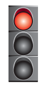
KEY MESSAGES

The *OECD Environmental Outlook to 2030* is based on projections of economic and environmental trends to 2030. The key environmental challenges for the future are presented according to a "traffic light" system (see Table 0.1). The *Outlook* also presents simulations of policy actions to address the key challenges, including their potential environmental, economic and social impacts.

Table 0.1. **The *OECD Environmental Outlook to 2030***

			
Climate change		• Declining GHG emissions per unit of GDP	• Global GHG emissions • Increasing evidence of an already changing climate
Biodiversity and renewable natural resources	• Forested area in OECD countries	• Forest management • Protected areas	• Ecosystem quality • Species loss • Invasive alien species • Tropical forests • Illegal logging • Ecosystem fragmentation
Water	• Point-source water pollution in OECD countries (industry, municipalities)	• Surface water quality and wastewater treatment	• Water scarcity • Groundwater quality • Agricultural water use + pollution
Air quality	• OECD country SO_2 and NO_x emissions	• PM and ground-level ozone • Road transport emissions	• Urban air quality
Waste and hazardous chemicals	• Waste management in OECD countries • OECD country emissions of CFCs	• Municipal waste generation • Developing country emissions of CFCs	• Hazardous waste management and transportation • Waste management in developing countries • Chemicals in the environment and in products

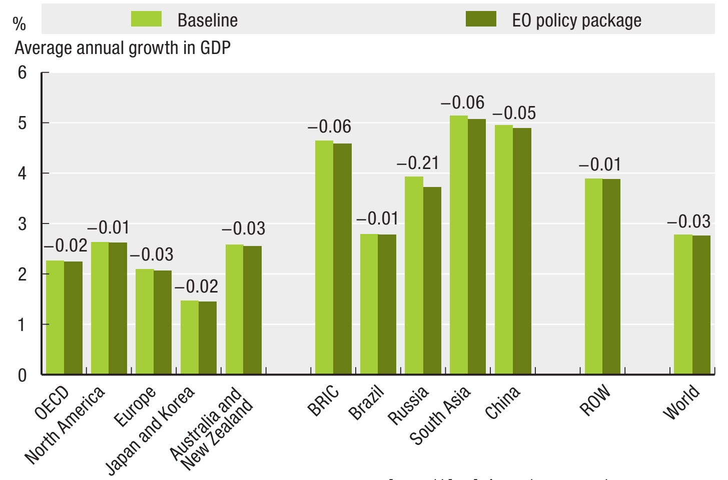
KEY: ***Green light*** = environmental issues which are being well managed, or for which there have been significant improvements in management in recent years but for which countries should remain vigilant. ***Yellow light*** = environmental issues which remain a challenge but for which management is improving, or for which current state is uncertain, or which have been well managed in the past but are less so now. ***Red light*** = environmental issues which are not well managed, are in a bad or worsening state, and which require urgent attention. All trends are global, unless otherwise specified.

Action is affordable: policy scenarios and costs

The *Outlook* highlights some of the "red light" issues that need to be addressed urgently. The policy scenarios in this *Outlook* indicate that the policies and technologies needed to address the challenges are available and affordable. Ambitious policy actions to protect the environment can increase the efficiency of the economy and reduce health costs. In the long-term, the benefits of early action on many environmental challenges are likely to outweigh the costs.

As an example, a hypothetical global "OECD Environmental Outlook (EO) policy package" (EO policy package, see Chapter 20) was applied. It shows that, by combining specific policy actions, some of the key environmental challenges can be addressed at a cost of just over 1% of world GDP in 2030, or about 0.03 percentage points lower average annual GDP growth to 2030 (Figure 0.1). Thus world GDP would be about 97% higher in 2030 than today, rather than nearly 99% higher. Under such a scenario, emissions of nitrogen oxides and sulphur oxides would be about one-third less in 2030 while little change is projected under a no-new-policy baseline scenario, and by 2030 growth in greenhouse gas emissions would be contained to 13% rather than 37%.

Figure 0.1. **Average annual GDP growth, 2005-2030**



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KEY MESSAGES

- The urban area expanded by 171% worldwide between 1950 and 2000, and some studies suggest that it may increase by another 150% to 2030.
- Nearly half the world's population now lives in urban areas, and this proportion is expected to grow to 60% by 2030. About 89% of the total projected urban population growth of 1.8 billion people from 2005 to 2030 will occur in non-OECD countries.

Environmental implications

Continuing urban sprawl will put pressure on the environment through land use stress, fragmentation of natural habitats, long-term soil degradation, and increases in greenhouse gas and air pollution emissions.

Developing countries often lack the necessary urban infrastructure to support human health and the environment – such as water supply and sanitation connections, sewerage and sewage treatment, waste collection and management systems, and public transport networks.

Cities also provide opportunities to improve the quality of urban life. From the perspective of sustainable development, compact cities can make more efficient use of natural resources and service provision by concentrating people and economic activities in a limited area. Economies of scale can minimise the adverse effects of consumption and production patterns on the environment.

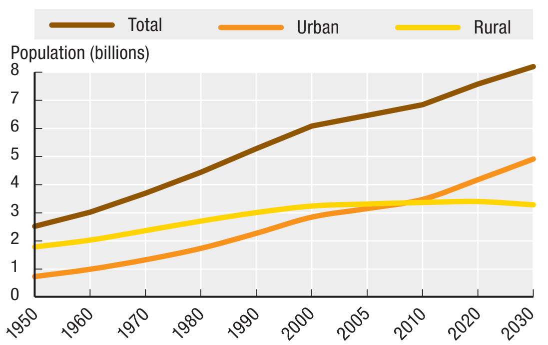
Most OECD cities have made significant progress in reducing their local environmental impacts (*e.g.* urban air and water pollution) through improved wastewater treatment, stricter vehicle emission controls and better public transport provision. Such continuing efforts will be critical to retain the sustainability of city areas.

