Did Paris solve the Problem?

Thomas Sterner

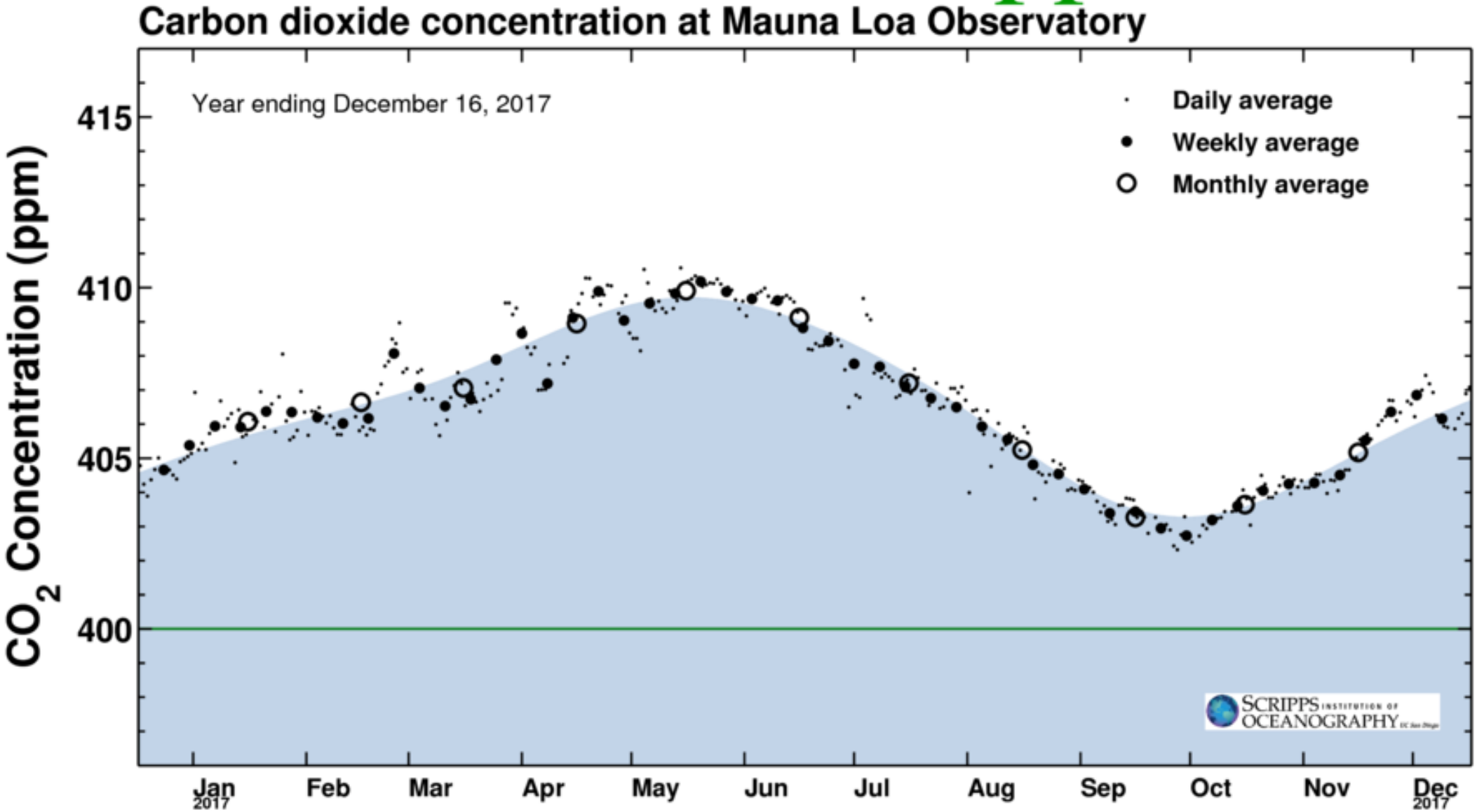
Univ of Gothenburg, EfD, EDF, ..

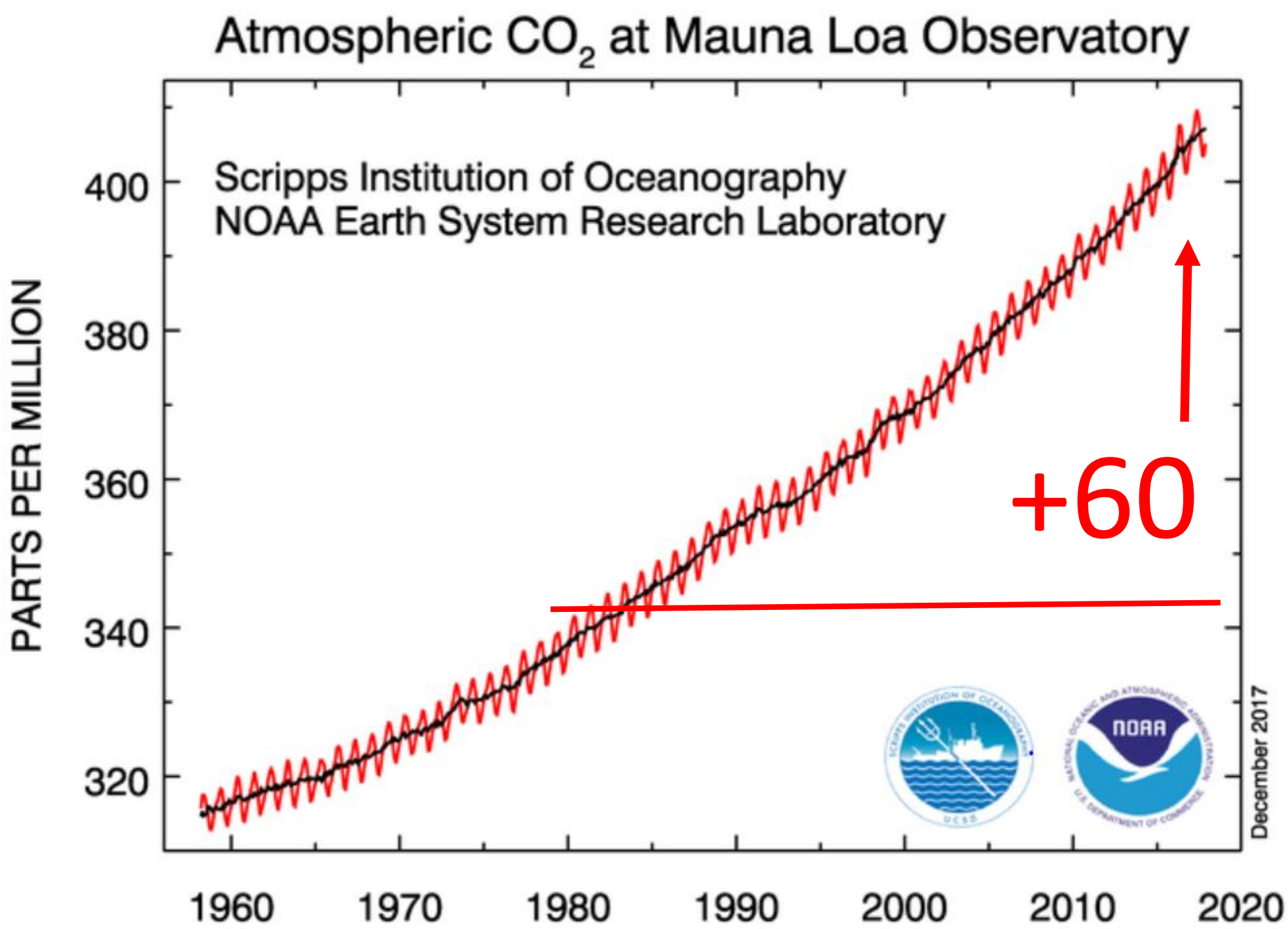

1. Climate Change & **Environment**
2. Stiglitz plenary 1%, inequality, AI – **Land**
3. **Price** on Carbon
4. Climate negotiations; **Fairness**
5. Paris
6. Technology & Green Finance

Inertia

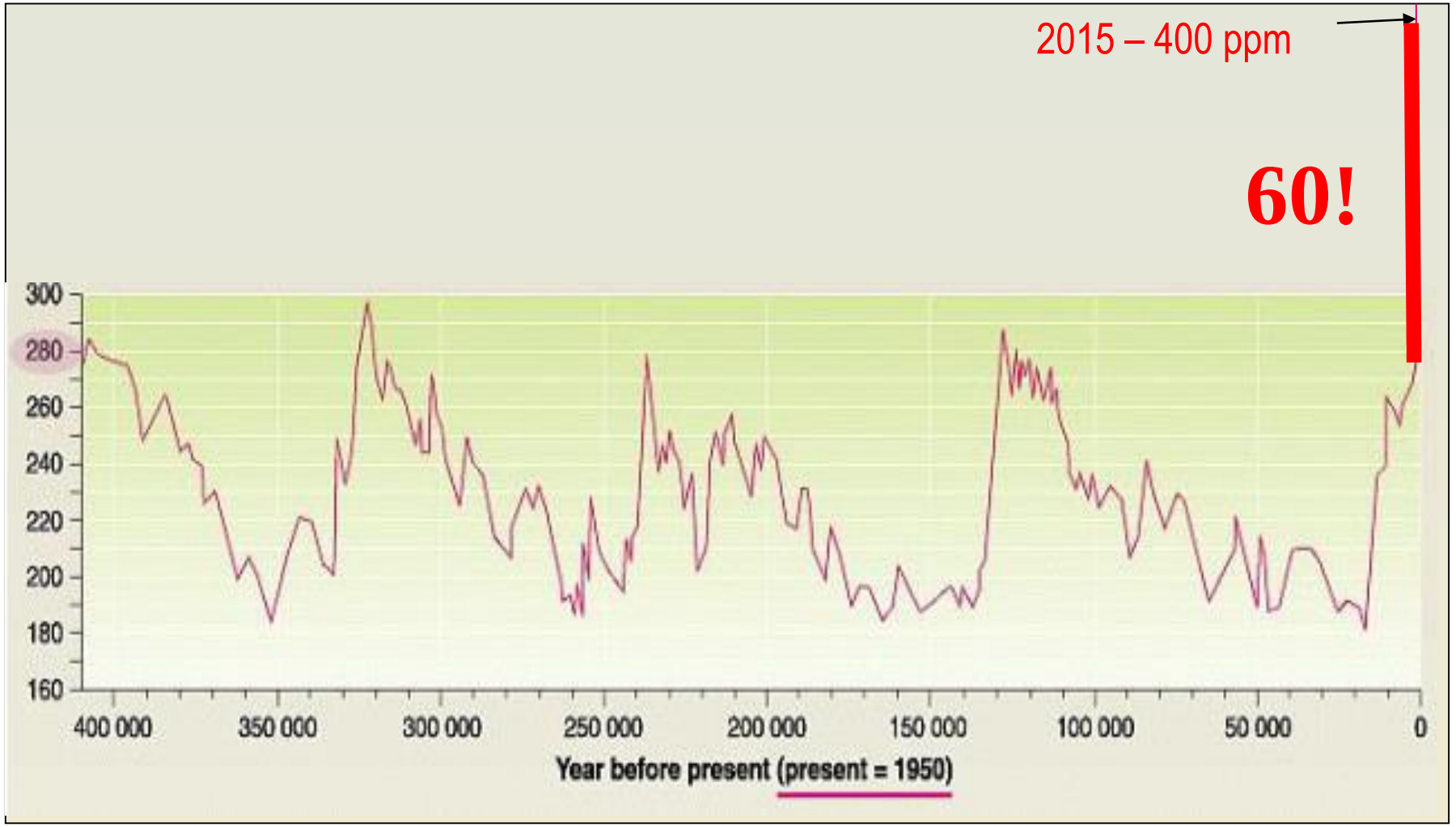
Latest CO_2 reading
December 16, 2017

407.08 ppm

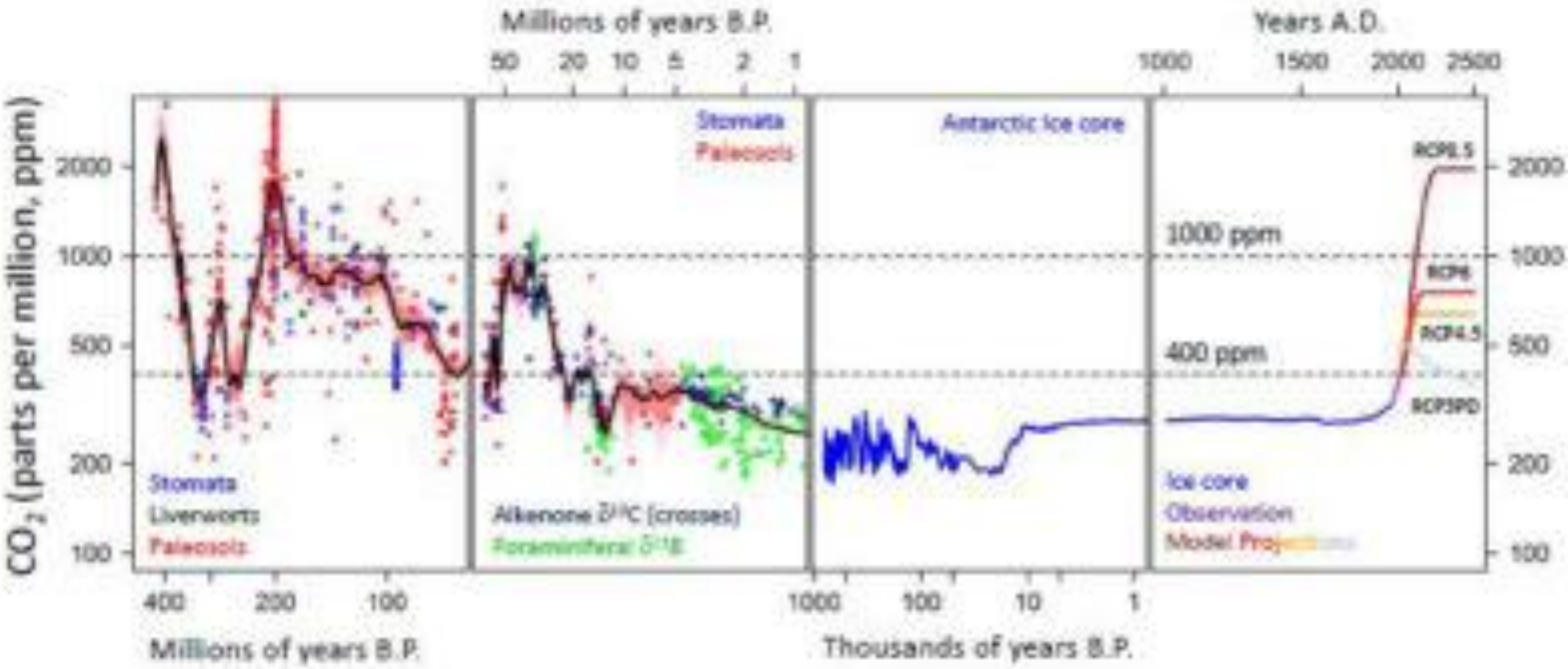



Atmospheric CO_2 at Mauna Loa Observatory
Scripps Institution of Oceanography
NOAA Earth System Research Laboratory
PARTS PER MILLION
400
380
360
340
320
1960
1970
1980
1990
2000
2010
2020
+60
NOAA
December 2017

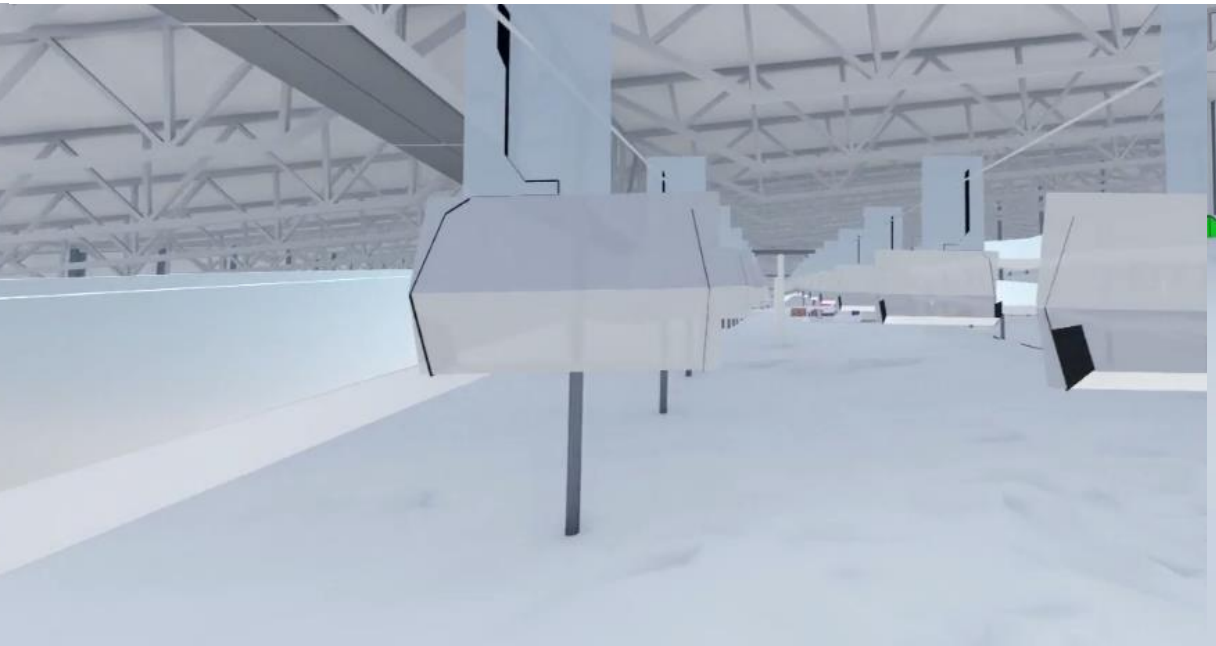
What is 400 ppm?



