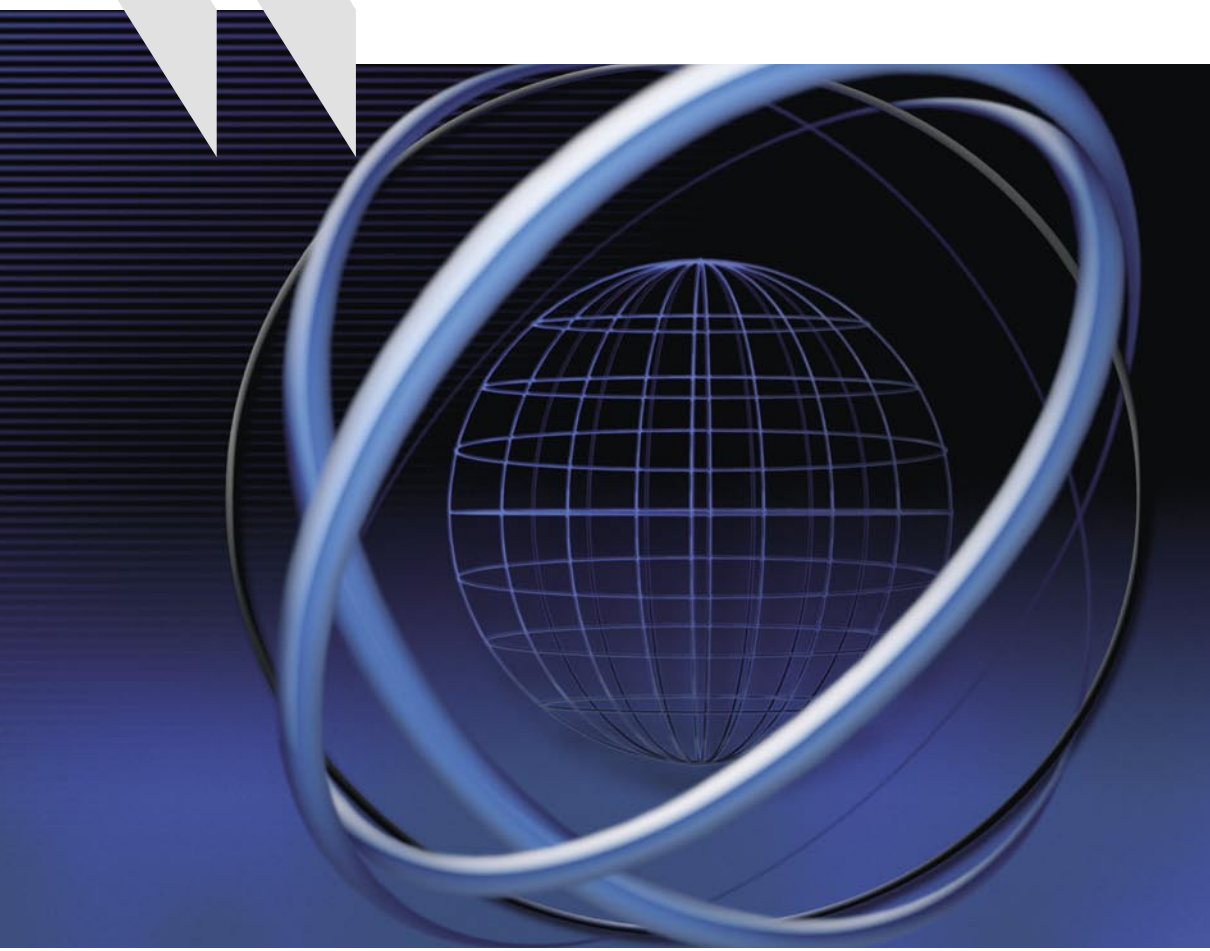
The Development Dimension

Reconciling Development and Environmental Goals

MEASURING THE IMPACT OF POLICIES



OECD

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Reconciling Development and Environmental Goals

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Foreword

Contributing to global development is a key objective of the OECD which it pursues through efforts to enhance development co-operation. Yet aid alone is not sufficient for achieving pro-poor growth; supportive policies across a wide range of economic, social and environmental issues are needed to accelerate poverty reduction.

OECD has played a pivotal role in promoting policy coherence for development since the early 1990s. We have explained the important contribution that policy coherence for development can make to aid effectiveness, and provided analysis of the "development dimension" across a number of policy areas.

The importance of policy coherence has been reinforced by globalisation. In a globalised world policies put in place by OECD countries and by emerging economies are especially likely to have a global reach. Increased interdependence of the world economy necessitates comprehensive and coherent policies. Neglecting the development dimension will in time undermine the pursuit of other objectives. This interconnectedness is perhaps most obvious and relevant in the environment sector. Global environmental challenges, such as climate change, can be tackled only by integrated and collective responses.

In an interdependent world achieving policy coherence is increasingly in the interest of both OECD countries and developing countries. Hence, decision makers need to be well informed to assess relevant policy options before disbursing public funds or adopting reforms or policies that may affect developing countries negatively. This study is an innovative contribution to better understanding the different dimensions of our policy actions in order to improve their coherence and thereby achieve better outcomes both for the environment and economic pillars of sustainable development. It uses quantitative modelling to develop numerical results for some of the linkages between environment and development objectives and policies.

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Under the guidance of the OECD's Working Party on Global and Structural Policy, the Development Assistance Committee, and ENVIRONET, this study was undertaken by a consultant, Kenneth Ruffing, in collaboration with Philip Bagnoli, Jean Chateau and Yong Gun Kim of the OECD Secretariat. This report is part of the Policy Coherence for Development programme, co-ordinated by Raili Lahnalampi. Comments from Alexandra Trzeciak-Duval and Helen Mountford were also helpful in improving the analysis reported herein. Anne Hamilton and the OECD Publishing Division helped to prepare the report for publication. Funding by the Government of Canada is gratefully acknowledged.

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Acronyms

BRIC	Brazil, Russia, India and China
BRIICS	Brazil, Russia, India, Indonesia, China and South Africa
CBD	Convention on Biological Diversity
CCS	Carbon capture and storage
CDM	Clean Development Mechanism
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2eq	Carbon dioxide equivalents
CSD	Commission on Sustainable Development
DAC	OECD Development Assistance Committee
EJ	Exajoules
EO	Environmental Outlook
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom
EU-25	Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom
EUR	Euro (currency of European Union)
FAO	Food and Agriculture Organisation of the United Nations
GBP	Pound sterling
GDP	Gross domestic product

GHG	Greenhouse gas
GJ	Gigajoules
GNI	Gross national income
Gt	Giga tonnes
GTAP	Global Trade Analyses Project
GW	Gigawatt
IEA	International Energy Agency
IMAGE	Integrated Model to Assess the Global Environment
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land use, land use change and forestry
MAD	Mutual Acceptance of Data
MDGs	Millennium Development Goals
MEA	Multilateral environmental agreement
MNP	Netherlands Environmental Assessment Agency
MSA	Mean species abundance
Mt	Million tonnes
MWh	Megawatt-hour
PFC	Perfluorocarbon
PM	Particulate matter
$PM_{2.5}$	Particulate matter, particles of 2.5 micrometres (µm) or less
PM_{10}	Particulate matter, particles of 10 micrometres (µm) or less
ppb	Parts per billion
ppm	Parts per million
ppmv	Parts per million by volume
PPPs	Purchasing Power Parities
ROW	Rest of world
RTA	Regional trade agreement

UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
VOC	Volatile organic compound
WHO	World Health Organization
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization

Executive Summary

Policy coherence implies mutually reinforcing policy actions across government departments and agencies in one or several countries. Advocates of policy coherence stress the systematic promotion of opportunities to create synergies towards achieving particular objectives in different policy domains. For objectives concerning economic development and the environment, policy coherence would involve avoiding policies that serve to provide a short-term boost to growth, but at the cost of environmental damage that would be (predictably) regretted in the long term. In some cases, this environmental damage can lead to adverse effects on longer-term economic growth. At the OECD, two particular aspects of policy coherence for development have been emphasised: *i)* internal, *i.e.* within development co-operation; *ii)* intra-country, *i.e.* national aid and non-aid policy coherence. Much of the work reported below falls within these categories.

This report uses the modelling framework that underpinned the *OECD Environmental Outlook to 2030* (EO). It comprises the ENV-Linkages computable general equilibrium model coupled with the Integrated Model to Assess the Global Environment (IMAGE) and the Timer Image Energy Regional (TIMER) model - both developed at the Netherlands Environmental Assessment Agency (MNP) - with some input from a Global Trade Analysis Project (GTAP) agricultural-economy model developed at the Agricultural Economics Institute of the Netherlands. Macroeconomic variables from ENV-Linkages and population variables from the United Nations 2004 Medium Variant projections are inputs to the other models. The baseline used is policy-neutral, *i.e.* it assumes no new policy action; however modest improvements in environmental policies in developing countries and equipment modernisation entailing greater use of less-polluting technologies are assumed to lead to some reductions in emission coefficients over time.

Developing and transition economies have been disaggregated to include the 6 individual BRIICS countries (Brazil, Russia, India, Indonesia, China and the Republic of South Africa) and 9 sub-regions. The sectoral breakdown comprises 30 sectors including four sectors particularly important for simulation of policy coherence, *i.e.* vegetables and fruits; plant-based fibres; refined sugar; and textiles and wearing apparel. This permits some analysis of such issues as end of European Union (EU) tariff preferences for bananas, suppression of OECD domestic support measures for cotton and sugar, as well as the impact on trade shares of the recent implementation of the Uruguay Round liberalisation of textiles and wearing apparel.

The report highlights that on the basis of a "no policy change" baseline scenario, developing countries, especially larger ones, will account for increasing shares of world economic activity, including in environmentally sensitive sectors, and large increases in absolute levels of production will cause a number of environmental pressures to increase as well. Environmental quality in developing countries is thus projected to worsen in a number of ways, as it does at the global level, imperilling prospects for sustained economic growth in certain developing countries regions.

The report also describes nine "single policy change" simulations that illustrate the need for "joined-up" policies. Further trade liberalisation - unless accompanied by improved environmental policies – can increase environmental pressure in both OECD and developing countries because they lead to increases in the output of environmentally sensitive goods and services. Measures to improve environmental outcomes taken by OECD countries can have unintended consequences for growth in developing countries, including potentially adverse impacts as illustrated by the simulations described in this report. Measures taken by developing countries to increase their own rates of economic growth can also increase environmental pressures. Indeed, the two simulations illustrating the potential impact of policy measures that developing countries can take on their own had much larger impacts on their economic growth than the simulations illustrating the impact of increased aid or greater trade liberalisation. This finding underscores the need to integrate environmental considerations into national planning and development co-operation, and thereby to invest some of the "growth dividend" in environmental protection, which in turn can help to support more sustainable economic growth over the long-term.

Even measures taken to address problems seemingly unrelated to economic development or environmental protection, such as improving pension fund viability by increasing work effort and, thus, economic growth, can have knock-on effects that can increase environmental pressure worldwide. For these reasons, integrated policy approaches are clearly needed. Indeed, this was underscored by the simulation of a number of illustrative "policy reforms", undertaken simultaneously by both OECD countries and developing countries and phased in over time as policy packages. The results suggest that some policies and policy combinations could substantially improve both economic outcomes and many environmental outcomes together – as suggested by the "policy coherence" paradigm.

Introduction

The OECD has been engaged in a programme to study *Policy Coherence for Development* (PCD) that addresses a broad range of areas. This has included institutional approaches, specific policy areas, regional experiences and country case studies. The programme aims to achieve greater integration of OECD-country efforts to encourage non-OECD country economic growth. It does so by helping to develop a better understanding of how various policies in OECD countries impact on the development prospects and competitiveness of developing countries. A new direction of the OECD work in this area is to use quantitative modelling to develop numerical results of some of the linkages between environment and development objectives and policies.

Policy coherence: a definition

A definition of policy coherence that has been used for publication in the DAC Guidelines: Poverty Reduction in 2001 is: "Policy coherence… involves the systematic promotion of mutually reinforcing policy actions across government departments and agencies creating synergies towards achieving the defined objective." A typology of policy coherence for development, developed as part of the work, identifies four main types: i) internal, i.e. within development co-operation; ii) intra-country, i.e. national aid-and non-aid coherence; iii) inter-donor; and iv) donor-recipient coherence. The OECD policy coherence programme focuses mainly on the first two types.

This report draws on the baseline reference scenario developed for the *OECD Environmental Outlook to 2030* (EO). It summarises the projected economic and environmental outcomes of most relevance for developing countries over the next few decades and generally provides more detail for developing countries and emerging economies than that presented in the EO. The implications of these possible developments for policy coherence are discussed and illustrated by alternative scenarios. These include the following:

- reduced support to agricultural producers in OECD countries;
- reduced tariffs on agricultural imports;
- enhanced levels of ODA targeted on the poorest countries;
- the widespread use of eco-labelling schemes for forestry and fisheries;
- a tariff on oil imports, higher labour force participation rates in OECD countries;
- improved macroeconomic policies in developing countries;
- ambitious structural reforms adopted by developing countries;
- more ambitious environmental policies in developing countries;
- and two policy "packages", combining these various elements.

The report demonstrates that on the basis of a "no policy change" baseline scenario, developing countries, especially larger ones, will account for increasing shares of world economic activity, including in environmentally sensitive sectors, and large increases in absolute levels of production due to increasing productivity, increasing international trade, and increasing populations. Accompanying this growth and change in the worldwide distribution of production, a number of environmental pressures can be expected to increase as well, including in developing countries. This will no doubt lead to improved environmental policies in many developing countries as their citizens become more aware of the importance of environmental issues and, with increasing economic growth, have a greater financial capacity to address these issues. However, in a number of countries, particularly least developed ones, increased attention will need to be paid to integrating environmental issues in development assistance so as to promote more environmentally sustainable development.

The quantitative results presented here should thus be thought of as illustrative of directions of change and comparing the relative size of different shocks. For a number of reasons they may understate the size of the

economic and environmental changes that could arise from the types of polices discussed – quantitative models represent simplified economies intended to highlight some salient characteristics that policy makers should pay particular attention to. They allow analysts to study various scenarios that can better prepare policy makers by providing a clearer understanding of what is happening and what can be done to ease the impacts, but are often poor predictors of more dramatic changes. In fact, recent events underscore the importance of economic drivers in changing geopolitical and social outcomes. The rise in the price of oil, as well as the price of food and other commodities can be understood in the context of rapid economic growth in China, India and some other developing regions, yet *ex ante* they were largely unanticipated[1]. These changes are causing foreign and trade policy to be realigned in many countries, and have led to severe strains on the proportion of the world's population that lives on USD 1 per day or less.

1. Although the magnitude of recent price changes is extraordinary, the baseline underpinning the *OECD Environmental Outlook* anticipated that real prices for many resources would rise as demand increased while limited production capacity precluded a rapid increase in supply.

Chapter 1

Development Implications of the Baseline Scenario of the OECD Environmental Outlook to 2030

Modelling framework

The modelling framework used for the *OECD Environmental Outlook to 2030* (EO) comprises the ENV-Linkages computable general equilibrium model coupled with the Integrated Model to Assess the Global Environment (IMAGE) developed at MNP, the TIMER energy model, and a GTAP agricultural-economy model developed at the Agricultural Economics Institute of the Netherlands. Basically macroeconomic variables from ENV-Linkages and population variables from the United Nations 2004 Medium Variant projections are inputs to the other models. There is no feedback from the MNP suite of environmental models to the macroeconomic ENV-Linkages model. In the baseline, modest improvements in environmental policies in developing countries and equipment modernisation entailing greater use of less-polluting technologies are assumed to lead to some reductions in emission coefficients over time.

Developing and transition economies have been disaggregated to include the 6 individual BRIICS countries and 9 sub-regions. The sectoral breakdown comprises 30 sectors including four sectors important for simulation of policy coherence, *i.e.*, vegetables and fruits; plant-based fibres; refined sugar; and textiles and wearing apparel. This permits some analysis of such issues as end of EU tariff preferences for bananas, suppression of OECD domestic support measures for cotton and sugar, as well as the impact on trade shares of the recent implementation of the Uruguay Round liberalisation of textiles and wearing apparel.

The baseline projection used here is not a prediction of the future worldwide economy; it merely attempts to reflect how the future economy

and environment might evolve in the absence of new policies or unforeseen disturbances. In the *OECD Environmental Outlook* the emphasis in developing the baseline was on constructing an analytical tool that would be useful for comparative analysis. Since some trends are obviously related to the introduction of new policies, they were suppressed so as to facilitate comparisons of policy simulations with a policy-neutral baseline. An example is seen with globalisation. As is reported below, the baseline has the ratio of imports to GDP stabilising over time – rather than continuing to increase as has been the case over recent periods.

Main drivers of economic growth

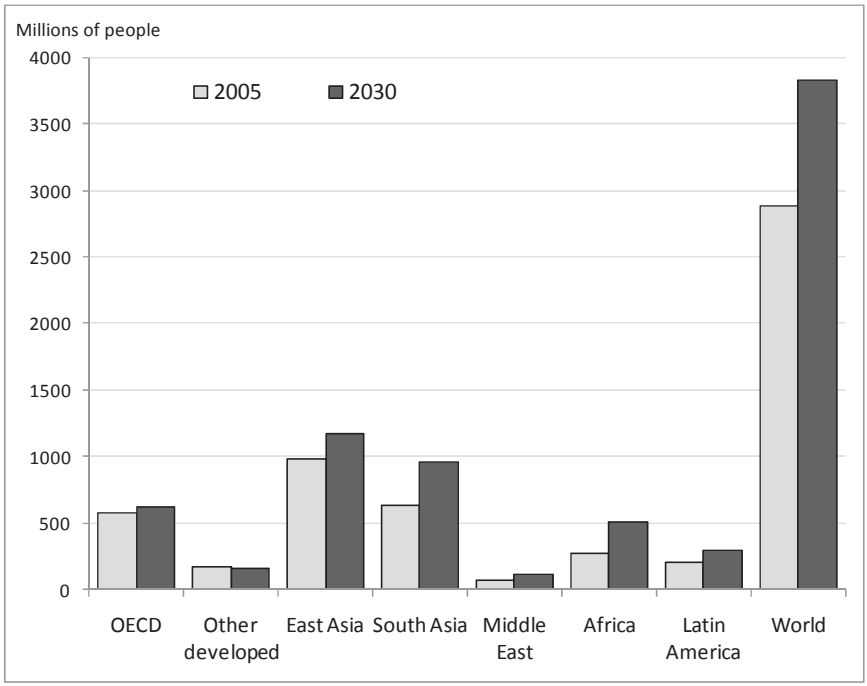
Changes in the primary economic drivers, *i.e.*, labour force, labour force participation rates, labour productivity by economic sector, and import/GDP ratios, have been used to compute growth in GDP and in GDP per capita for the period to 2030. These were projected for each of the 87 country/regions in the GTAP database prior to aggregating to the country/regional groupings used in this report. The potential labour supply, defined as people of age 15 or more, has been taken from the "medium variant" of the United Nations 2004 Revision, in which population grows to somewhat more than 8 billion by 2030 and eventually stabilises around 9 billion in 2050. Distribution of population among the countries of the world is also dependent upon assumptions about international migration that have been incorporated in the projections.

The actual labour force depends on labour force participation rates as well. When labour force participation rates are calculated for the total population age 15 or more, they will naturally be lower than for the age group 15 – 64 because participation rates are lower in older population cohorts as people move into retirement. These total labour force participation rates are expected to decline in OECD countries from current levels of 60 % to about 55% by 2030 due to the ageing of the population, although within the older cohorts themselves they may well increase somewhat compared to present levels due to reforms in labour markets and pension systems. For people in the age cohort 15 – 64, European countries have set a target for the participation rate of 70% by 2020. In developing countries, where currently measured labour force participation rates are considerably lower than 60%, an assumption is made that 1% of the gap between current labour force participation rates and 60% is closed per year. These assumptions lead to a considerable change in the world-wide distribution of the labour force. The developing country share would rise from 78% in 2005 to 82% by 2030 while that of the OECD countries would fall from 20% in 2005 to 16% in 2030, and the share of economies in

transition would fall from 5.9% in 2005 to 4.3% in 2030. Within the developing countries, the share of Africa in the world labour force would increase the most from 9% in 2005 to 13% in 2030.

Table A.5 provides more country and regional detail of the projected trends in labour force growth in the reference scenario.

Figure 1.1 Labour supply, 2005 and 2030



Source: ENV-Linkages/IMAGE model analysis.

Long-term productivity growth in OECD countries has tended towards a mean of 1.76% per year for OECD countries. All OECD countries are therefore assumed to move towards that rate by closing the gap between their individual historical rates during the period 1980-2001 and 1.76% at the rate of 2% per year beginning in 2012. During a transition period taking into account OECD medium-term forecasts they are also assumed to move from their current actual rates to their own long-term trend rates by 2011. For developing countries the same approach was used, except that for countries where the historical average was negative, the starting point was assumed to be a zero rate of productivity growth in 2011, and then gradually

moving towards the OECD rate by closing the gap at the rate of 2% per year. Overall rates of labour productivity growth have been disaggregated for 7 economic sectors, and those rates applied to the 26 sectors currently used in the ENV-Linkages model. In general, rates of productivity growth are higher in the durable and non-durable manufacture sectors and lowest in the services sectors. Differentiating among sectors is important because changes in the sectoral composition of output as economies grow will change their overall productivity growth rates. Increases in labour productivity measured may also be understood as the result of improvements in the skill level of the labour force, the rate of capital accumulation, and the rate of change of total factor productivity. In the baseline scenario, increasing scarcity of labour relative to capital results in a continuation of capital deepening with a gradually increasing share of investment in GDP. Thus, the capital stock grows at a somewhat faster rate than that of GDP as may be seen in Table A.4.

Economic outcomes

Growth in GDP and in GDP per capita

Based on the assumptions mentioned above, world economic growth gradually slows from a peak in 2005 and a peak decade growth rate of 3.35% for 2002-10 to 2.48% for the period 2020-30. For the entire forecast period 2002-2030 the average world rate of GDP growth is 2.82%. Transition economies exhibit a growth rate more than one percentage point higher on average, and developing countries one and one-half percentage point higher. OECD countries, on the other hand, are assumed to show average growth of 2.34%, about one-half percentage point lower than the world average. As may be seen from Table A.1, GDP growth rates in developing countries exhibit considerable variation among various countries and regions but average about one and one-half percentage points higher than the OECD countries.

In 2010 China and India would be growing at about 6% per year, but this growth would slow to about 4% per year in 2030 – somewhat higher in India and somewhat lower in China due to demographic factors that result in lower growth rates of the labour force. Indonesia, other countries in East Asia and in South Asia exhibit broadly similar trends, but since their growth is projected to be considerably less than that of India and China between 2005 and 2010, this trends imply considerable convergence in their growth rates with those of China and India. Brazil and other developing countries in Central and South America are expected to have GDP growth rates of about

3% by 2010, but slowing somewhat by 2030. This is due to slow growth of the working age population, and a gradual convergence of growth in labour productivity to that of OECD countries. Sustained implementation of ambitious economic reform policies involving greater competition and labour market flexibility could result in higher growth rates. The countries in the Middle East and in Africa are projected to exhibit faster growth than countries in Central and Latin America because of more rapid growth rates of the labour force combined with improvements in labour productivity trends. South Africa, however, is expected to continue to exhibit considerably slower growth leading to some convergence in per capita incomes with its neighbouring countries.

