The Economics of Large Scale Adaptation Policies in Developed and Developing Countries

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COP 18 Side-Event
The cost of climate change adaptation: new findings, old gaps and policy implications
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Overview

- ✓Adaptation as an unavoidable option.
- ✓Funding adaptation: size, when, by whom.
- ✓The role of mitigation
- ✓The equity issue in financing adaptation.
- ✓The financial gap, barriers and solutions.
- ✓Room for private initiative?
- ✓Conclusions

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Concentrations and temperature

Concentrations of GHG (ppm CO_2-eq)	Most Likely	Very Likely Above (>90%)	Likely in the Range (>66%)
350	1.0	0.5	0.6 - 1.4
450	2.1	1.0	1.4 - 3.1
550	2.9	1.5	1.9 - 4.4
650	3.6	1.8	2.4 - 5.5
750	4.3	2.1	2.8 - 6.4
1000	5.5	2.8	3.7 - 8.3
1200	6.3	3.1	4.2 - 9.4

Present level →

Table 1. Most likely, likely and very likely bounds/ranges of global mean equilibrium surface temperature increase in degrees Celsius above pre-industrial temperature for different levels of CO_2 equivalent concentrations (ppm). Source: IPCC Fourth Assessment Report, WG I, Chapter 10, Table 10.8 .

The present level of concentrations is about 440 ppm CO2-eq

However, uncertainty on the emissions-temperature nexus is relevant

Some Basic Facts

- According to IPCC, in order to keep temperature increase below 2° C with good probability, concentrations of GHGs should not exceed 380-390 ppm CO_2-eq.
- The present level of GHG concentration is 440 ppm CO_2-eq (390 CO_2 only), well above the 380-390 ppm level necessary to make a temperature increase above 2° C unlikely.
- 450 ppm CO_2-eq will be reached within three years, whatever world leaders will decide in Doha or at next negotiation rounds...
- If 550 ppm CO_2-eq are reached, there is little chance to stay below 2° C, unless technologies to reduce the stock of emissions are developed

Adaptation is unavoidable ….

Indeed just consider GHG emissions trends (GTCO2e)

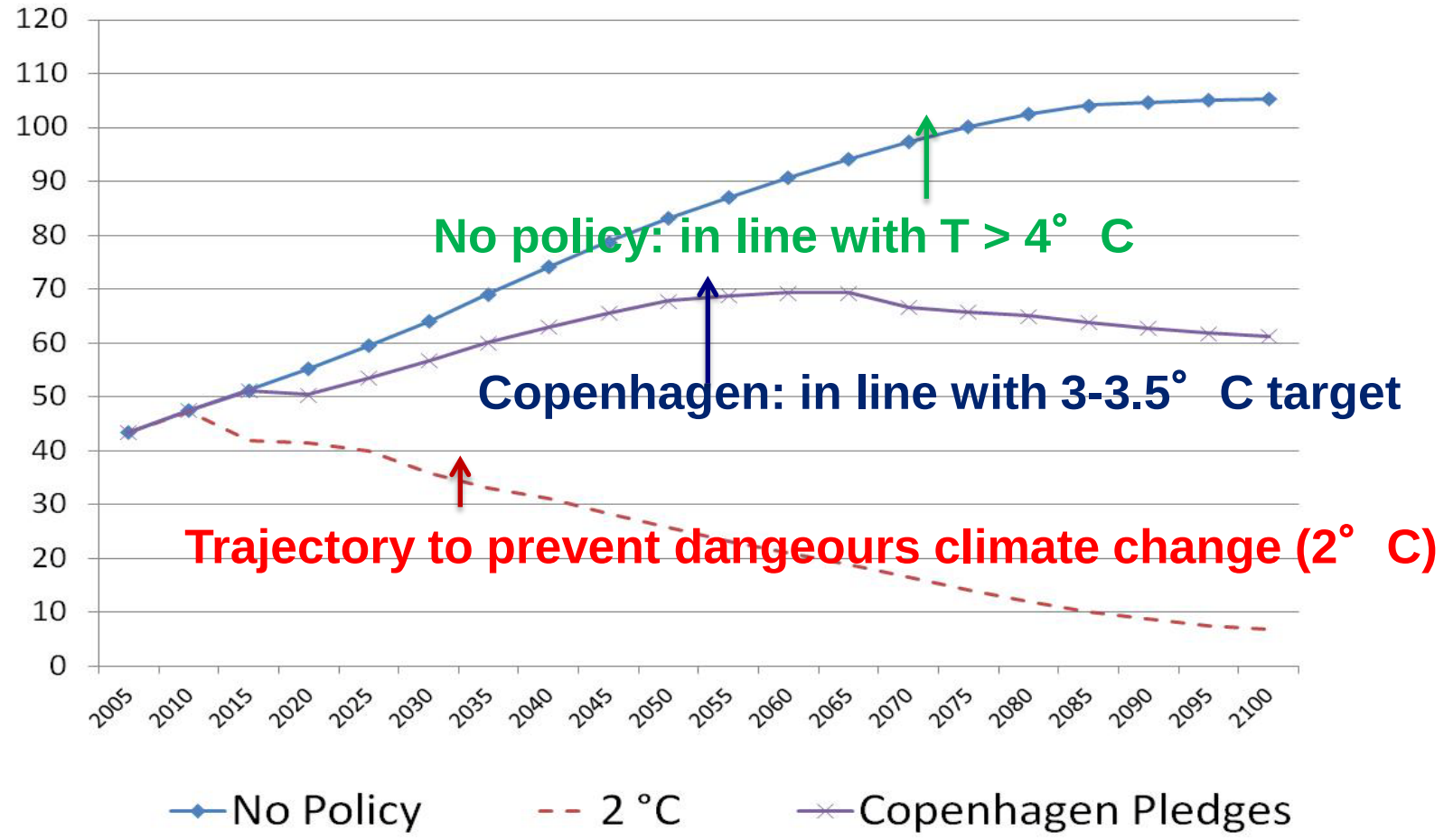


Figure Source: WITCH MODEL (FEEM)

