Renewable Energy and Europe's New Energy Policy
The next steps

WORLD FORUM ON ENERGY REGULATION IV– 20 October 2009
Track B –Session 8 : Massive deployment of renewable energy sources, market efficiency, system security and reliability

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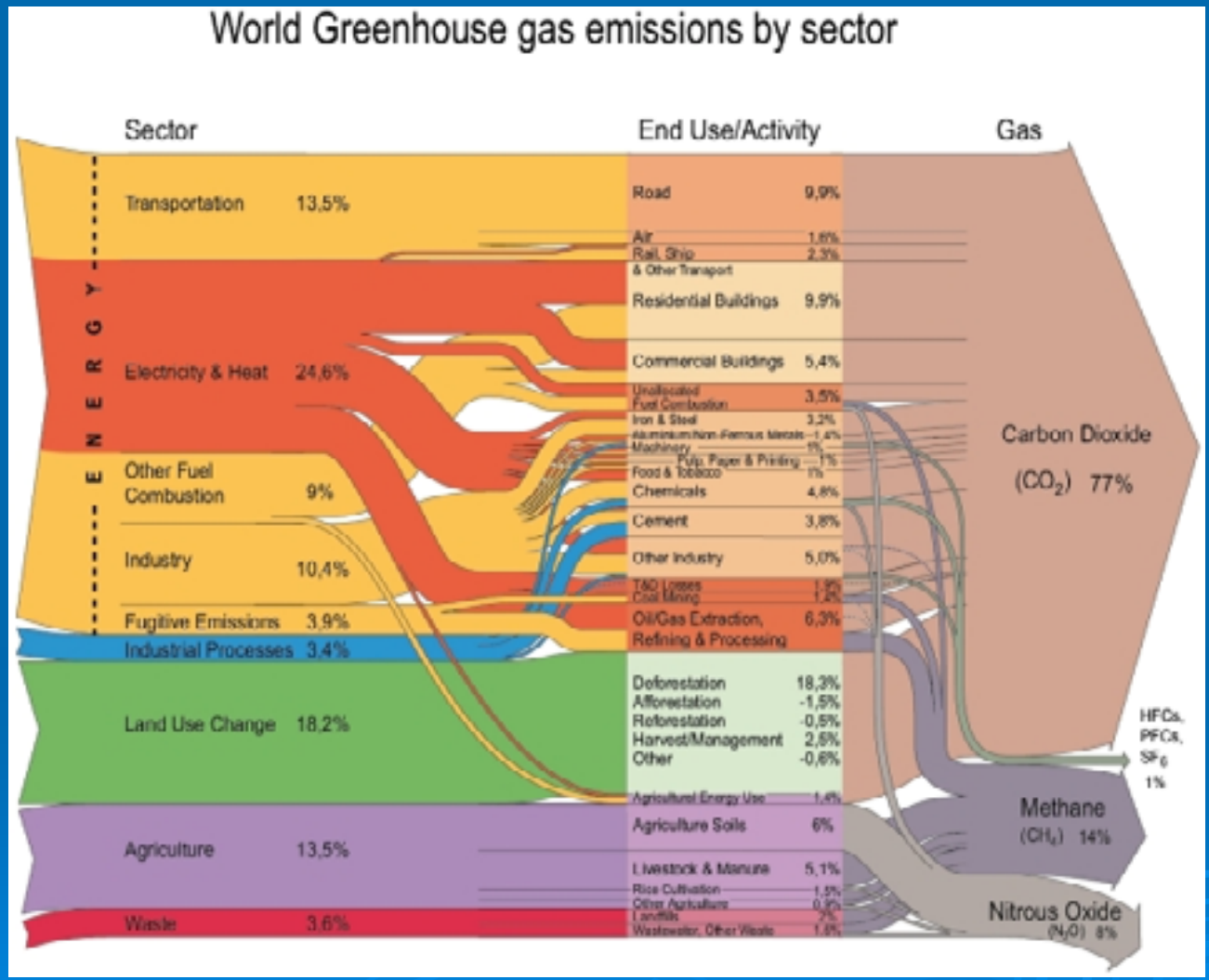
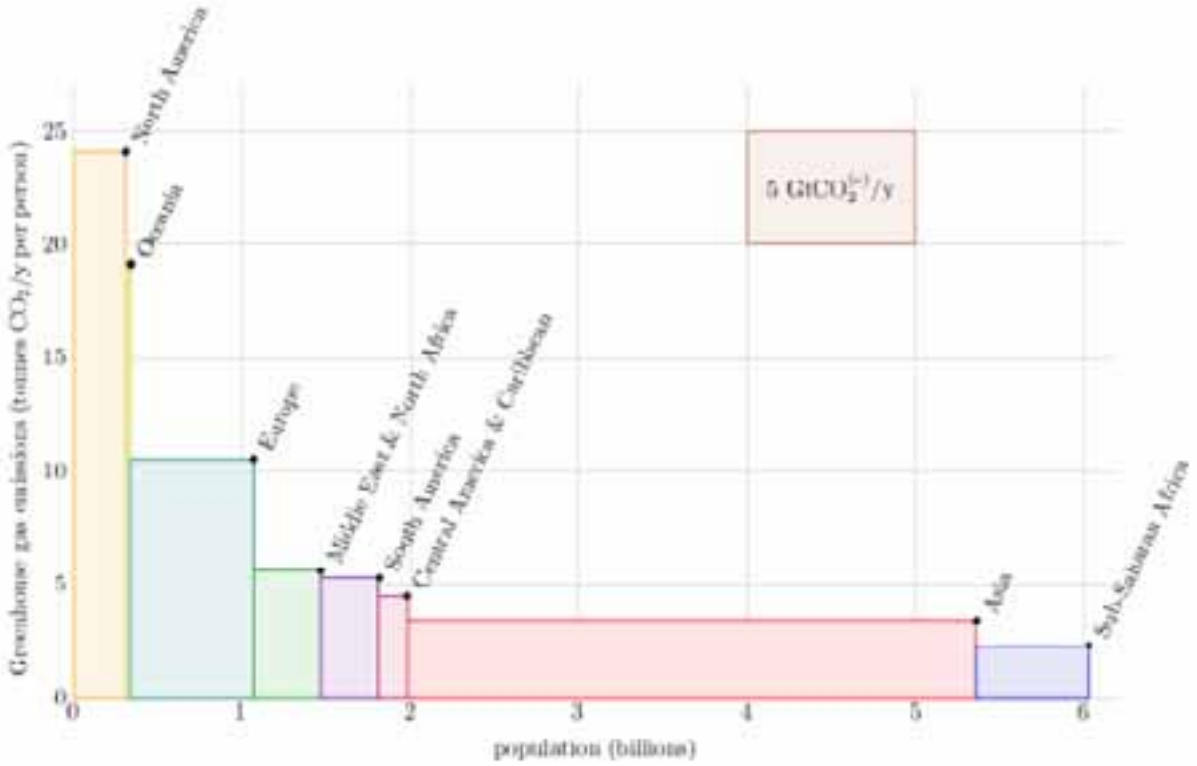
Directorate-General for Energy and Transport


World Greenhouse gas emissions by sector
Sector
End Use/Activity
Gas
ENERGY
Transportation 13,5%
Electricity & Heat 24,6%
Other Fuel Combustion 9%
Industry 10,4%
Fugitive Emissions 3,9%
Industrial Processes 3,4%
Land Use Change 18,2%
Agriculture 13,5%
Waste 3,6%
Road 9,9%
Air 1,6%
Rail, Ship & Other Transport 2,3%
Residential Buildings 9,9%
Commercial Buildings 5,4%
Unallocated Fuel Combustion 3,5%
Iron & Steel 3,2%
Aluminium/Non-Ferrous Metals 1,4%
Machinery 1%
Pulp, Paper & Printing 1%
Food & Tobacco 1%
Chemicals 4,8%
Cement 3,8%
Other Industry 5,0%
T&D Losses 1,3%
Coal Mining 1,2%
Oil/Gas Extraction, Refining & Processing 6,3%
Deforestation 18,3%
Afforestation -1,5%
Reforestation -0,5%
Harvest/Management 2,6%
Other -0,6%
Agricultural Energy Use 1,4%
Agriculture Soils 6%
Livestock & Manure 5,1%
Rice Cultivation 1,5%
Other Agriculture 0,9%
Landfills 2%
Wastewater, Other Waste 1,6%
Carbon Dioxide (CO_2) 77%
HFCs, PFCs, SF_6 1%
Methane (CH_4) 14%
Nitrous Oxide (N_2O) 8%



Total GHG emissions (2000) = 34 $GtCO_2^{(e)}$

Data source: Climate Analysis Indicators Tool (CAIT)
Version 4.0. (Washington, DC: World Resources Institute, 2009).

