



Policy and Legal Issues for CCS

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CCS in Southern Africa
Maputo, 12-13 April 2010



Overview

- Regulatory issues and needs
 - Capture
 - Transport
 - Storage
- Regulatory scheme design
- Regulatory developments to date
- Policy issues & incentives

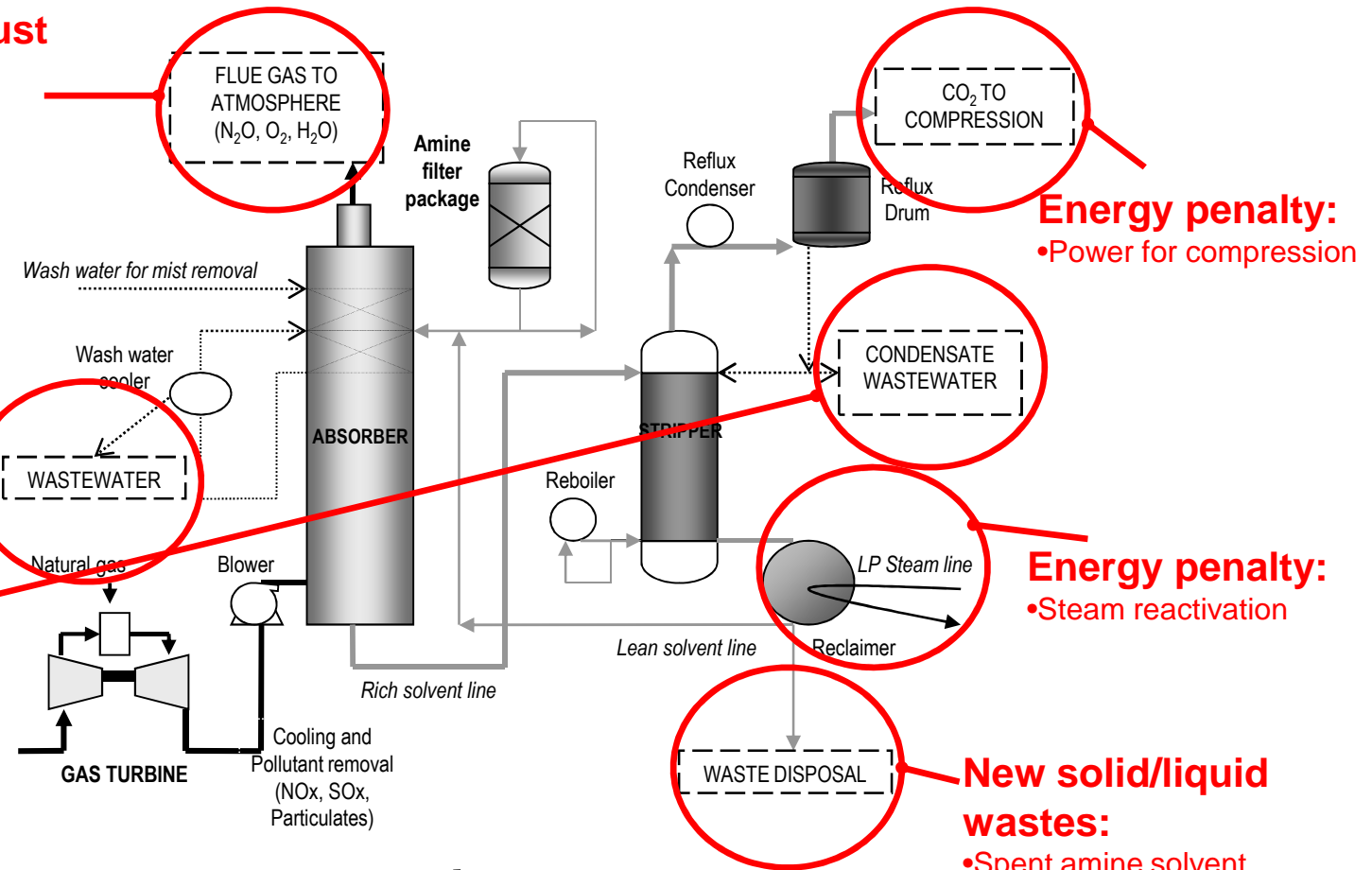
Regulatory Issues: CO₂ capture¹

Change in exhaust characteristics:

- Plume behaviour
- Thermal buoyancy
- Concentration of pollutants

Change in wastewater discharges:

- Trace amine concentrations



- No new permitting issues presented
- Need to ensure issues covered in scope of existing power plant permitting

¹ Layout based on typical post-combustion process. Issues apply across most capture technologies

Regulatory Issues: CO₂ pipelines

- **Pipeline corridor**
- **High pressure of pipeline relative to water / natural gas**
- **Asphyxiation risks**

No major new regulatory issues

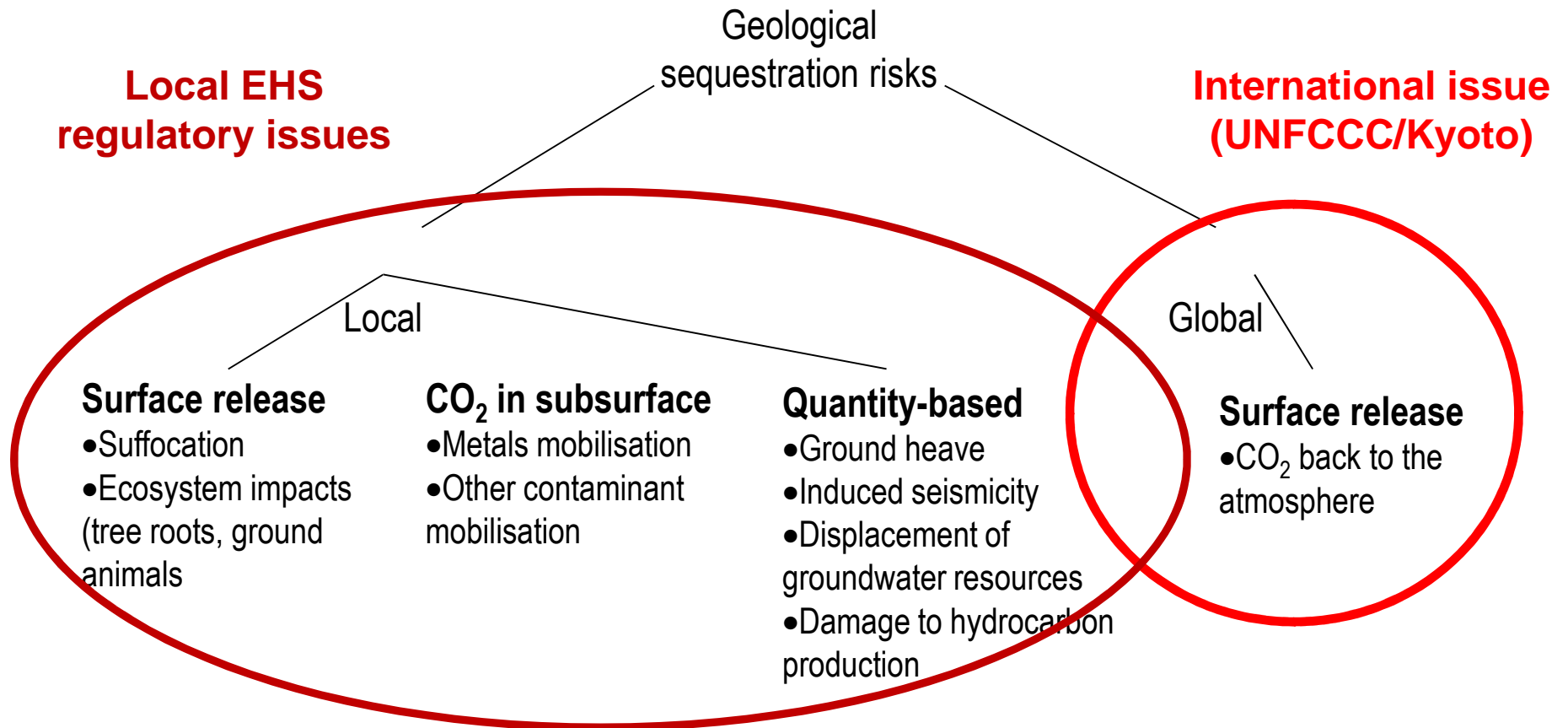
Needs appropriate:

- Routing and signage
- Materials
- Construction standards



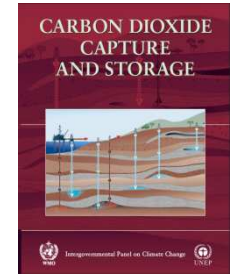
Lessons available from the US, Canada (EOR/AGI operations) and Netherlands (for greenhouses)

Regulatory Issues: CO₂ storage



Source: Adapted from Wilson and Keith (2002)

CO₂ storage: IPCC view



- “Fraction retained in appropriately selected and managed **geological** reservoirs is
 - very likely to exceed 99% over 100 years, and
 - is likely to exceed 99% over 1,000 years.

