HERCCULES
full CCUS chain demonstration

CCUS ZEN

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UK RI Innovate UK

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TAL TECH
DEPARTMENT OF GEOLOGY

Tallinn, Estonia. 13/06/2024

Analysis of the value chain scenarios in the Baltic and Mediterranean Regions

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Objectives

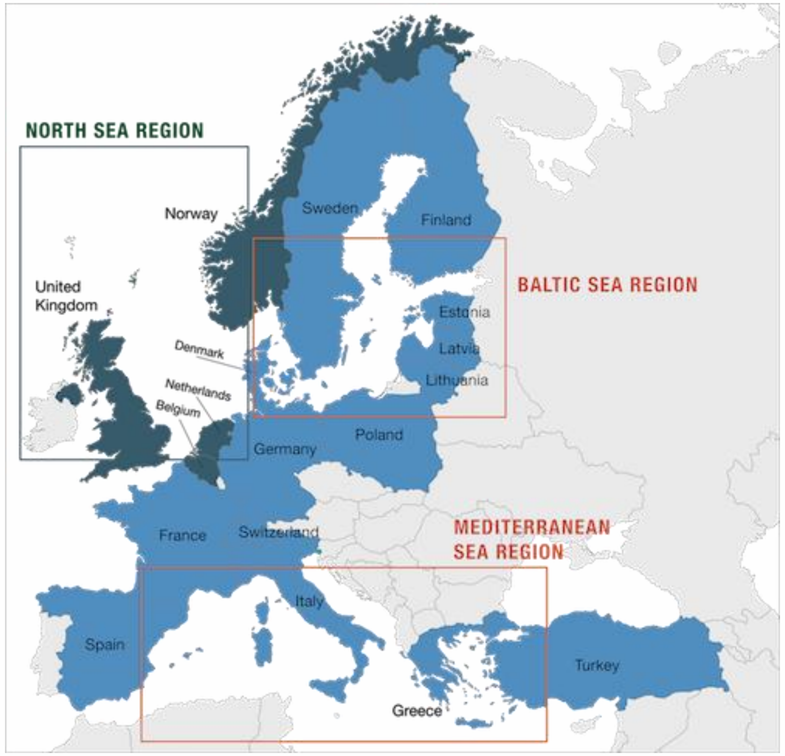
Work Package 3 – Value Chain Scenarios Objectives

Identify
- Identify the most promising CCUS value chains for the CCUS ZEN regions based on SWOT analysis.

Establish
- Establish a generic framework for the selection of the most prospective CCUS value chains, based on the high-level screening methodology established in WP1 and integrated with WP2 analyses.

Identify
- Identify potential PCI and determine key stakeholders.

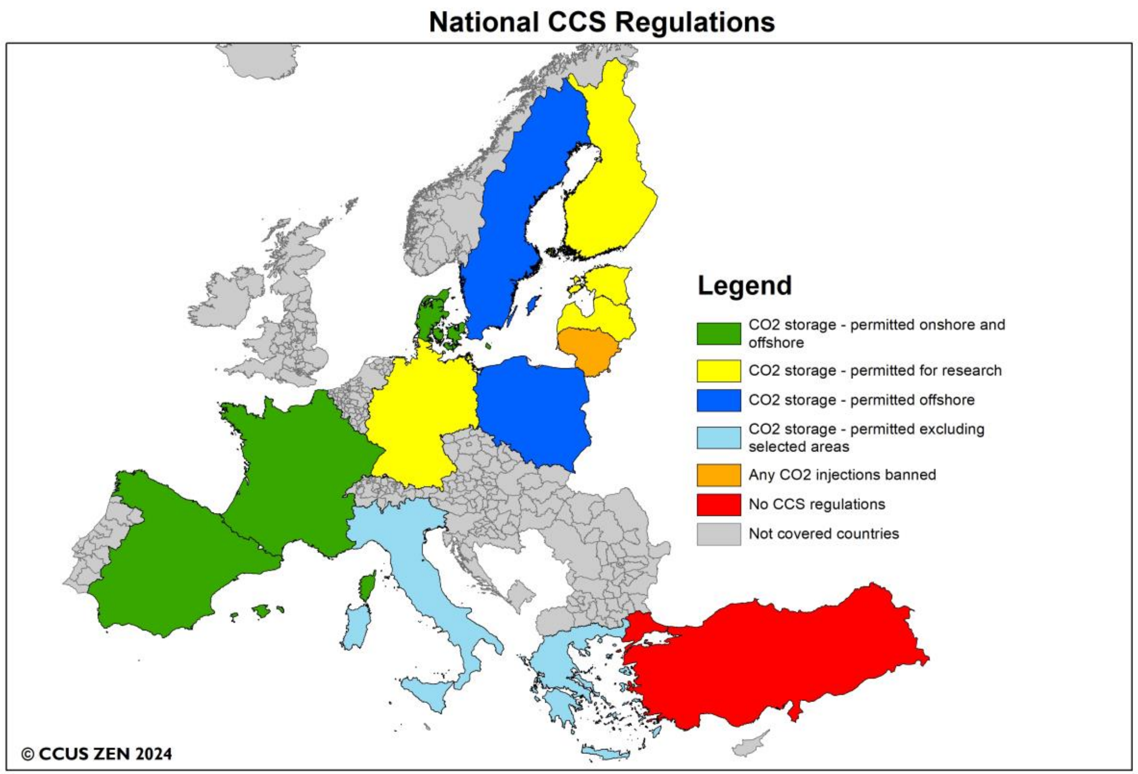
Integrating non-technical aspects

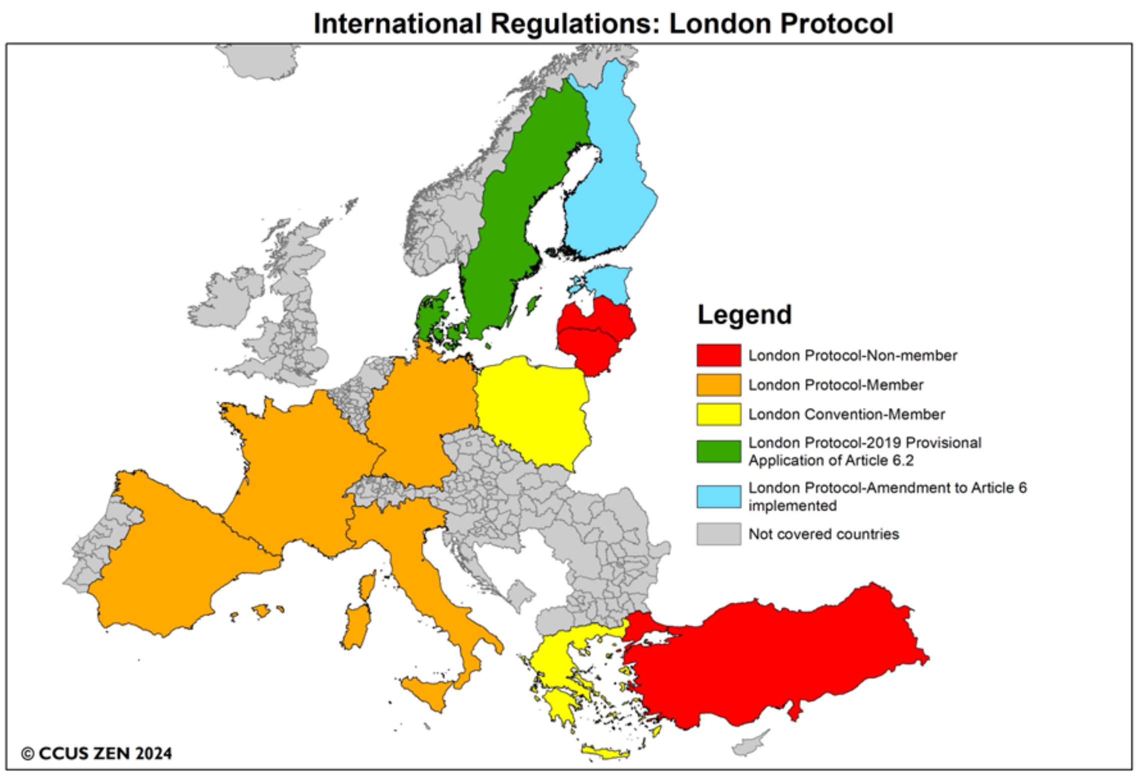


CCUS ZEN WEBSITE:
https://www.ccuszen.eu/about-project/project-partners

- Integrate technical and non-technical data collected by project into common maps showing overall situations in the two CCUS ZEN regions and selected CCUS value chains.
- Identify value chains facing severe challenges due to non-technical aspects such as legislation and social acceptance and propose mitigation measures and recommendations for immediate needed actions.
- Categorize the list of the promising CCUS value chains to be analysed further into the more ready (first-line readiness) and less-ready (second-line readiness) value chains and define the possible year for the projects to start

Integrating non-technical aspects: Regulations





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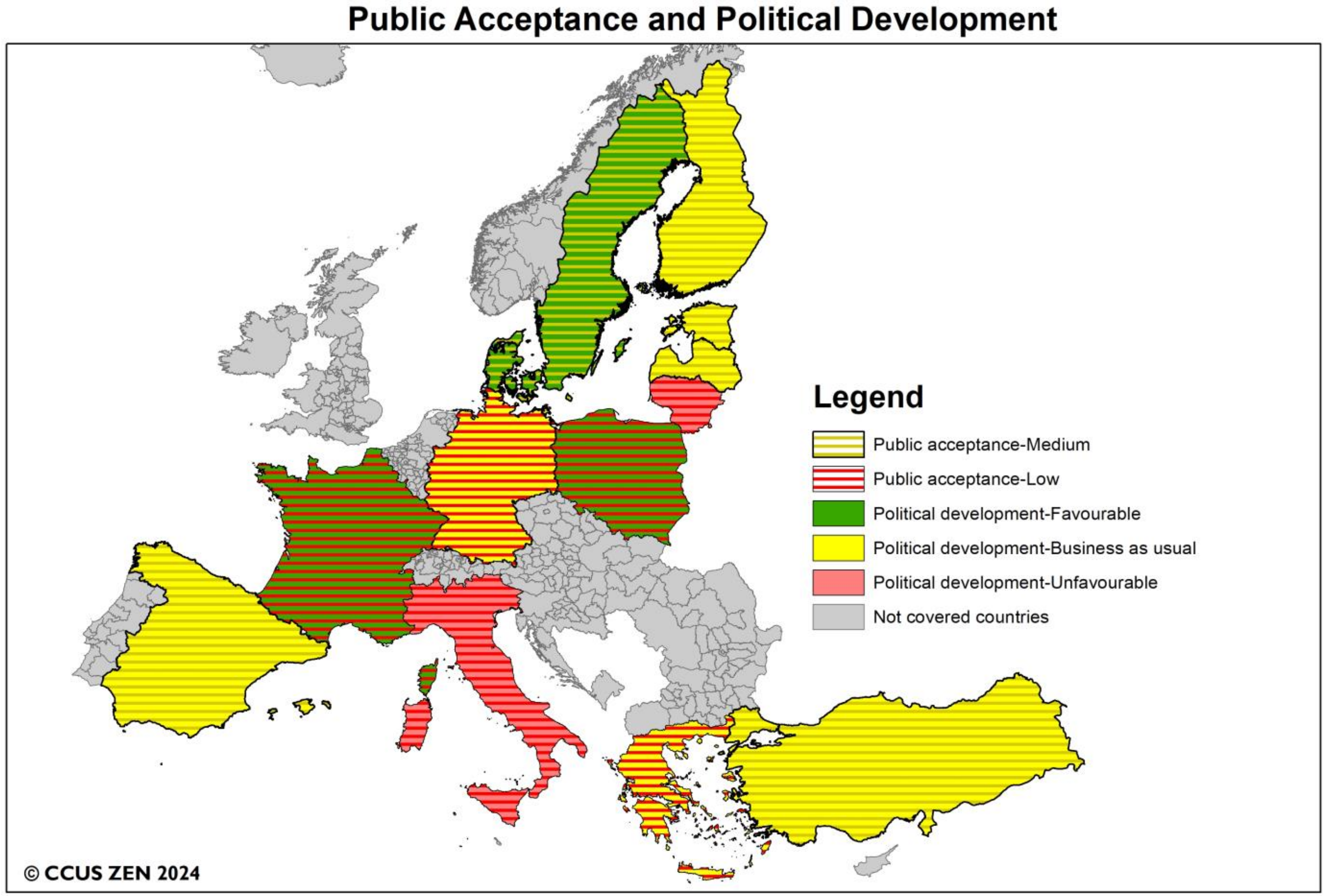
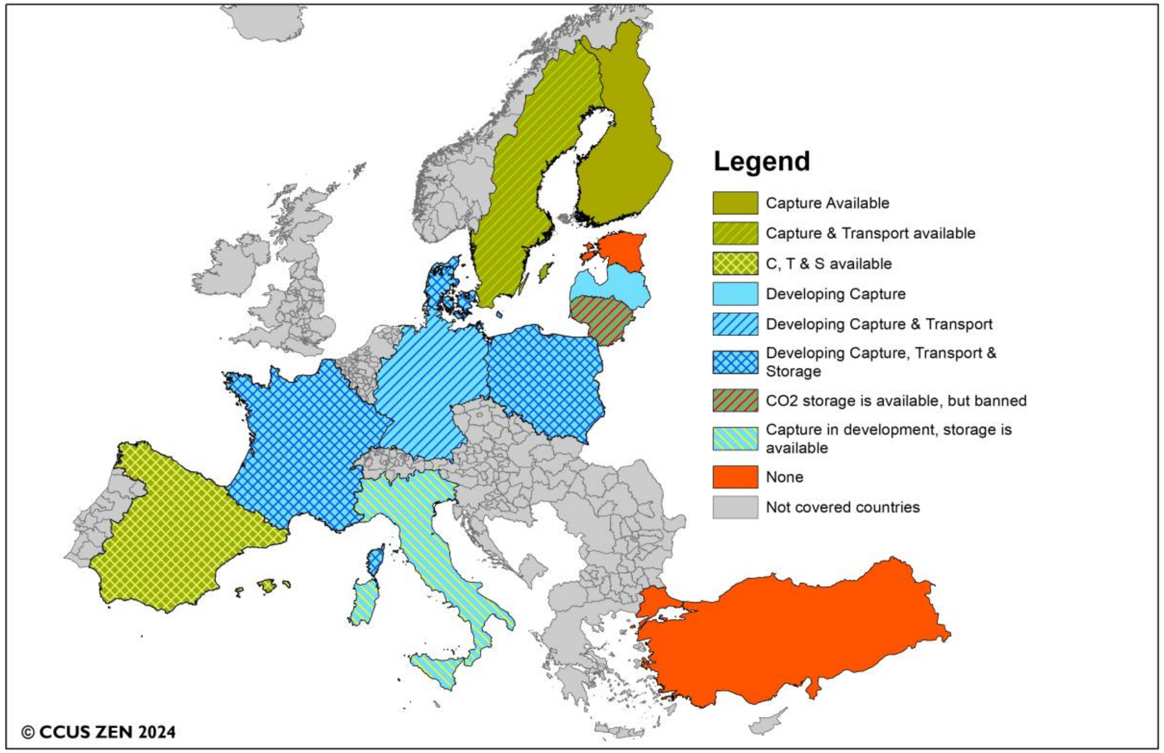
Public acceptance and political development

