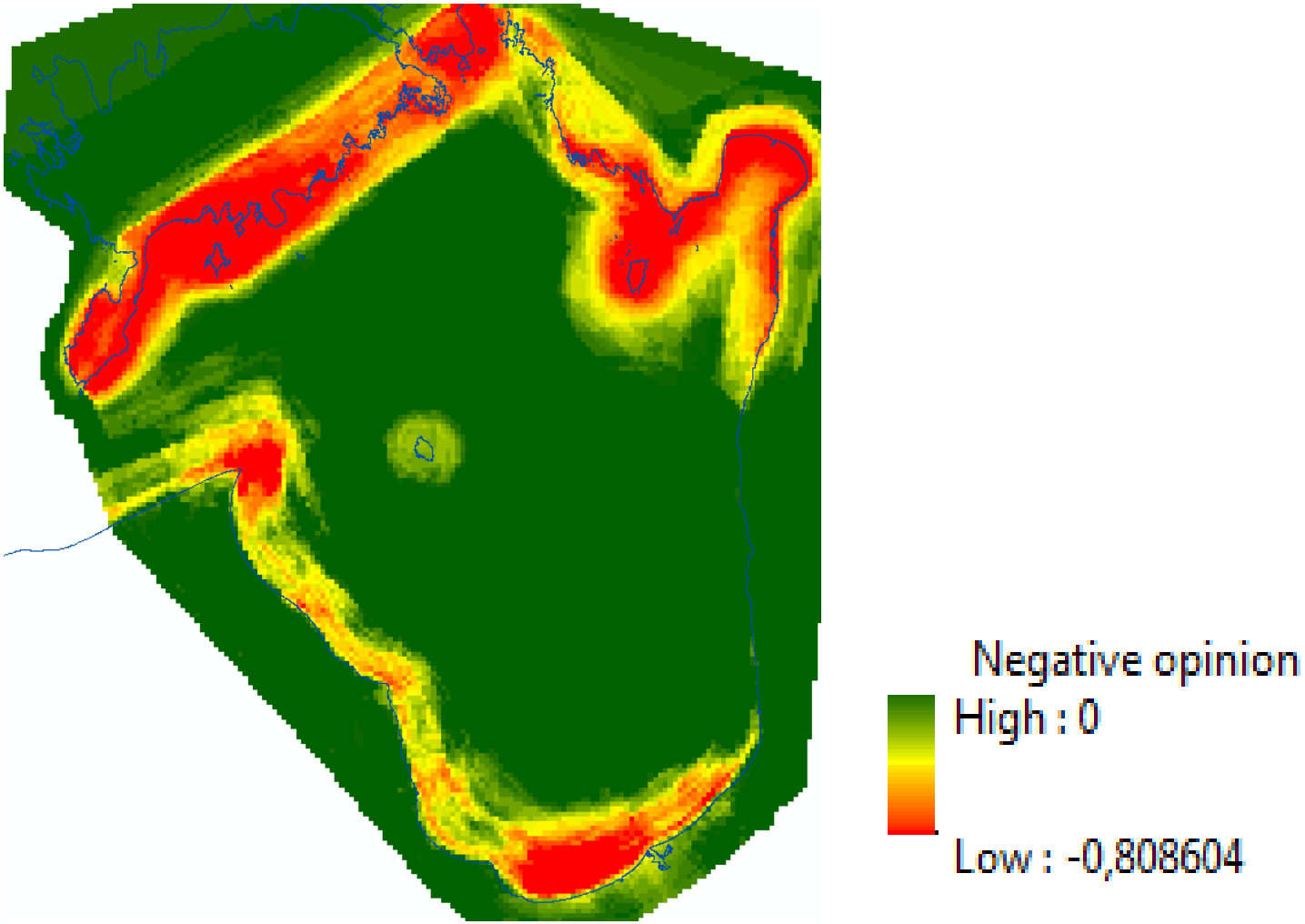
- Natura 2000 areas,
- IBA areas
- Heritage values

