THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Grantham Research Institute on Climate Change and the Environment

# DIE conference:
# "Managing economic rents for the green transformation"

## Rents and capture


**Dr Cameron Hepburn***

Senior Research Fellow
Grantham Research Institute
**London School of Economics**

Director, Vivid Economics

Research Fellow
New College
**University of Oxford**

Director, Climate Bridge


6 November 2012
12:00 to 13:00


*With thanks to Gavin Kader for research assistance

# What do I research?

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## Energy

1. Chinese Energy to 2030
2. Clean energy
3. International gas

## Climate

1. ETS design (EU, Aust. China)
2. Protectionism and climate
3. Energy policy interactions

## Biodiversity

1. Economics of biodiversity
2. Non-marginal CBA
3. Growth and env. limits

## Wealth of Nations

1. World Bank
2. Wealth accounting
3. The three capitals

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# "Environmental policy, government & the market"
*Oxford Review of Economic Policy (2010)*



## The 8 papers in this issue of the *Oxford Review of Economic Policy*

| | Author | Title |
|---|---|---|
| 1 | Hepburn | Environmental policy, government and the market |
| 2 | Stern and Bowen | Environmental policy and the economic downturn |
| 3 | Stavins and Reinhardt | CSR, business strategy and social welfare in the US |
| 4 | Helm | Government failure, rent seeking, and capture: The design of climate change policy |
| 5 | Anthoff and Hahn | Government failure and market failure: On the inefficiencies of environmental and energy policy |
| 6 | Hanemann | Cap-and-trade: a sufficient or necessary condition for emission reduction? |
| 7 | Newell | The role of markets and policies in delivering innovation for climate change |
| 8 | Dietz and Fankhauser | Environmental policy, uncertainty and policy reform |

Source: *Oxford Review of Economic Policy* (28)2, 2010

# Agenda

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1. Context
2. The scale of fossil rents and capture
3. The scale of climate rents and capture
4. Perverse impacts
5. Managing rents

# What "green transformation"?

# Our global energy system is resoundingly fossil fuelled, with growth from non-OECD…

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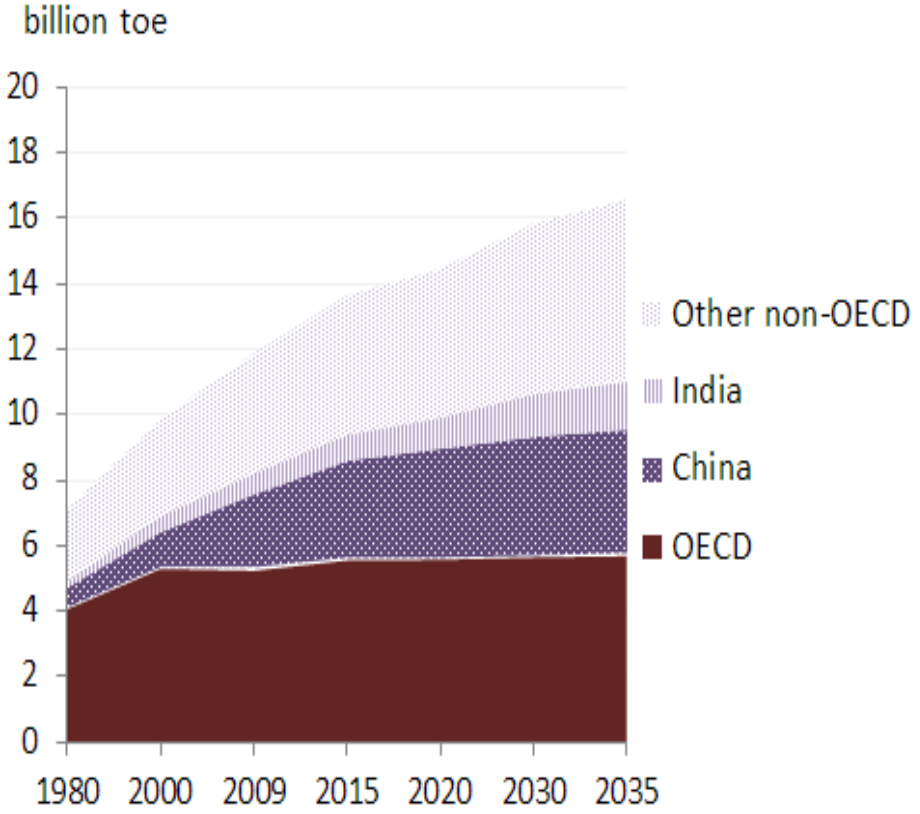
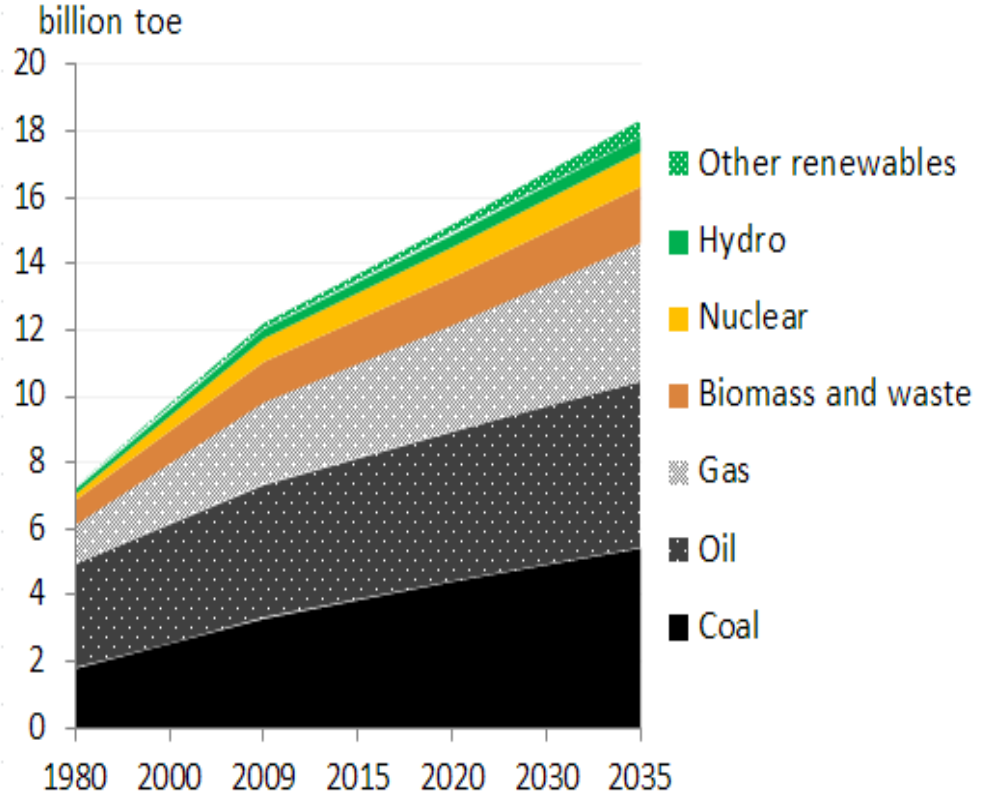
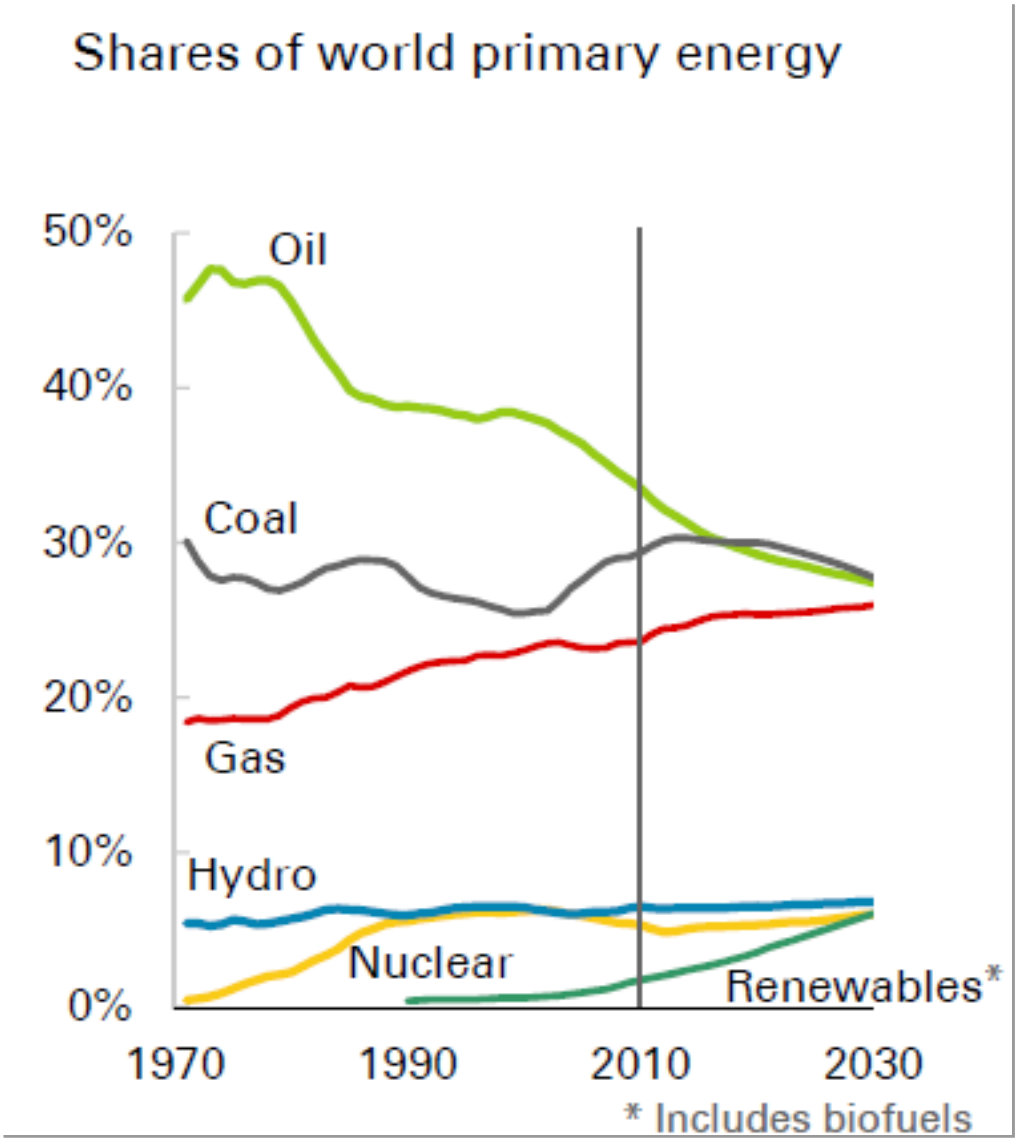
- And more fossil than non-fossil will be added in the next 1-2 decades




Source: Hepburn (2012) based on IEA (2011) data

# …even though share of cleaner energy is rising




Source: BP Energy Outlook (2012)

# An important part of the clean energy story will be the deployment in large countries such as China

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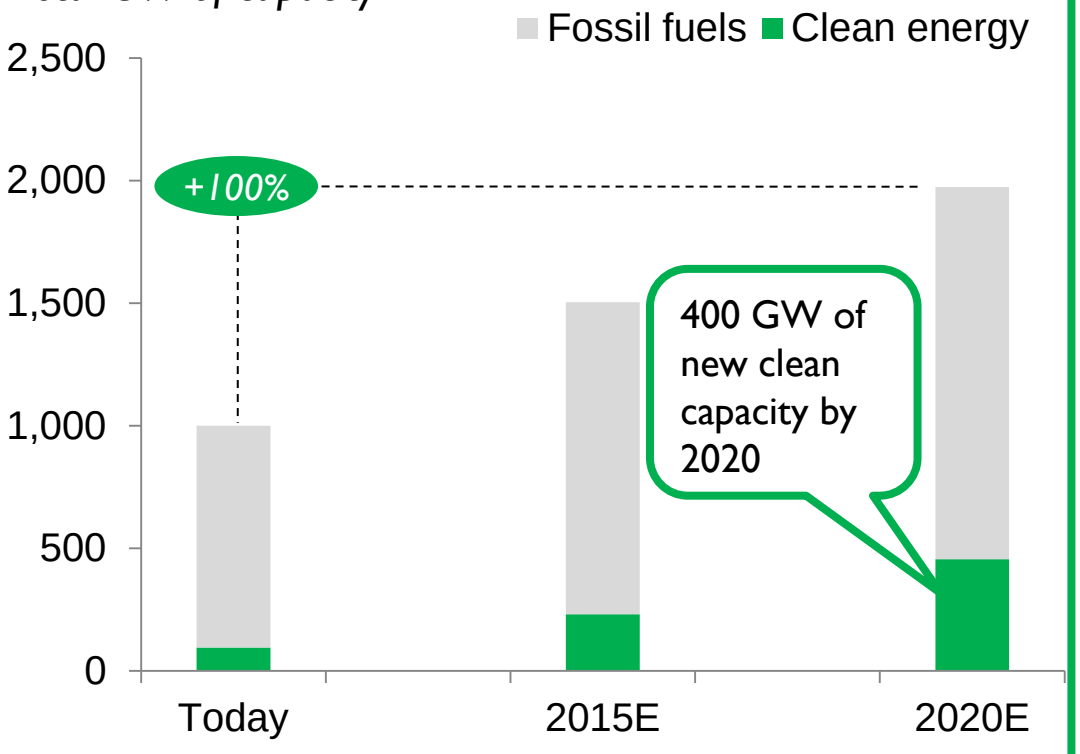
## Current consumption and projected supply in China

*Total GW of capacity*




Source: China's 12th Five Year Plan; The Climate Group

## Demand for clean energy in China will continue to grow

- The 2th Five Year Plan (2011-2015), targets non-fossil energy consumption of **11%** by 2015 and **15%** by 2020.
- China will add **> 400 GW clean capacity by 2020.** Compare total US power capacity of ~1,000 GW, and in the UK, 85 GW.
- Total investment in clean sector is expected to reach **$1 trillion.**

Source: China 12th Five Year Plan, The Climate Group (2011); Climate Bridge analysis

