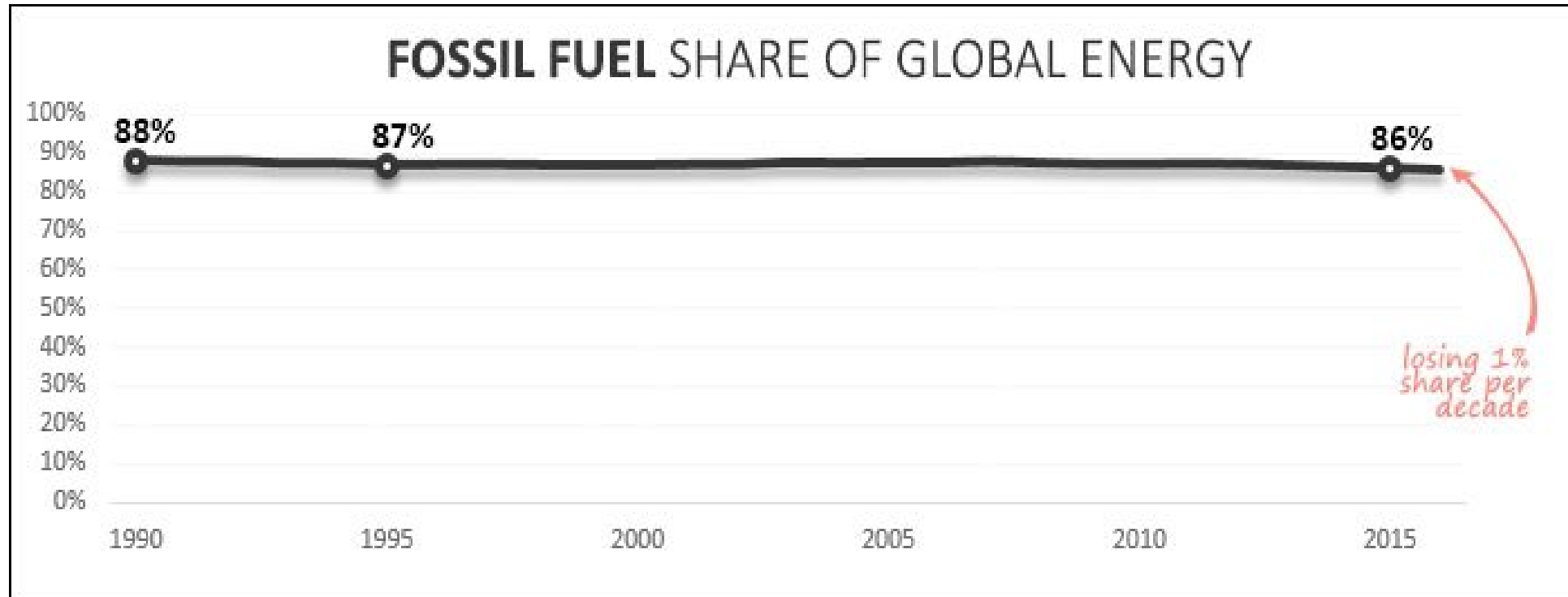


Carbon Take Back Obligation (CTBO)

