OECD Green Growth Papers, March 2013

What have we learned from attempts to introduce green-growth policies?

OECD
BETTER POLICIES FOR BETTER LIVES

Key messages

Long-term projections suggest that without policy changes, the continuation of business-as-usual economic growth and development will have serious impacts on natural resources and the ecosystem services on which human well-being depends. This highlights the necessity for both developed and developing countries to move to a new growth path that is consistent with the protection of the environment and a sustainable use of scarce natural resources, while still achieving sizeable gains in living standards and reducing poverty.

Relying on both country-specific and cross-country analyses undertaken at the OECD, this synthesis paper seeks to draw lessons applicable to green-growth policies from experience in OECD countries and elsewhere. While climate-change policies constitute an important part of green-growth policies, the latter are broader in scope and deal with several aspects of sustainability. They encompass all policies that favour the transition to a low-carbon, resource-efficient economy; that improve the management of the natural asset base; that raise the environmental quality of life; and that create economic opportunities associated with changes in consumption and production. Green growth is narrower in scope than sustainable development and entails an operational policy agenda that can help achieve and measure concrete progress.

These policies are interlinked and as such cannot be examined in isolation. The focus is on the synergies and trade-offs between the environmental and economic policies that policy makers aspire to. To couch the argument in these terms is not to ignore the social dimension. Economic developmental and environmental enhancement are pursued for essentially social reasons. Without them, human development is retarded. The social pillar is essential. Without good governance, transparency and equity, no transformative growth strategy can succeed.

Box 1. Green growth and sustainable development

Green growth is a subset of sustainable development. Specifically the OECD Green-Growth Strategy develops an actionable policy framework that provides a strong focus on fostering the necessary conditions for innovation, investment and competition that can give rise to new sources of economic growth – consistent with resilient ecosystems. It is designed to be flexible enough to be tailored to differing national circumstances and stages of development.

Green-growth strategies need to pay specific attention to many of the social issues and equity concerns that can arise as a direct result of greening the economy – both at the national and international level. This is essential for successful implementation of green-growth policies. Strategies should be implemented in parallel with initiatives centering on the broader social pillar of sustainable development.

In evaluating the key elements of these policies, it should be kept in mind that they are dynamic and that their design will vary according to each country's conditions and level of development, political economy considerations and social preferences. This implies in particular that policy lessons from this brief need to be tailored to account for the specificities of individual economies. In addition, the relatively short history of reforms in this area means that any lessons drawn should be viewed as preliminary. They will need to be modified as further experience accrues.

The main conclusions of this synthesis paper are as follows:

- Green-growth policies are likely to have beneficial welfare effects in the long term, but short-term transition costs have hampered their implementation.
- Despite some progress, green-growth frameworks remain limited in scope. The main challenge here is to coordinate policies and to develop indicators and instruments to monitor implementation progress.
- Pricing instruments have been widely used in green-growth strategies, but have also been complemented by regulations or subsidies that can address market and information failures and are more politically acceptable.
- Countries need to pursue efforts to manage natural resources in a sustainable manner. This requires the development of indicators to properly value natural resources.
- Innovation is key to foster green growth and could be encouraged by a mix of policies within a coherent framework. Technology transfers have an important role to play, as long as trade and financial flows can circulate freely.
- Countries are concentrating more and more effort to invest in resilient infrastructure and adaptation policies, but additional public and private financing need to be mobilised.
- One important challenge is to overcome resistance to reforms and to find ways to compensate losers in a cost-effective way.

Green-growth policies have long-term beneficial effects but face implementation challenges

Over the long term, green-growth policies can increase well-being by improving resource management and boosting productivity, encouraging economic activity to take place where it is of best advantage to society over the long term, and leading to new and innovative ways of meeting these objectives. Israel for instance has made good progress in lowering emissions of major air pollutants, in curbing the energy and carbon intensity of its economy, in reducing freshwater abstraction and in extending the number of protected areas. There is also evidence that absolute decoupling between economic growth and CO_2 emissions (emissions no longer being linked at all to growth) has occurred in some countries, although it is less common than relative decoupling (emissions increase less than growth) in OECD countries (Figure 1).

Uncertainties remain around the long-term effect of green-growth policies on employment. Model-based estimates point to a limited effect of climate-change policies on employment (Box 2). The sectoral composition of employment is expected to be altered, with fossil-fuel industries experiencing the steepest employment declines and renewable-energy industries the sharpest increases. Countries exporting fossil-based energies would be most affected. However, this reallocation should be modest compared with the underlying rates of labour reallocation generally observed in OECD countries.

Timely action to prevent crises or to limit their scope, and to adapt to their impacts that we already know will be inevitable will have to strike the right balance. On the one hand, any additional delays in the response to rising environmental pressures could lead to barely reversible environmental damage. It would also complicate management and result in more uncertain and more expensive solutions. On the other hand, taking action now runs the risk of being locked into inefficient technologies.

Short-term issues pose constraints. There are transition costs to shifting resources to new activities. The instruments used to achieve environmental objectives will tend to impose a burden on some firms, taxpayers or both, generally involving some economic distortions. At the same time, poor economic growth prospects limit public revenues, weigh on enterprises' margins and are not conducive for investment. While

Did you know that in the absence of new policy efforts, a further 10% of biodiversity will be lost by 2050 from 2010 levels?

banks' deleveraging in developed countries slows the recovery of lending, many structural factors hamper access to finance in emerging and developing economies.

But good policy can ease the transition to a greener model of growth. Investment in green growth and the implementation of structural reforms to support the transition can sometimes help to boost growth and employment in the short term. This motivated a number of governments, including France, Korea and the United States, to put in place green-growth stimulus packages. And of course, flexible product and labour markets, open trade and investment regimes can help to further lower transition costs.

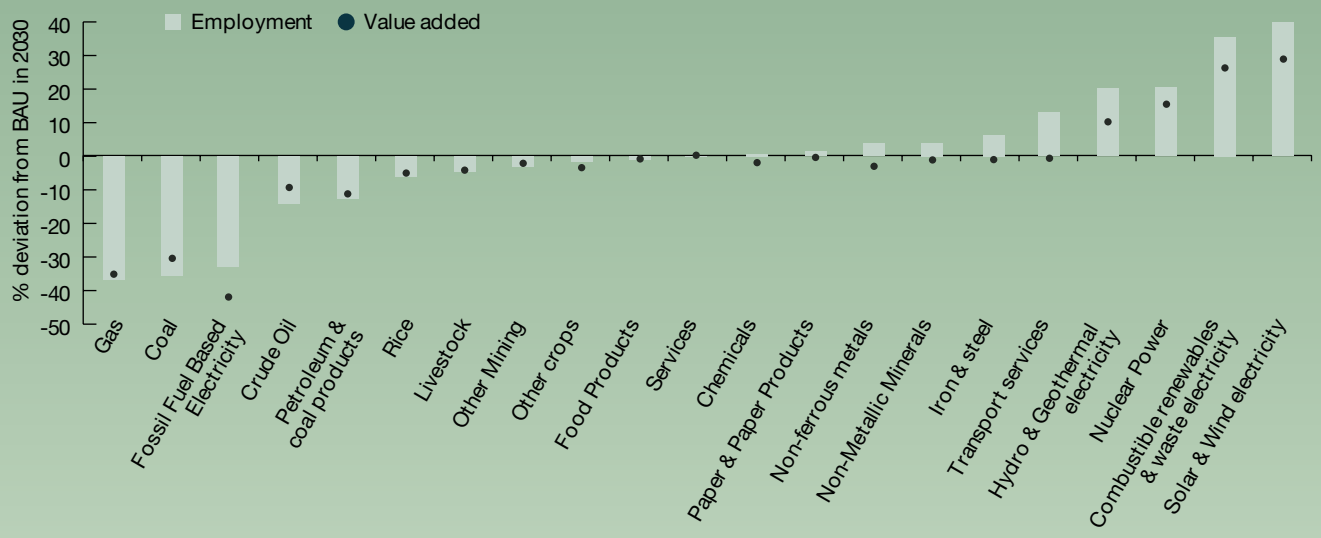
Skills bottlenecks can be a serious impediment for green investments and growth. Indeed, structural changes implied that new skills are needed to meet the requirements of changing and newly emerging occupations and demand for upgraded skills is growing.

