FONDAZIONE ENI ENRICO MATTEI

Energia e Clima 4

SSST

Torino, 21 Ottobre 2010

Aula Principi d'Acaja - Università di Torino

Andrea Bigano
Fondazione Eni Enrico Mattei

Outline

4. Externalities and energy (2 hours)

The concept of externality.

Local and global externalities. Supra-national policies and local issues

Local energy externalities: oil spills

Global energy externalities of energy: climate change, greenhouse gas (GHG) emissions, human activities

Pigouvian taxes and the Coase Theorem

Tools for the correction of negative externalities: taxes, subsidies, standards, and tradable permits.

5. Energy, climate and sustainability (2 hours)

Energy use and emissions of greenhouse gases: the link between GDP and GHG emissions.

The main drivers of change.

Responses to climate change. Mitigation and adaptation

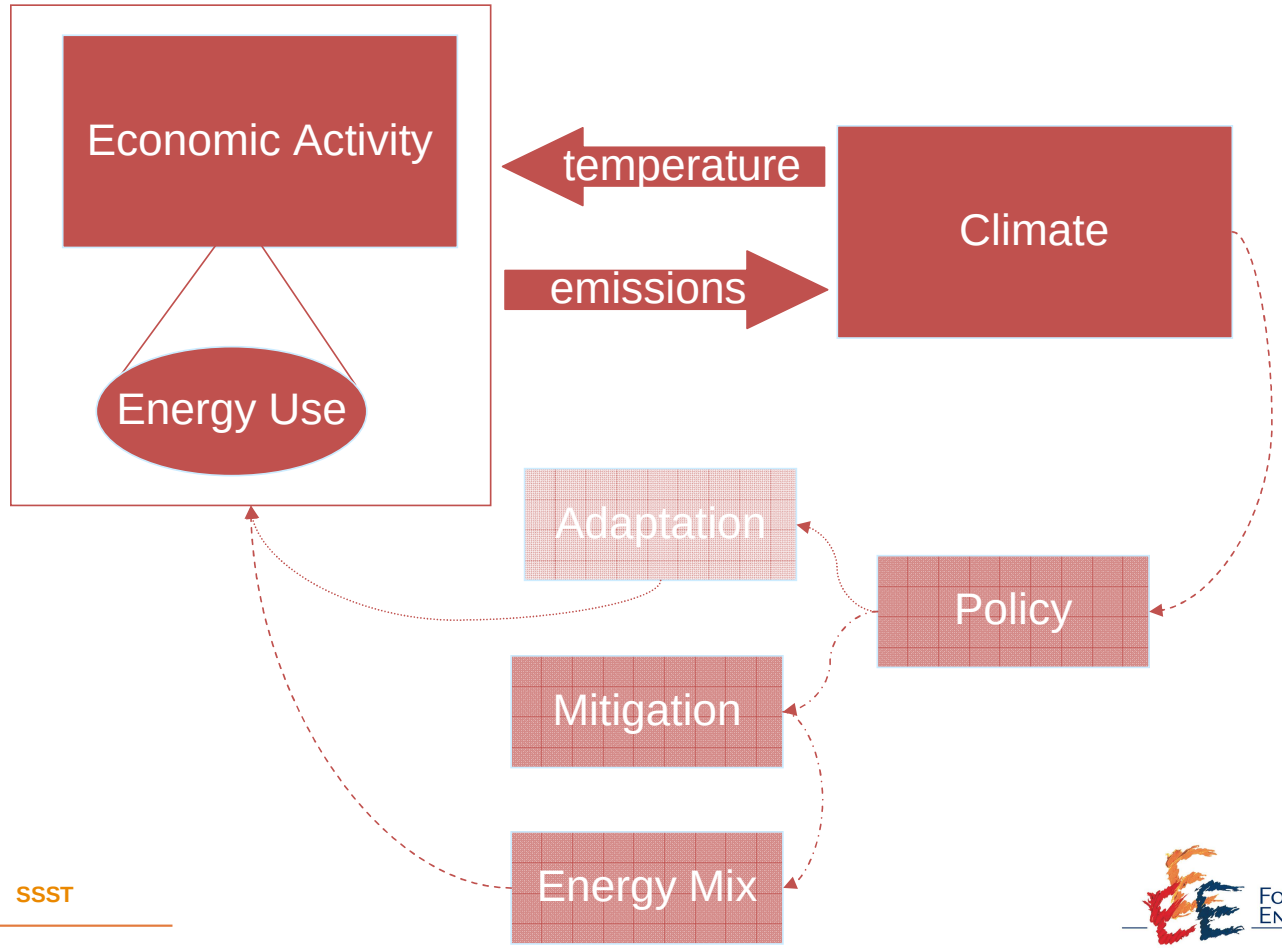
Model Scenarios: Business as usual and stabilization scenarios

The stabilization energy mix. Desirable goals and realistic objectives

Climate change mitigation policies and diplomacy: efficiency, equity and international agreements

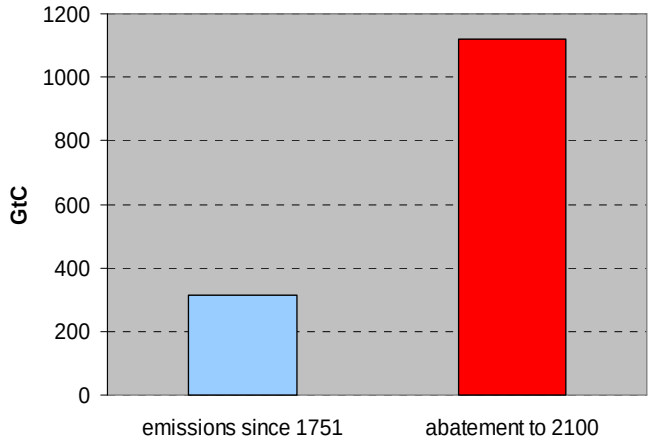
Conclusions: energy security and sustainability: conflicts and synergies.

