Foundation for the Urban Environment May 19th 2009

Building a Low Carbon Economy in a post-crisis world

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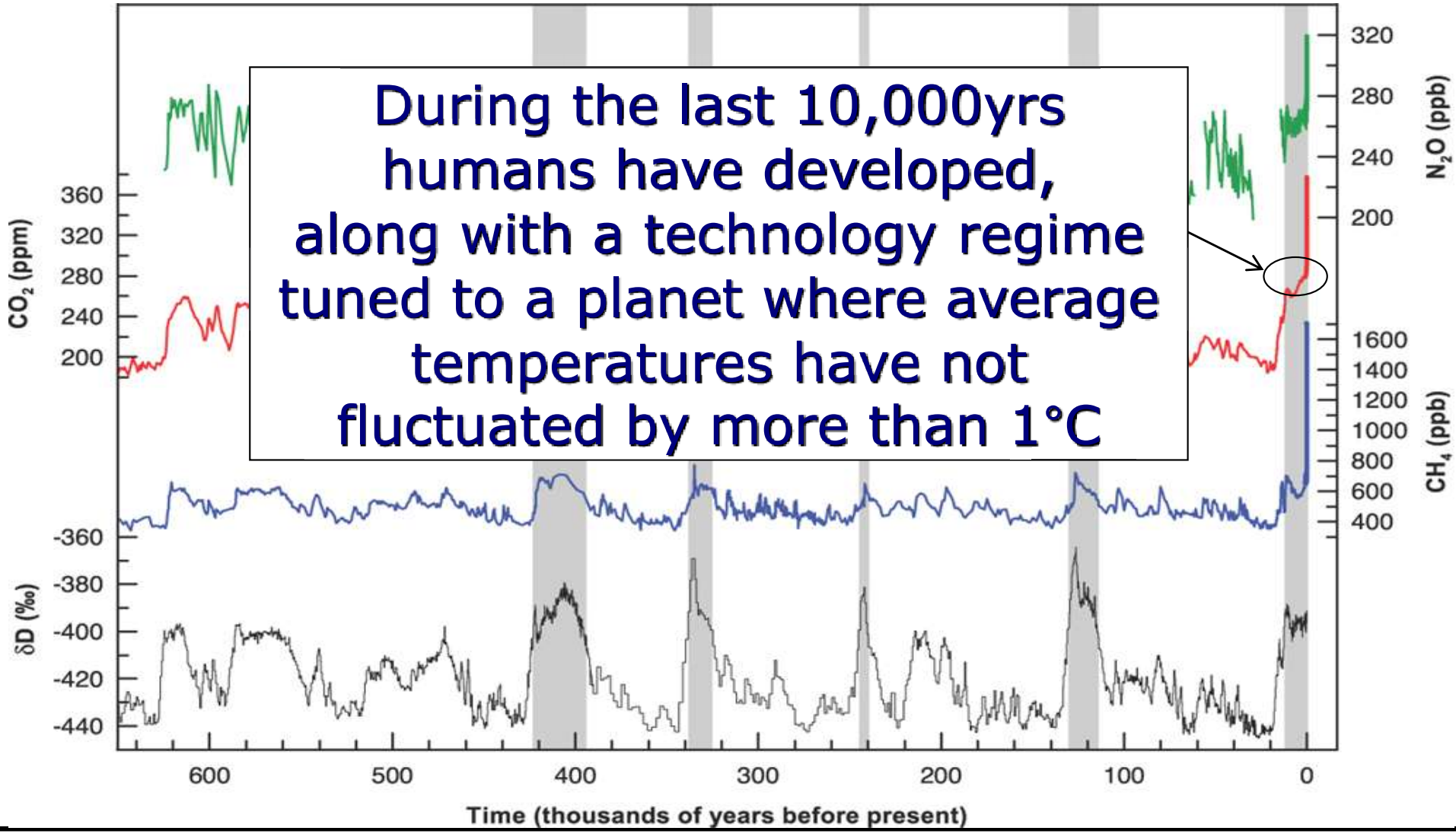
Executive Director
European Environment Agency

CO_2 concentration over the past 650 000 years

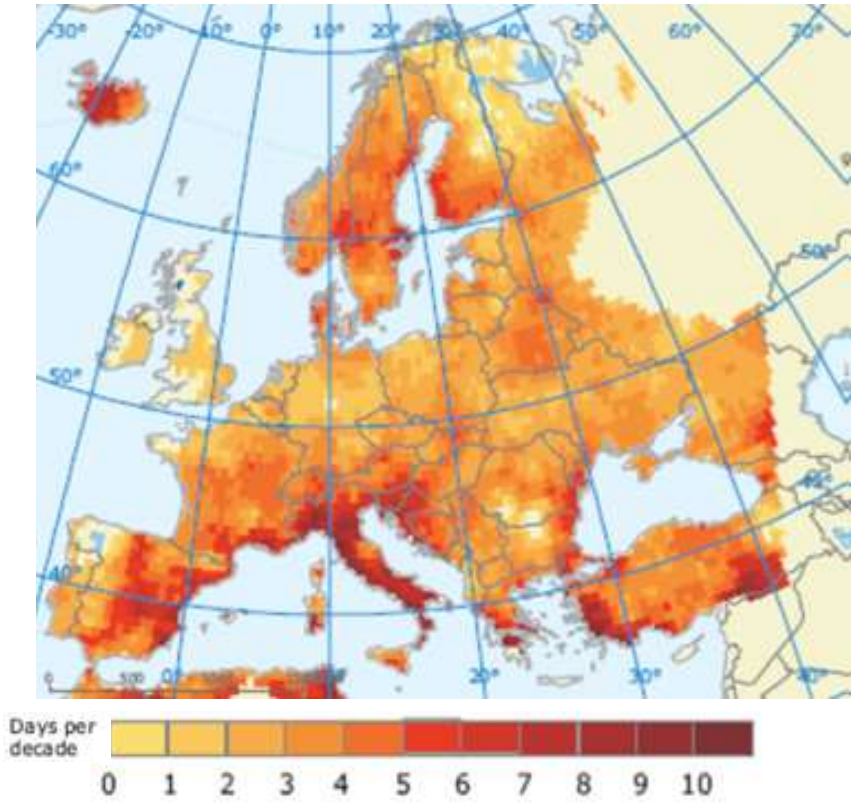
- Due to emissions from human activities the CO2 concentration is 387 ppm (2007), far exceeding the natural range over the last 650 000 years (180 – 300 ppm)

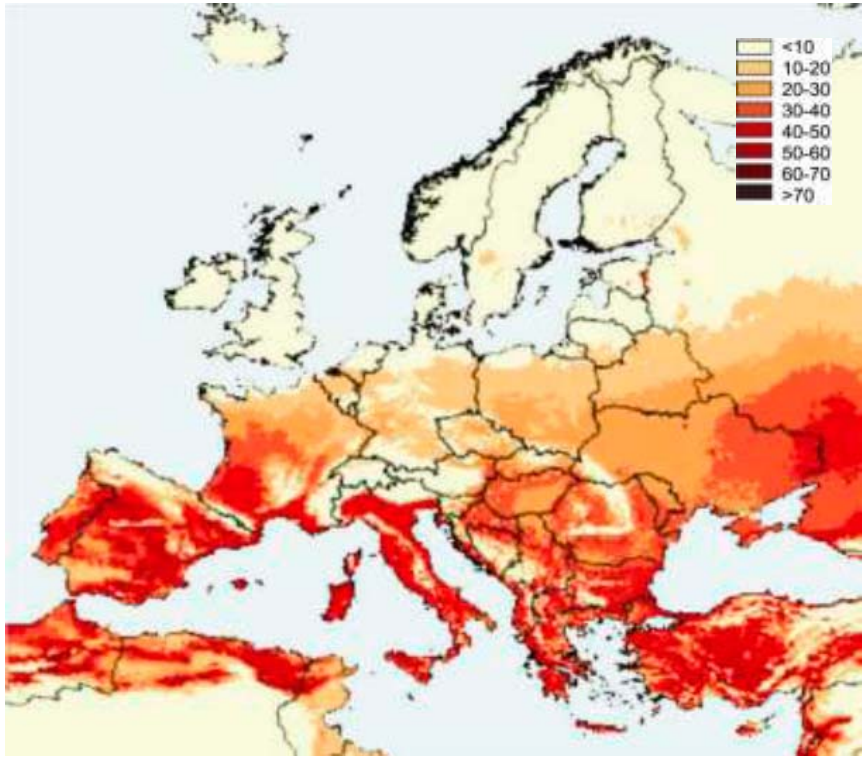


Temperature extremes in Europe

- Extremes of cold became less frequent and warm extremes more frequent
- Number of hot days almost tripled between 1880 and 2005

past





Observed changes in duration of warm spells in summer in the period 1976 - 2006
Projected changes in number of tropical nights between periods 1961-1990 and 2071-2100

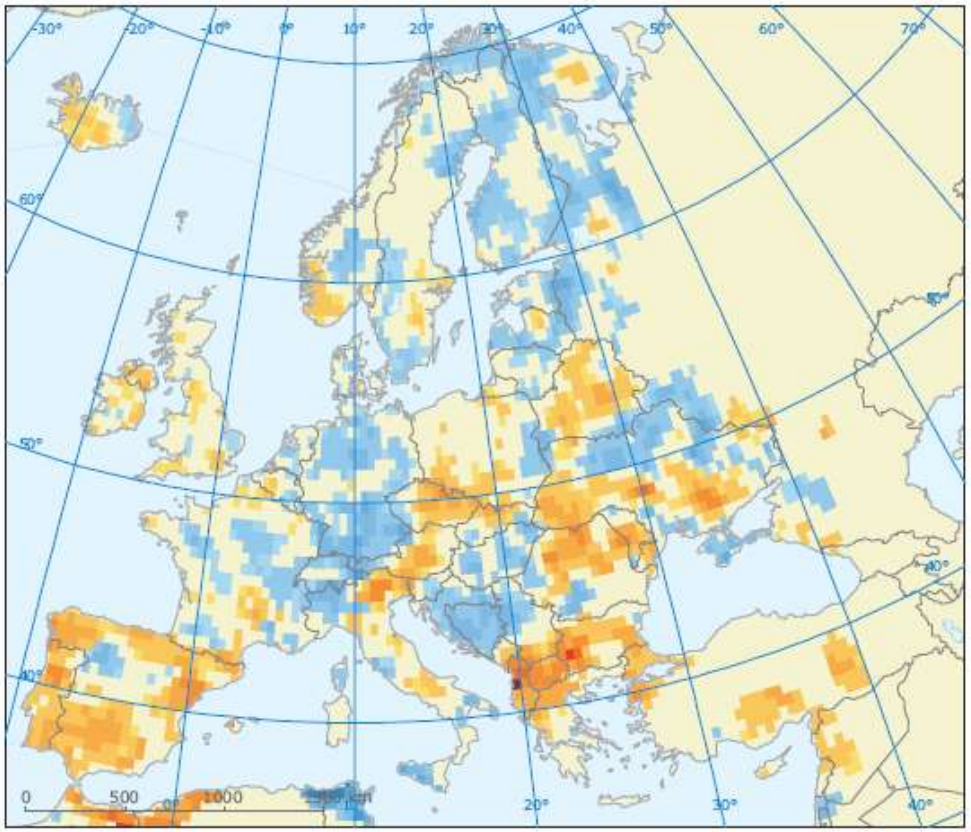
- Increase in frequency, intensity and duration of heat-waves
- Further decrease of number of cold days and frost extremes

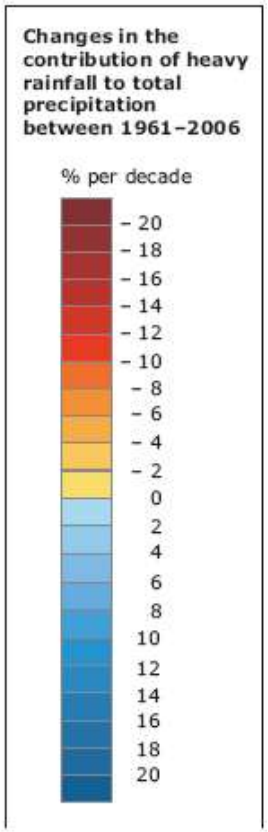
future

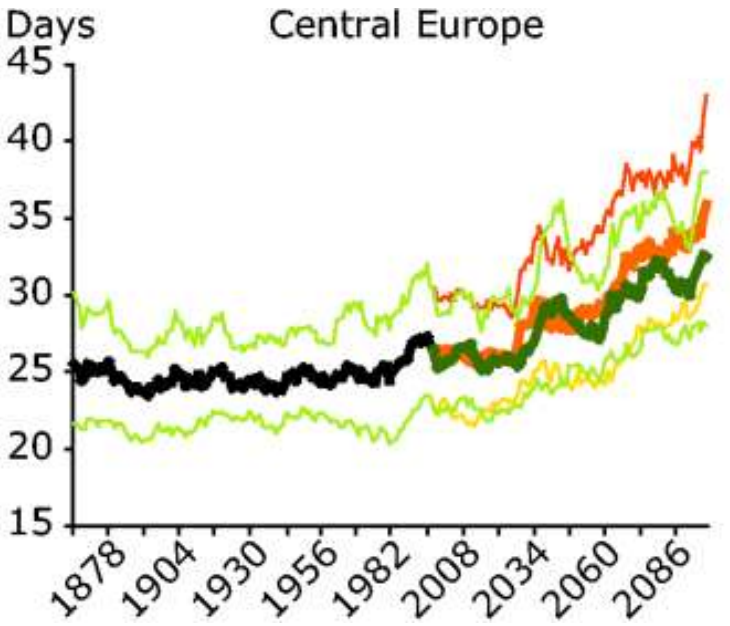
Precipitation extremes in Europe

past

- Intensity of precipitation extremes increased in the past 50 years (across Europe)
- No change in part of Europe experiencing meteorological drought conditions







Number of consecutive dry days (1860 – 2100)

Changes in the contribution of heavy rainfall to total precipitation between 1961-2006

