



BỘ TÀI NGUYÊN VÀ MÔI TRƯỜNG
VIỆN KHOA HỌC ĐỊA CHẤT VÀ KHOÁNG SẢN
VIETNAM INSTITUTE OF GEOSCIENCES AND MINERAL RESOURCES



OVERVIEW OF CCS STUDY IN VIETNAM

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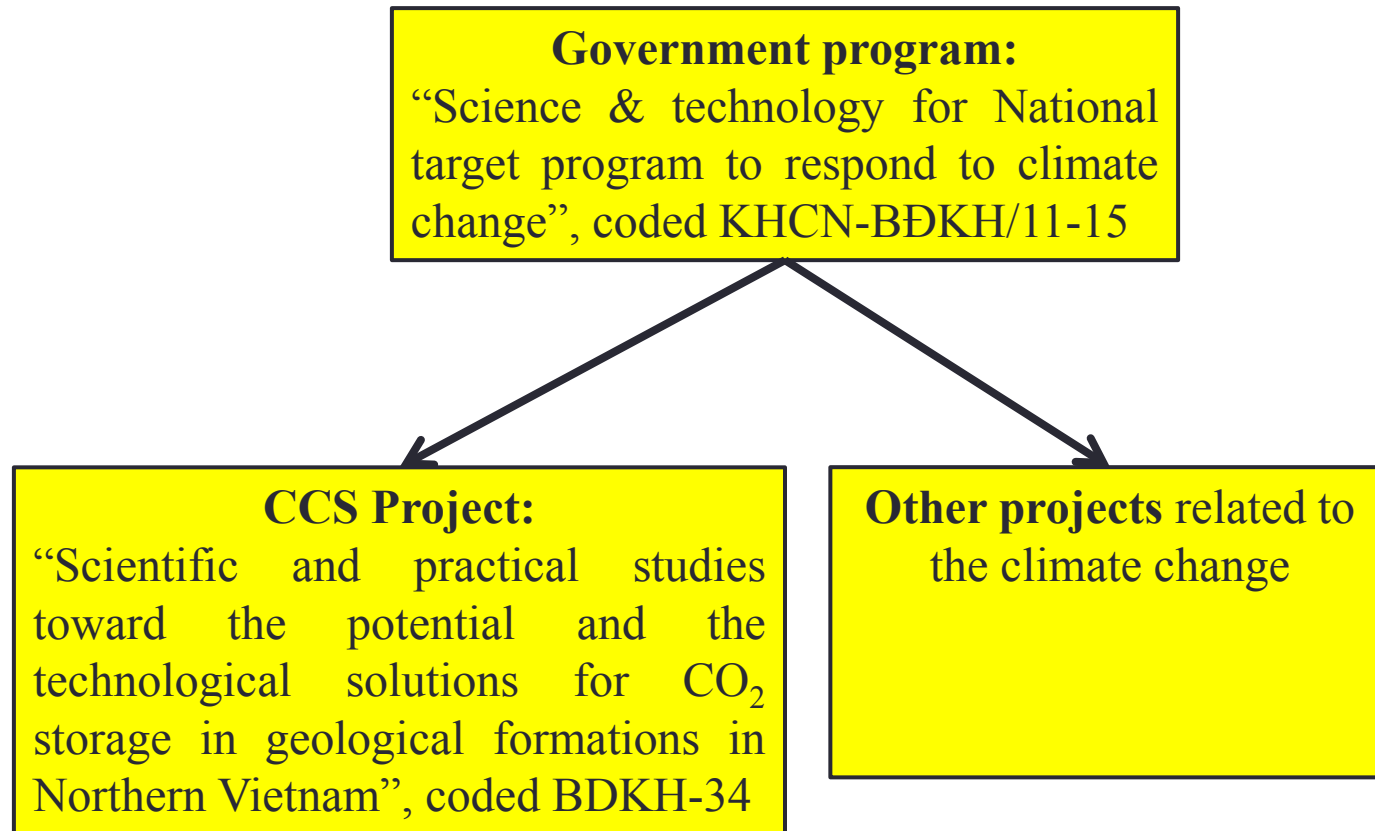
CCS STUDIES IN VIETNAM