II. Energy and GHG Facts – 1. Greenhouse gas emissions and global population growth – p.10

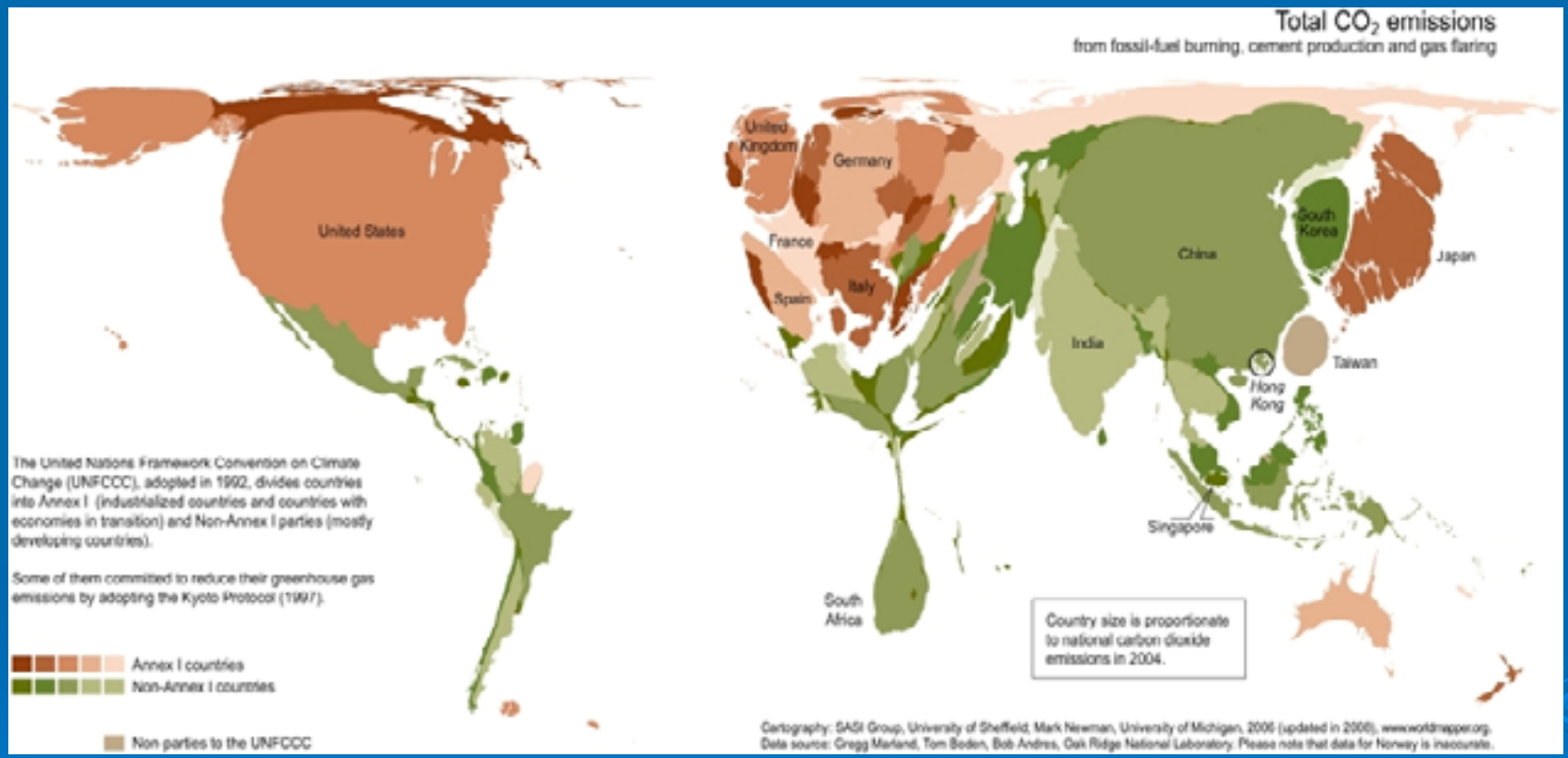
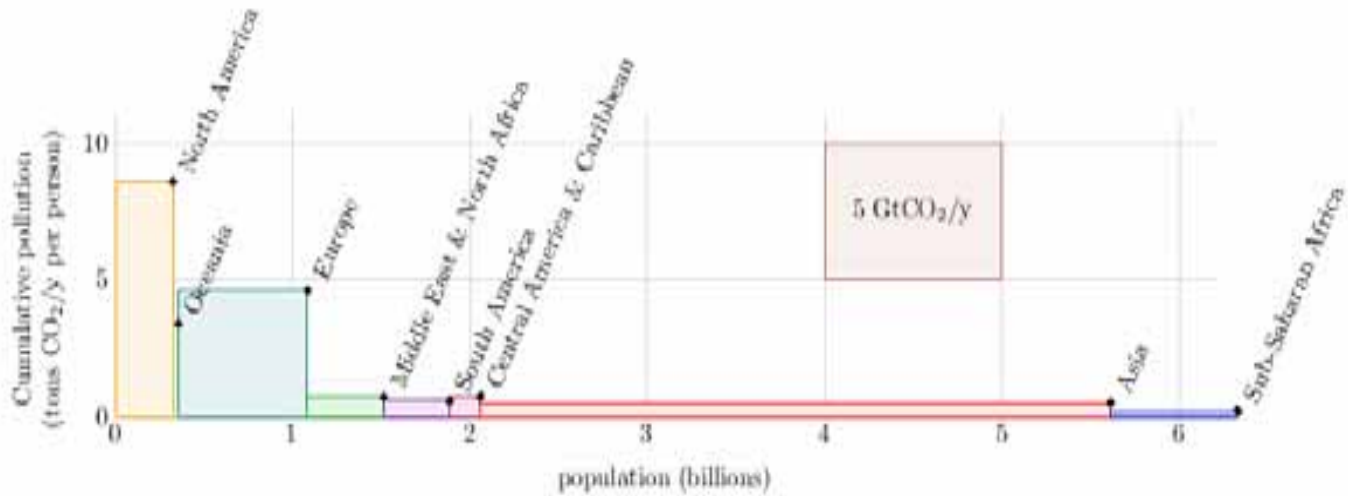
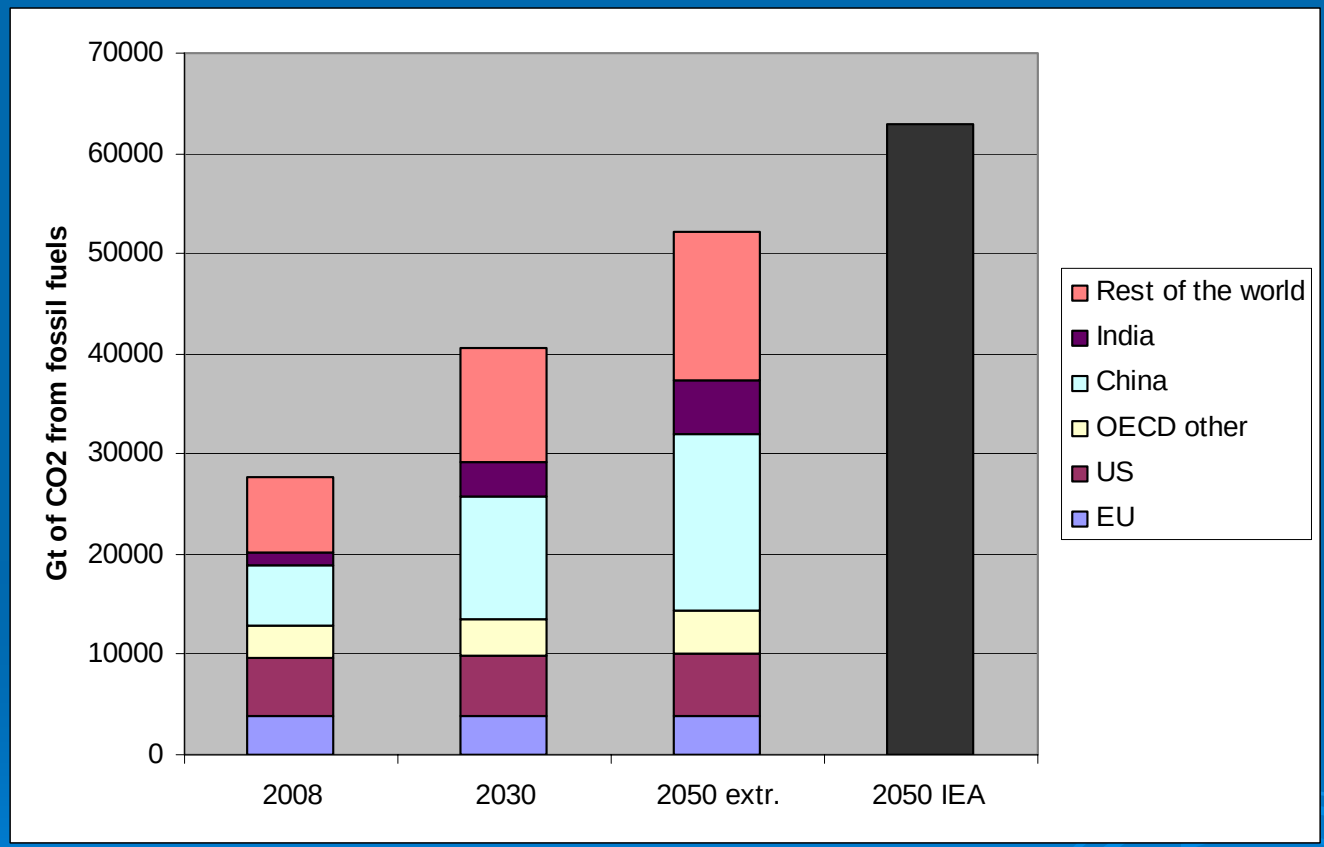