- Public acceptance /rejectance areas based on questionnaire

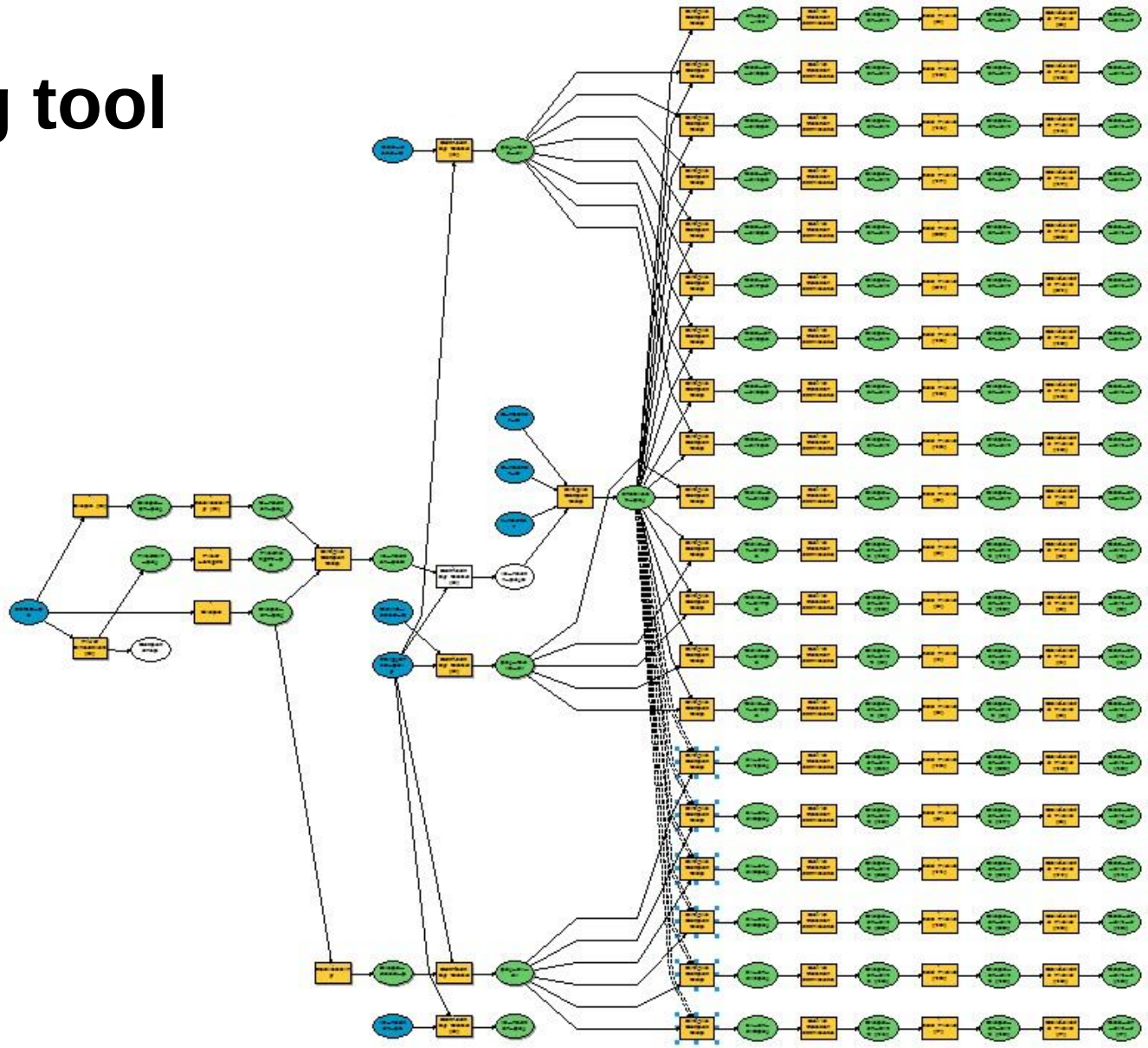
Nature reserves/protection/IBA

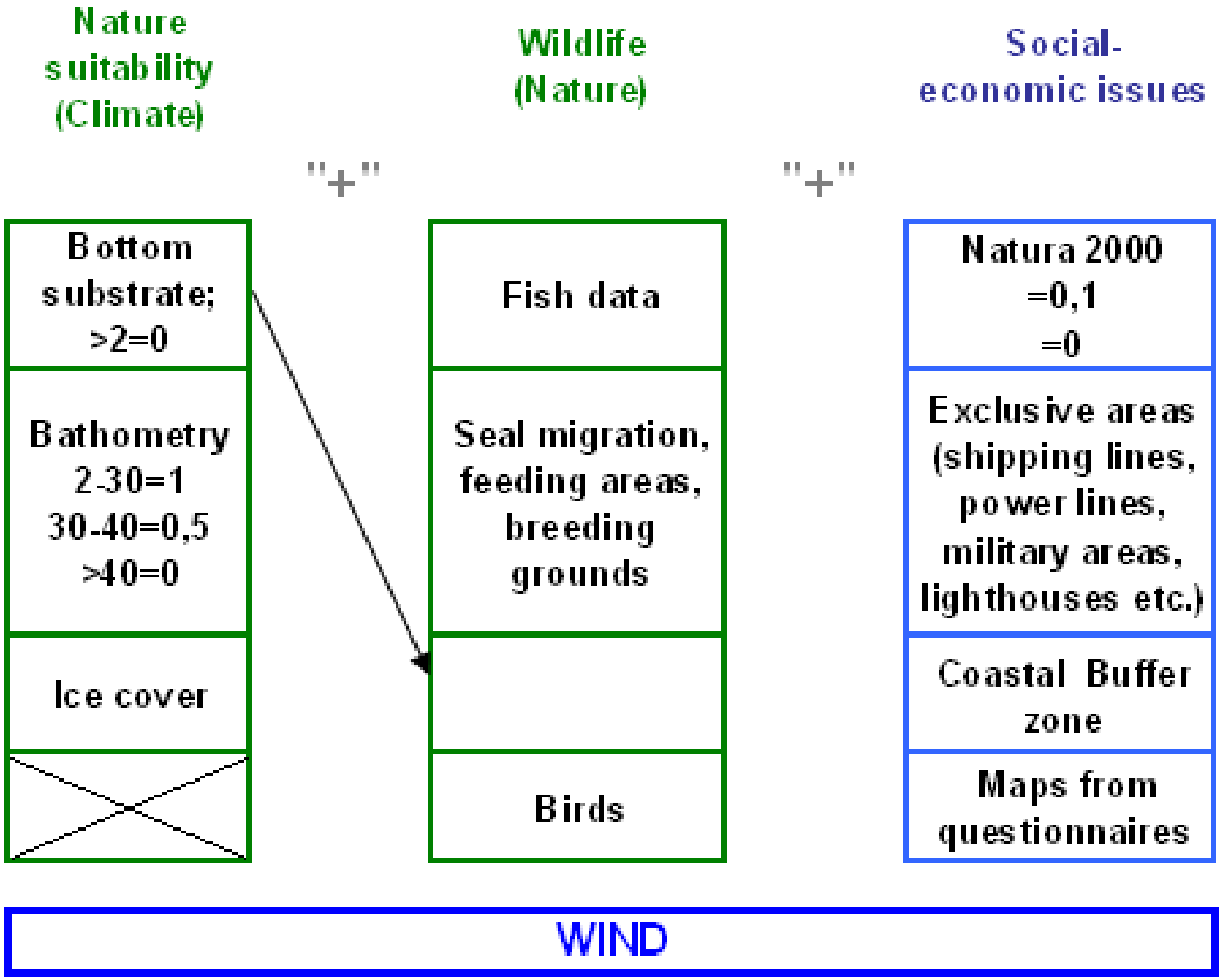


Public resistance towards wind turbines



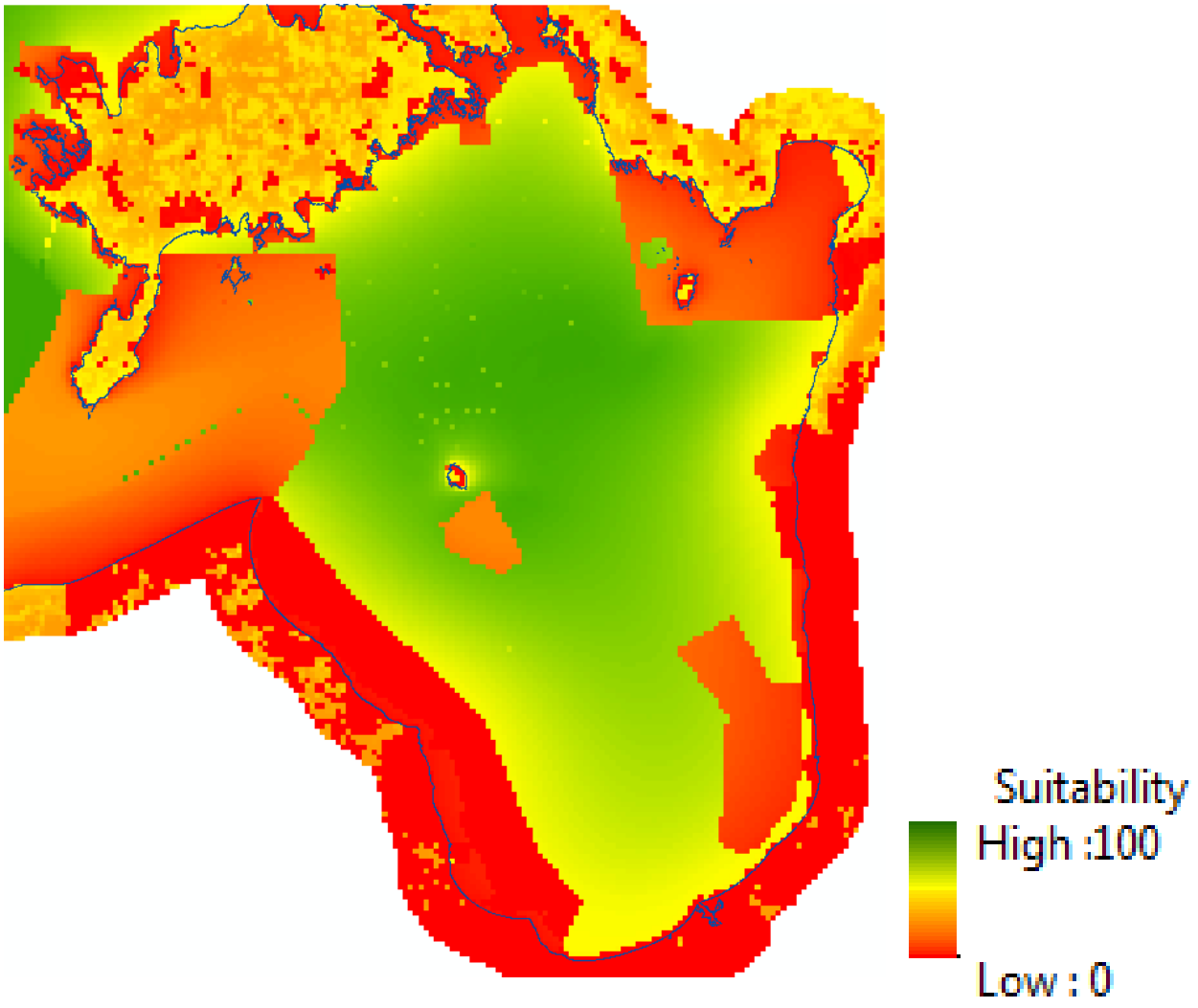
Model = planning tool