4 Million years ago sealevel + 25 M



OM SKIHALLEN



Death Toll in India's Intense Heat Wave Soars to Over 1,100

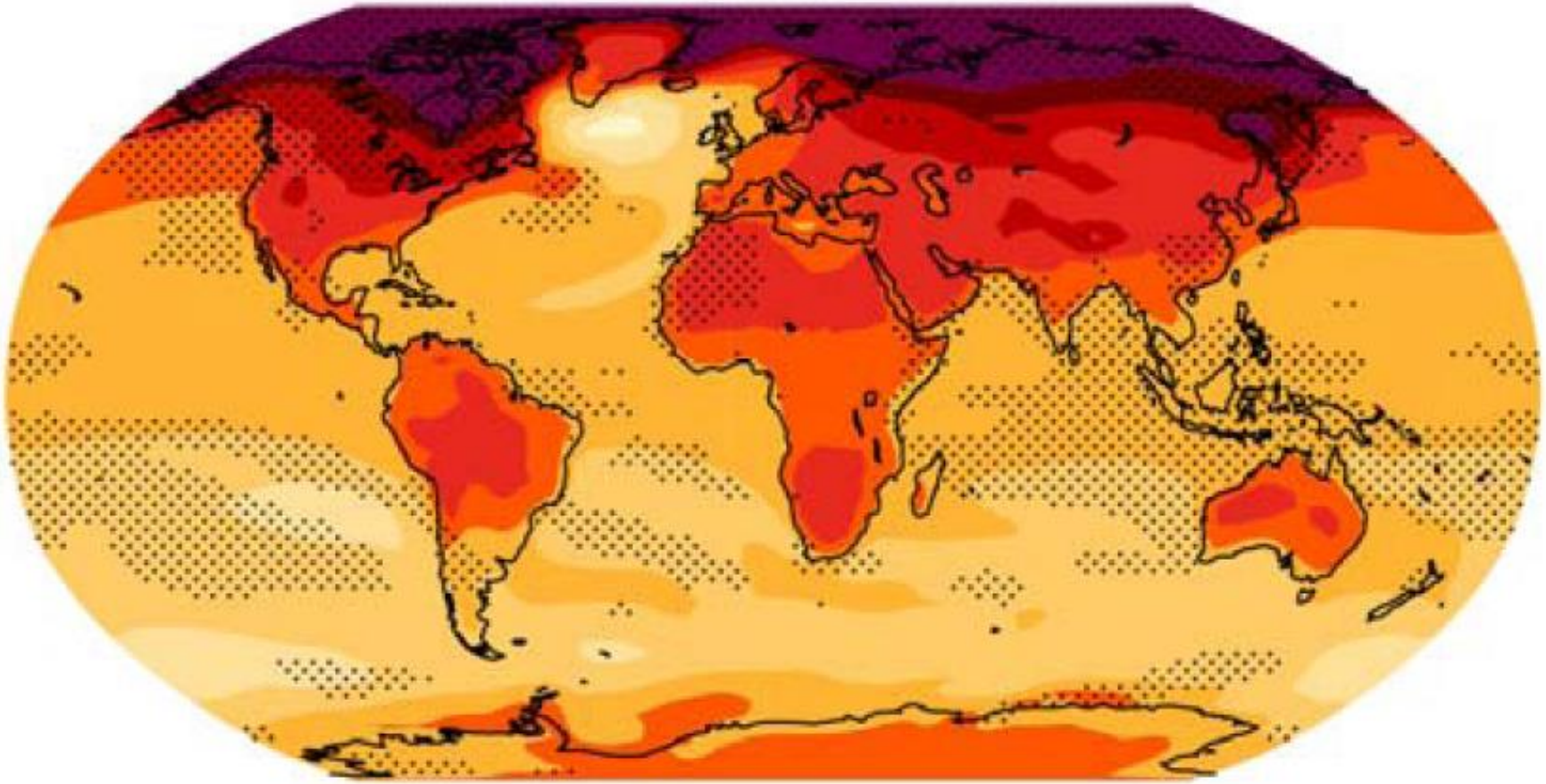
Rohit Inani / New Delhi @josefkisdrunk | May 27, 2015

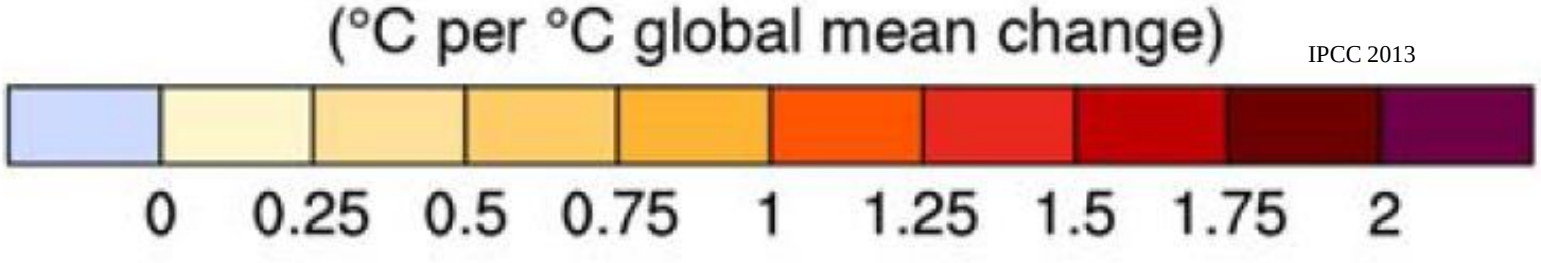
Temperatures in parts of the country have neared 122°F (50°C)

India's heat wave has now claimed over 1,100 lives, with spiking temperatures melting roads in the

Local heating in ºC

per +1ºC global average temperature





IPCC 2013

Mourning the Holocene

ECONOMICS

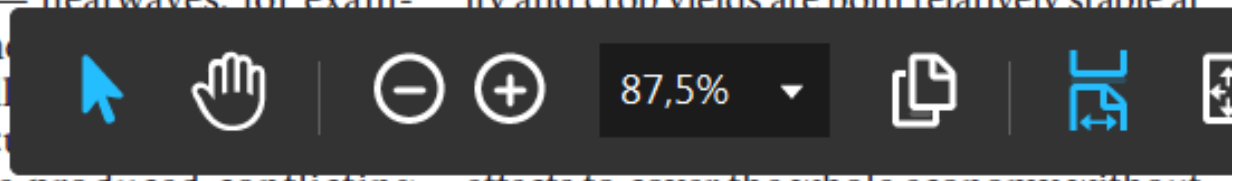
Higher costs of climate change

An attempt to reconcile the effects of temperature on economic productivity at the micro and macro levels produces predictions of global economic losses due to climate change that are much higher than previous estimates.

THOMAS STERNER

We are already experiencing the economic impacts of climate change — heatwaves, for example, are increasing h
absenteeism, as well
But attempts to calcu
temperatures have produced conflicting results, particularly between estimates at the

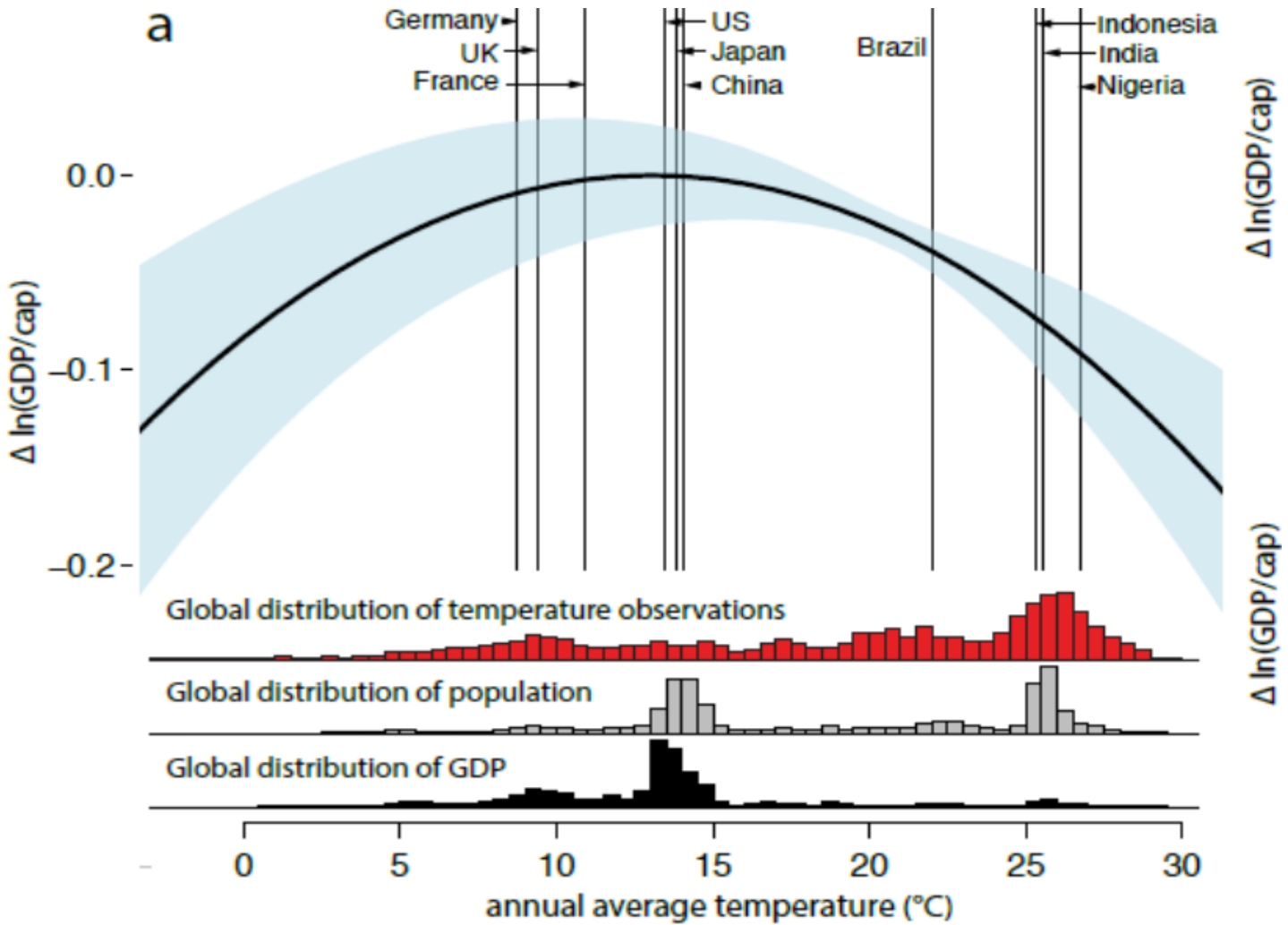
economy exhibit a highly nonlinear response to local temperature in a wide variety of countries, both rich and poor (see, for instance, refs 2 and 3). For example, worker productivity and crop yields are both relatively stable at



effects to cover the whole economy without double counting or missing vital parts. One

Global Non-linear Effect of Temperature on Economic Production

Marshall Burke,[1,2‡†*] Solomon M. Hsiang,[3,4‡] Edward Miguel[4,5]



The Impact of Temperature on Productivity and Labor Supply

Evidence from Indian Manufacturing

E. Somanathan[1]
Rohini Somanathan[2]
Anant Sudarshan[3]
Meenu Tewari[4]

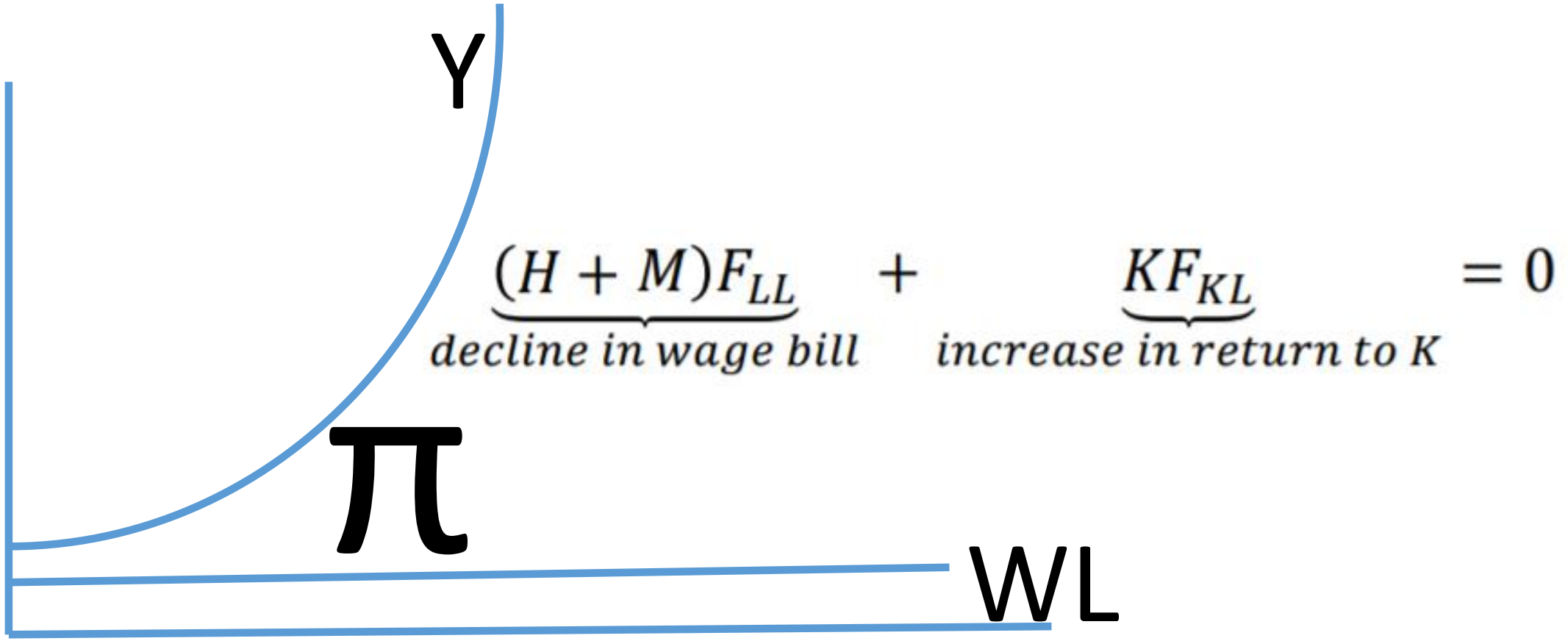
Hot days: Increasing absenteeism

Hot days: Decreasing output

Weaving, steel, diamond polishing…

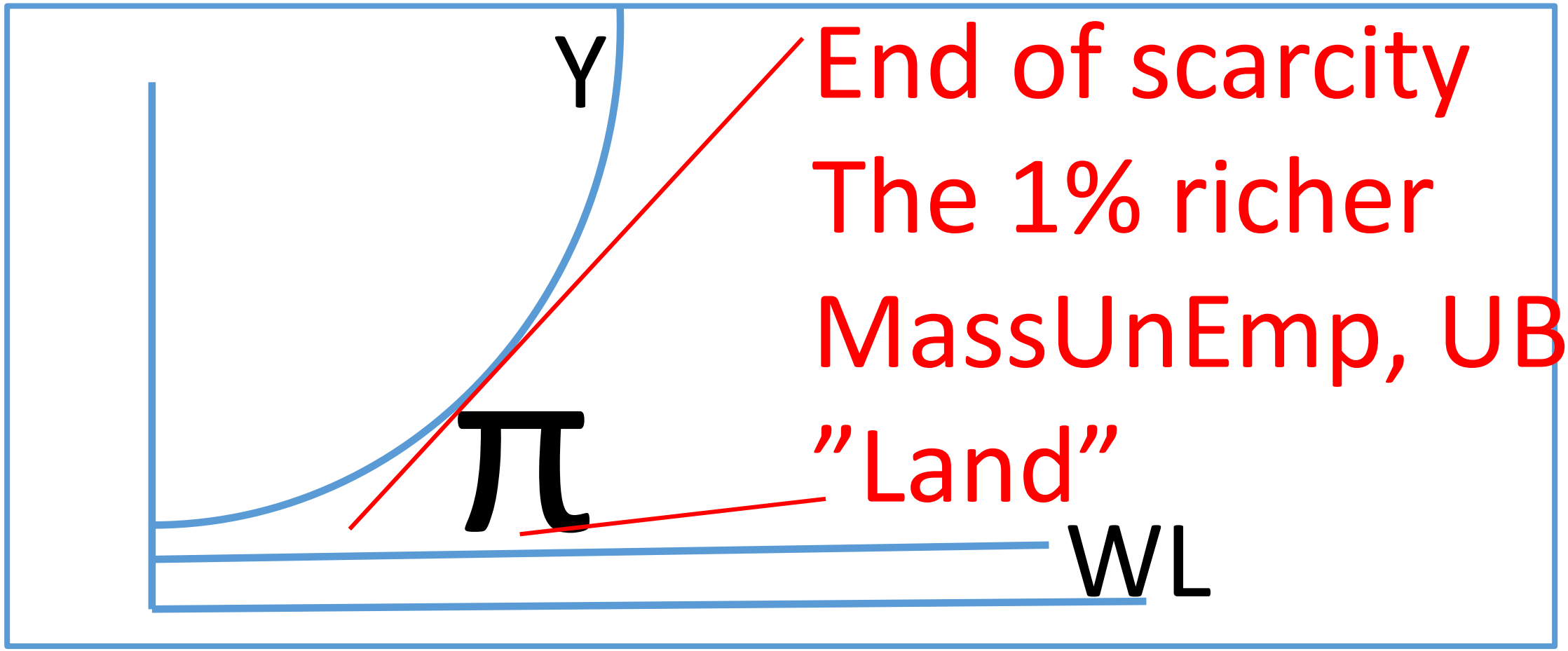
Stiglitz:

AI take-over: GDP grows, **Wages Const.**→ PROFIT



$$\underbrace{(H+M)F_{LL}}_{\text{decline in wage bill}} + \underbrace{KF_{KL}}_{\text{increase in return to K}} = 0$$

Stable Wages. Rising returns to C, Techn, Land

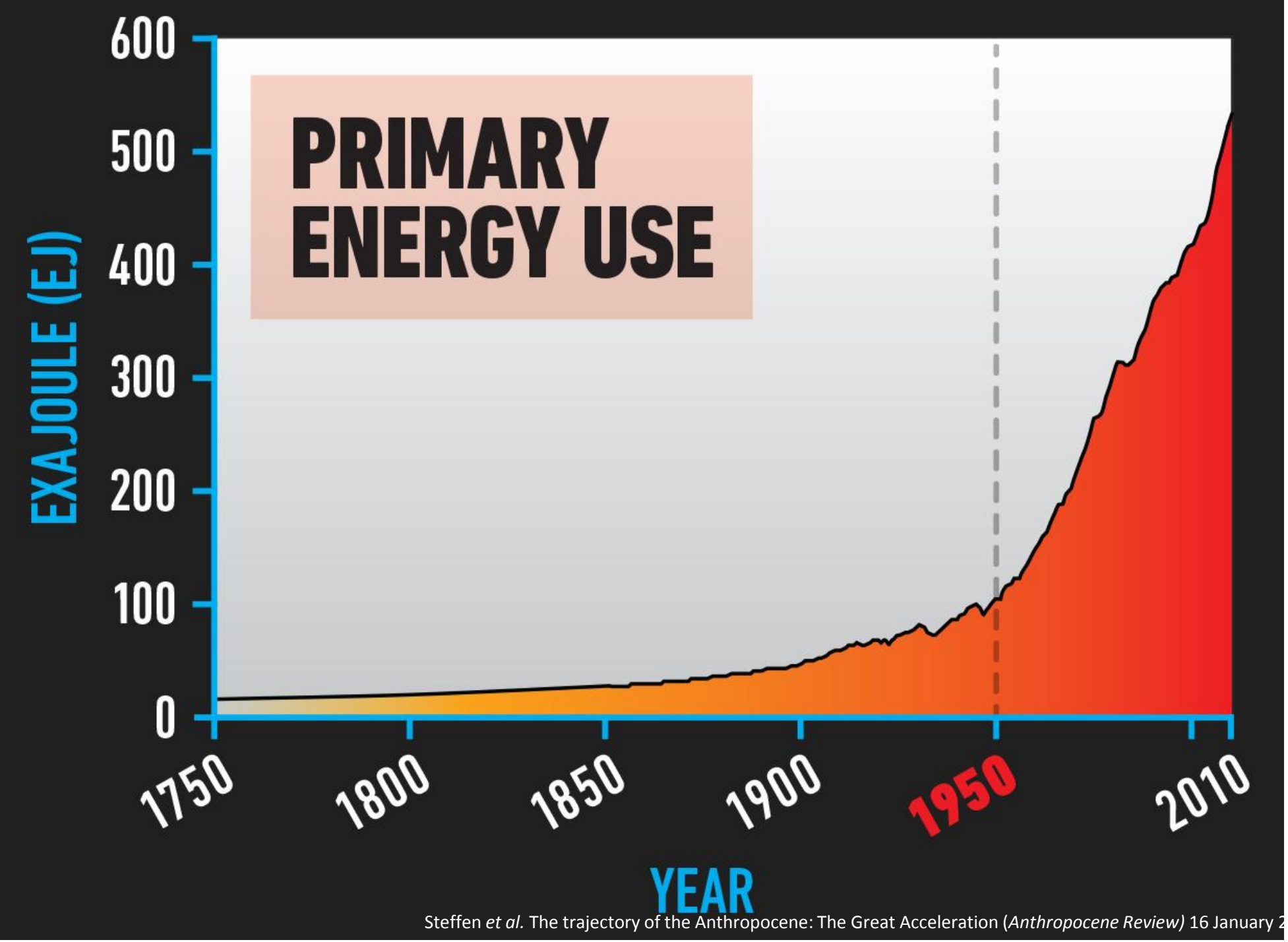


Challenge 1 Surplus or scarcity? Role of Land

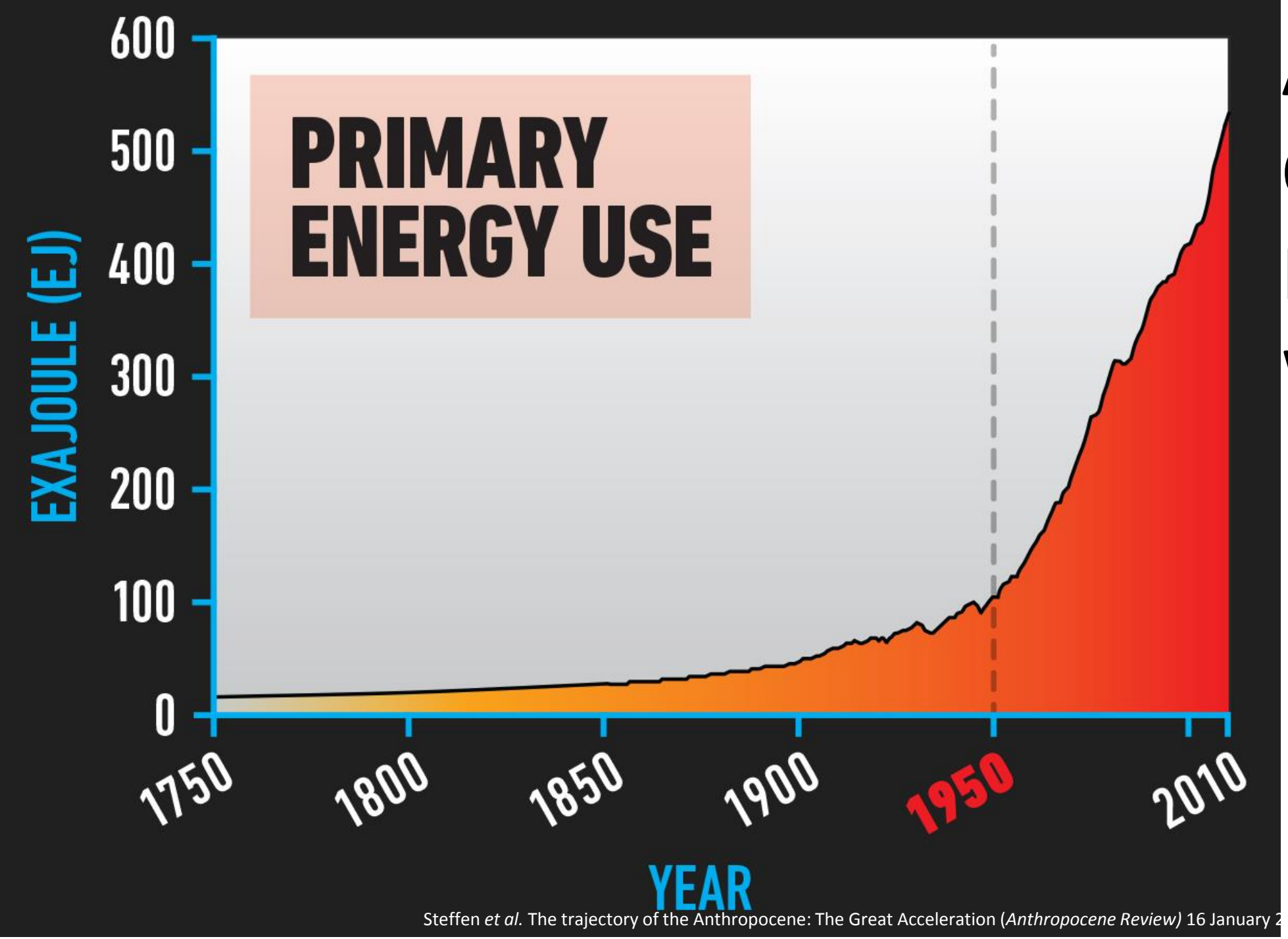
A Millions of taxidrivers & physicians replaced → massive joblessness in spite of GDP growth.

B Worse off! Lost honeybees, fish & ecosystem services

$$Q = f(K, H + M, L)$$



Steffen *et al.* The trajectory of the Anthropocene: The Great Acceleration (*Anthropocene Review)* 16 January 2

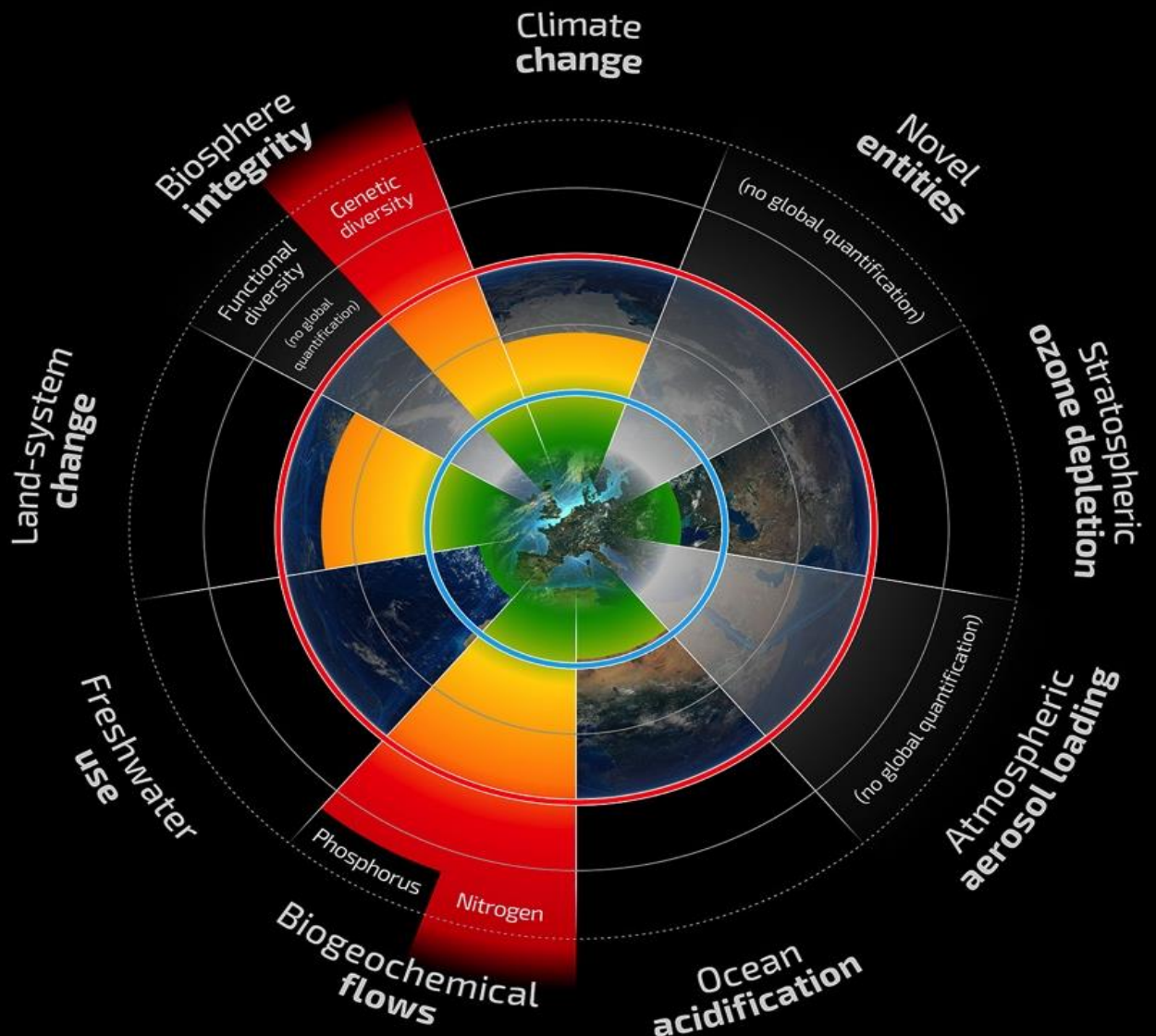


Steffen *et al.* The trajectory of the Anthropocene: The Great Acceleration (*Anthropocene Review)* 16 January 2

Also GDP, CO2, CH4, Population Water Dams Urbanis. Fertilizer Fishing..

Planetary Boundaries 2.0

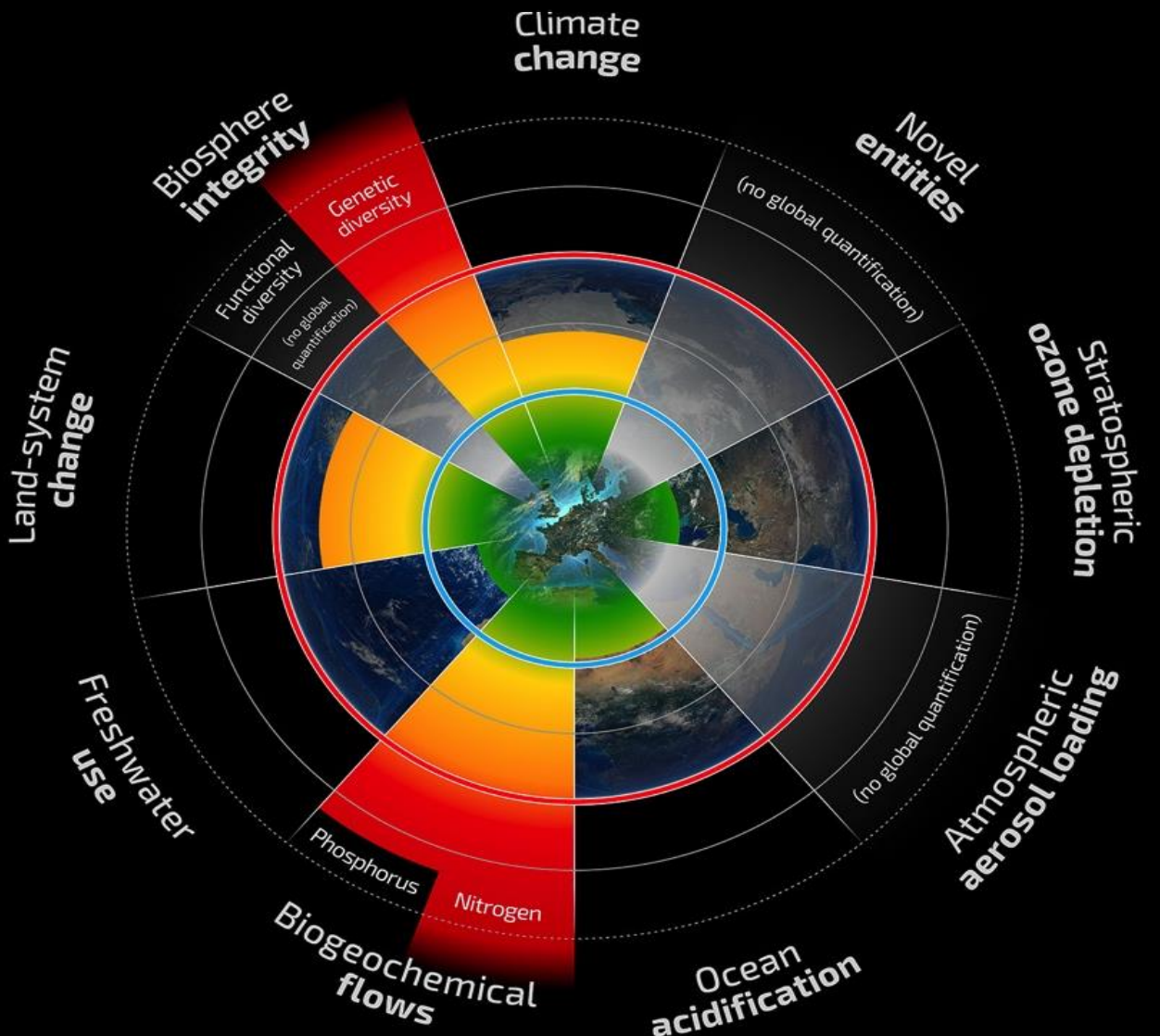
Steffen et al. (2015)



Planetary Boundaries 2.0

= LAND

Steffen et al. (2015)



Climate

Ocean Acidific.

