# Economische en Beleidsinzichten van Energietransitiestudies voor Nederland

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# Three energy problems

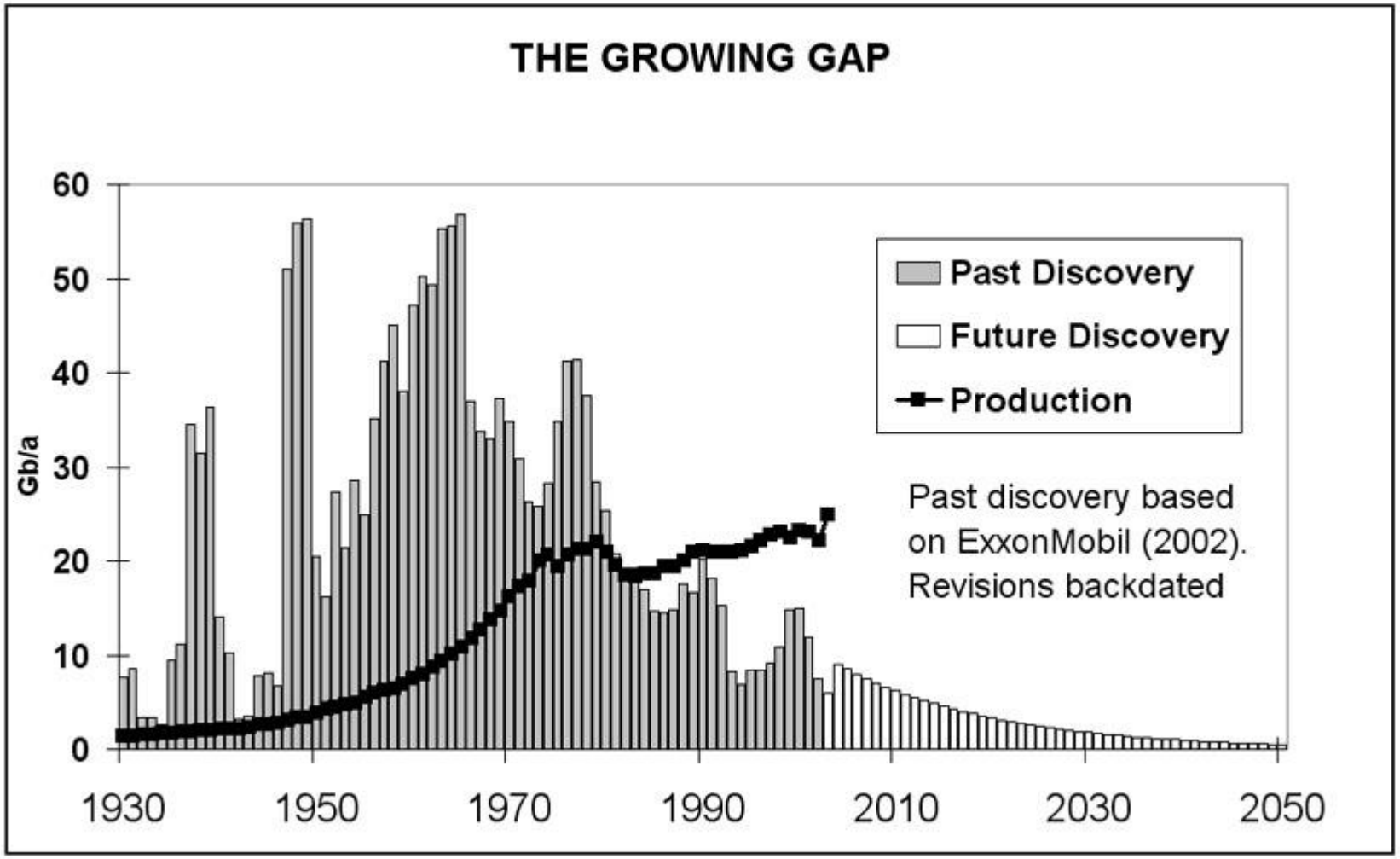
➔ Peak oil: oil production reaching a ceiling, which translates into steadily rising oil prices

- correctly predicted for USA in 1970s (Hubbert)
- predicted for World around 2010-20 (Hubbert, others).

