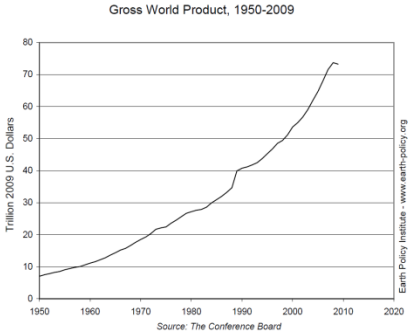
Climate Change Catastrophe: "Talk and Art" Event at Scandinavia House, New York, 10 June 2014

Climate change and market based mechanisms

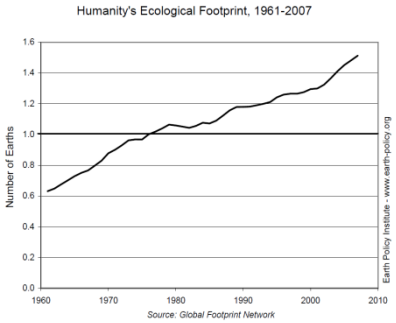
Jouni Keronen, PhD, MBA

The presentation was done as a private person and expert. Expertise gained in many development positions in the energy field , mainly in Fortum Oyj, as a docent (=”adjunct professor”) Lappeenranta University of Technology, as a Senior Advisor to Sitra – The Finnish Innovation Fund, as a founding member of the Stormwarning association and as a CEO of Here-to-There Consulting Oy.

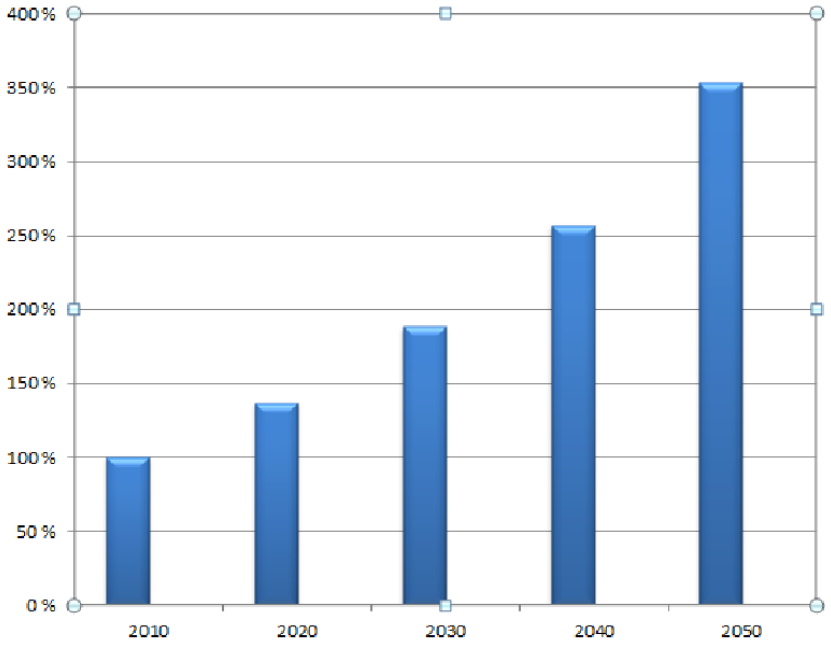
By continuing living as today, we need more planets.

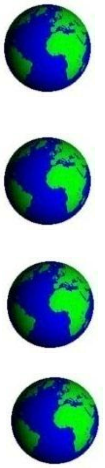


Between 1970-2009 gross world production grew 55 trillion USD (18-73)



In 1970 the Global Ecological Footprint was 100%. After that it has raised 50%. Ie. In parallel with 55 trillion GDP growth, Global Economical Footprint grew 50%.





If world GDP continues to grow 3,2%/y (2,5% economy + 0,7% population growth), it will be around 250 trillion in 2050.

If the ratio between the GDP and Ecological Foortprint growth remains the same than during last 40 years, the Global Economic Footprint will grow more than another 150% , ie. We would need the resources of 3-4 earths.

Source for GDP and PG growth estimates: P. Gilding; The Great Disruption; How the climate crisis will transform the global economy, Bloomsbury 2011

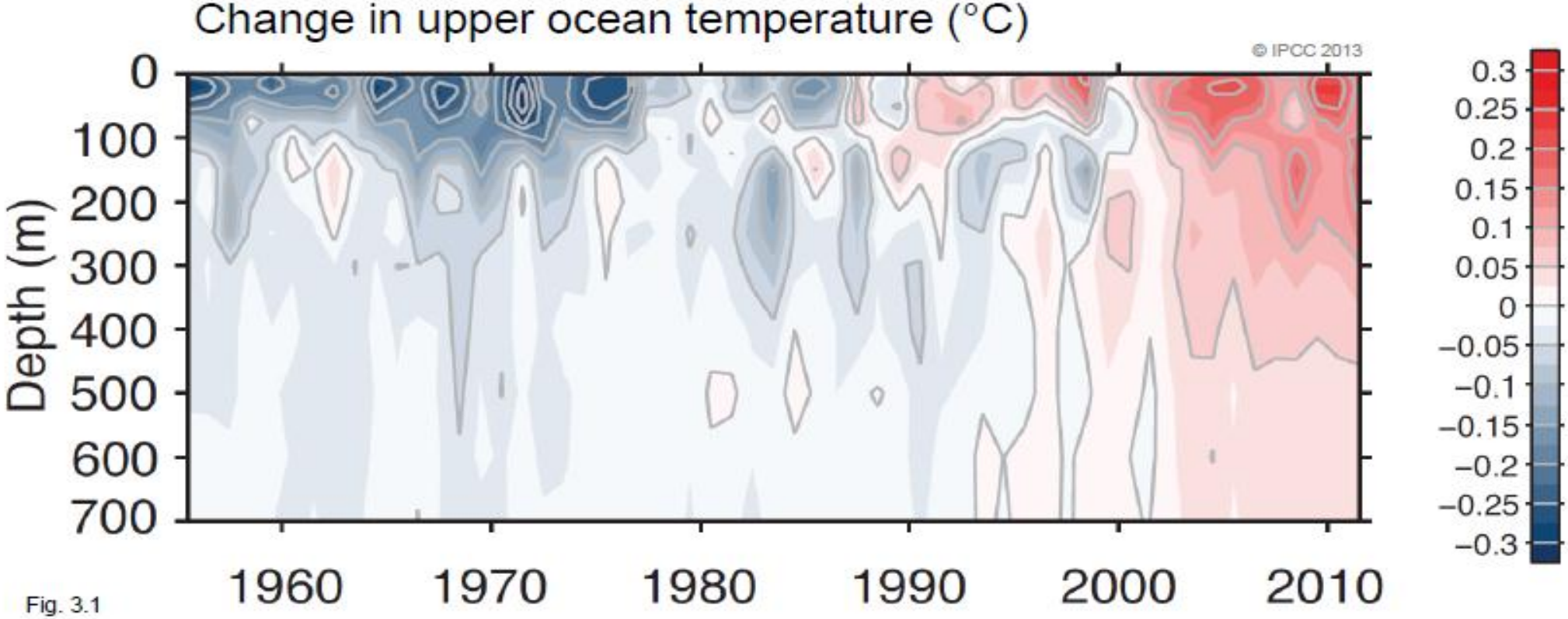
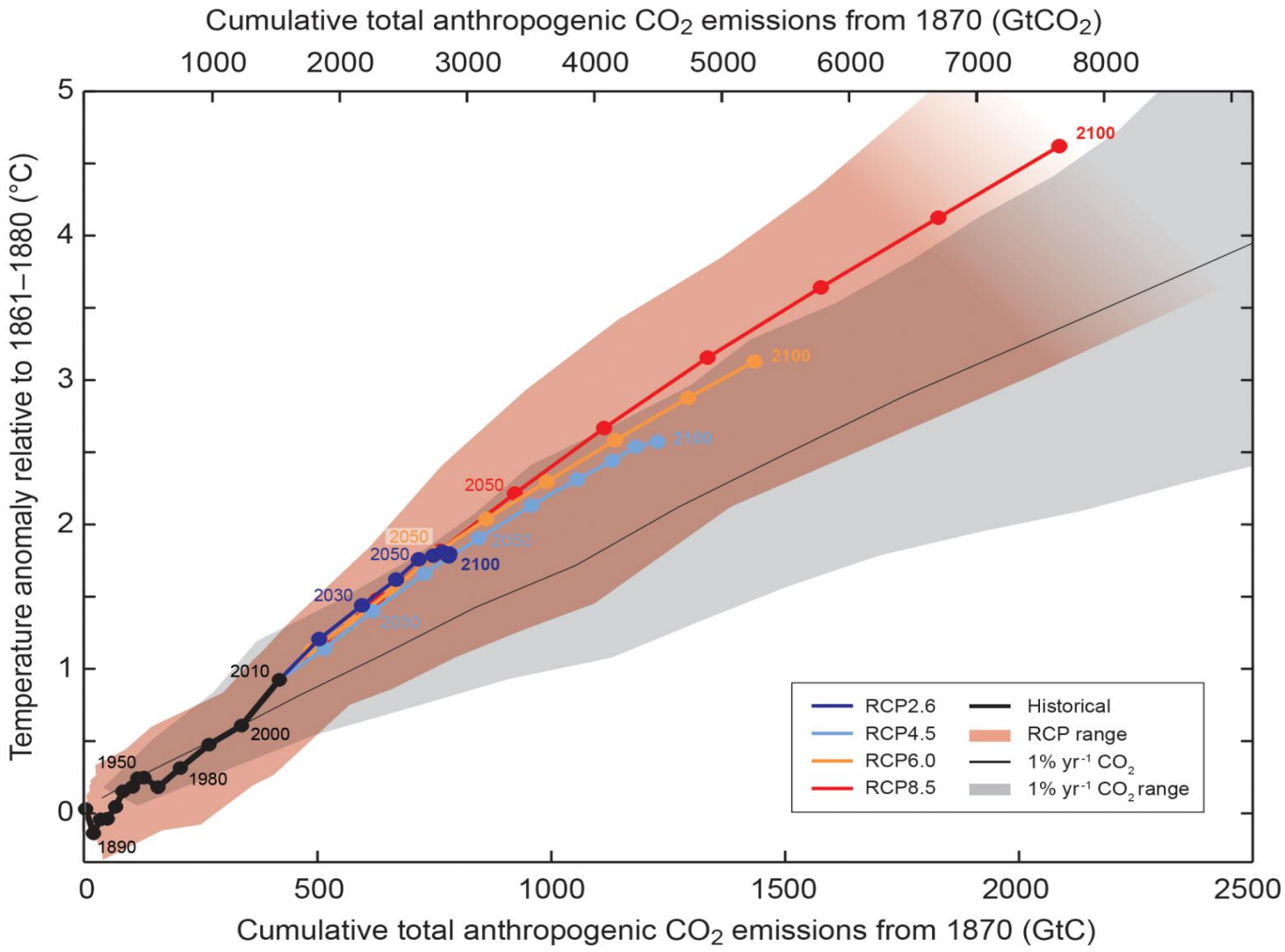


