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INDICATORS FOR THE GREEN GROWTH STRATEGY

Meeting of the Committee on Statistics

to be hold on 7 - 8 June 2010
at the OECD Conference Centre
OECD Headquarters, Paris

This document is for DISCUSSION under Agenda item 5 at the June meeting.

Delegates are invited to:
- *note the OECD's work on its Green Growth Strategy;*
- *comment on plans for the development of the associated indicators;*
- *share with the Secretariat any relevant work that has been carried out at the national level.*

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INDICATORS FOR THE GREEN GROWTH STRATEGY

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Background

1. The OECD Ministerial Council issued a Green Growth Declaration in 2009 giving a mandate to the Organisation to develop a *Green Growth Strategy* (GGS) to be presented to Ministers in 2011. This major horizontal initiative has generated work in several OECD Directorates that will include a conceptual framework for green growth and indicators to monitor progress with green growth. The indicators will be developed on the basis of existing work and experience in different directorates; they will support policy analysis in the OECD and should also give rise to a self-contained OECD product on green growth indicators. An interim report on the Green Growth strategy was submitted to OECD Council meeting at ministerial level in May 2010, outlining some preliminary results from OECD analytical and policy work, along with a general framework.

2. The general framework of the Green Growth Strategy is policy-oriented, and primarily discusses externalities and market failures with a view to identifying policy instruments to foster environmentally-compatible economic growth. No particular claim is made, however, to rigorously *define* green growth. Nonetheless, for purposes of measurement it is useful to narrow down what is meant by green growth or at least to specify what is *not* meant by it. We start by the latter and ascertain that green growth is not narrowly defined as economic growth of industries producing products for environmentally-friendly use (such as photovoltaic cells). Green growth has just as much to do with reducing the environmental pressure from processes used in production, whatever the industry. Greener growth concerns also consumption patterns with reduced environmental impact, both with regard to the environmental contents of goods and services consumed as well as with regard to the residues and emissions caused by consumption. Overall, green growth could best be described as *environmentally sustainable economic growth*.

3. The green growth strategy links into another broad-based OECD project, measuring the progress of societies. If green growth is broadly understood as environmentally sustainable economic growth, the work on progress sheds additional light on the notion of 'economic growth'. The progress agenda questions, for example, whether GDP per capita is a sufficient statistic to capture the essentials of material living standards and concludes that aggregate GDP needs complementing by indicators on household income and wealth, and how they are distributed. How economic growth is defined can shape the discussion on possible trade-offs and synergies between environmental goals and economic growth and has implications for formulating and measuring green growth.

4. There is a second element where the green growth strategy meets the work on societal progress and it concerns the environmental quality of life. The environment is an important dimension of people's quality of life, with issues such as access to environmental amenities, and the negative impact of people's exposure to pollution and residues. Several indicators described below therefore relates to the environmental quality of life.

How do we measure progress towards green growth?

A pragmatic approach

5. The indicators and the underlying measurement framework are being developed on the basis of well-established criteria (Box 1) and drawing on existing work and experience[1] in the OECD, the IEA, other international organisations, and in member and partner countries (Box 2).

6. The indicators and the measurement framework are kept flexible enough to adapt to different national contexts. As the indicators' relevance may vary across countries and circumstances, they will be supported by additional information to put them in a broader context and facilitate interpretation. This would cover both information about countries' ecological, social, economic, structural and institutional features, and information to explain the factors behind changes in the indicator values. For certain indicators, it may also be possible to explicitly control for economic structure with a view to distinguishing between structural and other effects in cross-country comparisons. Furthermore, an effort will be made to present both cross-country comparisons at a given point in time and evolutions of indicators over time to track patterns of convergence or divergence for example in resource efficiency.

Box 1. Key principles in selecting indicators to monitor progress with green growth

Policy relevance	The indicator set should have a clear policy relevance, and in particular: ◆ provide a balanced coverage of the key features of green growth with a focus on those that are of common interest to OECD member and partner countries ◆ be easy to interpret and transparent, i.e. users should be able to assess the significance of the values associated with the indicators and their changes over time ◆ provide a basis for comparisons across countries ◆ lend itself to being adapted to different national contexts, and analysed at different levels of detail or aggregation.
Analytical soundness	The indicators should be analytically sound and benefit from a consensus about their validity. They should further lend themselves to being linked to economic and environmental modelling and forecasting.
Measurability	The indicators should be based on data that are available or that can be made available at a reasonable cost, and that are of known quality and regularly updated.

[1] Examples include experience with: decoupling indicators, resource productivity indicators, energy efficiency indicators, policy integration indicators, core and key environmental indicators, innovation indicators, and sustainable development indicators.

