A Public Interest Perspective on Deployment of CCS Technologies

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Why CCS?

- Climate change is a real and urgent problem; we need to deploy *all* available technologies to combat the threat.
- CCS is an essential *component* because fossil fuels will not disappear soon.

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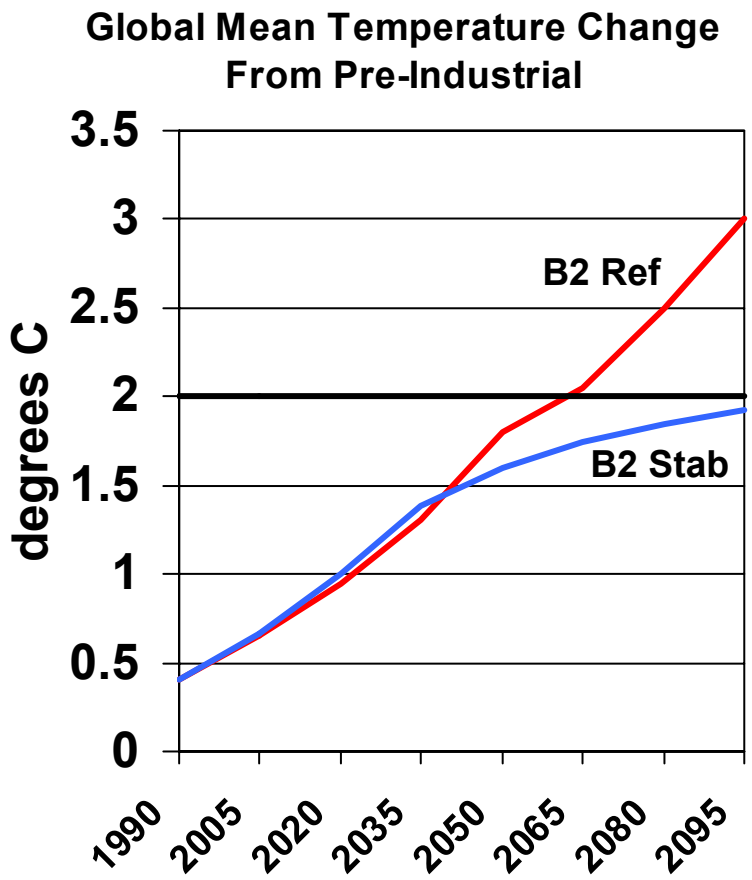
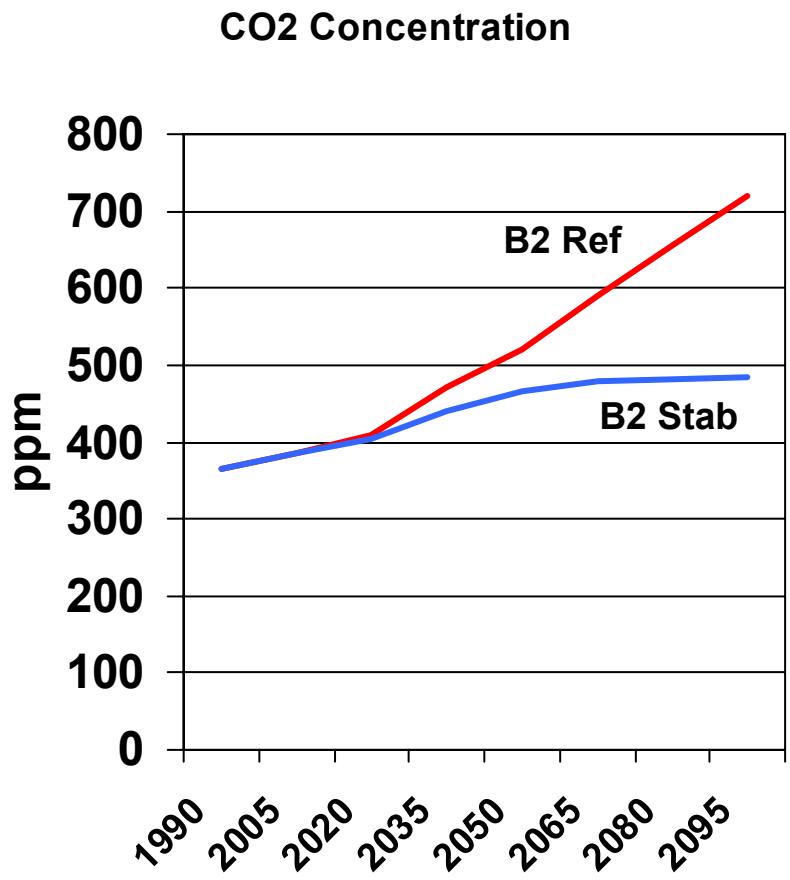
One Version of the Climate Challenge





