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Reflections on sustainability & energy policy

The cases of the EU & Spain

Ignacio Pérez-Arriaga

Geneva, March 30, 2006

Outline

- What is meant by a “sustainable energy system”?
- Is our present energy model sustainable?
- The challenge: the gap between the “expected future” & the “sustainable future”
- The mechanisms of response
- A common EU energy policy
  - What is it? Do we need one?
- General recommendations & lines for action
- The cases of Spain & the EU
  - Comments on recent developments

Energy & sustainability

What is meant by “a sustainable energy system”?

- Tolerable **environmental** impact
- Adequate **economic** development
  - Security of supply
    - Lasting & dependable access to primary energy sources
    - Adequate capacity of production, transmission & distribution
    - Plus security in system operation and power delivery
  - Acceptable or even beneficial impact on economic competitiveness
- **Social** acceptability
  - Reasonably fair **universal access** *(worldwide)* to modern forms of energy supply

Is our present energy model sustainable?

The shortcomings

- The current path of world energy production & consumption, *even with presently expected policy measures*, is not sustainable
  - Major concerns about access to lasting, dependable & affordable energy sources
  - Unsustainable environmental impact
  - Unacceptable disparity of levels of energy access & consumption

Is our present energy model sustainable?

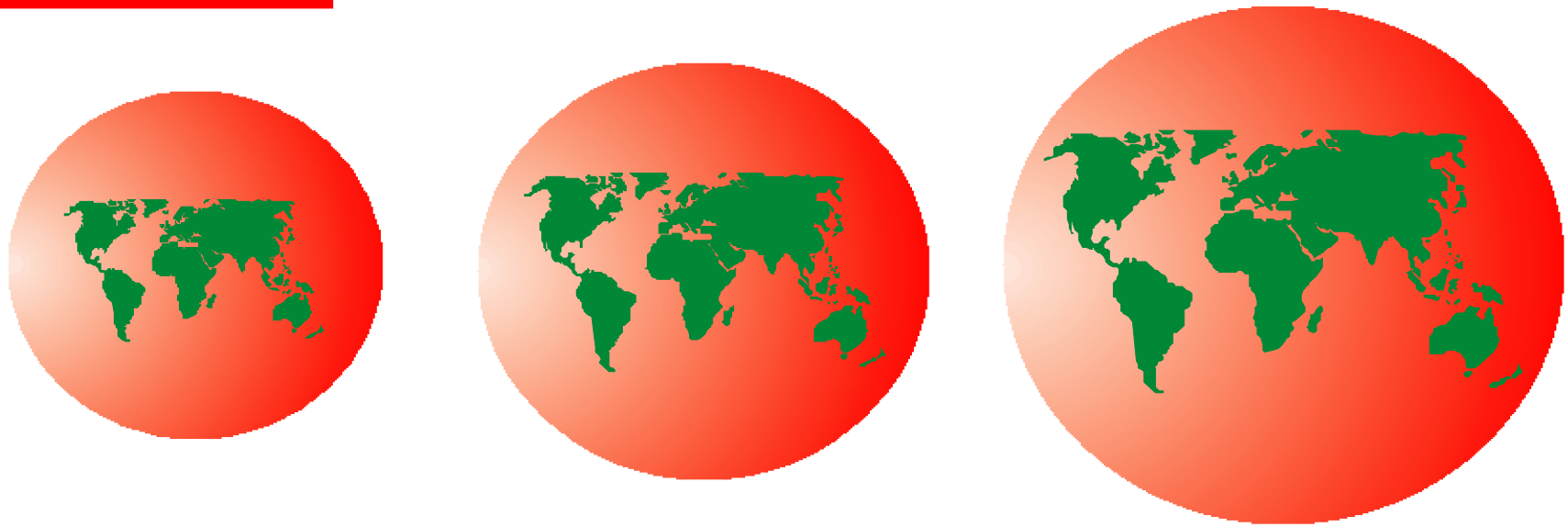
1. The availability of resources

The energy demand

Pop: 3.7 billion
5 billion toe

Pop: 6 billion
9.2 billion toe

Pop: 8.1 billion
14.7 billion toe



1970

2000

2030

1.35 toe/capita

1.5 toe/capita

1.8 toe/capita

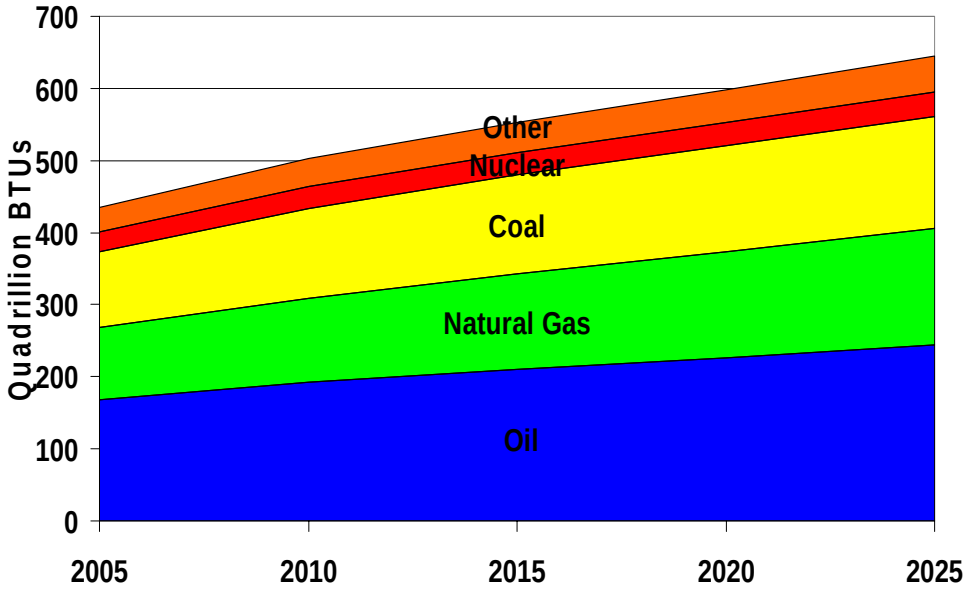
+11%

+20%

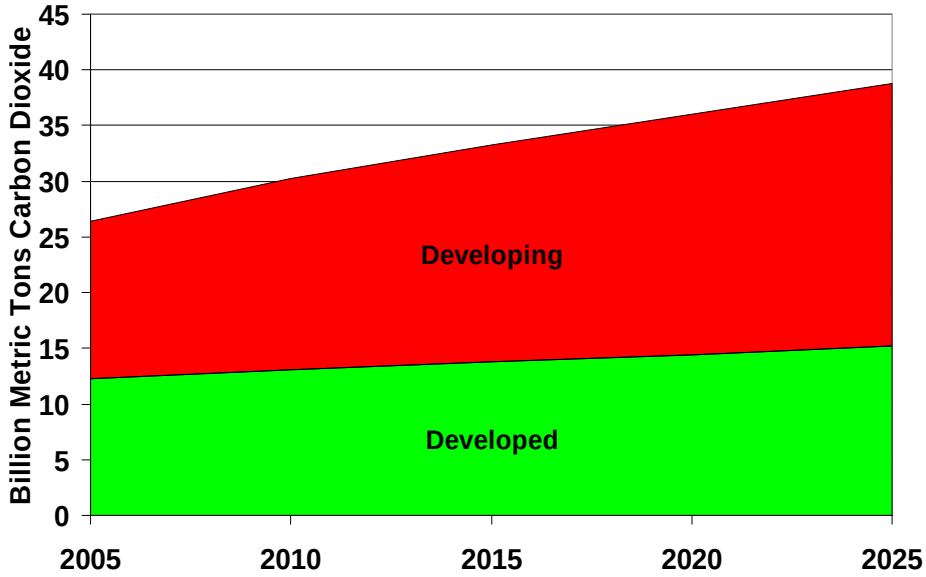
Sources : BP stat review, WEO 2005, Alternative Policy scenario

Over the Longer Term, World Energy Demand and Carbon Emissions Will Grow 45 Percent