A measurement framework combining production, consumption and the environment

7. The framework used for organising the indicator development builds on an extended growth accounting approach and on a selection of the most pressing environmental issues that are of relevance to green growth:

- At the core of the framework, is a production process that relates economic output (made up of goods and services) to economic, social and environmental inputs that are used to produce it. Inputs comprise traditional inputs (for which there are market prices that more or less reflect society's valuation) in the form of labour, capital, energy, materials, and a set of inputs that are not normally accounted for, in particular environmental services: flows of natural resources (water, fish, certain materials) and sink functions for air emissions and discharges into soil and water (Figure 1). In addition, there are wider ecosystem services, such as a stable climate/weather patterns, water regulation and purification services, services from biodiversity such as pollination and general resilience of ecosystems.
- The environmental issues that will be given prominence include: (i) climate change, (ii) ecosystems and environmental media (in particular biological diversity, air, soil and water quality); (iii) environmental resources (water, fish, forests), and (iv) waste and material resources (e.g. metals and other minerals).

A set of indicators capturing major aspects of "green" growth

8. Five inter-related groups of indicators will be distinguished: (i) indicators reflecting the environmental efficiency of production as well as the absolute pressures associated with production, (ii) indicators reflecting the environmental efficiency of consumption as well as the absolute pressures associated with consumption, (iii) indicators describing the natural asset base of the economy, (iv) indicators monitoring environmental quality of life, and (v) indicators describing policy responses and instruments.

Monitoring the environmental efficiency of production and changes in production patterns

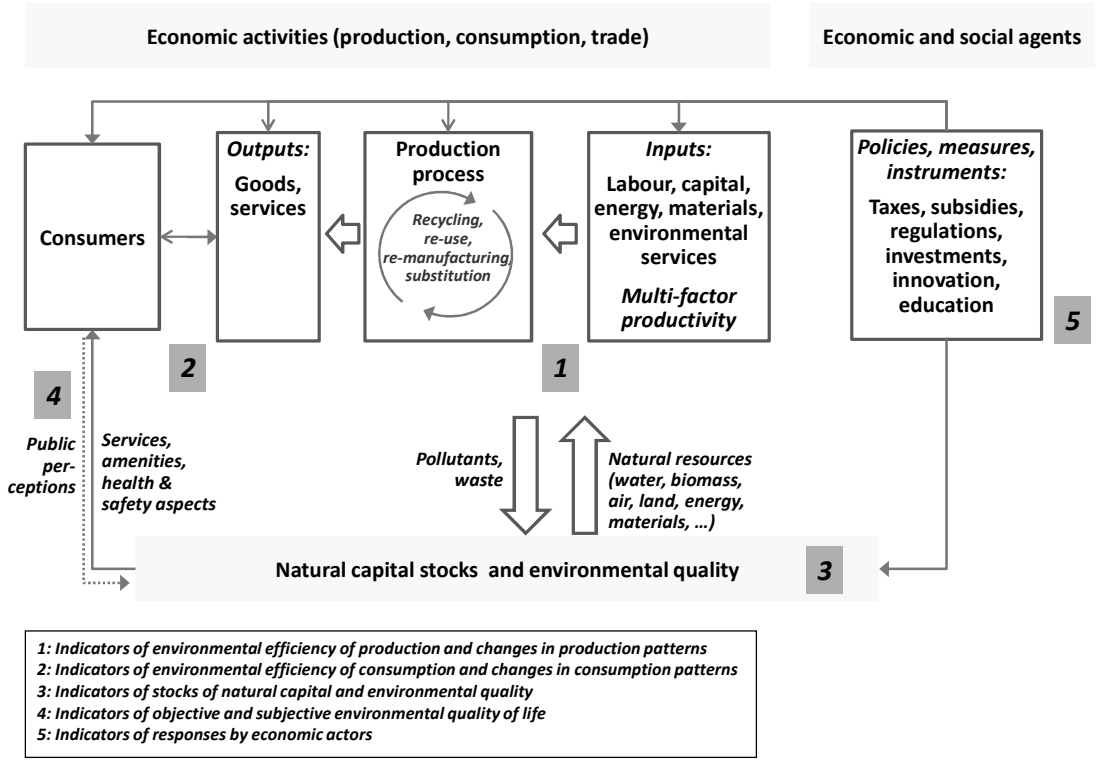
9. The environmental efficiency of production can be measured by the use of environmental services per unit of output (expressed in monetary or in physical terms). A declining use of environmental services per unit of output is a necessary condition for decoupling environmental pressure from economic growth and an indication of substitution processes where environmental inputs are replaced by other inputs or by more efficient production processes. The first group of indicators thus includes resource productivity and environmental efficiency measures that track quantities of residuals such as pollutants or waste in relation to conventional outputs or ratios of the natural capital input (water, energy, biomass and other materials) over quantities of conventional output. Such indicators would be based on a domestic perspective and rely on data by industries, activities or sectors (e.g. agriculture, manufacturing, energy, transport). Given that efficiency gains in resource use and improvements in pollution intensities can be offset by the volume effects of increased production and consumption levels, the set of indicators would also include measures of absolute changes in resource use and pollution emissions so as to indicate the environmental burden.