➔ Rise in global energy demand: Countries are improving their energy efficiency but since the ones with a relatively high energy intensity grow faster, world energy efficiency is not improving (*Simpson's paradox*). Relocation and international trade cause carbon leakage.

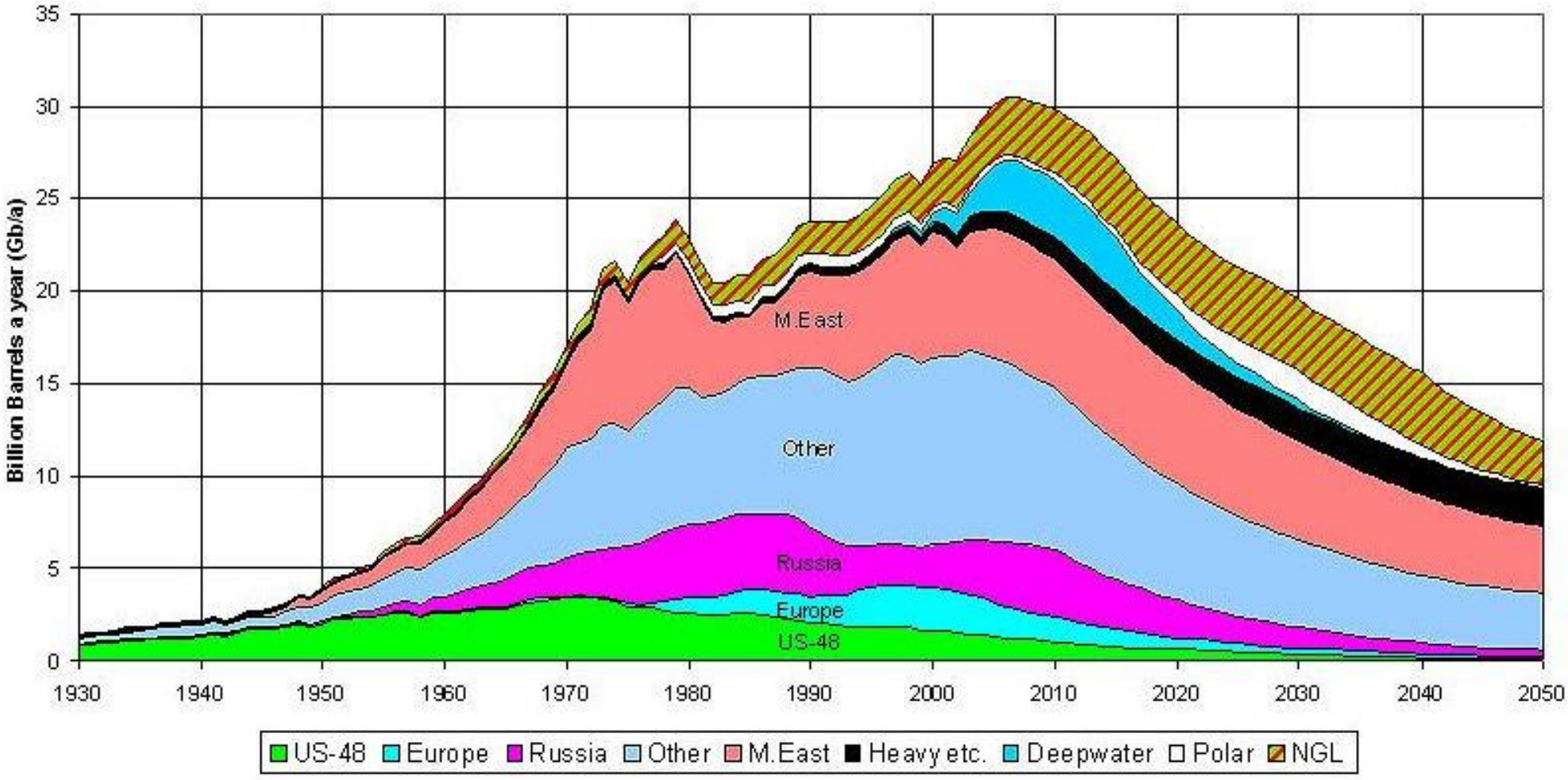
➔ Global warming: long term social, economic, security and health risk.