Energy Demand



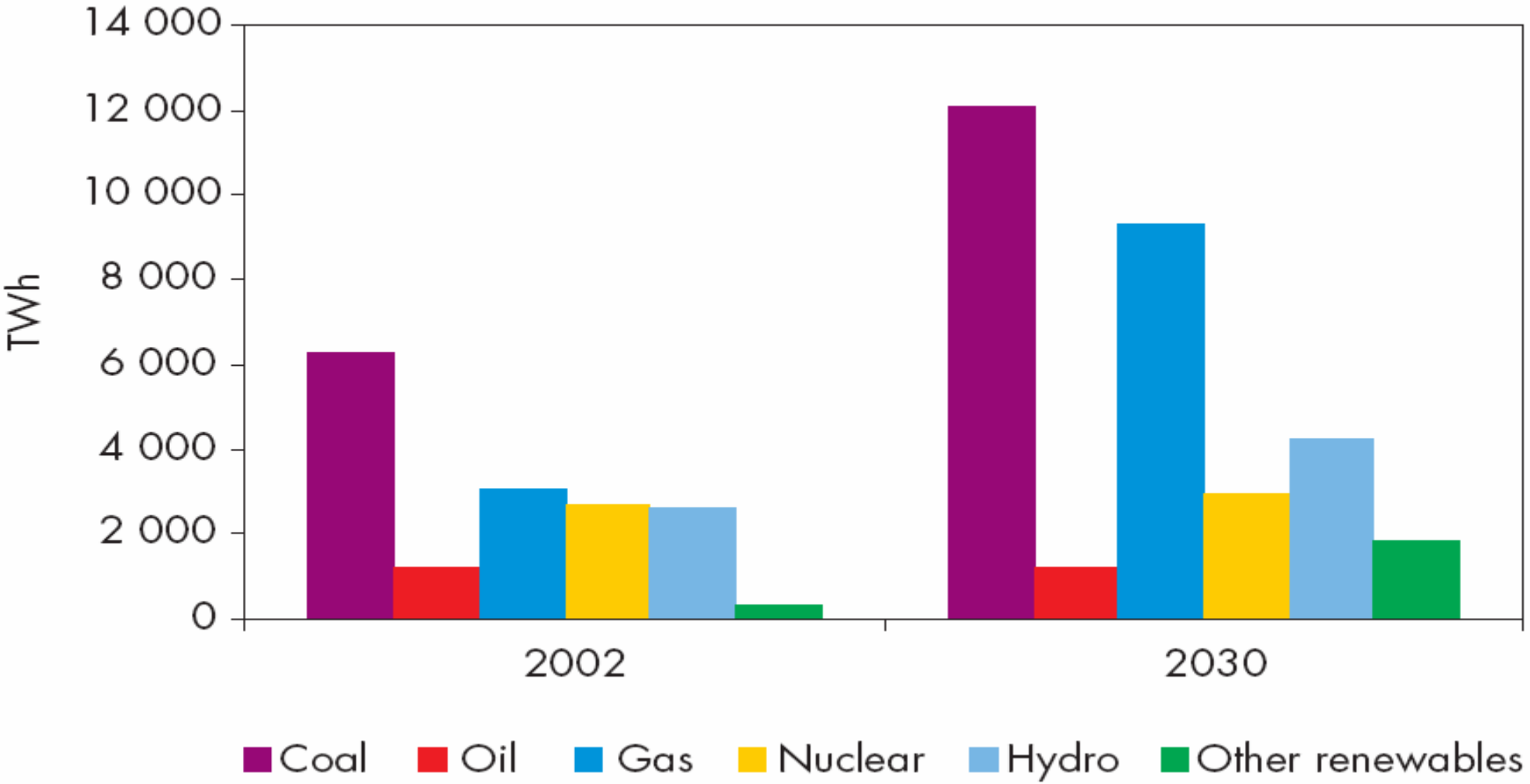
Carbon Dioxide Emissions



and Developing Countries will Account for 3/4 of the Increase

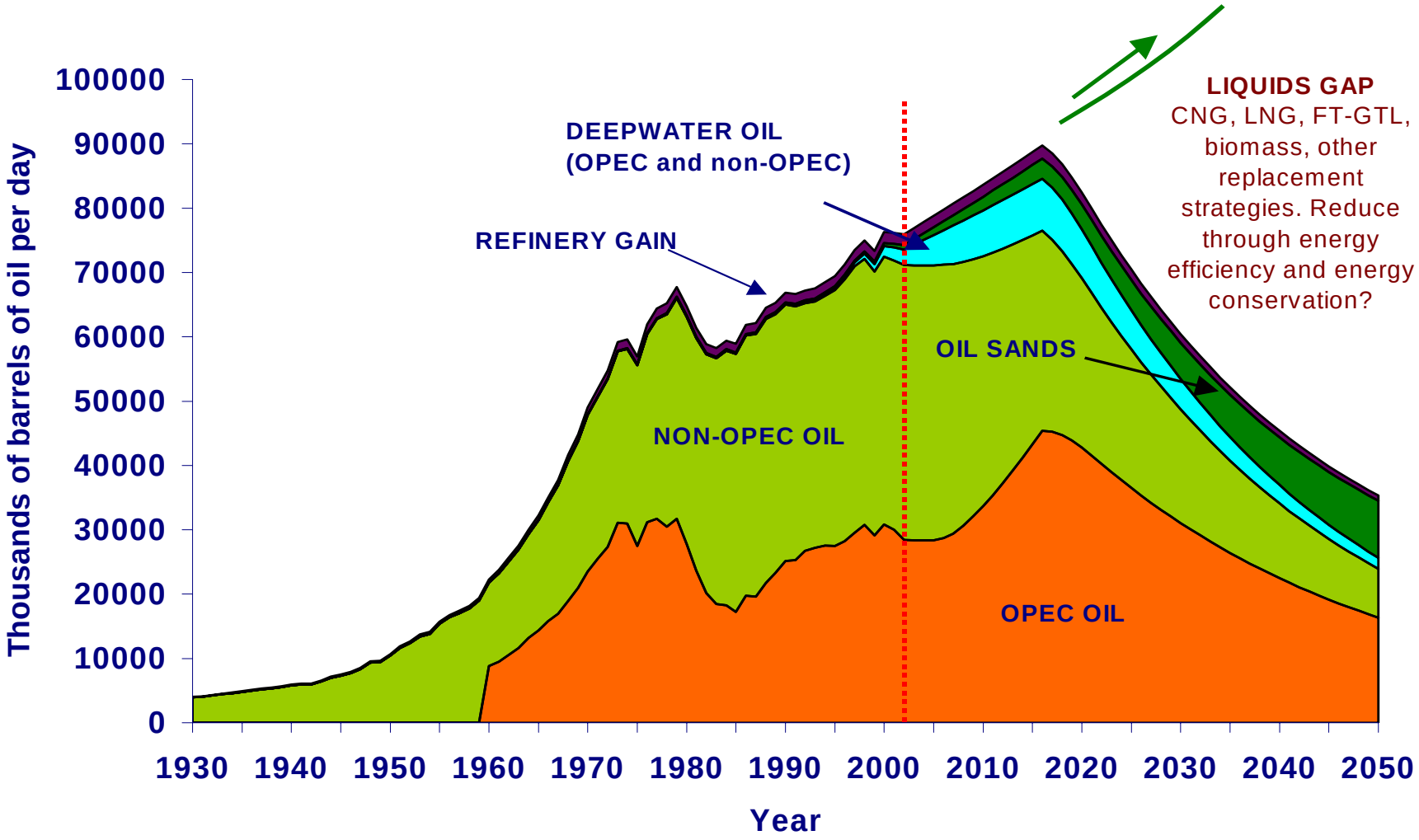
Source: USDOE EIA IEO 2005 Reference Case

World Electricity Generation, 2002 and 2030



Source: IEA, WEO 2004

Global oil; all supplies 1930-2050



Exxon: by 2015 we find 0.8 of every 10 barrel we consume today

'Plan now for a world without oil' (FT 01/2004)

World Conventional Proved Fossil Fuel Reserves are Geographically Concentrated

(Percent Share)

Region	Oil	Gas	Coal
Subtotal	64	40	*
Saudi Arabia	25	4	0
Iraq	11	2	0
Iran	10	15	*
Kuwait	10	1	0
UAE	6	3	0
Qatar	2	15	0
Russia	6	28	16
Venezuela	5	2	*
China	2	1	12
U.S.	2	3	25
India	*	*	9
Rest of world	21	26	38
Total	100	100	100

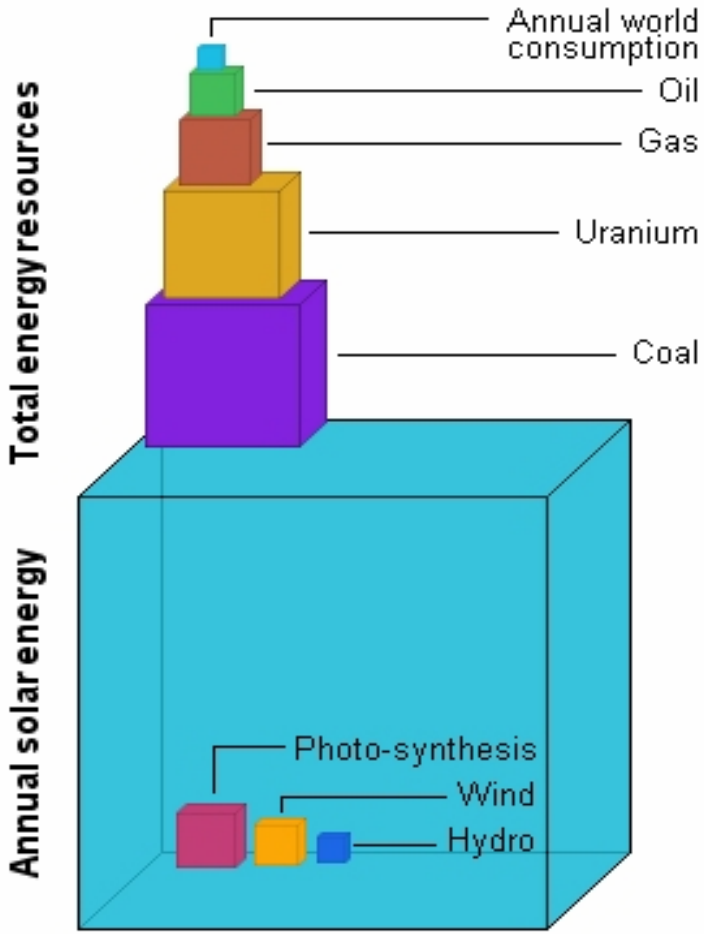
Source: EIA 2003. Excludes Oil Sands. * Less than 0.4 %

SAND2005-7855C

How about other energy resources?

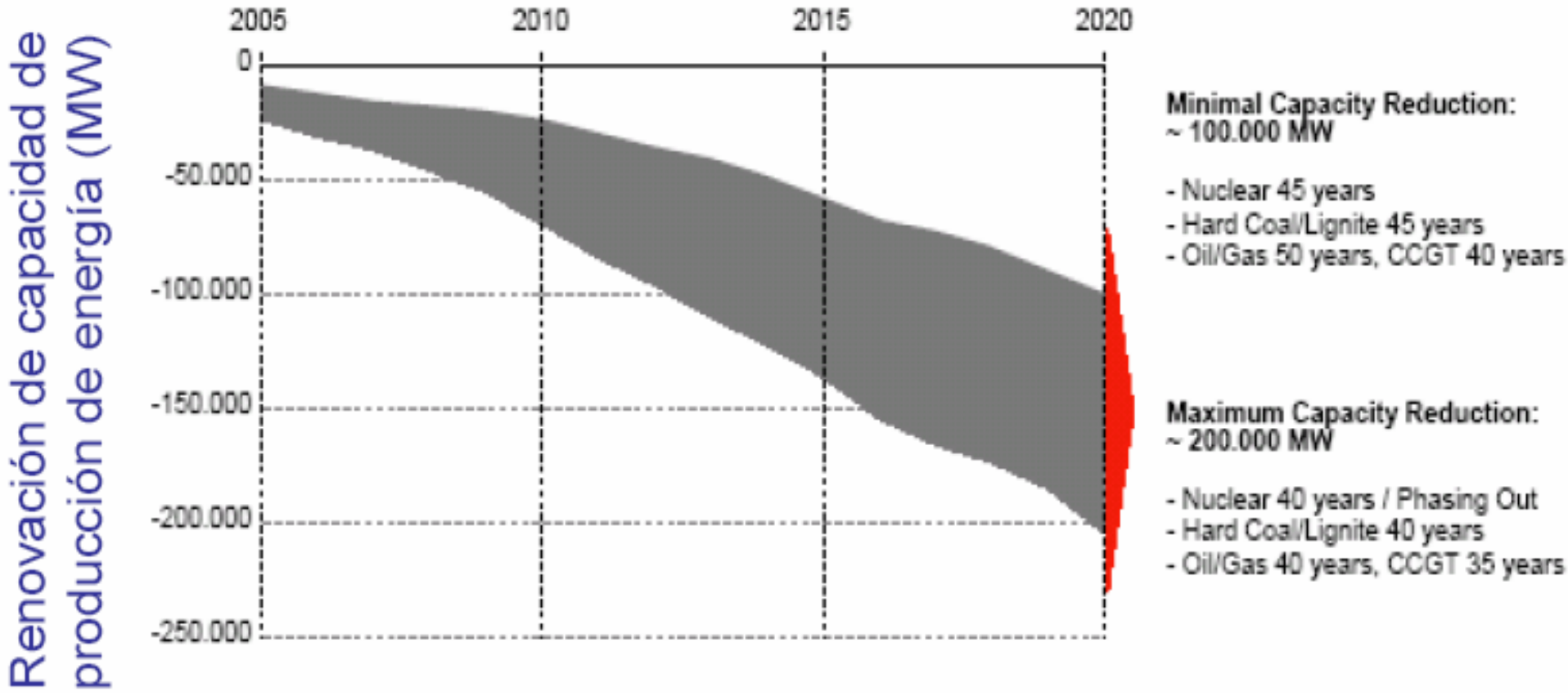
- Other energy sources & their substitution potential
  - Natural gas, coal, uranium & other radioactive materials, renewables
- Financial resources to replace present assets & to cover demand growth
  - The need for a stable regulatory framework for investors

Order of Magnitude of Energy Resources



Renewal of electricity generation capacity

(EU-25 without GB, GR, IRL, SLO, CY, M+BG, RO, N, CH)



** EU -25 sin GB,GR,IRL,SLO,CY,M + BG,RO,N,CH

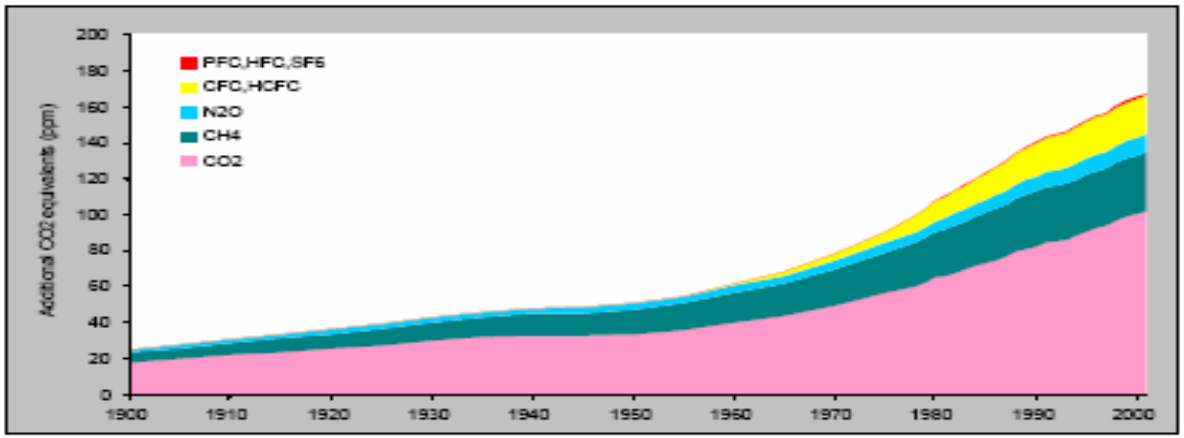
Is our present energy model sustainable?