Impacts of climate change

• **Today** GHG emissions, sea-level rise, and global temperature are in line with the highest scenarios projected in AR4 (Post-4AR)

• **Major concerns**: irreversible disruption of ecosystems, potential damages caused by changes in “extremes”. With medium confidence extreme droughts/floods, sea levels rise, precipitations will get worse, though with a lot of spatial variation (IPCC SREX 2012)

• **Socio-economic trends** will exacerbate the climate change challenge: increasing pressure on natural resources for food, energy production, and dwelling (OECD 2012)

Policy options to achieve 450-500 ppm CO2 - eq

1) Reduce (the **flow** of) emissions soon and cooperatively

2) Delay emission reductions => this requires **negative emissions later** (i.e. to reduce the **stock** of emissions)

3) **Adapt** to climate change

Mitigation is hard to achieve ….

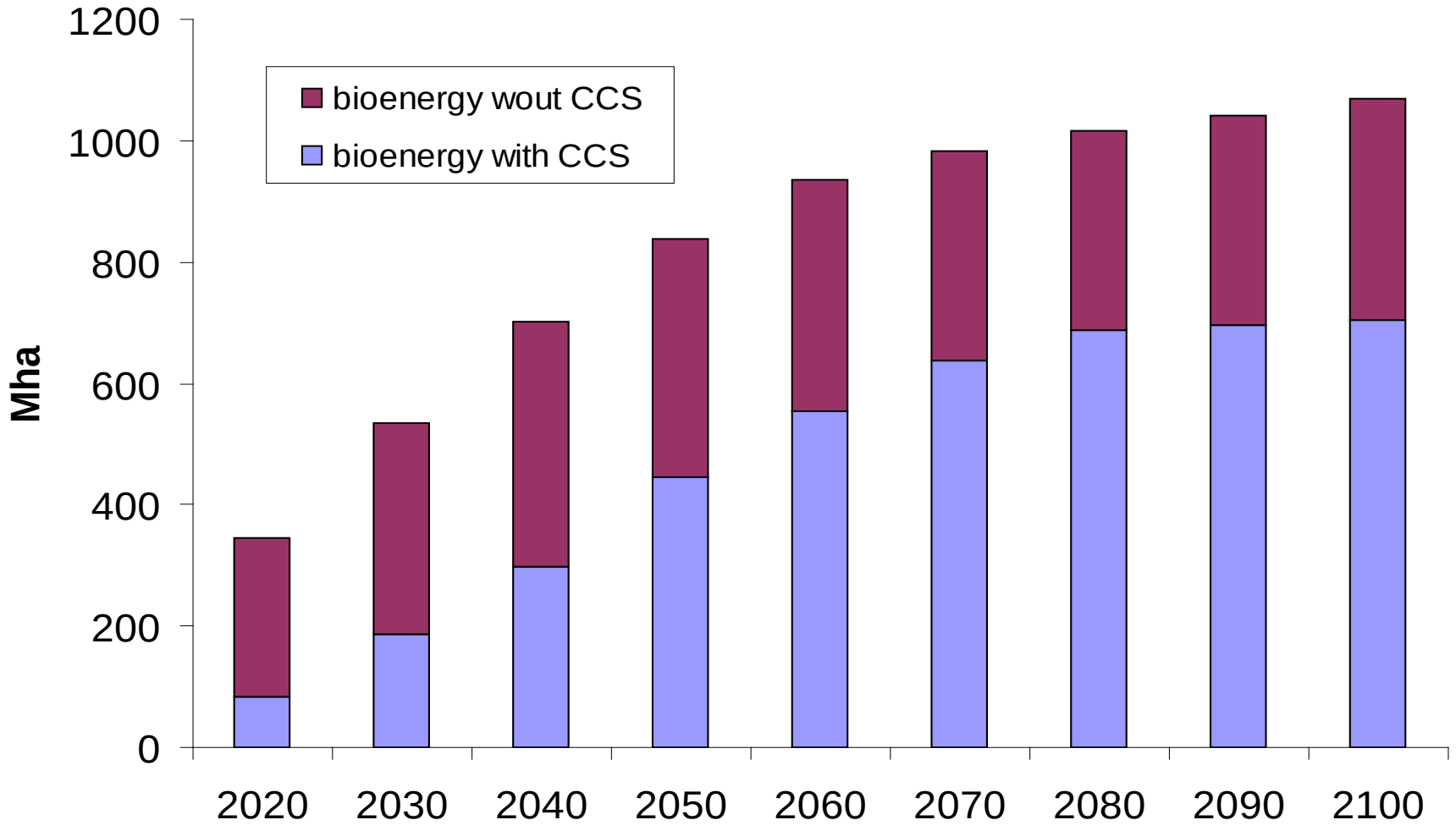
- Requires large participation to be effective => high transaction costs
- Requires strong commitments from poorer countries (efficiency-equity trade off)
- Has an externality + global public good nature => strong free riding incentive
- Offers uncertain future benefits vs rather certain present costs
- Has to work against strong technological lock ins and path dependency (fossil fuel based societies)

Size of negative emission possible initiatives is likely to be too limited …

Several options for carbon dioxide removal. The most promising ones are terrestrial biological:

- Land use and afforestation
- Bioenergy with CCS (BECS)
- Biomass and biochar

BIOENERGY LAND USE in stringent climate stabilization scenarios can reach 1000 Mha (@ 10 tons dry matter/ha). Total arable crop land today is approx. 1500 Mha



