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Sustainable Development and Energy in the European Union

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Sustainable Development

- ❑ Brundtland report, 1987: the most well-known definition of sustainable development;
- ❑ Targets *needs, relative limits* and *intra/inter generational equity*;
- ❑ The concept embodies links between:
 - economic development;
 - environment;
 - natural resources;
 - needs of the developing countries;

Sustainable Development

- ❑ An alternative way of development, seeking a balance between:
 - economic growth;
 - natural resources use;
 - quality of the environment;
- ❑ Addresses developed and developing countries;
- ❑ Present at both governmental and individual level;

Sustainable Development

- ❑ Historical perspective: an answer to the *Limits to Growth Report (1972)*
- ❑ LtG Report:
 - Exponential growth will lead to the decline of population and industrial output within the next century;
 - Resource collapse;
 - Presumes a direct relationship between growth and the levels of pollution;
 - Solution: contain population and capital growth in order to live within the *limits*;

Sustainable Development

Table 1: LtG exponential index for selected resources

Resource	Known quantities	Annual consumption growth (%)	Exponential index (years)
Aluminum	$1.17 \cdot 10^9$ t	6.4	31
Chromium	$7.75 \cdot 10^8$ t	2.6	95
Coal	$5 \cdot 10^{12}$ t	4.1	111
Copper	$308 \cdot 10^6$ t	4.6	21
Gold	$353 \cdot 10^6$ troy oz	4.1	9
Iron	$1 \cdot 10^{11}$ t	1.3	93
Manganese	$8 \cdot 10^8$ t	2.9	46
Oil	$455 \cdot 10^9$ barrels	3.9	20
Natural gas	$1.14 \cdot 10^{15}$ cubic ft	4.7	22

Source: Meadows *et al*, 1972

Table 2: Selected natural resources evolution 1950-1990

Resource (Mt)	1950	1990	Evolution	
Chromium	70	420	500%	↗
Coal	450	570	27%	↗
Copper	100	350	250%	↗
Iron	19000	145000	663%	↗
Manganese	500	980	96%	↗
Oil and natural gas (Mtoe)	30	250	733%	↗

Source: Taylor 1994, after World Bank 1992

Sustainable Development

□ Natural resources:

- Input for production process;
- Result of human knowledge;
- Dynamic character;
- Resource scarcity is reflected through price;
- What matters for society is the service that a resource provides not its current availability;

Sustainable Development

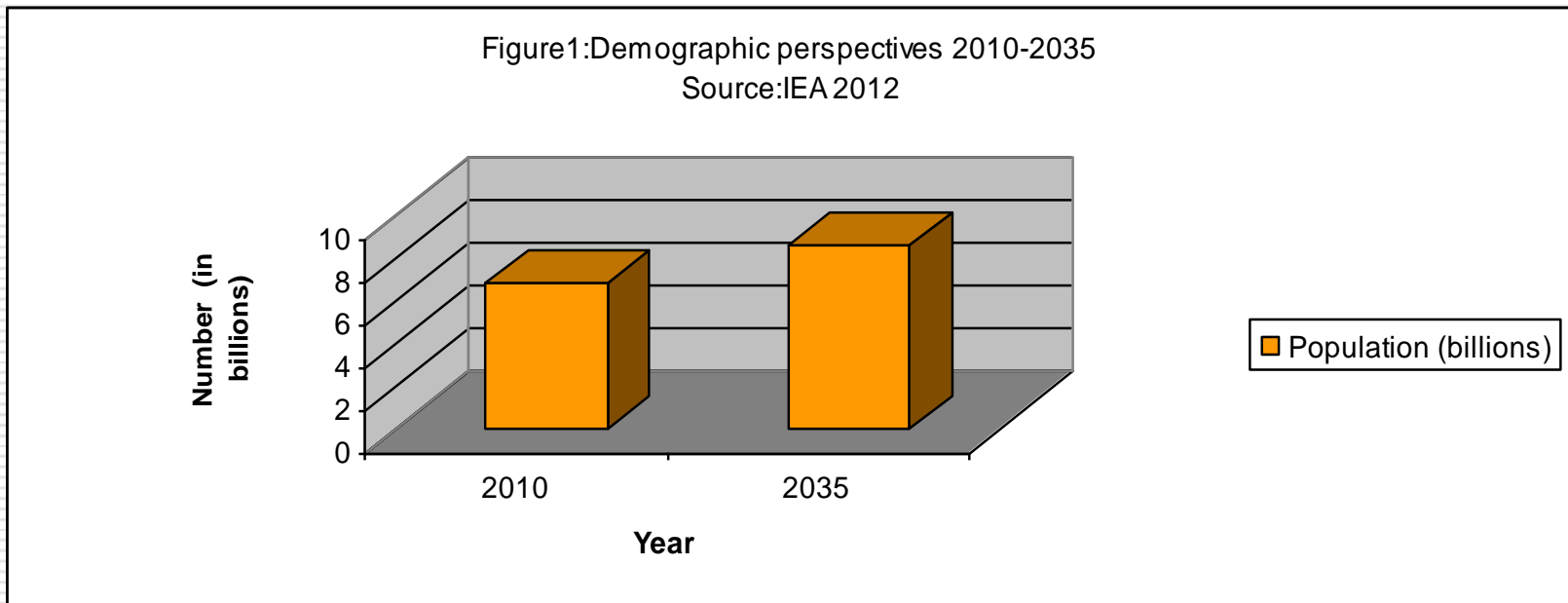
- ❑ Long term perspective;
- ❑ Does not aim at containing growth but at reorientating;
- ❑ Technology and social organization can be directed to certain ways in order to generate a new era of growth;
- ❑ Renewable vs non-renewable resources;
- ❑ Production and consumption patterns that will minimize impact upon environment;