# Overall, despite 20 years of international efforts, emissions continue to rise, and rise, and rise…

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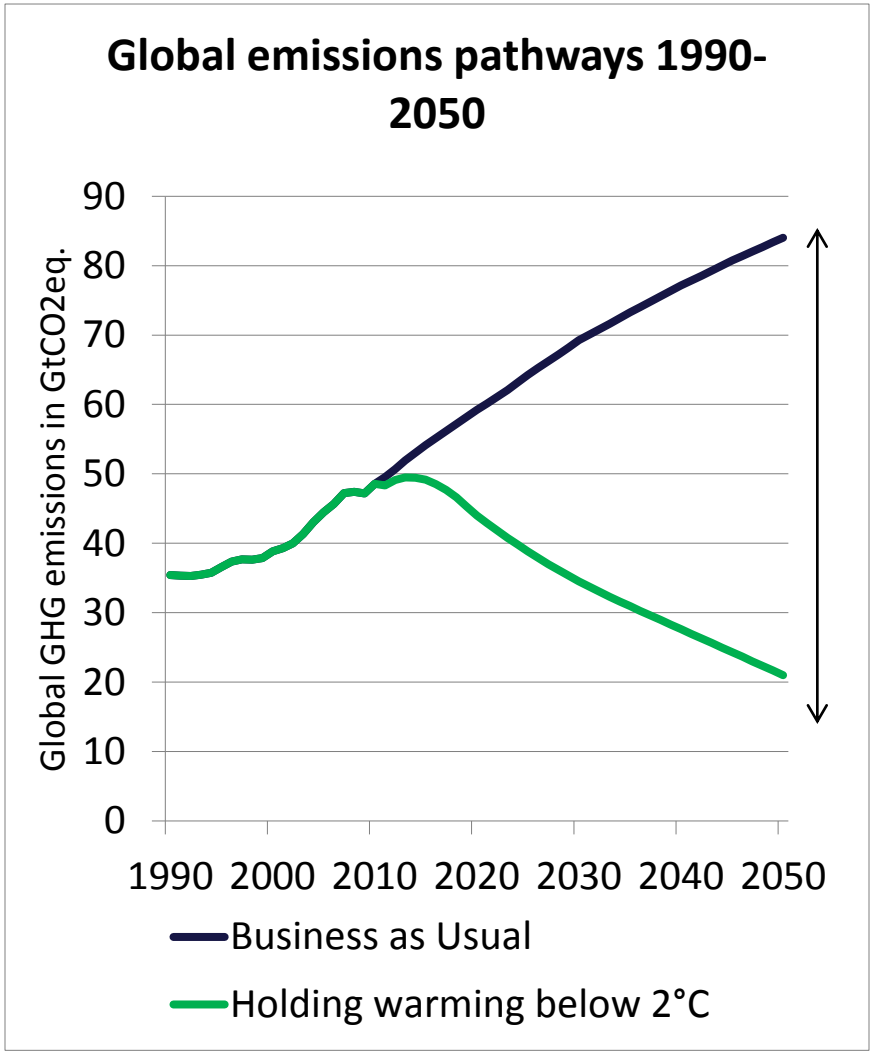


Results starting to look like "naïve hyperbolic discounting"

In fact, only two things have made much difference to global emissions:

- The global financial crisis and recession
- Large-scale fuel switching from coal to gas

Source: Climate Action Tracker

# So we are on track for 3-4°C warming…with new shipping routes and Artic oil to be exploited

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Source: http://www.economist.com/node/21556798

So, eventually, we must have a "green transformation"…

# With that transition comes enormous scope for "government failure"

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- Stern labelled climate change as the greatest **market failure** in history
- Hence the interventions required to correct it may provide scope for one of the greatest **government failures** in history
- Certainly the scale of the interventions is likely to be massive
- Hence assessing the scale of the subsidies, rents, and scope for political capture and government failure is important to delivering efficient, low-cost policies
- See collection of papers in the ***Oxford Review of Economic Policy***, 26(2) 2010 (which I edited), especially papers by Helm, and Anthoff and Hahn.

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# Is the energy sector particularly susceptible to political capture?

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1. **Resource rents** (from endowments of coal, oil, gas, solar, wind, tidal, biomass resources) accrue to countries fortunate enough to sit on the resource; the state is involved in allocating these resources
2. **Oligopoly rents** in some fuel markets (e.g. oil) are further accrued because of collusive state-sponsored action (e.g. OPEC)
3. State involvement in the power sector, for reasons of **national security** and **economies of scale** implies further scope for political capture
4. Finally, the importance of affordable energy to well-being has justified widespread **state subsidies**, creating further capture opportunities
   - Subsidies are a "second-best" for market-based energy prices and a welfare system

# Subsidies to the energy sector globally were second only to agriculture in the 1990s

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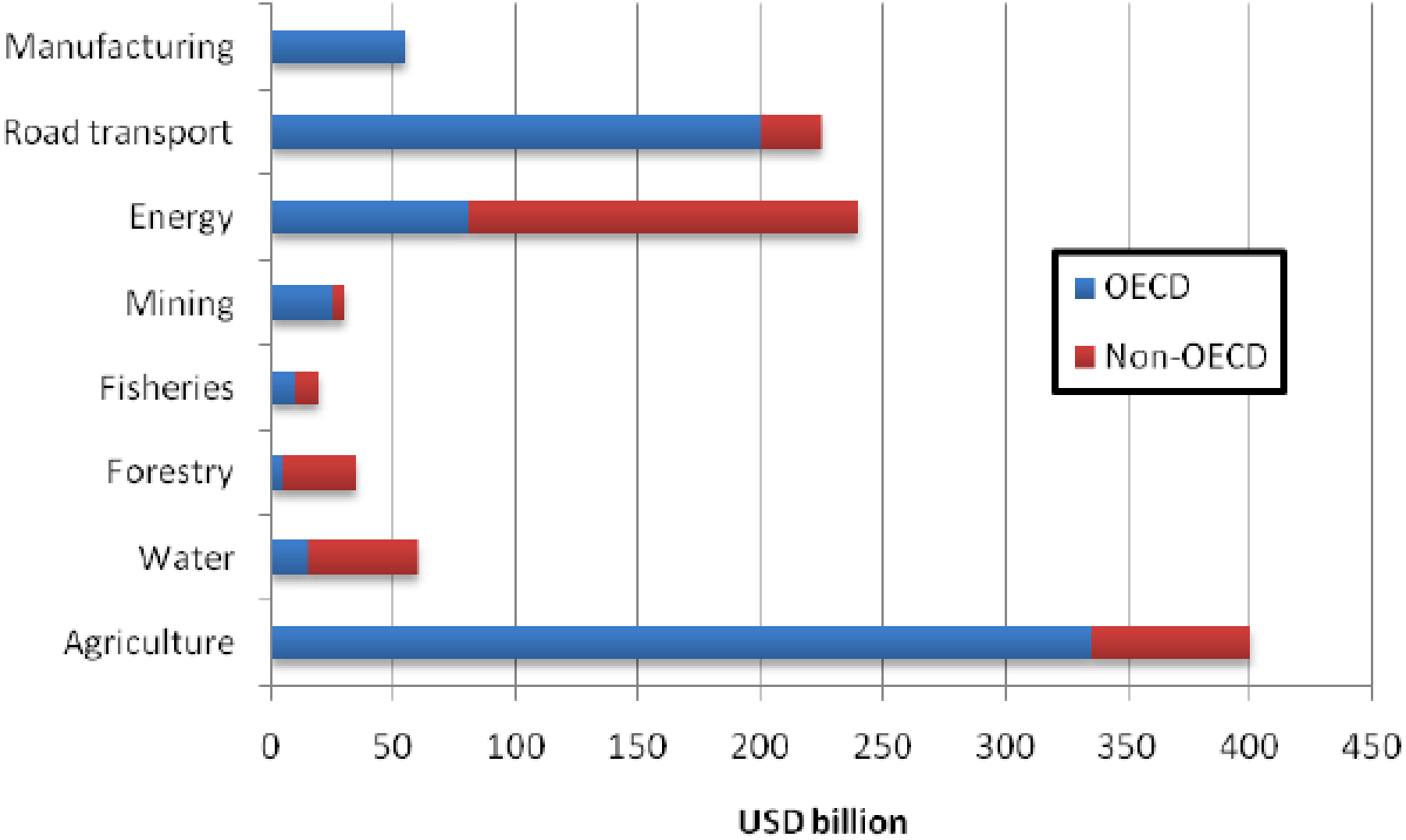
**Estimates of world subsidies 1994-1998 (USD)**




Source: Pearce (2003, OECD) Table 1

# And the resource rents from the exploitation of fossil fuels are also enormous

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- Scale of rents in the fossil system is already enormous
- According to World Bank data, total resource rents in 2009 were:

**≈ US$ 1.9 trillion**

- Our experience with rents in the fossil fuel sector has not been good

Source: data.worldbank.org/indicator

# Oil is the largest source of fossil rents and Saudi Arabia reaps enormous benefits *per capita*

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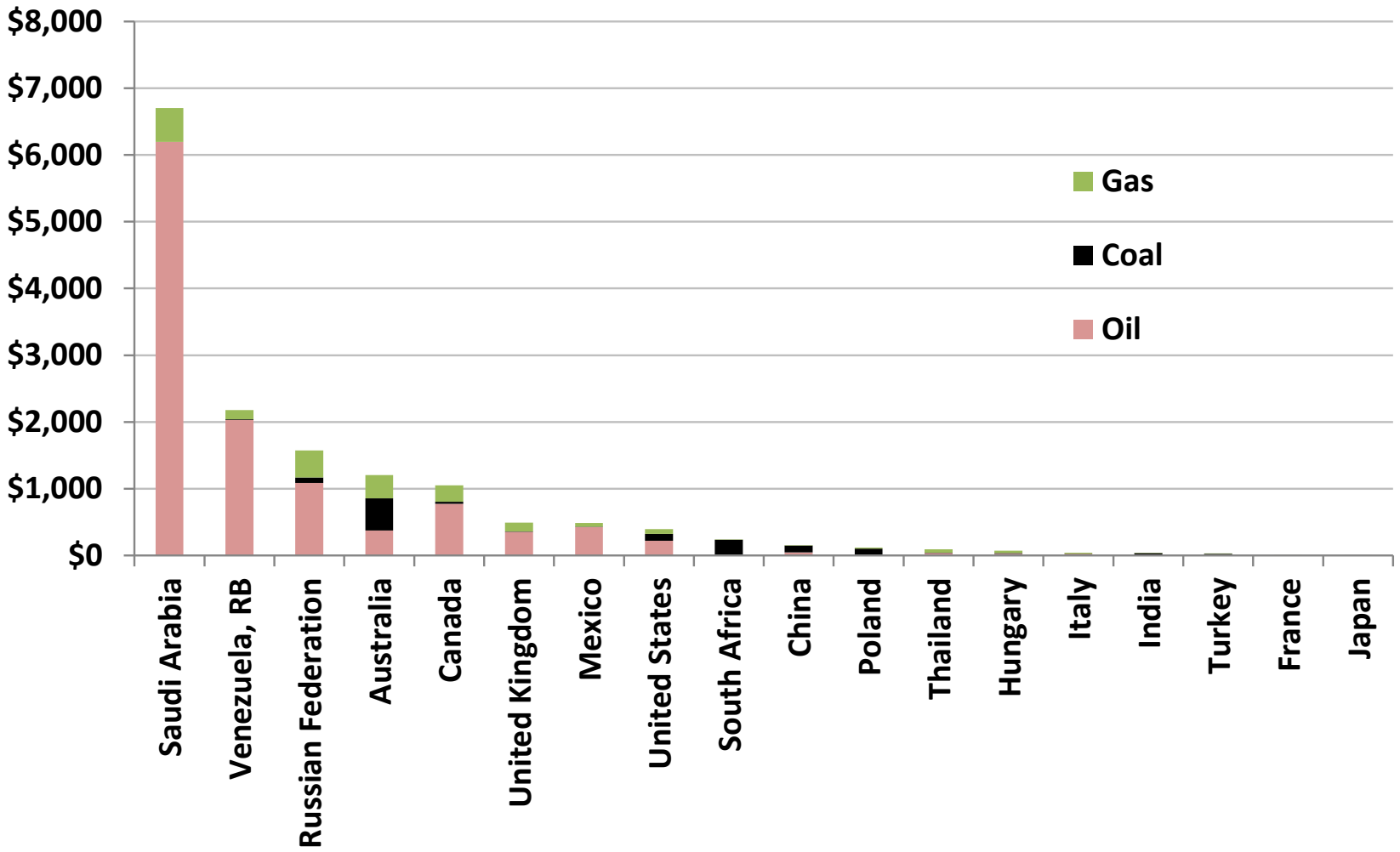
**Producer rents per capita by fuel**

