



Cost-Effective Actions to Tackle Climate Change

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Introduction

Governments around the world have reached consensus on the need to achieve large cuts in greenhouse gas (GHG) emissions over the coming decades. They are working towards an international agreement on actions required to achieve these reductions at the Fifteenth Conference of the Parties (COP15) under the UN Framework Convention on Climate Change (UNFCCC) in Copenhagen at the end of 2009.

Considering the costs and risks of inaction, taking action now, even in the midst of a global economic crisis, makes good economic sense. Delaying emission cuts would simply postpone the inevitable and undoubtedly require larger cuts at a later date, thus making it more costly than a more gradual approach. In addition, there is an opportunity now to use the economic stimulus packages that governments are putting in place to invest in innovative, clean technologies – which could both help stimulate the world's struggling economies and also shift them onto a low-carbon growth path.

Given the magnitude of emission cuts required to stabilise GHG concentrations at an acceptable level, it is imperative that such action to mitigate climate change is taken at the lowest cost. OECD analyses show that the cost of action would be minimised if a cost-effective set of policy instruments, with a focus on carbon pricing, were applied as broadly as possible across all emission sources, including all countries, sectors, and greenhouse gases.

In practice, broad-based international action covering all main emitters might be difficult to achieve immediately. Incentives for countries to participate in such ambitious international action can be enhanced through a range of instruments, including financial and technological support. This *Policy Brief* summarises the key findings from OECD analyses of the policies and actions urgently required to tackle climate change. ■

What is the economic rationale for ambitious action against climate change?

The OECD projects that, without new policy action, world GHG emissions would increase by about 70% by 2050 and continue to grow thereafter. While historically OECD countries have been responsible for most of these emissions, growing emissions in non-OECD countries account for most of this projected increase. This could lead to a rise in world temperatures of 4 °C above pre-industrial levels, and possibly 6 °C, by 2100. Considering the costs and, even more important, the risks of inaction, there is a need for ambitious actions to reduce emissions.

Mitigation actions will be neither cheap nor easy to implement. But the current global recession is no excuse for inaction: policies to tackle climate change must be put in place urgently. Even though the contraction in global economic output will result in reduced emissions, this reduction will be temporary and insufficient to deliver lasting emission cuts. Analysis suggests that initial actions to implement a cost-effective, international climate agreement can be relatively inexpensive, with the costs increasing over time once the economy is on the mend. For instance, action to prevent the mean global temperature from increasing by more than 3 °C would reduce average world GDP growth projected over 2012-2050 by 0.11 percentage points annually – or a nearly 4% reduction in GDP in 2050 compared to a business-as-usual scenario. To put this in perspective, world GDP would still be expected to grow by more than 250% over the same period, even if emissions are cut significantly. While world population is also projected to grow, citizens will still be financially better off, on average, than they are today. But if GHG emissions continue to accumulate in the atmosphere at current rates, the cost of reducing concentrations to an acceptable level later will be prohibitively high. Developing carbon-free technologies will also take time, and investors need a clear and credible long-term price signal now to make the appropriate investment decisions.

The benefits of reducing emissions are difficult to quantify. Nevertheless, OECD analysis finds that when non-market impacts, risks of inaction and co-benefits in other policy areas are factored in, ambitious action makes good economic sense. Some of these co-benefits, such as reduced air pollution, biodiversity and improved energy security, can be large, but they also vary significantly according to location. ■

How important is carbon pricing?

No single policy instrument will be sufficient to tackle the wide range of sources and sectors emitting GHGs. The use of market-based instruments, such as carbon taxes or emissions trading schemes (ETS), will be crucial to keep the costs of action low. These policies put a price on GHG emissions, which discourages the behaviour that generates emissions. They encourage emitters to look for and implement the cheapest abatement options. Carbon taxes and ETS are already in place in several OECD countries, including all EU member states.