Biodiversity

Chemicals

O_3, N, P,

Aerosols

#Planetary Boundaries# = LAND

Policies for Planetary boundaries

D*epend on the issue.*

For biodiversity property rights,

For Climate change:

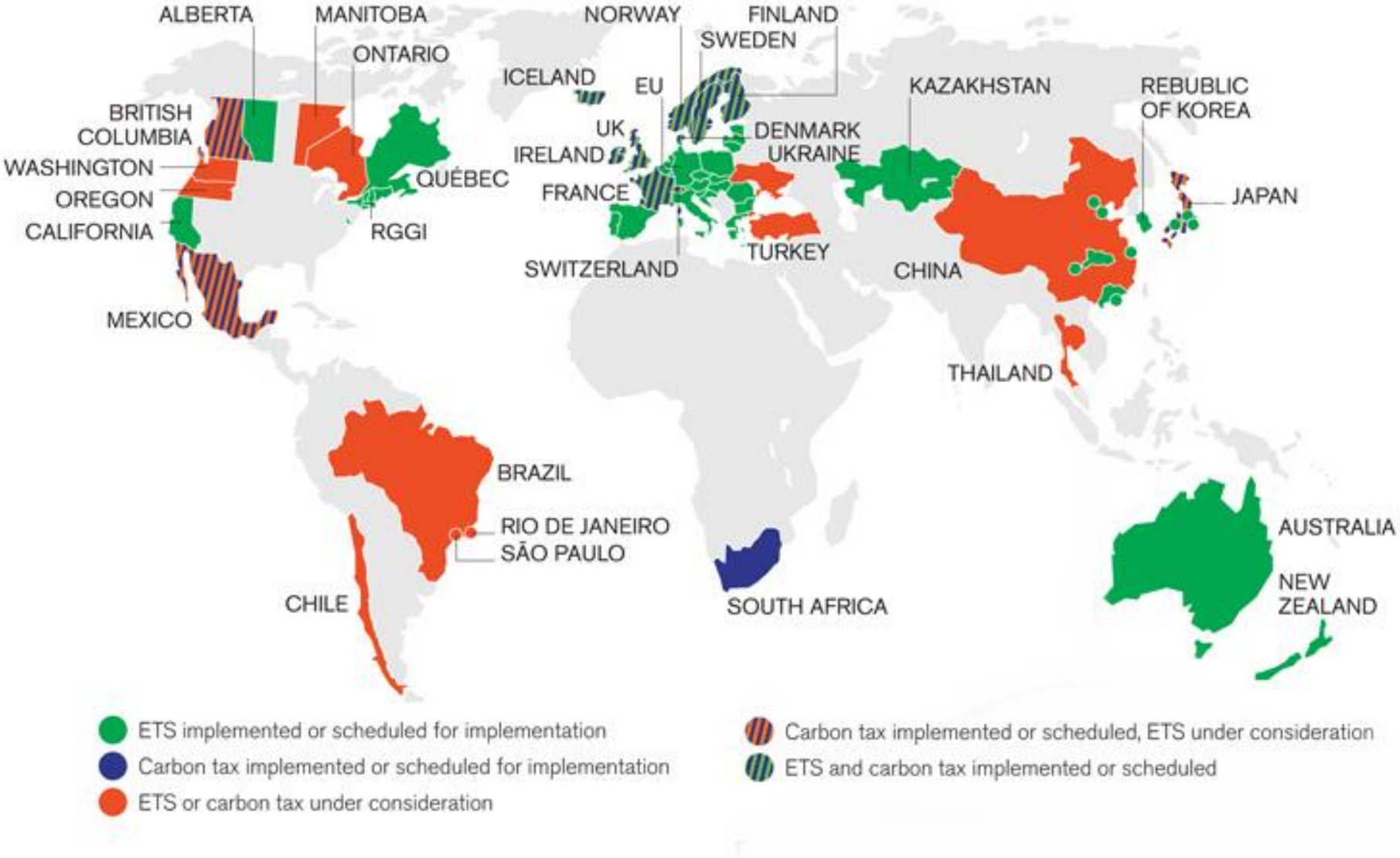
* *An abatement Plan*
* *A price on C*

Challenge 2: Is P_{carbon} important ?

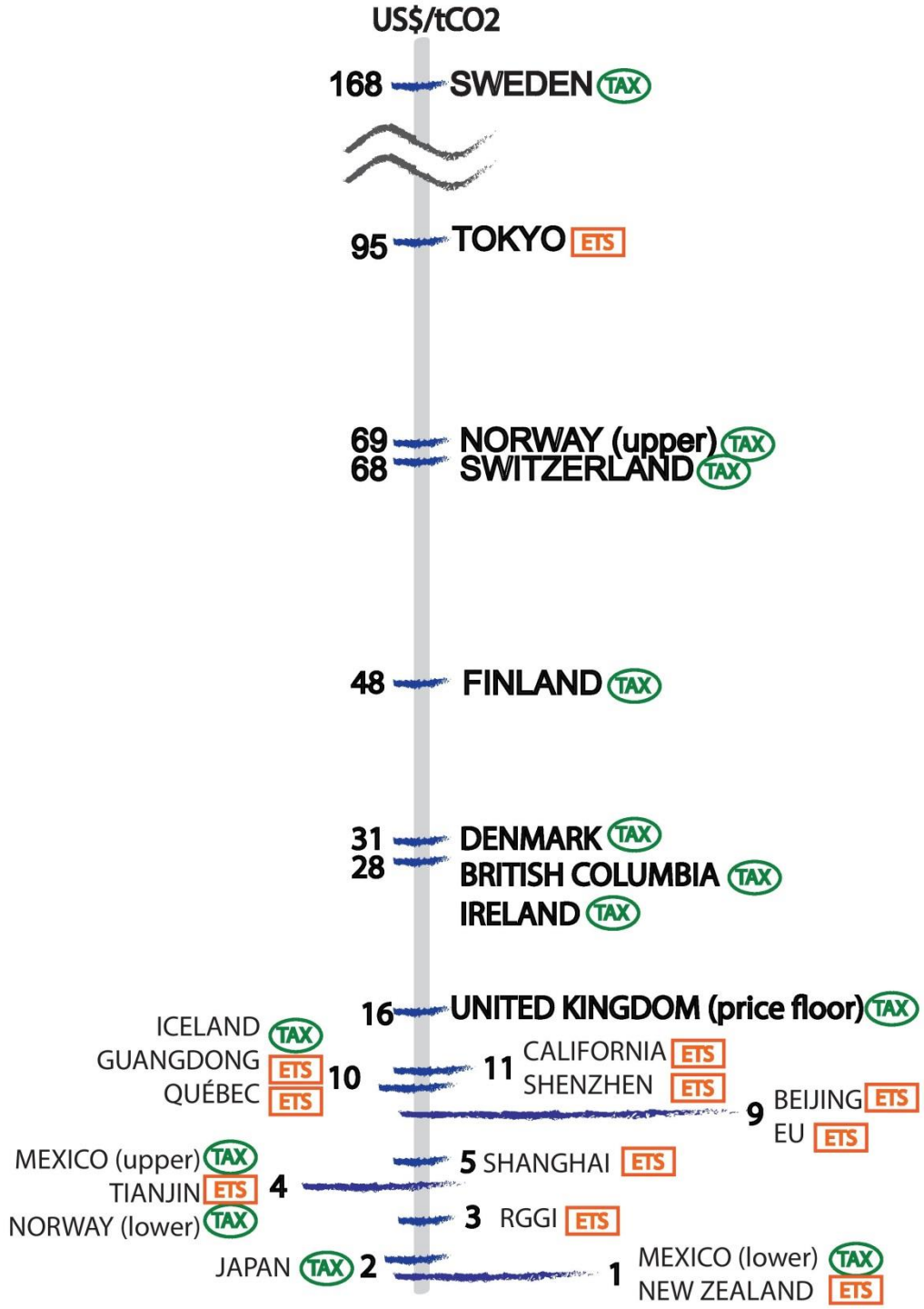
- Heterogeneity
- Links to other sectors
- Effects on technology
- Leakage and border tax issues

- Is economics failing to be relevant?

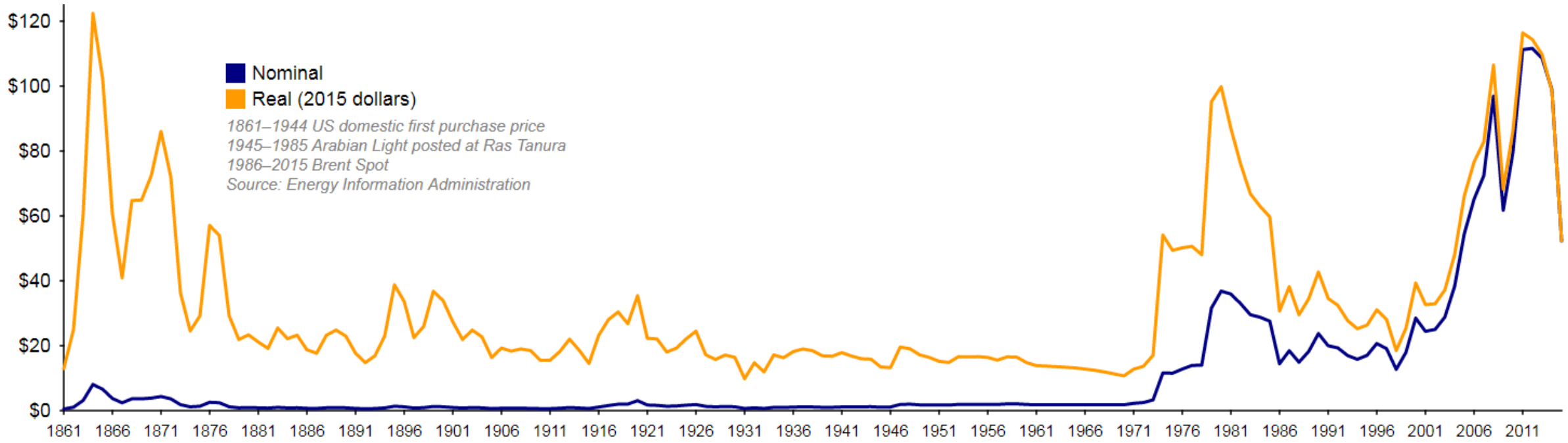
Taxes and Emission Trading



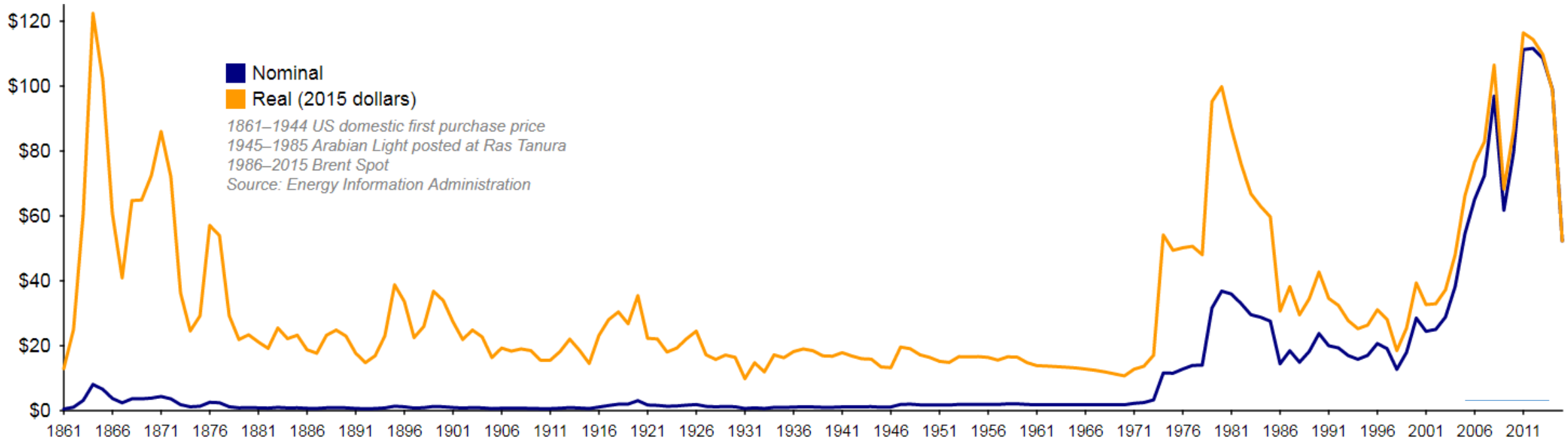
Source: State and Trends of Carbon Pricing, May 2014, World Bank


US$/tCO2
168 SWEDEN TAX
95 TOKYO ETS
69 NORWAY (upper) TAX
68 SWITZERLAND TAX
48 FINLAND TAX
31 DENMARK TAX
28 BRITISH COLUMBIA TAX
IRELAND TAX
16 UNITED KINGDOM (price floor) TAX
ICELAND TAX
GUANGDONG ETS
QUÉBEC ETS
10
11 CALIFORNIA ETS
SHENZHEN ETS
9 BEIJING ETS
EU ETS
MEXICO (upper) TAX
TIANJIN ETS
4
NORWAY (lower) TAX
5 SHANGHAI ETS
3 RGGI ETS
JAPAN TAX 2
1 MEXICO (lower) TAX
NEW ZEALAND ETS

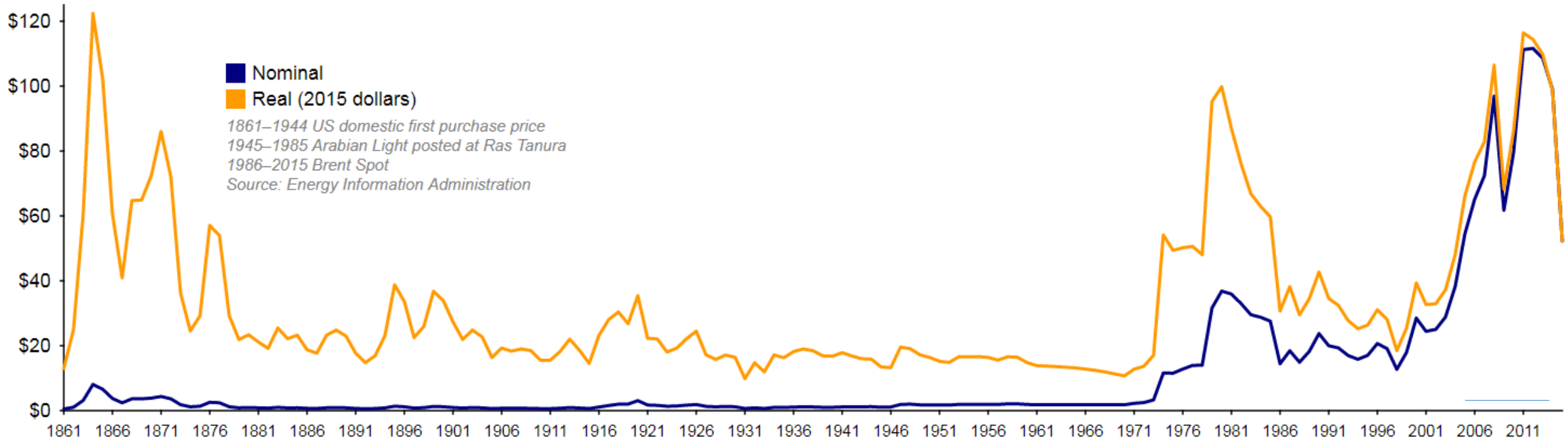
Oil prices, and Various Climate policies



