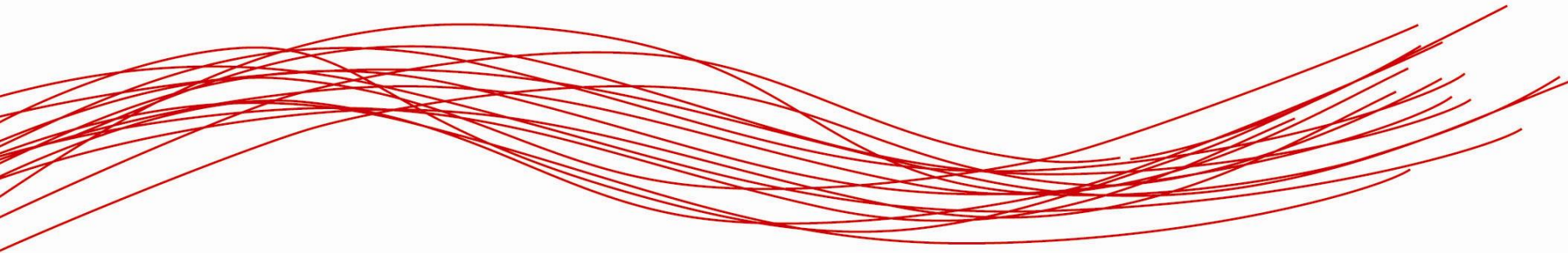


**Collège Belgique**  
**Académie royale des Sciences, des Lettres et des Beaux-Arts**

# **La prospective: Défis, limites et résultats**



**Domenico ROSSETTI di VALDALBERO**  
**Commission européenne, DG de la Recherche et de l'Innovation\***  
**Domenico.Rossetti-di-Valdalbero@ec.europa.eu**

**Bruxelles, le 6 avril 2011**

\* S'exprimant à titre personnel



***Ignoranti quem portum petat nullus suus  
ventus est***

***Seneca***

**If one does not know to which port one is sailing,  
no wind is favourable**

# Contents

- **Theoretical aspects of Forward Looking Activities (FLA)**
- **FLA limits and challenges - *Ex-post* and *Ex-ante* evaluations**
- **Trends and Tensions:**
  - Demography and macro-economics
  - Energy and land-use
  - Research and innovation
- **Transitions and personal conclusions**

# Theoretical aspects of Forward Looking Activities (FLA)

# Past, present and future

- **Human life: 80-85 years**
- **Professional life: 35-40 years**
- **Education: 10-20 years**
  
- **Building sector: 100 years**
- **Electricity sector and transport infrastructure: 50 years**
- **Industrial equipment: 10-20 years**
- **End-use appliances and cars: 3-10 years**



# A tentative definition

Using a combination of qualitative and quantitative methods, Forward looking is a sensitive exercise oriented towards the future at the junction of dream and reality aimed at shaping a more sustainable world

*Utilisant des méthodes aussi bien qualitatives que quantitatives, la prospective est un exercice périlleux tourné vers l'avenir au carrefour du rêve et de la réalité et qui vise à façonner un monde plus durable*

# Foresight – Vision - Imagination

- To anticipate new societal challenges / Scenarios
- To inspire EU policies by imaginative thoughts
- To scan the « weak signals » and the « wild cards » including the potential technological and social breakthroughs
- To provide a common European vision

## Theoretical and policy-relevant but... « rhetoric »

Delphi method and Experts opinions, public opinion perception (Eurobarometer), participatory workshops (EASW, CSO)



# Forecasting – Modelling - Planning

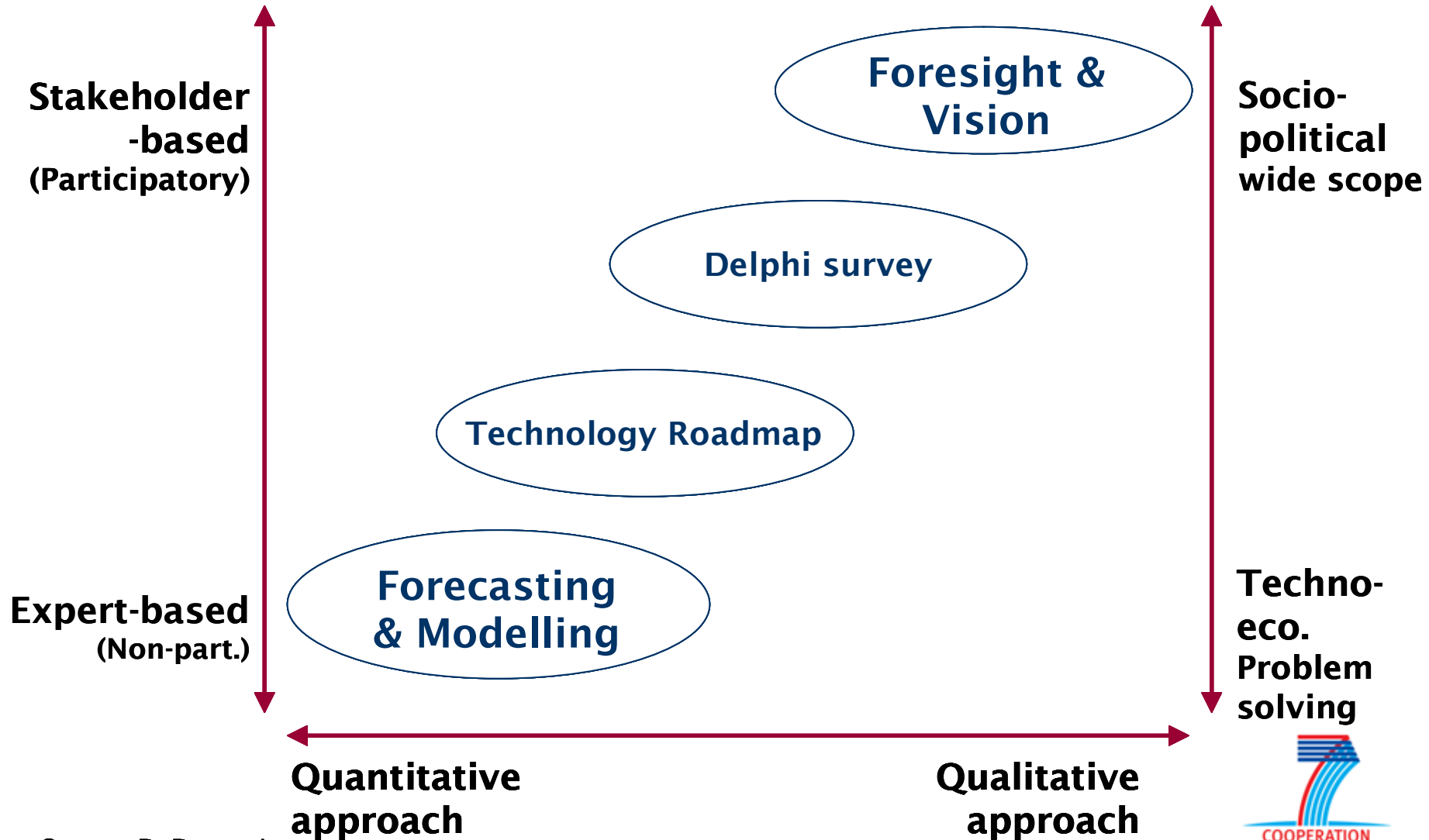
- To generate the evidences able to support priority setting
- To give transparency (cf. statistics) to several alternatives
- To evaluate the economic, social and environmental impacts of proposals (*ex-ante* Impact Assessment)
- To better plan and to draw a strategy

## Practical and operational but... « technical »

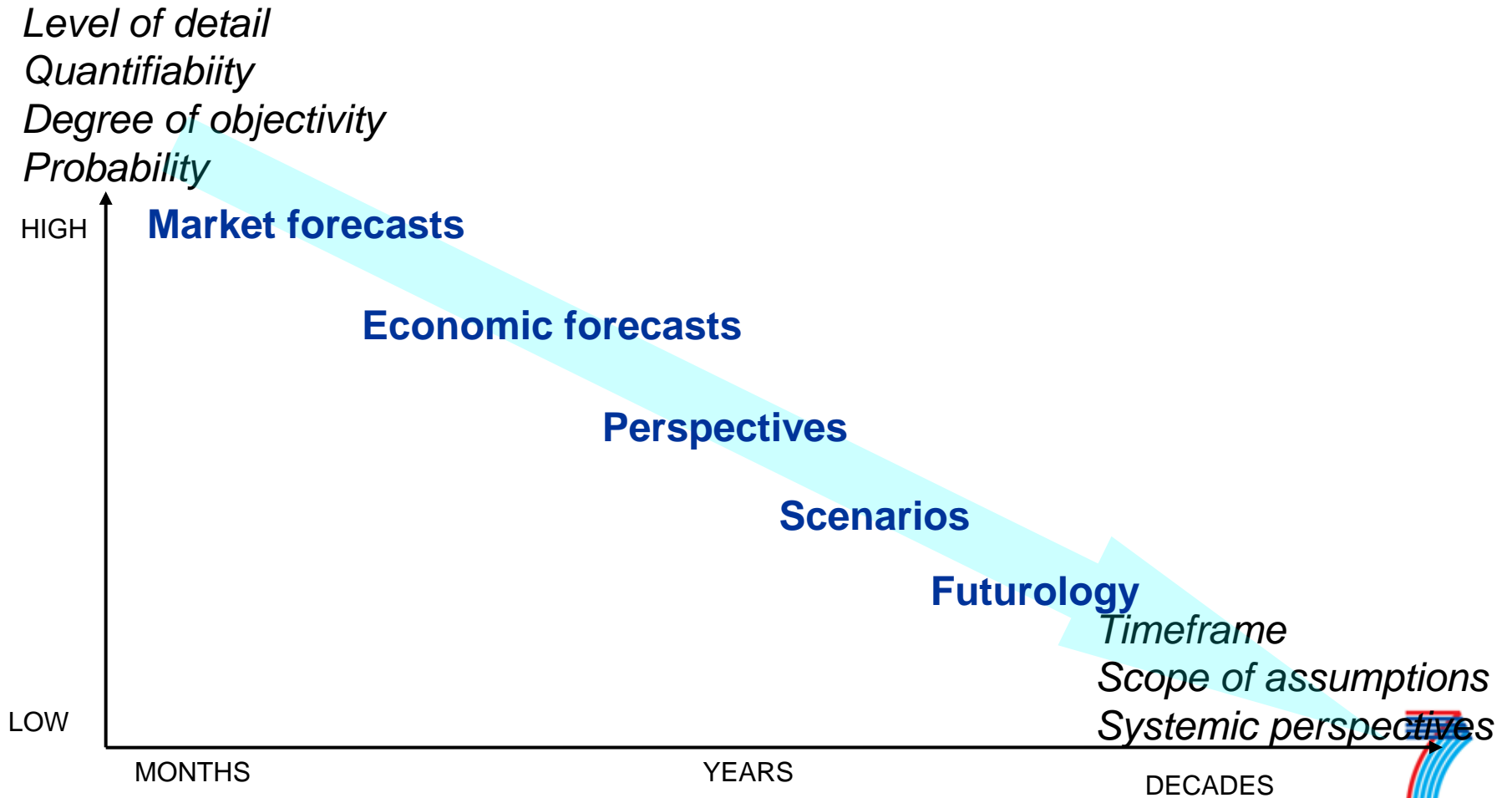
Top-down (econometric, CGE) and Bottom-up (technology-rich) models, accounting frames and databases



