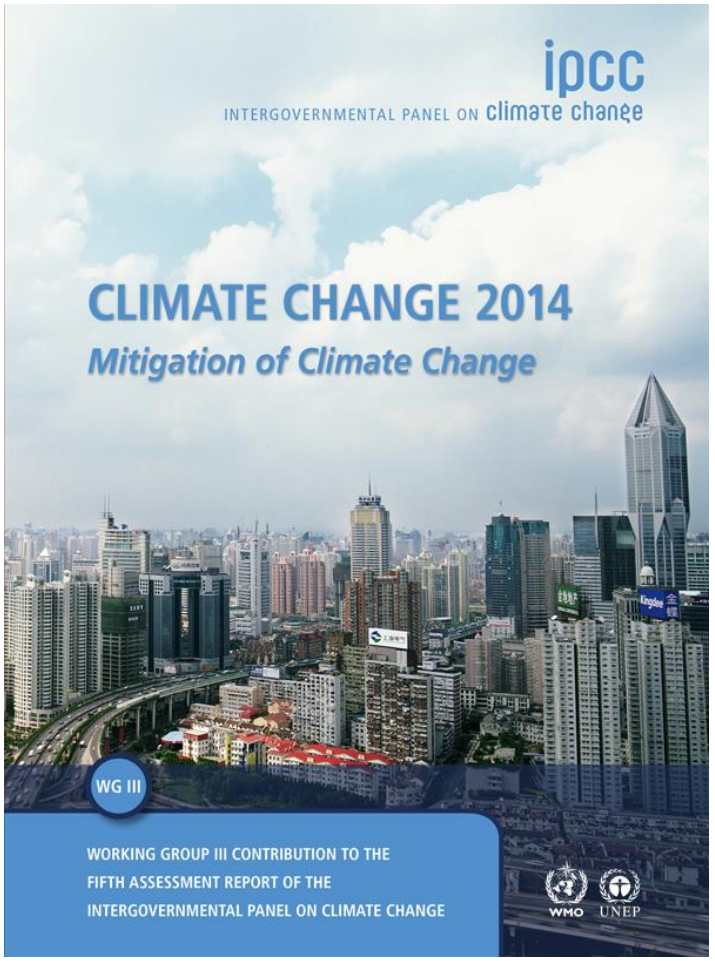
IPCC WORKING GROUP III
12TH SESSION
IPCC PLENARY
39TH SESSION
Berlin, 7–12 April 2014
ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO
UNEP

IPCC reports are the result of extensive work from scientists around the world.

1 Summary for Policymakers
1 Technical Summary

16 Chapters
235 Authors
900 Reviewers
More than **2000** pages
Close to **10,000** references
More than **38,000** comments



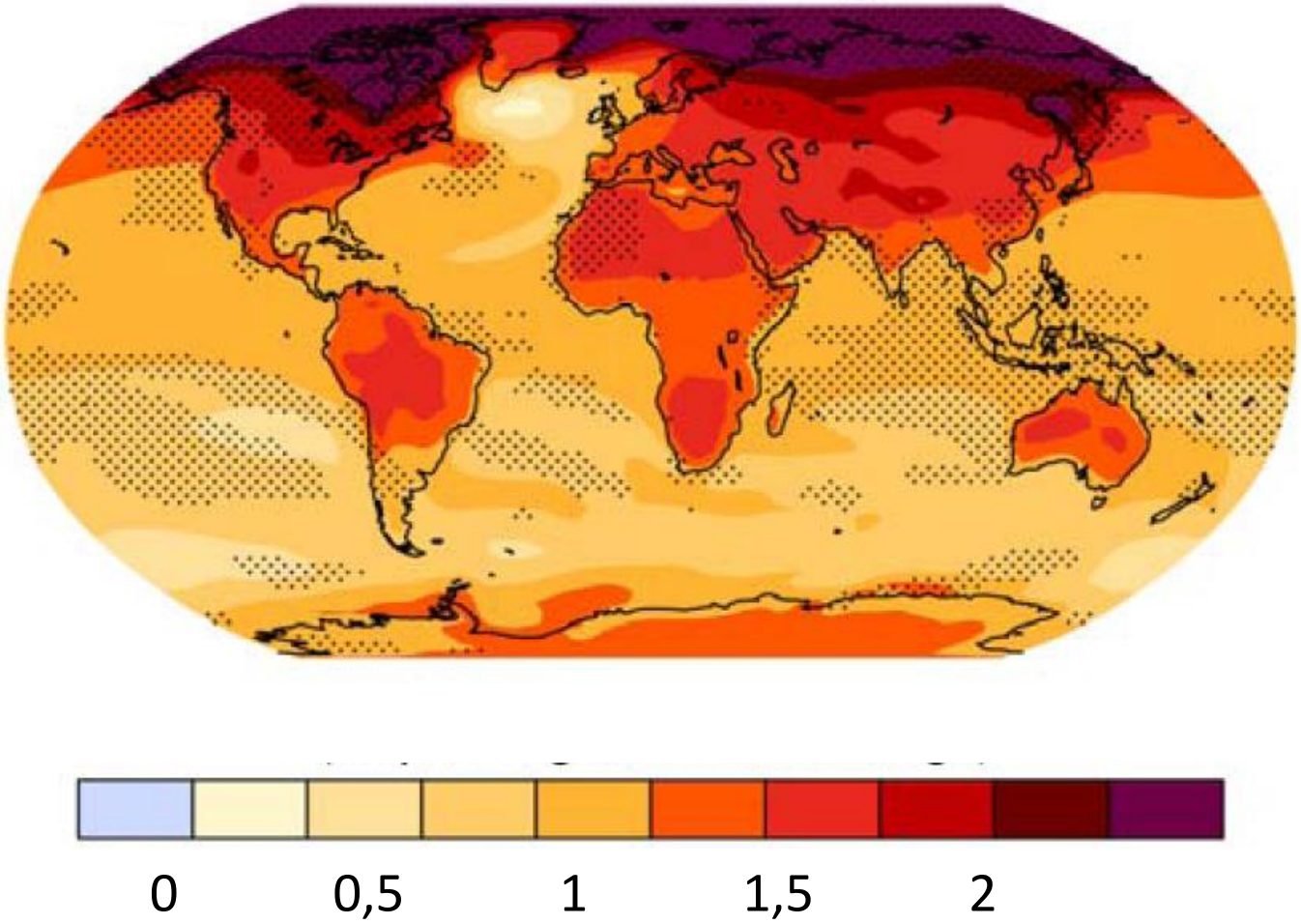
WG I & II

- WG1
- Certain that Earth is warming
- Virtually certain that cause is antropogeneous
- Moving towards + 4-5 degrees C

- WG2
- Species and even whole ecosystems moving
- Observed on all continents
- Loss of harvest for wheat and corn