2. The environmental impact

Greenhouse gas concentration

past trends

- Concentration of CO_2 has increased by 95 ppm (34%) to 375 ppm (global + Europe)
- All greenhouse gases rose by 170 ppm CO_2-equivalent (61% CO_2, 19% methane, 13% CFCs and HCFCs, and 6% N_2O)

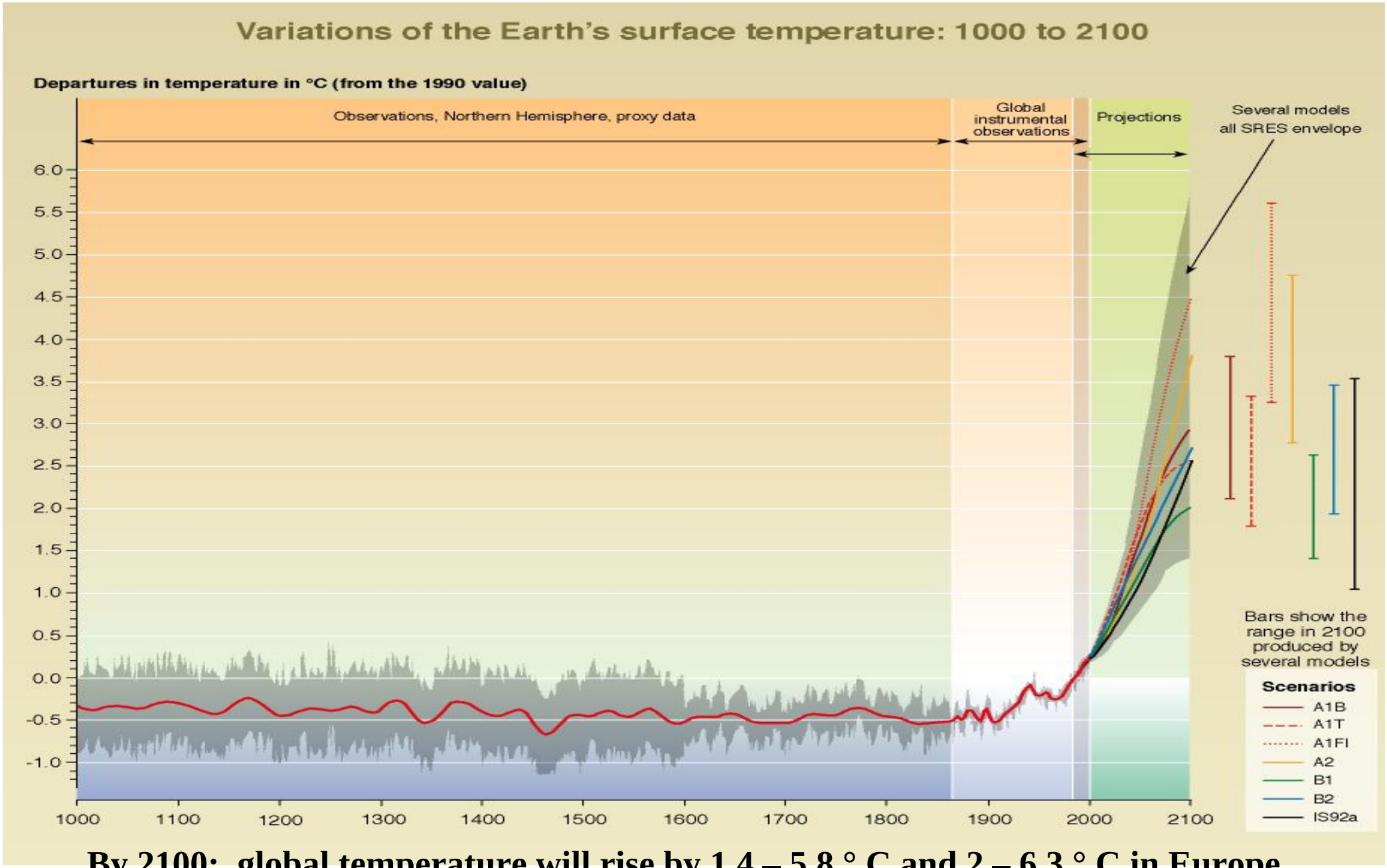


Rise of greenhouse gases (1900–2000) compared to the year 1750

future projection

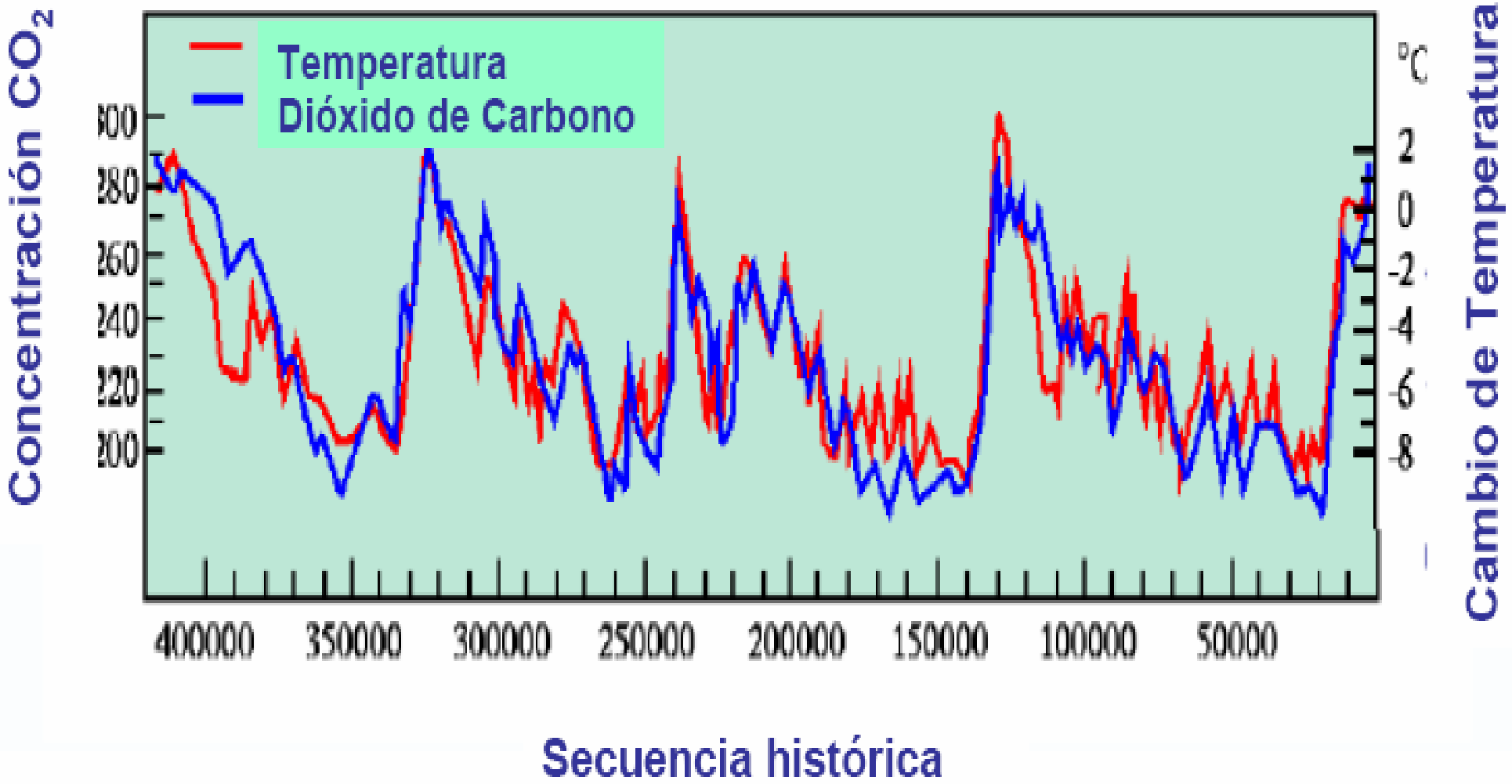
- Increase to 650 - 1215 ppm CO_2-equivalent is projected by 2100

Data-sources: IPCC

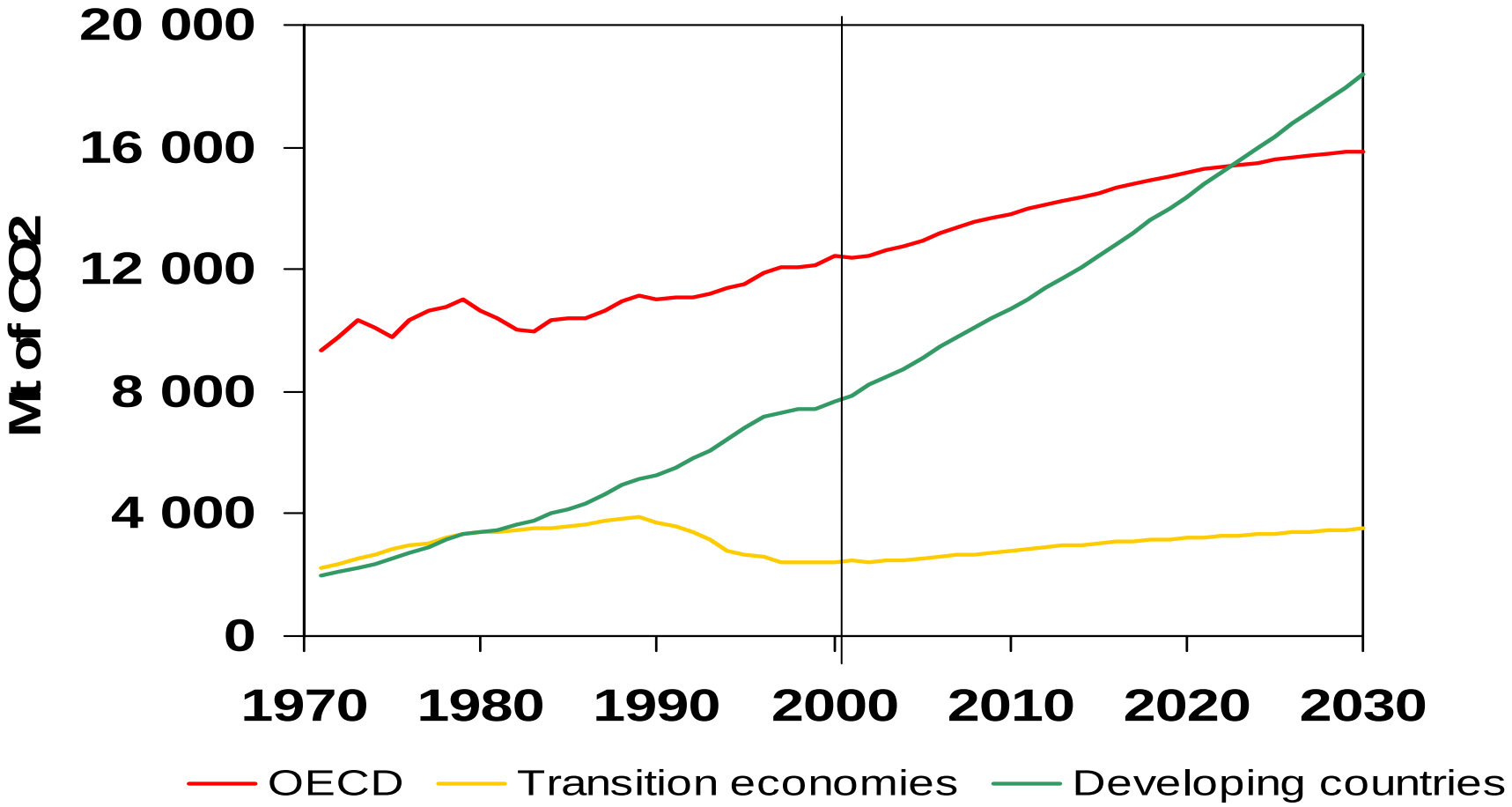


By 2100: global temperature will rise by 1.4 – 5.8 ° C and 2 – 6.3 ° C in Europe (EEA, 2004)