# Methods: Qualitative and Quantitative



# Methods: Prediction and Hope



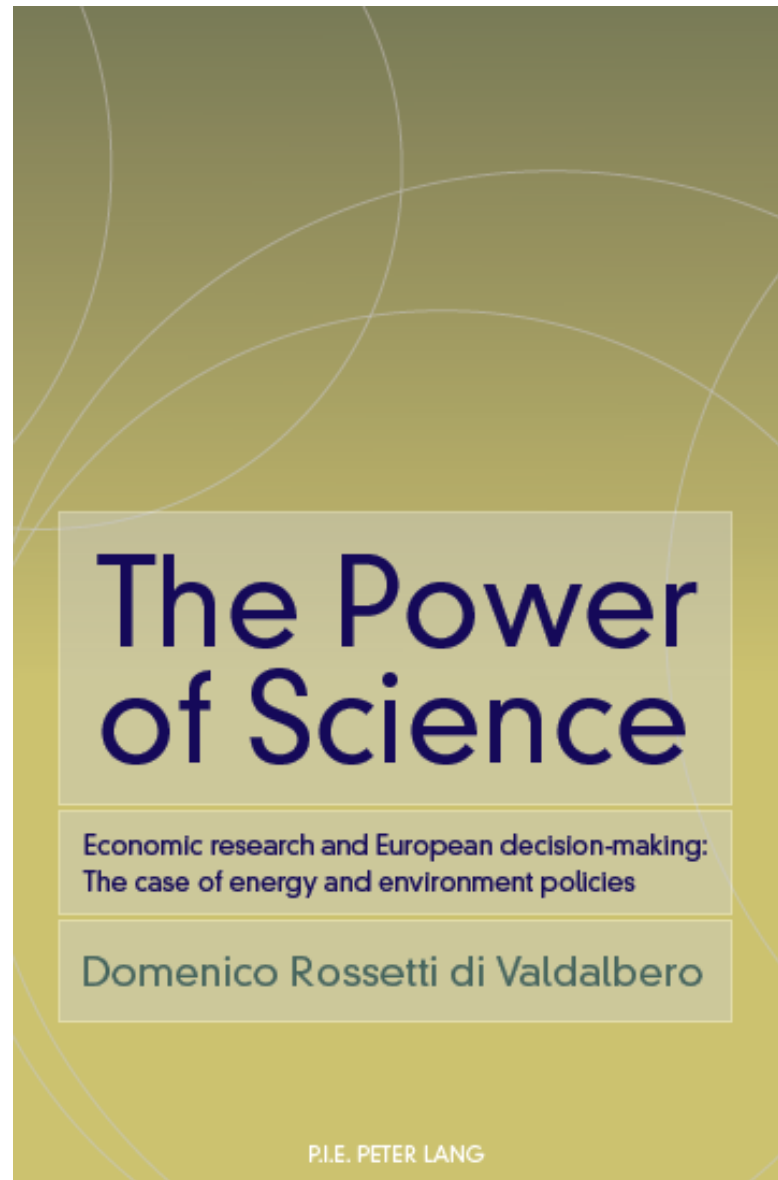
Source: Fraunhofer - Envisioning future research horizons

# EU Forward Looking Activities

- **Foresight, Forecast, Horizon scanning, Technology Assessment, Impact Assessment, *Prospective***
  
- **A long tradition in the EU**
  - European Council: Gonzalez Report « Europe 2030 »
  - EP: Scientific Technology Options Assessment (STOA)
  - Council and Member States: Joint Programming (JPI)
  - European Commission (see next slide)

# EU Forward Looking Activities

- **A long tradition in the European Commission:**
  - FAST and *Cellule de Prospective*
  - Multiannual Financial Perspectives
  - Long-term planning (SF, FP,...)
  - Europe 2020
  - Roadmap to a low carbon economy in 2050
  - Transports 2050
  - ...



# **FLA limits and challenges**

## ***Ex-post* and *Ex-ante* evaluations**

# Modesty is a must

- **Financial and economic crises**
- **Technological developments**
- **Social habits**
- **Political movements**
- **...**

# Controversies on FLA

- **Baseline / Reference scenario?**
- **Objectivity and bias among experts?**
- **Clarity and opacity of models?**
- **Conventional thinking and beyond it?**
- **Over and sub simplification of complexity?**

# Some Weak signals and Wild cards

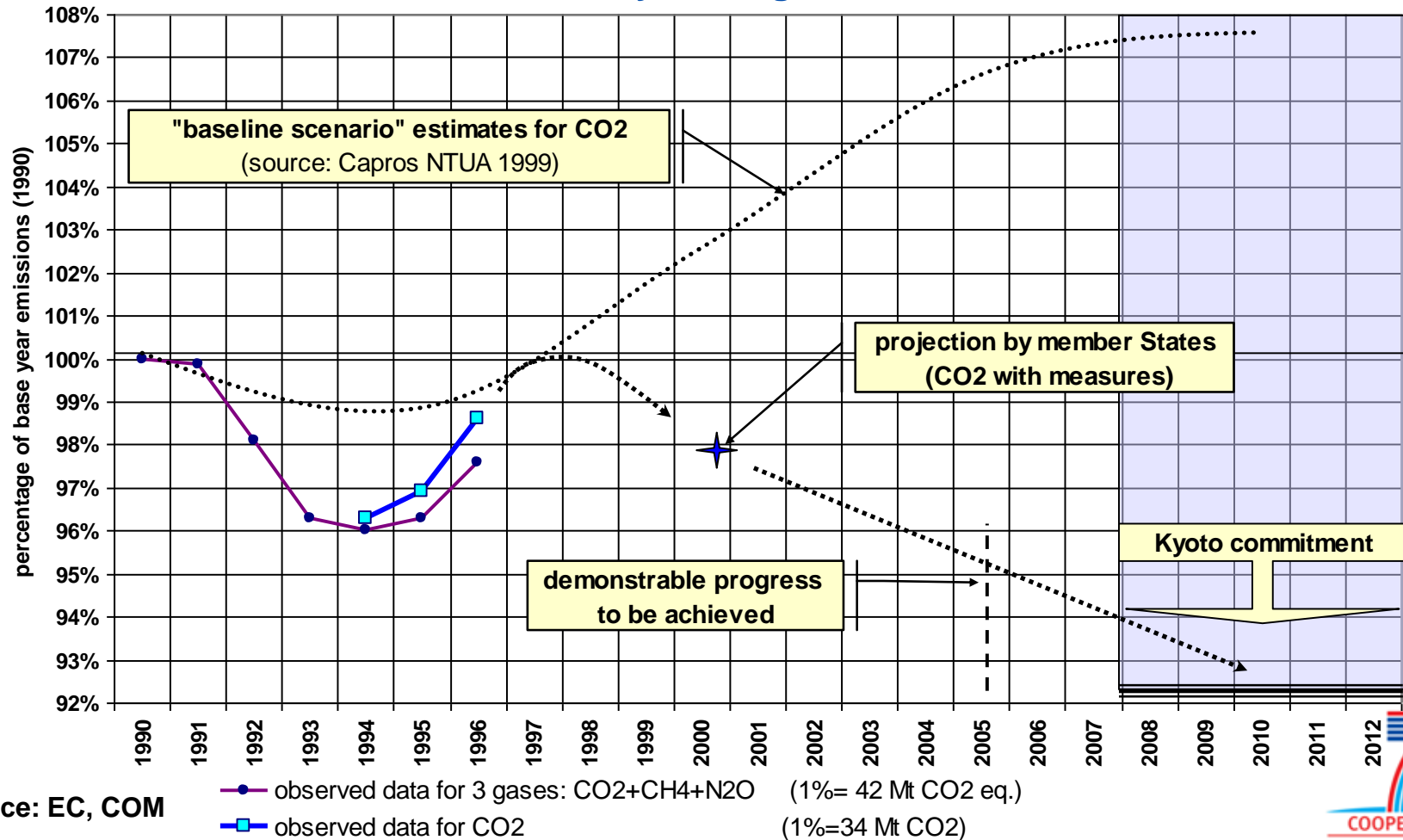
<b>Global pandemics</b>	<b>Extensive democratization of Arab countries</b>
<b>Civil war in China or India</b>	<b>Post-human or “trans-humanism”</b>
<b>World economic collapse</b>	<b>Loss of satellite communication</b>
<b>Major intergenerational conflicts</b>	<b>Nuclear war in Middle-east</b>
<b>Massive climate migration</b>	<b>Sharia in Europe</b>
<b>Extreme right governments (Europe, USA)</b>	<b>End of capitalism and privacy</b>

Source: European Commission, DG RTD, The World in 2025 and “Global Europe 2030/2050”