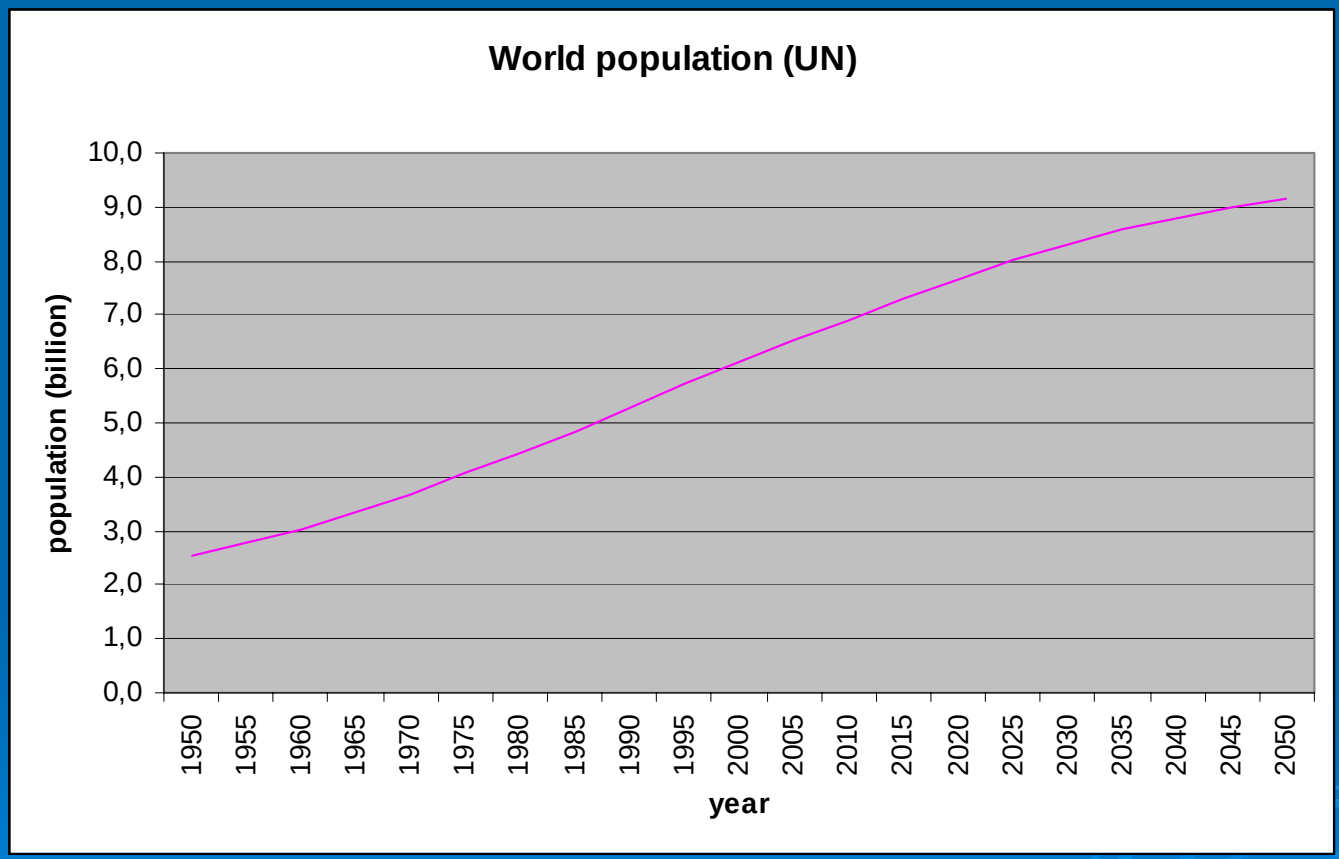
Table 1, share of cumulative CO2 emissions 1900-2004 emitted by countries/regions (WRI)



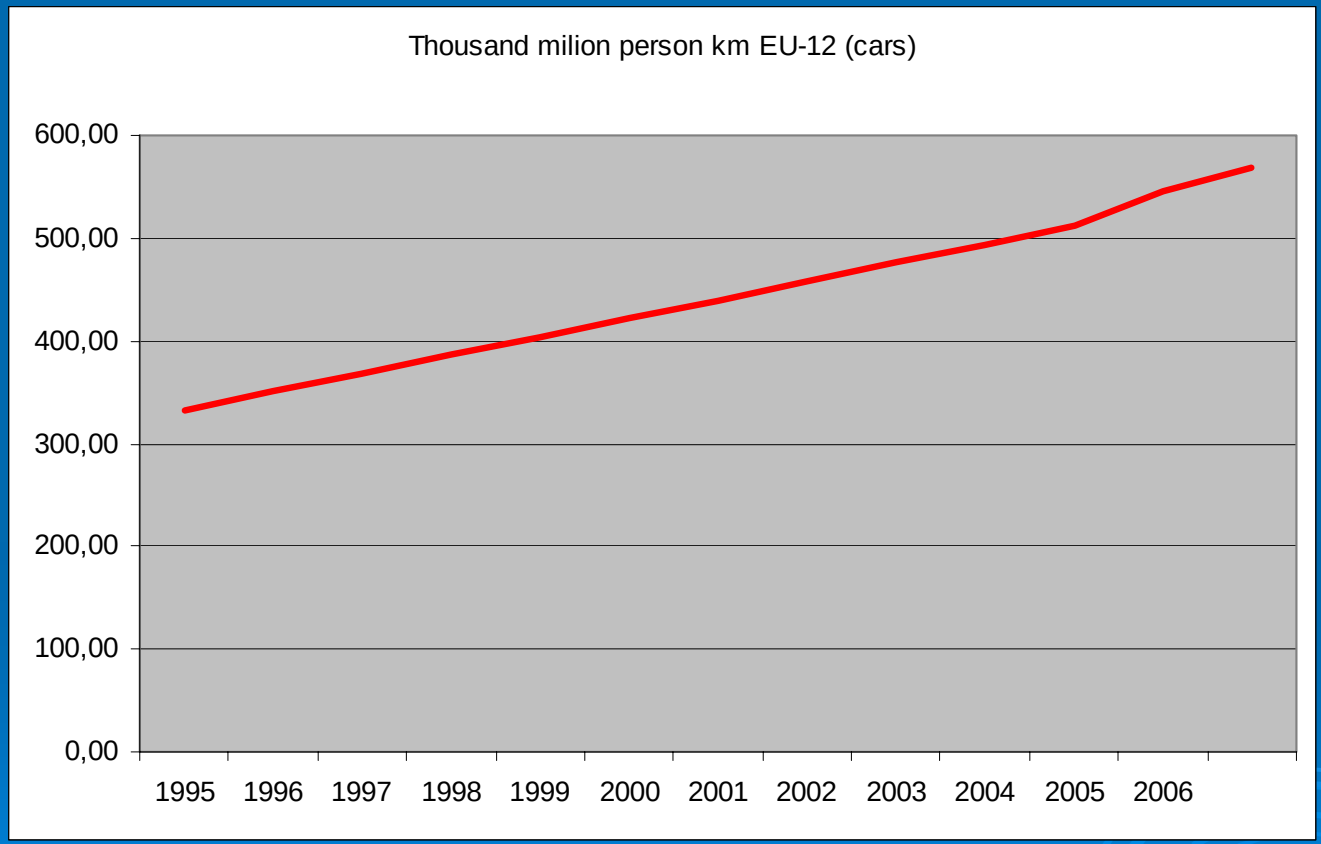
Cumulative emissions (average for 1880–2004) – CO_2 only