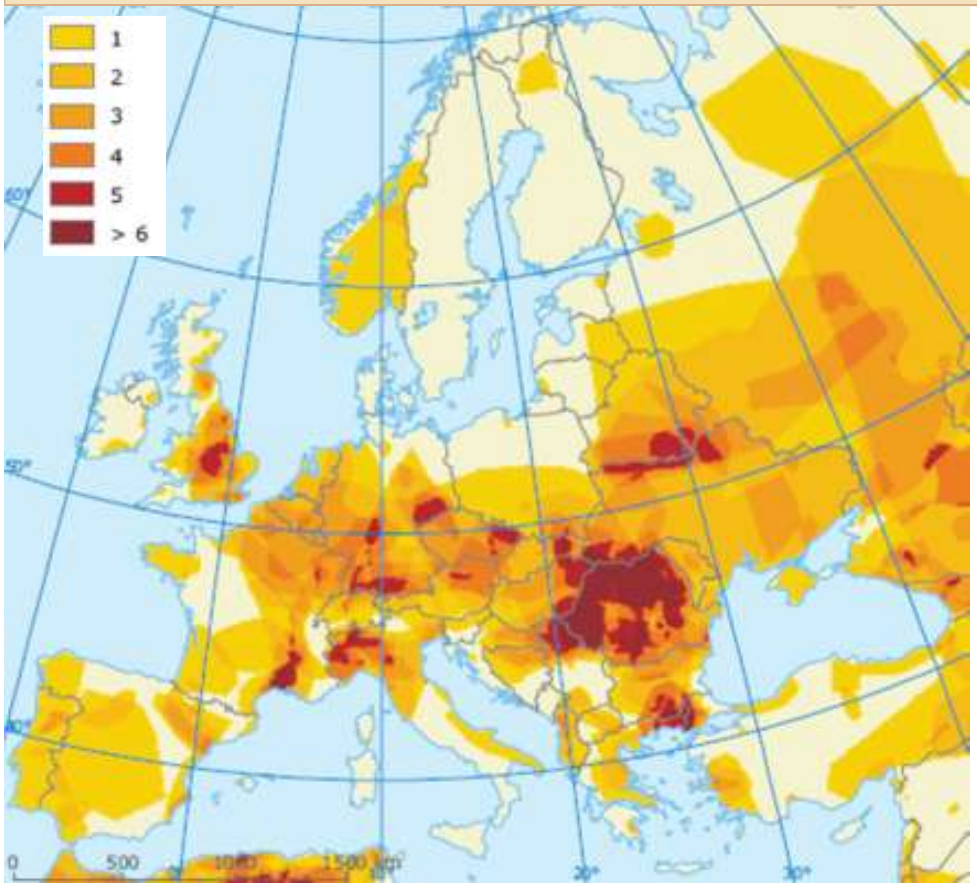
future

- More frequent heavy precipitation events (across Europe)
- More and longer dry periods (especially in southern Europe)

River flooding

- Since 1990, 259 major river floods have been reported in Europe (165 since 2000), the increase is mainly because of better reporting and land-use changes

past



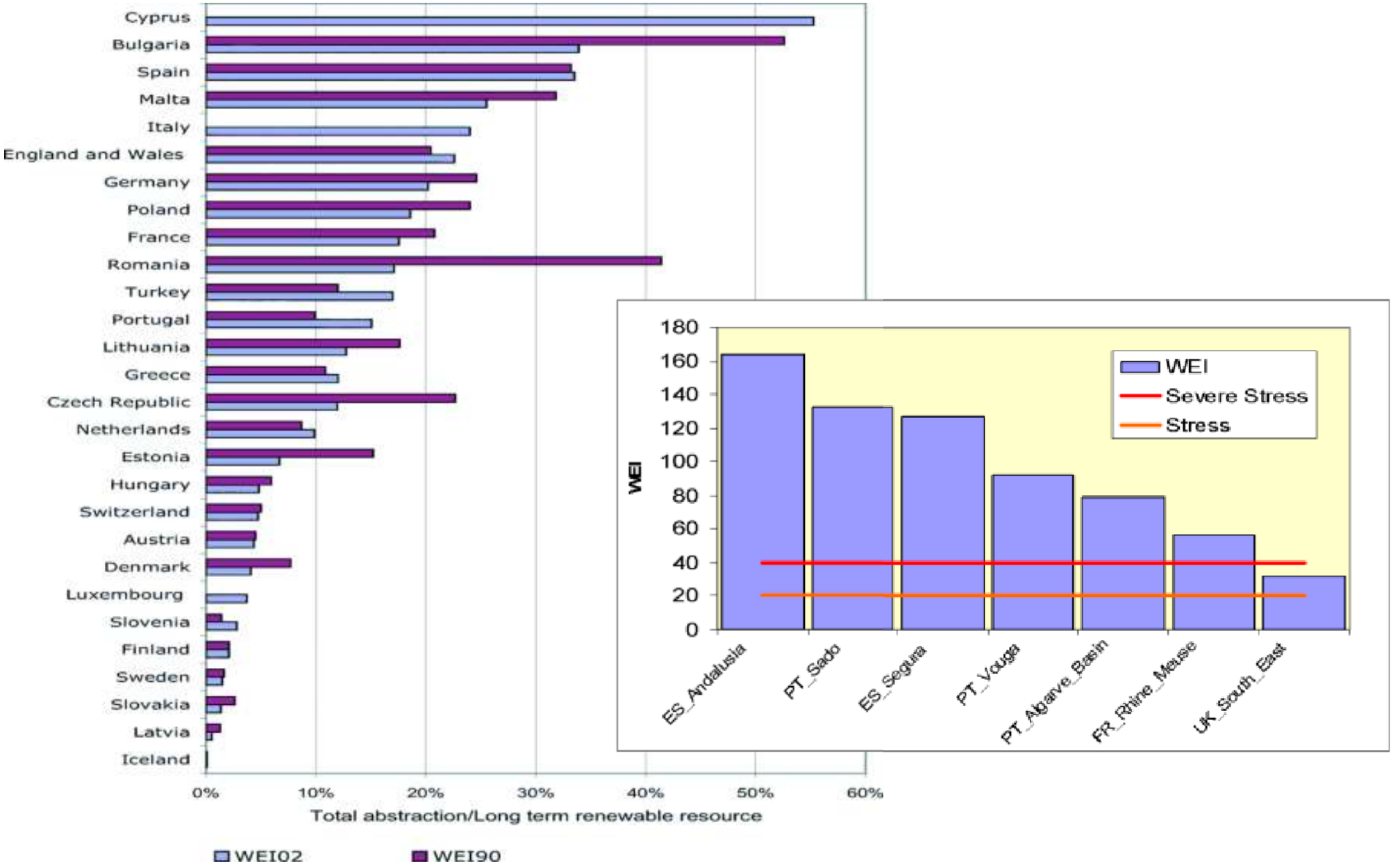
Occurrence of flood events 1998-2008

Relative change in 100-year return level of river discharge between 2071-2100 and 1961-1990

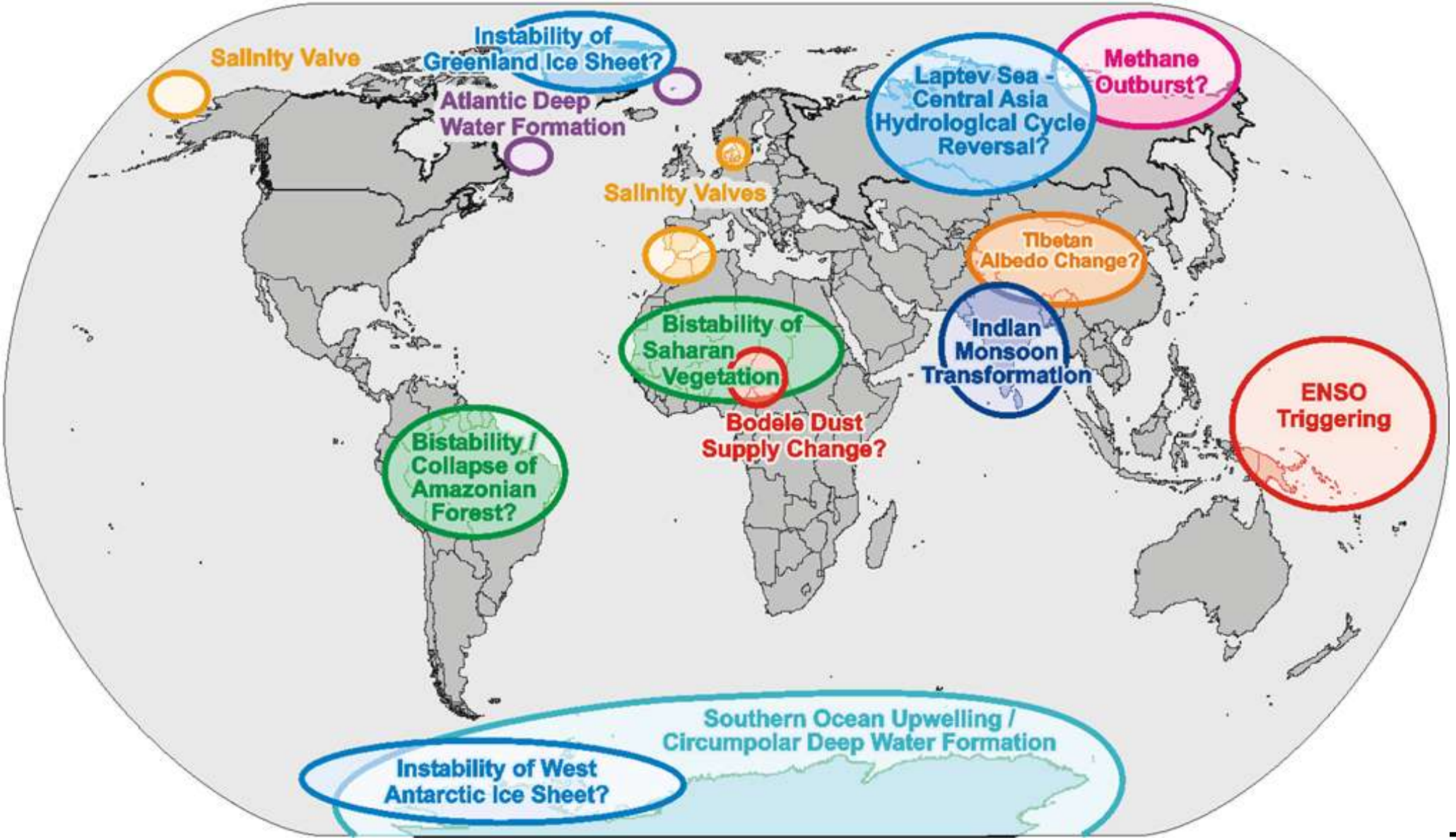
- Increase in the occurrence and frequency of flood events in large parts of Europe
- Less snow accumulation in winter and lower risk of early spring flooding

future

Water Exploitation Index



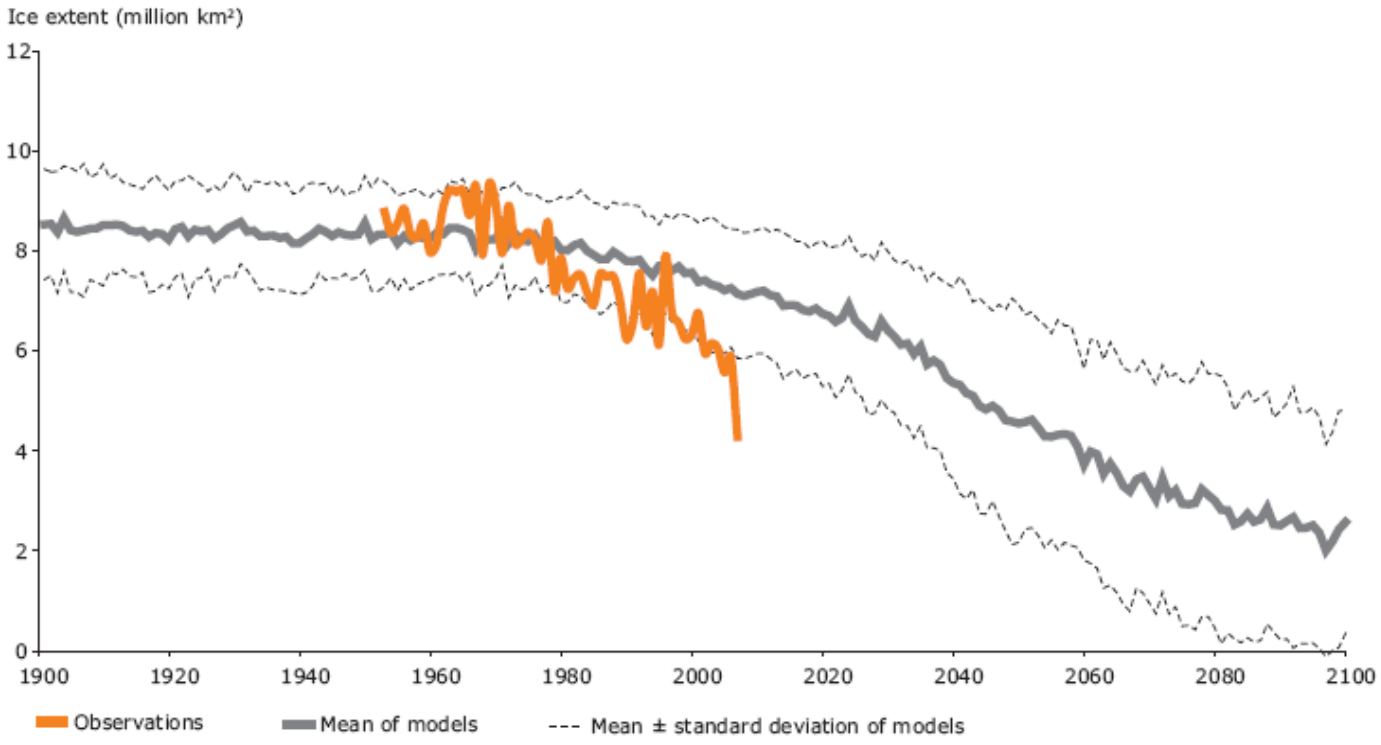
Tipping Points in the Earth System (Schellnhuber)



Arctic sea ice

past

- Arctic sea ice extent has declined at an accelerating rate, especially in summer
- The record low ice cover in September 2007 was half of the size of a normal minimum extent in the 1950s