# Ex-ante Impact assessment Climate Change

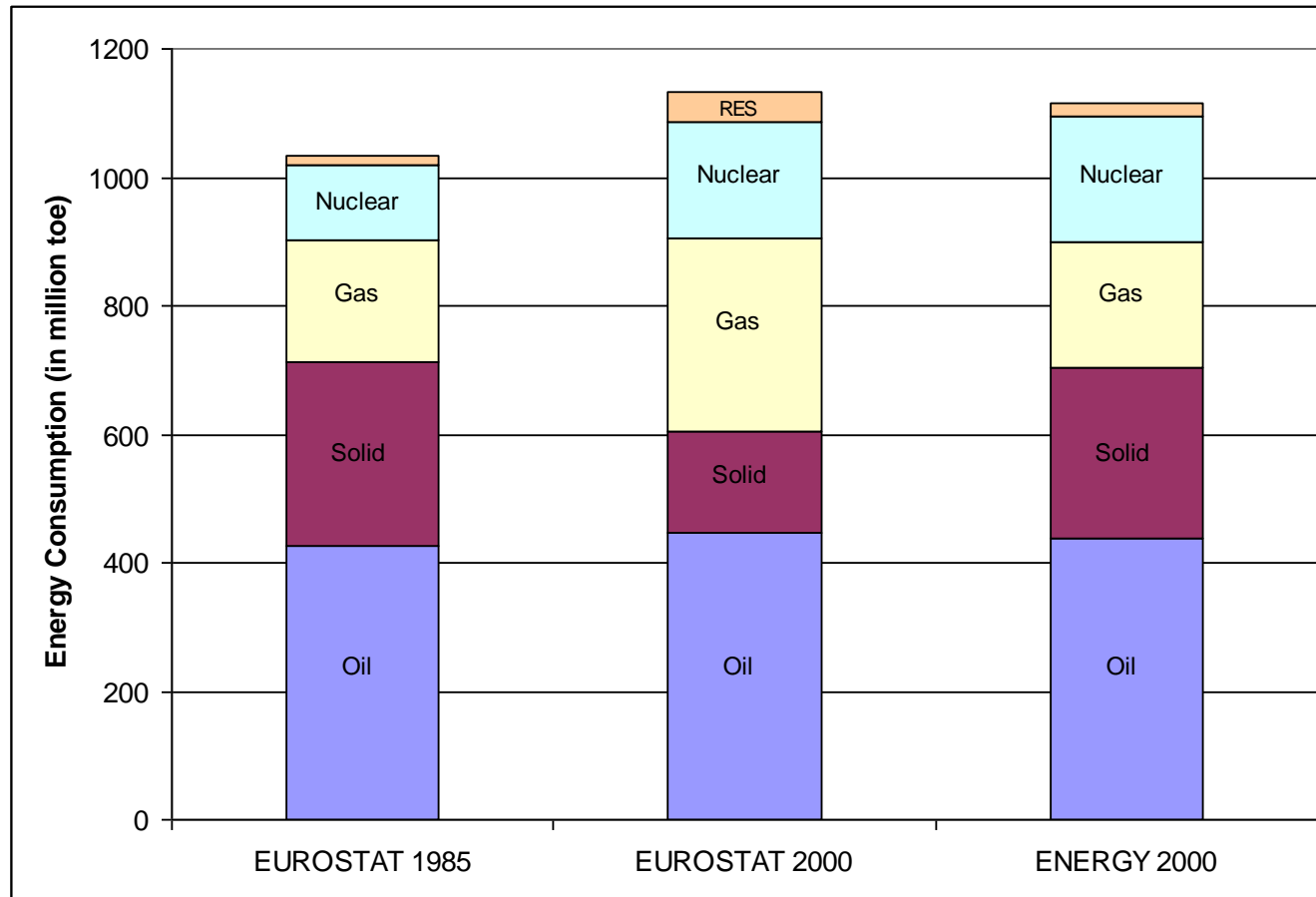
## Baseline for the Kyoto target – PRIMES model



# Ex-post evaluation of FLA

## « Energy 2000 »

### EFOM and MEDEE models



Source: D. Rossetti, The Power of Science



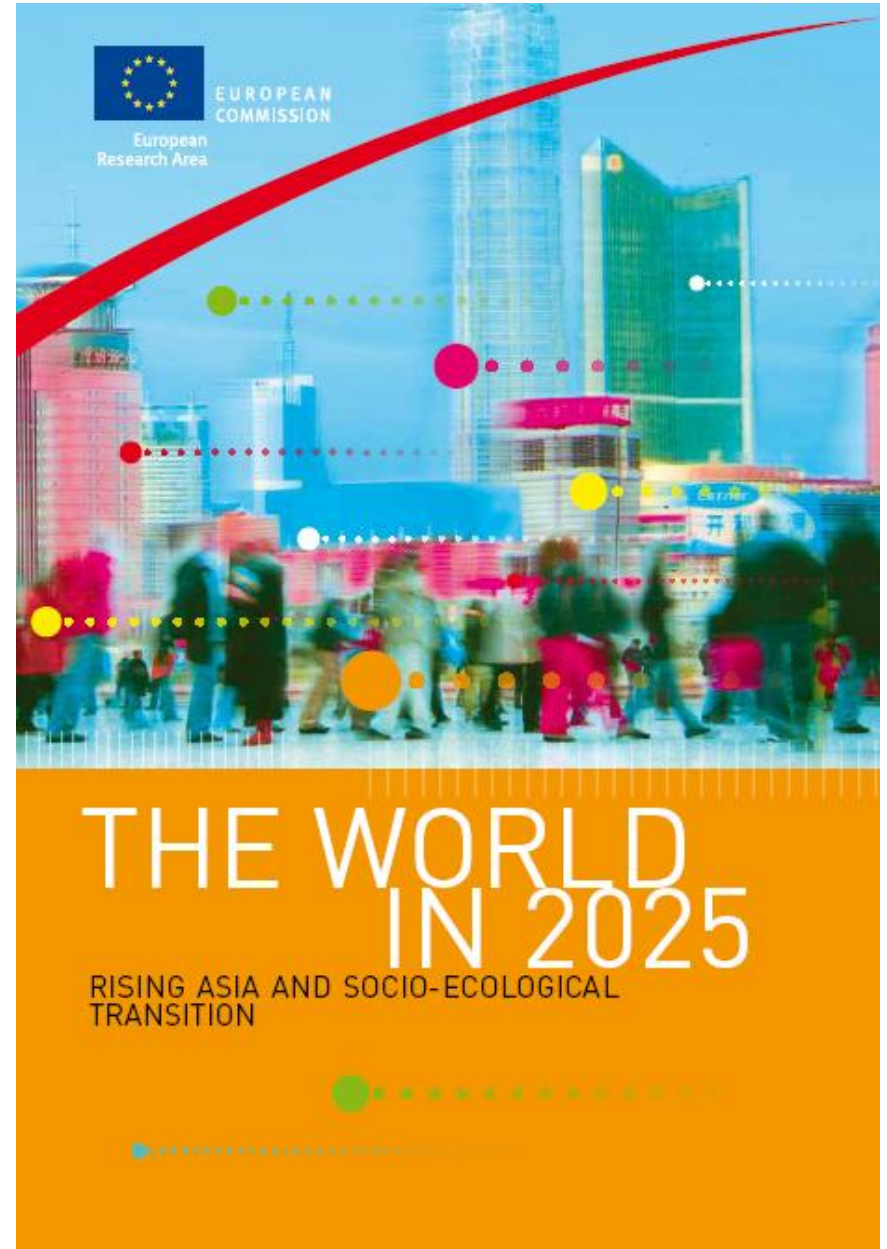
EUROPEAN COMMISSION / European Research Area / Socio-economic Sciences & Humanities

European Forward Looking Activities

EU Research in Foresight and Forecast

PROJECT INFORMATION

The cover features a vibrant, abstract image of a city at night with light trails and a purple-to-green gradient background. A white text box on the right contains the title and subtitle. The European Commission logo and project information are in the top left corner.



EUROPEAN COMMISSION / European Research Area

THE WORLD IN 2025

RISING ASIA AND SOCIO-ECOLOGICAL TRANSITION

The cover features a blurred city street scene with a large red curved line and colorful dots. The title 'THE WORLD IN 2025' is prominently displayed in white on an orange background. The subtitle 'RISING ASIA AND SOCIO-ECOLOGICAL TRANSITION' is below it. The European Commission logo and project information are in the top left corner.

# **Trends and Tensions**

## **Demography and macro-economics**

# Largest countries by 2025 (100 million or over)

- China (1453)
- India (1431)
- EU-27 (517)
- USA (358)
- Indonesia (263)
- Pakistan (246)
- Brazil (214)
- Nigeria (210)
- Bangladesh (195)
- Russia (132)
- Mexico (123)
- Japan (120)
- Ethiopia (119)
- Philippines (117)
- Egypt (105)
- **Not a *single* European country in this list**

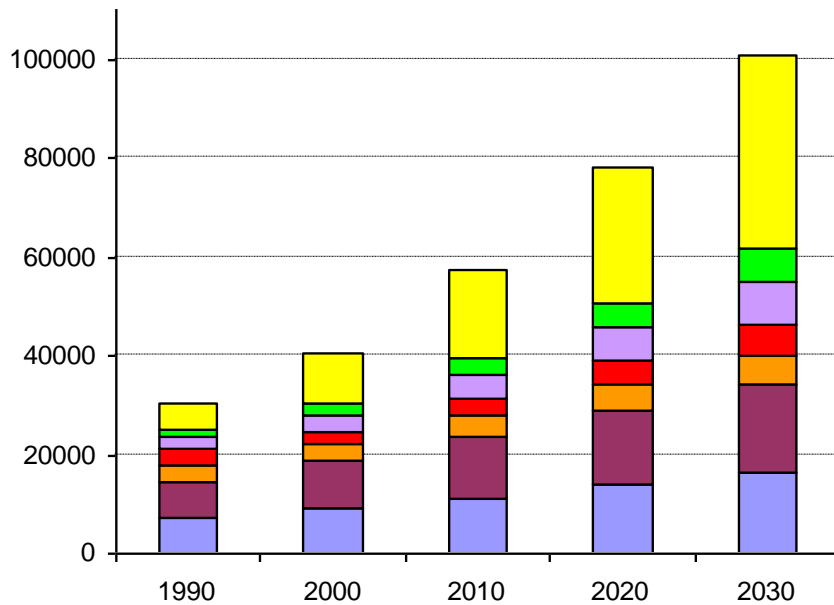
*Il n'y a plus que des petits pays en Europe, mais certains ne le savent pas (Paul-Henri Spaak)*

Source: UN

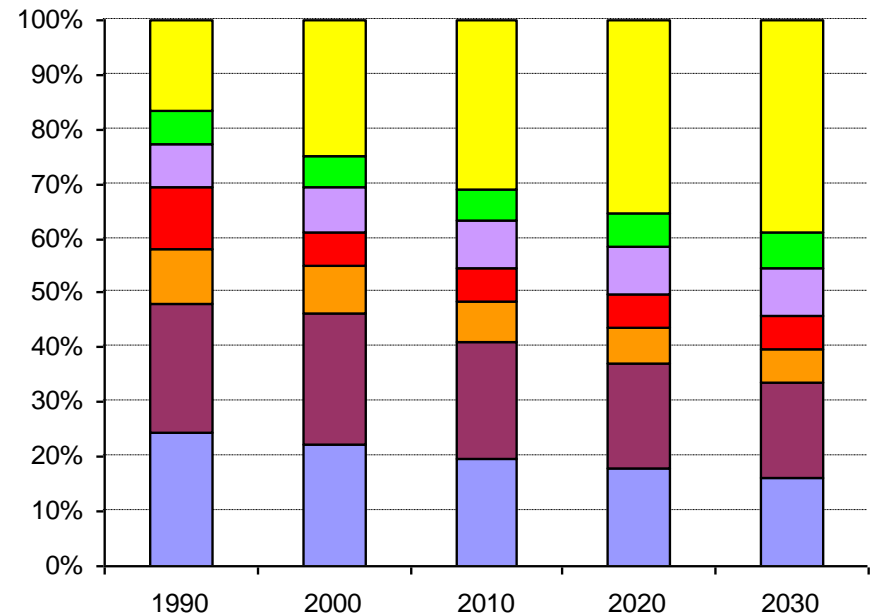


# World and EU GDP

World GDP (Billion 99 €)