Policy implications

- Ensure a holistic and long-term approach to integrate urban design with spatial planning, social objectives, transport policy, and other environmental policies (*e.g.* waste, energy, water); better governance and the harmonisation of policy tools will be central for such cross-sectoral integration.
- Implement appropriate financial incentives and building codes to support cost-effective greenhouse gas emission reductions from the building sector. This is particularly important for new building developments, as these buildings may be in place for decades to come.

If the growth in residential building development in China continues at the current rate, about 13 billion m^2 more floor space will be constructed over the next two decades – equivalent to the total building stock currently in place in the EU15 countries. There is an important window of opportunity now to adopt cost-effective energy efficiency measures that will keep the energy demands and greenhouse gas emissions from these new buildings low for their lifetimes.

World population, total, urban and rural, 1950-2030



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Consequences of inaction

Cities concentrate the impacts of human activities – resource use, pollution, and waste – into a small area, and thus often exceed the local capacity of the environment to provide such resources and to absorb the pollution generated. These are not only environmental concerns but also affect the health and well-being of citizens and economic viability. The current unprecedented rate of urbanisation poses formidable environmental, economic and social challenges within individual countries as well as for the world community. Urban environmental problems are now a pivotal issue, and how they are managed has a direct impact on the quality of life for urban dwellers and the achievement of sustainable development locally, regionally and globally.

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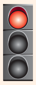
KEY MESSAGES

The *Outlook* Baseline assumes that world economic growth and globalisation will follow the same trends to 2030 as seen over the past few decades. This is an analytical tool and should not be seen as a forecast of the future: it represents what might happen without any major new events or policies. But other scenarios are possible, and this chapter explores some of them to: *a)* prepare policy-makers for a range of alternative outcomes, and *b)* gauge how they might affect policy prescriptions:

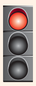
- Economic growth variations (variations 1-3 below): the five years between 2002 and 2007 witnessed much higher world economic growth rates than previously. Variation 1 projects these recent strong growth rates to 2020 to explore their medium-term impact. Variation 2 assumes countries' labour productivity growth levels off towards 1.25% over the long term instead of 1.75%. This reduced rate of labour productivity growth is more consistent with longer-term (*i.e.* longer than 20 years) historical rates of growth across all countries. Variation 3 assumes that productivity growth levels off to 2.25%. Given recent global growth rates and advances in transportation and communication technology, this is a plausible – if optimistic – long-term outcome.
- Globalisation variation (variation 4): this assumes continued strong increases in trade, *e.g.* as a result of explicit trade policies and/or "autonomous" reductions in the costs of international trade. These factors have been omitted from the *Outlook* Baseline in an effort to clearly distinguish a reference case from a policy case.

Environmental implications



The higher medium-term growth (variation 1) would increase impacts on the environment. If emissions of greenhouse gases from energy were 16% higher in 2030, the impacts would clearly be significant for climate change since an additional 1.7 gigatonnes of CO_2 would be emitted.

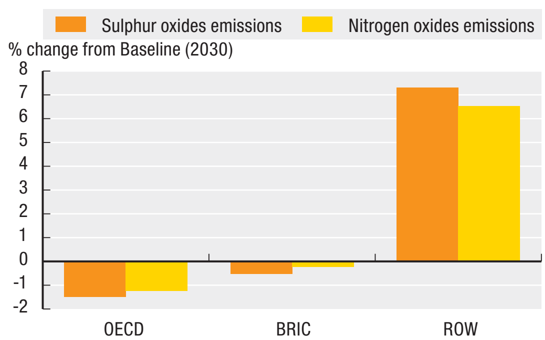
Variations in the rates of long-term productivity growth (variations 2 and 3) have less impact on the horizon to 2030, but have larger consequences for the environment in the longer term. Nonetheless, the faster growth represented by the 2.25% rate (variation 3) will mean greater and earlier impact on the environment than growth of 1.25% (variation 2). Though human material well-being will be better off, traditional sources of market failure regarding the environment imply that policy frameworks will need to be reinforced.



The increased trade and changing patterns of production (variation 4) will redistribute polluting activities and cause an overall increase for the world as a whole. While globalisation may not in itself lead to much larger economies, it can have environmental impacts through the much wider dispersion of stages of production (see graph).

For the developing world (ROW), the impact of increased trade on key environmental variables (variation 4, see graph opposite) is expected to be generally negative. This has some implications for policy coherence (*i.e.* achieving development and environmental goals in non-OECD countries). In OECD countries, there is a mild decrease projected in total primary energy supply under a globalisation scenario, leading to decreased greenhouse gas emissions. There is also a notable decrease in emissions of nitrogen oxides.

Selected environmental impacts of the globalisation variation



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Policy implications

These variations illustrate the considerable differences that changes in a few key drivers can make to the nature of the world economy. Given this level of variability, anchoring the *Outlook* in historical trends for the critical economic and social drivers of environmental change is important – both for putting the Baseline on a firm foundation, as well as for exploring the repercussions of various policy initiatives.