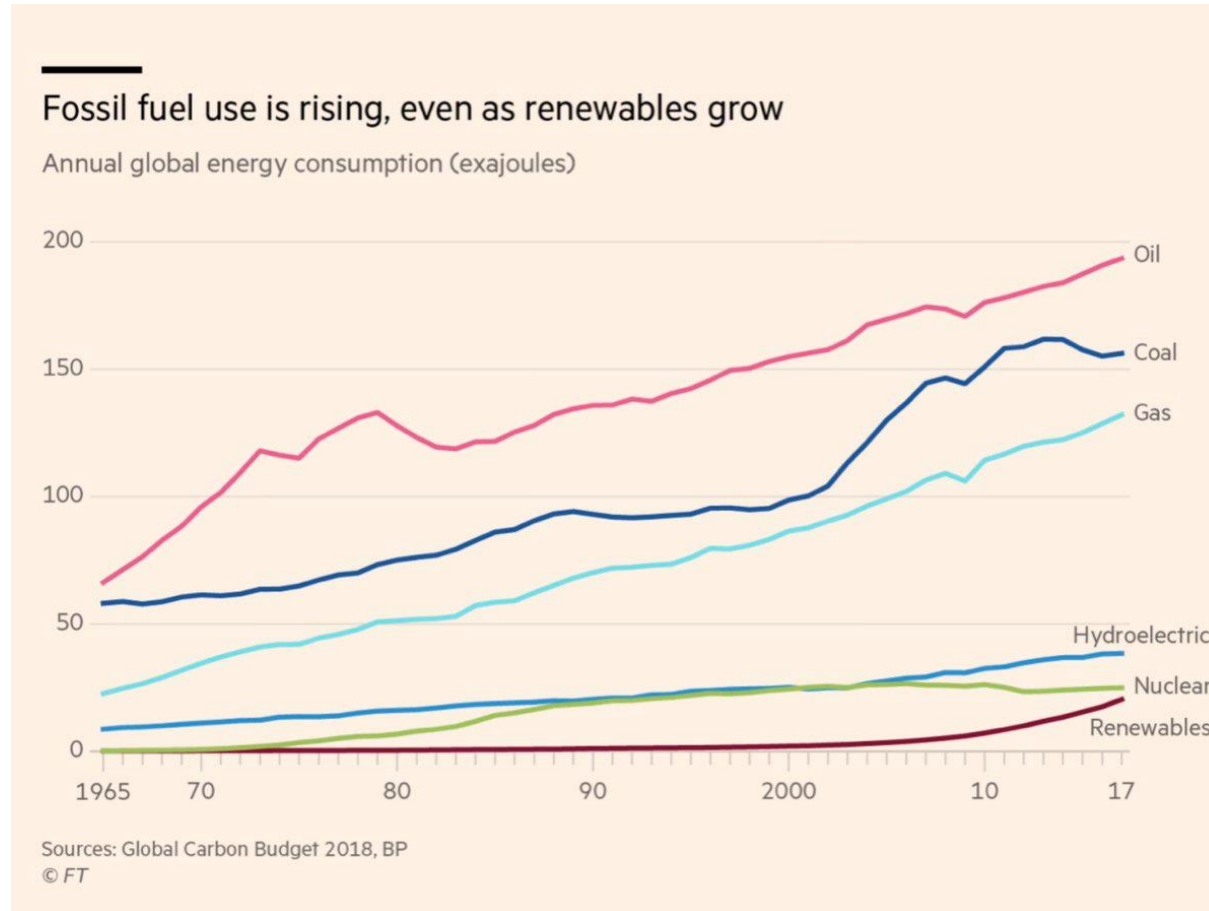
- Why do we need it?
- What is it?
- How do we pay for it, and who is 'we'?
- What impact could it have?
- Advantages & disadvantages
- Q&A's

Why do we need it?