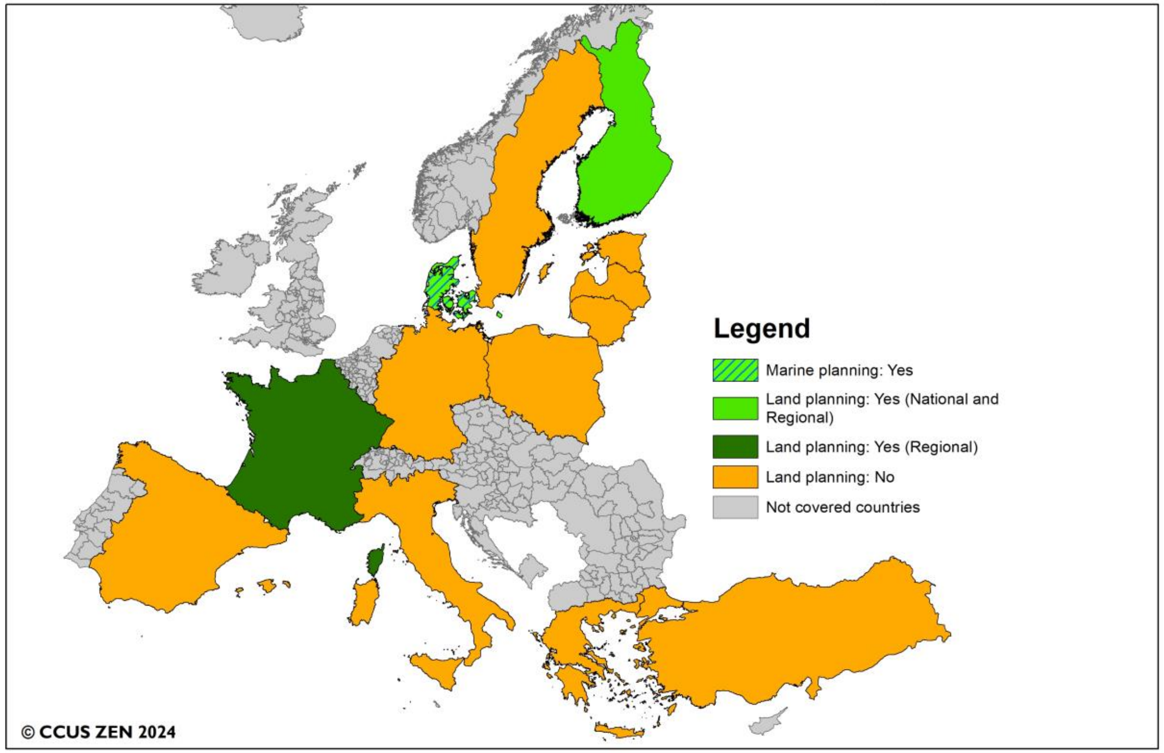


READINESS OF CCUS VALUE CHAIN AND CCUS IN MARINE AND LAND USE PLANNING

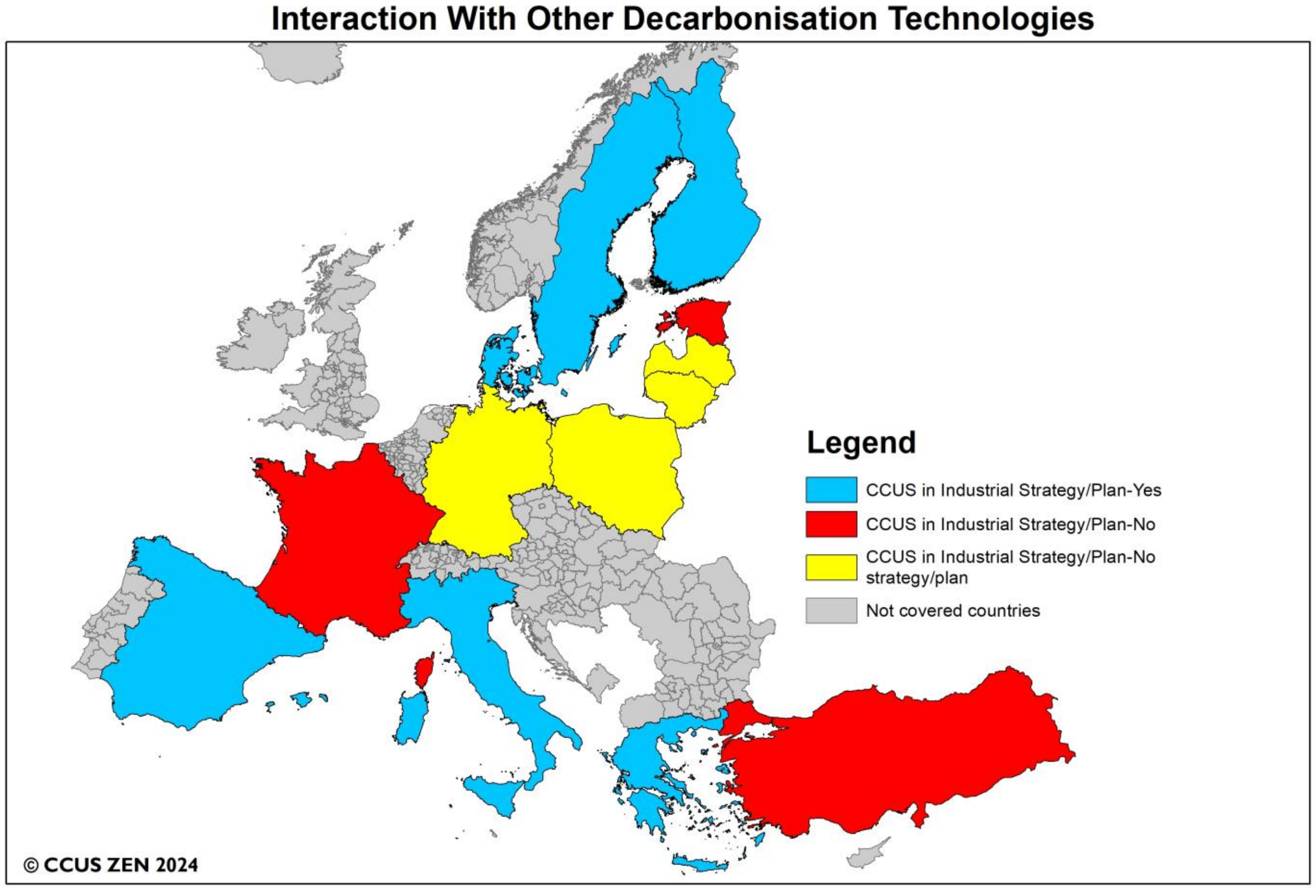
Readiness of the CCUS value chain



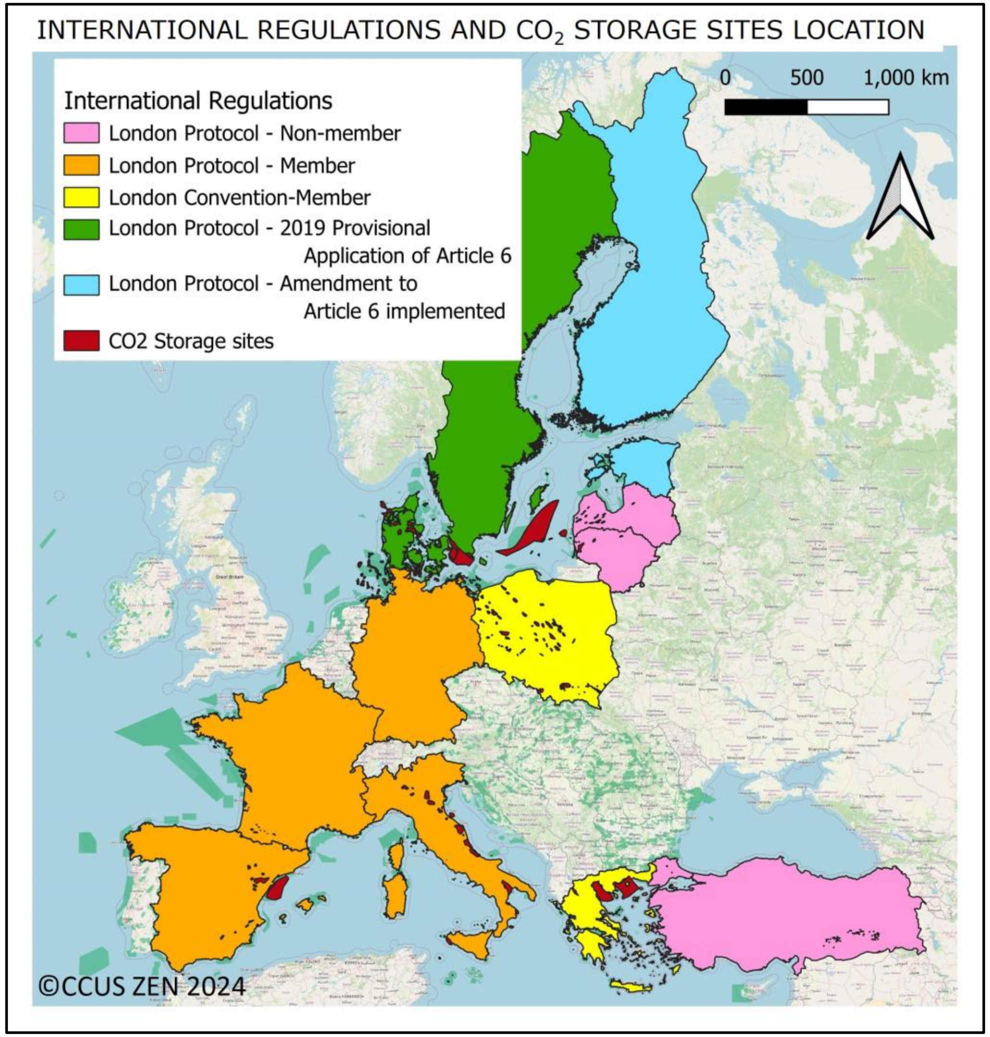
CCUS in Marine and Land Use Planning

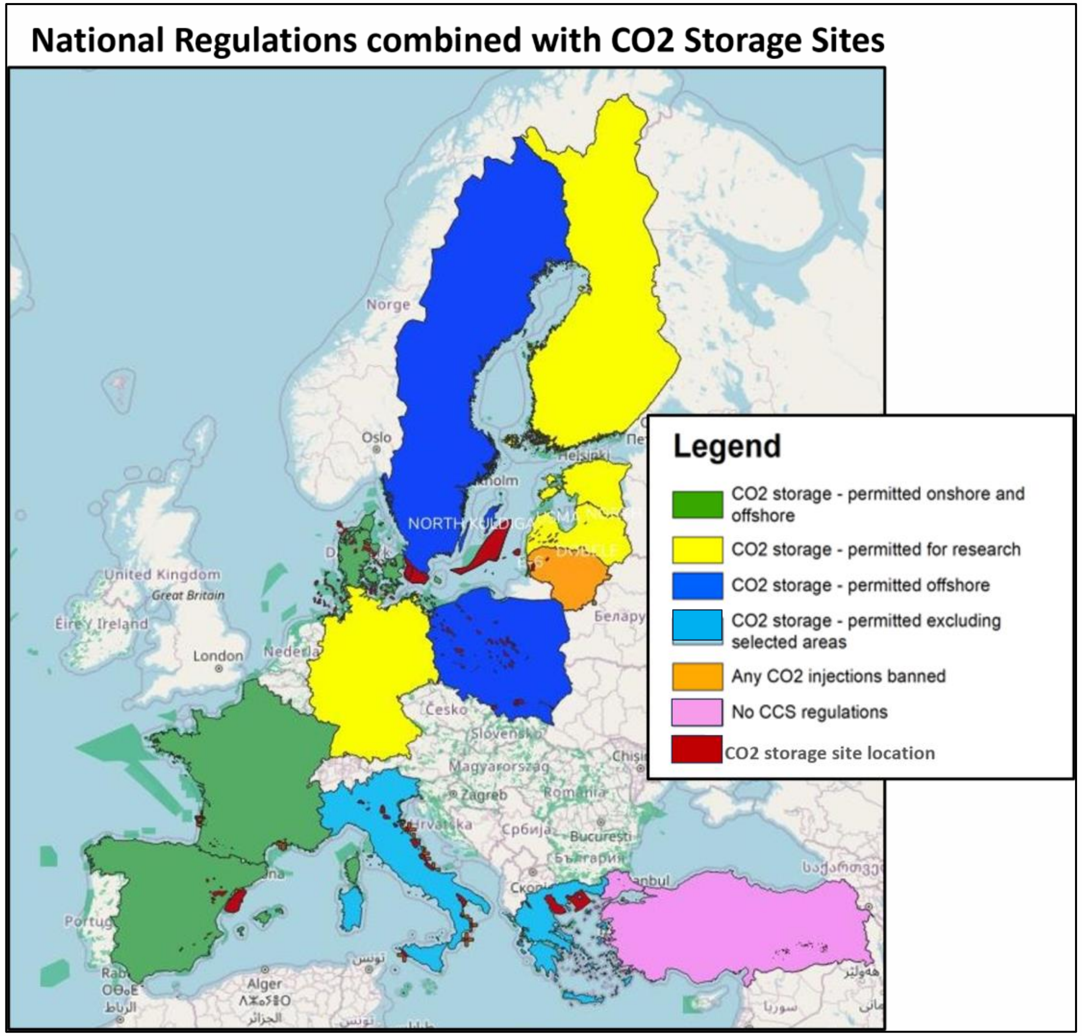


INTERACTION WITH OTHER DECARBONIZATION TECHNOLOGIES

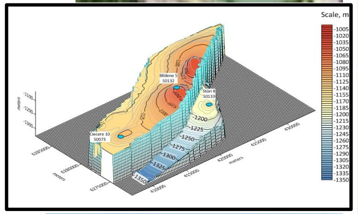


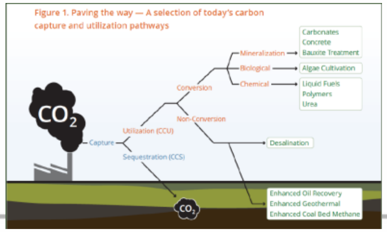
Integrating technical and non-technical data



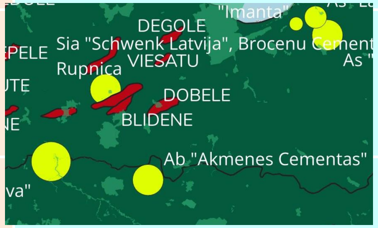


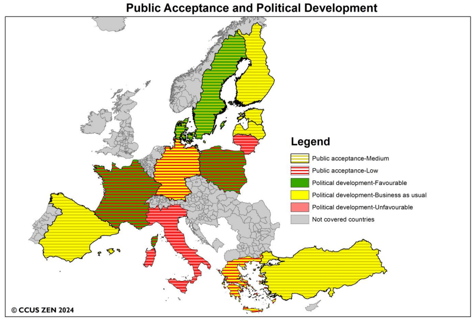
SWOT analyses of CCUS value chains

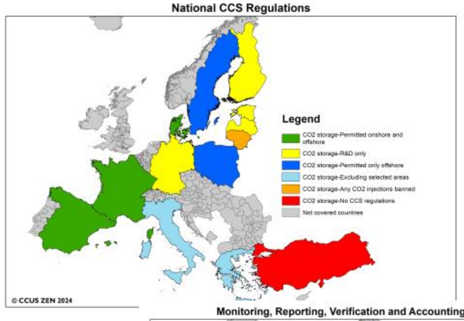


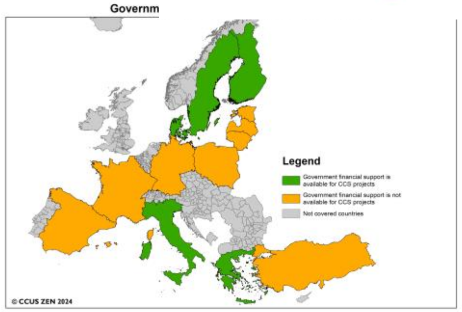


INTERNAL GROUPS Strength and Weakness	EXTERNAL GROUPS Opportunities and Risks	
Technical	**Technical**	**Non-technical**
CO_2 emission plants	Area around the storage site	Social
		Political development
CO_2 storage sites		Regulatory
Infrastructure (available and planned)		MRV (Monitoring Reporting and Verification)
CO_2 use options		Financial