Monitoring the environmental efficiency of consumption and changes in consumption patterns

10. The second group of indicators will look at the environmental efficiency of consumption and at changes in consumption patterns. This is important because many policy instruments, for instance price signals through taxes and subsidies or regulations, are directed at consumers, and changing consumer demand structures will affect the supply structure of our economies. This group also includes indicators that lie at the

interface between production and consumption and that go beyond the domestic perspective. The resource productivity of a country's production system can rise when products that are environmentally inefficient are imported and resource extraction and residuals arise abroad so that there is a displacement effect: domestic environmental services are replaced by imported inputs. Such indicators can build on input-output tables, used with trade data and information on the environmental content of certain products. This permits tracking the international flows of residuals or natural resources that are embodied in consumer products.

Figure 1. Framework for Green Growth Indicators



Monitoring the natural asset base of the economy, including natural resource and material stocks, and biodiversity

11. It is necessary to not only track whether there is decoupling of environmental pressures from economic growth, but to ensure that pressures on the environment are at a level compatible with available stocks and with the environment's carrying capacity. Hence, a crucial ingredient to measure progress is to look at stocks, along with flows, and to identify indicators that reflect the extent to which the asset base is being maintained in terms of quantity, quality or value. Tracking stocks and their changes empirically implies monitoring cumulative effects of extraction and renewal for a given type of natural resource. This group of indicators will thus monitor important stocks of natural capital and material resources[2], with focus on key natural resources and on biodiversity**,** supplemented by selected information on environmental quality (air, water, soil).

[2] A statistically challenging question is how to reflect in-use resource stocks (e.g. materials contained in existing buildings and equipments) and stocks contained in waste that can potentially substitute for natural stocks (in particular non-renewable ones) through improved recovery, recycling etc.

Monitoring the environmental quality of life

12. Closely associated with the consumer perspective is how pollution and changes in environmental services affect people's quality of life. This group of indicators would include measures covering (i) people's exposure to various pollutants and the associated health effects, (ii) people's exposure to environmental risks; and (iii) the access that different groups have to environmental services (water, sanitation, green space, etc.). Such objective indicators could be complemented by subjective measures of environmental quality of life reflecting (i) people's perceptions about the quality of the environment they live in, and (ii) environmental quality as one of the determinants of overall subjective measures of well-being.

Monitoring policy responses and instruments

13. The fifth group of indicators looks into the responses (policies, measures, instruments) put in place by economic actors to promote green growth, including economic and fiscal instruments, social and regulatory instruments. Response indicators would include:

- Indicators on *green innovation and technology*, covering aspects such as technology development and uptake, patents, R&D expenditure, etc.
- Indicators on *public and private expenditure and transfers*, including capital expenditure, taxes, fees, subsidies.
- Indicators on *international transfers*, including technology transfers, international investments, and development aid.

14. They could be complemented with selected indicators reflecting training policies and skill development measures.

Conclusion

15. Delegates are invited:

- to note the OECD's work on its Green Growth Strategy;
- to comment on plans for the development of the associated indicators;
- to share with the Secretariat any relevant work that has been carried out at the national level.

Box 2. Relevant work for green growth measurements

The indicators needed to measure progress with green growth are founded on existing OECD work that will be refined to suit the Green Growth Strategy.