# Peak in supply of conventional oil



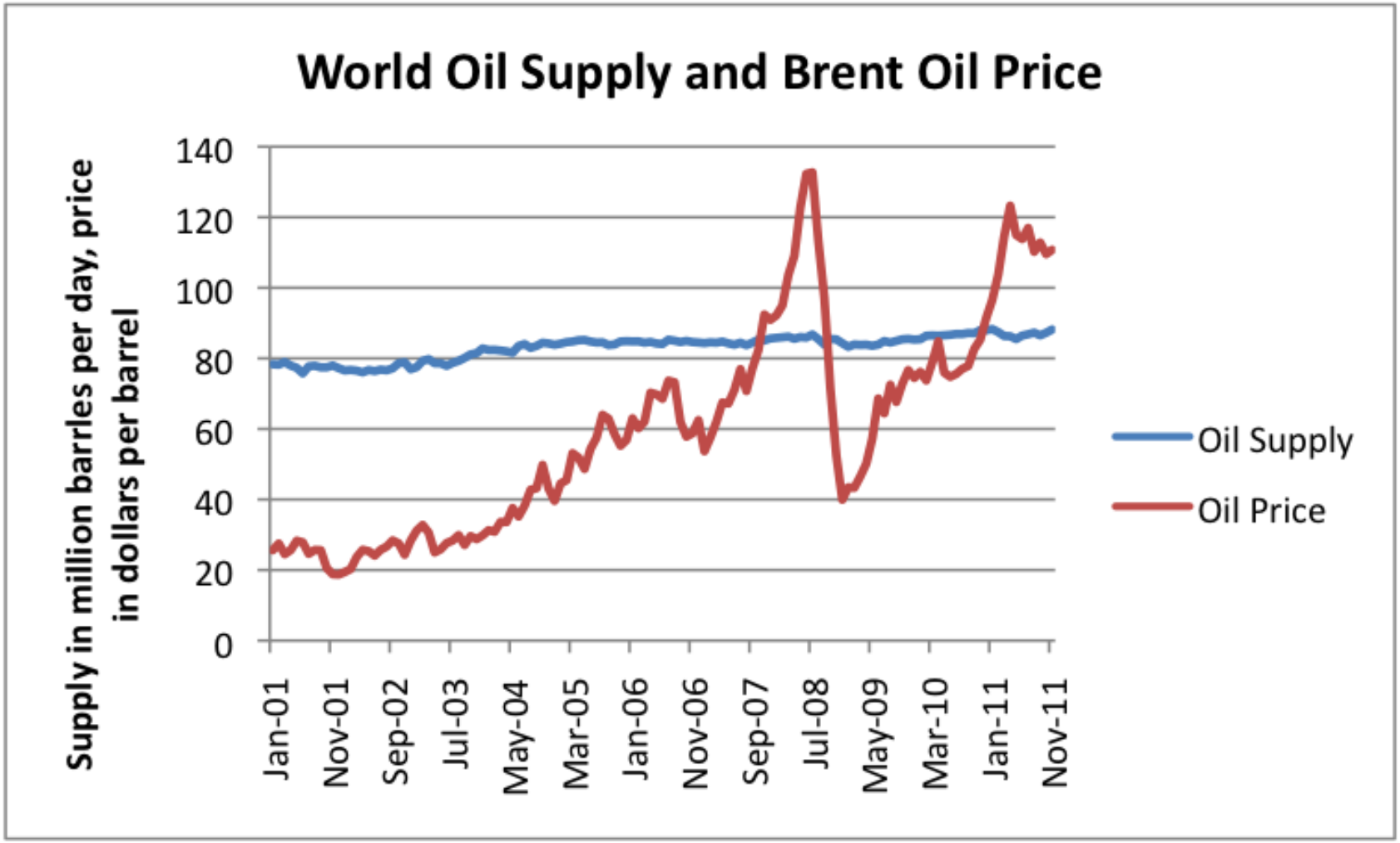

*Source:* Wikipedia.

