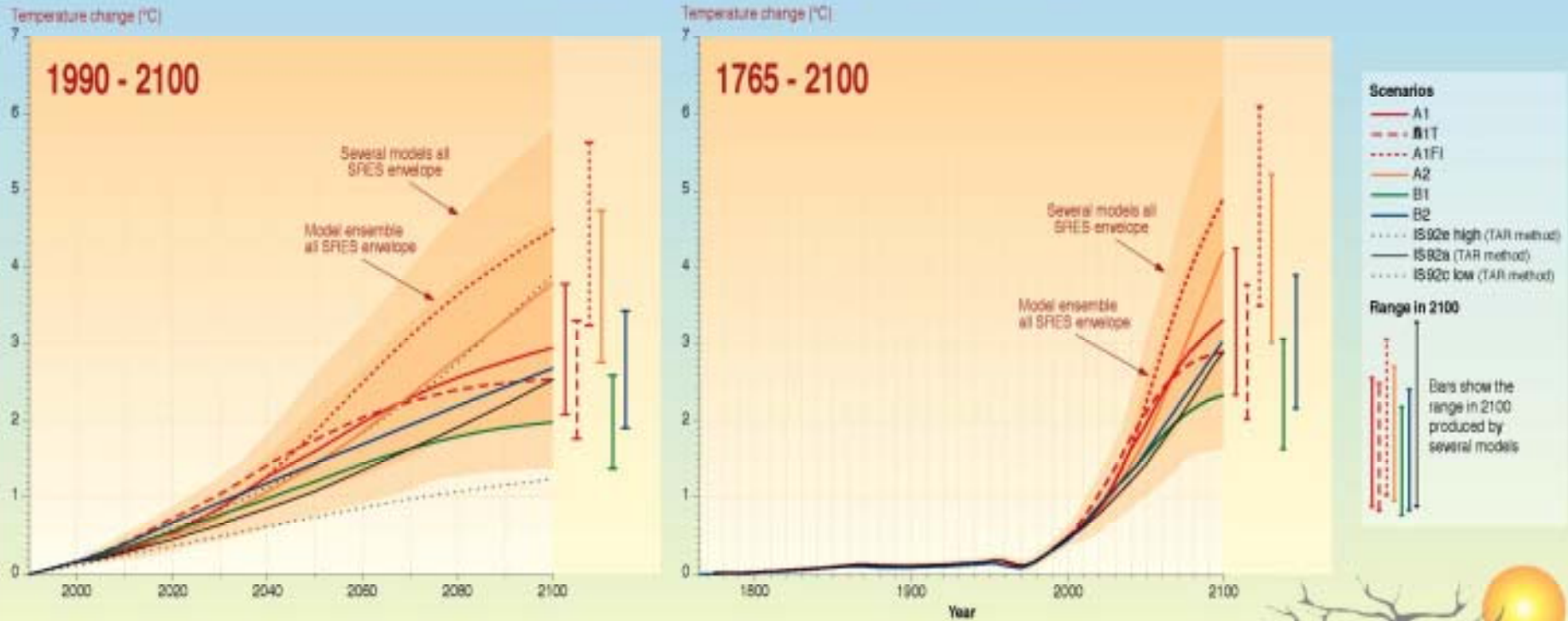


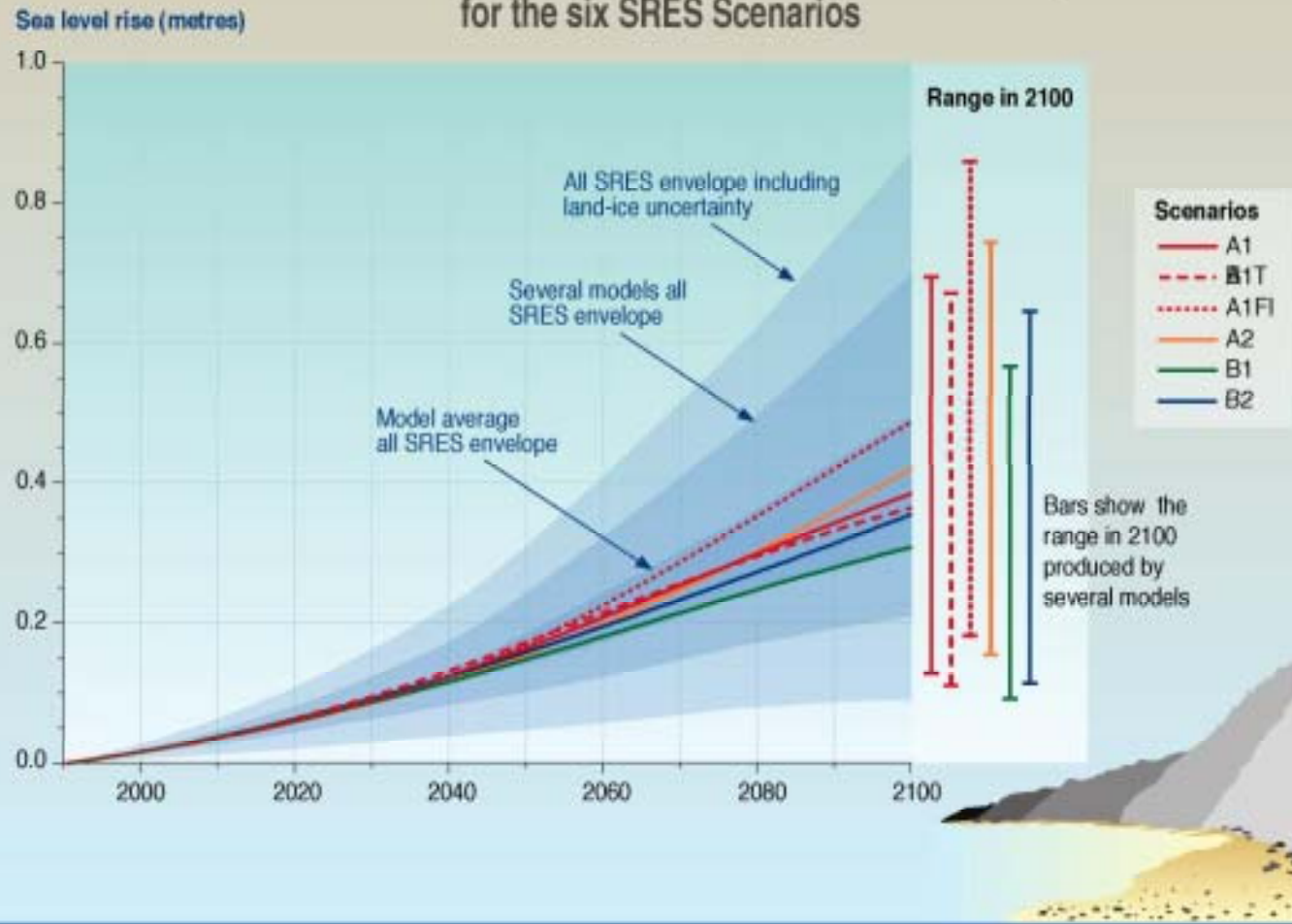
- **Human influence on climate implies that future changes of climatic variables are likely to be much **larger** and **faster** than those observed in the past...**

Temperature change (1760 - 2100)