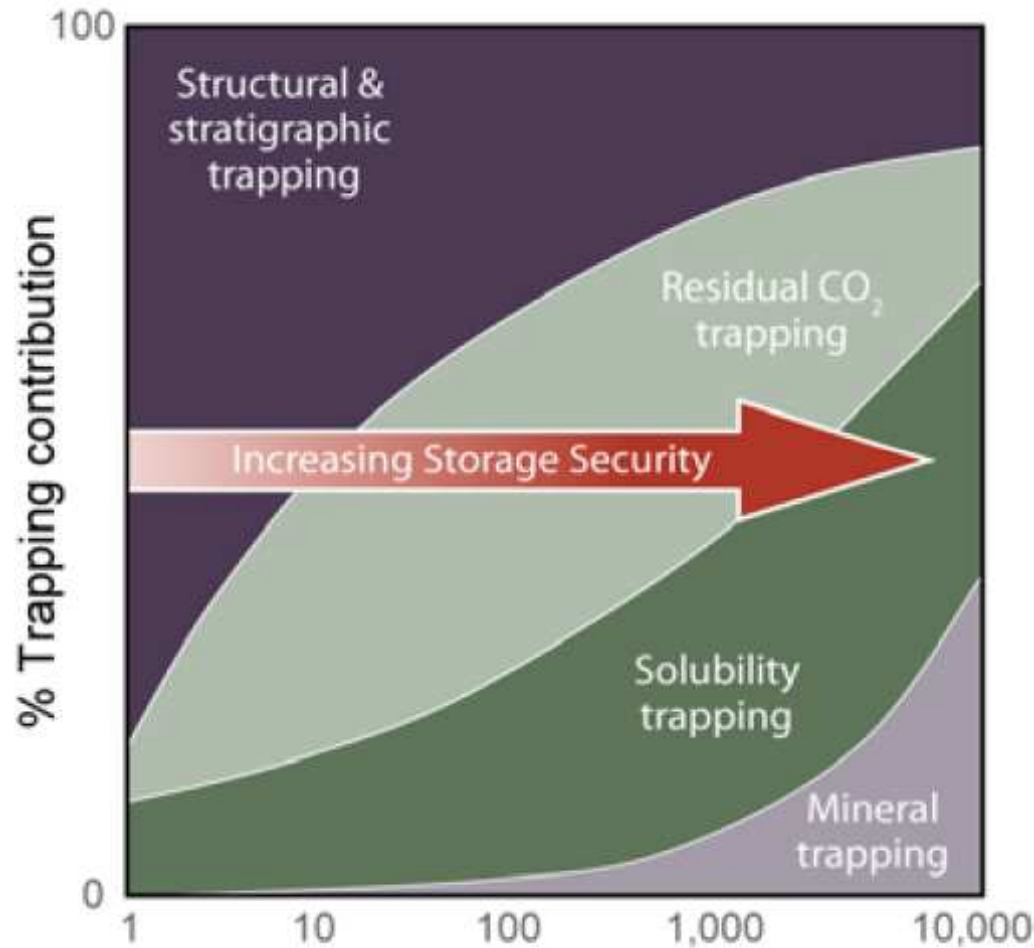
(“Likely” is a probability between 66 and 90%, “very likely” of 90 to 99%)

- But only if: appropriate **site selection**, a **monitoring** program to detect problems, a **regulatory system**, **remediation methods** [..], risks are comparable to risks of current activities (natural gas storage, EOR, disposal of acid gas)”

CO₂ storage: how to regulate?