Temperatura y CO_2



World Energy-Related CO2 Emissions



Global emissions grow 62% between 2002 & 2030, and developing countries' emissions will overtake OECD's in the 2020s

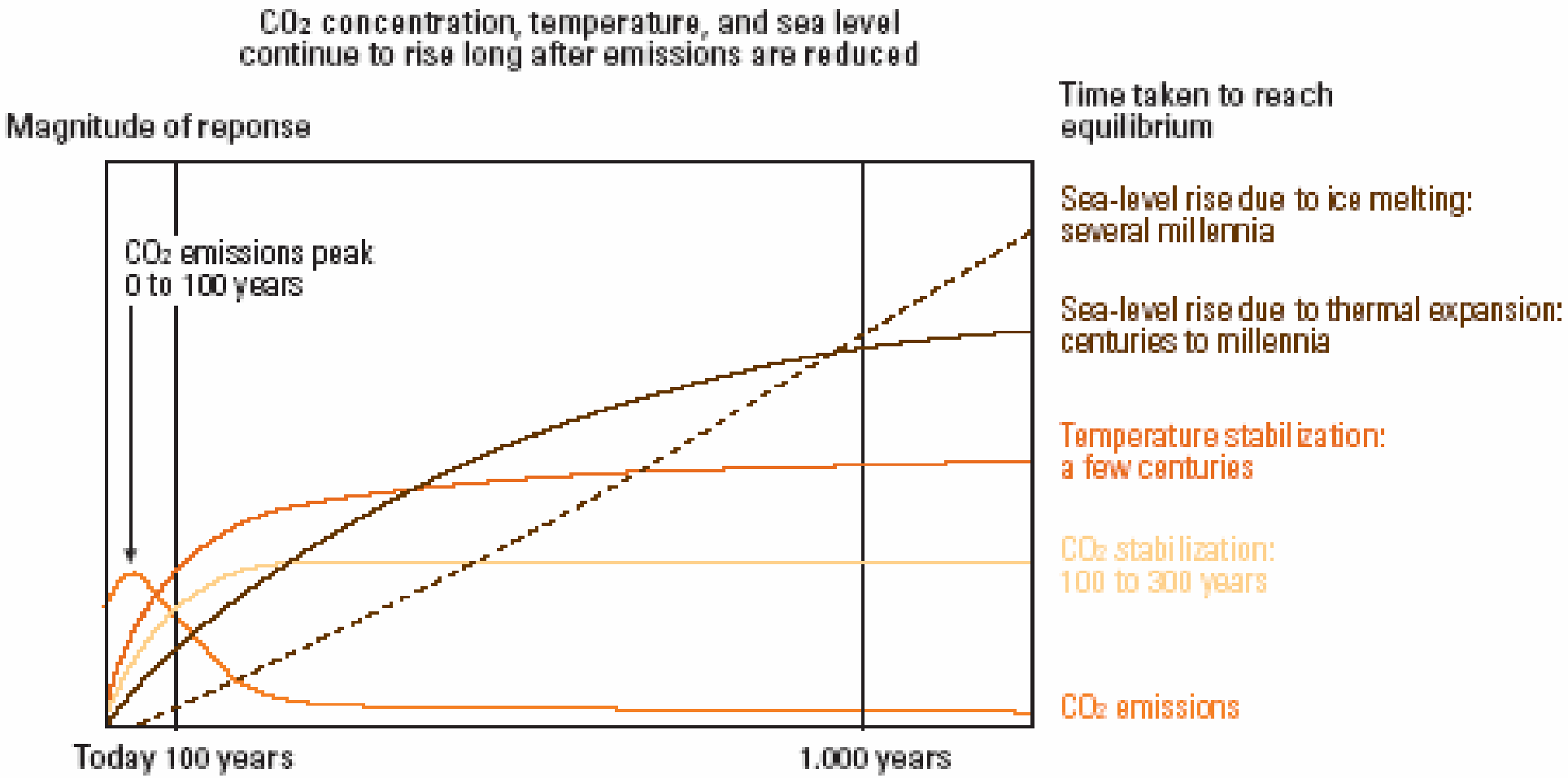
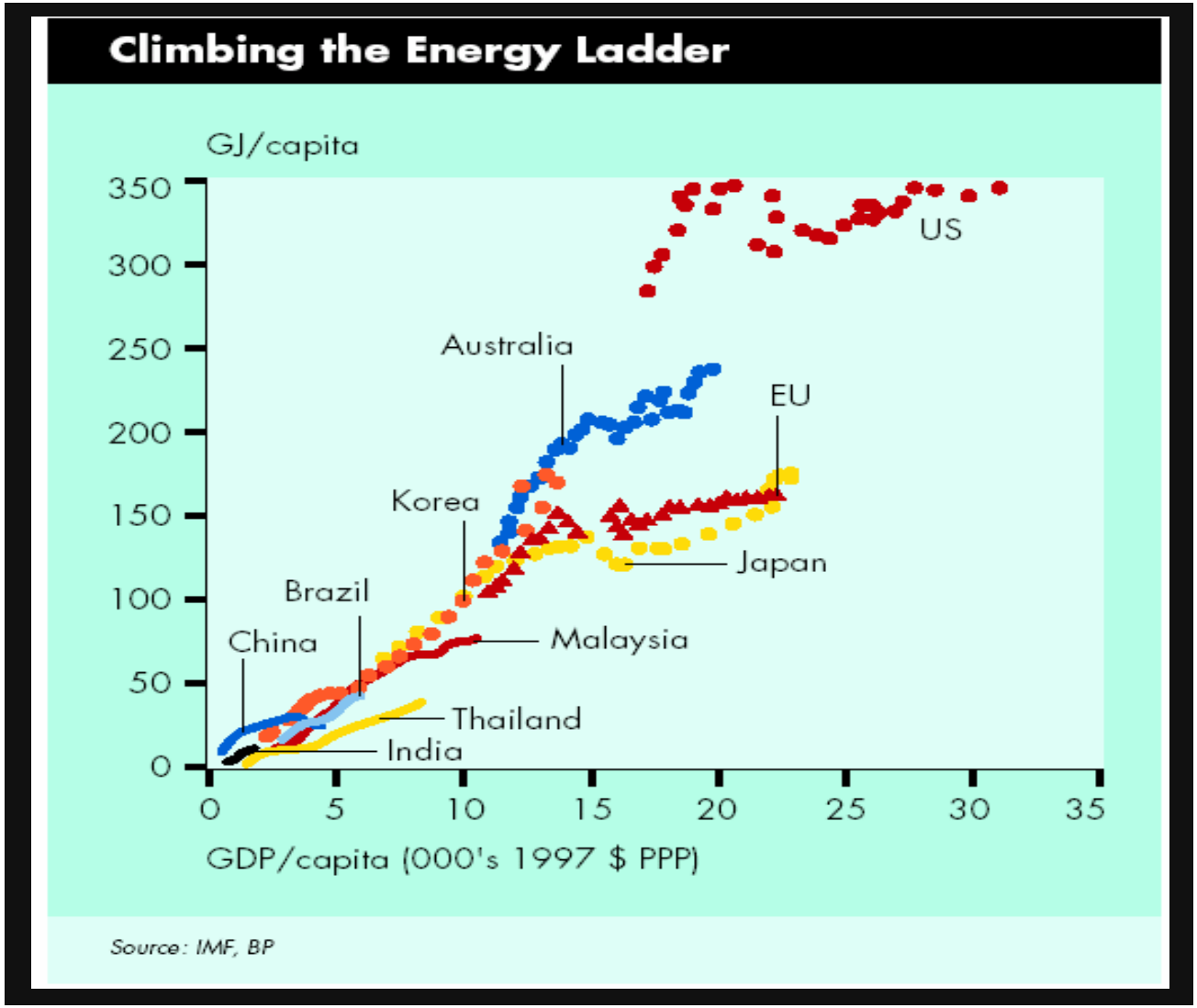


Gráfico 05 Relación temporal entre la reducción de las emisiones de CO_2 y la concentración atmosférica del mismo, el incremento de temperatura y el incremento en el nivel del mar. Para conseguir estabilizar las emisiones en un valor tolerable, deben reducirse drásticamente las emisiones en las próximas décadas (IPCC)

Is our present energy model sustainable?

3. The lack of universal access

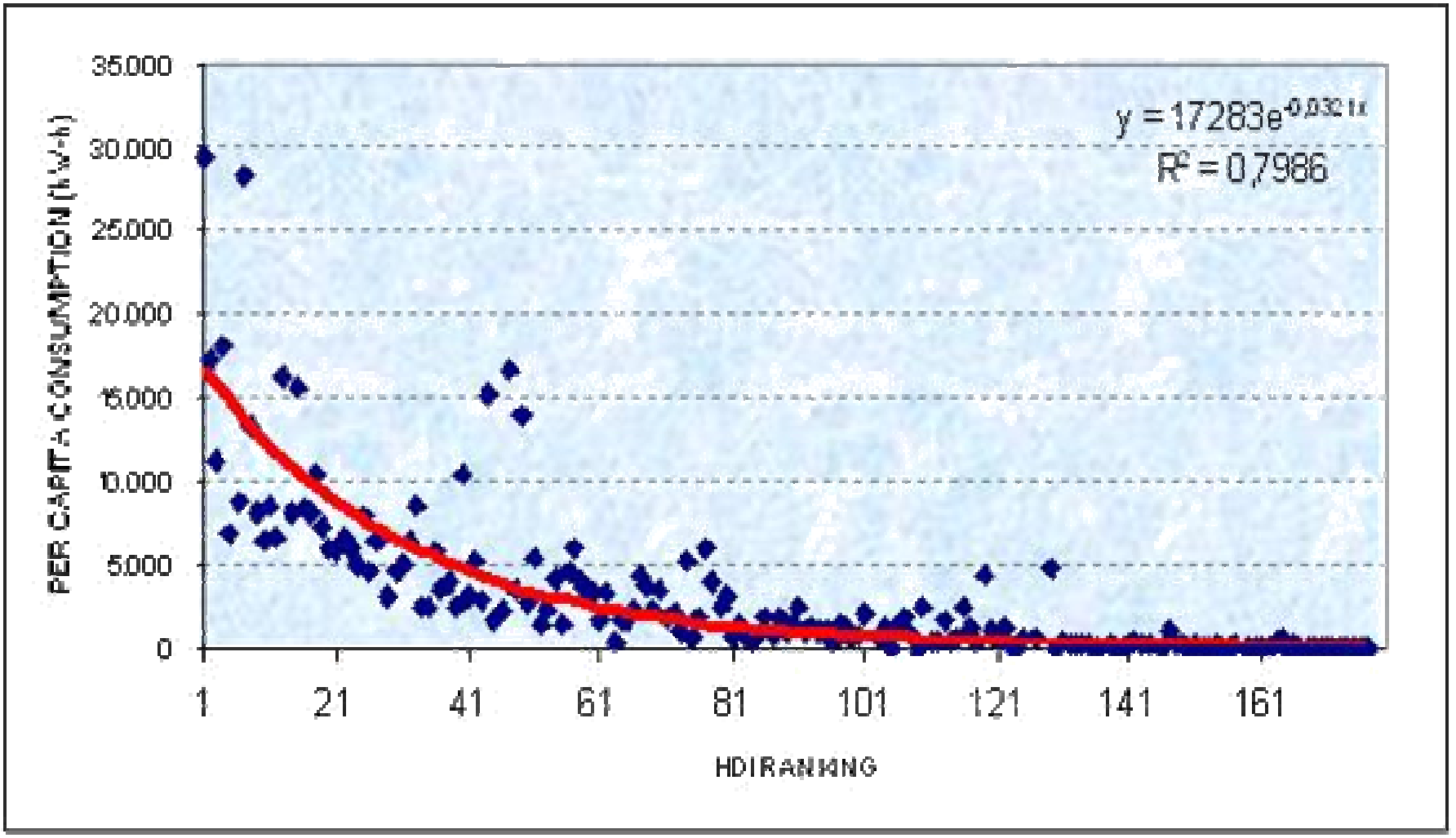
Economic prosperity and stability require access to reliable and affordable energy