# Past and Hubbert model predictions of geographical composition of oil supply



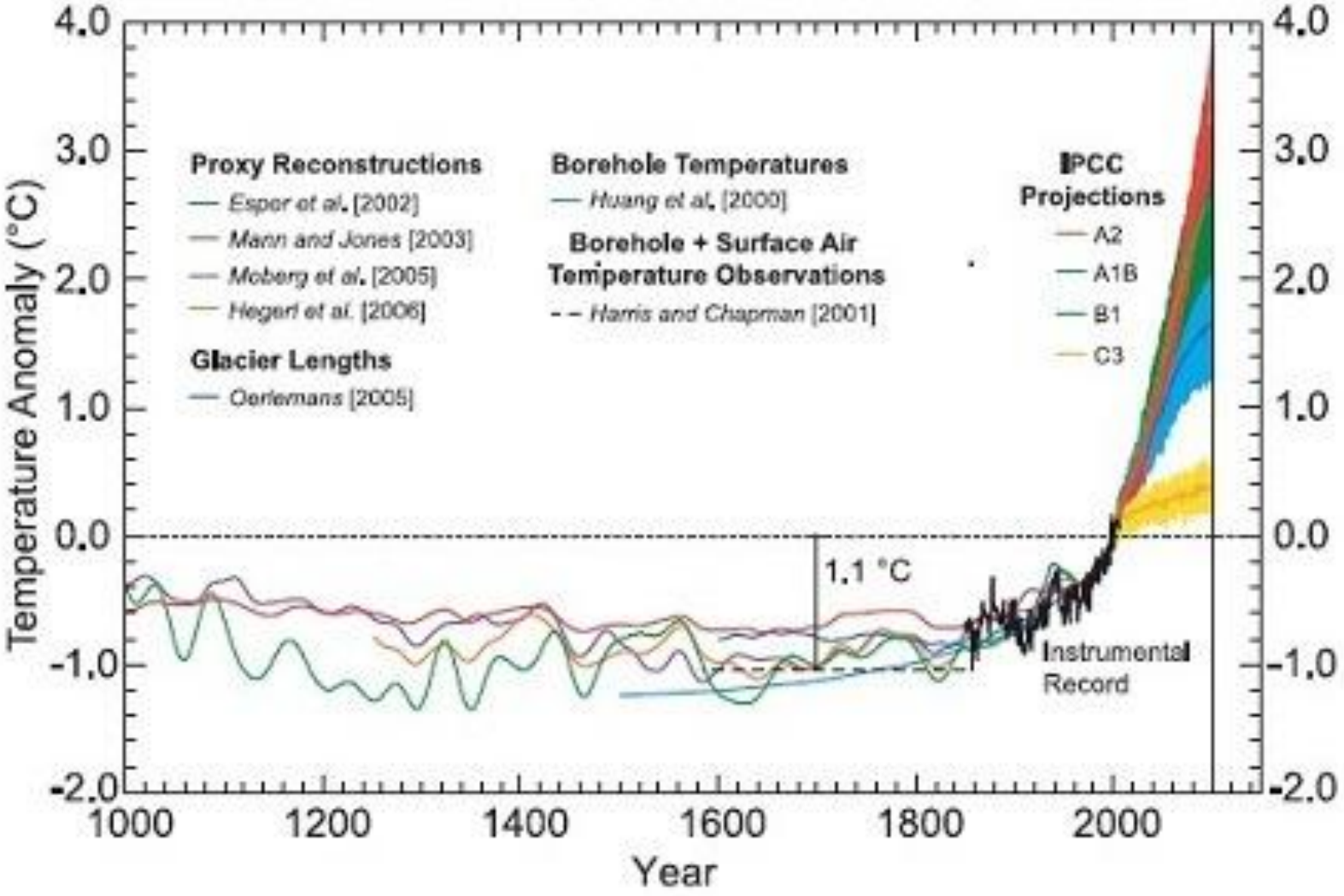

*Source:* ASPO (2004).

# Combined demand and supply effects on the oil price




*Source:* http://www.euribor.com.

# Climate change: "Temperature hockeysticks"




*Source:* Chapman and Davis (2010)

# Main solutions to these problems?

➔Peak oil as a solution to global warming?