- Why and how to regulate?
 - To authorise use of subsurface property for storing CO₂
 - To mitigate risk of leakage and/or unintended migration
 - To ensure liability allocated to recover cost of damages
- Leakage **IS NOT** an inherent function of storing CO₂
- Leakage **IS** a function of:
 - Site characterisation and selection
 - Risk assessment
 - Risk management
 - Monitoring and reporting
 - Remediation and short-term liability
 - Decommissioning
 - Stewardship and long-term liability
- **Regulations must be designed to cover these issues**

CO₂ storage: Site characterisation



- **Ultimate objective:** to find and select sites with evidence of effective long term trapping mechanisms

Source: IPCC SRCCS, 2005

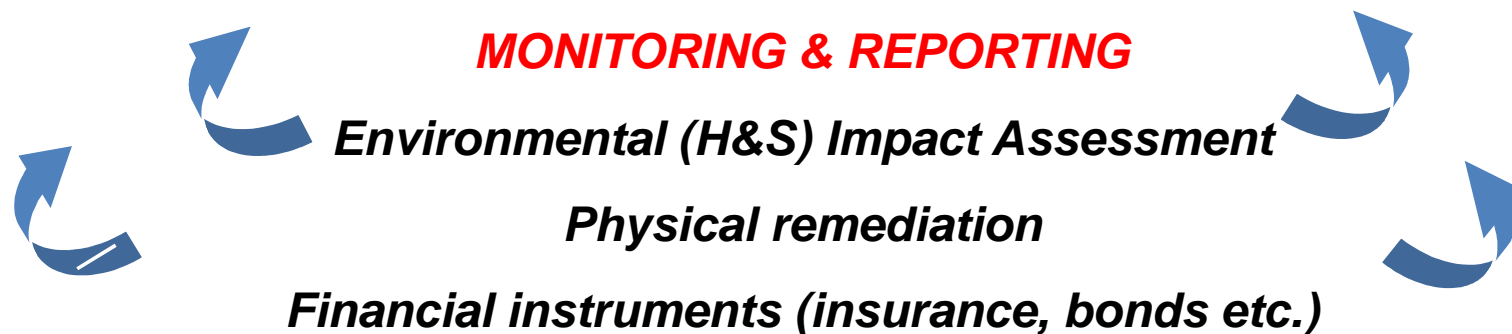
CO₂ storage: Risk management

Local EHS risks

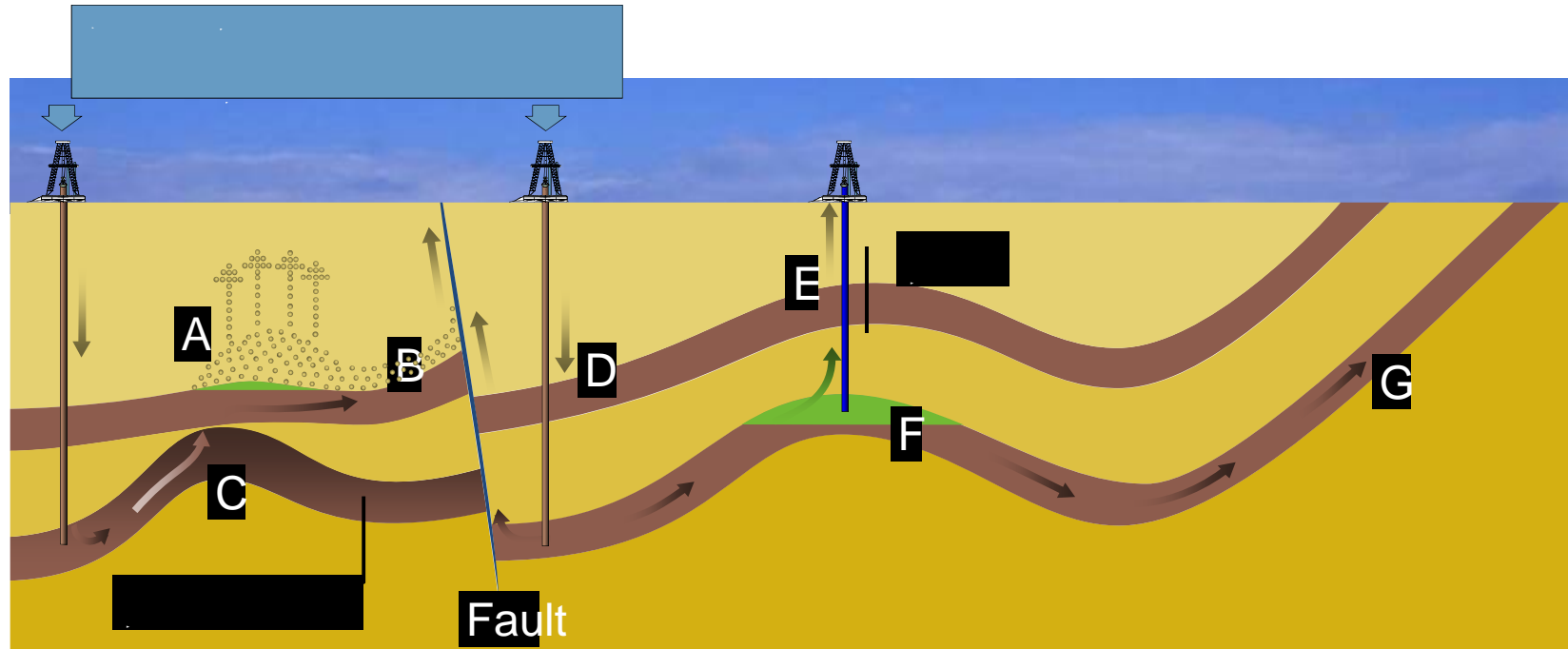
- Civil, Criminal law, etc.
- Evidence of damage and proof of negligence key features
- Will depend on liability in regulatory regime