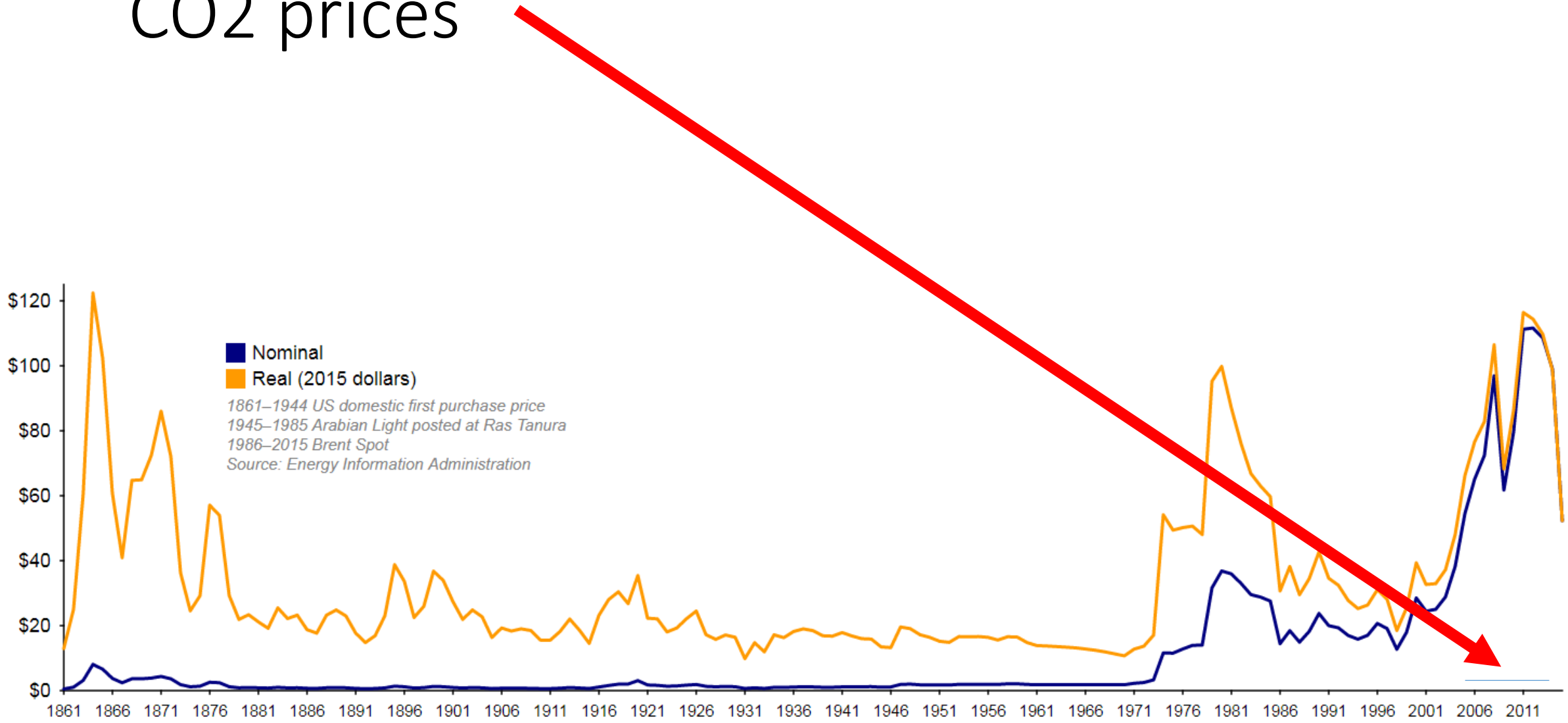
Tough climate policies…?



CO2 prices


$120
$100
$80
$60
$40
$20
$0
Nominal
Real (2015 dollars)
1861–1944 US domestic first purchase price
1945–1985 Arabian Light posted at Ras Tanura
1986–2015 Brent Spot
Source: Energy Information Administration
1861 1866 1871 1876 1881 1886 1891 1896 1901 1906 1911 1916 1921 1926 1931 1936 1941 1946 1951 1956 1961 1966 1971 1976 1981 1986 1991 1996 2001 2006 2011

CO2 prices


$120
$100
$80
$60
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Nominal
Real (2015 dollars)
1861–1944 US domestic first purchase price
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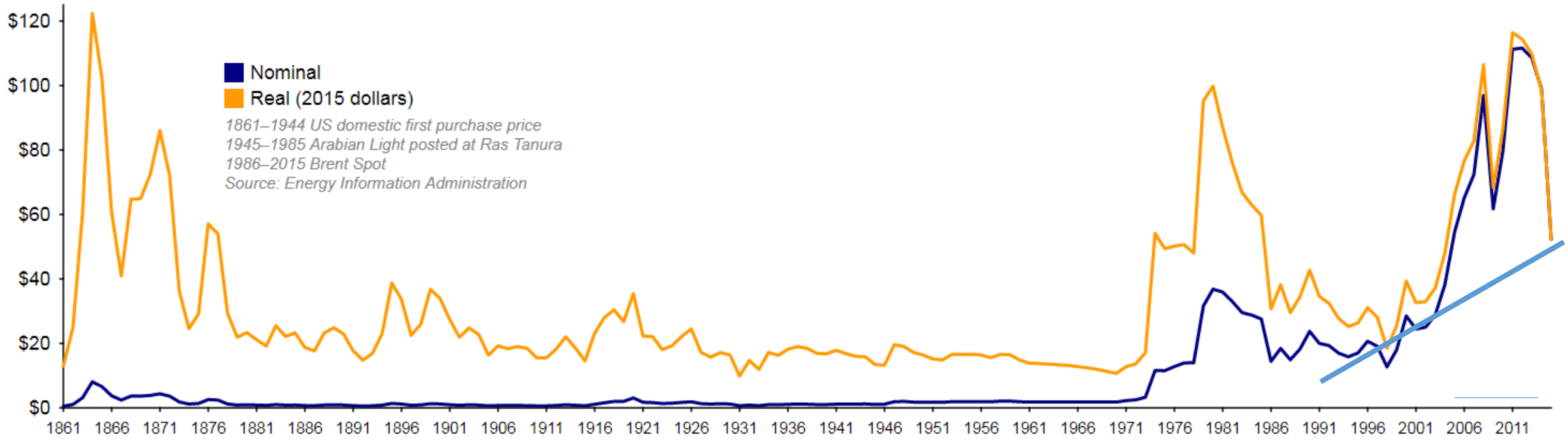
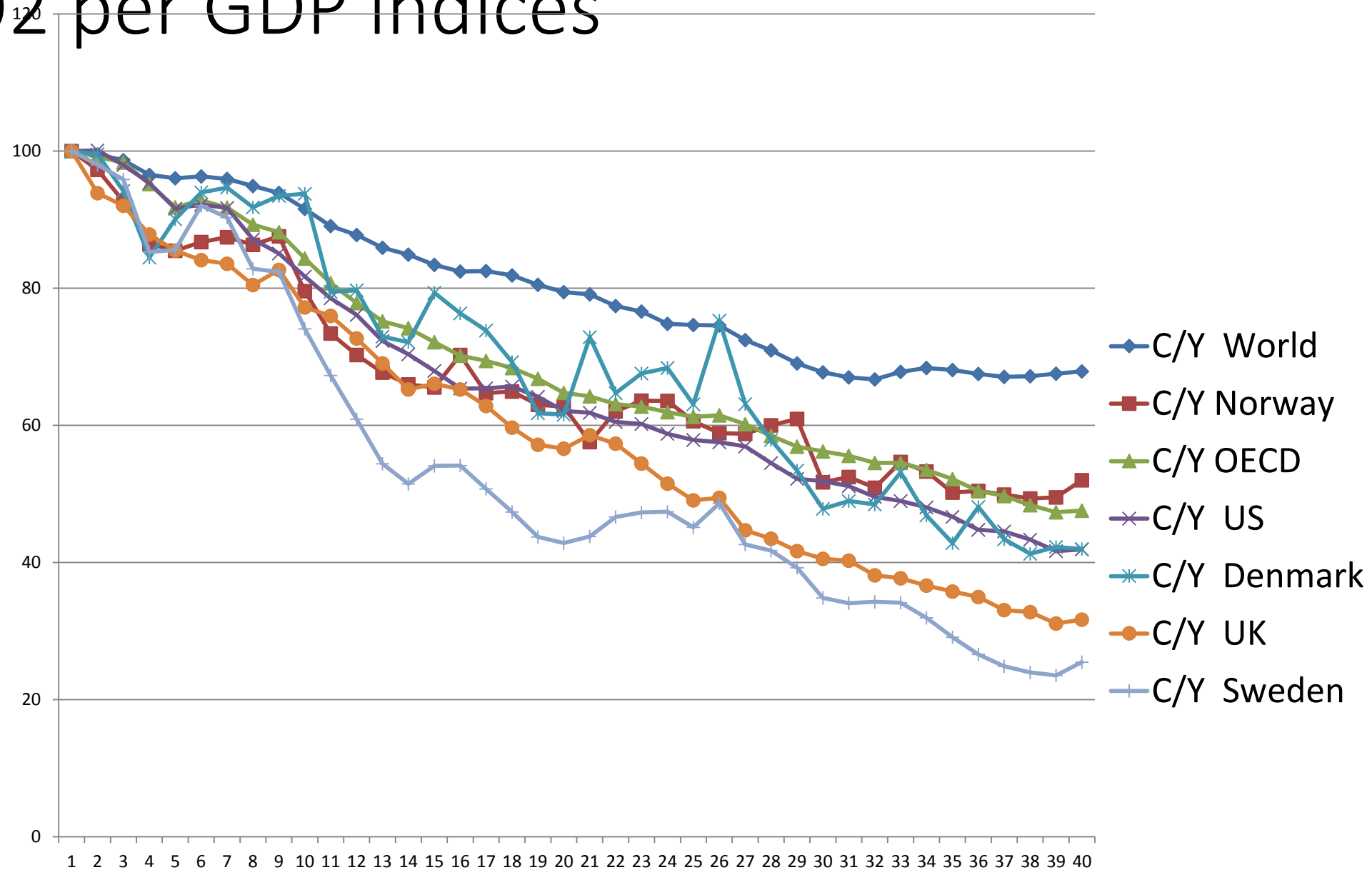
1986–2015 Brent Spot
Source: Energy Information Administration
1861 1866 1871 1876 1881 1886 1891 1896 1901 1906 1911 1916 1921 1926 1931 1936 1941 1946 1951 1956 1961 1966 1971 1976 1981 1986 1991 1996 2001 2006 2011