Removing environmentally-harmful subsidies to energy consumption and production is another important first step in pricing carbon because these subsidies amount to a de facto reward for carbon emissions. Removing these subsidies would lower the overall cost of meeting a given emission-reduction target. Energy subsidies are particularly high in Russia, other non-EU eastern European countries, and a number of large developing countries, including India. Joint analysis by the OECD and the International Energy Agency suggests that removing these subsidies could reduce GHG emissions in some of these countries by over 30% by 2050, and reduce global emissions by 10%. Global cuts will be even larger if binding caps on emissions are adopted in developed countries. Removing subsidies would also increase the efficiency of these

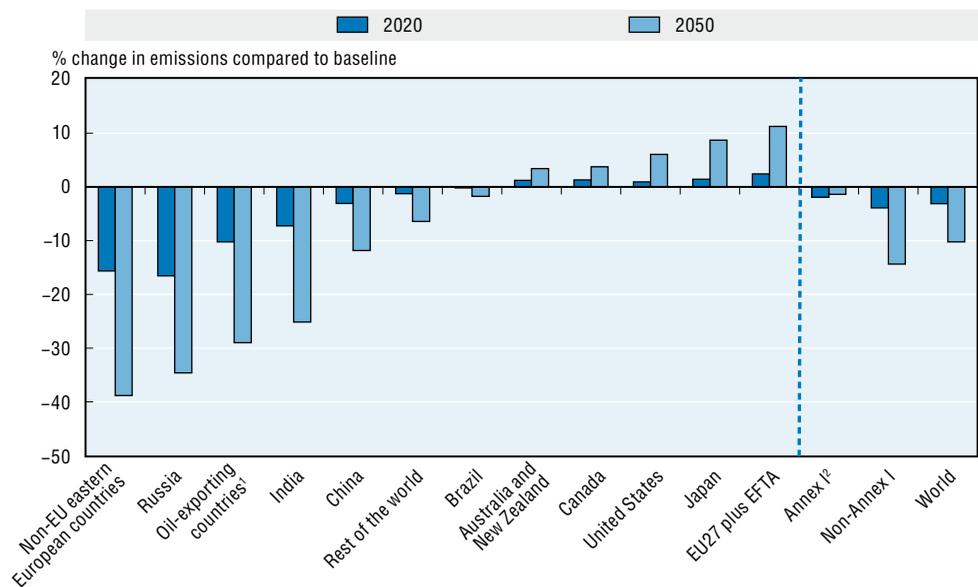
economies, leading to increased GDP growth, and would lower the global cost of stabilising GHG concentrations.

Market-based instruments should be complemented with other approaches, such as building codes and standards for household electrical appliances, measures to encourage the development and adoption of low-carbon technologies, and information campaigns to encourage changes in behaviour.

Development of low-carbon technologies will need to be supported through R&D policies. According to OECD calculations, a market-based policy that seeks to stabilise CO₂ eq concentrations at 550 ppm could provide incentives for a four-fold increase in world energy R&D spending by 2050. In practice, however, pricing carbon is unlikely to be enough to spur sufficient investment in R&D because barriers to innovation are large. The most obvious barrier is political uncertainty about future climate policy, and thus uncertainty about returns on R&D investment. But R&D funding remains a complement to, not a substitute for, carbon pricing. While R&D funding could help to develop new technologies, such as carbon capture and storage, it is unlikely that these will be aggressively deployed without complementary policies that place a sufficiently high price on carbon.

However, policies that overlap can generate some cost. Once a total emission-reduction objective is set through a national emission-trading scheme, additional targets, such as for renewables or biofuels, will not necessarily reduce emissions beyond the cap-and-trade target. Thus, potentially overlapping policies should only be used in situations where they can be justified on other grounds, for instance, as a way to boost low-carbon technologies or improve energy security. ■

Figure 1.
REMOVING ENERGY
SUBSIDIES IN NON-OECD
COUNTRIES WOULD
CUT GREENHOUSE
GAS EMISSIONS
SIGNIFICANTLY



1. The region includes the Middle East, Algeria-Lybia-Egypt, Indonesia, and Venezuela.
 2. Annex I countries are countries that have agreed to reduce their greenhouse gas emissions under the Kyoto Protocol. They include most OECD member states and some countries from Central and Eastern Europe in transition to a market economy.