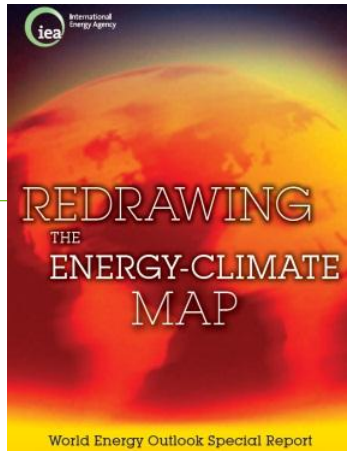
Fig. 3.1

It is *virtually certain* that the upper ocean (0-700 m) warmed from 1971 to 2010, [...]. It is *likely* that the ocean warmed between 700 and 2000 m from 1957 to 2009.

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

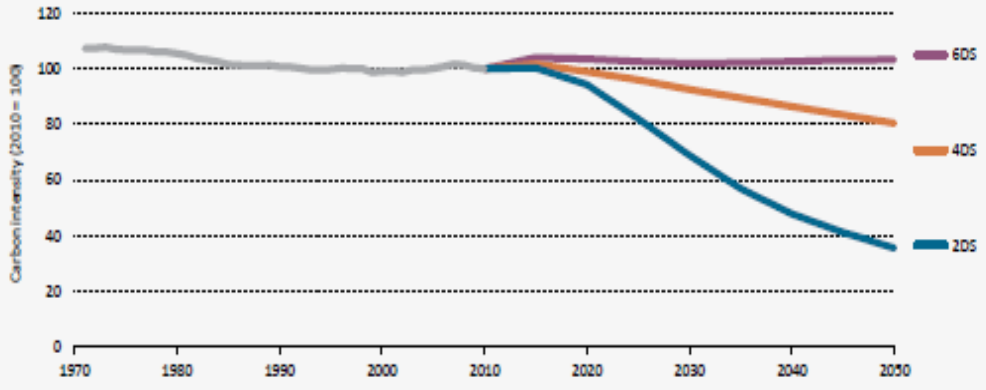


International Energy Agency 10 June 2013



Today world is not on track to meet the target agreed by governments to limit the long term rise in the average global temperature to 2 degrees Celsius (°C). Policies that have been implemented, or are now being pursued, suggest that the long-term average temperature increase is more likely to be between 3.6 °C and 5.3 °C (compared with pre-industrial levels), with most of the increase occurring this century.

Figure I.1 The Energy Sector Carbon Intensity Index (ESCII)

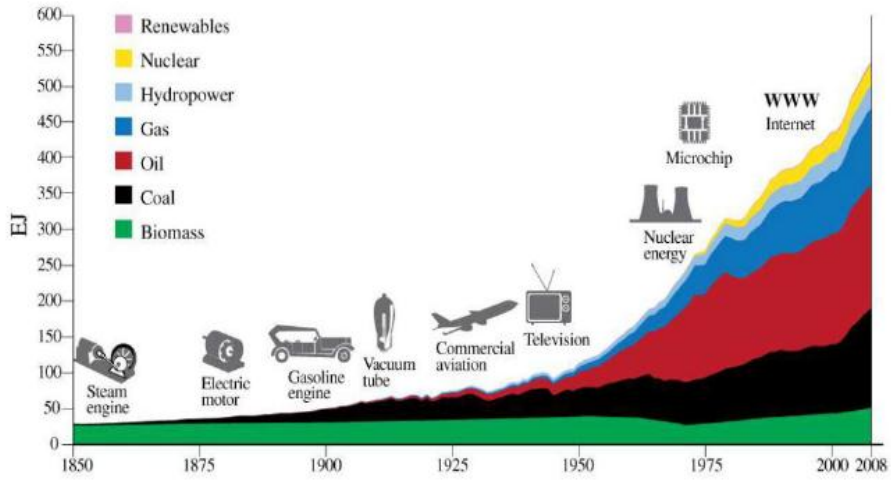


Sources: IEA 2012a, IEA 2012b. Note: the ETP scenarios (2DS, 4DS and 6DS) are defined in Box I.2. Figures and data that appear in this report can be downloaded from www.iea.org/etp/tracking.

Key point *The carbon intensity of global energy supply has hardly improved in 40 years, despite efforts on renewable energy.*

Increased use of fossil fuels has diluted the benefits gained by Efficiency improvements and renewables.

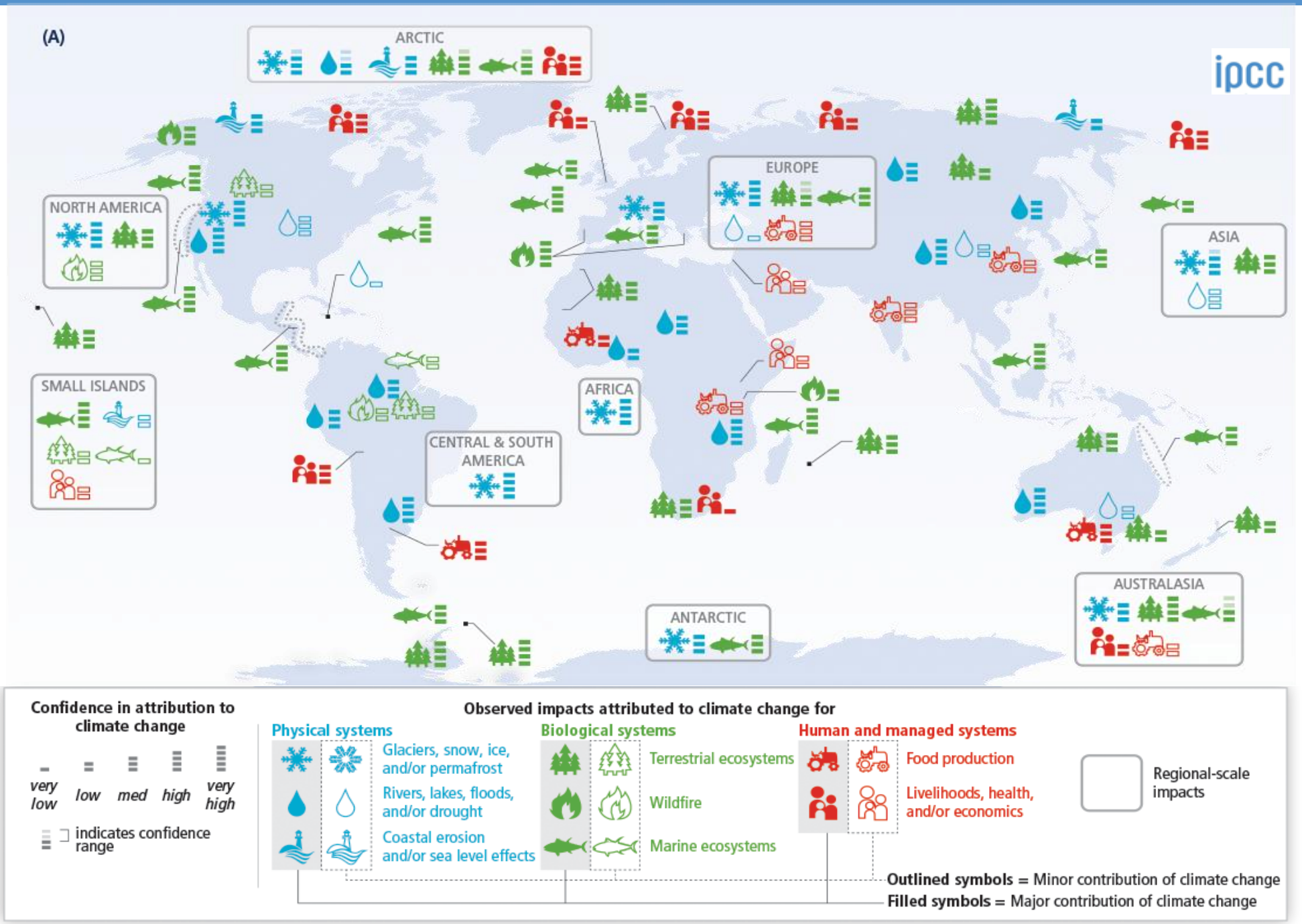
World primary energy use by fuel 1850-2011