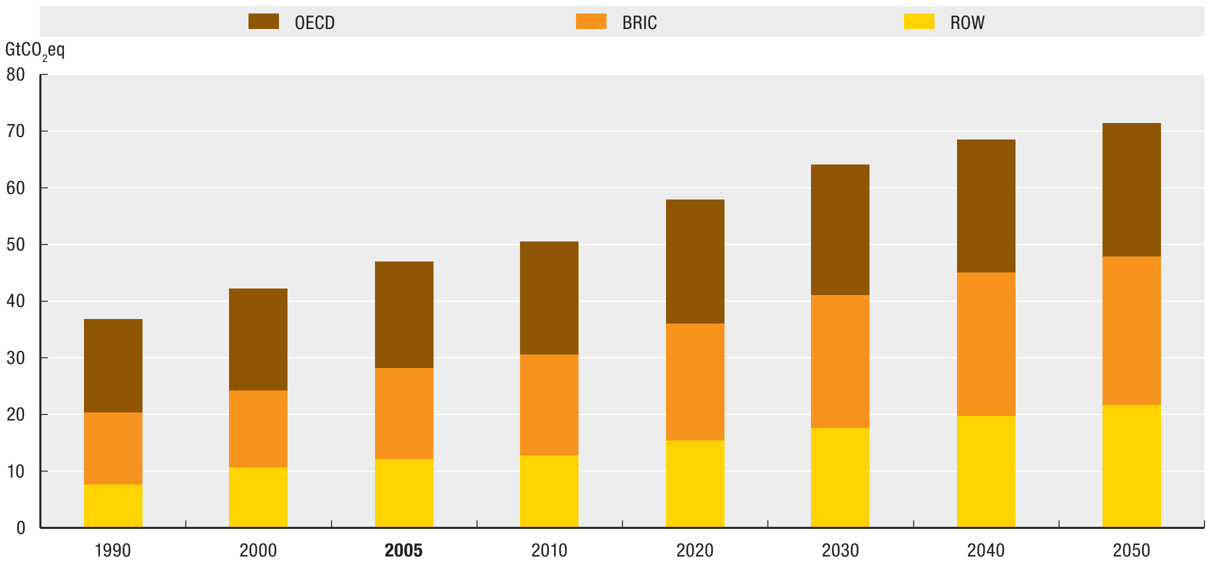
Table 7.1. ***Outlook* Baseline global emissions by region and GHG intensity indicators: 2005, 2030 and 2050**

	2005	2030	2050
		All GHG – Gt CO_2eq	
OECD	18.7	23.0	23.5
BRIC	16.1	23.5	26.2
ROW	12.1	17.6	21.7
World	**46.9**	**64.1**	**71.4**
		Change in GHG, 2030 and 2050	
		% increase	% increase
OECD	Base year	23%	26%
BRIC	–	46%	63%
ROW	–	45%	79%
World	–	37%	52%
		Shares of total GHG by region	
	% share	% share	% share
OECD	40%	36%	33%
BRIC	34%	37%	37%
ROW	26%	27%	30%
		CO_2eq per capita (T/person)	
OECD	15.0	16.8	17.0
BRIC	5.1	6.1	6.4
ROW	5.8	5.9	6.0
World	**7.2**	**7.8**	**7.8**
		CO_2eq per GDP (kg/USD real)	
OECD	0.7	0.5	0.3
BRIC	4.0	1.9	1.1
ROW	3.5	1.9	1.3
World	**1.3**	**0.9**	**0.6**

StatLink http://dx.doi.org/10.1787/257114344671

Note: Figures include land use change and forestry.
Source: *OECD Environmental Outlook* Baseline.

Figure 7.2. **Baseline GHG emissions by regions, 1990 to 2050**



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Note: 2005 also included as it is the base year.
Source: OECD Environmental Outlook Baseline.

A number of techniques to value the economic benefits of biodiversity and ecosystems have also been developed, and are gaining in rigour and acceptability in decision-making (OECD, 2002). Once economic values of biodiversity or ecosystem services are established, these can be used to inform policy decisions or in the development of appropriate economic incentives to internalise the full costs of natural resource use.

Costs of inaction

Biodiversity has high economic value. Some of the more obvious sources of value include: bio-prospecting, carbon sequestration, watersheds and tourism. These are direct sources of biodiversity value and do not include indirect aspects such as protection against major pathogens, sources of innovation in agricultural production, the existence value of biodiversity, etc. The pharmacological value of biodiversity may be in the multi-billion dollar range; a successful product can be worth USD 5 to USD 10 billion per year in revenues net of production costs, with a present value over its life of perhaps USD 50 to USD 100 billion. Indeed, finding just a small number of additional blockbuster drugs from the remaining biodiversity would justify significant conservation for bio-prospecting. Biodiversity's carbon storage value may also be in the tens of billions of dollars since it is a significant reservoir of carbon: there are now markets for carbon that allow the implicit pricing of stored carbon. The services provided by biodiversity through watersheds and charismatic megafauna are harder to estimate in total, but again clearly run to billions of dollars. New York City alone saved hundreds of millions of dollars by maintaining its source watershed rather than building a water purification plant (Heal, 2000).

The costs of biodiversity loss through continued policy inaction will thus be significant in both measurable economic loss and difficult-to-measure non-marketed terms. Getting a precise total figure for that loss is not possible, but there is good reason to suspect that it is large.

Notes

1. Mean species abundance (MSA) captures the degree to which biodiversity, at a macrobiotic scale, remains unchanged. If the indicator is 100%, the biodiversity is similar to the natural or largely unaffected state. The MSA is calculated on the basis of estimated impacts of various human activities on "biomes". A reduction in MSA, therefore, is less an exact count of species lost, than an indicator that pressures have increased.
2. In the US, for example, it takes one hectare of maize to produce 3 100 litres of ethanol (IEA, 2004). This is roughly the annual fuel requirement of a North American passenger vehicle that is driven 18 000 km/year (a rough North American average), so each passenger vehicle requires roughly one hectare of cropland to support its fuel use. Since the entire US maize crop was 32 million hectares in 2000, this would produce enough fuel to support roughly 32 million passenger vehicles – about 15 percent of all passenger vehicles in the US in 2000.
3. The extinction of a species of mountain-top frog that succumbed to changing precipitation and humidity (Pounds and Savage, 2004) is a good example of this type of study.
4. Convention on International Trade in Endangered Species of Wild Fauna and Flora.