Source: Royal Dutch Shell, “Exploring the Future – Energy Needs, Choices and Possibilities”

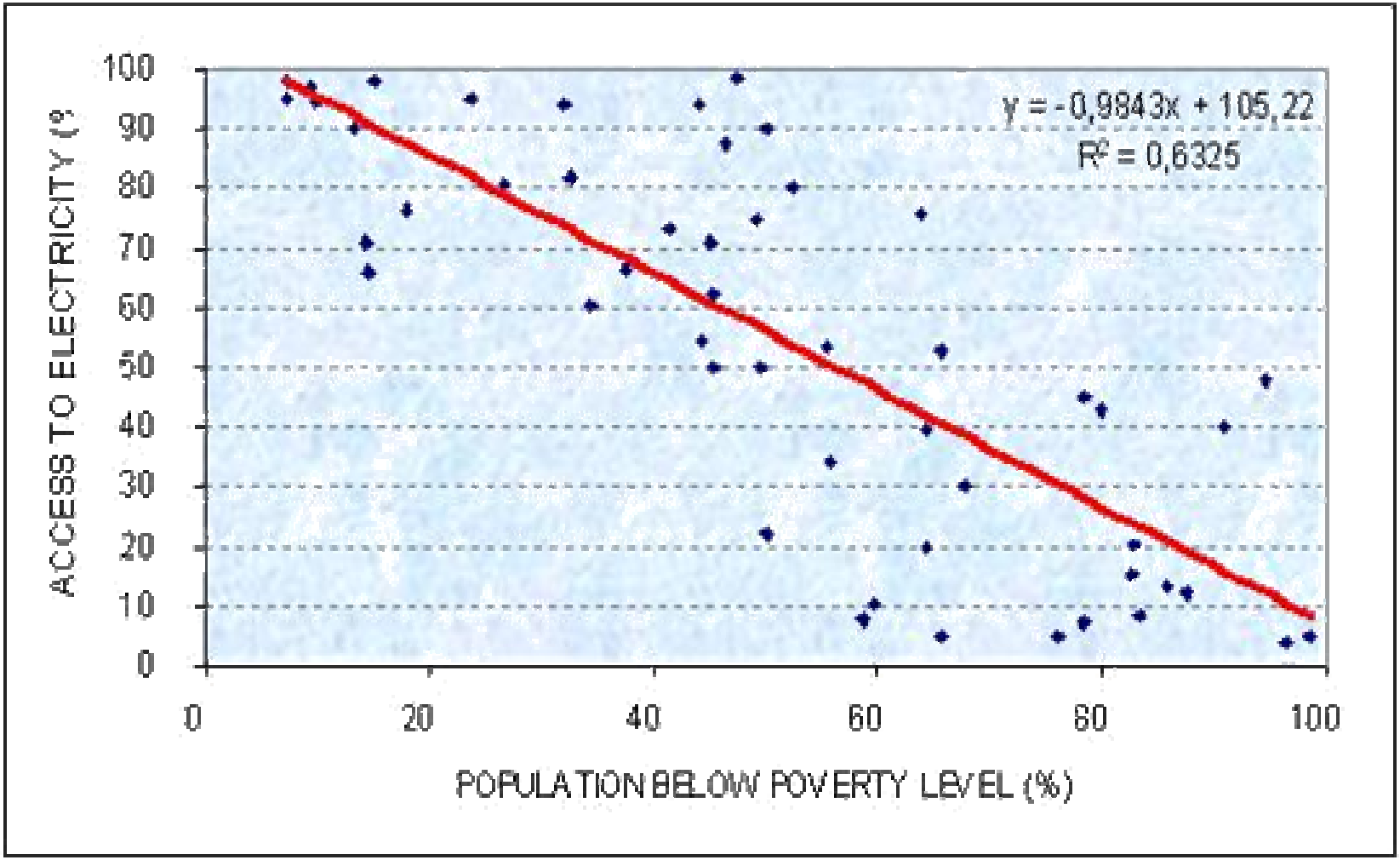
Human development index and per capita energy consumption

LINK ENERGY - POVERTY



• As a consequence, the more development the more per capita consumption (8520 kWh/year vs. 1022 for medium vs. 218 for low)