Global EHS risks

- Offset, or
-
-



CO₂ storage : Remediation



Potential escape mechanisms

- | | | | | | | |
|----|----|------------------------------|----|----|----|----|
| A. | B. | C. . . escapes through 'gap' | D. | E. | F. | G. |
|----|----|------------------------------|----|----|----|----|

Remedial measures

- | | | | | | | |
|--|--|--|--|----|--|--|
| | | | | E. | | |
|--|--|--|--|----|--|--|

Regulation: International

IEA CCS Legal and Regulatory Guidelines:

Under development

Will provide a framework for countries to follow

2006 IPCC Inventory Guidelines:

Rules for monitoring under UNFCCC
Require countries with CO₂ storage to have undertaken:

- Site characterization
- Leakage risk assessment
- Monitoring (*risk management*)
- Reporting (*risk management*)

Allows the country to report stored

CO₂ as ***not emitted***

Means CCS can be used for compliance with emission reduction commitments

Not yet approved by governments

London Convention/Protocol:

OSPAR Convention:

Modified to allow sub-seabed CO₂ storage

Sets requirements for:

- Site characterization
- Risk assessment

Provide guidelines for risk assessment

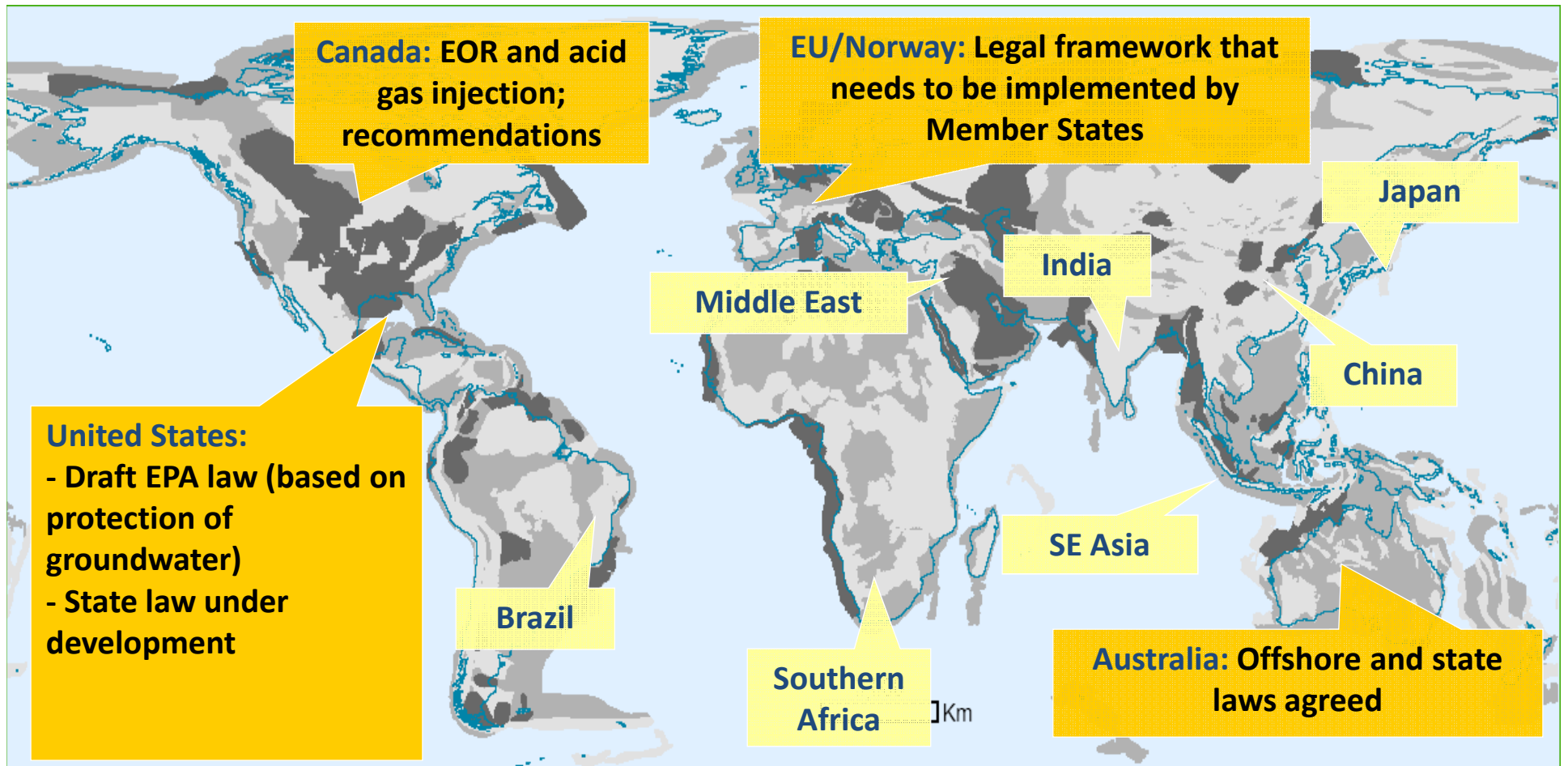
Require signatories to implement regulations to permit CO₂ storage

Transboundary movements of CO₂:

Uncertainty over whether allowed:

- London Convention - still includes a prohibition
- Basel/Bamako Conventions - not yet considered