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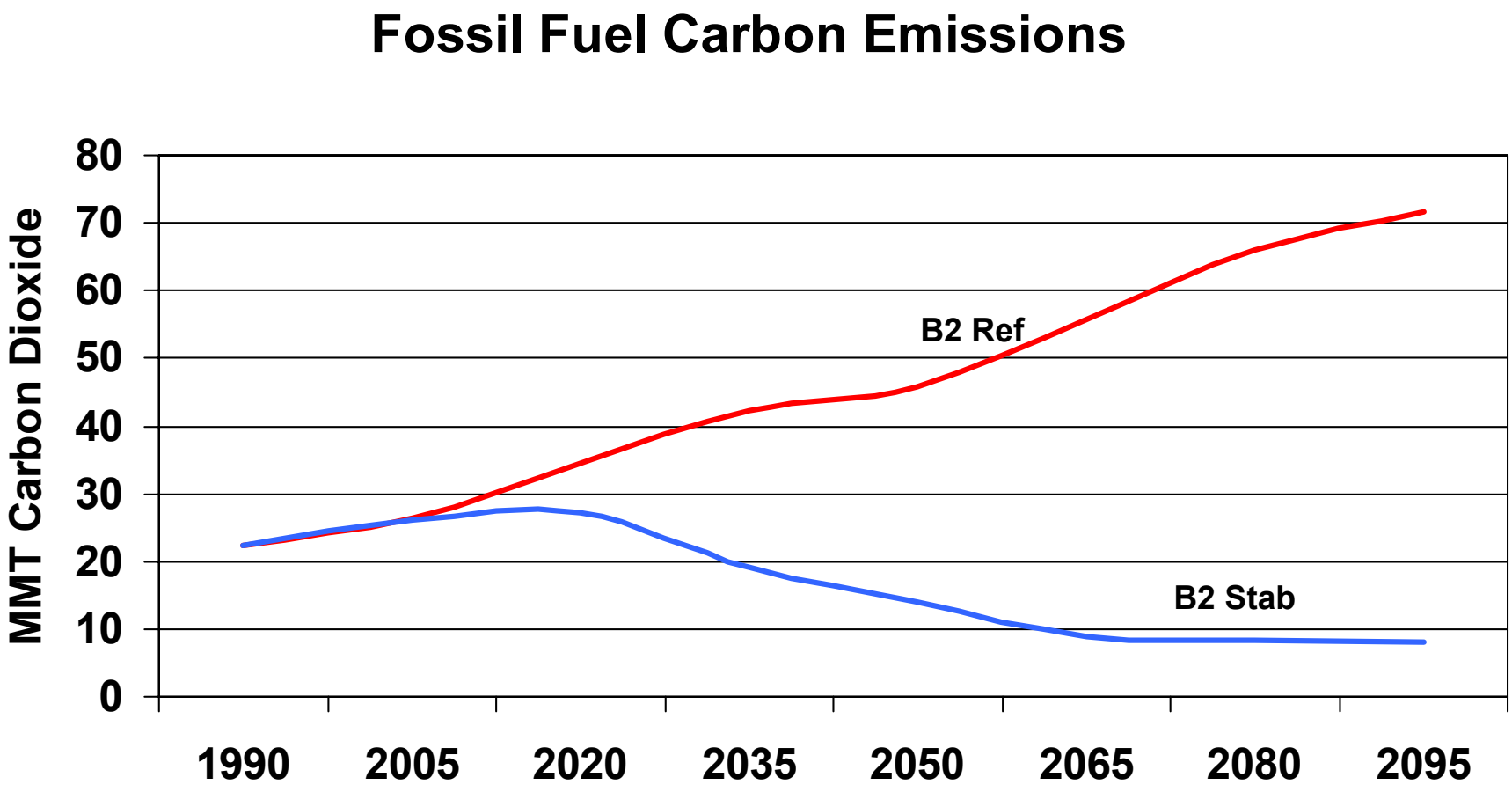
Global CO_2 Emissions



Source: J. Edmonds, Battelle, 2004.

