

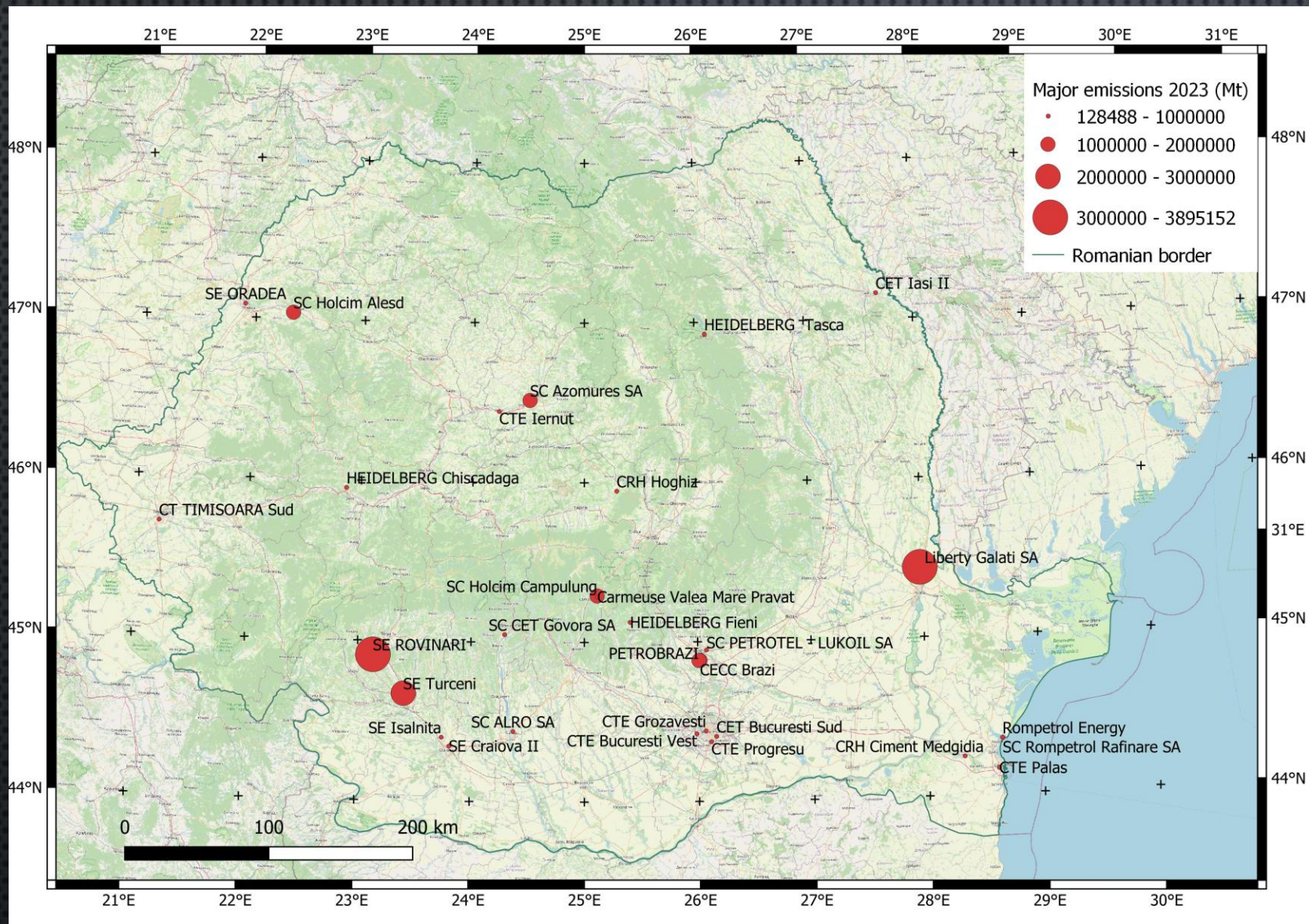
CCS ACTIVITIES IN ROMANIA

ALEXANDRA-CONSTANȚA DUDU, CORINA AVRAM, CONSTANTIN ȘTEFAN SAVA,
GABRIEL IORDACHE, LIA STELEA, SORIN ANGHEL , ANDREI-GABRIEL DRAGOȘ,
BOGDAN-MARIUS BĂRĂITĂREANU



PREMISES FOR CCS IN ROMANIA

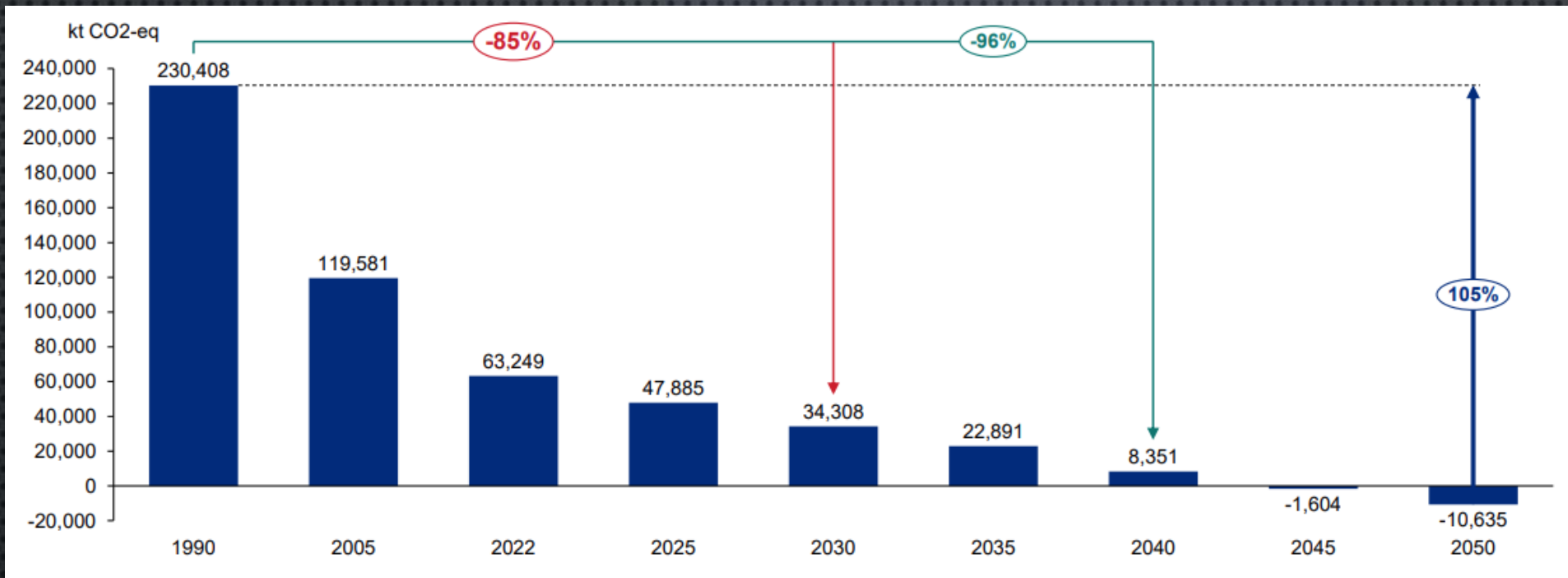
- CARBON PRICING: ROMANIA PARTICIPATES IN EU-ETS
- INTERESTED EMITTERS
- POTENTIAL FOR CO₂ STORAGE
- HIGH OBLIGATIONS UNDER NZIA
- MORE THAN 20 YEARS OF RESEARCH ON CCS AND CO₂ STORAGE