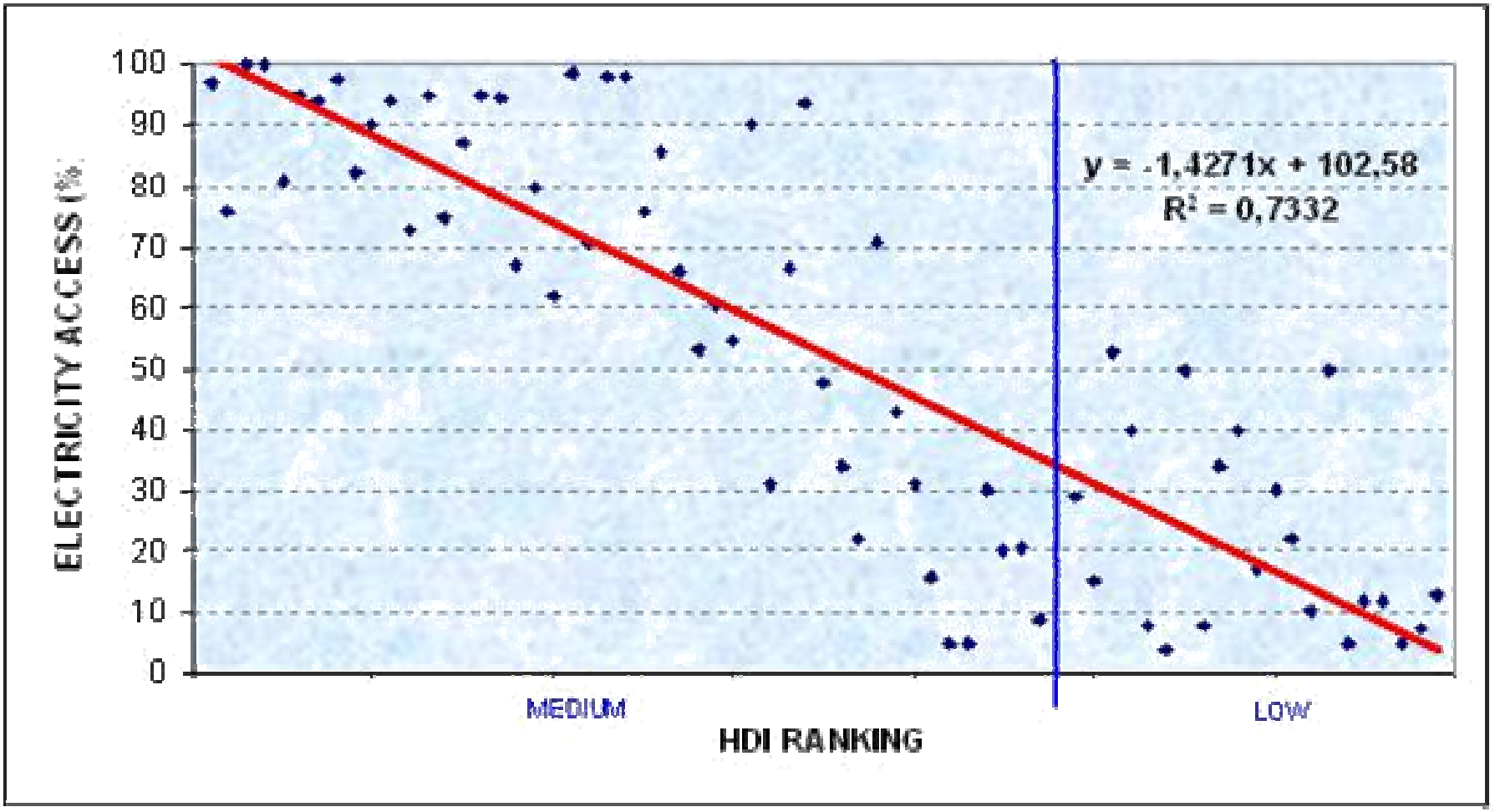
Poverty and access to electricity



- Correlation between access to electricity and poverty

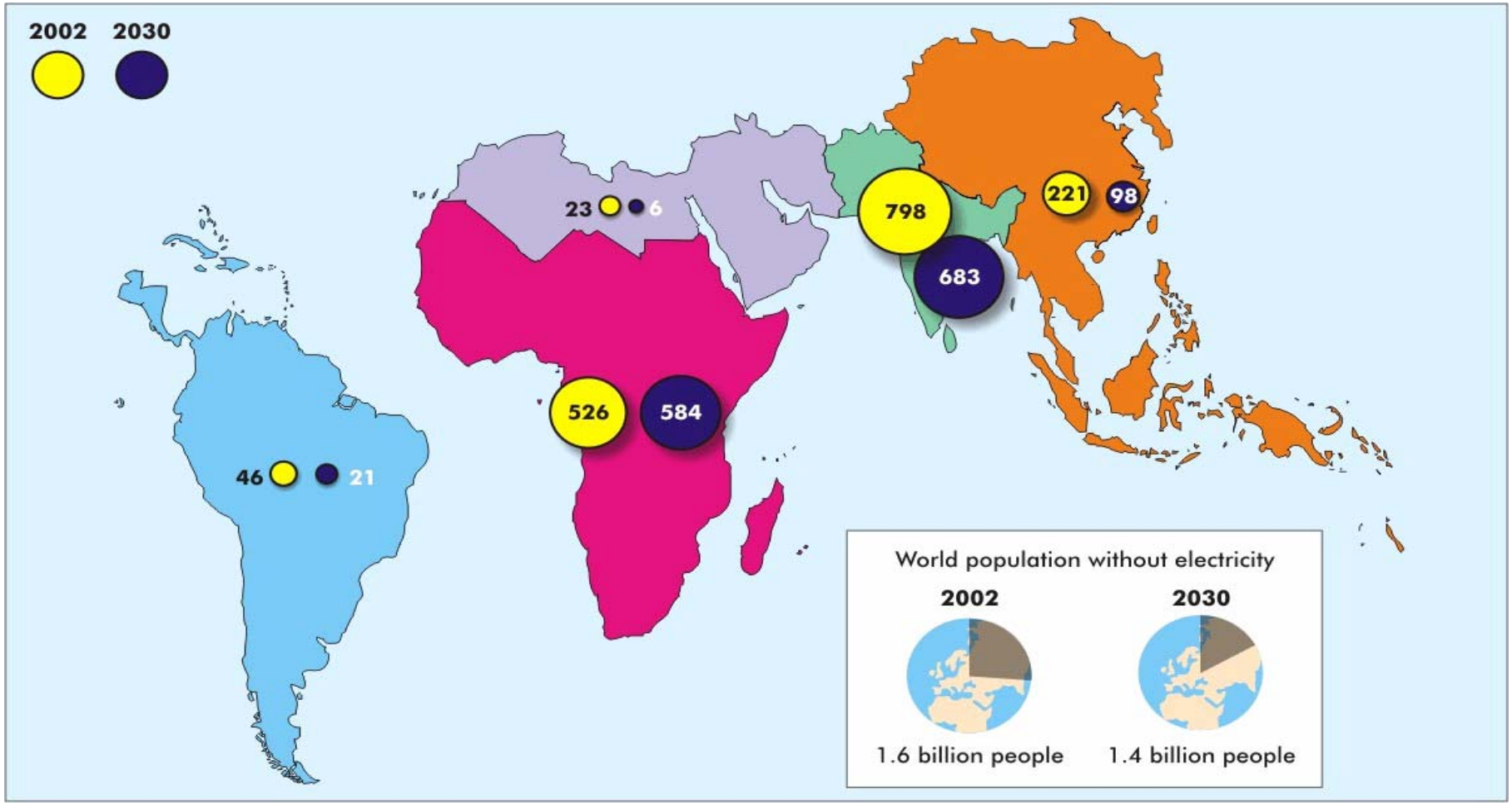
LINK ENERGY - POVERTY

Human development index and electricity access

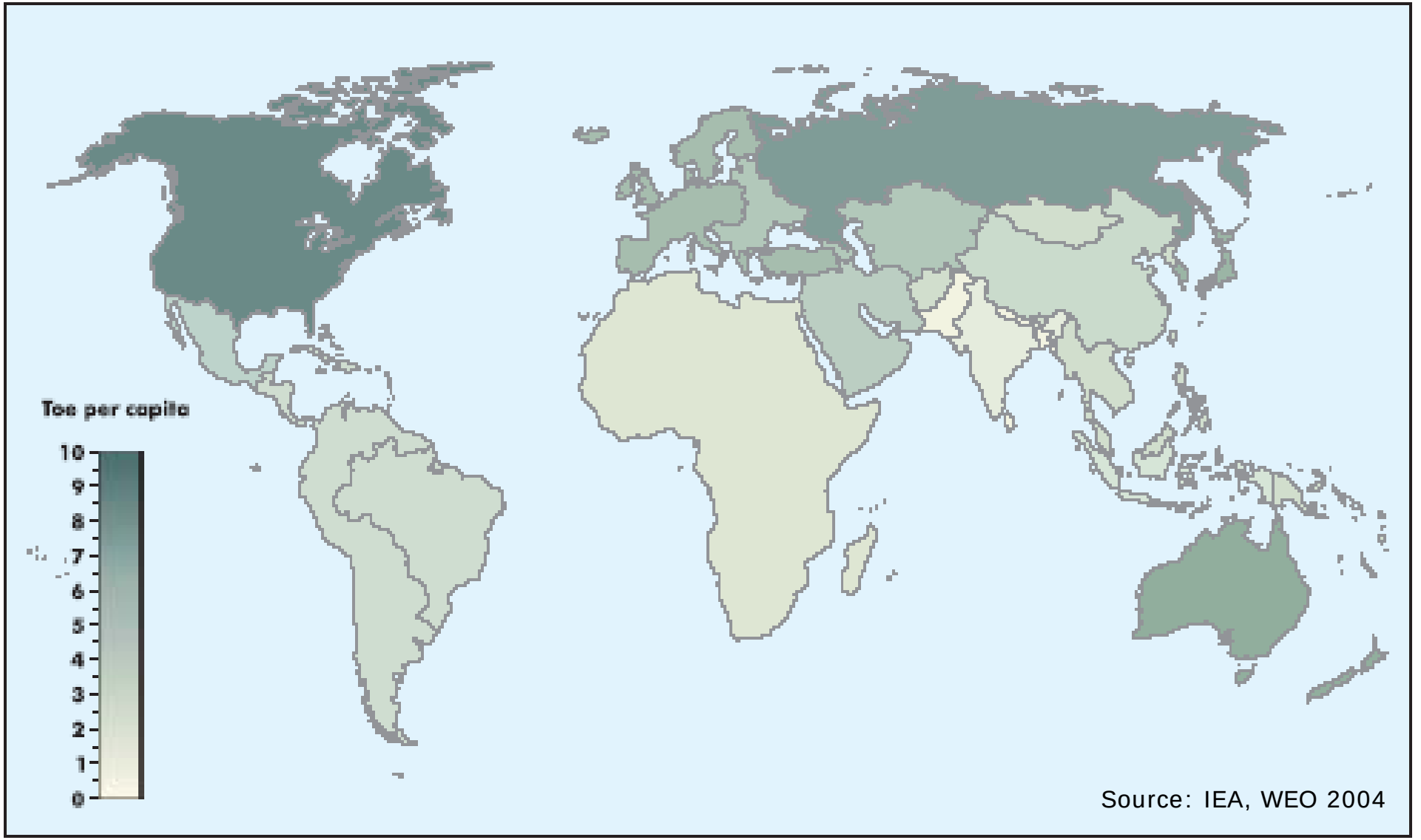


- Better correlation within low development countries according to the HDI

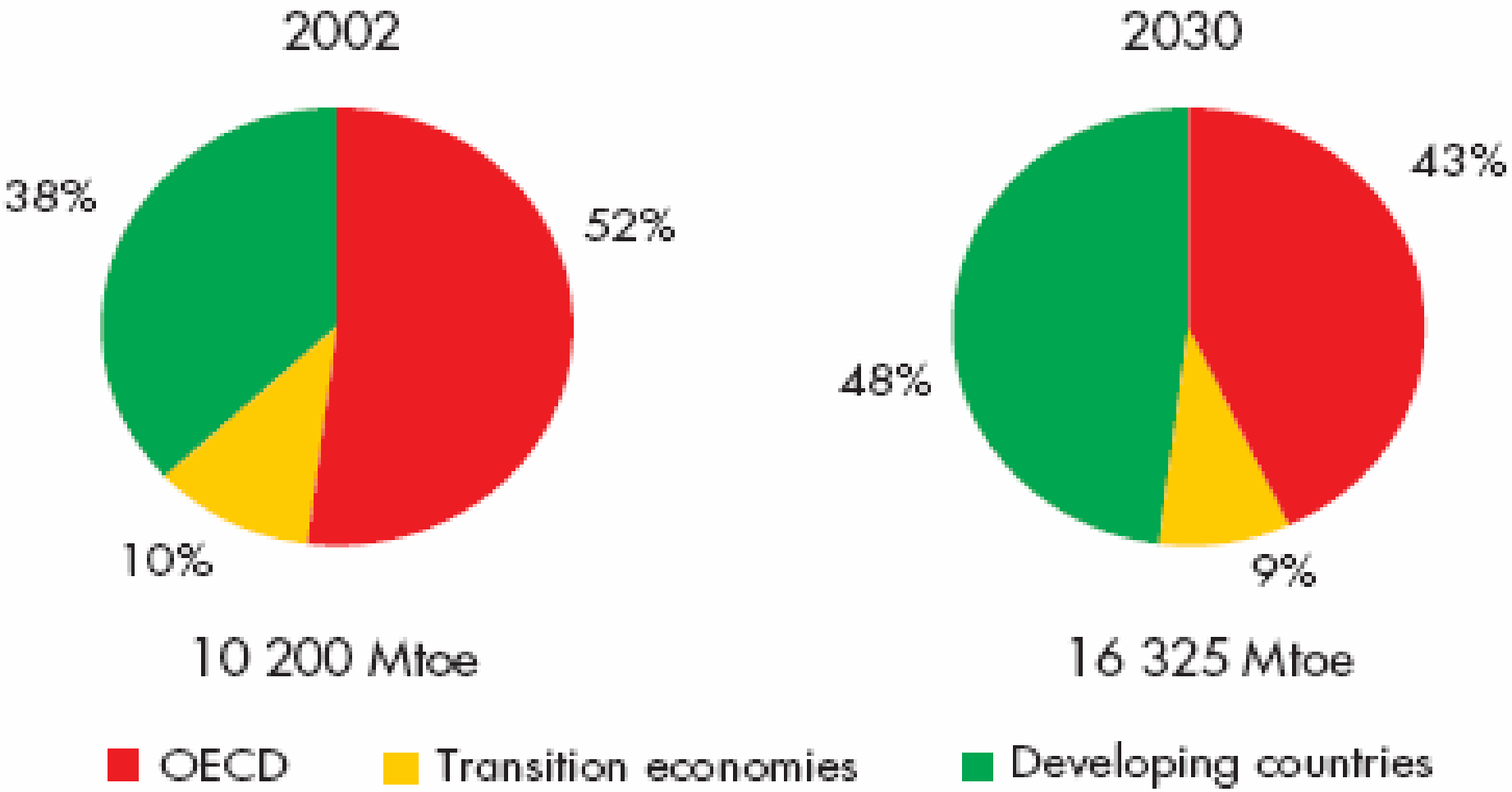
Electricity deprivation in the reference case
IEA WEO 2004