Box 2. What would climate-change policies mean for jobs?

A study using the OECD's ENV-Linkages model shows that a well-designed emissions trading system could sharply reduce GHG emissions while allowing GDP to keep growing (although at a slightly lower rate). These modeling results also indicate small net impacts on total employment.

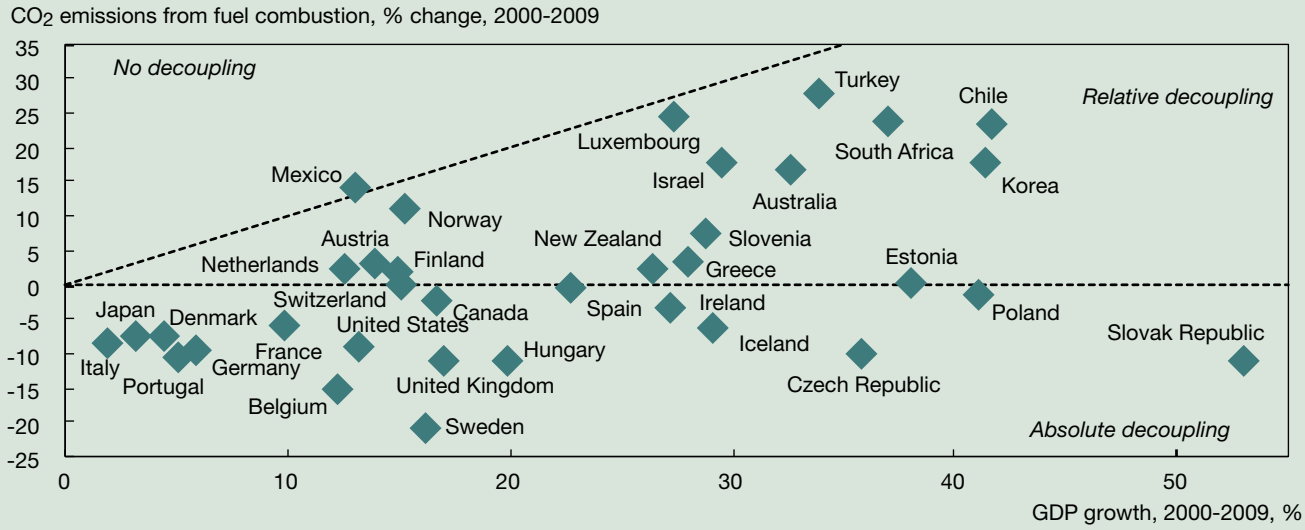
OECD modeling work demonstrated that the impact of GHG mitigation policy on GDP growth is small when the labour market adjusts smoothly to employment opportunities and losses, but that the costs rise significantly when workers in declining sectors become unemployable elsewhere due to an unwillingness to change and a lack of flexibility in labour markets. One way to combine environmental policy with measures to help workers take advantage of new opportunities would be to use revenues from environmental taxes to reduce taxes on labour income, as Nordic countries did in the past. This could generate a "double-dividend" by delivering both lower GHG emissions and higher employment.

Sectoral changes in employment with ambitious climate-change mitigation policies, OECD countries



Note: BAU means Business-As-Usual.
Source: OECD ENV-linkages model.

Figure 1. **Decoupling between real GDP and CO_2 emissions from fuel combustion**



Source: OECD National Accounts database and IEA (2011).

Skill shortage have been particularly severe in fast growing sectors such as renewable energies and energy efficiency. Lack of qualified teachers and trainers has also slowed skill development.

Labour market and skill policies can help maximise the benefits for workers and insure that adjustment costs are equitably shared. For this purpose, governments should take measures to support a smooth reallocation of workers from declining to growing firms, while reducing the adjustment costs borne by displaced workers. Strengthening initial education and vocational training and ensuring that overly-strict product market regulations do not blunt incentives to innovate can also foster green innovation and the diffusion of green technologies. Finally, reforming tax and benefit systems for workers can help to make sure that cost pressures generated by environmental policies do not become a barrier to employment.

Green-specific labour market and skill policies, including top-up training for mid-career workers who need to adapt to greener ways of working or acquire new skills to respond to changing demand, may be necessary. An OECD questionnaire to labour and employment ministries reveals that about 60% of the responding countries have implemented at least one green-growth labour market measure, with training being the most common. The emerging challenges are to detect how green growth is changing labour demand and jobs skill requirements, to co-ordinate labour market and skill policies with environmental policy, and to ensure that men and women are equally well-prepared for the shift to a greener economy and that they both benefit from new jobs and entrepreneurial opportunities.

International cooperation can trigger further action on green growth. Initiatives have multiplied around the 2012 Rio+20 conference. International organisations, for instance in the context of the GGGI-OECD-UNEP and World Bank GGKP partnership, are playing an increasingly important role in developing a global green-growth framework and disseminating information.

Countries have put in place green-growth frameworks but more efforts are needed to enhance policy coherence

Government efforts to promote greener growth have intensified in recent years. The European Union's Growth Strategy for 2020, Korea's National Strategy and 5-Year Plan for Green Growth and the green development focus of China's 12th 5-Year Plan are a few examples. Developing economies are also in the process of designing green-growth strategies. Still, despite the need for raising additional fiscal revenues, there has been little political momentum in favour of green-growth tax policies since the crisis.

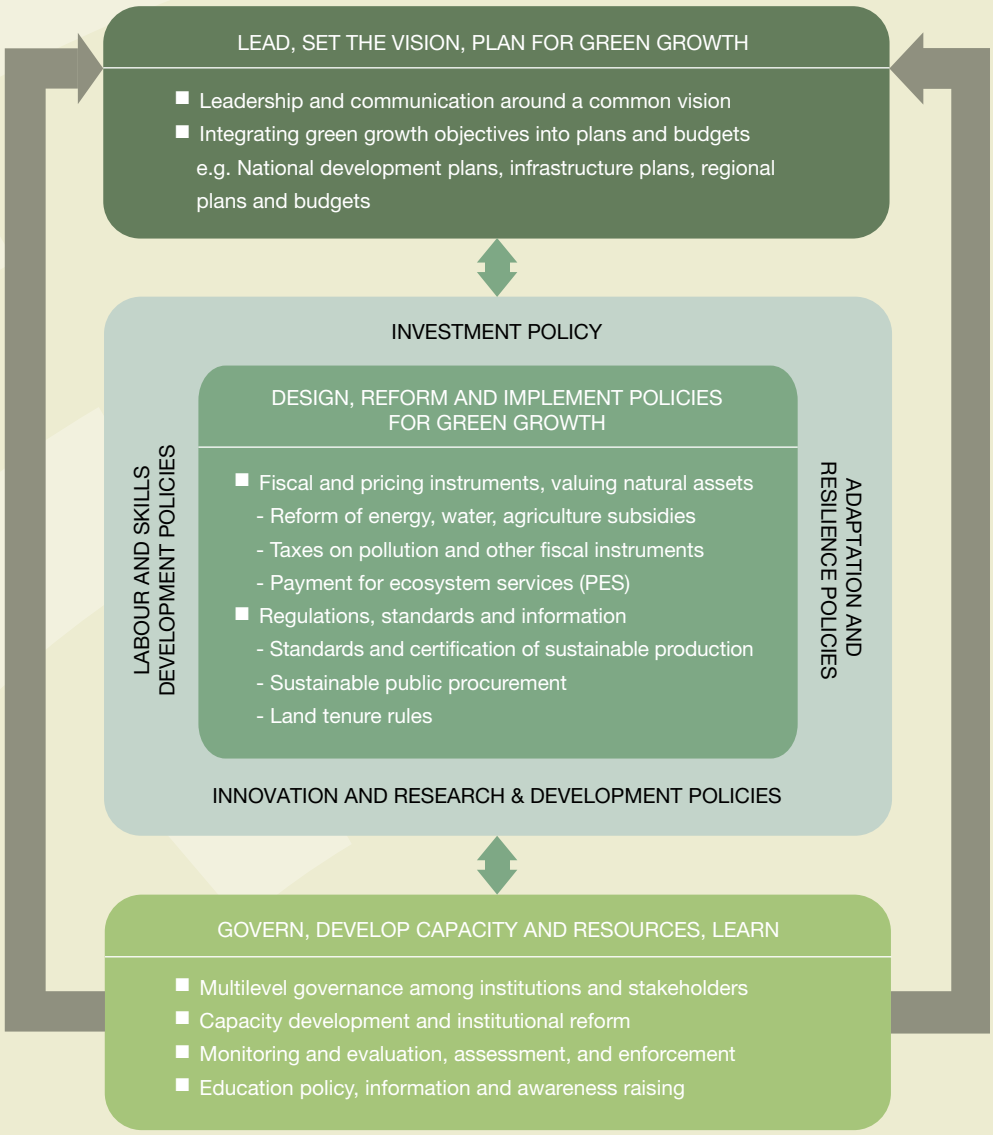
Governments need to integrate green-growth objectives into broader economic policymaking and development planning. Policy coherence tends to be given low priority, reflecting probably the lack of consensus amongst policymakers on which strategy to adopt, and the co-benefits of policies are likely to be under-estimated. Frameworks are usually limited to climate-change or energy policies and there is some risk that climate-related questions crowd out other important environment and development issues, such as biodiversity and water. Analysis of the effects of green growth on poverty and inequality is often underdeveloped and many countries do not have an overall green-growth strategy for key sectors such as agriculture. Awareness of the necessity to integrate environmental matters into development or poverty-reduction plans in emerging and developing countries is growing but very recent.

