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Europe must lead on adaptation

Europe's 'know-how' on climate adaptation needs to be made available to other countries. Martin Parry outlines the priority issues.

MARTIN PARRY

The flood situation all over Assam state has been critical since the beginning of July 2009 as the water levels of the main Brahmaputra River and its tributaries are still flowing above the danger level.

Faced with the advancement of the Sahara desert, a result of world climate change, the peasants of Burkina Faso are fighting with little means but certain success to stop the advancement of the dunes by planting shrubs.

Impacts from climate change cannot be fully avoided by mitigation. Some impacts can be observed now as a result of the 0.7°C warming above pre-industrial levels that has already been recorded. Even if emissions stopped altogether this very minute, then a further 0.6°C warming would occur due to past emissions. A depressing conclusion, is that 1.3°C of warming is unavoidable. The challenge, now, is for us to do our utmost not to commit to ourselves to further amounts of warming that might exceed our capacity to adapt. A target now being discussed in the talks leading up to and at the Copenhagen Conference of the Parties to the UNFCCC is to avoid exceeding 2°C of warming. What is often missed in this debate is the enormous challenge that 2°C warming (even if we were to avoid exceeding it) would place on our abilities to adapt.

Poor, children and elderly

We can be clear about those places in the world that are priority candidates for early adaptation. The Intergovernmental Panel on Climate Change (IPCC) concluded that the people most at risk are the poor, children and the elderly.

The most vulnerable systems and sectors are: a) some ecosystems, especially tundra, boreal forest, mountain, Mediterranean-type ecosystems, mangroves and salt marshes, coral reefs and the sea ice biomes; b) low-lying coasts, due to the threat of sea-level rise; c) water resources in low-

latitude regions, due to decreases in rainfall and higher rates of evapo-transpiration; d) agriculture in low-latitude regions, due to reduced water availability; and e) human health, especially in areas with low adaptive capacity
The most vulnerable regions are: a) the Arctic, because of high rates of projected warming on sensitive natural systems; b) Africa, especially the sub-Saharan region, because of low adaptive capacity and projected changes in rainfall; c) small islands, due to high exposure of population and infrastructure to risk of sea-level rise and increased storm surge; and d) Asian megadeltas, such as the Ganges-Brahmaputra and the Zhujiang, due to large populations and high exposure to sea-level rise, storm surge and river flooding.

Heat-waves, storms and droughts are likely to become more frequent, widespread and intense

Many of the regional differences in impact will stem from changes in water availability (which is essential for human health and food production). Over the past five years we have developed a clearer picture of how water availability may change regionally, with indications of important decreases in southern Europe, and in northern and southern Africa. If these projected changes occur, then impacts in these regions could be severe.

Extreme weather events

Extreme weather events, which can have large impacts as Hurricane Katrina did when it hit New Orleans in August 2005 causing 4,000 fatalities, are projected to increase in their likelihood and magnitude; and we may already be seeing signs of this. For example, the August 2003 heat-wave in western Europe, which led to the deaths of several thousand mainly elderly people, may well be partly explained by the overall warming of 0.7°C that we have already experienced. If a 4-5°C were to occur (which is projected by the end of this century if we take no mitigating actions to reduce emissions), then this kind of heat-wave could be expected to occur on average once every two years. In other words it would become a normal occurrence.

Major tipping points

Two large-scale events that could affect Europe are substantial sea-level rise and weakening of the Gulf Stream. Faster rates of ice melt and sea-level rise than projected by the IPCC have been reported by post-2007 research. A sea-level rise of over a metre this century seems possible, about double the IPCC projections. Much more substantial 'tipping points' for Europe are less likely: the 2007 IPCC assessment reported that complete melting of the Greenland ice sheet could lead to sea-level rises, over millennia, of 7 m; and for the West Antarctic ice sheet, complete melting could contribute 5 m to sea-level rise.

Weakening of the Gulf Stream, which could lead to cooling in NW Europe, would be very unlikely to occur during this century, the IPCC concluded, but the commitment to it (i.e. which then would occur more than 100 years hence but not be avoidable) could be made this century if there is a continuation of the current trend of thinning of Arctic ice.

A fifty per cent cut

It is now clear that current mitigation targets, even if fully achieved, would not avoid major global impacts. For example, probably the best the UNFCCC can achieve is agreement toward a 50 per cent cut of global current greenhouse gas emissions by 2050. However, this would not avoid exceedance of the 2°C warming target. It allows an even chance of, for example, a billion additional people being short of water due to climate change, as well as many other serious global damages. Additionally, the uncertainty range in Figure 4 indicates a substantial risk of much larger impacts occurring. To reduce serious global damage, we need to adopt much more stringent targets – at least an 80 per cent cut in global emissions, as shown in Figure 1. Even then, the global damage is likely to be severe.