Energy

- One of the most important area of application of SD concept due to:
 - Key element for economic development;
 - Non-renewable resources raises the question of availability;
 - Energy production implies an spillover effect related to pollution and global warming;

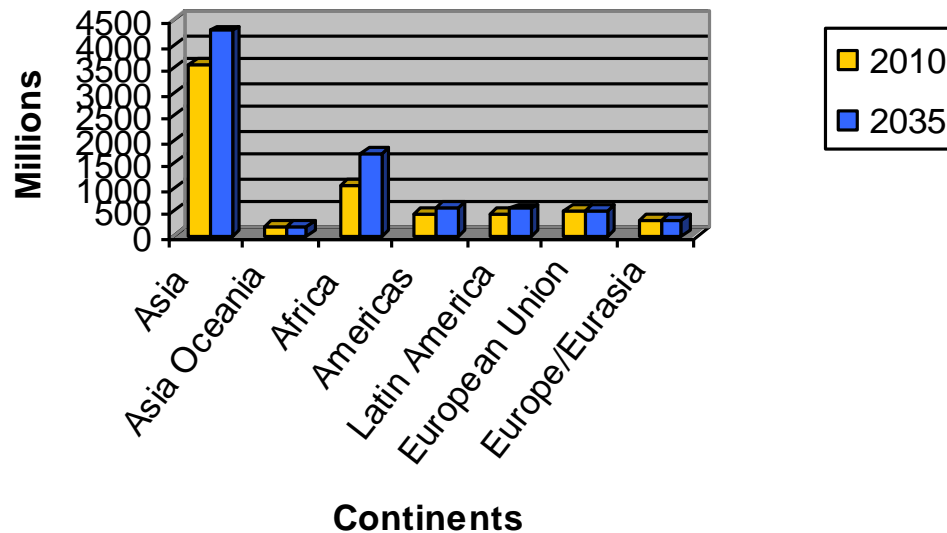
Energy

- Energy demand is influenced by:
 - Demographic growth;
 - Economic activity;