*$ US, 2009 data*



# The Saudis, Venezuelans and Russians accrue the greatest producer rents as a percentage of GDP

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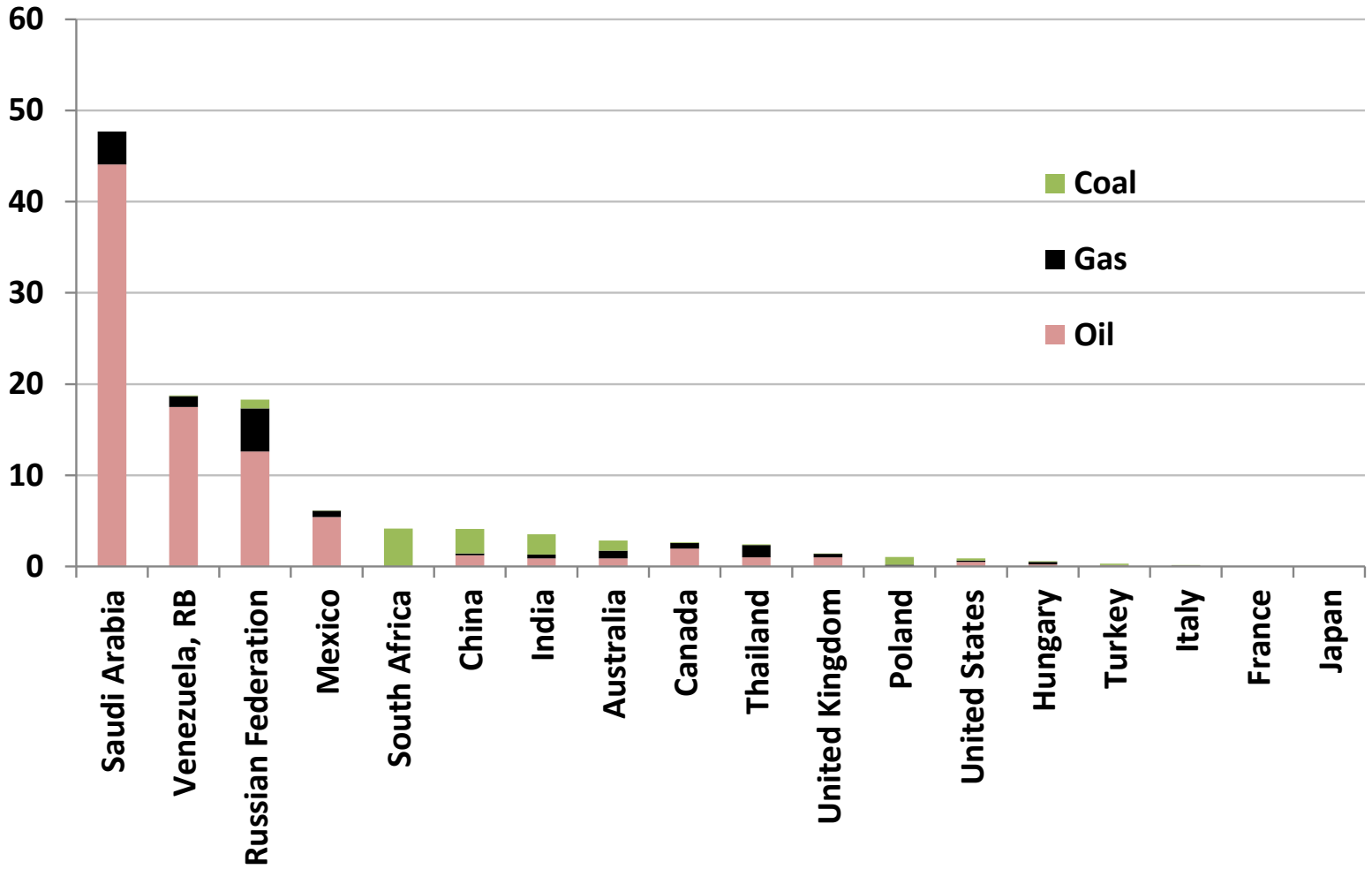
**Producer rents as a % of GDP**

*%, 2009 data*



**The energy sector is susceptible to political capture and government failure because of the sheer scale of subsidies & rents**

And that is just on the **producer** side….

# What about the **consumer** side of the story?

# Consumer surplus is generated for those who enjoy the fruits of fossil fuels (e.g. oil by the USA)

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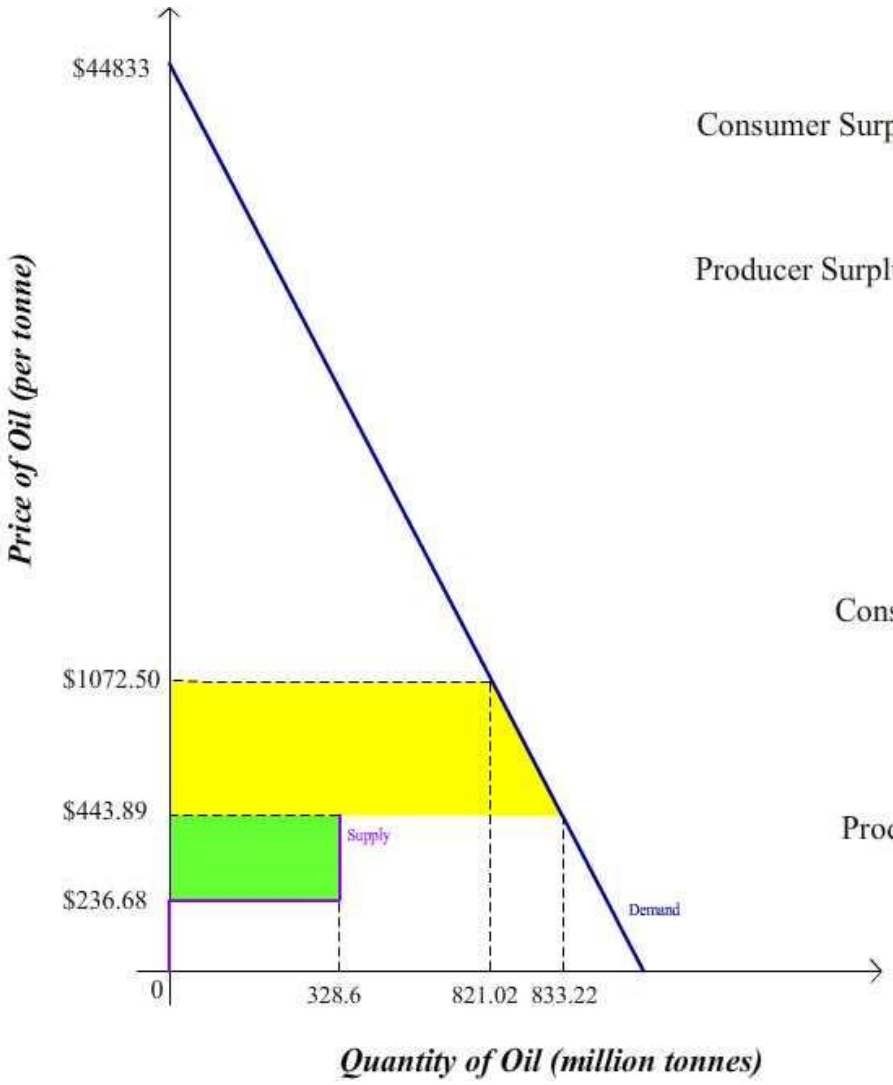



**APPROXIMATE**

Consumer Surplus = = $\frac{1}{2}$×(Backstop Quantity + Equilibrium Quantity) ×(Backstop Price - Equilibrium Price)

Producer Surplus = = (Equilibrium Price - Unit Cost of producing 1 tonne of Oil) ×(Quantity Produced)

Consumer Surplus = = $\frac{1}{2}$ × (821.02 + 833.22) × ($1072.50 - $443.89)

= $519935.90 Million

Producer Surplus = = ($443.89 - $236.68) × 328.6

= $117421.9 Million

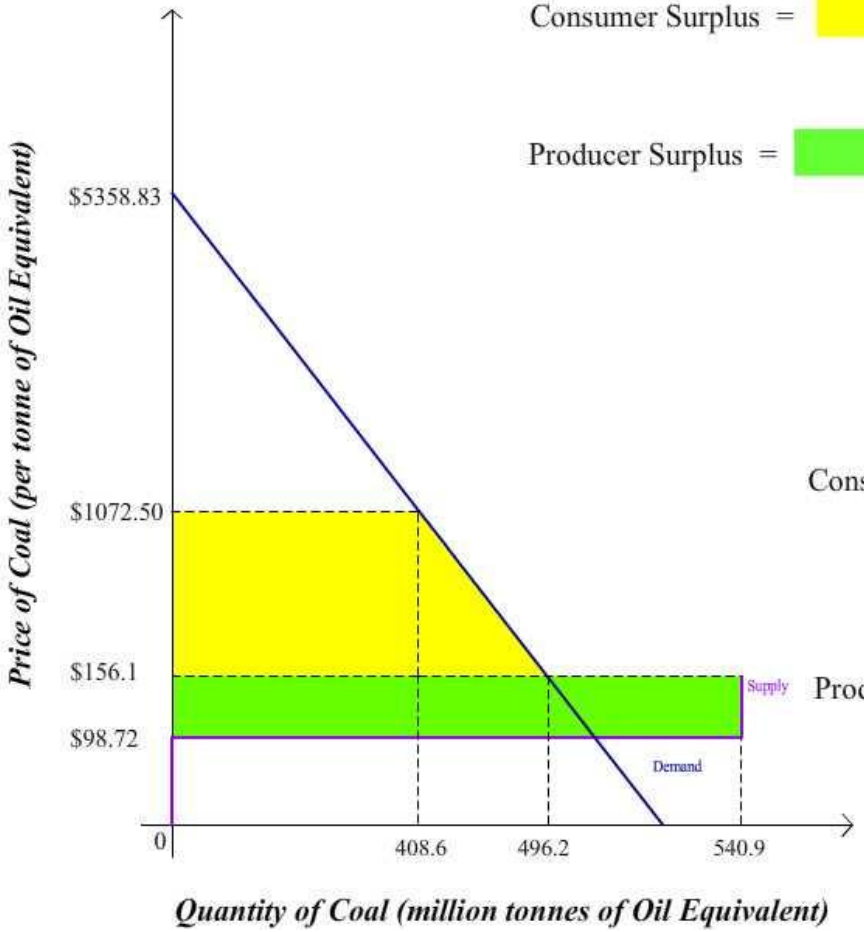
# We derive consumer surplus (with assumed backstop) for oil, coal and gas (e.g. US coal below)



**APPROXIMATE**

Consumer Surplus =  = $\frac{1}{2}$×(Backstop Quantity + Equilibrium Quantity) ×(Backstop Price - Equilibrium Price)

Producer Surplus =  = (Equilibrium Price - Unit Cost of producing 1 tonne of Oil Equivalent) ×(Quantity Produced)




Consumer Surplus =  = $\frac{1}{2}$ × (408.6 + 496.2) × ($1072.50 - $156.10)

= $414579.36 Million

Producer Surplus =  = ($156.1 - $98.72) × 540.9

= $31036.84 Million

# Saudi Arabia still extracts the highest consumer surplus from fossil fuels per person

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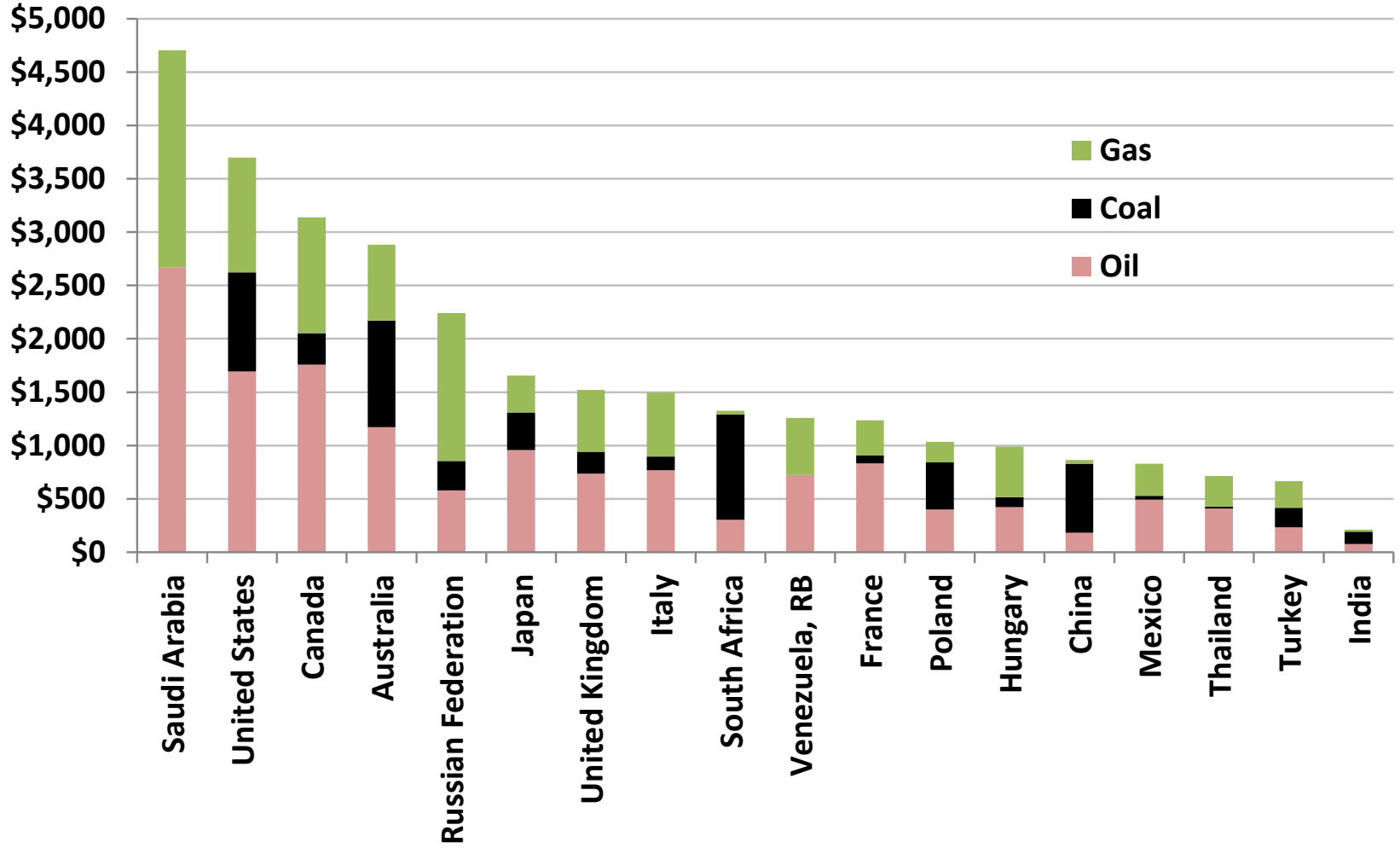
**Consumer surplus (backstop) per capita by fuel**

*$ US, 2009 data*




Sources: Serletis, Timilsina, and Vasetsky (2009), BP (2011), Wie et al. (2011) data.worldbank.org/indicator, CCPI