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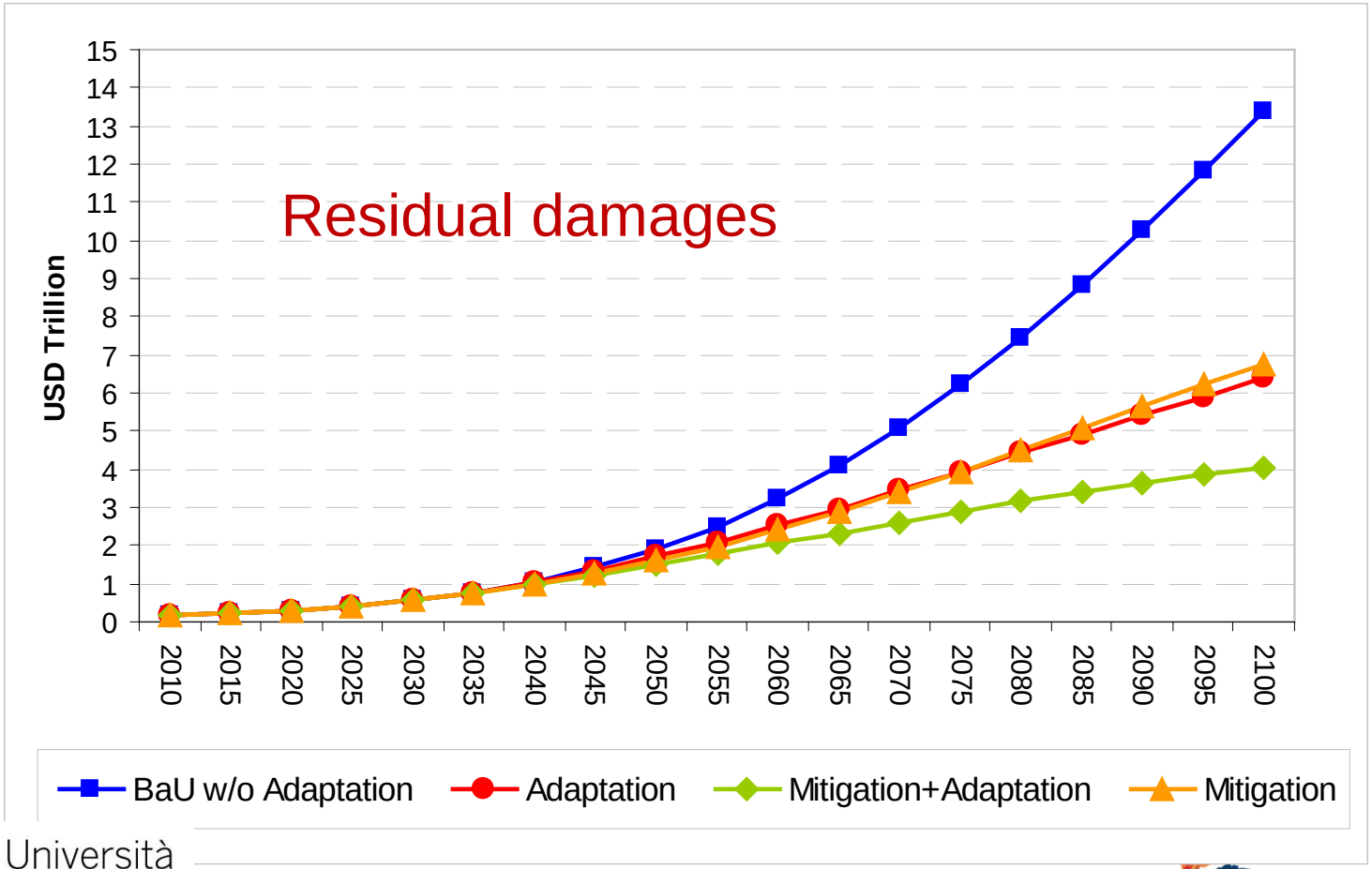
Adaptation

- Very uneven impacts climate change
- Developing countries are much more vulnerable
- Lower free-riding incentives. Those who pay the costs also get the benefits
- Likely to be necessary whatever mitigation policy is undertaken
- To a certaint extent, less costly
- Less international coordination is necessary

Adaptation - Strategic complementarity

Even in the presence of aggressive mitigation, adaptation is still needed to tackle damages from climate change not eliminated by mitigation