Observed and projected Arctic September sea-ice extent 1900-2100

The 2007 minimum sea-ice extent

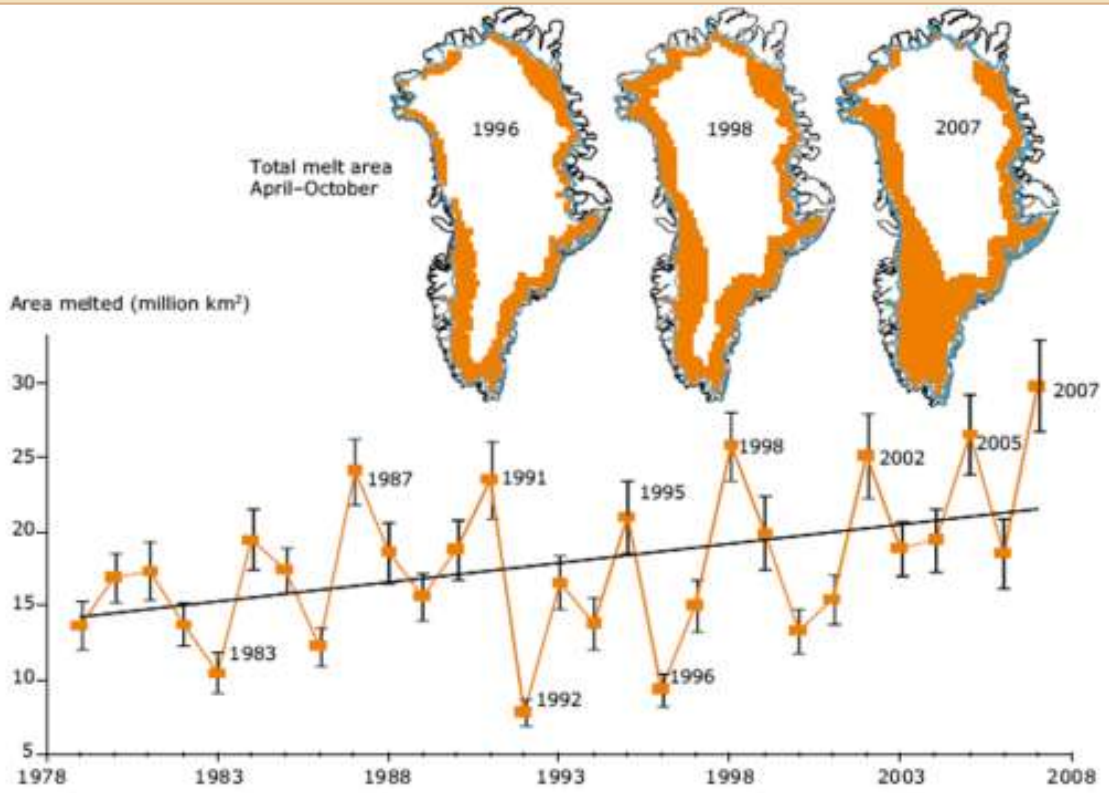
future

- Summer ice is projected to continue to shrink and may even disappear at the height of the summer melt season in the coming decades
- There will be still substantial ice in winter

Greenland ice sheet

- The Greenland ice sheet is losing 100 billion tons of ice per year since the 1990s
- The contribution of ice-loss from Greenland to global SLR is estimated at 0.14-0.28 mm/year for the period 1993-2003 and has since increased

past



Area of Greenland ice sheet melting 1979-2007

- No reliable prediction of the future of ice sheets can be made, since internal processes are poorly understood
- In the long term, melting ice sheets have the largest potential to increase SLR

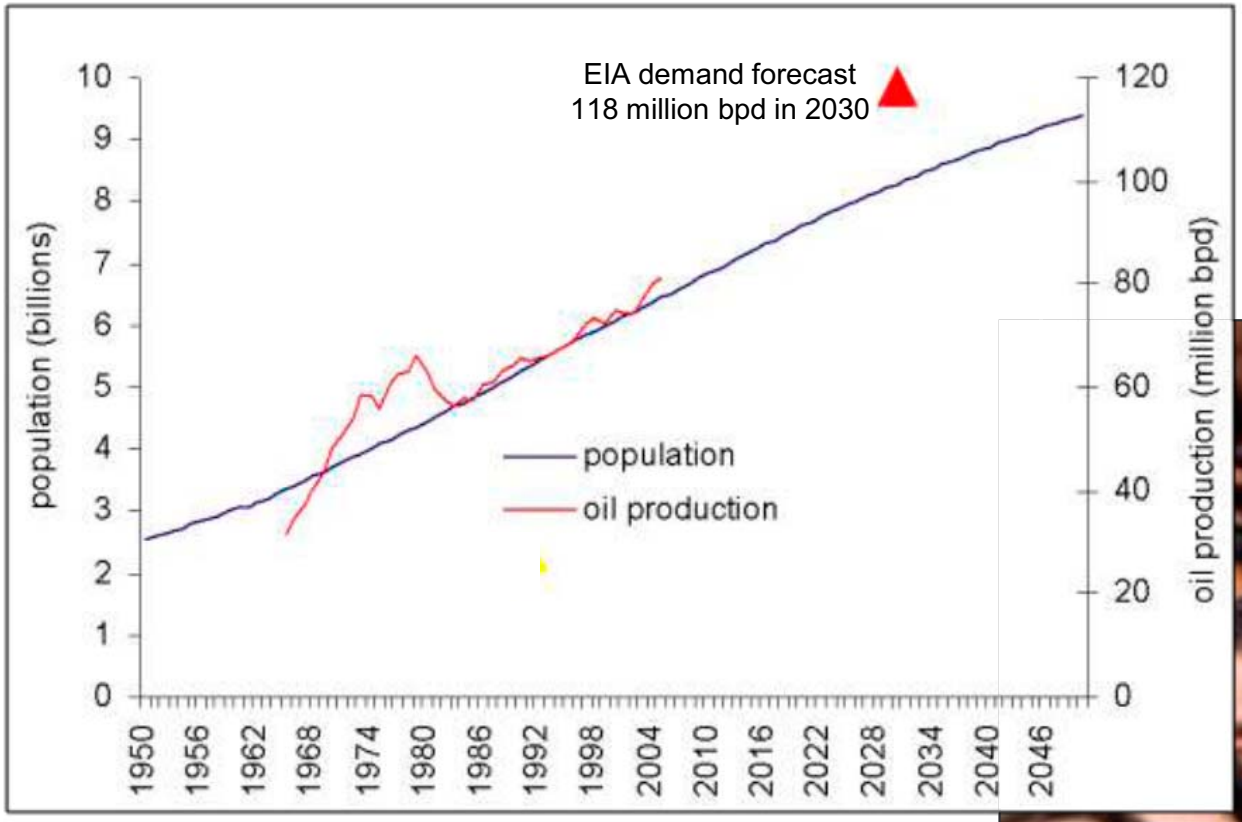
future

Latest scientific evidence and projections

Global average temperatures will increase as long as CO_2 is increasing and then remain approximately constant (within ≈ ±0.5 °C) until the end of the millennium despite zero further emissions in all of the test cases. This is because of deep-ocean mixing.

The changes are expected to lead to substantial and irreversible decreases in dry-season rainfall in a drought-prone areas, eventual sea level rise of the order of meters, leading to unavoidable inundation of many small islands and low-lying coastal areas. Solomon et al. 2009 PNAS

World population to grow by 1.8 billion by 2031



Consumption growth since ’65:

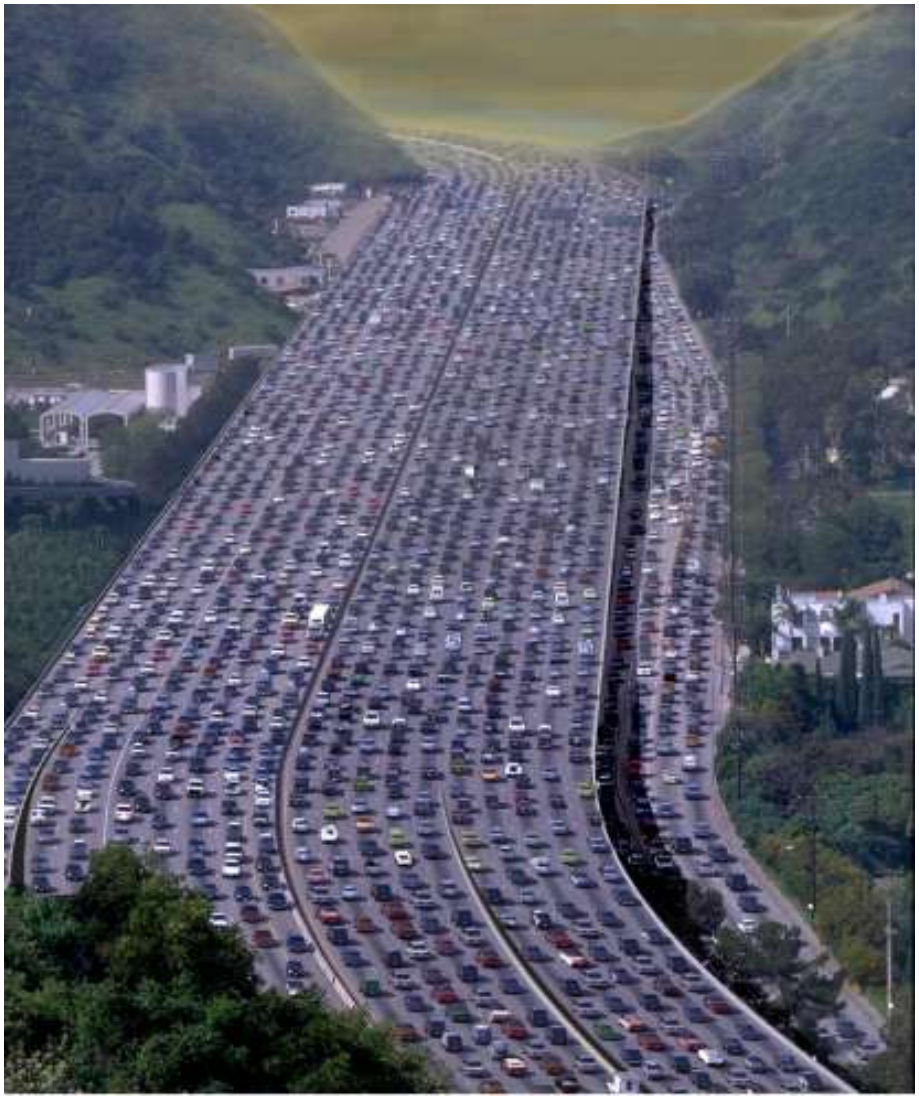
- total energy 284%
- oil 268%
- gas 435%

Energy demand growth:

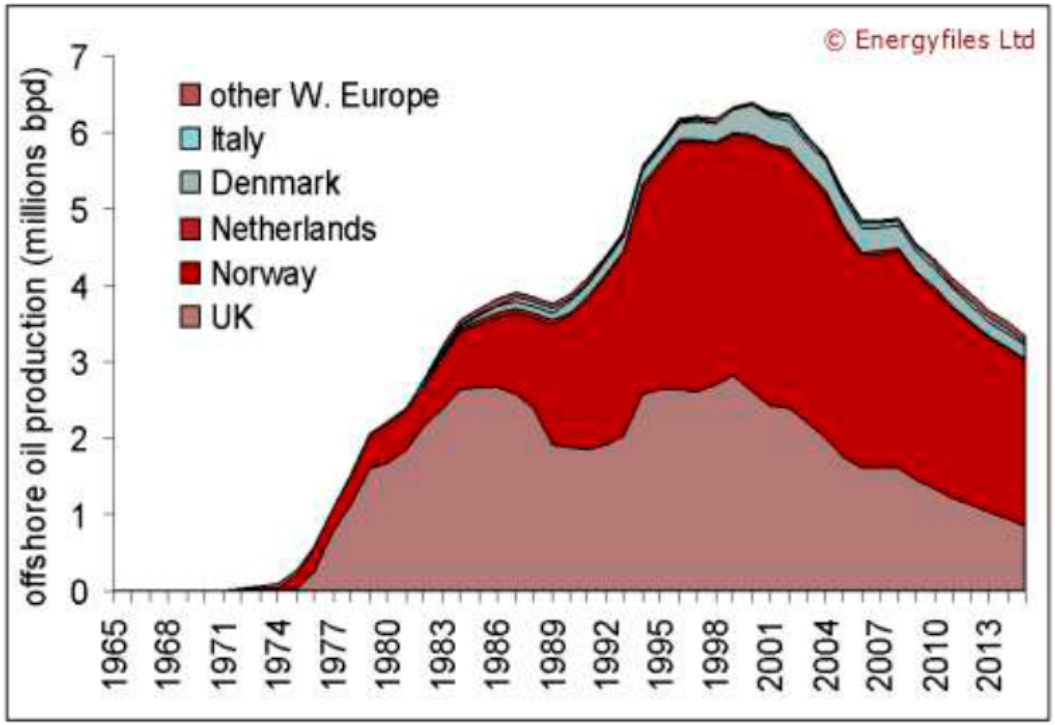
- developed world +111%
- emerging economies +645%