# But the "new world West" benefits hugely from oil – perhaps this is why it is an election issue

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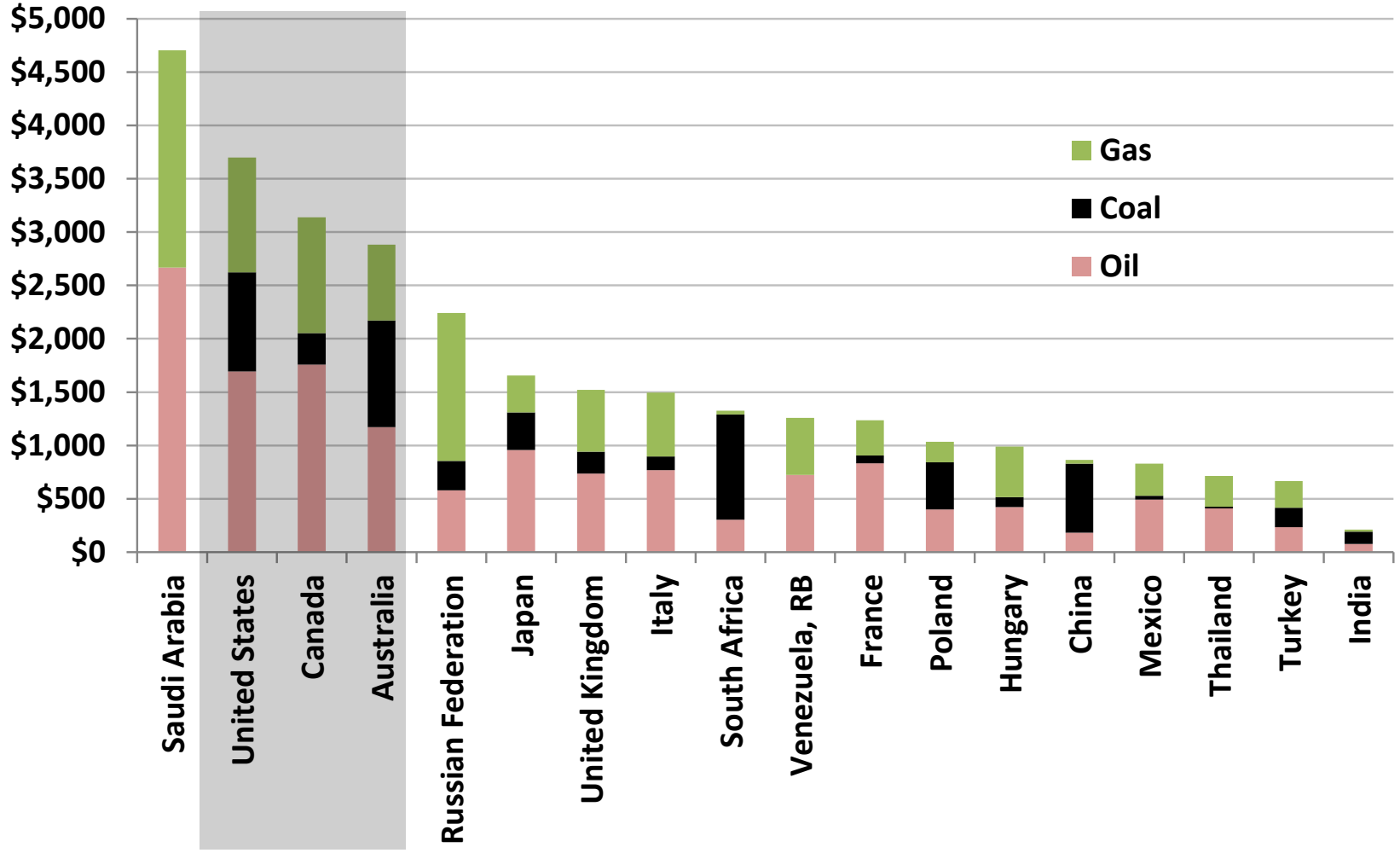
**Consumer surplus (backstop) per capita by fuel**

*$ US, 2009 data*




Sources: Serletis, Timilsina, and Vasetsky (2009), BP (2011), Wie et al. (2011) data.worldbank.org/indicator, CCPI

# And as a percentage of GDP, it is Saudis and the RICS (BRICS – Brazil) in the spotlight

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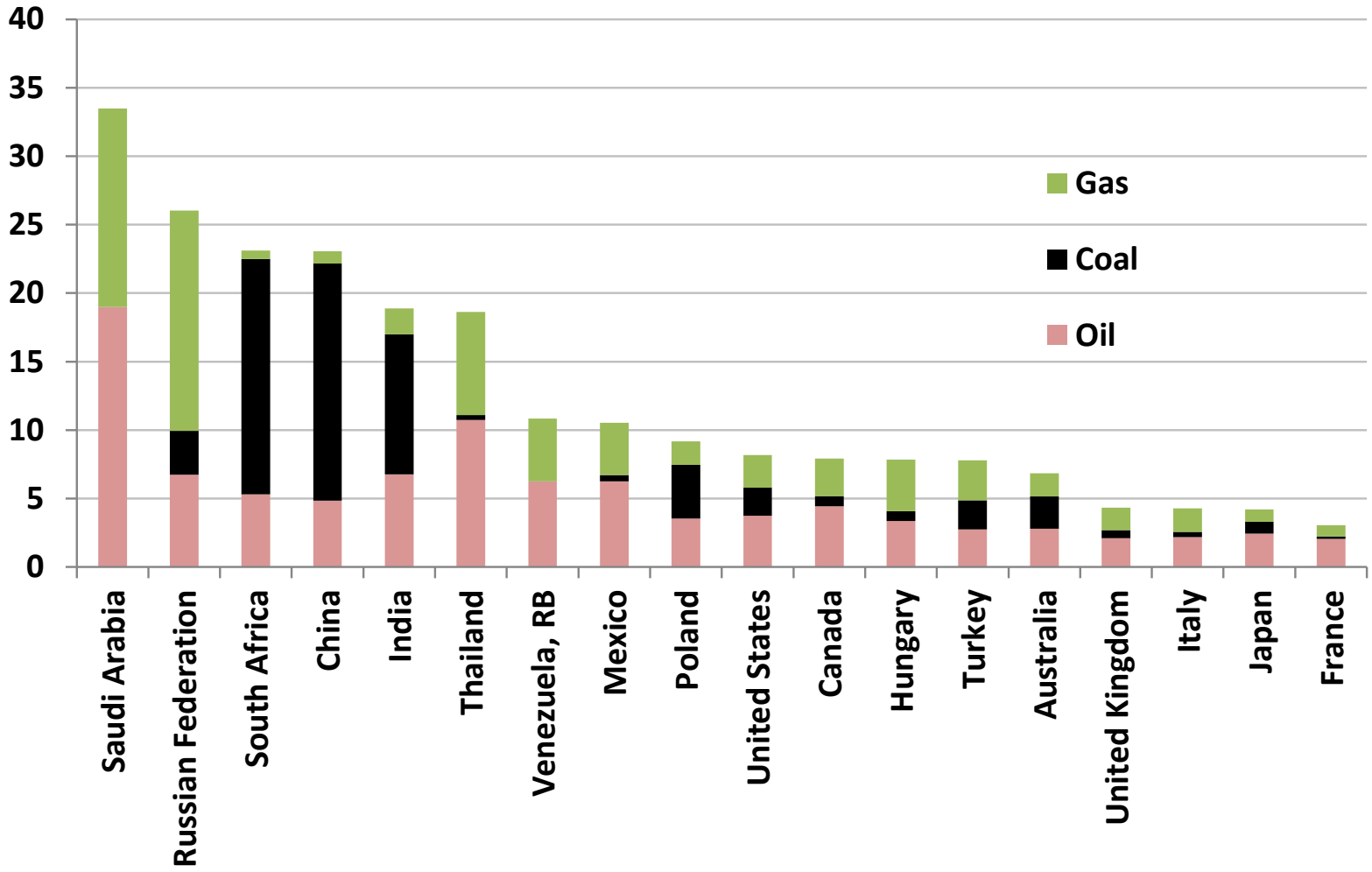
**Consumer surplus as a % of GDP**

*%, 2009 data*




Sources: Serletis, Timilsina, and Vasetsky (2009), BP (2011), Wie et al. (2011) data.worldbank.org/indicator, CCPI

# Combining the producer and the consumer sides gives interesting and potentially useful results

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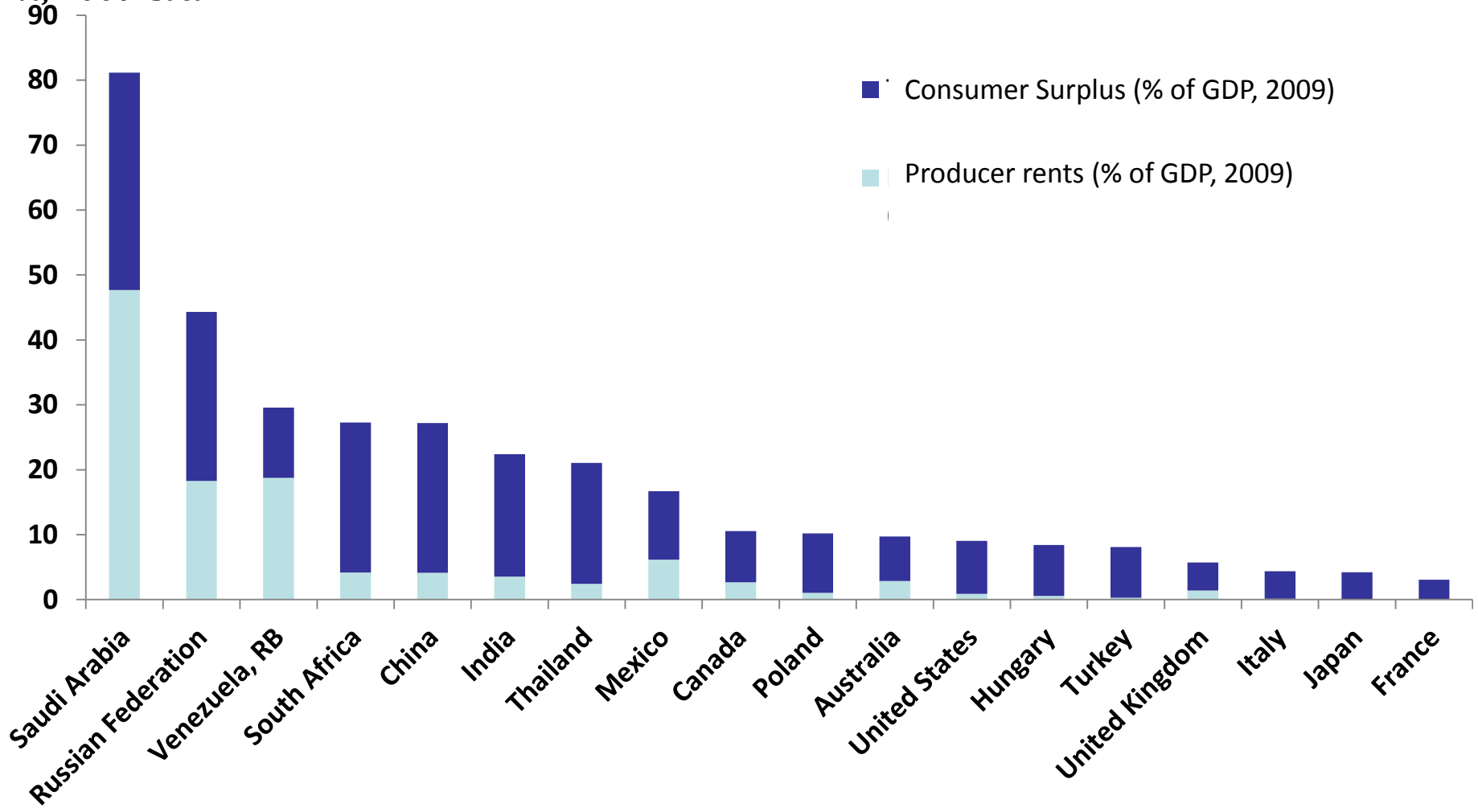
**Total fossil surplus and rents as a % of GDP**

*%, 2009 data*




Sources: Serletis, Timilsina, and Vasetsky (2009), BP (2011), Wie et al. (2011) data.worldbank.org/indicator, CCPI

# Climate Change Performance Index (CCPI)

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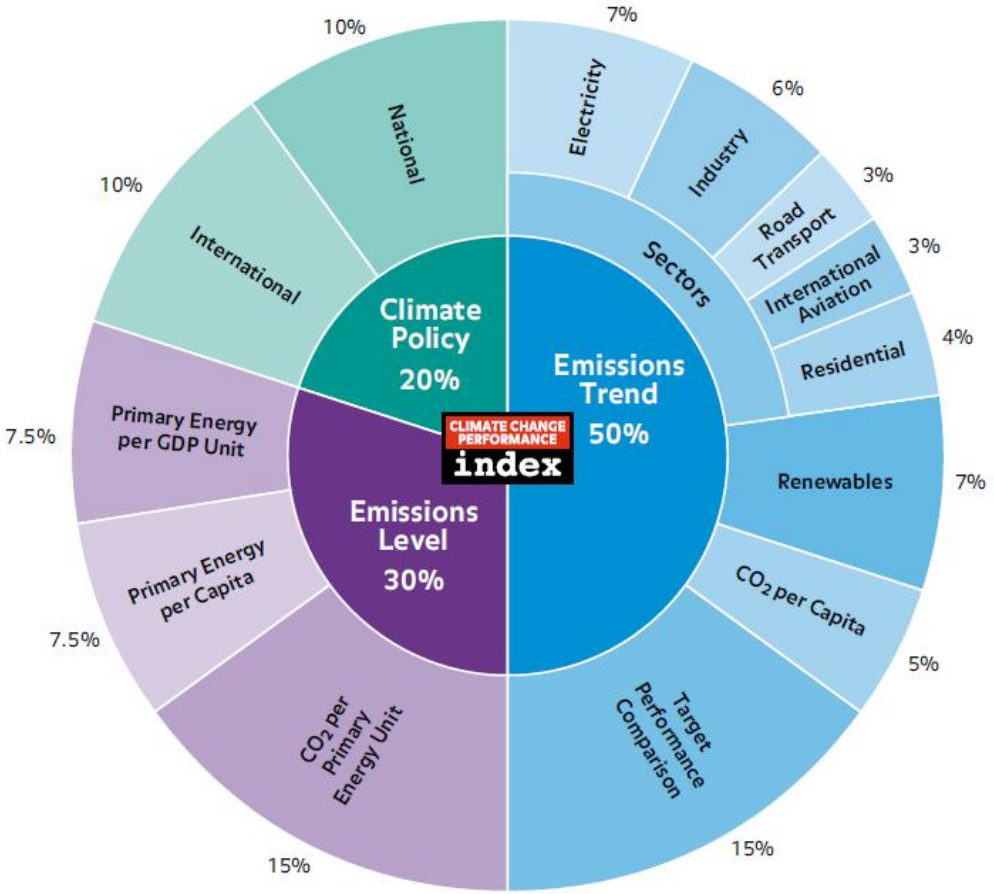
- Uses 13 different composite indicators
- 3 main categories : Emissions Trend (50%), Emissions Level (30%) & Climate Policy (25%)