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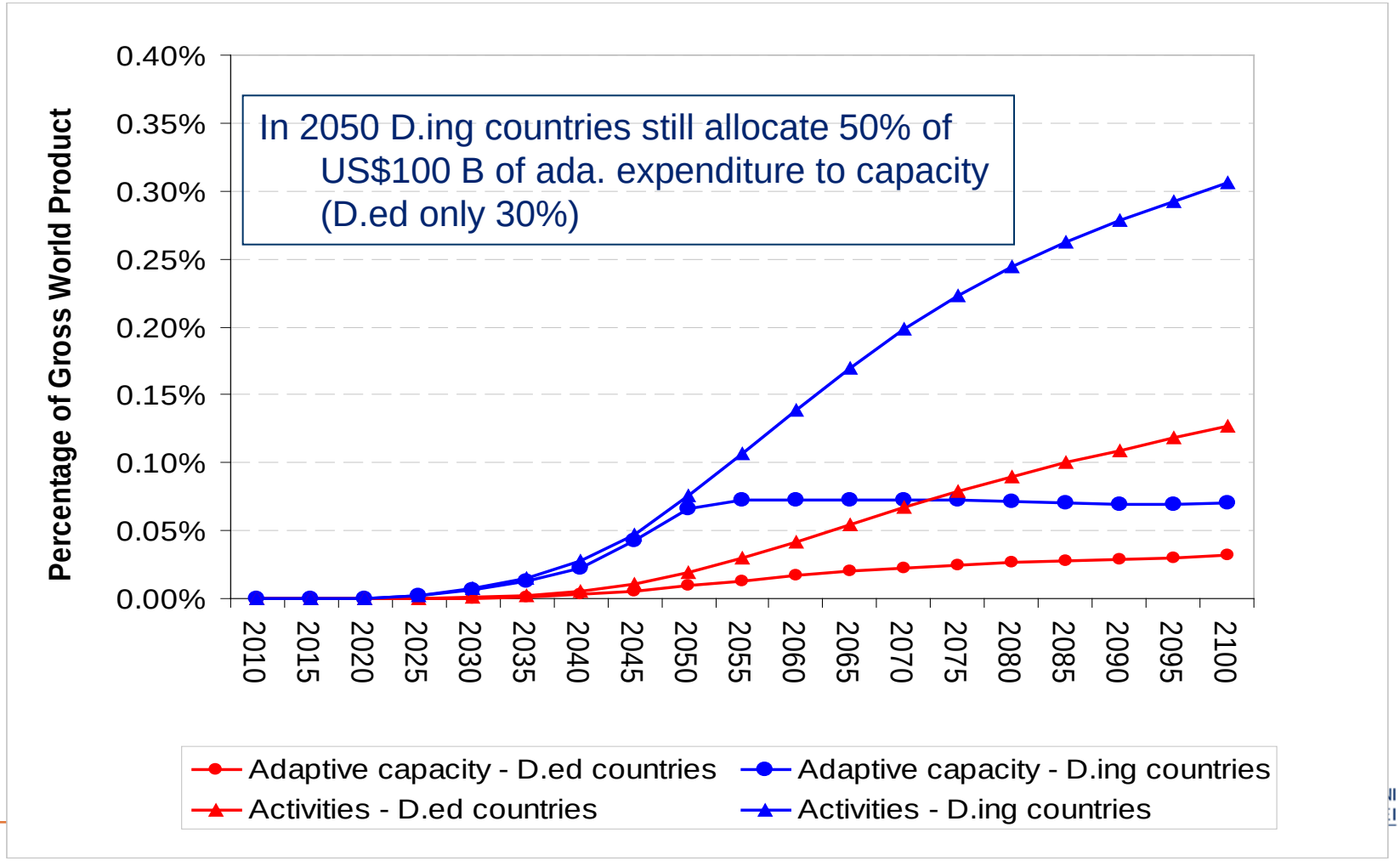
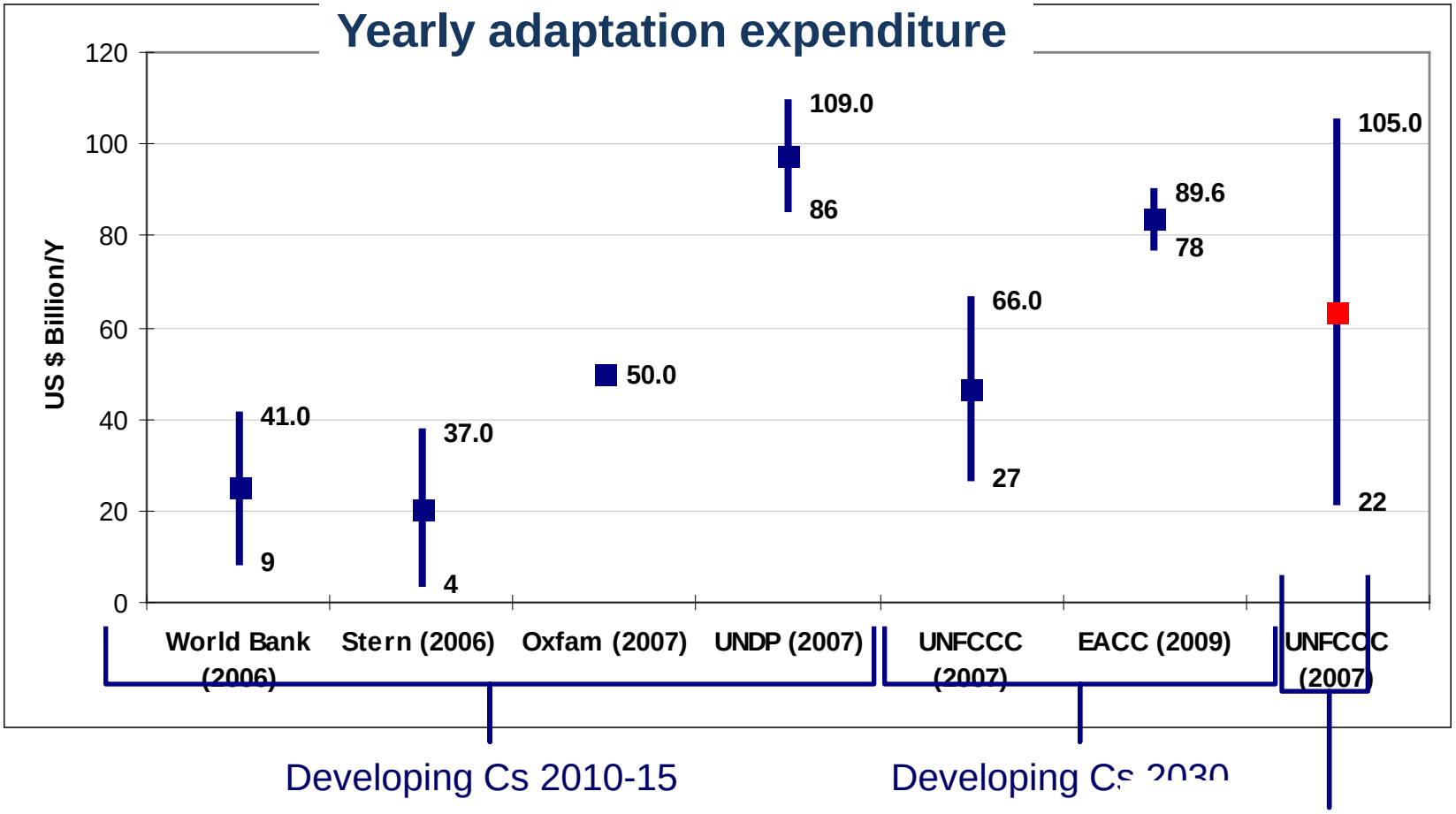
Regional adaptation: activities and building capacity

Developing countries would need more resources for adaptation activities and for building adaptive capacity. This reflects their adaptation deficit and their greater exposure to climate damages