The pattern of per capita GDP growth in the various developing countries and regions is somewhat different because those countries with relatively faster growth in their labour force do not have sufficiently rapid growth in labour productivity to fully offset the increases in population, so that the growth rate of their per capita incomes lags behind many countries and regions with slowing growth of population and labour force.

When purchasing power exchange rates are used to aggregate countries, a number of large developing and transition economies exhibiting rapid growth have larger weights in regional and world aggregates than results from using official exchange rates, resulting in substantially higher growth. Table A.2 shows the growth rates that result from this alternative weighting method.

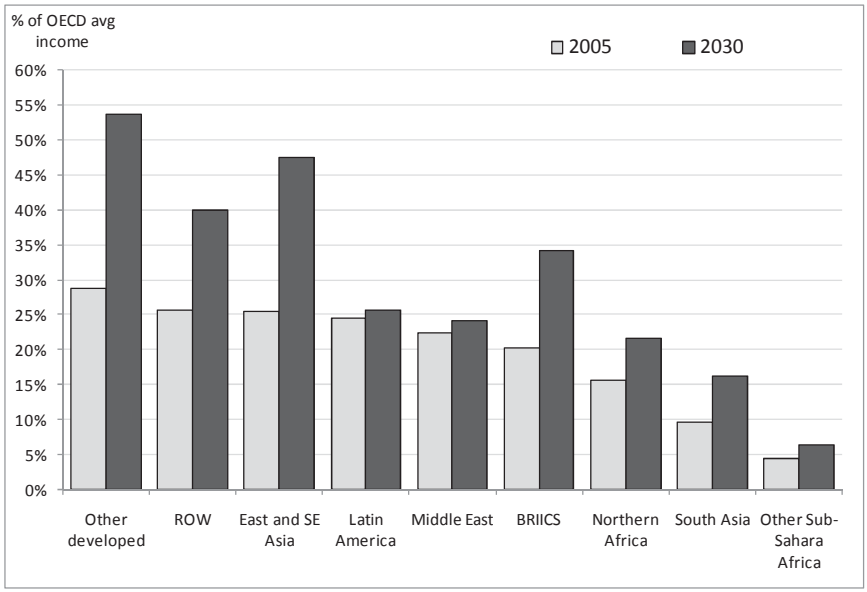
Levels of GDP per capita

The trends mentioned above translate into different rates of growth of per capita income which in turn result in varying degrees of convergence in the levels of per capita income. Table A.9 shows growth in per capita income for major countries and regions.

As the figure below shows, per capita incomes as a percentage of the OECD averages increase quite strongly for the BRIICS as a group, for East Asia and for South Asia, with less improvement in North Africa and little or no improvement in Middle East, Central and South America, and sub-Saharan Africa.

Shares of countries/regions in world GDP

Figure 1.2. Per capita income as a percentage of OECD average, 2005 and 2030

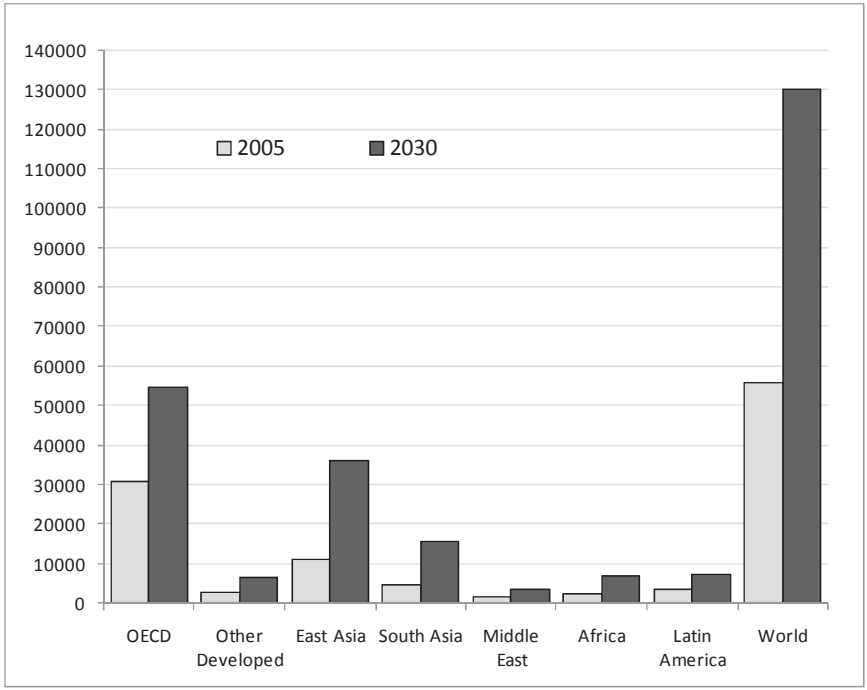


Source: Env-Linkages/IMAGE model analysis.

By 2030, GDP outside of the OECD countries is projected to be larger than within the OECD countries. The OECD share in world total would have fallen from about 55% in 2005 to 42% in 2030 and to about 36% in 2050. Most of the shift will be towards East and South Asia, regions dominated by China, India, and Indonesia. Table A.7 provides more regional and country detail on the evolution of shares of world GDP.

Figure 1.3. World GDP at PPP exchange rates by major region, 2005 and 2030

USD millions



Source: Env-Linkages/IMAGE model analysis.

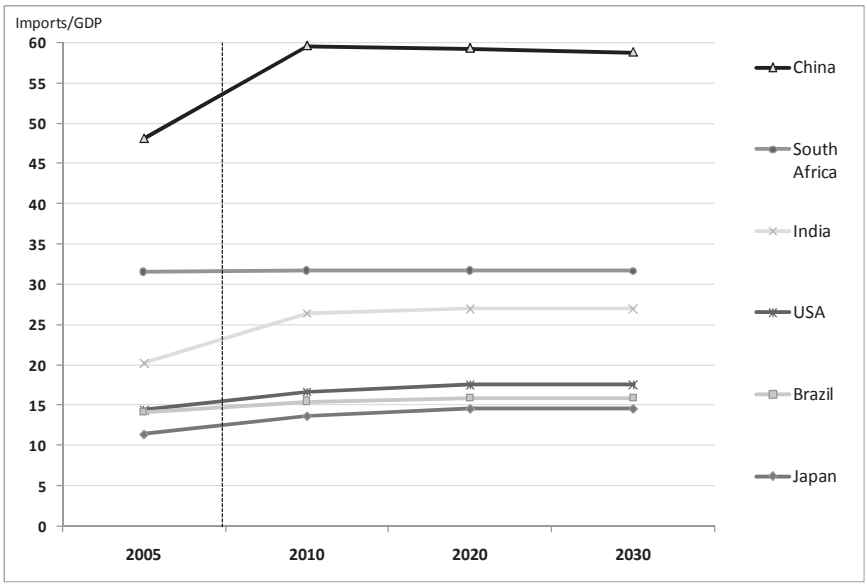
Changes in economic sector shares within each country/region

Regarding sectoral shares, most developing countries and regions are projected to have falling shares in their own GDP for agriculture; some of them are expected to have falling shares in manufactures (Middle East, Republic of South Africa) as well, but others will see the shares of manufactures increase (India, Other South Asia, Northern Africa, Other Sub-Saharan Africa). Nearly all are projected to exhibit an increase in the shares of the service sectors. In the OECD countries, sector shares in agriculture and in manufactures are expected to fall (but not by much because they are already quite low), and the share of services is expected to increase. World-wide, there is a shift from agriculture to services with industry broadly retaining its share between 2005 and 2030. In all regions the shares of trade and transport are projected to increase with consequences for environmental pressures discussed below.

Changes in import shares

Trade is represented in ENV-Linkages by an assumed import/GDP ratio. In the absence of *additional* policies to further liberalise trade, it is assumed that the recent growth in that ratio will gradually end so that the ratio becomes constant. This assumption has been implemented by placing countries in one of three categories. If there had been little growth in trade shares recently, no growth was assumed in the projection. If they had exhibited moderate growth, a 5% rate of import share growth was assumed for the initial period of the projection, which then gradually decreases toward zero. For countries that had shown high rates of growth in import shares, a 10% rate of growth was assumed for the initial period of the projection, which then gradually decreases toward zero. Import/GDP ratios are thus projected to continue to rise but at declining rates to reach about 33% worldwide in 2030, compared to 27% in 2005. Within this moderate increase are continued increases in China and India. China's projected import/GDP ratio will reach 60%, a very high ratio for a large economy, but the alternative of a declining ratio would have been arbitrary. Table A.10 provides more detail on changes in trade shares over time in the baseline scenario.

Figure 1.4. Import/GDP ratios, selected countries, 2005-2030



Note: 2005 is included as it is a base year.

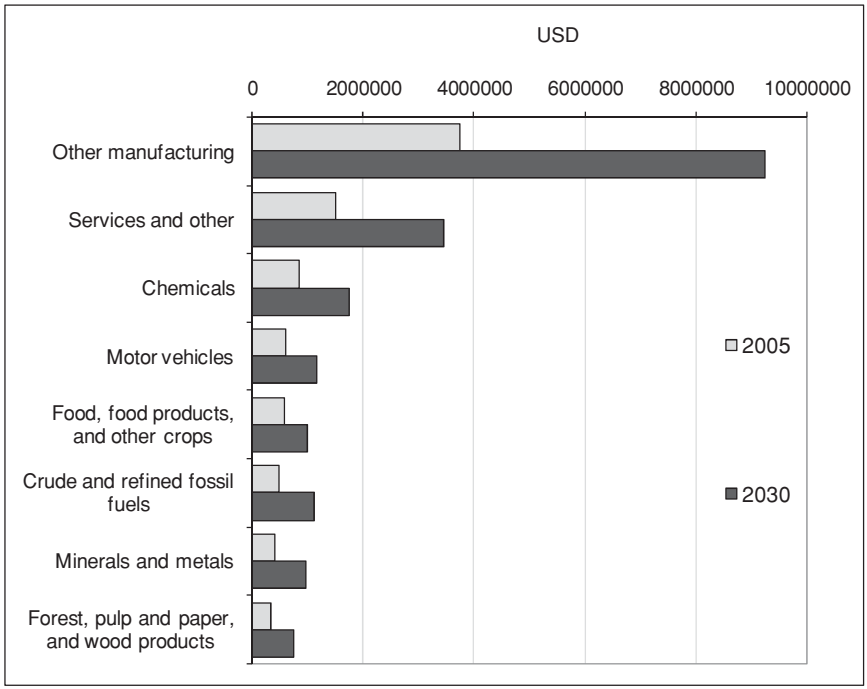
Source: Env-Linkages/IMAGE model analysis.

Changes in sectoral shares in world exports

At constant prices the volume of world trade in the baseline scenario is projected to expand cumulatively by 128% between 2005 and 2030, dominated by growth in the volume of manufactured products as may be seen in Figure 1.5.

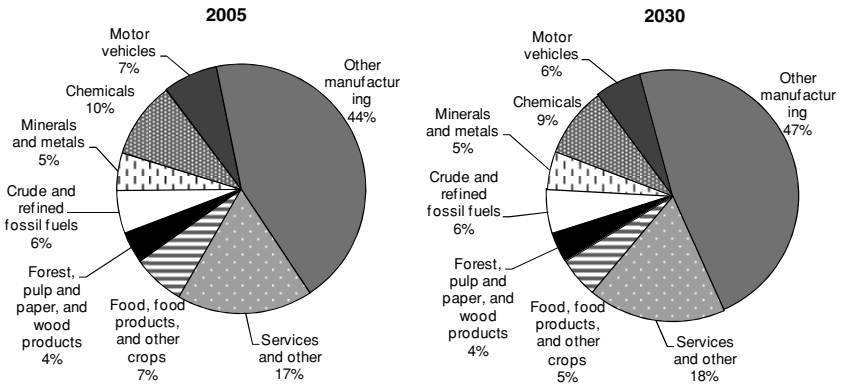
As may be appreciated from Figure 1.6, it is notable that there are relatively small changes in sector shares with the broad category of manufactured items other than food, wood products, chemicals, and motor vehicles expanding its share, and services retaining its share, with slight decreases in the shares of the other categories.

Figure 1.5. Exports to world by broad trade clusters, 2005 and 2030



Source: Env-Linkages/IMAGE model analysis.

Figure 1.6. World trade by broad clusters, 2005 and 2030

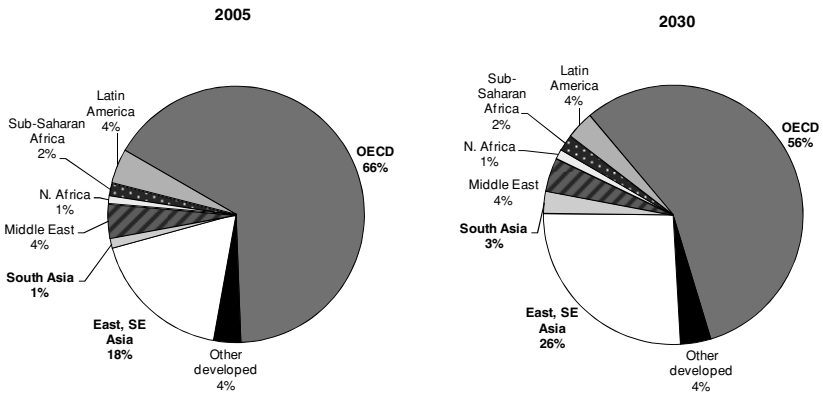


Source: Env-Linkages/IMAGE model analysis.

Changes in shares of world trade by country/region

Changes in the share of world trade by region of origin are more pronounced than changes in the sectoral composition of trade. Developing countries are projected to expand their trade shares at the expense of other regions, with the major increases occurring in East and Southeast Asia, followed by South Asia.

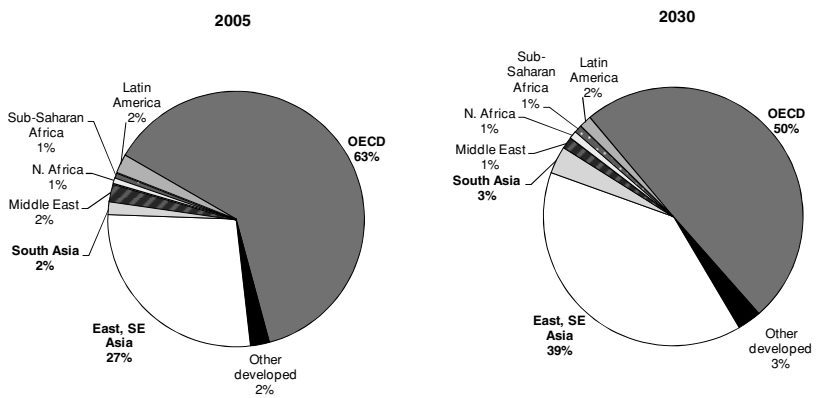
Figure 1.7. Total exports to the world by region, 2005 and 2030



Source: Env-Linkages/IMAGE model analysis.

This change in the distribution of total exports by region of origin is driven by changes in the distribution of exports in the category of other manufactures, which, as discussed in the preceding section was the sectoral category exhibiting the largest increase in share. As may be seen in Figure 1.8, this category exhibits changes in the regional distribution of exports that is considerably more pronounced than total world exports. This is because this category of exports is less closely linked to a raw material base than many other export categories. Capital goods are an important component of "other manufactures", and they also exhibited substantial shifts in the regional shares of exports to the world as may be seen from Table A.11. Importantly, similar shifts are projected in the worldwide distribution of imports of capital goods, suggesting that the projected expansion of trade comprises intra-industry trade to a considerable extent (Table A.12).

Figure 1.8. Exports of other manufactures to the world, 2005 and 2030



Source: Env-Linkages/IMAGE model analysis.

Without further trade liberalisation, the baseline scenario projects the trade deficits of OECD countries in agriculture and food processing to fall substantially except in OECD Asia as may be seen in Table A.17. The counterpart to this is increasing deficits in most developing and transition economies. Countries and regions with increasing surpluses include US & Canada, Australia & New Zealand, Brazil and other Central and South America, and sub-Saharan Africa.

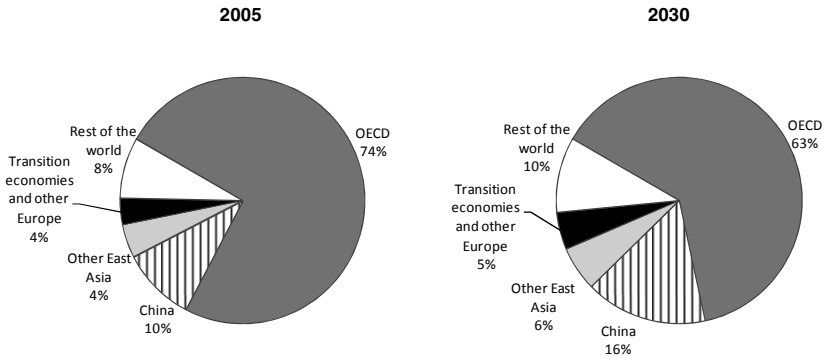
Changes in country/region economic sector shares in world-wide production

Changes in the world-wide pattern of growth and changing patterns of world trade lead to changing sector shares of production within countries and regions, which in turn results in substantial changes in the world-wide spatial distribution of output in all economic sectors. Sectors of concern for their environmental impacts on air and water quality and energy related greenhouse gas (GHG) emissions include chemicals, iron and steel, cement, pulp and paper, and energy and transport. Changes in agriculture are important for impacts on land use and water quality, and biodiversity. A number of tables in the Annex show changes in the regional distribution of sectoral outputs for agriculture and food, fossil fuels other than refined petroleum products, capital goods, energy-intensive industrial products, and services. The share of developing countries in world production of agriculture and food is projected to increase from 34% in 2005 to 41% in 2030 while that of OECD countries would fall from 57% to 48%. These changes are less pronounced than other sectors as can be seen in Table A.13.

Not surprisingly, the share of developing countries in the production of fossil fuels is projected to increase, from about 46% in 2005 to 53% in 2030. Increasing or stable shares characterise nearly all developing country regions. The share of Russian and other transition economies increases as well, from about 15% in 2005 to about 17% in 2030. Correspondingly, the share of OECD countries is projected to fall by nearly 10 percentage points from 39% in 2005 to 30% in 2030. This reflects the distribution of natural resource endowments (Table A.14).

Changes in the distribution of capital goods production are large, dominated by an increasing share of world production on the part of the BRIICS. Shares of several developing countries are projected to increase by as much as 50%. Thus, the share of developing countries increases from 26% in 2005 to about 36% in 2030 and that of transition economies from 4 to 5%. Correspondingly, the share of OECD countries falls from about 71% to 59% between 2005 and 2030 (Table A.15).

Figure 1.9. Regional composition of world energy-intensive production, 2005 and 2030



Source: Env-Linkages/IMAGE model analysis.

A similar picture is revealed for outputs of energy-intensive sectors, such as mineral refining, metal processing, chemicals, pulp and paper, and cement, although the shifts are slightly smaller than in the case of capital goods (Table A.19).

The shift in the share of services by region is less pronounced because of the low initial share of developing countries of 16% in 2005, which increases to 22% in 2030. This is a 50% increase, but the absolute shift is only 7 percentage points. The counterpart to this is a change in the share of OECD countries from nearly 83% in 2005 to 75% in 2030 (Table A.16).

Chapter 2

Physical Indicators of Potential Changes in Environmental Pressures and Environmental Impacts

Energy and transport

This section examines projected changes in energy, industry and transport-related demand for final energy services by source and for primary sources of energy for producing electricity. The models used to develop these projections have been calibrated to the projections prepared by the IEA in its *World Energy Outlook 2004*. The projections used in the EO are slightly higher than those of IEA, however, because of differences in the assumptions about economic growth.

The demand for total world-wide energy services in the baseline scenario is projected to increase from 279 exajoules (EJ) in 2000 to 472 EJ in 2030, an increase of more than 69%. Most of the growth of both population and energy use is projected to occur in developing countries. Thus, energy consumption of developing countries is expected to double over the same period. This will result in a significant shift in regional shares of world energy consumption, with the share of OECD countries falling from 53% in 2000 to 43% by 2030, with corresponding increases in the shares of many developing countries and regions. On a per capita basis, little growth is expected in OECD countries since energy efficiency gains are expected to just about match the increases in the demand for energy services. Developing countries per capita energy use is projected to increase from less than 100 gigajoules (GJ) to nearly 125 GJ over the same period, thus narrowing the gap with the OECD countries. Electricity demand is expected to more than double in absolute terms, while the demand for non-electric energy use in transport, industrial processes, heating, etc. is expected to increase by about 50%.

Country and regional shares in the primary inputs used for electric power exhibit similar changes to those for total energy use. The share of the 4 BRIC countries (Brazil, Russia, India and China) is expected to increase from 32% in 2005 to 36% in 2030, and that of the other developing and transition economies (the "rest of the world" or ROW) is expected to increase from 15% to 18% over the same period.

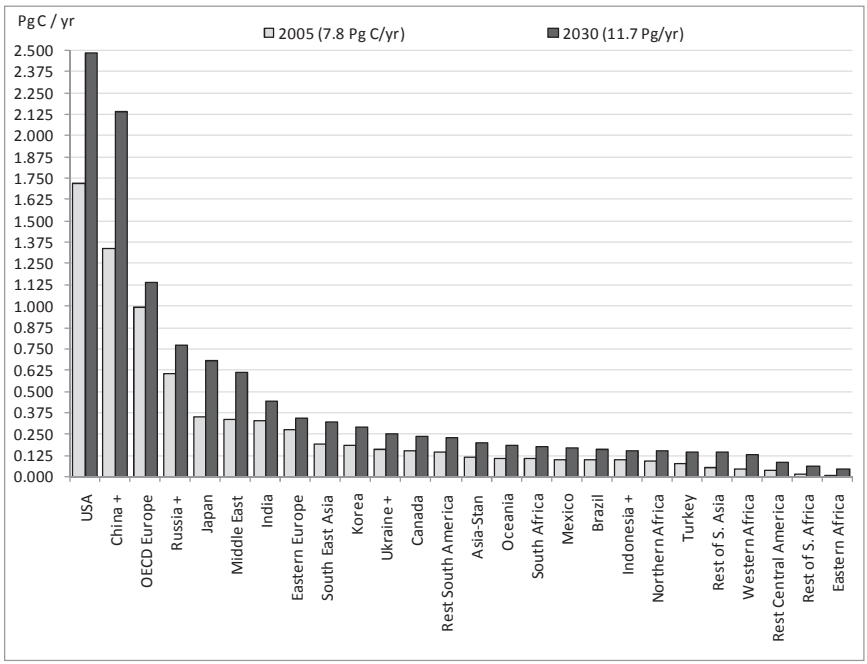
Between 2005 and 2030, the use of coal in electricity production is expected to continue to increase by 71%, and the use of other fuels by about the same amount, such that the share of coal will remain at about 55%. The share of the 4 BRIC countries in the use of coal for electricity is expected to increase from 39% in 2005 to 46% in 2030, while that of the other developing and transition economies, the (ROW), is expected to increase from 9% in 2005 to 12% in 2030. Increases in the use of coal are proportionately very large in many developing and transition countries and regions (China, 122%; S. Asia, 163%; other East and Southeast Asia, 276%; Africa, 149%).

