Baltic InteGrid

Integrated Baltic Offshore Wind Electricity Grid Development

Thematic Working Group - MSP

Klaipeda, November 22th

Andreas Möser, Lund University

LUND UNIVERSITY

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

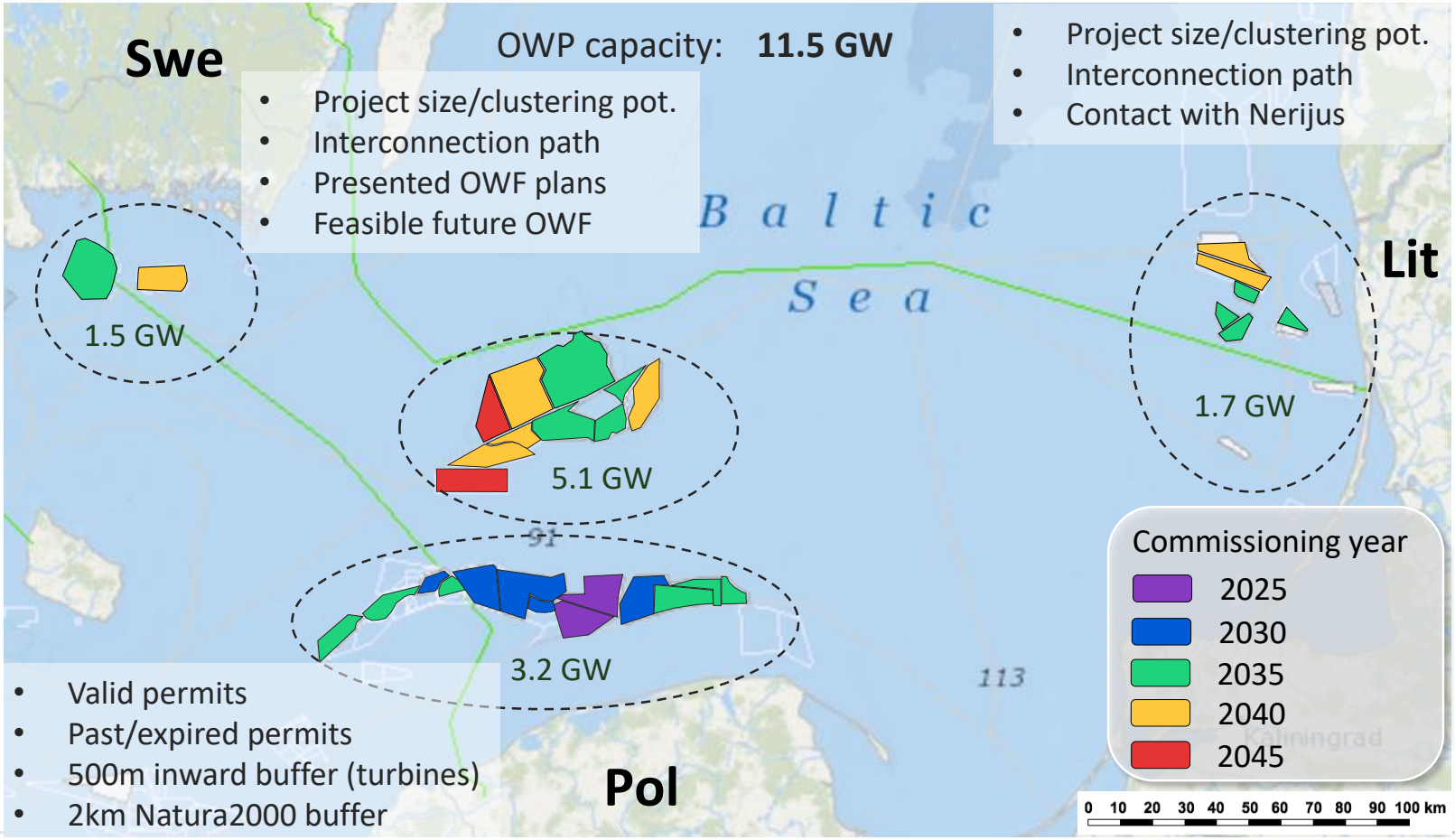
EUROPEAN UNION

EUROPEAN REGIONAL DEVELOPMENT FUND

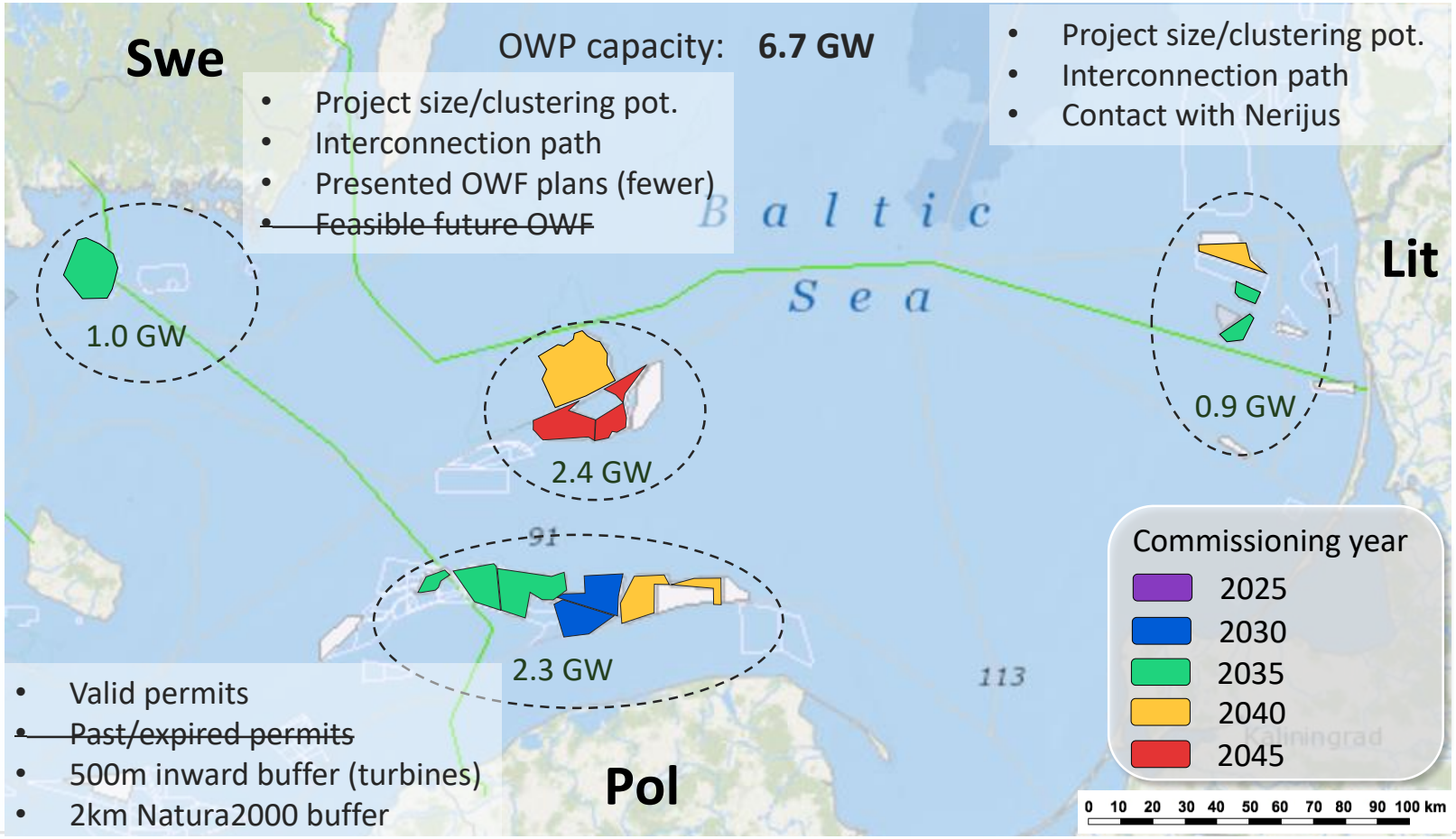
Outline

- High & Low OWP development
- Maritime Spatial Planning (MSP)
  - Sweden
  - Poland
  - Lithuania
- Scenario 1a and 3a
  - Draft layouts
  - GIS layouts
- Comparison 1a & 3a
- Scenario 2a
  - Draft layouts
  - GIS layout