Source: Climate Change Performance Index (CCPI) - http://germanwatch.org/klima/ccpi-meth.pdf

# Climate Change Performance Index (CCPI)

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- Isolate the "Climate Policy" category as a measure of "climate ambition"
- Equal weighting of "International Policy" and "National Policy"
- Based on research of 200 climate change "experts" on international and national policy
- Including performance at international conferences (e.g. UNFCCC conferences)
- Essentially a rough measure of government willingness to tackle climate change through political collaboration

Sources Climate Change Performance Index (CCPI) - http://germanwatch.org/klima/ccpi-meth.pdf

# Countries with greater producer & consumer fossil surplus p.p. may → weaker ambition?

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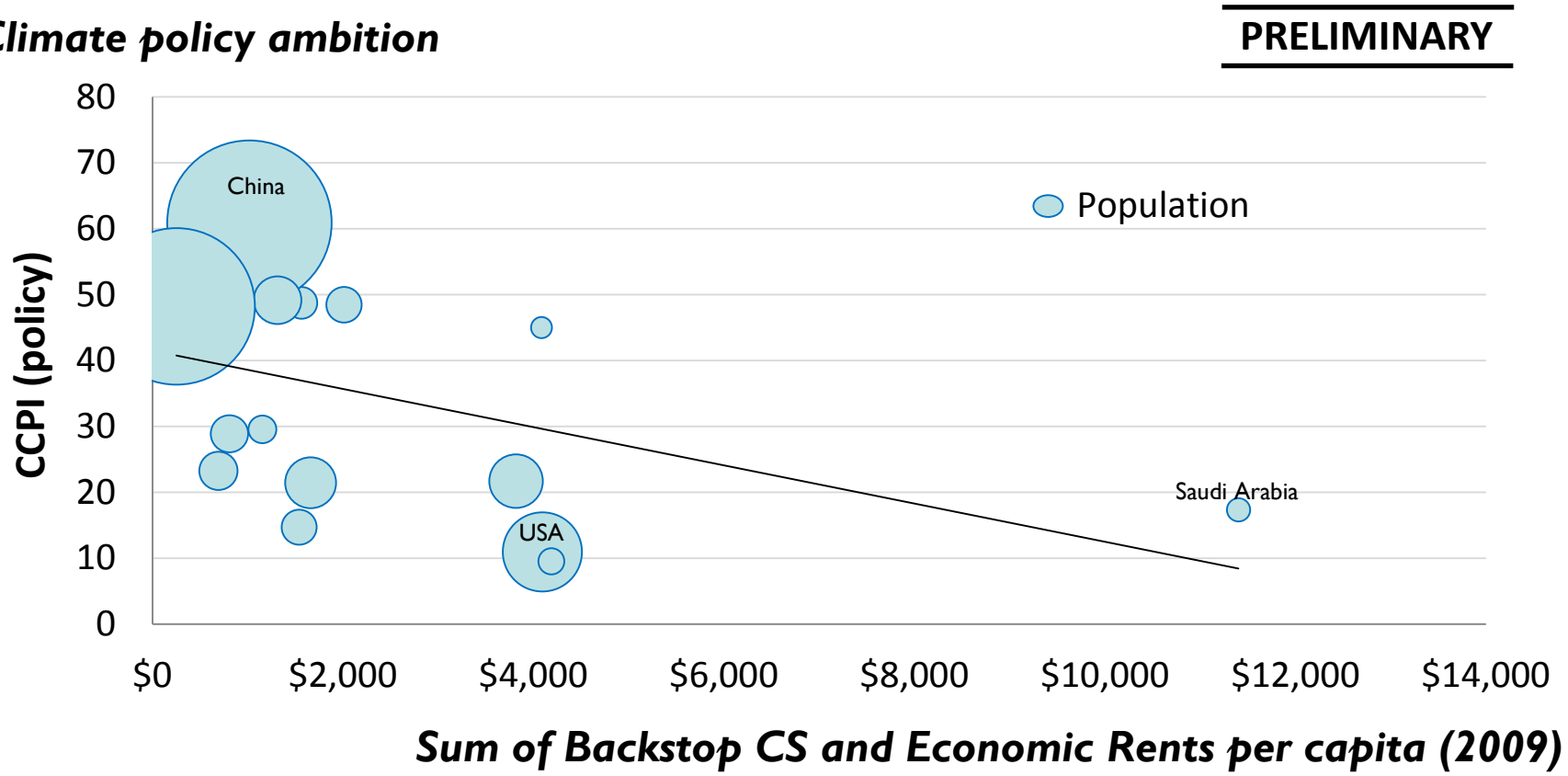


Sources: Serletis, Timilsina, and Vasetsky (2009), BP (2011), Wie et al. (2011) data.worldbank.org/indicator, CCPI

# Similarly, greater producer & consumer fossil surplus as a % GDP may → weaker ambition?

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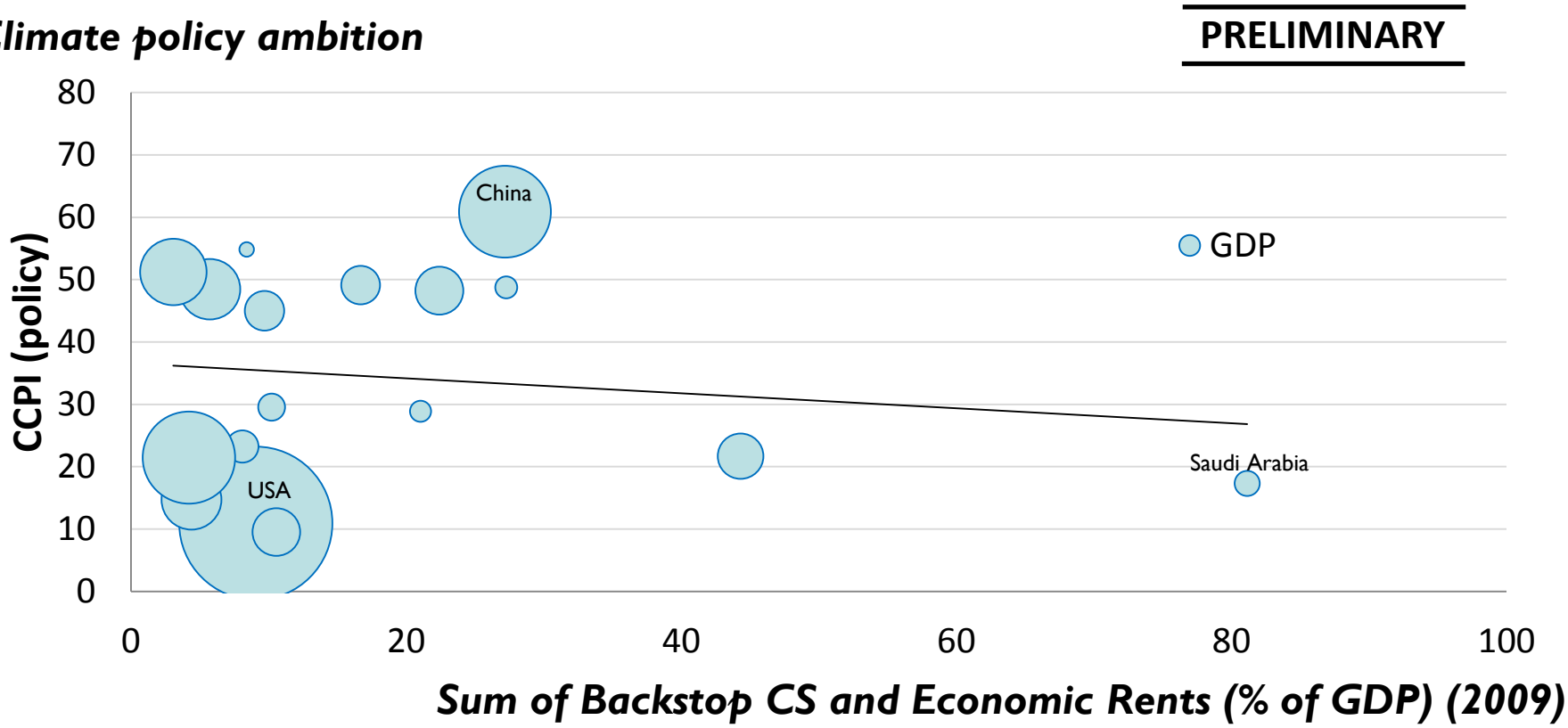


Sources: Serletis, Timilsina, and Vasetsky (2009), BP (2011), Wie et al. (2011) data.worldbank.org/indicator, CCPI

# On the producer side, political rent-seeking strategies can take several forms

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Most of them represent an application of principal-agent theory – distort the objectives of the agents to capture rents of the principal, by:

1. **Direct bribery:** Illegal, yet still occur both in OECD and non-OECD
2. **Political donations:** Surprisingly legal, given the manifest distortions created
3. **Revolving door:** Former ministers leave office to serve on boards of companies with interests in their successors political decisions
4. **Distort information provision:** Use trade bodies to provide suitable data sets to government decision-makers

# Sites like dirtyenergymoney.com suggests a serious problem with capture (in the USA)

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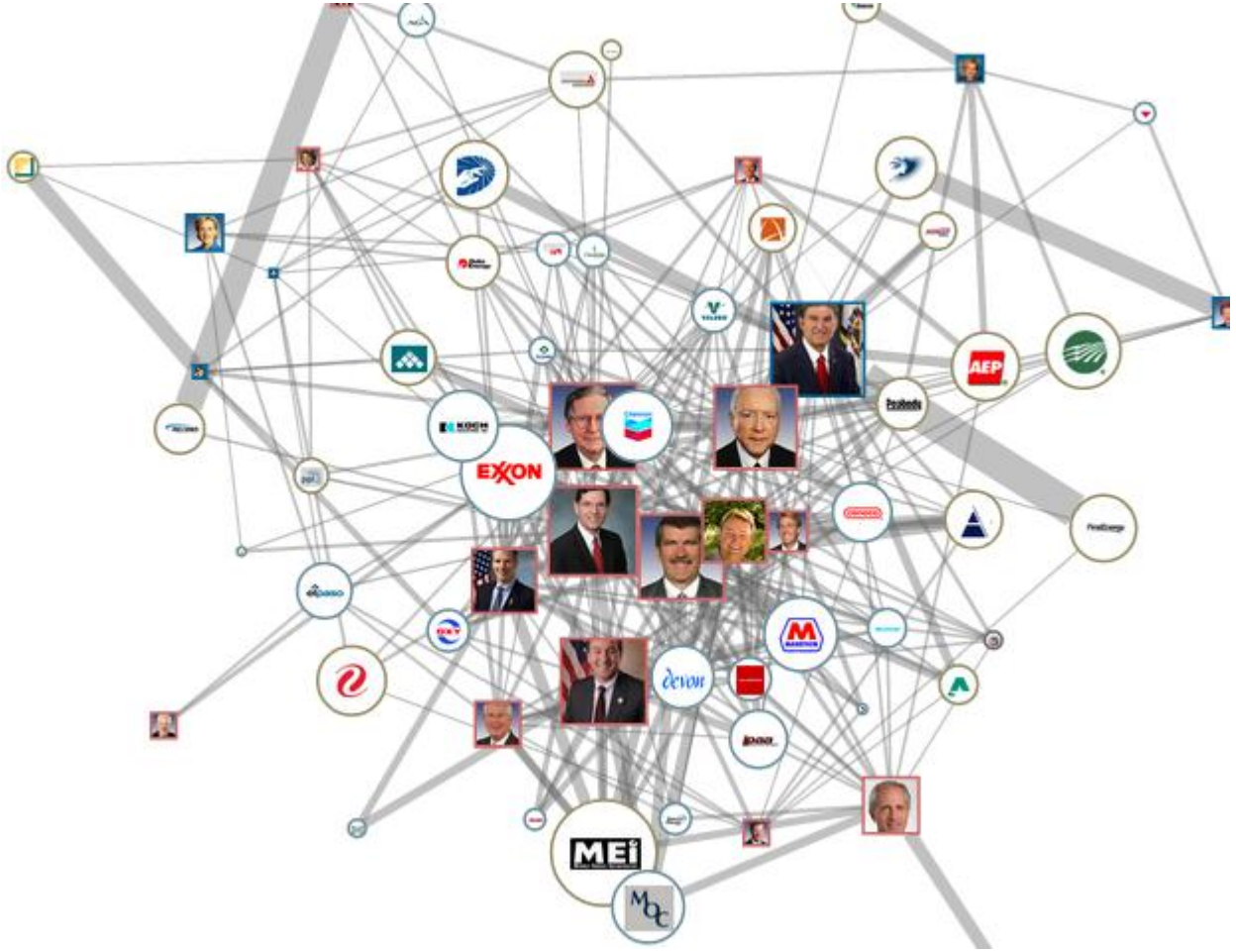


Source www.dirtyenergymoney.com

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# A "green transition" could create rents / surplus in four different ways



**Producer surplus**

1. **Resource rents**, accruing to owners of valuable sites, such as windy or sunny sites, potentially close to large sources of electricity demand (depending upon the evolution of energy transport costs)
2. **Rents from product and process innovation** along the clean energy supply chain, both fundamental R&D and the business models needed to roll out clean technologies at scale (e.g. *project developers*)

**Consumer surplus**

1. Consumers able to access **cheaper energy**
2. **Reduced local externalities** (noise, pollution, health risks, safety risks)