Share of World GDP



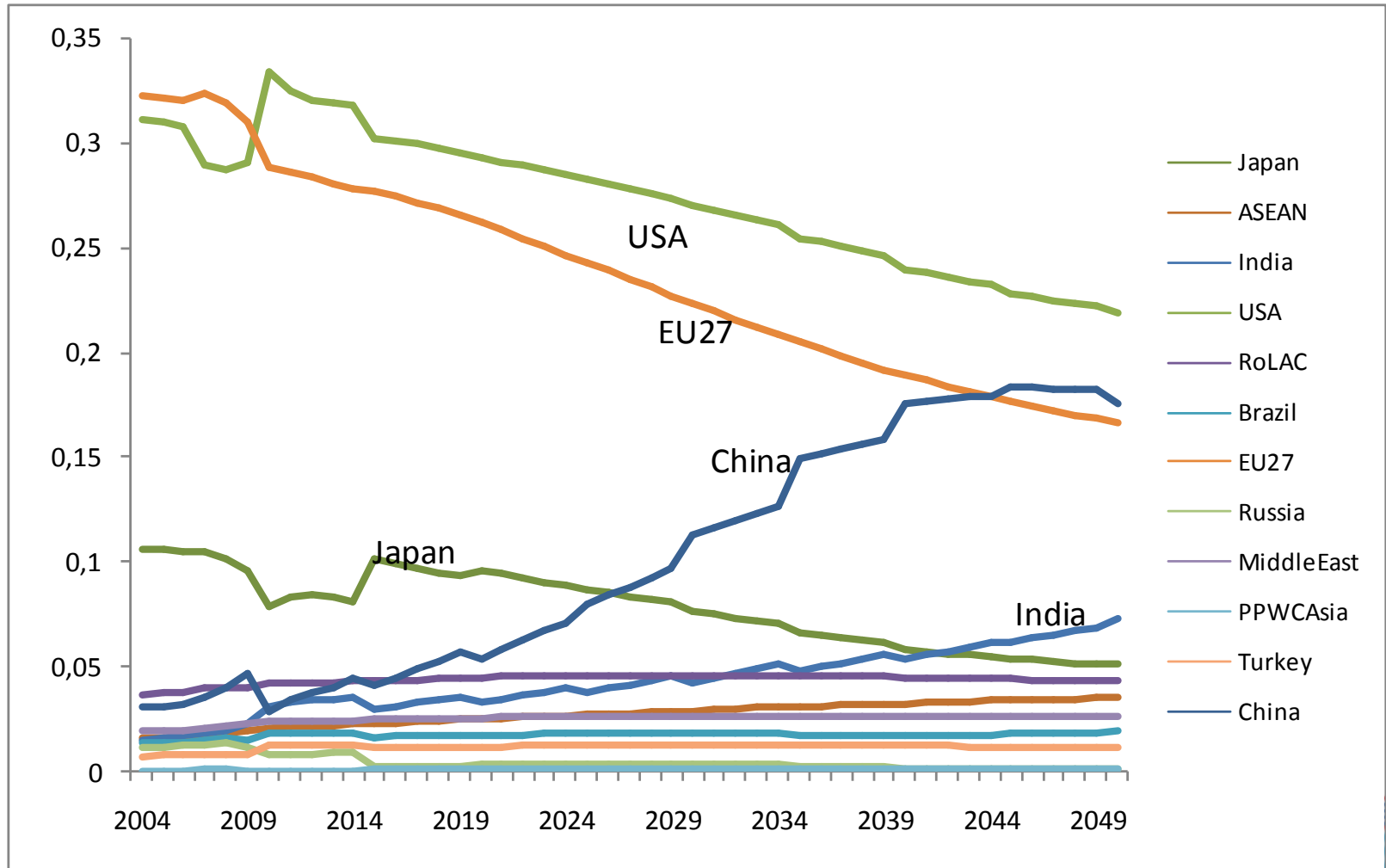
■ Western Europe    ■ North America    ■ Japan, Pacific  
■ CIS, CEEC    ■ Latin America    ■ Africa, Middle-East  
■ Asia

■ Western Europe    ■ North America    ■ Japan, Pacific  
■ CIS, CEEC    ■ Latin America    ■ Africa, Middle-East  
■ Asia

Source: European Commission, DG RTD (WETO), POLES model, P. Criqui

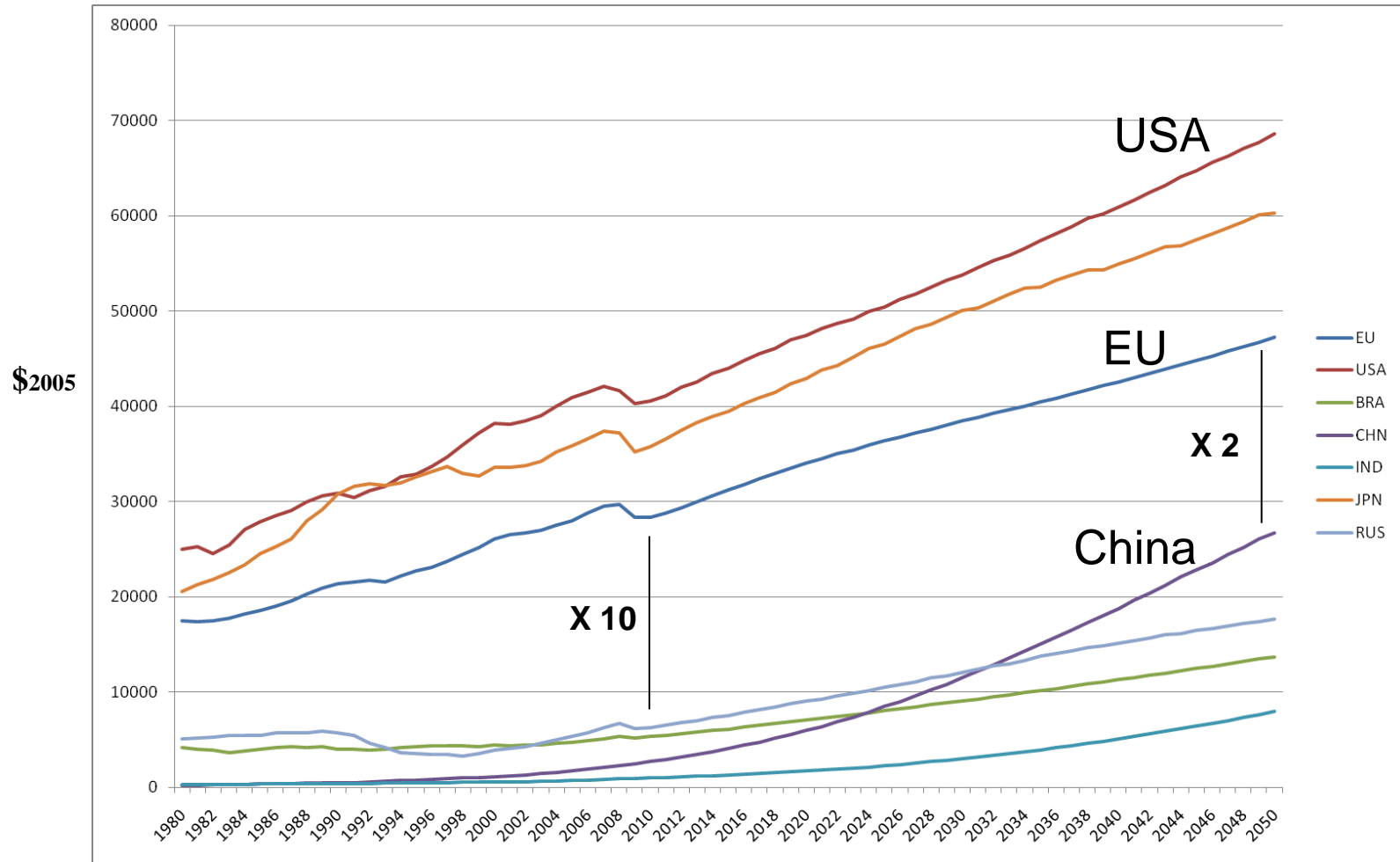


# “Nobody cares” – Consumption share



Source: European Commission, DG RTD (Global Europe 2030/2050), MIRAGE model, L. Fontagné