Because there are limits to damage-avoidance by mitigation, the challenge for adaptation will be truly enormous. Figure 1 shows this extent, the area left of the shaded mitigation columns being the field where impacts can only be avoided by adaptation. This 'adaptation field' is, however, almost certainly a substantial under-estimate because Figure 5 assumes global emissions to have peaked by 2015, something barely possible even in an ideal world. It is likely that the 'adaptation field' will have to expand right-wards on the figure to allow for mitigation which turns out to be slower and less stringent than the ideal.

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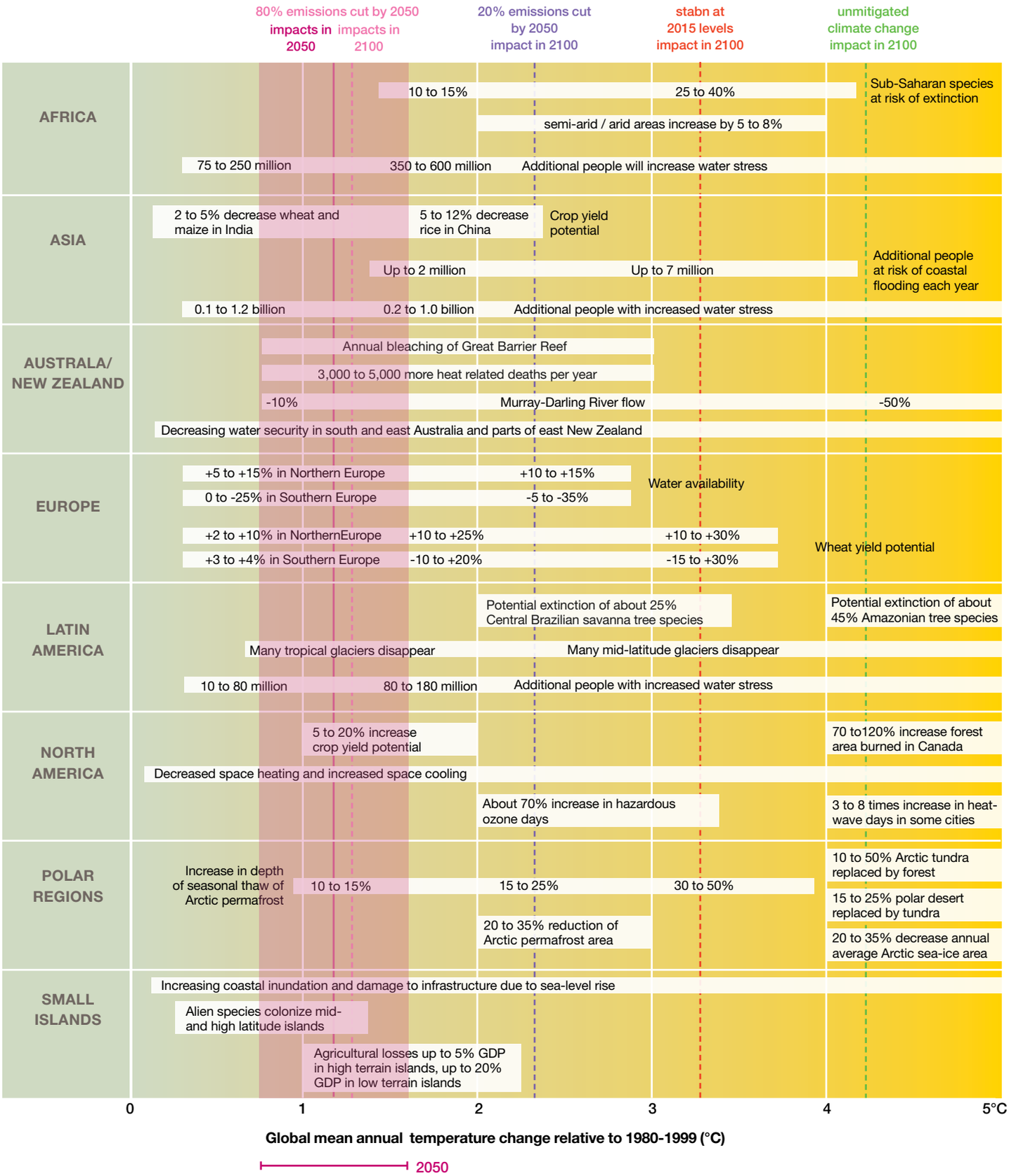
Future vulnerability

While current development status may well affect risk of damage from climate change, alternative future development may have an even greater effect. Of course, development experts have guessed this

Figure 1. Selected regional impacts projected for varying amounts of climate change, with shaded column indicating likely impact outcome in 2100 for a rate of greenhouse gas emissions reductions of 80% of current levels by 2050 (continued at constant rate to 2100) (modified from Parry, et al., 2008 and 2009). Note that the temperature changes in this Figure are scaled against current temperatures, which are c. 0.6°C higher than pre-industrial temperatures. Thus 2°C pre-industrial warming is equivalent to 1.4°C in this figure.