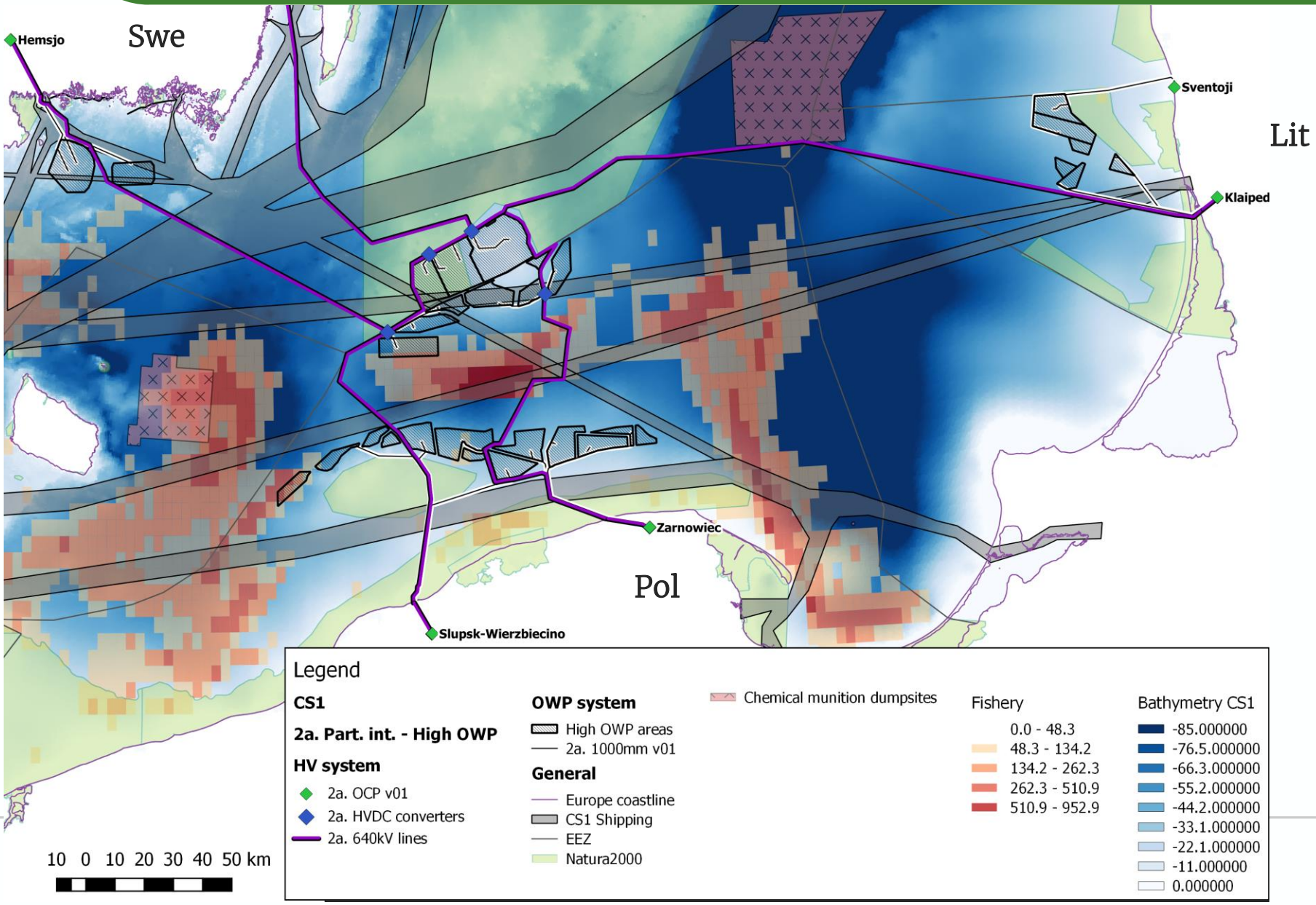
High OWP – Vision 2045



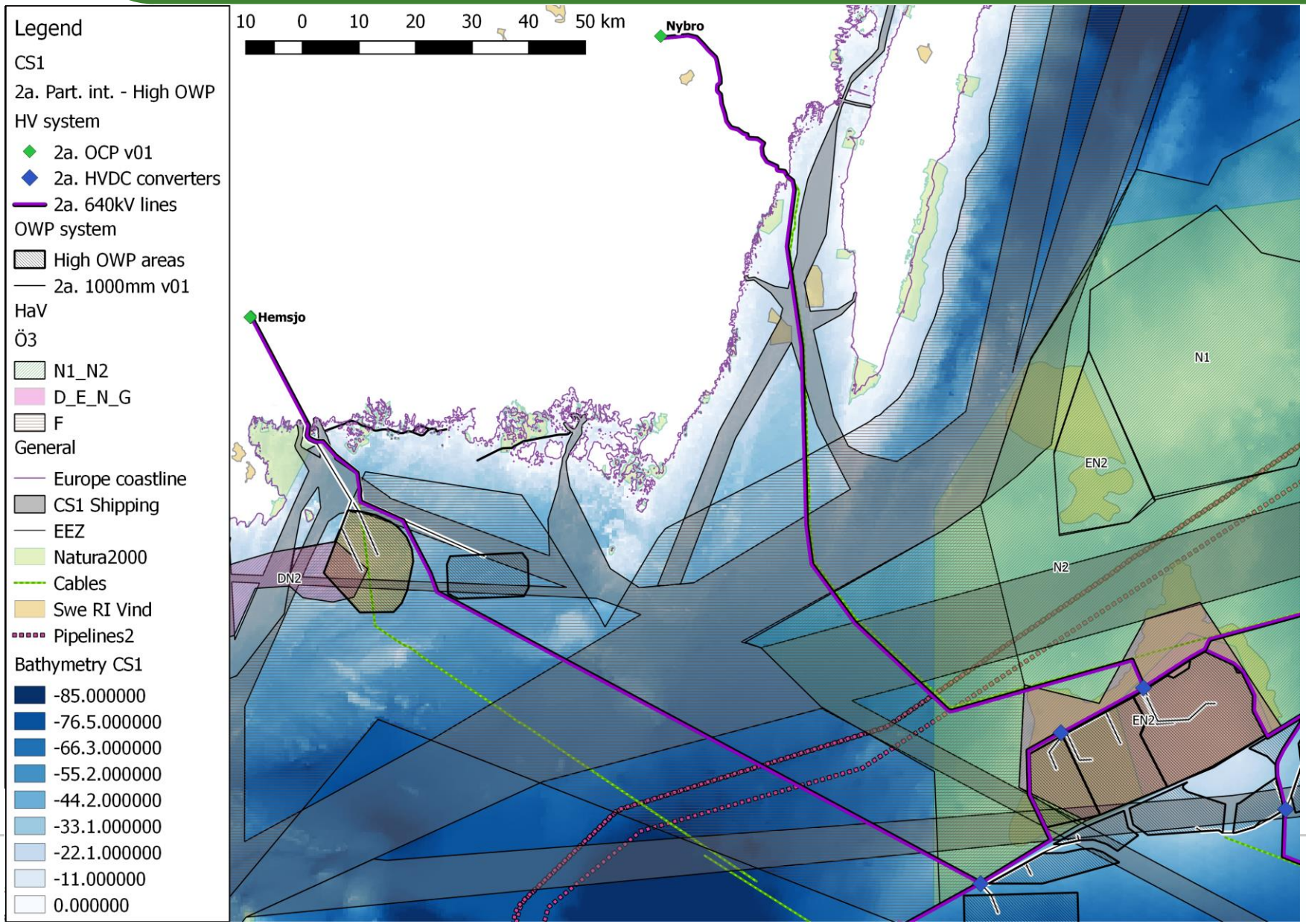
Low OWP – Vision 2045



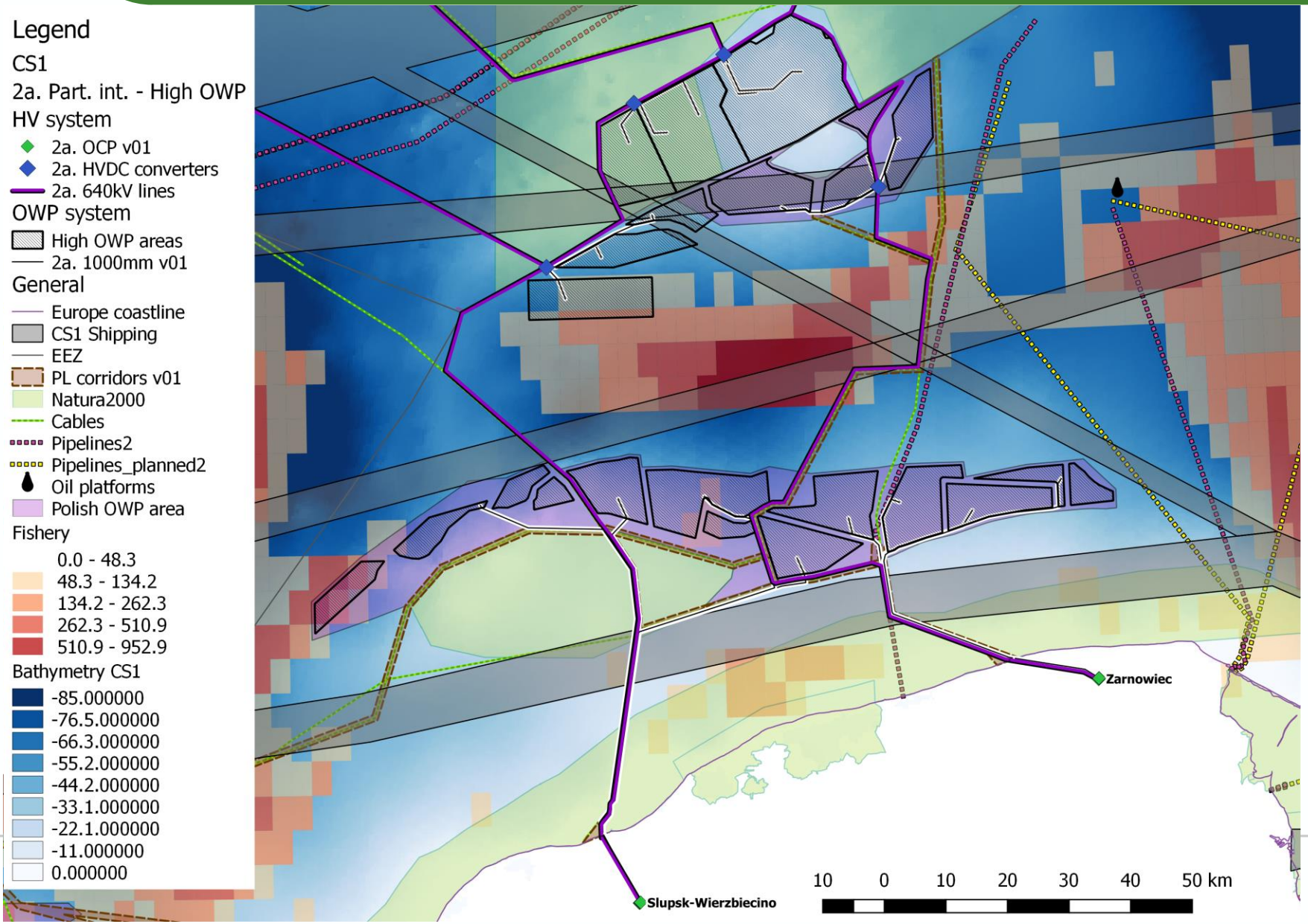
MSP – Overview



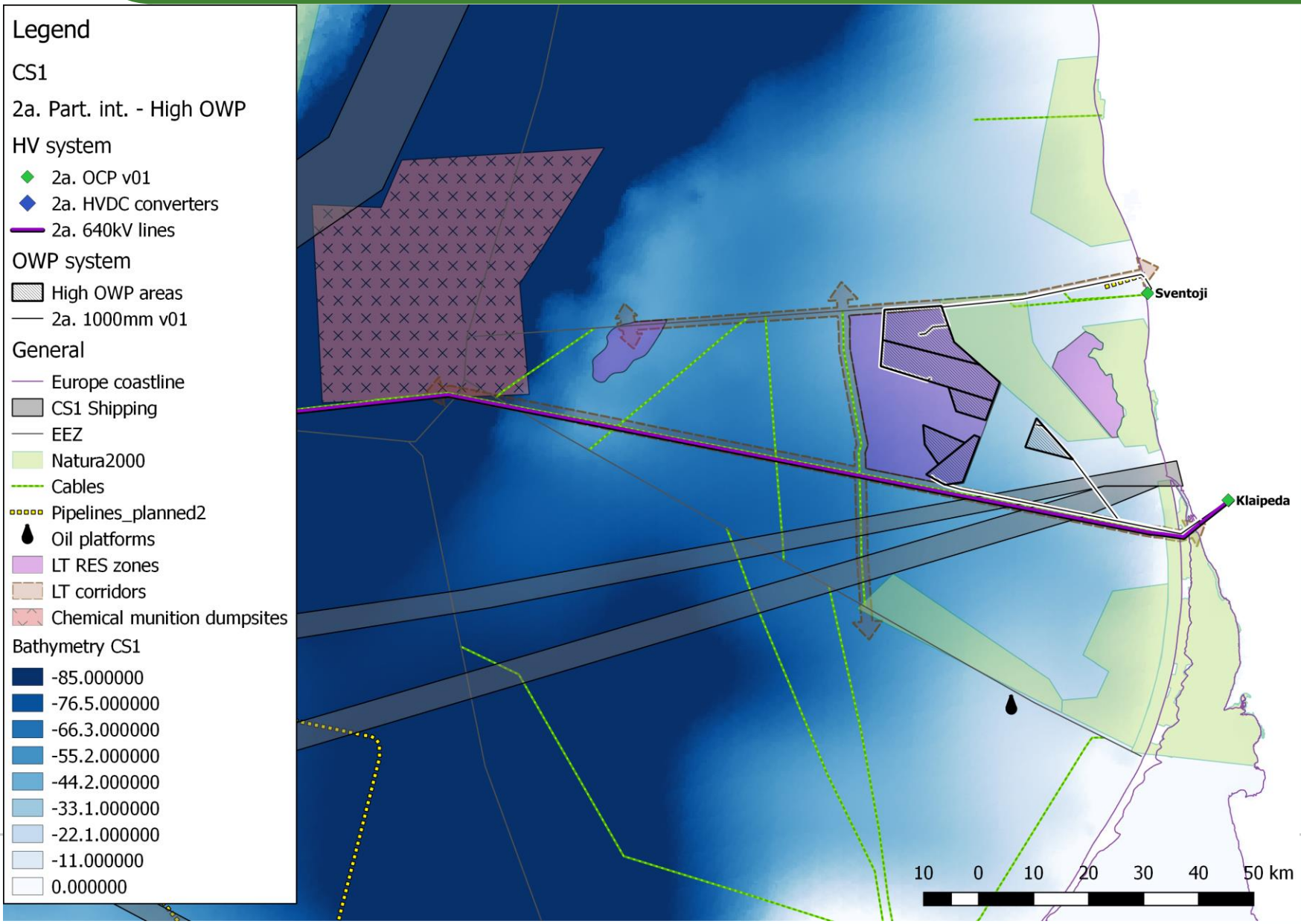
MSP – Sweden


Legend
CS1
2a. Part. int. - High OWP
HV system
2a. OCP v01
2a. HVDC converters
2a. 640kV lines
OWP system
High OWP areas
2a. 1000mm v01
HaV
Ö3
N1_N2
D_E_N_G
F
General
Europe coastline
CS1 Shipping
EEZ
Natura2000
Cables
Swe RI Vind
Pipelines2
Bathymetry CS1
-85.000000
-76.5.000000
-66.3.000000
-55.2.000000
-44.2.000000
-33.1.000000
-22.1.000000
-11.000000
0.000000
10 0 10 20 30 40 50 km
Nybro
Hemsjo
N1
EN2
N2
DN2
EN2