References

Atkinson, I.A.E. and E.K. Cameron (1993), "Human Influence on the Terrestrial Biota and Biotic Communities of New Zealand", *Trends in Ecology and Evolution*, 8: 447-51.

Balmford, A. *et al.* (2002), "Economic Reasons for Conserving Wild Nature", *Science*, Vol. 297, pp. 950-53.

KEY MESSAGES

Illegal shipments and unsound management of end-of-life materials and products constitute a considerable risk for human health and the environment.

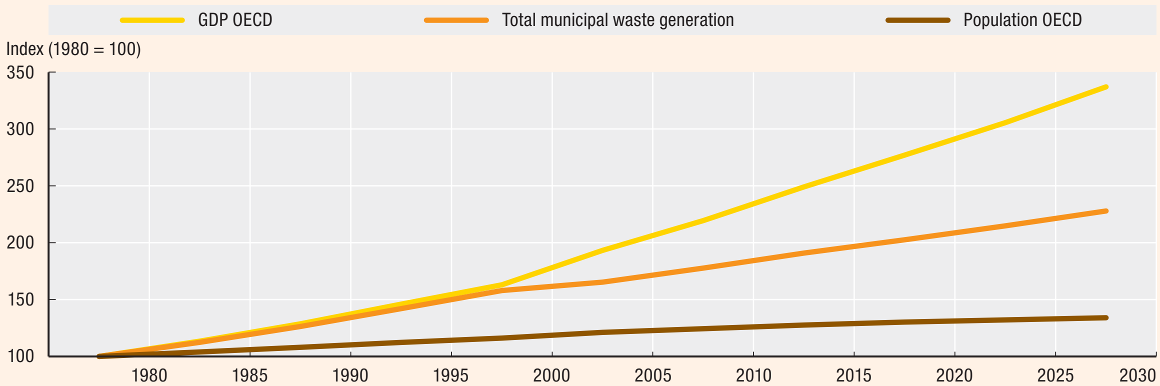
Management of rapidly increasing municipal waste in non-OECD countries will be an enormous challenge in the coming decades.

Municipal waste generation is still increasing in OECD countries, but at a slower pace since 2000. There has been a relative decoupling of municipal waste generation in OECD countries from economic growth, but waste generation is continuing to increase (see graph).

With continuous growth in global demand for materials and amounts of waste generated and subsequently disposed of, conventional waste policies alone may not suffice to improve material efficiency and offset the waste-related environmental impacts of materials production and use.

Current waste policies have been successful in diverting increasing amounts of valuable materials from landfills to further use, remanufacturing and recovery, thereby reducing considerably the associated environmental impacts, including greenhouse gas (GHG) emissions.

OECD country municipal waste generation, 1980-2030



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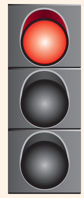
Policy options

- Develop new integrated approaches to address the environmental impacts of waste throughout the entire life-cycle of materials. Place stronger emphasis on material efficiency, redesign and reuse of products, waste prevention (reduction of both amount and hazard), recycling of end-of-life materials and products and environmentally sound management of residues.
- Support these integrated approaches with sound and reliable information on waste, material flows and resource productivity, including improved data quality and availability.
- Increase policy approaches which combine economic, regulatory and information instruments, as well as public-private partnerships, to address the negative environmental impacts of increasing waste volumes, and to encourage waste prevention and economically efficient and environmentally sound recovery of waste.
- Urgently address shipments of problematic end-of-life materials and products, such as electric and electronic appliances, ships and hazardous waste, to ensure they are managed in an environmentally sound manner. Recent incidents also call for intensified enforcement of existing rules and regulations, aimed at eliminating illegal shipments of these materials and products.
- Develop and transfer waste management technologies and know-how from OECD countries to developing countries.

Although very little is known about the actual volume and number of illegal shipments, their environmental and health impacts may be considerable. In order to be able to reduce these threats, effective compliance and enforcement of existing obligations, as well as increased border controls for shipments of end-of-life materials and products, should be considered.



Illegal shipments and unsound management of end-of-life materials and products constitute a considerable risk for human health and the environment.

Non-hazardous industrial waste

The generation of non-hazardous industrial waste has largely stabilised in OECD countries since the late 1990s, as has industrial production (OECD, forthcoming). Reasons for this could include the increased implementation of pollution reduction measures; the economic downturn in early 2000; or the relocation or outsourcing of waste-intensive OECD industry to non-OECD countries, and the subsequent increase in imports of semi-finished or finished products from non-OECD to OECD countries (Bringezu, 2006; Giljum *et al.*, 2007; ETC/RWM, 2007a). Studies of the EU-15 (EEA, 2005) suggest, however, that the volume of non-hazardous wastes from industry will increase by about 60% between now and 2020. There is little or no information available on the management of such waste.

Municipal waste[5] trends and outlook

OECD countries. Table 11.1 provides data and projections from 1980 to 2030 for population, real GDP, and generation of municipal waste for the OECD and its regions. OECD data for municipal waste exist for 1980-2005, and these form the basis of the OECD *Outlook* projections to 2030.