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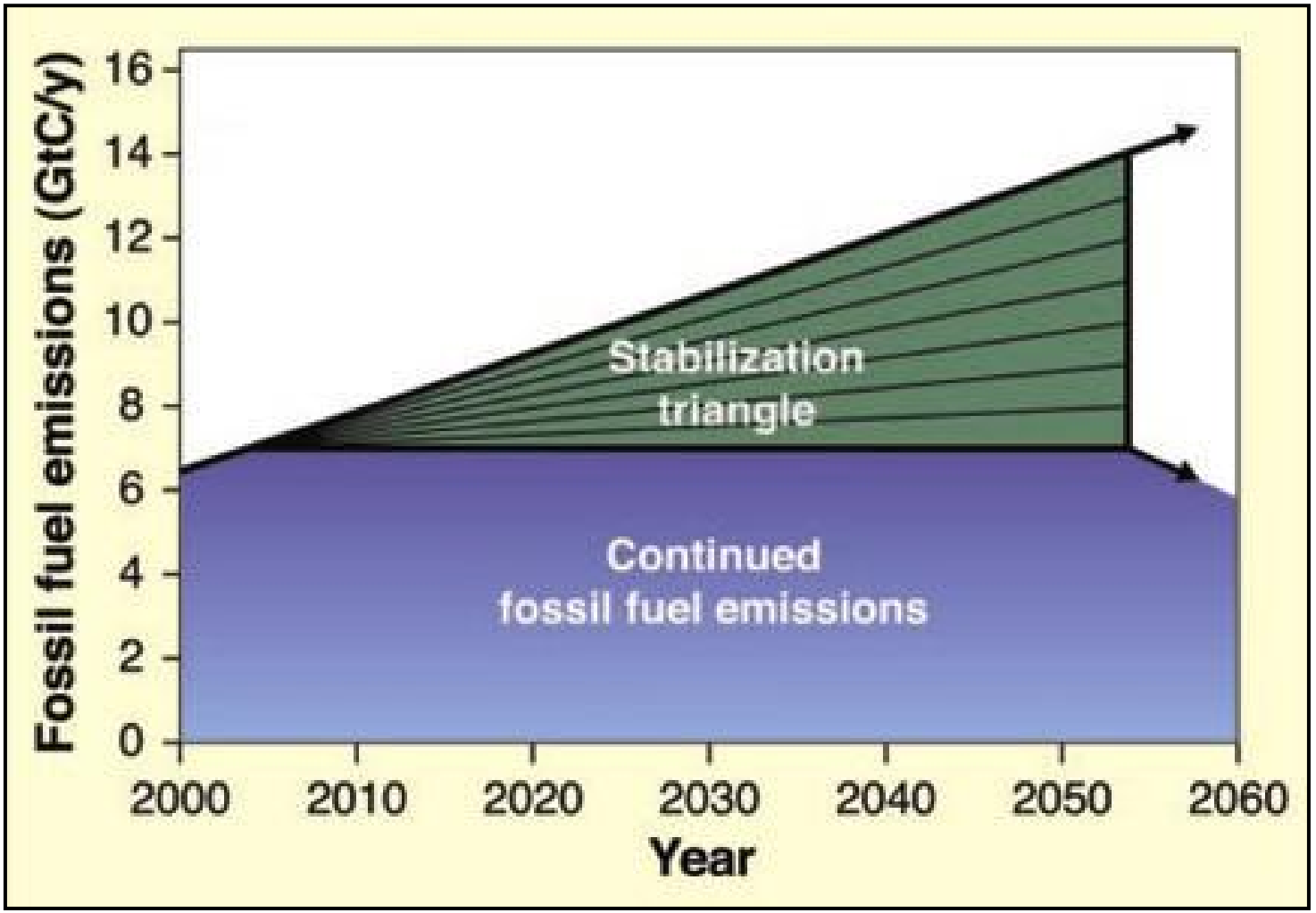
CCS Key for New (and Retrofit) Technology



- ***3 out of 15 potential "wedges"***

Pacala & Socolow, 2004

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Magnitude of Wedge Examples

Each providing 1GtC reduction by 2055

- **Wind**: new 2000 GW (50x today)
- **PV**: new 7200 square miles (700x today)
- **Natural Gas**: coal to gas at 700 large plants
- **Efficiency**: double mileage of 2 billion cars
- **Biofuels**: 1/6th of world's cropland (ethanol)
- **Nuclear**: new 700 GW (2x today)
- **CCS**: 800 GW of coal plants or 3500 Sleipners

Source: Pacala and Socolow, 2004.