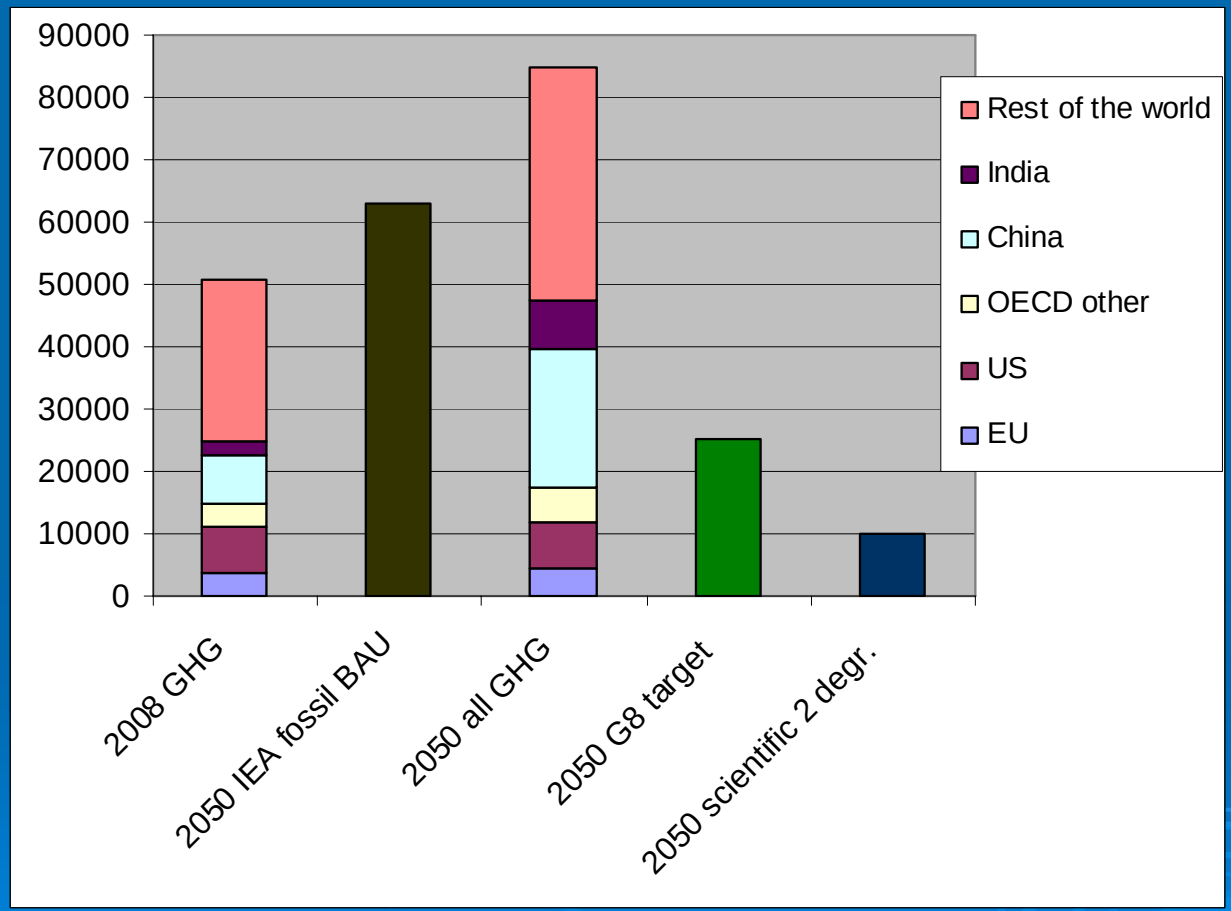
II. Energy and GHG Facts – 1. Greenhouse gas emissions and global population growth – p.13



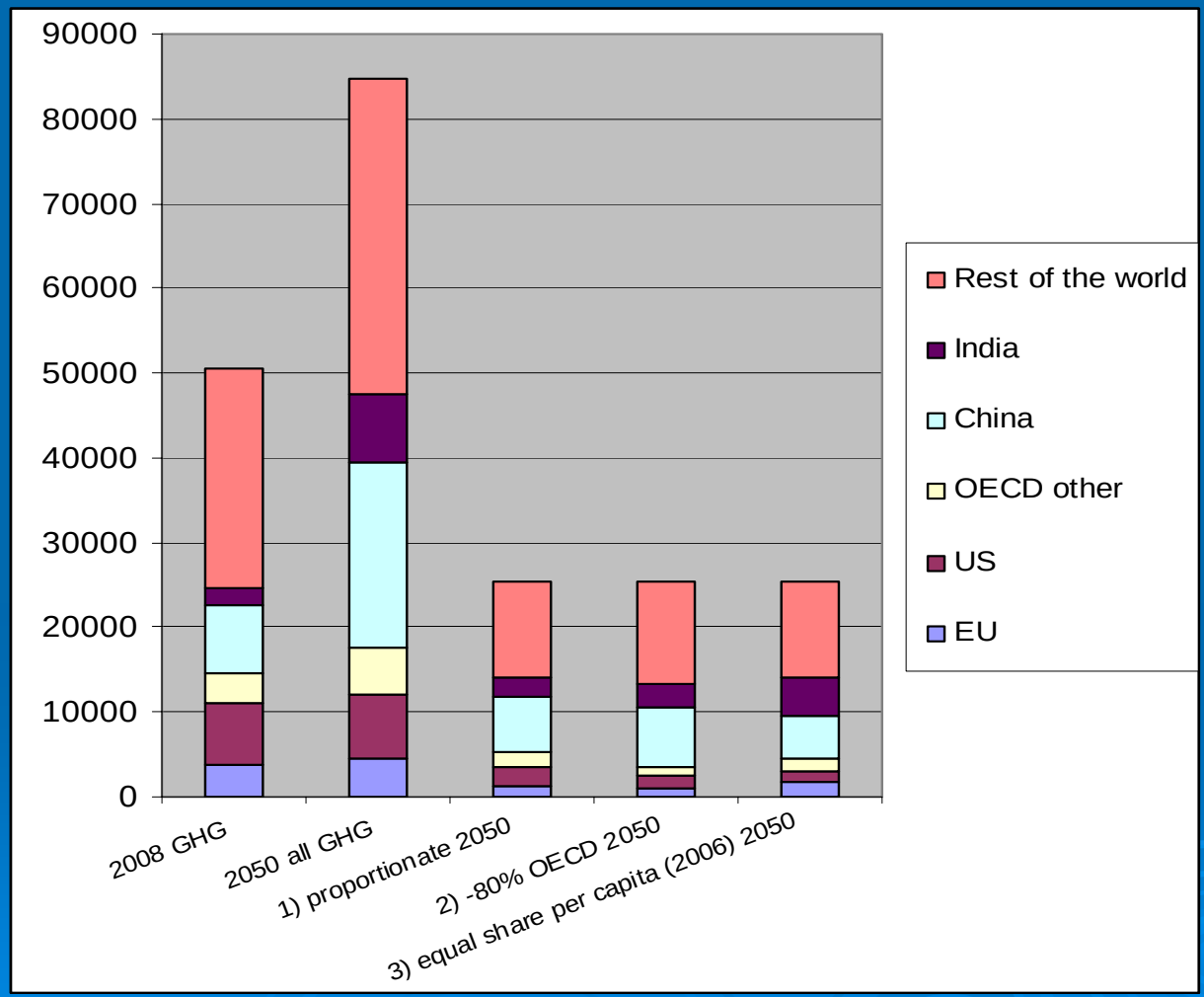

World population (UN)
population (billion)
10,0
9,0
8,0
7,0
6,0
5,0
4,0
3,0
2,0
1,0
0,0
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
year

II. Energy and GHG Facts – 1. Greenhouse gas emissions and global population growth – p.15




90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Rest of the world
India
China
OECD other
US
EU
2008 GHG
2050 IEA fossil BAU
2050 all GHG
2050 G8 target
2050 scientific 2 degr.