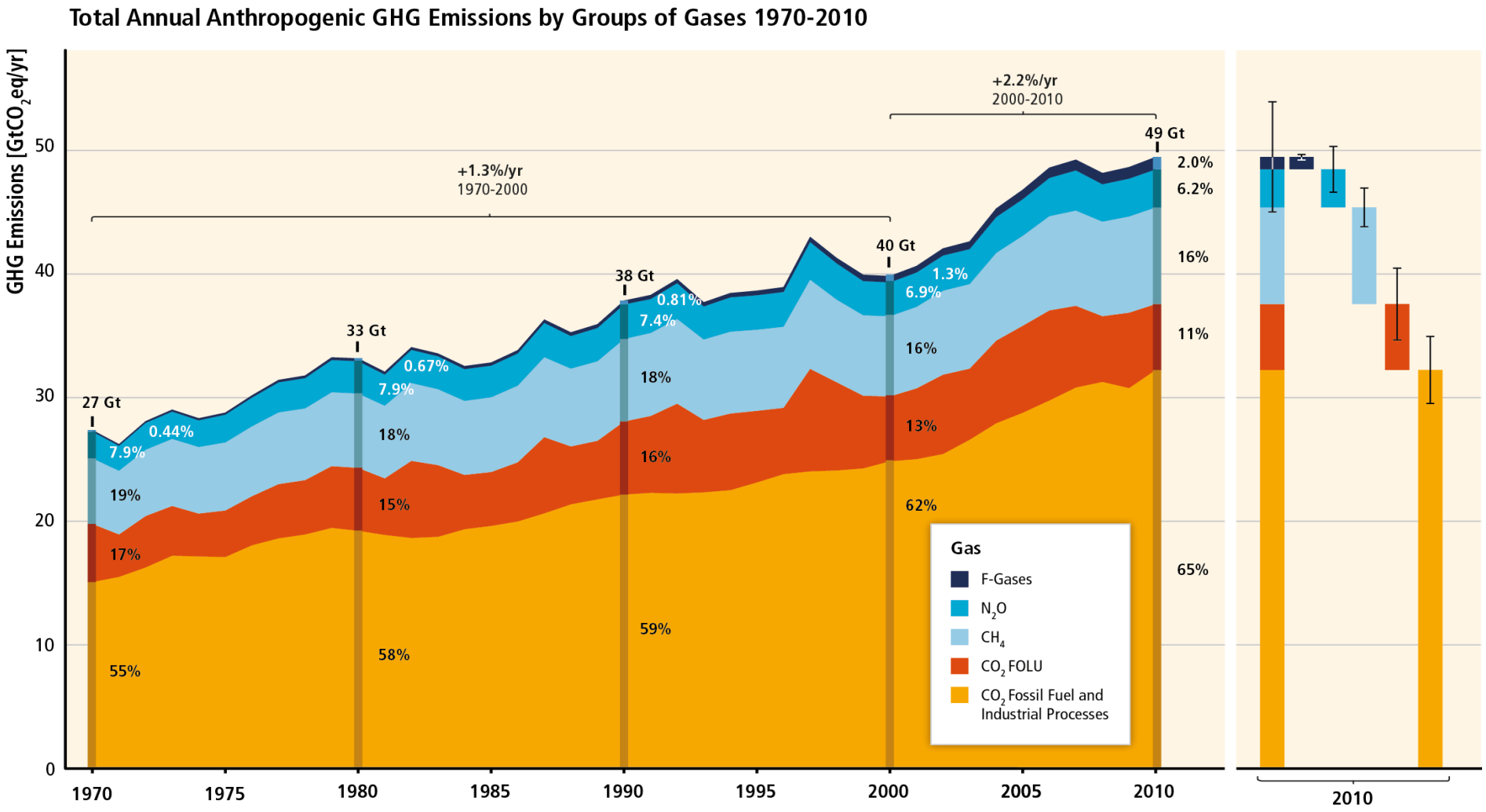
Source: GEA Summary 2011, available at http://www.iiasa.ac.at/Research/ENE/GEA/index.html.accessed 6.8.2012

Figure illustrates that the share of low- or no-carbon energy sourrces is still small.

http://www.iea.org/publications/TCEP_web.pdf


(A)
ARCTIC
NORTH AMERICA
EUROPE
ASIA
SMALL ISLANDS
AFRICA
CENTRAL & SOUTH AMERICA
AUSTRALASIA
ANTARCTIC
ipcc
Confidence in attribution to climate change
very low
low
med
high
very high
indicates confidence range
Observed impacts attributed to climate change for
Physical systems
Glaciers, snow, ice, and/or permafrost
Rivers, lakes, floods, and/or drought
Coastal erosion and/or sea level effects
Biological systems
Terrestrial ecosystems
Wildfire
Marine ecosystems
Human and managed systems
Food production
Livelihoods, health, and/or economics
Regional-scale impacts
Outlined symbols = Minor contribution of climate change
Filled symbols = Major contribution of climate change