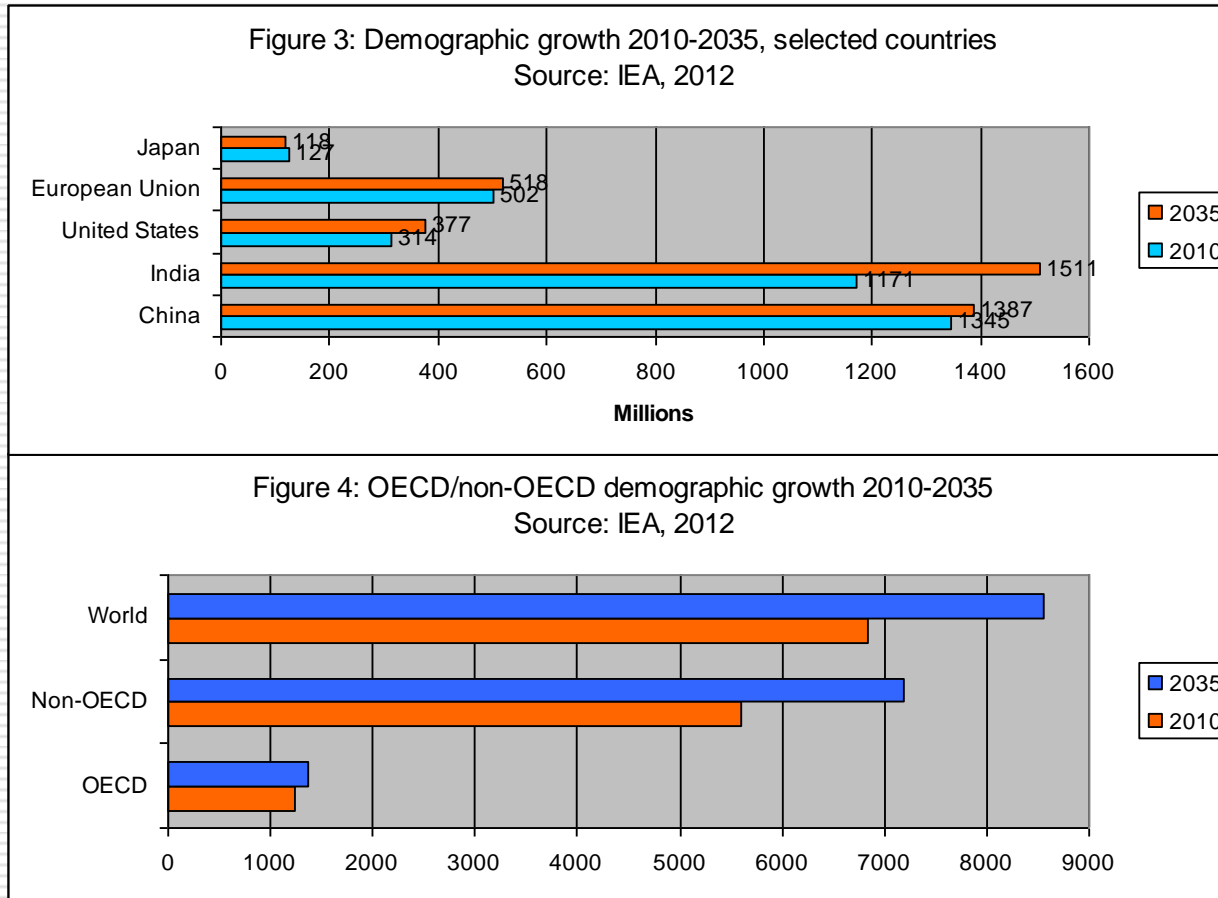


Energy

Figure 2: Demographic growth 2010-2035 selected continents
Source: IEA, 2012