European Environment Agency

Oil is the real problem – it is the fuel of transportation



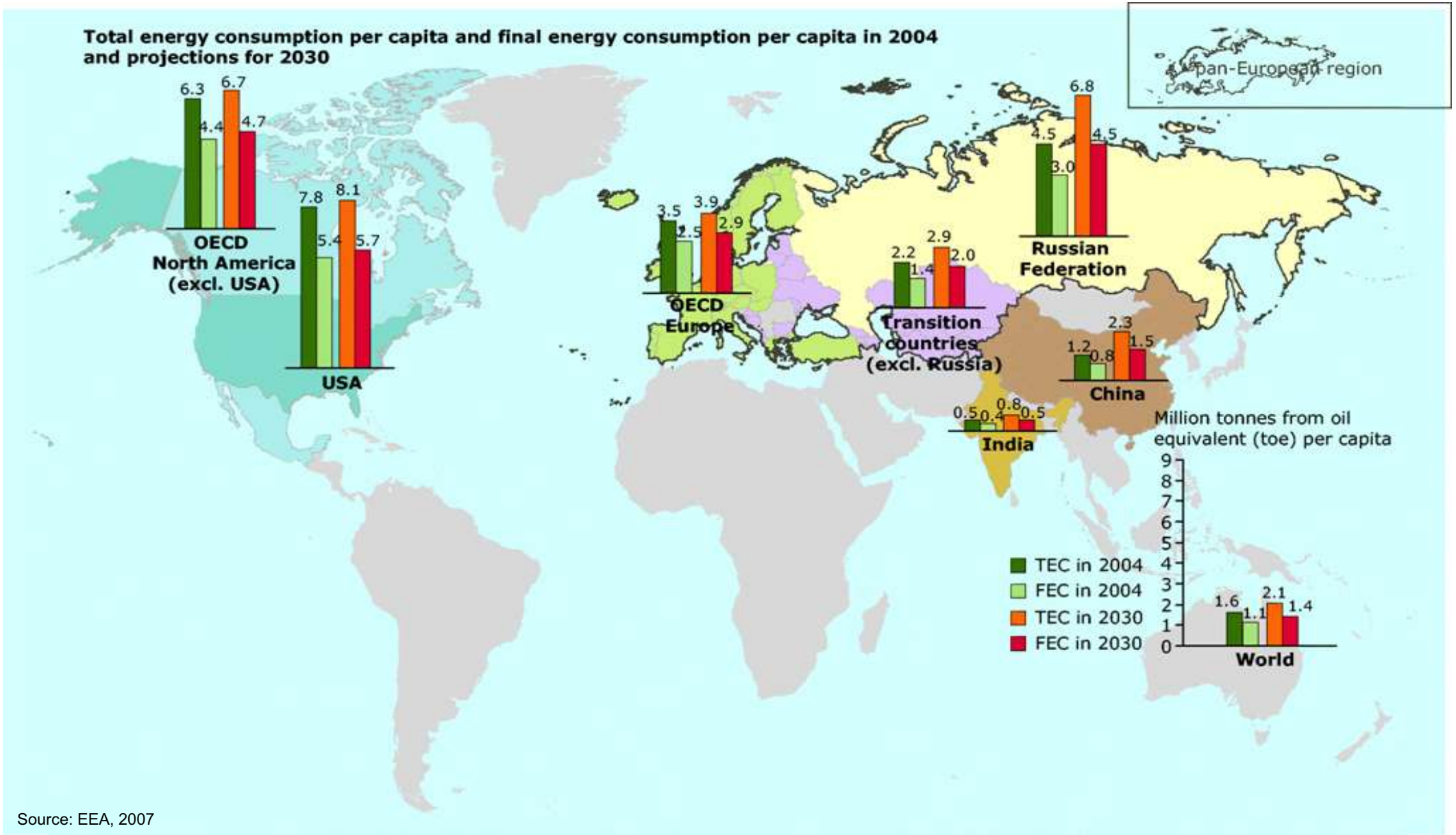
picture courtesy Transfuture.net



European offshore oil production forecast

- **Oil accounts for 32% of global energy consumption**
- **Demand is growing**
- **Non-Opec production is declining**
- **Major politically-induced constraints**

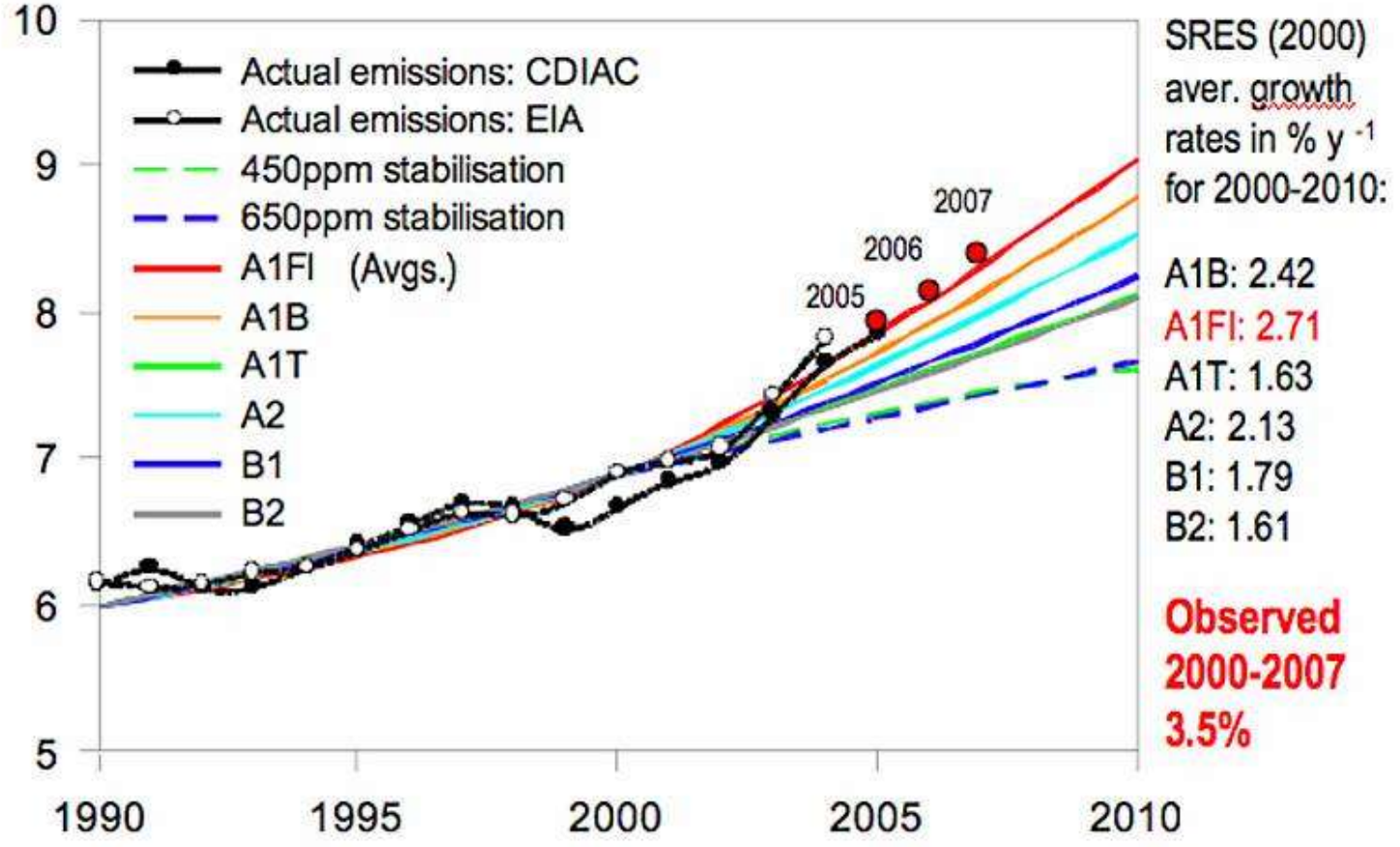
Total Energy Consumption Outlook per capita 2004 - 30



Source: EEA, 2007

Fossil Fuel Emissions: Actual vs. IPCC Scenarios

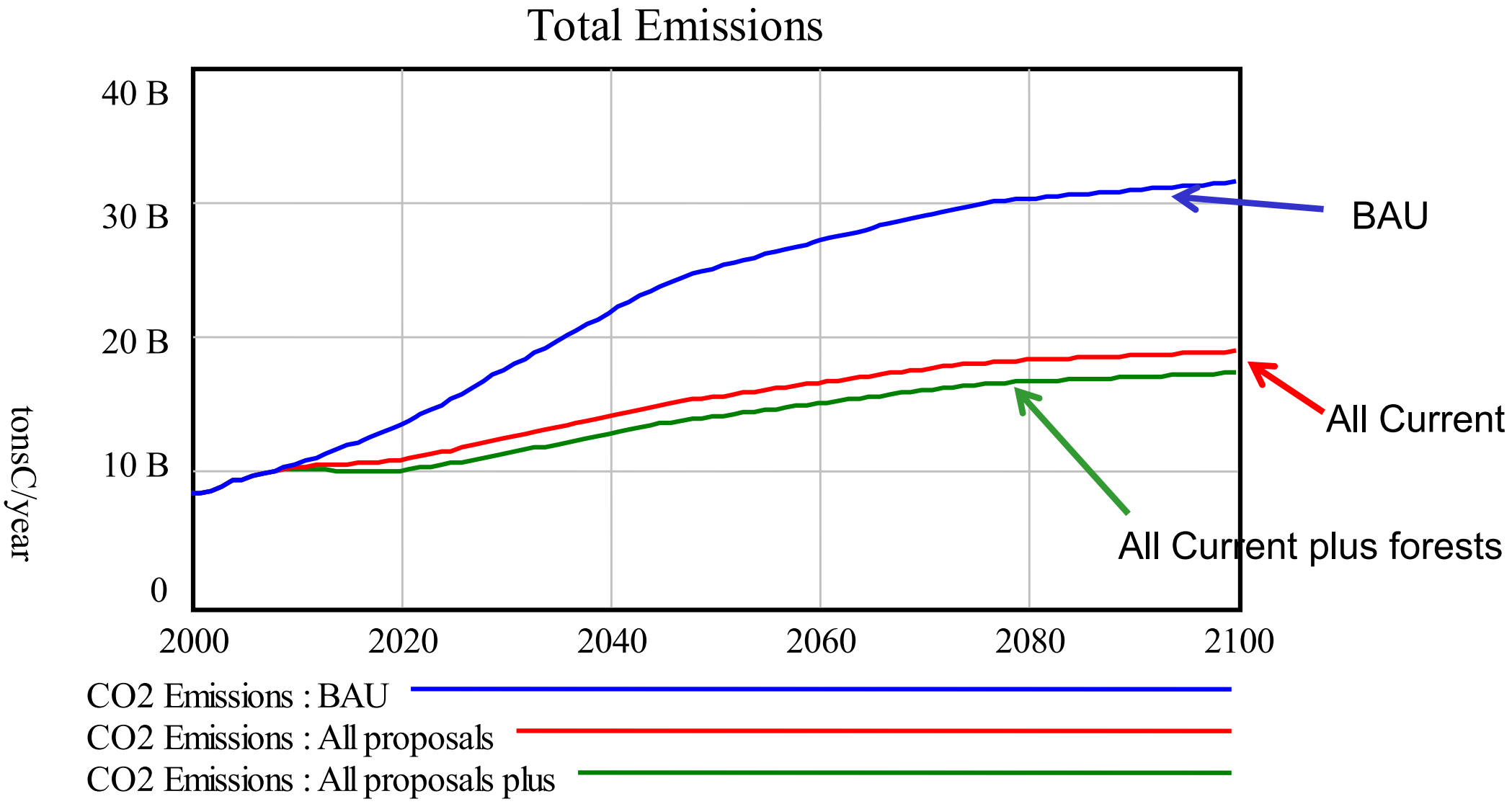
Note: Red is Business as Usual



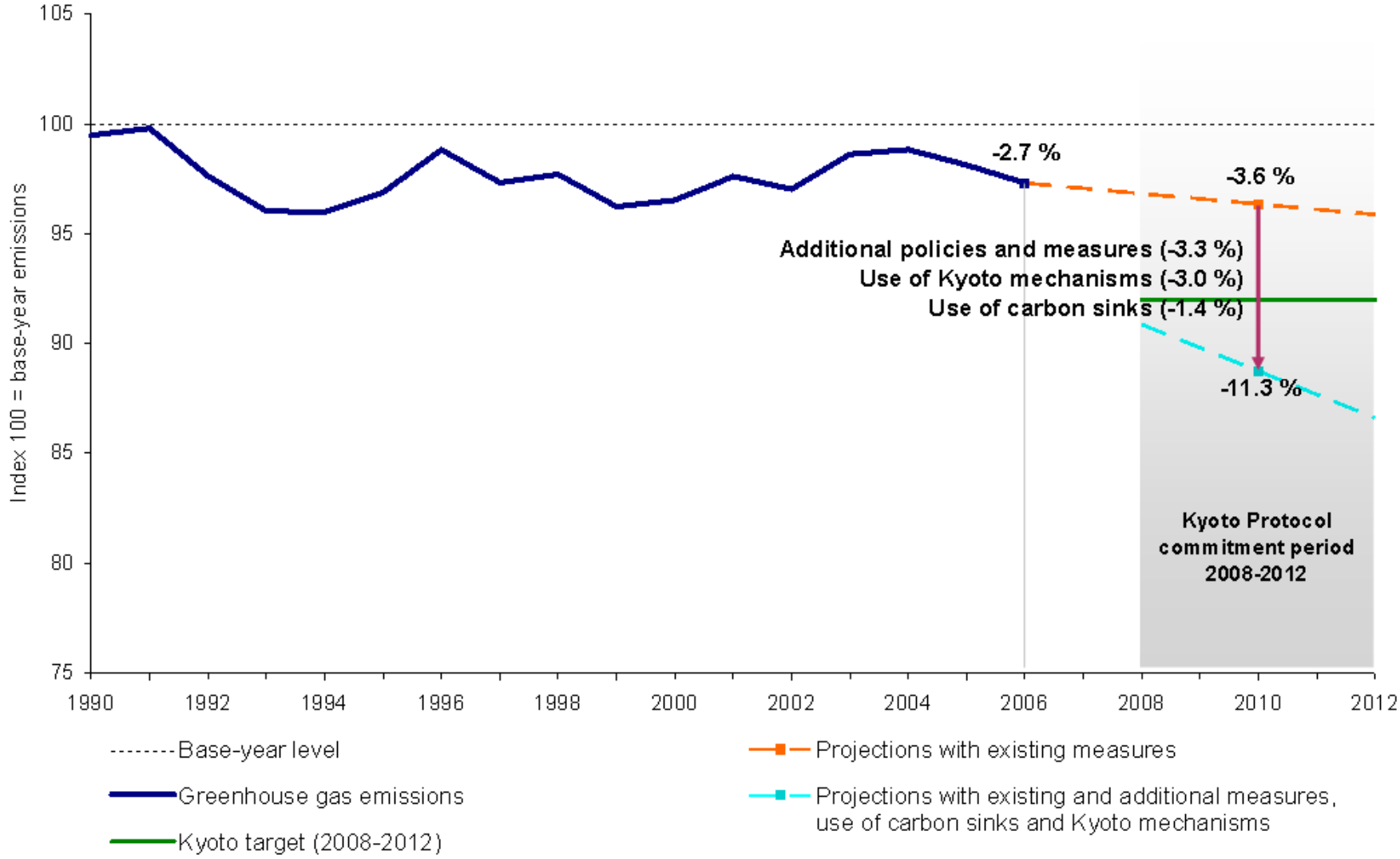
Raupach et al 2007, PNAS (updated)