Source: OECD, ENV-Linkages model.

What if not all countries participate?

Reaching even a moderately ambitious GHG-concentration target at a manageable cost will be difficult unless as many countries, industries and emission sources as possible are engaged in action to reduce emissions. Considering how rapidly emissions are projected to rise in a number of fast-growing regions, significant actions will be required by 2050 not only by all developed countries, but also by major emitters among developing countries, such as China and India.

Industry must also play its part. Exempting energy-intensive industries from carbon pricing, for example, could raise the cost – by 50% in 2050 – of stabilising concentrations at 550 ppm CO₂ eq.

Fears of “carbon leakage”, the risk that emission reductions in one set of countries are partly offset by increases in other countries, should not be exaggerated. Unless only a few countries take action against climate change, leakage rates are found to be almost negligible. For example, OECD analysis suggests that if the EU acted alone to reduce GHG emissions, almost 12% of their emission reductions would be offset by emission increases in other countries. However, if all developed countries were to act, this leakage rate would be reduced to below 2%.

OECD simulations indicate that some of the proposals to address competitiveness and leakage effects of mitigation policies may be costly. For example, some countries are considering imposing border tax adjustments (BTAs), which are import fees levied by carbon-restricting countries on goods manufactured in non-carbon-restricting countries. This measure can reduce carbon leakage to some extent, but at a relatively high cost to the economy of the implementing country or group of countries, and without significantly addressing competitiveness concerns. For instance, in the case of a 50% reduction of emissions in EU countries from 2005 levels by 2050, adding BTAs to the policy mix does not reduce the output losses of its energy-intensive industries, raises the cost of action in the EU (from 1.5% of GDP to 1.8% of GDP in 2050), and imposes a cost on trading-partner countries. BTAs could also be difficult to design and administer, and they risk triggering trade retaliation.

Broadening participation in actions to reduce GHG emissions to include the largest emitting emerging economies and, later, all developing countries remains the most cost-effective way to tackle carbon leakage. ■

How will a global carbon market evolve?

The development of a global carbon market can encourage participation by further lowering the cost of mitigation actions. In the near future, a global carbon market may gradually develop through links between national and regional emissions-trading schemes (ETSs) or through crediting mechanisms or other trading systems. Any eventual linking of ETSs would require some international harmonisation of features, including levels and/or procedures for setting emission caps, the adoption of safety valves, and the use of international offsets.

By broadening participation to include developing countries and lowering the carbon price differential between participating and non-participating countries, crediting mechanisms can also extend the carbon market, thereby reducing carbon leakage and related concerns. One such crediting arrangement is the Clean Development Mechanism (CDM), which allows the countries listed in Annex I to the Kyoto Protocol (the countries that have agreed to reduce their greenhouse gas emissions under the Protocol) to invest in projects that reduce emissions in developing countries.

Analysis shows that the cost-saving potential for developed countries using well-designed crediting mechanisms could be very large. However, there are serious concerns about the effectiveness and administrative burden of the current CDM, which is largely project-based. To address some of these concerns, it might be advisable to negotiate emission baselines at the sectoral level. Industries that reduce their emissions below their baseline would generate credits that could be sold in international carbon markets. Environmental effectiveness of emission cuts could be improved by setting these baselines significantly below the emission levels that would prevail if no further actions were to be taken.

In the long run, however, to achieve ambitious global emission reductions at low cost, such approaches will need to be integrated in a unified, global carbon market, such as using binding caps with trading. If well-designed, binding sectoral caps for energy-intensive industries and the power sector in developing countries, which account for almost half of current world GHG emissions from fossil-fuel combustion, could lower the cost of achieving a given global emissions target, broaden participation in actions to tackle climate change, and alleviate leakage and competitiveness concerns. Even so, they would need to be ambitious in order to be effective. Other sectoral initiatives, such as voluntary, technology-oriented approaches, can help diffuse cleaner process and technologies, but are unlikely to provide sufficient incentives for individual firms to reduce emissions as they put no explicit cost on carbon emissions.