In 2009, Report: “Where is the capacity of CO₂ storage in Vietnam” by the French Agency of Geology and Mine (BRGM) & the Vietnam Department of Geology and Mineral Resources (DGMV)

In 2009, Project “Studying the ability of using CO₂ to enhance oil recovery in offshore oil fields in Vietnam to partly respond with climate change” by Vietnam Institute of Petroleum (VPI) and PetroVietnam & General company of Petroleum and Metal of Japan (JOGMEC) and Nippon Company of Petroleum Exploration (NOEX)

In June 2013, State-level project “Scientific and practical studies toward the potential and the technological solutions for CO₂ storage in geological formations in Northern Vietnam” hosted by Vietnam Ministry of Natural Resources and Environment and implemented by Vietnam Institute of Geosciences and Mineral Resources (VIGMR)

CCS project: Origin

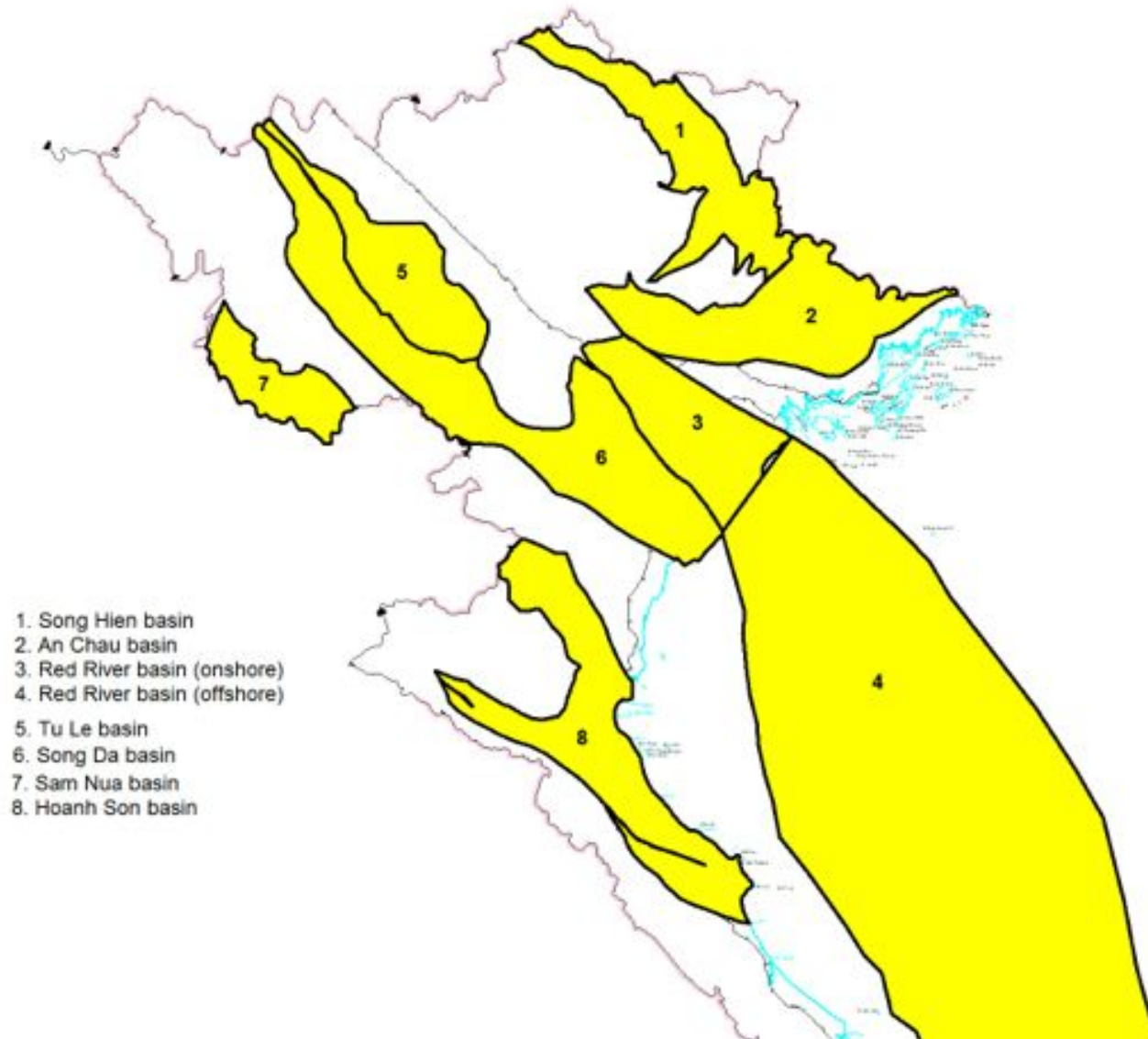


CCS project: Objectives

- ✓ To assess and rank the potential for CO₂ geological storage in Northern Vietnam.
- ✓ To determine the prospecting sites for CO₂ geological storage.
- ✓ To propose the solutions for CO₂ storage in geological formations in Northern Vietnam.
- ✓ To model a particular storage process