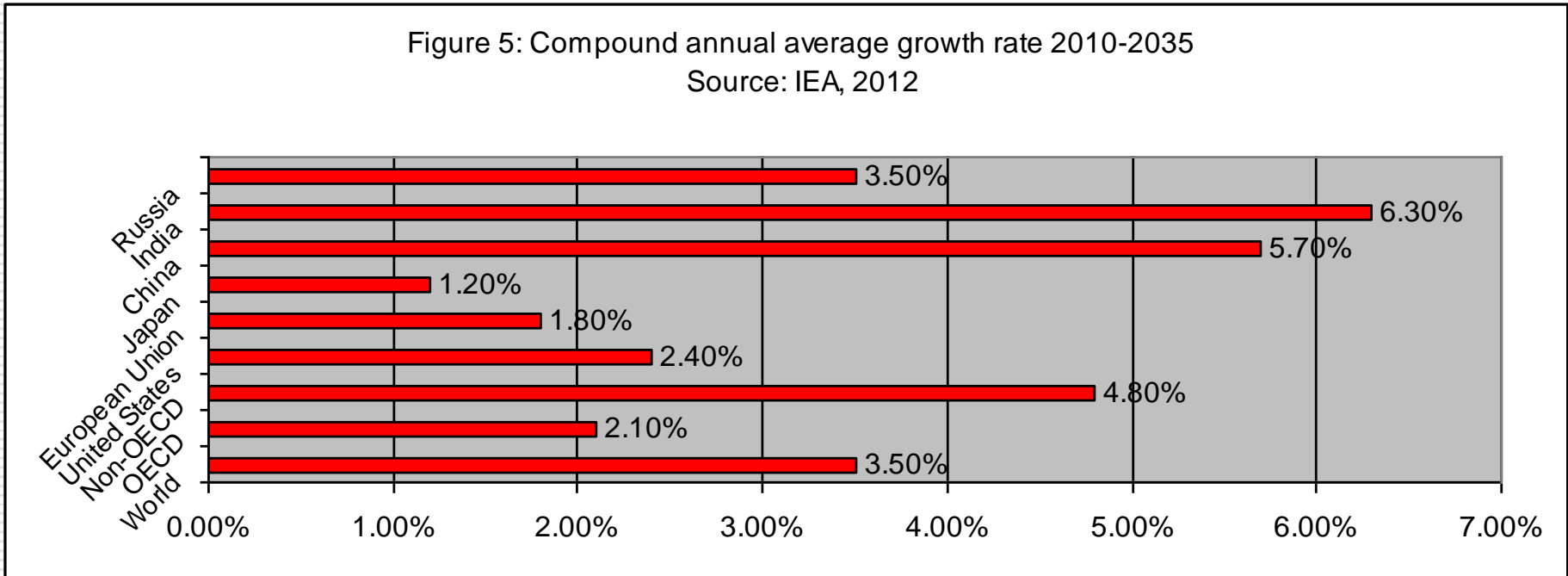
Energy



Energy

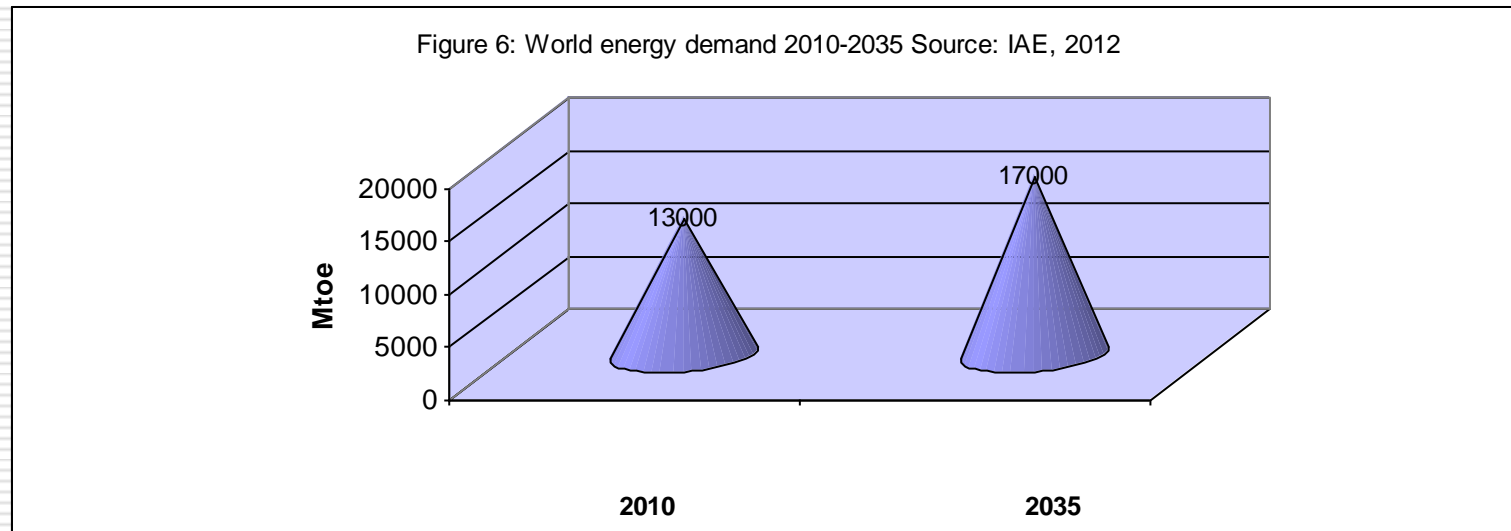
Figure 5: Compound annual average growth rate 2010-2035