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

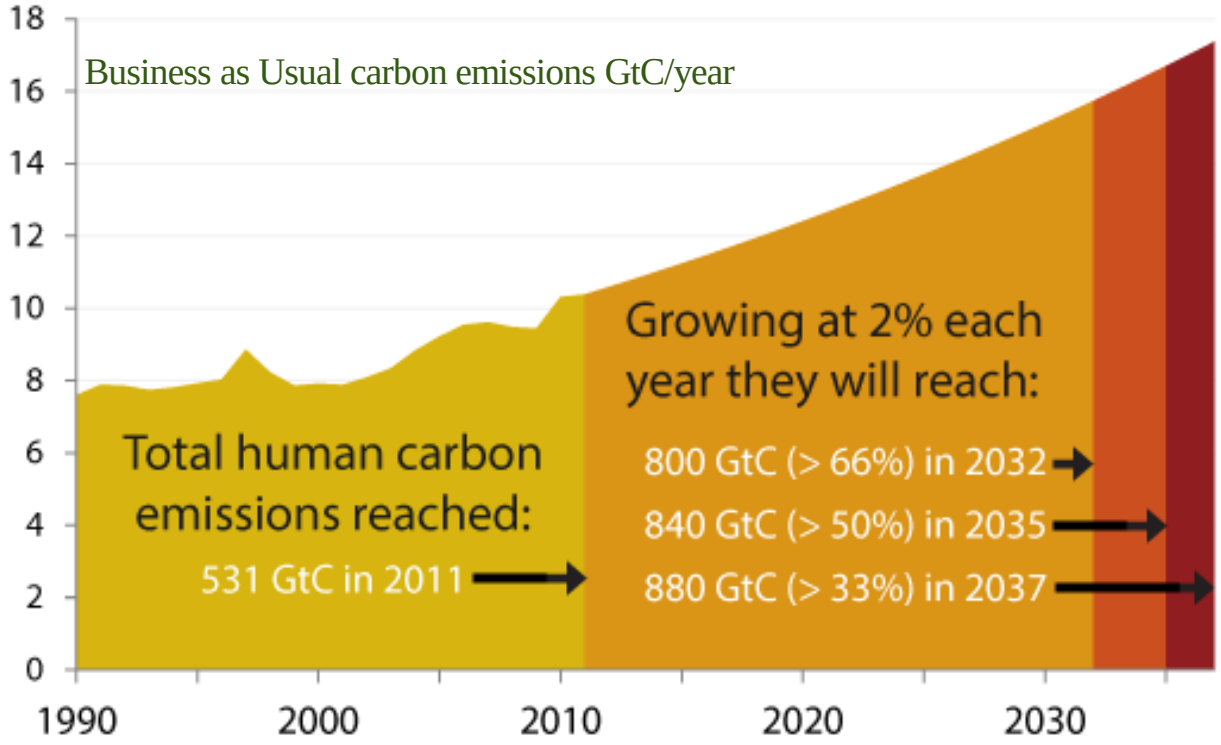


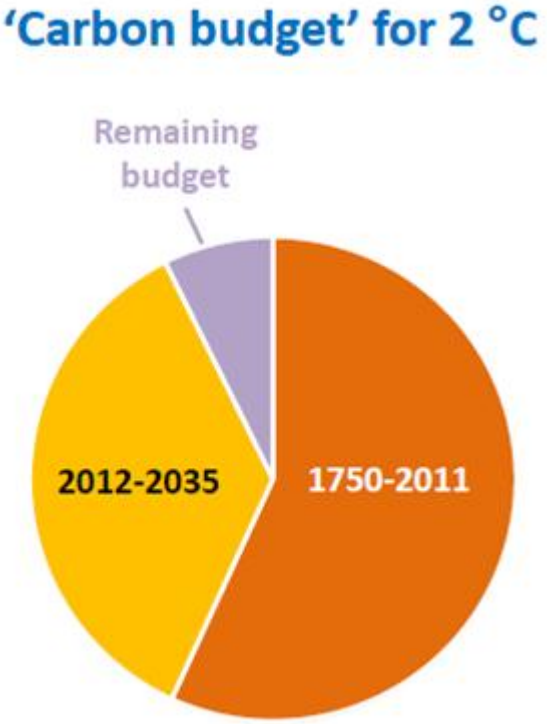
Working Group III contribution to the
IPCC Fifth Assessment Report

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

… and the 2°C carbon budget is exhausted soon.



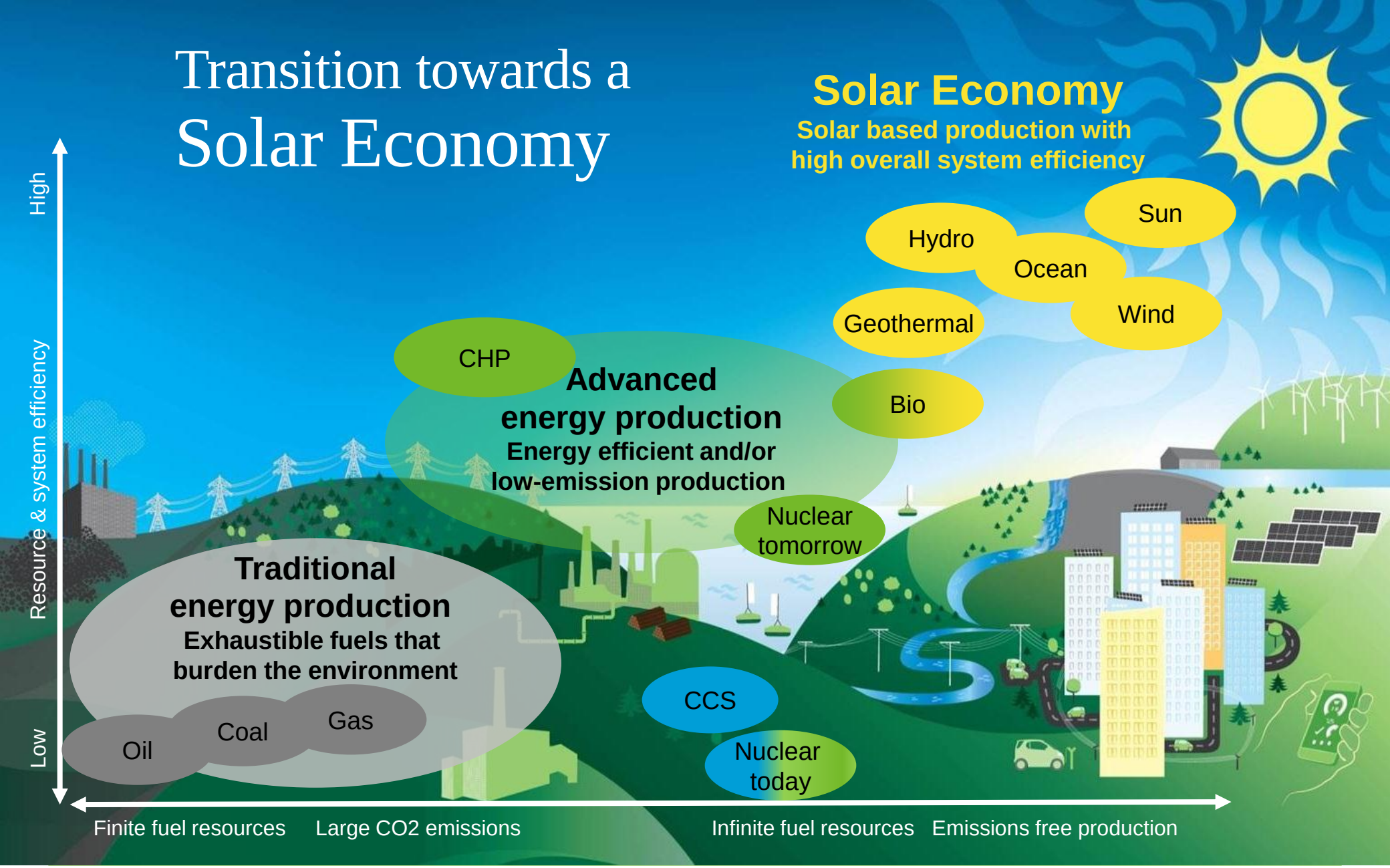


IEA World Energy Outlook 2013

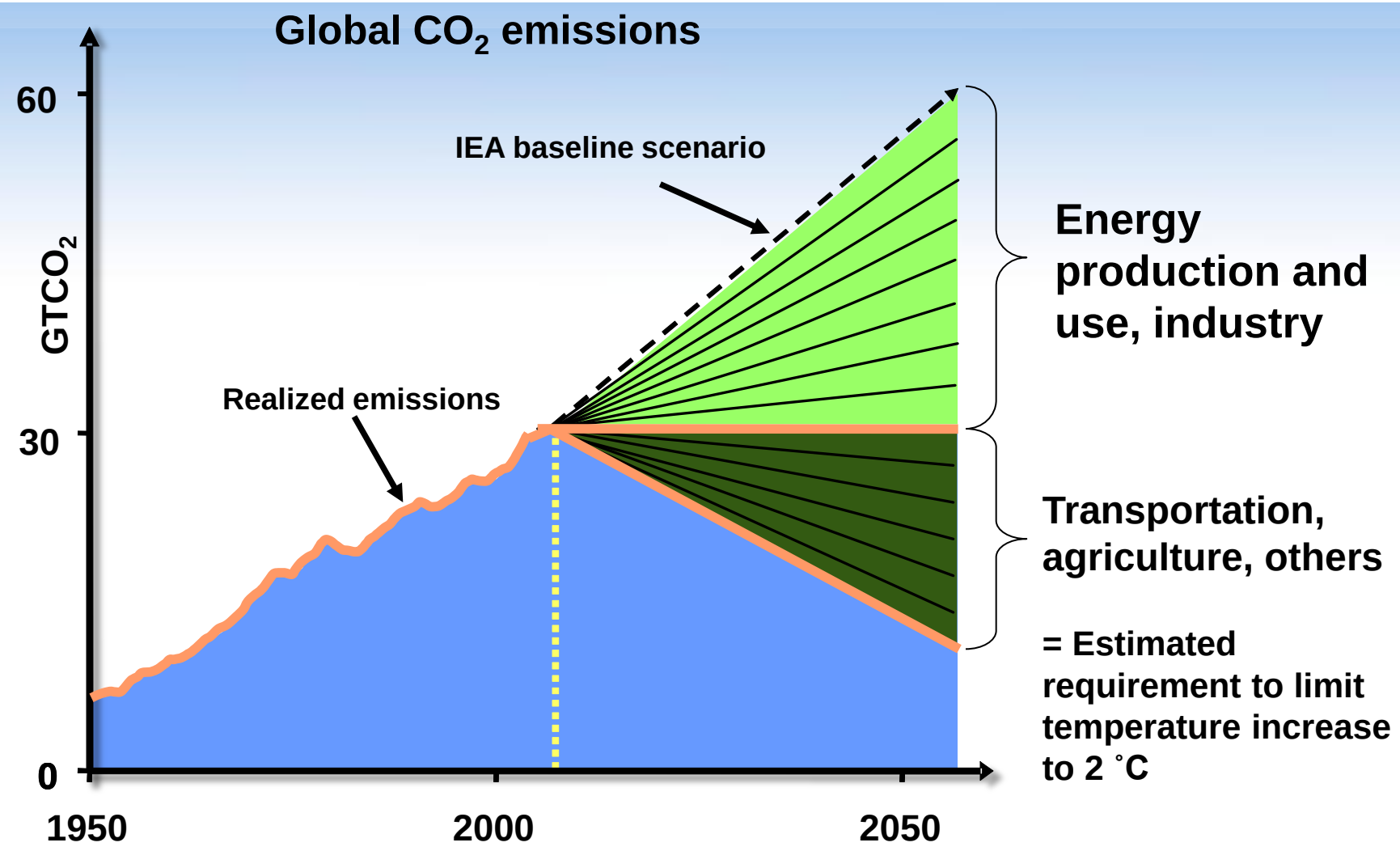
Note: the % in brackets are the chances of limiting warming to 2°C