II. Energy and GHG Facts – 1. Greenhouse gas emissions and global population growth – p.20



Oil: 42 years of proven reserves[1], of which 60% is situated in the Middle East (21% Saudi Arabia, 10% Iran, 9% Iraq), 6 % in Russia, 10% in Africa and 10% in South America (7.9% in Venezuela). On top of this one should also consider that (i) Canada has oil sands which amount to a little more than 10% of global oil reserves and (i) non-proven reserves surely exist, which in the IEA estimates to be as much as an additional 50% of the BP figure for proven reserves[2].

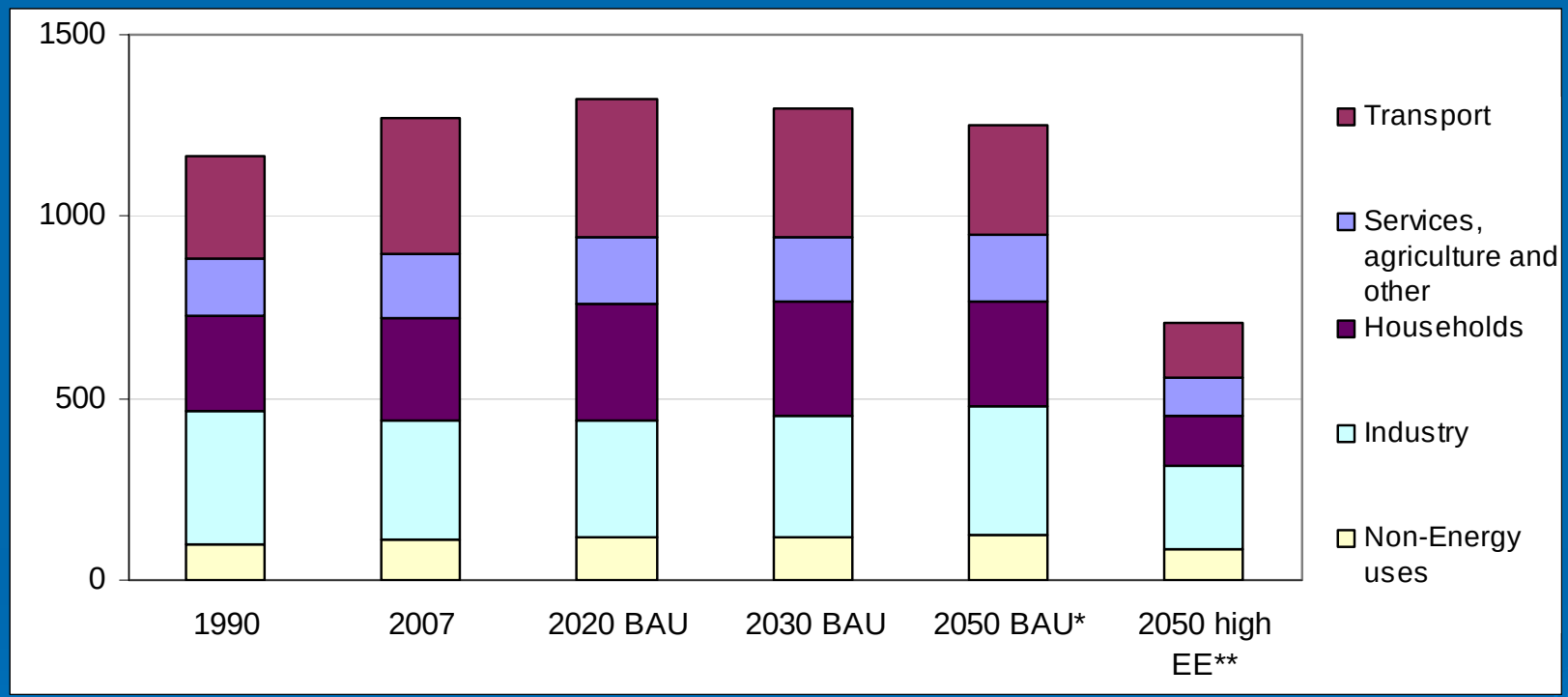
Coal: 122 years, of which 29% situated in the US, 19% in Russia, 14% in China, 9% in Australia, 7% in India, 4% in thee Ukraine, 3.7% in South Africa and 3.5% in the EU

Gas: 60 years, of which 23% situated in Russia, 16% in Iran, 14% in Qatar, 4% in Turkmenistan, and only 1.6% in Norway% and 1.7% in other EU countries. The same comment regarding undiscovered reserves can be made as regards gas as for oil, above.

[1] The figures in this section on reserves come from the BP Statistical Review of World Energy, June 2009 IEA, World Energy Outlook, 2008 has figures that are not materially different for the issue being considered in this article. The BP Review is available on http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622

[2] "Undiscovered reserves, Table 9.1, 2008 World Energy Outlook.

III. Some consequences for the EU's energy policy – p.27



Final energy consumption for EU-27 (including energy resources consumption for energy and non-energy use)

III. Some consequences for the EU's energy policy – p.33

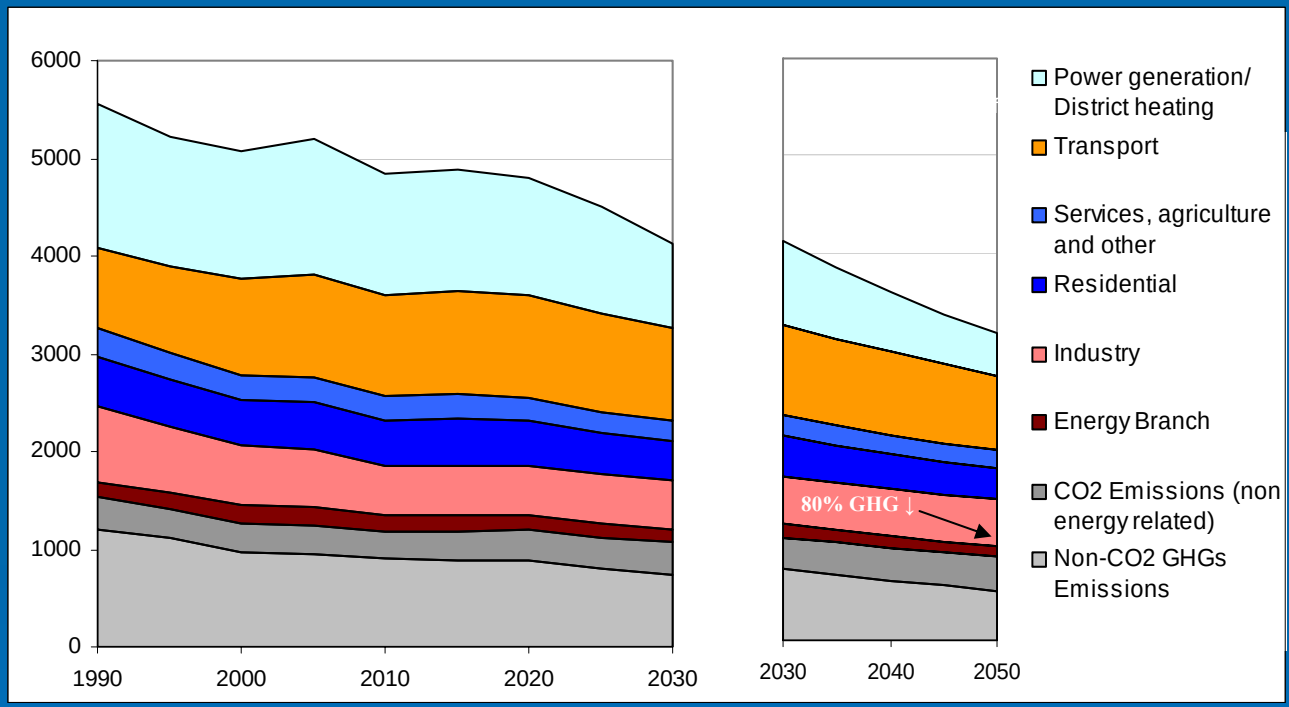


Figure X. Development of EU-27 total greenhouse gas emissions per sector under the Business-as-usual scenario
Assumptions:
Data from 2030 until 2050 are based on extrapolations of the annual growth of the period '20-'30