Institutional and governance capacity to implement wide-ranging policy reform is an essential condition for greening growth (Figure 2). At the moment, many ministries are involved in the development and implementation of green-growth policies. Unclear responsibilities between the national and the sub-national levels, and the lack of guidance and capacity at the municipal level often hinder policy implementation. Affecting changes in a cost-effective manner requires ongoing coordination across ministries, public agencies and between levels of government involved in policymaking. Green-growth policies will only have real leverage if central agencies such as finance ministries are at the centre of their elaboration. The Presidential Committee for Green Growth in Korea is an example. Some steps in this direction have also been achieved in developing countries. Vietnam has designated its Ministry of Planning and Investment as the focal point in charge of the coordination and the deployment of the country's green-growth strategy.

At the same time, green-growth policies need to provide a degree of policy stability beyond electoral cycles. One way to achieve this is to entrench policy strategies into the statutory or regulatory environment. Public commitment to a course of action that can be easily monitored is essential. One possibility would be to back this commitment up by legislation, as the example of the United Kingdom's climate legislation has shown. At the same time, the framework should be flexible enough to adapt policies as information becomes avalaible.

Targets have improved transparency but their multiplication may lead to policy inconsistency. For instance, many countries have pledged quantified economy-wide targets for reducing emissions of GHGs. These may also be complemented by a renewable energy target and an energy efficiency (or even sometimes an energy-saving) target. The introduction of such targets is good for transparency and underlines governments' commitments. Nevertheless, too many stringent and interacting targets, which are sometimes

Figure 2. **A National Green-Growth Policy Framework for developing countries**



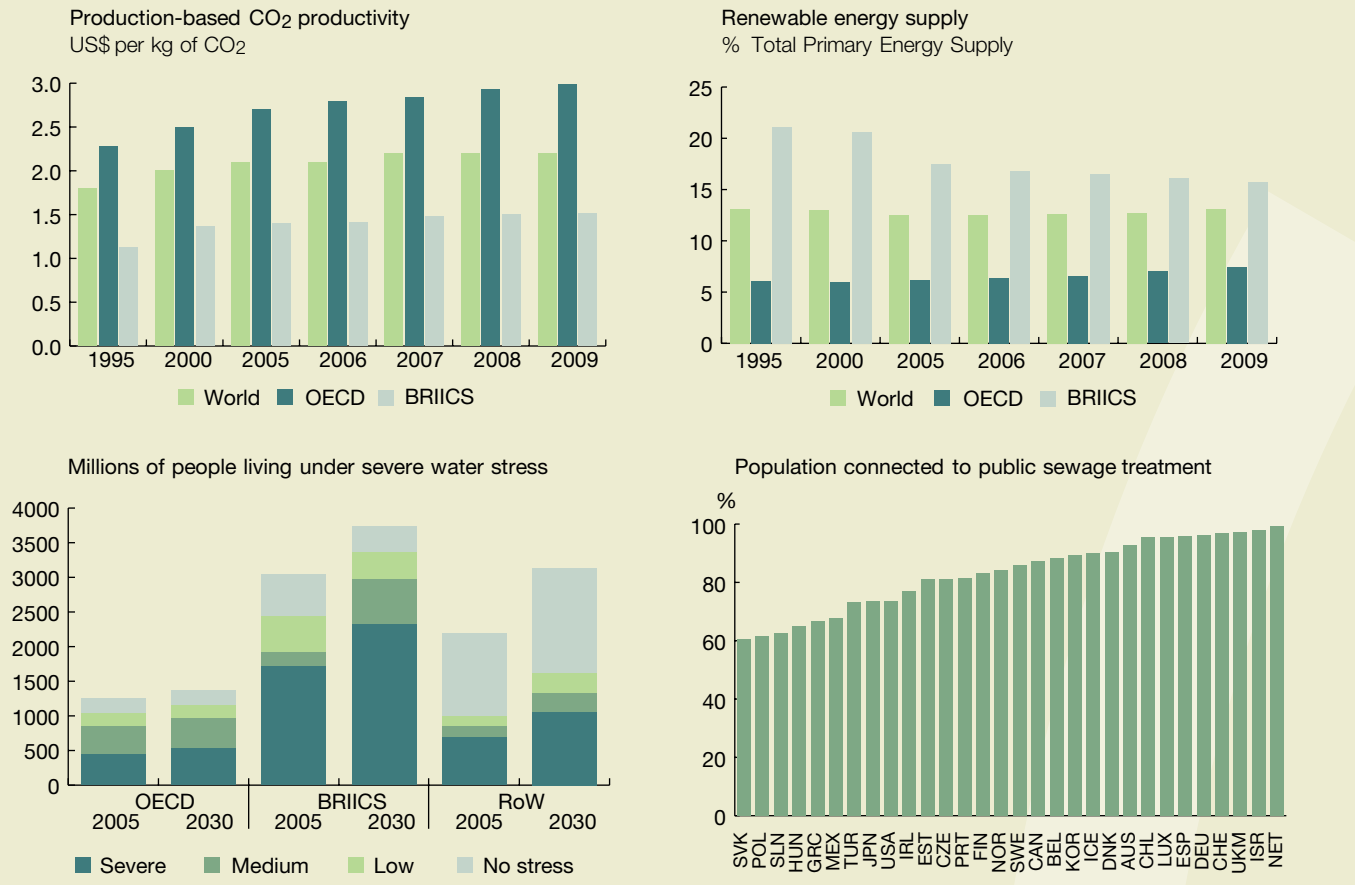
Source: OECD (2013), Putting Green Growth at the Heart of Development.

set at an arbitrary level, may go against the principle of seeking least-cost abatement options. The problem is compounded when regional targets are set in addition to national targets.