CO2 prices SWEDISH CARBON TAX

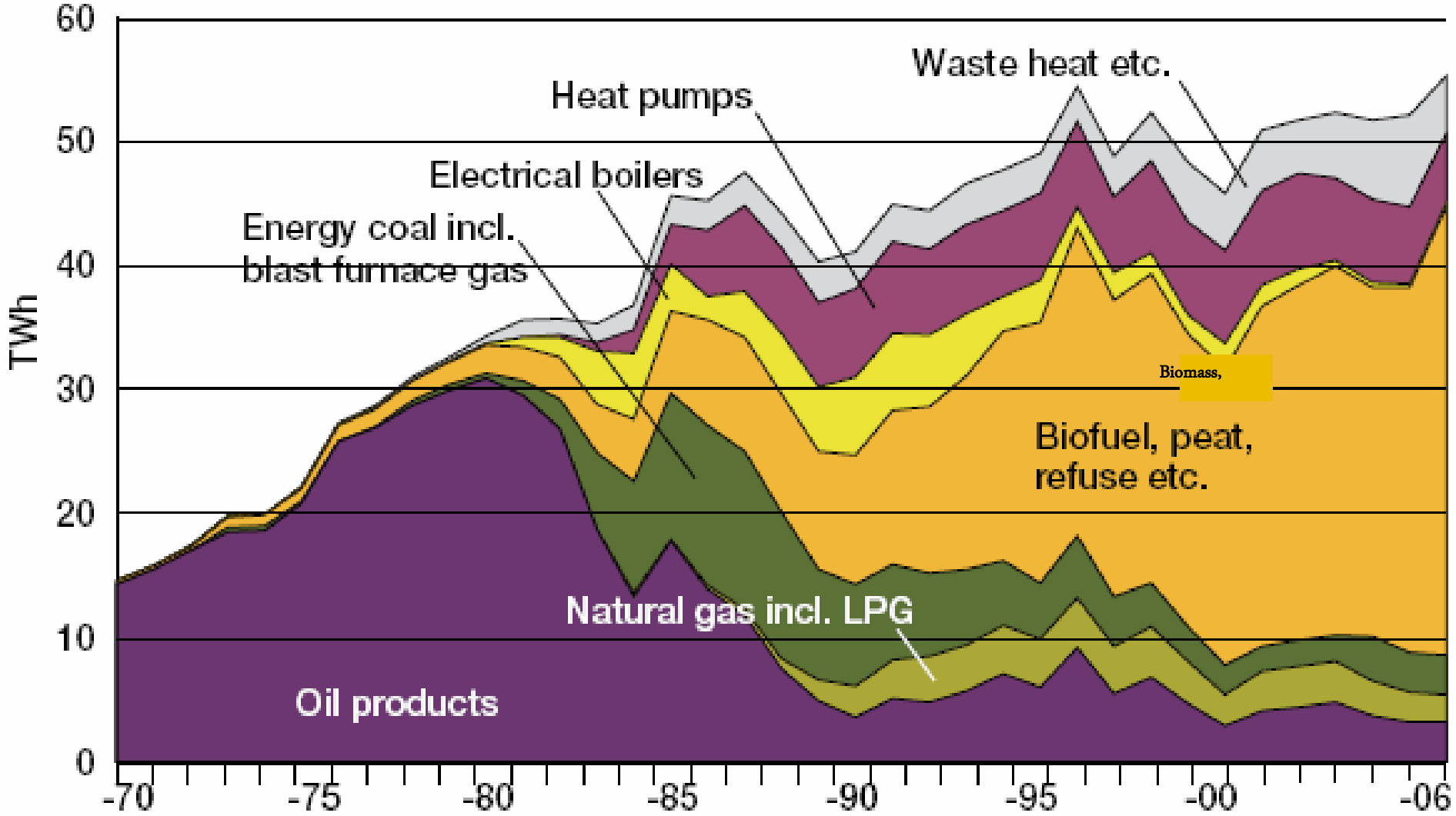


CO2 per GDP indices

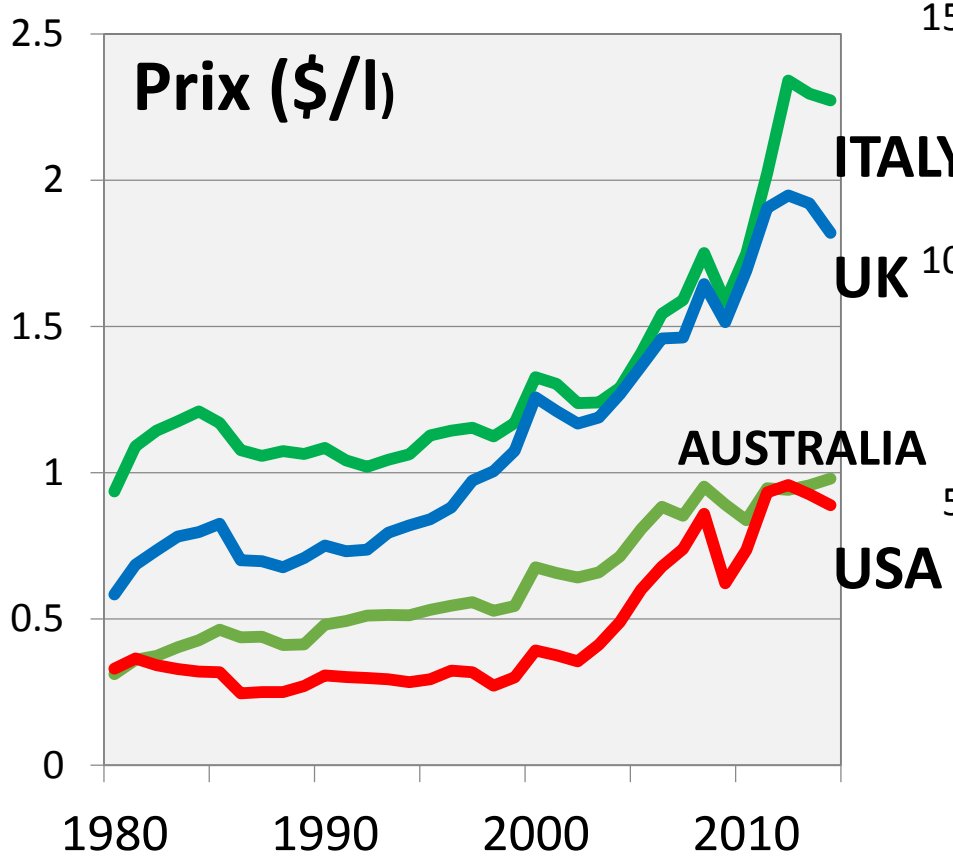


District heating 1970-2006

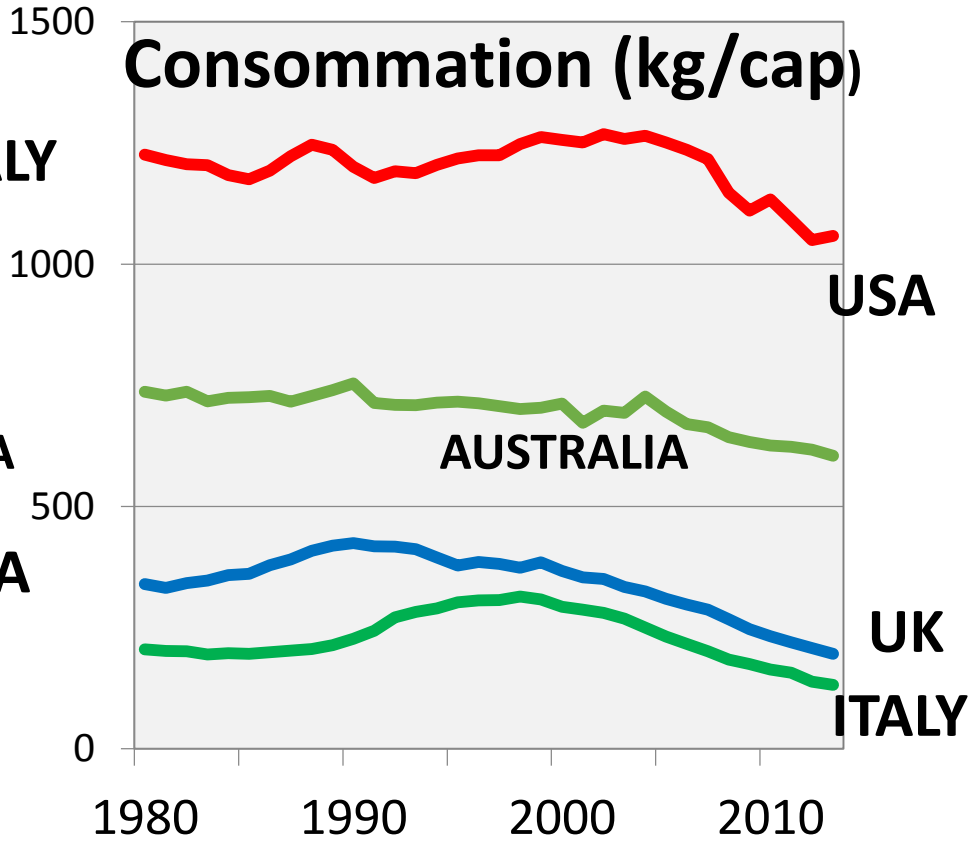
2007 54 TWh (+ 32 % > 1990) & Bio 24 →70 %
50 % of total heat. 76 % of flats.



Price of gasoline



Gasoline Consumption



Burden sharing and Fairness

EU promises 20% reduction in carbon emissions by 2020

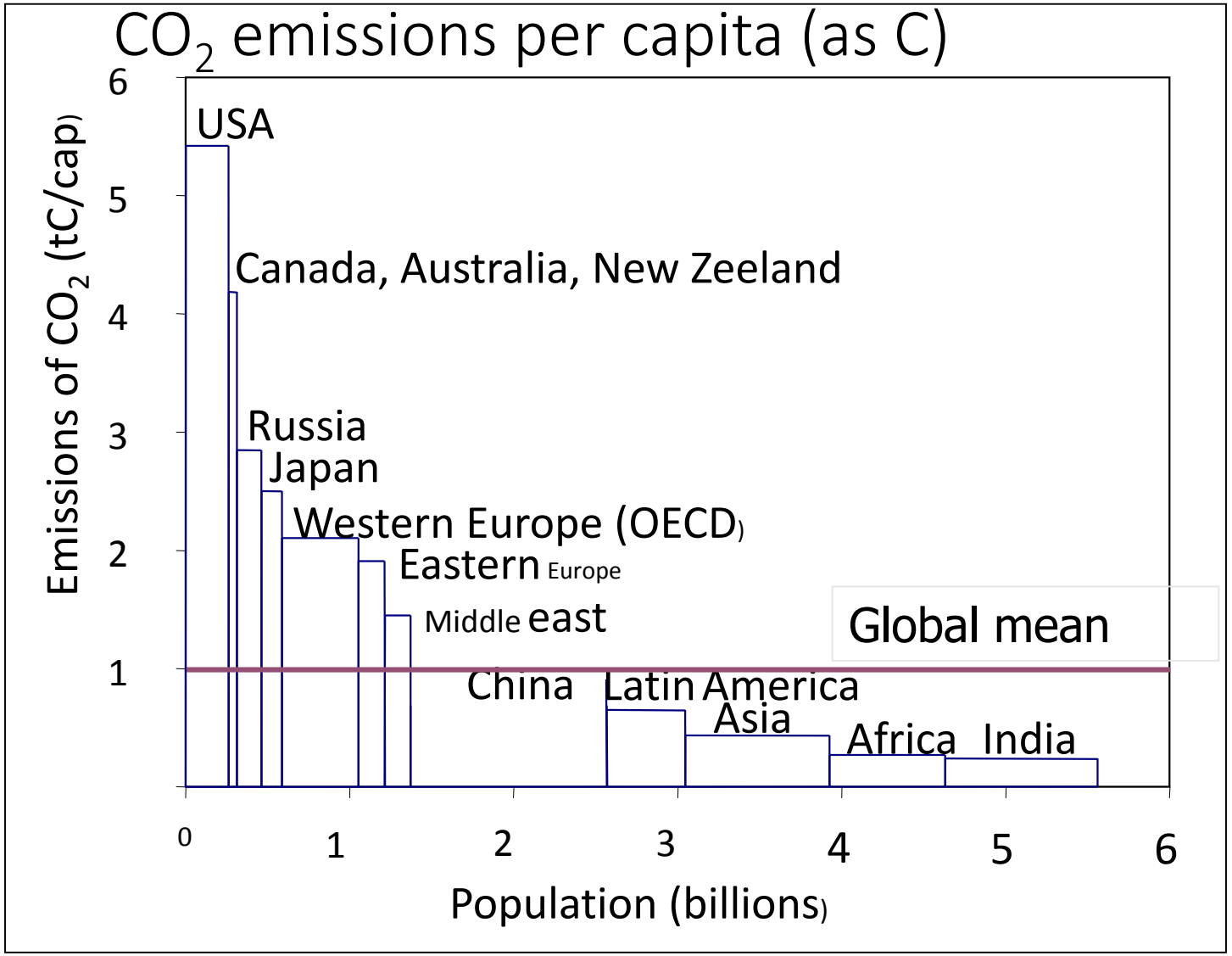
Ian Traynor and David Gow in Brussels

Wednesday 21 February 2007 00.07 GMT

FAIRNESS

Different burden allocations

	Current	GF	Per Capita
USA	5600	2800	800
INDIA	2400	1200	3200
Total	8000	4000	4000


CO_2 emissions per capita (as C)
Emissions of CO_2 (tC/cap)
6
5
4
3
2
1
0
1
2
3
4
5
6
Population (billions)
USA
Canada, Australia, New Zeeland
Russia
Japan
Western Europe (OECD)
Eastern Europe
Middle east
China
Latin America
Asia
Africa
India
Global mean

Copenhagen Failed…

Paris: Succé


Nations Unies
Conférence sur les Changements Climatiques 2015
COP21/CMP11
Paris, France
WWW.NEWS.CN

Paris: Succé … or not?

Do Markets Trump Politics?

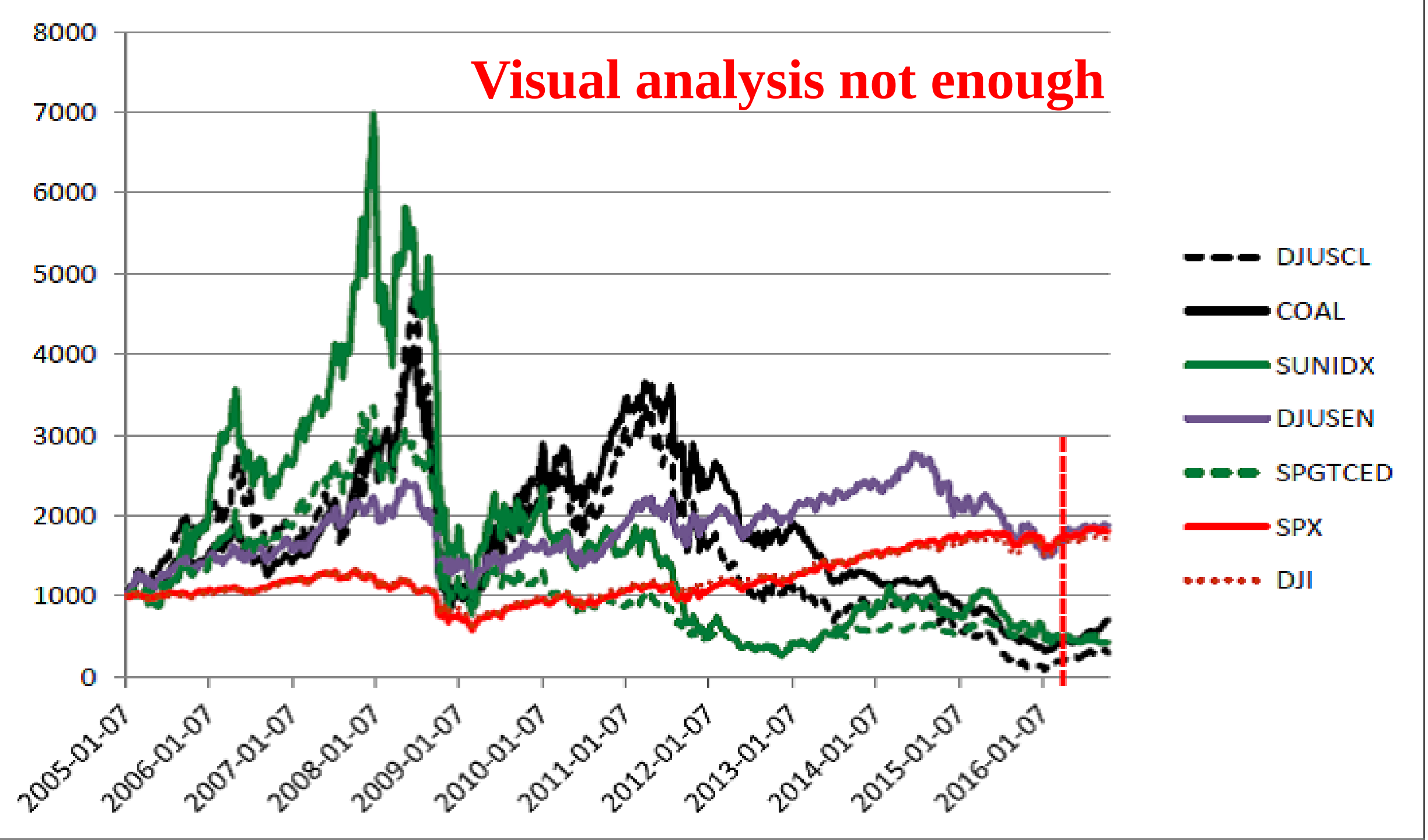
Evidence from Fossil Market Reactions

Samson Mukanjari and Thomas Sterner

University of Gothenburg

February 2016

Visual analysis not enough



Methodology How judge `success' of Paris?

1. Event Study Methodology

- Efficient Market Hypothesis
- Unexpected new information → abnormal returns.
- Natural experiment.

2. Impulse Indicator Saturation (IIS)

Methodology

Estimating Abnormal Returns

Market Model

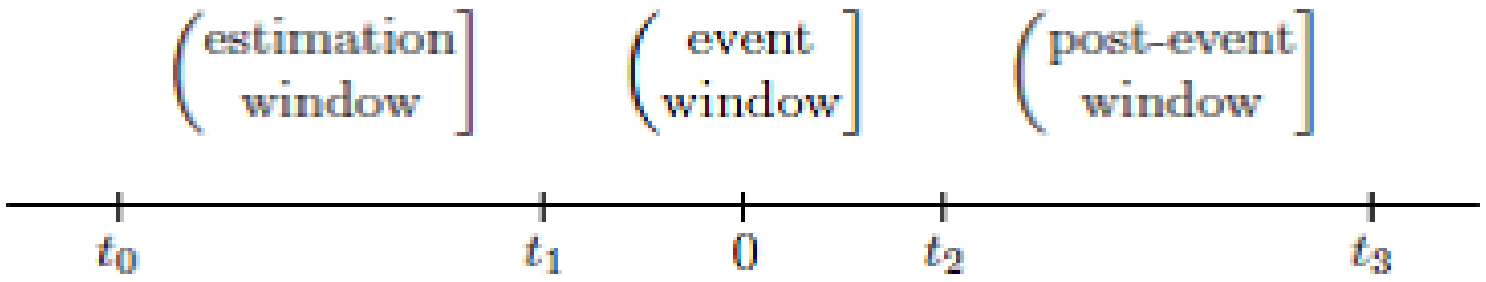
$$r_{it} = \alpha_i + \beta_i r_{mt} + \epsilon_{it} \qquad (1)$$

$$E[\epsilon_{it}] = 0 \; and \; Var[\epsilon_{it}] = \sigma^2_{\epsilon_i}$$

$$AR_{it} = r_{it} - (\widehat{\alpha}_i + \widehat{\beta}_i r_{mt})$$

- In the absence of unexpected news, the expected value of the abnormal returns ϵ_{it} is zero.

Figure 1: The Event Study Time line



Response to Paris using Exchange Traded Funds

	Coal	Oil	Gas	Solar	Wind	Energy	Nuclear
$CAR_{0,1}$	-0.0189	-0.0151**	-0.0278	0.0702**	0.0040	0.0167	0.0038
t_{CAR}	-0.7671	-2.3424	-1.2155	2.0016	0.2220	1.1537	0.2381
$CAR_{0,2}$	-0.0036	-0.0128	-0.0446	0.1281**	0.0216	0.0423*	0.0116
t_{CAR}	-0.0987	-1.3263	-1.3001	2.4367	0.8021	1.9540	0.4816
$CAR_{-1,0}$	-0.0308	-0.0051	-0.0355	0.0380	-0.0029	0.0090	-0.0051
t_{CAR}	-1.2531	-0.7948	-1.5513	1.0835	-0.1605	0.6243	-0.3194
$CAR_{-2,0}$	-0.0422	-0.0075	-0.0319	0.0369	-0.0117	-0.0005	-0.0130
t_{CAR}	-1.1437	-0.7773	-0.9305	0.7019	-0.4330	-0.0217	-0.5434
$CAR_{-1,1}$	-0.0349	-0.0125	-0.0381	0.0638	-0.0068	0.0166	0.0040
t_{CAR}	-0.9454	-1.2914	-1.1118	1.2134	-0.2513	0.7674	0.1658
$CAR_{-2,2}$	-0.0310	-0.0126	-0.0514	0.1207	0.0021	0.0328	0.0038
t_{CAR}	-0.5046	-0.7822	-0.8987	1.3772	0.0461	0.9086	0.0949
$CAR_{0,5}$	0.0267	-0.0202	-0.0485	0.1995	0.0345	0.0714*	0.0180
t_{CAR}	0.3622	-1.0441	-0.7071	1.8975	0.6400	1.6473	0.3760
$CAR_{-5,5}$	-0.0399	-0.0202	-0.0722	0.1912	0.0163	0.0582	0.0237
t_{CAR}	-0.2946	-0.5685	-0.5743	0.9917	0.1649	0.7327	0.2693
$CAR_{-10,5}$	-0.0533	-0.0061	-0.1002	0.2590	0.0314	0.0739	0.0173
t_{CAR}	-0.2708	-0.1186	-0.5475	0.9236	0.2189	0.6397	0.1350
N	1	4	3	2	1	7	1