Emissions from deforestation are substantial, and studies suggest that they can be avoided at relatively low cost, reducing carbon prices by up to 40% in 2020. Incorporating a mechanism to Reduce Emissions from Deforestation and Forest Degradation (REDD) in a global policy framework also raises a number of implementation issues, including how to measure, report and verify emission reductions. Funding from developed countries could help some developing countries to build the capacities needed to meet well-designed eligibility criteria.

Table 1.

MANY COUNTRIES HAVE ADOPTED OR SUGGESTED EMISSION REDUCTION TARGETS FOR 2020

Results for year 2020	Simulated target % change from 1990	GDP in 2020 % change from baseline ²	Explanation of target ¹
Australia and New Zealand	0	-0.7	Australia -15% from 2000; NZ -10% by 2020
Canada	0	-0.3	-20% from 2006
EU27 plus EFTA	-30	-0.3	EU27 and Switzerland -30% from 1990; Norway -30% from 1990; Iceland -15% from 1990
Japan	-8	-0.1	-15% from 2005 domestic reduction only
Non-EU eastern European countries	-18	-1.6	Ukraine -20% from 1990; Belarus -10% from 1990; both "under consideration"
Russia	-20	-2.0	-20% from 1990; not yet decided
United States	0	-0.3	Waxman-Markey bill -17% from 2005 (covering 85% of emissions); Obama/Stern "return to 1990 levels"
Brazil	none	0.0	No target announced
China	none	0.0	Ambitious target on energy intensity not translated into national cap on emissions
India	none	0.1	No target announced
Middle East	none	-0.3	No target announced
Rest of the world	none	0.0	South Africa "peak emissions between 2020 and 2025"; Korea will announce target later in 2009
Annex I	-14	-0.3	
Non-Annex I		0.0	
World		-0.2	

1. Based on submissions to the UNFCCC (July 2009) and, where appropriate, official declarations by and consultation of governments.

2. Assuming trading among Annex I and a maximum of 20% of reductions to be achieved through offsets; offsets are in addition to domestic reductions for Japan.

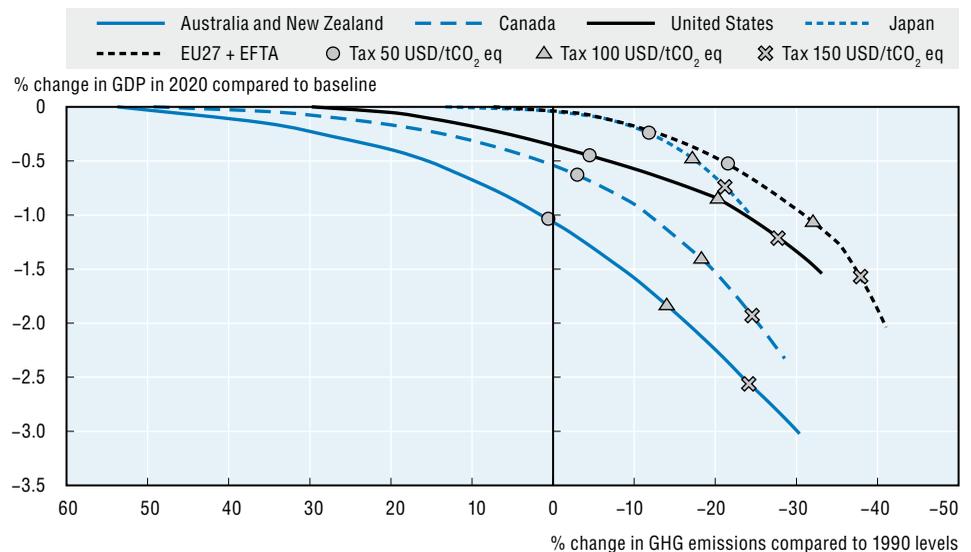
As carbon pricing gradually develops among the main emitting nations, the potential size of the global carbon market could become significant. For instance, if all Annex I countries bring their emissions down to a level that by 2050 is 50% below the level of 1990, and then link their carbon markets together, the size of the global carbon market could grow significantly. If a carbon tax or auctioned permits are used, the size of fiscal revenues could reach 2.5% of GDP in those countries by 2020. These revenues could, in turn, be used to bolster economies in the aftermath of the current economic crisis, reduce existing taxes, finance technological development and diffusion, or support adaptation and emission reductions in developing countries. ■

How do actions compare across countries?