The development of green-growth indicators undertaken in the OECD and in other national or international institutions will facilitate thorough monitoring and assessment (Figure 3). In particular, it has been widely acknowledged that natural capital needs to be fully incorporated in analytical frameworks. The endorsement of the UN System of Environmental and Economic Accounts is going to be particularly helpful in this regard. Meanwhile, the OECD is developing new indicators, including demand-based CO_2 emission indicators (which account for emissions from trade flows) and green productivity measures (which account for the impact of natural resource use and pollution). At the country level, the development of green business statistics in Denmark appears to be a very promising initiative. An increasing number of countries including the Czech Republic, Denmark, Germany, Korea and the Netherlands are also applying the OECD green-growth indicator framework.

A major weakness of existing green-growth frameworks is the lack of systematic ex ante and ex post assessments. Policies are usually reviewed but there are few quantitative assessments of their impact on the various dimensions of welfare. Furthermore the assessments are often irregular and limited to certain sectors and objectives and policies are frequently not seen in an international context. Rigorous policy evaluation needs to be further developed to better calibrate support and ensure that resources are directed to their most cost-effective use. This requires appropriate information and the development of relevant policy and performance indicators.

Figure 3. **Selected green-growth indicators**



Note: Production-based CO_2 productivity is measured by GDP generated per unit of CO_2 emitted from fuel combustion. Green patents comprise patents in climate-change mitigation and energy and pollution abatement and waste management. RoW means Rest of the World.
Source: OECD Database.

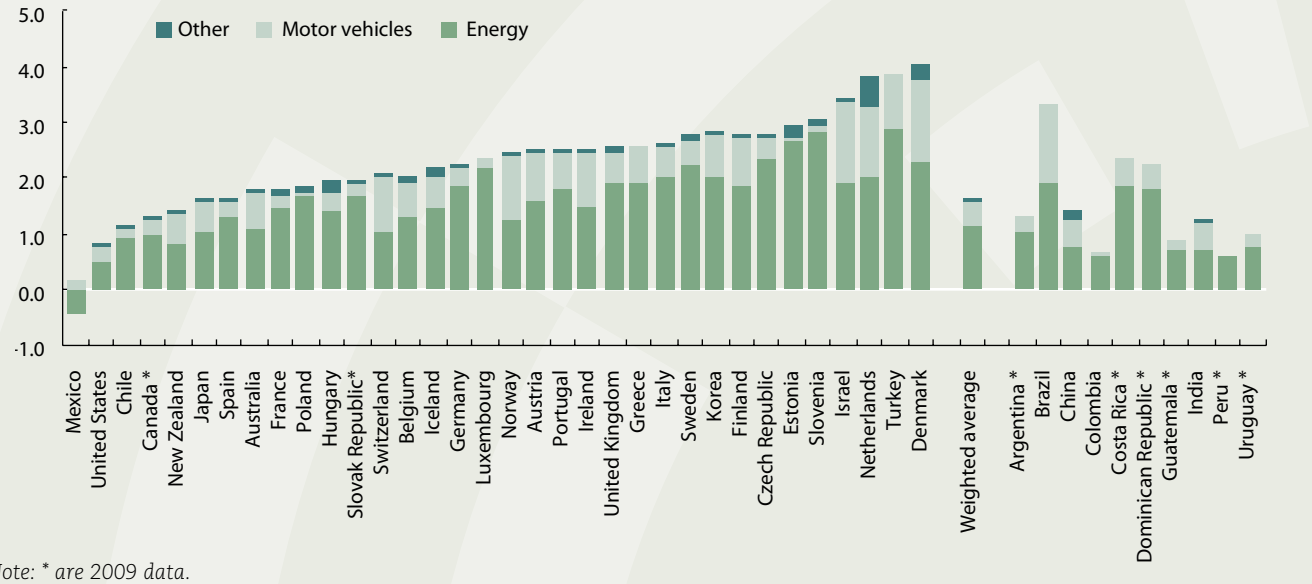
Pricing instruments have featured prominently in green-growth strategies

The relative strengths and weaknesses of the main green-growth tools vary with the country's institutional capacity, in particular in terms of monitoring progress or putting in place the appropriate instruments and with its capacity to tackle opposition to reforms. In practice the choice of instruments will be the result of a trade-off between the country's objectives and implementation challenges.

Emission trading schemes (ETS) are a primary means of pricing carbon. Most existing ETSs (*e.g.* those existing in the EU, some states in the United States or the Canadian province of British Columbia) have significant gaps. The New Zealand scheme is a notable exception. It covers the forestry sector, transport fuels and industrial-process emissions and may be extended in the coming years. In a number of schemes implemented to date, there has been a tendency for caps to be set leniently in the initial stages of trading. Indeed a lack of historical data on emissions, over-optimistic forecasts of GDP growth and a tendency to underestimate the potential for abatement and innovation have often led to overestimation of emission trends. This has sometimes resulted in the collapse of carbon prices, as occurred for instance in the EU's ETS.

The use of environmentally related taxes has widened but remains concentrated in specific areas (Figure 4). Environmental taxes have been levied almost exclusively on households and the transport sector. Motor fuel taxes, which are structured relatively homogenously across OECD countries, account for the vast majority of these taxes. Experience from Europe suggests that vehicle taxes based on CO_2 emissions per kilometre can lead to a rapid decline in the average emissions of the overall car fleet. By contrast, there is large variation across countries regarding taxes on pollutants. In some cases, those taxes have been

Figure 4. **Environment-related tax revenues**
Per cent of GDP, 2010



*Note: * are 2009 data.*
Source: OECD Environmental Policy Instruments Database.

difficult to administer as they require monitoring many dispersed and varied emission sources. Reviews of initial experience using pesticide and fertiliser taxes in Europe show that taxes can be effective, but that it is important to consider how actors are going to respond to these taxes when setting tax rates and bases.

Heterogeneity in carbon prices and the lack of competition in energy markets lower the cost-effectiveness of pricing instruments. An incomplete sectoral coverage of ETSs, the prevalence of fossil-fuel subsidies, numerous tax exemptions and rates result in a wide variability of explicit and implicit carbon prices within and across countries. As a consequence, emission abatement occurs in sectors where rates are the highest and not necessarily where marginal abatement costs are the lowest. In addition, state-owned firms still dominate electricity generation in many countries. As a result, political considerations often influence investment decisions and prevent an optimal response to carbon-price signals. Liberalising energy markets will be a prerequisite to getting the most out of the use of pricing instruments.

Did you know that in Europe, more than 20 million people still lack safe sanitary facilities?

Regulatory settings and subsidies have proliferated and can introduce inefficiencies in green-growth strategies. Since the crisis, a number of major countries have backed down from proposed legislation to introduce or extend the use of pricing instruments to address climate change and have had recourse to more politically acceptable policies. These measures seek to support energy efficiency through labelling requirements, minimum energy performance standards or subsidies. Experience from the Dutch tax allowance for energy investment shows that some of these measures can adress information failures and that regular updates are important to make regulation flexible. However, such schemes often target specific technologies and their cost is found to be high. In the case of subsidies, it is also difficult to prevent free-riding, although tight eligibility rules can improve effectiveness considerably. In many countries, these measures overlap with ETS, and can sometimes introduce inefficiencies in green-growth strategies. Regulatory measures should thus be carefully designed to address specific market failures and be used as a complement rather than a substitute of pricing instruments. It is also important to communicate clearly that command-and-control measures are second-best solutions compared to well-designed pricing instruments.

Consumers are to some extent locked into norms and habits of consumption but many countries are trying to get consumers to change their ways. Survey data suggest that spurring desirable behaviour requires a mix of instruments. Labelling and information campaigns can usefully supplement incentive-based measures. Labels providing information on energy efficiency of appliance, cars or buildings or organic food are common in OECD countries. A few countries such as Australia, Israel and the Netherlands have gone a step further and introduced labels on water-using devices that indicate their efficiency. More importantly, infrastructure provision, such as the development of public transportation, can be vital for consumer habits to change.