Skip Gas, ~~Wind, Nuclear…~~

	Coal	Oil	Solar	En eff
$CAR_{0,1}$	-0.0189	-0.0151**	0.0702**	0.0167
$CAR_{0,2}$	-0.0036	-0.0128	0.1281**	0.0423*
$CAR_{-1,0}$	-0.0308	-0.0051	0.0380	0.0090
$CAR_{-2,0}$	-0.0422	-0.0075	0.0369	-0.0005
$CAR_{-1,1}$	-0.0349	-0.0125	0.0638	0.0166
$CAR_{-2,2}$	-0.0310	-0.0126	0.1207	0.0328
$CAR_{0,5}$	0.0267	-0.0202	0.1995	0.0714*
$CAR_{-5,5}$	-0.0399	-0.0202	0.1912	0.0582
$CAR_{-10,5}$	-0.0533	-0.0061	0.2590	0.0739

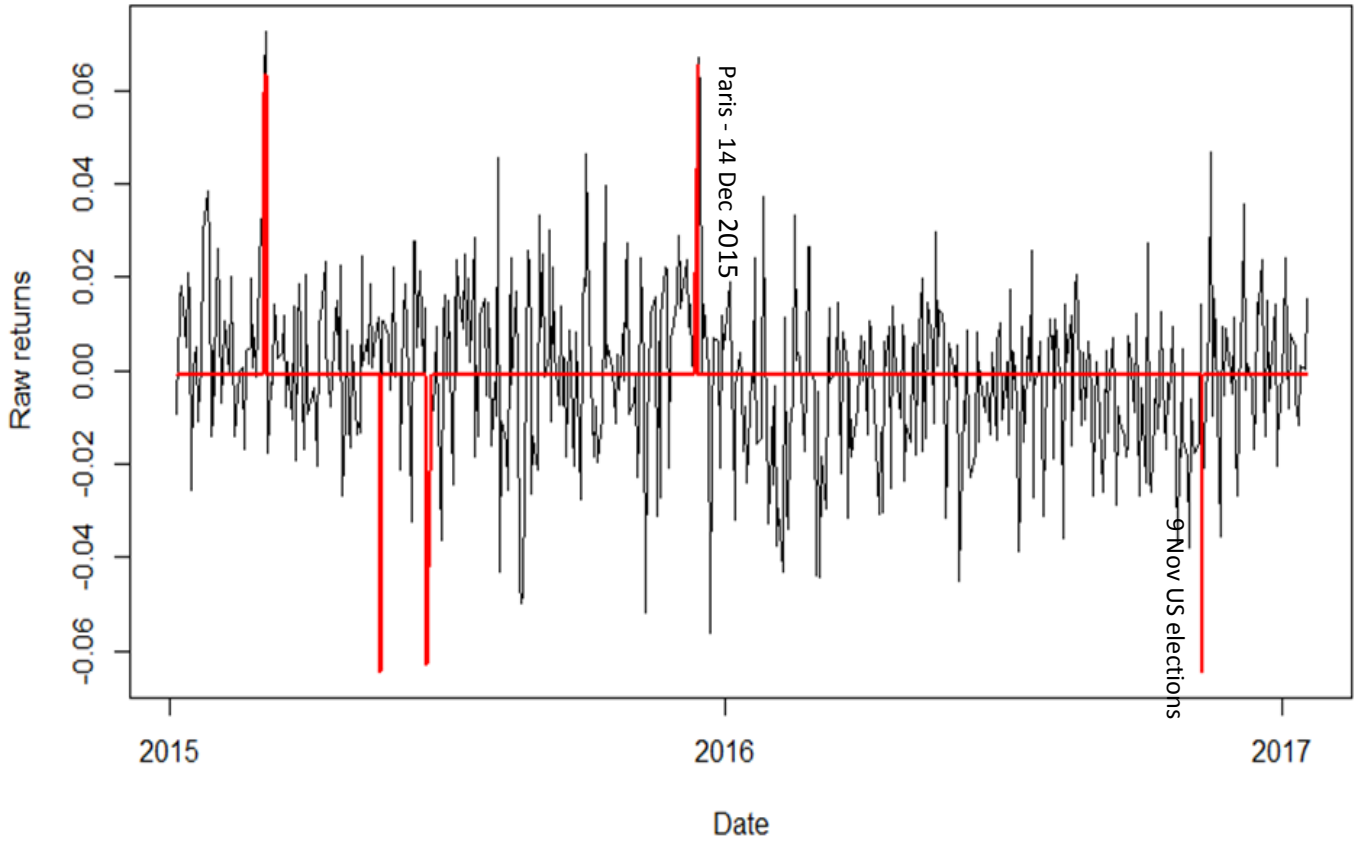
IIS Results

Six additional dates identified by IIS:

1. 4 March 2015
2. 05 March 2015
3. 20 May 2015
4. 19 June 2015
5. 16 December 2015
6. 22 December 2015

All associated with significant events in fossil and renewable markets.

Impulse indicator saturation detected climate-related political and market events between January 2015 and 2017



PARIS

- Limited market response
- Contrast media huge `success'.

Two key words:

1.Surprising

2.Strong

Conclusion

- No significant effects for coal.
- Unexpected ?

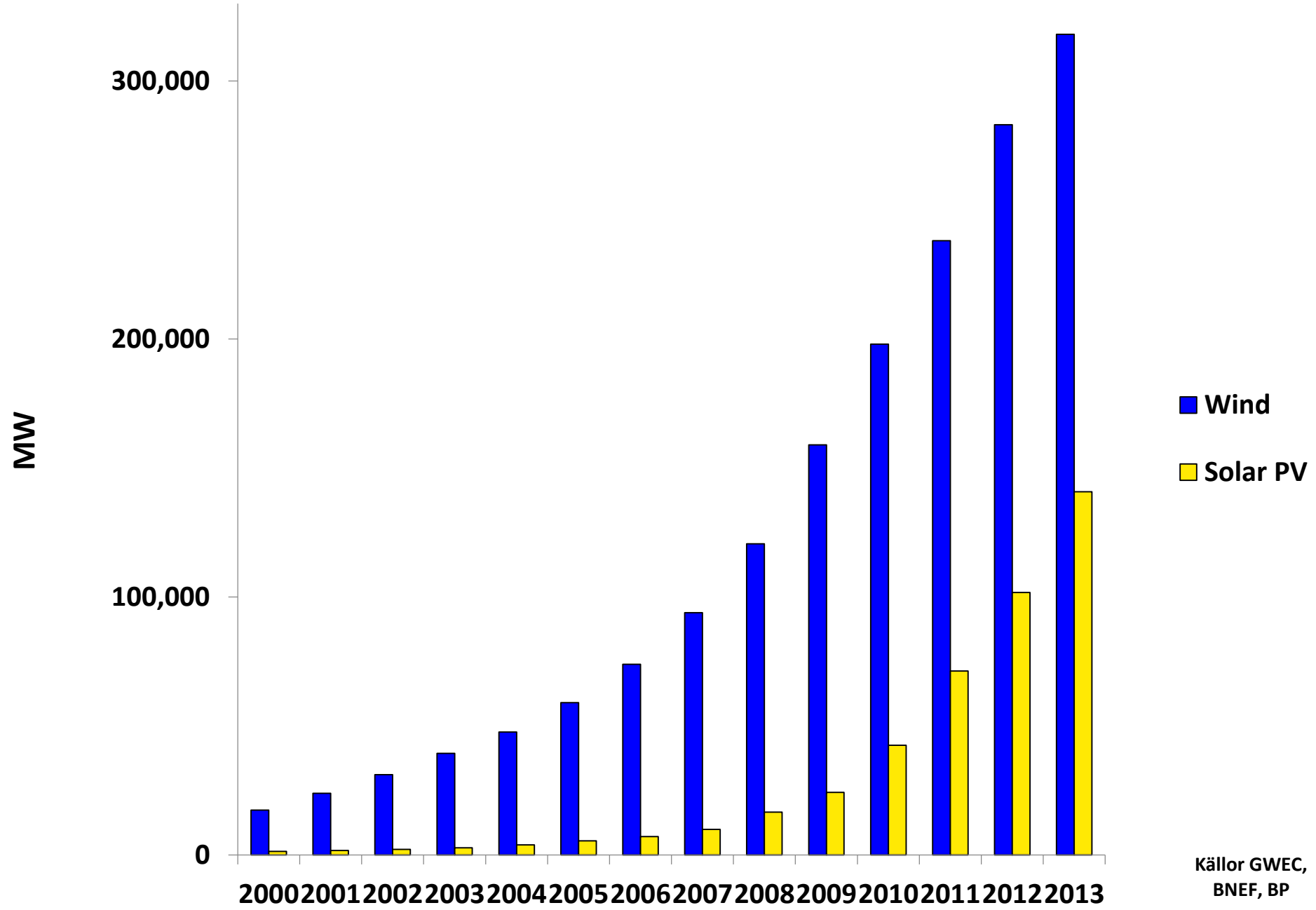
Conclusion

- Little effect of Paris
- What about Trump?
- Again: little effect.
- Some + renewables, but small

Conclusion

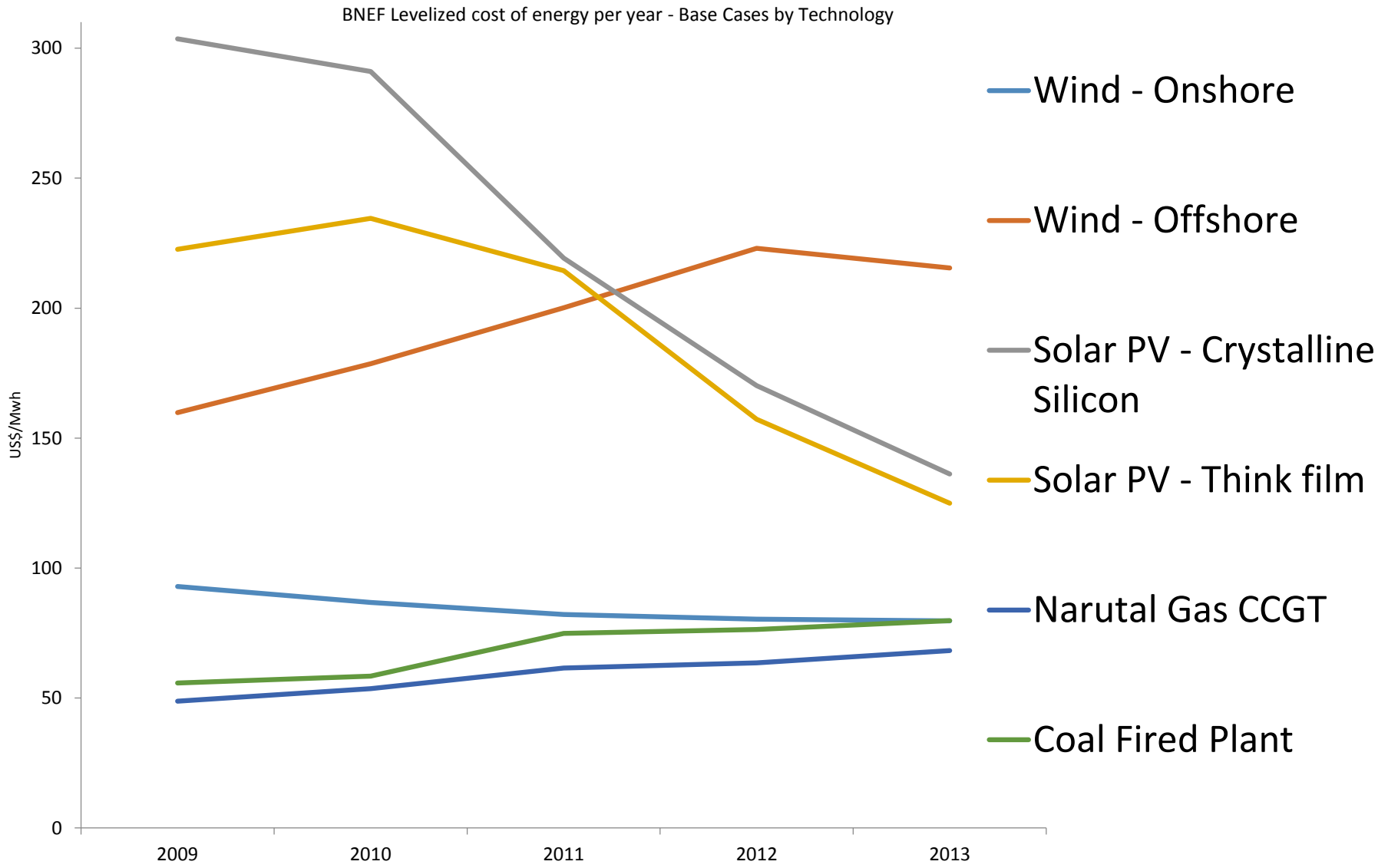
- No significant effects for coal.
- Unexpected ?
- What about Trump?
- Again: little effect.
- Some + renewables, but small
- **No Copenhagen fairness. No Price. No Paris**