Some estimates of adaptation costs

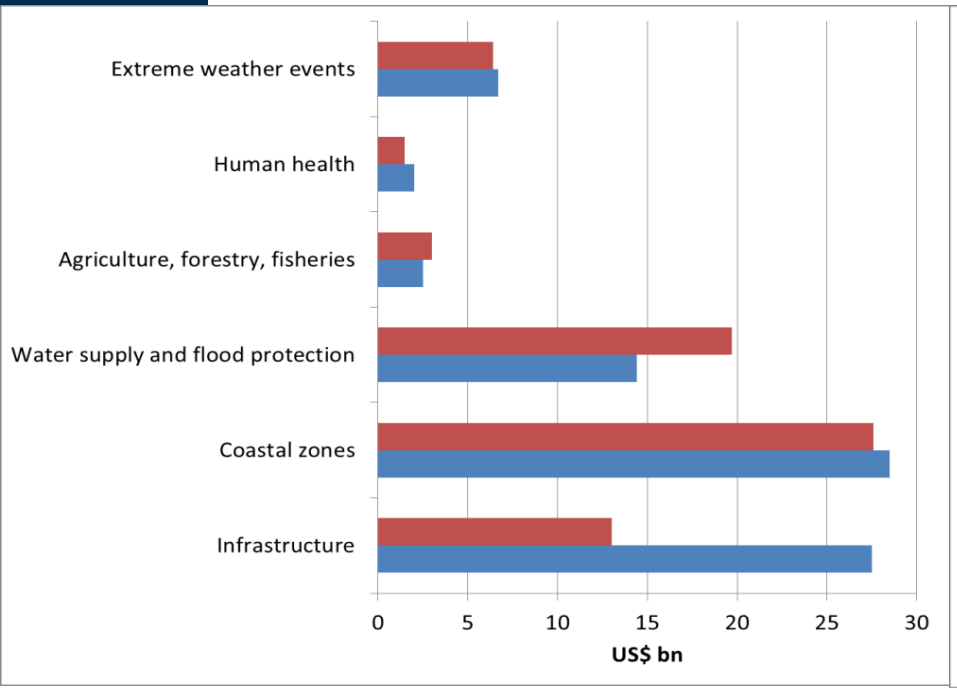
In the short-medium term adaptation costs are already relevant for developing and developed countries

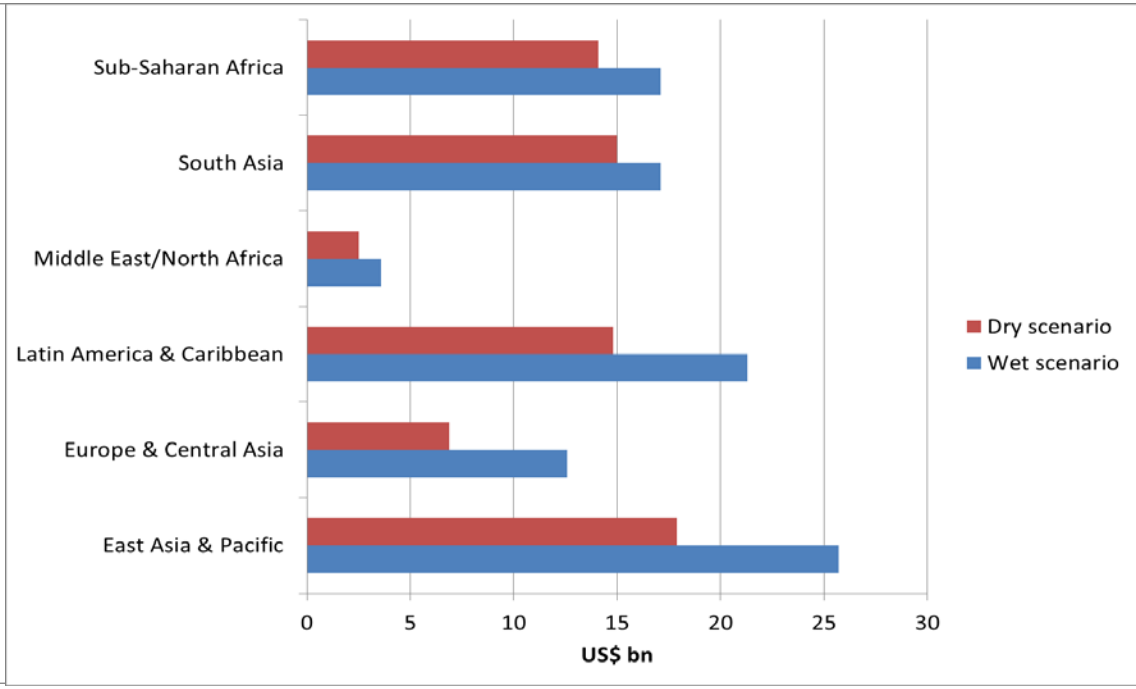


Some estimates of adaptation costs

In the longer term they will be particularly relevant in those areas key for the development of developing countries

Yearly adaptation expenditure (2010-2050)





Source: WB 2010

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Investments to adapt to climate change

Source IIED (2011)