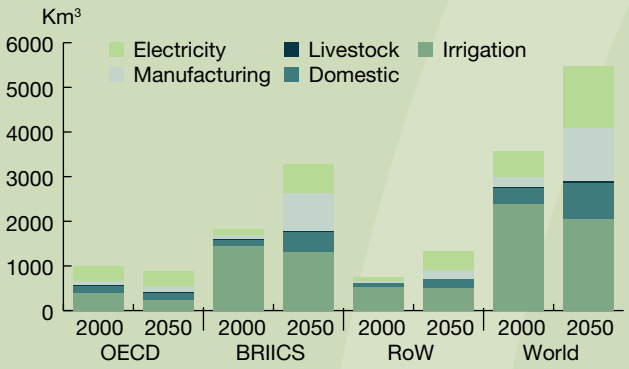
Countries are seeking to better manage natural resources

An important strand of green-growth policies is to ensure that economic developments are consistent with a sustainable use of scarce natural resources. Progress in this area has been uneven across countries and domains.

Most natural resources are under-priced and this can encourage over-exploitation. In particular water scarcity and higher competition to water access are becoming a major issue. Water allocation on the ground may not reflect national green-growth priorities. While growing population and higher urbanisation rates have fuelled water demand, agricultural water use amounts to 70% of water withdrawals and is becoming a major source of water pollution (Figure 5). Significant opportunities remain to increase water management efficiency and productivity in agriculture in all countries, especially in developing economies.

In both water and waste cases, public action and private involvement in securing finance and providing services are required. Regulatory intervention can also help to address market or information failures.

Figure 5. **Global water demand**



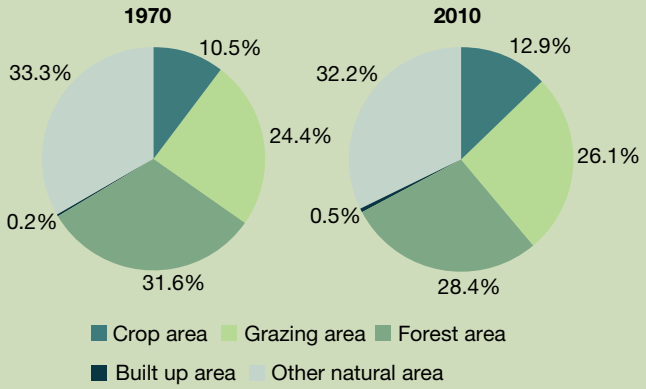
Note: RoW means Rest of the World.
Source: OECD Environmental Outlook to 2050, Baseline; output from IMAGE.

In particular, putting in place the appropriate pricing mechanisms could encourage investment to upgrade water supply and sanitation infrastructure and reduce high urban water leakage rates.

A growing number of countries are using taxes and charges on waste disposal, but do not always provide sufficient incentives for waste reduction (*e.g.* in Portugal). In addition to public action and appropriate regulations, more differentiated charges according to weight or waste fractions could further encourage recycling and waste reduction.

Effective governance to manage interdependencies across multiple policy areas and between levels of governments – including well-functionning institutions and a stable regulatory framework – is also key to reform. Without clearly defined and enforceable property rights, resources will not be optimally allocated. This is particularly the case for forests, whose surface has dramatically declined (Figure 6) and water resources. However, reform in this area is complex as it involves historical, cultural and institutional dimensions of change.

Figure 6. **Global land use**



Source: OECD Environmental Outlook Baseline; output from IMAGE.

Many fragile and conflict-affected states have little institutional capacity to manage their natural resources in a sustainable way. Revenues generated by the exploitation of natural resources may feed into a political economy that not only undermines good governance (particularly sound environmental management), but also contributes significantly to the country's overall fragility. While the application of green-growth policies needs to be part of a broader effort to improve basic governance in fragile states, efforts are being made by the international community to minimise any negative impacts of mineral extraction on fragile states. The OECD has worked with the United Nations, local governments, the private sector, and civil society organisations, to formulate the Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas. Multinational companies, along with their local suppliers and service providers throughout the mineral supply chain, are the main target audience for this Guidance. They are expected to adapt their internal procedures to avoid contributing to conflict and maximise opportunities for sustainable growth through responsible mineral sourcing. The OECD currently hosts a multi-stakeholder forum to implement the Guidance, foster peer-learning and build partnerships among producing, processing and consuming countries, the private sector and civil society.

Taxation of the extraction and use of natural resources is in most countries very limited. There is significant potential for increasing this tax base to incentivise an efficient use of resource and increase government revenues. The consensus in favour of rent taxes, which take the costs of the extracting companies into account, rather than royalties, which do not, is growing. Alaska, China and Algeria have introduced profit-based taxes in recent years. Australia's new mineral resource rent tax (MRRT) on coal and iron ore operations, along with the extension of the petroleum resource rent tax, are further examples. But attempts to move in this direction have faced strong opposition. Intermediate models have been introduced, for instance in the Israeli gas sector, where the tax system has moved to a rent scheme once profit begins to accrue.

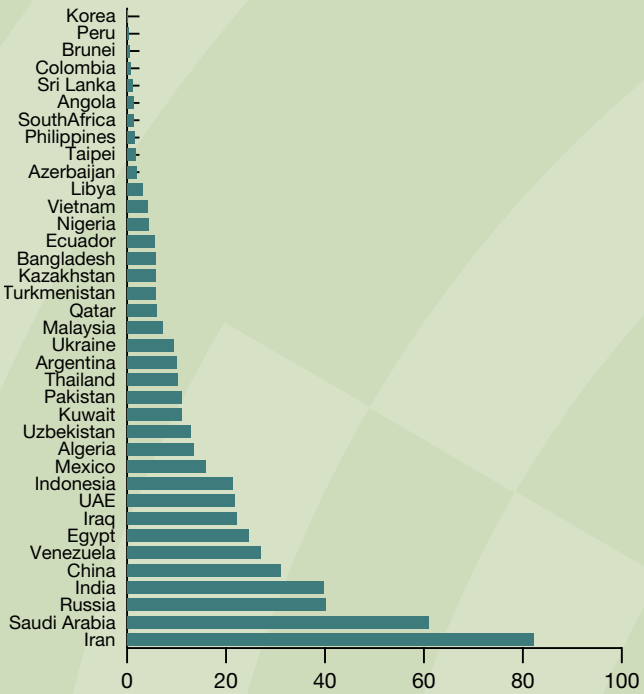
The public value of watershed services, biodiversity, forest or pollution is not sufficiently reflected in the market. The OECD and other institutions are developing instruments to correct this failure. Such information is critical to quantifying benefits, targeting policy measures and enabling performance assessment over time. A wide range of payments for ecosystem programmes is now avalaible. The Victoria Bush Tender Programme for instance aims to improve the management of native vegetation on private land in Austalia. In addition, following the lead initiative of the United States to protect wetlands, Germany and Australia have set up offset banks, and experiments are underway in France, Canada and the Netherlands. Such banks sell credits to put in place schemes that compensate for the environmental impact of development projects.

There has been little progress in reforming harmful agriculture, fishery and energy subsidies despite potential savings opportunities in times of fiscal retrenchment. After having markedly declined since the mid-1980s, support to agriculture has stabilised since 2000 to around 1% of GDP in the OECD as a whole. In addition, a number of emerging and developing economies heavily subsidise fossil fuels, but these subsidies fail to efficiently protect the poor (Figure 7). OECD estimates also suggest that support for fossil-fuel production and use amounted to USD 50-90 billion a year between 2005 an 2011 in the OECD area. Such support prevents an optimal allocation of scarce resources to more productive activities, hampers infrastructure investment in emerging and developing economies and increases the pressures on the environment. Experience shows that, once granted, subsidies may be very difficult to dismantle as reforms face strong political opposition. Heightened fiscal pressure has recently triggered an attempt to reduce energy subsidies in India, but more ambitious reforms are clearly required.