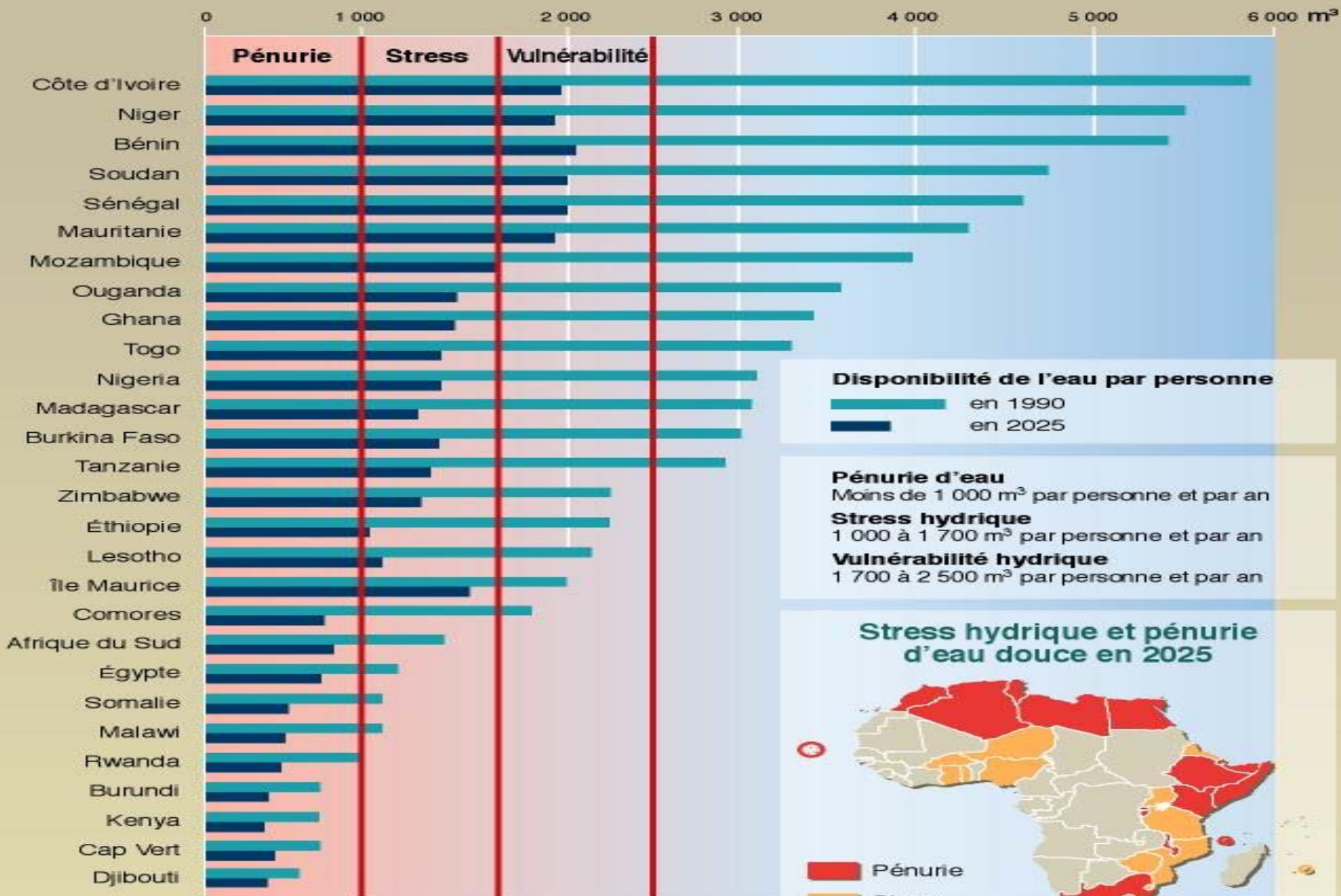
WG1 TS FIGURE 22

Global average sea level rise (1990 - 2100) for the six SRES Scenarios



WG1 TS FIGURE 24

Disponibilité de l'eau



- Whatever action to reduce GHG emissions is taken today, **climate is going to change anyway**. This is true for both those who believe that human influence is small and those who believe that human influence is very important.
- Therefore, we need **ADAPTATION** policies, at least in the short-run.