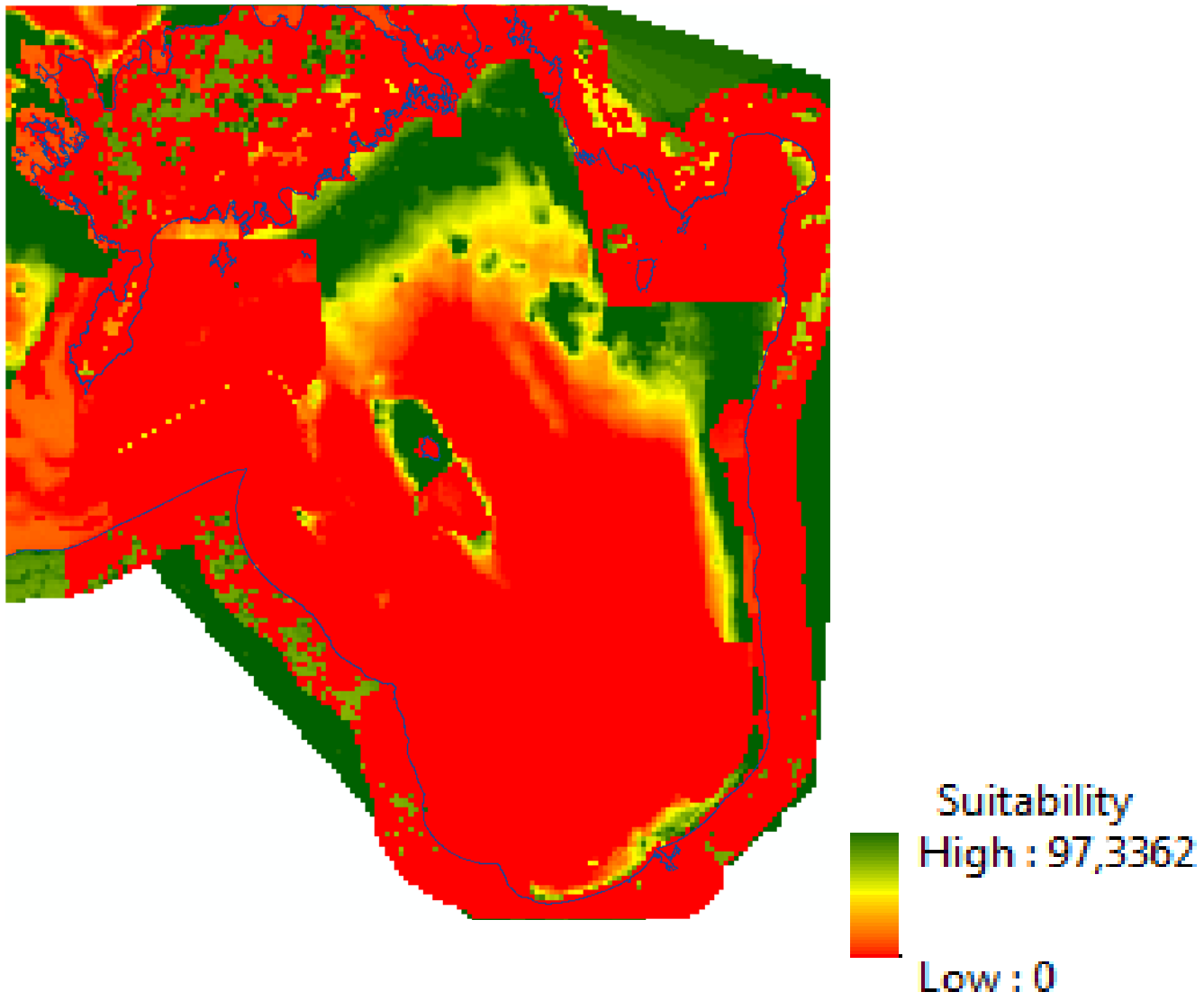

Nature suitability (Climate)
"+"
Wildlife (Nature)
"+"
Social-economic issues
Bottom substrate; >2=0
Bathometry 2-30=1 30-40=0,5 >40=0
Ice cover
Fish data
Seal migration, feeding areas, breeding grounds
Birds
Natura 2000 =0,1 =0
Exclusive areas (shipping lines, power lines, military areas, lighthouses etc.)
Coastal Buffer zone
Maps from questionnaires
WIND

Examples of draft tool in action testing suitability

- Wind speed and protected areas



- Adding more layers:



Influence on suitability (decreasing order)

1. Wind speed (scale 0-100) nature protection areas (scale 0-100), sea depth (scale 0-100), settlement buffers.
2. Energy consumption by ships (scale 0-32) and public opinion (scale 0-81) - important role in some particular places.
3. Fishery (0-5), seals (0-10), birds (0-25) and ice (0-5) is marginary.