Source: IEA, 2012

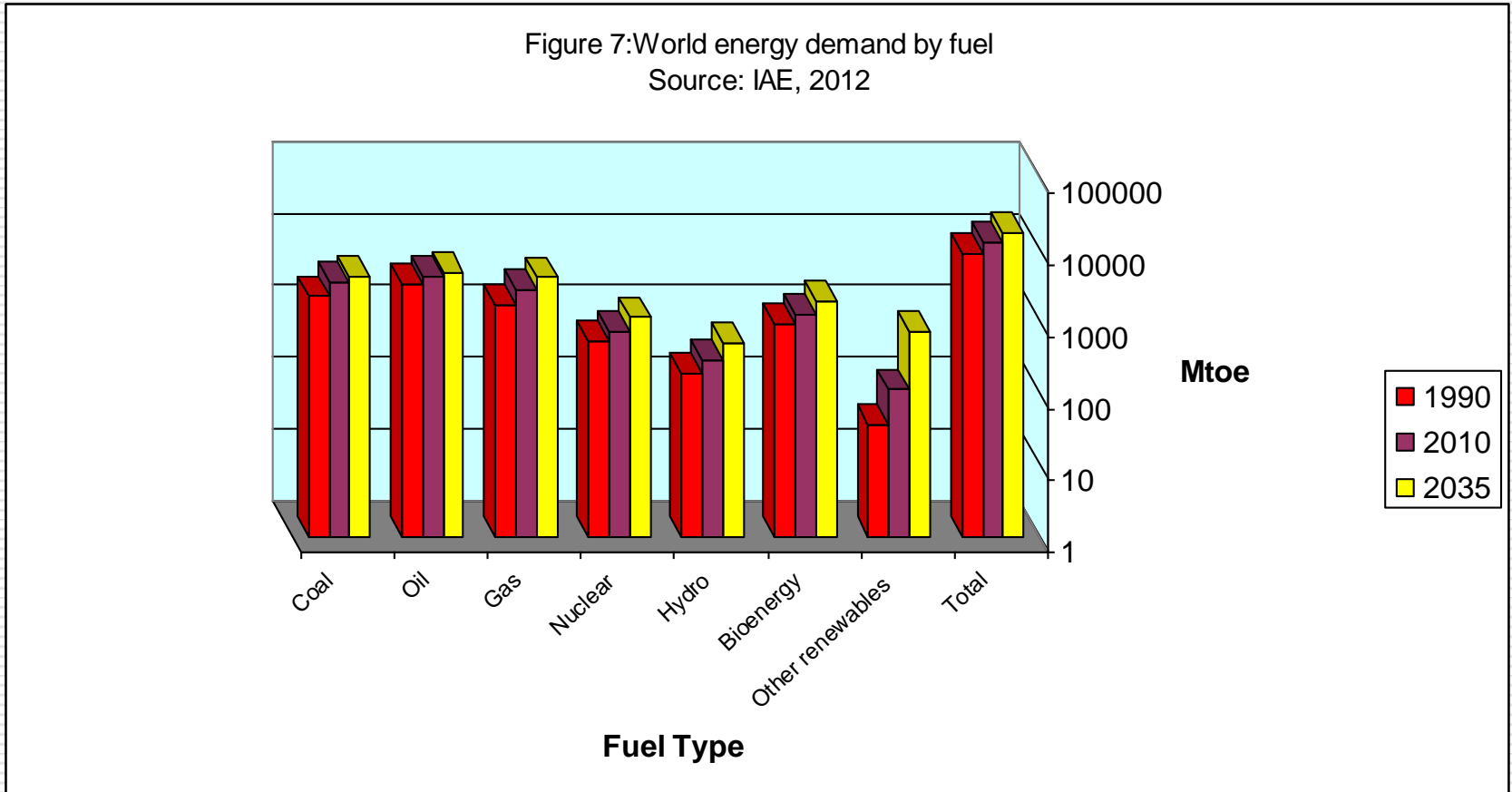


Energy

- Economic and demographic growth will come mainly from emerging economies. World energy demand will follow a similar pattern growing with 35% between 2010-2035:

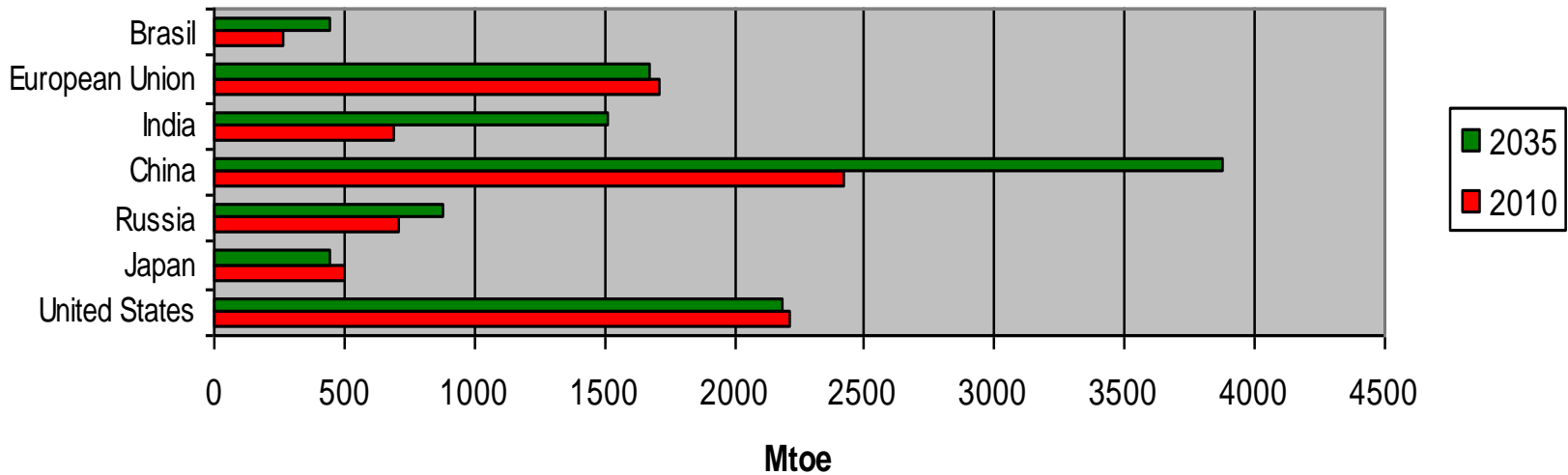


Energy



Energy

Figure 8: World energy primary demand by selected countries Source: IAE, 2012



Energy

- China will account for 33% of the global energy growth, followed by India;
- US emerges as self-sufficient by 2035 while others energy importers increase their dependency
- The demand will be mainly covered by fossil fuels, with natural gas presenting the biggest increase (50%);
- World primary demand for renewables will raise from 13% to 18%;
- Nuclear share will remain stable at about 12%;
- Carbon emissions will increase by 23% from 30.2Gt in 2010 to 37Gt in 2035. The growth will be consistent with a 3.6 °C long-term average growth;
- EU will stabilize its demand for energy but it will also increase its dependency and its expenditures for energy;

		2011	2020	2035	Evolution%
Oil imports	barrel	107.6	119.5	125	16.17
Natural gas imports	MBtu	9.6	11.5	12.5	30.21
Steam coal imports	tonne	123.4	112	115	-6.81

Table 3: EU Fossil fuel price assumptions 2011-2035 Source: IAE, 2012

EU Energy Policy

- Sustainable development: core objective of the EU;
- Regarding environment: will promote measures in order to deal with climate change;
- Regarding energy:
 - functioning of energy market;
 - security of supply;
 - energy efficiency;
 - development of new and renewables forms of energy.

EU Energy Policy

- ❑ Long tradition and strong advocator against climate change;
- ❑ Wants to lead by example other countries in taking actions;
- ❑ Is not limited puerly to emissions cutting;
- ❑ Developed an energy policy which combines economic and climate goals;
- ❑ It aims in transforming potential threats into opportunities of growth;
- ❑ EU energy policy goals:
 - Availability of energy products and services;
 - Affordable price for households and enterprises;
 - Contributing to EU wider social and climate goals.

EU Energy Policy

- EU Council 2007, climate and energy objectives for 2020:
 - 20% GHG emissions reductions compared with 1990 levels;
 - 20% energy efficiency improvement compared with projected levels;
 - 20% share of renewables in the final energy consumption.

- On the long run EU aims in decarbonising its economy with 80-95% GHG cuts by 2050

EU Energy Policy

□ Instruments used:

- European Trading Scheme: cap-and-trade approach. High and stable price of CO₂ are needed for the ETS to work;
- Renewable energy (Directive 2009/28/EC): national targets and action plans in order to promote renewables use;
- Energy efficiency (Directive 2012/27/EU): no binding targets for member states but it implies binding measures in order to improve energy savings;
- Energy taxation: latest Commission aims at taking account in taxation of both CO₂ and energy content;
- R&D (SET plan): cost reductions for low carbon technologies and propulsion of EU enterprises in the field.

EU Energy Policy

□ EU energy position:

- 14% of of the world gross inland consumption by region;
- 3rd position in the world in annual consumption (1656Mtoe);
- 7% to world energy contribution;
- Nuclear energy has the larges share in the EU produced energy;
- However its gross inland consumption (1759 Mtoe) is dominated by fossil fuels (oil, gas, coal).