Regulation: Regional



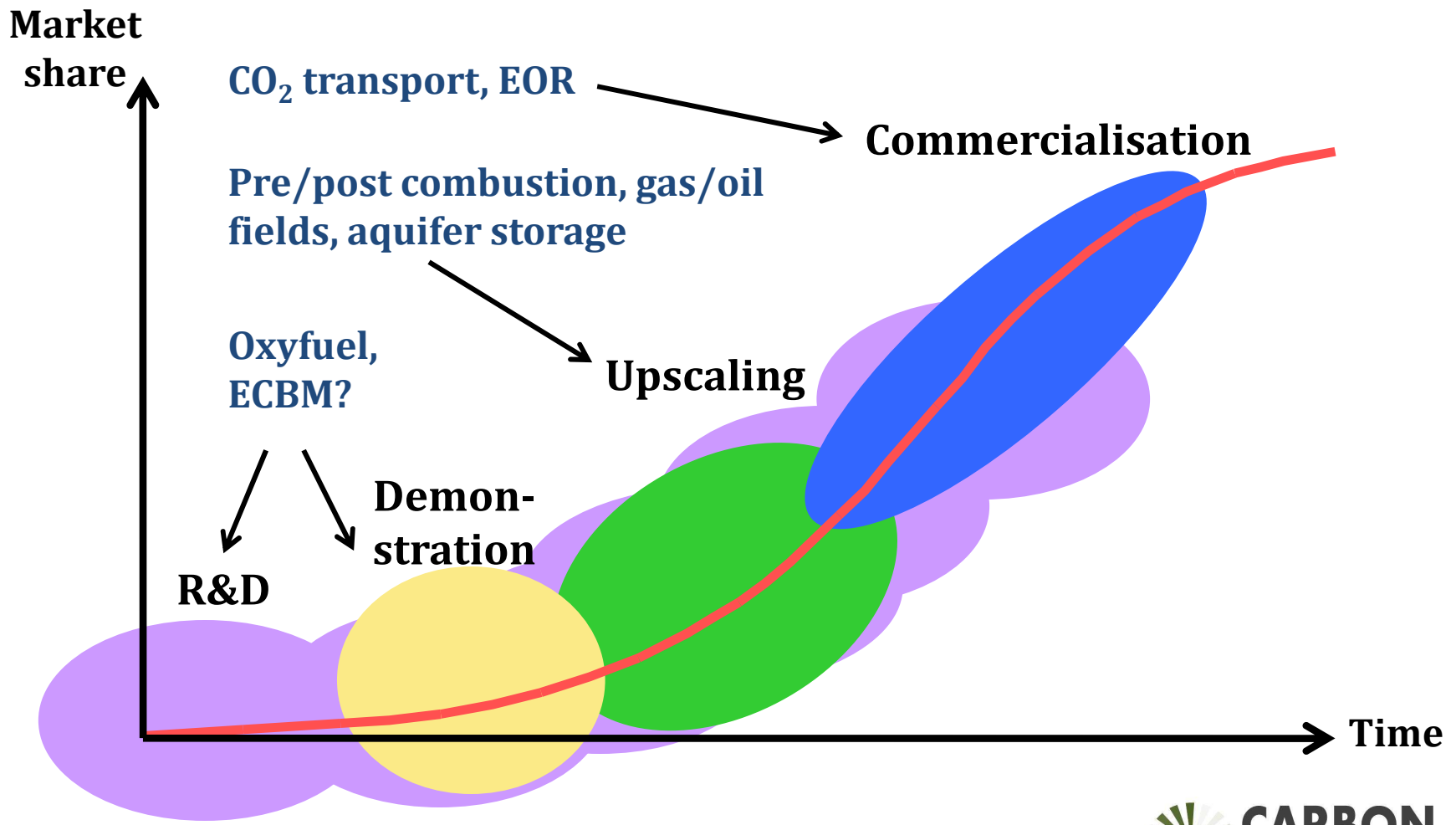
Regulation: EU experience

- CO₂ Geological Storage Directive (2008)
 - Storage site permit process introduced. Permit given if there is evidence of “no significant risk of leakage”
 - Prescribes to some degree site selection, characterisation, risk assessment and monitoring plan
 - Allows liability for the store to transfer to Member State when evidence indicates that the “CO₂ is completely and permanently contained”.
 - Confers some existing laws onto CCS activities (e.g. integrated pollution control permits for CCS units; environmental impact requirements)
 - Removes obstacles in some existing laws (e.g. waste, water)