- **Adaptation** implies investments to protect:
 - **coastal zones and small islands** (from sea level rise, ...)
 - **agriculture production** (from water stress, ...)
 - **poor countries** (from loss of natural resources, ...)
 - **ageing population** (from heat waves and other extreme events, ...)
 - **infrastructures** (from floods, ...)
 - **etc.**

MITIGATION

- However, future generations cannot run the risk of facing **unpredictable and dangerous** climate changes.
- Therefore, GHG emissions must be **reduced since today** to control future climate changes.
- We need both **MITIGATION** and **ADAPTATION**.
- Even if the Kyoto protocol is adopted, adaptation is necessary.....

HOWEVER ...

"The reasonable man adapts himself to the conditions that surround him... The unreasonable man adapts surrounding conditions to himself... All progress depends on the unreasonable man"

George Bernard Shaw

KYOTO PROTOCOL

- The Kyoto Protocol implies **a reduction of 5.2%** of global CO2 emissions with respect to 1990.
- This has a minor effect on the global climate. Temperature will be reduced by only **0.1 degrees Celsius** in 2050.
- This is not enough to control climate changes. We need more mitigation efforts, enhanced technologies and adaptation in the meanwhile.

**Many important suggestions from
ESRI collaboration projects**

A Global Action is a difficult goal

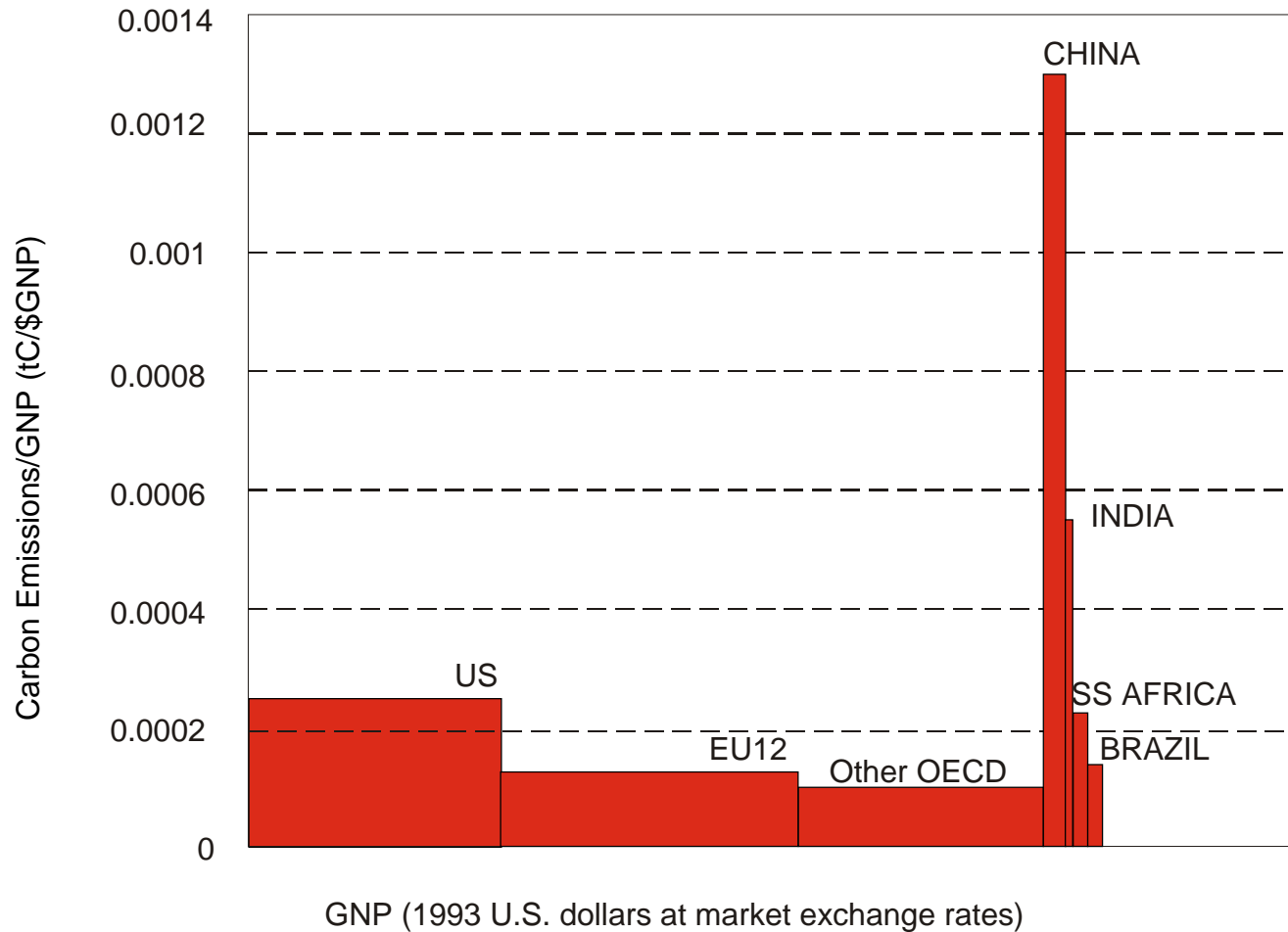
- **Mitigation** is a complex international and intergenerational issue because climate change is a **global and long-term** problem
- Therefore a global action is required, namely all world countries or a large part of world countries should reduce their **GHG** emissions
- **International agreements** are necessary.