# Global insolation maps suggest that Africa and Australia are well-endowed with solar resource

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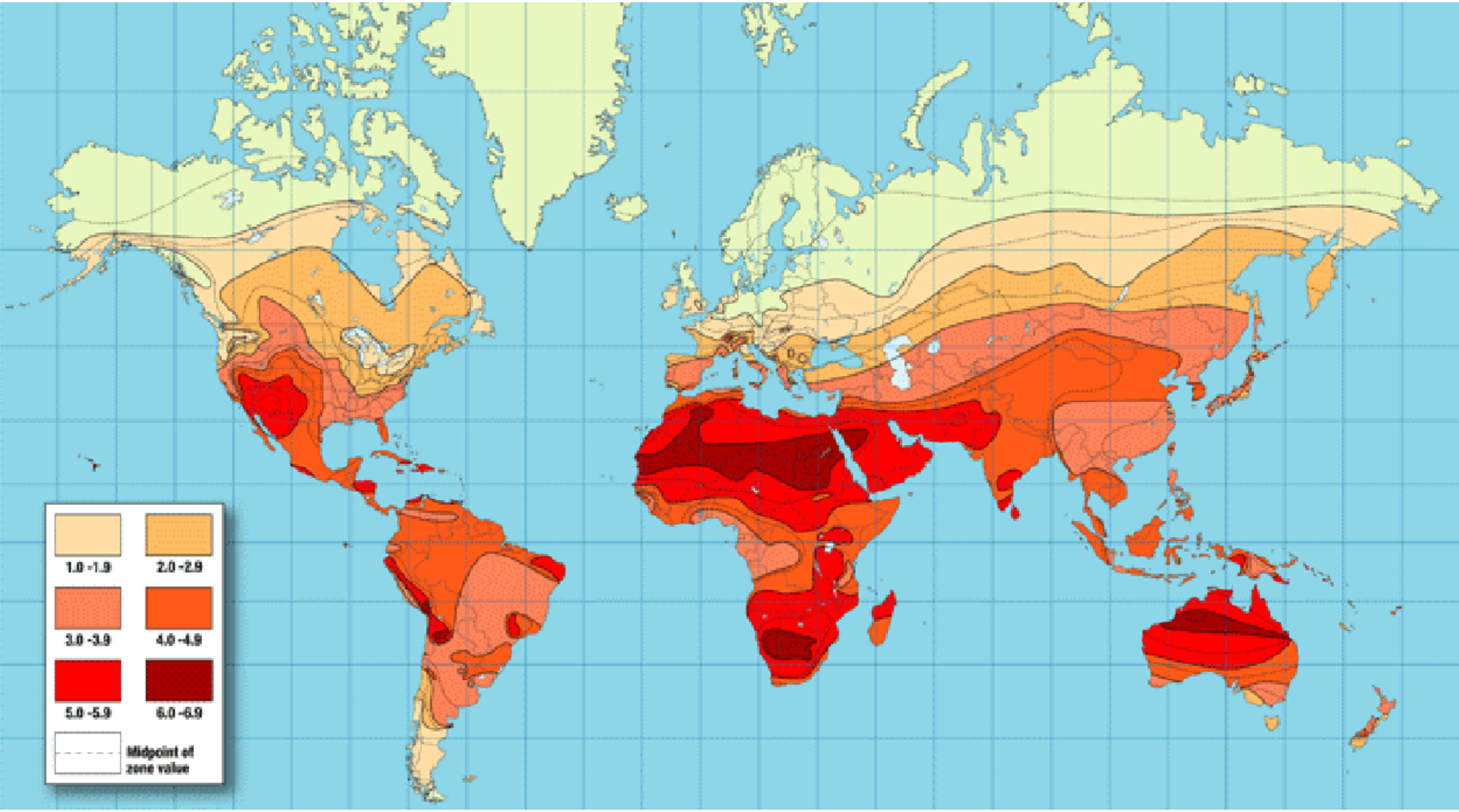


Source: Solar Energy Center/University of Central Florida

# And yet there are far more solar installations in Europe and the USA

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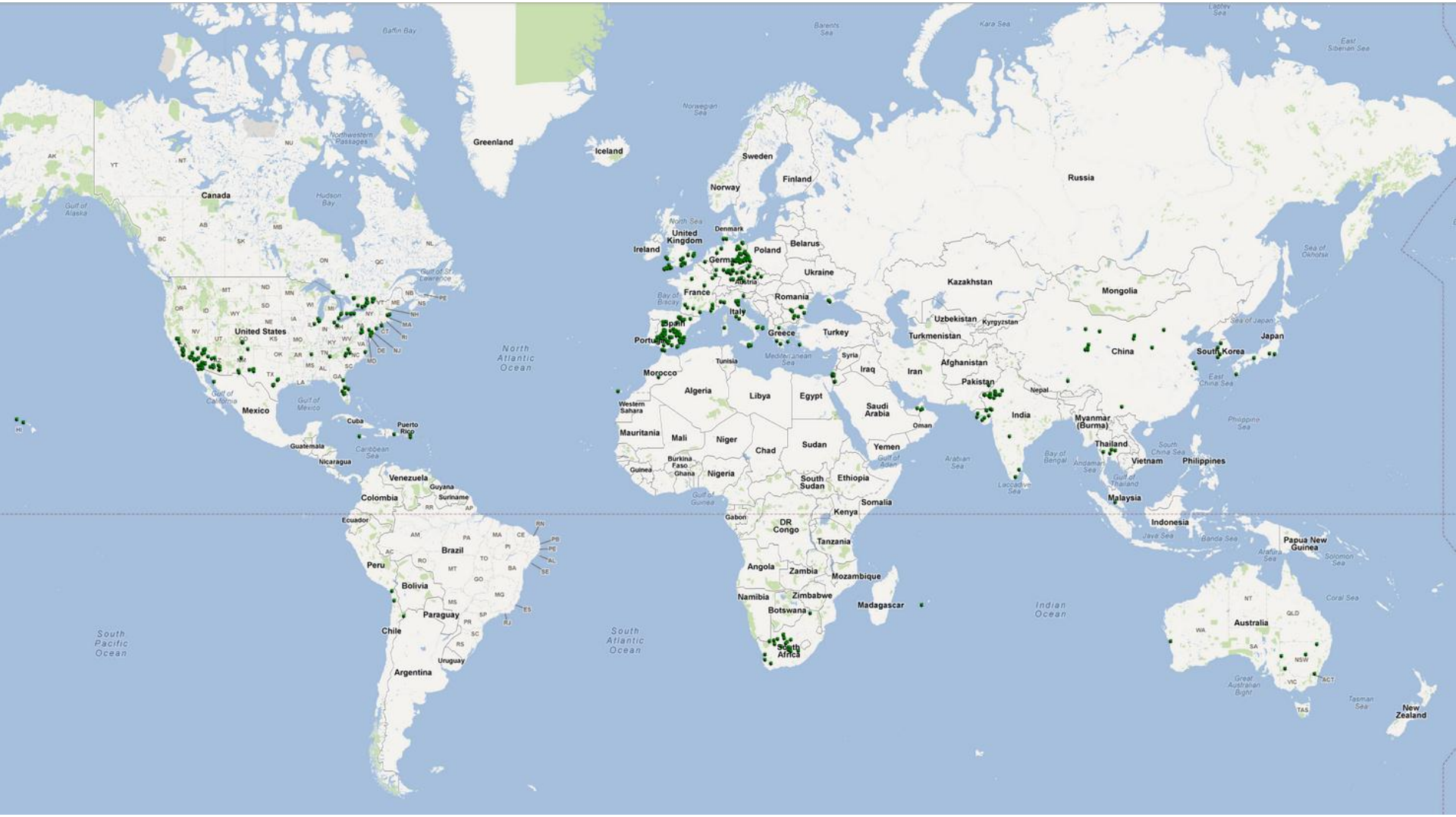


Source: WolfeWare - http://wolfeware.co.uk/Solar_Parks/Mapping.html

# A combined map shows the global irrationality of current solar policy

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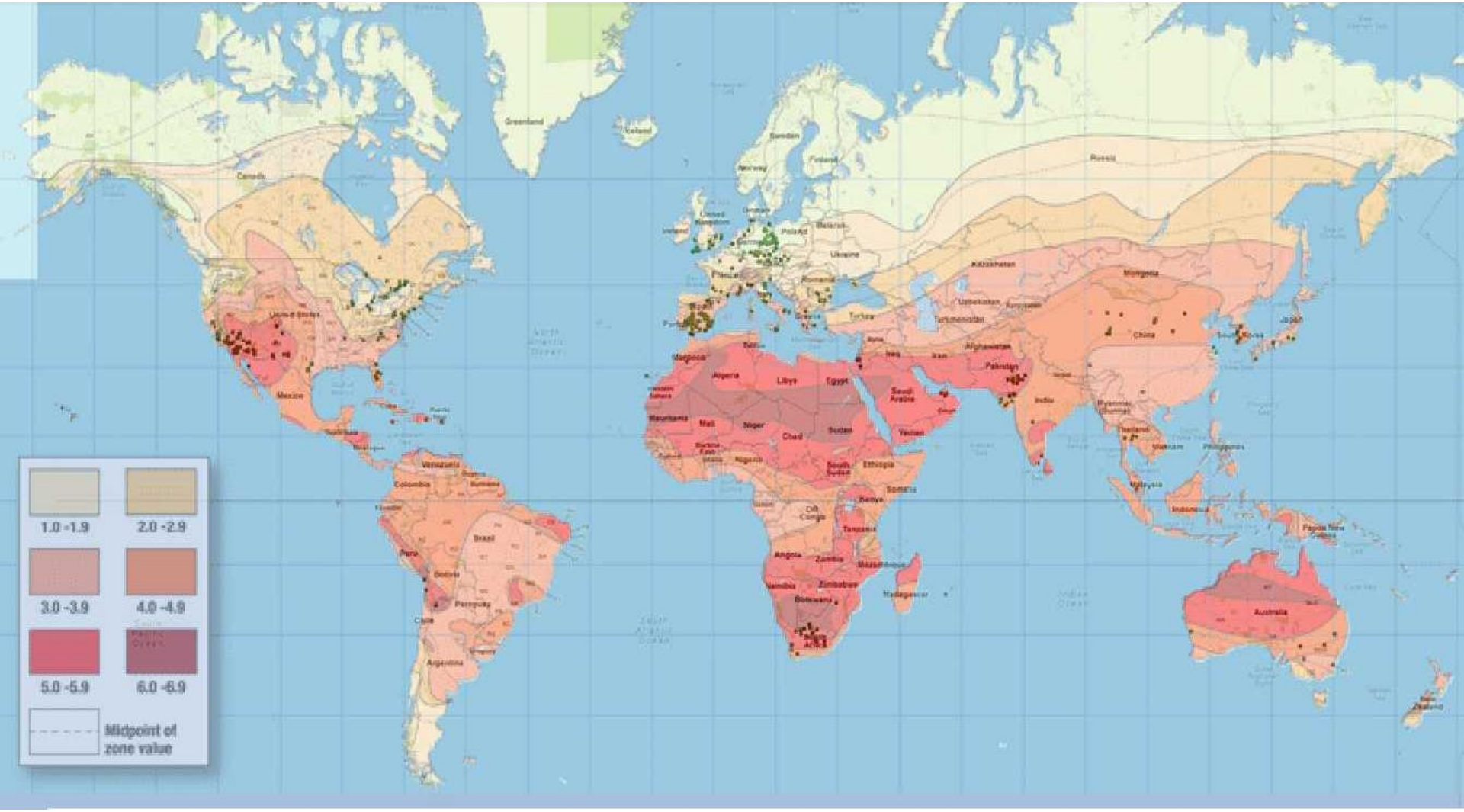


Sources: Solar Energy Center/University of Central Florida, WolfeWare - http://wolfeware.co.uk/Solar_Parks/Mapping.html

# The story in wind is not dissimilar – turbines are installed where the policy is, rather than the wind

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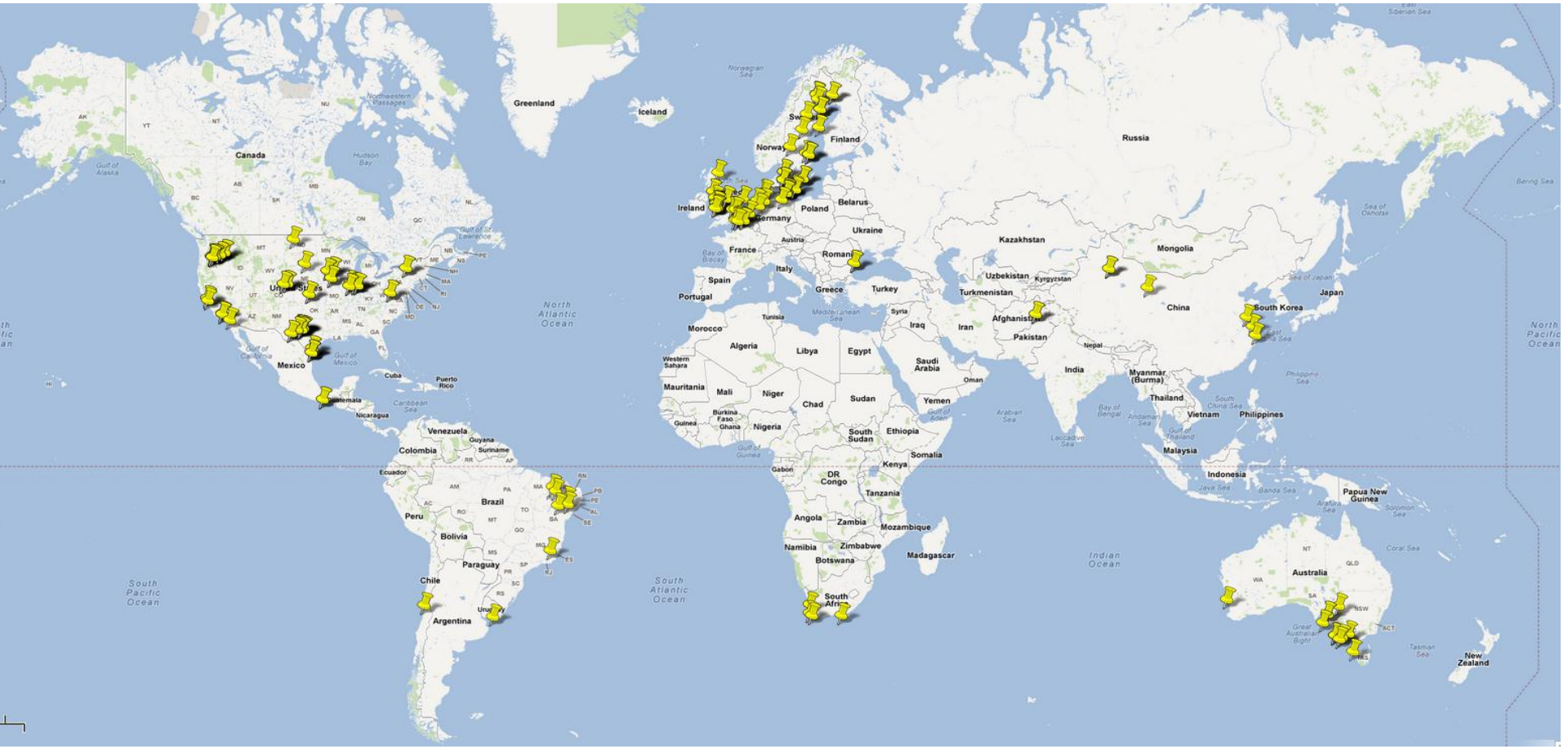