Energy and climate change: the issue



Energy and climate change: the issue

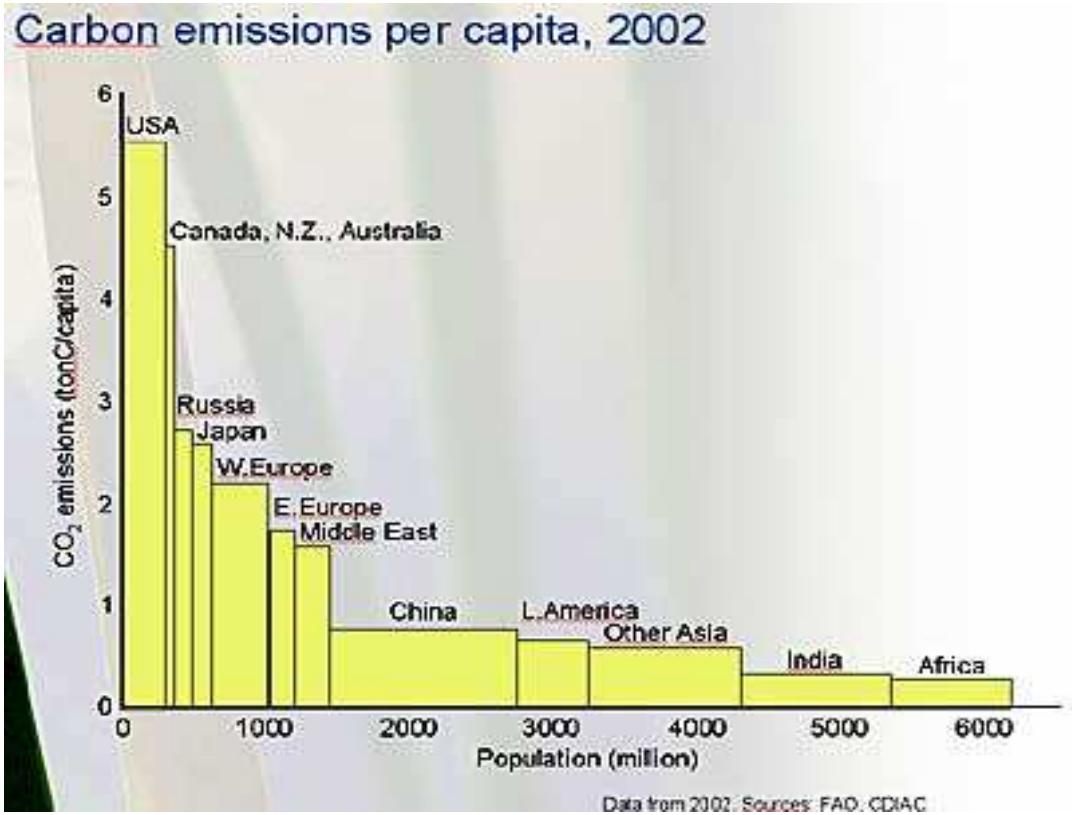
Mitigation effort needed for a 450 ppm di CO_2 stabilization scenario



Source: Bosetti V., C. Carraro, M. Tavoni, 2009

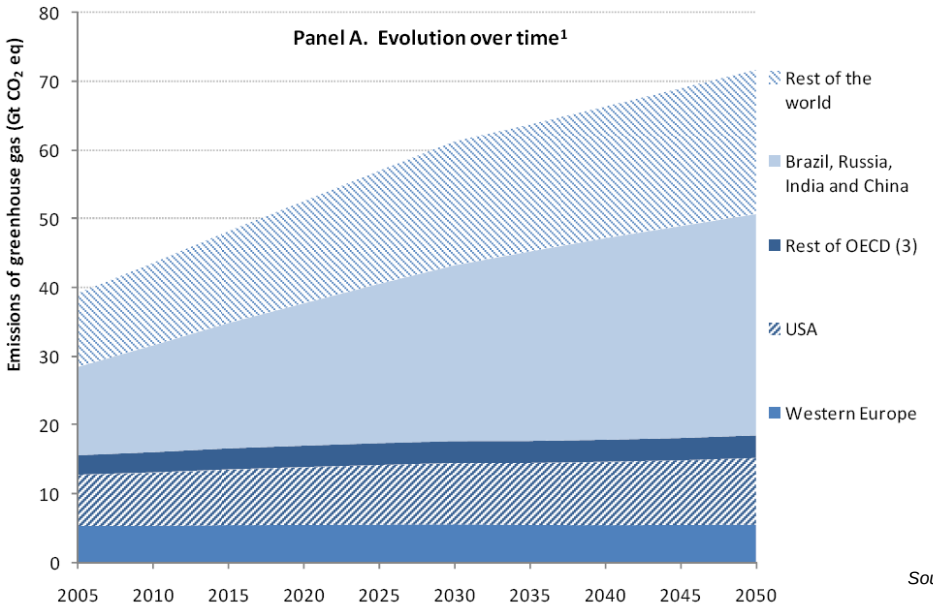
- **The abatement effort needed to stabilise atmospheric CO_2 to 450 ppm is almost 4 times all greenhouse gases emissions from preindustral times to date.**
- **In per capita terms, global average emission must fall from 2 to 0.3 tC per capita per year.**
- **The way we produce and consume energy must change!**