Table 2.1. Use of coal in electricity production by region, 2005 and 2030 (percentage)

	2005	**2030**
OECD	51.86	42.19
Russia	8.59	4.28
Other developed economies	2.60	1.14
China +	24.15	31.49
Indonesia +	1.00	1.82
South East Asia	1.49	3.68
India	6.48	9.58
Rest of S. Asia	0.05	0.51
Middle East	0.52	0.91
Northern Africa	0.12	0.29
Western Africa	0.01	0.05
Eastern Africa	0.00	0.21
South Africa	2.46	2.47
Rest of S. Africa	0.15	0.96
Brazil	0.16	0.20
Rest South America	0.35	0.17
Rest Central America	0.02	0.05
World total levels (PJ/yr)	**86 509**	**147 640**

Source: Env-Linkages/IMAGE model analysis.

Figure 2.1. GHG emissions from energy and transport, 2005 and 2030 (Pg C/Yr)

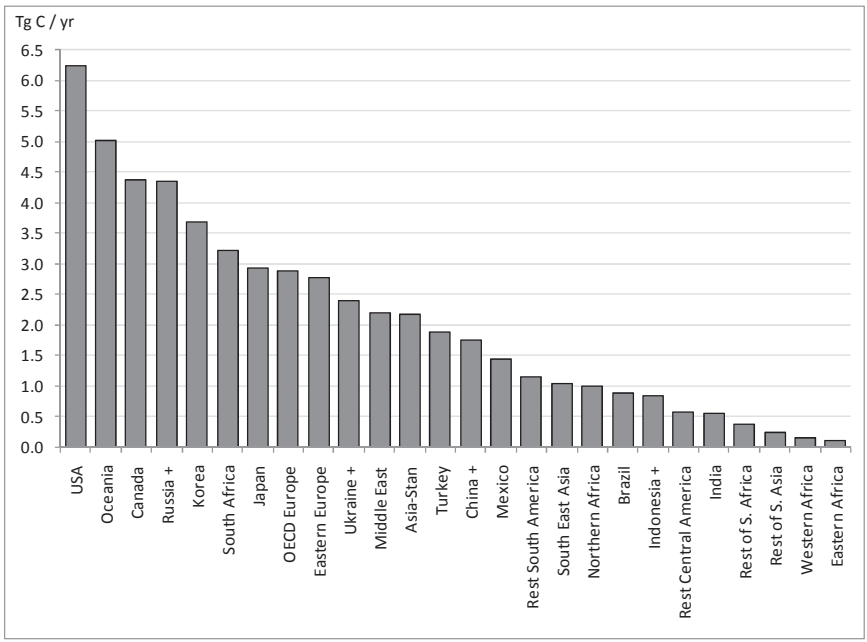


Source: Env-Linkages/IMAGE model analysis.

The emissions of greenhouse gases associated with energy and transport in the baseline scenario are projected to increase from 7.8 Pg C-equivalent in 2005 to 11.7 Gt C-equivalent in 2030, an increase of 50%. Thus, as may be seen in Figure 2.1, the combined share of developing and transition economies in world GHG emissions is projected to increase from 49% in 2005 to 58% in 2030.

Of course, energy-related greenhouse gases emitted by developing countries are projected for 2030 to remain much lower on a per capita basis than in OECD countries as may be seen from Figure 2.2. China, Middle East, Northern Africa, the Republic of South Africa, Brazil, other Latin American countries, Indonesia, and other East and Southeast developing countries are projected to reach per capita levels above or slightly below the world average.

Figure 2.2. Emissions per capita (Tg C/Yr) in 2030



Source: Env-Linkages/IMAGE model analysis.

Agriculture and land use

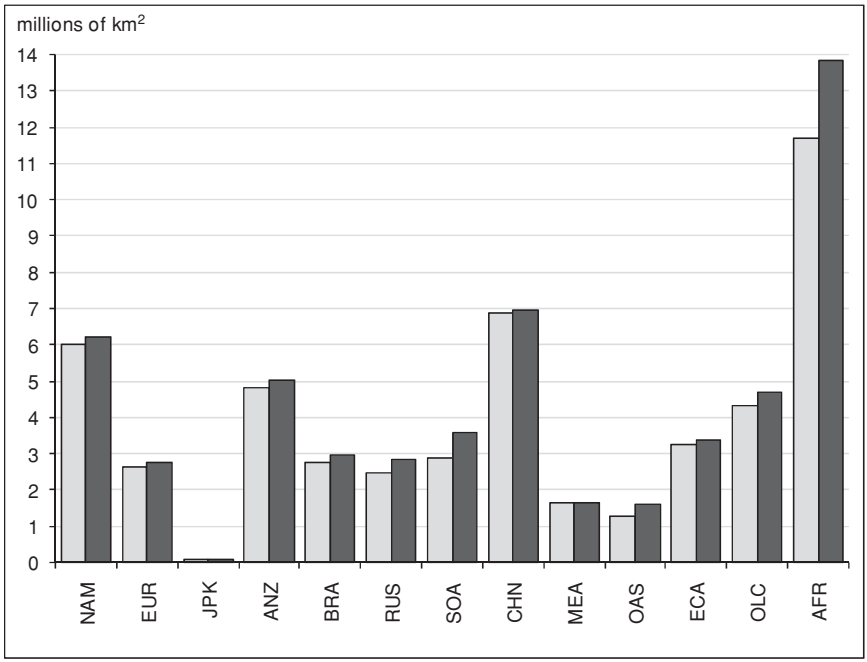
This section describes changes in land used for food crops and for animal husbandry, the pattern of agricultural production worldwide, and trade in agricultural products. It thus expands on the discussion of changing economic sector shares linked to macro-economic developments in section 1. Projected developments with respect to agriculture and land use have implications for greenhouse gas emissions, nitrogen deposition and exceedance, nutrient loading of soils and surface water, water stress, and biodiversity.

Increasing population and per capita incomes are projected to increase the demand for agricultural products, which are projected to grow at about 1.6% per year from 2005 to 2030, much more slowly than overall economic activity. Growth of animal products, oilseeds, and oil-crops are projected to outpace agricultural production generally with the slowest growth expected for rice and milk. Per capita consumption of agricultural products is expected to grow more rapidly in BRIC and ROW countries than in OECD countries. Production of processed agricultural products is projected to grow more rapidly than primary production, especially so in developing countries.

Agricultural export growth is expected to grow more rapidly than production, with exports from BRIC and other developing countries set to outpace growth in exports by OECD countries.

The total area used for agriculture is projected to expand by 9.5% between 2005 and 2030 although total agricultural outputs are expected to increase by 73%. This is mainly because of an assumption that agricultural productivity will continue to increase rapidly, mainly in developing countries. But it also reflects projections that land used for food crops will increase by about 16% while land used for grass and fodder will increase by 5.6%. Increases in crop areas are projected to be largest in Africa, with substantial increases in Brazil, other Latin American countries, and South Asia.

Figure 2.3. Total crop area by major world regions, 2005 and 2030



Note: Regional country groupings are as follows: **NAM**: North America (United States, Canada and Mexico); **EUR** (western and central Europe and Turkey); **JPK:** Japan and Korea region; **ANZ:** Oceania (New Zealand and Australia); **BRA:** Brazil; **RUS:** Russia and Caucasus; **SOA:** South Asia; **CHN:** China region; **MEA:** Middle East; **OAS:** Indonesia and the rest of South Asia; **ECA:** eastern Europe and central Asia; **OLC:** other Latin America; **AFR:** Africa.

Source: Env-Linkages/IMAGE model analysis.

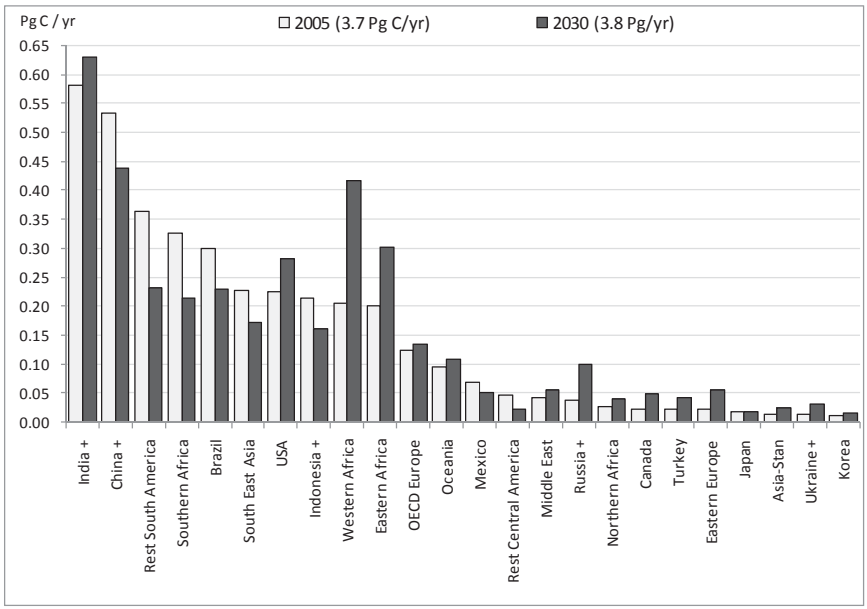
These projected developments for land use and changes in production patterns have implications for emissions of the greenhouse gases, methane and nitrous oxide, as well as carbon dioxide, and for water quality.

As far as methane emissions are concerned, more efficient production in intensive production systems and changes in diet are assumed to lead to lower emissions per kg of product. Nonetheless, agriculture related methane emissions are projected to increase in total by about 26% between 2005 and 2030 compared with an increase of total food crop production of 73%.

Nitrous oxide emissions arise from soil processes, fertiliser applications, and higher deposition from airborne nitrogen compounds. These are projected to increase by 18% between 2005 and 2030, much more than the increase in the amount of land used for agriculture or in the amount of land used for food crops due to an expected increase in intensive methods of agricultural production.

Carbon dioxide emissions from agriculture are projected to increase as well due to land use clearing that is only partly compensated by increased absorption of CO_2 by the crops themselves. Thus, total GHGs from agriculture worldwide are projected to increase marginally from 3.73 Pg C-eq in 2005 to 3.8 Pg C-eq in 2030, about 22% of the total GHG emissions projected for 2030. As may be seen in the chart below, the share of OECD countries in agricultural GHG emissions is projected to increase from 16% in 2005 to 18% in 2030. The shares of most developing country regions are projected to remain fairly stable except for Western Africa, where agricultural production is expected to expand significantly.

Figure 2.4. Land use emissions by major world regions, 2005 and 2030 (Pg C/yr)



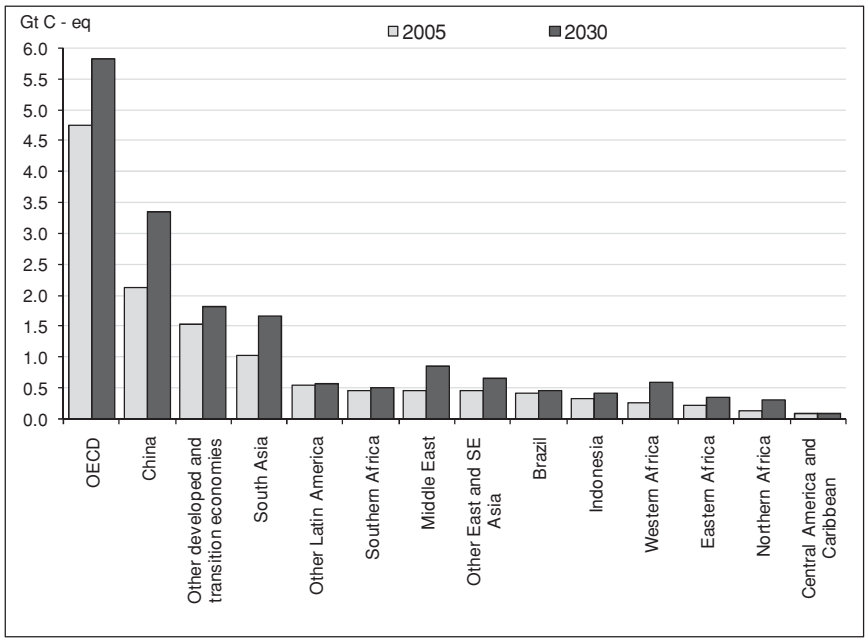
Source: Env-Linkages/IMAGE model analysis.

Global climate change

The factors discussed above are projected to lead to an increase of total anthropogenic GHG emissions from 12.8 Gt C-eq in 2005 to 17.5 Gt C-eq in 2030. OECD and other developed and transition economies would see their combined share fall from about 48% in 2005 to about 43% in 2030. As may be seen from the figure below, large increases are projected in all developing countries and regions, with the largest absolute increases projected for China. Increases in Africa are also projected to be large, especially in Western Africa, and the total amount would be similar to emissions in Latin America.

These emission trends are projected to lead to an increase in GHG concentrations in the atmosphere to 465 ppmv by 2030 and to 543 by 2050. Compared to pre-industrial levels, this will mean an increase in the average mean temperature of 1.2-1.6 degrees C by 2030, and to 1.7-2.4 degrees C by 2050 (OECD, 2008).

Figure 2.5. Anthropogenic emissions of greenhouse gases, 2005 and 2030 (Gt C-eq)

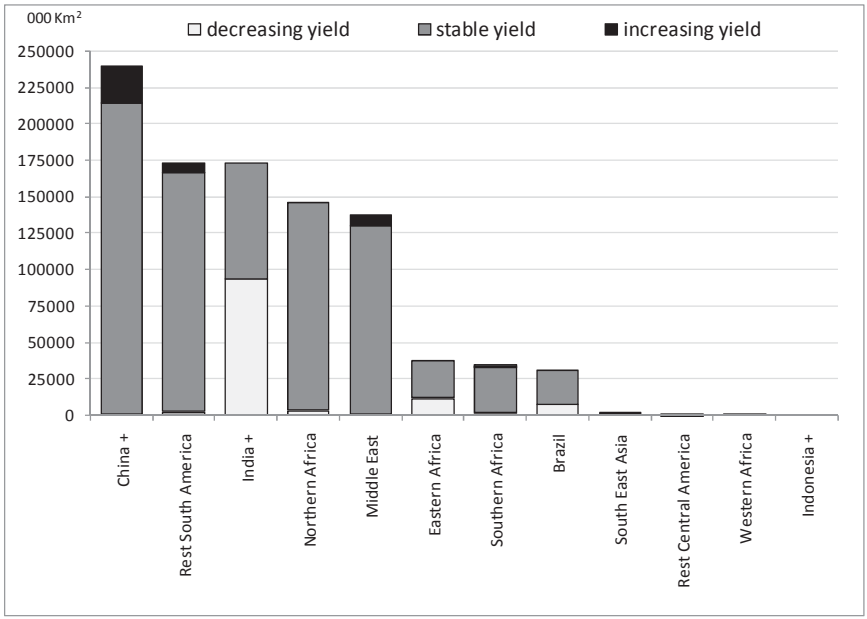


Source: Env-Linkages/IMAGE model analysis.

This global picture of climate change will have different implications for various world regions with, for example effects on the hydrological cycle resulting in regionally differentiated impacts regarding patterns of rainfall, with some regions becoming much dryer than others. The combination of changes in temperature and precipitation will have impacts on agricultural productivity and on the spatial allocation of crops. Figure 2.6 shows the projected changes in the distribution of agricultural land used for temperate cereal crops by the quality of crop yields (increasing, decreasing or stable).

In general, countries nearer to the equator become warmer and dryer. In the production of temperate cereals, South Asian countries are projected to experience large net decreases in yields. In Africa as a whole, a small net decrease in yields is projected as well. In the production of rice, a relatively large net decrease in yields is projected for South Asian countries.

Figure 2.6. Changes in area by quality of crop yields for developing country regions between 1990 and 2030



Source: Env-Linkages/IMAGE model analysis.

Air pollution

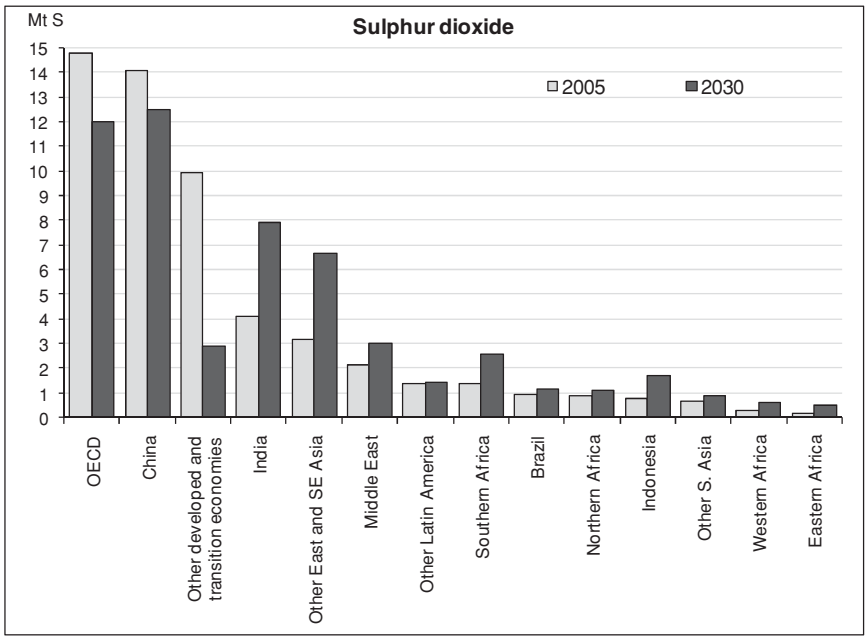
Some of the gases responsible for local air pollution represented in the modelling framework of the EO are sulphur oxides and nitrogen oxides, whose projected trends differ markedly from one another.

Sulphur oxides are produced primarily from combustion of fossil fuels in electricity generation, industrial production, and transport. Reductions in emission coefficients are due to increasingly stringent vehicle standards in OECD countries, which subsequently appear in developing countries with a time lag as the characteristics of their vehicle fleets change over time, and reflecting policies recently implemented in a number of developing and transition economies to install scrubbers in power plants. However, growth of energy intensive sectors and products is projected to increase more rapidly in most developing countries and regions than in OECD countries as has been mentioned earlier. Thus global emissions are projected to decrease slightly by 2030 as a result of strongly declining emissions in OECD countries and economies in transition offset by rising emissions in

developing countries, especially in the large BRIC countries. The share of OECD countries in total emissions of sulphur oxides is, thus, projected to fall from about 27% in 2005 to about 22% in 2030. Emissions from BRIC countries are projected to peak in 2015 and to decline slowly thereafter, whereas emissions from other developing countries are projected to continue rising throughout the entire period. As may be seen in Figures 2.7a and 2.7b, increases in emissions are projected to be particularly large in India, Other East and Southeast Asia, noticeably in Africa and in Latin America, but projected to decline in China.

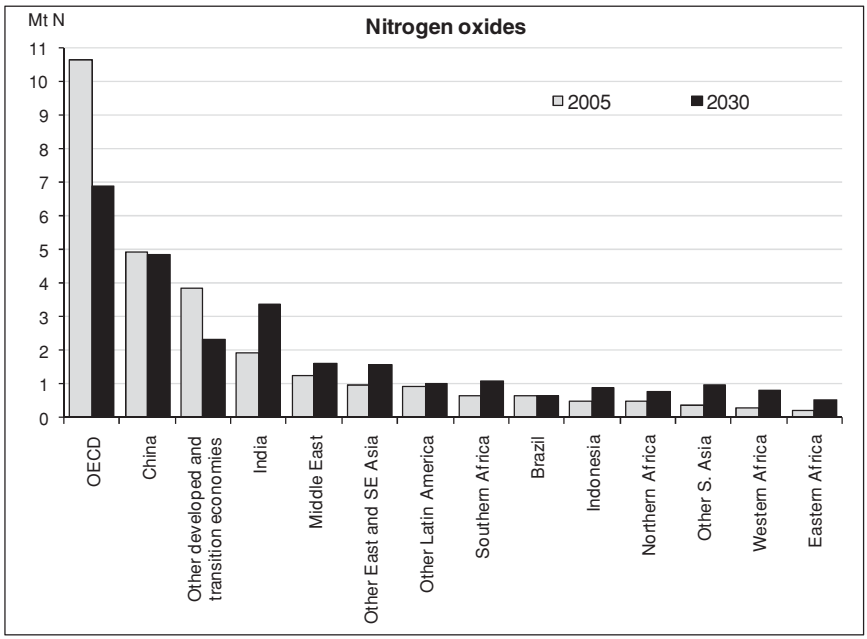
Nitrogen oxides are produced by a broader array of economic activities, especially transport and power generation, and have been harder to reduce until recently. Technical progress in reducing nitrogen oxides from transport has been substantial in recent years, with regulators following suit and increasing the stringency of regulation; thus nitrogen oxides from transport are projected to fall over the projection period. Emissions will, however, increase in other sectors. In OECD countries, they are projected to fall quite steeply overall, but this will be nearly offset by growth in emissions by developing countries. Between 2005 and 2030 emissions worldwide are projected to decrease marginally by 1.3% despite large increases in the underlying drivers. The share of developing countries in total emission of nitrogen oxides will consequently increase from 47% of the global total in 2005 to about 66 % by 2030. As may be seen from Figure 2.8, especially large increases are projected for India and other S. Asia, Indonesia and other East and Southeast Asia. Most regions in Africa also are projected to show sizeable increases. But emissions are projected to decline or stabilise in China, Brazil, and other Latin American countries.

Figure 2.7a. Emissions of sulphur dioxide, 2005 and 2030 (Mt)



Source: Env-Linkages/IMAGE model analysis.

Figure 2.7b. Emissions of nitrogen oxides, 2005 and 2030 (Mt))

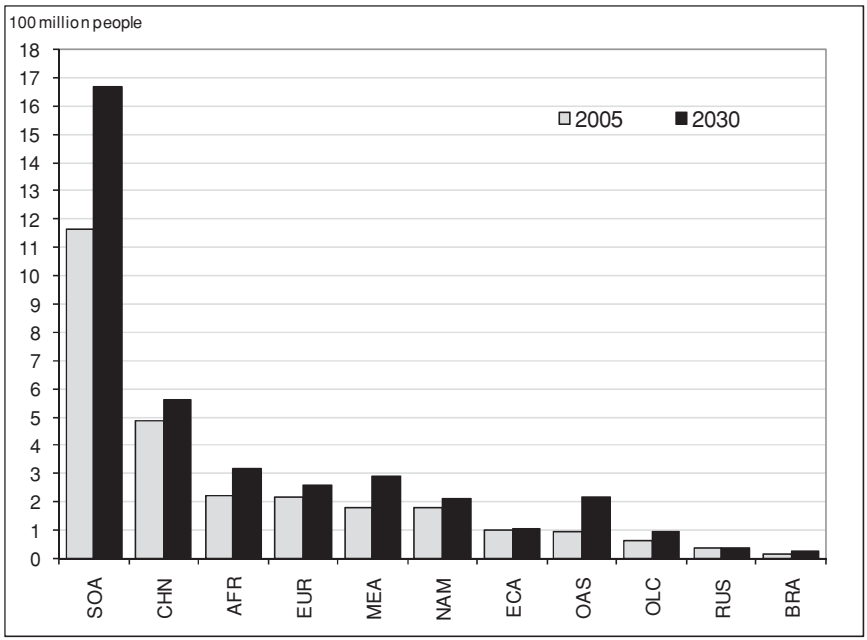


Source: Env-Linkages/IMAGE model analysis.

Freshwater resources

Increasing population and increased economic activity will mean greater demand for water use (abstractions). This will result in an increase of about 1 billion people living in areas subject to high water stress from now to 2030. The model analysis is based on the situation projected in 2030 for the drainage basins of some 6 000 major rivers throughout the world. The numbers of people living in situations of water stress are projected to increase in all developing country regions, with especially large percentage increases projected for South Asia and Africa. The methodology assumes that populations expand proportionately in all river basins within a given region or country.