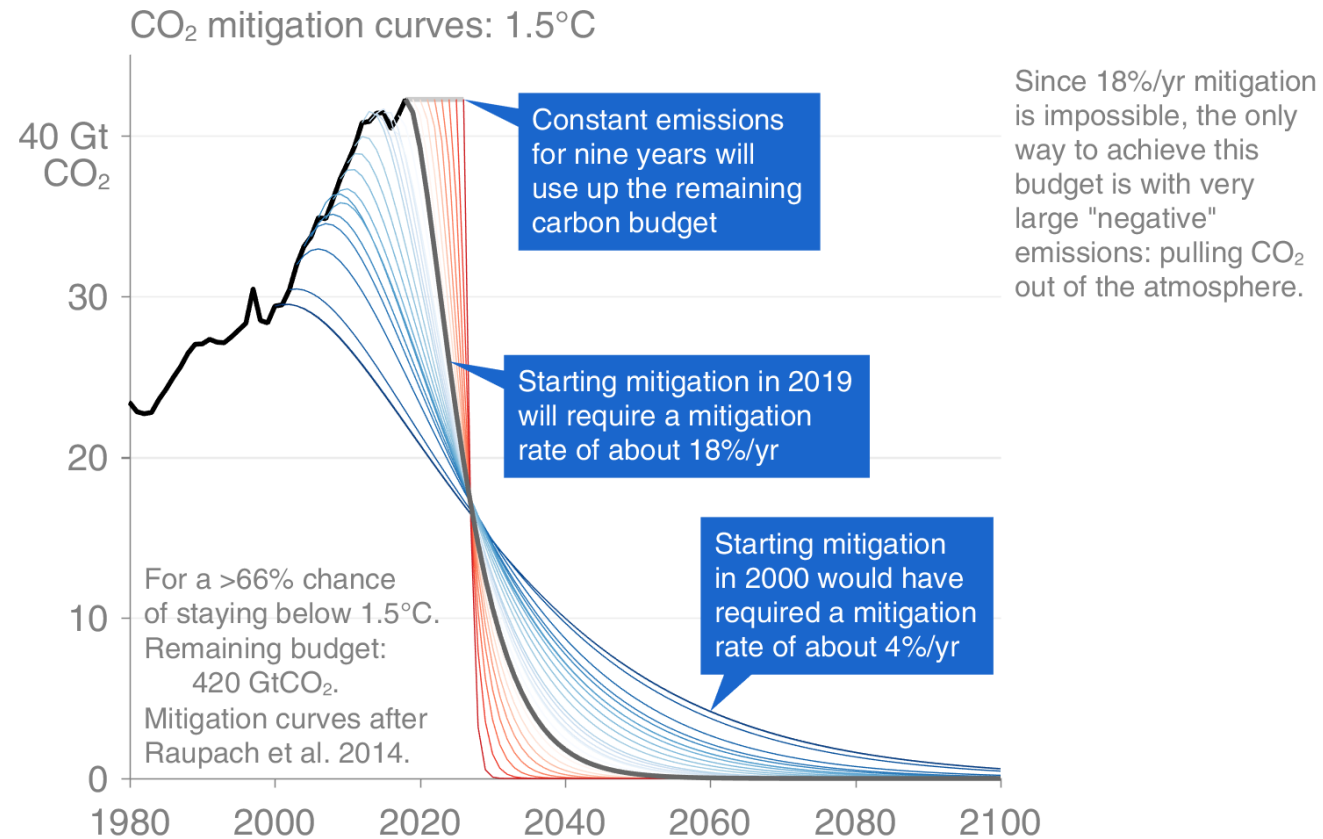


GLOBAL FOSSIL FUEL CONSUMPTION, 1990 - 2016. Percent of total energy consumption. SOURCE: Sum of Oil, Gas and Coal consumption vs total energy in BP Statistical Review of World Energy June 2017. CHART by Barry Saxifrage at VisualCarbon.org. June 2017.

Energy use continues to increase



The required emissions drop without CCS.... keep dreaming!



Globally



52% of natural gas reserves

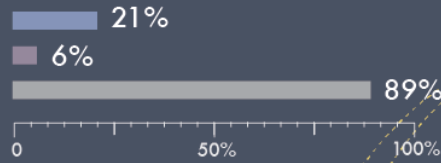


35% of oil reserves

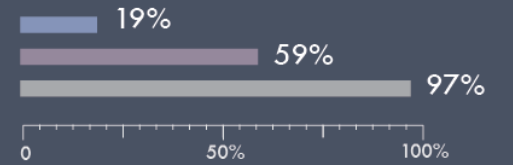


88% of coal reserves

Europe

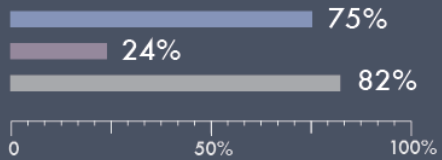


Former Soviet Union countries

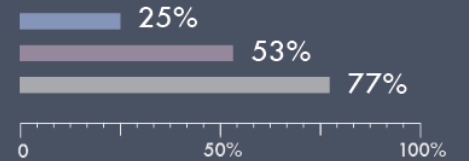


How much oil, gas and coal will we have to leave in the ground to stay under 2 degrees of warming?