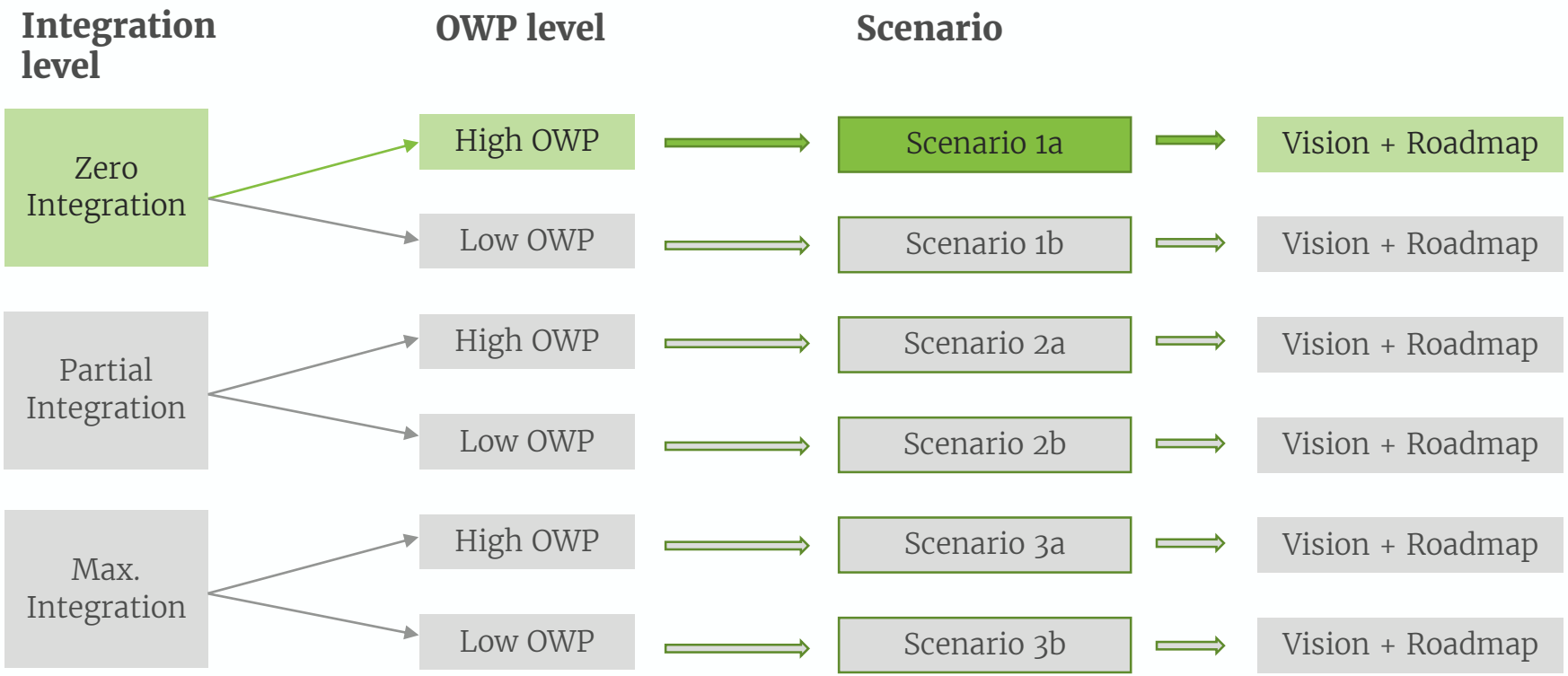
MSP – Poland


Legend
CS1
2a. Part. int. - High OWP
HV system
2a. OCP v01
2a. HVDC converters
2a. 640kV lines
OWP system
High OWP areas
2a. 1000mm v01
General
Europe coastline
CS1 Shipping
EEZ
PL corridors v01
Natura2000
Cables
Pipelines2
Pipelines_planned2
Oil platforms
Polish OWP area
Fishery
0.0 - 48.3
48.3 - 134.2
134.2 - 262.3
262.3 - 510.9
510.9 - 952.9
Bathymetry CS1
-85.000000
-76.5.000000
-66.3.000000
-55.2.000000
-44.2.000000
-33.1.000000
-22.1.000000
-11.000000
0.000000
Zarnowiec
Slupsk-Wierzbiecino
10 0 10 20 30 40 50 km