INDUSTRIAL EMISSIONS

- TOTAL INDUSTRIAL EMISSIONS 2023
 - 23.84 Mt CO₂
- LARGEST EMITTERS
 - POWER PLANTS (COAL+GAS)
 - STEEL
 - CEMENT

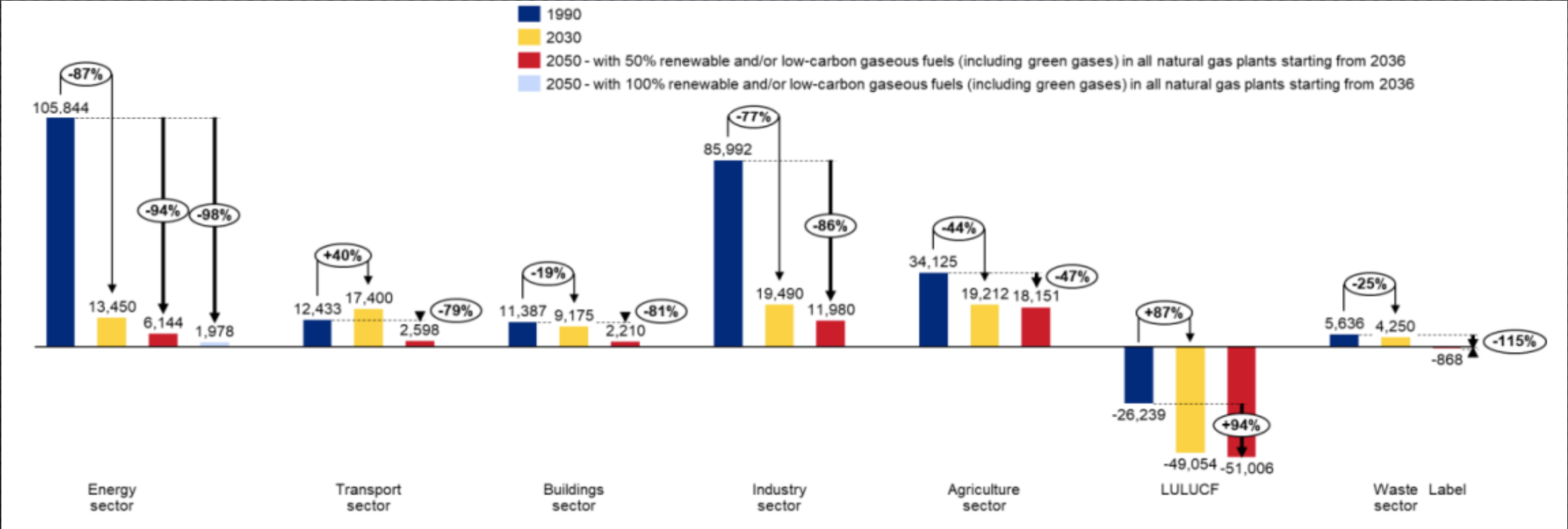
EMISSION REDUCTION TARGETS



- GHG REDUCTION TARGETS INCLUDING LULUCF
- 85% BY 2030
- 96% BY 2040
- 100% BY 2050

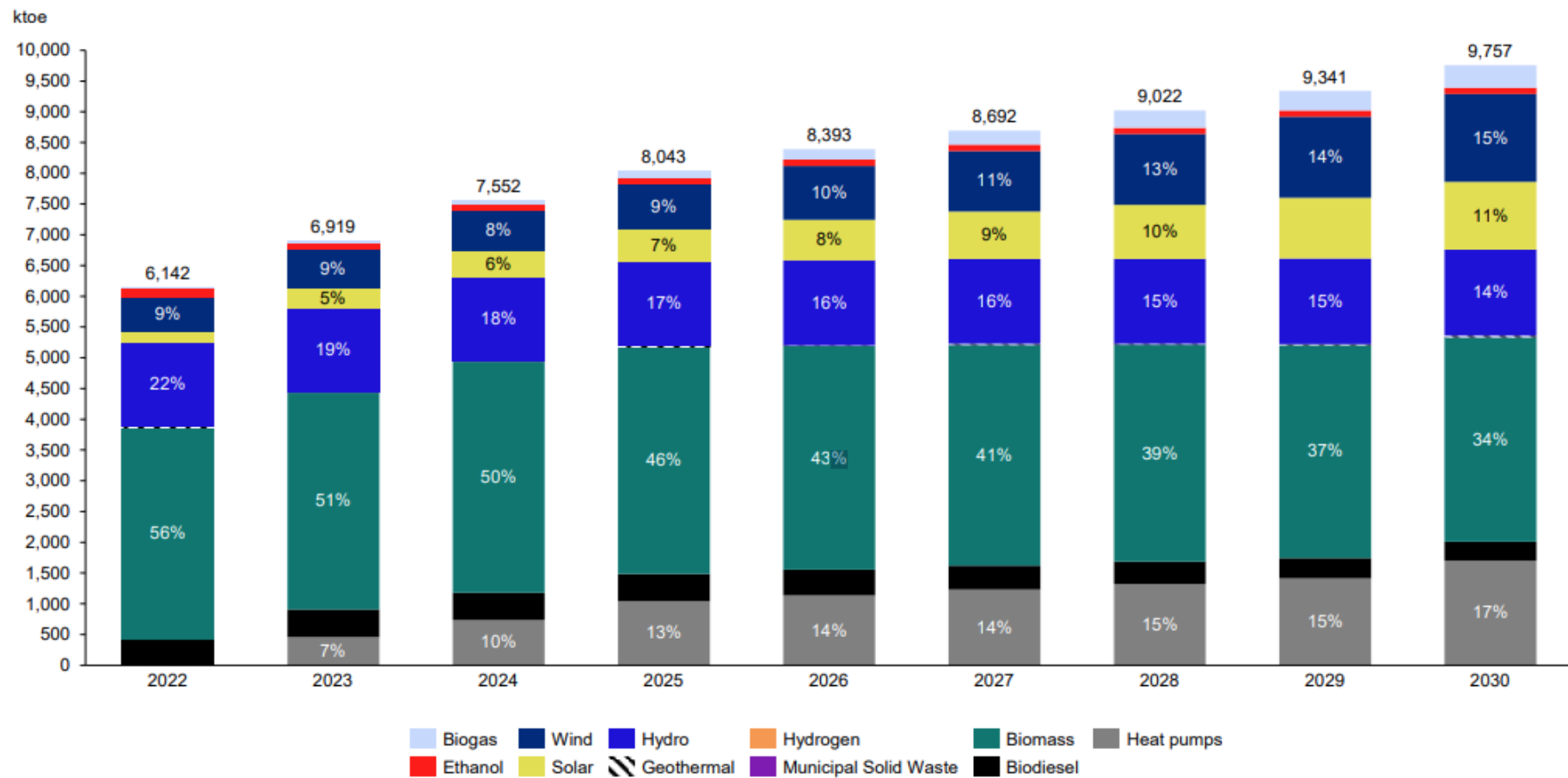
NECP, 2024

EMISSION REDUCTION TARGETS BY SECTOR



NECP, 2024

RENEWABLE ENERGY



- SHARE OF 38,3% IN THE GROSS FINAL CONSUMPTION OF ENERGY BY 2030

DECARBONISATION STRATEGY AND THE ROLE OF CCS