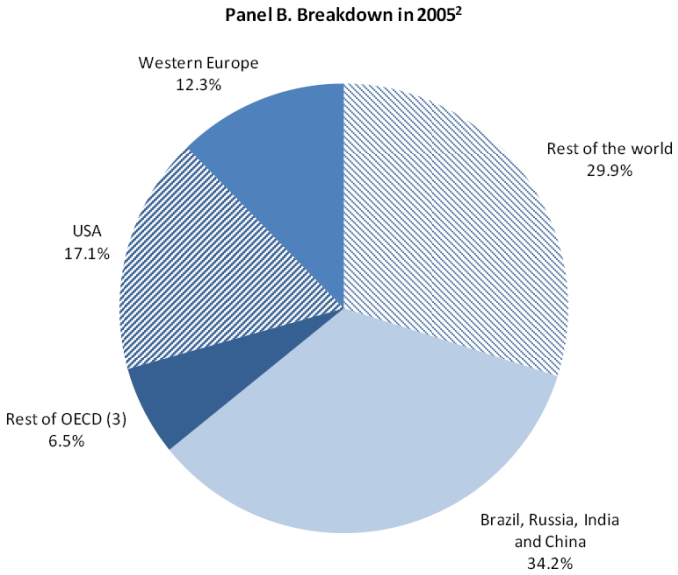
Climate change: present emissions per capita



Source: IPCC Climate Change 2007: The Physical Science Basis, Summary for Policymakers (2007), p11

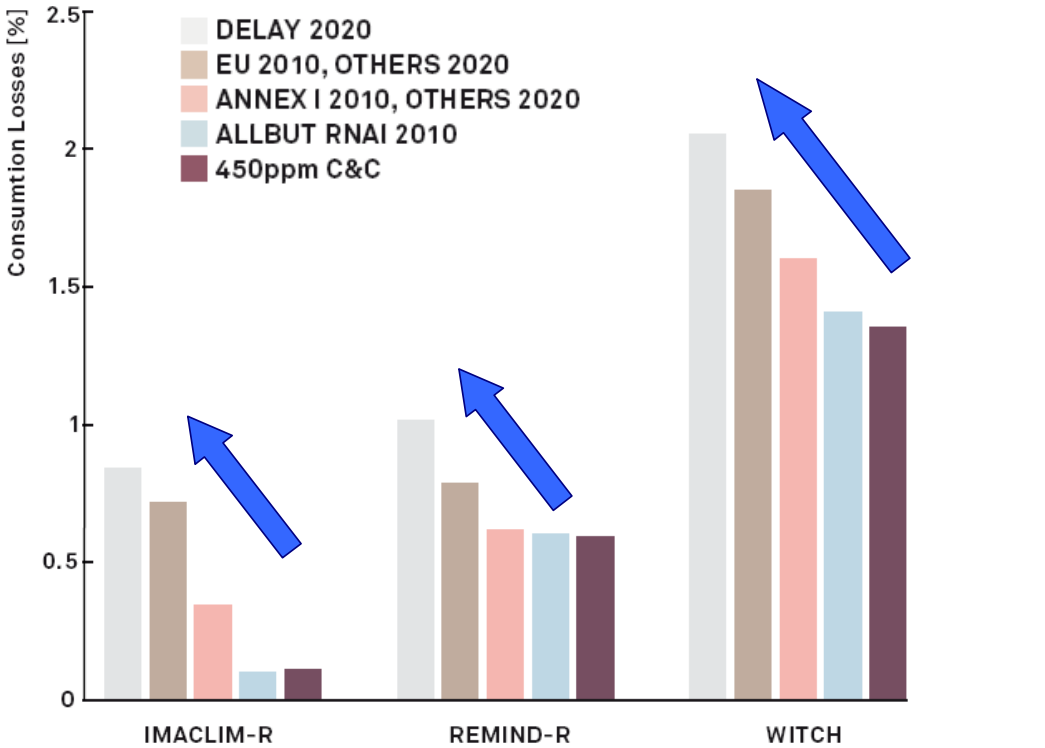
Emission trends – regional breakdown (baseline)