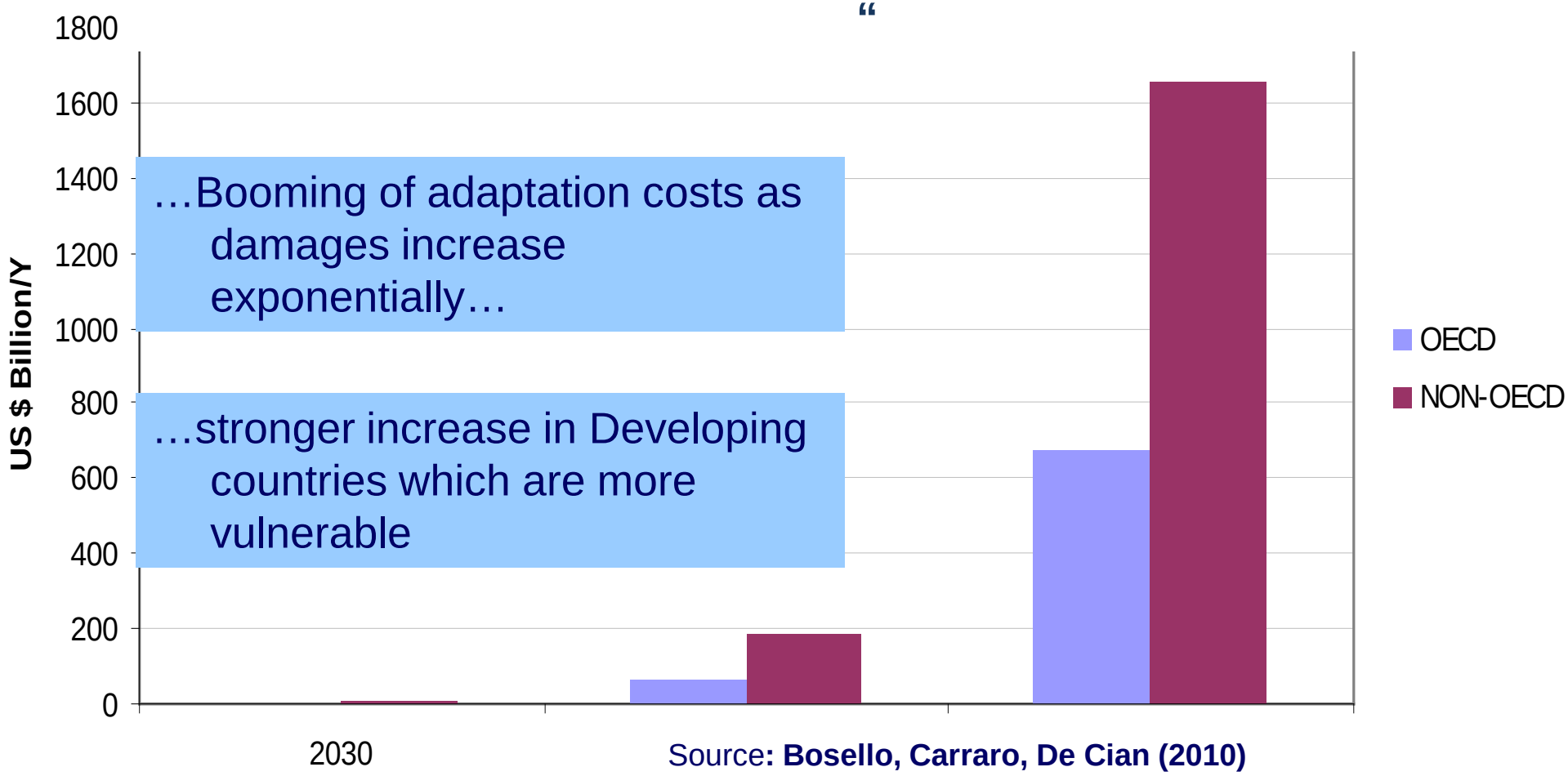
Sectors	UNFCCC estimates	Sources of underestimations	New IIED cost estimates
Agriculture	$11.3-12.6 billions/year	Adaptation deficit → recovering it could cost up to $40-60 billions	$11.3-12.6 + $40-60 billions
Water	$11 billions/year	Transfer of water across countries, no adaptation to altered flood risk	Significant underestimation, more studies needed
Human health	$4-12 billions/year	Population grows but share of illness-related deaths remains constant	30-50% increase in costs
Coasts	$11 billions/year	Sea level rise (SLR) faster than foreseen, residual damage estimation ($1 billion/year) too optimistic	Overall costs could double depending on speed of SLR, residual damage costs t $2-3 billions/year
Infrastructures	$8-130 billions/year	Infrastructural deficit → removing could cost up $315 billions/year	Besides deficit, $16-63 billions/year
Ecosystems	$65-80 billions/year for protected areas	Exclusion of adaptation costs for non-protected areas ($290 billions/year)	$65-80 + $290 billions/year

About 100-140 billions per year

Adaptation costs and mitigation

After 2050 the presence of mitigation will be crucial to determine adaptation cost. Indeed compare…

Adaptation costs in a "Copenhagen" mitigation context: "+ 3.5° C "