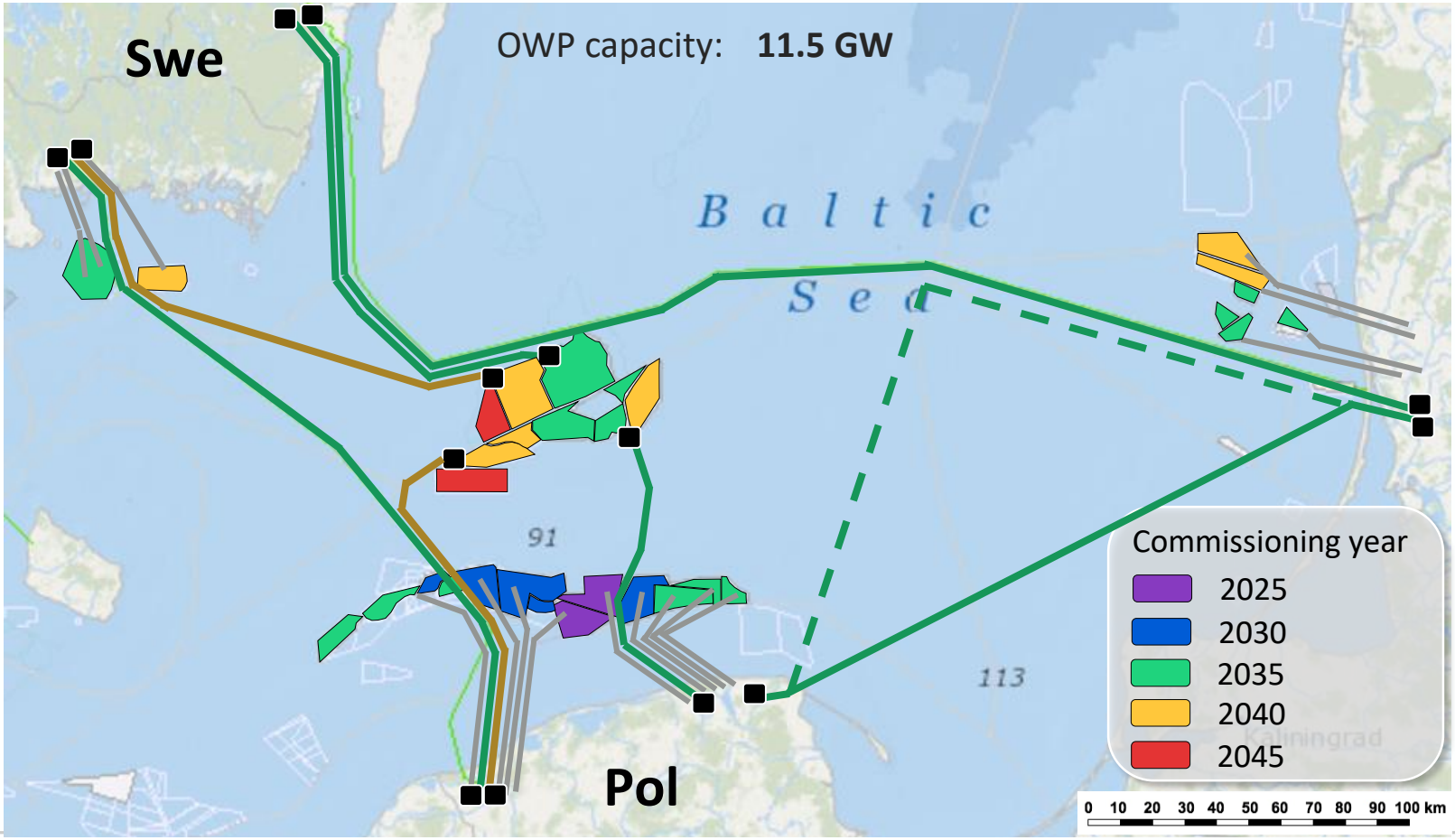
MSP – Lithuania



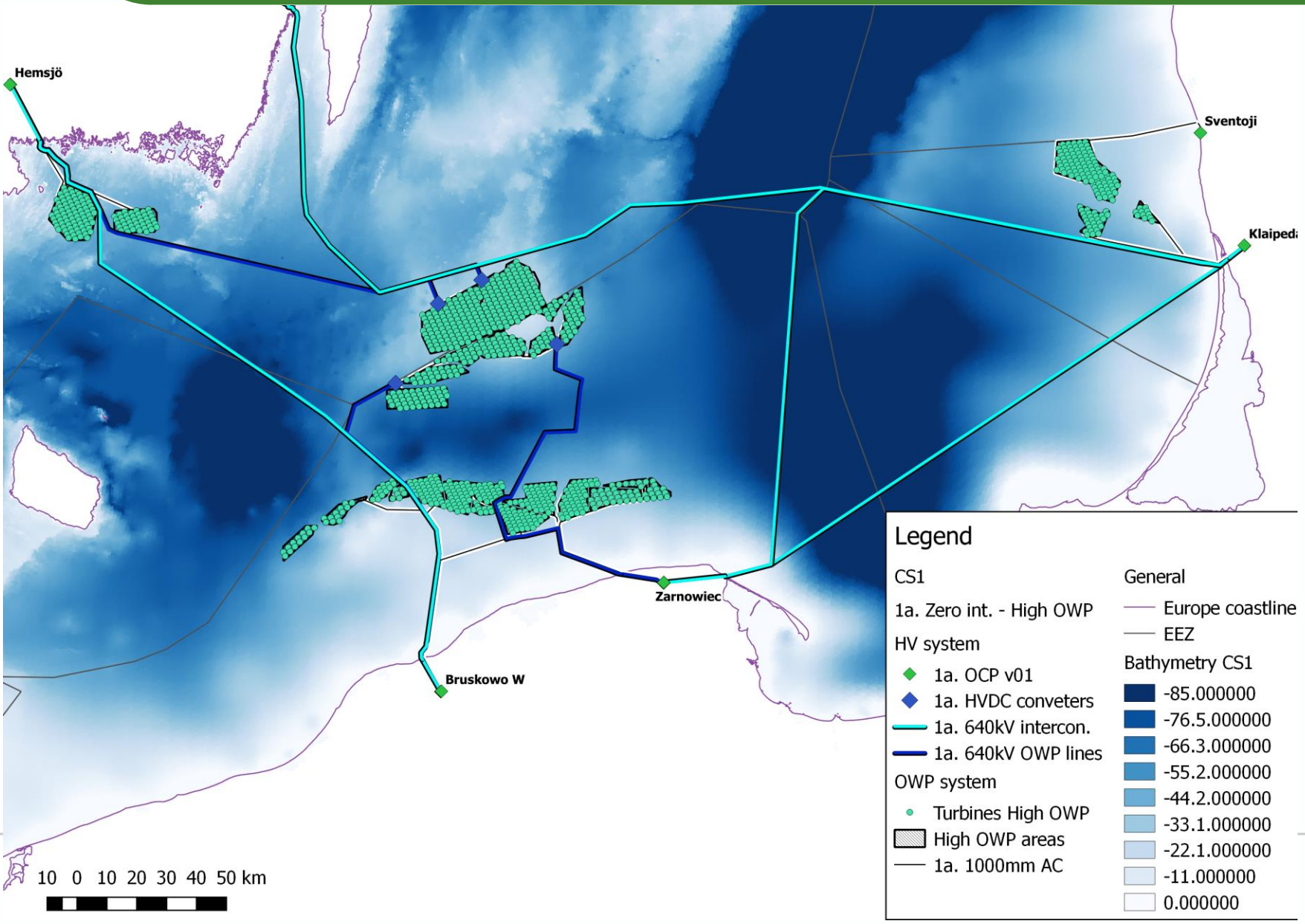
Scenarios


Integration level
OWP level
Scenario
Zero Integration
High OWP
Scenario 1a
Vision + Roadmap
Low OWP
Scenario 1b
Vision + Roadmap
Partial Integration
High OWP
Scenario 2a
Vision + Roadmap
Low OWP
Scenario 2b
Vision + Roadmap
Max. Integration
High OWP
Scenario 3a
Vision + Roadmap
Low OWP
Scenario 3b
Vision + Roadmap

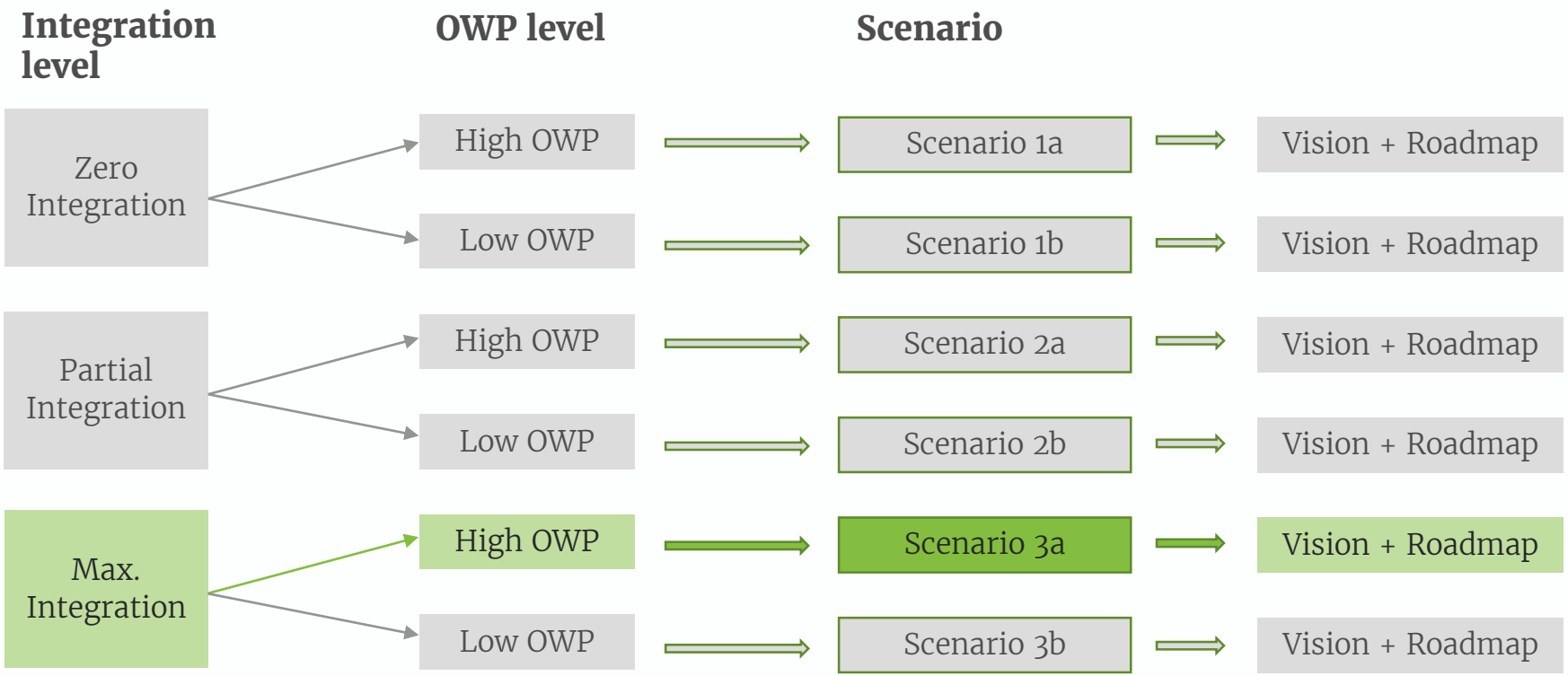
(1a) Zero integration – High OWP – Vision 2045