Regional warming, ºC

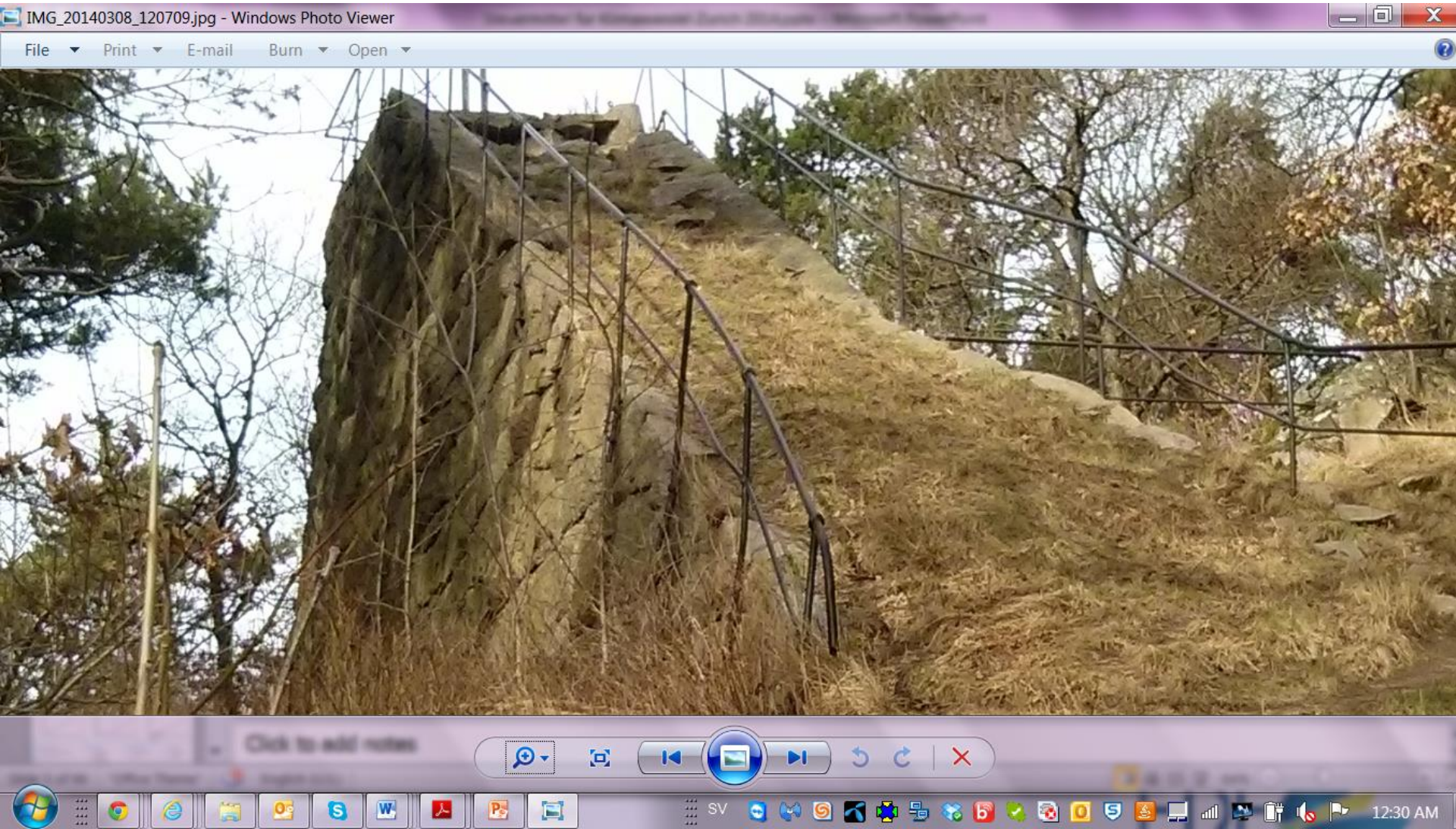
per +1ºC global average temperatur



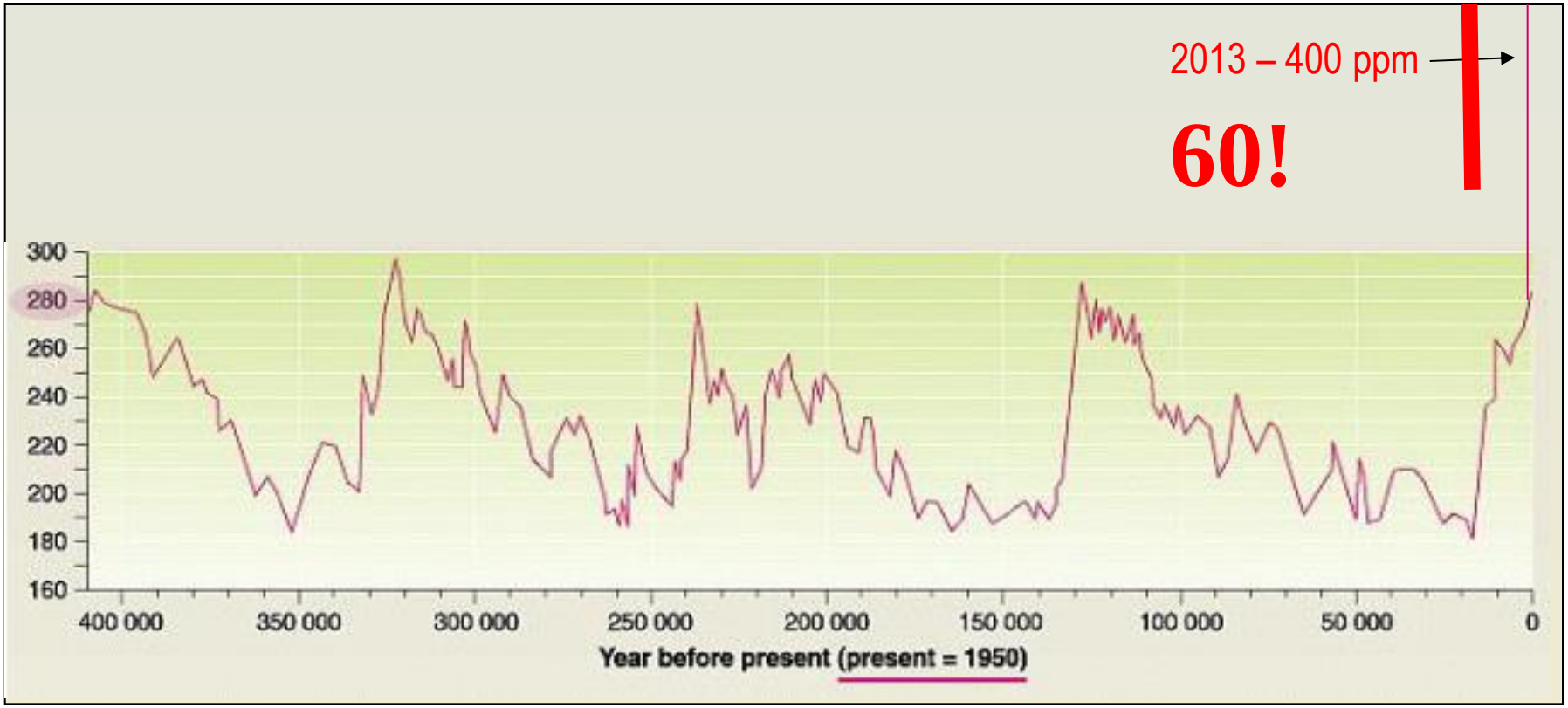
IPCC 2013

A Maya Ruin in Gothenburg

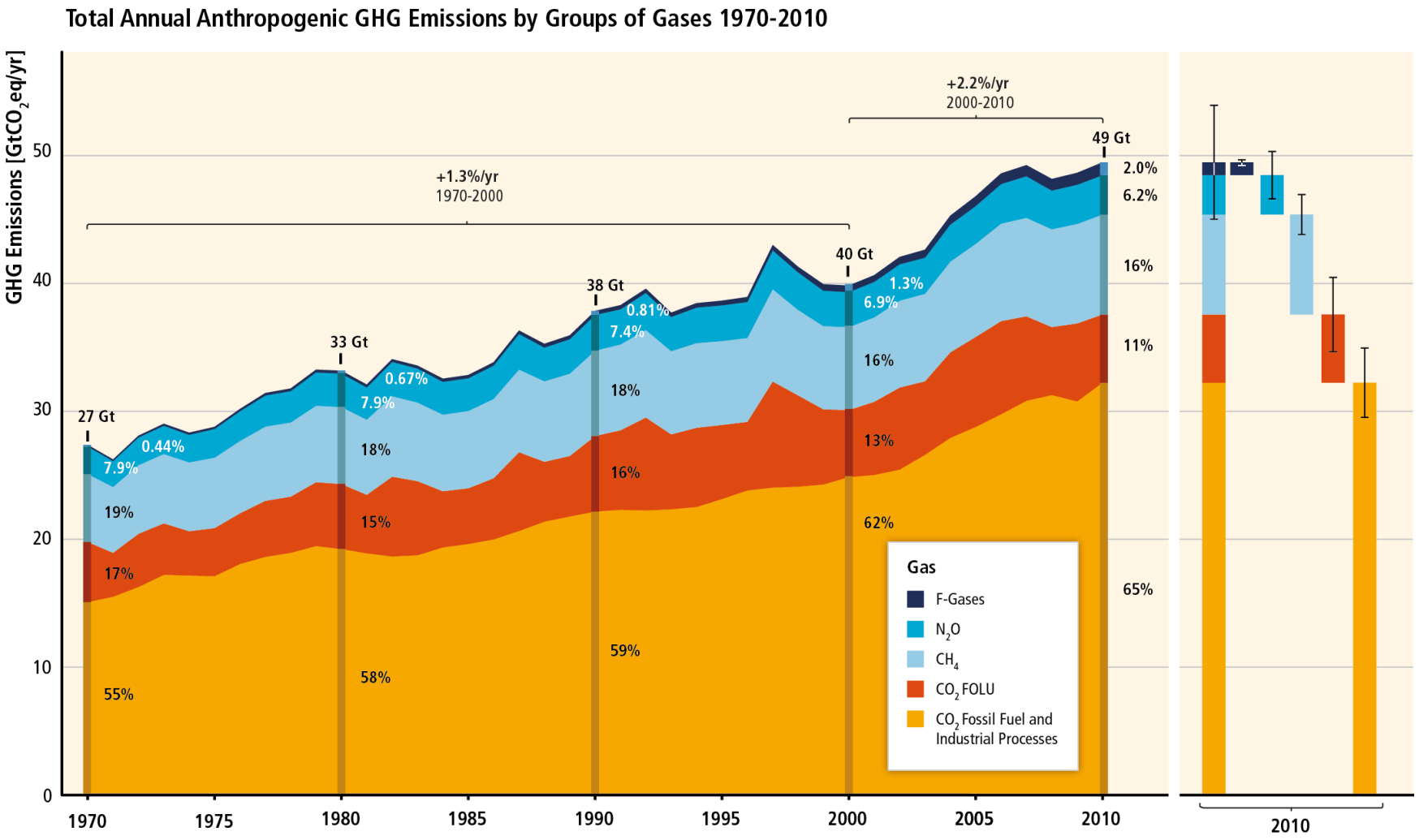
An old skijump



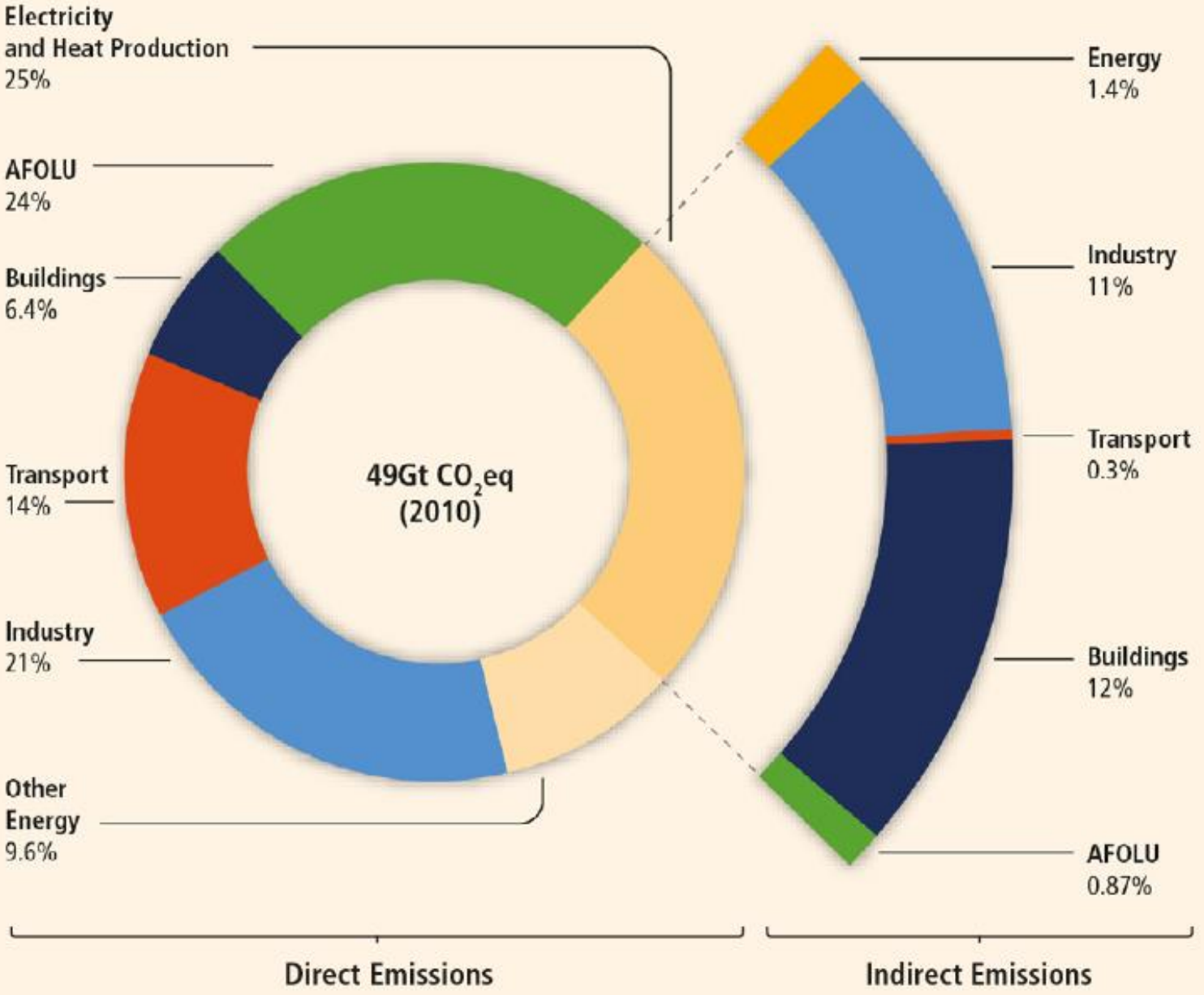
CO_2 content just increasing



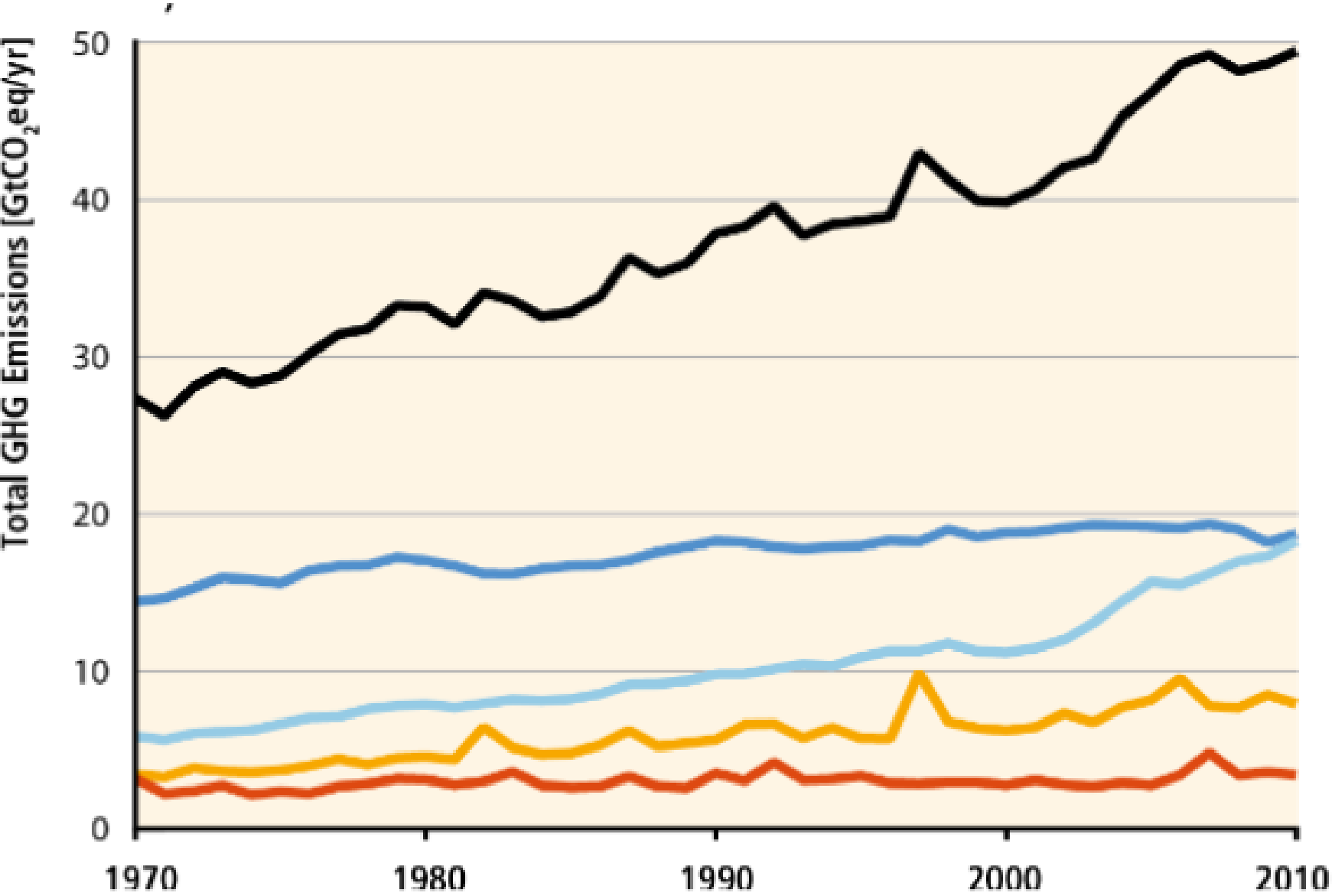
GHG emissions accelerate despite reduction efforts. Most emission growth is CO_2 from fossil fuel combustion.



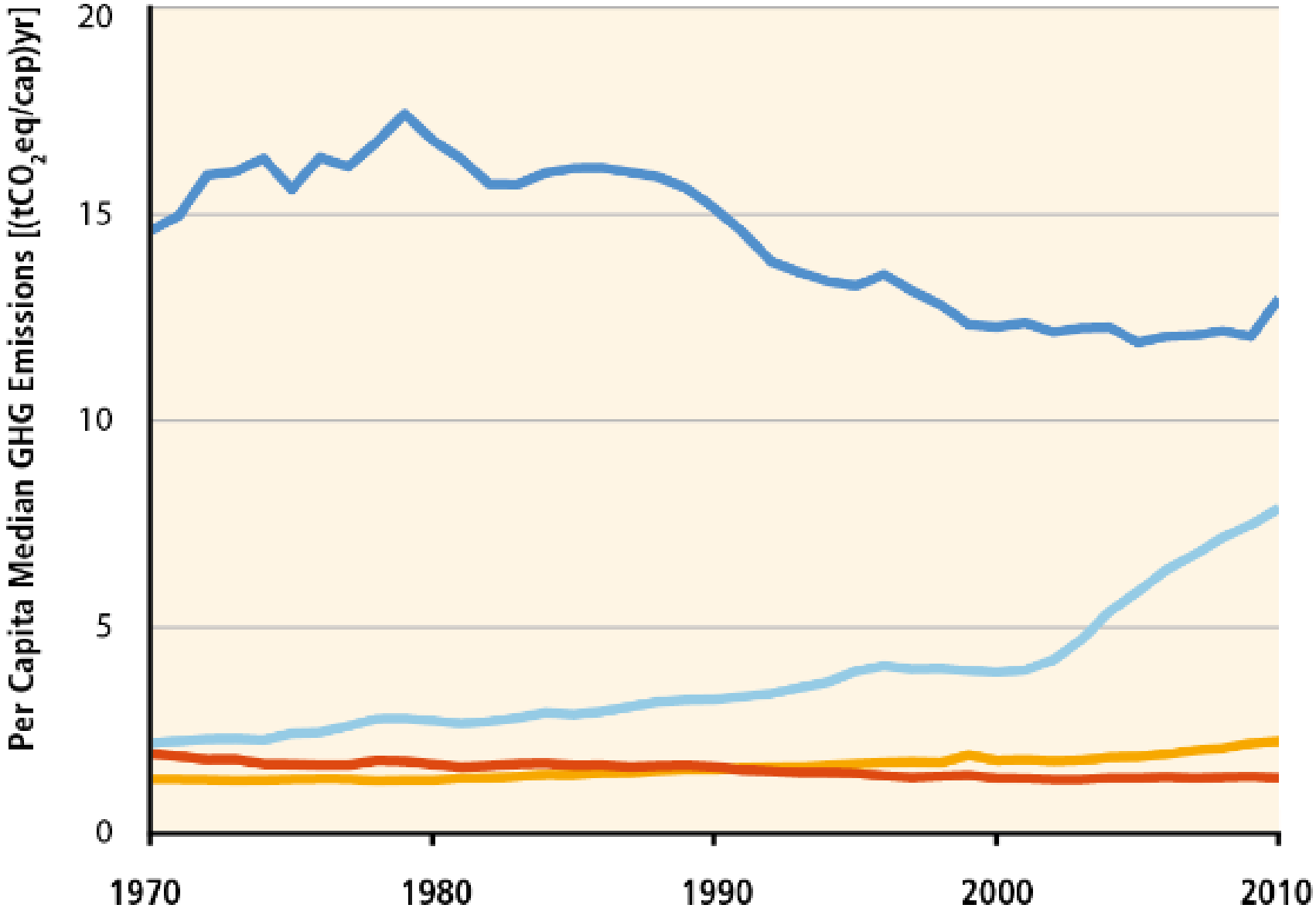
Greenhouse Gas Emissions by Economic Sectors and Country Income Groups

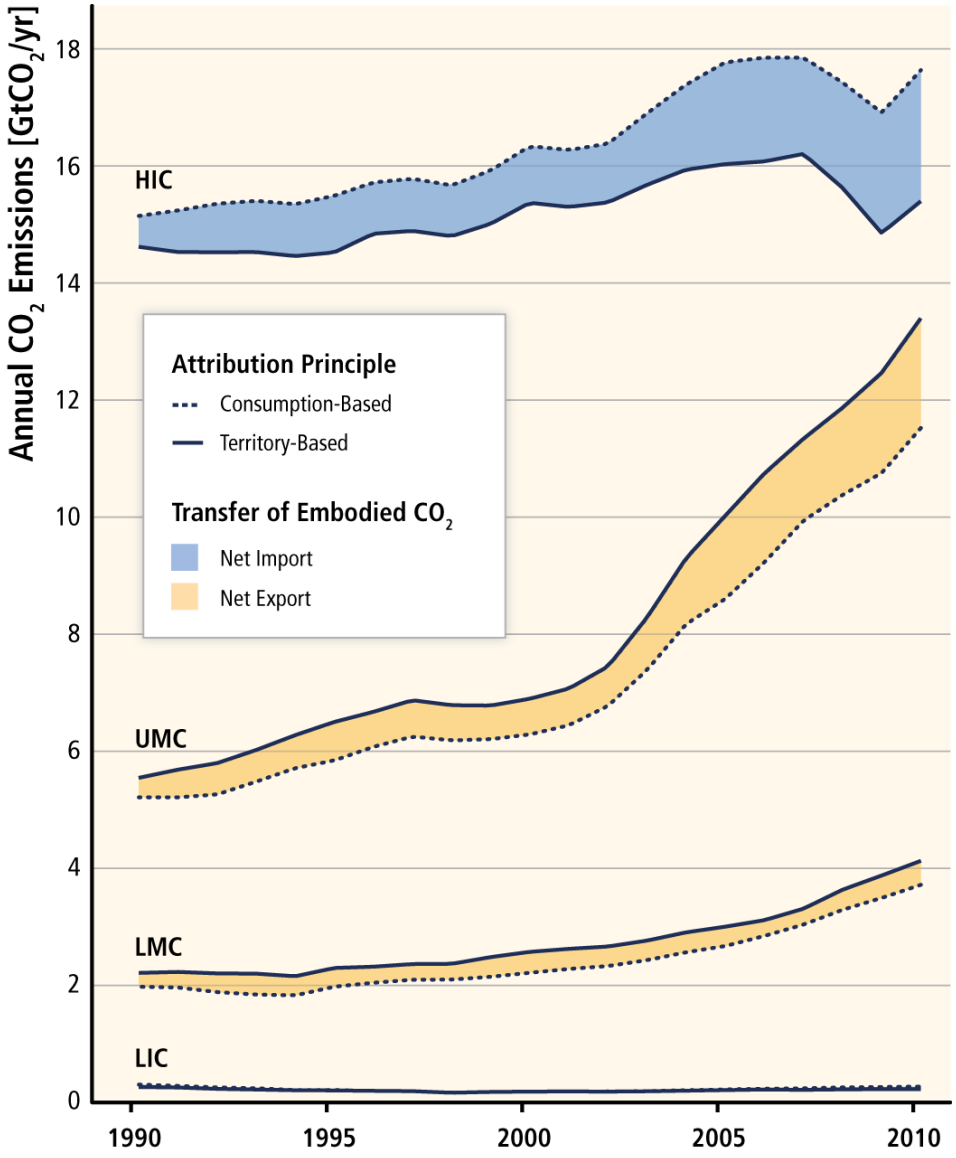


TOTAL GHG GtCO2eq, Total, High Y, Upper M, Lower M Low



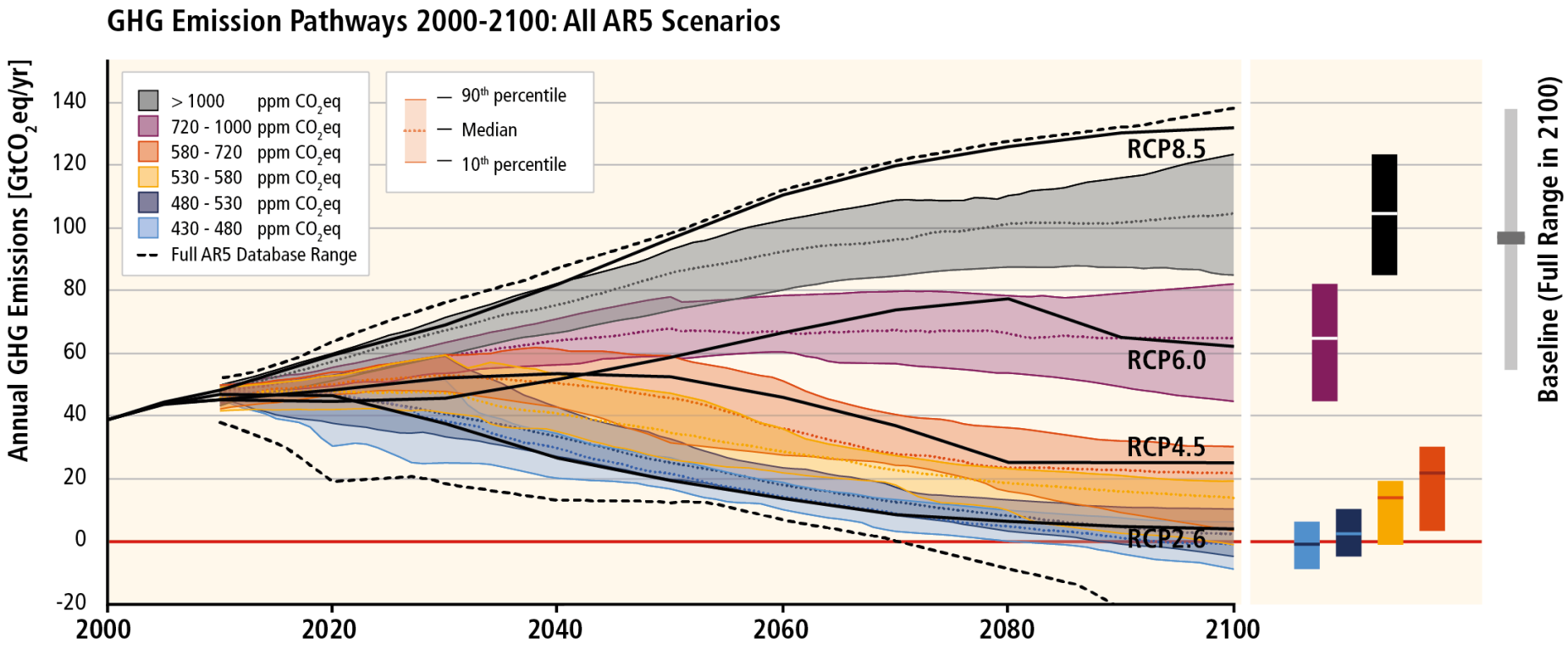
Per Capita emissions High, Upp M. Low M and Low