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INTERNAL FACTORS	EXTERNAL FACTORS (Opportunities and Threats)	
Technical (Strength and Weakness)	Technical	Non-technical

INTERNAL FACTORS

Technical (Strength and Weakness)

CO_2 emission plants

- CO_2 volumes (including Bio-CO_2)
- Longevity of the plant and capture-readiness
- Piloting/planning of CO_2 capture
- CO_2 use options available
- Green hydrogen production planning

CO_2 storage sites

- Porosity and permeability of the reservoir rocks
- CO_2 storage capacity
- Quality of the cap rock
- Safety and injectivity
- Storage Readiness Level (SRL)

Infrastructure

- Transport distance
- Availability of the natural gas pipelines
- Total CO_2 emissions per distance unit
- Wells in operation
- Availability of the offshore infrastructure
- Planned PCI projects

CO_2 use options

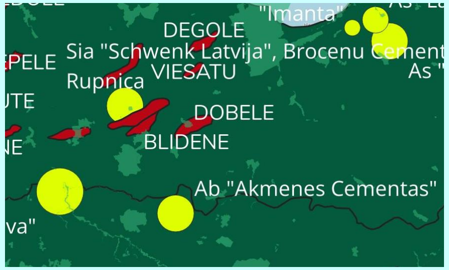
- CO_2 use projects in operation, or R&D
- Longevity of CO_2 use products
- Availability of Bio-CO_2 for CO_2 use
- Volume of CO_2 which could be used
- Possible revenues

EXTERNAL FACTORS (Opportunities and Threats)

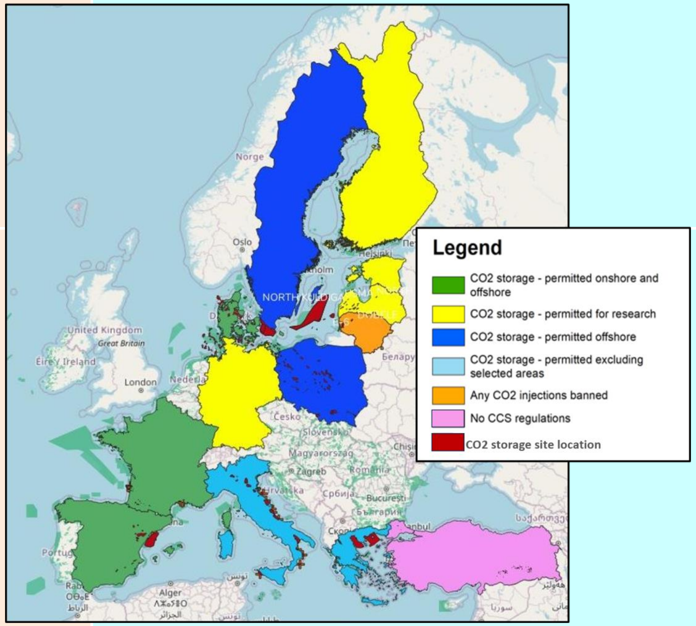
Technical

The area in and around the storage site:

- Located in a densely populated area
- Belonging to landlords
- Located in seismic risk area
- Located in Natura 2000 area or other protected area.



National Regulations combined with CO2 Storage Sites



Non-technical

Social
Public acceptance

Political development
Governmental Support
CCUS included in NECP

Regulatory
International Regulations:

- London Protocol and related issues

Regional Regulations:

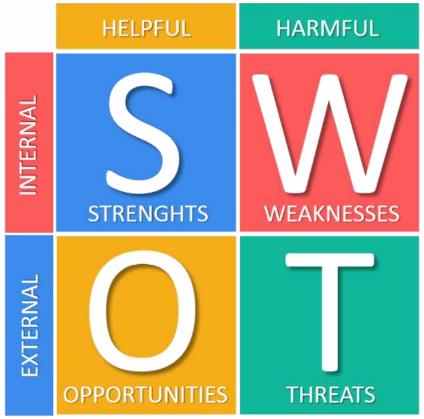
- Helsinlki Convention
- Balrcelona Convention

National Regulations

- CCS Regulations
- National CO2 tax

MRV (Monitoring Reporting and Verification)
MRV and accounting readiness

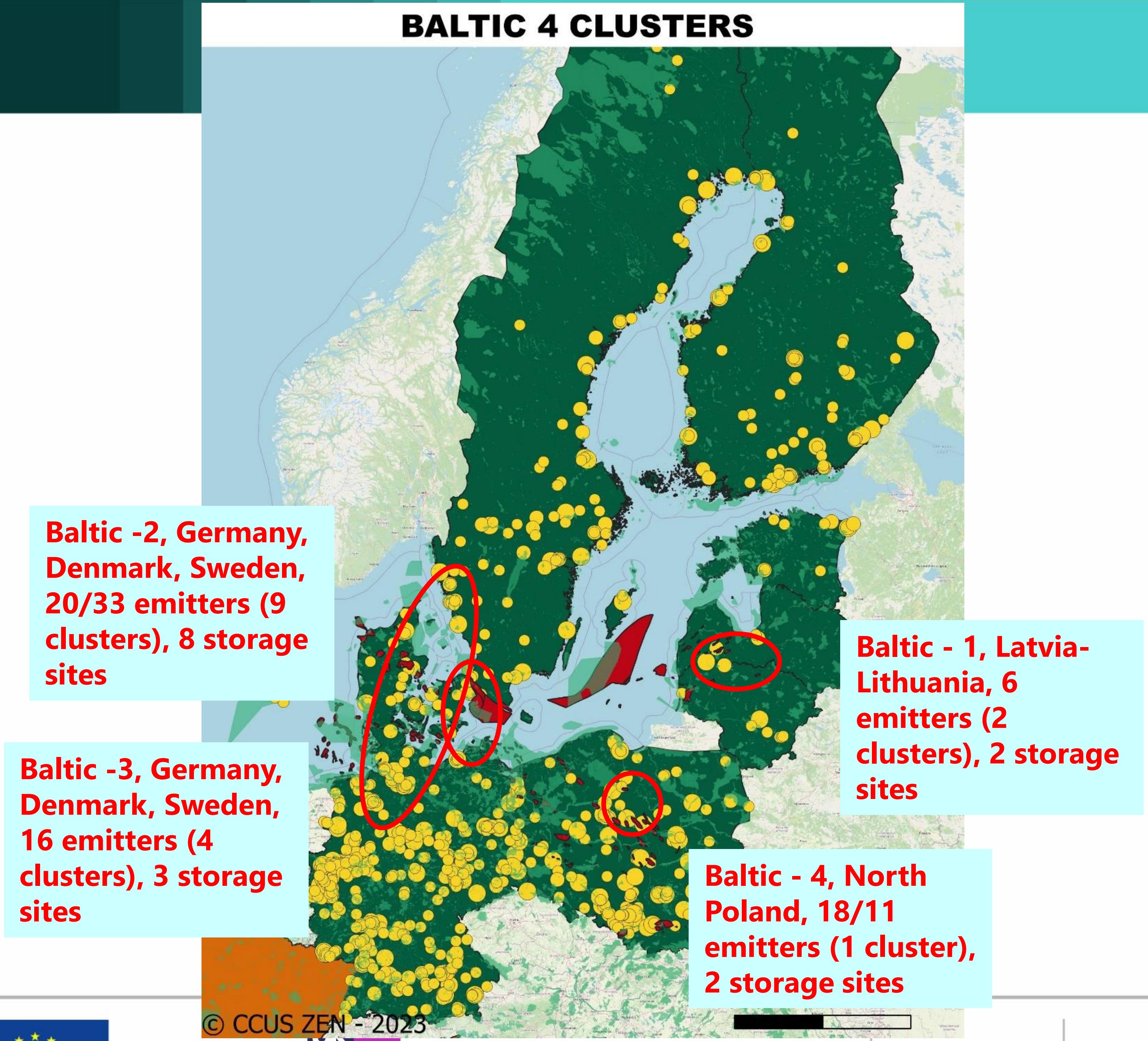
Financial
Availability of government financial support along the value chain



Multivariate SWOT analyses of CCUS value chains

Baltic Clusters

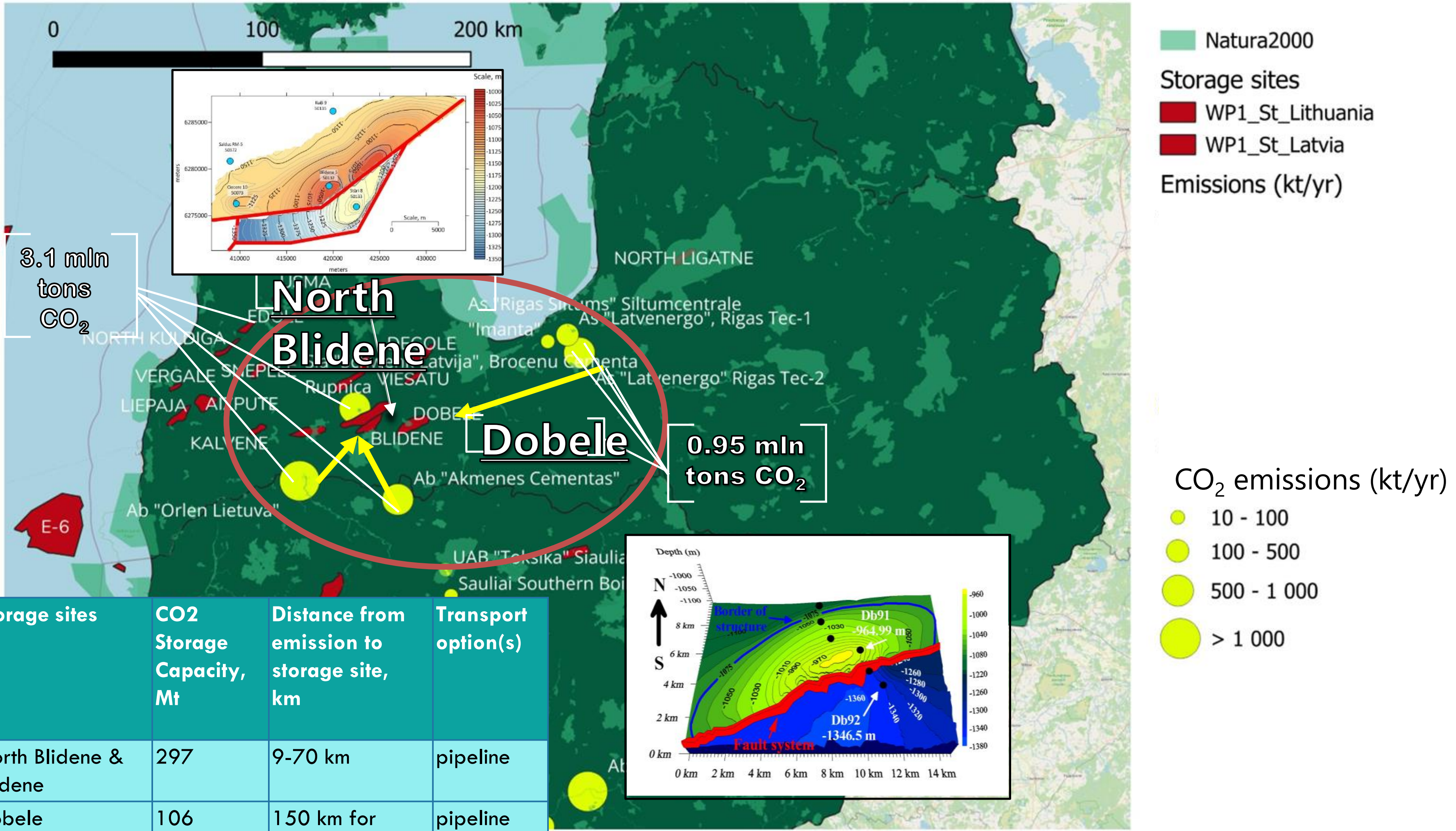
- ▷Storage sites location:
  - Latvia (B-1)
  - North Poland (B-4)
  - Denmark (B2, B3)
- ▷One national onshore project: North Poland (B-4)
- ▷One bilateral onshore project (B-1)
- ▷Two projects offshore and onshore for 3 countries (B2, B3)



Baltic-1: Latvian-Lithuanian onshore CCUS cluster

Latvian CO_2 emitters (4):
- Latvenergo PP (2 plants)
- Rigas Siltums Thermal Plant
- "Schwenk Latvia" SIA (Cement plant)

Lithuanian CO_2 emitters (2):
- Orlen refinery
- Akmenes cement plant (acquired by SCHWENK)



Value chain name	Emission cluster	Total CO_2 emissions, Mt/y	Storage sites	CO2 Storage Capacity, Mt	Distance from emission to storage site, km	Transport option(s)
Baltic Lat-Lit-Onshore (a)	Baltic Lat-Lit-onshore	3.25	North Blidene & Blidene	297	9-70 km	pipeline
Baltic Lat-Lit-Onshore (b)	Baltic Lat-Lit-onshore	1.00	Dobele	106	150 km for Latvenergo Tec-2	pipeline
Baltic Lat-Lit-Onshore (a+b)	Baltic Lat-Lit-onshore	4.25	North Blidene, Blidene and Dobele	403	9-150 km	pipeline