III. Some consequences for the EU's energy policy – p.34

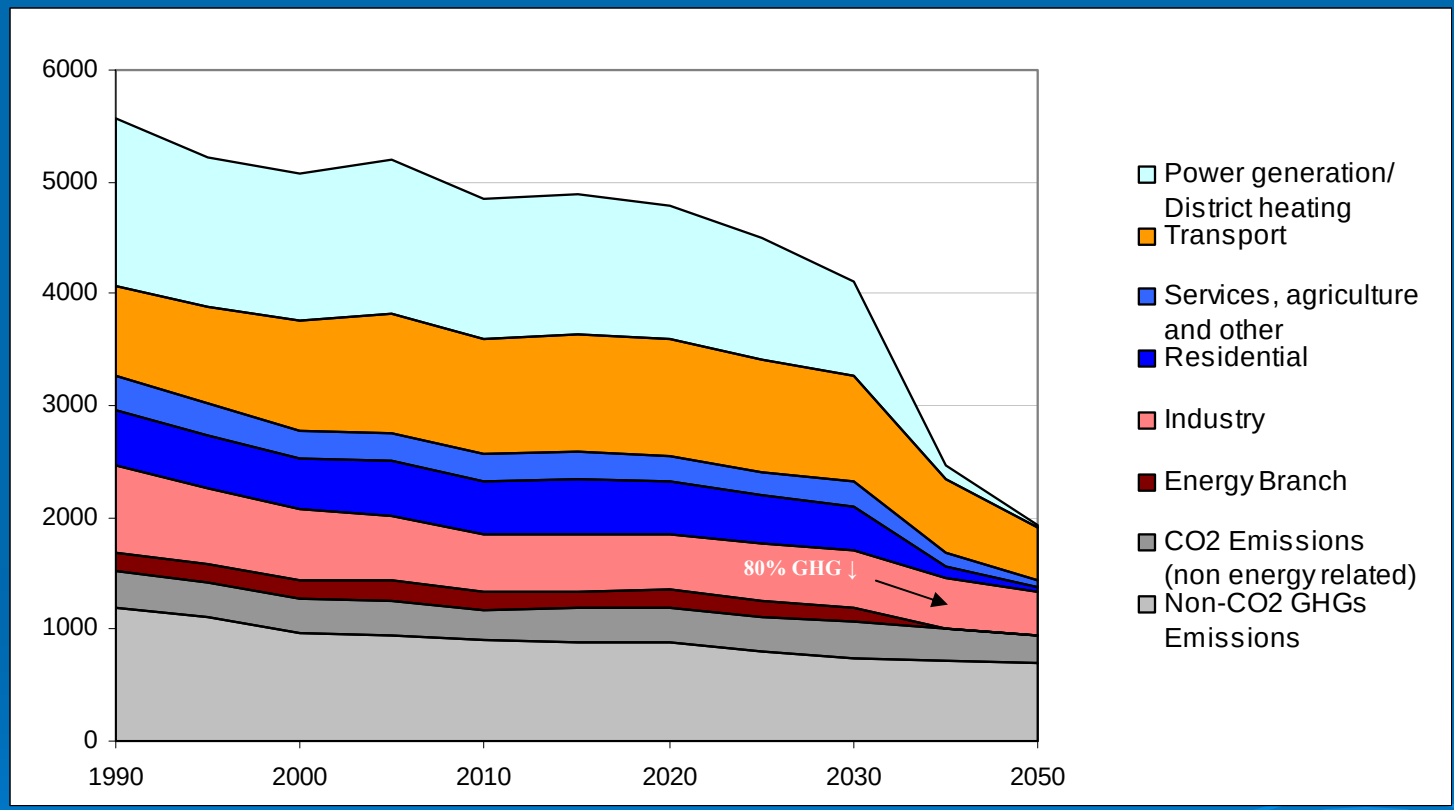


Figure X. Development of EU-27 total greenhouse gas emissions per sector if ambitious energy efficiency policies are introduced.

III. Some consequences for the EU's energy policy – p.35

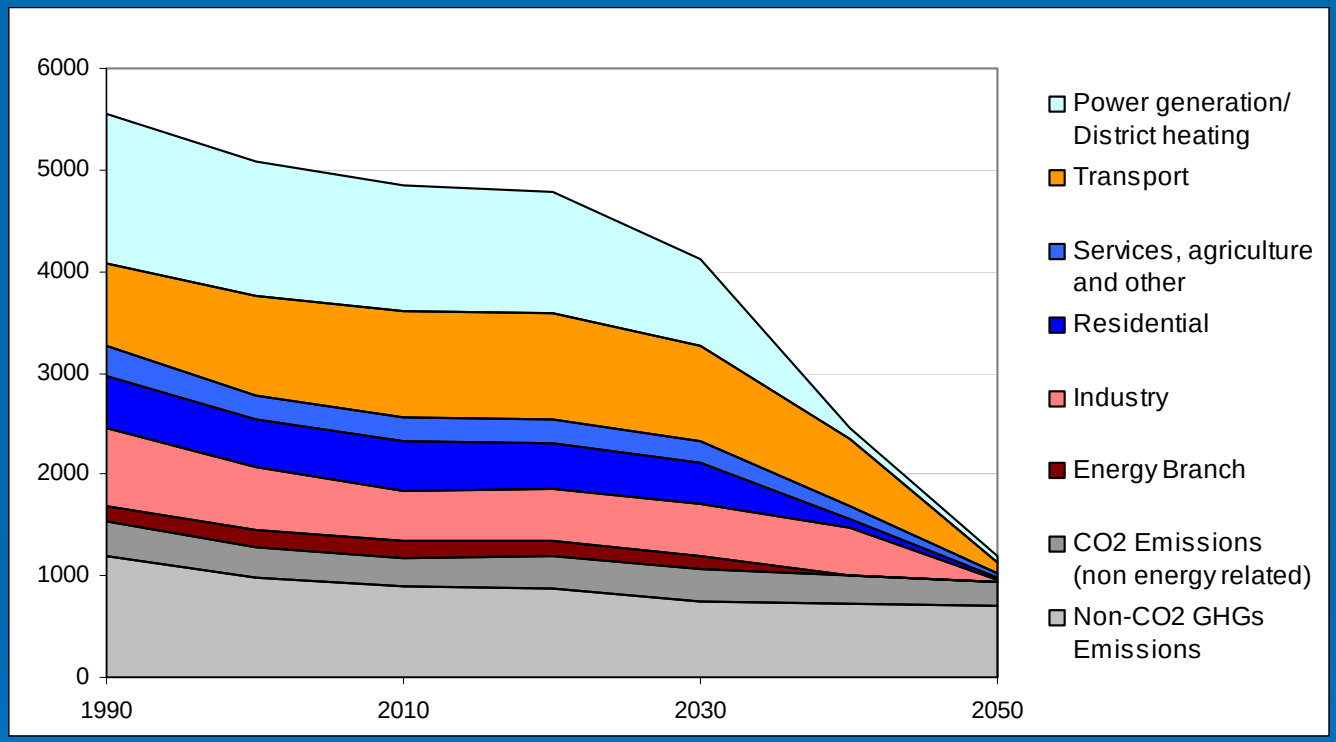
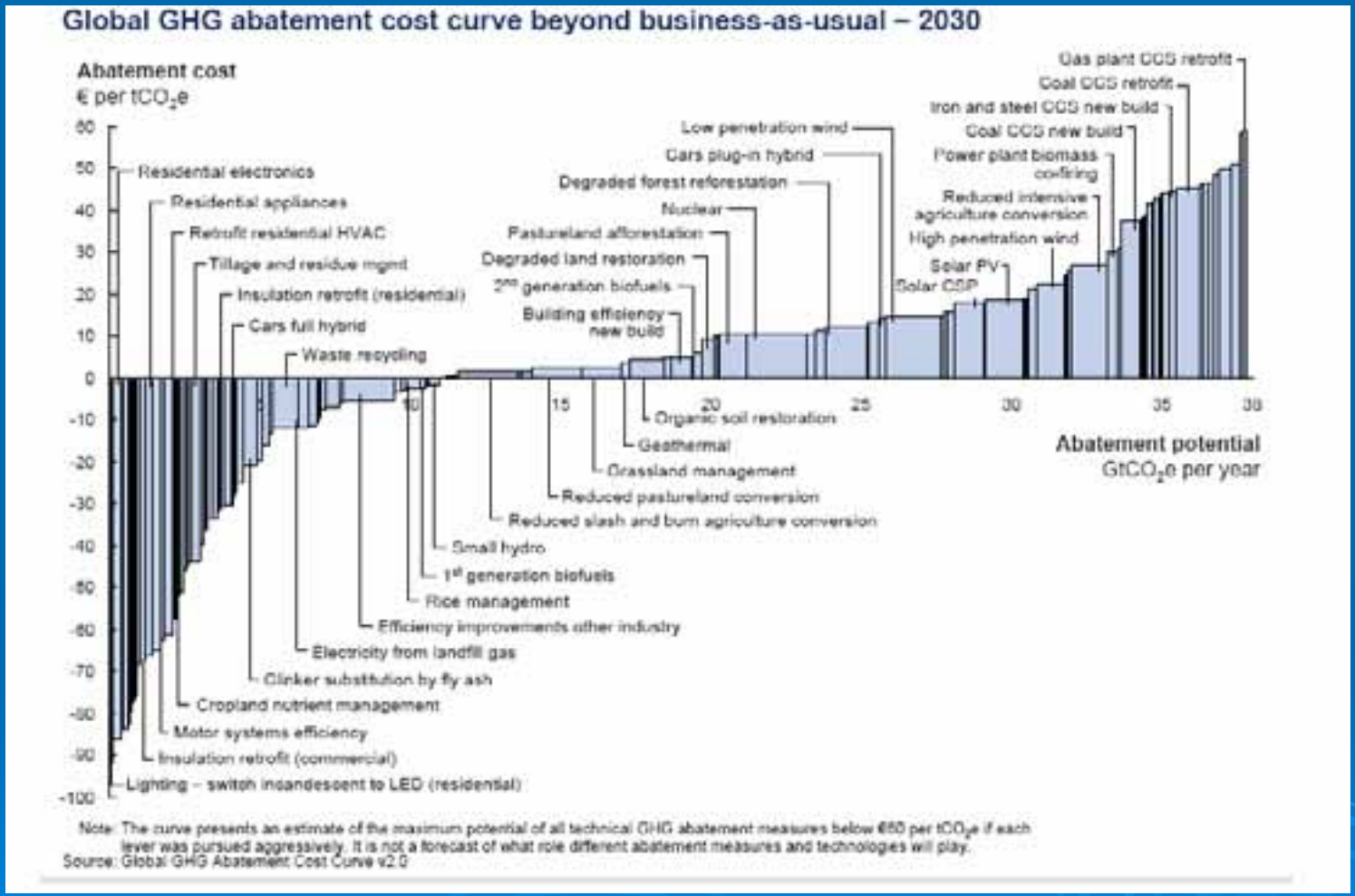