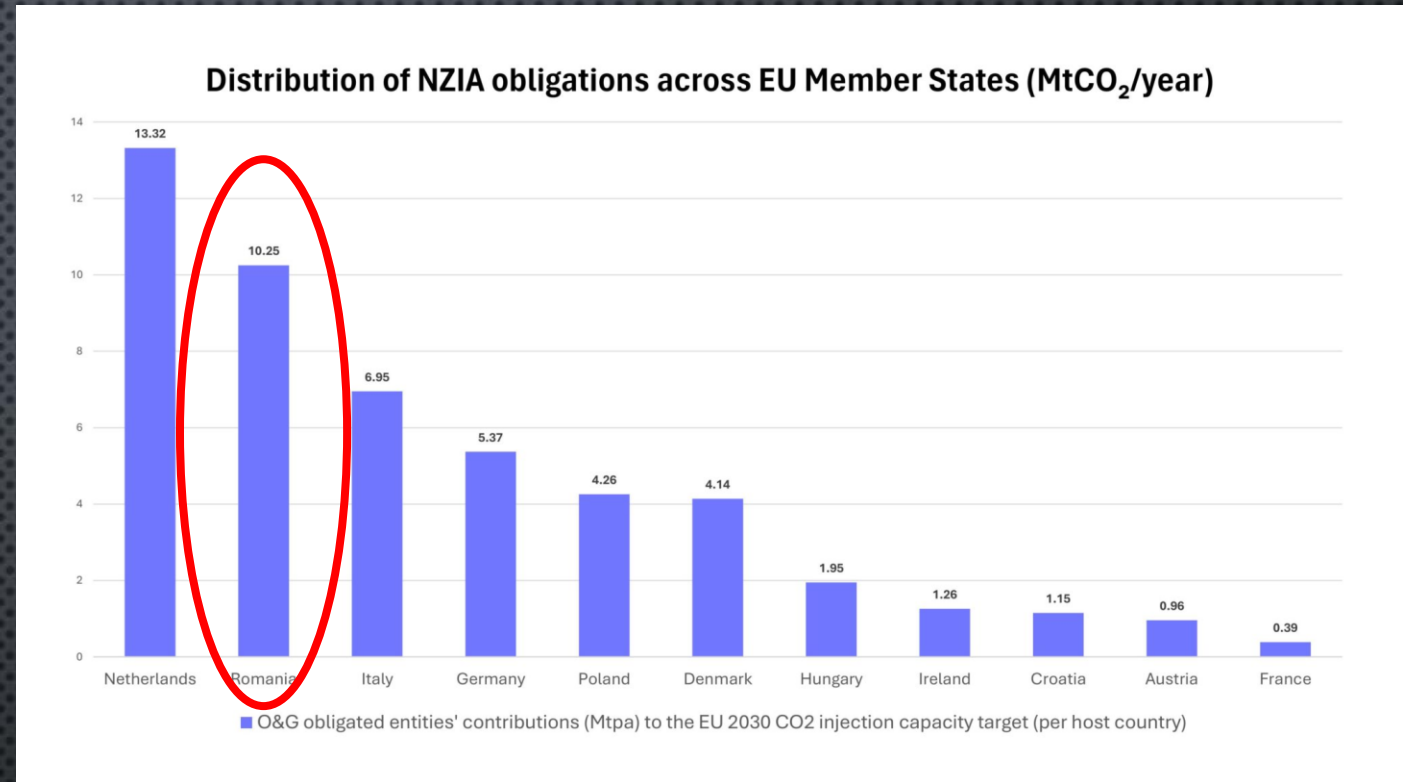
- ENERGY EFFICIENCY
- RENEWABLE ENERGY SOURCES DEVELOPMENT
- NUCLEAR ENERGY DEVELOPMENT
- RENEWABLE HYDROGEN PRODUCTION
- INCREASE OF GAS STORAGE CAPACITY AND NATURAL GAS EXTRACTION
- FURTHER DEVELOPMENT OF NATURAL GAS INFRASTRUCTURE
- NECP (2024): **PROMOTION AND CO-FINANCING OF CCUS FOR VAST EMISSION REDUCTION**
 - DEPLOYMENT OF CCUS TECHNOLOGIES IN ENERGY-INTENSIVE/HARD TO ABATE INDUSTRIES
 - BY 2050, AT LEAST 50% OF THE EMISSIONS IN THE MINERAL INDUSTRY (CEMENT INCLUDED) WILL BE CAPTURED