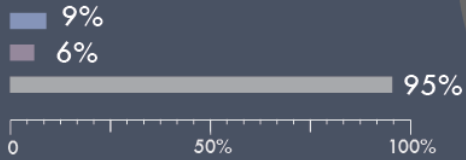
Canada



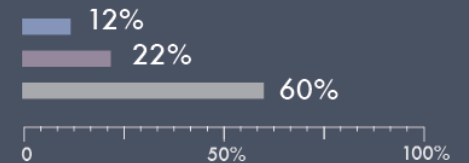
China and India



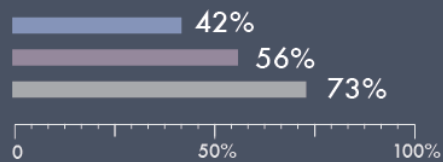
US



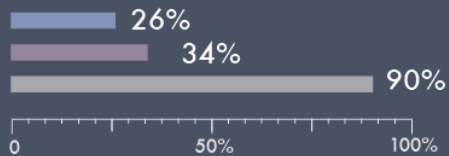
Other developing Asian countries



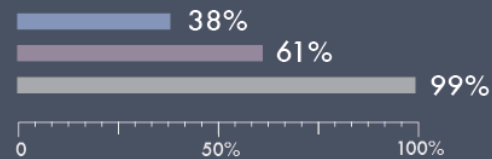
Central and South America



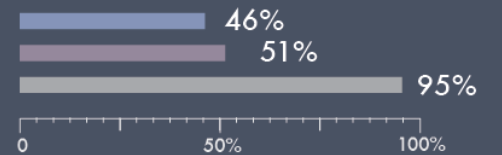
Africa



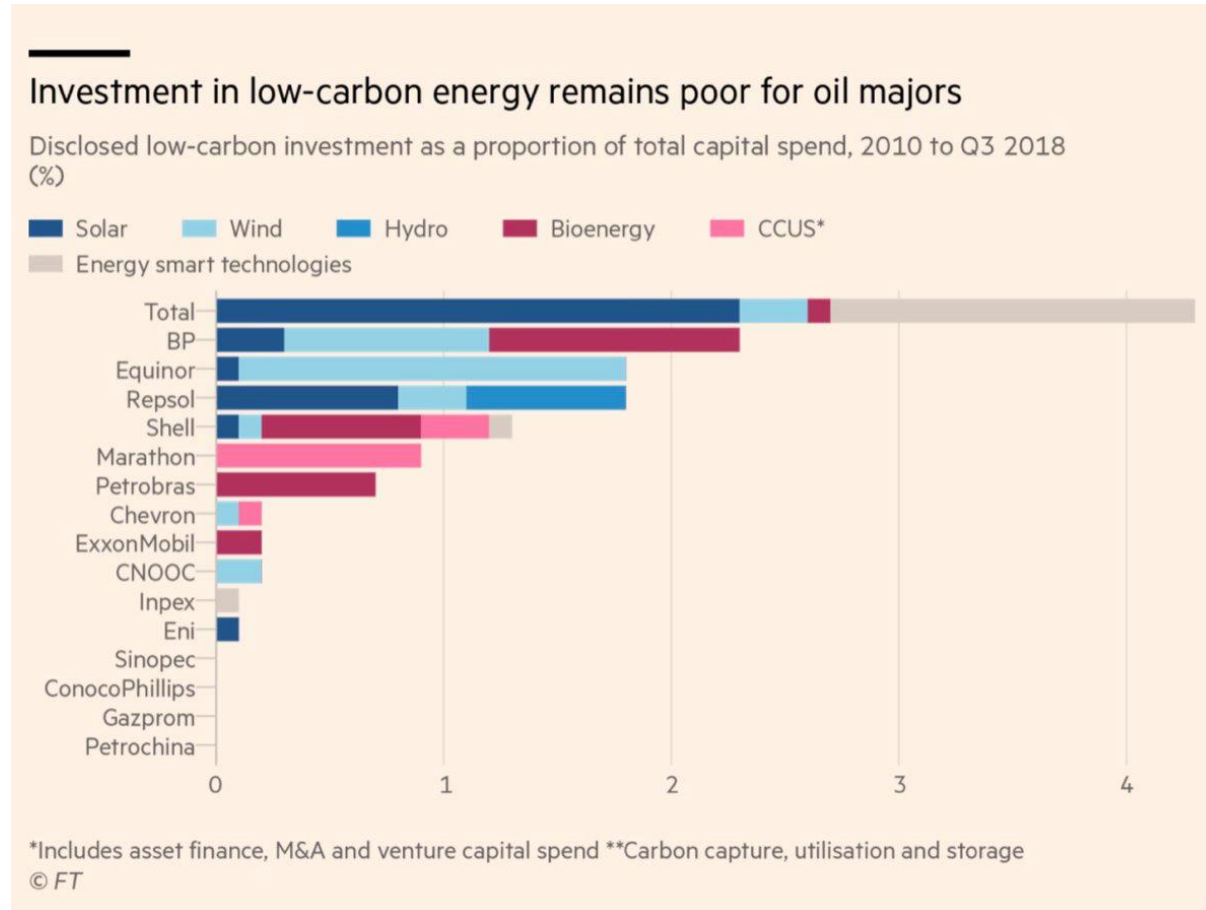
Middle East



OECD Pacific



Investment in CCS is too little and limited to only a few OG companies



Conclusion on why we need a CTBO

- Current approach is not working
- We need to speed up implementation of CCS
- We need to make future fossil energy production **conditional** on CO2 storage being implemented
- In short: We need governments and companies to commit to a Carbon Take Back Obligation → CLEAN-UP
- The alternative is increasing polarisation and supply side bans: 'leave it in the ground' , divestments, court cases → CLOSE-DOWN

So, what is a CTBO?

- Obligation on the producer to permanently store an increasing % of the carbon taken out of the ground
 - Comparable to RE portfolio standards
- Includes tradeable CO2 storage certificates