In the lead-up to COP15, several countries and the European Union have adopted, declared or suggested emission reduction targets for 2020. Assuming that the more ambitious targets are implemented in a context of fully harmonised emissions-trading schemes, they would together imply a 14% reduction of emissions in Annex I countries by 2020 from 1990 levels, including offsets in developing countries. Given the strong projected growth in emissions in non-Annex I countries, world emissions in 2020 would still rise by more than 20% above their 2005 levels, compared to more than 35% in a business-as-usual scenario. These declared targets and actions would not reduce emissions sufficiently to prevent temperatures from increasing by more than 2 °C above pre-industrial levels, which is the objective recently supported by major developing and developed countries. Even though ambitious stabilisation targets would still be achievable, far more significant efforts may be needed after 2020, at a higher cost.

The OECD has assessed emission reductions from key developed countries and the European Union and associated costs of a variety of carbon taxes applied across all Annex I countries. Both total costs and emission reductions achieved in 2020 compared with 1990 levels for a given carbon price vary substantially across regions. For several countries/regions, namely Australia and New Zealand, Canada, and the United States, carbon prices of at least USD 50 per tonne of CO₂ eq would be required if emissions are to return to 1990 levels by 2020. ■

Figure 2.
BOTH TOTAL COSTS AND EMISSION REDUCTIONS ACHIEVED FOR A GIVEN CARBON TAX VARY ACROSS COUNTRIES



Source: OECD, ENV-Linkages model.

How can countries be encouraged to participate?

Incentives to participate in mitigation action are likely to be lower in countries where the costs of action are relatively high and/or the expected damages from climate change are relatively low, unless international financial transfers or other support is provided. Given the differences in incentives among countries, and the large global environmental and economic costs that would result from low levels of participation, mechanisms for sharing the costs of action are needed to ensure that all major emitters participate. “Common but differentiated responsibilities and respective capabilities”, a cornerstone of the UNFCCC, implies some decoupling between where emission reductions take place and who bears the cost. Allocating negotiated emission targets across countries can be an effective way of encouraging countries to participate. OECD analysis suggests that, compared with a harmonised world carbon tax or full permit-auctioning with ETSS, developing countries are projected to gain significantly from permit-allocation rules under which their emission rights cover their business-as-usual emissions or are inversely related to their contribution to past emission levels. Developing countries would also benefit from rules based on population size or GDP per capita, albeit to a somewhat lesser extent. All of these rules generally impose significant costs on developed countries, although the costs vary widely from country to country. Setting national, or even sectoral, intensity targets, expressed as emission levels per unit of output, is another way of encouraging emerging economies to reduce GHGs without undermining their growth prospects.

There are several other ways to encourage participation in actions to reduce GHG emissions:

- International public funding to support mitigation actions in developing countries has gained prominence recently with a proliferation of multilateral funds and a number of bilateral initiatives. To enhance their effectiveness, these funds should be targeted primarily at those emission sources and/or market imperfections not covered by other market-based financing mechanisms, and in a way to encourage private-sector investment.
- A cost-effective way to boost international deployment of low-carbon technologies is to remove barriers to trade and foreign direct investment, and strengthen intellectual property rights.
- Climate-related R&D could be better incorporated in the portfolio of activities of existing multilateral funds.
- Any international agreement on mitigation will inevitably also have to address the issue of adaptation to climate change. International financing to support adaptation investments will be particularly important for least developed countries. ■

For further information

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Visit the OECD’s website on the economics of climate change at www.oecd.org/env/cc/econ.

More information on the OECD’s work on climate change can be found at www.oecd.org/env/cc.



For further reading

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