CCS project: Some initial results

Location of sedimentary basins in Northern Vietnam



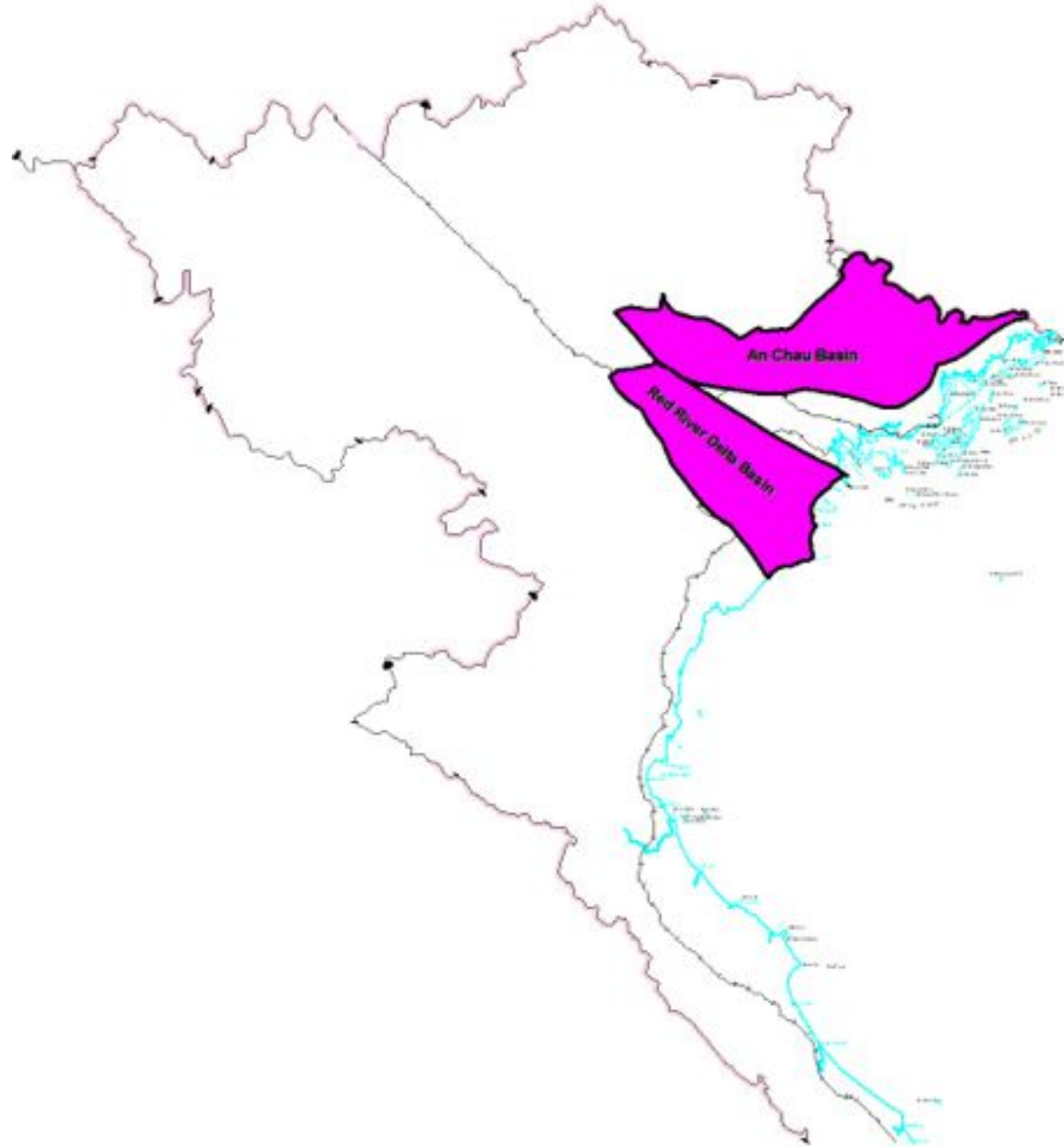
CCS project: Some initial results

Screening criteria

1. Reservoir
2. Seal
3. Size of basin
4. Depth of reservoir
5. Number of seal/reservoir couples
6. Origin of formations
7. Neo-tectonic activities
(seismicity)
8. Level of faulting and folding
9. Hydrogeological condition
10. Geothermal gradient
11. Hydrocarbon potential
12. Maturity of hydrocarbon exploration
and production
13. Coal and coal-based methane (CBM)
14. Onshore/offshore
15. Accessibility
16. Infrastructure
17. CO₂ sources
18. Knowledge and public reception
19. Availability of subsurface geological
data