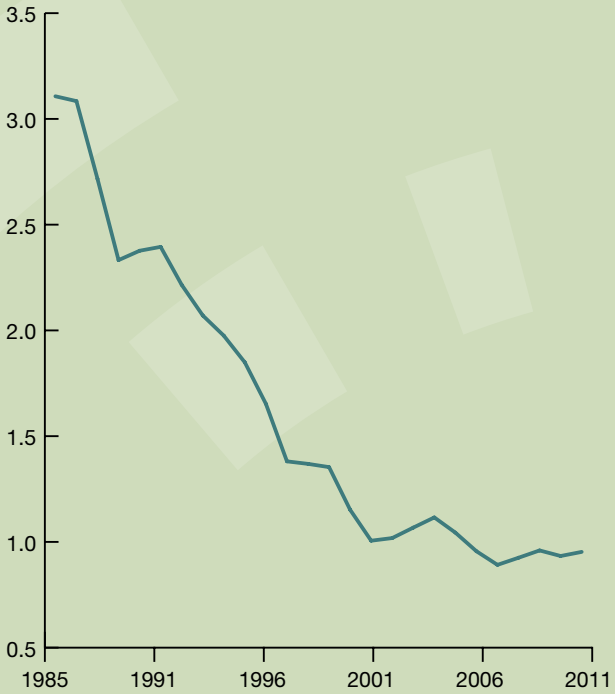
Governments in many OECD countries and in a number of emerging and developing economies, actively promote the production and use of biofuels, transport fuels made from agricultural commodities, through regulation or subsidies. This contributes little to reduced GHG emissions, while it adds to a range of factors that raise international prices for food commodities. Biofuel's expansion can also impact biodiversity as a result of land conversion and soil disturbance. Quantitative analyses suggest that biofuel production and use remain dependant on public support to a significant degree. A major exception is bio-ethanol produced in Brazil which will remain competitive, as long as sugar prices do not dramatically increase. It is important that biofuels are produced exclusively in countries where they can make the more cost-efficient contribution to reducing global GHG emissions and where environmental risks of land changes are the lowest. Current support to biofuels thus needs to be reconsidered in this light.

Figure 7. **Subsidies**

Fossil-fuel energy subsidies
USD billion 2011



Support to agriculture in OECD countries
Percentage of GDP



Source: IEA, World Energy Outlook (2012); OECD Database.

Green innovation is key to accelerate the transition to greener growth

Green innovation, as measured by patent counts, has accelerated in recent years, due to growing demand and a range of policy measures aimed at fostering green growth (Figure 8). The contribution of emerging-market economies to green patenting has risen. Although they have sometimes had the opportunity to leapfrog, developing economies have often had to adapt internationally-produced innovations to local needs through incremental R&D.

Figure 8. **Green patents, world**
Percentage of total patents

Source: OECD Green Growth Indicators Database.

Customer demand is an important driver of green innovation. Successful innovations are more likely in fast-growing economies or sectors. Hence policies that drive diffusion, strengthen markets for eco-innovation and change user behaviour need to be considered. In particular, regulation of harmful substances and activities, performance standards, green labels and certificates, as well as technology-based standards, appear to be among the most successful instruments. Public procurement and consumer subsidies can also help to ensure the economic viability and diffusion of eco-innovative products and services. Such policies need to be well designed to ensure that they support and do not distort market formation. This calls for a mix of policies within a coherent policy framework. Given the importance of demand as a trigger of innovation, one important question is how to induce innovations that are needed in developing countries but for which demand in high-income countries is limited or how to foster such innovation in developing economies.

Setting the appropriate framework can spur the development and diffusion of green technologies. Many of the enabling conditions are the same for green innovation as for innovation more generally. For example, a well-designed system of intellectual property rights is important to provide incentives for innovation and the diffusion of new technologies. The optimal approach would be to combine taxes levied directly on environmentally harmful activities with broad policies that address the main barriers to innovation. While the evidence shows that environmental regulation has had positive impacts on green innovation and its adoption, case studies do not provide unambiguous evidence that environmentally related taxation always leads to innovation and the adoption of new technologies, even though there have been successes (*e.g.* United Kingdom's Climate Change Levy on fossil fuels and electricity, Sweden's tax on NOx emissions). Importantly, tax design appears to be significant. While high tax rates generally strengthen incentives for innovation, there is also evidence that taxes levied closer to the actual source of pollution provide the best incentives for innovation.

Governments need to support the development of breakthrough technologies. Support needs to go beyond R&D, but large uncertainties render this task very challenging. For instance, there does not seem to be a consensus on the best instrument to foster

developments in renewable energy. Feed-in tariffs, which offer long-term contracts to renewable energy producers typically based on the cost of generation of each technology, have led to significant developments in renewable energy but can be costly and risk locking in inefficient technologies. By contrast a tradable certificate system is a market-based option that allows producers to choose among several technological options and encourages innovation in technologies that have the lowest cost. Tradable certificates are used in Sweden, Italy and the United Kingdom, while feed-in tariffs prevail in Germany and Spain. Korea has recently shifted from feed-in tariffs to a certificate system. While a certificate system can boost innovation in technologies that are closest to the market, feed-in tariffs appear to be more appropriate for technologies that are further from the market.

Where governments do provide targeted support, the design of schemes is important. Good policy designs need to ensure competitive selection processes, to remove regulatory obstacles and to focus on performance rather than specific technologies. In addition, it is important to avoid favouring incumbents or providing opportunities for lobbying, and ensure a rigorous evaluation of policy impact, while containing costs. Support for commercialisation should also be temporary and accompanied by clear sunset clauses and transparent phase-out schedules. This requires a good understanding of the state of development of alternative technologies and the market structure in which they are being developed.

It is crucial to provide predictable and long-term policy signals to foster private investment. For instance there is evidence that the high predictability of renewable energy development policy in Germany contributed significantly to foster renewable energy expansion, while uncertainties have hampered the development of this type of energy in some other OECD countries.

OECD experience shows that careful organisational and institutional changes play a key role in transitioning to green technology and innovation. So far, innovation policies have remained fragmented amongst different ministries. Local authorities take a number of valuable initiatives, in particular for exploration and experimentation. This has led to a proliferation of duplicative and wasteful programmes. A key challenge is to align the goals of ministries, sub

national governments, research funding agencies, higher-education institutions and social and market-based institutions so that they focus on green growth in all its dimensions.

Entrepreneurship and new business models can support the commercialisation of green innovations. New firms and business models are important to develop new technologies and may exploit opportunities ignored by incumbents. While such business models can sometimes provide only modest environmental benefits in the short term, there is evidence that they tend to create incentives to maintain environmental improvement in the long term and contribute to a faster introduction of green technologies. Policy needs to foster the creation of such new firms by enabling their entry and growth, ensuring fair competition and improving access to finance, which remains a major constraint for the entry and growth of young firms.

Low barriers to trade and investment, are key to promoting international transfers of green technologies. Concerns about green protectionism have been rising and it is important to ensure green-growth policies are consistent with international obligations regarding free trade and investment. The monitoring of such developments, *e.g.* in the context of the WTO and OECD Freedom of Investment Roundable, is particularly useful in this context. Continued vigilance is encouraged, and the Roundtable will keep monitoring investment measures to ensure that they are not disguised protectionism.

International transfers of green technologies to developing economies have been increasing over recent years, but have remained marginal compared to transfers that have occurred between developed countries. There is significant potential for South-South exchanges, particularly since the more advanced of these countries are developing inventions that may be better tailored to the need of developing countries. More generally, it is important that policy effort maximises incentives to share knowledge, for instance through international research-sharing agreements or support to international technology-oriented agreements. Efforts should be also directed at boosting human capital quality, through better education services and capacity building to make the most of knowledge transfers.

Did you know that in the last three decades 45% of the world's natural disasters occurred in Asia-Pacific?

Adaptation to and financing for green infrastructure are slowly developing

Green infrastructure represents a huge opportunity and boosts growth, in a context where large economic uncertainties hamper investment in many countries. As infrastructure projects are usually large-scale, they can offer potentially profitable markets for decades. This requires nonetheless that the appropriate framework conditions are in place, and to set up a comprehensive strategy involving relevant stakeholders to address these issues.