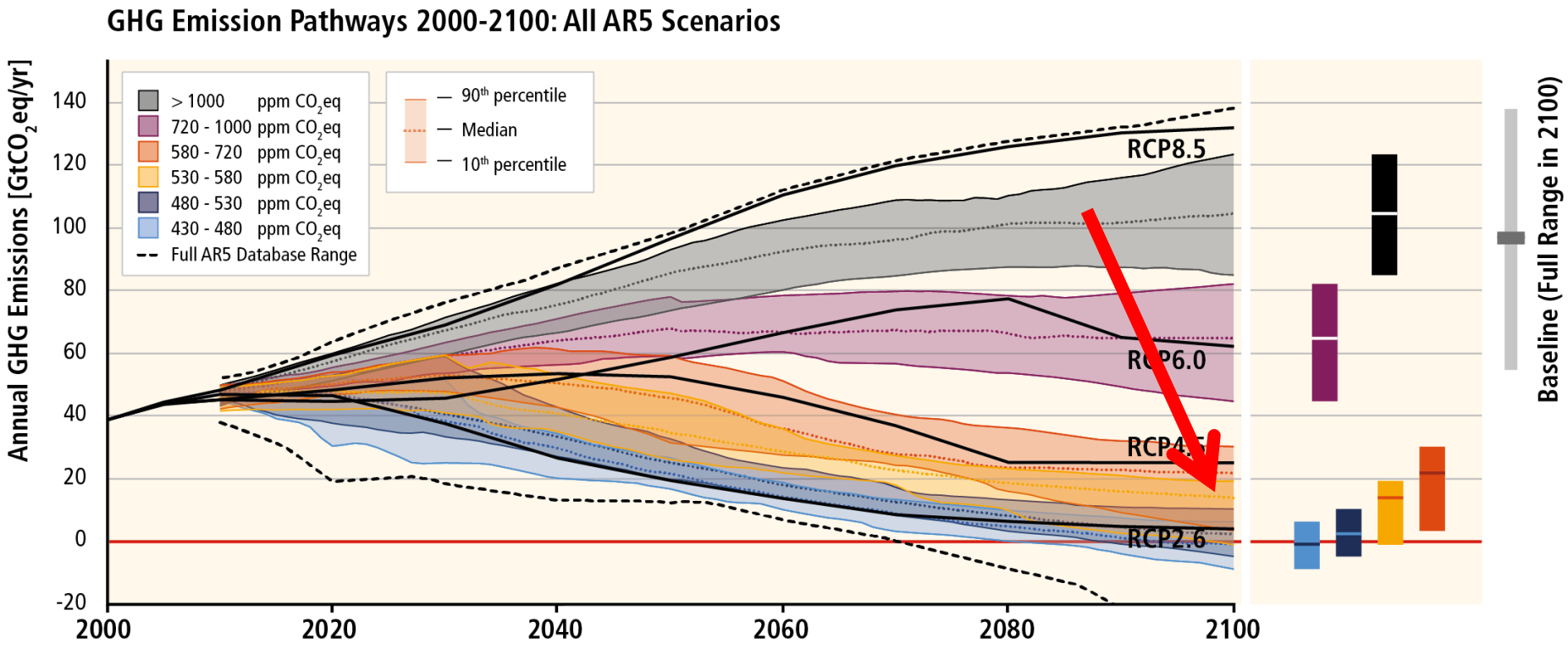
A growing share of CO_2 emissions from fossil fuel combustion and industrial processes in low and middle income countries has been released in the production of goods and services exported, notably from upper-middle income countries to high income countries.

Without more mitigation, global mean surface temperature might increase by 3.7° to 4.8°C over the 21st century.



What should we do ?

Without more mitigation, global mean surface temperature might increase by 3.7° to 4.8°C over the 21st century.



People's Climate March

New York 21/9/2014

CHALMERS CLIMATE CALCULATOR

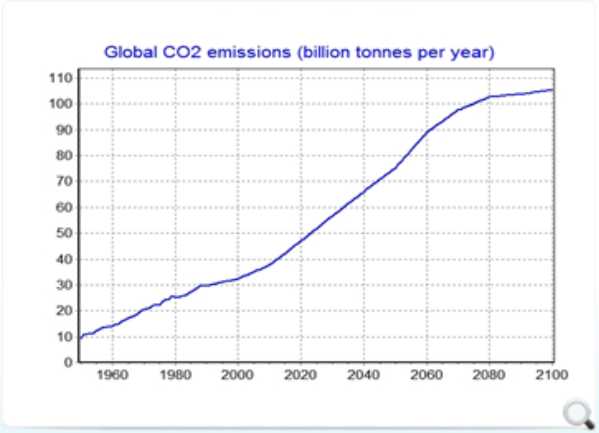
Christian Azar, Daniel Johansson (Frt) (1region vs)

CCC
CHALMERS CLIMATE CALCULATOR

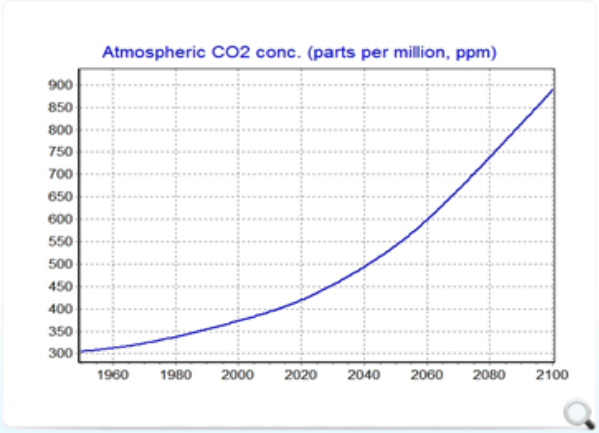
1-REGION MODEL | 2-REGION MODEL

CHALMERS

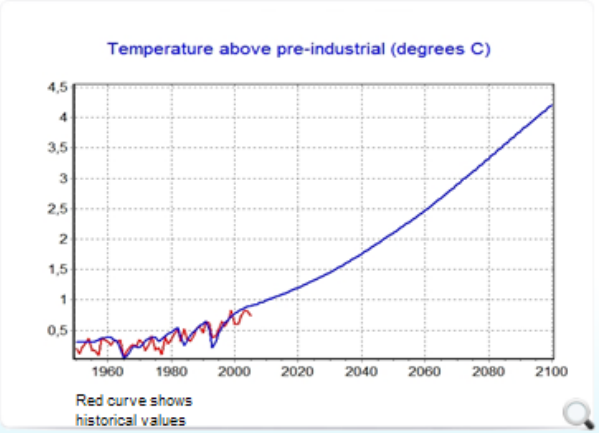
EMISSIONS



STOCK OF CO2



TEMPERATURE



Emission scenario

Emission reductions start in year: 2100

Rate of reduction (% per year): 0

Climate sensitivity

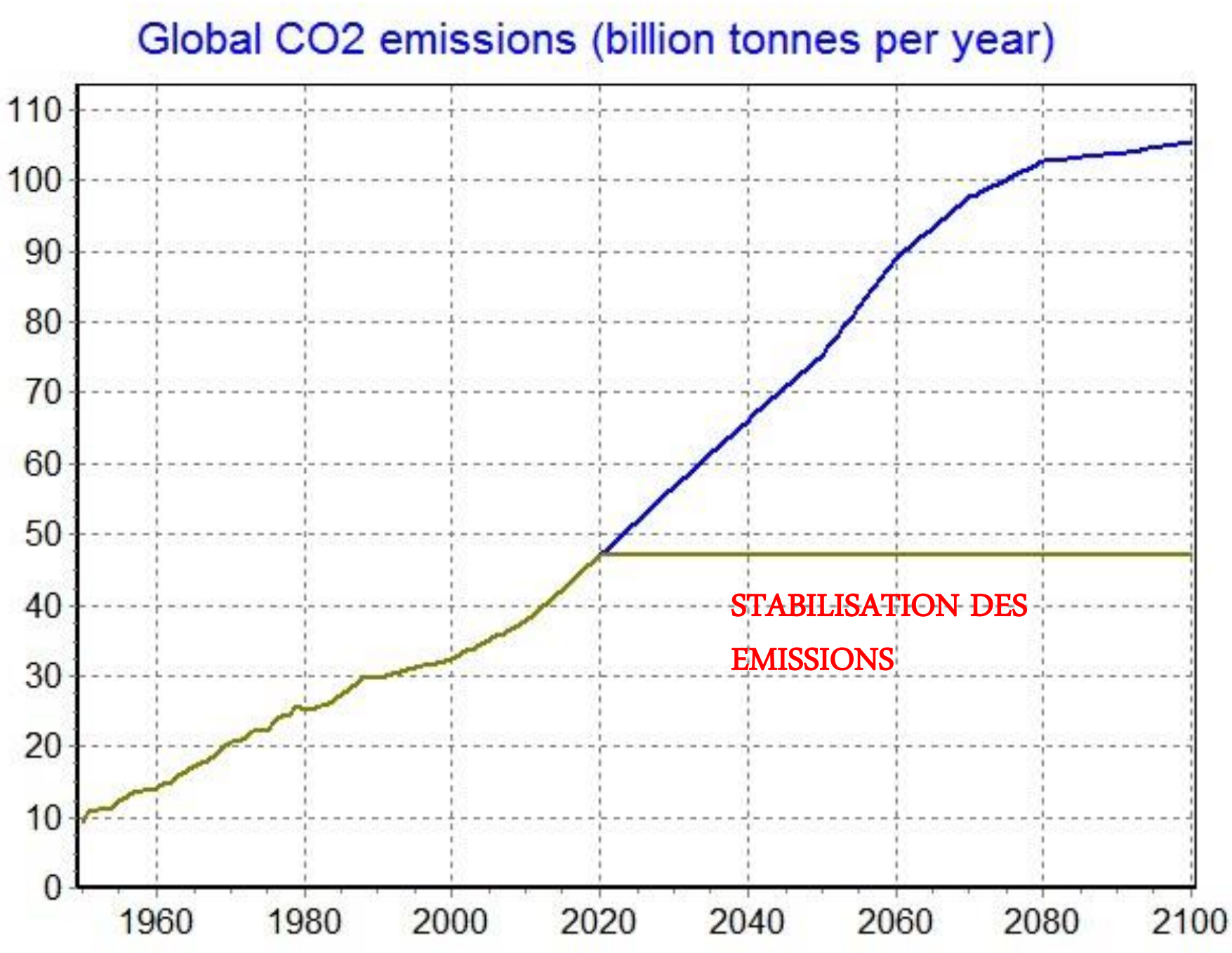
- 1.5 °C per CO_2 doubling
- 3.0 °C per CO_2 doubling
- 4.5 °C per CO_2 doubling
- 3.0 °C per CO_2 doubling (1 to 6)