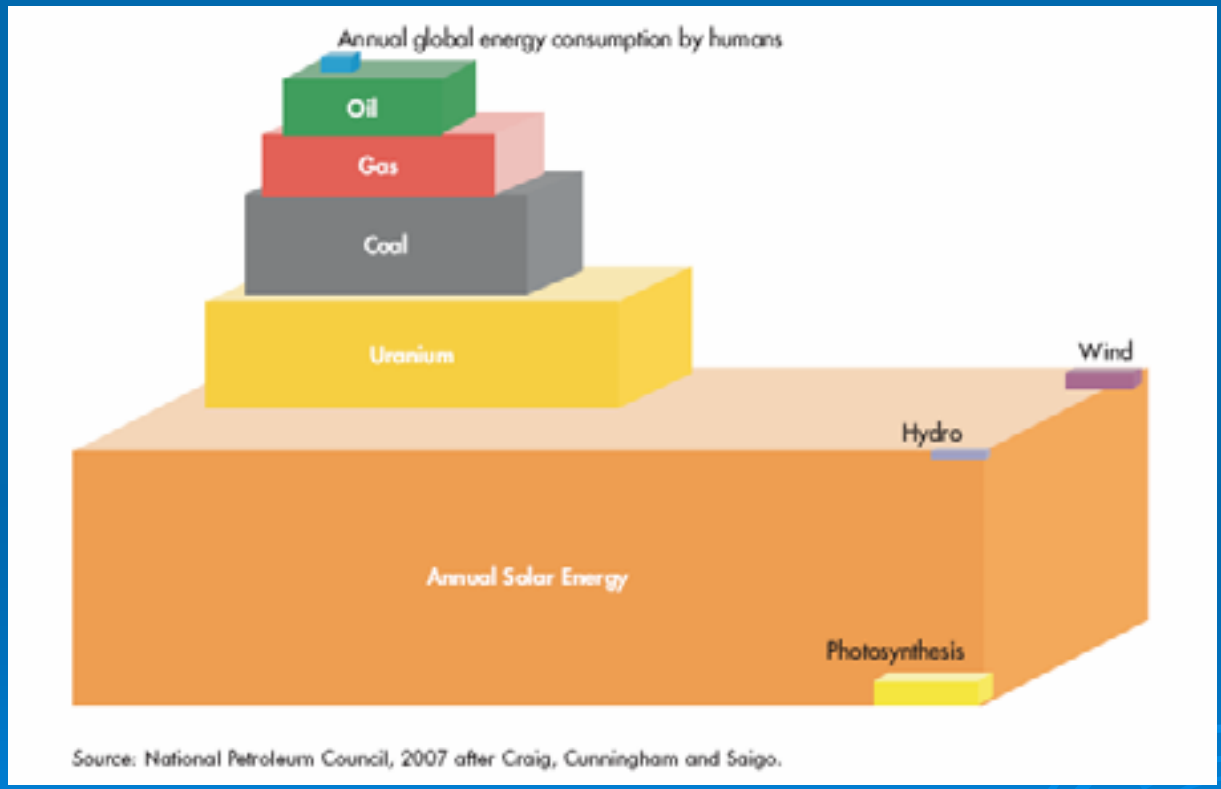
Figure X. Required development of EU-27 total greenhouse gas emissions per sector if the '80%' reduction target (compared to 1990) is to be reached

IV. The options available – p.40



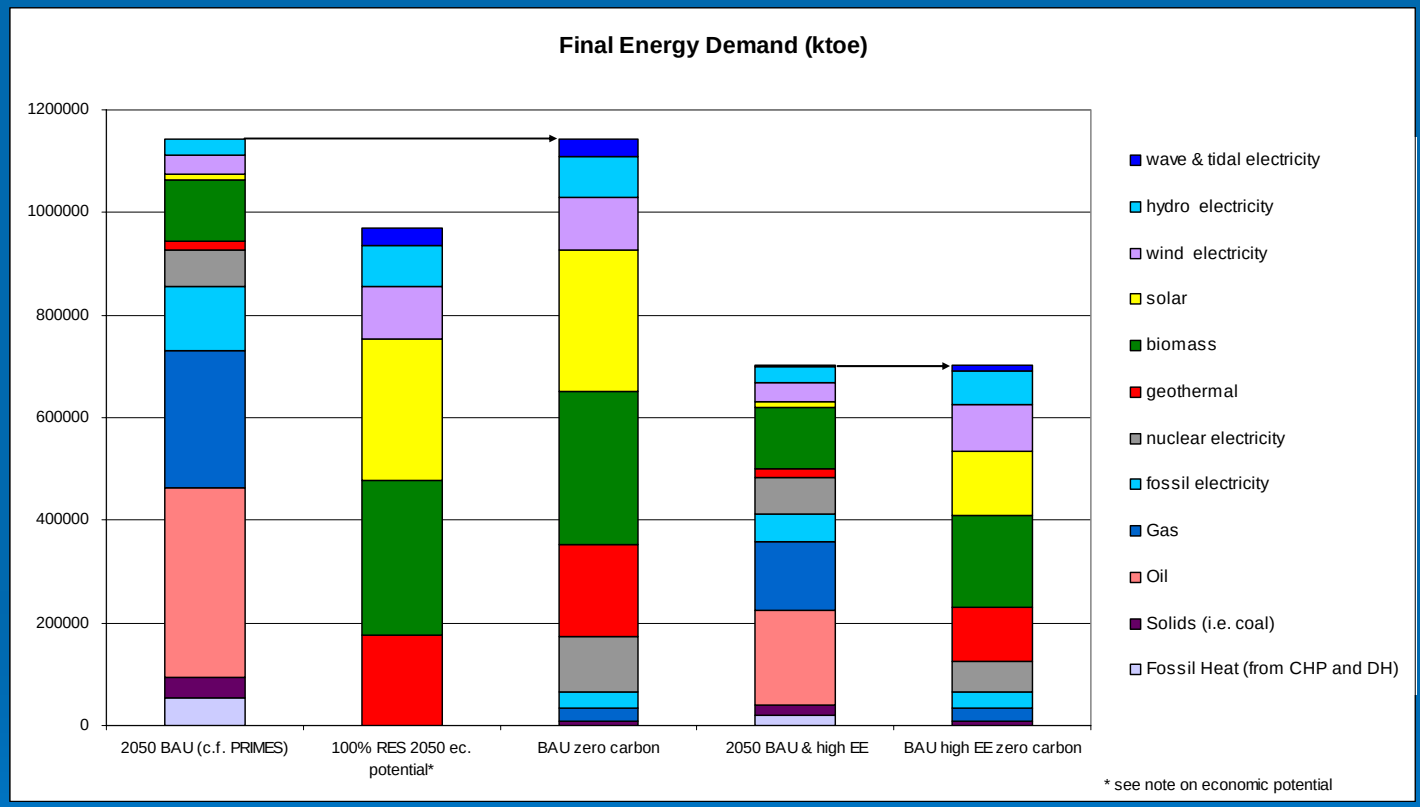
IV. The options available – 2. Renewable Energy –
2.2. Photovoltaic energy (PV) and Concentrated Solar Power (CSP) - p.46