Figure 2.8. Populations in river basins with severe water stress for selected countries and regions, 2005 and 2030



Source: Env-Linkages/IMAGE model analysis.

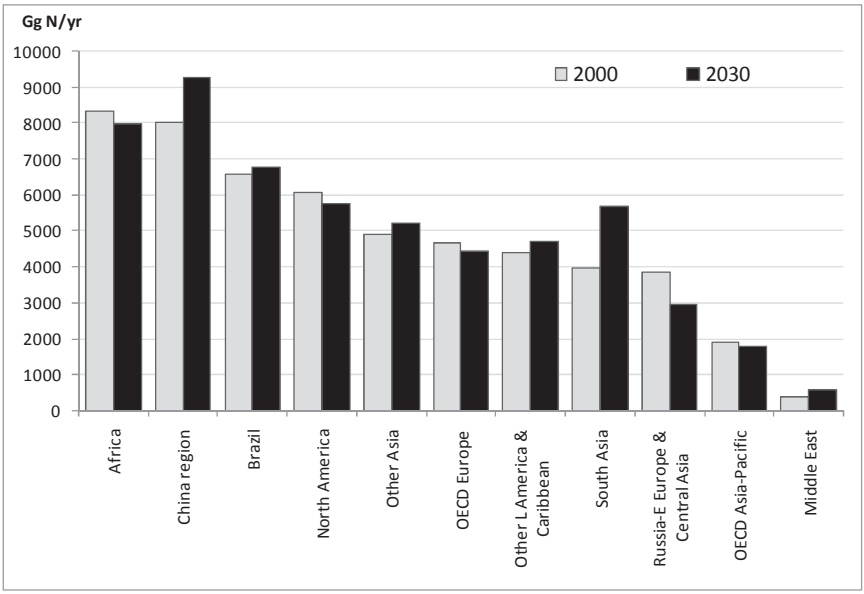
The baseline scenario thus points to the need to rationalise water use, especially in agriculture, and/or invest in desalination and inter-basin transfers of water to meet the highest priority need of supplying adequate supplies of freshwater to households. Significant population movements from agricultural areas experiencing increases in water stress to other areas may also pose challenges in a number of developing countries. Differences in country/region levels of development and administrative capacity will imply different policy packages tailored to their specific circumstances.

Water quality and coastal marine ecosystems

Impacts on surface water quality and coastal waters are measured by the projected levels of loading with nitrogen compounds. The difference between nitrogen inputs and outputs, the so-called surface nitrogen balance, is projected to increase in all countries and regions considered in this report, driven mainly by increases in intensive forms of agricultural production but also by atmospheric deposition resulting from combustion of fossil fuels in energy and transport. Atmospheric nitrogen deposition exceeding critical levels is projected to increase in Asia and in East Africa. The largest

increases in surface nitrogen balances are projected to occur in Asian regions and in OECD Europe. The surplus nitrogen enters into ground water and surface water bodies where denitrification and retention reduce the amount of reactive nitrogen compounds. The amount of surplus nitrogen resulting from agricultural practices and entering into water bodies is augmented by discharges from sewage water when wastewater treatment plants do not remove the nitrogen. Nitrogen is the major nutrient in rivers which transport it to coastal marine systems. Based on trends discussed above, the baseline scenario projects an increase of only 3.8% in the flow of nitrogen compounds to coastal marine systems worldwide between 2000 and 2030. This will lead to increasingly severe problems associated with eutrophication in a number of coastal seas. As may be seen in the table below, the projections indicate substantial differences among countries and regions with OECD and other developed countries showing a decrease of 10.2% while developing countries are projected to show an increase of 10.1% with particularly large percentage increases projected for China (16%) and South Asia (42%). Africa, on the other hand, is expected to exhibit a slight reduction due to a slower rate of growth of intensive agriculture combined with soil nutrient depletion.

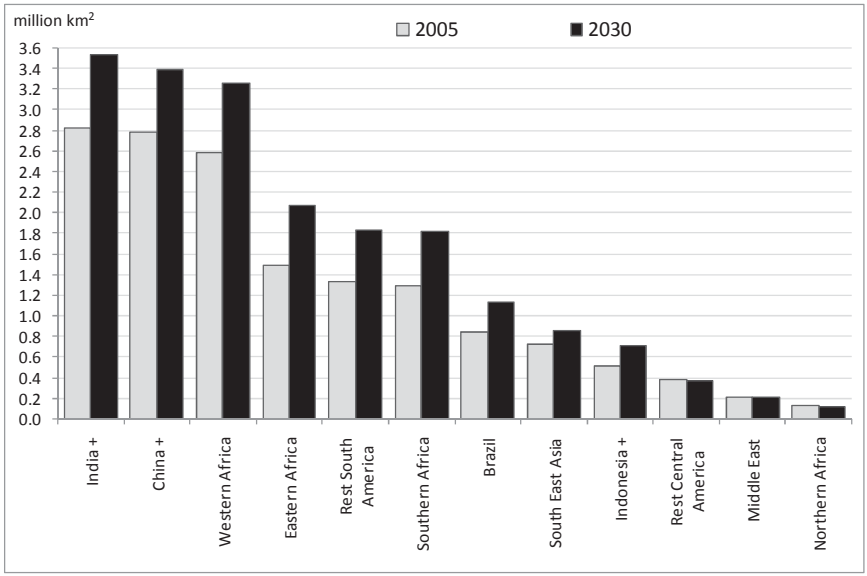
Figure 2.9. River nitrogen transport, 2000 and 2030 (Gg/yr)



Source: Env-Linkages/IMAGE model analysis.

Water-induced soil degradation

Figure 2.10. Land area subject to high erosion risk by major region, 2005 and 2030

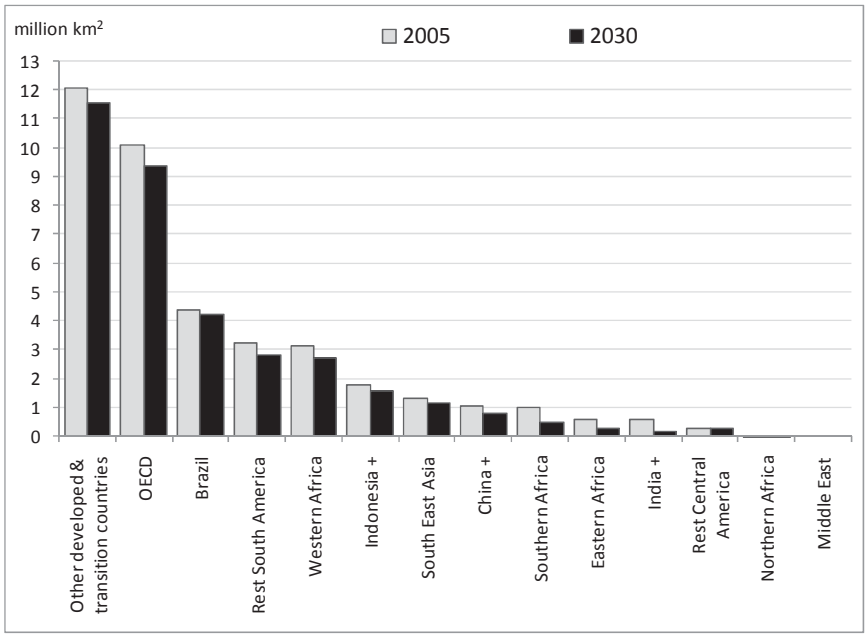


Source: Env-Linkages/IMAGE model analysis.

Water-induced soil degradation is projected to worsen as a result of an increase in the amount of land area characterised as subject to high levels of erosion risk. Worldwide an increase from 21.5 to 26.7 million sq km of land at risk from soil erosion is projected between 2005 and 2030. In developing counties, the area subject to such risk is projected to increase by 28% between 2005 and 2030 with the largest absolute increases projected to occur in Africa, especially eastern Africa (39%), and southern Africa (42%) as may be seen from Figure 2.10. Important increases are also projected for Brazil (35%), India and other South Asia (25%), and other Latin America (37%). This highlights the need for increased soil conservation measures like contour ploughing and terracing which can reduce the risk.

Deforestation and terrestrial biodiversity

Figure 2.11. Natural forest area remaining, 2005 and 2030 (Ha)



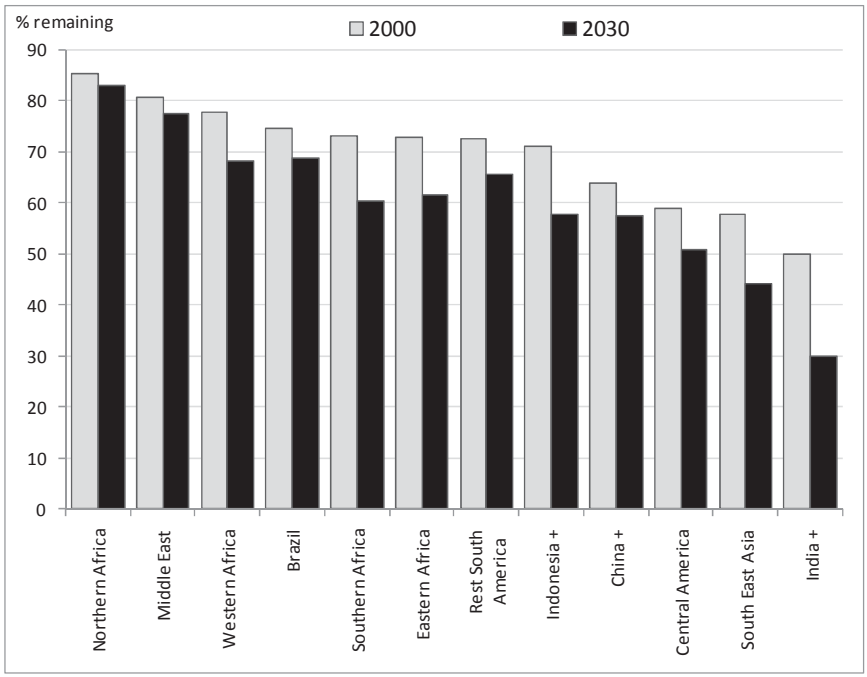
Source: Env-Linkages/IMAGE model analysis.

This section describes projected changes in the areas of natural forest, excluding re-growth between 2005 and 2030. The projections have been based on projections of agricultural land expansion and abandonment and on demand for industrial roundwood. The projections also take into account the expansion of plantations which are expected to meet a large and growing fraction of the incremental demand for wood and pulp. Calculations do not include re-growth after clear-cutting in the scenario period. Natural forests are projected to decline in nearly all regions and large countries and to decrease worldwide by 10.6%. In absolute terms most of the loss is projected to be in developing countries where the decline is projected to be 16.7%, with proportionately large declines in South Asia (71%), western Africa (13%), eastern Africa (57%), southern Africa (51%) and other Latin America (12%). Declines are projected to be proportionately smaller in Brazil, Russia and transition economies, China, and OECD countries.

Projected changes in terrestrial biodiversity are measured with the indicator, mean species abundance (MSA), defined as the change of selected

species relative to the undisturbed natural situation.[2] Changes in the MSA have been modelled as resulting from loss of habitat, annual mean temperature change, excess nitrogen deposition, infrastructure and fragmentation. Changes in MSA are quite large for many developing country regions as can be seen in the figure below which shows developing countries arrayed in descending order of biodiversity richness projected in 2030. Reductions in biodiversity are projected to be particularly large in Central and South America, in sub-Saharan African regions, and in Asian regions apart from China.

Figure 2.12. Biodiversity in developing countries, 2000 and 2030 (percentage remaining)

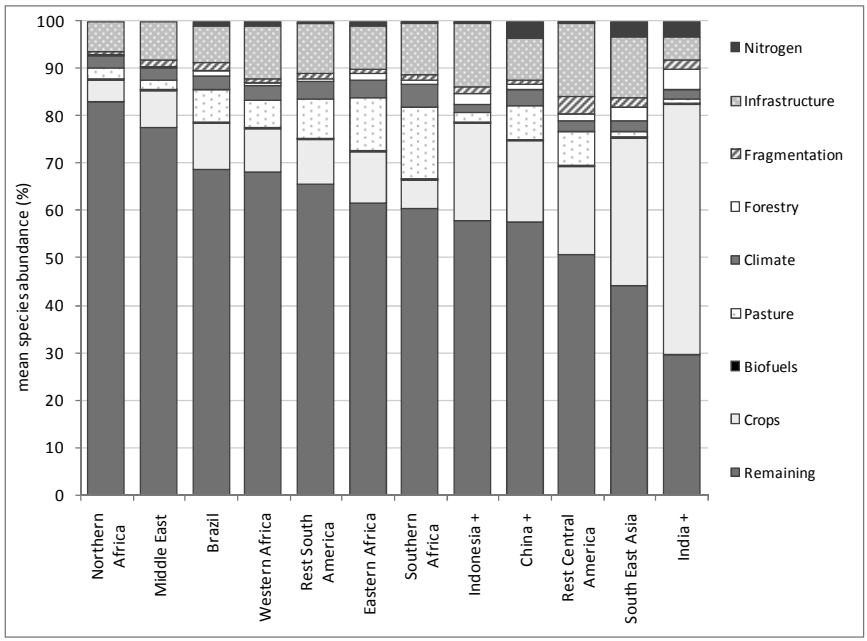


Source: Env-Linkages/IMAGE model analysis.

2 . 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. In this case, the MSA is calculated on the basis of the impacts of human activities on "biomes". A reduction in MSA, therefore, is less an exact count of species lost, than an indicator that pressures have increased.

The major cause of habitat loss projected for 2030 is conversion of natural land to agriculture; next in importance is infrastructure expansion which is driven by GDP growth; fragmentation which results from both agricultural expansion and infrastructure development is also important as can be seen in Figure 2.13 below. In a few regions, especially Indonesia and South Asia, forest clearing is projected to be important; excess nitrogen loading is projected to be important in China and the rest of East and South East Asia.

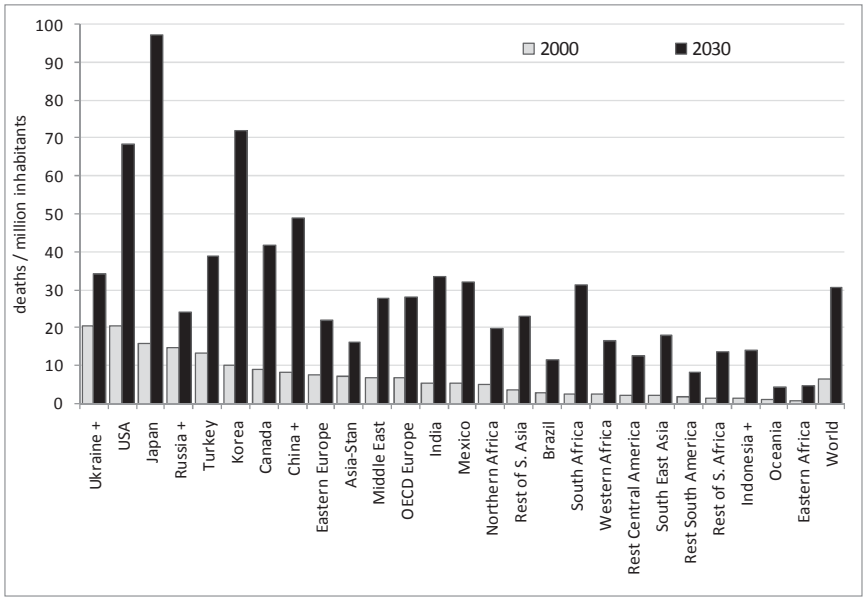
Figure 2.13. Pressures on remaining biodiversity, 2030 (percentages)



Source: Env-Linkages/IMAGE model analysis.

Human health impacts

Figure 2.14. Ozone related mortality in the urban population, 2005 and 2030 (deaths/million inhabitants)

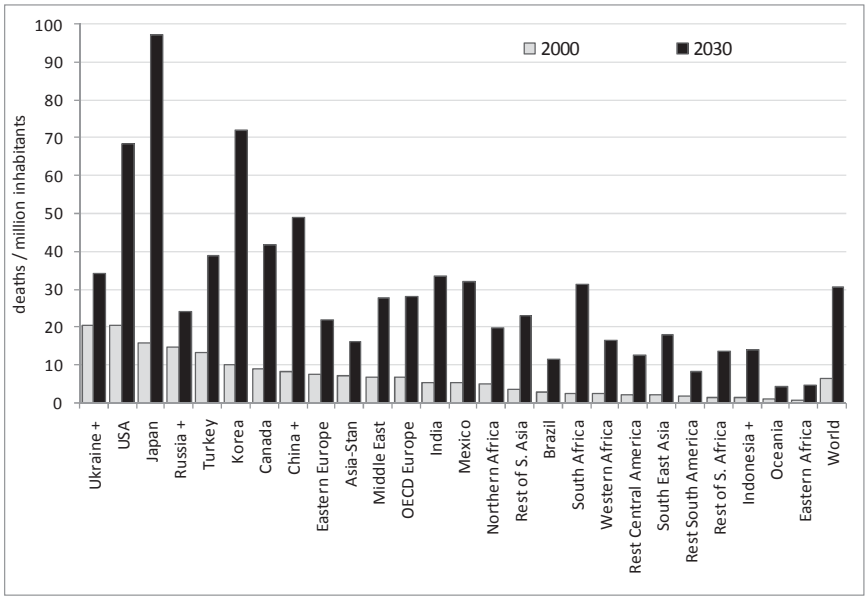


Source: Env-Linkages/IMAGE model analysis.

The impacts of environmental change on human health are mainly due to water-borne diseases related to unmet sanitation needs and to respiratory disease and asthma due to air pollution. As may be seen in Figure 2.14, the incidence of death due to exposure to ozone in urban areas is expected to worsen in all countries and regions, developed and developing alike between 2005 and 2030. The situation is expected to be similar to the situation in most OECD countries by 2030 for many developing countries and regions (northern, western, and southern Africa, Middle East, Indonesia, and other Southeast Asia), but it is expected to be substantially worse in India and other South Asia.

However, on a country-wide basis the mortality rates in most developing countries due to ozone exposure are projected to remain substantially lower than in OECD countries because rates of urbanisation are substantially lower even by 2030. In China, however, the mortality rate in 2030 is expected to exceed that in most OECD countries.

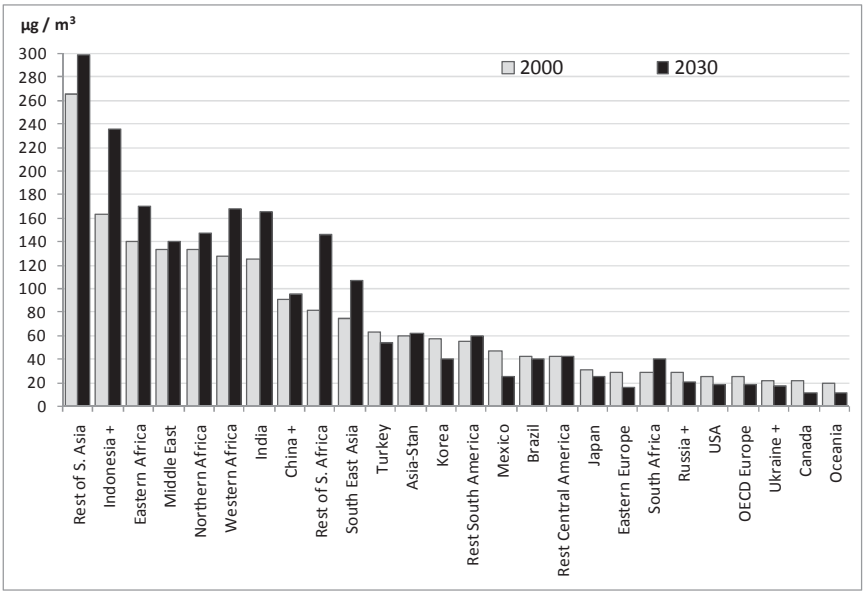
Figure 2.15. Ozone related mortality in the total population, 2000 and 2030 (deaths/million inhabitants)



Source: Env-Linkages/IMAGE model analysis.

Unlike the case of ozone which is mainly due to combustion of fossil fuels in transport, particulate matter can come from a variety of sources, including dust. Figure 2.16 shows that in 2005 concentrations of small particulate matter (PM_{10}) were already a great deal higher than in OECD countries in all African regions except South Africa, the Middle East, India, other South Asia, China, Indonesia, and other East and Southeast Asia. In Latin America countries they were only slightly higher than in OECD countries. Between 2005 and 2030, the concentrations of particulate matter are projected to fall in OECD countries and remain roughly stable in Latin America, but to increase in all other developing country regions.

Figure 2.16. Concentrations of particulate matter (PM_{10}) in world regions, 2000 and 2030 (Microg/M3)



Source: Env-Linkages/IMAGE model analysis.

Chapter 3

Policy Simulations

Quite a number of policy simulations can be envisaged, some reflecting policy actions by OECD countries, others by developing countries, and still others combining actions by both. A number of such policies are sketched out below, all of which were chosen because they would have impacts on developing countries.

Simulations of policy changes

Reduced support to agricultural producers in OECD countries (Table A.32)

Assumptions and rationale: Policies undertaken to promote economic development in developing countries could have unintended environmental consequences. From a policy coherence perspective, if these are adverse impacts they might need to be addressed by complementary policy measures. In the area of trade policy, for example, developed countries have been urged to remove subsidies from a range of agricultural commodities of interest to agricultural producers in developing countries as part of international trade liberalisation. This scenario is intended to illustrate such a hypothetical policy change. Support to agricultural producers is decoupled from commodity production or purchase of inputs, including removal of subsidies to sugar, cotton, tobacco, and rice; subsidies are reduced by 10% per year until they are eliminated; this is implemented in a fiscally neutral way by shifting expenditures to direct income support and/or investment in education.

Economic impacts described by the model: Subsidy removal tends to raise international prices significantly for only two of the targeted

commodities, mainly the category of *fibres* (which includes cotton) and *rice*. This, is turn, causes world export volumes of these commodities to fall by 3.2% and 7.9%, respectively, by 2030 compared with the baseline levels. However, exports of fibres by developing countries increase by 3.6% while those of OECD countries decline by 12.9%. In the case of rice, exports by developing countries increase by 16.2% while those of OECD countries decline by 39%. Developing country gains in the case of fibres are widespread, while in the case of rice, they are mainly concentrated in Asian countries. Because these commodities are a relatively small part of the agricultural sector, and because some inputs are redeployed within the agricultural sector itself, impacts at the sector level are much smaller. Thus, agricultural value added at constant prices is only about 1% lower in 2030 for the OECD countries, but is about 0.4% higher in developing countries with considerable differences among countries and regions. Because the share of agriculture in GDP is also small, total GDP is unchanged at the world level and for major country groups. However, countries in sub-Saharan Africa other than the Republic of South Africa register small gains.

Changes in indicators of environmental pressures described by the model: Implications for potential environmental impacts are related to changes in land use, demand for chemicals (fertilisers and pesticides), and CO_2 emissions. Changes in these variables are quite small, as might be expected from the description of the economic impacts. Land use for agriculture declines slightly in OECD countries, but the decrease is offset by increases in developing countries. Since biodiversity per hectare is often richer in developing countries than in OECD countries, the negative impact of this change in land use on biodiversity may be greater than that suggested by the lack of aggregate change in land use itself. For CO_2 emissions, the trends are similar, with declines in OECD countries and increases in developing countries. However, the overall balance for the world as a whole is slightly negative. Changes in the overall demand for chemicals (volume) show a similar pattern, declining slightly in OECD countries, but increasing in developing countries, with no change at world level.