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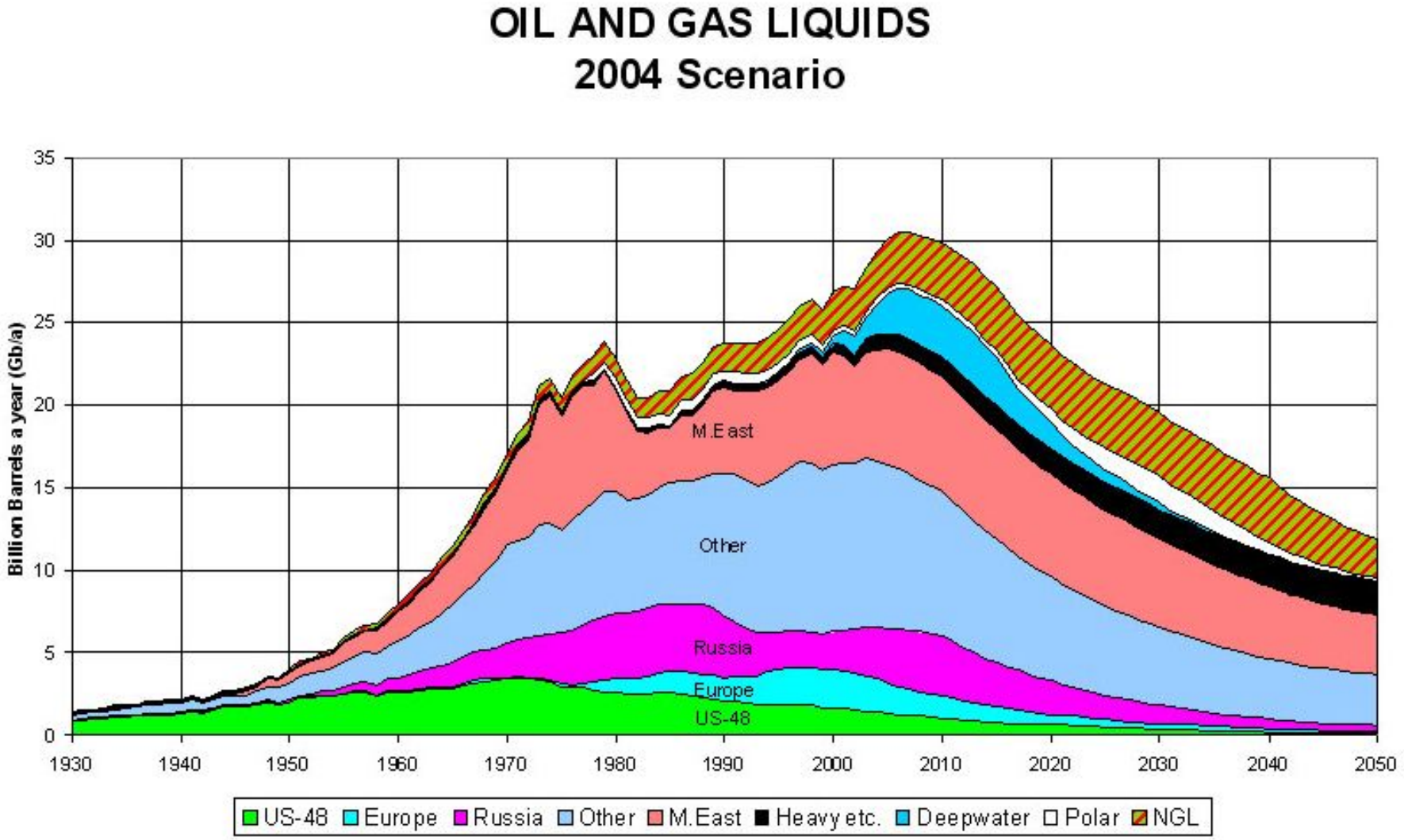
Conventional Global Oil Output Will Peak



Source: Campbell, C. J. http://www.hubbertpeak.com/campbell/

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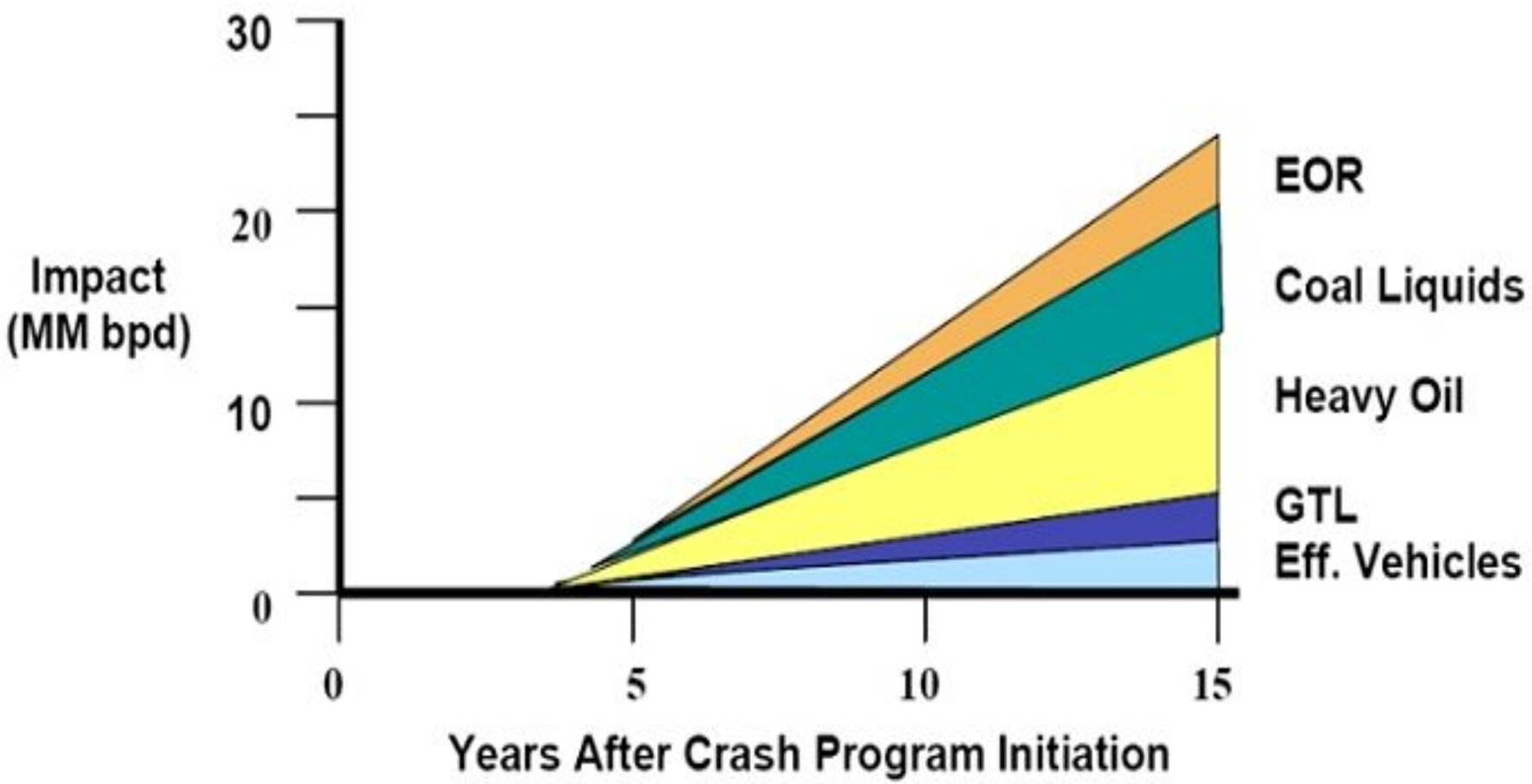
Peak Oil Wedges