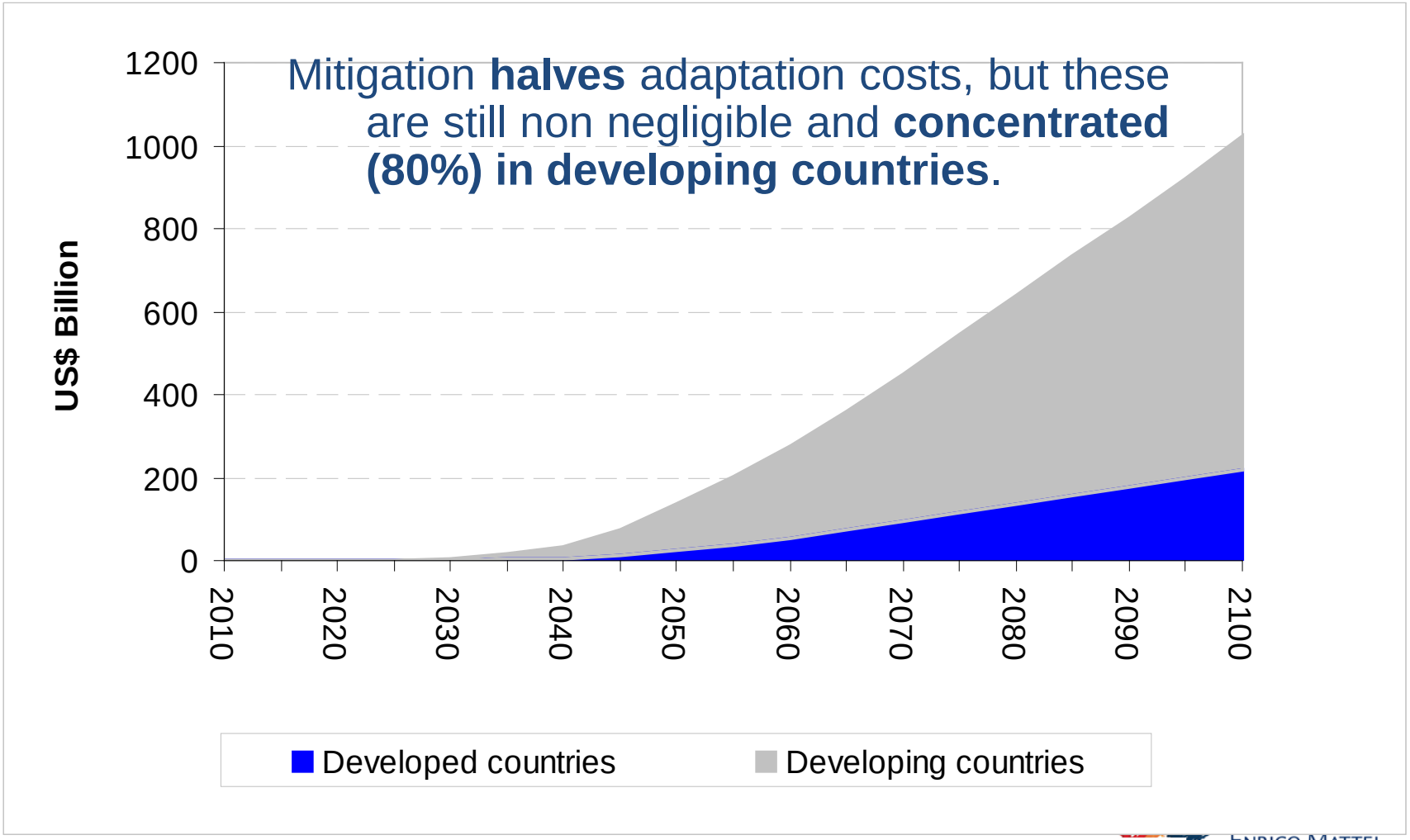


Source: **Bosello, Carraro, De Cian (2010)**

Adaptation costs and mitigation

…with

Adaptation costs in an aggressive mitigation context: + 2.5° C



Source: **Bosello, Carraro, De Cian (2010)**

Adaptation expenditure and equity

There is a clear equity issue:

- Developing countries have higher adaptation needs → according to simulations, on an annuitized basis (over 2010-2100) they would need about US$ 260 Billion for adaptation against the US$ 70 Billion of the developed ones.

- but they contributed less historically to the problem

For instance:

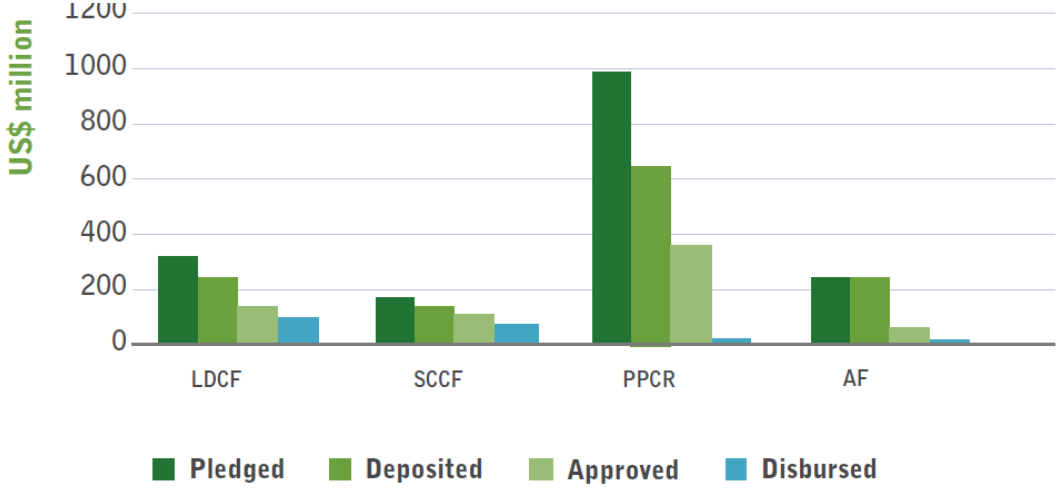
To equalize adaptation expenditure over GDP (loose equity principle), developed countries should transfer US$ 180 Billion to developing countries yearly

⇒ 0.2% of developed countries GDP

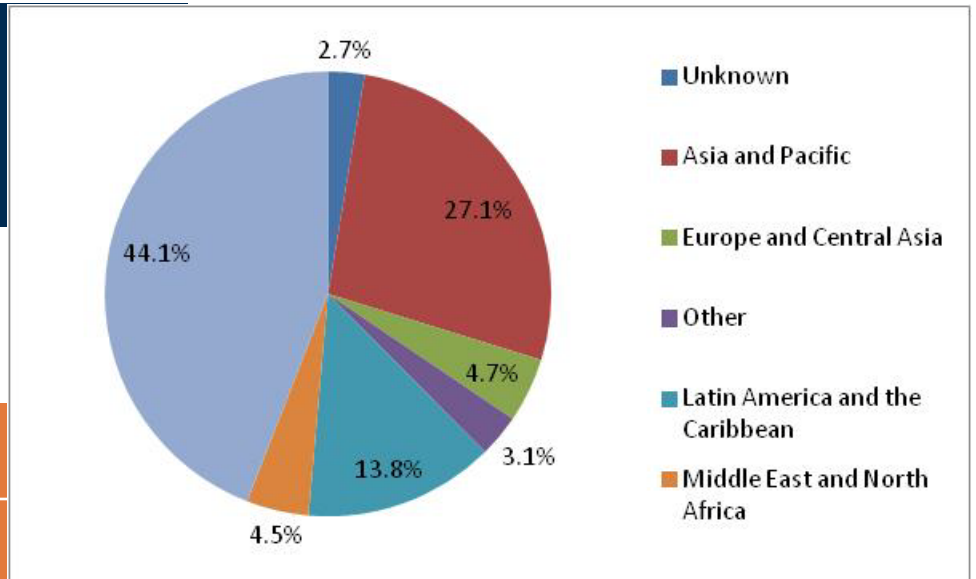
⇒ Additionality issue

Financing adaptation today

Adaptation funding through dedicated multilateral climate (public) funds (until 2011)