Data: Budget - IPCC WGI AR5. Historical - Global Carbon Project
Note: assumes limited further non-CO2 forcings as per RCP 2.6 shrinkthatfootprint.com

Transition towards a Solar Economy

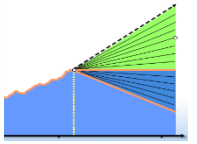


In order to avoid catastrohic temperature increase, we must stop the increase of green house gas emissions and get them into decreasing trend in about 10 years.



Sources: IEA ETP 2008, Princeton University, Fortum

… via following or similar ways…(indicative examples)



Efficiency

Halving emissions from all passenger vehicles

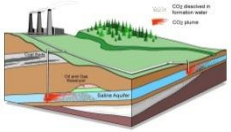
Halving car mileage (600 million cars,2 billion 2055)

Use best efficiency practices in <u>all</u> buildings (Replacing all incandescent bulbs = 1/4 wedge)

Doubling the efficiency of coal-fired power stations (Average efficiency 32%)

Decarbonizing of power

Build 1400 GW of capacity powered by natural gas instead of coal (60% of current fossil fuel electric capacity)



CCS at 800 GW coal electric plants (800 large plants, 3 projects on-going)

Build 500 1500 MW nuclear plants by 2060 (rate of installation equal to the rate 1975-1990)

Build 220.000 3 MW wind power plants

Install 5,000 km2 (=12,5% Switzerland**,** Fortum estimate, 2GtCO2)

Decarbonizing of fuel

Capture CO2 at H2 plants (H2 output from fossil fuels: 400 Mt)

Capture CO2 at coal-to-synfuels plants (30 million barrels per day)

Produce H2 by wind power (needs 4 m 1 MWp windmills)

A bio crops plantation equalling of India (>3 200 000 km2)

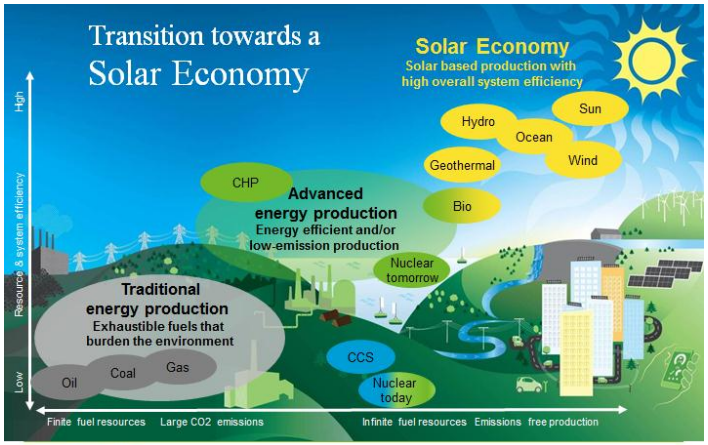
Forests and agricultural soils

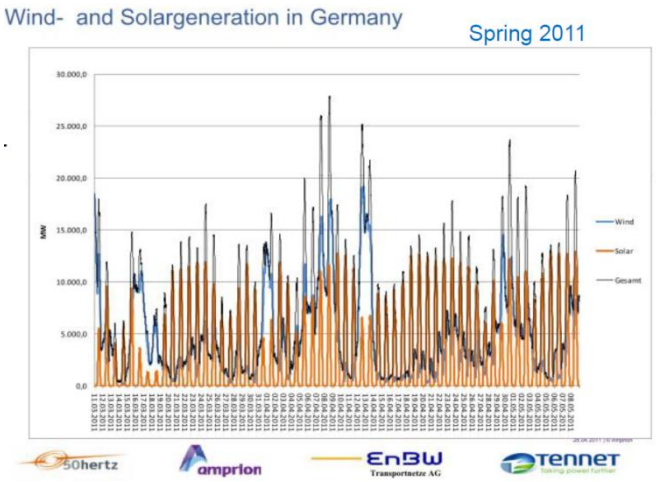
Eliminate tropical deforestation or plant new forests over an area the size of the continental U.S.

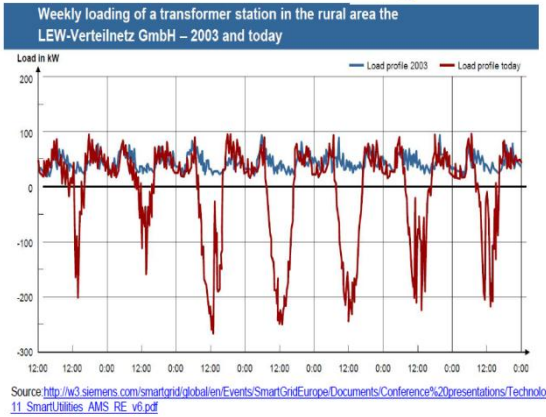
Use conservation tillage on all cropland, leaving the previous year's crop residue on fields before and after planting the next crop, to reduce soil erosion and runoff (1600 Mha)

Sources: IEA ETP 2008, Princeton University, Carbon Mitigation Initiative, Fortum

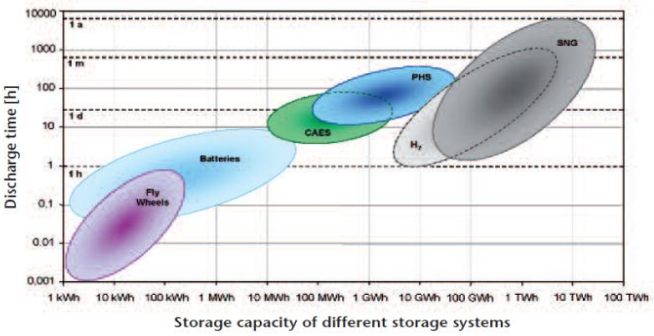
New game: solar economy, gas revolution, storages, market models, large investment opportunities







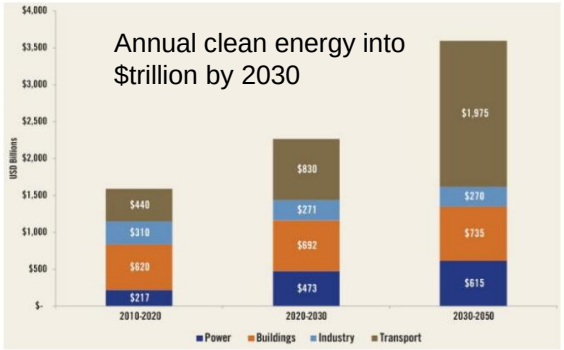
Source: http://w3.siemens.com/smartgrid/global/en/Events/SmartGridEurope/Documents/Conference%20presentations/Technology%20Plaza/121011_SmartUtilities_AMS_RE_v6.pdf



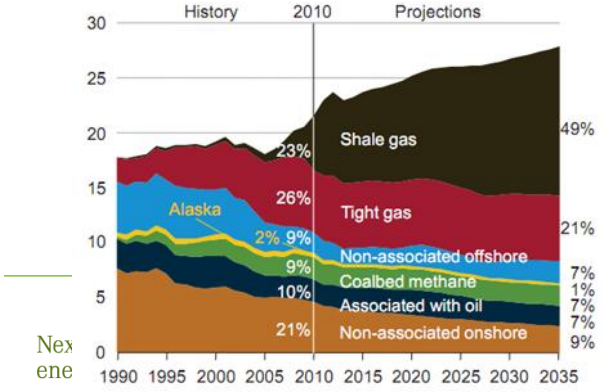
CAES: Compressed Air Energy Storage (Druckluftspeicherkraftwerk)
PHS: Pumped Hydro Storage (Pumpspeicherwerk)
H_2, SNG: Die Untertage-Ausspeicherung beinhaltet die Rückverstromung in GuD-Kraftwerken (Gas- und Dampf)

		Electricity	Natural gas	Liquid fuels[1)]
Consumtion	[TWh/a]	615	930	707
Average output	[GW]	70	106[2)]	81
Storage capacity	[TWh]	0,04[3)]	217[4)]	250[5)]
Mathematical storage coverage[6)]	[h]	0,6	2000	3100

Table 1
Energy consumption and storage capacities in Germany (2008)



Overall annual clean energy investment 2010-2050, in U.S. $B, for a 2°C global warming scenario. Credit: IEA, Ceres



The investments and money flows define our future and today majority goes fossil fuels …

Over 1400 1000 MW plants, inv. Cost over 1 trillion

top 200 oil and gas and mining companies have allocated up to $674bn in the last year for finding and developing more reserves and new ways of extracting them.