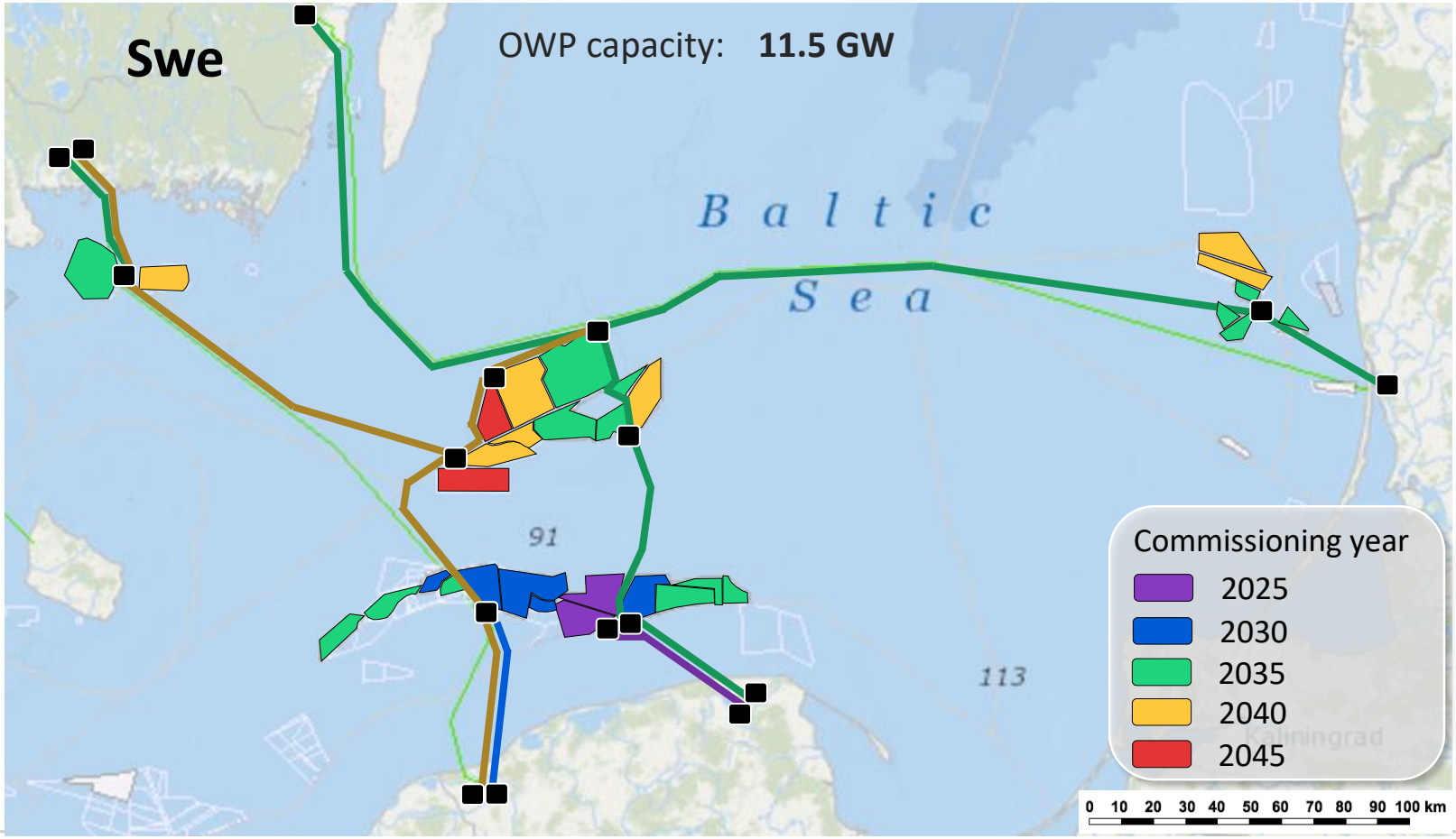
1a. High OWP, Zero integration – DC Overview



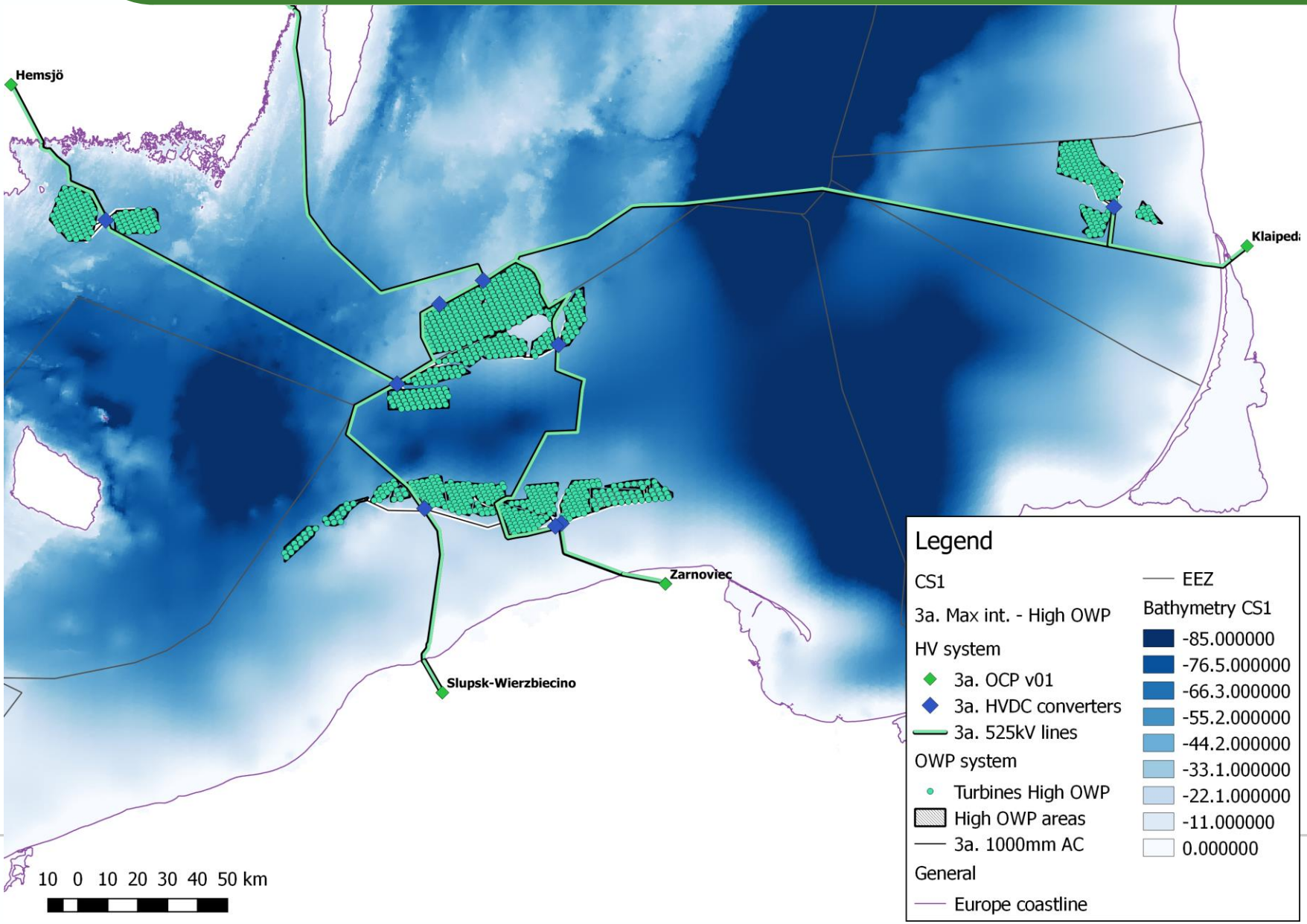
Scenarios


Integration level
OWP level
Scenario
Zero Integration
High OWP
Scenario 1a
Vision + Roadmap
Low OWP
Scenario 1b
Vision + Roadmap
Partial Integration
High OWP
Scenario 2a
Vision + Roadmap
Low OWP
Scenario 2b
Vision + Roadmap
Max. Integration
High OWP
Scenario 3a
Vision + Roadmap
Low OWP
Scenario 3b
Vision + Roadmap