80% emissions cut by 2050
impacts in 2050
impacts in 2100
20% emissions cut by 2050 impact in 2100
stabn at 2015 levels impact in 2100
unmitigated climate change impact in 2100
AFRICA
10 to 15%
25 to 40%
Sub-Saharan species at risk of extinction
semi-arid / arid areas increase by 5 to 8%
75 to 250 million
350 to 600 million
Additional people will increase water stress
ASIA
2 to 5% decrease wheat and maize in India
5 to 12% decrease rice in China
Crop yield potential
Up to 2 million
Up to 7 million
Additional people at risk of coastal flooding each year
0.1 to 1.2 billion
0.2 to 1.0 billion
Additional people with increased water stress
AUSTRALA/ NEW ZEALAND
Annual bleaching of Great Barrier Reef
3,000 to 5,000 more heat related deaths per year
-10%
Murray-Darling River flow
-50%
Decreasing water security in south and east Australia and parts of east New Zealand
EUROPE
+5 to +15% in Northern Europe
+10 to +15%
Water availability
0 to -25% in Southern Europe
-5 to -35%
+2 to +10% in NorthernEurope
+10 to +25%
+10 to +30%
Wheat yield potential
+3 to +4% in Southern Europe
-10 to +20%
-15 to +30%
LATIN AMERICA
Potential extinction of about 25% Central Brazilian savanna tree species
Potential extinction of about 45% Amazonian tree species
Many tropical glaciers disappear
Many mid-latitude glaciers disappear
10 to 80 million
80 to 180 million
Additional people with increased water stress
NORTH AMERICA
5 to 20% increase crop yield potential
70 to120% increase forest area burned in Canada
Decreased space heating and increased space cooling
About 70% increase in hazardous ozone days
3 to 8 times increase in heat-wave days in some cities
POLAR REGIONS
Increase in depth of seasonal thaw of Arctic permafrost
10 to 15%
15 to 25%
30 to 50%
10 to 50% Arctic tundra replaced by forest
15 to 25% polar desert replaced by tundra
20 to 35% reduction of Arctic permafrost area
20 to 35% decrease annual average Arctic sea-ice area
SMALL ISLANDS
Increasing coastal inundation and damage to infrastructure due to sea-level rise
Alien species colonize mid- and high latitude islands
Agricultural losses up to 5% GDP in high terrain islands, up to 20% GDP in low terrain islands
0
1
2
3
4
5°C
Global mean annual temperature change relative to 1980-1999 (°C)
2050

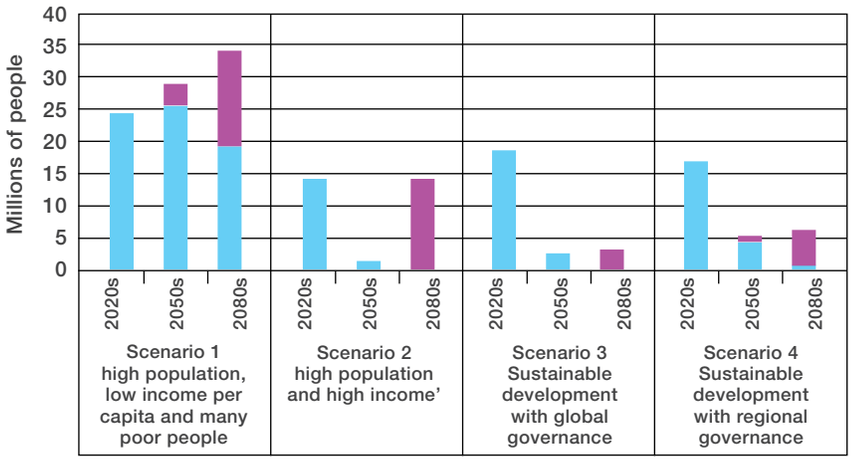


Figure 2. Estimated millions of people per annum at risk globally from coastal flooding. Blue bars: numbers at risk without sea-level rise; purple bars: numbers at risk with sea-level rise (modified from IPCC, 2007, Technical Summary)

for some time. But climate impact assessments now support this assumption. These have used varying social and economic scenarios of the future to examine what the climate change impacts might be under differing development pathways. Their overall conclusion is that *more of the difference in projected impact is due to future development than to climate change*. To illustrate, Figure 2 shows estimates of the number of people globally projected to be at risk from flooding in 2080. The blue bar shows the impact without sea level rise, the purple bar is the premium with sea level rise.