Primary Energy Consumption Per Capita, 2030

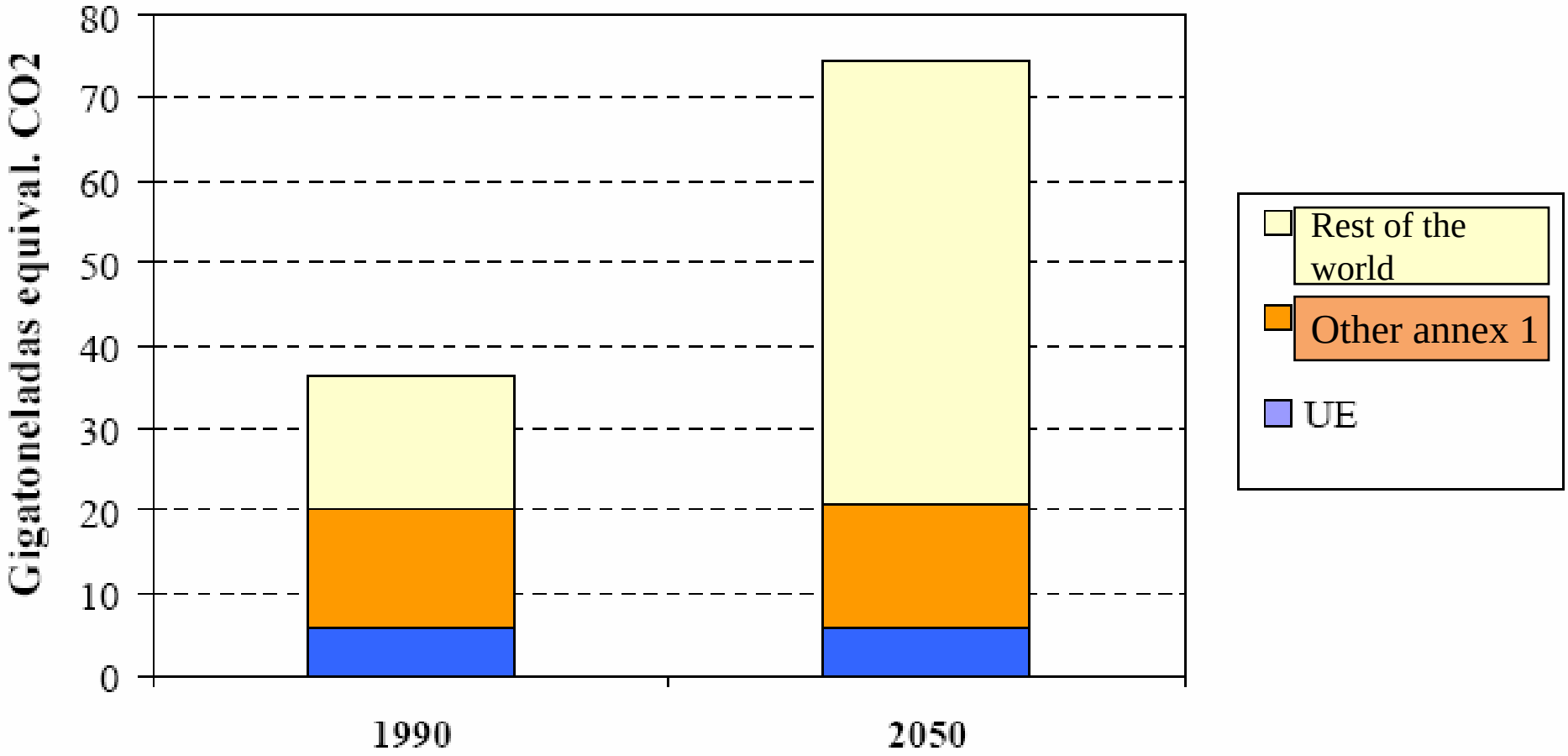


Regional Shares in World Energy Demand



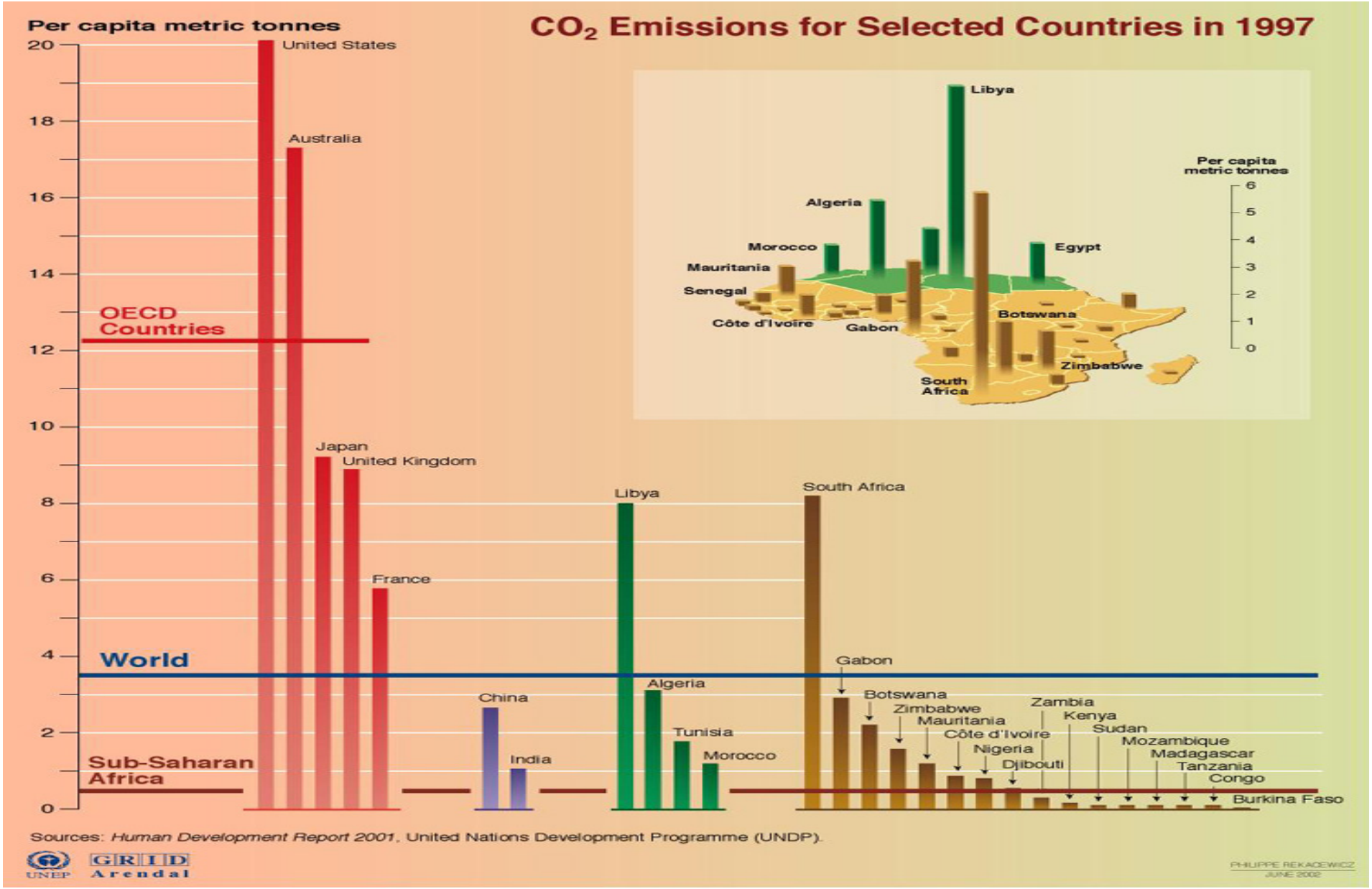
Source: IEA, WEO 2004

Estimated evolution of GHG emissions



Fuente: Greenhouse gas reduction pathways in the UNFCCC process up to 2025, CNRS/LEPII-EPE, RIVM/MNP, ICCS-NTUA, CES-KUL (2003).

The Dual Challenge



The challenge:

The gap between the “expected future” & the “sustainable future”

The outcome of prospective evaluation (1)

Main threats & challenges of the “current policies” scenario

- Global energy demand predicted to increase by 60% over the next 30 years
- Strong dependence on imports in most OECD countries or in the EU
  - EU energy dependence could rise from 50% to 70% by 2030; damaging volatility of oil prices and geopolitical instability
- Increasing carbon emissions, in contrast with climate change objectives
  - Over 90% of EU CO2 emissions, causing climate change, are attributable to energy

The outcome of prospective evaluation (2)

(continuation)

- Global energy investments of €12 trillion required up to 2030 – huge market potential, but EU under severe threat from global competitors
- Lack of a strategic choice of a sustainable base-load generation of electricity in the medium/long term: advanced nuclear? renewables?
- So far poor penetration of renewables, despite growth
- Need to drastically improve energy efficiency & saving, mostly in transport & building sectors
- Lack of universal access, but also the threat of implications of demand growth with a more equitable access to energy

The mechanisms of response

What can be done to move our energy model towards a sustainable path?

- Prospective & normative analysis
  - Identify threats / challenges
  - Define targets for action
- Fine tune the mechanisms of response
  - Demand-side measures
  - Renewable energy sources
  - Energy R&D
  - Define the role of nuclear energy
  - Universal access & international cooperation
  - Regulatory instruments
  - Education of public opinion

The need for normative evaluation
➔ Main guidelines for action

- Targets to achieve desired results, such as
  - How much effort in renewables?
  - What measures for high energy efficiency?
  - New standards & fuels for transportation?
  - What carbon emission limits?
  - Required advances in development of new technologies & the commensurate effort
  - How to meet the expected energy demand?

➔ Each country / Europe / world would need to agree on a strategic normative scenario

The mechanisms of response:
Some details

Demand-side measures (DSM)
Energy efficiency & energy saving

- Focus on energy significant sectors
  - In the long run, 40% of energy in buildings, 35% in transport & only 25% in industry
- Check final effectiveness of energy efficiency measures *(rebound effect)*
- Price measures can be effective in the case of **energy-intensive industries**
  - Here we have a competitiveness problem
  - Then, harmonization (at least European) of regulatory treatment is needed

Renewable energy sources (1)

- A large level of penetration of renewables is a key ingredient in any sustainable energy strategy
  - Promotion of renewables has direct costs
  - Difficulty in meeting the current targets
  - Progress strongly differs among Member States
    - Focus on the most successful promotion schemes
    - Identify & remove the barriers to penetration
- The challenges of integration into the electricity system
  - Volume of penetration depends on overcoming the present operational limits

Renewable energy sources (2)

- Much R&D in renewables is still needed
  - Precautionary principle would advise to make an extra effort so that electricity production with renewables takes off seriously as soon as possible
- Again, it is important to provide a long-term perspective
  - To reduce the uncertainty of investors
  - To quantify the role of renewables in the overall picture
- Adequate regulatory instruments *(see later)*

Renewables:

Will EU-25 achieve its targets in 2010?

	Target 2010	**Likely achieve-ment BAU**	**With additional <u>existing</u> policies**
RES-E	21%	18-19%	22-24%
RES-H	No % target Currently at 11%	12%	15%*
Biofuels	5.75%	~2-3%	~5%
RES total	12%	8-9%	11-12%

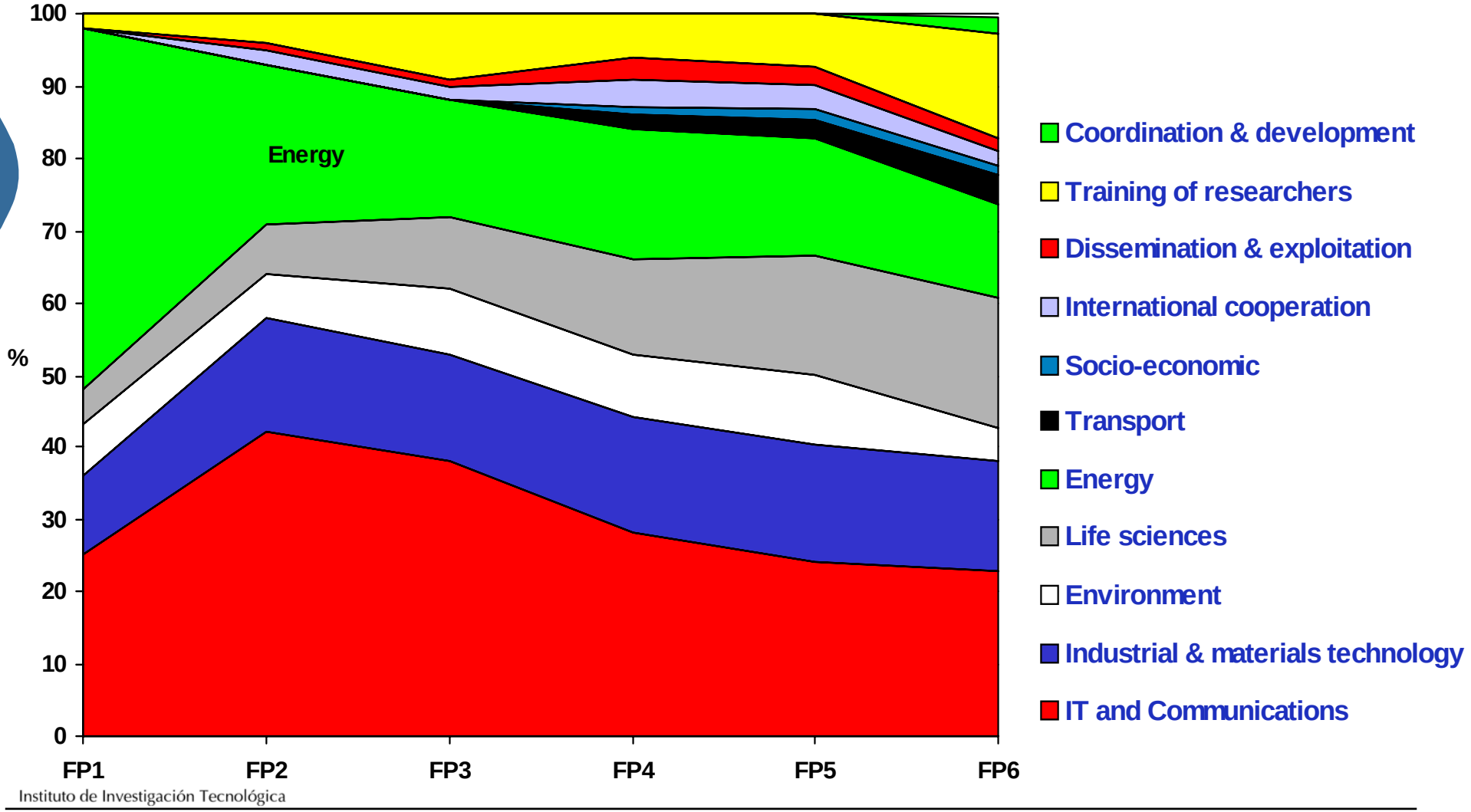
Fine tune the regulatory instruments *(examples)*

- Promotion of renewables
  - Identify / encourage the most successful / efficient methods
  - Avoid double counting *(e.g. feed-in tariffs on top of a market price that is affected by CO2 emission trading)*
  - Note that the benefits of most renewable sources accrue locally
- The EU emission trading scheme
  - Avoid allocating allowances on the basis of historical emissions for the present period ➔ no incentive towards a capacity mix with lower carbon emissions
  - No justification to give allowances whose cost is recovered by higher *(because of CO2)* electricity prices

R&D in energy

- The only route to a sustainable energy system is through new or improved energy technologies that will have to be found through research and development
- No single energy technology on its own will provide the solution, so research must be carried out across a wide range of technology options
  - Targeted research should be performed in a range of energy technology areas, but on well-selected topics, tackling key tasks where a technical breakthrough would dramatically improve our chances of making our energy system sustainable
- Research across Europe is fragmented
  - It is necessary a well-coordinated approach across Europe, and a pooling of the resources available at regional and national levels
- Effort devoted to energy R&D must drastically increase