- Storage (certificates) costs become part of operator's Opex
- Compliance options: generate own certificates, buy certificates
- Insufficient storage certificates: penalties, or possibly other options:
 - Purchase/retire ETS-allowances
 - Allow also certified nature-based CDR certificates, up to a certain maximum percentage e.g. (forestry, agriculture, etc)

For example, applied to NL natural gas use:

- we use around 40 bcm of gas in 2025,
- Which releases around 72 Mton of CO₂
- Assuming a CTBO of 5% in 2025, going up to 100% in 2050
- This will require storage certificates for 3.6 Mton (per year) in 2025.

- Companies can decide to act alone or to set up a dedicated company (private, or public/private partnership)

- Interesting precedents can be found in the waste industry, eg organisation set up to collect and process packaging waste (afvalfonds verpakkingen)

How do we pay for this? and who is 'we'?

Fossil energy value chain has many financial beneficiaries: producers, governments, industrial users, consumers: **they should all contribute and pay**

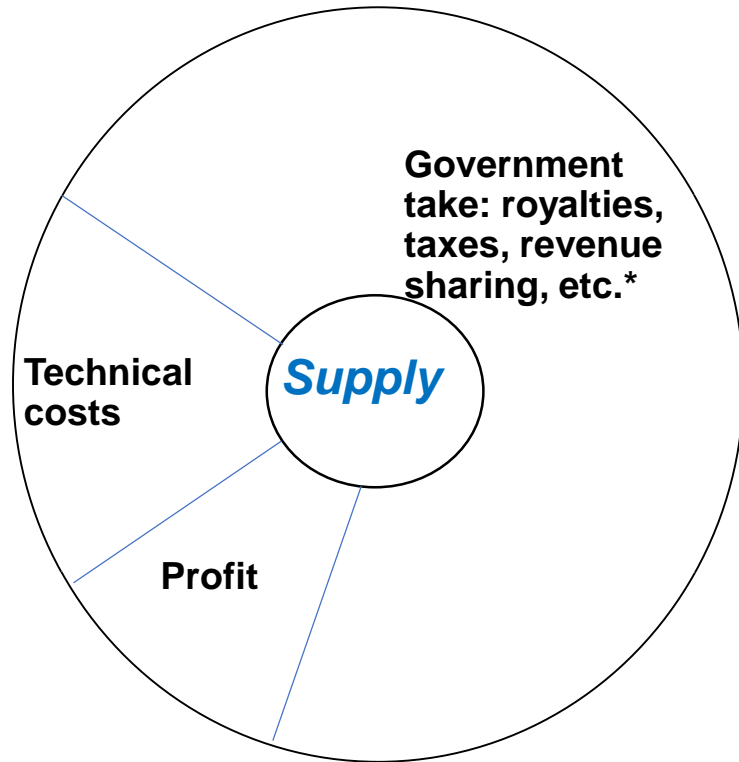
Two sources of revenue:

1. Redistributing fossil energy revenues on supply and demand side
who: governments & oil/gas companies
2. Premium product prices by selling 'Paris-compliant' fossil energy
who: customer

Climate emergency means: 'pay-to-clean-up' instead of 'pay-to-pollute'

Supply and Demand

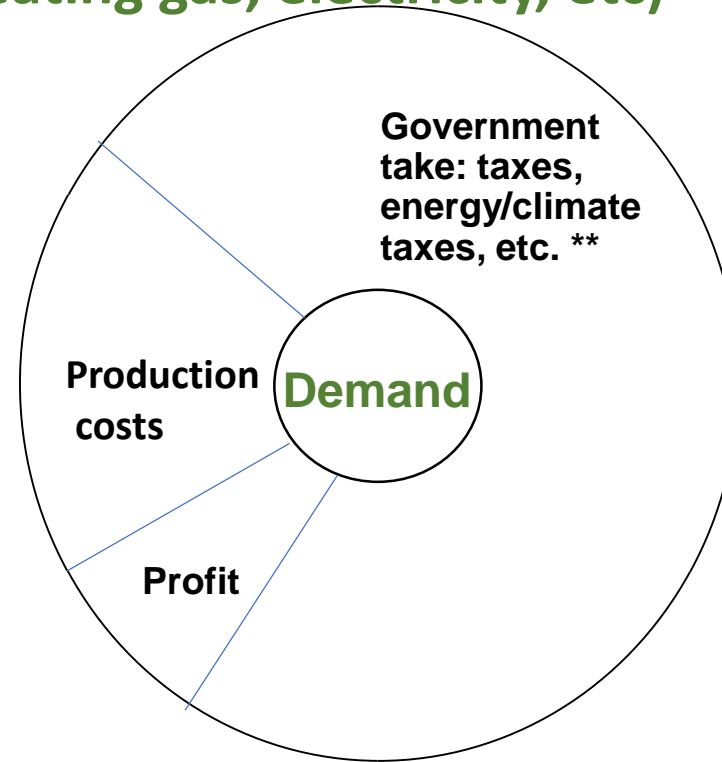
Commodity Price (oil, gas, coal)



Large margins often between 'technical production costs' and commodity market prices

* Government take varies from very little for small, marginal, end-of-life fields to very high for the best reserves (eg > 80% for Groningen gas field in NL)

Consumer price (gasoline, diesel, heating gas, electricity, etc)



Large margins often between product costs and consumer prices

** Government take varies significantly per country and for different types of consumers. Lower tax rates are common for large users in most countries and for eg aviation and shipping fuels.

What could be the impact of a CTBO?

1. Accelerates 'traditional' CCS projects: industry, blue hydrogen
2. Stimulates business-driven innovation: likely to see more integrated solutions in which producers convert fossil energy into end-user products such as hydrogen and electricity (and possibly other fuels with lower footprints)
3. Stimulates CDR (Carbon Removal) Technologies: DAC, BECCS, forestry, agricultural carbon storage, solid materials (olivine, concrete, building materials, etc)