Table 11.1. **Municipal waste generation within the OECD area and its regions, 1980-2030**

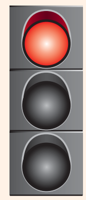
	1980	1995	2000	2005	2015	2020	2030	Estimated annual increase 2005-2030
Population (billions) in OECD	1.1	1.2	1.2	1.3	1.3	1.3	1.4	0.4%
(Index)	100	112	116	119	125	127	130	
Real GDP (trillion USD) in OECD	14.4	21.0	23.5	28.0	36.2	40.2	49.0	2.3%
(Index)	100	146	163	195	251	279	340	
Municipal waste generation in OECD								
(million tonnes/year)	395	561	624	653	754	800	900	1.3%
(Index)	100	142	158	165	190	202	228	
(Kg/capita/year)	376	476	512	522	576	600	658	
(index)	100	127	136	137	153	160	175	
OECD Pacific								
(million tonnes/year)	12	15	16	17	19	20	22	1.1%
(Index)	100	124	133	142	154	167	182	
OECD Asia								
(million tonnes/year)	55	68	69	74	84	88	97	1.1%
(Index)	100	124	126	135	153	160	176	
OECD Nafta								
(million tonnes/year)	164	242	272	284	326	347	389	1.3%
(Index)	100	147	166	173	199	212	237	
OECD Europe								
(million tonnes/year)	170	236	267	279	328	352	400	1.5%
(Index)	100	139	157	164	192	207	235	

StatLink http://dx.doi.org/10.1787/257332365178

Source: *OECD Environmental Outlook* Baseline.

risk above 150 µg/m^3. National demographic data (such as age groups and disease incidences) have been taken either directly or downscaled (from the regional level to the national level) from the world population prospect (UN, 2005) and the WHO burden of disease project (see Bakkes *et al.*, 2008 for further details).

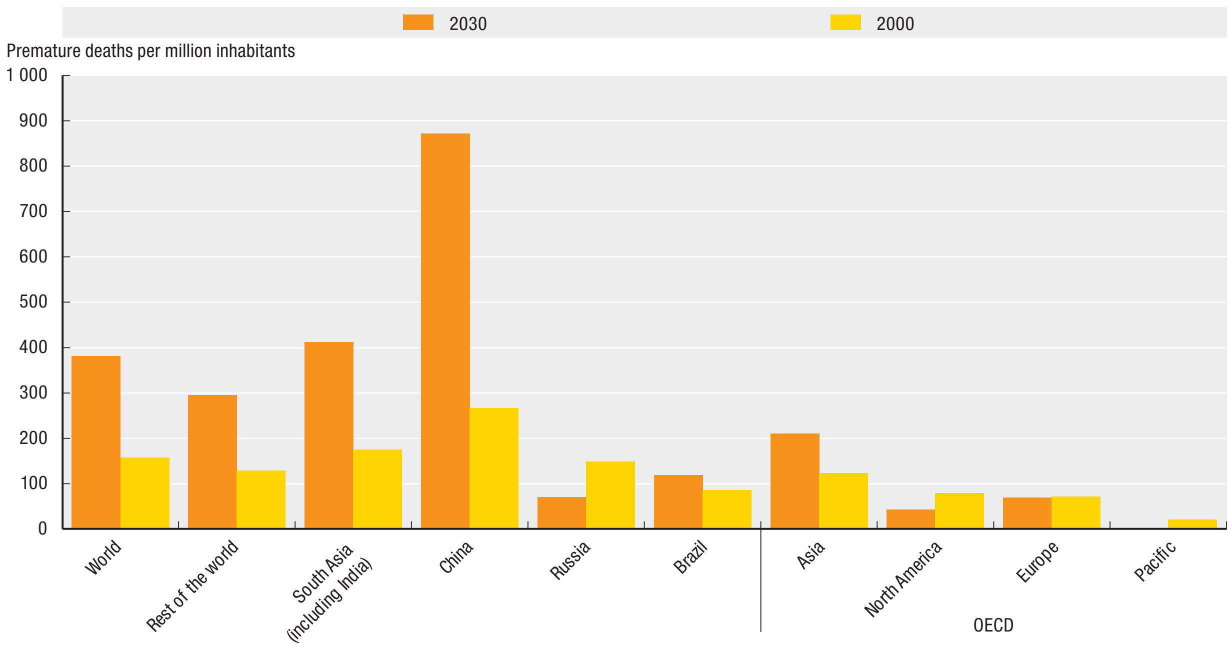
Mortality-related health damages can be expressed either as "premature deaths" or as "years of life lost". For the year 2000, the *OECD Environmental Outlook* Baseline estimated that exposure to PM_{10} caused approximately 960 000 premature deaths and 9.6 million years of life lost worldwide. The largest contribution to premature deaths came from cardiopulmonary disease in adults (80% to more than 90%, depending on the regional cluster).



The number of premature deaths caused by PM_{10} and O_3 pollution is projected to significantly increase by 2030.

The *OECD Environmental Outlook* Baseline also projects estimates of the premature deaths associated with PM_{10} pollution to 2030. Figure 12.1 shows premature deaths are likely to increase for most world regions by 2030, even those where PM_{10} levels are anticipated to decrease (for example, the regional clusters OECD Asia, and Brazil – see Chapter 8 on air pollution). For 2030, the worldwide number of premature deaths and years of life lost are estimated to be 3.1 million and 25.4 million, respectively.