Total Energy sources: solar energy is plentiful



Source: National Petroleum Council, 2007 after Craig, Cunningham and Saigo.

V. Some conclusions on the low-carbon energy sources - p.56



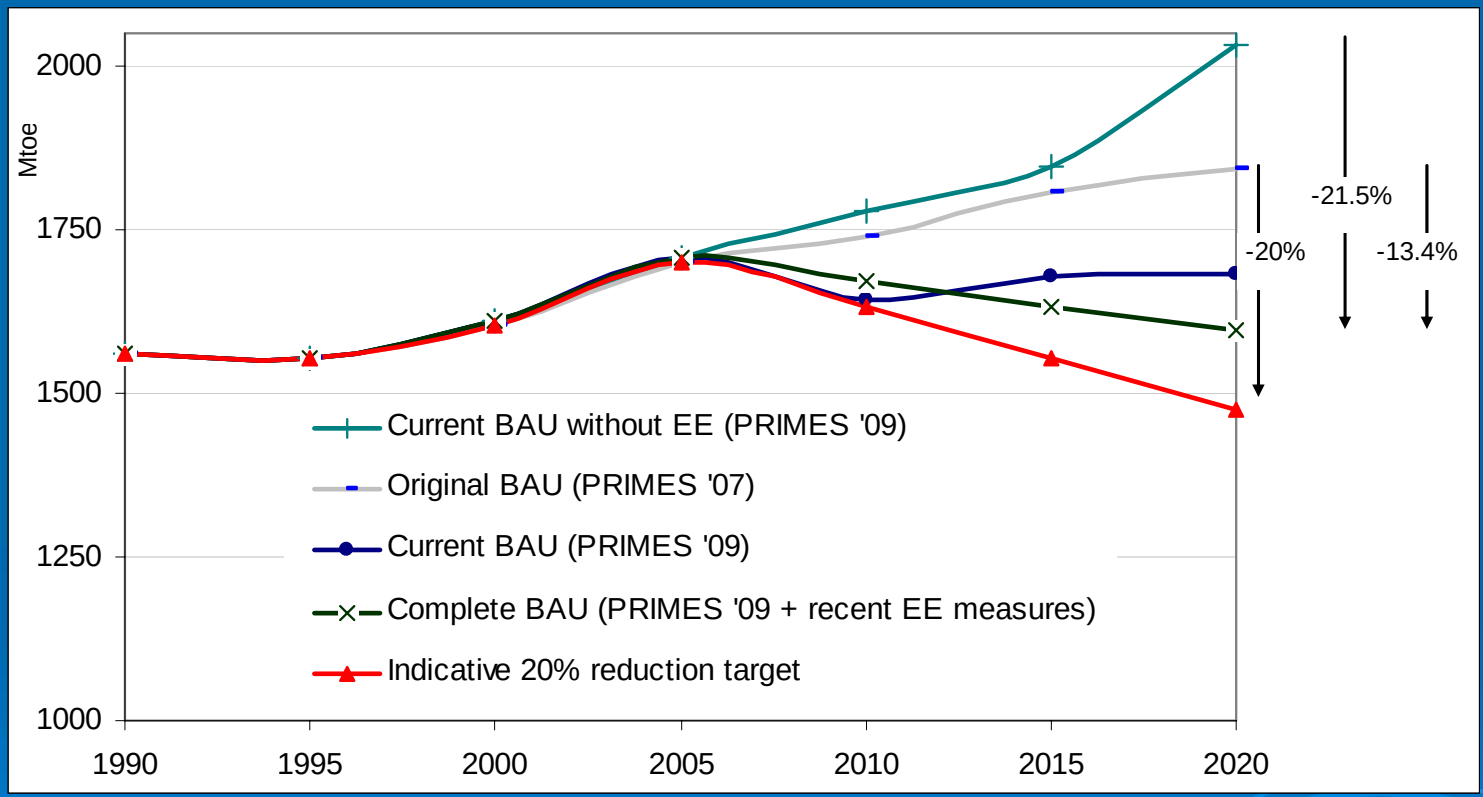
V. Some conclusions on the low-carbon energy sources - p.56

Estimates of power generation costs by technology type: current and future

	Current	Future
Coal	1.8 – 4.2	depends on fuel costs
Gas	2.8 – 4.2	depends on fuel costs
CCS	n/a	premium of 1.4 – 2.8
Wind	Onshore: 4.6 – 9.5 Offshore: 5.3 – 7.8	3.7 – 5.6 in 2015 25% reduction by 2020
Nuclear	2.1 – 5.3	no significant reduction
Solar PV (areas of good irradiation)	21.2 – 24.7	6.4 – 8.5 by 2030 3.5 – 4.9 by 2050
Concentrated Solar Power	8.8 – 15.9	2.5 – 4.2
Wave and Tidal	10.6 – 21.2	2.8 – 5.6
Biomass	4.2 – 12.7	3.5 – 8.5

Source: IEA (2008), Energy Technology Perspectives
Own table, sources for establishing economic potential has been derived from multiple sources:
Wind: IEA BLUE map of economic potential, with OECD Europe being 23% of global total.
Geothermal (including electricity and also domestic use of heat pumps): economic potential taken as 10% of resource potential for western Europe (only) from World Energy Assessment, UNDP.
Wave and tide: as per text; cec source footnote 124
Biomass: based on Green X modelled ec. potential of 260000 plus yield and management improvements.
Solar PV: Industry association (EPIA) assessment that PV can provide 12% of the EU's 20% goal (of 2020) and that 76% of this (76%*12**275mtoe) will be market competitive (n.b. by 2020)
Solar thermal:
Hydro:
Figures in € cent/Kwh, converted from US $ figures on 10/08/2009

VII. Conclusions: a blueprint for Europe's Energy Future – 1. Energy Efficiency - p.72



Development of gross inland energy consumption for energy needs (the non-energy uses are subtracted).
Source: PRIMES 2009

Existing Policies “world-leaders” but must be fully implemented

1. ETS and non-ETS
2. Renewable Energy Directive
3. Energy Efficiency: Buildings, Eco-Design, need for Member State action
4. SET-Plan: Financing Communication
5. Internal Energy Market
6. Security of supply

Conclusions

1. Energy Efficiency: truly a high Economic Priority
   - New Energy Efficiency Action Plan
   - Revision of Buildings Directive
   - Taxation
2. Emissions Trading to 2050
3. Renewable Energy
   1. Legally binding targets to 2050 ?
      - ETS suffers same uncertainties as green certificates?
      - Problem of Planning Permission: risk of failure ?
      - Uncertainty and infrastructure investment.
   2. Need for compatible support systems in medium term ?
   3. Grid issues
      - Need for infrastructure at same time as planning permission for new major wind parks?
      - Regional grid access rules for renewables
      - Smart grid and Regulator's obligations
      - Regulatory framework to promote balancing Capacity: who pays?
   4. Wider Europe agreement on renewable energy ?
4. Nuclear
5. Transport
   1. Emissions
   2. Electric vehicles