- Developing further guidelines for site selection etc
- Member States need to implement the CCS-Directive into National Law by mid-2011

Policy issues: CCS needs incentives

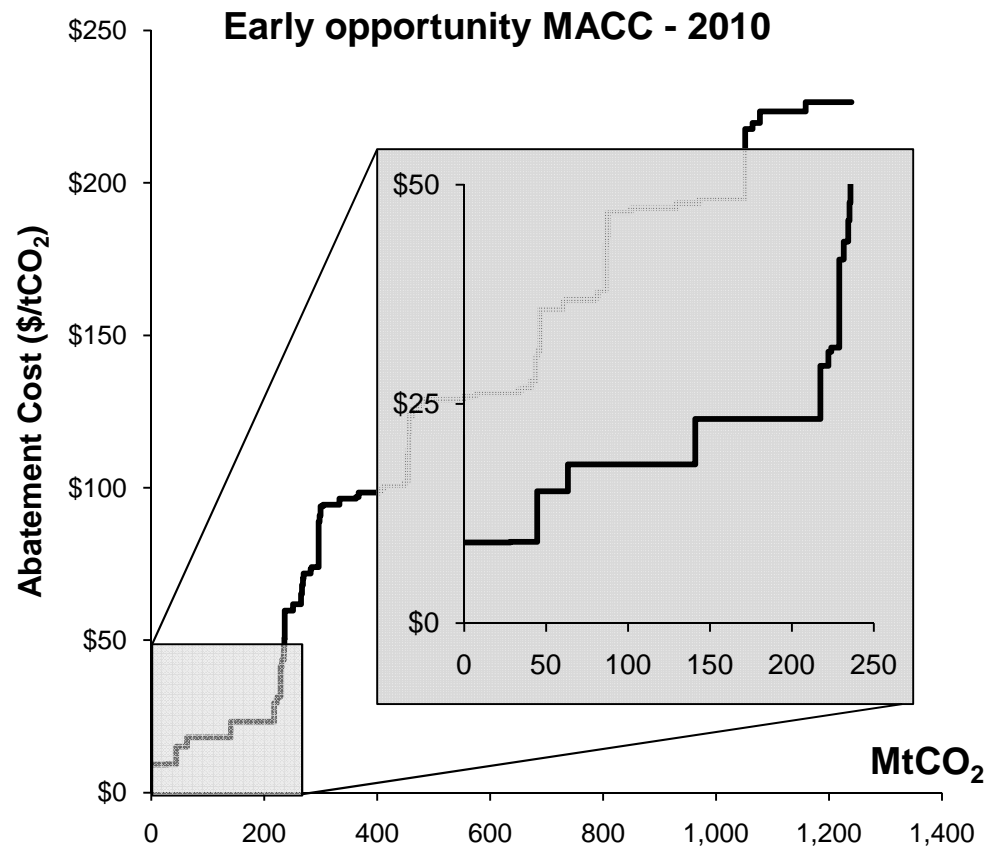
- **Public policy:** only way to create business cost linked to externalities (i.e. emitting CO₂)
- Range of options for CCS:
 - Emissions trading (cap-and-trade, project-based)
 - Carbon tax (although can just pay)
 - Technology mandate/portfolio standard
 - Tariff design (e.g. feed-in tariff or product support mechanism)
- Need careful design to support CCS through different phases of technology evolution
- Different incentives for different applications: e.g. early demo in power plants may need additional CO₂ price support