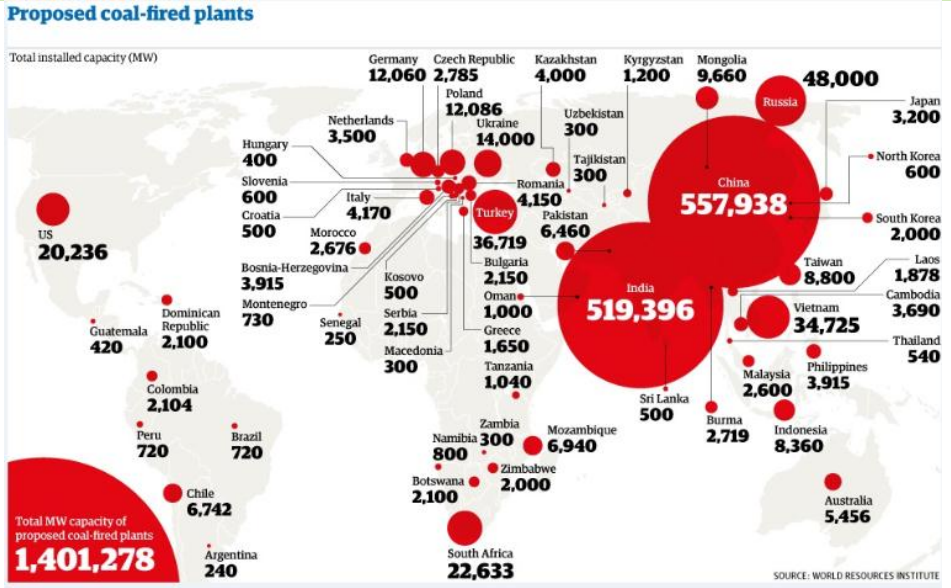
J Leggett, M Campanale, Grantham Research Institute on Climate Change and the Environment, London School of Economics / Unburnable Carbon 2013: Wasted capital and stranded assets

billion USD 523
fossil-fuel subsidies in 2011, up 20% from 2010

88 billion USD
renewable energy subsidies in 2011

EUR/tCO$_2$ 50
estimated carbon price to effect coal-to-gas switch in Europe

7.1 EUR/tCO$_2$
2012 average carbon price in Europe



MAP SHOWING THE GTCO$_2$ OF CURRENT COAL, OIL AND GAS RESERVES LISTED ON THE WORLD'S STOCK EXCHANGES.

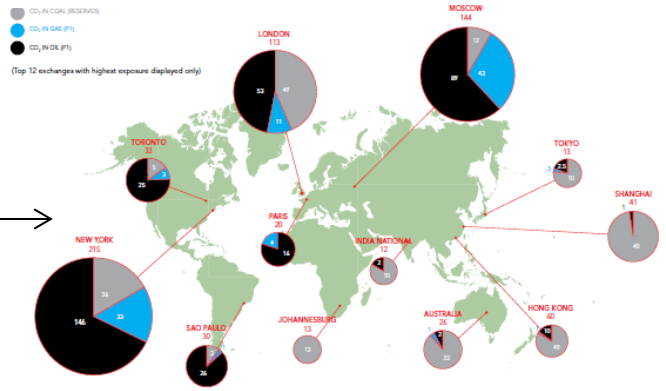
NEW INVESTMENT IN CLEAN ENERGY FELL 11% IN 2012

14 January 2013

overall global investment in 2012 was $268.7bn, down from a revised figure of $302.3bn in 2011.

Bloomberg NEW ENERGY FINANCE

… but if we want to have only 2DS, we could burn only one third of the existing fossil reserves….



Money flows 2011 ($billion)

- **New fossil reserves $674**
- **Planned coal plants >$1000**
- **Subsidies $523**

- **Clean energy investments $269**
- **Subsidies $88**

IEA Tracking Clean Energy Progress 2013

Unburnable Carbon 2013: Wasted capital and stranded assets
Grantham Research Institute on Climate Change
London School of Economics and Political Science.

Jouni Keronen
Here-to-There Consulting Oy

Underlying drivers for energy investments

Visibility for future
(20 years)

Driver	Visibility for the future
1. Fundamental drivers and parameters • Electricity demand; cost of capital; exchange rate	
2. Electricity price development • CO2, uncertain future in carbon pricing • Coal, oil, gas; uncertainty related to climate targets	
3. Energy market dynamics • Subsidies by governments, Market designs;	
4. Country risk • Local taxes (windfall, property taxes etc.)	
5. Increased requirements for nuclear; uncertain future	
6. Infrastructure not upgraded in sufficiently (transmission)	

= medium uncertainty

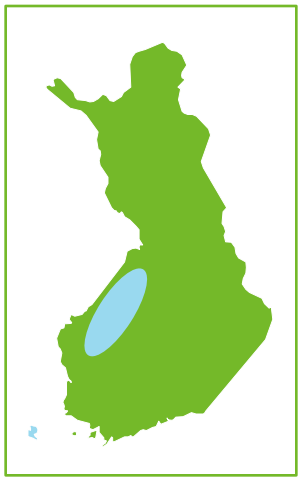
= large uncertainty

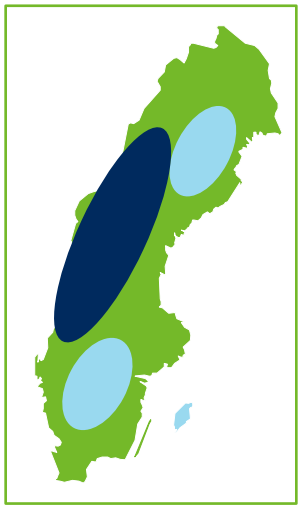
Decarbonisation requires European energy markets integration

Natural production areas of renewables:

- Hydro energy
- Wave energy
- Wind energy
- Bioenergy
- Solar energy

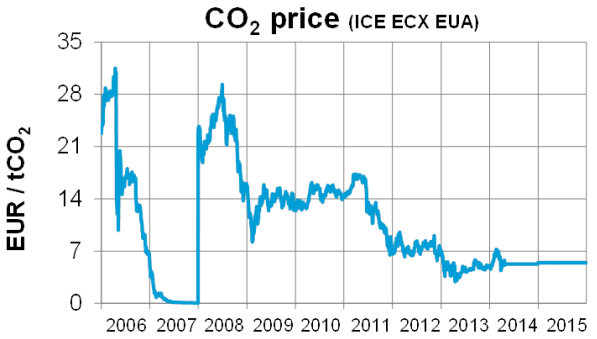
Transmission Needs:





Source: Fortum

We challenge decision makers to develop energy market integration and a predictable and strong carbon price



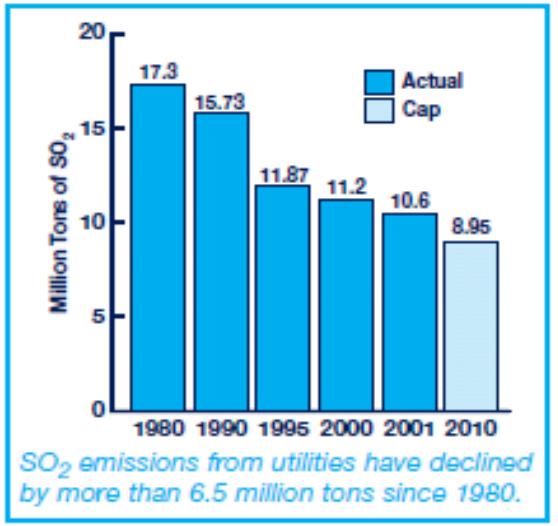
National RES and EE schemes
National carbon price floors/taxes
National capacity mechanisms

ETS as the key driver
Strong innovation policy

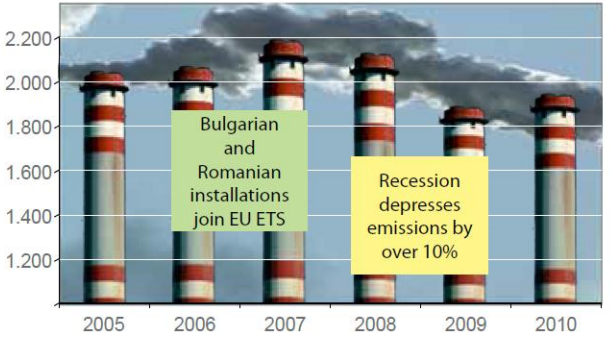
Success stories in emissions trading

- North America SO2 trading; Full success
  - Sulphur dioxide emissions down faster than predicted and at one-fourth of the projected cost
  - The Economist: "the greatest green success story of the past decade.“

- EU Emission Trading System (ETS); Potential success
  - Largest operational system with 11,000 installations
  - Technically working as planned and delivering the emission reduction target
  - Current oversupply of allowances is a consequence from overlapping policies and economic downturn
  - Could be improved for full success for example via dynamic allowance supply adjustment mechanism.