- Shift to coal and unconventional sources of oil (heavy crude oil, oil sands, and oil shale) which generate much more $CO_2$

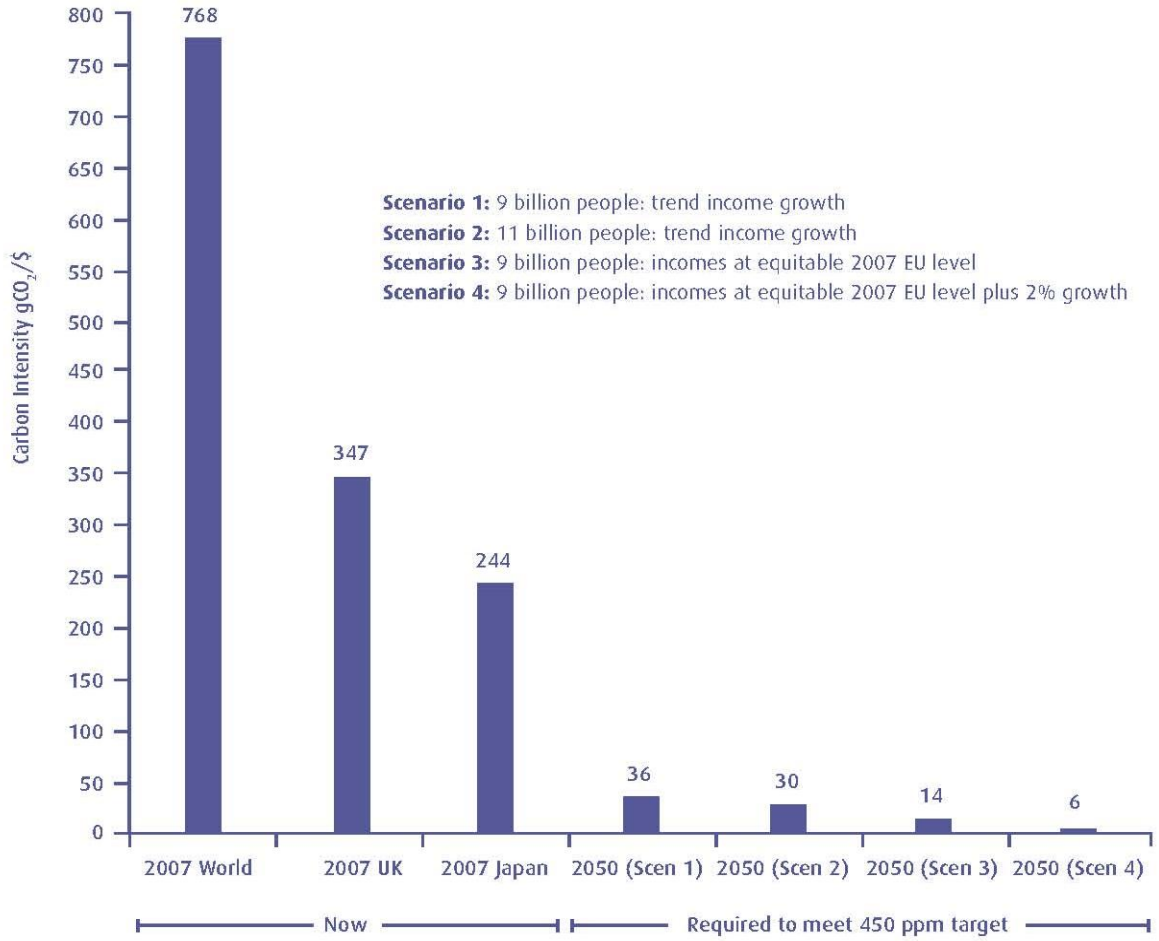
➔We have only three strategies to reduce $CO_2$:

- *Forestation* – limited options
- *Carbon capture & storage (CSS)* – very limited experience, needs much R&D
- *Less use of all fossil fuels* (regulating their supply and/or demand)– linked to energy conservation and renewable energy

# Decoupling requirement is astonishing:

## Factor 20-100 reduction in emission/energy intensity

Figure 17 **Carbon Intensities Now and Required to Meet 450 ppm Target**[25]




*Source:* Jackson (2009).