Policy: support timing and level



Policy: “early opportunity” costs¹

	2010		2020	
	Abatement potential (MtCO ₂)	Average cost (\$/tCO ₂)	Abatement potential (MtCO ₂)	Average cost (\$/tCO ₂)
Gas Process	219	\$18	313	\$14
Ammonia	97	\$62	97	\$62
Fertiliser	97	\$92	12	\$92
Ethanol	14	\$104	14	\$103
Refineries	292	\$115	292	\$115
Hydrogen	6	\$115	6	\$115
Cement	600	\$138	600	\$138
Coal power	0	n/a	93	\$36
Gas power	0	n/a	28	\$48
TOTAL	1,240	-	1,455	-



Notes: ⁽¹⁾ IPCC define *early opportunities* as projects that [are likely to] “involve CO₂ captured from a high-purity, low-cost source, the transport of CO₂ over distances of less than 50 km, coupled with CO₂ storage in a value-added application such as EOR.” Early opportunities here includes longer transport distances and lower purity sources (e.g. cement)

IEA/CSLF mandated to assess CCS ‘early opportunities’ by G8 leaders. Reported in 2007



Policy and Regulation interaction

- Intrinsic link between incentives and regulation
- Current UNFCCC issues for CCS in CDM
 - (a) Non-permanence, including long-term permanence;
 - (b) Measuring, reporting and verification;
 - (c) Environmental impacts;
 - (d) Project activity boundaries;
 - (e) International law;
 - (f) Liability;
 - (g) The potential for perverse outcomes;
 - (h) Safety;
 - (i) Insurance coverage and compensation for damages caused due to seepage or leakage.
- All linked to secure storage = regulatory issues that can underpin permanence issue

Incentives: EU experience

- EU Emissions Trading Scheme (2008)
 - Installations capturing CO₂ are not required to surrender emission permits (“allowances”) for the amounts captured and shipped offsite *only if CO₂ shipped to **permitted** CO₂ geological storage site*
 - Capture, transport and storage facilities are included as regulated installations – if they emit, they must surrender allowances (manages “global risk”)
 - Monitoring guidelines introduced for these types of installations
- New Entrant Reserve of EU ETS (2010) – co-finance
 - 300 million “allowances” to be distributed to CCS and other innovative renewable energies
 - Up to 8 CCS projects to receive 50% of ‘relevant costs’; Max. 45 M allowances per project
- European Energy Package for Recovery (EEPR)– co-finance
 - €1.05 Bn funds for 6 x CCS projects

Notice to Automobilists!

Notice is hereby given that under the Town By-laws no automobile shall be driven through the streets of the Town of Digby at a speed exceeding six miles an hour and the drivers of automobiles shall keep the horn sounding while approaching toward and passing any person driving, walking or standing upon the streets. The penalty for a violation of this By-law is \$30.00 or sixty days in jail.

By order,
HARRY L. DENNISON,
Town Clerk.



Thank you

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