REGULATORY FRAMEWORK FOR CCS

- **GEO 64/2011** TRANSPOSITION OF CCS DIRECTIVE, APPROVED THROUGH LAW 114/2013
- STORAGE PERMITTED ONSHORE AND OFFSHORE
 - SPECIFIC PROCEDURES FOR EXPLORATION AND STORAGE
 - COMPETENT AUTHORITY ANRMPSG, NATIONAL REGULATORY AUTHORITY FOR MINING, PETROLEUM AND GEOLOGICAL STORAGE OF CARBON DIOXIDE
- GEO 64/2011 MODIFIED AT THE END OF 2024 (**GEO 139/2024**) TO ALLOW HARMONIZATION WITH PETROLEUM LAW
 - EXPLORATION NOT NEEDED FOR STORAGE SITES INSIDE PETROLEUM LICENCES BLOCKS, IF
 - THE OPERATOR IS THE OWNER OF THE PETROLEUM LICENCE
 - THERE IS ENOUGH DATA TO PROVE CHARACTERIZATION AND EVALUATION
 - THE PETROLEUM LICENCE OWNER HAS THE TECHNICAL AND FINANCIAL CAPABILITY TO DEPLOY CO₂ STORAGE ACTIVITIES
 - TRANSPORT OF CO₂ IS LICENCED BY ANRE

NZIA OBLIGATIONS

- INJECTION CAPACITY OBLIGATION (ICO) – LISTED UNDER DELEGATED ACT
- 44 OBLIGATED ENTITIES LOCATED IN 11 EU MEMBER STATES: THE NETHERLANDS, **ROMANIA**, ITALY, GERMANY, POLAND, DENMARK, HUNGARY, IRELAND, CROATIA, AUSTRIA, AND FRANCE



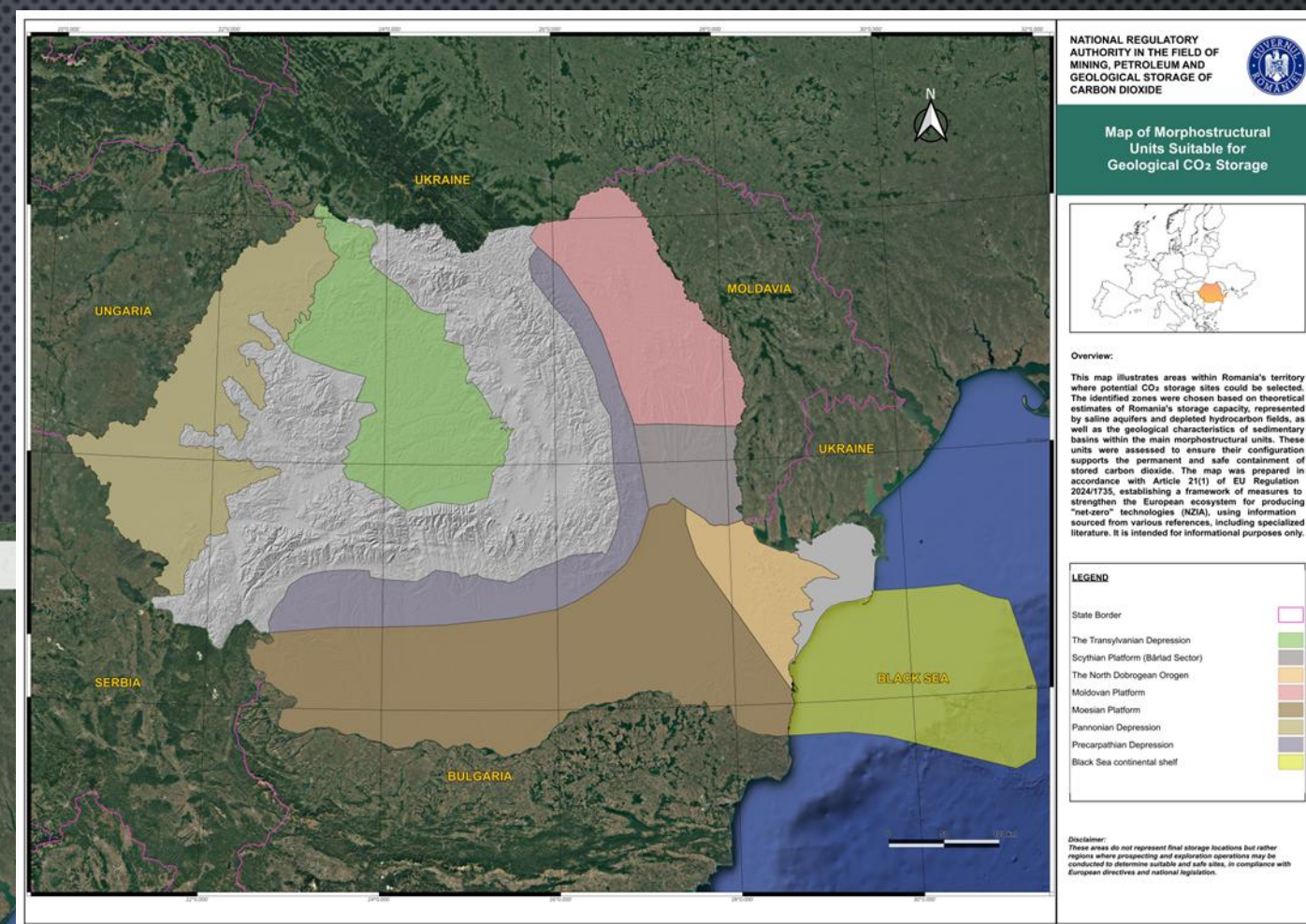
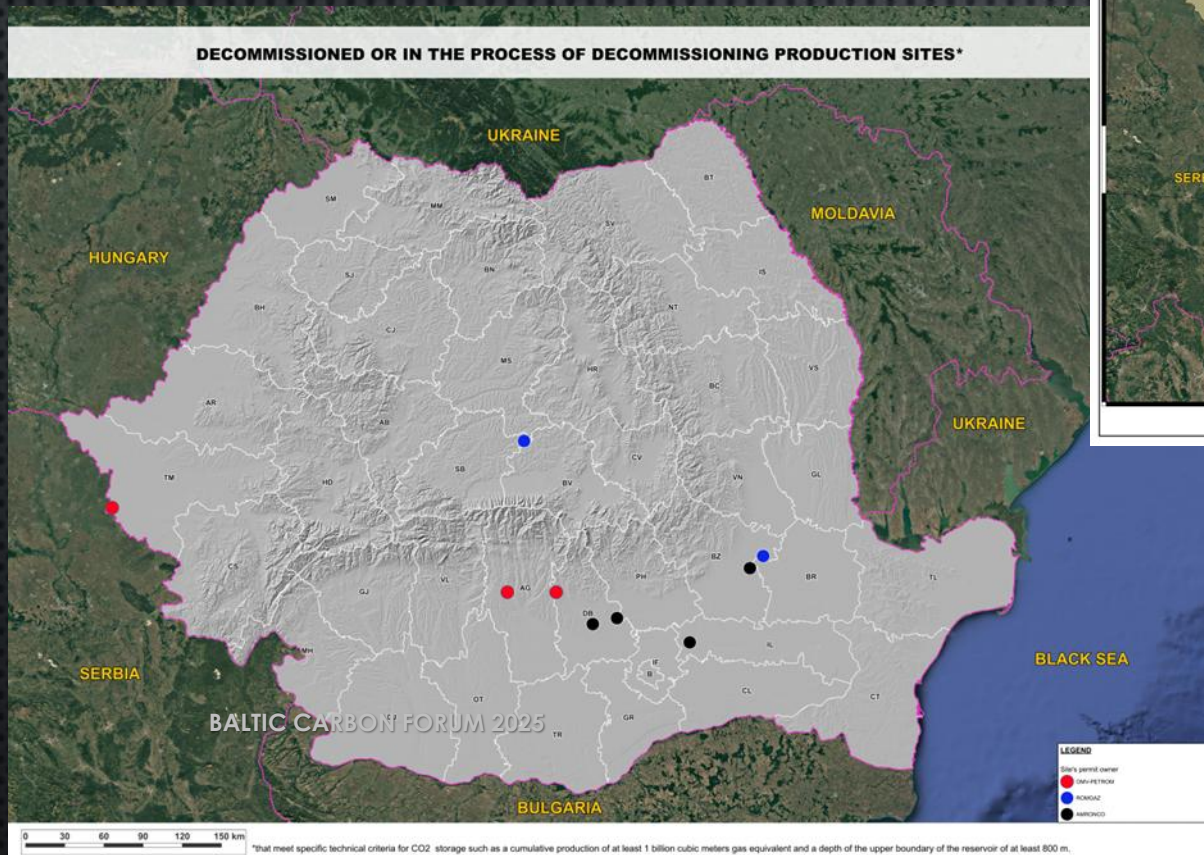
Romania – 10.25 Mt
allocation