Measuring environmental performance and resource productivity	The OECD has developed several sets of **environmental indicators** to support policy analysis and country reviews: key and core environmental indicators to track environmental progress; sectoral environmental indicators to monitor policy integration; and indicators to measure the decoupling of environmental pressures from economic growth. The indicators are supplemented with environmental data, including on environmentally related **taxes and expenditure**. Recent work has been focusing on the measurement of **material flows and resource productivity** in support of an OECD Council recommendation and of the G8 Kobe 3R Action Plan.
Monitoring trends in energy use and efficiency	The IEA maintains several databases, including energy efficiency indicators, energy balances and statistics, , energy prices and taxes, and publishes **energy and energy efficiency indicators**. Recent work has been focusing on the measurement of **energy efficiency** in support of the G8 Gleneagles Plan of Action for Climate Change, Clean Energy and Sustainable Development, and on improving the mandatory reporting of energy efficiency-related data.
Monitoring technology developments and innovation	The OECD maintains several databases and indicator sets keeping track of developments in technology and industrial performance: main science and technology indicators; indicators on the information economy, globalisation, and entrepreneurship; international patent database, input-output tables and estimates of carbon embedded in trade. Recent work has been focusing on indicators in support of the OECD **innovation** strategy, and on an indicator toolkit to promote and monitor **sustainable manufacturing** at corporate level.
Measuring the environmental performance of agriculture	The economic and environmental performance of agriculture is monitored through a set of **agri-environmental indicators**, supported with the measurement of producer subsidies.
Monitoring international transfers	The OECD maintains two major databases monitoring international monetary transfers: international **investment** flows and official **development assistance**. Recent work aims at developing indicators of "green" foreign direct investment flows and at mapping relevant international investment flows by country and sector of destination.
Measuring sustainable development	The OECD has been promoting the development of indicators and coherent approaches to measure sustainable development. Recent work has been focusing on improving the measurement of different types of capital with emphasis on **human and social capital**.
Measuring well-being and progress	The OECD promotes the development of better measures and indicators of people's well-being and societal progress, to be used alongside standard economic measures such as GDP. Recent work aims at implementing the recommendations of the Stiglitz-Sen-Fitoussi Commission with emphasis on **well-being and sustainability**.
Other relevant work	To underpin its socio-economic analysis, the OECD further maintains databases on a wide range of other topics that are important to characterise economic growth and its outcomes. Examples include: national accounts, international trade, balance of payments, prices and taxes, productivity, government debt, employment, education, health, etc.

Continued co-operation is taking place with other international organisations, the European Commission, and international institutes.

ANNEX I. ILLUSTRATIVE INDICATOR EXAMPLES EXTRACTED FROM RECENT OECD WORK

- Air and climate
- Waste and materials
- Energy supply and efficiency
- Water resources
- Development aid
- Research and technology development

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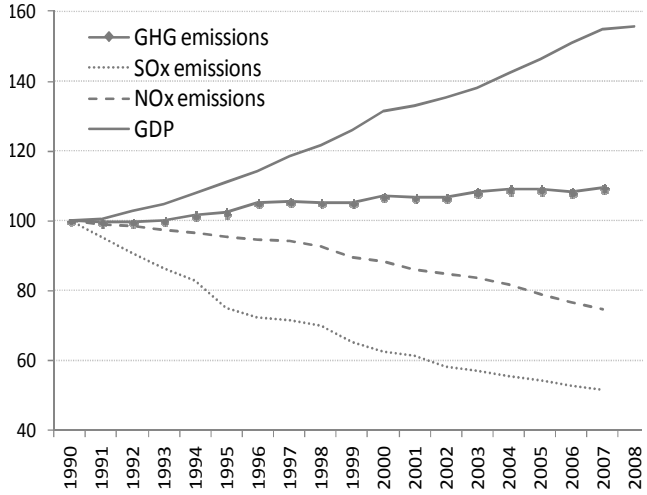
The indicators presented here are extracted from recent work. They are included in this document for illustration purposes only.

Annex I. Illustrative indicator examples extracted from recent OECD work

AIR AND CLIMATE

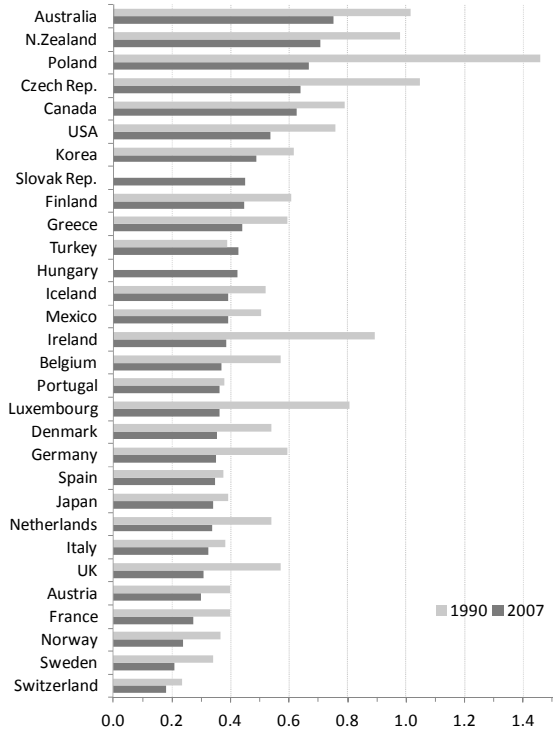
Emission trends and GDP growth
OECD (Index 1990=100)



Source: OECD Key Environmental Indicators.