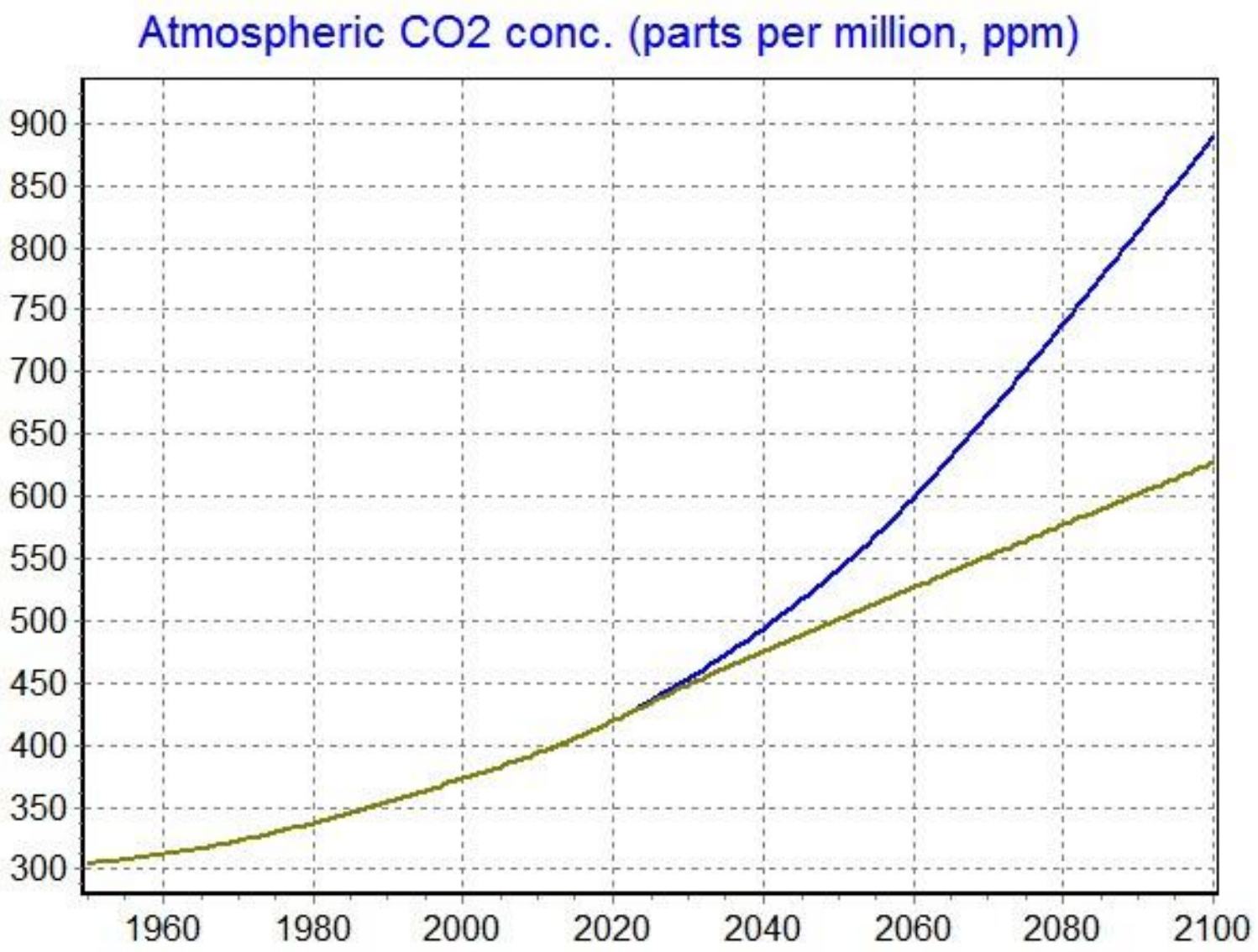
Aerosol forcing in 2005

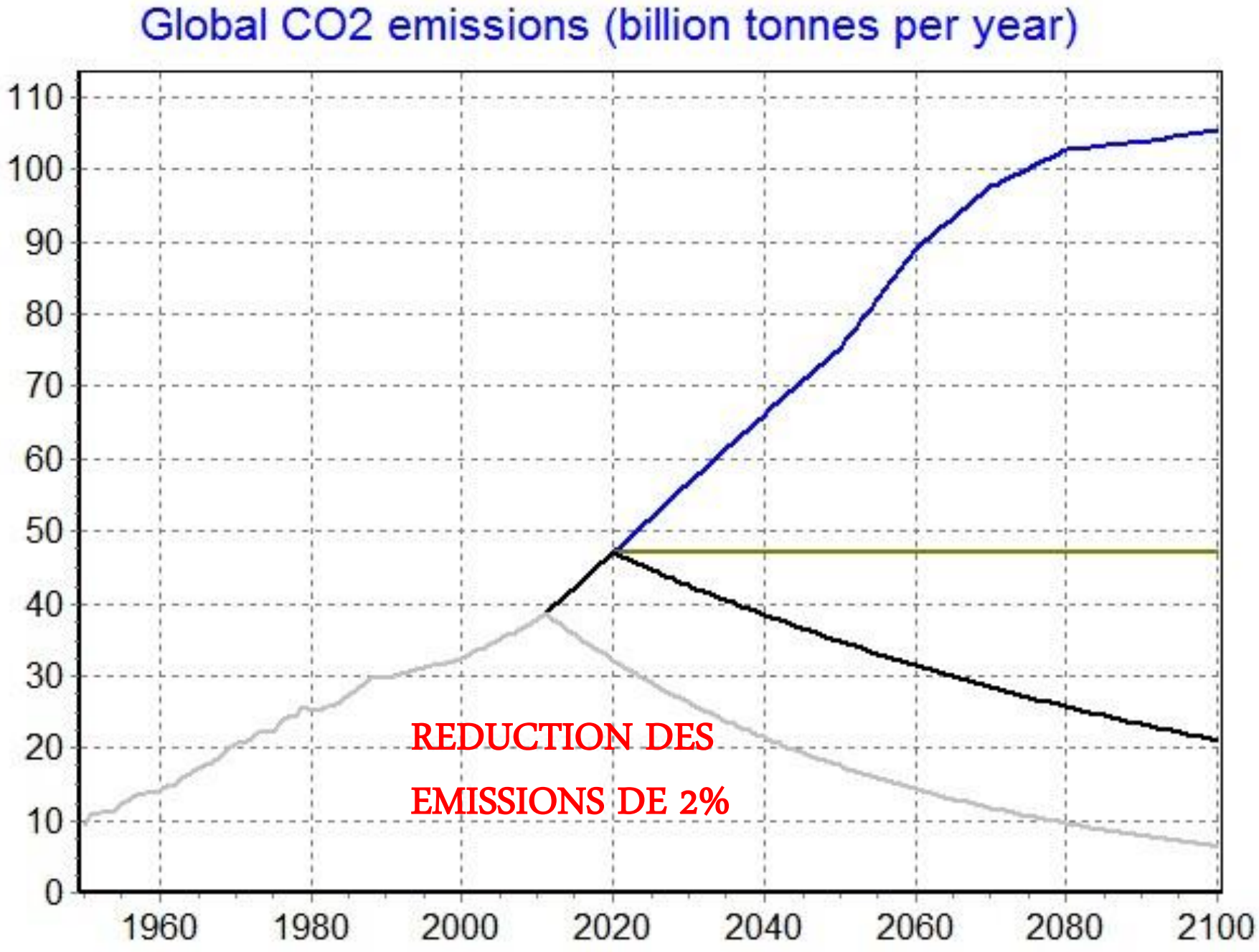
- Automatically calculated value
- -1 W/m² (-2.2 to -0.5)

User guide
Model documentation
Modeling team

GENERATE SCENARIO | CLEAR GRAPHS AND GENERATE


Global CO2 emissions (billion tonnes per year)
110
100
90
80
70
60
50
40
30
20
10
0
1960
1980
2000
2020
2040
2060
2080
2100
STABILISATION DES
EMISSIONS


Atmospheric CO2 conc. (parts per million, ppm)
900
850
800
750
700
650
600
550
500
450
400
350
300
1960
1980
2000
2020
2040
2060
2080
2100


Global CO2 emissions (billion tonnes per year)
110
100
90
80
70
60
50
40
30
20
10
0
1960
1980
2000
2020
2040
2060
2080
2100
REDUCTION DES
EMISSIONS DE 2%

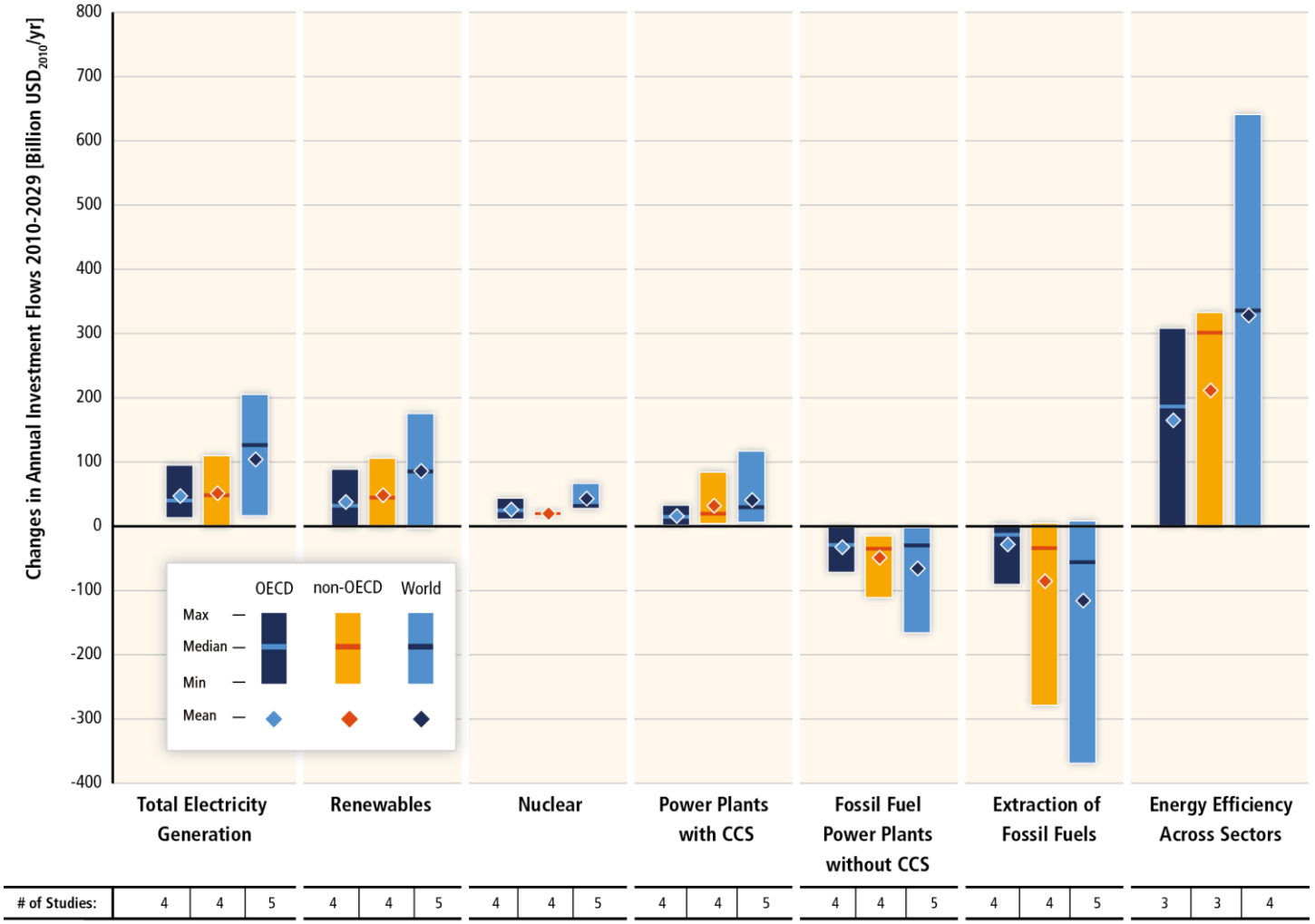
WHAT WE NEED

1. Global Treaty
2. Price on Carbon
3. (Removed subsidies)
4. Good conditions for renewables
5. CCS etc

Climate treaty needed...

Or ”Decentralized Architecture”

Substantial reductions in emissions would require large changes in investment patterns.



Imagine... ☼

- All Cars electric or biofuel
- Most power renewable
- All buildings ”0 energy”
- Cities with public transport, district heat...
- All industrial processes factor 10
- Use less plastics, aluminium etc ?
- People eat less meat
- Bike more
- Work more at home
- Manage personal use
- Fly less

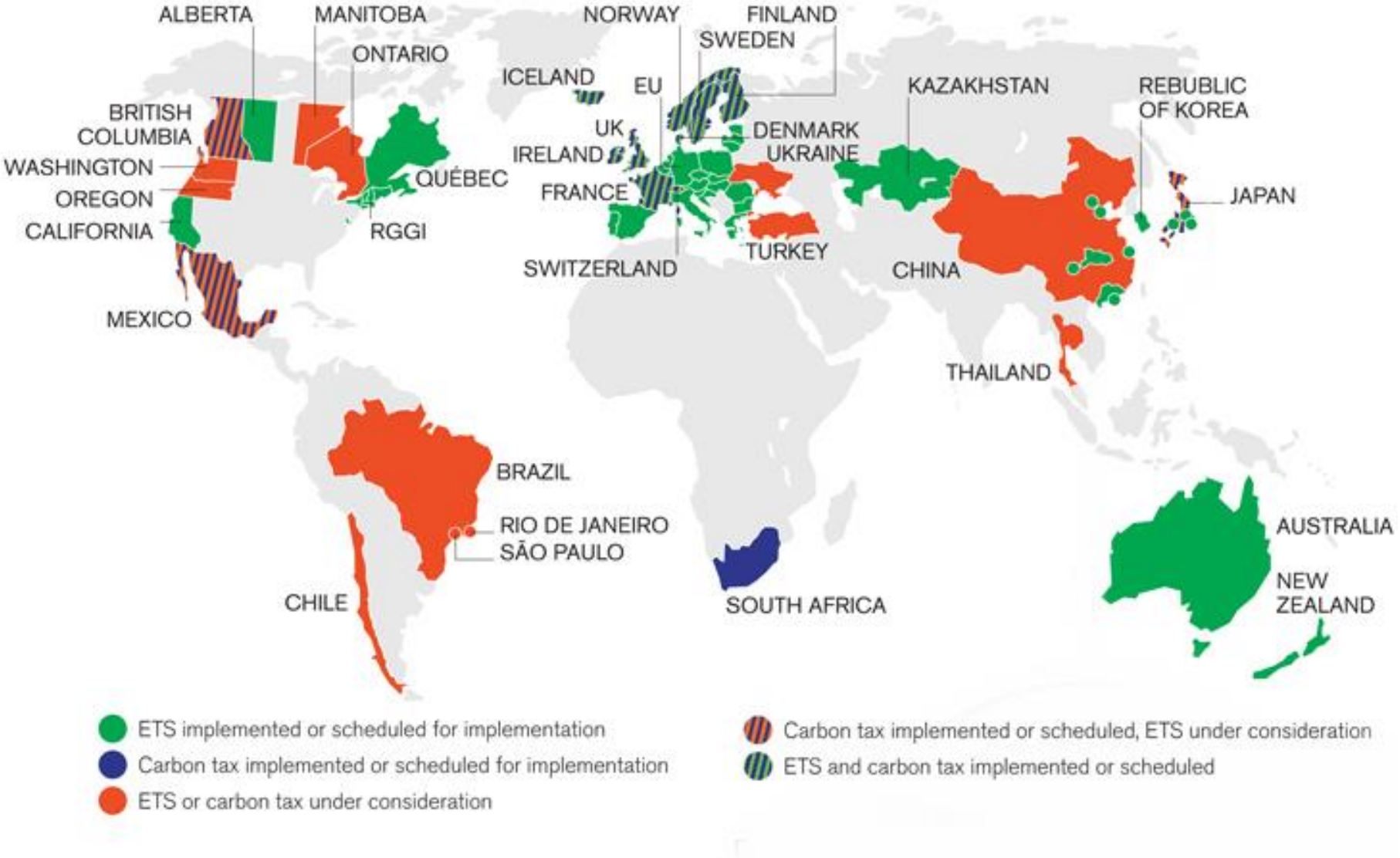
What will make this happen: ?

What will make this happen:

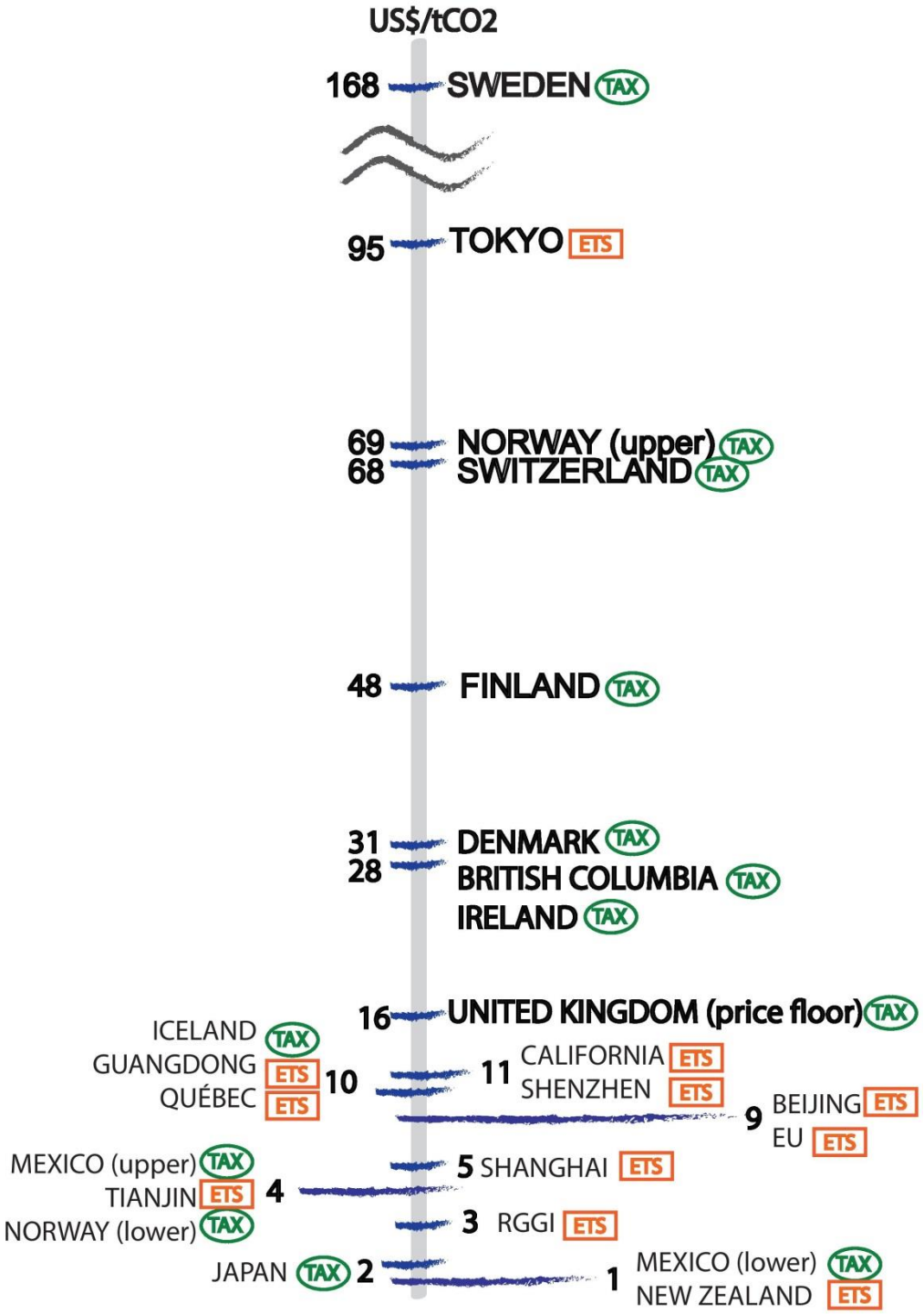
- Technology mandates?
- Recomendations

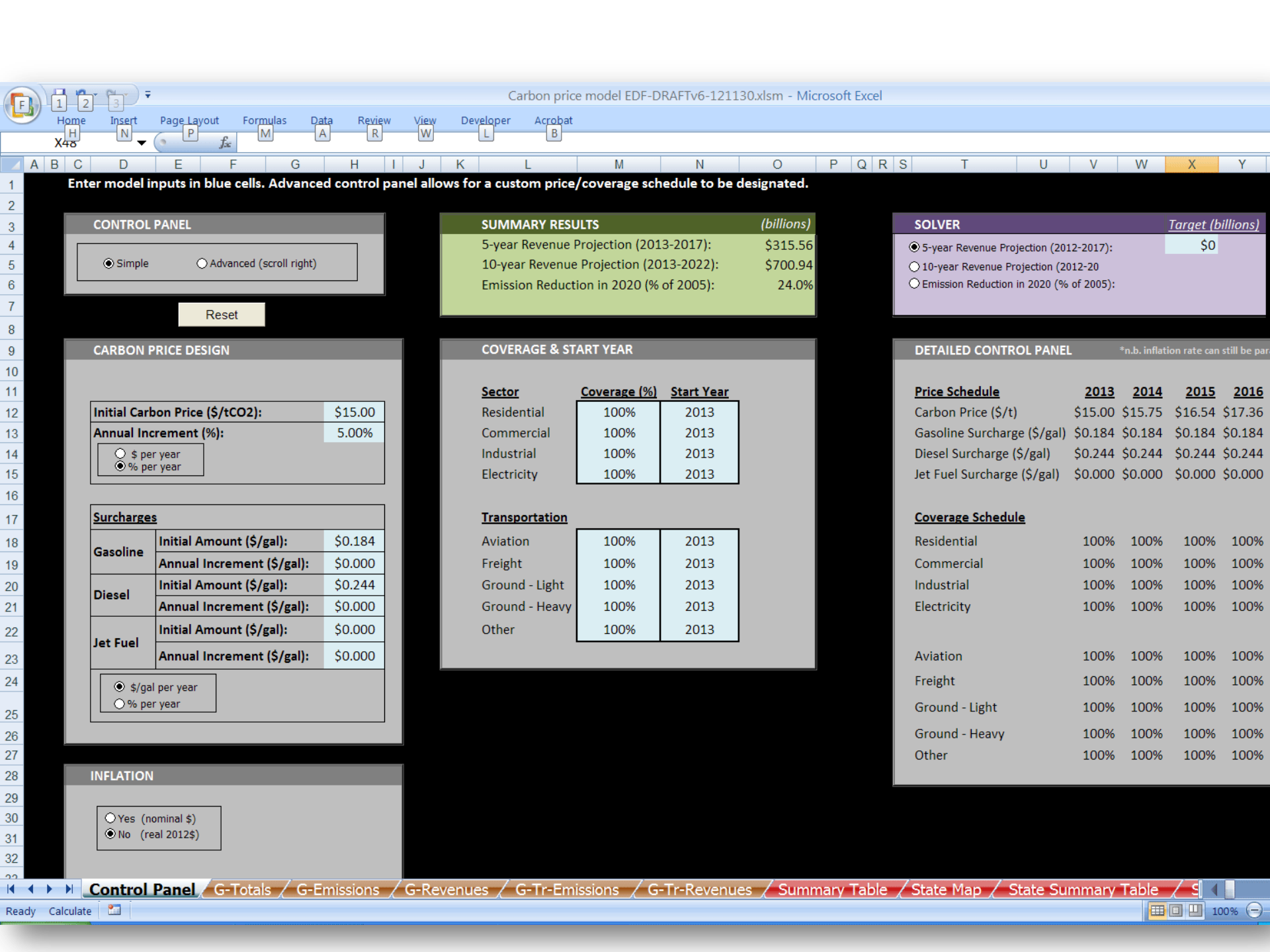
- Yes and No
- Price on carbon.
- Technology

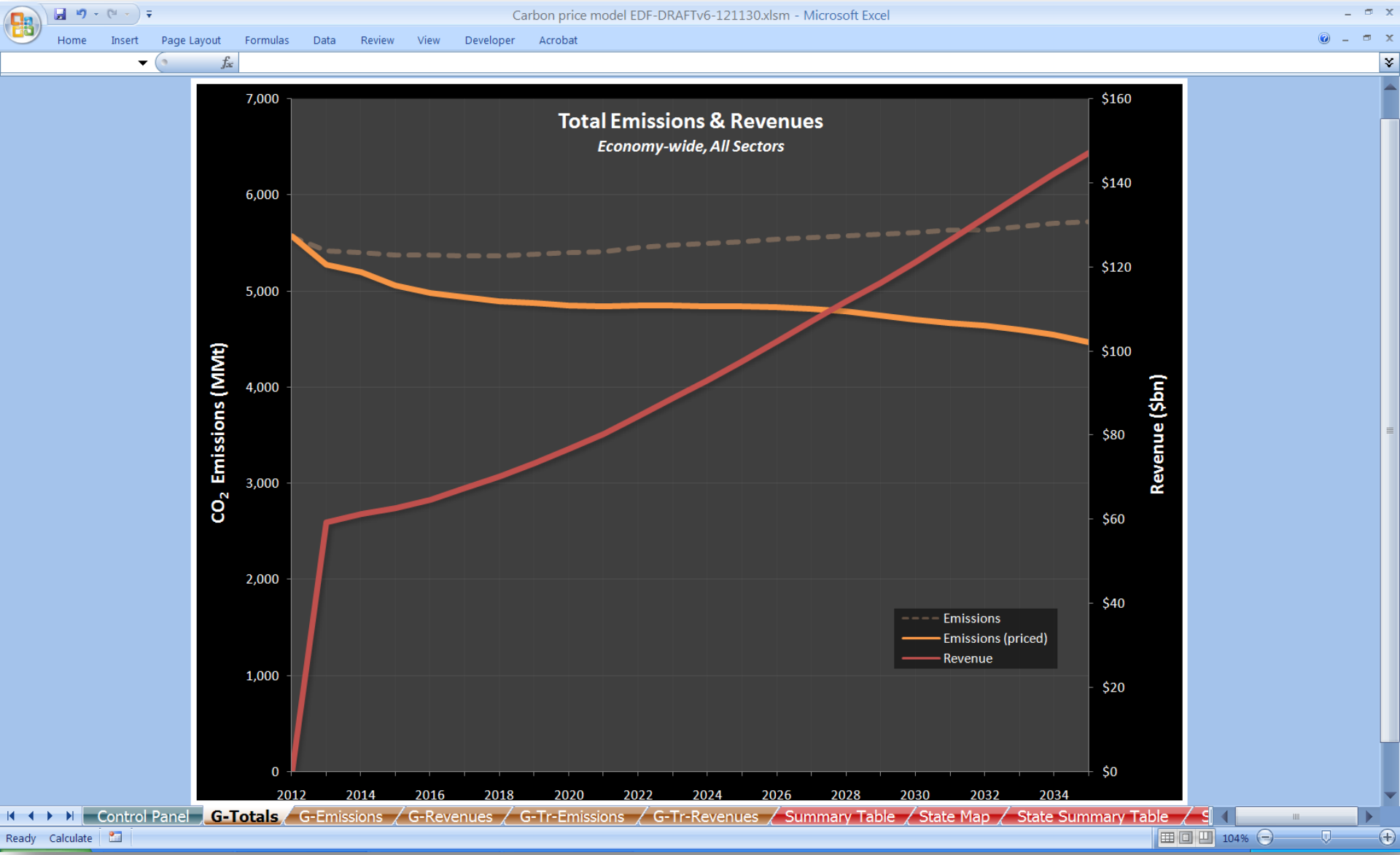
Taxes and Emission Trading



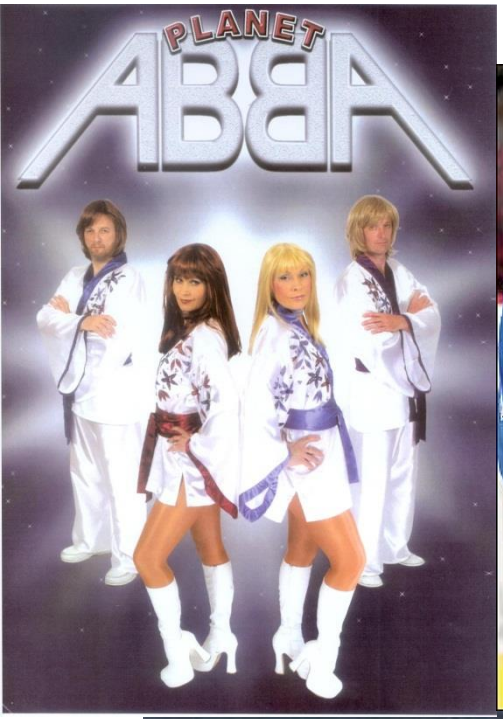
Source: State and Trends of Carbon Pricing, May 2014, World Bank

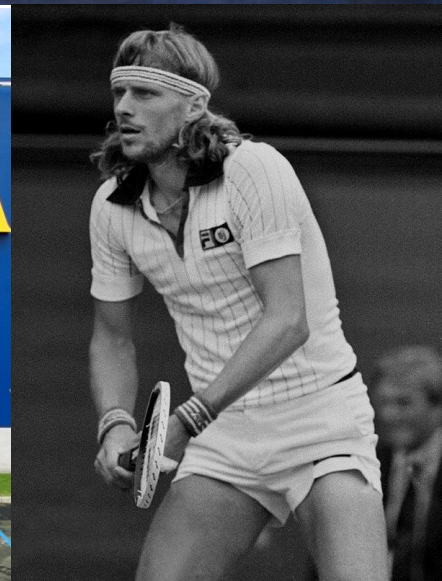

US$/tCO2
168 SWEDEN TAX
95 TOKYO ETS
69 NORWAY (upper) TAX
68 SWITZERLAND TAX
48 FINLAND TAX
31 DENMARK TAX
28 BRITISH COLUMBIA TAX
IRELAND TAX
16 UNITED KINGDOM (price floor) TAX
ICELAND TAX
GUANGDONG ETS
QUÉBEC ETS
10
11 CALIFORNIA ETS
SHENZHEN ETS
9 BEIJING ETS
EU ETS
MEXICO (upper) TAX
TIANJIN ETS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


Carbon price model EDF-DRAFTv6-121130.xlsm - Microsoft Excel
Home Insert Page Layout Formulas Data Review View Developer Acrobat
Enter model inputs in blue cells. Advanced control panel allows for a custom price/coverage schedule to be designated.
CONTROL PANEL
Simple
Advanced (scroll right)
Reset
SUMMARY RESULTS (billions)
5-year Revenue Projection (2013-2017): $315.56
10-year Revenue Projection (2013-2022): $700.94
Emission Reduction in 2020 (% of 2005): 24.0%
SOLVER Target (billions)
5-year Revenue Projection (2012-2017): $0
10-year Revenue Projection (2012-20
Emission Reduction in 2020 (% of 2005):
CARBON PRICE DESIGN
Initial Carbon Price ($/tCO2): $15.00
Annual Increment (%): 5.00%
$ per year
% per year
Surcharges
Gasoline Initial Amount ($/gal): $0.184
Annual Increment ($/gal): $0.000
Diesel Initial Amount ($/gal): $0.244
Annual Increment ($/gal): $0.000
Jet Fuel Initial Amount ($/gal): $0.000
Annual Increment ($/gal): $0.000
$/gal per year
% per year
COVERAGE & START YEAR
Sector Coverage (%) Start Year
Residential 100% 2013
Commercial 100% 2013
Industrial 100% 2013
Electricity 100% 2013
Transportation
Aviation 100% 2013
Freight 100% 2013
Ground - Light 100% 2013
Ground - Heavy 100% 2013
Other 100% 2013
DETAILED CONTROL PANEL
*n.b. inflation rate can still be par
Price Schedule 2013 2014 2015 2016
Carbon Price ($/t) $15.00 $15.75 $16.54 $17.36
Gasoline Surcharge ($/gal) $0.184 $0.184 $0.184 $0.184
Diesel Surcharge ($/gal) $0.244 $0.244 $0.244 $0.244
Jet Fuel Surcharge ($/gal) $0.000 $0.000 $0.000 $0.000
Coverage Schedule
Residential 100% 100% 100% 100%
Commercial 100% 100% 100% 100%
Industrial 100% 100% 100% 100%
Electricity 100% 100% 100% 100%
Aviation 100% 100% 100% 100%
Freight 100% 100% 100% 100%
Ground - Light 100% 100% 100% 100%
Ground - Heavy 100% 100% 100% 100%
Other 100% 100% 100% 100%
INFLATION
Yes (nominal $)
No (real 2012$)
Control Panel G-Totals G-Emissions G-Revenues G-Tr-Emissions G-Tr-Revenues Summary Table State Map State Summary Table
Ready Calculate
100%


Carbon price model EDF-DRAFTv6-121130.xlsm - Microsoft Excel
Home
Insert
Page Layout
Formulas
Data
Review
View
Developer
Acrobat
Total Emissions & Revenues
Economy-wide, All Sectors
CO_2 Emissions (MMt)
Revenue ($bn)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
$160
$140
$120
$100
$80
$60
$40
$20
$0
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
Emissions
Emissions (priced)
Revenue
Control Panel
G-Totals
G-Emissions
G-Revenues
G-Tr-Emissions
G-Tr-Revenues
Summary Table
State Map
State Summary Table
Ready
Calculate
104%

CO2 tax Sweden 165 $/Ton





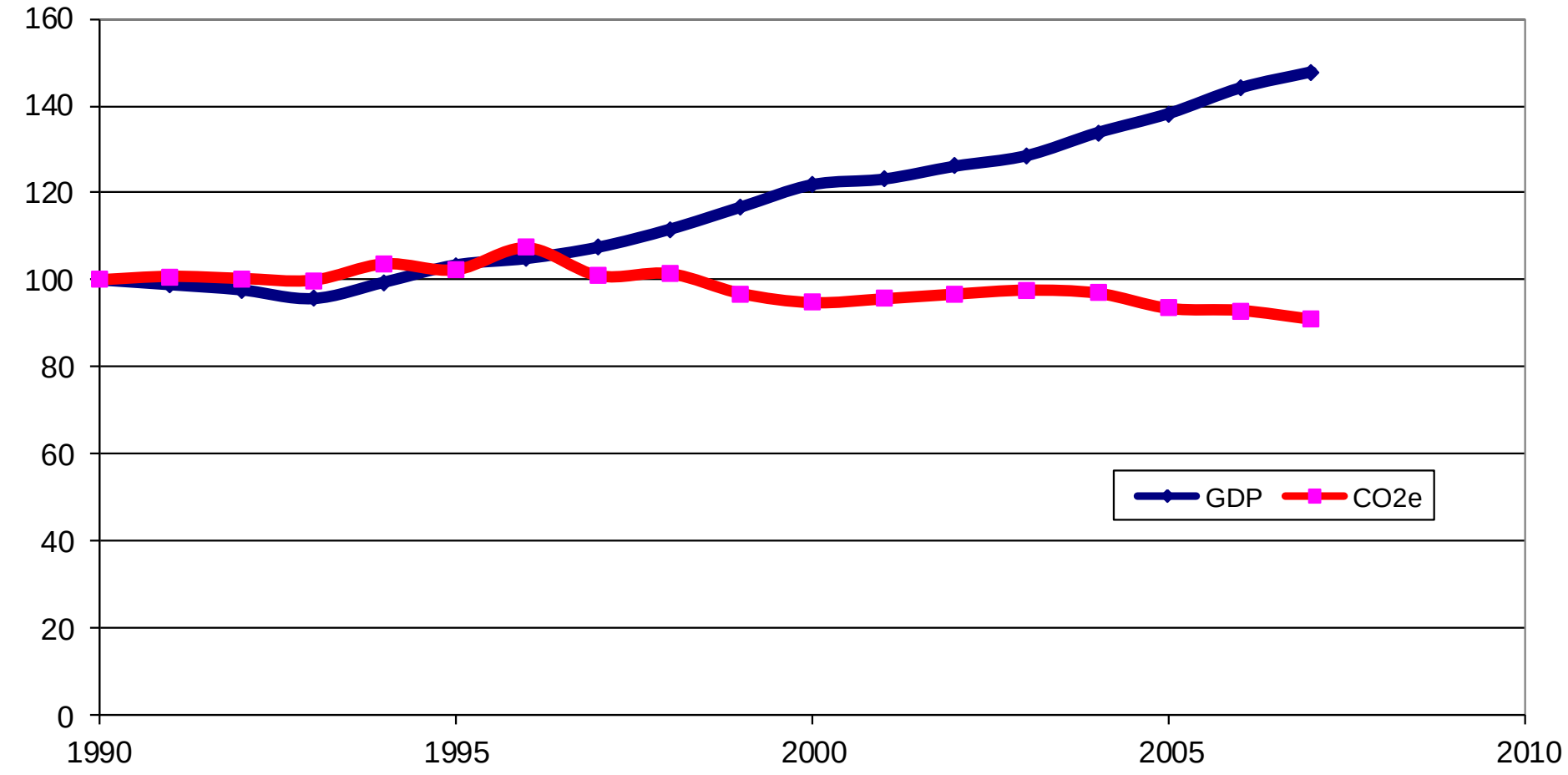
Parlament also:

- Abolished wealth tax, inheritance tax,
- Modified property tax
- Broadened tax base for VAT etc
- includes Services, energy, télévis., heat etc
- Reduced profit taxes for companies
- Total 10 billion € (30% environnemental)

This is a big **FAT** Carbon **TAX**

- Nordhaus: 17 $/tonne
- Stern speaks of 20-50 $/tonne
- 2008: RGGI 3.80 Chicago 4.50 MDP 17-25
- EU ETS : ~ 5 - 20$
- French Tax: 32 -- 17 €/tonne
- US 10 or 20
- Swedish Tax **165 $/ton + energy tax, fuel tax VAT etc. Gasoline costs about 9$/gal**

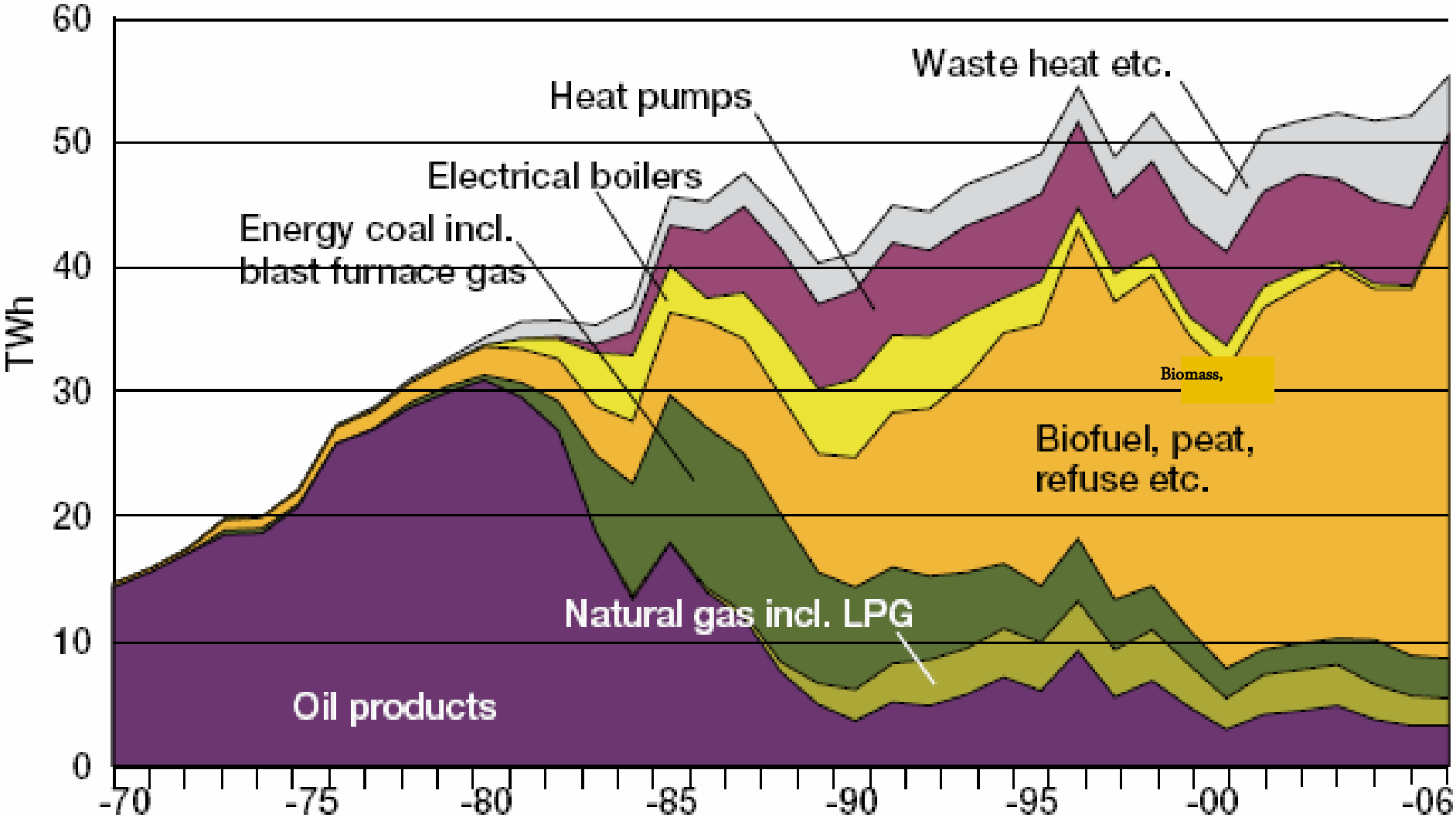
CO_2 -9% & GDP + 48% 1990 - 2007



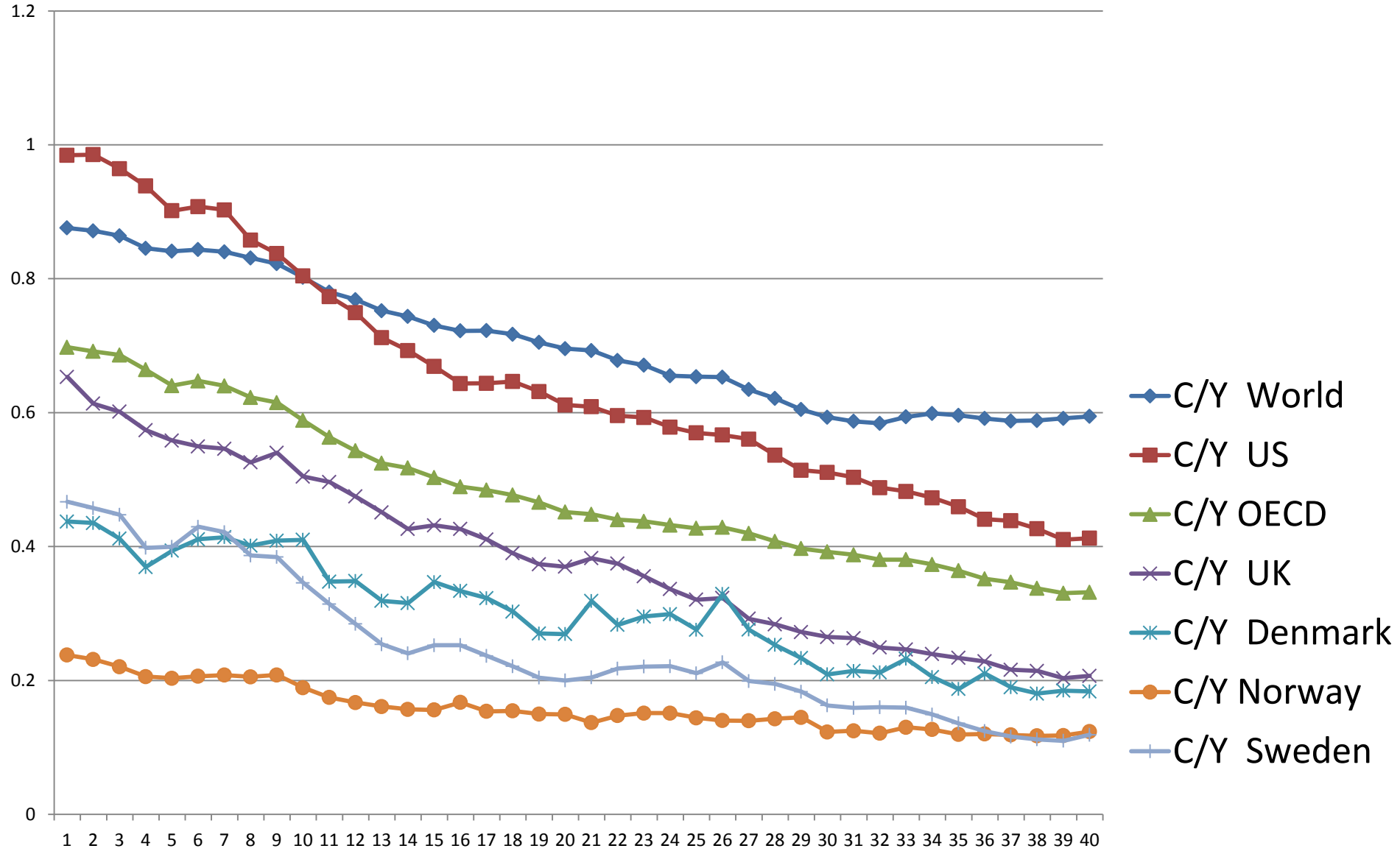
District heating 1970-2006

2007 54 TWh (+ 32 % > 1990) & Bio 24 →70 %

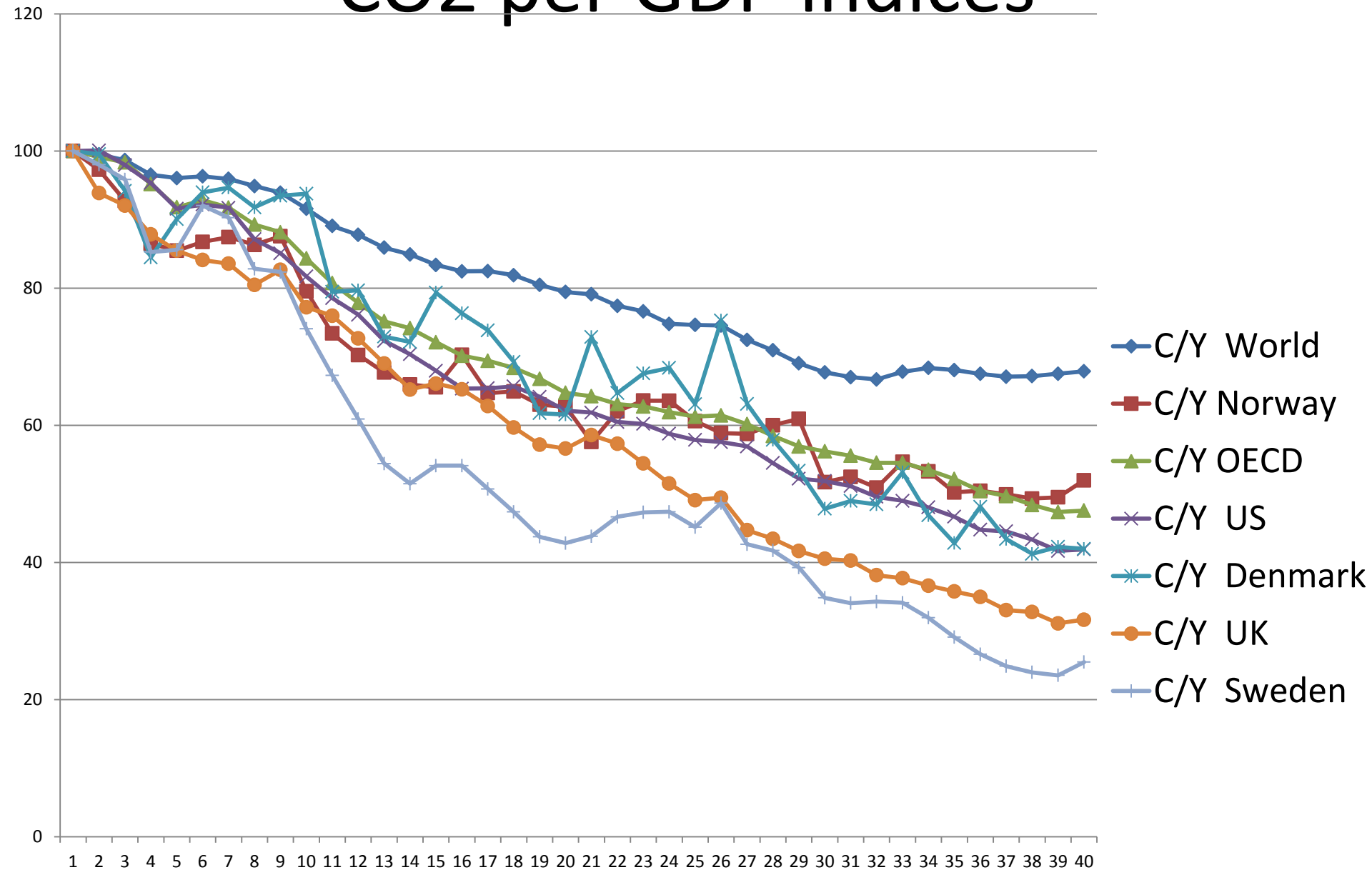
50 % of total heat. 76 % of flats.



Tons CO2 / $ GDP


1.2
1
0.8
0.6
0.4
0.2
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
C/Y World
C/Y US
C/Y OECD
C/Y UK
C/Y Denmark
C/Y Norway
C/Y Sweden