Reduced tariffs on agricultural imports (Table A.33)

Assumptions and rationale: Another hypothetical policy measure which could promote economic development in some developing countries would be to reduce or eliminate import duties as part of an international agreement. As in the previous scenario, this could also have unintended environmental consequences that might need to be addressed by complementary policy measures. In this scenario, agricultural import tariffs are reduced in both OECD countries and developing countries by 5% per year until they are eliminated; this is assumed to be implemented in a fiscally neutral way by

shifting expenditures to direct income support and/or investment in education.

Economic impacts described by the model: This simulation was found to have impacts on a greater number of commodity groups than the previous simulation. Phasing out tariffs has substantial impacts on *meat*, *meat products, unprocessed and processed rice, sugar,* and *dairy products.* For these products world exports increase by amounts ranging from 18% to 76% by 2030 compared with their baseline levels. Increases in rice exports are substantial for North American and Asian OECD countries and for developing countries in most Asian country regions. Increases in sugar exports are important for OECD countries in Oceania, for developing countries in East and Southeast Asia, sub-Saharan Africa and Latin America, with some of the increase offset by large declines in OECD Europe. Exports of meat increase for most world regions, except for developing Asian regions. Exports of dairy products increase in most OECD and developing country regions as well, except for Africa where they fall slightly. However, because production is by and large shifted within the agriculture sector, there is little impact on total world agricultural value added at constant prices. Unlike the scenario of reduced subsidies, removing tariffs has a positive, but small, impact on world GDP, with most regions showing gains. Developing countries show larger percentage gains than OECD countries. Household consumption in real terms increases by larger percentages than GDP as a whole because the relative prices of a number of food items fall.

Changes in indicators of environmental pressures described by the model: As in the previous simulation discussed above, implications for potential environmental impacts are related to changes in land use, demand for chemicals (fertilisers and pesticides), and CO_2 emissions. Changes in these variables are quite small, as might be expected from the description of the economic impacts, but they are larger in the case of tariff removal. Land use increases by nearly 2% in OECD countries compared with the baseline by 2030, and this is in addition to increases in developing countries, resulting in an increase at the world level. CO_2 emissions increase in all world regions except North America OECD where they decline slightly. Percentage increases range from negligible amounts in OECD Europe to 1.6% in other South Asia. For the world as a whole the increase is quite small at 0.3%. The overall demand for chemicals (volume) shows an increase of 0.2% at the world level but with much less variation than in the case of CO_2 emissions or land use.

Enhanced levels of ODA targeted on the poorest countries (Table A.34)

Assumption and rationale: In recent years members of the Development Assistance Committee (DAC) of the OECD have made policy commitments to scale up substantially the official development assistance (ODA) which they provide to least developed and other poor countries. If successful in accelerating growth, this could have environmental benefits (depending on how the ODA is used) unintended negative environmental consequences that might need to be addressed by complementary policy measures from a policy coherence perspective. This scenario simulates a hypothetical scaling up of ODA in line with current projections of the Directorate for Development Co-operation based on the assumption that DAC donors fully meet their recent commitments. In the scenario, about USD 22 billion in additional ODA (in 2001 prices) is transferred from DAC countries to sub-Saharan African countries other than the Republic of South Africa. Of this, roughly one-third is allocated to the countries in southern Africa, and the rest goes to regions sometimes referred to as western and eastern Africa. The proceeds are assumed to finance enhancements in water, transport, and forestry sectors by the recipient countries.

Economic impacts described by the model: In the two sub-Saharan African regions targeted, the total demand (volume) in the three sectors increases in a range of 1.3% to 2.9% in 2013 compared with the baseline. This is associated with an increase of GDP of about 2% in each of the two sub-regions. The impact on GDP in the OECD countries and in the world as a whole is negligible, because of the small absolute size of the transfer.

Changes in indicators of environmental pressures described by the model: Direct effects of improved environmental sustainability in forestry, in water resource management, and in improving access to safe drinking water and improved sanitation are assumed to follow directly from the enhanced level of spending. As regards indirect effects, emissions of CO_2 are taken as a proxy for environmental pressures. Since the model simulation results in an increase of GDP, there is a derived demand for energy; this is enhanced by the portion of the spending that goes to transport. Thus, CO_2 increases in the targeted sub-regions in Africa by 3.7% by 2013 compared with the baseline. However, this is negligible at the world level (0.01%).

Eco-labelling schemes for forestry and fisheries (Table A.35)

Assumptions and rationale: As a complement to national and international legally binding measures for protecting the environment,

voluntary approaches such as eco-labelling schemes with an international reach are gaining adherents. Certification schemes for sustainable forestry and fisheries are in use, for example, but so far cover only a small percentage of production. These schemes could have unintended economic consequences such as reducing export prospects in some developing countries. In so far as the schemes enjoy some measure of support from developed countries (since they reduce the burden on environmental policy) a policy coherence perspective would suggest that consideration might be given to compensatory policy measures for those developing countries most seriously affected. In this scenario, certification systems for sustainable forestry and fishing in OECD countries are assumed to gain adherents to become (nearly) 100% effective. Protection of fisheries includes measures to deal with illegal, unregulated, and unreported (IUU) fishing practices, and to increase the extent of coastal marine reserves. These are modelled in a fairly rough manner as the equivalent of an import tariff of 10% levied on fish and on forestry products.

Economic impacts described by the model: Export volumes at the world level in 2030 for forest products and fish are lower than the baseline by 12.6% and 6%, respectively. The reductions are slightly greater for developing countries than for OECD countries. The largest impacts for exports of forest products fall on Latin America and on Asian developing countries. The impacts for exports of fish are more evenly distributed among developing countries. There is no discernible impact on GDP at the world level, nor at the level of developing countries as whole. However, the impact on sub-Saharan Africa (apart from Republic of South Africa) is to reduce GDP by 0.8% by 2030, small but much larger than for any other region.

Changes in indicators of environmental pressures described by the model: The direct effects of the simulation are to improve the environmental sustainability of fishing and forestry, although the quantitative impacts on the resources themselves are not fully captured by the model. Due to the impacts of slightly reduced levels of GDP and to the reduced demand for energy inputs in the sectors themselves, there is an indirect effect on emissions of CO_2 which by 2030 are lower than in the baseline, albeit by a negligible amount at the world level. At the regional level, the largest reductions in CO_2 emissions are in China (0.12%) and in East and West Africa (0.28%).

A tariff on oil imports (Table A.36)

Assumptions and rationale: A major objective of environmental policy in OECD countries is to stimulate a shift in demand from oil (and other fossil fuels) to alternative energy sources. Policies to achieve this could have

unintended economic consequences for developing countries by reducing their export earnings. From a policy coherence perspective, such policies might be accompanied by compensatory transfers, at least to the poorer countries among developing country oil exporters. In the scenario, it is assumed that a 20% tariff is imposed on oil imports beginning in 2006. The revenue could be used in a number of ways, including possibly to finance ODA transfers or to subsidise the cost of renewable energy; however, the revenue has not been recycled in this simulation.

Economic impacts described by the model: At the world level oil exports fall by 10% in 2030 compared with the baseline. This reduction has a significant effect on GDP which decreases in all regions, but more in developing countries than in developed ones, and, naturally, more in oil exporting regions than in others. Thus, GDP in 2030 is projected to be 1.5% lower than the baseline in the Middle East, and 1.1% lower in West and East Africa, but only 0.25% lower for developing countries as a whole, and only 0.15% lower at the world level. Effects on real household consumption are stronger than on GDP, nearly twice as large, in fact, in the case of developing countries.

Changes in indicators of environmental pressures described by the model: Environmental pressures are modelled by the change in CO_2 emissions. Substitution effects magnify the effects of slightly lower GDP and household consumption. Thus, emissions of CO_2 in 2030 are 1.15% lower than in the baseline at the world level, and are 2.5% lower in the OECD countries.

Higher labour force participation rates in OECD countries (Table A.37)

Assumptions and rationale: Policy reforms may be undertaken in OECD countries in order to deal with pressing domestic issues. From a policy coherence perspective, however, the impact of such reforms on environmental and developmental objectives should be considered as there may well be unintended consequences requiring that consideration be given to complementary policy measures to address them. In order to illustrate this type of policy coherence conundrum, in this scenario, various policy measures are assumed to be implemented in order to deal with pension financing and youth unemployment issues by maintaining OECD labour force participation rates at their current levels of 60% instead of converging to the lower level of 55% assumed in the baseline scenario. The simulation explores some of the developmental and environmental implications of such policies.

Economic impacts described by the model: By 2030, the effective labour supply in OECD countries would be nearly 6% higher than in the baseline scenario. Since an assumption of the model is that this increased labour force would be fully employed, GDP would be higher as well, by 4.8%. Since relative wages would also fall slightly, there would be enhanced competitiveness compared to developing countries, limiting the positive spill-over effects on GDP which would be confined for the most part to a few of the BRIICS countries, while the GDP of African countries would be lower than in the baseline by 1.8%. Household consumption in real terms would increase by more than GDP, but by a slightly smaller percentage than the increase in the effective labour supply.

Changes in indicators of environmental pressures described by the model: The higher levels of economic activity resulting from the increased labour inputs would lead to increases in the value added in OECD countries of environmentally sensitive industrial sectors as iron and steel (5%), electricity (3.3%), minerals including cement (3.2%), pulp, paper and publishing (4.6%) and chemicals (4.7%). Increases would be somewhat smaller at the world level, because of decreases in production elsewhere. CO_2 emissions would be higher in OECD countries by 4.8%, and at the world level by 1.9%. There would also be an increase in the effective supply of land to agriculture, by 0.4% in OECD countries, while developing countries decrease land used for agriculture. The increase in participation rates means that more consumption in OECD countries is sourced within the region – lessening the need for products, particularly agriculture, from developing countries. Environmental pressures increase slightly in OECD, but lessen elsewhere. Development assistance might need to be increased to offset the effects of deteriorating terms of trade in the poorer developing countries.

Improved macroeconomic policies in developing countries (Table A.38)

Assumptions and rationale: Developing countries are routinely given policy advice by development partners, especially though international financial institutions, on macroeconomic policy because it has become widely recognised that poor macroeconomic policy can be a strong constraint on sustaining economic growth. When such advice is taken up, however, there could be unintended environmental consequences. From a policy coherence perspective, these might then be addressed by complementary environmental policy measures in developing countries supported by their development partners. In order to illustrate this point, the scenario assumes that all developing countries/regions would put in place

minimally sound macroeconomic policies that would result in convergence to the world average rate of change of labour productivity (1.75% per year) by 2015 for all those regions exhibiting *less* than that in 2005 and then maintain that rate to 2030. Economic reform in developing countries often encompasses two distinct strands. One removes the impediments to business activity of government failure in the form of poor macroeconomic policy: excessive inflation, government spending crowding out private investment, or excessive foreign borrowing. The other track is to remove structural impediments by investing in infrastructure, reforming regulatory regimes, liberalising labour markets, etc. The first set of reforms can produce noticeable increases in GDP growth during a relatively short period of time, but these effects then taper off. This simulation explores the environmental consequences of such short to medium-term reforms.

Economic impacts described by the model: For developing countries as a whole, GDP in 2030 would be about 4.6% higher than in the baseline; however, the higher growth in developing countries does not spill over into OECD countries. The regions experiencing higher than average increases in economic activity include Latin America, especially Central America and the Caribbean, the Republic of South Africa, and the Middle East where productivity growth in the recent past has been quite low. Exports increase by more than GDP; for developing countries the increase is 4.2% by 2030 and for the world as a whole the increase is 1.5%.

Changes in indicators of environmental pressures described by the model: In the developing countries, iron and steel; electricity; pulp, paper and publishing; and chemicals all increase in percentage terms by between 3 and 4.2%. At the world level the increases are much smaller, ranging from 0.9% to 1.5%. Minerals, however, increase by only 0.9%. Associated with the increase in value added in energy-intensive industry, emissions of CO_2 in developing countries increase by 3.8% in 2030 compared with the baseline and by 1.8% at the world level. The effective supply of land to agriculture in developing countries also increases, by more than 2%. These increases in environmental pressures suggest the need for improved environmental policies to accompany the higher rates of economic growth. Development partners could well consider supporting developing countries in their efforts to make such improvements in their environmental policies.

Ambitious structural reforms adopted by developing countries (Table A.39)

Assumptions and rationale: Structural reforms in developing countries are also recommended by development partners, including the international financial institutions, with a view to improving economic performance,

above and beyond the improvements which can be brought about by relatively sound macroeconomic policies. As in the previous scenario, the additional growth that might result could give rise to unintended environmental consequences. In this scenario, for the same groups of countries targeted in the previous scenario, it is assumed that about one-half of them (in terms of size of GDP) adopt ambitious structural reforms that would boost labour productivity growth gradually to 4% between 2010 and 2020 and then maintain that rate to 2030; it is further assumed that the other half begin such a process starting in 2020, attaining the 4% rate by 2030.

Economic impacts described by the model: The increases in GDP for developing countries as a whole compared to the baseline approach 9% by 2030, with particularly strong growth occurring in the Middle East, South Africa, Brazil, Central America and the Caribbean, and other Latin America. In developing countries, increases in household consumption are slightly larger than for GDP while increases in total exports are about the same.

Changes in indicators of environmental pressures described by the model: Accompanying the increase in GDP, output of environmentally sensitive industrial categories increase as well. The categories of iron and steel and electricity increase by about 6% and 9%, respectively by 2030 compared with the baseline; minerals, including cement, increase by more than 3%, but production of pulp, paper and publishing, and of chemicals increase by more than GDP, 9 and 7%, respectively. Increases in CO_2 are substantial as well, by about 9% in developing countries and by more than 4% for the world as a whole. Land use for agriculture also increases substantially in some areas, *e.g.* in Central America by 4%, and the Other Latin America sub-regions by 7%. These increases in environmental pressure clearly point to the need for more ambitious environmental policy to accompany the policies responsible for the increase in growth. And development partners could well consider supporting developing countries in their efforts towards that end.

More ambitious environmental policies in developing countries (Table A.40)

Assumptions and rationale: The types of more ambitious environmental policies that developing countries might put in place with support from their development partners could include measures to enhance access to drinking water and improved sanitation, as well as to improve the environmental sustainability of transport. This scenario was run in order to be able to combine it with some of the others described above in the more complex scenarios of "policy packages" described below. In the scenario it is assumed that all developing country regions with per capita income of USD

5000 or more increase environmental expenditures from current levels to 1% of GDP. It is assumed that new EU countries and other non-OECD Europe move to this level immediately. It is further assumed that other Latin America and Middle East will move to this level by 2010 and hold that share constant thereafter. It is also assumed that much of the additional spending is allocated to water and wastewater treatment and to improvements in the transport sector.

Economic impacts described by the model: For developing countries as a whole, the volume of total demand for water and wastewater treatment services increases by 1.1% in 2030 compared with the baseline scenario, and that for transport increases by 0.8. This includes increases of 3%, and 5.5% in the water sector in the Middle East and Other Latin America, respectively; and more than 4% in the transport sector in these same two regions. Real household consumption in these two regions increases by 5% and 2.9%, respectively because the increased spending on the water sector and on transport is modelled as an increase in services consumed by households. The impact on total GDP in these two regions is somewhat smaller, amounting to an increase of about 0.5% because overall factor productivity does not increase much with the increased share of water and transport services in total demand. For developing countries as a whole the increase is only half as large, and change at the world level is negligible.

Changes in indicators of environmental pressures described by the model: By definition, the additional spending improves environmental outcomes in drinking water and sanitation. CO_2 emissions would increase together with the increase in transport activity in the regions receiving the additional aid, but this is a small effect at the world level.

Policy package 1: Trade liberalisation plus enhanced environmental policies in developing countries plus targeted increases in ODA for environment and infrastructure in least developed countries (Table A.41)

Assumptions and rationale: This is a combination of simulations reflected in Tables 32, 33, 34 and 40. In terms of the OECD's taxonomy of policy coherence it would be a combination of developed country "intra-country coherence" (aid plus trade), *i.e.*, type 2, and donor-recipient coherence (improved environmental policies in developing countries as a *quid pro quo*), *i.e.* type 4.

Economic impacts described by the model: The gradual removal of income support to agricultural producers and tariff reductions confined to agriculture together with higher ODA to two regions in sub-Sahara Africa

results in an increase in exports of fibre, rice, sugar, meat and meat products, and dairy products in many developing country and developed country regions (see Tables A.32 and A.33). This translates into only a small increase in overall export volumes, however (see Table A.41). By 2015 world exports are about 1.5% higher than in the baseline. Increases in GDP appear to be driven more by the increase in ODA than by trade liberalisation, as may be seen by comparing Tables A.32 and A.33 with Table A.34. Most of the increase in GDP in developing countries is concentrated in Africa and the Middle East. The largest increases are in Other Southern Africa (2.8% higher than in the baseline) and Other Africa (2.6% higher) Other Latin America and Middle East show an increase of more than 1%. However, Asian countries do not appear to benefit much, nor do countries in North Africa. Spill-over effects to OECD countries do not appear to be significant. The impact on real consumption of households is greater than that for GDP itself because some of the higher demand represented by increased spending on environmental sectors and infrastructure is satisfied with imports.

Changes in indicators of environmental pressures described by the model: The negative environmental effects are proxied by the changes in CO_2 emissions. These follow more closely the changes in household consumption than GDP because they arise mainly in the transport sector. The largest increases are in the Middle East (7.3%), Other Africa (7.4%) and Other Latin America (8.9%). Changes at the world level are much smaller (0.6% higher than in the baseline). This suggests that trade and aid which help increase GDP and consumption in developing countries should be accompanied by measures to encourage more spending in those countries on reducing the environmental impacts. Investing a portion of the "growth dividend" in environmental measures would be an appropriate policy response if supported politically.

Policy package 2: Environmental policies in developed countries with potential adverse effects on developing countries compensated by increased ODA for environment and development in the least developed countries (Table A.42)

Assumptions and rationale: This is a combination of simulations reflected in Tables 32, 35 and 36. This would be an illustration of developed country "intra-country" policy coherence (coherence between environmental objectives and development promoting objectives). Policies which are implemented for environmental purposes to promote more sustainable fishing and forestry practices and to discourage consumption of petroleum would have adverse effects on the export earnings of some developing

countries. It is assumed that these effects are counter-balanced to some extent by increases in ODA to the poorest countries.

Economic impacts described by the model: There are small decreases in overall export volumes in almost all world regions (Table A.42). The largest percentage decreases are in the two regions of sub-Sahara Africa (apart from South Africa), because the share of oil in total exports is very high. Increasing the cost of oil has small negative impacts on most developed and developing country regions (Table A.36). However, in sub-Saharan African countries, the increased aid offsets the negative effects of the tariff imposed by the OECD countries on oil imports. This is not the case in forest product exporting countries outside of Africa, although the overall negative effects on GDP are quite small. As in the previous scenario, increases in consumption are much larger than for GDP. Thus, by 2015, increases in real household consumption in Other Africa and in Other Southern Africa are higher than in the baseline by 6.6 and 9.6%, respectively.

Changes in indicators of environmental pressures described by the model: Reductions in the demand for oil lead to reductions in CO_2 emissions by nearly 1% for the world as a whole in 2015. This is because reduction of about 2% in OECD countries more than offset increases of about 5% in sub-Sahara Africa. Other regions exhibit little change.

Chapter 4

Conclusions

The effects of the simulations on macroeconomic variables appear to be very small. This is due, in part, to the fact that the policy changes simulated are themselves small relative to the size of GDP, especially at the world level. However, certain features of the model are also responsible for the small effects observed, especially in developing country regions. Sources of growth in the model are three: changes in labour inputs, changes in assumed technological progress, and movements of factors of production from sectors with lower labour productivity to sectors with higher productivity. Full employment is assumed to prevail so wages adjust to impacts on labour markets. The quantitative results presented above should thus be thought of as illustrative of directions of change and comparing the relative size of different shocks, but they probably understate the size of the economic and environmental changes that could arise from the types of polices discussed[3].

The baseline scenario describes a world with economic dynamics as usual, without reflecting any new policies. There is modest economic growth in all world regions, accompanied by increasing economic interdependence. However, gaps in per capita income between most

3. Two changes to the model might improve its relevance for examining issues related to the development of developing countries. One would consist of introducing higher and lower productivity sub-sectors in some of the traded goods categories, so that shifting production within agriculture, say, from subsistence crops to higher value added export crops would show up as having a strong effect on labour productivity. This does not seem to be the case presently, although the model does have differences in productivity across sectors, such as agriculture and manufacturing. Another change would allow for some slack in labour markets in developing countries, such that a shift in production to exports would be treated as in fact increasing the supply of labour to those sectors without reducing the level of production elsewhere.

developing and developed countries show little signs of closing – though the gap does continue to close for economies that have been growing rapidly, *e.g.* China, India, Eastern Europe, etc. Thus, for most developing countries accelerating pro-poor growth will remain the priority. Moreover, a number of other problems are not being adequately addressed in OECD countries, such as the need to increase employment (hours worked per person per year) in OECD countries, *e.g.*, to address pension financing; the need to adapt to increasing scarcity of conventional oil; the need to assist developing countries to achieve the Millennium Development Goals related to income poverty; drinking water and sanitation; protecting biodiversity; and others. Environmental quality in developing countries is projected to worsen in a number of ways, as it does at the global level, imperilling prospects for sustained economic growth in certain developing countries regions. The nine "single policy change" simulations illustrate the need for "joined-up" policies. Further trade liberalisation - unless accompanied by improved environmental policies – can increase environmental pressure in both OECD and developing countries. Measures to improve environmental outcomes taken by OECD countries can have unintended adverse consequences for growth in developing countries. Measures taken by developing countries to increase their own rates of economic growth can increase environmental pressures, unless some of the "growth dividend" is invested in environmental protection. Even measures taken to address problems seemingly not directly to economic development or environmental protection, such as improving pension fund viability by increasing work effort, can have knock-on effects that can increase environmental pressure worldwide. For these reasons, integrated policy approaches are clearly needed. Indeed, the simulation of a number of illustrative "policy reforms" undertaken simultaneously by both OECD countries and developing countries and phased in over time as policy packages suggests that some policies and policy combinations could substantially improve both economic outcomes and many environmental outcomes as suggested by the "policy coherence" paradigm.

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Annex A. Background Tables for Policy Simulations

Table A.1. Real GDP growth (percentage)

	2002-10	2010-20	2020-30
OECD	**2.8**	**2.2**	**2.0**
North America	3.6	2.5	2.3
US & Canada	3.5	2.4	2.3
Mexico	5.0	3.6	3.1
Europe	2.2	2.1	1.8
Pacific	2.0	1.8	1.3
Asia	1.9	1.7	1.2
Oceania	3.5	2.5	2.2
Transition economies and other Europe	**5.5**	**3.7**	**3.4**
Russia	5.4	3.9	3.6
Other EECCA	6.6	3.5	3.2
Other economies	4.8	3.5	3.1
Developing countries	**6.0**	**4.2**	**3.9**
East and Southeast Asia and Oceania	7.0	4.7	4.0
China	8.0	4.9	4.1
Indonesia	5.7	4.5	3.9
Other East Asia	5.3	4.3	3.7
South Asia	7.0	5.1	4.5
India	7.1	5.2	4.5
Other South Asia	6.8	4.8	4.4
Middle East	5.2	3.6	3.9
Africa	5.7	4.2	4.4
Northern Africa	5.7	4.3	4.1
Republic of South Africa	3.6	2.2	2.4
Other sub-Saharan Africa	6.6	4.9	5.3
Latin America	4.2	2.9	2.8
Brazil	3.3	2.8	2.5
Other Latin America	5.3	3.1	3.1
Central America and Caribbean	2.9	2.7	2.6
World	**3.5**	**2.7**	**2.5**
European Union (25)	2.2	2.0	1.7
BRIICS	**6.6**	**4.5**	**3.9**
ROW	**5.3**	**3.9**	**3.7**

Source: Env-Linkages/IMAGE model analysis.