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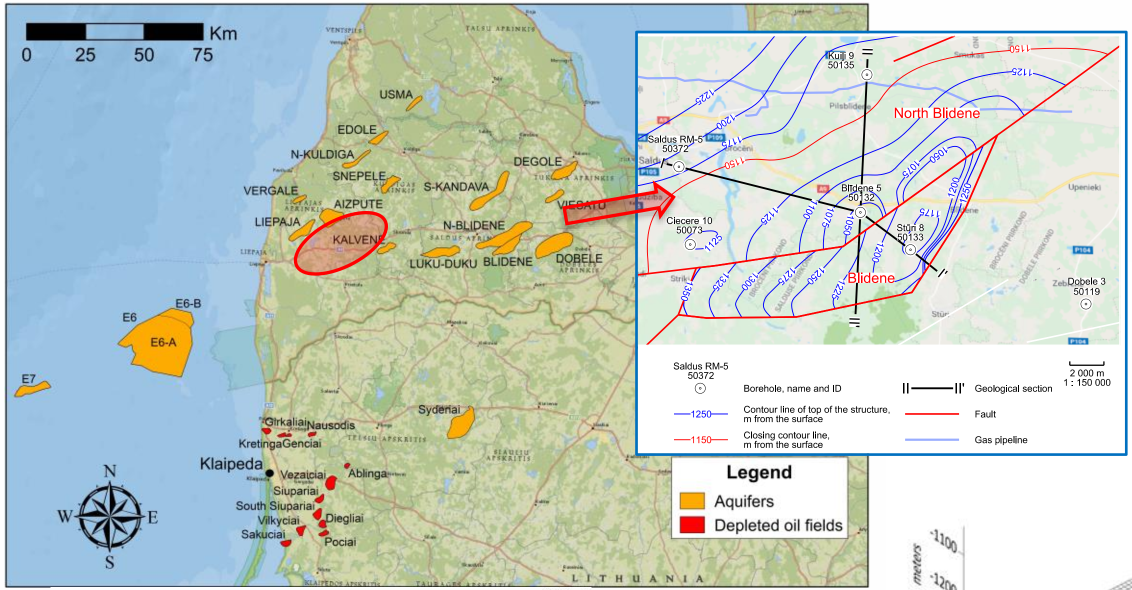
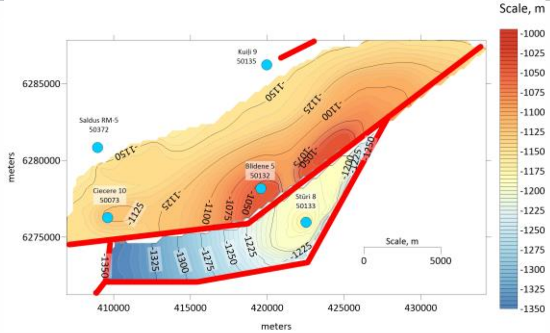
Union UK

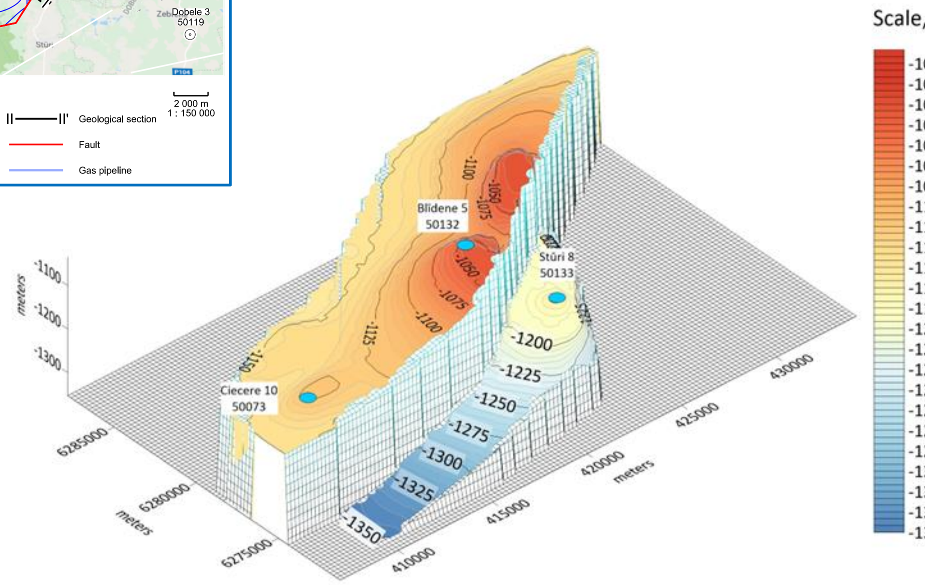
Blidene and North-Blidene structures



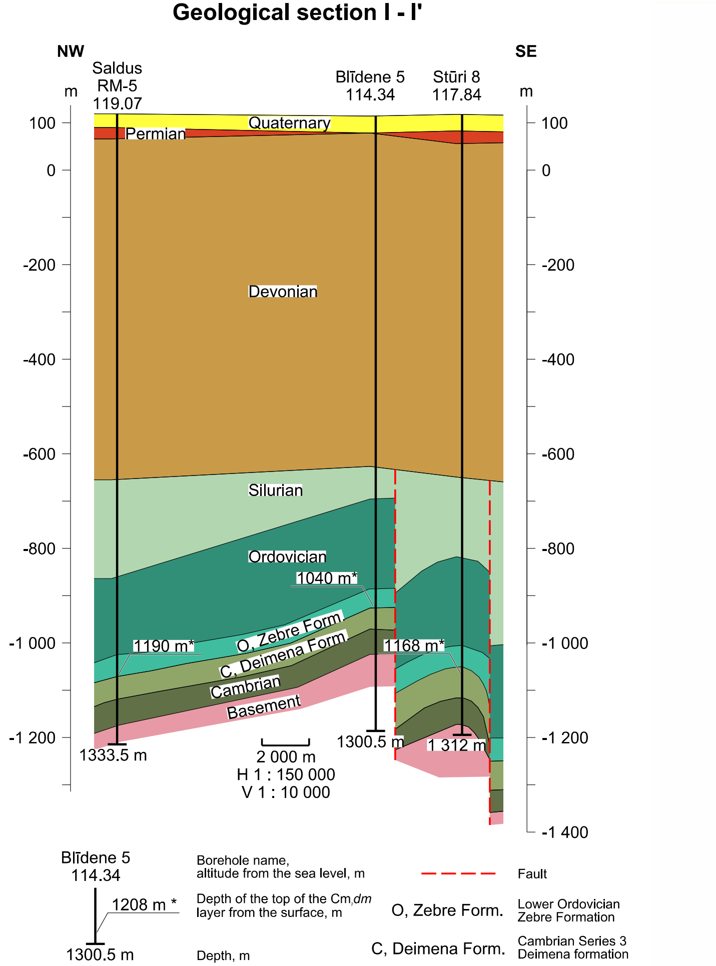
Structure map of the the top o the Cambrian Series 3 Deimena Formation sandstones in the North Blidene and the Blidene structures. Base map is from the Google Maps, 2018 (Simmer, 2018)



Contour maps of the top o the Cambrian Deimena Formation in the North Blidene (left) and the Blidene (right) structures. Fault line is indicated with red polyline



3D structure maps of the Deimena Formation in the North Blidene (above) and the Blidene (below) structures. Both pictures are composed using Golden Surfer 15 software (Simmer, 2018)



Geological sections across line I-I'. The map and section are composed using Bentley PowerCivil for Baltics V8i (SELECTseries 2) software (Simmer, 2018)

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Baltic-1: Latvian-Lithuanian onshore CCUS project

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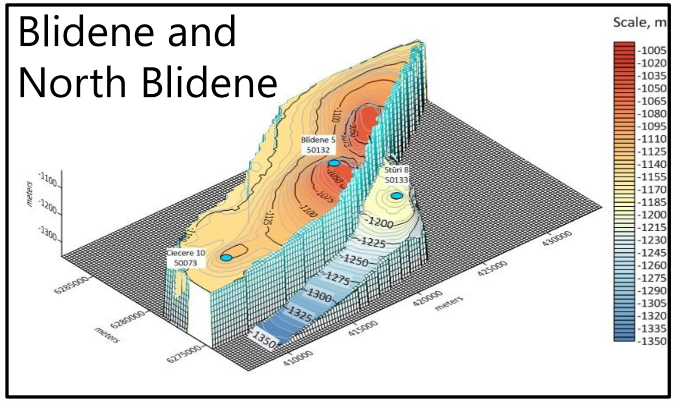
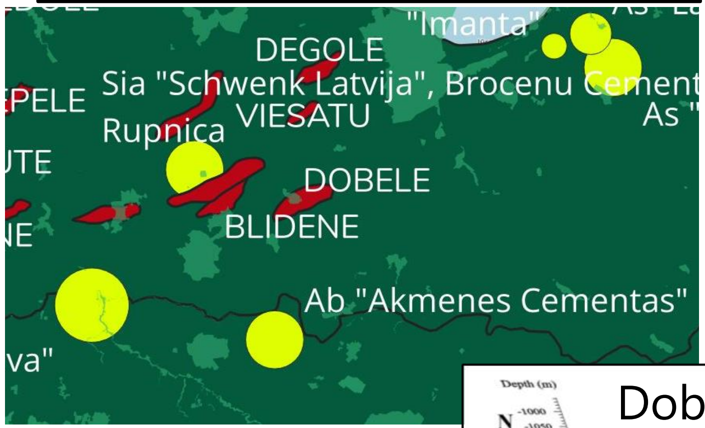
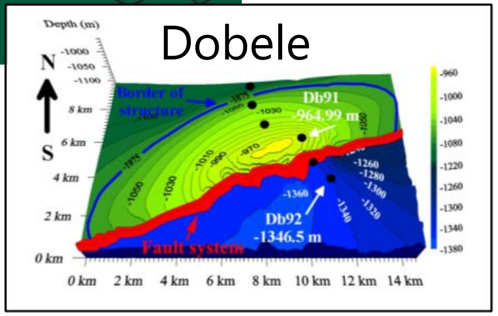
Cambrian Deimena Formation sandstones reservoir in Latvia

Parameters	North Blidene	Blidene	Dobele
Storage ID	S_LV10	S_LV2	S_LV4
Depth of reservoir top, m	**1035-1150**	**1168-1357**	**965-1013**
Reservoir thickness, m	48	66	52
Trap area, km^2	141	62	70
CO_2 density, kg/m^3	881	866	900
Net to gross ratio, %	75	80	85
Salinity, g/l	100-114	100-114	114
Permeability, mD	370-850	370-850	0.1-670/360
T, °C	18	22.9	18
Storage eff. factor (Seff) Optimistic/Conservative (%)	30/4	5/3	20/4
Porosity (min-max/avg), %	12.5-25.6/20	13.5-26.6/21	10-26/19
Optimistic CO_2 storage capacity (min-max/avg), Mt	**167-342/267**	**19-37.5/29.6**	**56-145/106**
Conservative CO_2 storage capacity (min-max/avg), Mt	**22.2-45.5/35.6**	**11.4-2.5/17.8**	**11-29/21**







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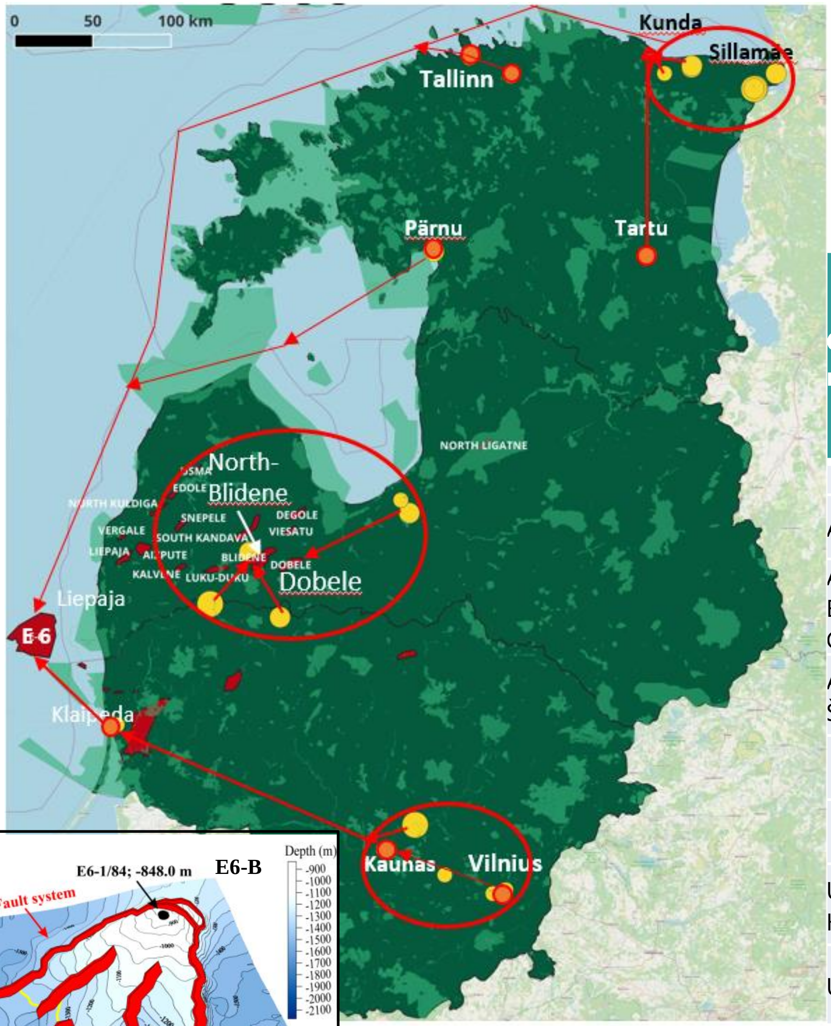
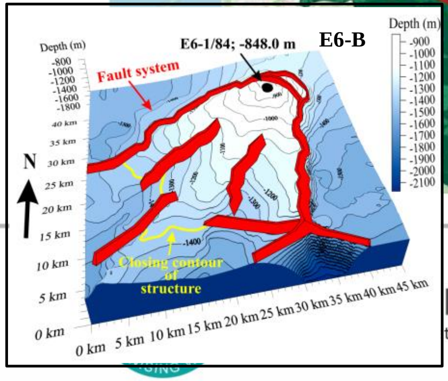
Baltic offshore scenario





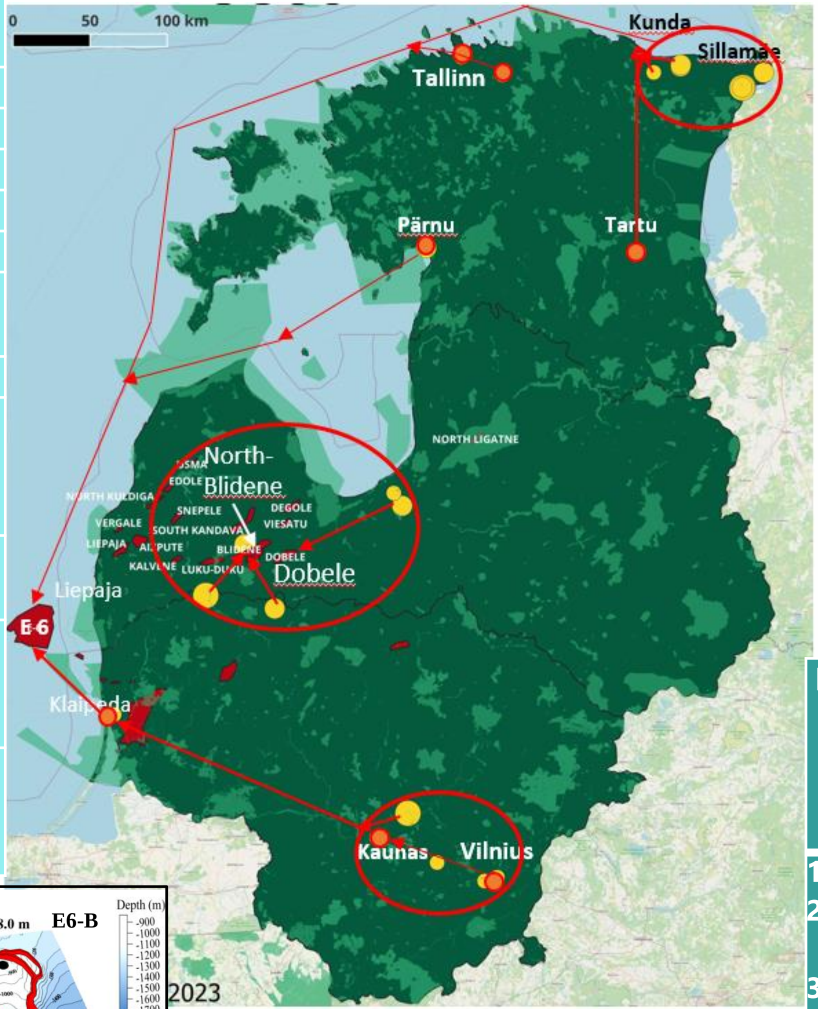
		Company name	City	Industry sector	CO2 reported (ETS) (t/y)	CO2 from Waste-to-energy (t/y)	Total CO2 emissions (t/y)
		Ab "Achema"	Kaunas	Chemical	2208916		2208916
		Ab "Lietuvos Energijos Gamyba"	Vilnius	Power	304646		304646
		Ab "Vilniaus Šilumos Tinklai"	Vilnius	Power	293090		293090
			Kaunas	WtE		198000	198000
			Vilnius	WtE		169000	169000
		Uab „Fortum Klaipėda"	Klaipeda	WtE		126007	126007
		UAB "Toksika"	Šiauliai	Hazardous WtE		79000	79000
Baltic Est-Lat-Lit-Offshore	UAB Kauno WtEP	UAB Kauno kogeneracine jegaine	Vilnius	WtE	112704	112704	112704
Total for Lithuania							**3491363**
Total for offshore cluster							**11655826**