OMV PETROM SA - 5.880 Mt

S.N.G.N ROMGAZ S.A. - 4.120 Mt

Black Sea Oil & Gas S.A. – 0.250 Mt

ROMANIA REPORT UNDER NZIA



AREAS WHERE STORAGE IS PERMITTED/FEASIBLE
PRODUCTION SITES DECOMMISSIONED OR UNDER
DECOMMISSION

LIST OF ABANDONED WELLS – VER1

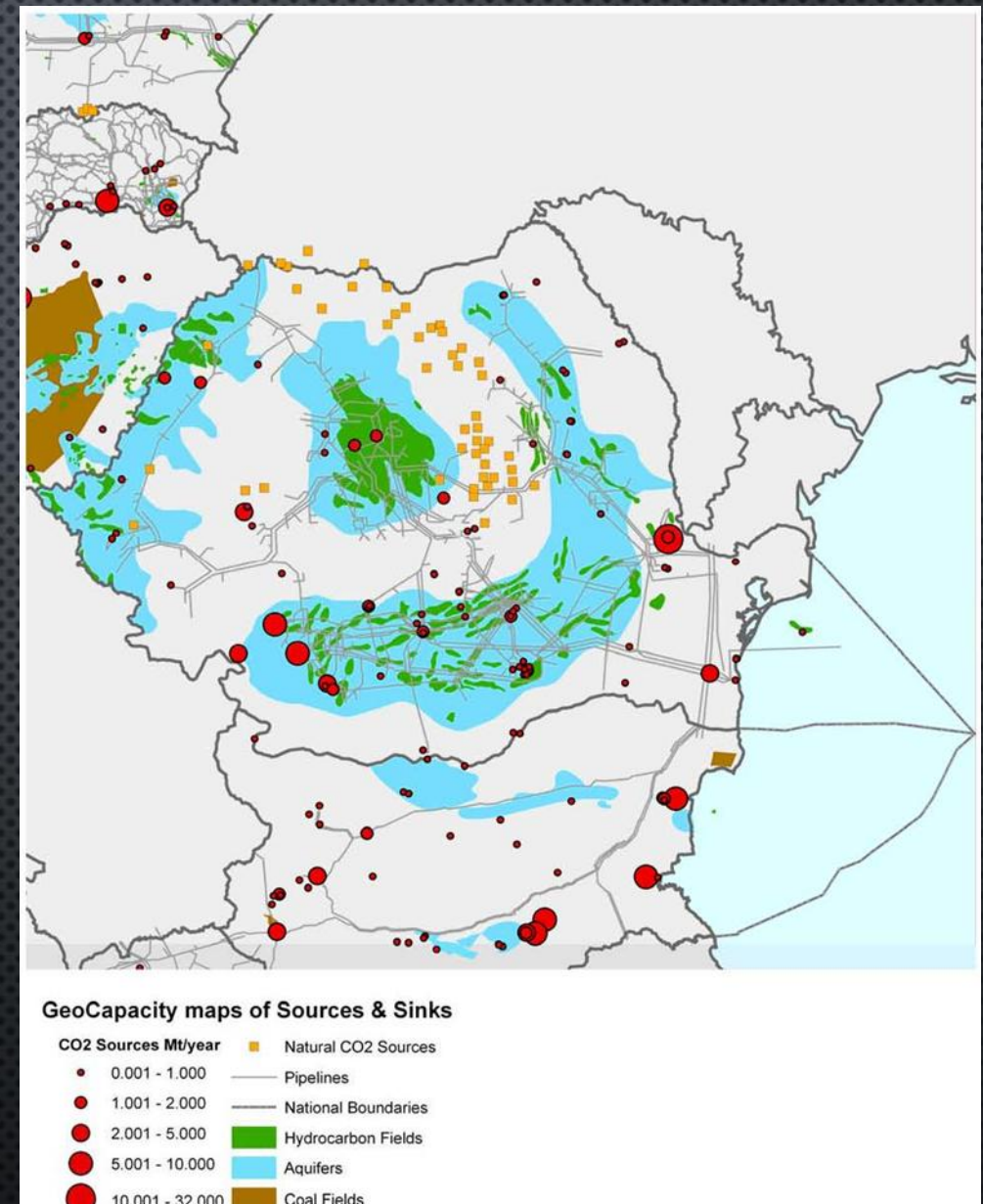
SOURCE: ANRMPSG

ONSHORE STORAGE POSSIBILITIES

- EUGeoCAPACITY PROJECT (2006-2008)
- CO2 STOP - CO2 STORAGE POTENTIAL IN EUROPE

https://setis.ec.europa.eu/european-CO2-storage-database_en

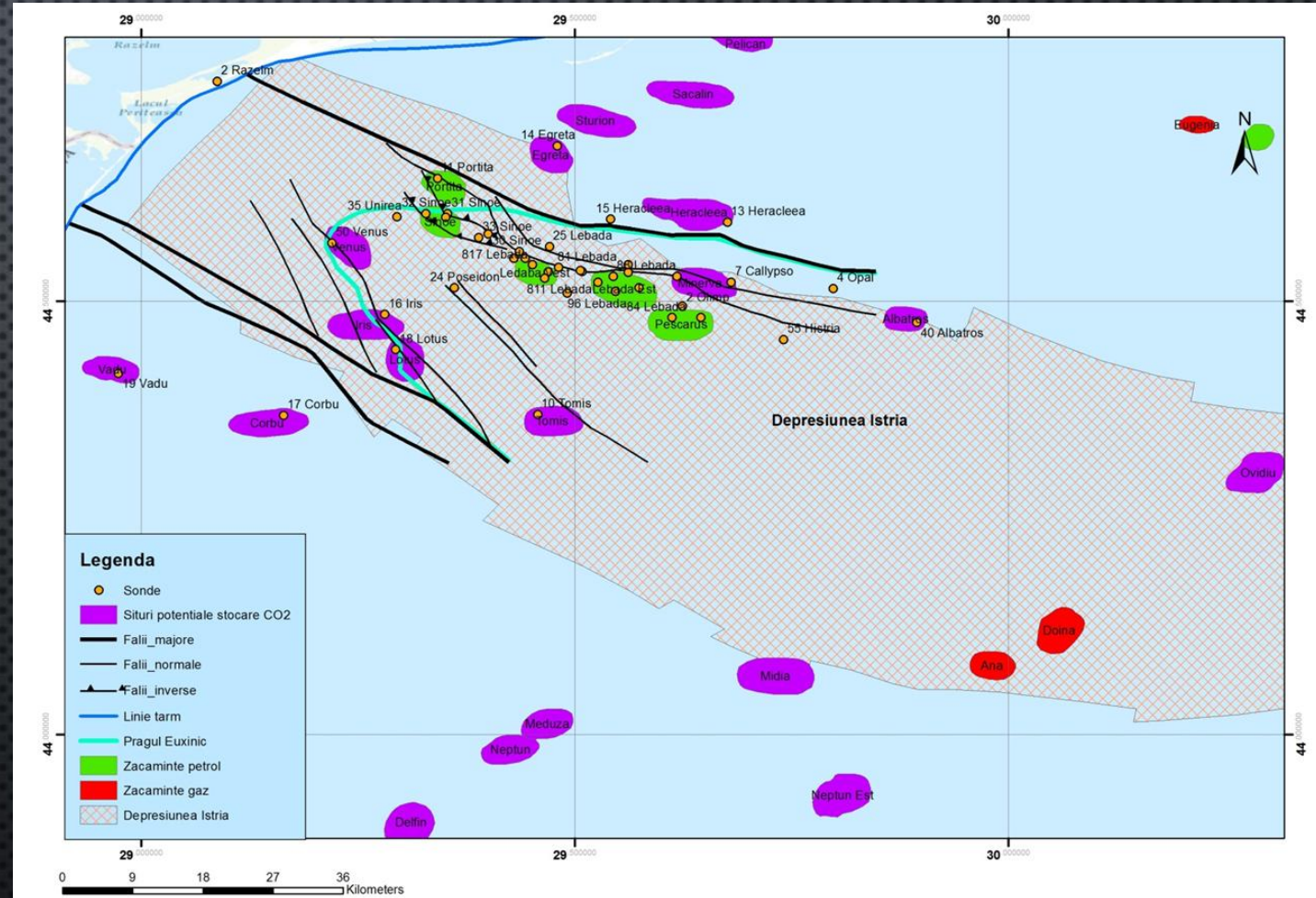
- Estimation of **theoretical** CO₂ geological storage capacity for Romania (2009)
 - 18 Gt deep saline aquifers (regional aquifers extended at the level of suitable formations)
 - 4 Gt hydrocarbon fields (all)