Figure 12.1. **Premature deaths from PM_{10} urban air pollution for 2000 and 2030**



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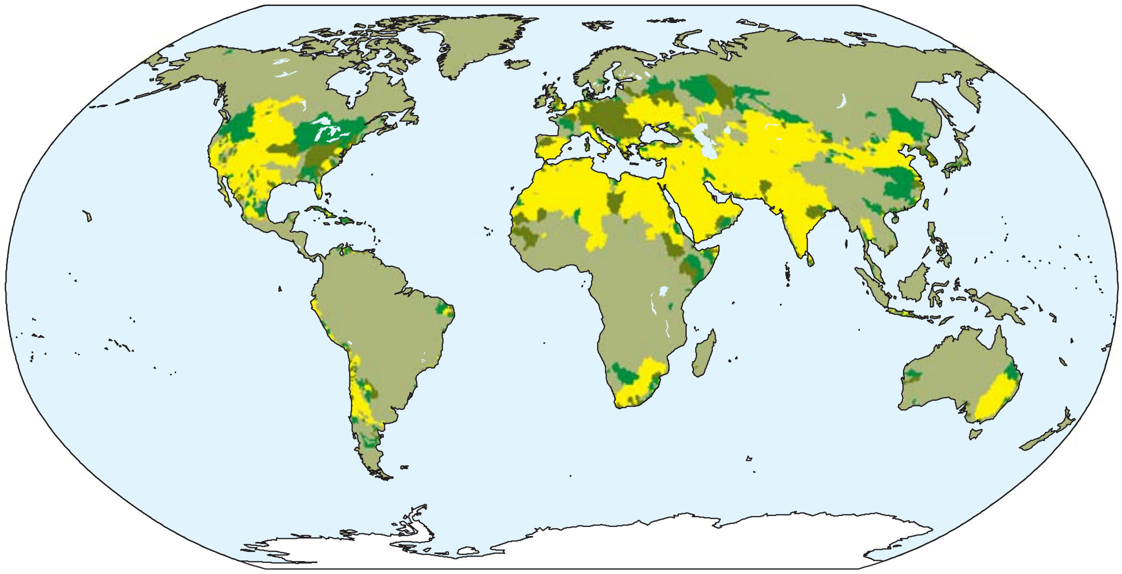
Source: *OECD Environmental Outlook* Baseline.

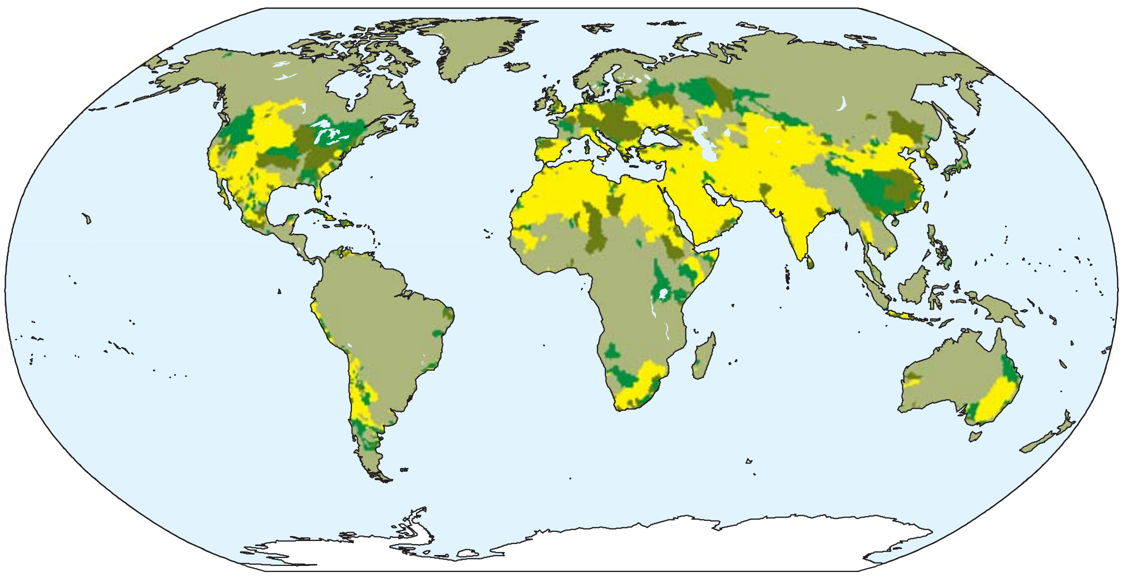
Factors other than PM_{10} levels and the population's exposure to these levels of pollution are also thought to influence this outcome. Increasing urbanisation, especially in China and South Asia, as well as ageing of the population (since the elderly are generally more susceptible to air pollution) could be potential contributors to this phenomenon.

Figure 14.5. **Water stress, 2005 and 2030**

2005



2030



No water stress

Low water stress

Medium water stress

Severe water stress

Source: OECD Environmental Outlook Baseline.

KEY MESSAGES

World primary energy use is projected to grow by 54% between 2005 and 2030 in the Baseline – an average annual rate of 1.8% per year.

Fossil fuels are likely to continue to dominate primary energy use, accounting for most of the increase in energy between 2005 and 2030 (86%). Oil looks to remain the largest single global energy source in 2030, though its share of total energy use is projected to fall from 36% to 33%. Power generation and transport account for most of the increase in energy consumption. Electricity is the fastest growing final form of energy.

For as long as fossil fuels dominate the world energy system, rising energy production and use threaten the stability of ecosystems, global climate and the health of current and future generations. Fossil fuel combustion is the main contributor to air pollution and greenhouse gas emissions, especially carbon dioxide.

Energy intensity – the amount of energy needed to produce one unit of gross domestic product – is projected to continue to decline, thanks to improved energy efficiency and a structural economic shift in all regions towards less energy-intensive activities.

The net environmental effect of switching to renewable energy sources is expected to be positive, despite some adverse environmental effects which need to be addressed through policy.