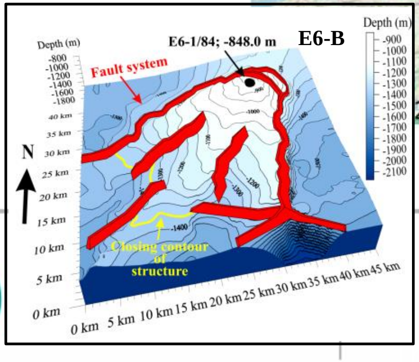
Cluster name	Facility name	Company name	City	Industry sector	CO2 reported (ETS) (t/y)	CO2 from biomass (t/y)	CO2 from Waste-to-energy (t/y)	Total CO2 emissions (t/y)
	ESTONIA							
Baltic-Est-Lat-Lit-Offshore	Eesti Power Plant	Enefit Power As	Auvere	Power	2607958	16000		2623958
Baltic Est-Lat-Lit-Offshore	Auvere Power Plant	Enefit Power As	Auvere	Power	885666	409944		1295610
Baltic Est-Lat-Lit-Offshore	Auvere Shale Oil Plant	Enefit Power As	Auvere	Shale Oil Plant	788760			788760
	Balti Power Plant	Enefit Power As	Narva	Power	645847	187767		833614
	VKG Shale Oil Plant	VKG Oil As	Kohtla-Järve	Shale Oil Plant	697209			697209
	VKG Energia North Thermal Power Plant	VKG Energia Oü	Kohtla-Järve	Power	593857			593857
	Kiviõli Chemical Plant	Kiviõli Keemia-tööstuse OÜ	Kiviõli	Shale Oil Plant	159357			159357
	Horizon Paper Factory	Horizon Tsellu-loosi ja Paberi AS	Kehra	Paper and pulp	12888	239481		252369
	Utilitas Tallinn Power Plant	Utilitas Tallinna Elektrijaam Oü	Tallinn	Power	9796	259000		268796
	Fortum Cogeneration Plant	Fortum Eesti As	Pärnu	Power		268000		268000
	Anne Cogeneration Plant	Anne Soojus As	Tartu	Power		244450		244450
	Iru Waste to Energy Plant	Enefit Power As	Iru	WtE			138483	138483
					Total for Estonia:			**8164463**

Baltic offshore scenario

Carbon Neutral Scenario for the Baltic States

Parameters	E6-A
Storage ID	S_LV5
Depth of reservoir top, m	848-901
Reservoir thickness, m	53
Trap area, km^2	553
CO_2 density, kg/m^3	658
Net to gross ratio, %	90
Salinity, g/l	99
Permeability, mD	10-440 (170)
T, °C	36
Storage eff. factor (Seff) Optimistic/Conservative (%)	10/4
Porosity (min-max/avg), %	14-33/21
Optimistic CO_2 storage capacity (min-max/avg), Mt	243-582/ 365
Conservative CO_2 storage capacity (min-max/avg), Mt	97-233/ 146





2023

The Baltic offshore cluster includes most of the large Estonian and Lithuanian fossil and bio-emission sources – one of which Klaipeda WtE Plant and other sources located in central and south-eastern Lithuania.

The CO_2 is supposed to be transported from proximal emitters by pipelines, while the E6 structure is to be linked by pipelines and ships, located as far as 80 km from Klaipeda Port.

Estonian north-east cluster, composed of seven emission sources (four plants produced only fossil emissions and three power co-generation plants using both oil shales and biomass for energy production) will use CO_2 pipeline or truck/train transport to Sillamäe and Kunda ports and then ship CO_2 to the E6 storage site in Latvia (615 km by ship from Sillamäe).

This cluster will be able to capture and store annually 11.1 t CO_2, including 9 Mt of fossil and 2.1 Mt of bio-CO_2.

N	Cluster Name	Number of emitters	Fossil CO_2 Mt	Bio- CO_2 Mt	Total CO_2 Mt	Storage site	Capacity Opt/Cons. Mt	Transport	Distance km
1	Latvian Onshore	3	1.0		1.0	Dobele	106/21	Pipelines	150
2	Lat-Lit Onshore	3	3.25		3.25	North-Blidene & Blidene	267/35.6; 29.6/17.8	Pipelines	15-185
3	Est-Lit Offshore E6	20	9.45	2.21	11.66	E6A	365/146	Pipelines; Ship	30-140; 80-645
	Total produced	26	13.7	2.21	15.91		767.6/220.4		
	Total stored	26	13.02	2.1	15.23				

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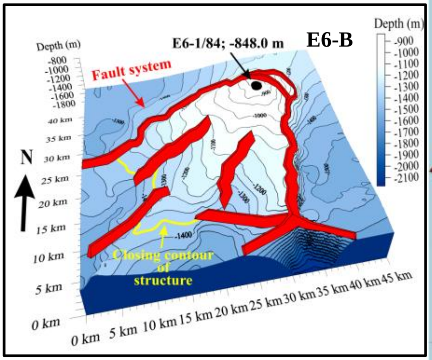
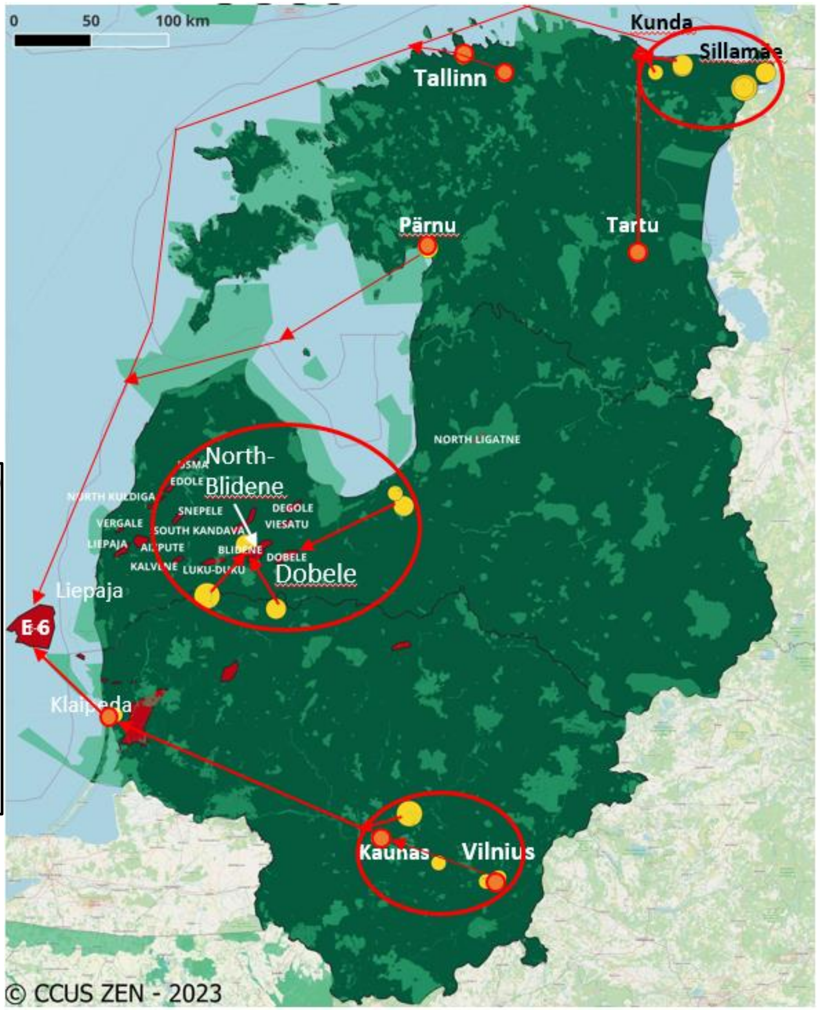
Baltic offshore scenario





Among CO2 use options:

- The alternative CO_2 use option for Estonia is the application of CO_2 for mineral carbonation of Estonian burned oil shale (BOS) (Shogenova et al, 2021).
- Another option is the use of CO_2 for geothermal energy recovery in the E6 structure for the local energy needs of the drilling rig. More details you could see yesterday in our Poster presentation.
- All Baltic countries are looking forward to produce hydrogen.
- It can be stored in the smaller E6-B compartment of the E6 structure offshore (Figures 1-3).

N	Cluster Name	Number of emitters	Fossil CO_2 Mt	Bio- CO_2 Mt	Total CO_2 Mt	Storage site	Capacity Opt/Cons. Mt	Trans-port Distance km
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	Total produced	26	13.7	2.21	15.91		767.6/220.4	
	Total stored	26	13.02	2.1	15.23			

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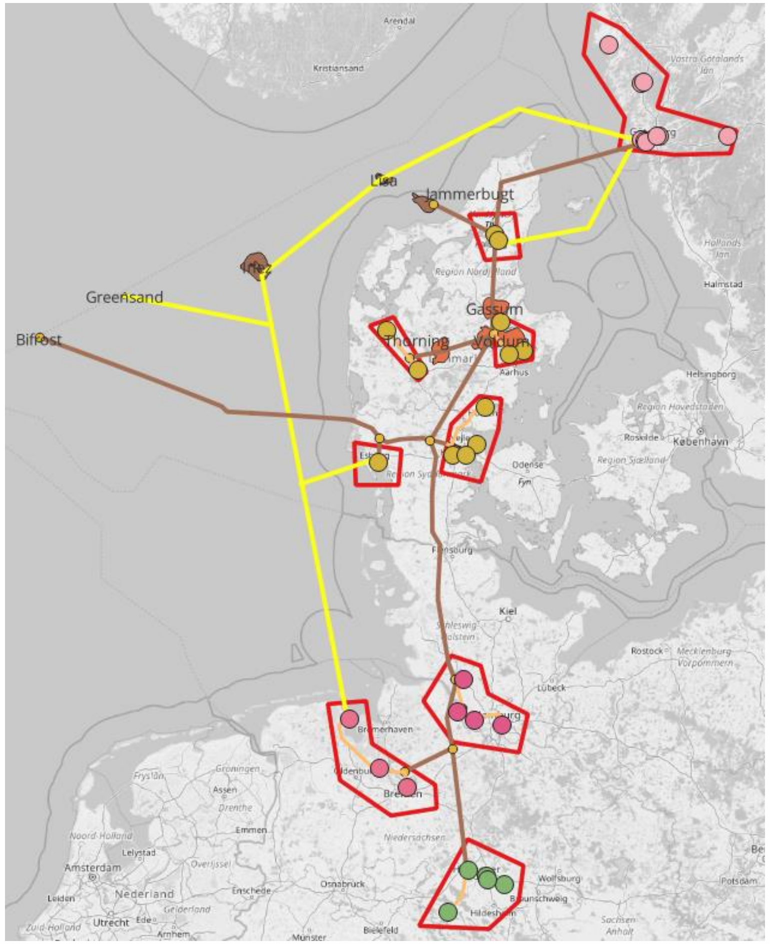
Baltic-2

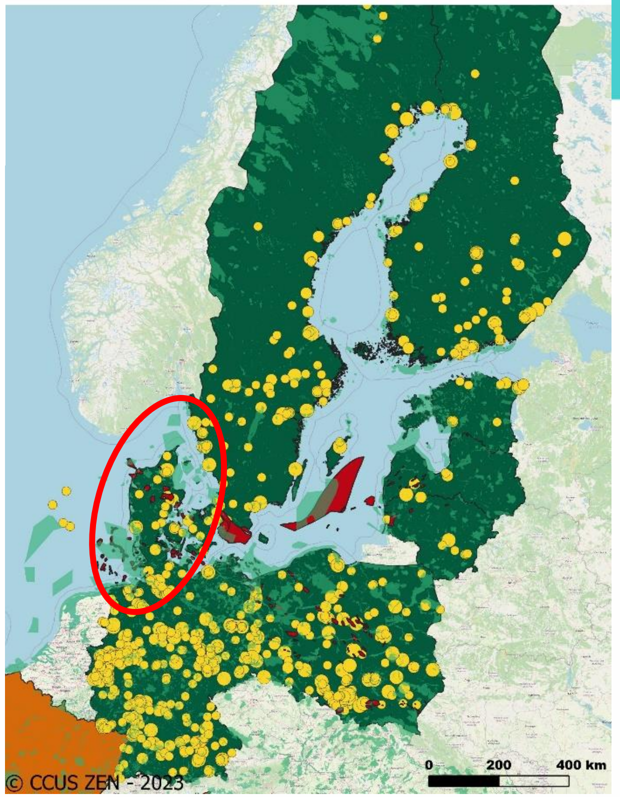
RAMBOLL

GEUS

- 33 significant emitters with capture capacity of about 20 Mt of CO2 annually.
- 20 of them has high potential to adopt CO2 capture.
- Eight geological storage sites in Denmark onshore and offshore with a mean capacity of around 928 Mt.
- Among these, Bifrost and Greensand
- Six projects with CO2 use options elaborating CO2 conversion into methanol with a conversion rate up to 72%.
- 30% of captured CO2 could be used and 70% stored
- 15.1 Mt CO2 could be injected annually
- 6 Mt CO2 could be used annualy within 15 CCU plants