European Environment Agency

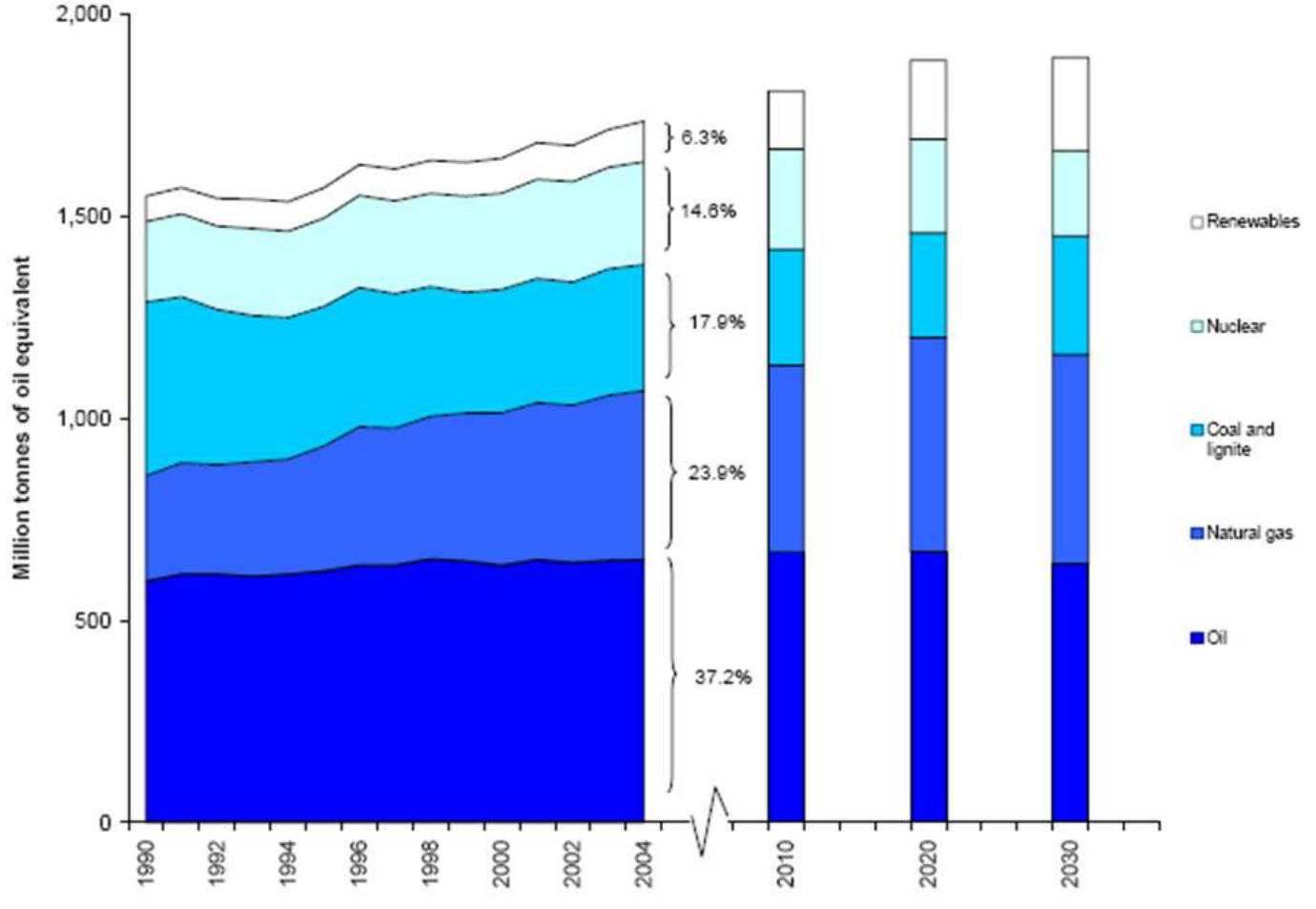
Total Fossil Fuel CO_2 Emissions



In 2006 EU-15 emissions were above the -8% Kyoto target, but commitments will be achieved by a large margin if all policies deliver



Total Energy Consumption by Fuel – EU 25



Data source: Eurostat (historic data), Primes Energy Model (European Commission 2006) for projections.

Today's three systemic crises

- Systemic multiple crises: finance/real economy, energy/climate, ecosystem/biodiversity, social

- Trust crisis: exposure of concealed debts (including ecological debt which is not even recorded in accounting books)

- Governance crisis: responses are a series of untested rescue packages and trial and error solutions

Common features of these 3 systemic crises:

- Making money from money

- Over consumption of natural resources

- Capital destruction

COMMON FEATURES	FINANCIAL CRISIS	CLIMATE CRISIS	NATURAL RESOURCES CRISIS
CAPITAL DESTROYED			
Financial	YES	YES	YES
Human	YES	YES	YES
Natural	YES	YES	YES
Social	YES	YES	YES
RISKS/ DEBTS PASSED ON TO CURRENT AND FUTURE 'OTHERS'?	YES	YES	YES

COMMON FEATURES	FINANCIAL CRISIS	CLIMATE CRISIS	NATURAL RESOURCES CRISIS
MARKET PRICES: Cover All costs?	NO	NO	NO
Reflect real risks?	NO	NO	NO
TRANSPARENT TRANSACTIONS?	NO	NO	NO
ACCOUNTING FOR WHAT MATTERS?	NO	NO	NO
EARLY WARNINGS HEEDED?	NO	NO	NO
ROBUST AND SUSTAINABLE SYSTEMS?	**NO**	**NO**	**NO**

Some features of good governance

- Maintaining capitals
- Meeting needs of today's ageing populations and next generations
- Balancing resource consumption
- Public participation

GOOD GOVERNANCE	FINANCIAL SYSTEMS	ENERGY SYSTEMS	ECOSYSTEMS
CONSUMING FLOWS WHILST MAINTAINING QUALITY AND QUANTITY OF ASSETS	CONSERVATIVE ASSET/ DEBT RATIOS	FROM *STOCKS* OF FOSSIL FUELS TO *FLOWS* OF RENEWABLES	MAINTAINING NATURAL CAPITAL *STOCKS* WHILE SECURING *FLOWS* OF ECOSYTEM SERVICES
ALL RISKS AND DEBTS INTERNALISED INTO MARKET PRICES	REALISTIC ASSET/ DEBT PRICING	EXTERNALITIES INTERNALISED INTO PRICES	EXTERNALITIES INTERNALISED INTO PRICES
ECONOMIC TAX & SUBSIDY REFORM TO FINANCE "GREEN NEW DEAL", AGEING POPULATION COSTS ETC	***"TOBIN TAX" ON CURRENCY/COMMODITIES SPECULATION?***	***FROM TAXING PEOPLE TO TAXING ENERGY AND RESOURCES***	***FROM TAXING PEOPLE TO TAXING ENERGY AND RESOURCES***
TRANSPARENT TRANSACTIONS	UNDERSTANDABLE FINANCIAL PRODUCTS	MARKET PRICES REVEALING "ECOLOGICAL TRUTH"	MARKET PRICES REVEALING "ECOLOGICAL TRUTH"

GOOD GOVERNANCE	FINANCIAL SYSTEMS	ENERGY SYSTEMS	ECOSYSTEMS
ACOUNTING FOR WHAT MATTERS	REAL DEBT / ASSET RATIOS	ALL COSTS/ SUBSIDIES	ECOSYSTEM SERVICES AND ASSETS
	"B E Y O N D G D P"		
EARLY WARNINGS FROM LATE LESSONS	"INCONVENIENT TRUTHS" ACTED ON		
COMMUNITY LEVEL INITIATIVES	MICRO-FINANCE	DISTRIBUTED NETWORKS	CO-MANAGEMENT OF ECO-SYSTEMS
DIVERSE DISTRIBUTED, PARTICIPATORY, RESILIENT AND SECURE SYSTEMS?	YES	YES	YES

Key factors to take into account in designing a low carbon economy

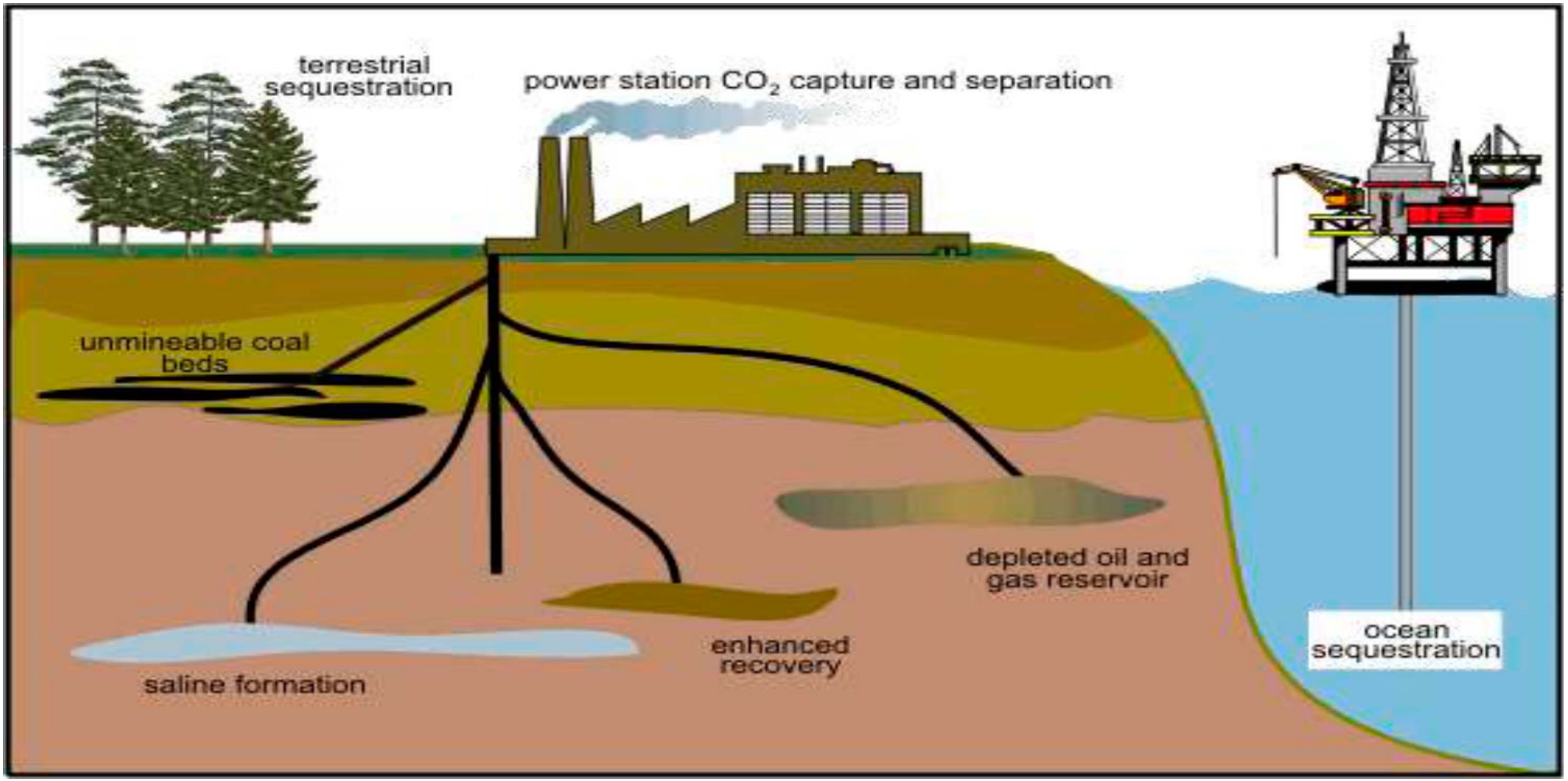
- Limits on exploitable fossil fuel resources
- Energy security concerns around non-indigenous sources
- Fiscal and legislative instability
- Incorrect price signals via subsidies
- Climate change policies and impacts on using indigenous sources

Financial action: replace carbon subsidies, aid & incentives with zero-carbon investments

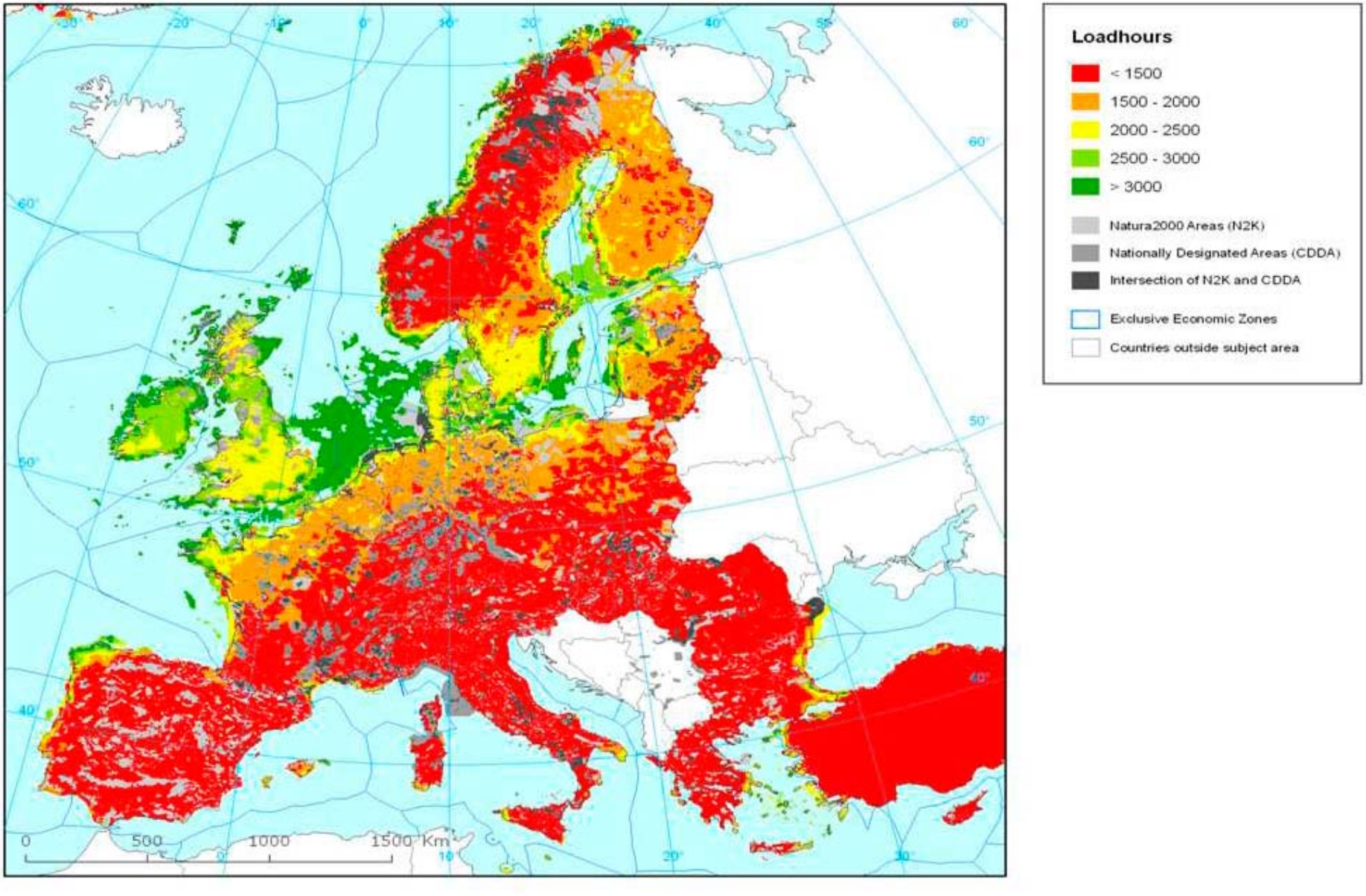
- EU: traditional fuels €35b in 2005
  vs renewables €5b/yr
- EU: energy package €3.5b over 2 yrs
  (1.75b for interconnectors, 1.25b for carbon capture and storage, 0.5b offshore wind)
- UK package £100b for 4000 onshore & 3000 offshore installations,160k jobs by 2020