Source: Wikipedia + Google Earth/Maps Coordinates

# North Africa has very strong potential which is not being exploited

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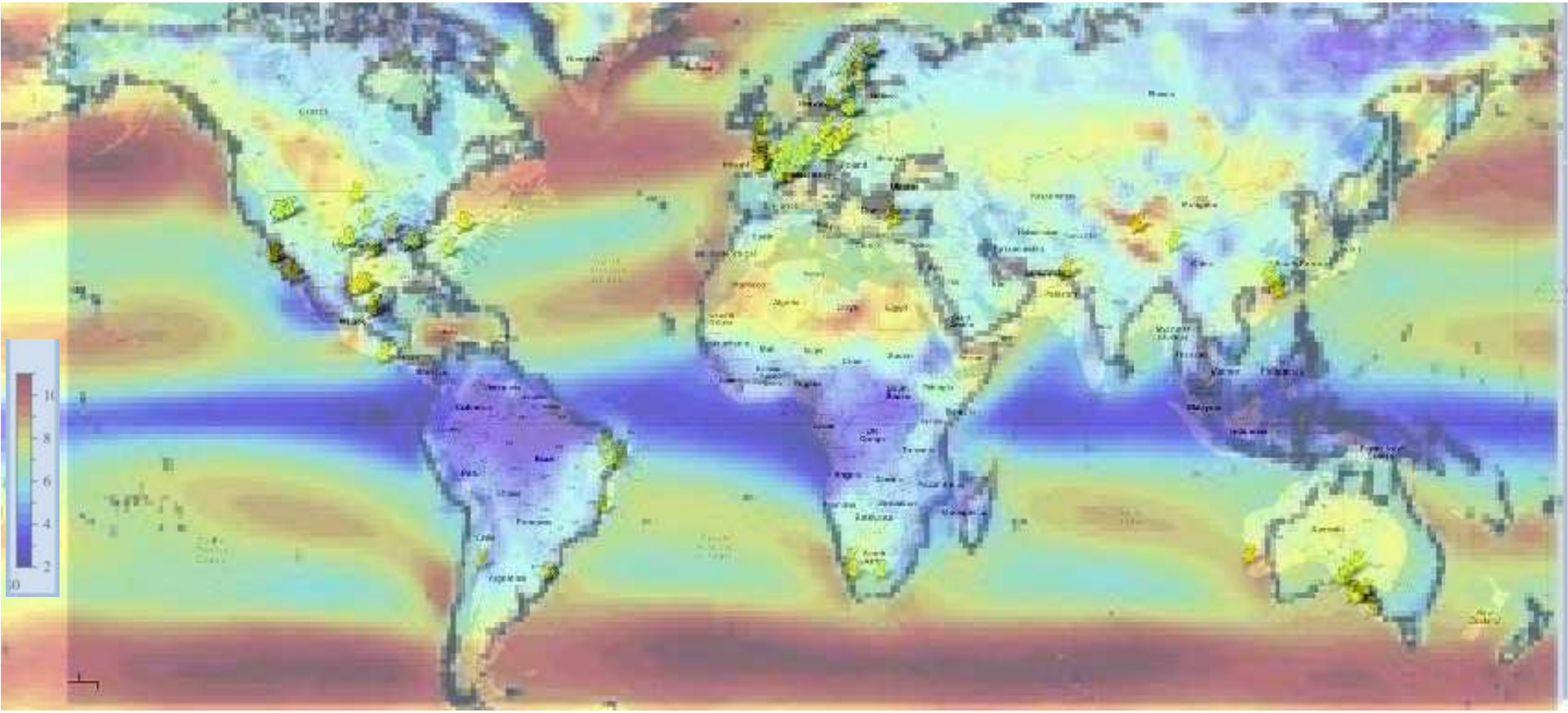
**Average annual wind speed 100m above topo**

Global average: 7.0; Land average: 6.1; Sea average: 7.3



Source: Wikipedia, Google Earth/Maps Coordinates, Jacobson & Delucchi (2010)

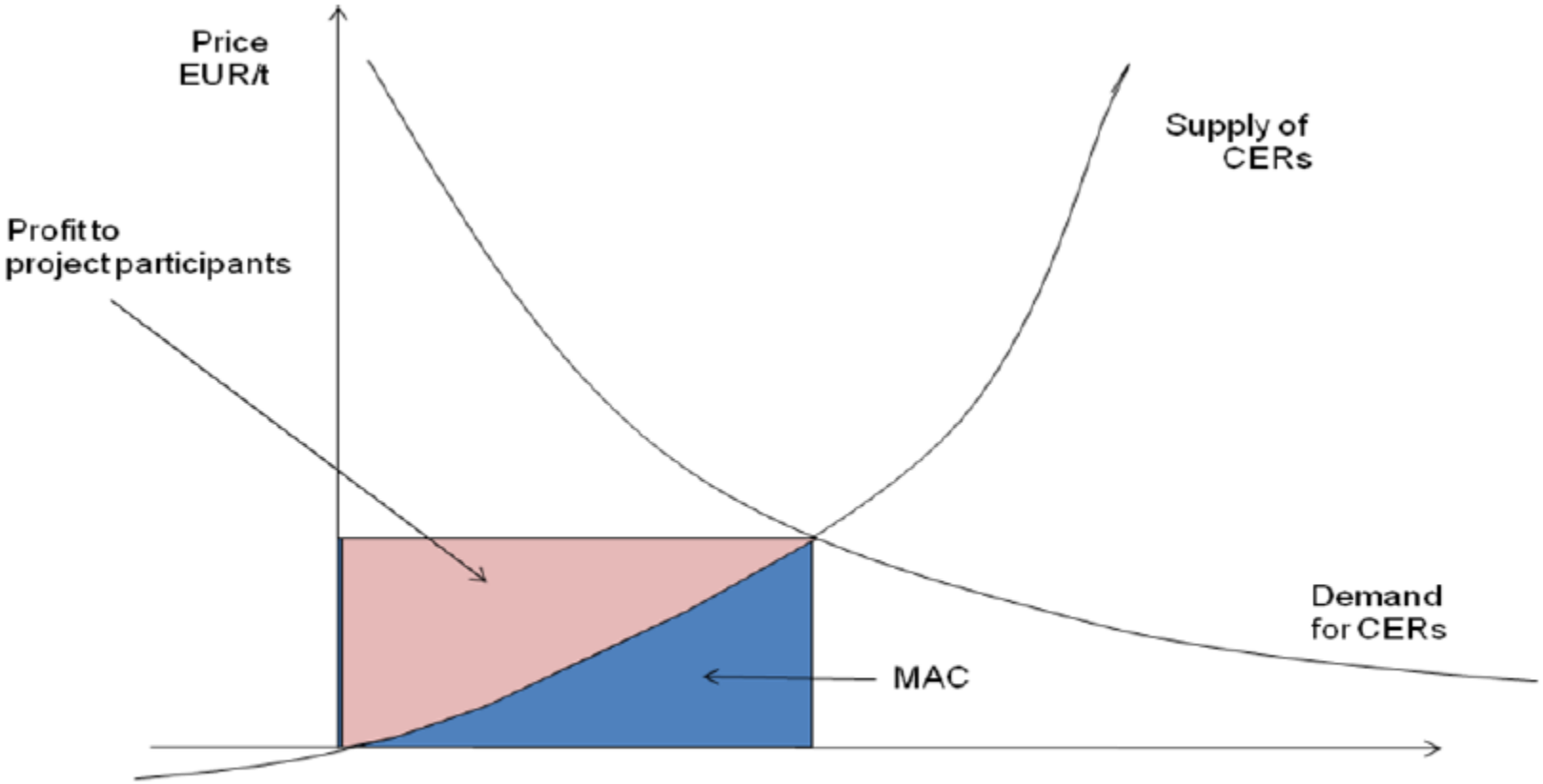
# The CDM provides an early case study of how markets deliver profits to low-cost providers



- **Additionality** did not require minimisation of rents
- The market was used, so cheap emission reductions (e.g. HFCs) achieved large-scale profits
- Given scarce resources, was this a sensible use of funds? Or should HFCs been addressed in a side-deal?
  - Would we have eliminated HFC emissions otherwise…?
- On the other hand, this is precisely how every market works….

# When markets are used to find / reward emissions reductions, lower-cost sources make profits

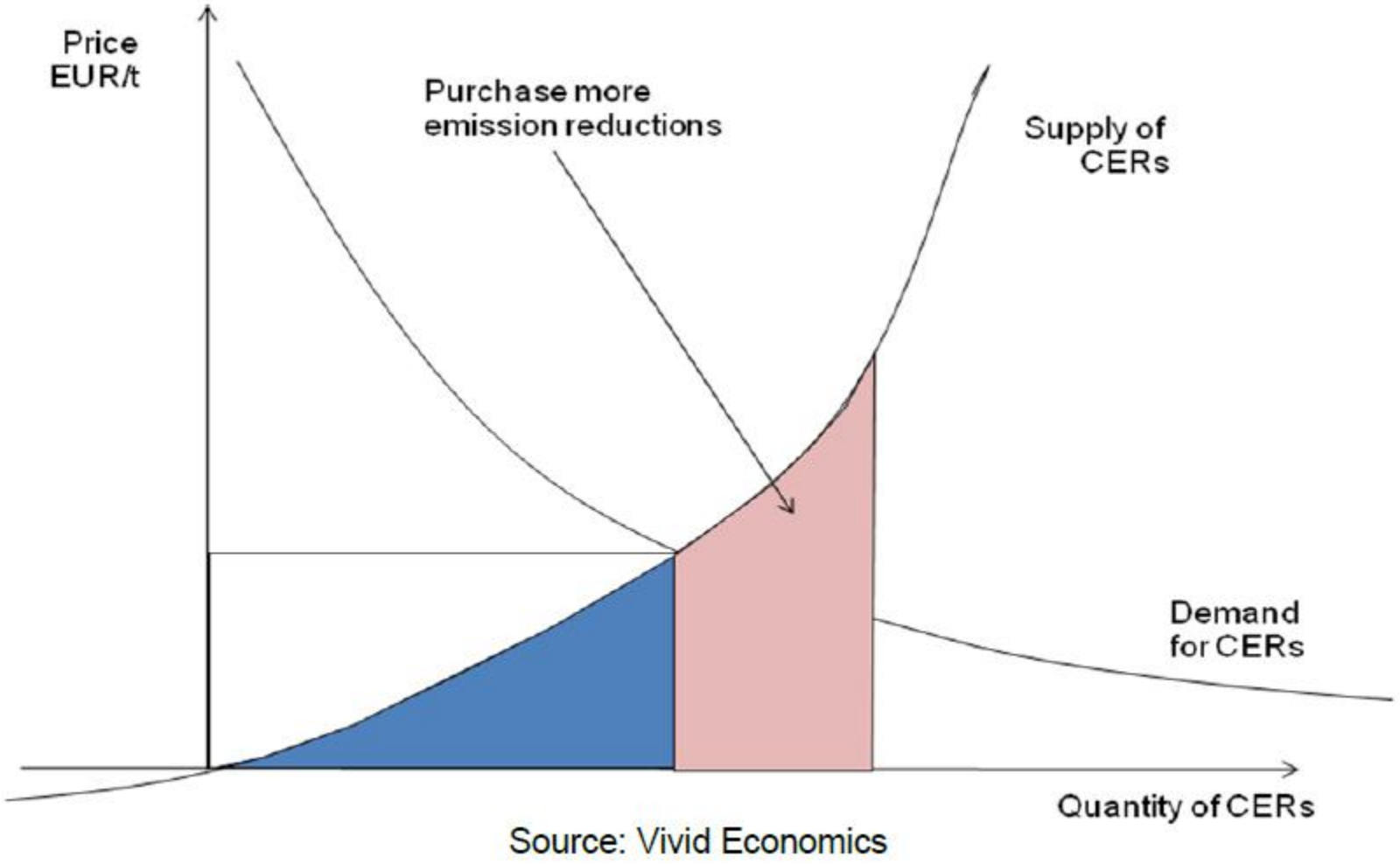





Source: Vivid Economics

# Some degree of price discrimination can reduce profits and purchase more emissions






Source Vivid Economics (2008)

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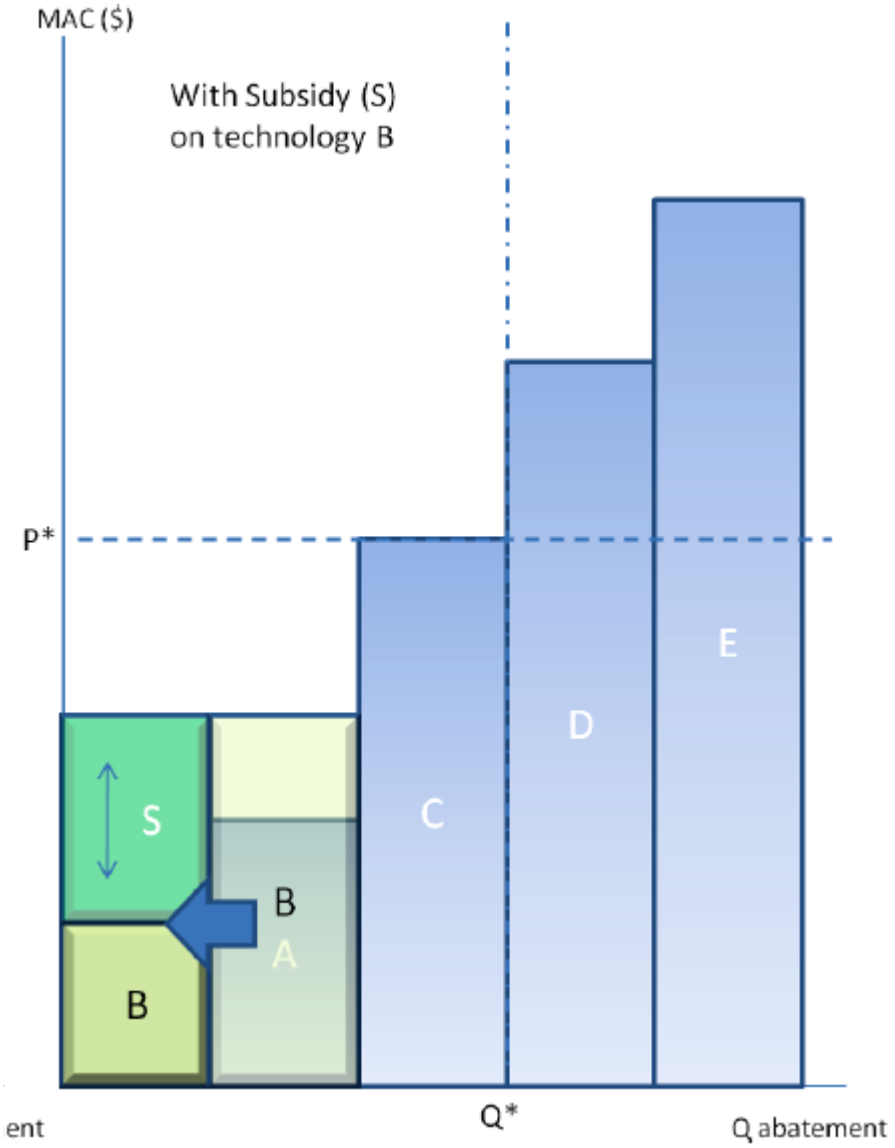
# A subsidy for technology B merely channels rents to technology B without reducing emissions