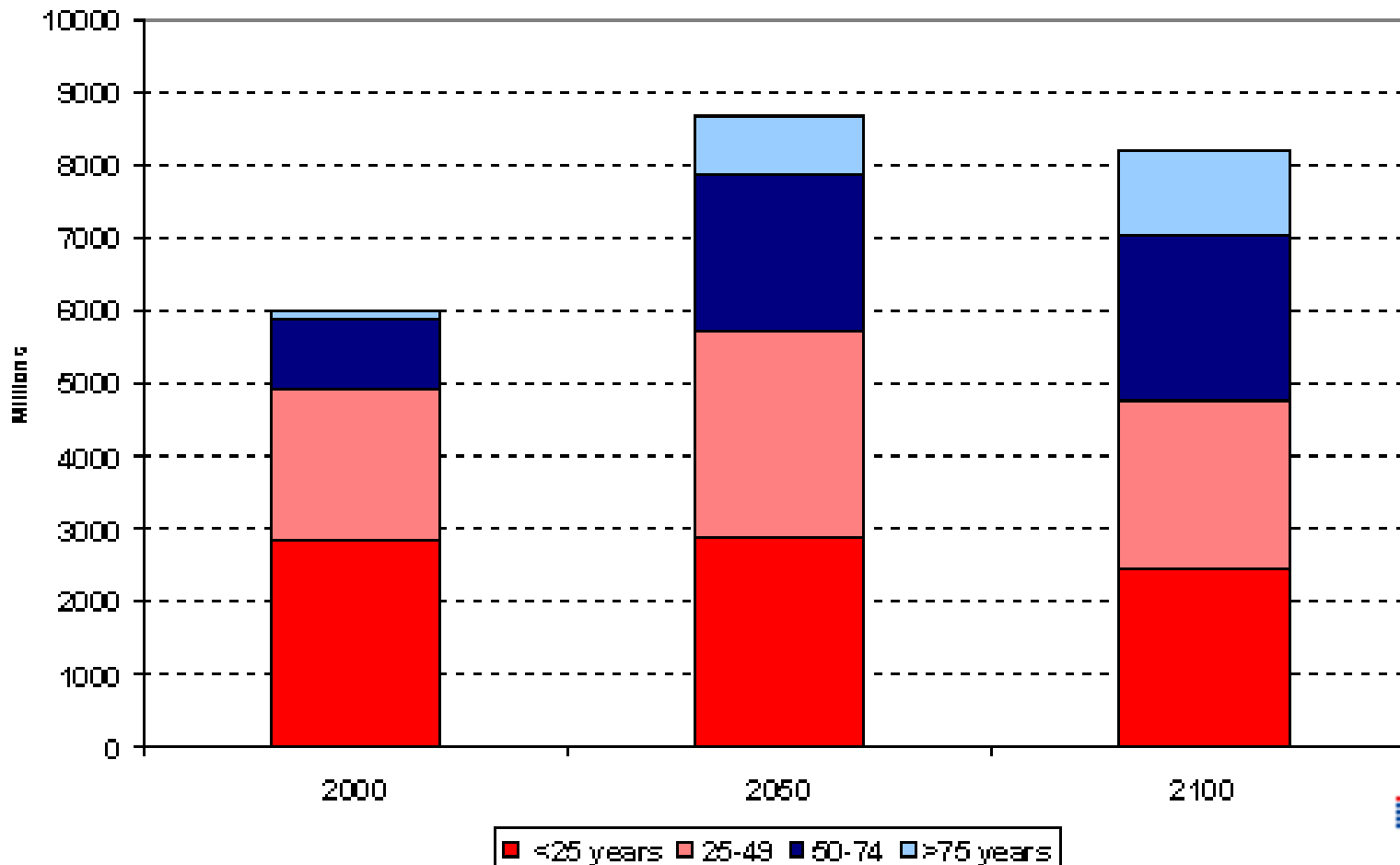
# Income per capita



Source: European Commission, DG RTD (Global Europe 2030/2050), MIRAGE model, L. Fontagné



# World (ageing) population



Source: European Commission, DG RTD (VLEEM) and UN

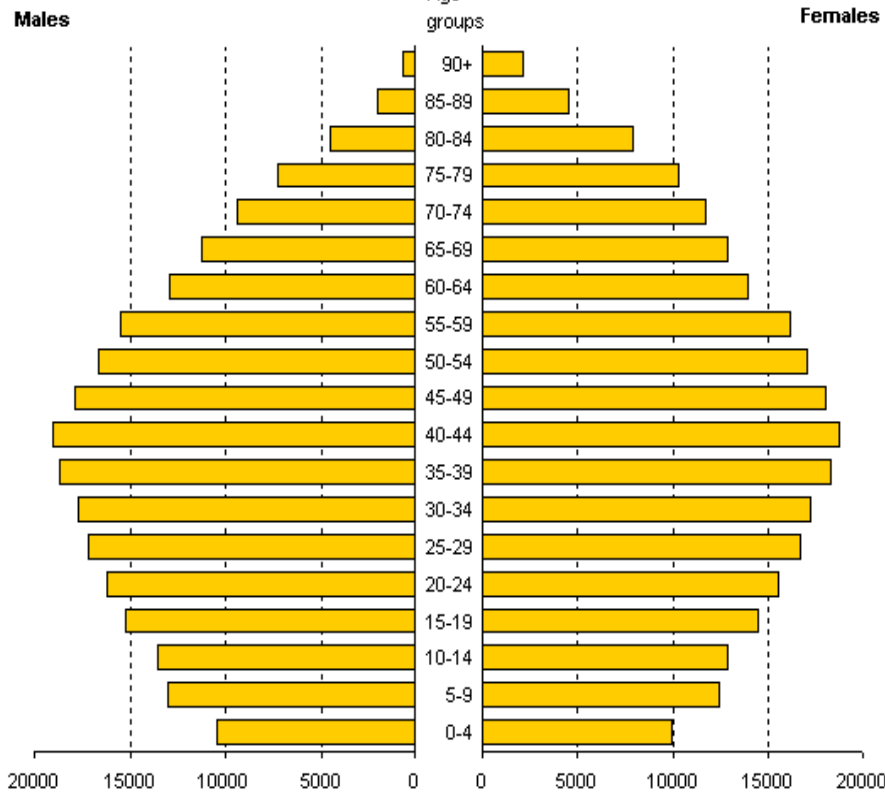


# EU population

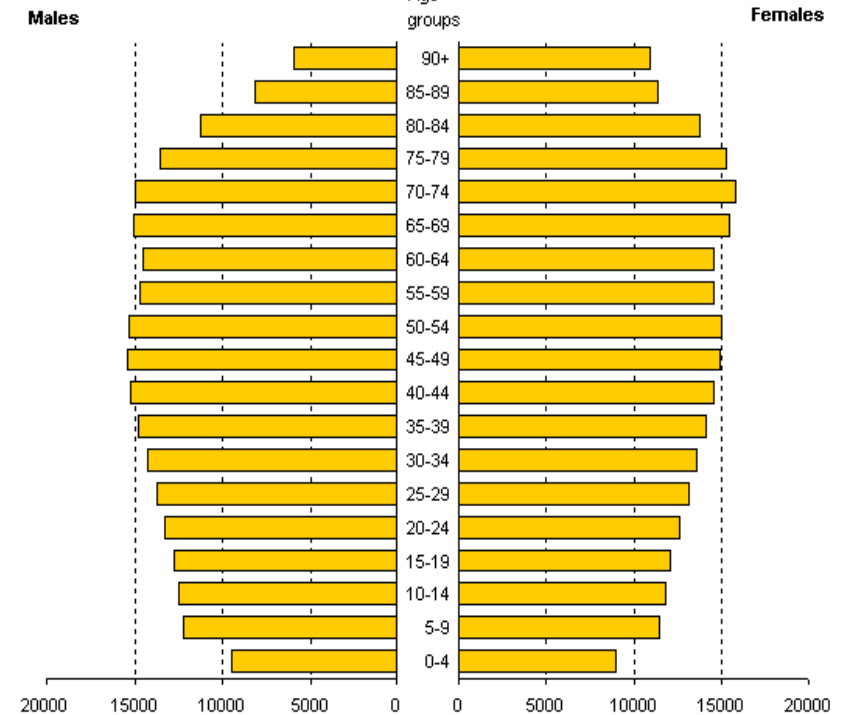
## 2008

## 2060

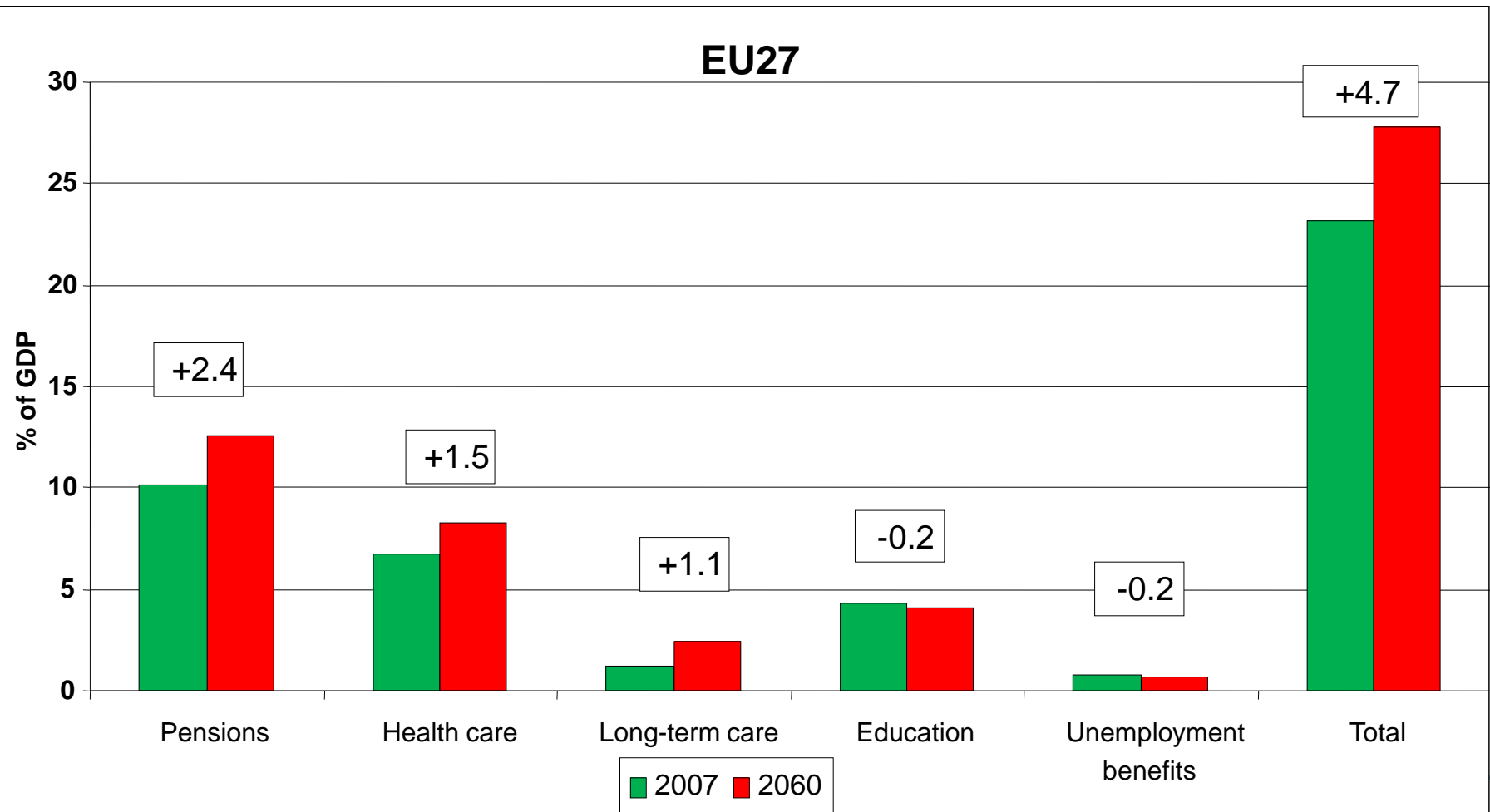
EU27: 2008 Population by age groups and sex