EuGeoCapacity, 2009

OFFSHORE STORAGE

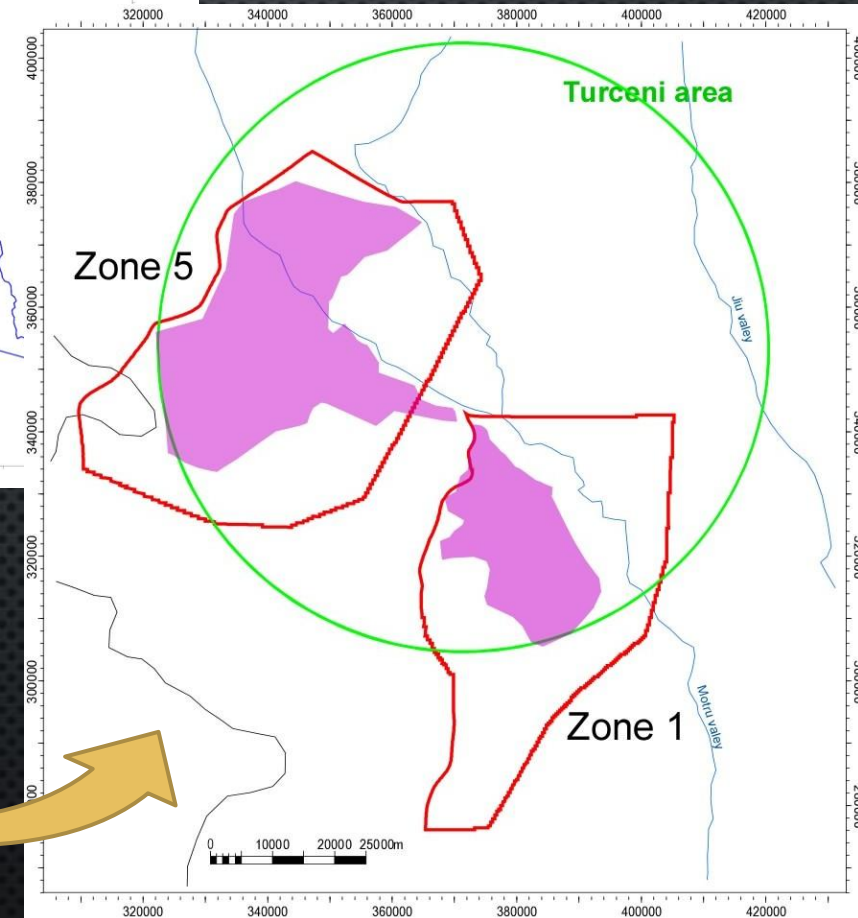
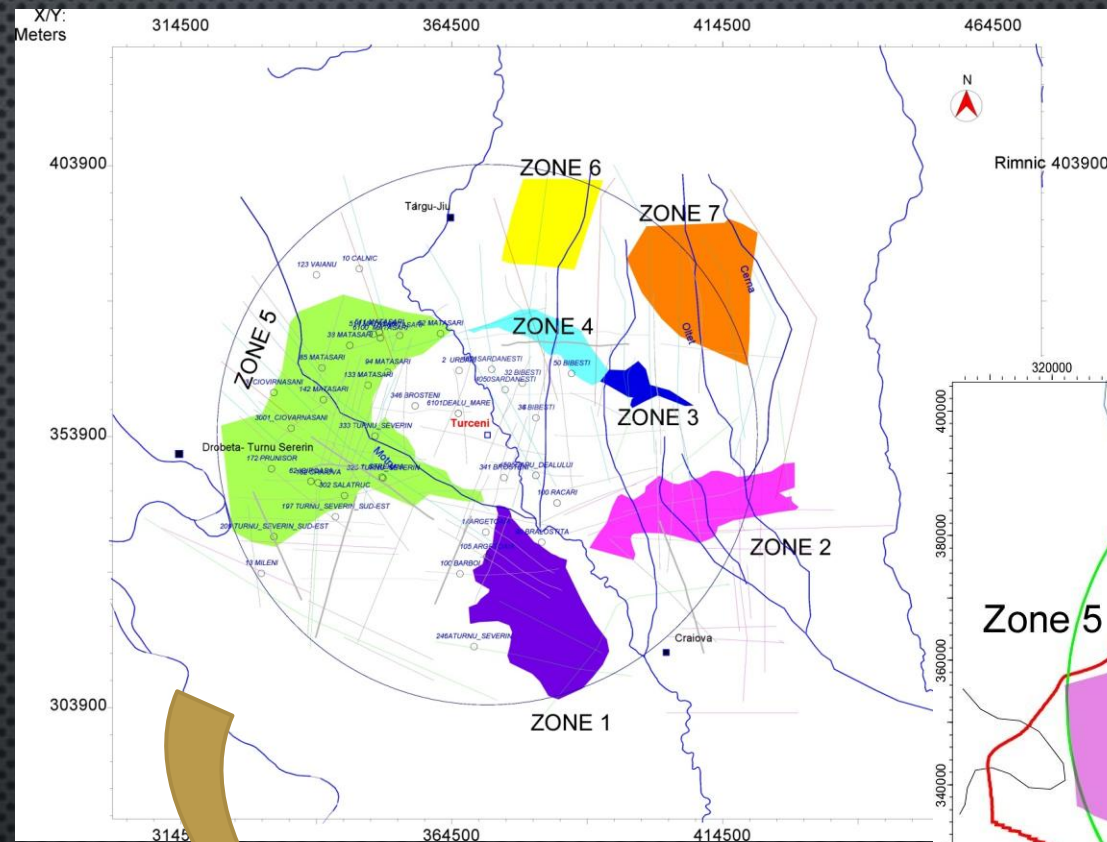
- MANY HYDROCARBON FIELDS
- NON-PRODUCTIVE STRUCTURES – POSSIBLE DEEP SALINE AQUIFERS
- RESEARCH STARTED IN 2017 (PN 16450303)
- RESEARCH DONE IN THE PAST YEARS BY OIL AND GAS COMPANIES



