

BREAKING THE CLIMATE DEADLOCK

**TECHNOLOGY
FOR A LOW
CARBON FUTURE**

EXECUTIVE SUMMARY



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In recent years the scientific evidence on climate change has become increasingly clear: it is now almost universally accepted that, in order to minimise the risk of irreversible damage to our planet and our livelihoods, we need to strive to keep the average global temperature increase below 2°C. It is also widely recognised that, to achieve this, we will need to peak global emissions before 2020 and then reduce them by 50-85% below 2000 levels, setting interim targets along the way.

Likewise, the political will to act is in place. Heads of government from all parts of the world have declared their willingness to adopt ambitious emissions targets, both individually and collectively, but have wanted to be sure that such goals, while certainly challenging, are practically achievable. This report shows that this is indeed the case. From analysis of the current status of the major abatement solutions, we draw five major conclusions:

1. We know the technologies we need, where to deploy them and the investment required.

To put ourselves on a path to meet our emissions goals, we need to reduce global emissions by 19 Gigatonnes (Gt) in 2020 and energy-related emissions by 48 Gt by 2050. In addition to slowing and eventually halting deforestation, the global roadmap for technology development and deployment must focus on four key sectors:

- **Power:** Approximately 38% of total savings to 2050. Renewable energy, carbon capture and sequestration (CCS), nuclear power and biomass will all be critical areas.
- **Transport:** Approximately 26% of total savings to 2050. Key technologies include electric and hydrogen fuel cell vehicles, improved efficiency and current and next generation biofuels.
- **Buildings:** Approximately 17% of total savings to 2050. Key technologies include improved efficiency in building appliances.
- **Industry:** Approximately 19% of total savings to 2050. Key technologies include CCS for industrial processes, and industrial motor systems.

The total required annual average investment to scale technology up to the required level is approximately \$1 trillion between now and 2050. This is equivalent to 40% of global infrastructure investment or 1.4% of GDP. But much of this investment displaces business as usual spending on high-carbon alternatives and so the incremental cost of additional investment is much smaller. Estimates suggest that a global incremental cost of additional investment of approximately \$317bn annually in 2015, rising to \$811bn in 2030, is required with an oil price of \$60 per barrel. But if the oil price rises to \$120 per barrel, this will reduce the cost by \$700bn annually – making the incremental additional cost over the period very small or even zero.

2. The technologies required to meet our 2020 goals are already proven, available now and the policies needed to implement them known.

Over 70% of the reductions needed by 2020 can be achieved by investing in three areas: increasing energy efficiency, reducing deforestation and using lower-carbon energy sources, including nuclear and renewables. We also know that by implementing just seven proven policies these reductions can be delivered:

- **Renewable energy standards:** Regulation to require or feed-in tariffs to stimulate an increased production of energy from renewable sources, in particular wind and solar, could deliver 2.1 Gt of savings.
- **Industry efficiency:** Improved motors and other efficiency gains could deliver 2.4Gt of savings.
- **Building codes:** Improving standards for new build and modernising existing building stock could save 1.3 Gt.
- **Vehicle efficiency standards:** Driving up standards for vehicle efficiency could save 0.4 Gt.
- **Fuel carbon content standards:** Reducing the carbon content of fuels could lead to 0.3 Gt of savings.
- **Appliance standards:** Increasing the energy efficiency of white goods and other appliances could reduce emissions by 0.3 Gt.
- **Policies to reduce emissions from deforestation and forest degradation (REDD):** could deliver close to 9 Gt of reductions.

All seven policies have already been successfully implemented in countries around the world but need scaling up. While cap and trade systems or other means of creating a carbon price can help provide incentives for businesses to invest in low-carbon solutions, in the short term at least, it is these seven policy measures and direct action and investment by governments that will achieve the targets.

3. Investment now in the technologies of the future order is essential if we are to meet longer-term targets.

Although we have the technologies we need through to 2020, new technologies – many available but not yet commercially proven – will be needed to meet the more challenging long-term goals. Therefore, at the same time as we deploy existing solutions, we must invest in future options, such as carbon capture and storage (CCS), new generation nuclear, concentrated solar power (CSP) and electric vehicles, and the infrastructure, such as smart grids, necessary for them to operate at scale. Instead of locking in high-carbon infrastructure, countries must agree now to speed up the deployment of technologies with potential for long-term carbon reduction. The situation is critical. The status of current technologies shows considerable potential for the future but there is a long way to go before they reach full commercialisation.