EU27: 2060 Population by age groups and sex



# Cost of ageing



Source: European Commission, Ageing Report, H. Bogaert

# Trends

## Geopolitical transformations (2025)

- **61% of world population in Asia, EU: 6,5%**
- **35% of the European population will be old**
- **More than 30% of GDP produced by Asia, less than 20% in EU**
- **Asia is the 1<sup>st</sup> world exporter (EU 32%, Asia 35%)**
- **Asia on par with US & Europe in the field of R&D**
- **Globalization of R&D means that access to knowledge is key**

# Tensions

## Resources and risks (2025)

**In 2025 resources are scarce and the absence of global regulation and distribution mechanisms involves risks:**

- **1/3 of the population undernourished or badly nourished**
- **Carbon-based energy remains dominant**
- **3 billion people will not have access to water**
- **More and more competition on land**
- **If EU not followed on climate change policy, a warming of less than two degrees is unlikely**



# Gonzalez Report “Europe 2030”



*Europe is at a crossroads: either we keep and strengthen the role as one of the main global actors, or we become an “increasingly irrelevant outgrowth on the Asian continent”*



# **Trends and Tensions**

## **Energy and land-use**

# Total Primary Energy Supply (TPES)

- **1970: 5000 Mtoe**
- **1990: 8000 Mtoe**
- **2010: 12000 Mtoe**
- **2030: ~ 17000 Mtoe**
- **What's next?**

# EU Oil consumption and production



Source: Grande Reportagem

## Oil reserves in the hands of national companies (in billion barrels)

<b>Exxon Mobil</b>	<b>8</b>
<b>Saoudi Oil Company</b>	<b>260</b>
<b>Iranian National Oil Company</b>	<b>136</b>
<b>Venezuela National Oil company</b>	<b>99</b>

Source: The Wall Street Journal, 22/5/2010

*OPEC is set for \$ 1,000 billion in export revenues in 2011*

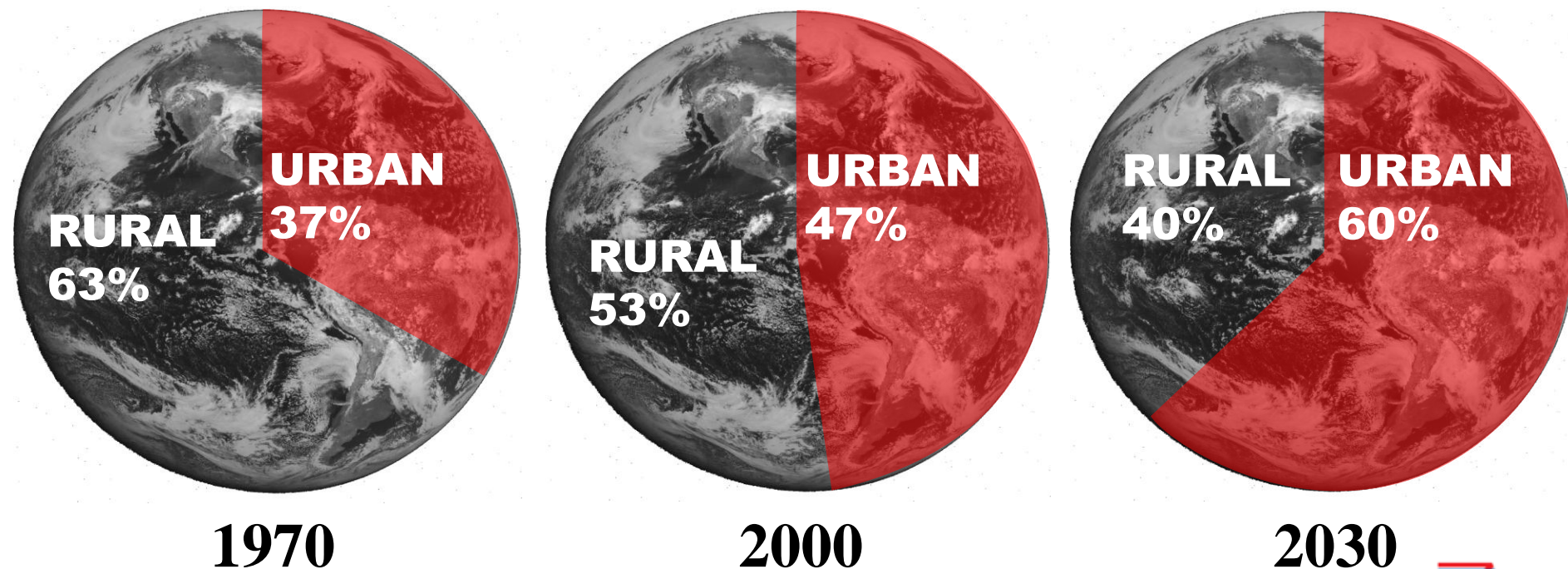
Source: Financial Times, 29/3/2011



# Energy by the end of the century

- Energy used for food will double
- Energy for thermal comfort and living-space heating and cooling will triple
- Energy for mobility will increase by a factor of five
- Energy for economic production will only increase moderately
- Energy for leisure and self-fulfilment (sports, cultural, social, and tourism activities) will have the fastest growth

# Urbanisation



Source: UN-HABITAT



# Megacities

	<b>1950 (millions)</b>	<b>2005 (millions)</b>
<b>Mexico</b>	<b>3</b>	<b>23</b>
<b>Seoul</b>	<b>1</b>	<b>23</b>
<b>Sao Paolo</b>	<b>2,5</b>	<b>21</b>
<b>Mumbai (Bombay)</b>	<b>3</b>	<b>20</b>
<b>Jakarta</b>	<b>1,5</b>	<b>16</b>
<b>Dacca</b>	<b>0,5</b>	<b>16</b>
<b>Cairo</b>	<b>2,5</b>	<b>15</b>
<b>Manila</b>	<b>1,5</b>	<b>14</b>
<b>Lagos</b>	<b>0,5</b>	<b>14</b>
<b>Shanghai</b>	<b>5,5</b>	<b>13</b>
<b>Teheran</b>	<b>1</b>	<b>12</b>
<b>Istanbul</b>	<b>1</b>	<b>11</b>

Source: Davies /  
Le Quément  
(rounded figures)

# Poverty and slums

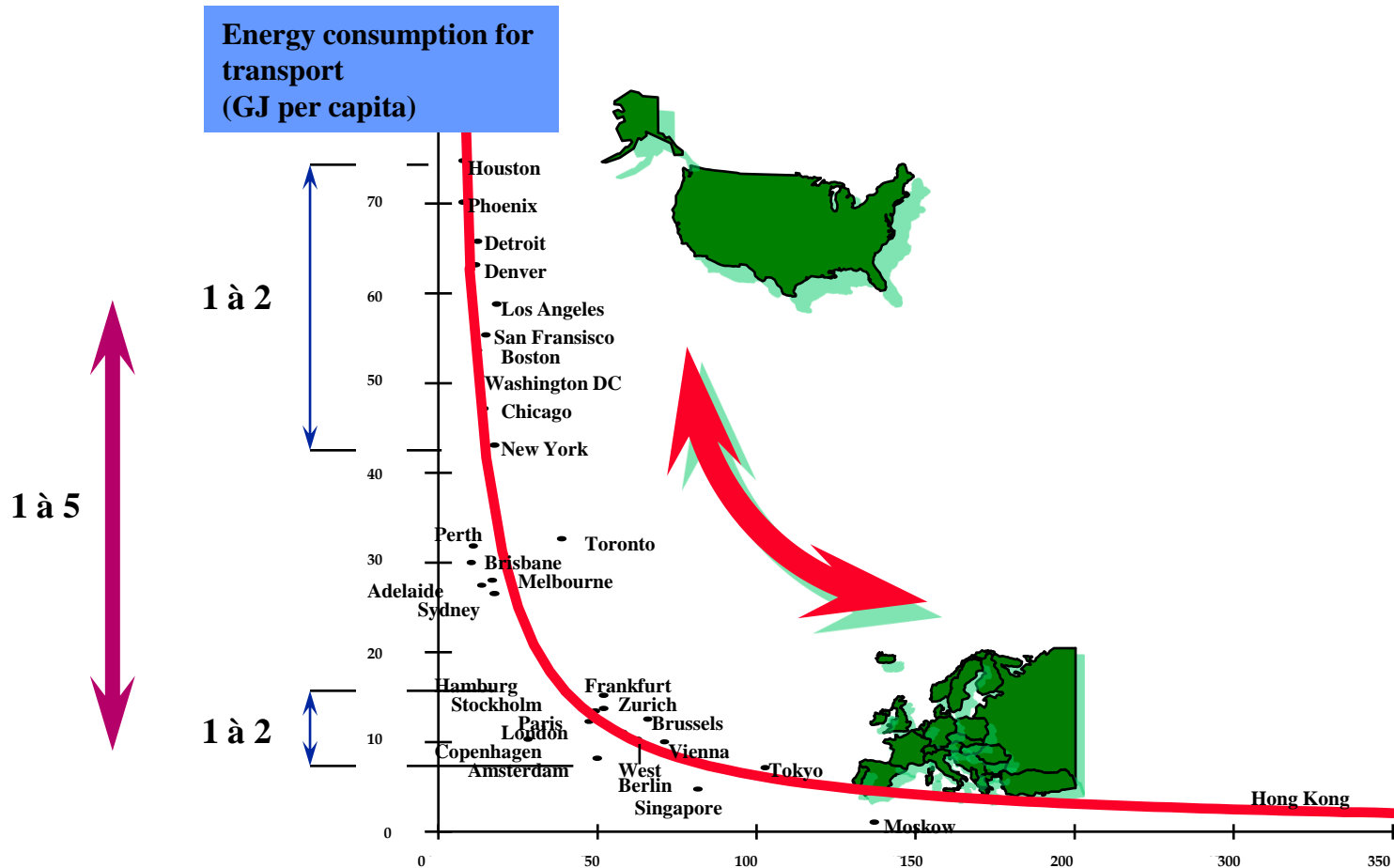
## (% of urban population living in slum)

<b>Developping World</b>	<b>36</b>
<b>Sub Saharian Africa</b>	<b>62</b>
<b>Latin America</b>	<b>27</b>
<b>Eastern Asia</b>	<b>36</b>
<b>Southern Asia</b>	<b>43</b>
<b>South Eastern Asia</b>	<b>27</b>
<b>Western Asia</b>	<b>24</b>
<b>Oceania</b>	<b>24</b>