INTERNATIONAL AGREEMENTS

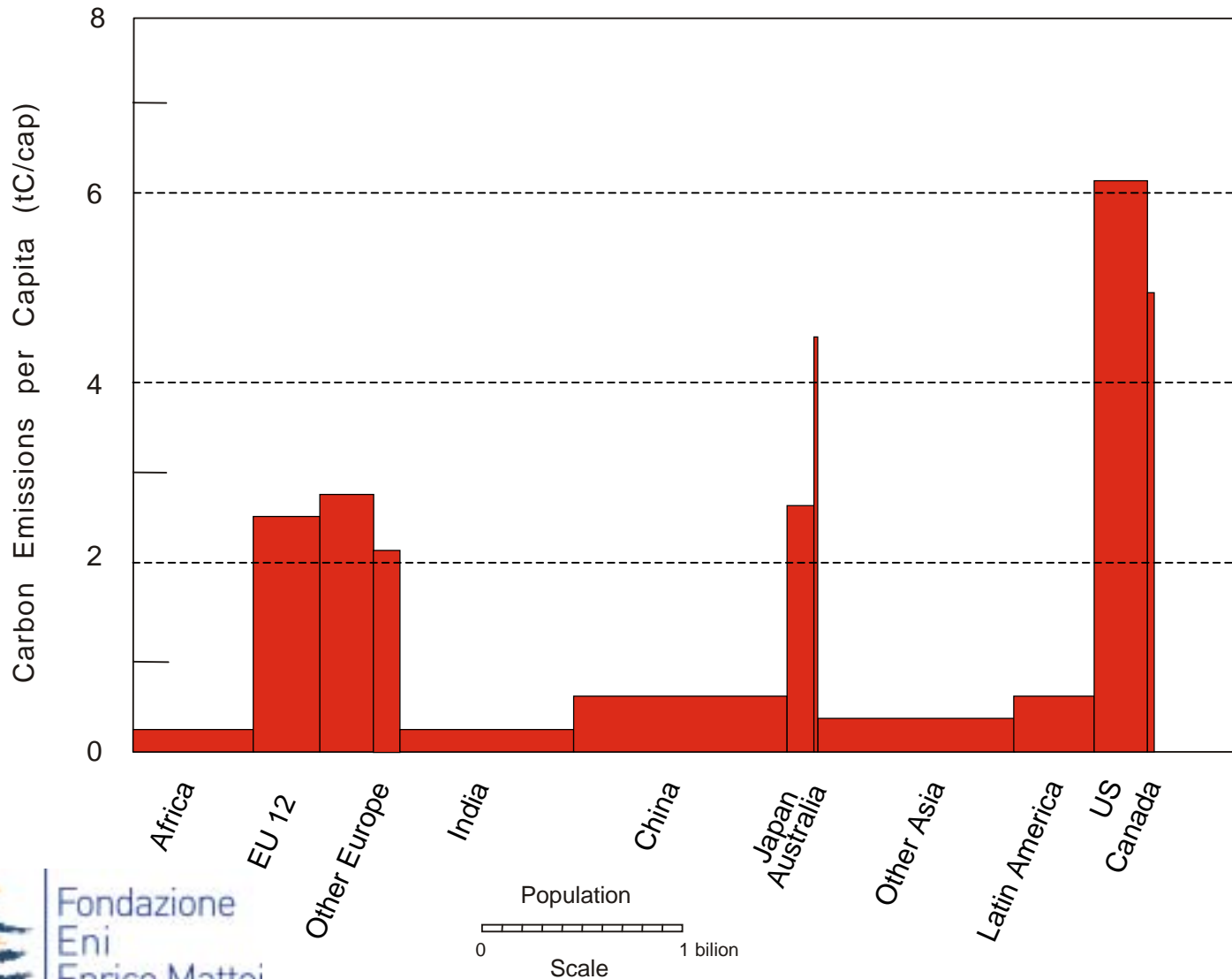
However, broad voluntary participation in international agreements is hard to achieve because of:

- Large economic and environmental **asymmetries** among world regions.
- Intrinsic **instability** of environmental negotiations. Even in the absence of asymmetries, some countries may prefer to free-ride (climate change control is a **global public good**).

Carbon emissions per unit of GNP and total GNP



Carbon emissions per capita and population



THE PRESENT SITUATION

- **Kyoto Protocol:**

 - low environmental effectiveness, even though ratified by 120 countries (as of Jan. 29th, 2004)

- **EU** and **Japan** have ratified the Protocol and are leading the climate coalition

- **EU** is negotiating with **Russia** to provide incentives for ratification

AND ...

- **US** adopted a limited emission intensity target (-18%) which is equivalent to an increase of emissions of about 4% w.r.t 1990 levels
- **China** announced ratification, but no target
- A number of **bilateral / regional cooperations**, particularly on research and technological developments

- The **participation of the US** in a co-operative effort to reduce **GHG** emissions is crucial to effectively control climate change
 - ⇒ Large US emissions
 - ⇒ LDC participation
 - ⇒ Technological progress
- However, the US considers the Kyoto Protocol too costly and with small uncertain environmental benefits.

- Russia lost the benefits agreed upon in Kyoto (the so called **hot-air**) because the US defection induces a large decline in the expected price of emission permits.
- Russia gained a relevant **bargaining power** because ratification decisions were taken sequentially. Russia's decision is crucial for the Kyoto Protocol to enter into force.
- Pressures on Russia? Economic incentives?

Where do we want to go?

- **higher environmental effectiveness**
i.e. **more countries in the Kyoto Protocol**;
in particular US and developing countries
- ⇒ **global approach** to effectively address the
global problem of climate change

Two possible future paths:

- **1. Extension of the Kyoto Protocol**
(signals in particular from EU and Japan)
- **2. Deviation from the Kyoto Protocol**
(signals from countries currently outside the Kyoto framework)

Path 1: Build on Kyoto ...

- Include more countries (according to differentiated commitments)
- Improve approach both regarding mitigation and adaptation
- Widen the scope (e.g., aviation)
- Encourage use of market-based instruments (emission trading)

However:

Will the Kyoto Protocol ever come into force?

Will current “outsiders” want to join a regime based on the Kyoto architecture?

... and improve the Kyoto Protocol

- The current proposals to adjust, revise, improve the Kyoto Protocol have some common features:
 - use of relatively moderate short-term goals;
 - use of market-based mechanisms;
 - cost constraints through hybrid instruments;
 - provision of incentives for participation and compliance.