(3a) Max integration – High OWP – Vision 2045



3a. High OWP, Max integration – Overview DC system



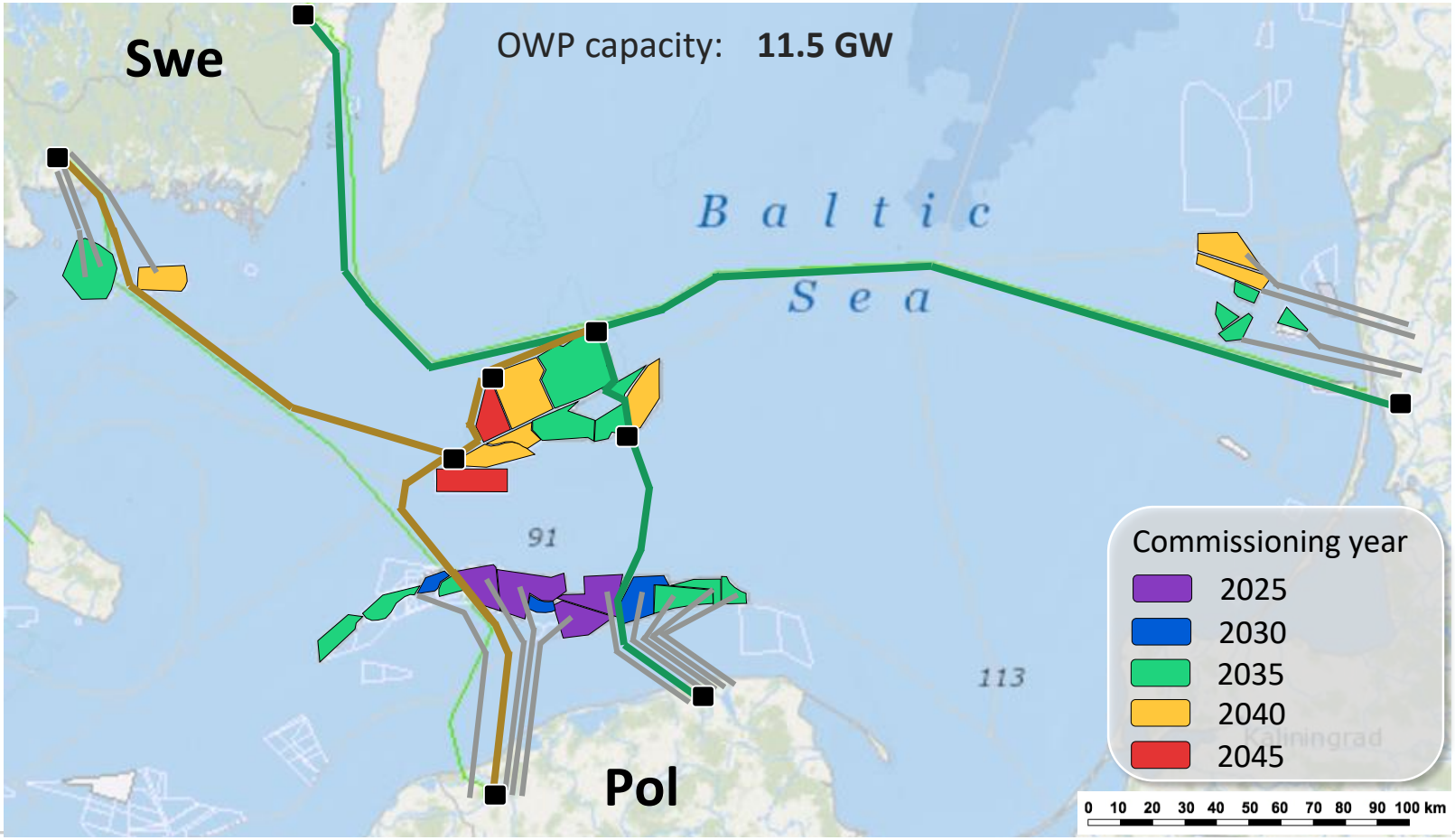
Component comparison 1a and 3a

Feature \ Scenario	1a (Zero)	3a (Max)	Difference
Converter substations	14	17	+21 %
DC cable length (km)	3 730	2 434	-35 %
DC conductor volume (km*mm^2)	4.48*10^6	6.53*10^6	+46 %
OWP on DC system (GW)	5.1	11.5	+56 %
Onshore AC transformers	15	0	-100 %
AC export cable length (km)	1 093	374	-66 %

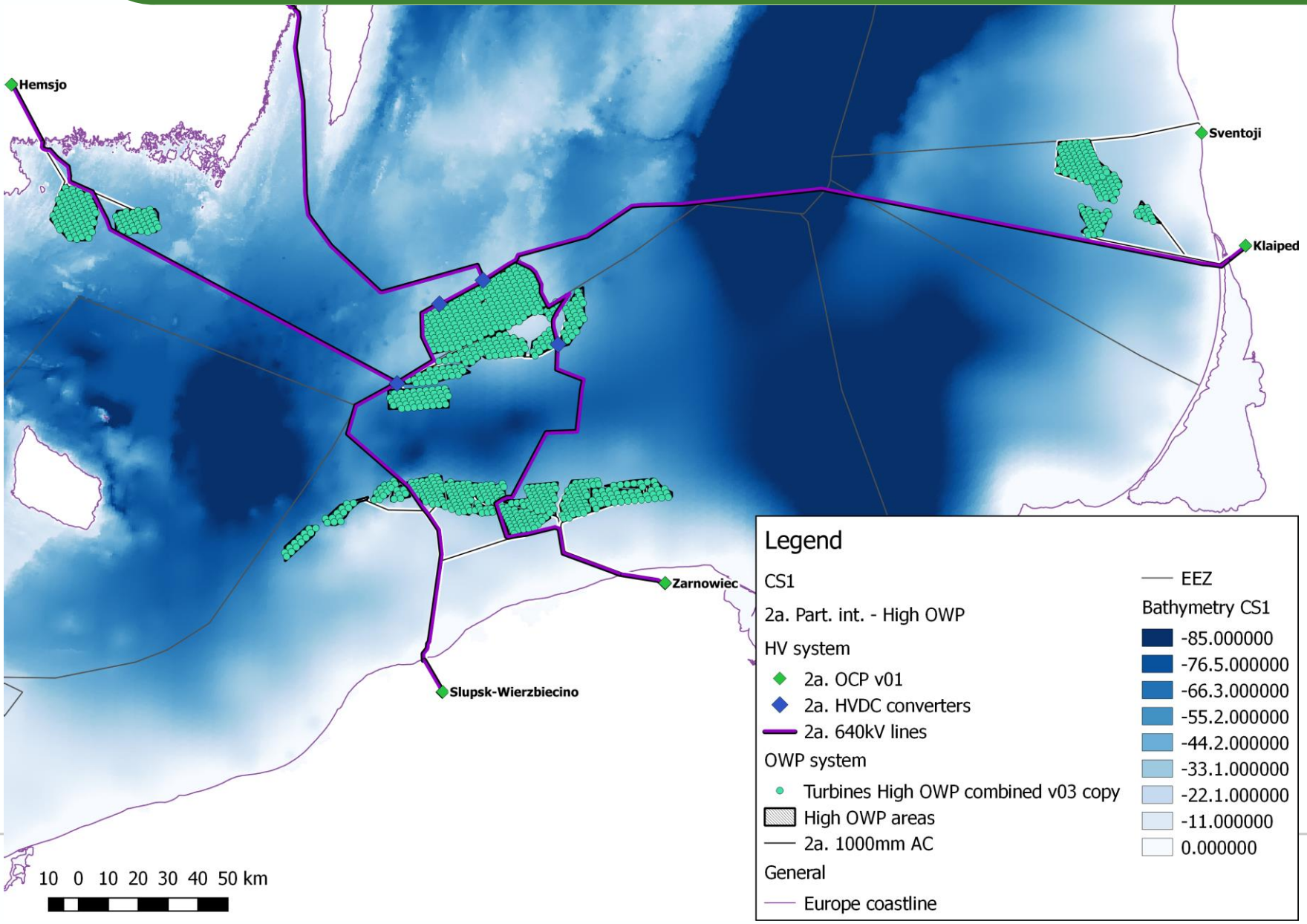
Further analysis:

- Market flow in combination with wind patterns
- DC cable utilization factor
- Power flow control strategies
- DC protection zones