Hirsch, Bezdek, Wendling, 2005.

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Liquid Fuel Alternatives Scorecard

	Readiness	Climate	Cost
CTL	0	-3	-1
GTL	+1	-1	-1
Heavy Oil	+1	-2	-1
Hydrogen	-1	depends	-2
Biofuels	+1	+2	-1
Oil Shale	-1	-2	-2
End-Use	+3	+1	+1

Scale: +3 (best) to -3 (worse)

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Getting to CCS

- Technology largely exists; voids in policy, regulatory, and institutional frameworks
- Policy drivers essential
- Public acceptance uncertain
- Developing country participation crucial, but U.S. leadership needed first

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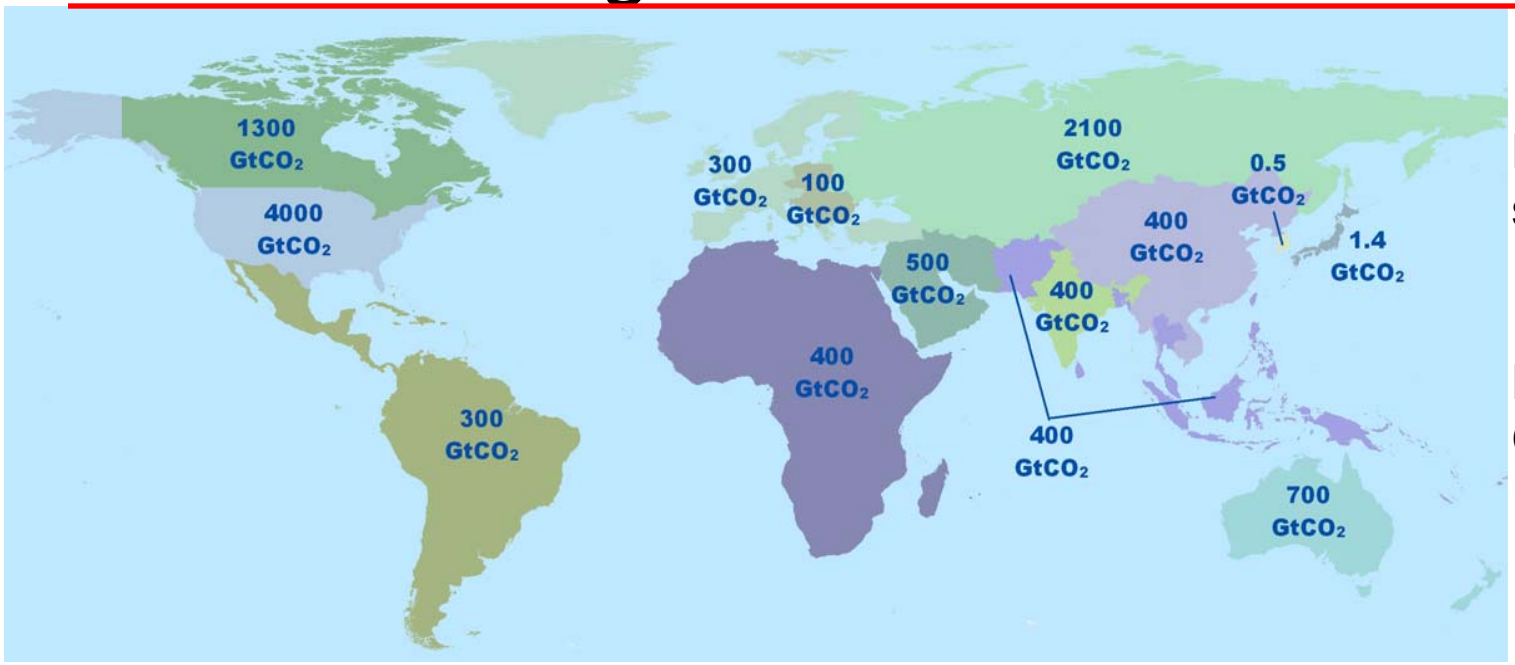
Global CO_2 Storage Capacity