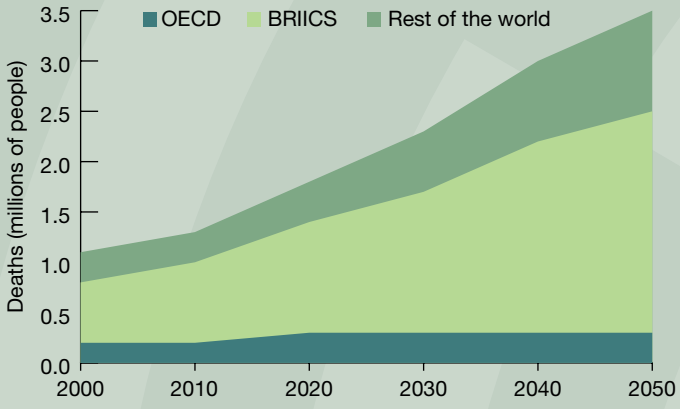
Conventional structural reforms to boost investment will ease constraints weighing on green growth. In particular, it is important to rely on policies based on clear rules for review so that the private sector can operate under a sufficient degree of certainty on public commitments.

But more needs to be done to mobilise large financial resources of private investors, including institutional investors such as pension funds. In particular, the public sector may have to commit resources to make green investment policy credible and restore confidence through direct co-investment or guarantees. Green investment banks such as the UK Green Investment Bank (GIB), the German Kreditanstalt für Wiederaufbau (KfW), the Bank of Philippines Islands (BPI) and the new French Banque Publique d'Investissement, have been established with rapidly developing innovative instruments to invest public funds and spur private investment. Well-designed private and public partnerships remain scarce, especially in countries where the environment is not business-friendly.

It is also important to ensure adequate financing of adaptation to climate-change strategies or plans, which have developed rapidly over the past years. Most plans do not discuss funding requirements and sources because of a lack of data on costs and benefits and concerns that discussing costs upfront could be a barrier to engagement. France's national adaptation plan, which clearly identifies the costs of measures, is a notable exception.

Cities are likely to play an important role in greening infrastructure. They are well placed to develop innovative policy solutions and pilot programmes, that could eventually be scaled up if proven successful. There is evidence that some urban policies (such as congestion charges, public transport policies, construction of energy efficient buildings) can reduce national GHG emissions and air pollution and support long-term growth. Copenhagen, for instance, has managed to become a low-emitting city thanks to a local strategy that is consistent but in some areas more ambitious than the national one. Some cities, such as those in coastal areas in Asia, face specific challenges related to rapid urbanisation and high vulnerability to natural disasters. Air pollution has been growing at a high pace which will have detrimental consequences on human health (Figure 9). Governments are putting in place innovative solutions; the Eco-town programmes developed in Philippines, in which groups of municipalities incorporate the protection of the ecosystem and vulnerability risk assessment in land planning, appear to be promising in this regard.

Figure 9. **Premature deaths worldwide from exposure to particulate matter**



Source: OECD Environmental Outlook Baseline; output from IMAGE.

Reforms pose real challenges for the political economy

The implementation of a green-growth strategy faces a number of political economy challenges. The introduction of pricing instruments for instance needs to solve delicate acceptability issues linked to redistributive or competitive impacts. This option requires judicious accompanying tools to address resistance due to a perceived increase in the tax burden and, of course, to handle the opposition of economic lobbies who will otherwise benefit from the exploitation of natural resources. Without accompanying measures, putting a price on carbon is creating losers, whose resistance is likely to block the implementation process or lead to exemptions that sharply deteriorate the overall efficiency of the measure.

Risks of carbon leakages and competitiveness effects are often used to oppose reforms. In practice these effects are estimated to have been small so far. The worry is that new investment and changes in trade flows could cause a shift in polluting production to countries with less stringent regulations or hamper firms' competitiveness, especially those specialised in heavily traded productions. Studies suggest that these effects tend to be generally small and non linear, as carbon pricing is not the sole input to location decisions, especially in developing economies where the lack of good-quality infrastructure is often reported to be the main impediment to investment.

Free allocation of carbon permits and exemptions have been instrumental in overcoming resistance to the introduction of a pricing instrument for carbon. Over the medium to long term a high proportion of free permits can raise dynamic efficiency and equity concerns and may erode support to the use of emission trading. There are some ways to enhance the acceptability of reforms. Presenting a carbon tax as a way of reshaping existing taxes rather than as an additional levy facilitates implementation, as the experience from Sweden has shown.

Distributional effects and concerns about rising poverty are likely to be a major obstacle to reform. Increases in most environmentally-related taxes, in particular energy taxes, or lowering energy consumption subsidies are often perceived as regressive. Still, the regressivity of such reform is hard to demonstrate in practice. For instance, there is evidence from Mexico and Indonesia that energy subsidies are not the best way to protect the poor and benefit disproportionately well-off households. In Mexico for instance the poorest 20% of the population captures only 11% of residential electricity subsidies. Higher energy prices can nevertheless increase the financial burden borne by poorer households, and lead to a rise in poverty. At the same time, directly tackling the source of poverty and providing cash transfer compensation would be a more efficient way to fight against material deprivation. More generally, governments should analyse the overall impact on poverty and income equality from the transition to a greener economy and incorporate comprehensive counter-measures into the strategy to prevent an increase in poverty. In general, redistribution concerns could best be addressed through personal income tax cuts, or for the poorer households well-targeted cash transfers rather than exemptions.

Green-growth policies have a better chance of being successful if implemented in a gradual manner. This allows adapting policy parameters to account for change in the economic environment and if changes are predictable, they create stable expectations. The examples of the UK Climate Change Levy and the recently introduced carbon tax in British Columbia, show that even when accompanying measures to facilitate the transition were planned, the acceptability of these tax reforms, has been building only gradually.

Communicating the benefits of reform is crucial to ease implementation. It is not easy to convince current voters to incur a cost that will benefit future generations. Strong leadership is necessary to implement reform. Dissemination of work on the high cost of inaction, using non-technical terms, has been useful in building support for green-growth action, even though such support may be short-lived. There is a need for continuous efforts to build a sufficiently broad constituency for a successful policy. In poorer countries where poverty reduction is a key priority, there is a need to convince stakeholders that moving to a green-growth path will be consistent with poverty alleviation goals.

FOR MORE INFORMATION

Please visit our webpage at:
www.oecd.org/greengrowth/asia.htm

Find the complete series of OECD green growth papers at: **http://www.oecd-ilibrary.org/**

For any queries or if you wish to sign up to the OECD green growth **newsletter, send us an email at greengrowth@oecd.org**

Further reading

Environmental Performance Reviews

OECD (2013), Environmental Performance Reviews: Mexico, OECD Publishing.

OECD (2012), Environmental Performance Reviews: Germany, OECD Publishing.

OECD (2011), Environmental Performance Reviews: Israel, OECD Publishing.

OECD (2011), Environmental Performance Reviews: Norway, OECD Publishing.

OECD (2011), Environmental Performance Reviews: Portugal, OECD Publishing.

OECD (2011), Environmental Performance Reviews: Slovak Republic, OECD Publishing.

OECD (2012), Environmental Performance Reviews: Slovenia, OECD Publishing.

Chapters from Economic Surveys

Bibbee A. (2011), "Green Growth and Climate Change Policies in New Zealand", OECD Economics Department Working Papers, No. 893, OECD Publishing.

Bowen A. and J. Rydge (2011), "Climate Change Policy in the United Kingdom", OECD Economics Department Working Papers, No. 886, OECD Publishing.

Egert B. (2012), "Climate Change Policies in Poland - Minimising Abatement Costs", OECD Economics Department Working Papers, No. 953, OECD Publishing.

Jamet S. (2011), "Enhancing the Cost-effectiveness of Climate Change Mitigation Policies in Sweden", OECD Economics Department Working Papers, No. 841, OECD Publishing.