(2a) Partial integration – High OWP – Vision 2045



2a. High OWP – Part integration – Zoom overview



Contact & Disclaimer

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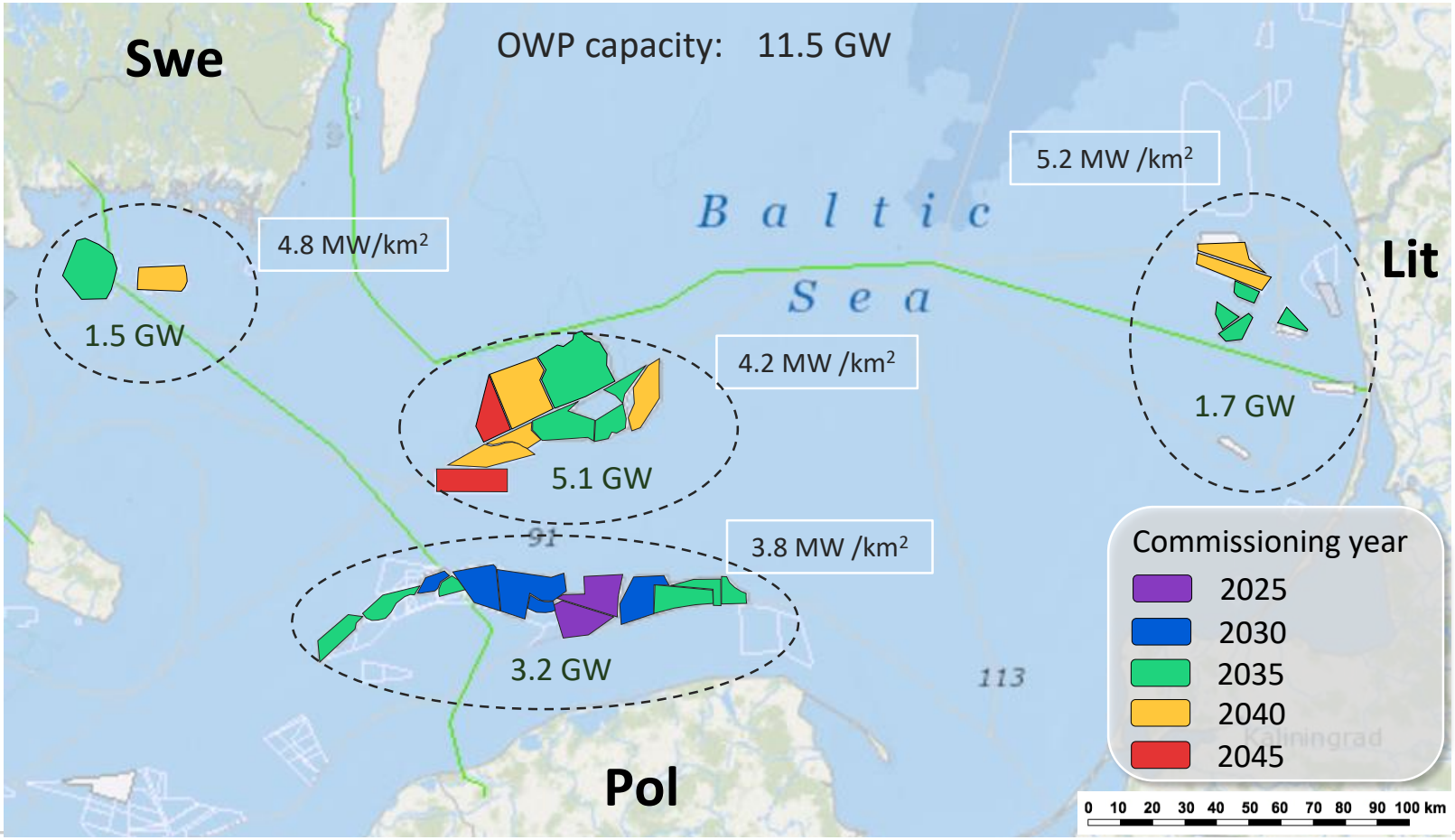
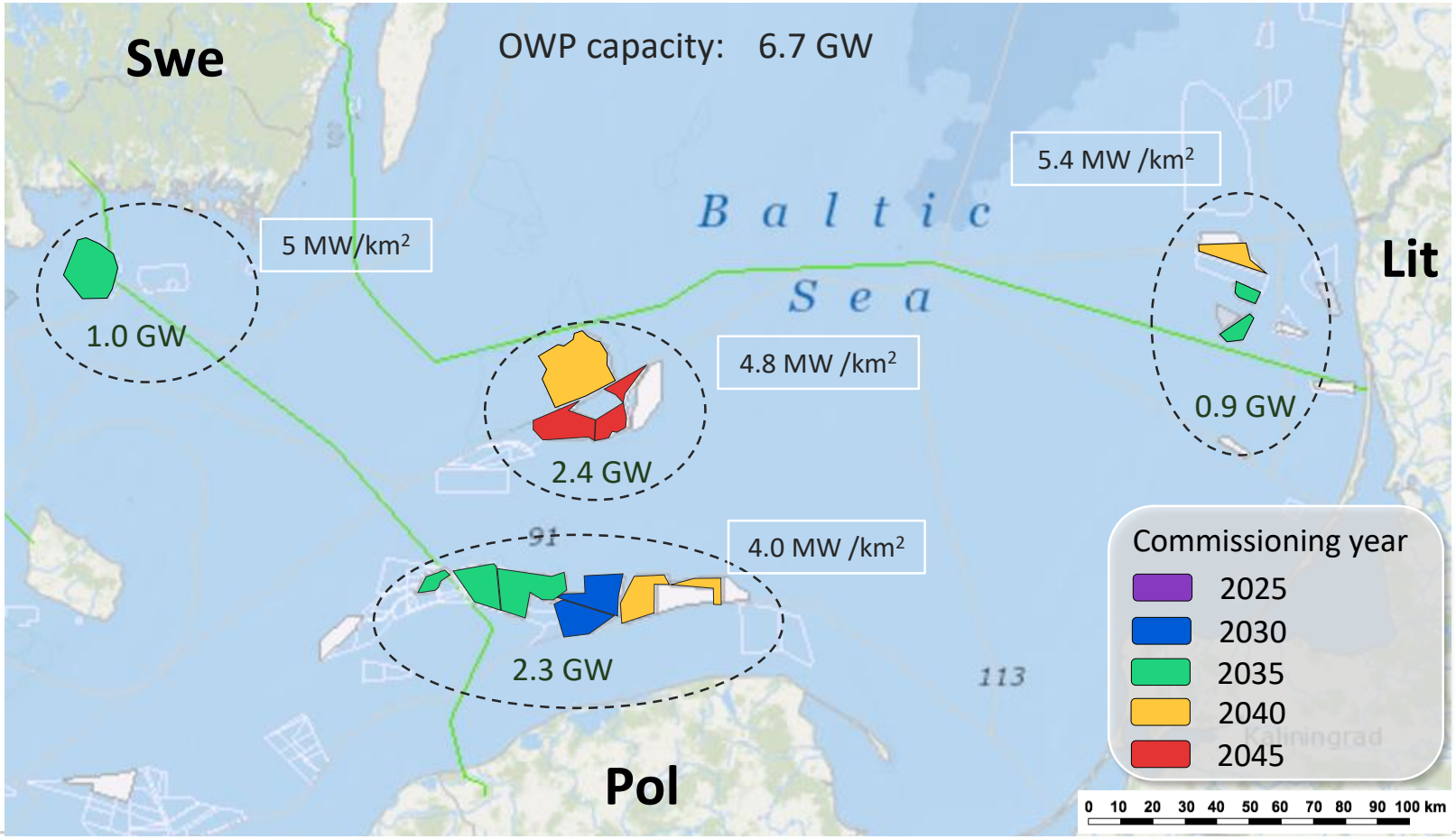
Extras

High OWP – 2045



Low OWP – 2045


Swe
OWP capacity: 6.7 GW
5.4 MW /km²
Baltic Sea
Lit
5 MW/km²
1.0 GW
4.8 MW /km²
0.9 GW
2.4 GW
4.0 MW /km²
2.3 GW
Commissioning year
2025
2030
2035
2040
2045
Pol
0 10 20 30 40 50 60 70 80 90 100 km