# How logical and easy is a transition to renewable energy?

➔ Economically logical energy transitions: Food ⟶ Animal power & firewood ⟶ Carbon ⟶ Oil, gas, electricity

➔ Transition to renewable energy only logical from environmental but not economic angle

- *Low-EROI renewables* compete with *locked-in, high-EROI fossil fuels*
- Environmental innovations are *factor-saving* rather than *quality improving*
- *Diffuse public benefits, concentrated private costs*

Two lessons:

⇒ Large-scale diffusion of environmental innovations not through unregulated markets

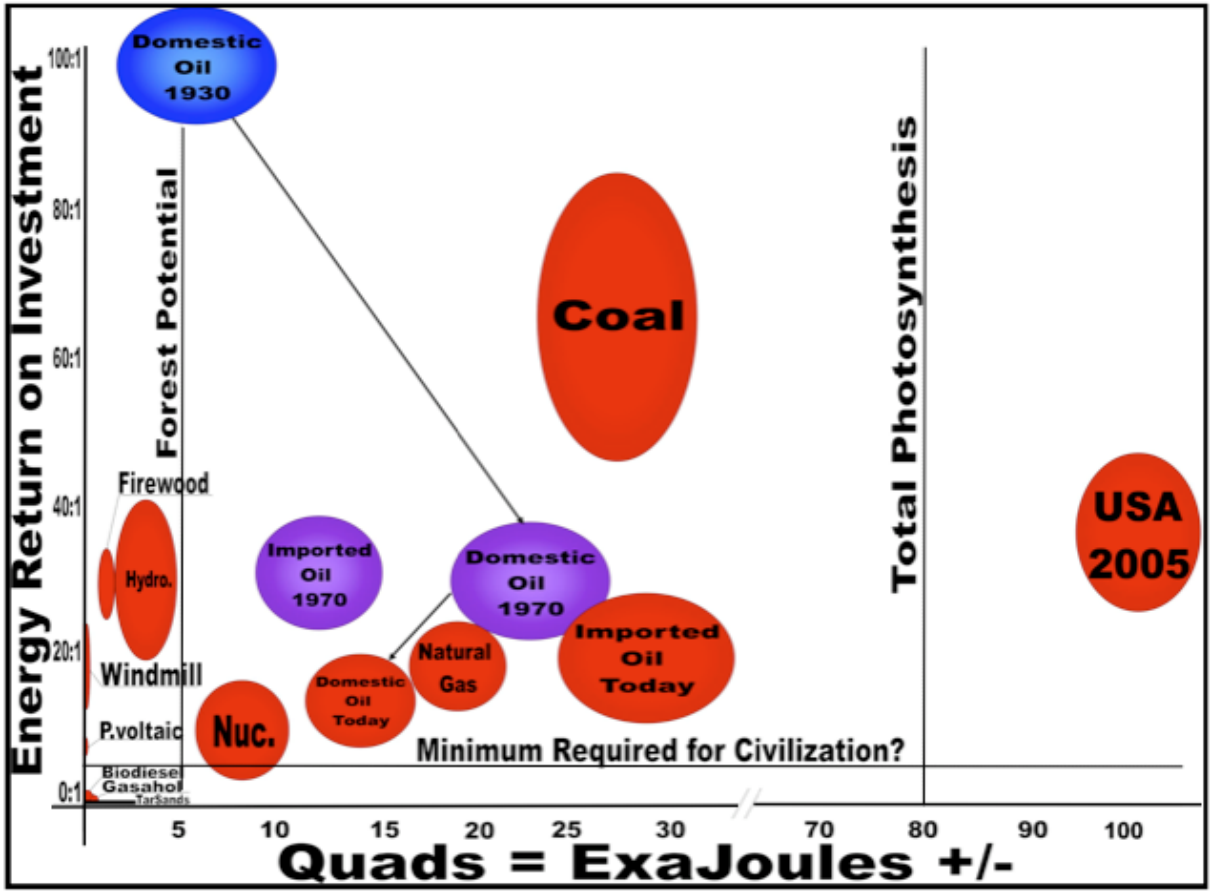
⇒ EROI of renewable needs to be improved considerably – public and private R&D

# Energy return on (energy) investment – ERO(E)I

Indicator of physical cost of obtaining energy resources for economic use: net energy or energy surplus

"Renewable future": Many energy and labor inputs needed indirectly – *transition to renewables economically unlogical*

Surplus energy in the past was basis for creating complex economy/society!