Emissions of acidifying substances show absolute decoupling from GDP. Many countries have also decoupled their GHG emissions from GDP growth, but have not succeeded in meeting their national commitments. The main challenge is to stabilise the concentration of GHG in the atmosphere at a level that would limit anthropogenic interference with the climate system, to limit emissions of other air pollutants and to limit population exposure to air pollution.

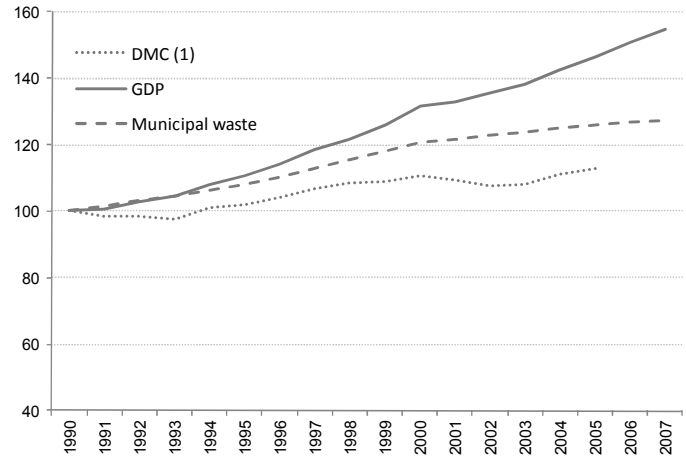
Emission intensities, 2007
Greenhouse gas emissions per unit of GDP
(tonnes CO2-eq/1000 USD)



Source: OECD Key Environmental Indicators.

WASTE AND MATERIALS

Waste generation, materials use and GDP growth
OECD (Index 1990=100)



Notes: (1) Domestic (apparent) Material Consumption.
Source: OECD Key Environmental Indicators, OECD Environmental Data.

Despite achievements in waste recycling and relative decoupling of municipal waste generation from economic growth, many valuable materials contained in waste continue to be disposed of and are potentially lost for the economy.

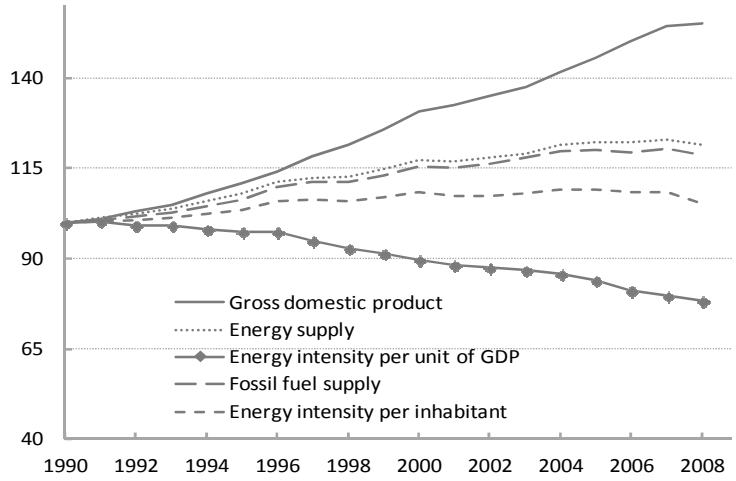
The main challenge is to strengthen measures for waste prevention and recycling, and to move further towards integrated life cycle management of materials and products (circular economy approaches).

Illustrative indicator examples extracted from recent OECD work (continued)

ENERGY SUPPLY AND EFFICIENCY

Energy use and GDP growth

OECD (Index 1990=100)



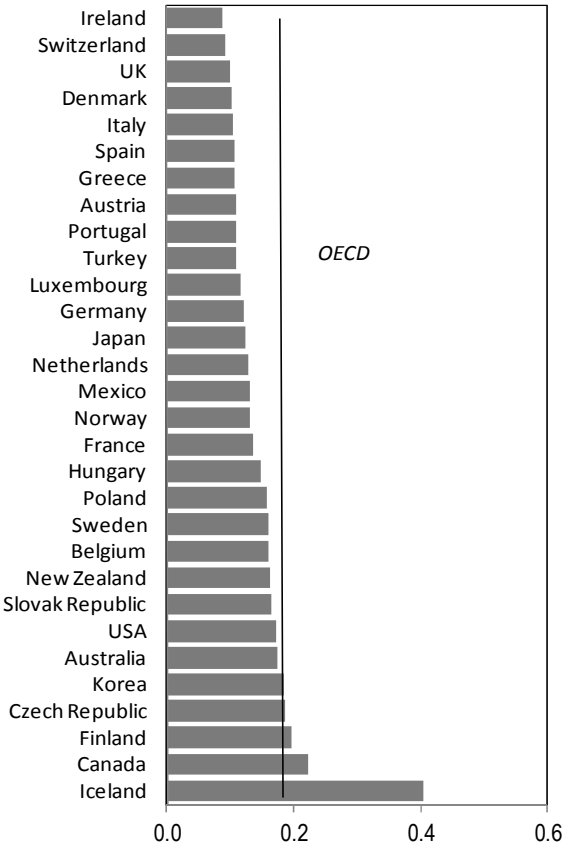
Source: IEA, OECD.