Source: *OECD Environmental Outlook to 2030* (2008) and OECD ENV-Linkages model

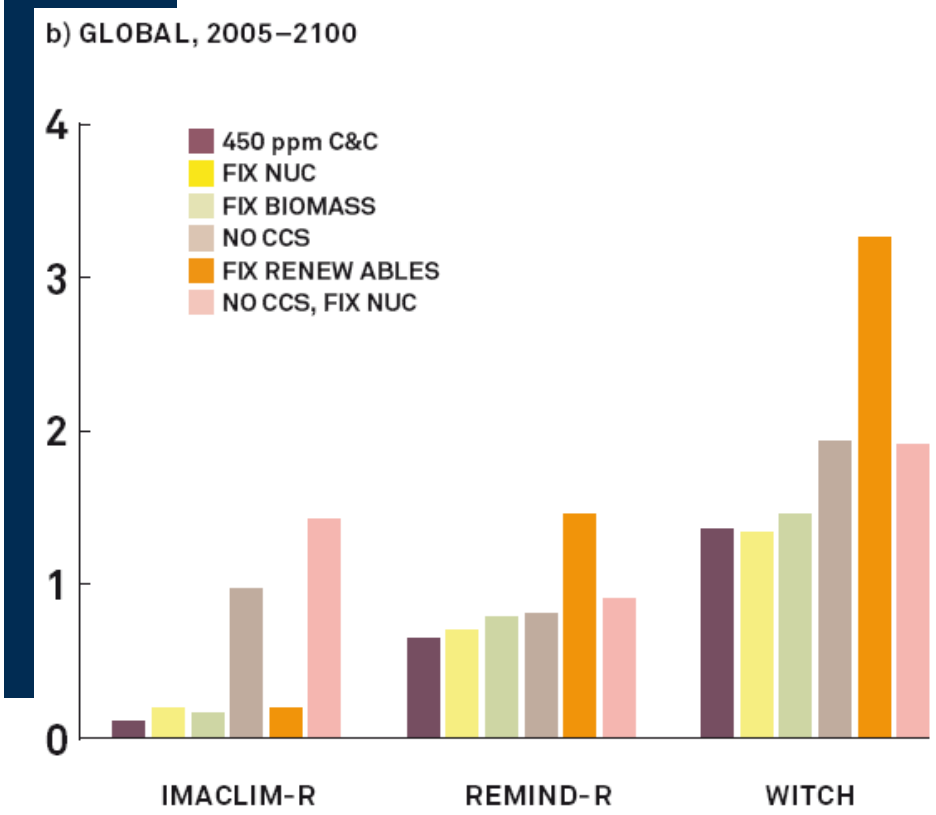
However…



Source: RECIPE Project (2009) : alternative assumptions on international cooperation, 450ppm scenarios

- Previous projections are based on optimistic assumptions on international cooperation, swiftness of action and availability of technologies
- In case of delays or uncoordinated actions costs soar
- Delaying action to 2030 may make it impossible to reach 450 ppm CO_2

However (continued)…

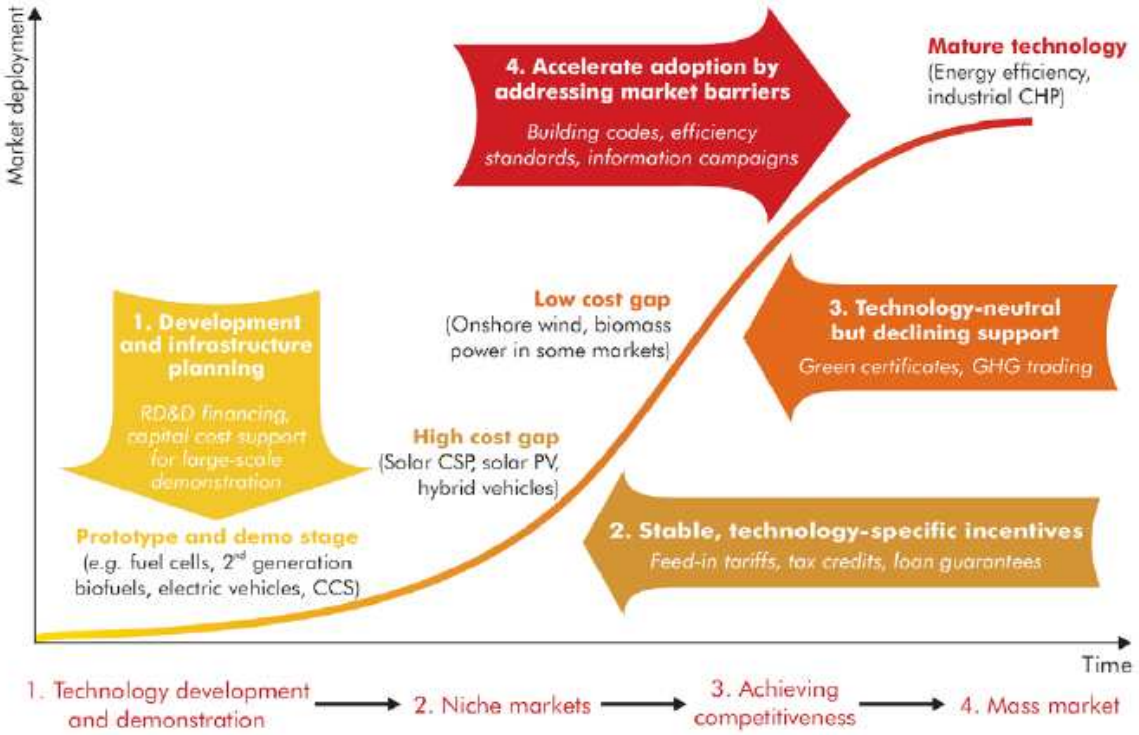


- **Problems in renewable energy technologies diffusions…**
- …or in CCS deployment…
- … can result in soaring costs!

Source: RECIPE Project (2009) : alternative assumptions on tecnology availiability, 450ppm scenarios