*Source:* Hall et al. (2009)

# Transition strategies/policies: Avoid three "escape routes"

➔ Indirect and avoidable effects of well-intended strategies and policies: *undercut their effectiveness*

➔ *Carbon leakage of unilateral policies:* relocation of dirty industries and increase of dirty import flows

- happened with ETS – aluminium, cement and paper industries, imports of energy-inefficient products from emerging economies (China)

=> International climate treaty essential

➔ *Green paradox due to market subsidies for renewable energy:* subsidies interact with oil market - may increase $CO_2$ emissions

➔ *Energy rebound:* esp. incomplete technical standards or voluntary action

# Energy rebound mechanisms

- *More intensive use of efficient energy-consuming equipment*
- *Purchase of larger units or units with more functions*
- *Re-spending financial savings due to conservation*
- *New, more energy-efficient devices embody much energy*
- *Wide diffusion of more (energy-)efficient technologies ... etcetera*

- Examples and consequences:
  - Steam engine – Jevons paradox (> 100% rebound)
  - UK 2000: cost of lighting 1/3000 of 1800 value; same period income 15x. But so much more light use now: relative spending on light down only 50%.
  - Energy intensity defined as energy input per monetary output has dropped by >30 % since the 1970s – but total energy use has risen.

# Many reasons for environmental regulation by prices

1. Price instruments equalize marginal abatement costs among polluters => cost-effective which *contributes to social/political acceptability*

2. Subtle, complete control: all goods/services have prices in proportion to pollution generated over life-cycle – *minimize rebound & green paradox*

3. Price represents permanent incentive for both *technology adoption and innovation* (environmental innovation trajectories are misguided if prices wrong)

4. Empirical evidence for price incentives strong – econometric studies

➔ *Distribution/equity concerns:* Block-pricing for basic needs, recycle tax revenues relatively much to poor (note: all strong regulation will redistribute)

# But policy package needed

➔ Only carbon pricing – but early *lock-in*:

- Reinforces early lock-in of currently cost-effective technologies
- Learning potential of alternatives is neglected
- Incremental innovation more attractive than radical innovation

=> Technology-specific policies: "keep promising but expensive options open".

➔ Only technology support– but *green Paradox*:

- Subsidizing renewables stimulates accelerated extraction of fossil fuels
- Moreover, no carbon tax means net energy cost low, so energy demand up

=> "Supply policy" needed – cap/price fossil fuel extraction, possibly using prices/standards/tradable permits (Sinn, 2008)

=>Innovation (policy) no substitute for environmental regulation

# Should the Netherlands do much more than other countries?

➔ Pro:

- First-mover advantage (Denmark-wind, Germany-solar)
- Set an example for other countries.

➔ Con:

- 1% country, slechts 4% hernieuwbare energie.
- Voluntary energy conservation leads to much rebound, and is thus ineffective.
- Serious, strict national regulation of $CO_2$ emissions means considerably higher costs of energy, stimulating relocation of polluters and trade flows => *damage to Dutch economy + carbon leakage (emissions shift abroad, and imports and international freight transport will increase).*

➔ Effective alternative strategies? invest much in public R&D, subsidize private R&D, fight for an international climate agreement and EU policy, and fund information provision for "international consciousness"

# Energieakkoord 2013

- Toont geen tot weinig begrip van de mechanismen die ik hier heb besproken.
- Bijv. energiebesparing in de bouw via subsidies, dus nog veel meer rebound dan bij vrijwillige energiebesparing.
- Doelen onrealistisch gegeven historie en beleidsinzet (geen regulering/beprijzing)
- Wordt er überhaupt over rebound gesproken in het akkoord? Heeft men beleid bedacht om rebound tegen te gaan?
- 15000 banen is niet indrukwekkend en zijn dure, gesubsidieerde banen.
- PBL, CPB en ECN niet positief.

# Conclusions

- No bottom-up without top-down regulation and incentives:
  Thus a post-Kyoto treaty essential – unilateral & voluntary policies ineffective

- Policy package: pricing $CO_2$ (tax revision), technological policy (subsidies), information provision ... regulating advertising.

- Innovation returns channeled back to the public sector: *transition fund*.

- If we tax $CO_2$ oil prices will not go up to the same extent as we will indirectly tax oil producers (OPEC).

- Patience needed, but difficult with threat of dangerous climate change:
  - Decades of high expenditures on R&D and technological diversity – transition in 2050
  - Avoid large renewables market with quickly outdated technology –R&D vs. market support

# Wetenschappelijk tijdschrift gespecialiseerd in de onderhavige thematiek

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