EU Energy Policy

Figure 9: EU-27, 2010 Energy production by fuel

Source: EC, 2012

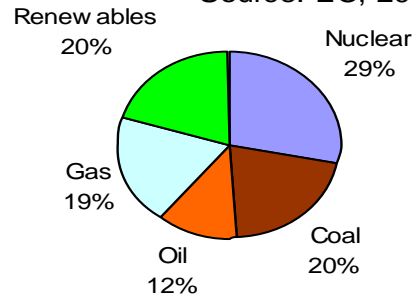
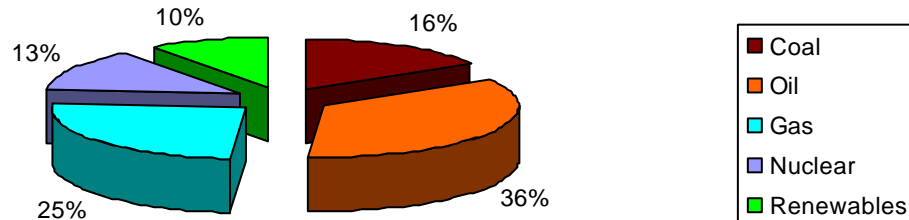


Figure 10: EU-27, 2010 Gross inland consumption

Source: EC 2012



EU Energy Policy

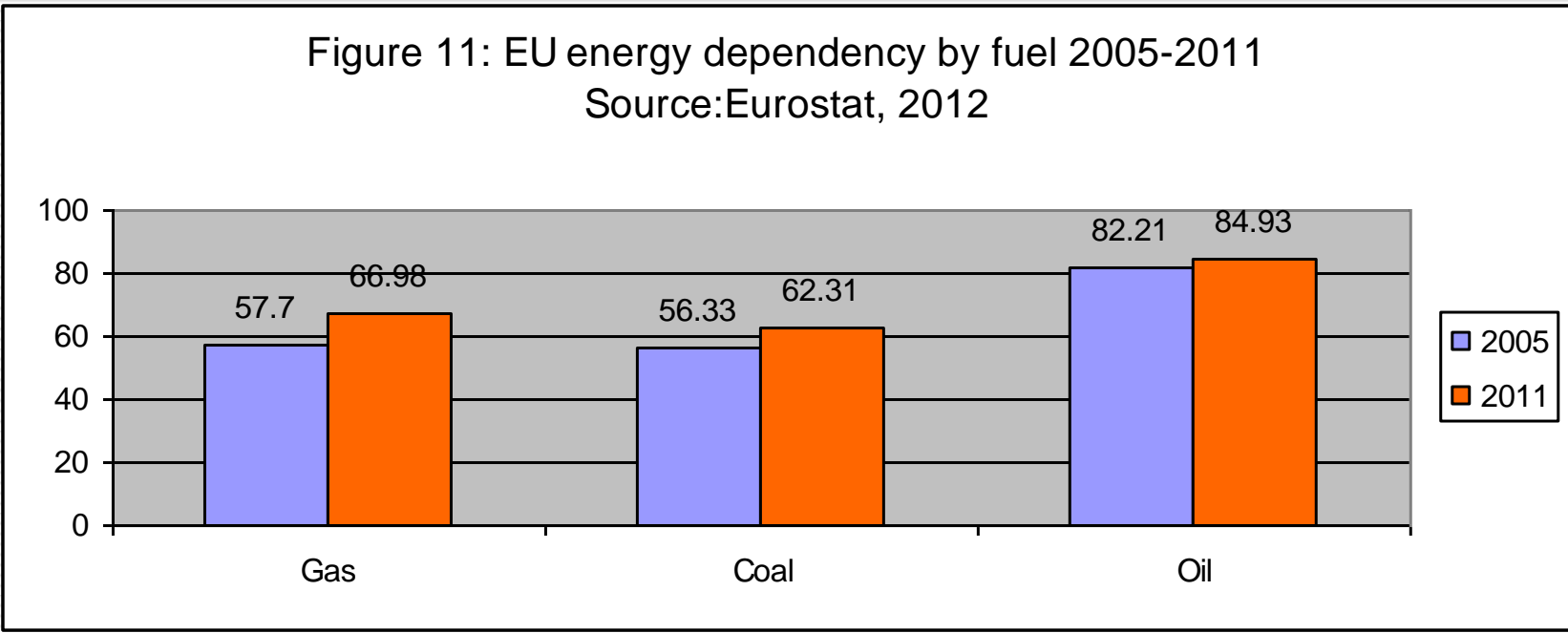
- High import dependency rate, which increased steadily over the last 30 years;
- Influenced by the economic recession in 2009 and 2010, resumed growth in 2011;
- Renewables share have increased from 10% to 13% between 2005-2011, however they could not halt the growing dependency rate of fossil fuels.