Policy options

Government policies will be critical to promote a lasting technology shift which steers the world onto a more sustainable energy path. To keep the costs of mitigation low while also stimulating innovation, policies will need to:

- Emphasise market-based instruments in the policy mix to establish a clear price on carbon and other greenhouse gas emissions and encourage mitigation where it is least-cost.
- Reverse growth in energy-related greenhouse gas emissions.
- Encourage more efficient energy use and promote the supply of renewable and low-carbon energy sources.
- Commercialise carbon capture and storage technologies to permit the environmentally acceptable use of coal and other fossil fuels.
- Alter radically the way energy is produced and consumed. Ultimately, the world will need to move away from carbon-intensive fossil fuels towards renewables and/or nuclear power. No one technology or fuel choice will dominate; a mix will be required.

Greater deployment of cleaner technologies in this sector will also deliver a wide range of other benefits, from energy security to environmental benefits (*e.g.* healthier people, cleaner cities, clearer skies).

This figure shows the mix of technologies and mitigation options likely to be important to achieve very low emission levels, *i.e.*, to stabilise atmospheric concentrations of greenhouse gases at 450 ppm CO_2 equivalent. Key approaches in the short term will be low-cost measures that reduce non-CO_2 greenhouse gases, combined with expanding sinks and avoiding emissions from land use and forestry as well as energy efficiency measures. Also essential by 2020 to achieve this objective will be the use of second generation biofuels and carbon capture and storage (CCS) technologies on a worldwide basis, along with increased renewables.

450 ppm CO_2eq emission pathway compared to Baseline: technology "wedges" of emission reduction

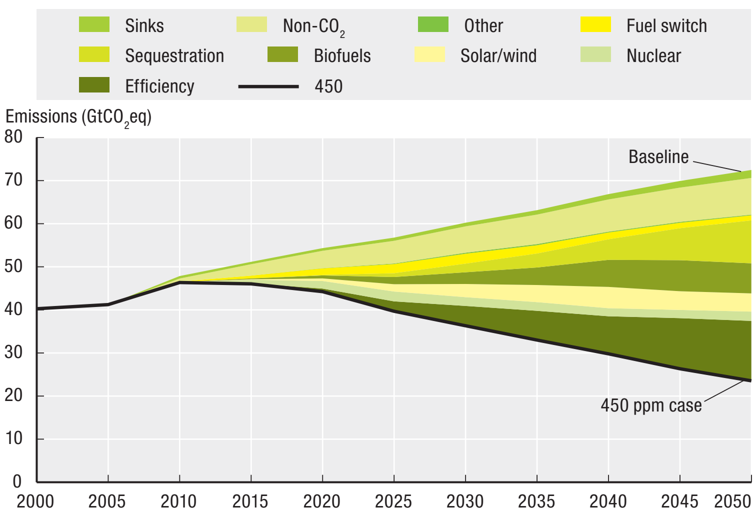


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Table 19.3. **Integrated kraft mill wastewater, TSS waste load and BOD5 waste load**

Technology	Waste water discharge (gal/tonne)		TSS waste load (lb/tonne)		BOD5 waste load (lb/tonne)	
	Bleached	Unbleached	Bleached	Unbleached	Bleached	Unbleached
1964 older	110 000	90 000	200	170	200	160
1964 current	45 000	27 000	170	130	120	90
1964 new	25 000	16 000	90	80	90	80
1990 design	16 000	8 000	50	45	60	50
% reduction 64/90	85%	91%	75%	73%	70%	69%

StatLink http://dx.doi.org/10.1787/257614204873

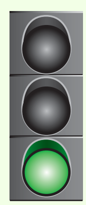
Source: K. Ferguson, cited in FAO, 1996.

Box 19.3. **The procurement issue in perspective**

The industry has engaged in sustained efforts to diversify its fibre base and, in particular, to substitute virgin raw material with recovered paper. However, this policy has its limitations as, at least in Western Europe, most quality recovered paper sources are already tapped; the challenge now is to increase the quality of recovered paper (see CEPI, 2006a) and the recyclability of paper products, via an integrated environmental approach. Recovered paper is now increasingly traded around the world, in particular between the EU/US and China.

Another challenge is looming. Wood supply may well be influenced by the increasing demand for biofuels. A number of governments are enacting policies to support the development of bio-energies, including biomass, thus increasing competition for raw and recovered resources for the pulp and paper industry. According to a recent European Environment Agency report (EEA, 2006), increasing market values for bio-energy would lead to substantial mobilisation of wood biomass resources for bio-energy from other competing industries, including pulp and paper (for a more detailed discussion of the consequences of EU energy policy on forest-based industries, see EC-DG Environment, 2000). With a woodchip price of EUR 70/m^3, chemical pulp production in Europe might decline by around 10-15%. If the price increases to EUR 100/m^3, the reduction could be up to 50%. Since pulp and paper are produced globally and widely traded, higher production costs in Europe may not be reflected in pulp and paper prices, unless similar developments occur in the world market.

In Europe and in North America, at least, energy-efficiency has become a key issue for the industry, not least as a means to reduce energy costs (Jokinen, 2006). However, some energy savings achieved through improved production processes have been counteracted by demand for increasing quality paper products. However, the pulp and paper industry already generates approximately 50% of its own energy from biomass residues, and in the long term it could develop into a clean energy supplier.

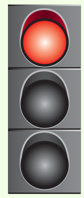


The pulp and paper industry already generates approximately 50% of its own energy from biomass residues, and could become a clean energy supplier.

It is notable that the European industry sets the world standards via the European reference document on best available technologies (BREF)[3] and the leading machine manufacturers are established in Europe. The BREF identifies negotiations, but progress on the environmental component is unlikely to be fast given the slow progress with the Doha Development Agenda. Given the growing importance of regional trade agreements (RTAs) in advancing international trade, the on-going inclusion of environmental elements in RTAs is encouraging. Most RTAs dealing with environmental issues do so in the form of commitments by parties to co-operate on environmental matters. The scope and depth of these commitments vary, and range from co-operation in one specific technology area to fully-fledged co-operation programmes (see Chapter 4 on globalisation).