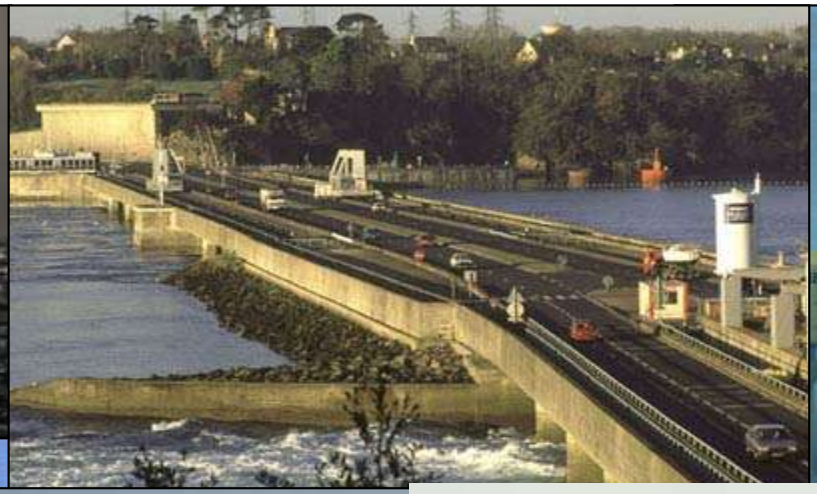
Citizen bonds to support rapid developments for green infrastructure (e.g.Canada)

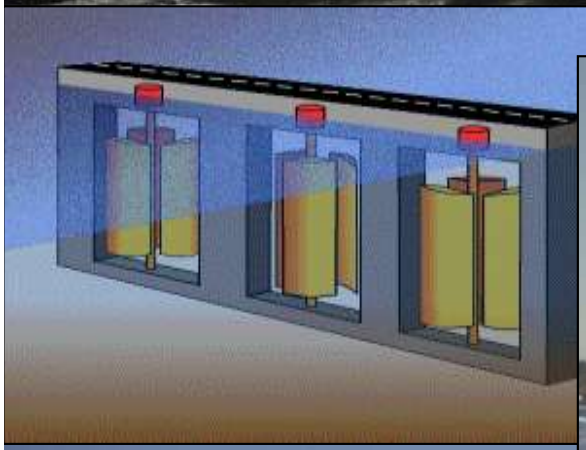
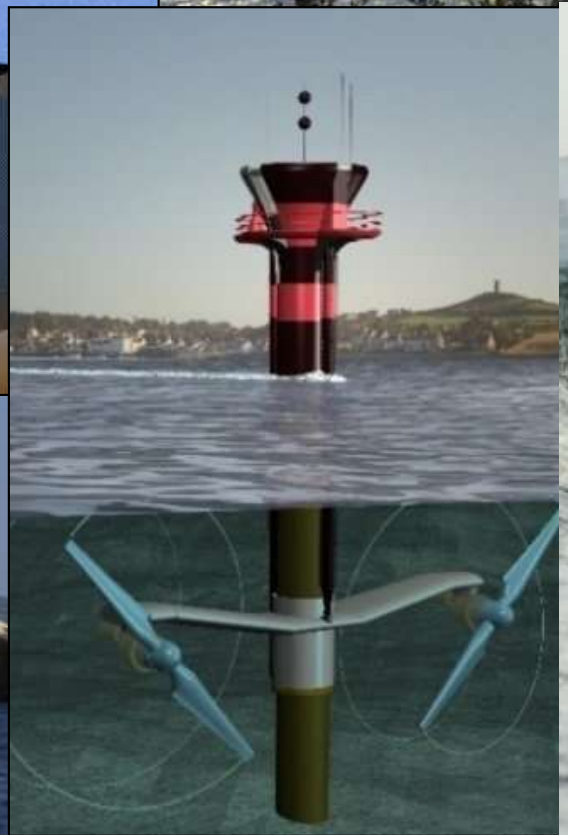
Intermediate action: accelerate implementation of carbon capture and sequestration

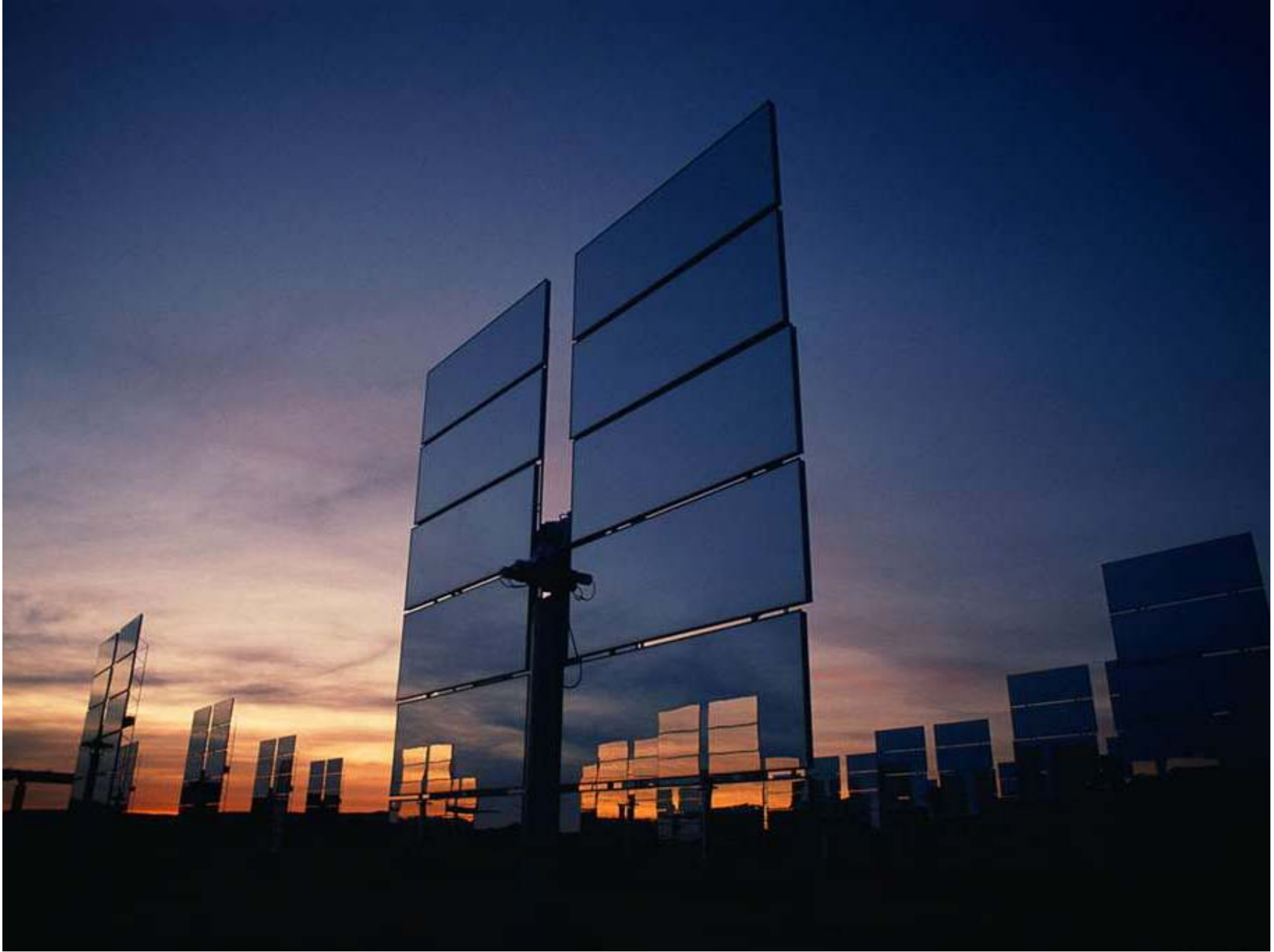


Wind potential in Europe - EEA

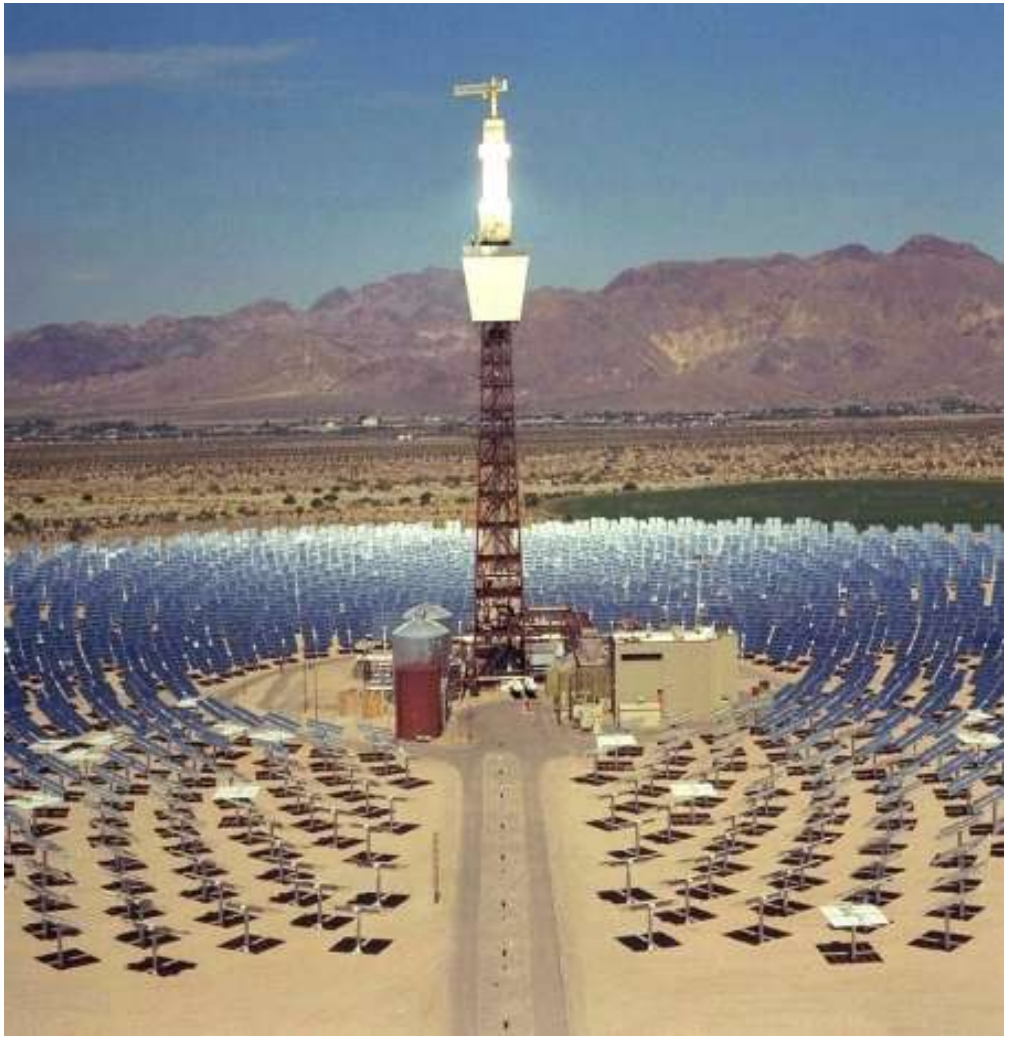


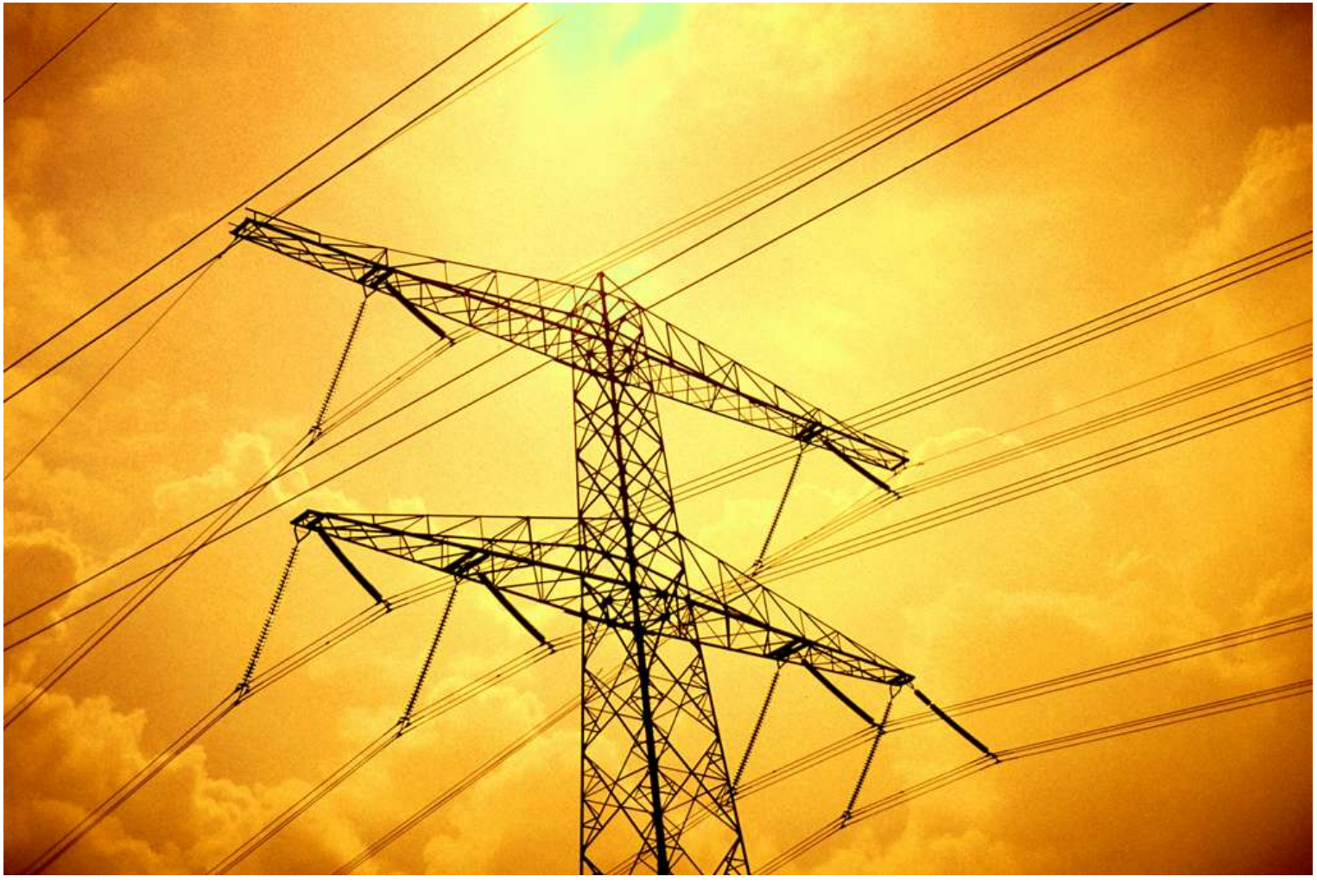


Solar Power PVs and SCP with storage



- Costs dropping rapidly with new technologies and economies of scale ($0.7/watt by 2010)
- Market growing rapidly (projected at $40bn by 2010) but not fast enough