A Heterogeneous Natural Resource



<u>Sinks</u>

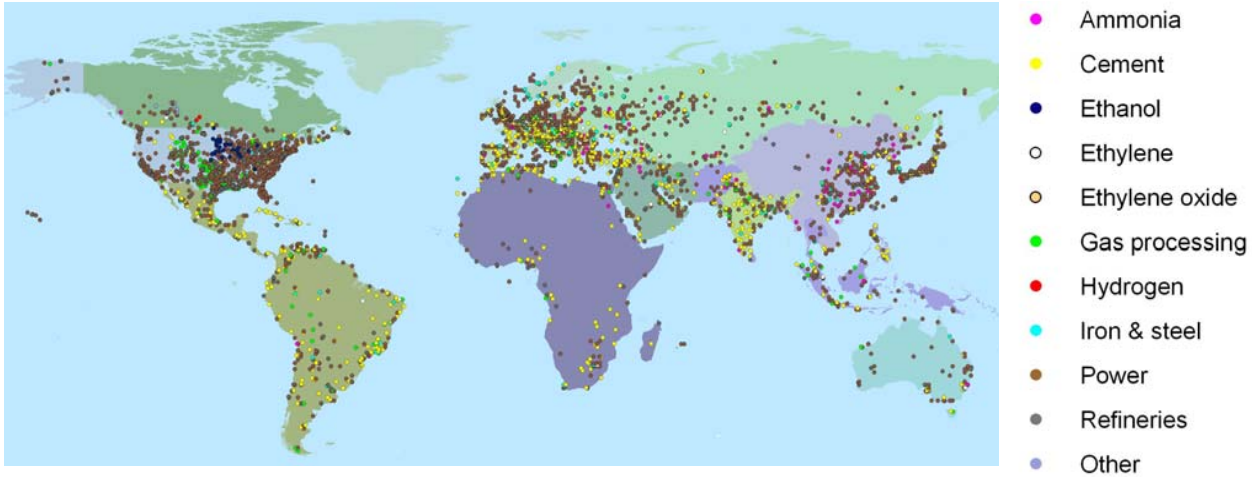
Potential global storage capacity: 11,000 Gt CO_2

Plentiful in U.S., Canada, Australia

<u>Sources</u>

8100 Large Point Sources

>60% of all human CO_2



Source: J. Dooley, Battelle Memorial Institute

Some Key Questions

- How to site GS projects?
- How long should CO2 stay there? Remediation?
- MMV: What, when, how?
- Inventory and accounting?
- How should we structure long-term liability?
- EOR vs. CO2 sequestration?
- Something for everyone…

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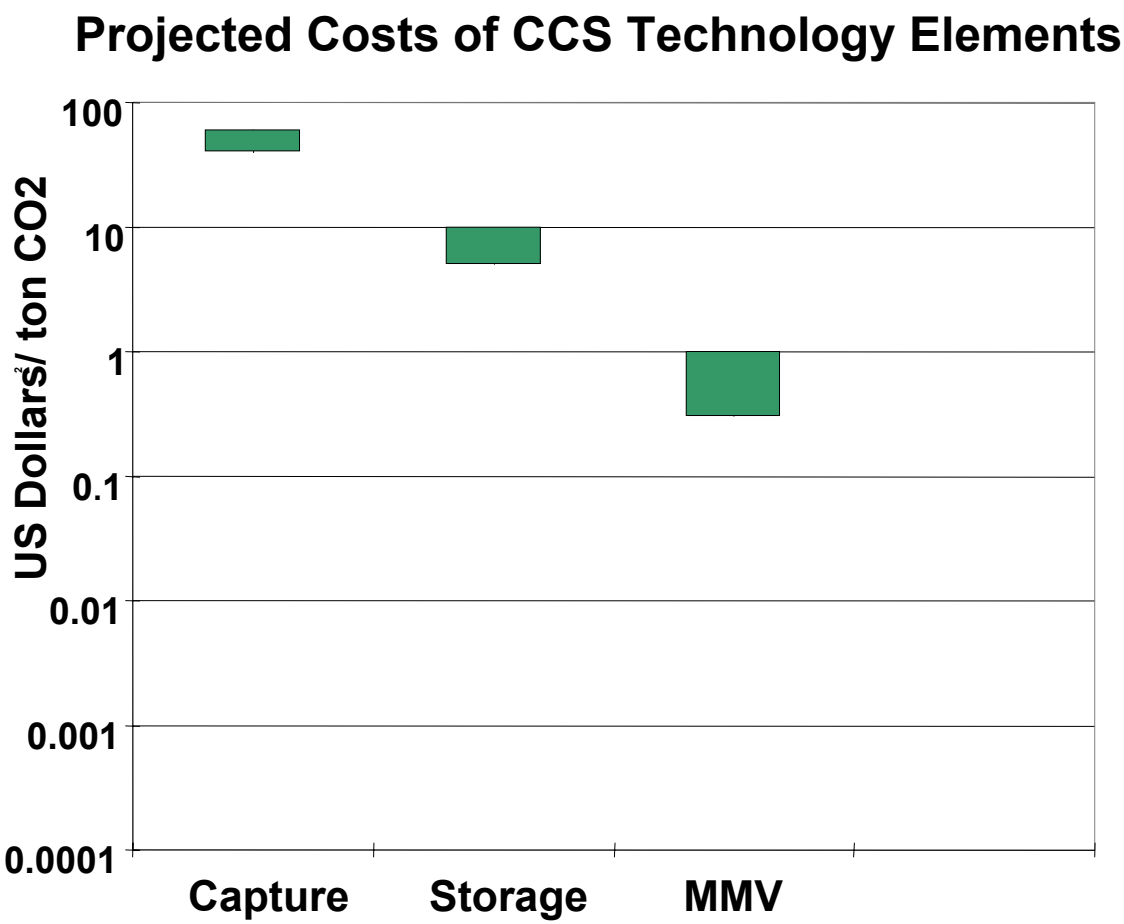
CCS Cost Components