Accumulated global capacity

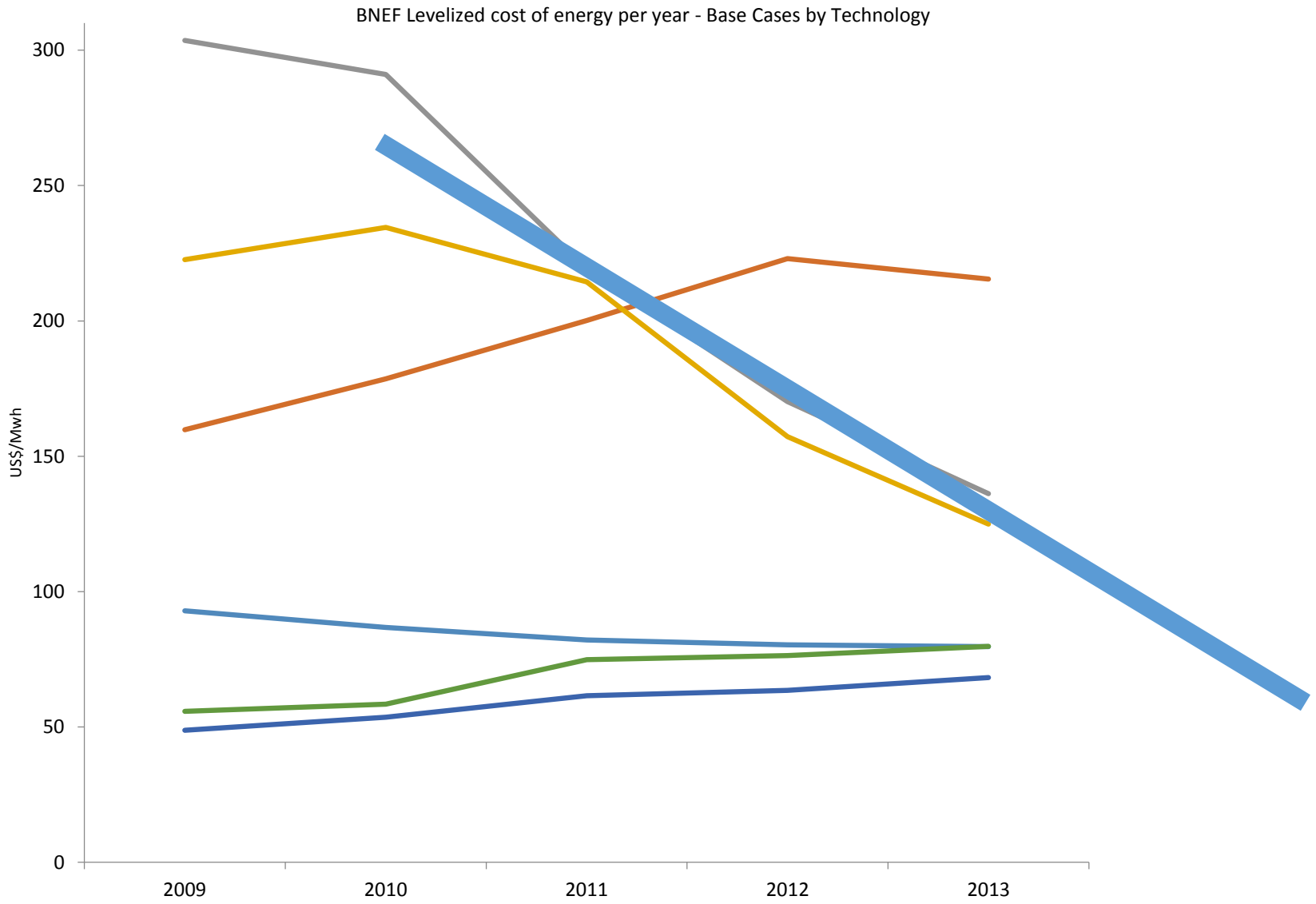


Källor GWEC, BNEF, BP

RENEWABLE ENERGY



RENEWABLE ENERGY



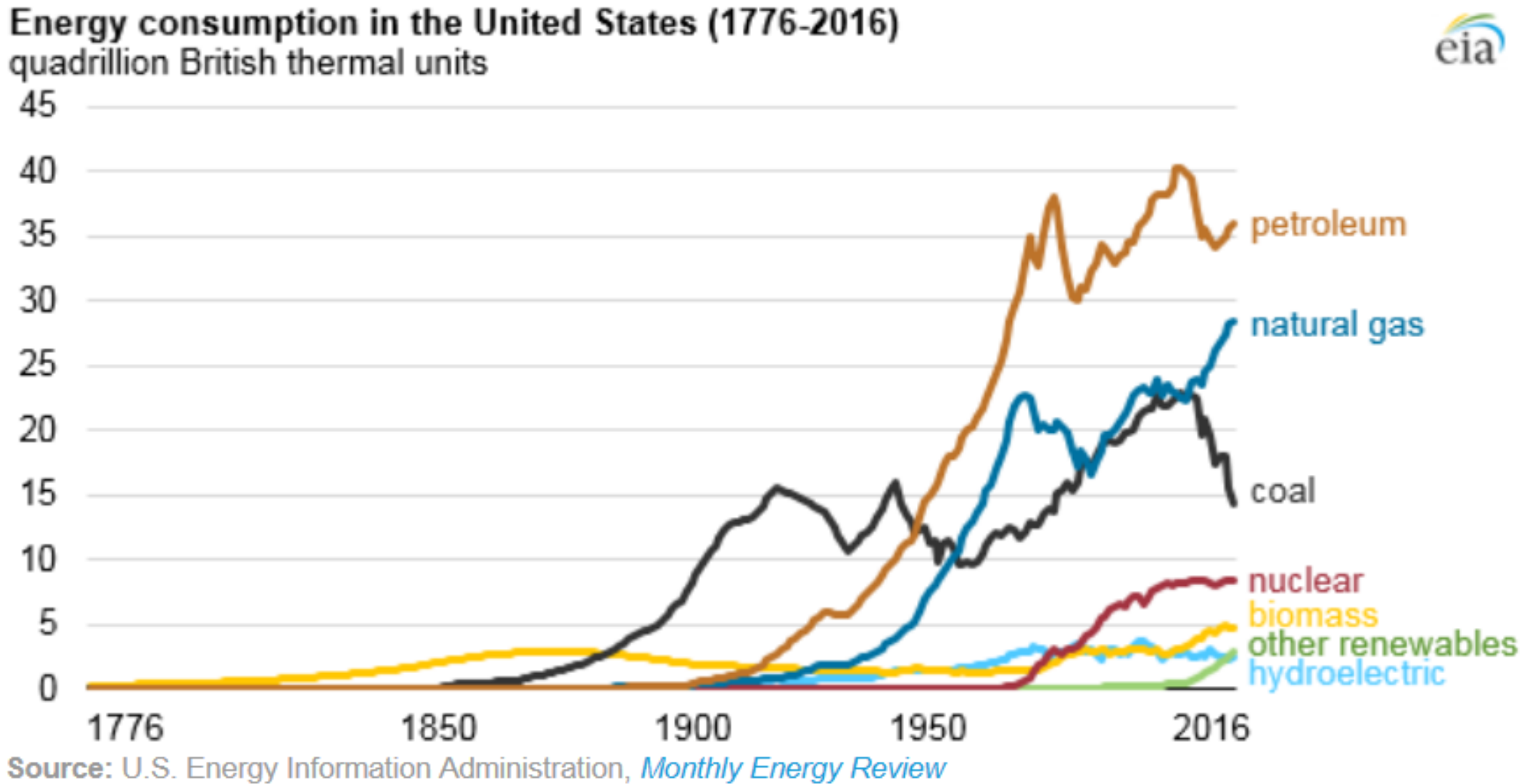
Finow Tower I&II, Germany

10 000 roofs?

Indias largest solar farm Kamuthi

Solar bids now within range of Coal fired in India.

Possibility demonstrated
But long way to go



Green finance

- Gothenburg 100 M$
- France 10 B€

Green finance

- Gothenburg 100 M$
- France 10 B€
- Actually renewable investments in trillions
- Green bonds not cheaper than others.
- Desinvestment movement has little immediate effect.

Is Technology & Finance enough?

- Technical progress in fossil too

- Timing of policy… Weakening Fossil lobby

- (echo Dixit: no perfect route):
- Support renewables, green finance, non-gov agents,
- In the end get a price when fossils are already ½ dead

THANK you and welcome…

6th World Congress of Environmental and Resource Economists

WCERE 2018, Gothenburg Sweden

25–29 June
www.wcere2018.org

Very welcome to the 6th World Congress of Environmental and Resource Economists located at the School of Business, Economics and Law, University of Gothenburg. We welcome you to our campus situated right in the heart of the city.

Call for papers – you are invited to submit theoretical and applied papers in all areas of environmental and resource economics. Suggestions for special invited sessions are also welcome.

wcere
World Congress of Environmental and Resource Economists

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17.9K
SHARES

Share

More

11 Benefits of Green Tea That You Didn't Know About

LIFESTYLE MAY 9 BY CIARA CONLON

Summary

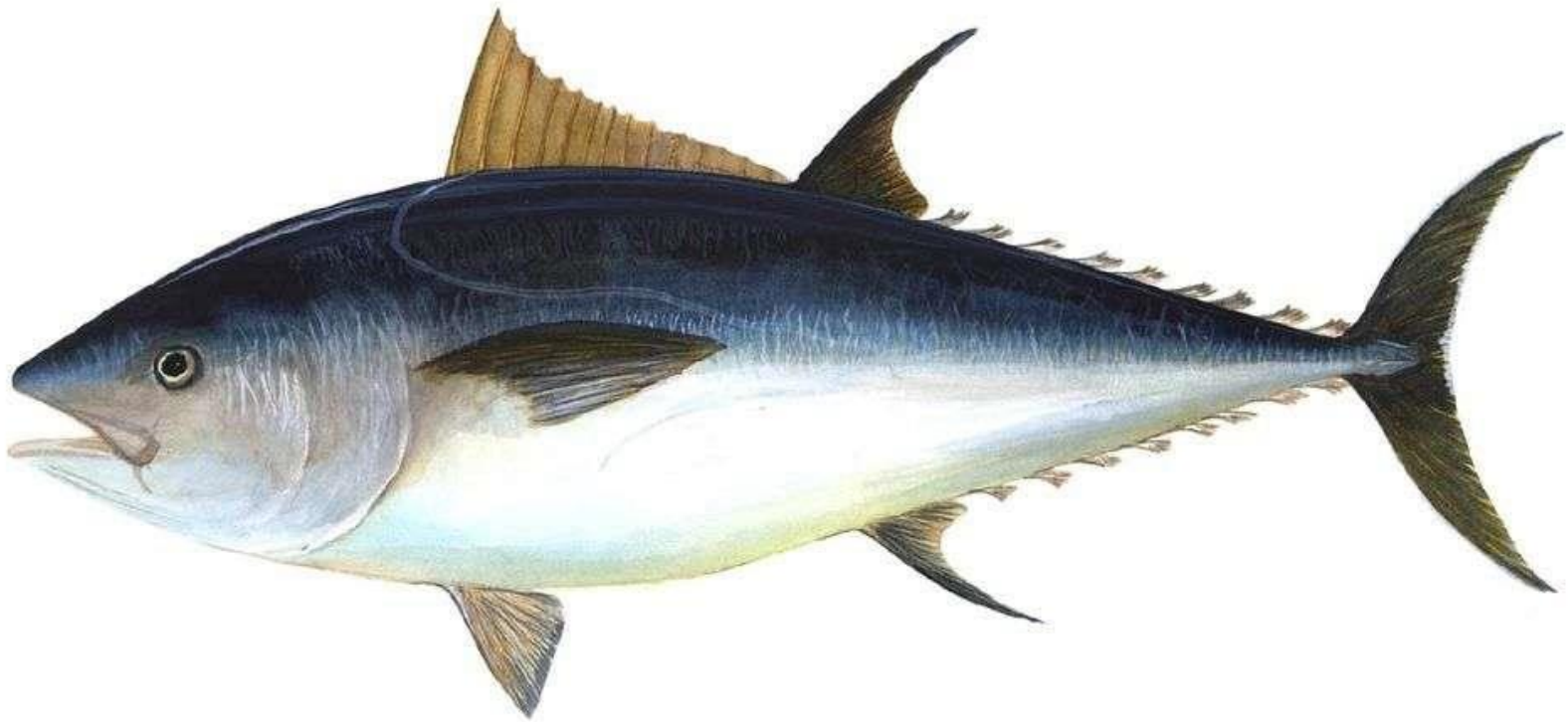
- Land alias PB key to conciliating growth, distrib
- Burden sharing did not work
- Cap and trade will not work
- Taxes do not work (outside sweden)
- International agreements do not work
- Fossil interests have captured goverment
- We do not believe in technology policy?
- Green Finance does not work

Thomas Sterner Chaire Développement durable -
Environnement, énergie et société


SES

2 simultanious crises: a Coincidence?

2 simultaneous crises: a Coincidence?



5 KANSKE SKIPPA International climate negotiations

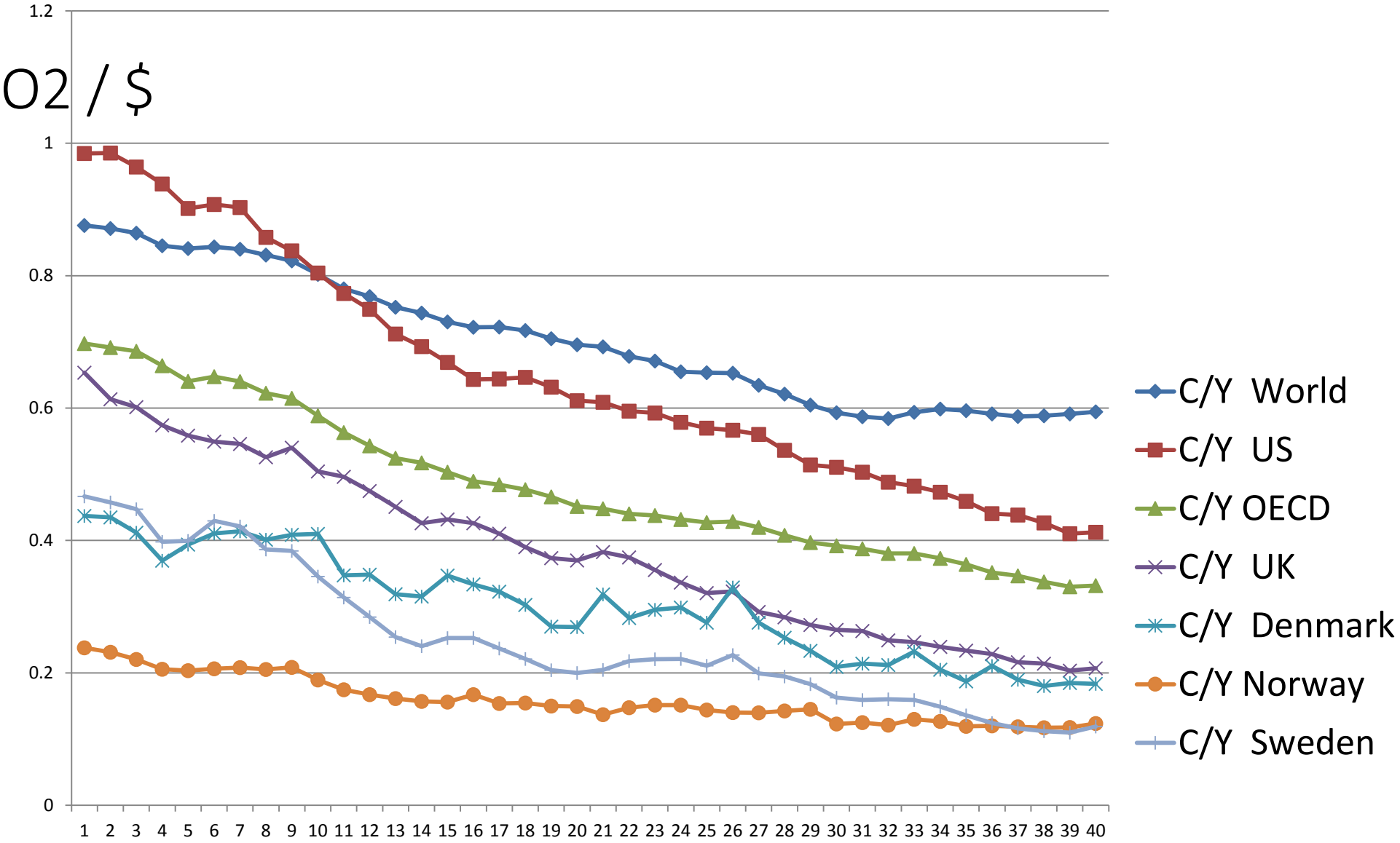
- Efficiency (=Price)
- Sovereignity
- Fairness
- Weitzman Price argument
- Nordhaus club arguments
- Technology .. Changing foces of lobbyism

“We, economics students of the world, declare ourselves to be generally dissatisfied with the teaching that we receive… We wish to escape from imaginary worlds!”

Challenges to economics both in teaching RESEARCH and Policy

Prices do work if given a chance!

Tons CO2 / $ GDP



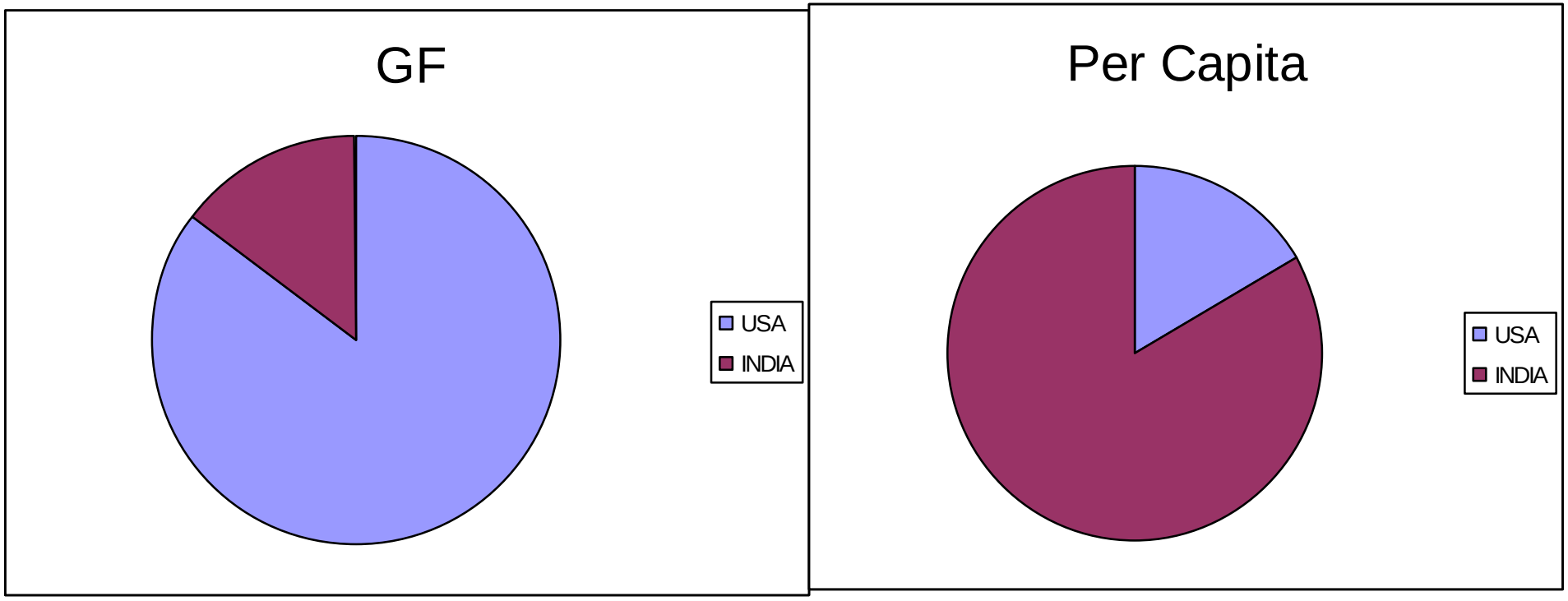
Transport Fuel Use in OECD
Gtons fuel (and ~C*(12/14))

	Real	UK prices	US prices
Fuel use	**1,13**	0,72	1,47
		-36%	+30%

PRICE ON CARBON EMISSIONS ETS or Tax

- Anyone builds a metro → would be rewarded
- Or a clean factory
- Solar cells, hydroplants, windpower
- Or planted a forest
- **REQUIRES ”Fair” allocation of permits**

The allocation between US and India



The right to emit **valuable**
20 Gtons CO_2 à 50 $/t = 1000 B$

	Grand father	Per capita
INDIA	4%	16%
USA	16%	4%