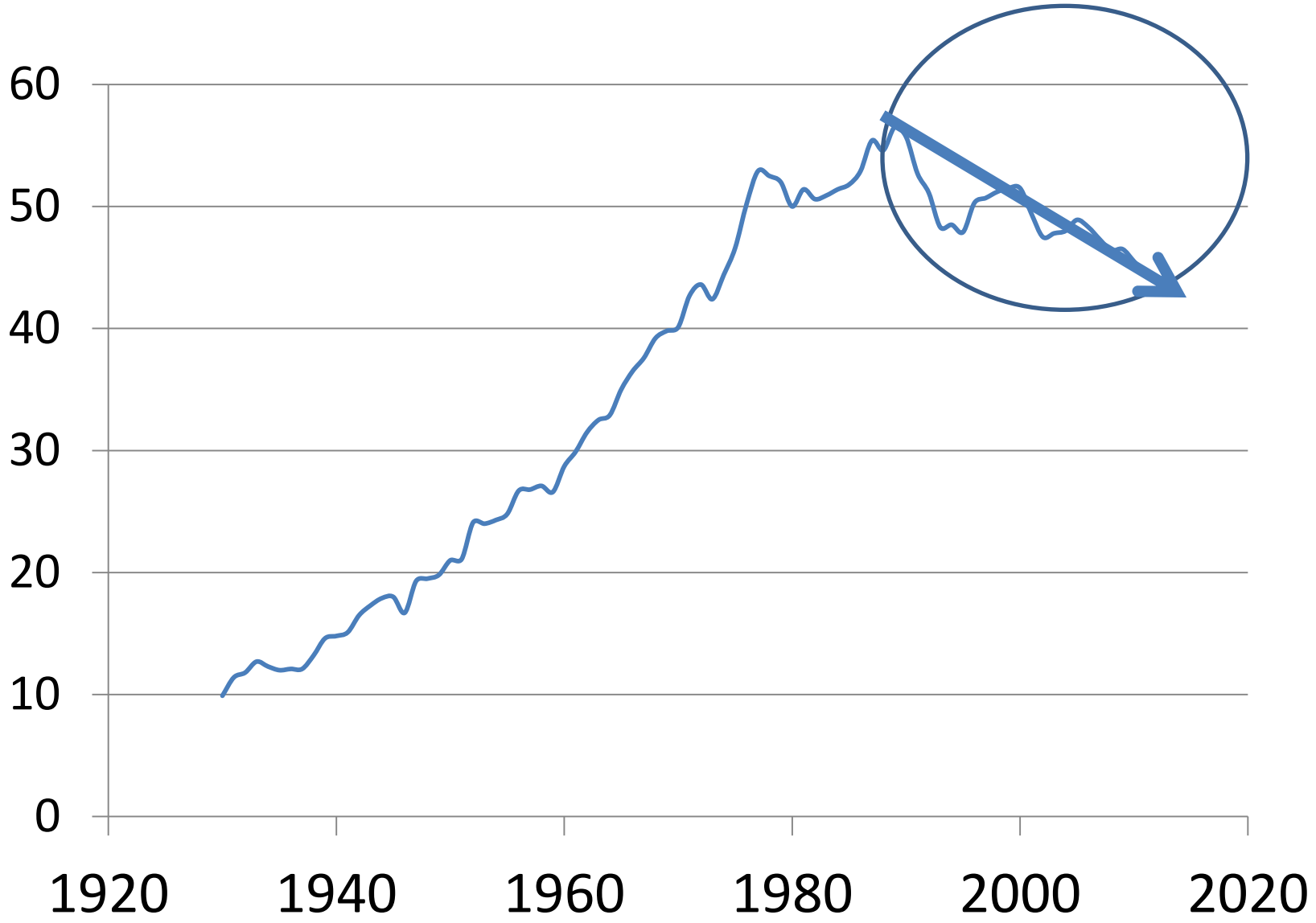
CO2 per GDP indices



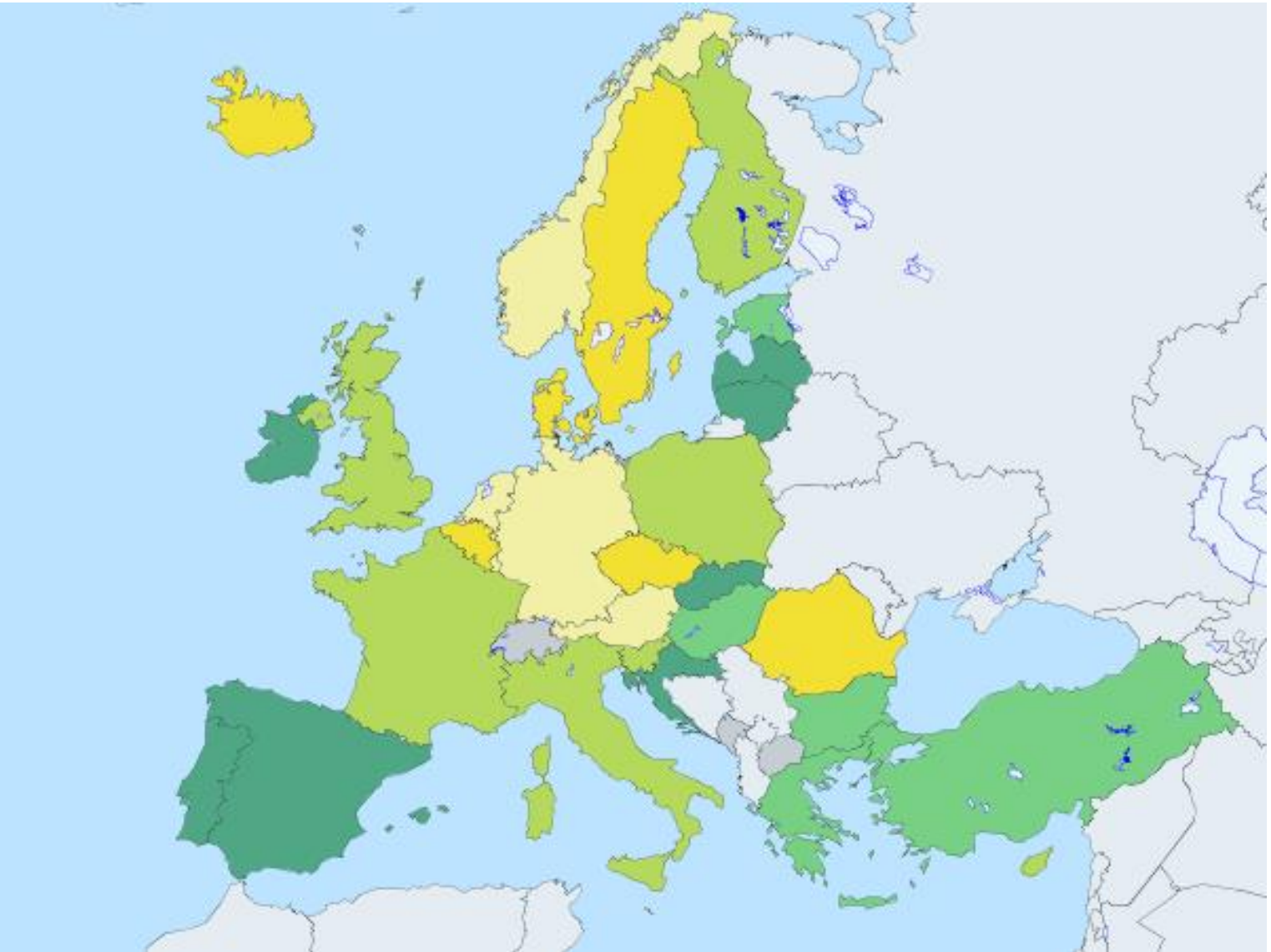
Carbon Tax

	Billion €
CO2	3
Tot Env	10
Tot Taxes	111
GDP	367

Taxes in Sweden did NOT go up in total



Unemployment not higher



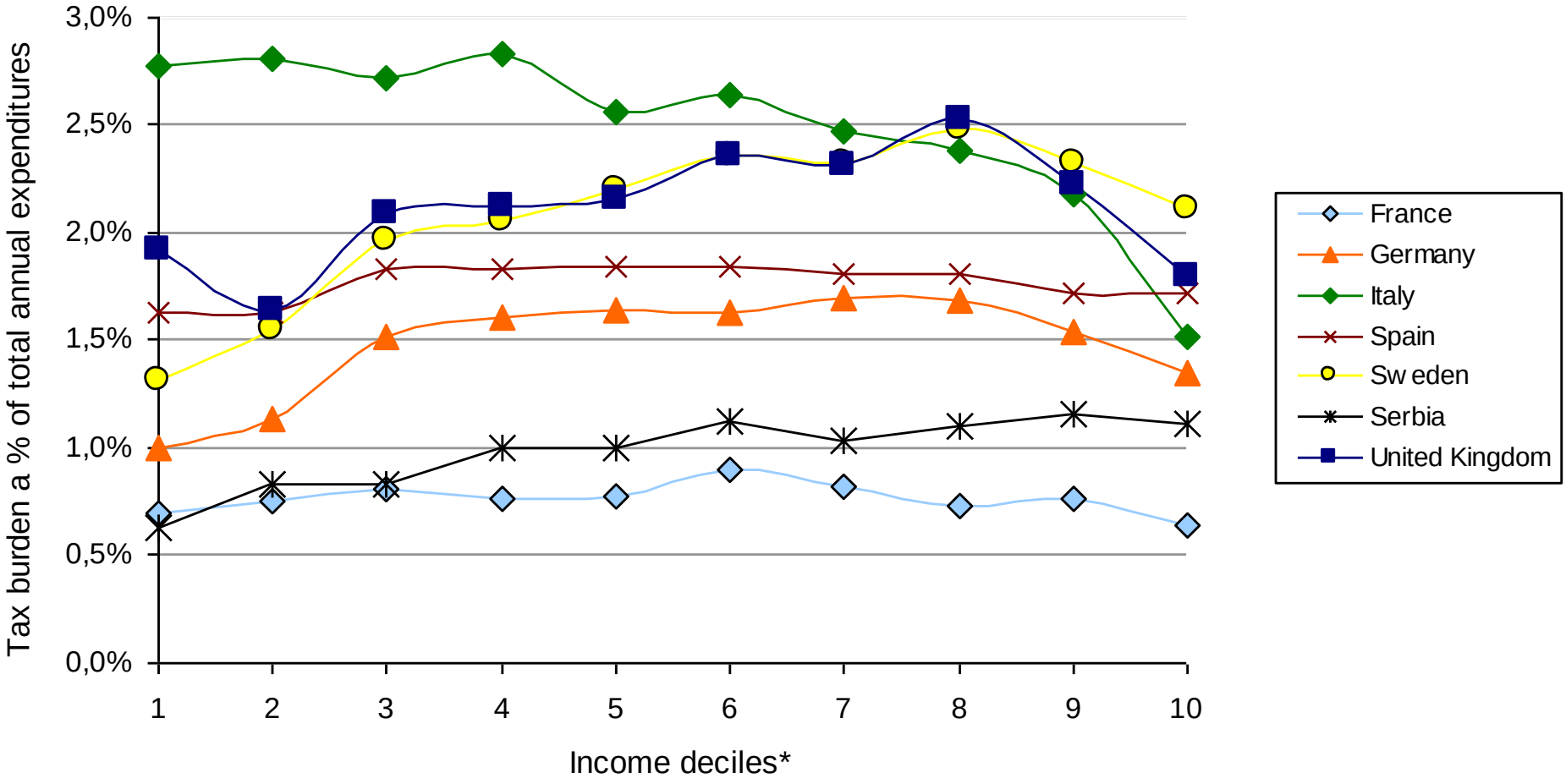
Other instruments...

- Sulfur taxes
- Nox Fee
- No revenue for treasury
- No output effect
- Focused on technology
- Compare Norway

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%

Regressive?


3,0%
2,5%
2,0%
1,5%
1,0%
0,5%
0,0%
Tax burden a % of total annual expenditures
1
2
3
4
5
6
7
8
9
10
Income deciles*
France
Germany
Italy
Spain
Sw eden
Serbia
United Kingdom

Graphique I.1. L'inégalité des revenus aux Etats-Unis, 1910-2010

Lecture: la part du décile supérieur dans le revenu national américain est passée de 45-50% dans les années 1910-1920 à moins de 35% dans les années 1950 (il s'agit de la baisse mesurée par Kuznets); puis elle est remontée de moins de 35% dans les années 1970 à 45-50% dans les années 2000-2010. Sources et séries: voir piketty.pse.ens.fr/capital21c.

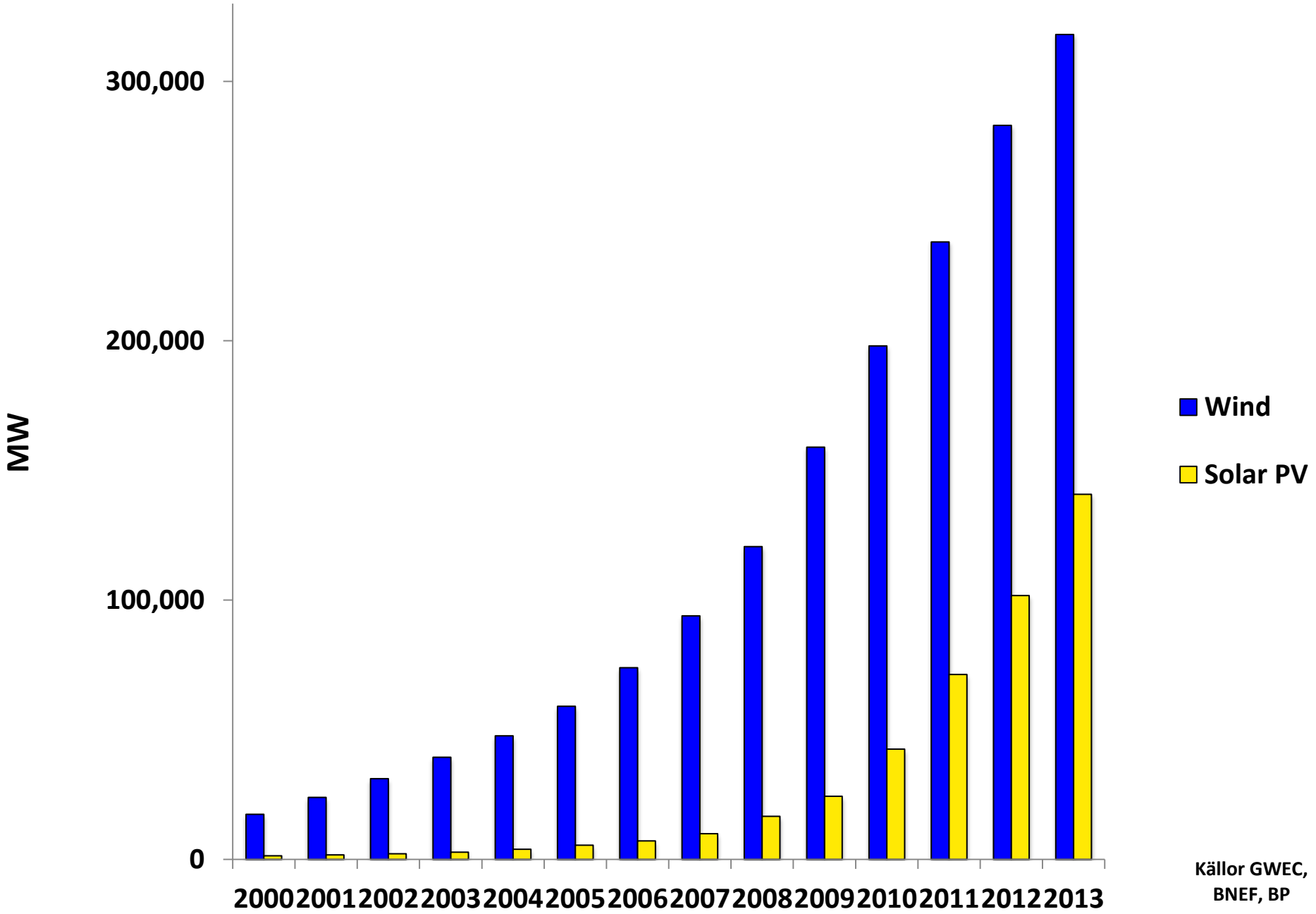
1 / 1

Why so hard?

- Lobbying
- Behavioral explanations
- Will Cap and trade be easier?
- Combine C&T with Tax?

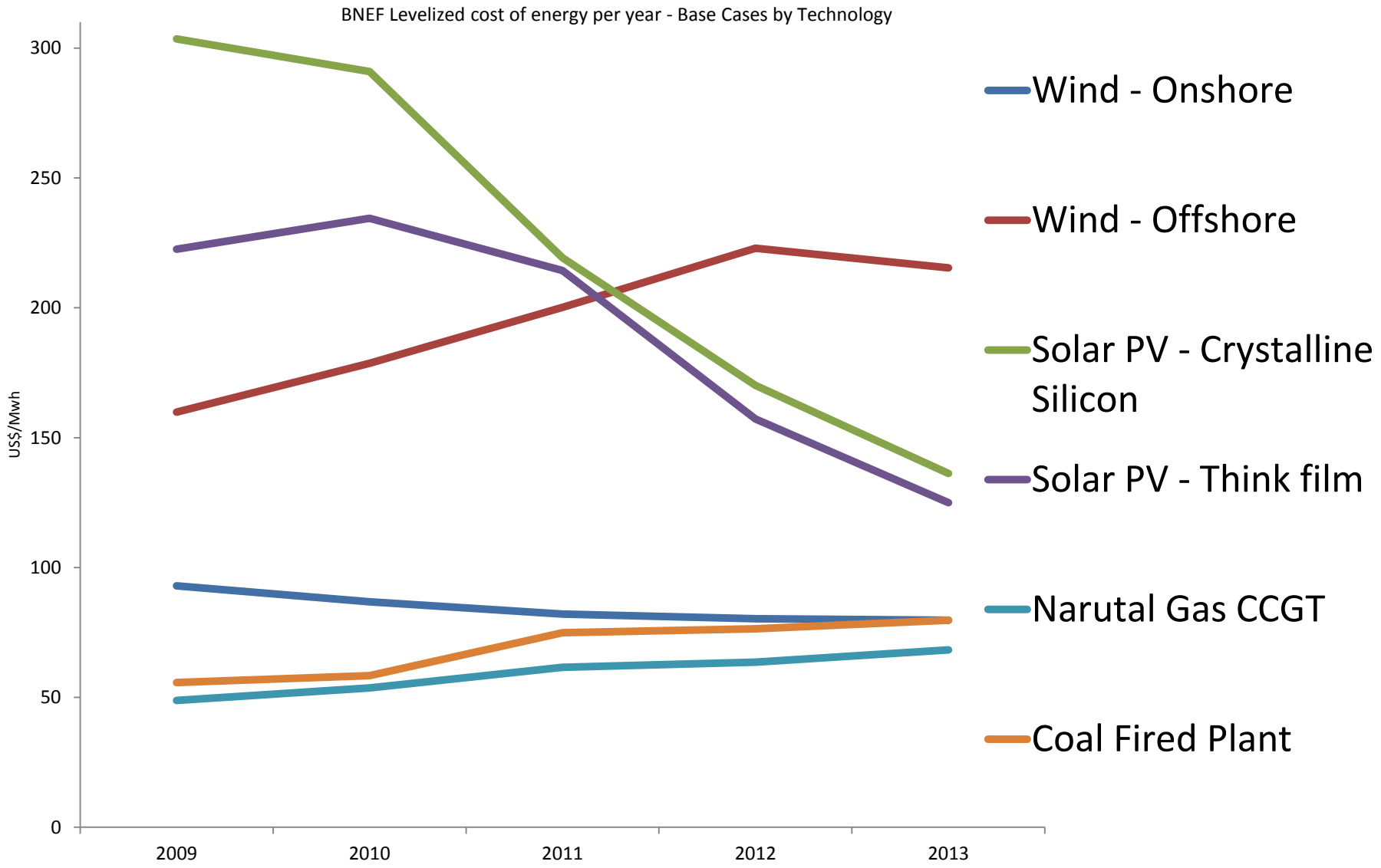
Is it POSSIBLE ?