Aid for environment in a changing development co-operation context

In the international arena, OECD countries are often proponents of progressive solutions for environmental problems, but they also co-operate with developing countries on environmental issues through traditional development co-operation channels. Indeed, a significant part of environmental co-operation takes place within the broader development co-operation agenda (the development track of environmental co-operation). In recent years, this agenda has been evolving in ways that pose both challenges and opportunities for strengthening environmental co-operation.



Environmental aid has been decreasing since 1996 as a share of donor country GDP and total aid.

Official development assistance to developing countries from member countries of the OECD's Development Assistance Committee (DAC) has increased rapidly in recent years. The 2002 Monterrey Conference on Financing for Development set the target of doubling official development assistance (ODA) from a base of USD 50 billion. From 2004 to 2005 alone, ODA rose 31% to a record high of USD 106 billion, or 0.33% of DAC members' combined gross national income (GNI). This rapid growth in ODA has mainly been fuelled by debt relief,[4] and so it is unlikely to continue as debt relief scales back. Indeed, between 2005 and 2006 aid fell by 5.1%.

The environment has not benefited from the increased availability of aid money. In real terms, aid for environment has been relatively stable over the last 15 years when defined in broad terms, but declining when defined narrowly.[5] The decline in "core" environmental aid can be attributed to a 17% reduction in support from bilateral donors (who have traditionally provided over 80% of this aid) between 1996 and 2005. A recent upsurge in "extended" environmental aid (which peaked in 2005 at over USD 12 billion) is explained by much stronger support of bilateral donors for water-related programmes – it more than doubled between 2003 and 2005. By any definition, however, environmental aid has been declining as a share of donor country GDP and of total aid (see Figure 22.2). This is not just the case for the "environment sector" and it can be partly explained by an increase in non-sector specific ODA, such as debt relief and aid for emergencies and reconstruction.

The composition of environmental aid is changing. The water sub-sector accounts for the lion's share of "extended" environmental aid, at about 40% of total environmental aid since 1990. This is expected to continue at least for the next decade, given the visibility of water issues within the Millennium Development Goal framework (MDG, see below). Donor support for biodiversity and solid waste has increased by some 50% in real terms in the same period, but it remains relatively small, at less than 2% of total environmental aid for

From the point of view of the *OECD Environmental Outlook*, the models coupled to the IMAGE framework can be subdivided into two broad categories:

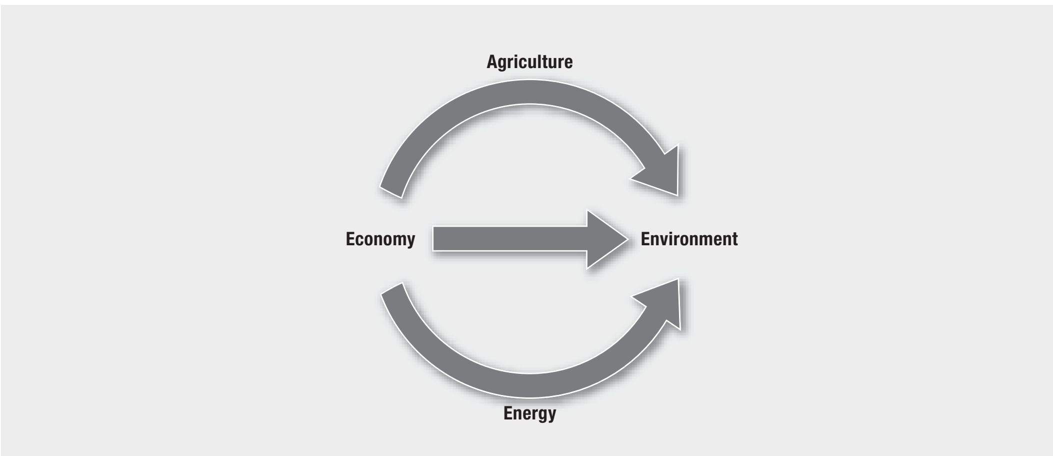
- Models that help specify important socio-economic drivers of environmental change (energy and the agricultural system) with the necessary detail.
- Models with a predominantly environmental focus.

Models that describe socio-economic drivers of environmental change

Economic models, such as ENV-linkages, describe socio-economic activities in accounting units that allow aggregation: *e.g.* monetary units or utility indexes. While this facilitates a description of shifts between the deployment of production factors in very broad terms (labour, energy, land), it does not permit insight into the changes in more physical parameters as in energy technology or the technology used for crop growing or animal farming in different regions.

However, assessing the environmental consequences of the Baseline and simulated policy requires this sort of physical, technical and spatial detail. Therefore, as depicted in Figure B.3, part of the IMAGE framework applied for the *OECD Environmental Outlook* more or less operates as a bridge between the macroeconomic description of the Baseline and the environmental systems modelling.

Figure B.3. **Main links between models deployed for the *OECD Environmental Outlook***



Source: MNP and OECD, 2008.

The two main models for this function in the *OECD Environmental Outlook* are the LEITAP model on agricultural economy and the TIMER model of energy supply and demand. Both can be found in the literature as models in their own right, but are here applied as part of the IMAGE framework.

Agricultural land supply and use

The LEITAP model, named after the LEI Agricultural Economics Institute that developed and applies it, is an extended version of the GTAP model developed at Purdue University. A more detailed description of LEITAP is included in the background report to this *OECD Environmental Outlook* (MNP and OECD, 2008); an example of a stand-alone application can be found in Francois *et al. (*2005).