Source: Source: UN-HABITAT



# Urban density and energy consumption



Source: IDDRI (L. Tubiana) - Newman/Kenworthy

# EU Cities

- Symbol of democracy and rule of law since Antiquity
- Place of economic devt. and trade in the Middle Ages (Hanseatic cities)
- Centre of entrepreneurship spirit and Renaissance culture
- Heart of revolutions and social battles
- Emblematic of today's grand challenges: knowledge, poverty, social differences, integration, mobility



# **Trends and Tensions**

## **Research and Innovation**

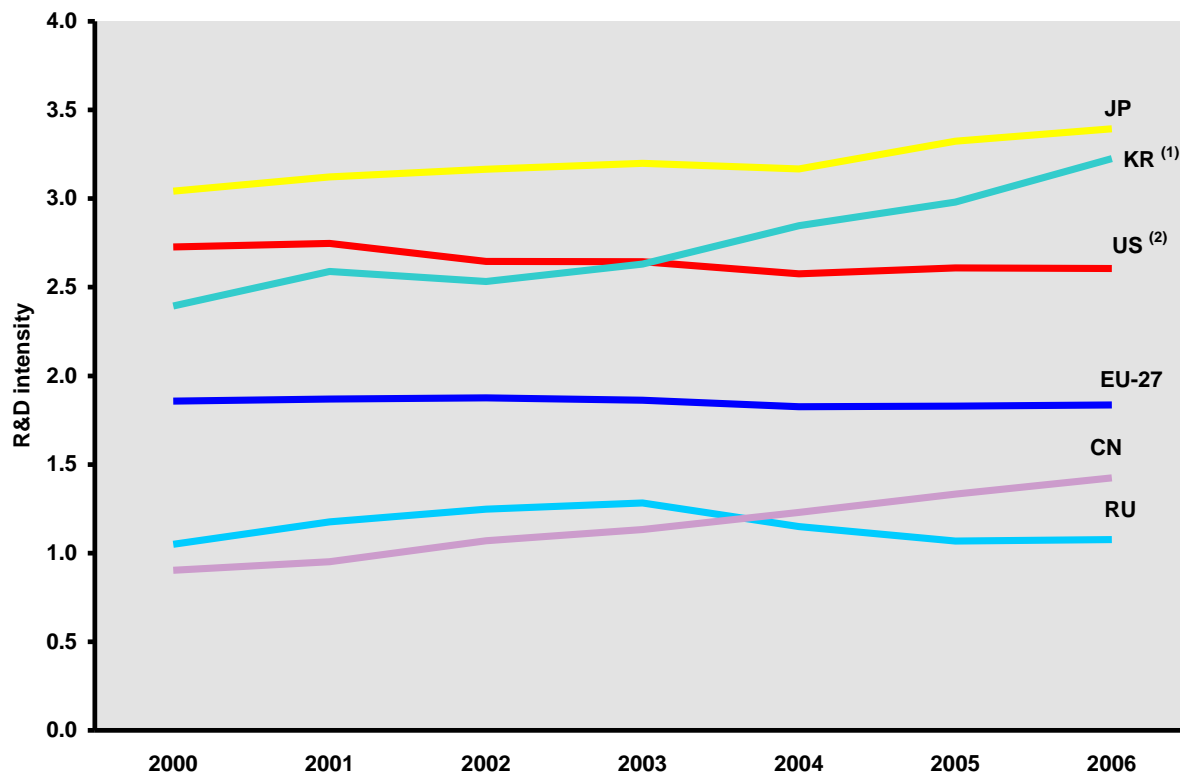
# Innovation

- **Technological innovation**  
But the value of manufactured products is increasingly based on intangibles
- **Social innovation and demand-side innovation**  
Importance of customer's-employee interface, marketing and organisational innovation
- **Open innovation**  
Firms do not develop innovation in a closed system
- **Global innovation**  
Not only the production but also the innovation networks are now globalized



# R&D intensity

Figure I.1.2 Evolution of R&D intensity, 2000-2006



**EU R&D intensity has remained almost constant these last ten years while Chinese and Korean R&D intensity has increased by more than 50%**

Source: DG Research

Data: Eurostat, OECD

Notes: (1) KR : GERD does not include R&D in the social sciences and humanities.

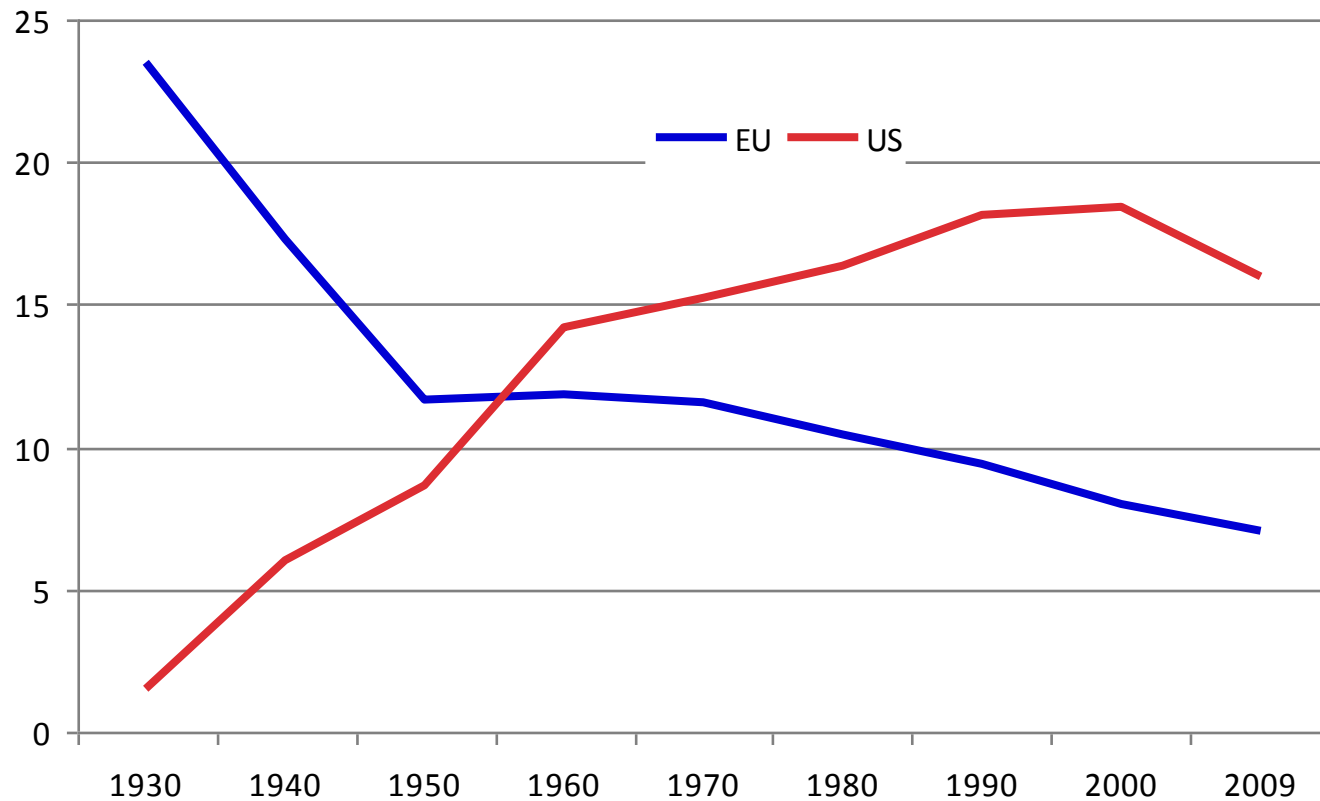
(2) US : GERD does not include most or all capital expenditure.