Some proposals:

- 1) A Hybrid International Trading Program with Safety Valve (Kopp, Morgnestern and Pizer, 1997; Aldy, Orszag, and Stiglitz, 2001)
- 2) A Research and Development Protocol (Barrett, 2001, 2003)
- 3) Harmonized Domestic Carbon Taxes (Cooper, 1998, 2001)
- 4) Domestic Hybrid Trading Schemes (McKibbin and Wilcoxon, 1997, 2000)

More ...

- 5) An Efficient Set of Harmonized Carbon Taxes (Nordhaus, 1998)
- 6) A Global Climate Marshall Plan (Schelling, 1997, 1998, 2000)
- 7) A Broad but Shallow Beginning (Schmalensee, 1996, 1998)
- 8) A Three-Part Policy Architecture (Stavins, 2001b)
- 9) Emission intensity regime (Pizer, 1998)

And more ...

- 10) Using Quotas to Attract Developing Countries
(Stewart and Wiener, 2001)
- 11) Increasing Compliance through Buyer Liability
(Victor, 2001)
- 12) The Global Public Good Purchase System
(Bradford, 2002)
- 13) Regional Climate Agreements (Carraro, 1998, 2002)
- 14) Trade and Banking (Viguier, 2003)

SAFETY VALVE

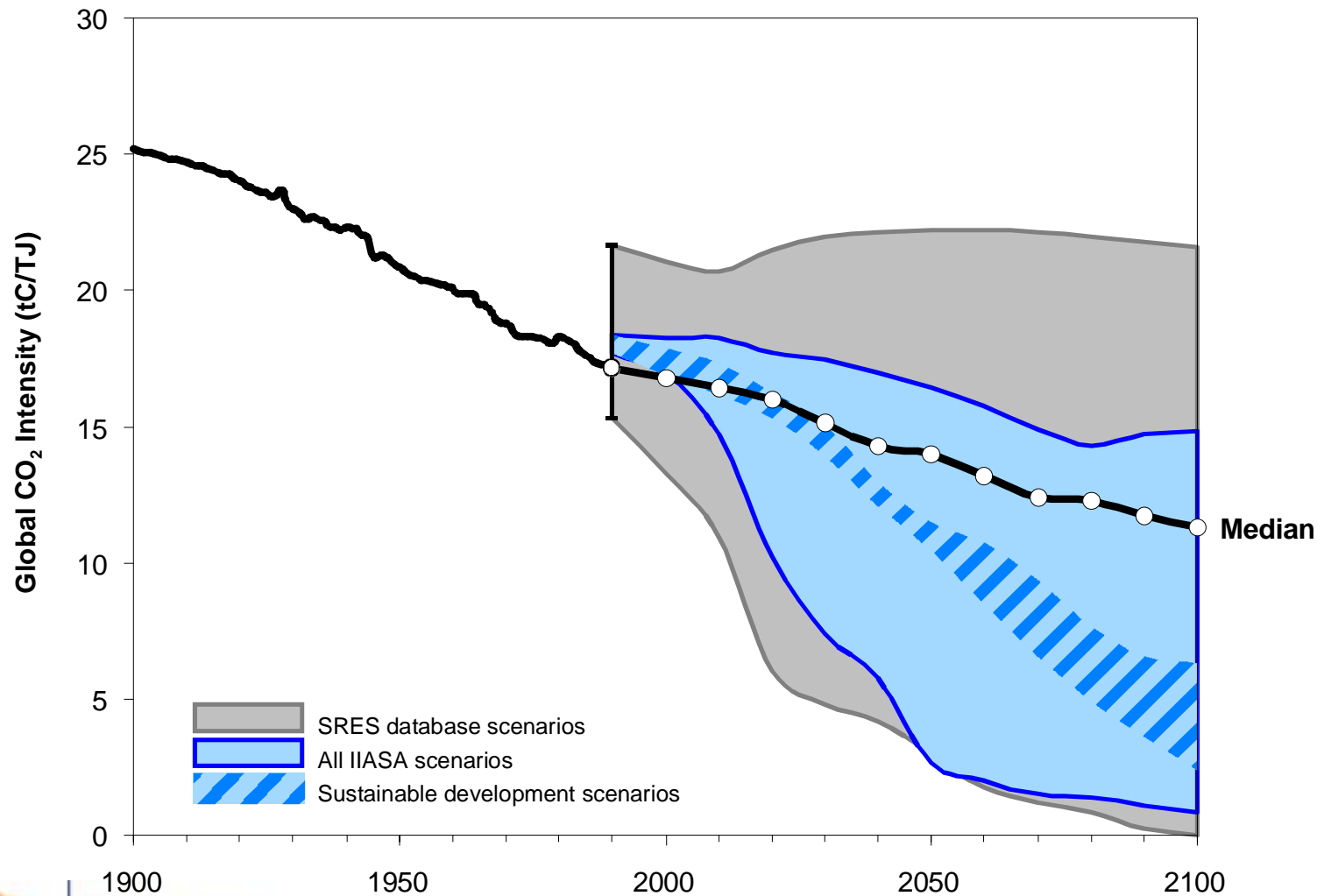
- There is a **risk** of unexpected increases in the price of carbon if no new technology to reduce GHG emissions becomes available in the next decades.
- Therefore, it would be useful to introduce a **ceiling** on the price of carbon (i.e. on the permit price).
- At the same time a **floor** on the price of carbon could lessen some of the negative consequences of an excess supply of permits in the short run.