Table A.2. Real GDP growth in PPP (percentage)

	2002-10	2010-20	2020-30
OECD	**2.8**	**2.4**	**2.1**
North America	3.4	2.6	2.4
US & Canada	3.5	2.5	2.3
Mexico	4.5	3.8	3.1
Europe	2.3	2.3	1.9
Pacific	2.3	2.0	1.5
Asia	2.1	1.9	1.4
Oceania	3.7	2.6	2.2
Transition economies and other Europe	**5.8**	**3.7**	**3.5**
Russia	5.5	3.9	3.7
Other EECCA	6.9	3.5	3.3
Other economies	4.9	3.5	3.1
Developing countries	**6.4**	**4.5**	**4.0**
East and Southeast Asia and Oceania	7.4	4.8	4.0
China	8.2	5.0	4.2
Indonesia	5.5	4.6	4.0
Other East Asia	5.4	4.3	3.6
South Asia	7.0	5.2	4.5
India	7.1	5.3	4.6
Other South Asia	6.7	4.9	4.5
Middle East	5.5	3.6	3.9
Africa	5.7	4.1	4.4
Northern Africa	5.7	4.4	4.2
Republic of South Africa	3.9	2.1	2.4
Other sub-Saharan Africa	6.6	4.8	5.2
Latin America	3.6	2.9	2.8
Brazil	3.3	2.8	2.6
Other Latin America	4.2	3.1	3.1
Central America & Caribbean	2.8	2.7	2.6
World	**4.4**	**3.4**	**3.1**
European Union (25)	2.1	2.1	1.8
BRIICS	**6.9**	**4.7**	**4.1**
ROW	**5.4**	**4.0**	**3.8**

Source: Env-Linkages/IMAGE model analysis.

Table A.3. TFP growth (percentage)

	2002-10	2010-20	2020-30
OECD	**1.1**	**0.9**	**0.8**
North America	1.4	0.9	0.9
US & Canada	1.4	0.9	1.0
Mexico	0.9	-0.2	-0.1
Europe	0.9	0.9	0.7
Pacific	0.8	0.8	0.7
Asia	0.7	0.8	0.7
Oceania	1.5	0.7	0.8
Transition economies and other Europe	**5.4**	**3.1**	**3.0**
Russia	5.6	3.4	3.2
Other EECCA	6.4	2.5	2.2
Other economies	4.2	2.8	3.1
Developing countries	**2.7**	**0.8**	**0.9**
East and Southeast Asia and Oceania	2.6	1.0	1.0
China	3.2	1.2	1.2
Indonesia	0.7	0.1	0.1
Other East Asia	1.7	0.7	0.7
South Asia	1.9	0.6	0.7
India	1.8	0.6	0.6
Other South Asia	2.4	0.9	1.2
Middle East	2.1	-1.0	-0.4
Africa	4.4	1.6	1.7
Northern Africa	4.8	2.0	1.4
Republic of South Africa	2.0	0.5	0.9
Other sub-Saharan Africa	5.3	1.6	2.1
Latin America	2.8	0.9	0.9
Brazil	1.8	1.0	0.8
Other Latin America	4.4	0.7	0.8
Central America and Caribbean	0.5	1.0	1.3
World	**1.5**	**0.9**	**0.9**
European Union (25)	0.8	0.9	0.8
BRIICS	**2.8**	**1.2**	**1.2**
ROW	**3.3**	**1.2**	**1.2**

Source: Env-Linkages/IMAGE model analysis.

Table A.4. Capital growth (percentage)

	2002-10	2010-20	2020-30
OECD	**3.7**	**3.6**	**3.0**
North America	4.5	3.9	3.2
US & Canada	4.5	3.7	3.1
Mexico	5.1	5.6	4.6
Europe	3.0	3.5	3.0
Pacific	3.4	3.2	2.8
Asia	3.3	3.1	2.7
Oceania	4.9	4.3	3.4
Transition economies and other Europe	**3.9**	**4.5**	**4.0**
Russia	4.1	4.9	4.4
Other EECCA	3.4	4.1	3.9
Other economies	3.8	3.9	3.2
Developing countries	**7.2**	**7.1**	**5.6**
East and Southeast Asia and Oceania	10.8	8.2	5.8
China	12.6	8.8	6.0
Indonesia	8.6	7.2	5.5
Other East Asia	7.4	6.9	5.4
South Asia	9.5	8.2	6.1
India	9.9	8.4	6.2
Other South Asia	8.3	7.3	5.7
Middle East	4.7	6.9	6.0
Africa	2.8	4.2	4.8
Northern Africa	2.1	4.0	4.9
Republic of South Africa	3.3	3.3	3.0
Other sub-Saharan Africa	3.3	4.9	5.7
Latin America	1.7	3.1	3.5
Brazil	1.9	3.0	3.4
Other Latin America	1.2	3.5	4.0
Central America and Caribbean	2.8	2.3	2.2
World	**4.4**	**4.4**	**3.8**
European Union (25)	3.0	3.4	2.9
BRIICS	**9.1**	**7.7**	**5.7**
ROW	**4.4**	**5.3**	**4.8**

Source: Env-Linkages/IMAGE model analysis.

Table A.5. Labour growth (hours worked, percentage)

	2002-10	2010-20	2020-30
OECD	**0.6**	**0.4**	**0.2**
North America	1.2	0.9	0.7
US & Canada	0.9	0.6	0.5
Mexico	2.4	1.9	1.3
Europe	0.4	0.2	0.0
Pacific	0.1	-0.2	-0.5
Asia	0.0	-0.3	-0.7
Oceania	1.0	0.7	0.4
Transition economies and other Europe	**0.2**	**-0.3**	**-0.2**
Russia	-0.2	-0.6	-0.4
Other EECCA	0.6	0.1	0.1
Other economies	0.1	-0.3	-0.4
Developing countries	**1.8**	**1.4**	**1.2**
East and Southeast Asia and Oceania	1.3	0.8	0.4
China	1.1	0.5	0.2
Indonesia	1.5	1.2	0.8
Other East Asia	1.8	1.3	0.9
South Asia	2.2	1.8	1.4
India	2.0	1.6	1.3
Other South Asia	2.7	2.2	1.9
Middle East	3.1	2.5	2.3
Africa	2.7	2.6	2.5
Northern Africa	2.5	2.0	1.9
Republic of South Africa	0.8	0.6	0.5
Other sub-Saharan Africa	2.9	2.8	2.8
Latin America	1.8	1.5	1.1
Brazil	1.5	1.3	1.0
Other Latin America	1.9	1.6	1.2
Central America and Caribbean	2.0	1.6	1.3
World	**1.5**	**1.2**	**1.0**
European Union (25)	0.2	-0.1	-0.2
BRIICS	**1.4**	**1.0**	**0.7**
ROW	**2.1**	**1.8**	**1.7**

Source: Env-Linkages/IMAGE model analysis.

Table A.6. Investment share (percentage)

	2005	2030
OECD	**22**	**26**
North America	21	22
US & Canada	20	21
Mexico	26	33
Europe	21	28
Pacific	27	34
Asia	27	35
Oceania	24	28
Transition economies and other Europe	**20**	**26**
Russia	20	29
Other EECCA	15	20
Other economies	24	24
Developing countries	**28**	**38**
East and Southeast Asia and Oceania	40	49
China	46	54
Indonesia	30	35
Other East Asia	31	40
South Asia	31	38
India	32	40
Other South Asia	28	32
Middle East	15	36
Africa	17	22
Northern Africa	15	22
Republic of South Africa	23	25
Other sub-Saharan Africa	15	21
Latin America	14	18
Brazil	16	22
Other Latin America	11	17
Central America & Caribbean	18	15
World	**23**	**29**
European Union (25)	21	27
BRIICS	**35**	**44**
ROW	**21**	**27**

Source: Env-Linkages/IMAGE model analysis.

Table A.7. Regional distribution of GDP (percentage)

	2005	2030
OECD	**54.8**	**42.0**
North America	23.9	19.8
US & Canada	22.1	17.8
Mexico	1.8	2.0
Europe	21.5	15.9
Pacific	9.3	6.3
Asia	8.1	5.3
Oceania	1.2	1.0
Transition economies and other Europe	**4.7**	**5.1**
Russia	2.6	2.9
Other EECCA	1.2	1.3
Other economies	0.9	0.9
Developing countries	**40.5**	**52.9**
East and Southeast Asia and Oceania	20.0	27.7
China	14.0	20.3
Indonesia	1.5	1.9
Other East Asia	4.6	5.4
South Asia	7.9	11.9
India	6.3	9.5
Other South Asia	1.6	2.3
Middle East	2.4	2.7
Africa	4.0	5.2
Northern Africa	1.3	1.7
Republic of South Africa	0.9	0.7
Other sub-Saharan Africa	1.7	2.7
Latin America	6.2	5.6
Brazil	2.6	2.2
Other Latin America	2.6	2.5
Central America and Caribbean	0.9	0.8
World	**100.0**	**100.0**
European Union (25)	20.1	14.2
BRIICS	**27.9**	**37.7**
ROW	**14.9**	**17.7**

Source: Env-Linkages/IMAGE model analysis.

Table A.8. GDP per capita (USD 1 000 PPP 2001)

	2005	2030
OECD	**31 006**	**48 272**
North America	36 036	55 634
US & Canada	37 583	58 470
Mexico	9 518	19 137
Europe	26 139	40 642
Pacific	27 441	40 439
Asia	27 318	40 000
Oceania	28 732	43 956
Transition economies and other Europe	**8 926**	**25 909**
Russia	10 164	30 434
Other EECCA	4 951	12 317
Other economies	9 238	25 932
Developing countries	**6 815**	**16 266**
East and Southeast Asia and Oceania	7 913	22 949
China	5 897	18 200
Indonesia	3 660	9 059
Other East Asia	12 553	36 684
South Asia	2 992	7 812
India	3 188	8 580
Other South Asia	2 337	5 138
Middle East	6 908	11 701
Africa	4 692	8 086
Northern Africa	4 874	10 468
Republic of South Africa	10 914	19 751
Other sub-Saharan Africa	1 392	3 022
Latin America	7 605	12 422
Brazil	7 856	12 373
Other Latin America	7 717	13 178
Central America and Caribbean	6 702	9 948
World	**25 809**	**38 537**
European Union (25)	26 141	41 253
BRIICS	**6 259**	**16 489**
ROW	**7 979**	**19 316**

Source: Env-Linkages/IMAGE model analysis.

Table A.9. GDP per capita growth (percentage)

	2002-10	2010-20	2020-30
OECD	**2.2**	**1.9**	**1.7**
North America	2.7	1.9	1.8
US & Canada	2.6	1.8	1.8
Mexico	3.7	3.0	2.6
Europe	1.7	1.8	1.6
Pacific	1.8	1.9	1.7
Asia	1.7	1.9	1.7
Oceania	2.9	1.8	1.6
Transition economies and other Europe	**6.3**	**4.4**	**4.2**
Russia	6.4	4.7	4.6
Other EECCA	7.1	3.7	3.6
Other economies	5.5	4.1	3.9
Developing countries	**5.0**	**3.5**	**3.4**
East and Southeast Asia and Oceania	6.7	4.4	4.0
China	8.0	4.8	4.3
Indonesia	4.7	4.0	3.6
Other East Asia	4.6	3.8	3.5
South Asia	5.7	4.1	3.7
India	5.9	4.3	3.9
Other South Asia	4.9	3.2	3.1
Middle East	3.5	1.8	2.5
Africa	4.2	2.9	3.3
Northern Africa	4.3	3.1	3.3
Republic of South Africa	3.6	2.3	2.6
Other sub-Saharan Africa	4.4	2.8	3.5
Latin America	2.4	1.9	2.1
Brazil	2.1	1.9	2.0
Other Latin America	2.9	2.0	2.3
Central America and Caribbean	1.5	1.6	1.8
World	**2.8**	**2.3**	**2.2**
European Union (25)	2.0	2.1	1.9
BRIICS	**6.3**	**4.2**	**3.9**
ROW	**4.1**	**3.1**	**3.1**

Source: Env-Linkages/IMAGE model analysis.

Table A.10. Import to GDP ratio (percentage)

	2005	2030
OECD	**20**	**26**
North America	17	20
US & Canada	16	19
Mexico	26	33
Europe	27	34
Pacific	17	26
Asia	15	25
Oceania	28	37
Transition economies and other Europe	**39**	**43**
Russia	21	21
Other EECCA	58	68
Other economies	62	74
Developing countries	**40**	**50**
East and Southeast Asia and Oceania	55	67
China	48	59
Indonesia	27	27
Other East Asia	73	92
South Asia	20	25
India	20	27
Other South Asia	19	19
Middle East	44	61
Africa	33	37
Northern Africa	31	36
Republic of South Africa	26	31
Other sub-Saharan Africa	37	39
Latin America	21	25
Brazil	14	16
Other Latin America	20	25
Central America and Caribbean	40	45
World	**24**	**33**
European Union (25)	37	48
BRIICS	**34**	**43**
ROW	**45**	**55**

Source: ENV-Linkages/IMAGE model analysis.

Table A.11. Regional composition of world exports of capital goods (percentage)

	2005	2030
OECD	**68.1**	**58.1**
North America	18.7	19.1
US & Canada	15.9	16.1
Mexico	2.8	3.0
Europe	35.5	27.4
Pacific	13.9	11.6
Asia	13.2	10.9
Oceania	0.7	0.7
Transition economies and other Europe	**2.7**	**3.3**
Russia	1.1	1.3
Other EECCA	0.7	0.8
Other economies	1.0	1.2
Developing countries	**29.2**	**38.6**
East and Southeast Asia and Oceania	21.8	29.8
China	11.4	16.7
Indonesia	0.6	0.7
Other East Asia	9.8	12.4
South Asia	1.4	2.6
India	1.0	1.9
Other South Asia	0.4	0.7
Middle East	1.9	1.9
Africa	1.5	1.9
Northern Africa	0.6	0.7
Republic of South Africa	0.4	0.4
Other sub-Saharan Africa	0.4	0.8
Latin America	2.6	2.3
Brazil	0.9	0.7
Other Latin America	0.8	0.9
Central America and Caribbean	0.8	0.6
World	**100.0**	**100.0**
European Union (25)	33.9	25.7
BRIICS	**15.5**	**21.8**
ROW	**14.5**	**18.2**

Source: Env-Linkages/IMAGE model analysis.

Table A.12. Regional composition of world imports of capital goods (percentage)

	2005	2030
OECD	**69.3**	**60.5**
North America	26.6	22.7
US & Canada	24.0	19.9
Mexico	2.6	2.8
Europe	34.3	29.6
Pacific	8.4	8.3
Asia	7.1	7.1
Oceania	1.3	1.2
Transition economies and other Europe	**2.5**	**2.7**
Russia	0.7	0.7
Other EECCA	0.5	0.8
Other economies	1.2	1.2
Developing countries	**28.2**	**36.8**
East and Southeast Asia and Oceania	18.9	24.9
China	9.7	14.0
Indonesia	0.6	0.7
Other East Asia	8.6	10.2
South Asia	1.7	2.5
India	1.2	1.9
Other South Asia	0.5	0.6
Middle East	2.5	3.5
Africa	2.2	2.8
Northern Africa	0.8	1.1
Republic of South Africa	0.5	0.5
Other sub-Saharan Africa	0.9	1.2
Latin America	3.0	3.1
Brazil	0.7	0.8
Other Latin America	1.2	1.4
Central America and Caribbean	1.1	0.9
World	**100.0**	**100.0**
European Union (25)	32.2	27.6
BRIICS	**13.5**	**18.6**
ROW	**14.8**	**17.4**

Source: Env-Linkages/IMAGE model analysis.

Table A.13. Regional composition of world output of agriculture and food (percentage)

	2005	2030
OECD	**56.9**	**47.7**
North America	24.6	21.8
US & Canada	21.6	19.5
Mexico	2.9	2.2
Europe	22.4	18.1
Pacific	10.0	7.8
Asia	8.3	6.2
Oceania	1.6	1.6
Transition economies and other Europe	**8.6**	**11.4**
Russia	1.6	2.2
Other EECCA	4.9	6.8
Other economies	2.2	2.4
Developing countries	**34.4**	**41.0**
East and Southeast Asia and Oceania	15.2	18.4
China	10.3	13.1
Indonesia	1.3	1.6
Other East Asia	3.6	3.7
South Asia	6.0	6.5
India	4.3	4.6
Other South Asia	1.7	1.8
Middle East	1.6	1.8
Africa	4.6	6.5
Northern Africa	1.7	2.4
Republic of South Africa	0.6	0.6
Other sub-Saharan Africa	2.3	3.5
Latin America	7.0	7.8
Brazil	2.2	2.4
Other Latin America	3.6	4.2
Central America and Caribbean	1.2	1.2
World	**100.0**	**100.0**
European Union (25)	21.0	16.8
BRIICS	**20.3**	**24.5**
ROW	**21.1**	**26.0**

Source: Env-Linkages/IMAGE model analysis.

Table A.14. Regional composition of world output of fossil fuels excluding refined petroleum products (percentage)

	2005	2030
OECD	**38.9**	**29.8**
North America	25.4	19.9
US & Canada	22.2	16.4
Mexico	3.2	3.5
Europe	11.1	7.9
Pacific	2.4	2.0
Asia	0.2	0.1
Oceania	2.2	1.8
Transition economies and other Europe	**14.7**	**17.4**
Russia	10.4	11.2
Other EECCA	3.5	5.3
Other economies	0.8	0.8
Developing countries	**46.4**	**52.8**
East and Southeast Asia and Oceania	8.8	10.4
China	4.4	5.3
Indonesia	2.7	3.2
Other East Asia	1.7	1.9
South Asia	1.5	1.7
India	1.1	1.2
Other South Asia	0.4	0.5
Middle East	22.2	25.0
Africa	8.0	10.2
Northern Africa	3.4	4.2
Republic of South Africa	1.2	1.1
Other sub-Saharan Africa	3.4	4.9
Latin America	5.9	5.6
Brazil	0.8	0.6
Other Latin America	4.9	4.8
Central America and Caribbean	0.2	0.2
World	**100.0**	**100.0**
European Union (25)	8.1	6.2
BRIICS	**20.7**	**22.6**
ROW	**18.2**	**22.7**

Source: Env-Linkages/IMAGE model analysis.

Table A.15. Regional composition of world output of capital goods (percentage)

	2005	2030
OECD	**70.5**	**58.7**
North America	27.7	24.3
US & Canada	25.5	22.0
Mexico	2.2	2.2
Europe	26.6	20.9
Pacific	16.3	13.5
Asia	15.6	12.9
Oceania	0.7	0.6
Transition economies and other Europe	**3.9**	**5.1**
Russia	1.0	1.6
Other EECCA	1.9	2.4
Other economies	1.0	1.1
Developing countries	**25.6**	**36.2**
East and Southeast Asia and Oceania	18.3	26.9
China	12.4	19.0
Indonesia	0.6	0.8
Other East Asia	5.4	7.1
South Asia	2.2	3.5
India	1.7	2.6
Other South Asia	0.5	0.9
Middle East	1.0	1.0
Africa	1.3	1.9
Northern Africa	0.5	0.7
Republic of South Africa	0.4	0.4
Other sub-Saharan Africa	0.4	0.7
Latin America	2.8	2.9
Brazil	1.3	1.3
Other Latin America	0.9	1.1
Central America and Caribbean	0.6	0.5
World	**100.0**	**100.0**
European Union (25)	25.2	19.4
BRIICS	**17.4**	**25.8**
ROW	**11.1**	**14.5**

Source: Env-Linkages/IMAGE model analysis.

Table A.16. Regional composition of world output of services (percentage)

	2005	2030
OECD	**82.5**	**75.2**
North America	40.1	37.9
US & Canada	38.6	36.3
Mexico	1.5	1.6
Europe	26.9	24.7
Pacific	15.5	12.6
Asia	14.0	11.1
Oceania	1.5	1.6
Transition economies and other Europe	**2.1**	**2.8**
Russia	0.8	1.4
Other EECCA	0.6	0.7
Other economies	0.6	0.7
Developing countries	**15.5**	**22.0**
East and Southeast Asia and Oceania	7.8	12.1
China	4.8	7.7
Indonesia	0.4	0.6
Other East Asia	2.6	3.8
South Asia	1.7	2.5
India	1.3	1.9
Other South Asia	0.4	0.6
Middle East	1.4	1.7
Africa	1.4	2.0
Northern Africa	0.6	0.9
Republic of South Africa	0.4	0.4
Other sub-Saharan Africa	0.5	0.7
Latin America	3.1	3.6
Brazil	1.2	1.3
Other Latin America	1.4	1.8
Central America and Caribbean	0.5	0.6
World	**100.0**	**100.0**
European Union (25)	25.3	23.0
BRIICS	**8.8**	**13.2**
ROW	**7.3**	**9.8**

Source: Env-Linkages/IMAGE model analysis.

Table A.17. Exports minus imports in agriculture and food processing (USD millions)

	2005	2030
OECD	**-87 035**	**-62 771**
North America	9 002	30 614
US & Canada	14 018	37 444
Mexico	-5 017	-6 830
Europe	-42 067	-28 189
Pacific	-53 970	-65 196
Asia	-78 969	-113 934
Oceania	24 999	48 738
Transition economies and other Europe	**-14 338**	**-30 323**
Russia	-8 159	-20 050
Other EECCA	414	865
Other economies	-6 593	-11 138
Developing countries	**-463**	**-86 138**
East and Southeast Asia and Oceania	-28 222	-94 313
China	-26 124	-77 646
Indonesia	1 388	-82
Other East Asia	-3 486	-16 584
South Asia	-7 189	-12 316
India	-3 568	-11 080
Other South Asia	-3 621	-1 236
Middle East	-17 164	-52 709
Africa	1 773	-12 926
Northern Africa	-7 333	-23 435
Republic of South Africa	1 006	2 269
Other sub-Saharan Africa	8 100	8 241
Latin America	50 339	86 126
Brazil	17 347	30 755
Other Latin America	31 303	51 959
Central America & Caribbean	1 689	3 412
World	**-101 836**	**-179 231**
European Union (25)	-40 130	-22 246
BRIICS	**-18 110**	**-75 835**
ROW	**20 473**	**12 083**

Source: Env-Linkages/IMAGE model analysis.