During the 1990s, energy intensity per unit of GDP has generally decreased in the OECD, as a consequence of structural changes in the economy, energy conservation measures, and in some countries decreases in economic activity.

The current rate of energy efficiency improvements is however not enough to overcome other factors driving up energy use. The main challenge is to further decouple energy use and related air and GHG emissions from economic growth, through additional improvements in energy efficiency and through the use of cleaner fuels.

Energy intensity, 2007

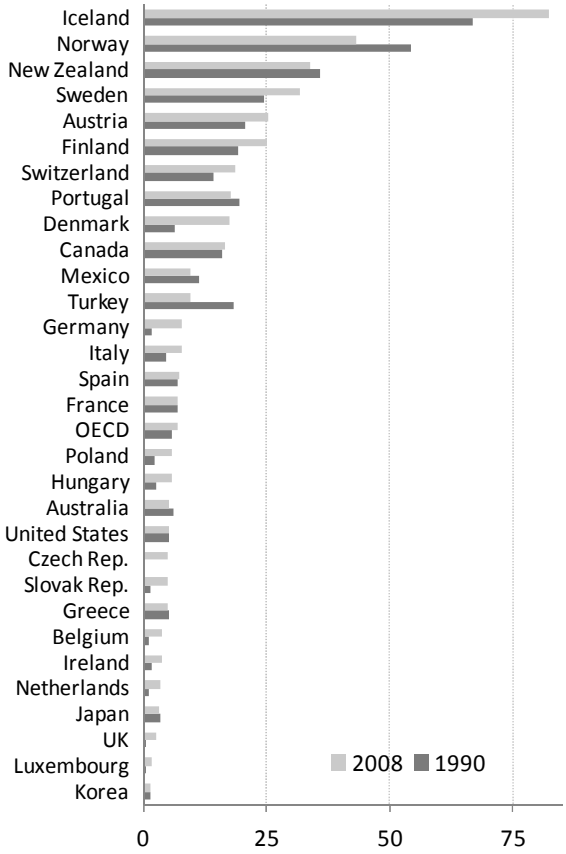
Energy Supply per unit of GDP (TOE/1000 USD)



Source: IEA

Share of renewable energy*, 1990, 2008

(% of energy supply)



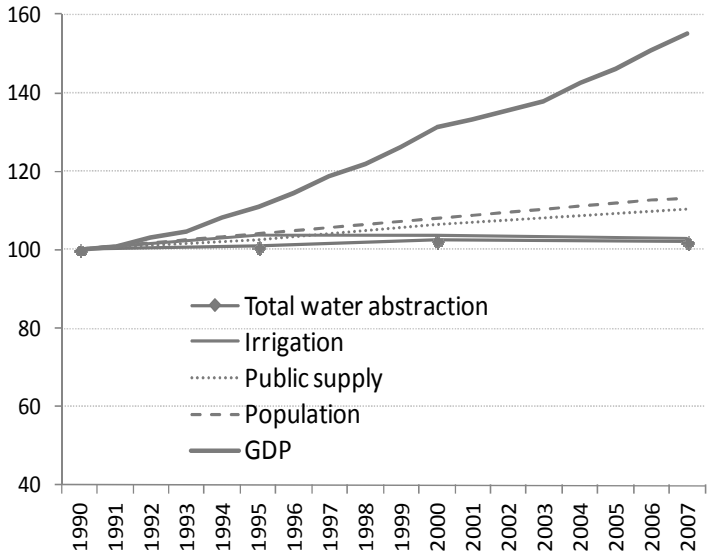
** Hydro, solar, geothermal and wind energy.*

Illustrative indicator examples extracted from recent OECD work (continued)

WATER RESOURCES

Water abstractions and GDP growth

OECD (Index 1990=100)