CCS project: Some initial results

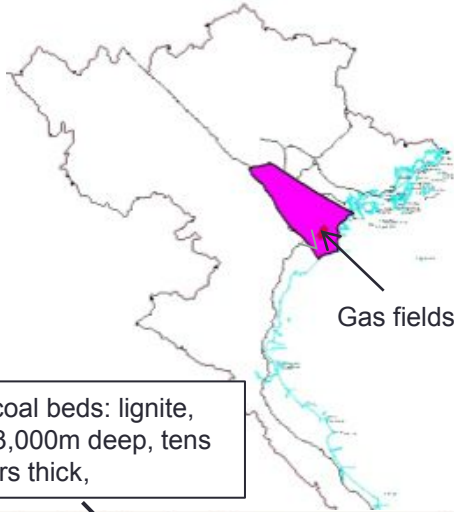
Potential sedimentary basins for CCS



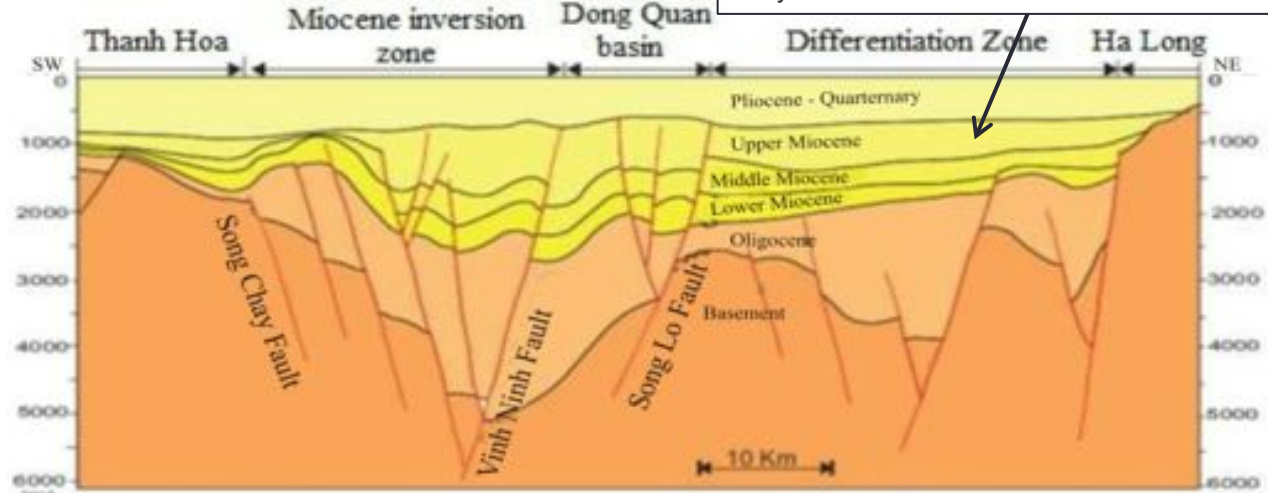
CCS project: Some initial results

Red River Delta Basin

Sandstone: thickness: 10-30m, porosity: 5-30%; permeability: 50-300mD
Claystone: thickness : 5-30m

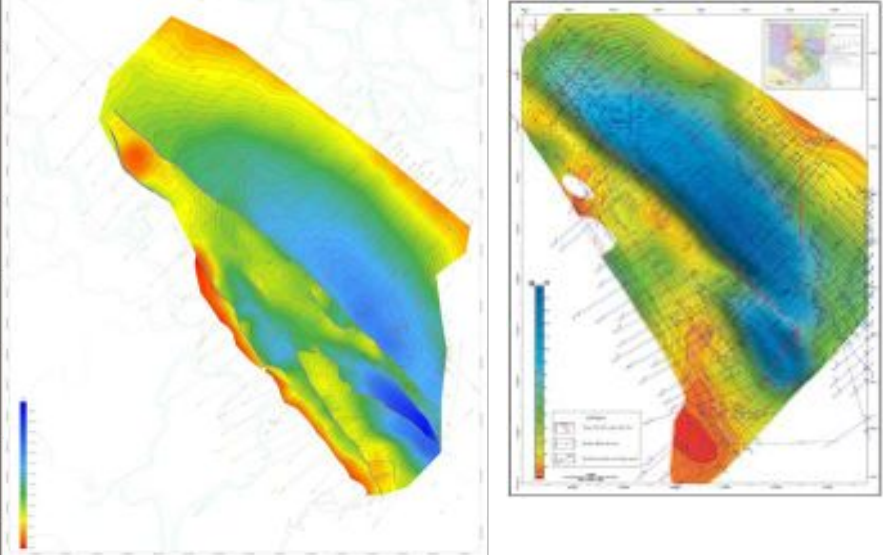


115 coal beds: lignite, 300-3,000m deep, tens meters thick,



Eratem	Period	Epoch	Sub-epoch	Formation	Stratigraphic column			Thickness (m)	Description	Origin	Oil/gas Occurrence
					PHU CU TIEN HAI	THAI THUY	VINH BAC BO				
KAINOZOIC	D	N ₂		KIEN XUONG HAI DUONG			0-200	Cobble and gravel, overlaid by sand, silt, clay and peat			
							100-500	Unconsolidated sand, silt and clay and relics of marine animals	Marine		
	NEOGENE	N ₁		TIEN HUNG			400-1200	Gray-colored thick sandstone layers, interbedded by siltstone, claystone and coal layers	Delta		
				PHU CU			500-1000	Gray claystone and siltstone layers inbedded by sandstone and coal layers	Delta and shallow sea	☀	
				PHONG CHAU			400-1400	Sandstone layers interbedded by lense-shaped siltstone layers	Delta	☀	
	PALEOGENE	E ₃		DINH CAO			100-1000	Gray sandstone, siltstone and claystone layers interbedded by pudding-shaped conglomerate layers	Swamps and lakes	☀	
				PHU TIEN			500-600	Violete - colored conglomerate and sandstone layers interbedded by siltstone and claystone layers	Swamps and lakes and Aluvium		
Pre-K ₂				Basement						●	