Key Figures 2008

Source: STC key figures report 2008/2009



# Nobel Prize winners\*

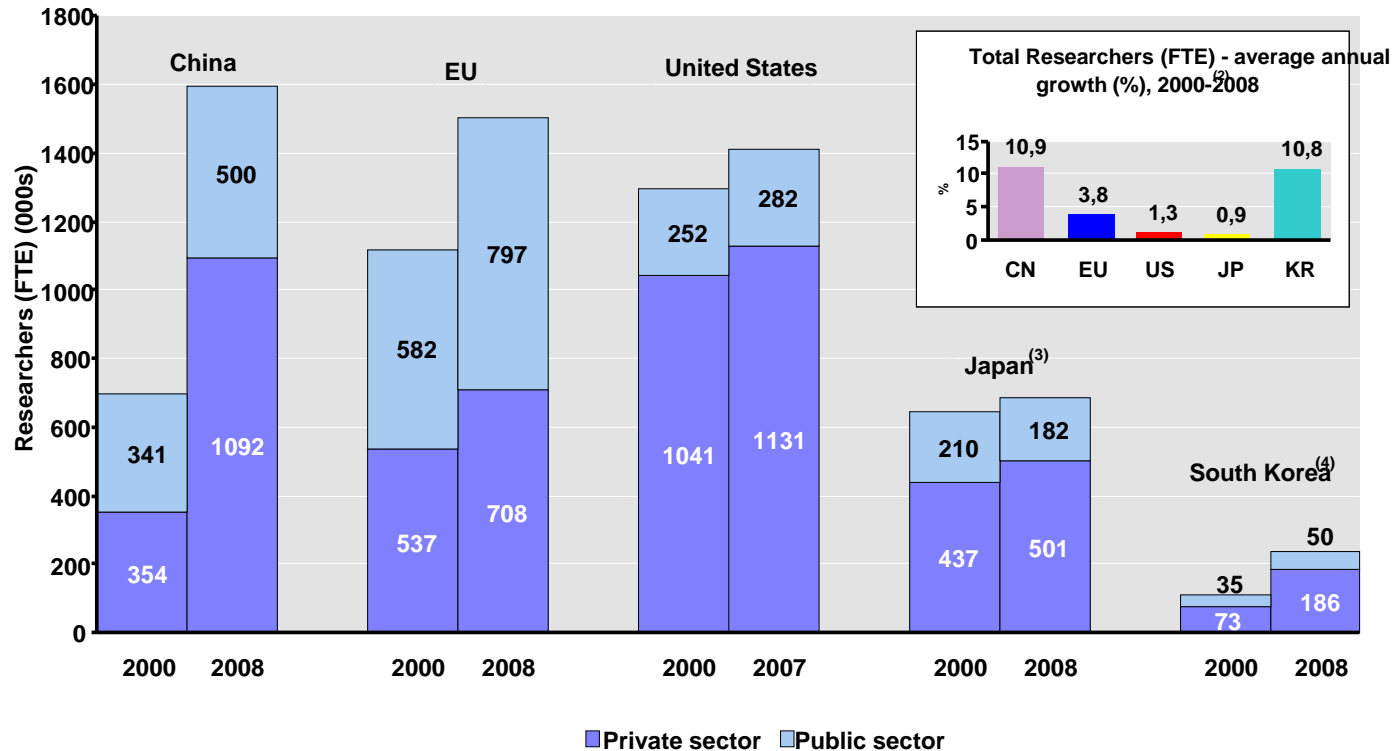


\* Physics, Chemistry and Medicine

Source: European Commission based on Jürgen Schmidhuber, 2010



# Number of researchers (FTE)

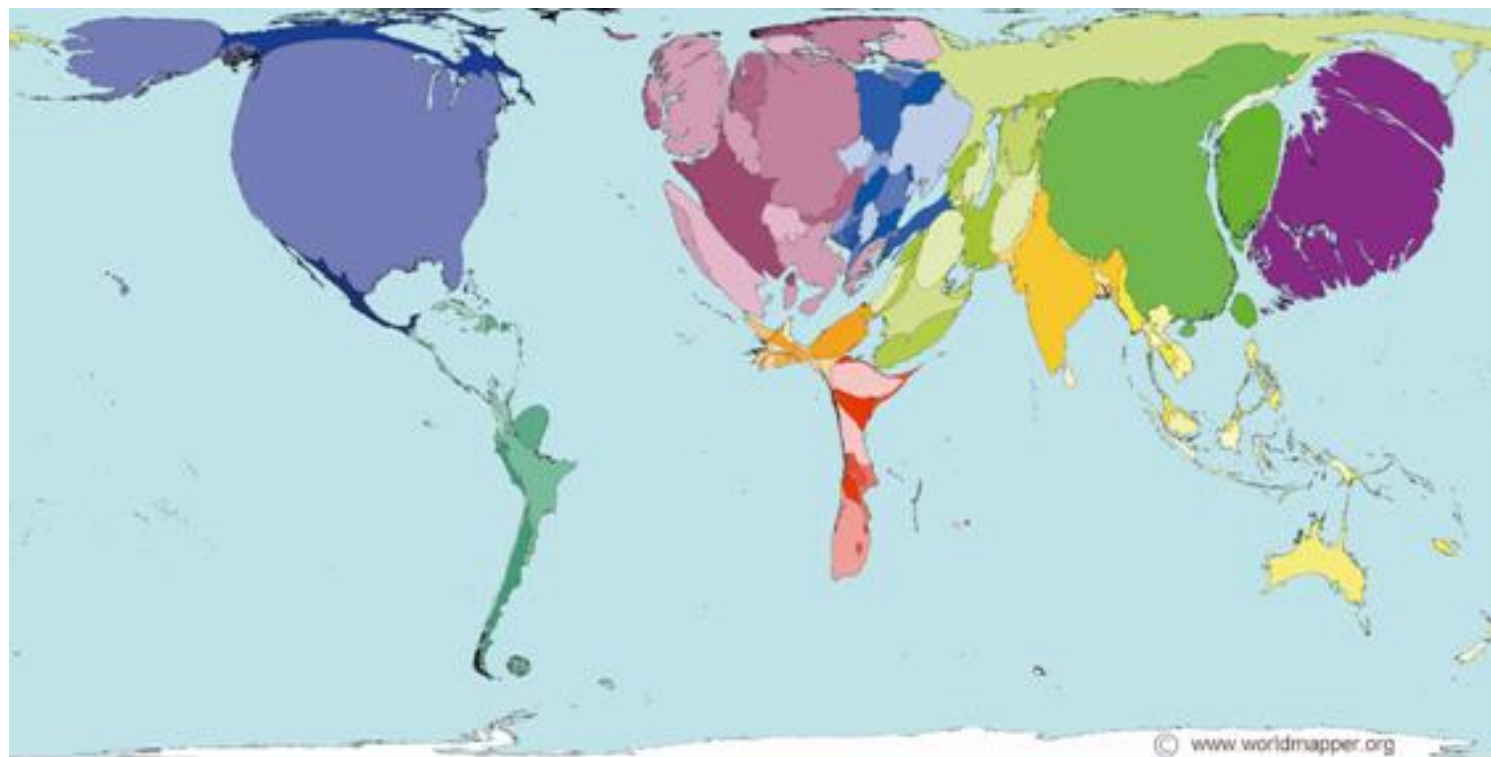


**In 2008, China employed about 1.6 million researchers, compared to about 1.5 million in the EU. Trends over time and differences in the share of private and public sectors are also significant**

Source: European Commission, DG RTD – RIC report 2011, data from Eurostat, OECD

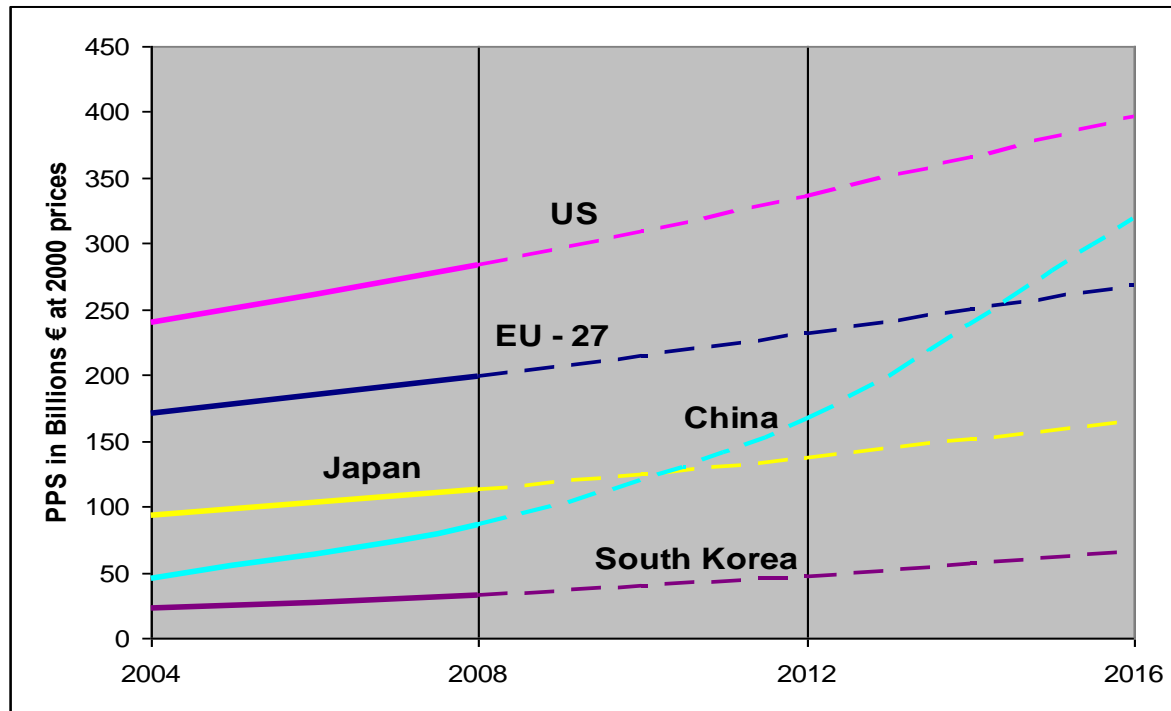


# Numbers of people employed in research



Source: SASI Group (University of Sheffield) and Mark Newman (University of Michigan)

# Evolution of world R&D expenditure



Note: (China excluding Hong-Kong)

**The US spends most on R&D whilst emerging economies are quickly catching up. On current trends, China is set to overtake the EU by 2014**

Source: European Commission, DG RTD



# RTD&I priorities: From vertical themes to horizontal challenges ?

<b>FP7 Cooperation programme</b>	<b>Some national and EU FLA suggestions</b>
<b>Health</b>	<b>Human-Technology cooperation (robotics, brain)</b>
<b>Biotechnology, food and agriculture</b>	<b>Manufacturing on demand (individually tailored products)</b>
<b>Information society</b>	<b>Smart infrastructures for the future</b>
<b>Nanotech, materials and prod.</b>	<b>Sustainable living spaces</b>
<b>Energy</b>	<b>Environmentally friendly solutions</b>
<b>Environment</b>	<b>Renewing services and prod. by digital means</b>
<b>Transport</b>	<b>Changing lives / Needs of different age groups</b>
<b>Socio-economic sciences</b>	<b>Urban mining / Transforming waste into mines</b>
<b>Space</b>	<b>Bioresource based production</b>
<b>Security</b>	<b>...</b>

Source: European Union (FP7) and results of national forward looking studies



# Transitions

# Personal conclusions

# Evolving regimes

- **1840-1914** Imperial liberalism
- **1914-1945** Mercantilism and war economy
- **1945-1980** State interventionism and socialism
- **1980-2008** Liberal capitalism
- **2008-...** State capitalism?

# Blurring world and EU *sui generis* model

- National sovereignty and infra/supranational aspiration
- Soft power and hard power
- Community method and intergovernmental method
- *Elargissement – Approfondissement* (“global Europe”)

# EU binomial rethinking

- **Role of men and women**
- **Professional and private life**
- **Individual freedoms and collective responsibilities /  
Economic growth and social well-being**
- **Public and private sectors**
- **Manufacturing and services**
- **Man-Technology**
- **Society-Science**
- **Ethics-Progress**
- **Faith-Reason**

# Dangerous concepts

- **Purely materialistic view of man and the world - False happiness**
- **Euroscepticism and thinking that a EU country alone can play a significant role in a globalized world**
- **Standardization and harmonization (vs. creativity, imagination, emotion)**
- **NIMBY (Not in my backyard) and BANANA (Build absolutely nothing, anywhere, near anybody)**
- **Neo-colonialism and non-interventionism**



# Transitions and emerging ideas

- **Multipolar world and world governance implying major “post-national actors” (EU, G20, major cities, MNC)?**
- **New territorial and ageing dynamics (megacities, intergenerational benefits, active and healthy ageing)?**
- **Services-based economy, third sector and intangibles?**
- **C2C: *Consumer to Consumer* (“thrust relationships”) and *Cradle to Cradle* (“environmental concerns”)?**
- **New indicators: Beyond GDP?**
- ***Paulo humaniora canamus ?***

***Change is the law of life. And those who look only to the past or present are certain to miss the future***

**John Fitzgerald Kennedy**

***Le changement est l'essence de la vie et ceux qui regardent seulement le présent ou vers le passé sont certains de passer à côté du futur***