Table A.18. Exports minus imports of fossil fuels, excluding refined petroleum products (USD millions)

	2005	2030
OECD	**67 911**	**225 336**
North America	7 925	6 401
US & Canada	7 624	5 609
Mexico	301	793
Europe	-30 235	-6 714
Pacific	90 221	225 648
Asia	85 756	221 617
Oceania	4 465	4 031
Transition economies and other Europe	**-5 180**	**-15 323**
Russia	2 401	-839
Other EECCA	-1 385	-2 204
Other economies	-6 196	-12 280
Developing countries	**25 483**	**-25 414**
East and Southeast Asia and Oceania	-18 762	-53 933
China	-4 220	-15 637
Indonesia	-704	-1 409
Other East Asia	-13 838	-36 887
South Asia	-1 274	-10 505
India	-6 835	-18 765
Other South Asia	5 562	8 260
Middle East	3 626	-2 322
Africa	44 772	47 391
Northern Africa	19 230	18 012
Republic of South Africa	-119	-168
Other sub-Saharan Africa	25 661	29 547
Latin America	-2 879	-6 046
Brazil	-5 007	-11 075
Other Latin America	4 934	10 645
Central America & Caribbean	-2 805	-5 616
World	**88 213**	**184 598**
European Union (25)	-55 242	-80 793
BRIICS	**-14 484**	**-47 892**
ROW	**31 161**	**9 477**

Source: Env-Linkages/IMAGE model analysis.

Table A.19. Regional composition of world energy-intensive industrial outputs (percentage)

	2005	2030
OECD	**74.3**	**63.4**
North America	29.3	26.1
US & Canada	27.2	23.9
Mexico	2.1	2.2
Europe	29.2	23.1
Pacific	15.8	14.1
Asia	14.9	13.3
Oceania	0.9	0.8
Transition economies and other Europe	**3.5**	**4.9**
Russia	0.7	1.4
Other EECCA	1.9	2.4
Other economies	0.9	1.1
Developing countries	**22.1**	**31.8**
East and Southeast Asia and Oceania	14.6	22.8
China	9.7	16.1
Indonesia	0.5	0.8
Other East Asia	4.4	5.9
South Asia	1.9	2.9
India	1.5	2.2
Other South Asia	0.4	0.7
Middle East	0.9	1.1
Africa	1.4	1.8
Northern Africa	0.6	0.8
Republic of South Africa	0.4	0.5
Other sub-Saharan Africa	0.4	0.6
Latin America	3.3	3.2
Brazil	1.4	1.4
Other Latin America	1.3	1.3
Central America & Caribbean	0.6	0.5
World	**100.0**	**100.0**
European Union (25)	27.7	21.6
BRIICS	**14.3**	**22.4**
ROW	**10.4**	**13.2**

Source: Env-Linkages/IMAGE model analysis

Table A.20. Use of coal to produce electricity (PJ)

	2005	2030
OECD	**44 862**	**62 284**
North America	26 661	37 128
Canada	1 071	1 231
USA	25 272	35 428
Mexico	319	469
Europe	12 503	16 472
Other OECD Europe	6 593	9 819
Eastern Europe	5 209	5 410
Turkey	701	1 243
Pacific	5 699	8 684
Asia	3 826	6 250
Oceania	1 873	2 434
Other developed and transition economies	**9 683**	**8 001**
Russian Federation	7 433	6 321
EECCA countries	4 500	3 360
ECA	2 250	1 680
Ukraine +	1 457	1 328
Asia-Stan	793	352
Developing countries	**31 963**	**77 355**
East and Southeast Asia and Oceania	22 045	54 611
China +	20 889	46 488
Indonesia +	866	2 683
South East Asia	1 290	5 440
South Asia	5 653	14 894
India	5 609	14 145
Rest of S. Asia	44	748
Middle East	447	1 348
Africa	2 366	5 883
Northern Africa	101	432
Sub-Saharan Africa	2 265	5 451
Western Africa	5	79
Eastern Africa	1	314
Republic of South Africa	2 131	3 643
Rest of Southern Africa	128	1 415
Latin America	453	619
Brazil	134	294
Rest South America	303	250
Rest Central America	16	75
World	**86 509**	**14 7 640**
BRIC	**34 065**	**67 248**
ROW	**7 581**	**18 107**

Source: Env-Linkages/IMAGE model analysis.

Table A.21. Total GHG emissions from energy and transport (1 000 Pg C-eq)

	2005	2030
OECD	**3 967**	**4 557**
North America	1 973	2 492
US & Canada	1 872	2 309
Mexico	101	183
Europe	1 342	1 642
Pacific	652	746
Asia	541	594
Oceania	111	152
Other developed & transition countries	**1 156**	**895**
Russia Federation	877	610
EECCA countries	271	285
Developing countries	**2 900**	**5 963**
East and Southeast Asia and Oceania	1 632	3 157
China +	1 341	2 482
Indonesia	97	233
Other East and Southeast Asia	194	442
South Asia	383	918
Middle East	336	680
Africa	268	659
Northern Africa	95	227
Sub-Saharan Africa	173	432
Western Africa	45	147
Eastern Africa	10	46
Southern Africa	118	239
Latin America	281	549
Brazil	99	199
Rest South America	146	291
Rest Central America	36	59
World	**7 745**	**11 736**
BRIC	**2 429**	**4 209**
ROW	**1 349**	**2 647**

Source: Env-Linkages/IMAGE model analysis.

Table A.22. Energy-related CO_2 emissions per capita (tonnes of C-eq)

	2005	2030
OECD	**3.17**	**3.57**
North America	4.60	4.77
Canada	4.66	4.23
USA	5.89	6.06
Mexico	0.96	1.41
Europe	2.24	2.64
Western Europe	2.51	2.81
Eastern Europe	2.16	2.70
Turkey	0.97	1.86
Pacific	2.92	3.31
Asia	2.73	3.06
Japan	2.77	2.81
Korea	2.67	3.49
Oceania	4.45	4.93
Other developed & transition countries	**3.05**	**3.33**
Russia +	3.70	4.26
EECCA countries	2.18	2.27
Ukraine +	2.46	2.34
Central Asia	1.89	2.20
Developing countries	**0.59**	**0.90**
East and Southeast Asia and Oceania	0.86	1.46
China +	1.01	1.70
Indonesia	0.42	0.84
Other East and Southeast Asia	0.58	1.04
South Asia	0.26	0.45
India	0.30	0.54
Rest of S. Asia	0.13	0.24
Middle East	1.72	2.25
Africa	0.28	0.43
Northern Africa	0.58	1.00
Sub-Saharan Africa	0.22	0.33
Western Africa	0.12	0.23
Eastern Africa	0.04	0.12
South Africa	2.11	3.14
Rest of South Africa	0.11	0.37
Latin America	0.63	0.96
Brazil	0.55	0.89
Rest South America	0.79	1.19
Rest Central America	0.45	0.56
World	**1.19**	**1.42**
BRIC	**0.86**	**1.25**
ROW	**0.56**	**0.78**

Source: Env-Linkages/IMAGE model analysis.

Table A.23. Total crop area (billions km^2)

	2005	2030
OECD	**13.57**	**14.10**
North America	6.00	6.22
Europe	2.65	2.77
Pacific	4.92	5.11
Asia	.10	.09
Oceania	4.82	5.02
Other developed & transition countries	**5.72**	**6.22**
Russian Federation	2.48	2.85
EECCA countries	3.24	3.37
Developing countries	**31.45**	**35.26**
East and Southeast Asia & Oceania	8.14	8.55
China +	6.88	6.95
Other East and Southeast Asia	1.26	1.60
South Asia	2.89	3.60
Middle East	1.66	1.65
Africa	11.70	13.82
Latin America	7.06	7.64
Brazil	2.75	2.96
Other Latin America	4.31	4.68
World	**50.75**	**55.58**
BRIC	**15.00**	**16.36**
ROW	**22.18**	**25.12**

Source: Env-Linkages/IMAGE model analysis.

Table A.24. Total GHG emissions from agriculture and land-use change (Pg C-eq)

	2005	2030
OECD	**0.62**	**0.76**
North America	0.32	0.38
US & Canada	0.25	0.33
Mexico	0.07	0.05
Europe	0.17	0.24
Pacific	0.13	0.14
Asia	0.03	0.03
Oceania	0.10	0.11
Other developed and transition countries	**0.07**	**0.17**
Russian Federation	0.04	0.10
EECCA countries	0.03	0.06
Developing countries	**3.07**	**2.91**
East and Southeast Asia and Oceania	0.97	0.77
China +	0.53	0.44
Indonesia	0.21	0.16
Other East and Southeast Asia	0.23	0.17
South Asia	0.58	0.63
Middle East	0.04	0.06
Africa	0.77	0.97
Northern Africa	0.03	0.04
Sub-Saharan Africa	0.74	0.93
Western Africa	0.21	0.42
Eastern Africa	0.20	0.30
Southern Africa	0.33	0.21
Latin America	0.71	0.48
Brazil	0.30	0.23
Rest South America	0.36	0.23
Rest Central America	0.05	0.02
World	**3.73**	**3.82**
BRIC	**1.45**	**1.40**
ROW	**1.67**	**1.66**

Source: Env-Linkages/IMAGE model analysis.

Table A.25. Total anthropogenic GHG emissions (Gt C-eq)

	2005	2030
OECD	**5.1**	**6.3**
North America	2.6	3.2
US & Canada	2.4	3.0
Mexico	0.2	0.3
Europe	1.7	2.1
Pacific	0.9	1.0
Asia	0.7	0.7
Oceania	0.2	0.3
Other developed & transition countries	**1.2**	**1.3**
Russian Federation	0.8	0.9
EECCA countries	0.4	0.4
Developing countries	**6.5**	**10.0**
East and Southeast Asia and Oceania	2.9	4.4
China +	2.1	3.3
Indonesia	0.3	0.4
Other East and Southeast Asia	0.5	0.7
South Asia	1.0	1.7
Middle East	0.5	0.9
Africa	1.1	1.8
Northern Africa	0.1	0.3
Sub-Saharan Africa	1.0	1.5
Western Africa	0.3	0.6
Eastern Africa	0.2	0.4
Southern Africa	0.5	0.5
Latin America	1.0	1.2
Brazil	0.4	0.5
Rest South America	0.5	0.6
Rest Central America	0.1	0.1
World	**12.8**	**17.5**
BRIC	**4.3**	**6.4**
ROW	**3.4**	**4.8**

Source: Env-Linkages/IMAGE model analysis.

Table A.26. Total SO_x (Mt sulfur)

	2005	2030
OECD	**19.36**	**13.07**
North America	7.15	6.70
US & Canada	6.33	6.30
Mexico	0.82	0.40
Europe	9.32	4.68
Pacific	2.88	1.70
Asia	2.38	1.43
Oceania	0.50	0.27
Other developed & transition countries	**5.35**	**1.82**
Russian Federation	3.61	1.13
EECCA countries	1.74	0.69
Developing countries	**29.83**	**39.86**
East and Southeast Asia and Oceania	17.94	20.82
China +	14.05	12.47
Indonesia	0.75	1.68
Other East and Southeast Asia	3.14	6.67
South Asia	4.76	8.73
India	4.10	7.88
Rest of South Asia	0.66	0.85
Middle East	2.14	2.99
Africa	2.68	4.77
Northern Africa	0.85	1.10
Sub-Saharan Africa	1.83	3.67
Western Africa	0.27	0.58
Eastern Africa	0.19	0.51
South Africa	1.23	1.78
Rest Southern Africa	0.14	0.80
Latin America	2.31	2.55
Brazil	0.93	1.16
Rest South America	0.90	0.95
Rest Central America	0.48	0.44
World	**54.54**	**54.79**
BRIC	**22.69**	**22.64**
ROW	**12.49**	**19.08**

Source: Env-Linkages/IMAGE model analysis.

Table A.27. Total NO_x (Mt N)

	2005	2030
OECD	**11.55**	**7.43**
North America	6.17	4.01
US & Canada	5.84	3.72
Mexico	0.43	0.29
Europe	4.65	2.40
Pacific	1.64	1.02
Asia	1.19	0.72
Oceania	0.45	0.30
Other developed & transition countries	**2.95**	**1.76**
Russian Federation	2.05	1.04
EECCA countries	0.90	0.72
Developing countries	**13.05**	**17.99**
East and Southeast Asia and Oceania	6.38	7.28
China +	4.93	4.85
Indonesia	0.49	0.87
Other East and Southeast Asia	0.96	1.56
South Asia	2.28	4.33
India	1.91	3.37
Rest of South Asia	0.37	0.96
Middle East	1.25	1.61
Africa	1.59	3.12
Northern Africa	0.46	0.78
Sub-Saharan Africa	1.13	2.34
Western Africa	0.29	0.78
Eastern Africa	0.20	0.50
South Africa	0.50	0.59
Rest Southern Africa	0.14	0.47
Latin America	1.56	1.64
Brazil	0.64	0.63
Rest South America	0.70	0.77
Rest Central America	0.22	0.24
World	**27.55**	**27.19**
BRIC	**9.61**	**12.32**
ROW	**6.39**	**7.44**

Source: Env-Linkages/IMAGE model analysis.

Table A.28. River nitrogen transport (1 000 Gg/yr)

	2000	2030
OECD	**12.8**	**12.1**
North America	6.1	5.8
Europe	4.7	4.5
Pacific	2.0	1.8
Asia	1.3	1.1
Oceania	0.7	0.7
Other developed and transition countries	**3.9**	**2.9**
Russian Federation	3.3	2.5
EECCA+	0.6	0.4
Developing countries	**36.6**	**40.3**
East and Southeast Asia & Oceania	12.9	14.5
China +	8.0	9.3
Other East and Southeast Asia	4.9	5.2
South Asia	4.0	5.7
Middle East	0.4	0.6
Africa	8.3	8.0
Latin America	11.0	11.5
Brazil	6.6	6.8
Other Latin America	4.4	4.7
World	**53.3**	**55.3**
BRIC	**21.9**	**24.3**
ROW	**18.6**	**18.9**

Source: Env-Linkages/IMAGE model analysis.

Table A.29. Land subject to high risk of water erosion (1 000 billion km^2)

	2005	2030
OECD	6 212.3	7 085.1
North America	4 096.7	4 760.7
US & Canada	3 270.0	3 843.2
Mexico	826.7	917.5
Europe	1 374.9	1 540.5
Pacific	740.7	783.9
Asia	114.8	98.2
Oceania	625.9	685.7
Other developed & transition countries	**226.3**	**311.7**
Russian Federation	172.9	271.8
EECCA countries	53.4	39.9
Developing countries	15 103.5	19 304.8
East and Southeast Asia and Oceania	**4 008.2**	**4 960.7**
China	2 777.0	3 383.2
Indonesia	511.7	715.1
Other East and Southeast Asia	719.5	862.4
South Asia	2 824.3	3 527.6
Middle East	207.3	212.7
Africa	5 502.4	7 269.0
Northern Africa	134.4	124.3
Sub-Saharan Africa	5 368.0	7 144.7
Western Africa	2 587.1	3 250.8
Eastern Africa	1 492.2	2 067.6
Southern Africa	1 288.7	1 826.3
Latin America	2 561.3	3 334.8
Brazil	837.9	1 130.5
Other Latin America	1 336.0	1 830.7
Central America and the Caribbean	387.4	373.6
World	**21 542.2**	**26 701.6**
BRIC	**6 612.2**	**8 313.1**
ROW	**8 717.7**	**11 303.4**

Source: Env-Linkages/IMAGE model analysis.

Table A.30. Remaining natural forest cover (1 000 km^2)

	2005	2030
OECD	**10 863**	**10 072**
North America	7 896	7 388
Canada	5 184	4 963
USA	2 352	2 102
Mexico	360	323
Europe	1 768	1 645
Pacific	1 199	1 039
Asia	409	384
Oceania	790	655
Other developed & transition countries	**11 652**	**11 131**
Russia Federation	11 390	10 944
EECCA countries	262	187
Developing countries	**17 265**	**14 376**
East and Southeast Asia and Oceania	4 102	3 448
China +	1 057	757
Indonesia	1 748	1 557
Other East and Southeast Asia	1 297	1 134
South Asia	580	169
Middle East	0	0
Africa	4 691	3 442
Northern Africa	1	1
Sub-Saharan Africa	4 690	3 441
Western Africa	3 112	2 702
Eastern Africa	587	253
Southern Africa	991	487
Latin America	7 892	7 317
Brazil	4 394	4 216
Rest South America	3 224	2 834
Rest Central America	274	267
World	**39 780**	**35 579**
BRIC	**14 421**	**16 086**
ROW	**14 496**	**9 421**

Source: Env-Linkages/IMAGE model analysis.

Table A.31. Remaining biodiversity (percentage of original)

	2000	2030
OECD	**70.6**	**64.5**
North America	74.5	68.8
Canada	88.1	83.3
USA	62.4	56.3
Mexico	65.9	57.2
Greenland	97.6	97.6
Europe	47.8	39.7
Western Europe	49.3	43.9
Central Europe	41.7	35.1
Turkey	51.2	27.4
Pacific	n.a.	n.a.
Asia	56.5	46.4
Japan	53.4	46.5
Korea	61.8	46.2
Oceania	78.0	72.9
Other developed & transition countries	**n.a.**	**n.a.**
Russian Federation	83.1	77.8
EECCA countries	61.6	54.9
Ukraine +	36.0	30.7
Central Asia	67.2	60.1
Developing countries	**n.a.**	**n.a.**
East and Southeast Asia and Oceania	n.a.	n.a.
China	64.0	57.5
Indonesia	71.1	57.8
Other East and Southeast Asia	57.8	44.2
South Asia	50.0	29.8
Middle East	80.7	77.6
Africa	77.2	68.0
Northern Africa.	85.3	82.9
Sub-Saharan Africa	n.a.	n.a.
Western Africa	77.9	68.2
Eastern Africa	72.8	61.7
Southern Africa	73.2	60.4
Latin America	n.a.	n.a.
Brazil	74.6	68.8
Rest South America	72.6	65.6
Central America	58.8	50.8
World	**73.0**	**65.6**
BRIC	**72.3**	**64.7**
ROW	**74.1**	**65.6**

Source: Env-Linkages/IMAGE model analysis.

Table A.32. Policy simulation 1: reduced support to agricultural producers in OECD countries

Percentage difference from baseline in 2030

	GDP	Household consumption	Export volume	Land Use	CO_2
OECD	**0.00**	**0.00**	**-0.01**	**-0.29**	**-0.02**
North America	0.00	0.00	-0.02	-0.63	-0.03
US & Canada	0.00	0.00	-0.02	-0.82	-0.03
Mexico	-0.01	-0.03	-0.01	0.29	-0.01
Europe	0.00	0.00	-0.01	-0.11	-0.01
Pacific	-0.02	-0.03	-0.02	0.07	-0.01
Asia	-0.02	-0.04	-0.01	0.95	-0.01
Oceania	0.00	0.01	-0.02	0.06	0.00
Other developed & transition countries	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**
Russian Federation	0.00	0.00	0.00	0.01	0.00
EECCA and other countries	0.00	-0.01	0.00	0.03	0.00
Developing countries	**0.00**	**0.00**	**-0.02**	**0.13**	**0.00**
East and Southeast Asia and Oceania	0.00	0.00	-0.02	0.15	0.00
China	0.00	-0.01	-0.01	0.02	0.00
Indonesia	-0.01	-0.02	0.00	0.03	-0.02
Other East and Southeast Asia	0.01	0.01	-0.03	0.54	0.00
India	0.00	0.00	-0.05	0.18	-0.02
Other South Asia	-0.02	-0.02	-0.07	0.16	0.03
Middle East	0.00	0.00	0.00	0.07	0.00
Africa	0.01	0.01	0.02	0.12	0.01
Northern Africa	0.00	0.00	0.00	0.03	0.00
Sub-Saharan Africa	0.01	0.01	0.03	0.12	0.01
Other Africa	0.02	0.02	0.05	0.16	0.02
South Africa	0.00	0.01	0.00	0.02	0.00
Other Southern Africa	0.01	0.00	0.02	0.09	0.03
Latin America	0.00	0.00	-0.02	0.12	0.01
Brazil	0.00	0.00	0.01	0.05	0.00
Other Latin America	0.00	0.00	0.01	0.06	0.01
Central America & Caribbean	-0.01	-0.01	-0.08	0.46	0.02
World	**0.00**	**0.00**	**-0.01**	**0.00**	**-0.01**
BRIICS	**0.00**	**0.00**	**-0.02**	**-0.12**	**0.00**
ROW	**0.00**	**0.00**	**-0.01**	**0.10**	**0.00**

Source: Env-Linkages/IMAGE model analysis.

Table A.32. Policy simulation 1: reduced support to agricultural producers in OECD countries (continued)

Percentage difference from baseline in 2030

	Agr. prod.	Fibres exports	Rice exports	Chem. demand
OECD	**-1.03**	**-12.88**	**-39.0**	**-0.01**
North America	-1.77	-11.69	-74.04	-0.02
US & Canada	-2.10	-11.79	-74.04	-0.02
Mexico	8.28	2.12	0.00	0.00
Europe	-0.79	-36.16	-26.03	-0.01
Pacific	-0.53	-0.03	-23.67	0.01
Asia	-1.82	-1.32	-25.62	0.01
Oceania	0.05	-0.02	15.12	-0.02
Other developed & transition countries	**0.21**	**3.43**	**0.02**	**0.00**
Russian Federation	0.01	1.50	0.02	0.00
EECCA and other countries	0.35	3.61	0.00	0.00
Developing countries	**0.37**	**3.61**	**16.19**	**0.01**
East and Southeast Asia and Oceania	0.44	4.20	12.94	0.01
China	0.27	6.26	19.74	0.01
Indonesia	-0.19	0.00	0.00	-0.01
Other East and Southeast Asia	3.01	2.40	6.41	0.01
India	0.46	1.19	81.74	-0.01
Other South Asia	0.43	2.75	10.69	-0.01
Middle East	0.28	3.97	514.91	0.03
Africa	0.19	3.70	0.16	0.03
Northern Africa	0.09	4.00	0.13	0.00
Sub-Saharan Africa	0.23	3.66	0.27	0.05
Other Africa	0.25	3.60	0.27	0.07
South Africa	0.04	3.37	0.00	0.00
Other Southern Africa	0.19	4.09	0.00	0.05
Latin America	0.28	3.27	10.83	0.01
Brazil	0.17	4.15	0.00	0.00
Other Latin America	0.14	2.71	10.55	0.01
Central America & Caribbean	0.92	6.93	26.01	0.03
World	**0.22**	**-3.21**	**-7.91**	**0.00**
BRIICS	**0.31**	**3.46**	**43.54**	**0.01**
ROW	**0.40**	**3.58**	**12.42**	**0.01**

Source: Env-Linkages/IMAGE model analysis.

Table A.33. Policy simulation 2: reduced tariffs on agricultural imports

Percentage difference from baseline in 2030

	GDP	Cons.	Exports	Land	CO_2
OECD	**0.05**	**0.09**	**2.64**	**1.70**	**0.12**
North America	-0.03	-0.07	2.90	1.45	-0.07
US & Canada	-0.04	-0.05	2.70	2.27	-0.05
Mexico	0.05	-0.36	4.40	-2.54	-0.37
Europe	-0.02	0.05	1.61	-1.48	0.01
Pacific	0.44	0.80	5.50	3.55	0.94
Asia	0.52	0.87	5.71	-17.02	0.98
Oceania	-0.28	0.35	4.22	4.00	0.75
Other developed & transition countries	**0.18**	**0.43**	**0.81**	**0.31**	**0.37**
Russian Federation	0.21	0.28	0.52	0.21	0.31
EECCA and other countries	0.15	0.55	0.99	0.38	0.45
Developing countries	**0.17**	**0.66**	**1.24**	**1.59**	**0.45**
East and Southeast Asia and Oceania	0.13	0.88	1.36	0.42	0.46
China	0.10	1.04	1.78	0.23	0.48
Indonesia	0.29	0.51	1.22	-0.03	0.28
Other East and Southeast Asia	0.18	0.68	0.76	1.06	0.46
India	0.13	0.36	1.47	0.06	0.24
Other South Asia	0.50	0.88	3.89	0.32	1.58
Middle East	0.24	0.53	0.44	0.18	0.48
Africa	0.17	0.29	0.52	1.83	0.23
Northern Africa	0.09	0.21	0.54	0.47	0.26
Sub-Saharan Africa	0.23	0.35	0.50	1.90	0.21
Other Africa	0.13	0.21	0.05	0.12	0.15
South Africa	0.09	0.20	0.49	1.54	0.11
Other Southern Africa	0.55	1.03	1.49	4.74	0.87
Latin America	0.17	0.64	1.44	3.79	0.49
Brazil	0.19	0.92	2.55	7.73	0.77
Other Latin America	0.16	0.37	0.62	1.75	0.22
Central America & Caribbean	0.18	1.01	1.95	1.08	0.75
World	**0.09**	**0.25**	**2.01**	**1.44**	**0.31**
BRIICS	**0.13**	**0.78**	**1.65**	**-0.76**	**0.41**
ROW	**0.21**	**0.54**	**0.81**	**1.46**	**0.49**

Source: Env-Linkages/IMAGE model analysis.