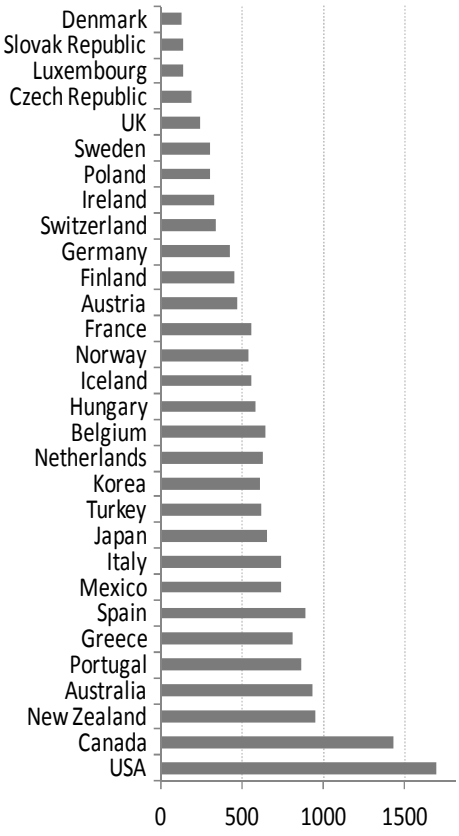
Source: OECD Key Environmental Indicators

Though many countries have stabilised their abstractions through more efficient irrigation and cleaner production technologies, most of them face seasonal or local water quantity problems and several have extensive arid or semi-arid regions where water is a constraint to economic development.

The main challenge is to ensure a sustainable management of water resources, avoiding overexploitation and degradation, so as to maintain adequate supply of freshwater of suitable quality for human use and to support aquatic and other ecosystems.

Water use intensities, mid 2000s

Abstractions per capita (m3/person/year)

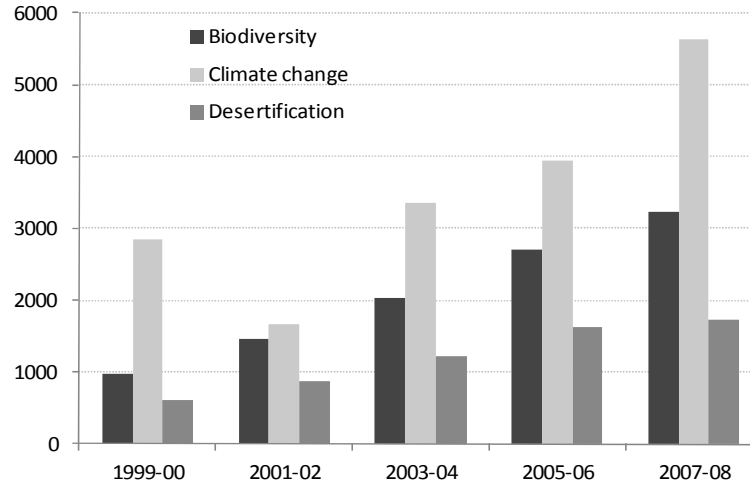


Source: OECD Key Environmental Indicators

DEVELOPMENT AID

Aid* targeting the Rio Conventions, 1998-2007

USD million



** members of the OECD's Development Assistance Committee (DAC), two-year averages, commitments, constant 2007 prices.*
Source: OECD-DAC: CRS Aid Activity database.

Trends in aid targeting the objectives of the Rio Conventions show an increase since the late 1990s. In 2008, DAC members allocated approximately USD 3.4 billion for biodiversity-related aid, USD 8.4 billion for climate-change-related aid and USD 2.4 billion for desertification-related aid.

In 2008, total net official development assistance (ODA) from DAC members amounted to USD 119.8 billion, i.e. 0.30% of members' combined gross national income.

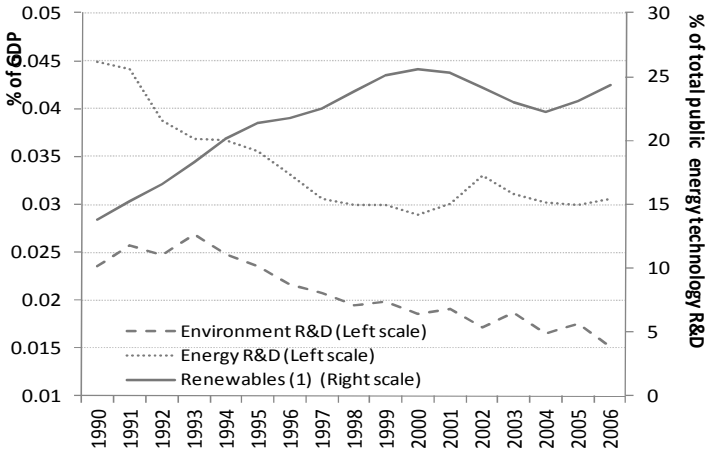
With foreign direct investment and other private flows to low-income countries on the decline, aid has a role to play in countering the development impact of the crisis.