Recipients of adaptation funding (until 2011)



In 2011 total ***approved*** adaptation finance was $ 957 million (Nakooda et al. 2011), Cancun Adaptation Framework proposes additional $ 30 billion 2010-2012 for mitigation and adaptation…

… still far from $180 billion…

Source: Nakooda et al., (2011)

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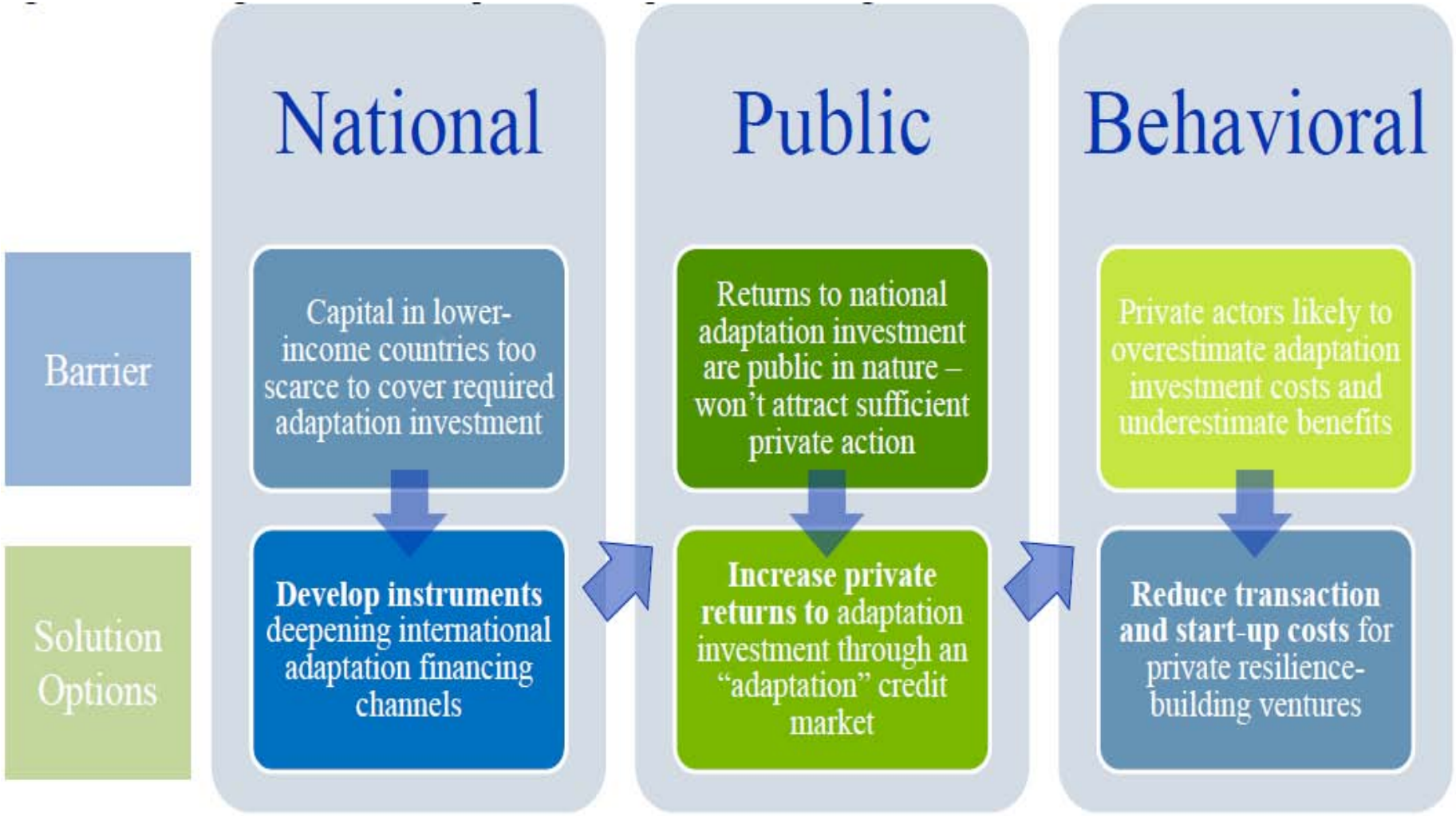
Issues in adaptation financing



Source: DNV KEMA Energy and Sustainability

Ideas under debate…

- Relevant part of adaptation is a “private good” that could be efficiently provided by the individual
- Today about 60% of funding for climate-related investments originates from the private sector (Buchner 2011).

Could private initiative help to cover the adaptation financial gap?

- **E.g. collective insurance** and **microfinance** may be ways to help developing countries communities to respond to climate change → **Pros**: they can mobilize financing to adaptation in times of austerity. **Cons:** financing adaptation through loans put more stress on already highly indebted communities

Conclusions

Mitigation should be used to avoid irreversibility and keep adaptation costs manageable → adaptation will be unavoidable to deal with residual damages that mitigation cannot accommodate. This damage is likely to be large…

Adaptation costs are expected to increase sharply in the second half of the century, but they are already non negligible. Largest adaptation needs are in developing countries. Equity consideration and resource constraints calls for international cooperation on adaptation. Current funding for adaptation appear largely insufficient.

Mobilize more financing for adaptation => involve private actors to flank public intervention. Transaction costs need to be lowered, a better information on the potential returns to adaptation investment could be provided, think innovatively e.g. creation of an adaptation credit market.