FONDAZIONE ENI ENRICO MATTEI

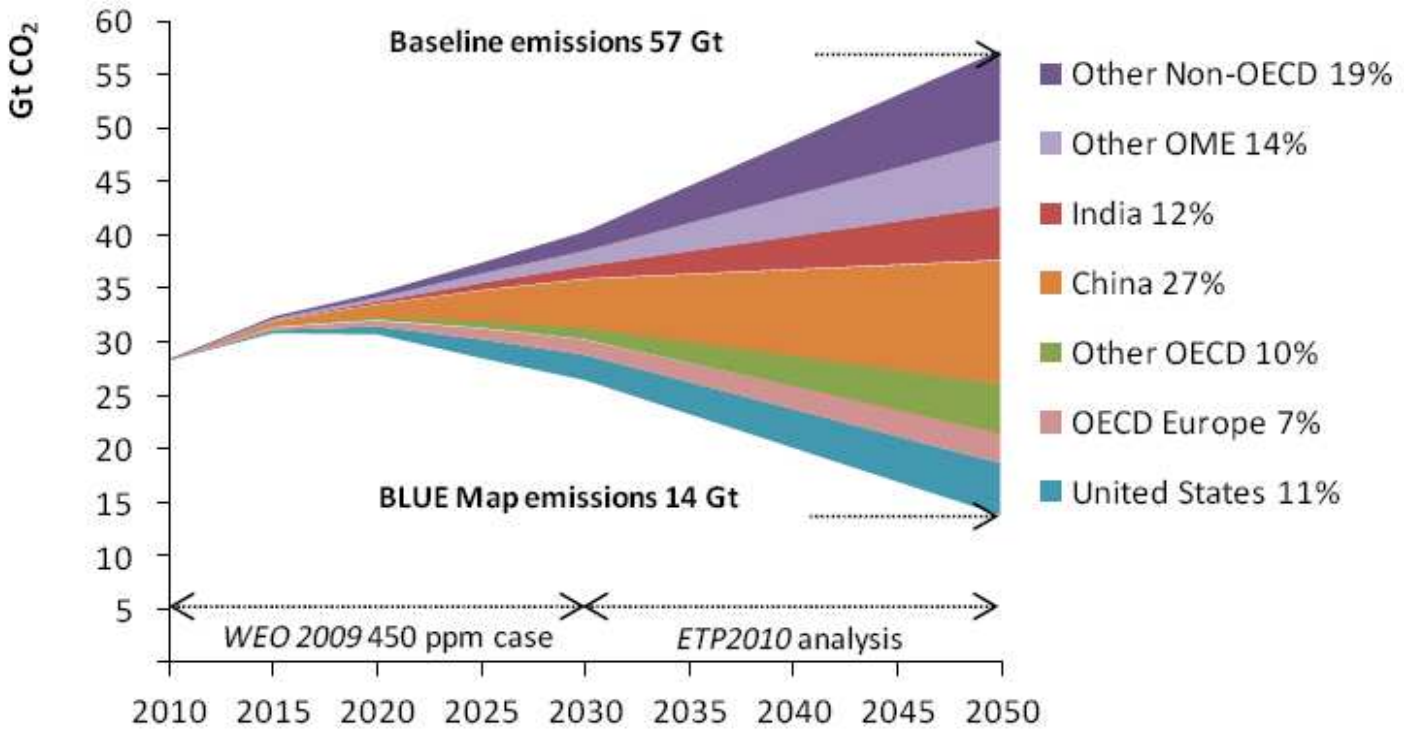
However (continued)…



Source: IEA, Energy Technology Perspectives, 2009

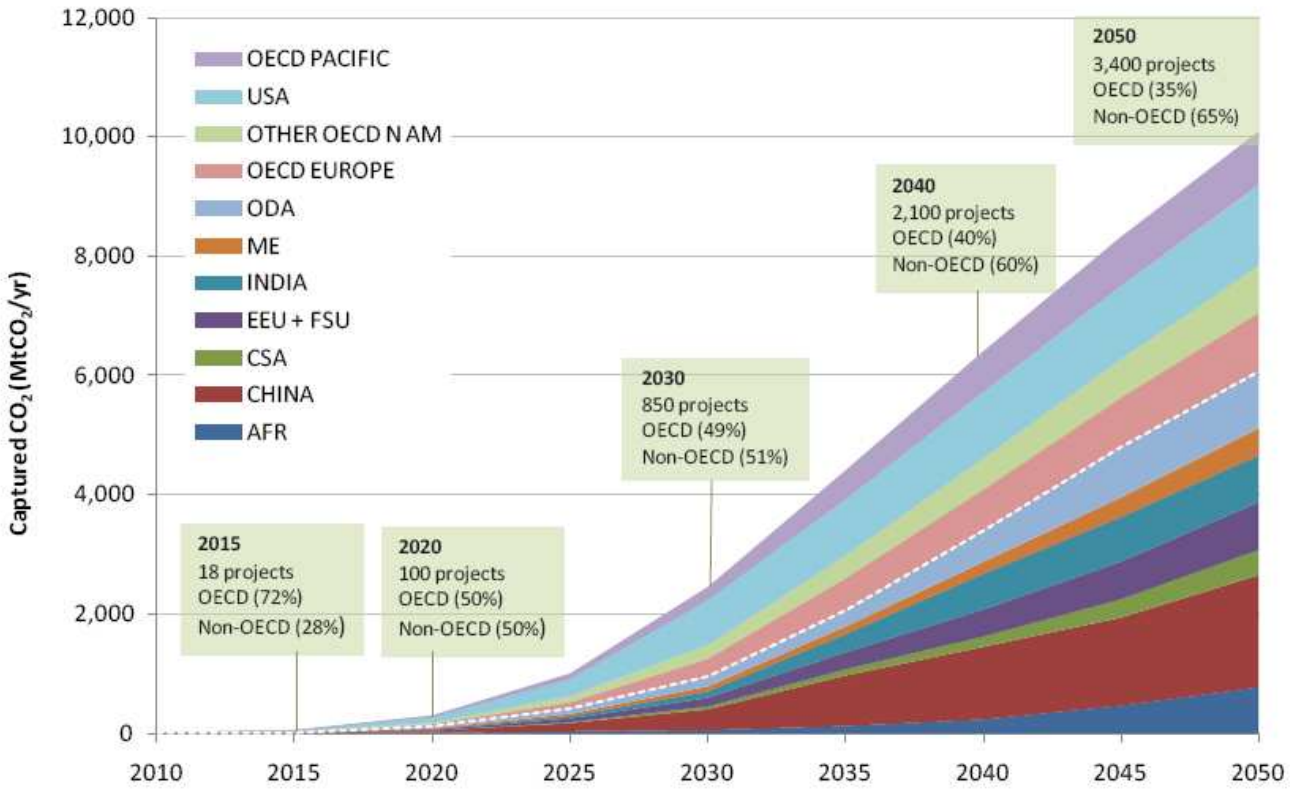
technology development and deployment requires policy support!