Accumulated global capacity

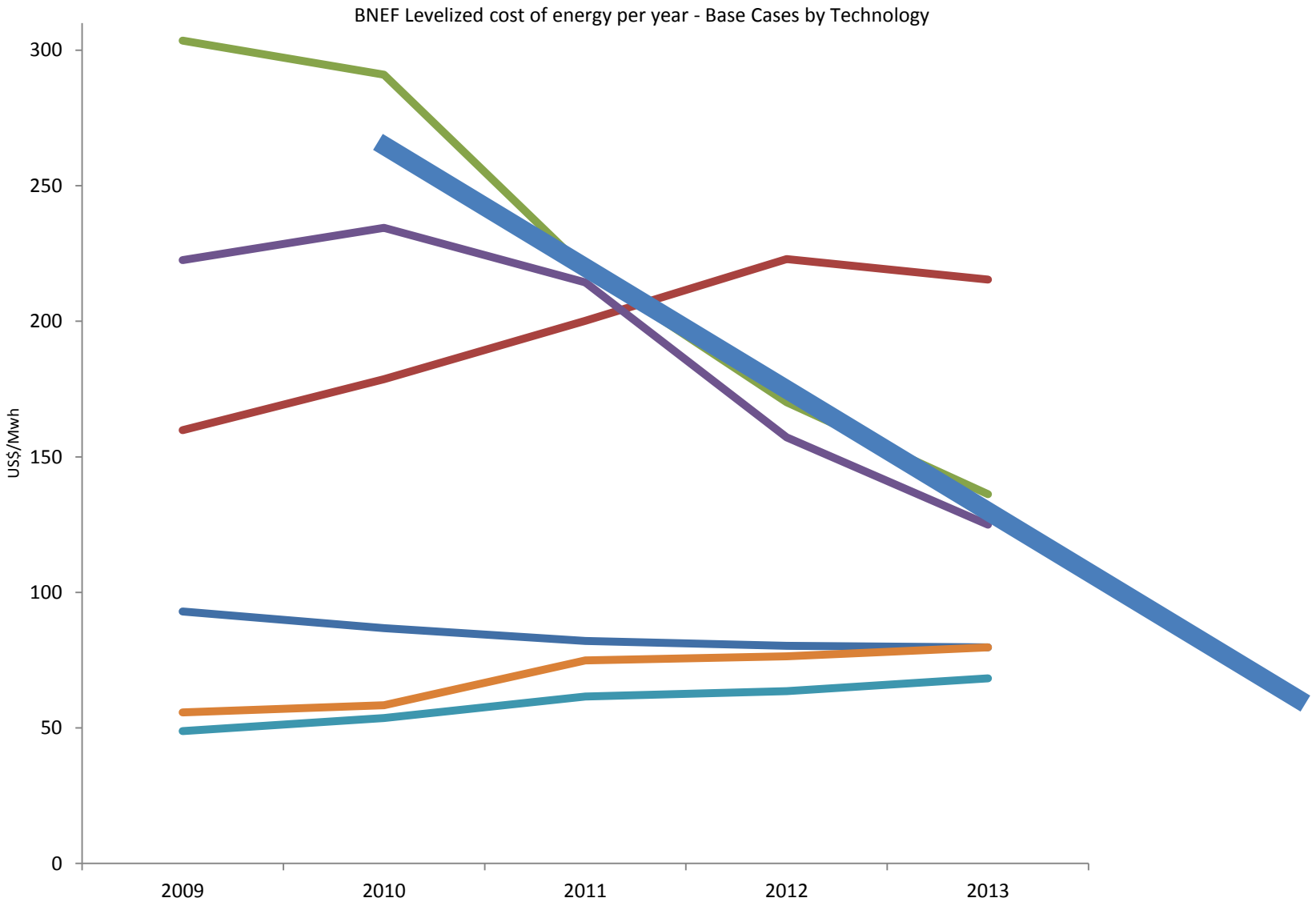


Källor GWEC, BNEF, BP

RENEWABLE ENERGY



RENEWABLE ENERGY



On May 24th, 2013, Xcel Colorado set a new record on its energy system with 60.5% of energy produced coming from wind energy

Even in Texas, wind soaring to prominence

Previous Article

Next Article

17.9K
SHARES

Share

More

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

LIFESTYLE MAY 9 BY CIARA CONLON

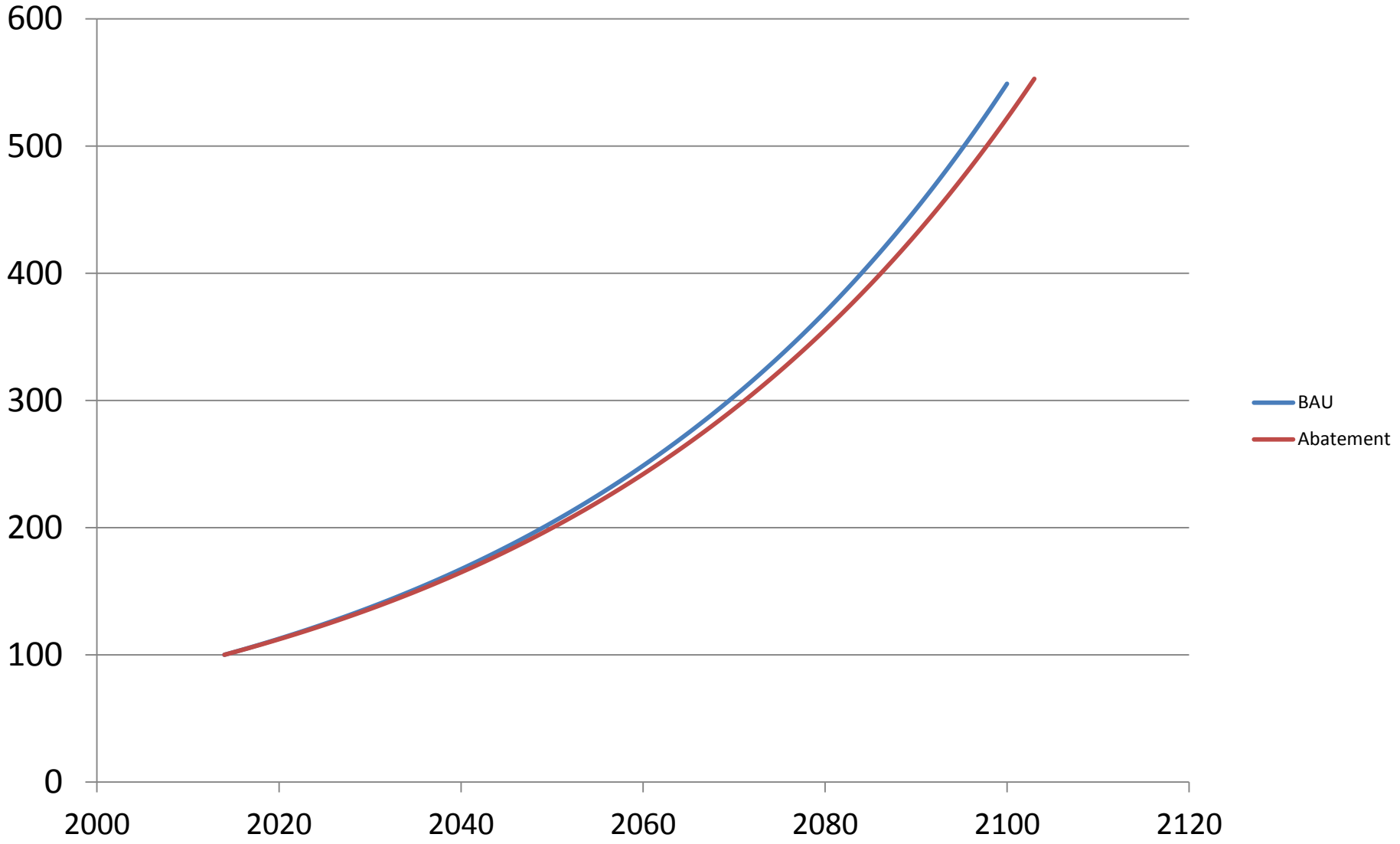
The Cost of action

- To stay below 450ppm CO_2eq costs 1.7% (1%-4%) as lost Consumption 2030, 4.8% (3%-11%) 2100
- Corresponds to a lowering in the rate of growth by 0.06% (compared to 1.6% - 3%)
- With 2% growth we get 5,5 times richer 2100.
- With costs of action this is lowered to 5,2 x
- Wait till July 2102...

A lot of $

- GDP now 10^{14} $
- 2100 ca 5. 10^{14} $
- Loss ca 2 .10^{13} $
- 20 000 000 000 000 $ in 2100.
- 10 000 SEK per capita 2100
- Or 30 kr/day

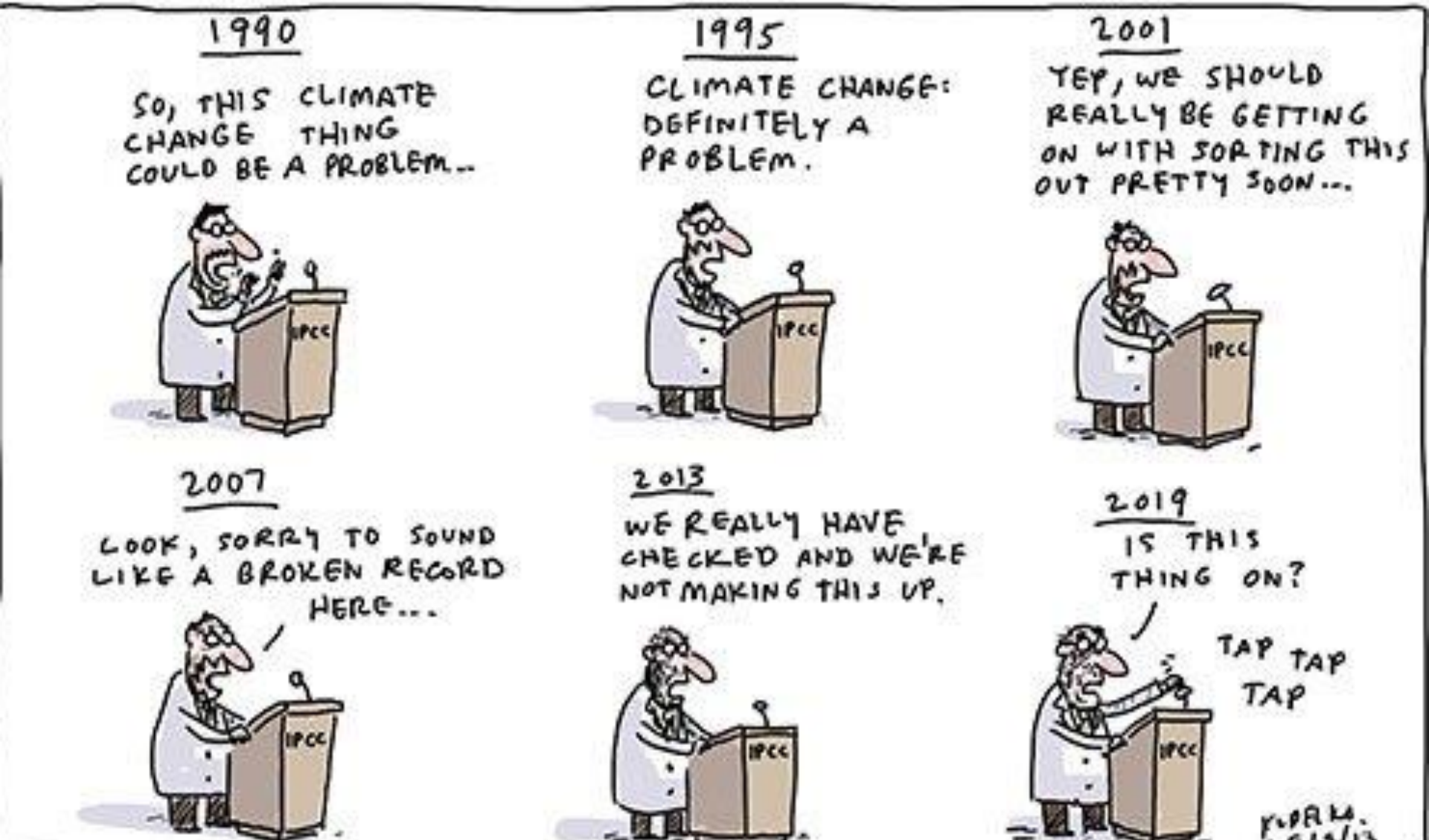
-but - not back to stone age



The Cost of action

- To stay below 450ppm CO_2eq costs 1.7% (1%-4%) as lost Consumption 2030, 4.8% (3%-11%) 2100
- Corresponds to a lowering in the rate of growth by 0.06% (compared to 1.6% - 3%)
- With 2% growth we get 5,5 times richer 2100.
- With costs of action this is lowered to 5,2 x
- Wait till July 2102...
- The costs of climate damage – and/or health etc related to local air pollution is NOT included

Är mikrofonen på?



WORDs, WORDs WORDs

- **Cap and trade systems for GHGs are being established in a growing number of countries and regions. Their short-run environmental effect has been limited as a result of loose caps or caps that have not proved to be binding** (*limited evidence, medium agreement*). This was related to factors such as the financial and economic crisis, changes in fossil fuel markets, interactions with other policies and regulatory uncertainty. In principle A well-designed cap and trade system can be cost-effective. (national circumstances) Though earlier programmes relied almost exclusively on grandfathering (free allocation of permits), auctioning permits is increasingly applied. If allowances are auctioned, revenues can be used to address other investments with a high social return, and/or reduce the tax and debt burden. [14.4.2, 15.5.3]

- **Tax-based policies, some specifically aimed at reducing energy consumption or emissions–alongside technology and other policies–have helped to weaken the link between GHG emissions and GDP** (*high confidence*). In a large group of countries, fuel taxes (although not designed for the purpose of mitigation) have effects that are akin to sectoral carbon taxes. The demand reduction associated with a 1% price increase is 0.6% to 0.8% in the long run, although the short-run response is much smaller [15.5.2]. In some countries revenues are used to reduce other taxes to render policies more politically feasible. This illustrates the general principle that mitigation policies that raise government revenue generally have lower social costs than approaches which do not. While it has previously been assumed that fuel taxes in the transport sector are regressive, there have been a number studies since AR4 that have shown them to be progressive, particularly in low-income countries (*medium evidence, medium agreement*). [3.6.3, 14.4.2, 15.5.2]

- **The reduction of subsidies to fossil fuels (for GHG related activities) can achieve emission reductions at negative social cost depending on the social and economic context** (*high confidence*). Since AR4 a small but growing literature has quantified emission reductions from subsidy reform and suggests that complete removal of subsidies to high emission technologies in all countries could cut global emissions from (depending on circumstances and definitions) a few percent to as much as 18% (*low evidence, medium agreement*) [14.3.2, 15.5.2]. Although political economy barriers are substantial, some countries have reformed their tax and budget systems to reduce fuel subsidies. To help reduce possible adverse effects on lower income groups who often spend a large fraction of their income on energy services, many governments have utilized lump-sum cash transfers or other mechanisms targeted on the poor. [15.5.2]

Bolivia

- **Within an appropriate enabling environment, the private sector can play an important role in mitigation** *(medium evidence, high agreement)***.** The share of total mitigation finance from the private sector, acknowledging data limitations, is estimated to be on average between two-thirds and three-fourths on the global level (2010-2012) (*limited evidence, medium agreement)*. In many countries, public finance interventions by governments and national and international development banks direct

Bolivia

- **In many countries the private sector plays central roles in the processes that lead to emissions ….Within an appropriate enabling environment, the private sector can play an important role in mitigation** *(medium evidence, high agreement)***.** The share of total mitigation finance from the private sector, acknowledging data limitations, is estimated to be on average between two-thirds and three-fourths on the global level (2010-2012) (*limited evidence, medium agreement)*. In many countries, public finance interventions by governments and national and international development banks direct

SPM.5.2 International cooperation

- **International cooperation on climate change has diversified over the past decade**. The United Nations Framework Convention on Climate Change (UNFCCC) remains a primary THE MAIN international forum for climate negotiations, and is seen by many as the most legitimate international climate policy venue due in part to its virtually universal membership [13.3.1, 13.5]. However, other institutions organized at many different scales have risen in importance due to the inclusion of climate change issues in other policy arenas and growing awareness of the co-benefits that can arise from linking climate mitigation and other issues [13.3, 13.4, 13.5].

Getting Late

Some Key Findings

A number of **cap and trade systems** have been established. Their short-run environmental effect has been limited as a result of loose caps or caps that have not proved to be constraining.

In some countries, **tax-based policies** specifically aimed at reducing GHG emissions- alongside technology and other policies- have helped to weaken the link between GHG emissions and GDP.

The reduction of **subsidies** for GHG-related activities in various sectors can achieve emission reductions, depending on the social and economic context.

Government planning and provision can facilitate shifts to less energy and carbon-intensive infrastructure and lifestyles.

Successful **voluntary agreements** between governments and industries to reduce emissions are characterized by a strong institutional framework with capable industrial associations.

The ability to undertake policy action requires information, knowledge, tools and skills, and therefore **capacity building** is central for mitigation and to the sustainable development agenda.

Public finance mechanisms reduce risks that deter climate investments. **Mainstreaming** climate change into development planning has helped yield financing.

Technology policy complements other mitigation policies.

- Technology policy includes **technology-push** policies such as publicly funded R&D and **demand-pull** such as governmental procurement programmes.
- Technology support policies have promoted substantial **innovation and diffusion** of new technologies, but the **cost effectiveness** of such policies is often difficult to assess.
- **Program evaluation** data can provide empirical evidence on the relative effectiveness of different policies and can assist with policy design.

Policy interactions

Interactions between or among mitigation policies may be synergistic or may have no additive effect on reducing emissions.

A **carbon tax** can have an additive environmental effect to policies such as subsidies for the supply of renewable energy.

If **cap and trade** system has a binding cap, then other policies such as RE subsidies may have not further impact on reducing emissions within the time period that the cap applies (although they may affect costs ad possibly the viability of more stringent future targets).

Some mitigation policies raise the prices for some energy services and could hamper the ability of societies to expand access to modern energy services to underserved populations. These potential adverse side effects can be avoided with the adoption of complementary policies.