Source Fankhauser,, Hepburn and Park (2011)

# A subsidy to technology E achieves nothing at all and is a waste of government time and effort

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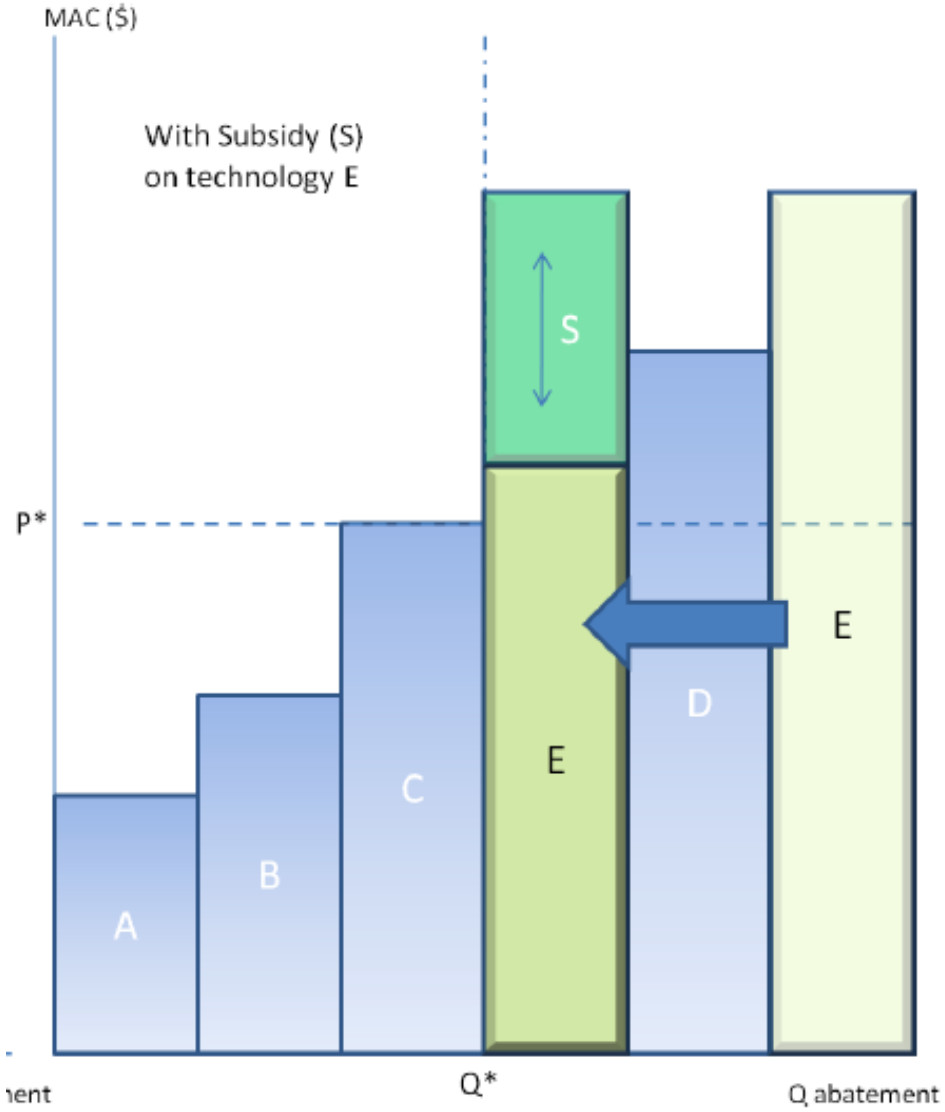


Source Fankhauser,, Hepburn and Park (2011)

# A subsidy to D will displace cheaper abatement, increasing overall social costs

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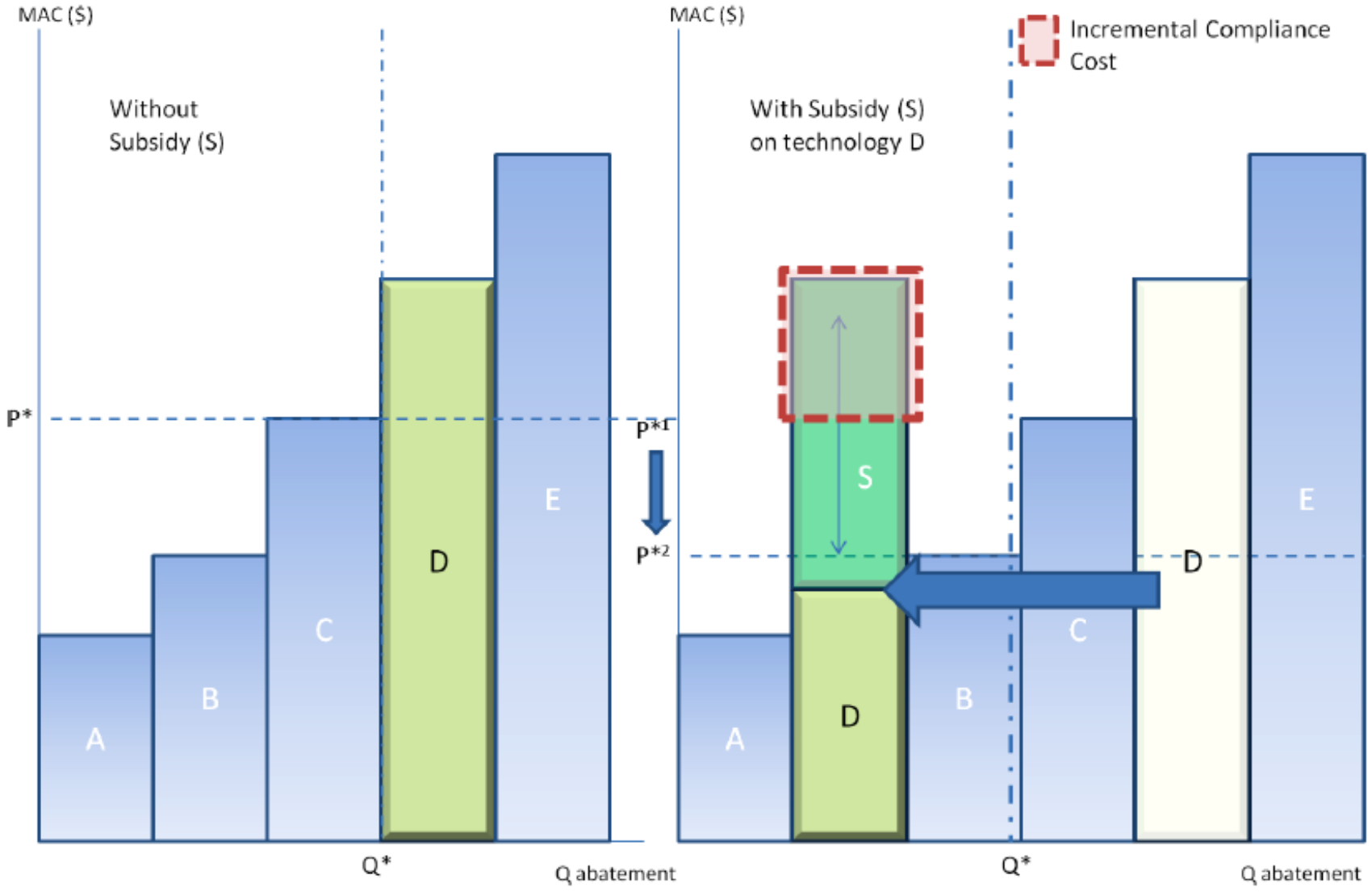


Source Fankhauser,, Hepburn and Park (2011)

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# Could countries with fossil rents be paid off with climate rents? It would seem not.

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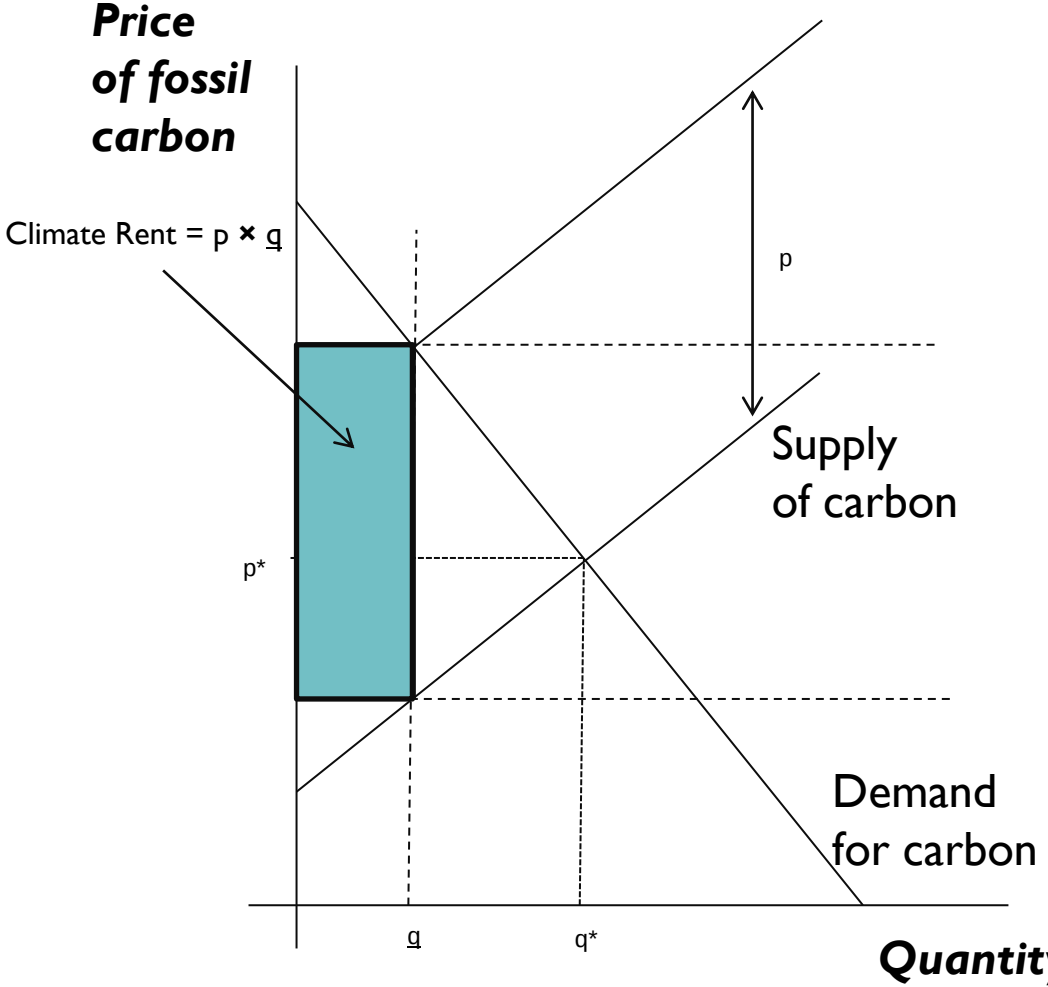


**ILLUSTRATIVE**

- Consider a world cap on cumulative $CO_2$ emissions at level $\underline{q}$ (e.g. 1000GT)
- Using a $CO_2$ permit allocation system constrains supply of $CO_2$
- Collect revenues from auctioned permits to extract "climate rents"
- But "climate rents" are a fraction of the total producer and consumer surplus

# Both fossil and clean rents are important, but the fossil rents are **much** larger

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- In the zeal to ensure that we don't make the same mistakes in clean energy, we need to ensure that things are kept in perspective
- Fossil fuel rents and subsidies still far exceed clean energy rents and subsidies

# From a political economy perspective, some clean energy profits may be desirable

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- Necessary transition to climate change involves overcoming powerful vested interests created by those rents, and minimising the creation of a new industry extracting rents in similar fashion
- Losers are present, identifiable and powerful
- Winning industries do not yet exist, winning individuals (from avoided climate impacts) may not yet be born, and are certainly not powerful
- So although benefits outweigh costs, at present the losers (alive and powerful) outplay the winners (not yet alive and/or weak)
- Some limited role to tolerate some rents to flow to the clean energy sector

# How to proceed?



- Start with an accurate understanding of the current and potential future scale of the problem
- Two key problems, and objectives
  - Reduce existing fossil rents, which are unproductive
  - Minimise "green pork barrel", while accepting that some profits are required in green sectors to encourage entry, but also take care to avoid "rent addiction"
- A degree of "rent replacement" for fossil players may help
- But eventually either (i) the transformation must be forced through by majority (not unanimous) voting and/or border carbon adjustments; or (ii) clean energy needs to become cheaper than fossil energy

# Policy design principles to minimise rents and capture

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1. **Create institutional credibility and independence**
   - Minimise the revolving door
   - Ensure independent agency (e.g. CCC) has staff and power to do job
2. **Avoid picking "winning" companies**
   - Use auctions or market mechanisms instead
   - Where picking winners is somewhat unavoidable (e.g. R&D), take decisions out of politicians hands
3. **Avoid complexity**
   - Increases scope for gaming and capture

# Thank you

Twitter: @camjhep