Differentiated efforts: abatement effort



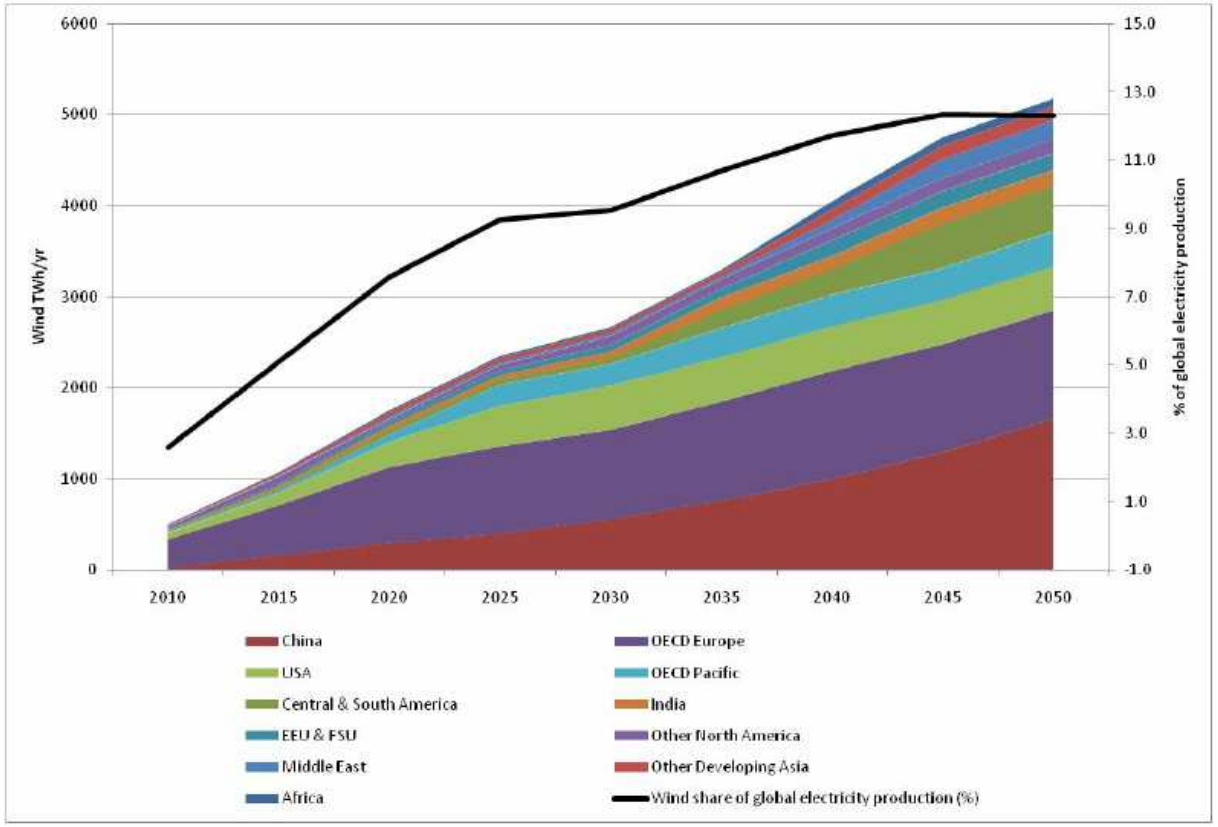
Source: IEA, Energy Technology Perspectives, 2009