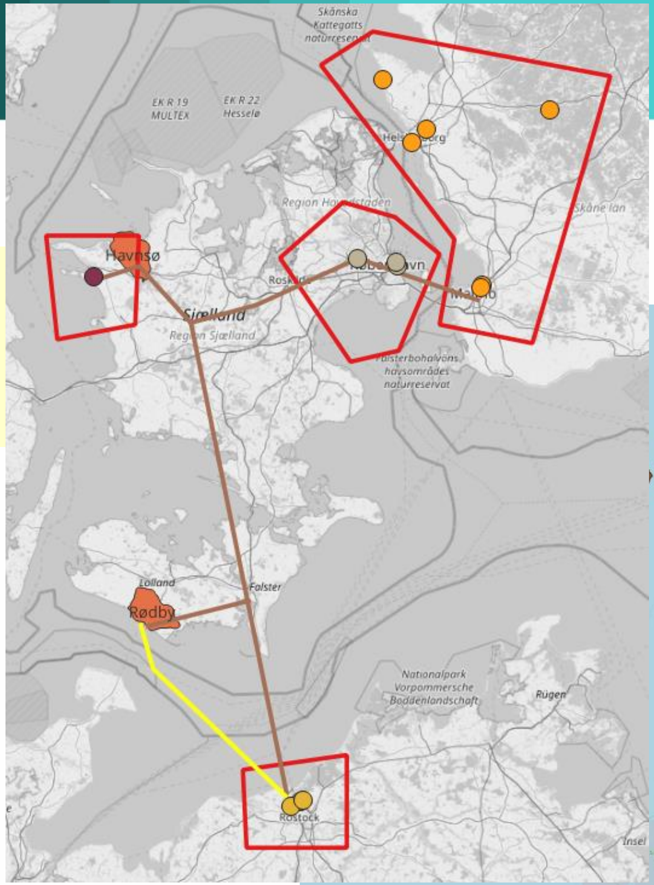
BALTIC 4 CLUSTERS

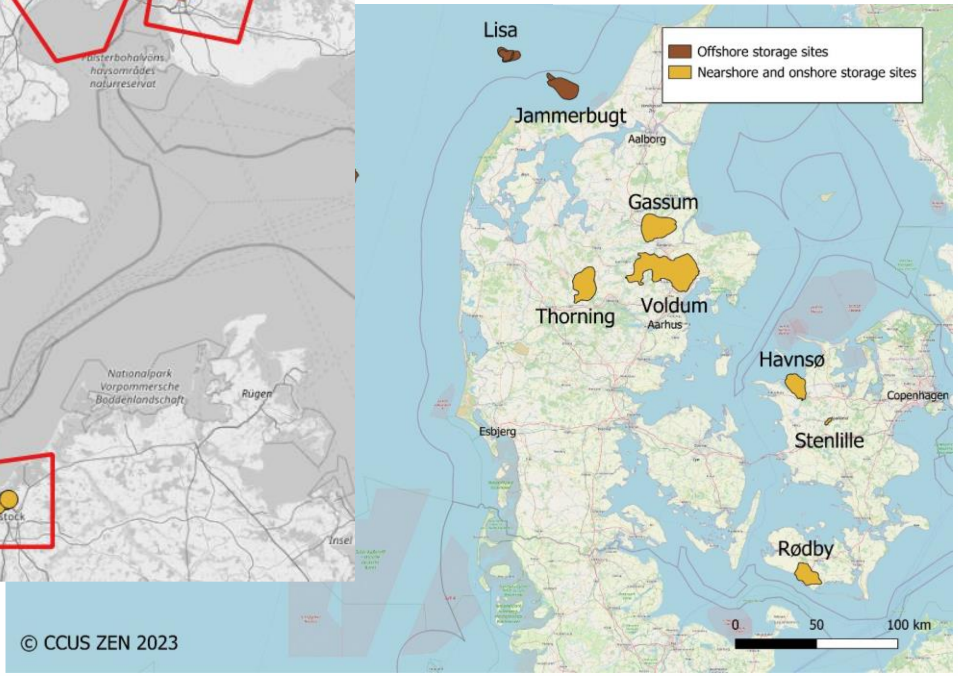


Baltic 3

- Baltic 3:
  - 4 clusters with 13 emitters
  - Maximum emission volume: 5.7 Mt annually
  - 3 storage sites
  - Maximum storage volume: approximately 456-882 Mton
- Possible transport infrastructure includes pipeline and ship

•Potential transport alternatives:
•Ship (yellow)
•Pipeline (brown)





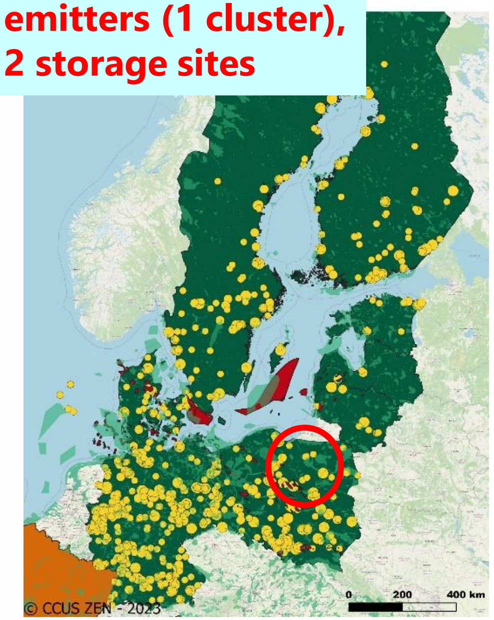
Country	Cluster	Total CO2 emissions [kton/yr]	Emitters number
Germany	Rostock Cluster	2,515.0	3
Denmark	Copenhagen Cluster	1,191.5	3
	North-western Zealand Cluster	534.0	1
Sweden	South Sweden Cluster	1,495.0	6
Total		5,735.5	13

Storage name	On / offshore	Capacity mean (million tonnes)		Status
		P90	P10	
Havnsø	Nearshore	204	423	Seismic campaign
Rødby	Onshore	242	449	Seismic campaign
Stenlille	Onshore	10 (mean)		Seismic campaign finished

Baltic-4. North-Poland

Project ID	Value chain name	Involved countries	Num-ber of count-ries	Total CO_2 emissions, Mt/y	Number of emission sources	Number of emission clusters	Storage sites	Number of storage sites	Total CO_2 storage capacity, Mt	Total years for storage	Distance from emission sources to storage sites, km
Baltic-4	North Poland onshore	Poland	1	13.63/ 7.37	18(11)	1	KonaryJ, Kamionki K	2	381	28/52	6.8-62.8

Baltic - 4, Northern Poland, 18/11 emitters (1 cluster), 2 storage sites

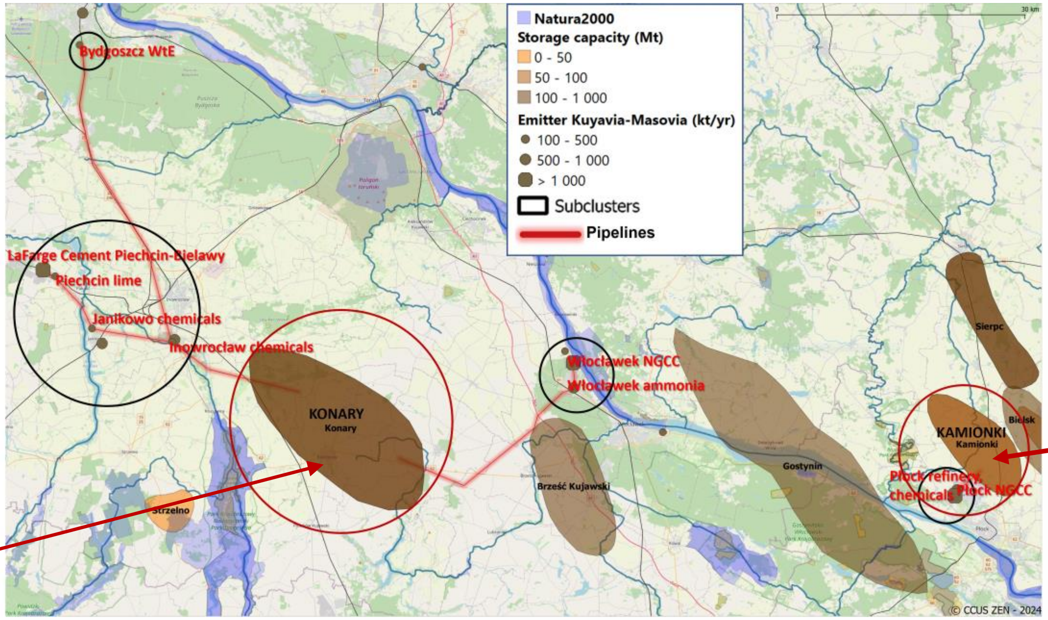


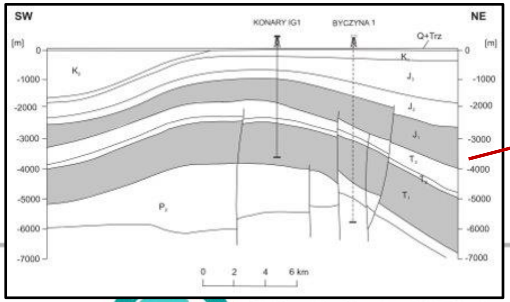
Kamionki storage site

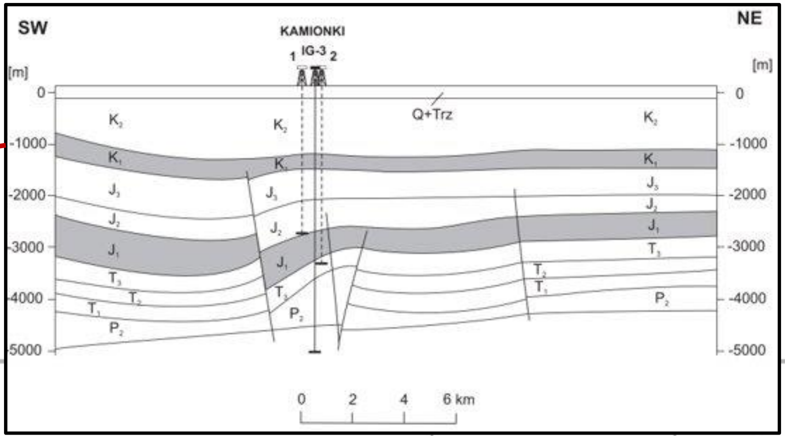
1) Reservoir 1:
Lower **Cretaceous** sandstones, thickness ~80 m
Porosity 20%;
Permeability~400 mD
Caprock:
Upper Cretaceous ~200 m (marl, marly limestone)
2) Reservoir 2: Lower – Middle **Jurassic sandstones**,
Porosity~15%;
Permeability~200 mD
Caprock(s):
Upper Aalenian to Lower Bajocian, Bathonian (secondary)

Konary storage site

- Lower-Middle **Jurassic** sandstones (multiple),
- total thickness ~160 m
- porosity~15%; permeability~300 mD
- caprock(s):Lower Bajocian ~71 m (claystone, mudstone),
- Bathonian (secondary)







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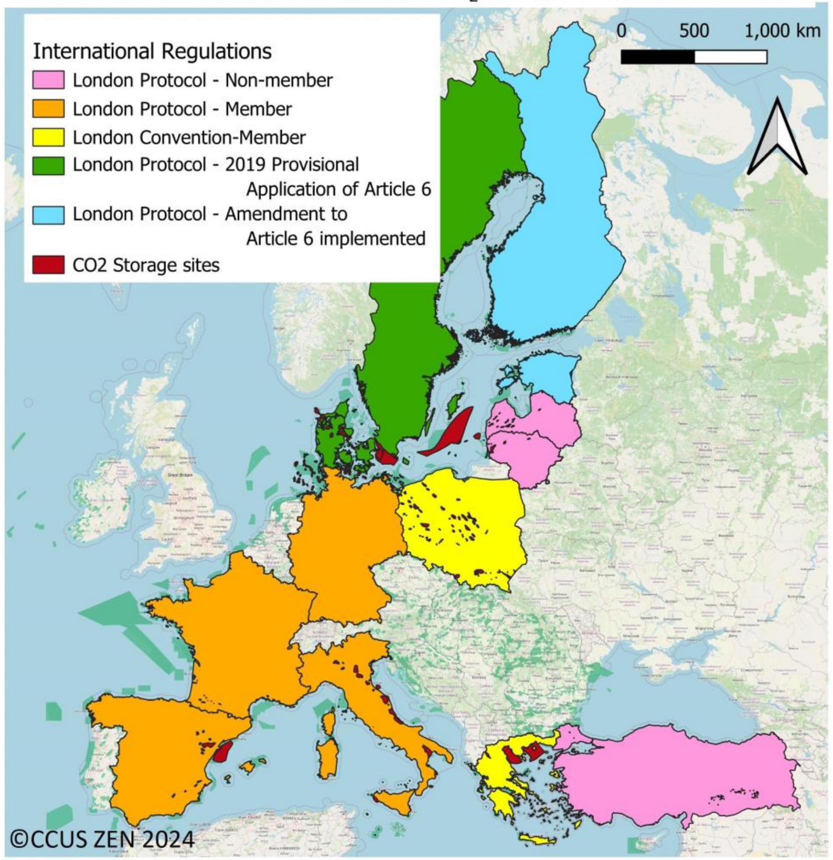
Regulatory readiness of the analysed value chains: Baltic Region

Among higher - readiness value chains are

- Cross-border Baltic-2 (onshore and offshore storage)
- Baltic-3 (onshore storage)
- CCUS projects with CO_2 emission sources in Denmark, Sweden and Germany and CO_2 storage in Denmark.
- **The main internal strengths of these two value chains:**
- **The high storage capacity associated with very good reservoir properties, large thickness of primary cap rocks**
- **High density of total emissions per unit distances and other strong technical parameters**
- **CO_2 capture and CO_2 use options are under development**
- **Many CCUS research and demo projects in Denmark**
- **Their main external opportunities are**
- **The favourable CCS policies and regulations and financial governmental support in Denmark, where CO_2 storage sites are located**.
- Germany, Sweden and Denmark are Contracting Parties to the London Protocol (LP),
- **Sweden and Denmark have deposited a declaration of provisional application of Amendment to Article 6**
- **The main risks**
- Among the risks for Baltic -2 and -3 **is German international regulations.**
- **Germany** has not yet deposited a declaration of provisional application **of Amendment to Article 6** with the IMO.

This, in addition to a bilateral agreement, is needed before the export of CO_2 for offshore storage.