For example, without CCS technology, the cost of decarbonisation will be over 70% higher in 2050. Yet there are currently no full-scale CCS plans up and running anywhere in the world, even though the technology is expected to contribute 20% of global emission reductions by 2050. For CCS to reach its full potential we will need to have at least ten full-scale power demonstration plants and a further eight industry demonstration plants up and running by 2015.

Technology will be developed and deployed when the private sector is presented with the right balance of risk and reward. Action is therefore required to create markets for innovation and diffusion that work in a globalised world. This will require not only the acceleration of a comprehensive global carbon market but also the implementation of practical and collaborative technology policies both nationally and internationally. The overall goal must be to aggressively deploy the existing tried and tested options that can deliver mid-term reductions, and to prepare for the long-term development of game-changing technologies.

A long-term global carbon price will be essential to pull technologies through to commercialisation and disseminate them widely. Accelerating the development of national and regional carbon markets, and tools to link these together, must therefore be a priority. Access to the international carbon market will reduce the total cost of abatement by up to 20%.

But alone this is not enough. The reality is that carbon pricing does not address many other market failures along the innovation chain. Overcoming these requires world leaders to develop and implement policies focused specifically on technology development and deployment which are both practical and collaborative. Putting in place strong domestic legislation to decarbonise the power, transport, buildings and industry sectors is an essential starting point.

Looking ahead, governments should adopt a strategic top-down approach to ensure that critical technologies arrive on time and provide investment in disruptive options to allow radical transformation in the future. This is not a policy of picking winners; rather it is to guarantee that there will be enough winners to pick from.

4. Financial support will be needed to enable global deployment of low-carbon technologies but the non-climate benefits are also significant.

More than 30% of global abatement between now and 2030 will be in large emerging economies such as India and China, and developing countries will require significant financial flows to enable them to make the necessary investments. Estimates suggest that this needs to be approximately \$100bn-\$160bn annually between 2010 and 2020. Funding to developing countries could be through both market-based mechanisms, such as the Clean Development Mechanism, or through multilateral financing such as the World Bank Climate Investment Funds.

Yet investment in low-carbon technologies will lead to substantial job creation and growth. Germany created 100,000 jobs in the renewable sector between 2004 and 2006. In the US it is estimated that producing 5% of electricity from wind power by 2020 would add \$60bn in capital investment in rural America, provide \$1.2bn in new income for farmers and rural landowners and create 80,000 new jobs.

In addition, investment must be made in supporting infrastructure such as smart grid technology, which will facilitate the use of new technologies.

Internationally, developed countries should also agree to at least double public research, development and demonstration (RD&D) for low-carbon technologies by 2015 and quadruple it by 2020. This would deliver an additional \$10-\$30bn per annum to push through key technologies. Countries should prioritise international cooperation for strategically important technologies such as CCS, CSP and zero-carbon transport. The Major Economies Forum (MEF) could kick-start this process by agreeing to a global demonstration project for CCS and CSP technology.

5. Copenhagen can provide the spur for international collaboration that will bring costs down and accelerate diffusion and deployment.

Although many of the policies needed will be implemented nationally or regionally, a strong agreement in Copenhagen will provide the framework for international cooperation to drive long-term change and assist in deploying existing technologies and to provide RD&D opportunities for future technologies. A comprehensive technology mechanism must be put in place, which sets the scale and pace of market and direct finance support, defines the areas where cooperation will take place and establishes an institutional structure to measure, report and verify actions and facilitate joint ventures. This mechanism should:

- Establish a Technology Development Objective to scale up market creation and finance for new technology.
- Agree to the creation of Technology Action Programmes covering market development, global demonstration and orphan areas of research for critical technologies such as CCS.
- Reform and scale up the Clean Development Mechanism to ensure it can support technology diffusion in developing countries.
- Establish a Technology Executive Board under the United Nations Framework Convention on Climate Change (UNFCCC) to oversee the creation of global roadmaps and technology action programmes. The board would also contribute to the creation of measurable, reportable and verifiable (MRV) criteria to track technology action and support.
- Establish a protect and share framework for intellectual property rights (IPR), with capacity-building support to strengthen IPR protection in developing countries and provide a clear framework for using the existing flexibilities in national and international law.

Successfully reducing emissions to prevent dangerous climate change is without doubt a huge challenge and will require a revolution in the way we produce and consume energy, travel and design and manage our urban and rural environments. However, the pathway to this revolution is clear and, by means of ambitious international collaboration to develop and deploy low-carbon technologies, well within our grasp. We know what we have to do; this report shows us how.