PN 16450303, 2017

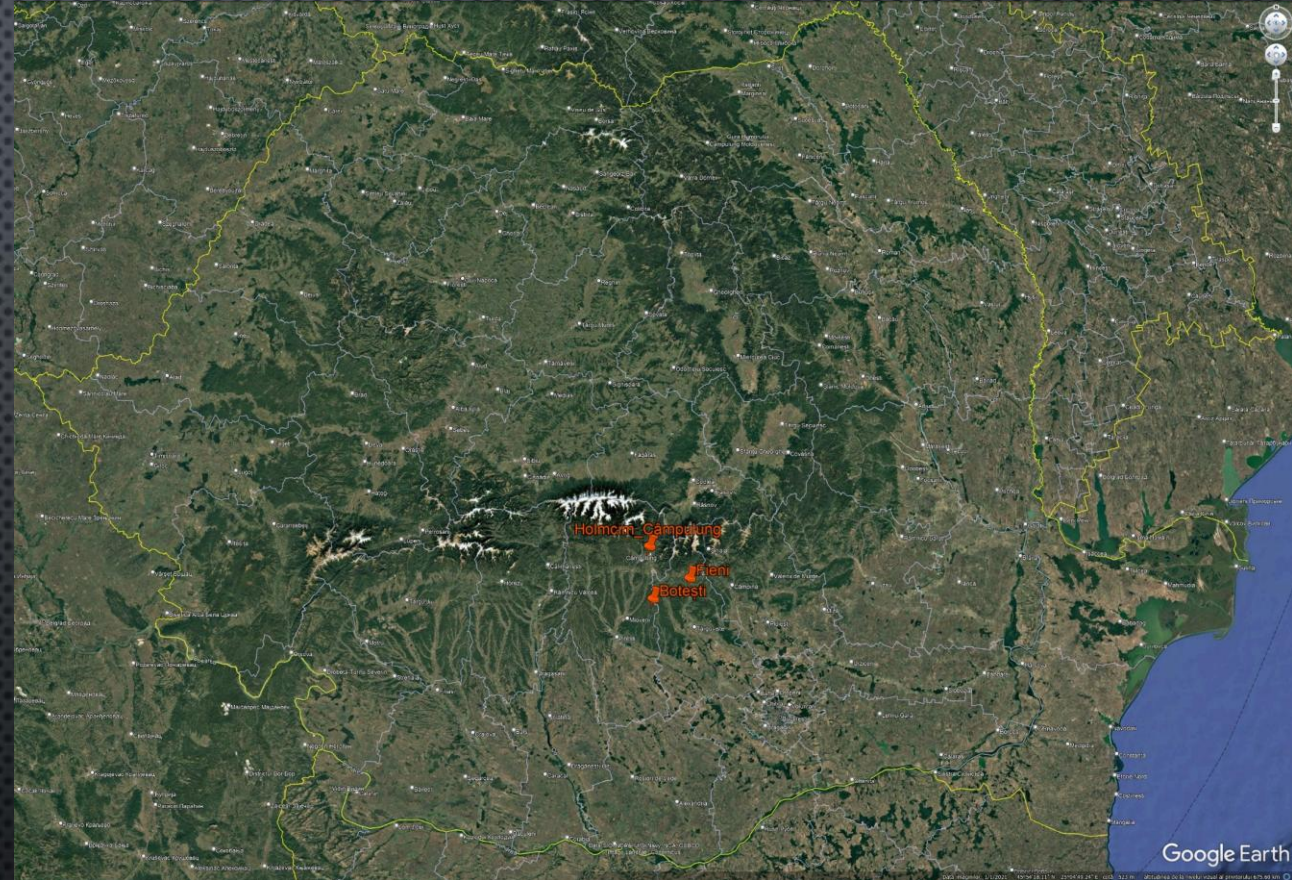
OLD PROJECTS – GETICA CCS

- **CAPTURE:** TURCENI – 1.5 Mt/Y
- **TRANSPORT:** ONSHORE PIPELINES
- **STORAGE:** DEEP SALINE AQUIFERS
- FEASIBILITY STUDY COMPLETED, FINANCED BY GCCSI AND MINISTRY OF ECONOMY
- APPRAISAL AND MONITORING PLANS COMPLETED
- TECHNICAL CONSORTIUM: ISPE, ALSTOM, GEOECOMAR, SCHLUMBERGER
- PROJECT COMPANY (NOT FORMALIZED/LLEGALIZED): TURCENI, TRANSGAZ, ROMGAZ
- ON THE WAITING LIST FOR NER 300



PLANNED CCS PROJECTS

- 2 FLAGSHIP PROJECTS
 - FIENI-BOTEȘTI PROJECT
 - OMV PETROM AND HEIDELBERG MATERIALS
 - STORAGE IN DEPLETED GAS FIELD
 - 0.6 MT PER ANNUM
 - HOLCIM PROJECT
 - 1.2 MT OF CO₂ CAPTURED FROM MULTIPLE SOURCES
- CO₂ TRANSPORT PROJECTS
 - EXPLORING THE POTENTIAL REUSE OF EXISTING PIPELINES FOR CO₂ TRANSPORT.
 - DEVELOPING NEW DEDICATED INFRASTRUCTURE, WITH AN ESTIMATED CAPACITY OF UP TO 10 MILLION TONS OF CO₂ PER YEAR BY 2030, DEPENDING ON THE PACE OF CCS PROJECT IMPLEMENTATION.
- BLACK SEA OIL AND GAS – TO USE ANA AND DOINA OFFSHORE FIELDS FOR CO₂ STORAGE AFTER END OF



https://climate.ec.europa.eu/document/download/0638a76f-46c4-473b-8735-20ee6659287f_en?filename=RO_NZIA_Art.21_2024_combined_PDF.pdf

RESEARCH ON CO₂ GEOLOGICAL STORAGE

- STARTED IN 2001 WITH AFFILIATION OF GEOECOMAR TO ENERG
- INTERNATIONAL RESEARCH PROJECTS
 - FP6: EUGEOCAPACITY, CO2NETEAST,
 - FP7: CO2STOP, ENOS
 - HORIZON 2020: STRATEGY CCUS
 - ACT: ECOBASE, ALIGN CCUS, REX-CO2, ACTION
 - CETP: CTS, RAMONCO
 - HORIZON EUROPE: EASTERN LIGHTS
- NATIONAL PROJECTS
 - GETICA CCS
 - NATIONAL PLAN FOR CARBON CAPTURE AND STORAGE TIME HORIZON 2020
 - PROJECTS FUNDED BY THE MINISTRY OF RESEARCH UNDER THE CORE PROGRAM FOR NATIONAL RESEARCH INSTITUTES
 - MAINLY FOCUSING ON ENVIRONMENTAL MONITORING



REX-CO₂

RESEARCH ON CO2 CAPTURE

- INTERNATIONAL PROJECTS
 - HORIZON EUROPE: EMPOWER, CALBY2030
 - HORIZON 2020: SEWGS
 - NORWAY GRANTS: HYBRID SOLVENT
 - DG JRC: HYPOGEN
 - ACT PROJECTS: 3D-CAPS, GaSTech
- NATIONAL PROJECTS
- LABORATORY TEST FACILITIES AT UBB, UPG, UPT



Calcium looping laboratory facility at UBB



Experimental capture installation at UPB

KEY ACTIONS FOR CCUS DEVELOPMENT IN ROMANIA

- **ASSESS AND UPDATE GEOLOGICAL CO₂ STORAGE CAPACITY.**
- DEVELOP A NATIONAL CARBON MANAGEMENT STRATEGY INTEGRATING CCUS WITH HYDROGEN AND OTHER CLIMATE STRATEGIES.
- ESTABLISH A CLEAR REGULATORY AND LEGISLATIVE FRAMEWORK ALIGNED WITH EU NZIA AND NET ZERO TARGETS.
- CONDUCT FEASIBILITY STUDIES FOR FINANCING, FOCUSING ON ONSHORE STORAGE AND INDUSTRIAL HUBS.
- FACILITATE ACCESS TO EU AND NATIONAL FUNDING (EU ETS, MODERNIZATION FUND).
- STRENGTHEN INSTITUTIONAL CAPACITY AND PROMOTE KNOWLEDGE EXCHANGE BY 2025.
- LAUNCH PUBLIC AWARENESS PROGRAMS ON CCUS BENEFITS AND CROSS-BORDER ASPECTS.
- ENSURE INSURANCE AND CO-FINANCING FOR AT LEAST THREE CCUS PROJECTS BY 2027.

THANK YOU FOR YOUR ATTENTION!

ALEXANDRA DUDU

ALEXANDRA.DUDU@GEOECOMAR.RO