SO_2 emissions from utilities have declined by more than 6.5 million tons since 1980.



Towards global carbon pricing

Carbon price

- Incentive for low-carbon investments
- Extra cost for high-carbon investments
- Internalises the external cost

Cap-and-trade

- Technology neutral
- Flexible and cost-efficient
- Enables global optimisation
- Enables technology transfer and capability building to developing countries

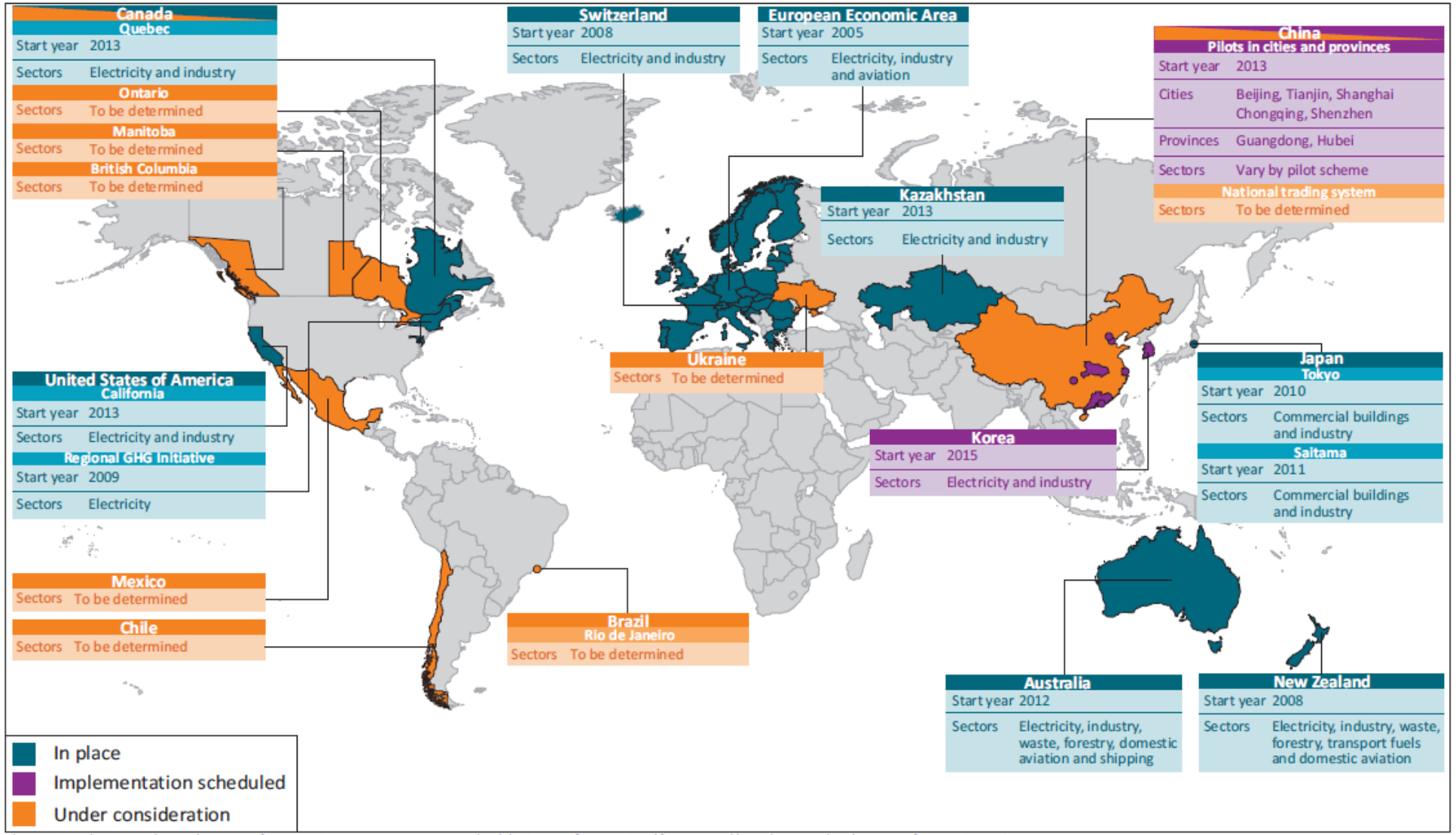
Global scope

- Climate change a global challenge
- Global solution and collective will required
- Competitiveness distortions to be avoided

The way forward

- Linking of regional trading schemes
- Economic cooperation organisations in a key role

Current and proposed emission trading schemes



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Next generation energy company | Fortum

Source: IEA Redrawing the energy-climate map. 2013.

Investors waking up for carbon risks …

CORPORATE

BRITISH PENSION FUNDS AT RISK FROM CLIMATE CHANGE: REPORT

THOMSON REUTERS

29 Oct 2013 18:39

LONDON, Oct 29 (Reuters Point Carbon) - British pension funds should invest more in low-carbon technologies and cut their exposure to fossil fuel-based assets likely to be left "stranded" due to climate change policies, or risk squandering savers' holdings, a report said Tuesday.

Table IV.1 | Public International Financers of Coal-Fired Power Plants

PUBLIC FINANCIAL INSTITUTION	COUNTRY OF ORIGIN	TOTAL FINANCING (IN MILLION US$)	NUMBER OF PROJECTS FINANCED
Japan Bank for International Cooperation (JBIC)	Japan	8,138.65	21
World Bank Group (IBRD/IDA/IFC/MIGA) *	Multilateral	5,315.49	29
Asian Development Bank (ADB)	Multilateral	3,912.95	21
US Export-Import Bank	United States	3,478.80	17
European Investment Bank (EIB)	Multilateral	2,510.94	9
Nippon Export and Investment Insurance (NEXI)	Japan	2,089.48	6
Kreditanstalt für Wiederaufbau (KfW)	Germany	1,769.15	6
China Development Bank	China	1,680.60	3
Euler Hermes	Germany	1,174.14	5

The World Bank cuts off funding for coal. How big an impact will that have?

The Washington Post

BY BRAD PLUMER July 17, 2013 at 12:33 pm

On Tuesday, the World Bank Group announced that it would restrict funding for new coal plants in developing countries except "in rare circumstances" — say, in poorer nations that have no good alternatives.

A bucket-truck picks up coal at Chotia mine in India. (Rama Lakshmi/The Washington Post)

Instead, the bank, which financed some $52.6 billion worth of infrastructure projects last year, will focus on scaling up cleaner natural gas and hydroelectric dams in order to deliver electricity to hundreds of millions of people around the world who still don't have it.

Hedegaard urges development banks to divest from fossil fuels

EurActiv.com July 2013

Stop fossil fuel subsidies: Hedegaard

BY CONNIE HEDEGAARD

ABC Environment | 10 APR 2013

Comments (8)

The World Bank has joined an expanding list of international bodies calling for an end to fossil fuel subsidies. The time is right for European banks to lead the way.

From: Institute for Governance & Sustainable Development
Published September 5, 2013 04:10 PM

Obama gains allies for de-funding coal plants, expanding cuts in short-lived pollutants

Focus on heads of government critical for fast, near-term mitigation in Arctic, elsewhere
Leader focus also critical for success with UN climate treaty in 2015 treaty

Washington, DC, 5 September 2013—During his visit to Sweden yesterday, President Obama gained allies in his effort to stop coal plants when the leaders of Denmark, Finland, Iceland, Norway, and Sweden agreed to join the U.S. "in ending public financing for new coal-fired power plants overseas, except in rare circumstances." The leaders also agreed "to secure the support of other countries and multilateral development banks to adopt similar policies," and "to continue their work, in all appropriate channels, to reduce the use of domestic fossil fuel subsidies globally."