Differentiated efforts: CCS



Source: IEA, Energy Technology Perspectives, 2009

Differentiated efforts: Wind



Source: IEA, Energy Technology Perspectives, 2009

SSST

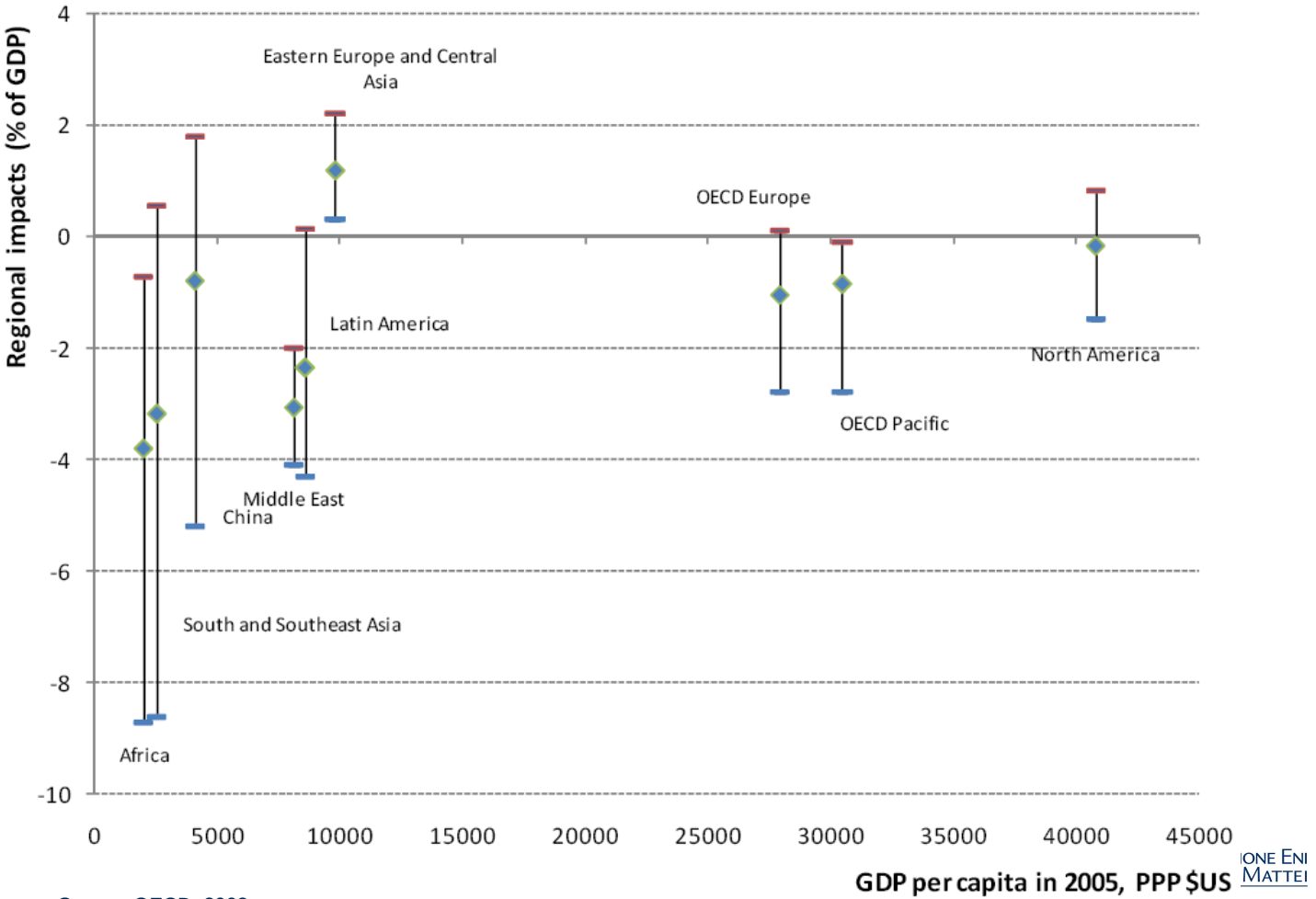
FONDAZIONE ENI ENRICO MATTEI

Why to join? cobenefits of GHG–free technologies

Energy Technologies	Life Cycle Impacts (Pre- and Post-Generation)			Power Generation Impacts			CO_2 Emissions t/MWh
	Air	Water	Land	Air	Water	Land	
Coal - USC	*Baseline Technology for Relative Assessments Below*						0.777
Coal - Biomass	Positive	Positive	Variable / Uncertain	Variable / Uncertain	Minimal	Minimal	0.622
Coal - CCS	Negative	Negative	Negative	Variable / Uncertain	Negative	Minimal	0.142
Coal - IGCC	Minimal	Variable / Uncertain	Minimal	Positive	Positive	Minimal	0.708
NGCC	Positive	Positive	Positive	Positive	Positive	Positive	0.403
Nuclear	Positive	Variable / Uncertain	Variable / Uncertain	Positive	Negative	Positive	0.005
Solar - CSP	Positive	Positive	Positive	Positive	Negative	Minimal	0.017
Solar - PV	Positive	Positive	Positive	Positive	Positive	Minimal	0.009
Wind	Positive	Positive	Positive	Positive	Positive	Variable / Uncertain	0.002

Source: IEA, Energy Technology Perspectives, 2009

Why to join? distribution of global warming impacts



Source: OECD, 2008

Climate negotiations: what happened so far

Mid '70s: climate change (CC) emerges a scientific issue

1979: first world climate conference in Geneva

Supranational institutions on CC established in **1988** (IPCC) and **1992** (UNFCCC)

After initial commitment to emission reduction of Bush (1990) and Clinton (1993) administrations, CC mitigation drops from US agenda, priority given to knowledge advancement

Since 1995, annual Conferences Of Parties (COP) for CC negotiations

December 1997: More than 150 countries sign the Kyoto Protocol, which binds 38 industrialized countries (called Annex 1 countries) to reduce greenhouse gas emissions by an average of 5.2% below 1990 levels for the period of 2008-2012. To become law, at least 55 countries must ratify the Protocol and 55% of Annex 1 emissions must be covered.

March 2001: Two months after his inauguration, U.S. President George W. Bush announces his country's withdrawal from the Kyoto Protocol.

February 16, 2005: The Kyoto Protocol becomes international law after Russian ratification pushes the emissions of ratified Annex 1 countries over the 55% mark.

July 2009: G8 countries agree that 2°C of average global warming is a limit which should not be exceeded. GHG emissions should be reduced by at least 50% by 2050 and emissions from developed countries should be reduced by 80% or more.

December 2009: The COP15 in Copenhagen was the deadline for a fair, ambitious, and binding global agreement on climate change. Unfortunately no binding agreement was reached.

Source: blogs.dickinson.edu/cop15/

FONDAZIONE ENI ENRICO MATTEI


The Japan Times

Conference adopts Kyoto Protocol

Greenhouse gas emissions to be cut by average of 5.2%

KYOTO COP3

The Kyoto Protocol

"The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. […] It sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions .These amount to an average of 5% against 1990 levels over the five-year period 2008-2012.