- A Global agreement on technological cooperation could favour a rapid **dissemination** of technologies designed to reduce emissions of greenhouse gases.
- This agreement could also stimulate economic growth ...
- Better if coupled with emission targets and other incentive schemes. **Stick and carrot better than carrot alone ...**

CONSENSUS VIEW:

- Efforts to develop **new climate friendly technologies**, in particular in the energy sector (hydrogen, fuel cells and other renewables...), are crucial to achieve large GHG emission reductions
- Japan has a leadership that may bring both environmental and economic benefits....

Carbon Intensity of Primary Energy



REGIONAL CLIMATE REGIMES

“In substance, even though not in form, the Kyoto Protocol reflects agreements among several different coalitions”

Eric Haites, former head of the IPCC Technical Support Unit

“It is increasingly becoming clear, [that] the Kyoto Protocol is less a global agreement than a set of differing regional approaches”

Christian Egenhofer, Center for European Policy Studies

Some results:

- ✓ A climate regime with adequate economic incentives for the participating countries/regions could be the one in which the **US and China** decide to cooperate to control their GHG emissions and sign a bilateral agreement rather than joining a large global coalition.
- ✓ Alternatively, a **Far-East climate coalition** which includes China could be established under the leadership of Japan (similarly to the EU bubble).

- The Kyoto Protocol establishes emission targets only until 2012. What afterwards?
- A more equitable and cost effective design of **future commitments** could induce more participation in a climate agreement.

SUGGESTIONS FROM ESRI COLLABORATION PROJECTS

- **Regional agreements** as a **first step** towards a global strategy
- Increased funding and cooperation on **R&D and technological** change
- Increase **mitigation** efforts in all sectors. More efforts on **adaptation**
- Design of **policy mixes** (safety valve, tax and permits, linkage with trade policy, etc.) possibly sector specific
- Agreement on **future commitments**

ALL ACTIONS, IN ALL SECTORS, FROM ALL INDIVIDUALS, COMPANIES AND INSTITUTIONS, WILL BE VERY IMPORTANT AND USEFUL TO CONTROL CLIMATE CHANGE

The golden rule is that there are no golden rules.

George Bernard Shaw



**corso Magenta 63
20123 Milano - Italy**

**tel +39 | 02 | 5203.6975
fax +39 | 02 | 5203.6946
web <http://www.feem.it>**