Illustrative indicator examples extracted from recent OECD work (continued)

RESEARCH AND TECHNOLOGY DEVELOPMENT

Public spending in energy- and environment-related R&D

OECD*



Source: OECD.stat (R&D statistics), IEA database.

The development and diffusion of clean technologies is crucial for moving to resource efficient, low-carbon economies.

While the share of GDP dedicated to public environment- and energy related R&D expenditure has slightly decreased since 1990, the amount dedicated to renewable energy and energy efficiency has gained in importance.

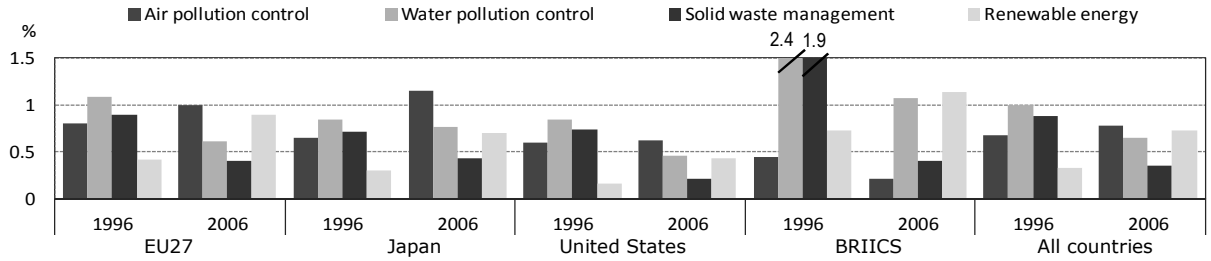
Notes:

* Data on energy related R&D refer to IEA averages. Non-IEA members (Iceland, Mexico, Poland, Slovak Republic), Belgium and Luxembourg are excluded.

1. Energy technology R&D expenditures directed towards "Renewable Energy" and "Energy efficiency" measures.

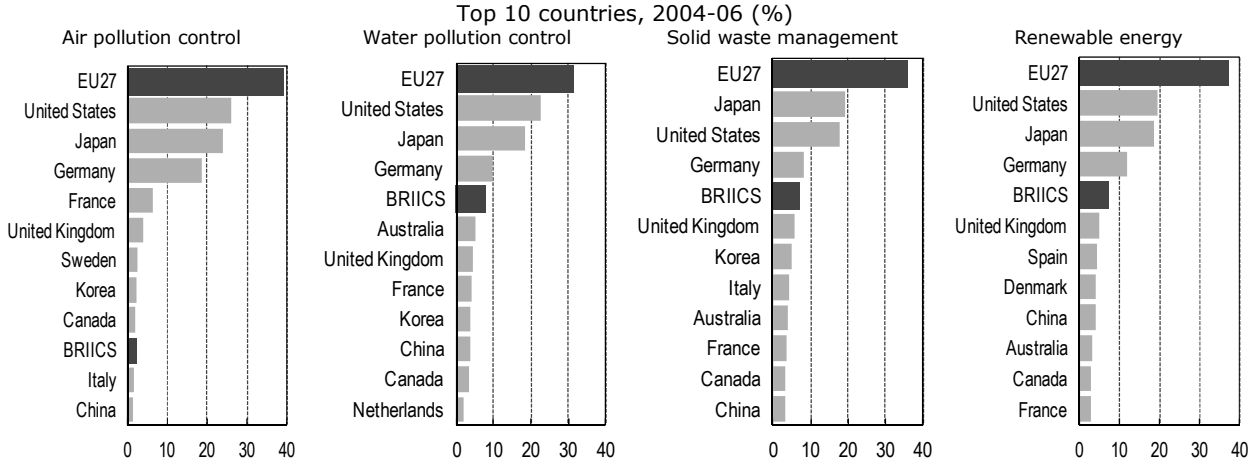
Patents in selected environmental technologies

As a share of total PCT* patent applications (%)



Share of countries in environmental technology patents filed under PCT*

Top 10 countries, 2004-06 (%)



**The number of Patent Cooperation Treaty (PCT) applications is used as the main indicator of inventive performance.*

In the last 10 years, in most regions and countries there has been an increase in the share of total patents related to air pollution and renewable energy, while for water pollution and solid waste management the share has fallen. Japan, the United States and Germany are the most important inventor countries. Other countries such as Sweden (air pollution), Australia (water pollution) and Spain (renewables) are also important sources of invention in specific fields, as are the BRIICS (Brazil, Russian Federation, India, Indonesia, China, South Africa), and in particular China.

Source: EPO/OECD Worldwide Patent Statistical Database.