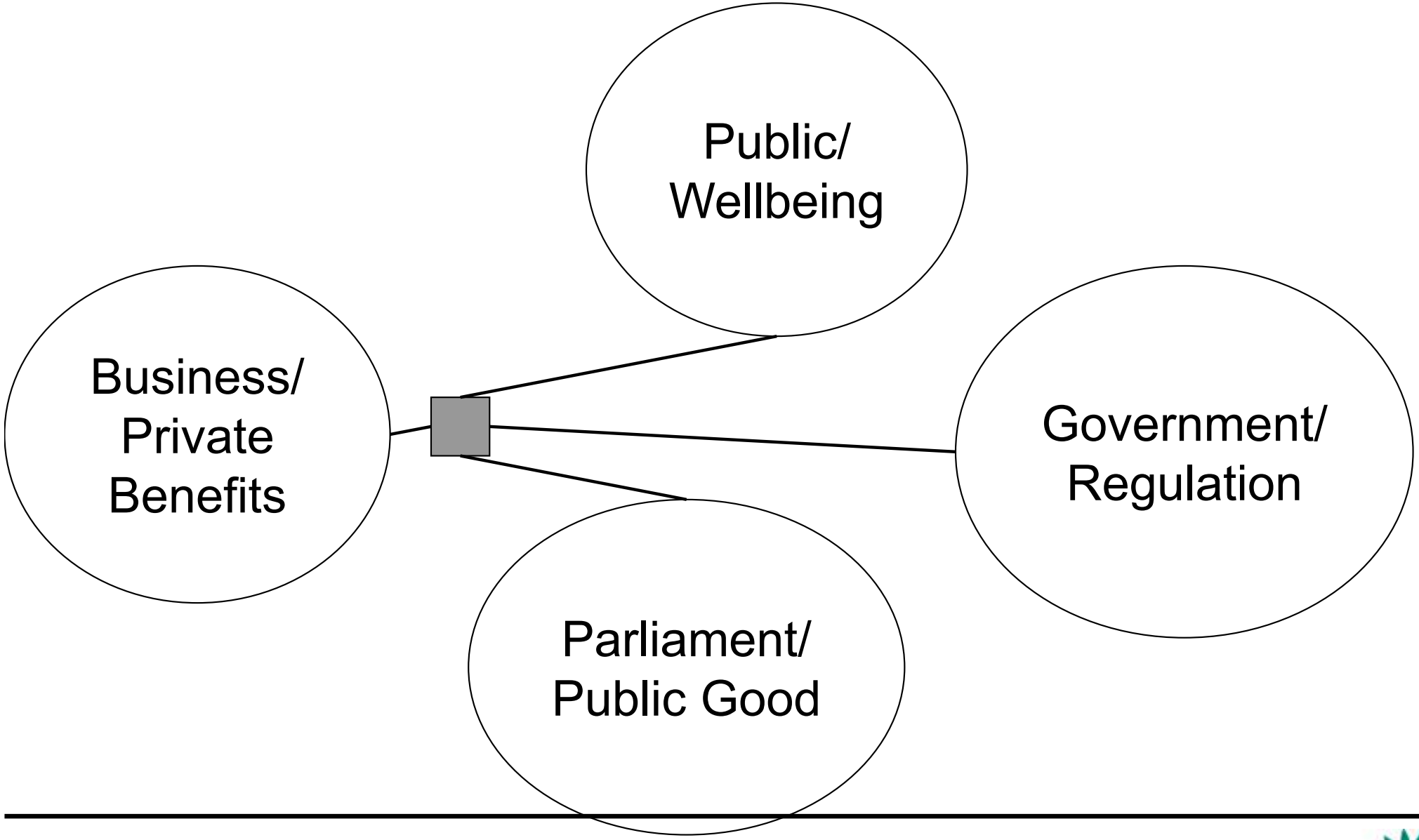
Decentralisation of power via super grid infrastructure



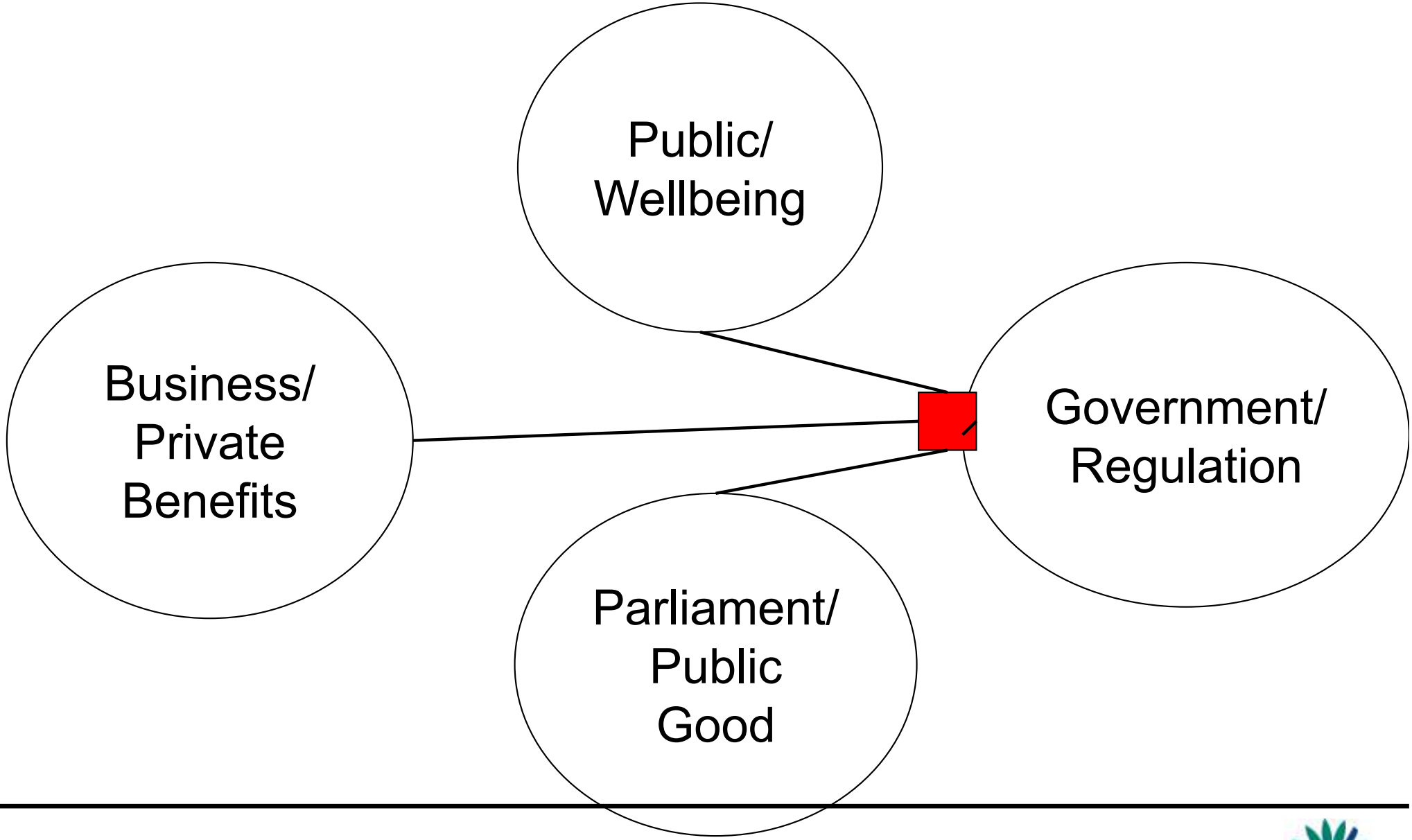
Energy Efficiency

- Major drive in Europe and elsewhere
- EU targeting 9% improvement in energy efficiency over next 9 years
- New EC Directive on Energy Performance of Buildings
- Global energy efficiency technology market currently worth $450bn

Current deregulated governance model

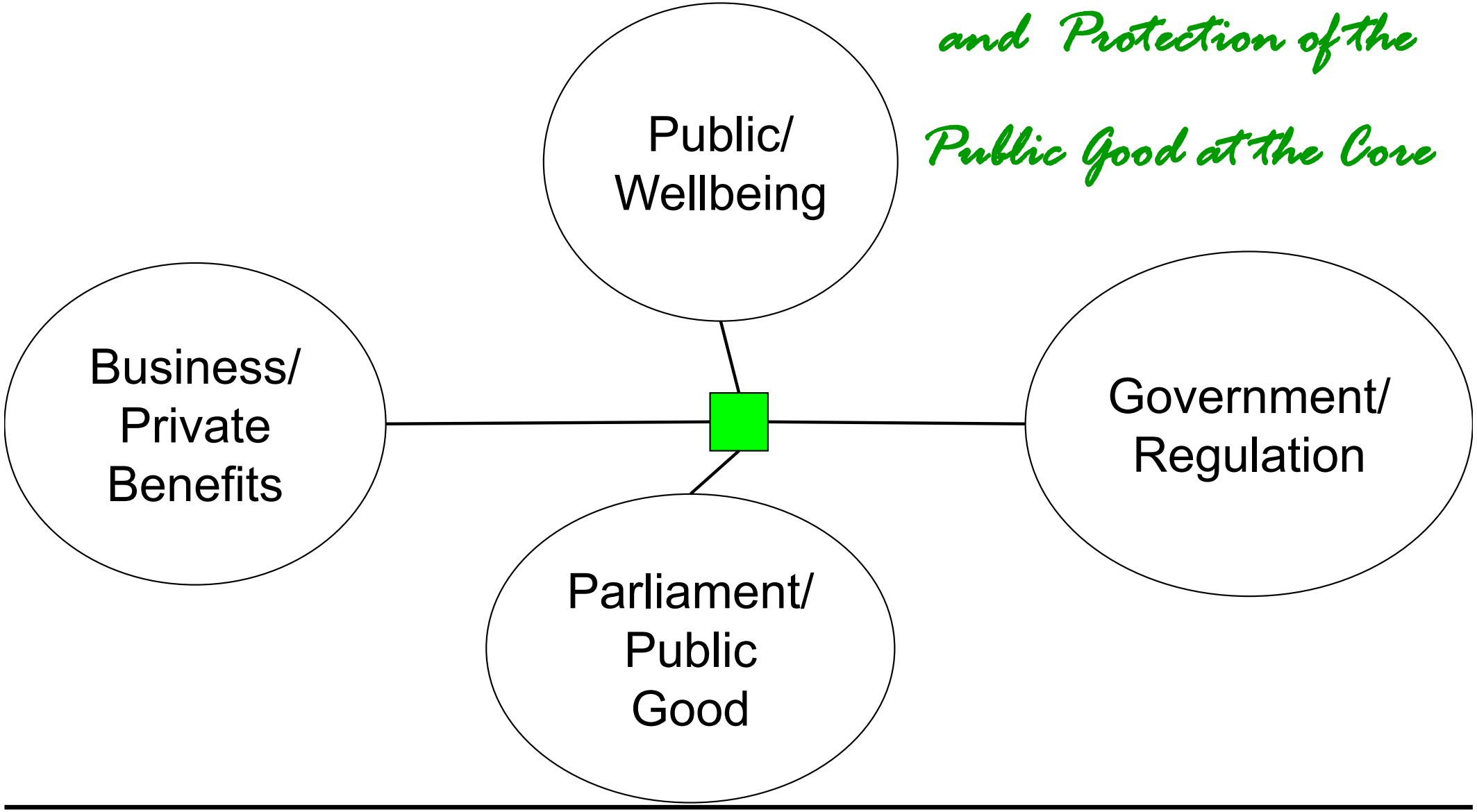


State control governance model ??