Last updated: February 28, 2014 10:53 am

Norway's oil fund to debate ending fossil fuel investments

ft.com > world > Europe

By Richard Milne in Oslo

Norway is to debate whether the world's largest sovereign wealth fund – funded by petroleum revenues – should stop investing in oil, gas and coal companies.

The two governing centre-right parties and two of their allies have agreed to set up an expert group to look into the $840bn oil fund's investments in fossil fuels and report back in a year's time.

Storebrand, one of Norway's largest private investors, has excluded many fossil-fuel related companies from its funds on sustainability grounds and has urged the oil fund to do the same.

Investors waking up for carbon risks …

INVESTOR PROFILE

AP4 retreats from carbon

SARAH RUNDELL

October 11, 2013 | 0 Comments | print

The $38-billion Fourth Swedish National Pension Fund, AP4, one of a group of five state-owned pension funds, plans to invest in a tailored emerging markets fund comprising companies that have both low-carbon emissions and low fossil-fuel reserves. AP4, which returned over 6 per cent in the first six months of 2013 buoyed by domestic and global equity particularly, has some of its largest foreign equity holdings in oil and gas companies held in passive mandates. If the latest initiative proves successful, exposure to these companies could begin to tail off, explains chief executive, Mats Andersson, who describes the process as trial and error but says the trend is clear. "If it works, we will increase our exposure so that hopefully it will be a much bigger part of our portfolio. We want to do this on a global basis. In 10 years time, carbon will be priced and valued in a different way so that companies with a high carbon footprint will perform worse. This sustainable approach isn't about charity, but about enhancing returns."

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INVESTMENT STRATEGIES FOR THE WORLD'S LARGEST INSTITUTIONAL INVESTORS

ANALYSIS

Wake up to wasted capital, stranded assets

SARAH RUNDELL

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Sobering new figures in the latest report to highlight climate risk should resonate with trustees more than usual. According to the second study from **Carbon Tracker** and the **Grantham Research Institute on Climate Change and the Environment**, part of the London School of Economics ***Unburnable carbon 2013: Wasted capital and stranded assets***, between 60 and 80 per cent of current fossil fuel reserves listed on world markets can never be used if global warming is capped at the 2-degree-Celsius increase targeted by policy makers. It means pension funds, renowned for their high allocations to oil and gas majors, are in danger of holding stranded assets, investments that have plummeted in value because of regulations to tackle climate change coming into play. Current values placed on many of these companies are based on the future development of reserves – coal, oil and gas groups spent $647 billion on exploitation last year alone, according to the report – yet when governments take action to limit carbon emissions, the exploitation on which these values depend may never be realised.

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MAJOR PENSION FUNDS ASK FOR CLIMATE CHANGE STUDY

By KEVIN BEGOS — Oct. 24, 2013 10:13 AM EDT

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PITTSBURGH (AP) — Some of the largest pension funds in the U.S. and the world are worried that major fossil fuel companies may not be as profitable in the future because of efforts to limit climate change, and they want details on how the firms will manage a long-term shift to cleaner energy sources.

In a statement released Thursday, leaders of 70 funds said they're asking 45 of the world's top oil, gas, coal and electric power companies to do detailed assessments of how efforts to control climate change could impact their businesses.

Bloomberg LP Launches First Tool That Measures Risk of 'Unburnable Carbon' Assets

The tool, which can assess how companies might fare in the carbon-constrained economy, is now on the desks of the world's most influential investors.

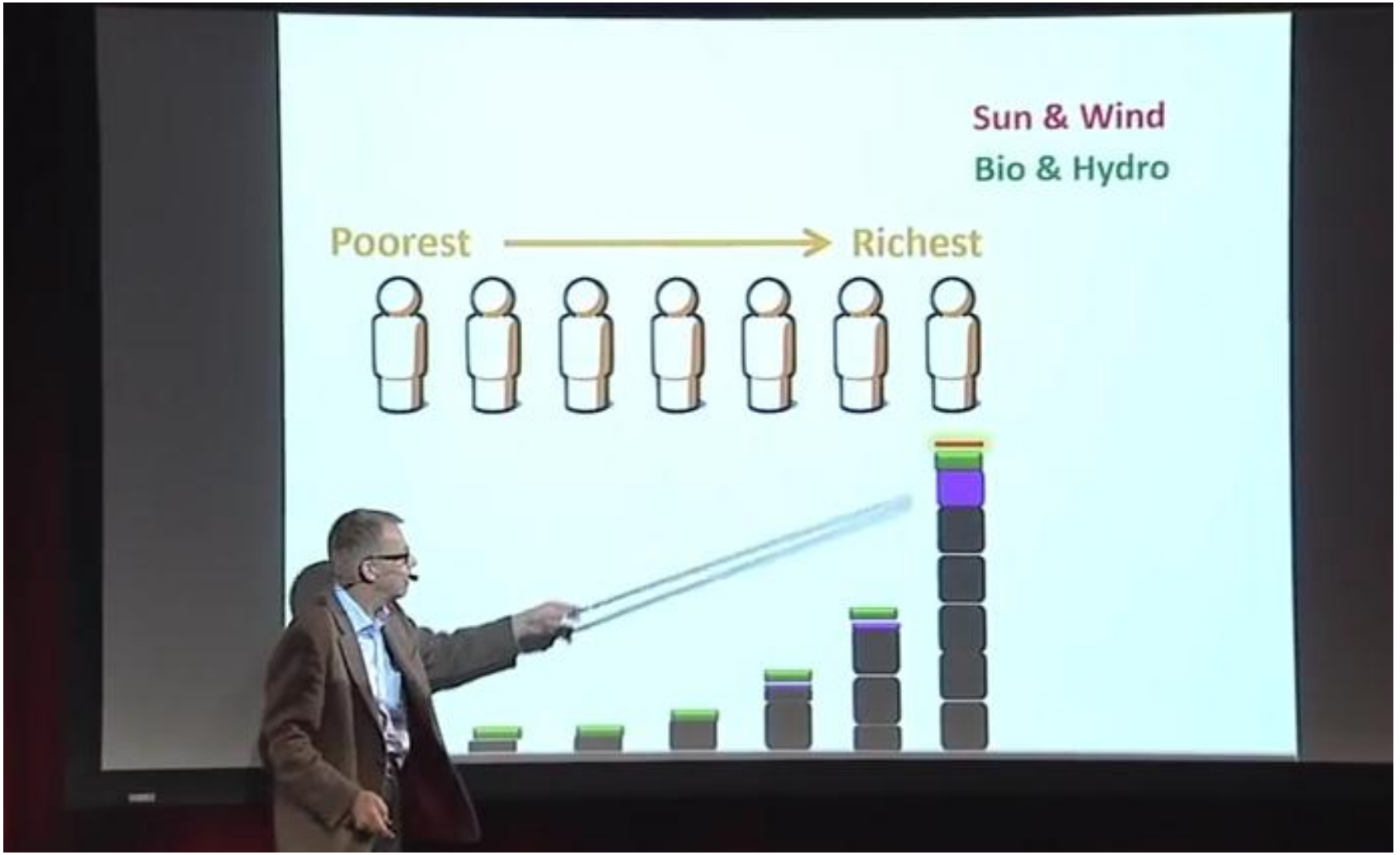
By Elizabeth Douglass, InsideClimate News — Dec 3, 2013

Bloomberg LP is now offering a Carbon Risk Valuation Tool through its terminal subscription service (seen here), which is available to more than 300,000 high-end traders, analysts and others. Credit: CUNY Graduate School of Journalism

In a move that underscores Wall Street's growing unease over the business-as-usual strategy of the world's fossil fuel companies, Bloomberg L.P. unveiled a tool last week that helps investors quantify for the first time how climate policies and related risks might batter the earnings and stock prices of individual oil, coal and natural gas companies.

Global energy use by wealth

Prof. Hans Rosling on IPCC event, Stockholm, 28.9.2013



Source: http://youtu.be/grZSxoLPqXI

We must be the change we wish to see in the world (Mahatma Gandhi)

Choose CO2 free energy …

..eliminate unnecessary use of energy…

…improve efficiency of energy use…

…optimize the time of use…

… use renewables…

..reduce transportation emissions…

… and think what to eat.

… and compensate other emissions…

Market mechanisms should enable and speed up the change

- Integrate markets; physical and market rules
- Set price for carbon; preferably cap&trade
- Remove subsidies from mature technologies
- Take climate change and carbon risks into account
- Activate consumers for clean solutions and increased flexibility
- Focus investments into clean solutions and enabling infrastructure
- Do long term decisions


"It always seems impossible,
until it's done." Nelson Mandela
Thank you!