CCS is *NOT* a free technology; a carbon price will be needed to drive market penetration

Friedmann et al., in press

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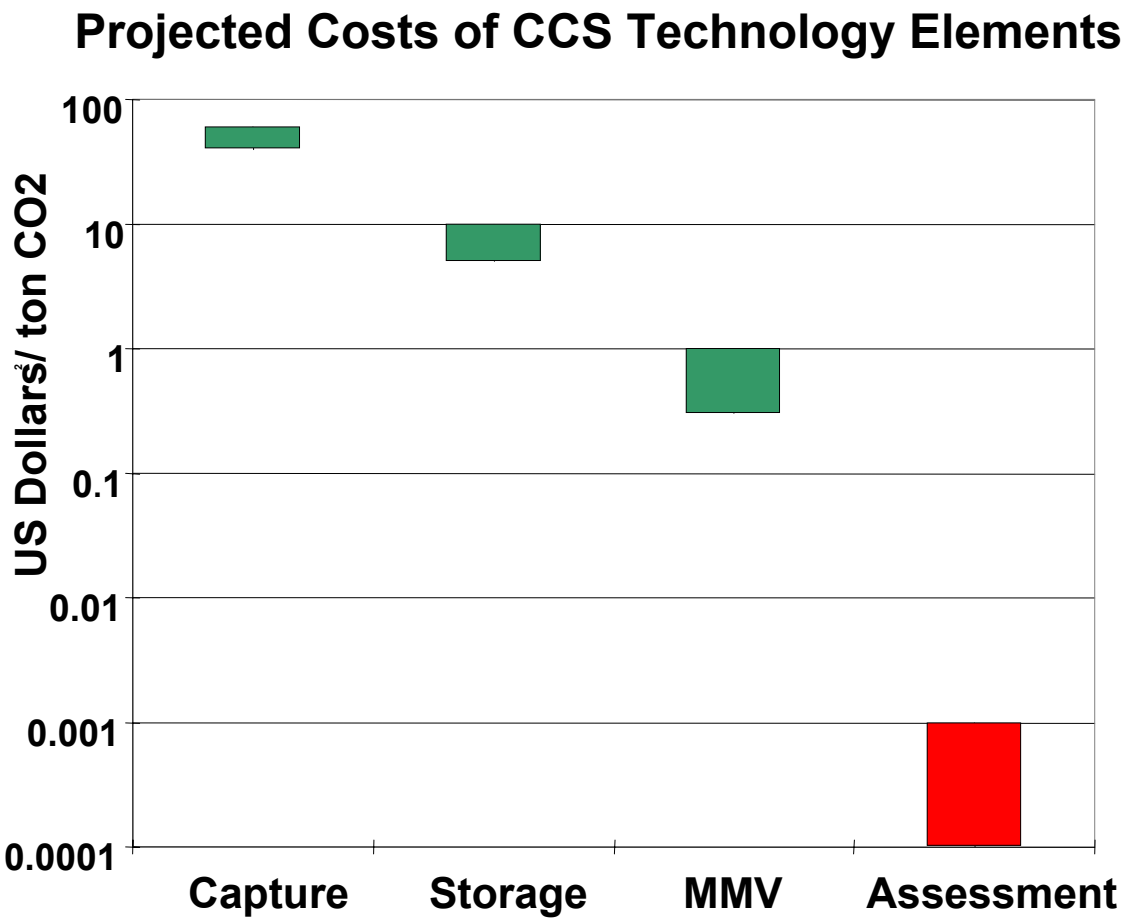
CCS Cost Components



Friedmann et al., in press

Assessments and full scale field tests are low cost, and a clearly required before launching a full scale program

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Forming public views on CCS

- Awareness of climate change and energy
- Perceived vs. actual risk
- Assemble facts to give meaning vs. “fitting” facts to existing perceptions
- Importance of successful initial projects
- Local stakeholders: NUMBY?