Jamet S. (2012), "Towards Green Growth: Improving Energy and Climate Change Policies", OECD Economics Department Working Papers, No. 974, OECD Publishing.

Jones R. and B. Yoo (2011), "Achieving the "low carbon, green growth" Vision in Korea", OECD Economics Department Working Papers, No. 890, OECD Publishing.

Klein C. (2011), "Reaping the Benefits of a Transition to Greener Growth in Slovakia", OECD Economics Department Working Papers, No. 905, OECD Publishing.

Klein C. (2012), "Climate Change Policies: Make Ambition Pay", OECD Economics Department Working Papers, No. 982, OECD Publishing.

Kozluk T. (2011), "Greener Growth in the Belgian Federation", OECD Economics Department Working Papers, No. 894, OECD Publishing.

OECD (2009), Economic Surveys: European Union, Chapter 4.

OECD (2010), Economic Surveys: United States, Chapter 3.

Cross-country reports

Corfee-Morlot J., V. Marchal, C. Kauffmann, C. Kennedy, F. Steward, C. Kaminker and G. Ang (2012), "Toward a Green Investment Policy Framework: The Case of Low-Carbon, Climate-Resilient Infrastructure", Environment Directorate Working Paper, No. 48, OECD Publishing.

de Serres, A., J. Llewellyn and P. Llewellyn (2011), "The Political Economy of Climate Change Mitigation Policies: How to Build a Constituency to Address Global Warming?", OECD Economics Department Working Papers, No. 887, OECD Publishing.

Haščič, I. (2012), "Environmental Innovation in Germany", *OECD Environment Working Papers*, No. 53, OECD Publishing.
doi: 10.1787/5k8x9b2lljzv-en

Haščič, I., J. Silva and N. Johnstone (2012), "Climate Mitigation and Adaptation in Africa: Evidence from Patent Data", *OECD Environment Working Papers*, No. 50, OECD Publishing.
doi: 10.1787/5k8zng5smxjg-en

Haščič, I., N. Johnstone and N. Kahrobaie (2012), "International Technology Agreements for Climate Change: Analysis Based on Co-Invention Data", *OECD Environment Working Papers*, No. 42, OECD Publishing.
doi: 10.1787/5k9fgpw5tt9s-en

Lanzi, E., I. Haščič and N. Johnstone (2012), "The Determinants of Invention in Electricity Generation Technologies: A Patent Data Analysis", *OECD Environment Working Papers*, No. 45, OECD Publishing.
doi: 10.1787/5k92v111shjc-en

OECD (2009), Natural Resource and Pro-poor Growth, OECD Publishing.

OECD (2011a), Towards Green Growth, OECD Publishing.

OECD (2011b), Towards Green Growth: Monitoring Progress: OECD indicators, OECD Publishing.

OECD (2011c), Fostering Innovation for Green Growth, OECD Publishing.

OECD (2011d), Invention and Transfer of Environmental Technologies, OECD Publishing.

OECD (2012a), OECD Environmental Outlook to 2050, OECD Publishing.

OECD (2012b), Employment Outlook, Chapter 4, What Green Growth Means for Workers and Labour Market Policies: An Initial Assessment, OECD Publishing.

OECD (2012c), Policy Instruments to Support Green Growth in Agriculture – Main Report.

OECD (2012d), Lessons from 15 years of experience for the Dutch Tax Allowance for Energy Investment for Firms, November.

OECD (2012e), OECD Science and Technology Outlook, Chapter 5, Transitioning to Green Innovation and Technology, OECD Publishing.

OECD (2012f), National Adaptation Planning: Lessons from OECD countries.

OECD (2012g), "An OECD-wide Inventory of Support to Fossil-Fuel Production or Use, OECD Policy Brief.

OECD (2012h), Energy and Climate Policy: Bending the Technological Trajectory, OECD Publishing.

OECD (2012i), Implementation of the OECD Environment Strategy, OECD Publishing.

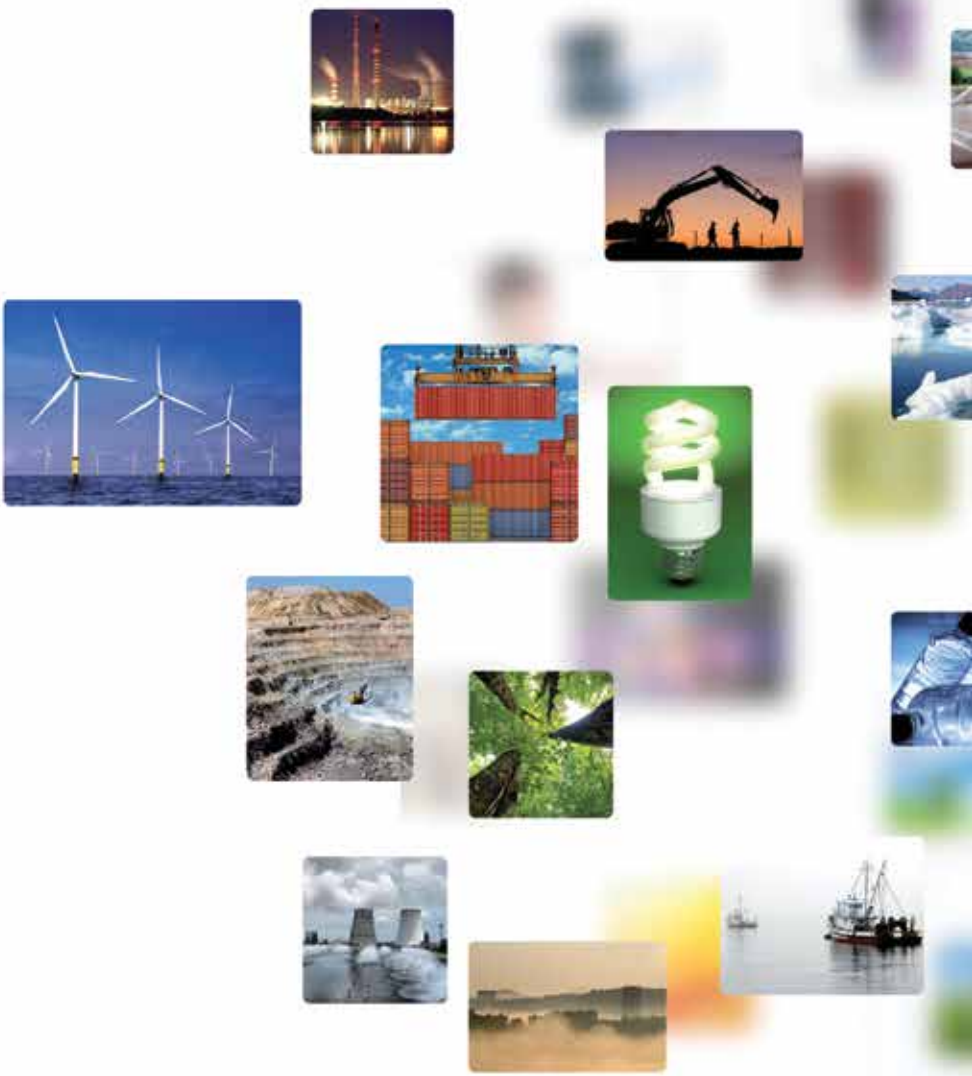
OECD, World Bank, United Nations, Incorporating Green Growth and Sustainable Development Policies into Structural Reform Agenda, Report prepared for the G20 Los Cabos Summit, 18-19 June 2012.

OECD (2013) International Cooperation for Climate Change Innovation: A Problem Shared is a Problem Halved (forthcoming).

OECD (2013), Greening Business – The Role of New Business Models , *OECD Green Growth Papers*, OECD Publishing, January.

OECD (2013), Greening Household Behaviour: Overview of 2011 Survey Data (forthcoming).

OECD (2013), Green Growth and Biodiversity (forthcoming).



OECD

BETTER POLICIES FOR BETTER LIVES