

## THE ECONOMICS OF CLIMATE CHANGE

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The annual flow of carbon dioxide and other greenhouse gases that warm the Earth's atmosphere has increased ever since coal, then oil and gas too, began to fuel the industrial revolution that has brought great opportunities and better lives to so many. Atmospheric greenhouse gas levels have already reached the equivalent of around 430ppm (parts per million) of carbon dioxide (CO<sub>2</sub> equivalent, CO<sub>2</sub>e), compared with 280ppm before the industrial revolution. Human activities are pushing the accumulated stock of gases higher, by 2–3 ppm every year.

Our work suggests that it is possible to use hard-headed economic analysis to identify goals for global efforts to limit the ultimate level of greenhouse gases in the atmosphere – the evidence points to a range of 450–550ppm CO<sub>2</sub>e. This is achievable, economically feasible, and will significantly reduce the risk of extreme temperature changes. To reach the upper end of the change, the world will have to reduce the annual flow of emissions by at least 25 per cent from today's levels by 2050, cutting emissions until they eventually fall to a level at least 80 per cent lower than now. It would be much safer to go for the middle of the range, which would require a cut in the annual flow of around 50 per cent by 2050, the target agreed at the G8 summit in Heiligendamm in June this year.

Three elements of policy are required for an effective global response. The first is carbon pricing, through tax, trading or regulation, so that people factor the full costs of their actions into their decisions. We must harness the power of markets. Price signals – whether generated by taxes, regulation, or emissions-trading schemes like those pioneered in the USA – can drive a myriad of innovations in technology. Using markets recruits every entrepreneur to help tackle the global challenge.

The second policy element is to support innovation and deployment of low-carbon technologies. The world needs to overhaul how it produces its energy. Yet the power sector in OECD countries spent only all of 0.33 per cent on research and development, compared with 2.65 per cent for the manufacturing sector as a whole. The United States showed the way when oil displaced coal and then with electrification. It can do so again, with bio-fuels, carbon capture and storage, and other vital technologies.

The third element is the removal of barriers to energy efficiency and measures to inform, educate and persuade. As people's understanding of the issue develops, they will increasingly demand strong action by public authorities. Public discussion is itself a crucial ingredient of policy.

Businesses around the world have told us that they need a 'long, loud, and legal' framework with clear policy signals, credible over the medium to long term, if they are to play their part. With such a framework, the transition to a low-carbon economy would produce enormous business opportunities, creating demand for new products and financial services worth hundreds of billions a year.

In contrast, 'business as usual' is not an option. Unabated climate change risks raising average global temperatures by over 5°C – equivalent to the difference between now and the last Ice Age. This would take humankind into uncharted territory. Economic activity would be increasingly affected as higher temperatures, heavier storms, longer droughts, more frequent floods and rising sea levels exert an ever-heavier toll. India, along with many Asian countries, would be hit very hard by the retreat of snows and glaciers from the Himalayas. This, as PM Manmohan Singh has said would severely damage 'the water tower' for the region, causing uncontrollable torrents and

flooding in the rainy season and dry rivers at other times. The monsoon would probably be badly diverted, with Africa hit particularly hard. Throughout the world there would be serious damage from floods, droughts, storms and sea level rise. At temperature increases of this magnitude, much of the area around the equator would be uninhabitable and there would be a massive movement of population with the ensuing conflict that would result.

Man-made climate change cannot be controlled like the thermostat in your home. Ignoring the problem will undermine our quality of life, change economic growth, undermine the fight against poverty and eventually transform both the physical and human geography of the world.

Climate change is a global problem, and demands a global response. North America and Europe have produced around 70 per cent of the world's CO<sub>2</sub> emissions from energy production since 1850. But fast-growing and highly populated developing nations, like China and India, will account for most of the increases this century. China's total emissions are likely to overtake US levels by 2010, although they will still be using far less energy per person. If their growing energy requirements are to be met without damaging the planet, they will have to draw on the expertise and technologies that the businesses of the developed world have to offer. It is crucial that any global deal encourages the growth ambitions of the poorer countries of the world, including India. The problem of climate change is inequitable: the rich countries have responsibility for most of the concentration now with us and poor countries are hit earliest and hardest. The global response must take this carefully into account.

As part of an equitable response, rich countries must promote a flow of carbon finance to developing countries and demonstrate and share technologies. They must also deliver on aid promises of the last decade, since development in the context of climate change will be much more difficult and costly.

Despite the size of the challenge ahead, there are reasons to be optimistic. If we act now, and work internationally, we can reduce the risks drastically at modest cost. But if we delay even 10 or 20 years, the costs will be much higher, and the risks much greater. The risks

will be most pronounced for developing countries, but it is the rich countries that must take the load. Our children's future depends on what we as a world decide now. With strong and urgent action, governments, businesses and individuals, working together we can safeguard growth and prosperity.

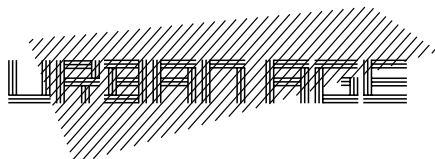
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