Depth and thickness of Tien Hung Upper-Miocene Formation



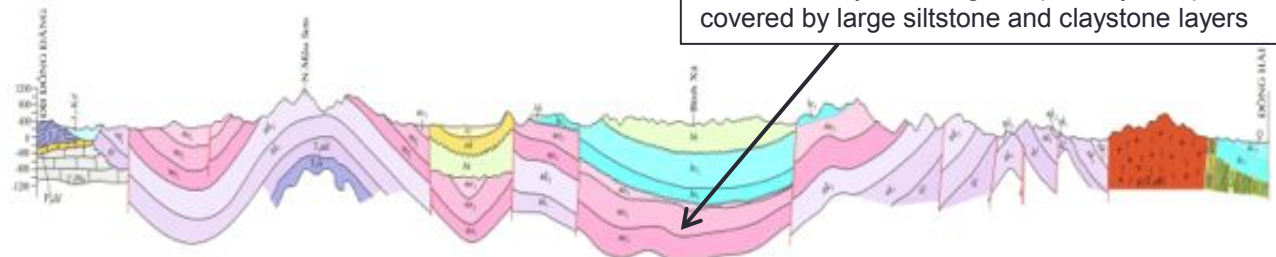
CCS project: Some initial results

Red River Delta Basin

- Miocene Formations, which comprise sandstone layers with thickness of tens meters, porosity 5 – 30%, and permeability 50 – 300mD, interbedded by large claystone layers with thickness 5 – 30m, might be potential for finding suitable CO₂ storage structures.
- Tien Hai and Dong Quan Gas Fields can be used for CO₂ storage in combination with enhanced gas recovery (EGR).
- 115 coal-beds with depth 300 – 3000m, thickness meters – tens meters, and of lignite type which contains high content of methane, can be used for CO₂ storage in combination with collection of methane (CBM).
- Brine aquifers are also considered to have a high potential for CO₂ storage.

CCS project: Some initial results

An Chau Basin



Stratigraphic column of Mau Son Upper-Triassic Formation (T_3,ms)

Part	Stratigraphic column	Thickness (m)	Description
			Ha Coi formation ($J_{1-2}hc$): Conglomerate and gravel-sandstone layers
4		~220	Part 4: Sandstone and sandy-gravelstone layers, interbedded by few siltstone layers
3		~300	Part 3: Thin-bedding lime-claystone, clayey-limestone and lime-siltstone layers. Mineral composition: cryptocrystalline carbonate 30-35%; sericite, chlorite and other clay minerals: 60-65%.
2		~280	Part 2: Thick-bedding siltstone and clayey-siltstone layers, interbedded by few sandstone and sandy-siltstone layers.
1		~650	Part 1: Coarse to fine-grained sandstone layers with thickness of 1.5 – 2m, interbedded by few siltstone layers. Mineral composition: quartz 30-40%, feldspar 10-15%, sericite, chlorite and other clay minerals: 45-60%.
			Na Khuat Formation (T_2nk): Sandstone and siltstone layers

CCS project: Some initial results

An Chau Basin

- Coals are of anthracite which contains very few methane, and normally lie very shallow, so they cannot be used for CO₂ geological storage.
- Deep brine aquifers could be found for CO₂ storage. Mau Son Triassic Formation (*T_{3c}ms*), which comprises sandstone layers with good porosity and permeability covered by large siltstone and claystone layers, might be potential for finding suitable geological structures.

B. Appeal

- ✓ To carry out successfully the project, the co-operation with CCOP and other international scientists in training specialists is necessary
- ✓ To develop the CCS study in Southern Vietnam or case studies, we need the co-operation and support of international organizations and scientists.

**THANK YOU VERY MUCH FOR YOUR
ATTENTION !**