Green Economy

Public Participation and Protection of the Public Good at the Core

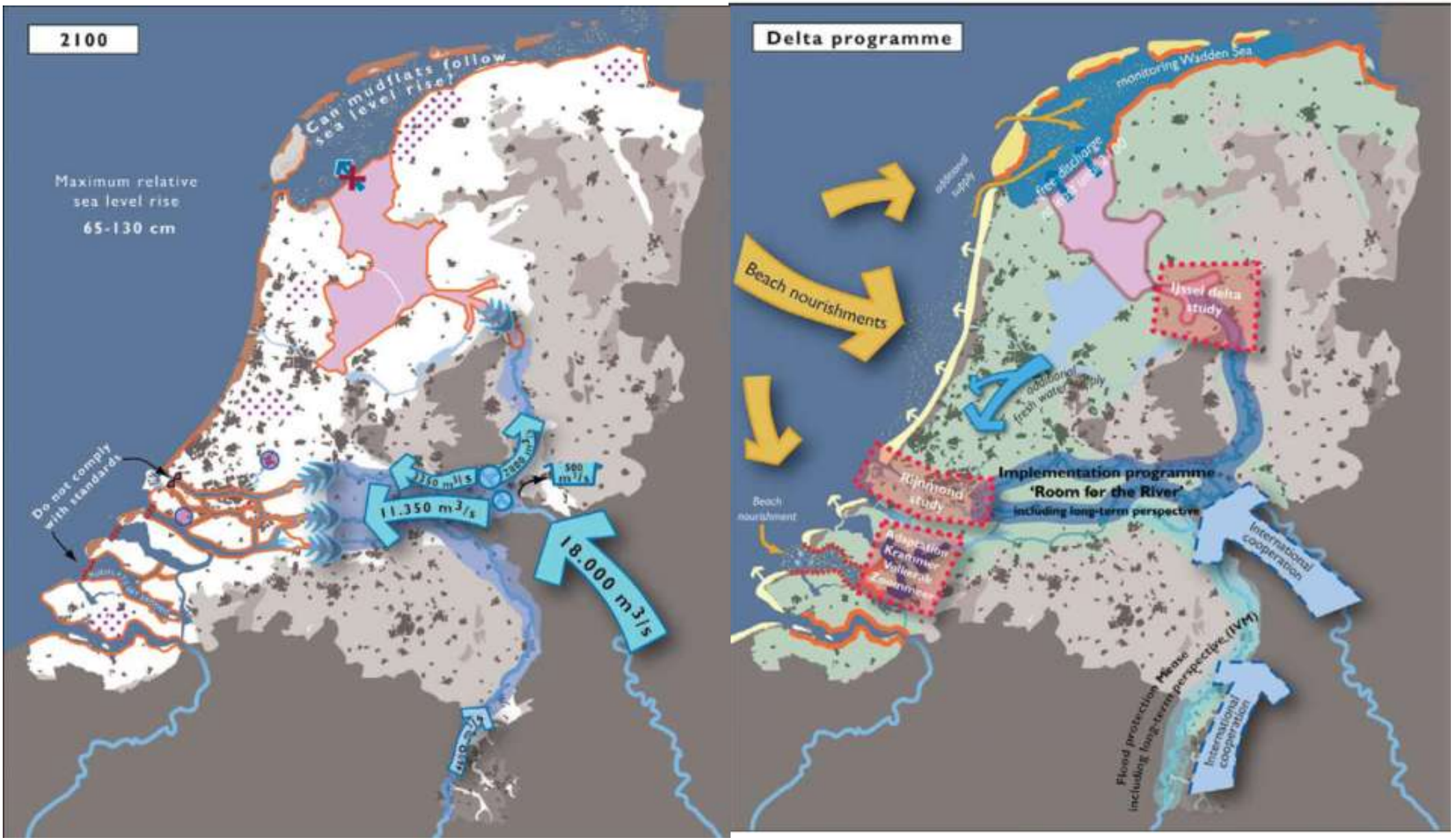


To avoid negative feedbacks from the fiscal rescue packages and push towards a low carbon future will require everyone's participation

International institutions: common objectives, equity
National governments: regulation, justice, security
Parliaments, democratic bodies: protection of the public good
Local governments, communities: participatory stewardship
Households: change in consumption patterns, from goods to services
Business: full costs, eco-profits

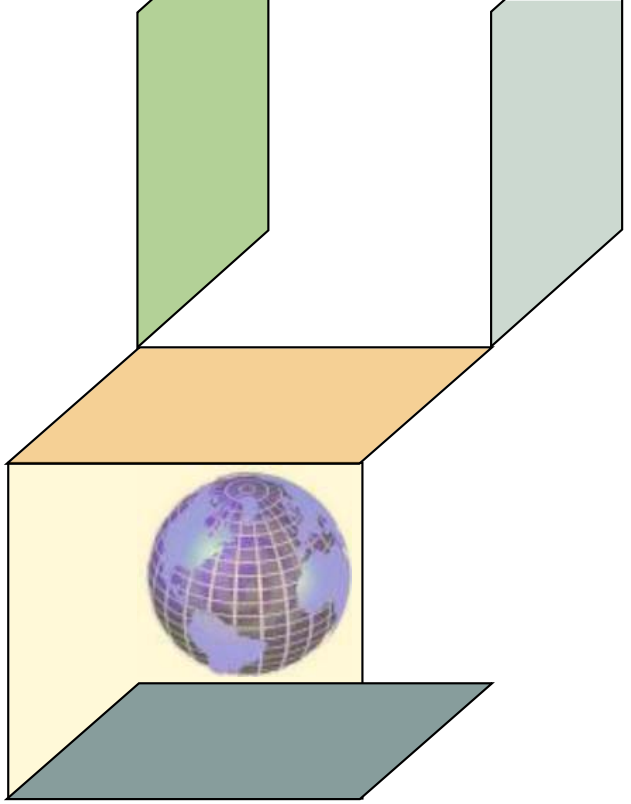

Maak ruimte voor klimaat!
Working together with water
Adapting to climate change in England
defra
Finland's National Strategy for Adaptation to Climate Change
Stratégie nationale d'adaptation au changement climatique
Strategi for tilpasning til klimaændringer i Danmark
PLAN NACIONAL DE ADAPTACIÓN AL CAMBIO CLIMÁTICO
Deutsche Anpassungsstrategie an den Klimawandel
NEMZETI ÉGHAJLATVÁLTOZÁSI STRATÉGIA
2008-2025
FINLAND
ESTONIA
LATVIA
LITHUANIA
BELARUS
KAZAKHSTAN
UNITED KINGDOM
THE NETHERLANDS
GERMANY
POLAND
BELGIUM
LUXEMBOURG
CZECH REPUBLIC
SLOVAKIA
FRANCE
LIECHTENSTEIN
AUSTRIA
HUNGARY
SWITZERLAND
PORTUGAL
SPAIN
GEORGIA
ARMENIA
IRAQ
0
500

Delta committee plan for Netherlands (2008)



Statistical approach to harnessing the crises to changing society

Georges Braque – Harbour in Normandy, 1909



Ecosystem Footprint *(land, soil, water, carbon)*

Biodiversity Rarefaction *(loss of adaptability)*

HANPP *(biomass diverted from Nature)*

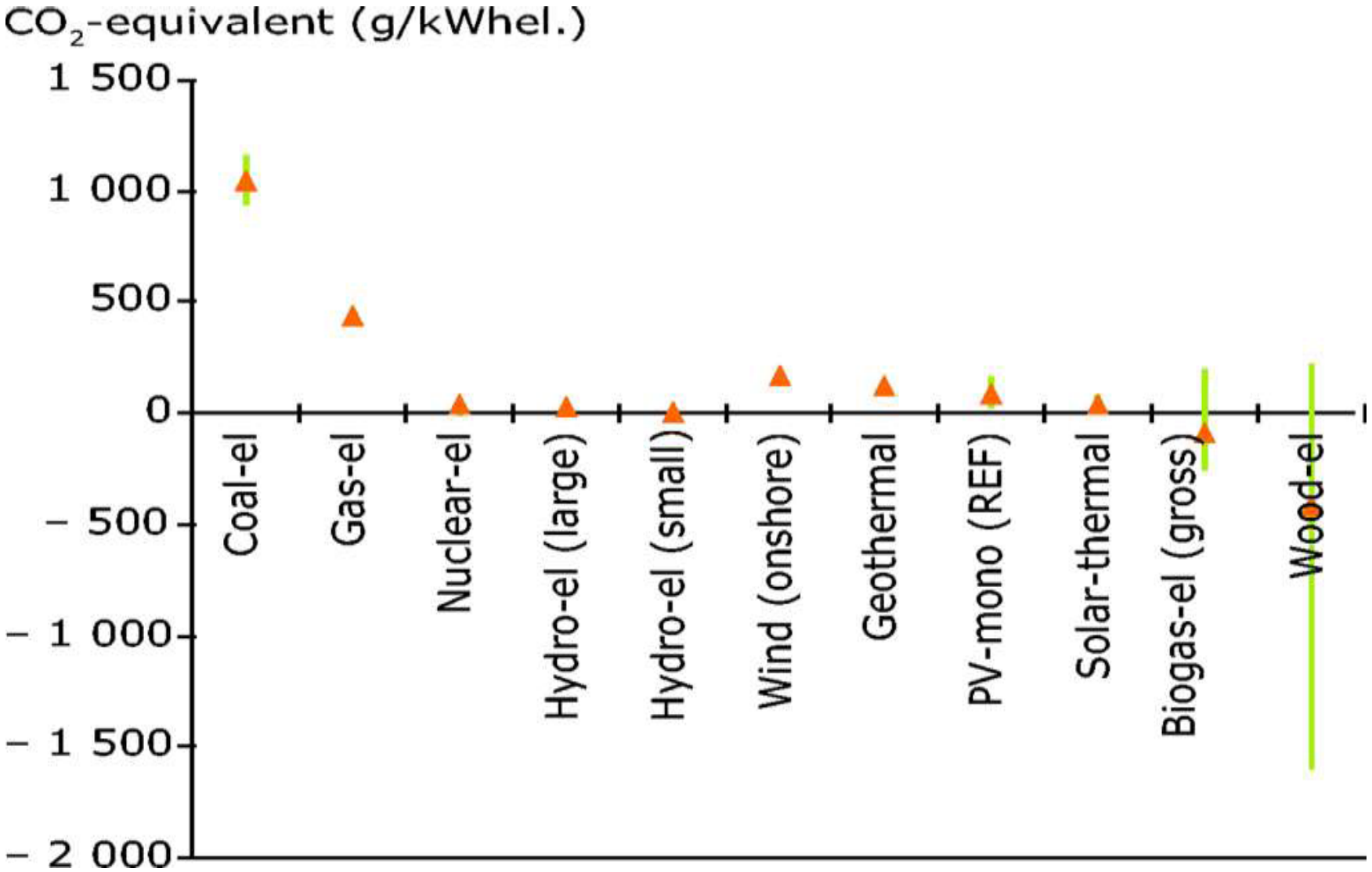
Landscape Ecological Potential *(the landscape radiography)*

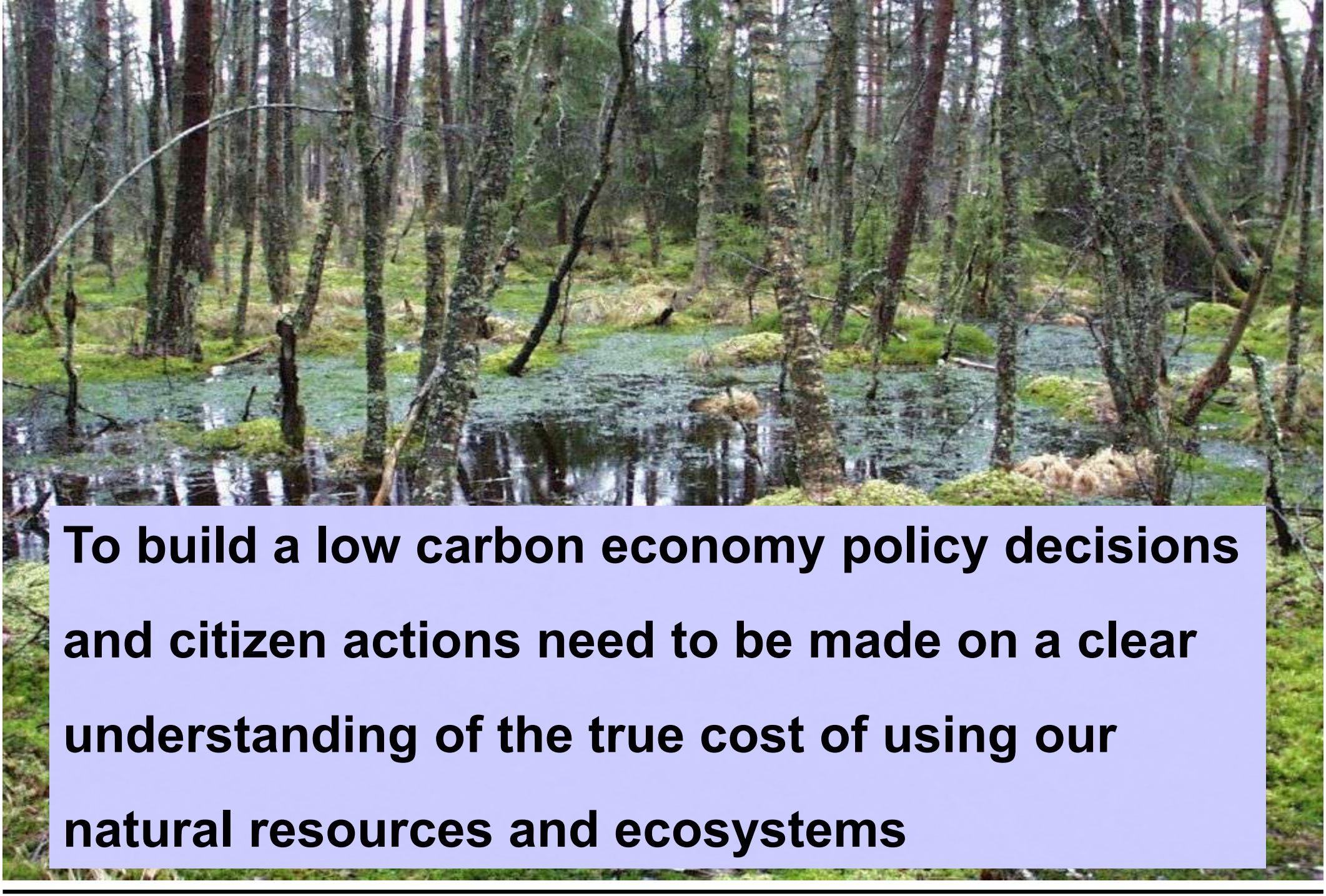
Consumption of Ecosystem Capital *(restoration costs of potentials)*

Catchments Exergy Loss *(from water evaporation & pollution)*

Adjustment Of Net Disposable National Income

LCA GHG emissions of energy systems (EEA 2008)





To build a low carbon economy policy decisions and citizen actions need to be made on a clear understanding of the true cost of using our natural resources and ecosystems