Countries must meet their targets primarily through national measures. However, the Kyoto Protocol offers them an additional means of meeting their targets by way of three market-based mechanisms […] :

Emissions trading

Clean development mechanism (CDM)

Joint implementation (JI).

Monitoring emission targets

Under the Protocol, countries' actual emissions have to be monitored and precise records have to be kept of the trades carried out.

Registry systems track and record transactions by Parties under the mechanisms. […]

Reporting is done by Parties by way of submitting annual emission inventories and national reports under the Protocol at regular intervals.

A compliance system ensures that Parties are meeting their commitments and helps them to meet their commitments if they have problems doing so."

Source: UNFCCC website (http://unfccc.int/kyoto_protocol/items/2830.php)

Kyoto Protocol: pros and cons (Aldy and Stavins, 2010)

Pros

provides for market based mechanisms, enhancing cost efficiency (Art. 17 on emission trading)

nations are free to meet their targets in any way they like (sovereignty)

appearance of fairness: most effort on richer countries "Annex I"

Politically viable, given the 180 signatories

Cons

- world's major emitters are not constrained
- Few active countries: carbon leakage
- fairness declining as word changes
- countries are not cost minimisers
- CDM flawed
- short term horizon: ends in 2012
- measurement issues

The trouble with carbon leakage

"If only some countries participate in ambitious climate policies, then energy-intensive industries in participating countries would be at a disadvantage *vis-à-vis* competitors in nonparticipating countries.

At the same time global emissions would not fall by as much as expected due to "carbon leakage", where emission reduction in participating countries may be offset by higher emissions in others.

It operates through two distinct channels: a competitiveness effect, and an energy-intensity effect.

The **energy-intensive effect** would come because abatement in participating countries would reduce demand for fossil fuels worldwide, pushing their price down. This may lead non-participating countries to produce and consume more energy-intensive products than they otherwise would as these become cheaper." (OECD, 2008)

The **competitiveness effect** would come because energy intensive industries in non participating countries would have a cost advantage on international markets. This reduces further the incentive to commit to emission reductions.

"If certain industries, and their workers, feel threatened by abatement strategies that weaken their competitiveness, the leakage argument has considerable weight in sectoral terms. There is a very real risk that opposition by these industries could undermine the willingness of particular regions to continue to make progress in putting in place a comprehensive global mitigation approach."

Remedies:

Border taxes? Clashes with WTO and introduces inefficiencies.

carbon leakage effects can be important if the group of countries that constrain emissions is small; but these diminish rapidly as this group grows

co-operative approaches on sectoral action in the most carbon intensive sectors.

Source: OECD, 2008

After 2012: Post Kyoto policy architectures (Aldy and Stavins, 2007, 2010)

- COP 13 in Bali, 2007 set up a RoadMap for post 2012 negotiations. Proposed measures included combating deforestation in poor countries, scaling up investment in green technology, and enhancing funding for adaptation measures. Details on future emissions targets for a post-Kyoto period were not included.
- COP 15 failed to reach a binding agreement, but political, and unilateral commitment was offered by major players.

Fondazione Eni Enrico Mattei

So how will future CC policy architectures may look like?

targets and timetables

Top-down, Kyoto-like, international agreements

but based on formulas rather than absolute levels (e.g. targets based on GDP: wealthier countries cut more emissions)

"graduation" criteria

climate clubs

international fund for low carbon technologies

harmonized national policies

international agreement on similar national policies

uniform carbon taxes

effectiveness - equity tradeoff

coordinated and unilateral national policies

bottom-up approach

coordination around a common goal, but reliance on domestic policies to set incentives for compliance

examples: regional and national ETS, Chinese energy intensity standards,

Key Principles for a New International Agreement (Aldy and Stavins, 2010)

Climate change is a global commons problem

- Countries must cooperate (UNFCCC, G20, or bilateral negotiations)
- Sovereignity implies that treaties must foresee incentives for participation and compliance
- all countries must move to less carbon intensive growth paths.

Equity is crucial for credibility

- Industrialized nations should accept responsibility for historic emissions
- Policies should promote both mitigation and adaptation without penalizing development, but
- Key rapidly growing, developing countries will need to take on increasingly meaningful roles
- Scope of attention and action should include all GHG, not only Carbon from fossil sources

A credible agreement must be cost-effective

- Technological change & transfer must be promoted
- Consistency with international trade regime

A credible agreement must be practical and realistic

- Build on existing institutions and practices, whenever possible, to minimise institutional costs

Conclusions

Most of the energy used today comes from finite sources; there are many non exhaustible sources, but we still have to learn how to use them efficiently. This is crucial for the challenges ahead.

The two main challenges in finding the wisest way of using energy may lead to conflicting solutions in the short-medium run.

In particular coping with climate change may help towards a more secure energy supply; however in the next 10-20 years the easiest ways to securing energy supply may make harder the task of mitigating climate change.

10-20 years is also all the time we have left to enforce a credible climate change policy architecture, least we'll miss our only chance to attain GHG emissions stabilization compatible with a manageable temperature increase

In this time frame we must find a way to commit China, India, USA and later, developing countries to emissions reduction without prejudice for their right to reach our level of welfare

An uncontroversial price for carbon is crucial both for long term sustainability and to dispel uncertainty around energy security.

It is thus crucial to place the right items on the political agenda, with the right timing and with the support of the best available scientific knowledge.

Grazie!

andrea.bigano@feem.it

www.feem.it

www.secure-ec.eu

corso Magenta 63
20123 Milano - Italy

tel +39 | 02 | 5203.6934
fax +39 | 02 | 5203.6946