EU RTD PRIORITIES

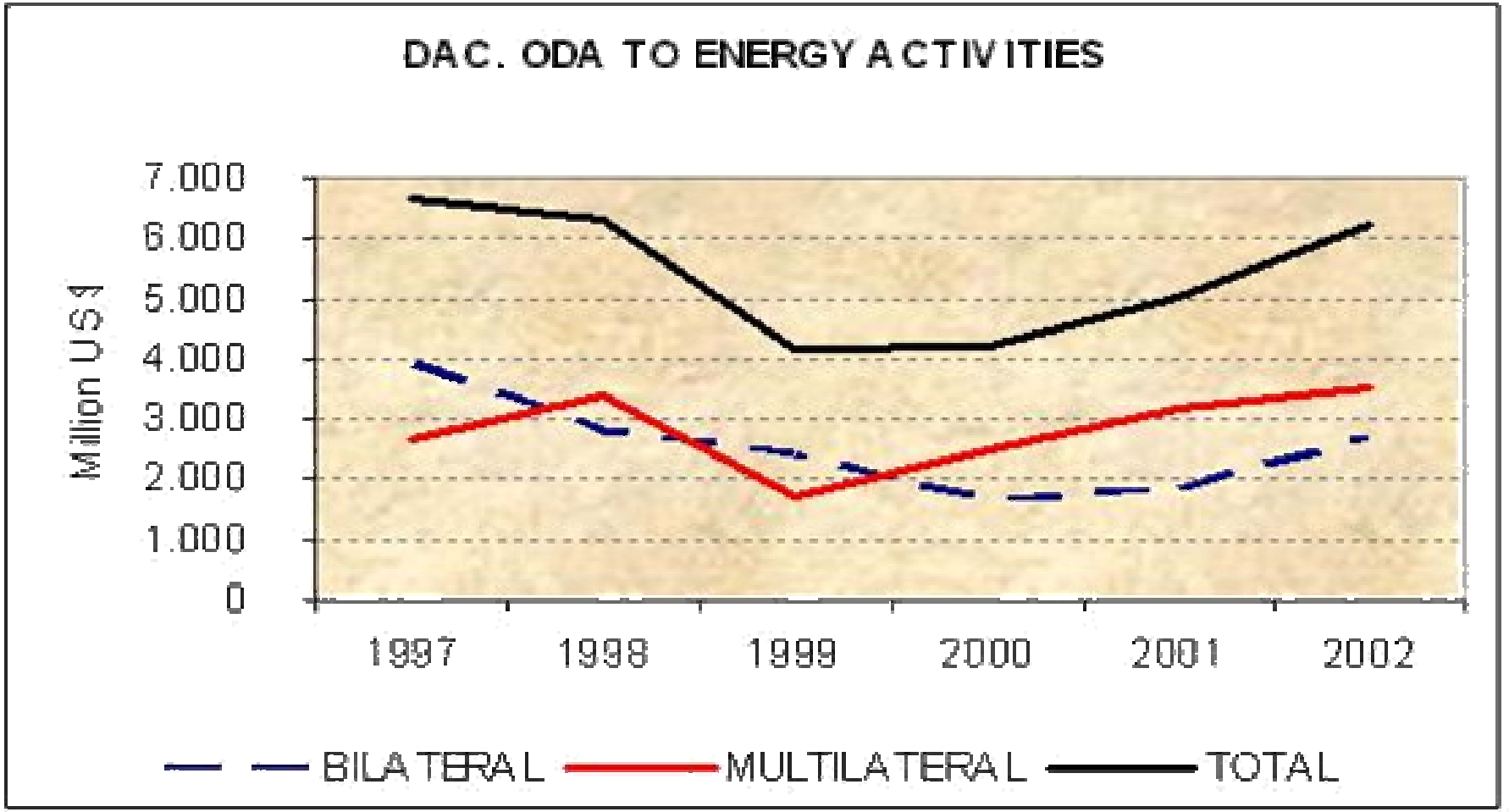


Universal access & international cooperation

- Aid programs for energy access in developing countries have to be thought over again
  - Do not confuse just access to modern forms of energy for the poor with climate change issues
  - General electricity regulatory reforms will do no good ➔ specific measures will be needed
  - Public *(or private via ad hoc regulation)* funds will be needed for electrification *(they may result from restructuring processes in parallel)*
  - Good government, market reform & stable investment climate are essential
  - Strategies should be tailored to the specific needs of each society
  - Sound economic & regulatory principles
    - E.g. implement subsidies that facilitate investment and not ones that subsidize consumption

Bilateral and multilateral aid

DAC ODA



- Fluctuation between years both in quantity and type (more multilateral than bilateral)
- Total mean value is about 5400 MUS $
- Bilateral is 2560 (6.5 % of total ODA)

What is a common EU energy policy?

Do we need one?

What is a common EU energy policy?

- We start from the reality of an **Internal Market of Electricity & Gas**, open to competition, which should work properly
- Plus some **additional objectives** *(long-term ones, typically; sustainability is most important)*, which have to be made compatible with this market
- An **energy policy** would consist of a package of regulatory measures that are addressed to
  - making possible the correct functioning of the EU energy market
  - meeting the “additional objectives”

Instruments to meet the additional objectives

- Are these **additional objetives** compatible with **competitive** markets?
  - **YES,** since the role of any energy policy is to establish **boundary conditions** e **incentives** in the competitive market or to **eliminate barriers**, so that:
    - the **objectives** are met,
    - by means of **incentives**, elimination of **barriers** or establishing **restrictions**,
    - & facilitating this task with some **horizontal measures**

A common EU energy policy

- It does not exist yet
- **We need one**, since it will help in
  - designing & enforcing the rules of the IEM
  - making sure that the "additional objectives" *(such as compliance with the economic, environmental & social dimensions of sustainability* are also met
    - while complying with any established constraints

General recommendations

(source: SESSA project, www.sessa.eu.com)

General recommendations (1)

The lack of sustainability of our energy model will require strong changes in energy consumption & production patterns in the medium & long term; then

1. Move up energy in the political agenda
2. Rally public opinion around one major issue: the fight against climate change
3. Use a normative approach to establish specific long-term targets & guidelines to get there & check the consistency of any proposed package of measures with the long-term targets
4. Precautionary strategy: favor a multiplicity of approaches

General recommendations (2)

5. Reconcile markets & public policy by making clear strategic choices, removing uncertainties, using market mechanisms whenever possible & correct market failures whenever needed
6. Reduce regulatory uncertainty by a credible commitment of governments & regulators to long-term guidelines & targets
7. Policies affecting the energy sector should be made more consistent & harmonized at EU level *(emission allowances allocation, support to renewables, biofuels, strategy for acquisition of gas, etc.),* while trying to find the right equilibrium between regulatory measures adopted at MS & EU-levels

General recommendations (3)

8. Incorporate all countries to the solution: engage in "environmental diplomacy"
   - Nothing substantial can be achieved without the cooperation of the major players, as the USA
   - Maintain strong relationship with fuel-supplying countries
   - New aid strategies to facilitate energy access to deprived populations
9. It is necessary to educate & communicate better, open a public debate on the energy model & promote a radical change in attitudes towards a responsible use of energy

More specific policy actions

(source: BP chair on sustainable development, http://www.upcomillas.es/catedras/bp/Foro_05.asp)

The short-term actions

- Establish a **policy frame** ➔ normative scenario
  - Based on an informed assessment of the situation & capability & implications of each measure

  ➔avoid arbitrariness, provide predictability

  ➔provide conditions for change *(public awareness, cost internalization)*
- Undisputable **elements** *(based on normative scenario)*
  - Programs to curb energy consumption & to promote energy efficiency
  - Drastic promotion of renewable energy sources
  - Promotion of long-term R+D in energy field

Other priority actions

- Cooperation with developing countries to eradicate energy poverty
- Keep all energy options open
  - Establish the role of **nuclear** energy in the short / medium & long term
- Direct measures of limitation of emissions of greenhouse gases & contaminants
- Environmental diplomacy
- Education efforts to create a global conscience
- Regulatory measures to make compatible the liberalization of the energy sector & adequate infrastructure investment

Recent developments

- At EU level
- In Spain

The White Paper on regulatory reform in Spain
Sustainability issues

- The role of **indicative energy planning**
- An adequate treatment of renewable energy sources for electricity production
- Electricity demand-side management
- A special economic treatment for nuclear energy production
- Criteria for the allocation of CO2 emission rights to electricity generators

Sustainability issues in the White Paper
The role of indicative energy planning, IEP

- IEP is established by the Spanish Law, but it has not been used yet
- IEP does not replace nor interfere with freedom of entry &/or operation of the investors
- IEP must contribute a comprehensive perspective of all energy concerns & possible lines of action
- IEP must establish just boundary conditions & specific objectives
  - Desired renewable penetration levels
  - Targets for energy efficiency
  - Criteria for allocation of transmission rights
  - Environmental & energy taxes
  - Rol of nuclear power
  - Support to domestic coal
  - Reliability margins
  - Required capacity of interconnections, etc.
- Regulatory stability requires a political consensus on IEP

The EU Council of March 23 & 24, 2006
Identified challenges

- Increasing import dependency in oil & gas
- Limited diversification achieved so far, with high and volatile energy prices
- Growing global energy demand
- Security risks affecting producing and transit countries as well as transport routes
- Growing threats of climate change
- Slow progress in energy efficiency and the use of renewables
- The need for increased transparency on energy markets
- Further integration and interconnection of national energy markets with the energy market liberalisation nearing completion (July 2007) but limited coordination between energy players
- Large investments are required in energy infrastructure

The EU Council of March 23 & 24, 2006
Energy Policy for Europe: objectives

Security of supply

- Develop a common external policy approach in support of energy policy objectives
- Intensified diversification with respect to internal & external energy sources
- Ensure common operational approaches to address crisis situations in a spirit of solidarity
- Develop tools for analysis of long-term energy supply & demand perspectives

The EU Council of March 23 & 24, 2006
Energy Policy for Europe: objectives

EU competitiveness

- Full opening of the IEM by 2007
- Ensure full implementation of the EU IEM legislation
- Enhance the coordination & role of energy regulators
- Promote extension of IEM approach to neighboring countries
- Foster rapid development of most needed gas & electricity interconnections
  - Facilitate integration of regional markets
  - Reduce administrative & regulatory barriers

The EU Council of March 23 & 24, 2006
Energy Policy for Europe: objectives

Environmental sustainability

- Action Plan on energy efficiency
- Continue present effort to deploy renewable energy sources in a cost-efficient way & increase the present targets in the medium & long term
  - Implement a Biomass Action Plan
- Review the current Emission Trading Scheme with a view to the post-Kyoto period
- Ensure adequate support to energy R&D
  - Energy efficiency, sustainable energies & low emission technologies

The EU Council of March 23 & 24, 2006
EPE: maneuvering to avoid the conflicts

(source: Declaration of the EU Council, March 23 & 24, 2006)

- *"In fulfilling these main objectives the Energy Policy for Europe (EPE) should:*
  - *Ensure transparency and non-discrimination on markets*
  - *Be consistent with competition rules*
  - *Be consistent with public service obligations*
  - *Fully respect Member States' sovereignty over primary energy sources and choice of energy-mix"*

The struggle to maintain “national champions”

- Conflicts have appeared when some countries, such as Spain or France, have attempted to protect their “national champions” from being taken over by companies from other countries
  - Do these takeovers really affect security of supply in the considered country?
  - Should security of supply be entirely left to adequate regulation or should countries keep some measure of control? Up to which point?
  - Should capital markets have no restrictions crossing borders while energy markets progress so slowly & some countries are not even sufficiently connected to others?

Personal reflections

- EPE is
  - missing the global perspective of the energy problem
  - downplaying the social component of sustainability
  - not providing a clear guideline on the conflict between national & European interests

End of presentation

Thank you for your attention