INTERNATIONAL REGULATIONS AND CO_2 STORAGE SITES LOCATION



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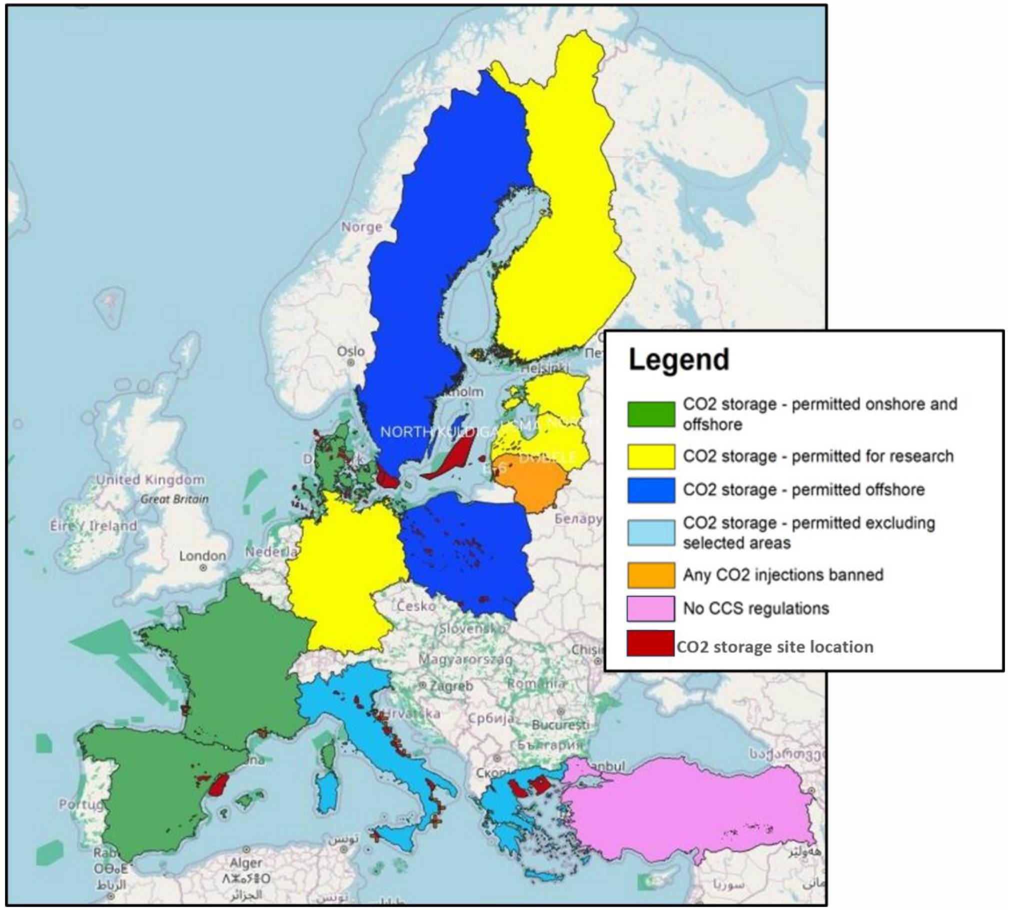
Readiness of the analysed value chains : Baltic Region

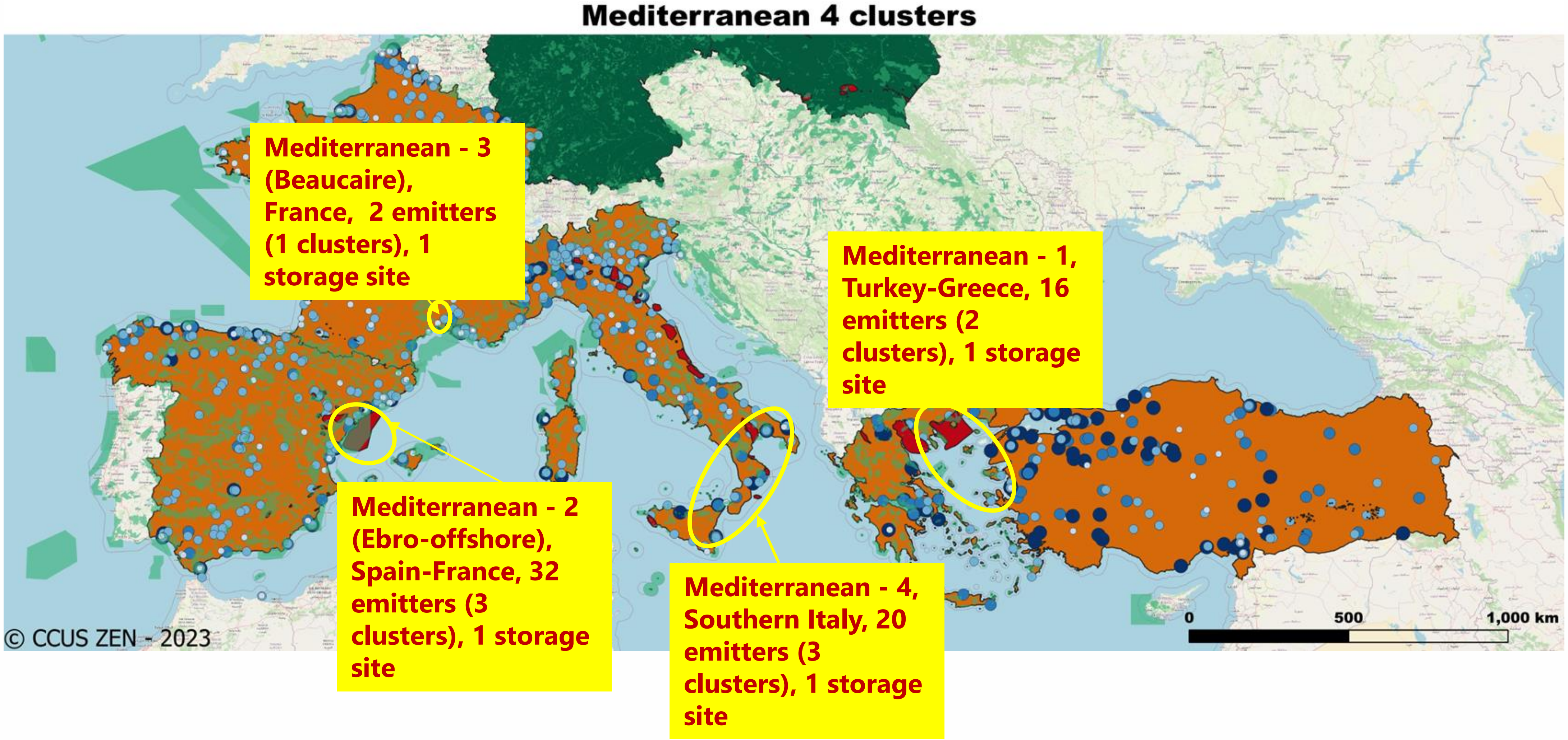
Baltic-1 value chain with CO_2 storage onshore Latvia and Baltic-4 value chain with CO_2 storage onshore Poland are categorized as less ready since they have regulatory risks:

- Industrial-scale CO_2 storage **is not yet permitted** in **Latvia**
- In **Poland,** CO_2 storage **is permitted now offshore** in the Baltic Sea. However, considering that CO_2 storage in the Baltic Sea is not permitted by the Helsinki Convention, it is not possible now to inject CO_2 offshore Baltic, and regulations on onshore storage are still being developed.
- Despite the planned changes in the CCS regulations and other available technical strengths, these regulatory changes in Latvia and Poland may take additional time and the risks should be seriously considered.

National Regulations combined with CO2 Storage Sites



Four Mediterranean clusters



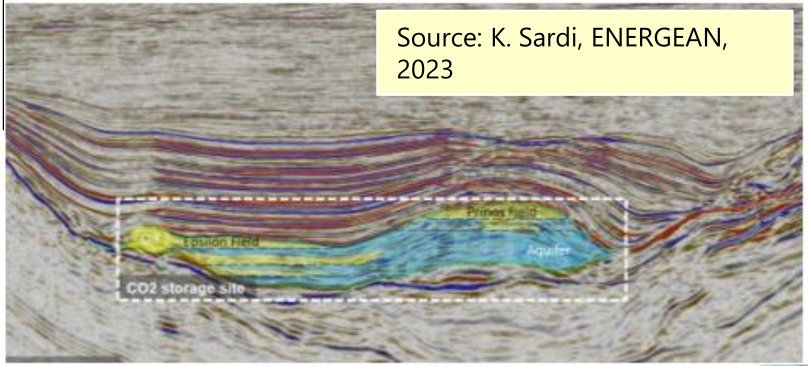
Mediterranean -1. Türkiye - Greece

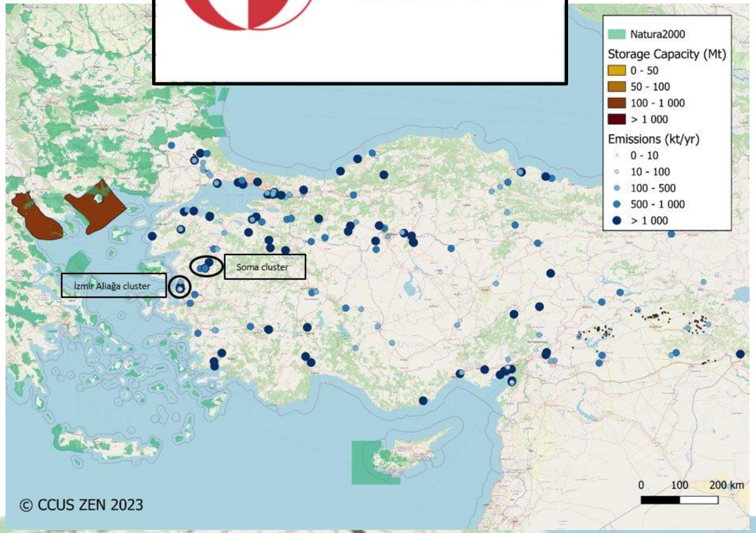
CO2 emissions:
- Soma cluster and İzmir Aliağa cluster

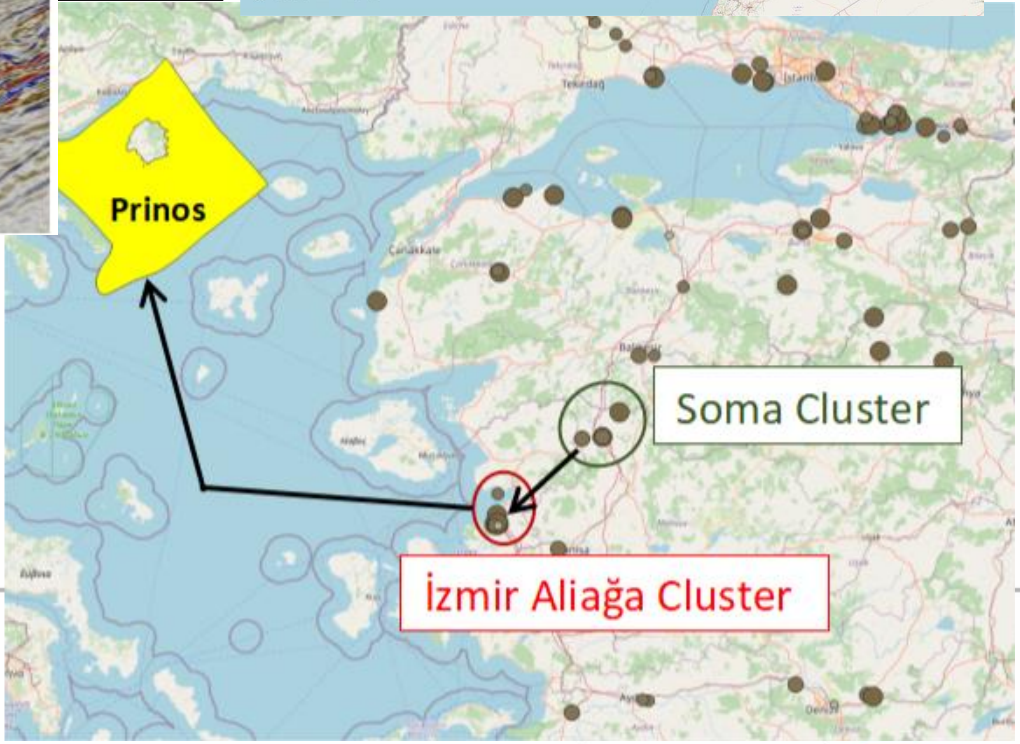
Transport routes
- Pipelines
- Ship transport - 360 km from İzmir-Aliağa port
- Prinos storage site in Greece
- CO_2 could be used in production of di-methyl ether (DME) in Aliağa region as suggested by CO2Fokus project.

Prinos Basin
Areal extent: 800 km^2
Saline aquifer
Rock type: Sandstone
The thickness of reservoir: 260 m
Depth: 1-3.5 km (2.4 km)
Geothermal gradient : 78^{o}C/km
Porosity: 15-20% (Avg. 18%)
Permeability: 50 mD
N/G=0.8
Storage capacity: 1000 Mt

PRINOS RESERVOIR







Project ID	Value chain name	Involved countries	Num-ber of counts-ries	Total CO_2 emissions, Mt/y	Number of emission sources	Number of emission clusters	Storage sites	Number of storage sites	Total CO_2 storage capacity, Mt	Total years for storage	Distance from emission sources to storage sites, km
Mediterranean -1 (M-1)	Soma - İzmir Aliağa - Prinos	Türkiye, Greece	2	40.0	16	2	Prinos	1	1000	25.0	120-360

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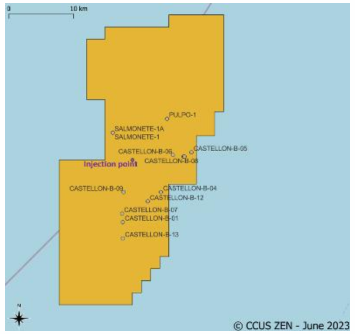
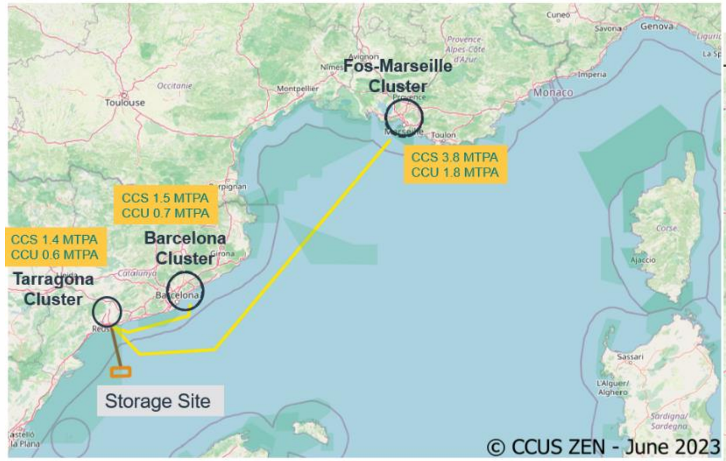
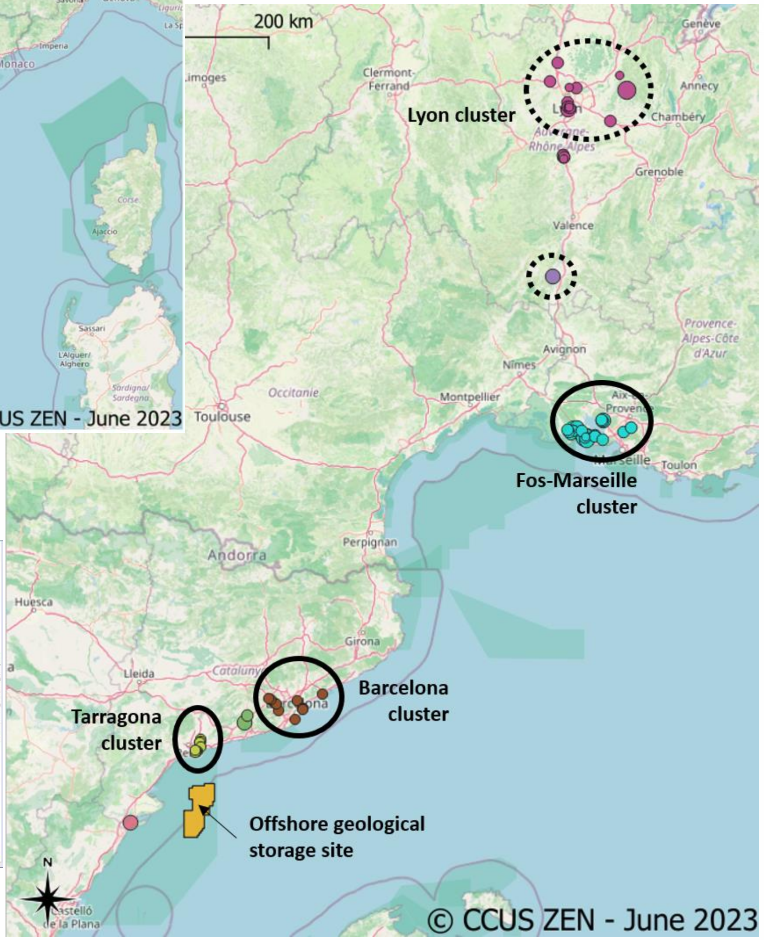
Mediterranean 2