Year	Dependency rate %
2005	52.44
2008	54.62
2009	53.77
2010	52.65
2011	53.84

Table 4: EU import dependency rate 2005-2011 Source: Eurostat, 2012

EU Energy Policy

Figure 11: EU energy dependency by fuel 2005-2011
Source: Eurostat, 2012



EU Energy Policy

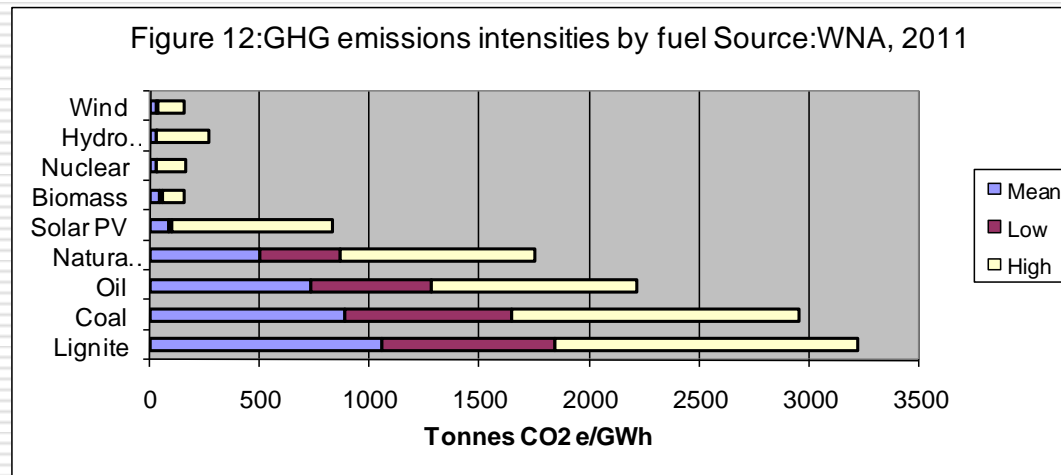
- ❑ On the long run EU will reduce its demand from 1713 Mtoe in 2010 and to 1670 Mtoe in 2035;
- ❑ In the transition towards low carbon economy EU will substitute coal share with gas and renewables;
- ❑ In spite of this effort by 2035 it will still rely on 64% share of fossil fuels;
- ❑ Remarkable results in GHG emissions reductions but influenced by the economic recession;
- ❑ EU produces only 15% of the world GHG gasses. It will not be able to mitigate climate change in the absence of a global agreement;

Year	GHG emissions indexed to base year 1990
2005	92%
2007	91%
2008	89%
2009	83%
2010	85%

Table 5: EU GHG evolution 2005-2010 Source: Eurostat, 2012

EU Energy Policy

- ❑ Nuclear energy: an alternative in order to reduce GHG emissions and the dependency of fossil fuels;
- ❑ Low GHG emissions;
- ❑ Competitive price: 2.1-6.9 US cents/kW-h. More expensive than coal and gas but cheaper than renewables;
- ❑ Stability of supply, less sensitive to fuel price (15% fuel cost component)



Conclusions

- ❑ Sustainable development: a way of reorientating economic growth towards a lower environmental impact;
- ❑ Energy represents an important topic of SD due to its links with economic development, natural resource use and impact upon the environment;
- ❑ The future world energetic landscape will be modelled by a growing energy demand from the emerging economies;
- ❑ The EU will stabilize its demand for energy but it will increase its import dependency rate having thus an impact upon competitiveness;
- ❑ Its energy policy aims at replacing fossil fuels use by renewables through market instruments and technological development;
- ❑ However in the years that followed the policy implementation the GHG reduction was only relative due to the lowering energy demand not a direct consequence of the policy

Conclusions

- ❑ In the meantime EU import dependency rate grew due to the fact that renewables could not fully substitute fossil fuels reduction;
- ❑ In the absence of global agreement regarding climate change the current European energy policy will only affect economic competitiveness;
- ❑ Although natural resources represent a function of knowledge which evolves over time, currently the EU is lacking natural energetic resources given the fact that presents a high import dependency rate;
- ❑ Sustainable development represents a balanced towards economic, environmental and social aspects; The current European perspectives focuses mainly on GHG reductions and renewable promotion;
- ❑ An alternative would be to improve its indigenous energy production due to the fact that current perspectives point to higher prices and import dependency;
- ❑ Nuclear energy represents an available solution having the biggest share in the mix of produced energy, a competitive price and a low impact towards the environment;
- ❑ From this perspective we can say that nuclear energy represents a sustainable solution