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The CO_2 Risk

- CO_2 could: escape into atmosphere; contaminate USDW; contaminate soil
- OSHA 8-hr level: 0.5%; >10% can be lethal
- 2 risk scenarios
  - Slow, steady escape
  - Massive accidental release
- Can be stored with zero effective escape
- Local focus: safety; larger: GHG emissions

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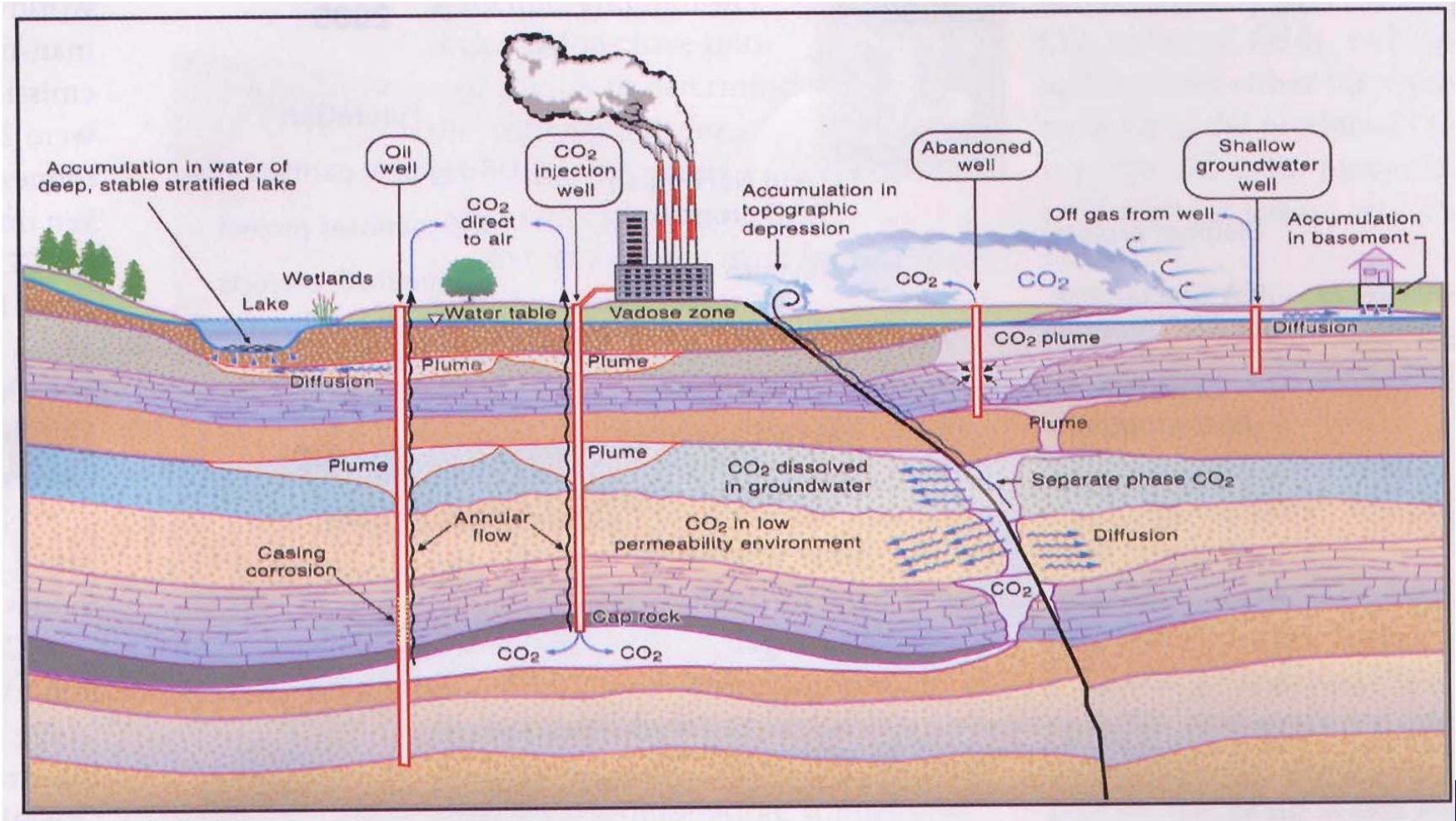
Potential CO_2 Hazard Pathways



Source: Imbus, S.W., 2003: CO_2 Capture Project NGD Group Meeting, Houston

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WRI Project on CCS

- **Objective**: Identify key regulatory and policy gaps in CCS framework. Build consensus on addressing them through stakeholder convening process.
- **Process**: Stakeholders to meet 2-3 times annually for two years; initial focus on US with outreach to EU and Asian partners
- **Partners:** Power companies, oil and gas companies, Research institutes/labs, federal and state government, NGOs and legal experts
- **Outcomes**:
  - Adaptable guidelines focusing on siting, monitoring, liability and accounting
  - Test guidelines in field demonstrations to verify (tie-in to pilot/demonstration projects)
  - Development (and support) of state and regional initiatives

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Conclusions

- Policy drivers are essential
- Public acceptability will be crucial
- Rapid deployment of large-scale field experiments needed to test technology
- Nation-wide assessment of storage sites with clear view to long term measurement, monitoring and verification
- Need to build appropriate institutions at national and global level

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