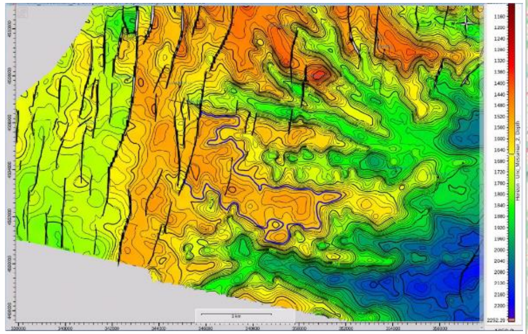
- The Mediterranean-2 project comprises of 3 clusters of large emitters (32 emitters, producing 23.8 $MtCO_2$) and one storage site offshore in Spain.
- The industrial clusters:
  - Tarragona - Spain
  - Barcelona - Spain
  - Fos-Marseille cluster in France.
- Geological storage site for is located offshore Tarragona in the Ebro Basin.
- Various CO_2 utilization options are considered on the base of CCU feasibility projects in France and Spain.
- It is assumed that 9.8 Mt CO_2 will be captured, from which 6.7 Mt stored and 3.1 Mt CO_2 used







Storage site parameters	
Country	Spain
Site name	Castellon
Reservoir Lithology	Upper Miocene Castellon Sandstone
Cap rocks	Ebro Shales
Top depth	1600 m
Thickness	300-600 m
Reservoir pressure at 1600m	16 Mpa
Reservoir temperature at 1600 m	74 °C
Porosity	14-20 %
Permeability	0.010-0.500 D
Average Storage Capacity	>200 Mt CO2



Structural map of the Castellon storage site (source: PilotSTRATEGY project – Gravaud & Canteli, 2023)

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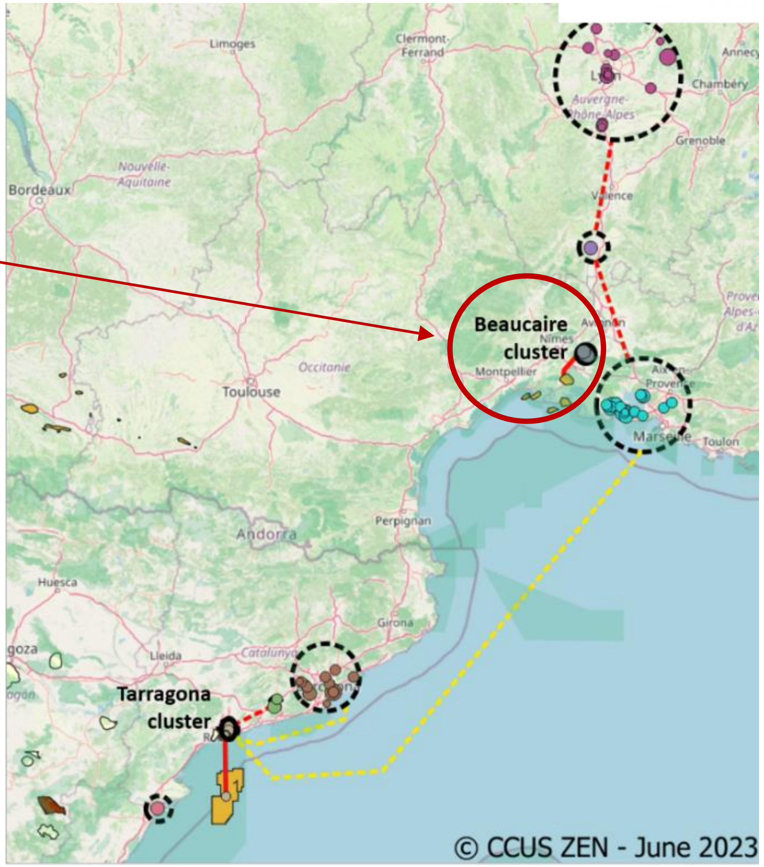
Mediterranean 3

- The **Beaucaire value chain** is a local-scale scenario with two emitters (a paper plant and a cement plant) emitting 1.17 Mt/y
- The storage is onshore saline aquifer site Haut d'Albaron, with a storage capacity 34 Mt.
- Onshore pipeline of total length 32.6-38.5 km.
- Proximity with protected area is taken into account.
- In the Beaucaire area, CO_2 use for catalytic methanol production can be considered with a potential of 200 kt CO_2/y.



- Location of Tarragona and Beaucaire clusters, transport pipelines and storage sites. In dashed lines are potential extensions of the CCUS project.

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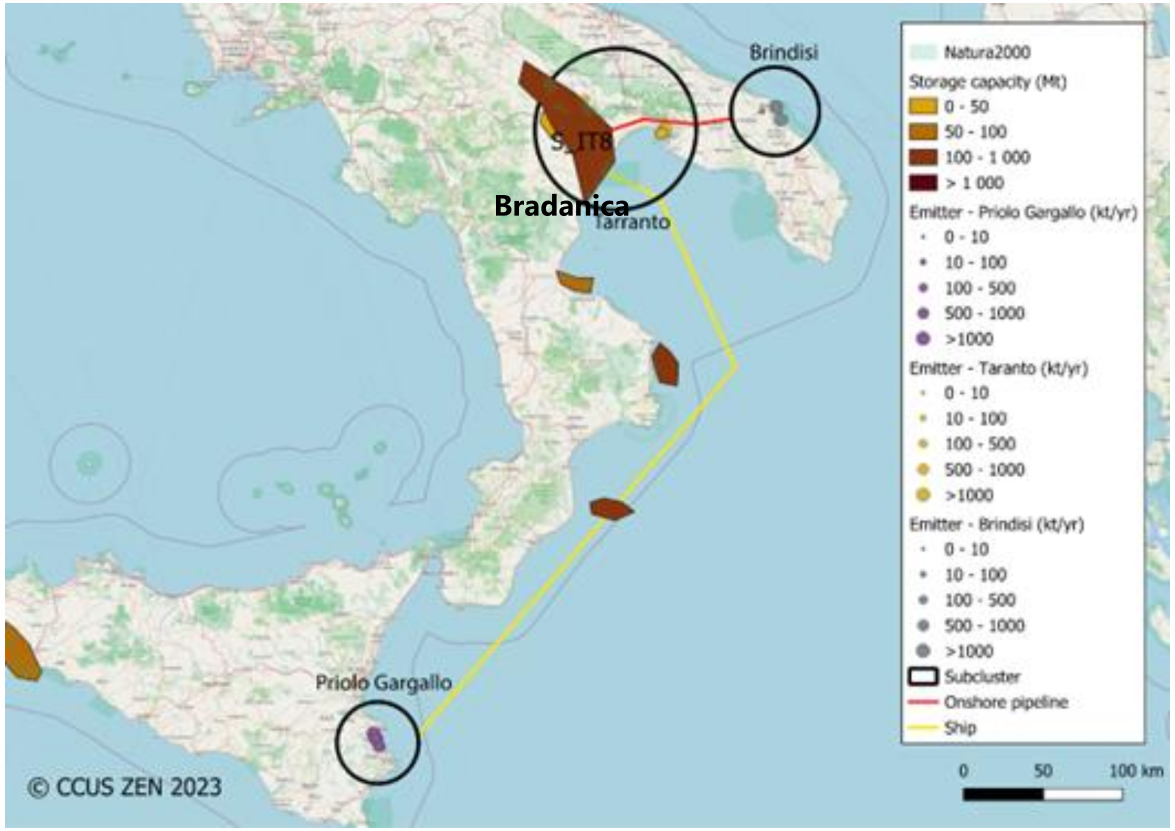
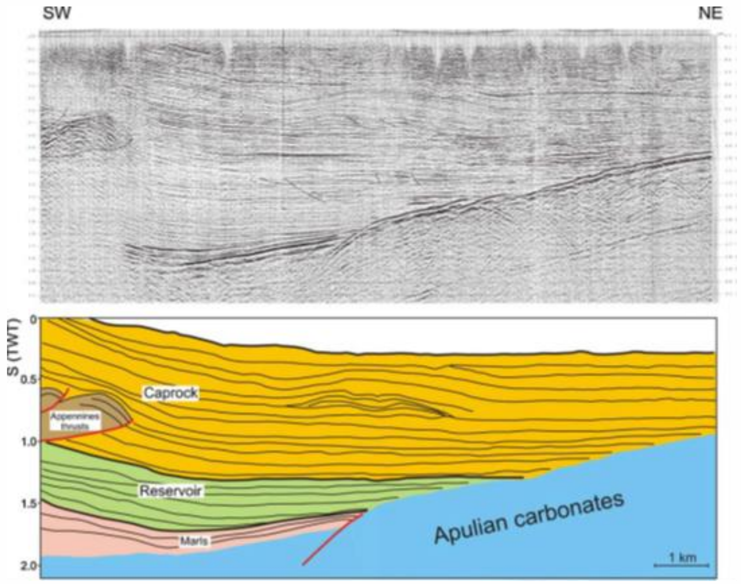
Mediterranean - 4

- CCUS value chain from Southern Italy, with three emitters clusters:
- Brindisi, Taranto and Priolo Gargallo.
- Transport to onshore storage site.
- Ship transport is marked from Priolo Gargallo
- Pipelines from Brindisi and Taranto.





Bradanica storage site:

•Reservoir:

Late Pliocene sands and silty sands with marl, locally more than 800 m thick, effectively 650 m thick.

•Caprock:

•Clay and silty clay, 1500 m thick in places.

•Storage capacity:

with efficiency of 1% - 344 Mt,

4% - 1376 Mt.

Project ID	Value chain name	Involved countries	Number of counts-ries	Total CO_2 emissions, Mt/y	Number of emission sources	Number of emission clusters	Storage sites	Number of storage sites	Total CO_2 storage capacity, Mt	Total years for storage	Distance from emission sources to storage sites, km
Mediterranean -4 (M-4)	Southern Italy (Taranto, Brindisi, Priolo Garalo)	Italy	1	26.51	20	3	Bradanica	1	344-1376	7.8 - 19.0	50 - 450

Readiness of the analysed value chains:

Mediterranean-2, 3 and 4 value chains, which include emission sources and storage sites in Spain (M-2), France (M-3) and Italy (M-4), are assessed as more ready at regulatory side than M-1.

- **Mediterranean-1 including CO_2 emissions from Türkiye and CO_2 storage in Greece as less ready, considering the regulatory risks:**
- There is a lack of CCS regulations and CO_2 capture and transport infrastructures in Türkiye.
- **Türkiye and Greece are not Contracting Parties to the London Protocol** and are therefore not bound by its requirements for cross-border CO_2 transport
- **France, Spain and Italy are members of the LP.**
- **Italy is planning to implement Amendment and provisional application to the Article 6.**

However technical and geological parameters of the storage sites in M-3 are not satisfied to the known requirements

Some projects in both regions have also technical risks for the area around storage site (external group 1):

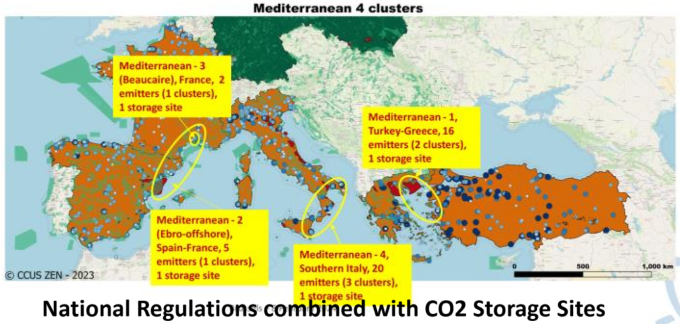
For Italy seismic risks should be checked for the storage site areas.

Most countries have risks connected with location of Natura 2000 areas close to the storage sites or intersected with storage sites.

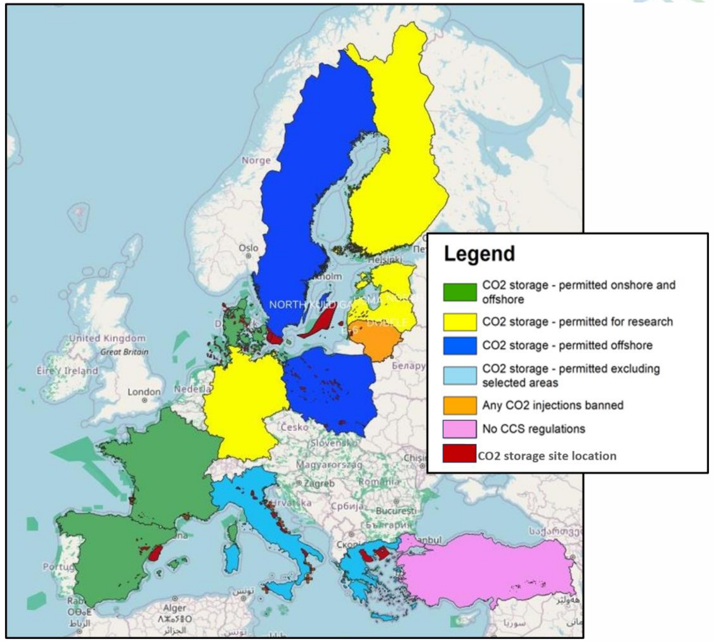
The study will be finalized with an overview of readiness and recommendations for advancing ready and less ready cases toward CCUS implementation.

Using multivariate SWOT analysis, quantitative estimations will be also applied.

Four Mediterranean clusters



National Regulations combined with CO2 Storage Sites



Overview of parameters in the analysed values chains

Project ID	Value chain name	Involved countries	Number of count-ries	Total CO_2 emissions, Mt/y	Number of emission sources	Number of emission clusters	Storage sites	Number of storage sites	Total CO_2 storage capacity, Mt	CO_2 transport Distance, km	Regulatory problems	
											National	International
Baltic-1	Baltic Lat-Lit-onshore	Latvia, Lithuania	2	4.25	6	2	North Blidene, Blidene and Dobele	3	**403**	9-150	√	
Baltic-2	DE DK SWE Jutland network	Germany, Denmark, Sweden	3	20	33	9	Gassum, Voldum, Jammerbugt Inez, Bifrost, Greensand, Lisa, Thorning	8	**928**	5-750		√
Baltic-3	Copenhagen	Germany, Denmark, Sweden	3	5.9	16	4	Rødby, Havnsø, Stenlille	3	**657**	5-115		√
Baltic-4	North Poland onshore	Poland	1	13.6/7.4	18(11)	1	Konary J, Kamionki K	2	**381**	7-63	√	
Mediterranean - 1 (M-1)	Soma - İzmir Aliağa - Prinos	Türkiye, Greece	2	40.0	16	2	Prinos	1	**1000**	120-360	√	√
Mediterranean - 2 (M-2)	Ebro offshore	Spain, France	2	24	32	3	Castellon	1	**>200**	50-450		
Mediterranean - 3 (M-3)	Beaucaire	France	1	1.17	2	1	Haut d'Albaron	1	**34**	27		
Mediterranean - 4 (M-4)	Southern Italy (Taranto, Brindisi, Priolo Garalo)	Italy	1	26.51	20	3	Bradanica	1	**344-1376**	50 - 450		
Total range for all clusters			**1-3**	**1.2 -40**	**2-33**	**1-9**		**1-8**	**34-1400**	**5-750**		

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