The figure shows that under the scenario with 'high population, low income per capita and many poor people' (scenario 1) these numbers are much higher than under the scenario with 'high population and high income' (scenario 2). Then there are two sustainable development scenarios; one with global governance (scenario 3) and one with regional governance (scenario 4). These scenarios include more robust and adaptive societies and show a much lower number of people at risk of flooding.

Even assuming no climate change and no sea-level rise (the blue bars), there is a striking difference between the impacts of the *scenario-1-future* and the other futures. This is because more poor - and therefore exposed - people are assumed to be living in the future in flood prone areas in East and Southeast Asia than in the other futures. Unfortunately, the *scenario-1-pathway* is the one we are following at present. The challenge for Europe and other rich countries is to transfer technologies and fund development that helps put poorer countries onto a sustainable development track, making them much less vulnerable to the impacts of climate change.

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The previous example indicates that, with the 'right kind' of development, we can develop our way out of the climate change crisis. But that will require a radical change in type of development. Trying simply to 'add on' to our current development pathway the large mitigation and adaptation tasks that we face would make confronting climate change immensely costly, which may partly explain why we have not yet been successful in agreeing a way forward. For example, protecting billions of poor people against impacts would, when all the costs are added up, be far more costly than raising people from poverty. A change in paradigm of development appears to be necessary; one of sustainable development.

Conclusion

Patching up a 'development-as-usual' pathway will not work and will be immensely costly. Much more likely to be successful is a strategy of sustainable development to ensure high levels of efficiency and equity in resource use, investment and governance. Europe, already providing nearly half the world's current overseas development aid, will need to take the lead in meeting this challenge. It will need to become the 'champion' of adaptation.

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Financing adaptation

In October this year EU leaders agreed that 100 billion Euros would be needed annually to enable poorer countries to adapt to climate change, and pledged that Europe would pay its 'fair share' of this, though did not decide on a specific figure.

They estimated that about a half of this would need to be public funding with the remainder coming from the private sector. However, developing countries have argued that 3 to 4 times this sum is needed, and this is a key difference which will need to be resolved at the Copenhagen Conference of the Parties to the UN Framework Convention on Climate Change. There is an Adaptation Fund which developing countries can draw from to finance adaptation projects, but it currently owns just a few million dollars.

Several times greater

The difference in these cost estimates seems mainly to stem from different assumptions about what needs to be done to avoid major damage. Most studies of adaptation costs measure only the damage-prone fraction of each human activity, then apply this as a 'climate mark-up' across all sectors in all countries. Studies by the World bank and the UNFCCC thus arrive at adaptation costs of about $20 to $100 billion (annually by 2030) for developing countries. But developing countries often have substantial difficulty adapting to existing climate risks to start with, this so called adaptation deficit is estimated by some to be several times greater than the climate mark-up alone; and without making good this deficit, they argue, poorer countries will always be vulnerable to climate change.

Source: M.L.Parry, and others (2009) 'Assessing the costs of adaptation to climate change', IIED and Grantham Institute, Imperial College London.

World Bank study on global costs of adaptation

The World Bank is working with Bangladesh, Bolivia, Ethiopia, Ghana, Mozambique, Samoa and Vietnam on a new study – *The Economics of Adaptation to Climate Change*. The study will deliver a better understanding of the global costs of adapting to climate change. The study is funded by the United Kingdom, the Netherlands and Switzerland.

The Economics of Adaptation to Climate Change study is a multi-year, multi-country study. It's designed to help decision makers design climate change adaptation strategies through an improved understanding and assessment of the risks posed by climate change and possible adaptation measures that can be taken to reduce the risks. The report will also help national decision makers to better cost, prioritize, sequence and integrate robust adaptation strategies into their development plans and budgets in a context of high uncertainty, competing needs and limited financial resources. By identifying the climate change adaption needs of developing countries and their costs, the study also helps inform the international community's efforts to provide access to adequate support and new and additional resources to help the most vulnerable developing countries meet the costs of adapting to climate change.

Vulnerability of the poor

A primary focus of the study is on government-led (or planned) adaptation at the sector level, encompassing public infrastructure investments, capacity building, implementation of regulations to enable private adaptation, and safety net programs to help the vulnerable cope when adaptation measures are insufficient. Given competing needs for public sector investments in social and economic development, the study will cost, prioritize, sequence, and integrate specific adaptation strategies within the context of development plans and budgets. The study places particular emphasis on improving understanding of the impacts, sensitivity and vulnerability of the poor and most vulnerable social groups, of what adaptation would imply for their livelihoods, and what forms of public support are needed to facilitate such changes.

Additional information can be found at www.worldbank.org/eacc