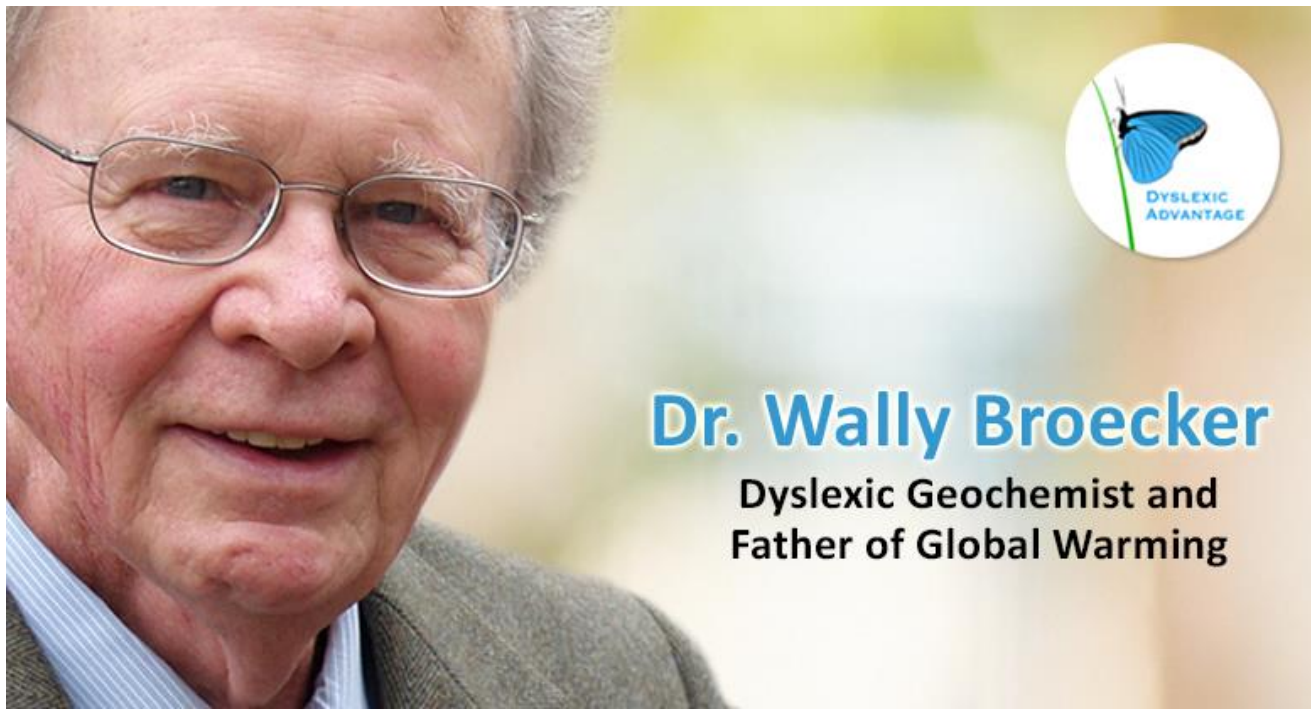
Advantages

- More certainty that **emissions will actually reduce**
- More **public support** as 'supply-side' is made co-responsible for waste disposal
- **Reduces subsidies** needed for CCS for industry
- Makes **blue hydrogen economically feasible** with no or minimal public funding
- Can be done at national level with **little risk of leakage**, waterbed, etc.
- Will **incentivise oil & gas producers** to efficiently use their assets, expertise and resources to decarbonise the use of fossil resources
- High cost hydrocarbons (oil sands, arctic oil, etc) will not be economic anymore; can not absorb waste disposal costs
- Supply-side measures are **easier to administer** than demand-side measures: 100 companies are responsible for 71% of world-wide production

*This could lead to more **ALIGNMENT** instead of more **POLARISATION***

Possible disadvantages, objections:

- Geopolitical impacts, energy security
- Fossil energy companies: additional costs, responsibility for waste of their product
- Ngo's: fear that this will lead to continued use of fossil energy
- Governments: reduced revenues from oil/gas production and/or sales of oil/gas products (upside of this is reduced 'carbon entanglement')
- Interaction with other policy measures: needs further investigation



Dr. Wally Broecker

Dyslexic Geochemist and
Father of Global Warming



"Garbage brought disease to our streets.

We learned to dispose of it.

Sewage poisoned our waters.

We learned to treat it.

CO₂ threatens to change our climate.

Hence, we must learn how to capture and bury it."

Want to know more?

We hope to find enough interested parties to start-up a study after the summer to explore options and impacts in a bit more detail.

If you are interested please contact :

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Jan Paul van Soest, jpvs@jpvs.nl

Evert Holleman, evert.holleman@rhdhv.com