Table A.33. Policy simulation 2: reduced tariffs on agricultural imports (continued)

Percentage difference from baseline in 2030

	Agr. prod.	Chem. demand	Fibres exports	Rice exports	Sugar exports
OECD	**0.04**	**0.25**	**2.03**	**117.51**	**24.46**
North America	2.27	0.11	2.56	238.26	4.84
US & Canada	4.06	0.12	2.53	238.26	6.85
Mexico	-51.81	0.01	7.22	0.00	1.32
Europe	-2.27	0.27	2.84	-68.89	8.96
Pacific	2.70	0.62	0.52	63.13	76.22
Asia	8.12	0.65	69.10	48.92	11.68
Oceania	0.26	0.29	0.31	346.04	76.89
Other developed & transition countries	**0.33**	**0.19**	**0.37**	**2.23**	**-1.90**
Russian Federation	0.24	0.20	4.10	2.23	0.32
EECCA and other countries	0.40	0.18	0.03	0.00	-2.18
Developing countries	**-0.07**	**0.20**	**0.70**	**44.36**	**40.77**
East and Southeast Asia and Oceania	-0.20	0.18	-0.55	375.85	95.71
China	0.30	0.10	-2.50	661.32	45.90
Indonesia	-4.37	0.07	0.00	0.00	65.97
Other East and Southeast Asia	-6.56	0.47	1.16	101.71	98.58
India	-0.14	0.03	2.73	5.25	11.86
Other South Asia	0.17	1.47	-1.84	-2.95	-18.53
Middle East	0.15	0.74	2.26	44.29	29.40
Africa	-0.02	0.23	1.09	-1.05	54.31
Northern Africa	-0.58	0.10	0.78	-1.46	-6.92
Sub-Saharan Africa	0.18	0.35	1.13	0.16	61.46
Other Africa	0.13	0.04	1.55	0.16	27.19
South Africa	1.63	0.09	0.94	0.00	21.04
Other Southern Africa	0.08	1.58	-1.65	0.00	76.10
Latin America	0.26	-0.02	-1.44	1.11	25.59
Brazil	-3.12	-0.49	-1.38	0.00	4.33
Other Latin America	1.29	0.16	0.30	1.03	64.29
Central America & Caribbean	0.73	0.59	4.36	5.30	34.15
World	**-0.01**	**0.23**	**1.21**	**75.96**	**37.00**
BRIICS	**0.02**	**0.05**	**-1.08**	**336.84**	**8.34**
ROW	**-0.07**	**0.41**	**0.76**	**5.41**	**55.35**

Source: Env-Linkages/IMAGE model analysis.

Table A.33. Policy simulation 2: reduced tariffs on agricultural imports (continued)

Percentage difference from baseline in 2030

	Meat exports	Meat prod. exp.	Dairy exports
OECD	**14.50**	**24.59**	**22.11**
North America	22.95	61.55	58.24
US & Canada	23.25	58.39	64.82
Mexico	15.59	86.25	8.42
Europe	8.74	13.65	15.71
Pacific	12.91	41.40	38.86
Asia	17.81	82.17	66.64
Oceania	12.89	5.95	38.75
Other developed & transition countries	**3.19**	**3.55**	**60.44**
Russian Federation	1.73	-0.28	26.40
EECCA and other countries	3.25	4.89	63.91
Developing countries	**101.12**	**6.39**	**16.62**
East and Southeast Asia and Oceania	-3.22	6.50	23.25
China	-4.25	0.25	-1.36
Indonesia	-2.87	8.15	-1.50
Other East and Southeast Asia	-0.92	13.68	41.37
India	-0.52	-8.44	-0.89
Other South Asia	-5.08	-5.10	0.35
Middle East	9.09	3.81	1.01
Africa	219.15	-3.65	-1.08
Northern Africa	913.55	-1.51	-1.37
Sub-Saharan Africa	178.62	-4.63	-0.80
Other Africa	1.20	-2.00	-1.81
South Africa	99.46	-3.70	1.27
Other Southern Africa	222.84	-9.84	-2.36
Latin America	114.18	11.14	30.37
Brazil	214.81	11.24	-6.41
Other Latin America	38.80	17.53	36.36
Central America and the Caribbean	1.67	-11.25	7.18
World	**40.90**	**17.82**	**24.64**
BRIICS	**123.45**	**4.15**	**7.16**
ROW	**68.52**	**8.73**	**39.33**

Source: Env-Linkages/IMAGE model analysis.

Table A.34. Policy simulation 3: enhanced levels of ODA targeted on the poorest countries

Percentage difference from baseline 2013

	GDP	Water demand	Transp. demand	Forestry demand	CO_2
OECD	**-0.01**	**-0.01**	**0.00**	**-0.01**	**-0.01**
North America	0.00	0.00	0.00	0.00	0.00
US & Canada	0.00	0.00	0.00	0.00	0.00
Mexico	0.00	0.00	0.00	0.01	0.01
Europe	-0.02	-0.03	-0.01	-0.03	-0.04
Pacific	0.00	0.00	0.00	-0.01	-0.01
Asia	0.00	0.00	0.00	-0.01	0.00
Oceania	-0.01	-0.02	0.00	-0.01	-0.03
Other developed & transition countries	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
Russian Federation	0.00	0.00	0.00	0.01	0.01
EECCA and other countries	0.00	0.00	0.00	-0.01	0.00
Developing countries	**0.17**	**0.17**	**0.09**	**0.40**	**0.08**
East and Southeast Asia and Oceania	0.00	0.00	0.00	0.00	0.00
China	0.00	0.00	0.00	0.00	0.00
Indonesia	0.00	0.00	0.01	0.01	0.01
Other East and Southeast Asia	0.00	0.01	0.00	-0.01	0.00
India	0.00	0.00	0.00	0.02	0.00
Other South Asia	0.00	0.00	-0.01	0.00	-0.01
Middle East	0.04	-0.04	0.01	0.07	0.07
Africa	0.97	1.14	0.93	2.36	0.93
Northern Africa	0.01	0.02	0.00	0.03	0.03
Sub-Saharan Africa	1.97	1.96	1.59	2.52	1.53
Other Africa	1.98	2.57	2.47	2.92	3.71
South Africa	0.01	0.04	0.03	0.00	0.03
Other Southern Africa	1.94	2.38	2.25	1.33	3.71
Latin America	0.01	0.01	0.01	0.03	0.05
Brazil	0.00	0.00	0.00	0.01	0.04
Other Latin America	0.01	0.02	0.02	0.05	0.06
Central America & Caribbean	0.00	0.00	0.00	-0.01	0.01
World	**0.01**	**0.03**	**0.02**	**0.20**	**0.03**
BRIICS	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ROW	**0.16**	**0.21**	**0.16**	**0.83**	**0.18**

Source: Env-Linkages/IMAGE model analysis.

Table A.35. Policy simulation 4: eco-labelling schemes for forestry and fisheries

Percentage change from baseline in 2030

	GDP	Export volume	Forestry exports	Fish exports	CO_2
OECD	**0.00**	**-0.01**	**-10.9**	**-4.9**	**0.00**
North America	0.00	-0.01	-17.3	-8.2	0.00
US & Canada	0.00	-0.02	-17.1	-8.3	0.00
Mexico	0.00	0.00	-21.4	-7.1	0.00
Europe	0.00	-0.01	-6.8	-3.7	0.00
Pacific	0.00	-0.01	-11.8	-9.8	0.00
Asia	0.00	-0.02	-23.8	-10.2	0.00
Oceania	0.01	0.04	-11.8	-9.0	0.00
Other developed & transition countries	**0.01**	**0.03**	**-13.1**	**-8.0**	**-0.01**
Russian Federation	0.02	0.10	-14.4	-10.4	-0.01
EECCA and other countries	0.00	-0.01	-10.6	-7.8	-0.01
Developing countries	**-0.01**	**-0.05**	**-13.6**	**-8.6**	**-0.08**
East and Southeast Asia and Oceania	-0.01	-0.07	-14.0	-8.6	-0.12
China	0.00	-0.13	-18.1	-6.6	-0.16
Indonesia	-0.02	0.05	-15.6	-10.0	-0.03
Other East and Southeast Asia	-0.01	0.01	-13.5	-9.8	-0.01
India	0.01	-0.13	-22.3	-10.4	-0.01
Other South Asia	0.00	-0.03	-19.2	-9.9	0.00
Middle East	0.00	-0.02	-21.0	-10.5	-0.01
Africa	-0.04	0.02	-12.9	-9.6	-0.08
Northern Africa	-0.01	-0.02	-21.0	-10.2	-0.01
Sub-Saharan Africa	-0.07	0.04	-12.9	-9.2	-0.13
Other Africa	-0.10	0.09	-12.5	-9.8	-0.28
South Africa	-0.01	-0.02	-17.3	-8.5	0.00
Other Southern Africa	-0.04	-0.04	-15.3	-10.6	-0.05
Latin America	0.00	0.00	-17.4	-7.3	0.00
Brazil	0.00	0.00	-18.1	-7.6	0.02
Other Latin America	0.00	0.00	-17.1	-7.9	0.00
Central America & Caribbean	0.00	0.00	-18.4	-6.5	0.00
World	**0.00**	**-0.03**	**-12.6**	**-6.0**	**-0.04**
BRIICS	**0.00**	**-0.10**	**-15.1**	**-7.7**	**-0.09**
ROW	**-0.01**	**0.00**	**-13.0**	**-9.0**	**-0.02**

Source: Env-Linkages/IMAGE model analysis.

Table A.36. Policy simulation 5: tariff on oil imports

Percentage change from baseline in 2030

	GDP	Cons.	Export volumes	Oil exports	CO_2
OECD	**-0.11**	**-0.12**	**-0.72**	**-15.1**	**-2.50**
North America	0.00	0.03	-0.81	-18.6	-1.72
US & Canada	0.02	0.06	-0.91	-32.1	-1.85
Mexico	-0.18	-0.40	-0.14	-11.8	0.05
Europe	-0.30	-0.41	-0.65	-11.0	-3.38
Pacific	-0.08	-0.05	-0.73	-18.7	-3.29
Asia	-0.08	-0.06	-0.66	0.0	-3.47
Oceania	-0.03	-0.04	-1.17	-18.7	-2.63
Other developed & transition countries	**-0.06**	**-0.16**	**-0.11**	**-6.7**	**-0.13**
Russian Federation	-0.08	-0.15	-0.10	13.5	-0.10
EECCA and other countries	-0.03	-0.17	-0.12	-3.1	-0.16
Developing countries	**-0.25**	**-0.53**	**-0.16**	**-9.6**	**-0.21**
East and Southeast Asia and Oceania	-0.04	-0.10	-0.02	-10.8	0.01
China	-0.01	-0.07	-0.03	-12.0	0.02
Indonesia	-0.20	-0.36	-0.17	-11.8	0.32
Other East and Southeast Asia	-0.06	-0.11	0.01	-8.3	-0.13
India	-0.01	0.00	0.02	14.6	0.02
Other South Asia	0.03	0.06	0.07	-4.2	0.58
Middle East	-1.49	-2.51	-1.16	-8.6	-1.37
Africa	-0.56	-1.10	-0.35	-12.0	-0.97
Northern Africa	-0.36	-0.76	-0.10	-17.0	-0.55
Sub-Saharan Africa	-0.69	-1.37	-0.51	-10.0	-1.28
Other Africa	-1.08	-1.99	-0.81	-9.6	-2.61
South Africa	-0.01	0.02	-0.02	0.0	0.01
Other Southern Africa	-0.37	-0.82	-0.18	13.0	-1.35
Latin America	-0.09	-0.21	0.05	-11.4	0.24
Brazil	-0.04	-0.04	0.02	-3.9	0.49
Other Latin America	-0.16	-0.36	-0.03	-11.1	0.14
Central America & Caribbean	0.00	-0.05	0.25	-20.6	0.02
World	**-0.15**	**-0.23**	**-0.47**	**-10.1**	**-1.15**
BRIICS	**-0.03**	**-0.07**	**-0.03**	**-12.5**	**0.02**
ROW	**-0.46**	**-0.83**	**-0.27**	**-9.2**	**-0.58**

Source: Env-Linkages/IMAGE model analysis.

Table A.37. Policy simulation 6: higher labour force participation rates in OECD countries

Percentage change from baseline in 2030

	GDP	Cons.	Export volumes	Labour inputs	Land inputs	CO_2
OECD	**4.79**	**5.41**	**6.63**	**5.93**	**0.41**	**4.78**
North America	0.00	0.10	-0.37	0.00	-0.37	-0.20
US & Canada	0.00	0.10	-0.39	0.00	-0.54	-0.18
Mexico	0.00	0.08	-0.24	0.00	0.43	-0.41
Europe	10.34	12.46	9.68	10.75	-0.24	10.30
Pacific	8.79	9.89	11.89	9.57	1.81	9.76
Asia	9.34	10.67	13.13	10.48	12.45	11.49
Oceania	4.38	5.03	3.81	4.28	1.58	3.39
Other dev. & transition countries	**0.00**	**0.30**	**-0.53**	**0.20**	**-1.60**	**0.01**
Russian Federation	-0.17	0.08	-1.19	-0.17	0.00	-0.34
EECCA and other countries	0.22	0.50	-0.14	0.44	-2.72	0.52
Developing countries	**-0.04**	**-0.04**	**-0.57**	**0.26**	**-0.18**	**-0.24**
East and Southeast Asia and Oceania	0.41	0.46	-0.12	0.91	0.06	0.37
China	0.74	0.94	0.48	0.78	-0.30	0.62
Indonesia	1.01	1.30	0.61	1.01	1.33	0.45
Other East and Southeast Asia	-0.46	-0.40	-1.08	1.25	0.69	-0.67
India	0.53	0.56	0.44	0.53	-0.03	0.09
Other South Asia	0.11	0.11	0.27	0.38	-0.14	-0.49
Middle East	-1.61	-1.49	-2.67	-1.61	0.17	-2.44
Africa	-1.84	-1.66	-2.48	-1.47	-0.77	-1.74
Northern Africa	-2.10	-1.87	-2.90	-1.96	-1.66	-2.08
Sub-Saharan Africa	-1.66	-1.50	-2.23	-1.37	-0.73	-1.50
Other Africa	-1.44	-1.17	-2.12	-1.30	-0.13	-1.21
South Africa	-1.58	-1.89	-1.54	-1.58	-7.45	-1.67
Other Southern Africa	-2.27	-2.09	-2.91	-1.56	0.00	-1.92
Latin America	0.40	0.51	-0.25	0.63	0.21	0.01
Brazil	0.89	1.06	0.47	0.89	0.03	0.30
Other Latin America	0.09	0.16	-0.57	0.47	0.36	-0.14
Central America & Caribbean	0.34	0.68	-0.33	0.37	0.16	-0.11
World	**3.29**	**3.88**	**3.42**	**1.18**	**-0.22**	**1.86**
BRIICS	**0.60**	**0.73**	**0.34**	**0.65**	**0.20**	**0.26**
ROW	**-0.73**	**-0.58**	**-1.38**	**-0.26**	**-0.11**	**-0.98**

Source: Env-Linkages/IMAGE model analysis.

Table A.37. Policy simulation 6: higher labour force participation rates in OECD countries (continued)

Percentage change from baseline in 2030

	Iron & steel volume	Elect. volume	Minerals volume	Pulp, paper volume	Chemical volume
OECD	**5.01**	**3.33**	**3.18**	**4.56**	**4.73**
North America	-1.39	-0.13	-0.44	-0.06	-0.67
US & Canada	-1.49	-0.12	-0.48	-0.05	-0.69
Mexico	-0.91	-0.10	-0.31	-0.22	-0.47
Europe	9.16	6.58	11.33	9.76	9.54
Pacific	7.77	5.86	4.37	9.00	9.07
Asia	8.00	6.24	7.41	9.62	9.41
Oceania	2.44	2.60	2.54	4.34	3.28
Other developed & transition countries	**-1.09**	**-0.02**	**-0.07**	**-0.48**	**-0.67**
Russian Federation	-1.74	-0.44	-0.67	-1.18	-1.69
EECCA and other countries	-0.71	0.59	0.06	-0.27	-0.32
Developing countries	**-1.07**	**-0.19**	**-0.04**	**-0.48**	**-0.99**
East and Southeast Asia and Oceania	-0.75	0.14	0.18	-0.01	-0.54
China	-0.24	0.57	0.19	0.40	0.05
Indonesia	-1.03	0.27	1.38	0.46	-0.43
Other East and Southeast Asia	-2.93	-0.56	-0.61	-1.89	-2.22
India	-0.76	0.36	0.67	0.31	0.28
Other South Asia	-1.21	-0.38	-0.19	-0.83	-0.39
Middle East	-7.10	-2.21	-1.67	-4.73	-6.25
Africa	-1.09	-1.63	-1.71	-3.26	-3.62
Northern Africa	-5.59	-2.32	-2.55	-4.23	-4.35
Sub-Saharan Africa	-2.94	-1.32	-1.02	-2.65	-2.88
Other Africa	-4.74	-1.28	-0.92	-2.94	3.17
South Africa	2.70	-1.27	0.04	-1.58	-2.56
Other Southern Africa	-2.64	-1.59	-2.83	-3.49	-2.71
Latin America	-1.27	0.62	0.94	0.24	-0.54
Brazil	-0.63	1.28	2.00	1.14	0.21
Other Latin America	-1.81	0.24	0.55	-0.44	-0.99
Central America & Caribbean	-2.07	0.06	-1.17	0.13	-1.07
World	**2.07**	**1.77**	**0.81**	**3.07**	**2.47**
BRIICS	**-0.55**	**0.19**	**0.30**	**0.31**	**-0.06**
ROW	**-2.28**	**-0.59**	**-0.61**	**-1.58**	**-2.18**

Source: Env-Linkages/IMAGE model analysis.

Table A.38. Policy simulation 7: improved macroeconomic policies in developing countries

Percentage change from baseline in 2030

	GDP	Cons.	Export volume	Land	CO_2
OECD	**-0.03**	**0.05**	**-0.34**	**-0.73**	**0.04**
North America	-0.02	0.05	-0.36	-0.75	-0.04
US & Canada	0.00	0.07	-0.37	-0.87	-0.03
Mexico	-0.22	-0.11	-0.32	-0.17	-0.16
Europe	-0.05	0.07	-0.32	-0.46	0.11
Pacific	-0.03	0.02	-0.33	-0.84	0.14
Asia	-0.03	0.03	-0.35	-0.26	0.23
Oceania	-0.06	-0.02	-0.21	-0.85	-0.16
Other developed & transition countries	**0.00**	**0.08**	**-0.15**	**-0.10**	**0.00**
Russian Federation	0.00	0.03	-0.09	-0.13	-0.05
EECCA and other countries	0.00	0.11	-0.19	-0.09	0.05
Developing countries	**4.59**	**5.56**	**4.24**	**2.13**	**3.77**
East and Southeast Asia and Oceania	0.77	0.70	0.94	0.86	0.50
China	0.00	0.10	-0.16	-0.04	0.08
Indonesia	0.00	0.02	-0.09	0.08	0.26
Other East and Southeast Asia	2.71	1.72	2.67	3.59	2.43
India	0.00	0.11	-0.49	-0.08	-0.19
Other South Asia	0.00	0.10	-0.36	-0.32	0.31
Middle East	17.57	17.04	19.56	5.10	20.44
Africa	3.60	3.50	3.81	2.22	4.65
Northern Africa	1.38	1.43	1.59	0.66	1.49
Sub-Saharan Africa	5.19	5.09	5.17	2.29	7.02
Other Africa	5.07	4.59	5.41	2.59	5.28
South Africa	9.31	10.59	8.98	4.82	9.99
Other Southern Africa	2.13	1.88	2.24	1.21	2.06
Latin America	11.88	13.25	13.66	3.91	9.95
Brazil	12.87	14.85	13.76	1.28	11.97
Other Latin America	9.28	10.08	9.88	4.66	7.07
Central America & Caribbean	18.57	20.38	21.19	7.70	16.55
World	**1.29**	**1.48**	**1.53**	**1.05**	**1.82**
BRIICS	**1.45**	**2.23**	**0.56**	**-0.41**	**0.56**
ROW	**7.25**	**7.31**	**6.81**	**1.07**	**7.52**

Source: Env-Linkages/IMAGE model analysis.

Table A.38. Policy simulation 7: improved macroeconomic policies in developing countries (continued)

Percentage change from baseline in 2030

	Total Demand (volume)				
	Iron & Steel	**Elect.**	**Minerals**	**Pulp, paper, pub.**	**Chem.**
OECD	**-0.32**	**-0.17**	**-0.55**	**-0.02**	**-0.20**
North America	-0.41	-0.11	-0.55	0.00	-0.14
US & Canada	-0.39	-0.11	-0.54	0.01	-0.13
Mexico	-0.46	-0.23	-0.61	-0.16	-0.20
Europe	-0.41	-0.21	-0.52	-0.04	-0.27
Pacific	-0.13	-0.22	-0.58	-0.04	-0.21
Asia	-0.15	-0.21	-0.42	-0.06	-0.21
Oceania	0.13	-0.34	-0.92	0.03	-0.17
Other developed & transition countries	**-0.03**	**-0.08**	**-0.20**	**0.08**	**-0.01**
Russian Federation	0.07	-0.11	-0.35	0.01	-0.03
EECCA and other countries	-0.09	-0.05	-0.17	0.09	-0.01
Developing countries	**2.78**	**4.75**	**1.77**	**4.57**	**3.64**
East and Southeast Asia and Oceania	0.53	0.62	0.14	0.65	0.52
China	0.04	-0.08	-0.13	0.05	-0.10
Indonesia	0.21	0.15	-0.07	-0.16	0.04
Other East and Southeast Asia	2.43	1.87	2.66	3.12	2.66
India	0.06	0.02	-0.23	0.00	-0.24
Other South Asia	0.00	0.23	-0.15	0.12	-0.18
Middle East	24.41	19.75	23.23	20.11	21.89
Africa	4.74	5.21	3.46	4.44	4.09
Northern Africa	2.27	1.65	1.53	1.74	1.66
Sub-Saharan Africa	7.58	6.85	5.58	6.36	6.23
Other Africa	7.02	6.49	5.96	5.95	5.55
South Africa	13.55	8.74	9.53	9.97	10.94
Other Southern Africa	2.22	1.84	2.14	2.44	2.00
Latin America	17.01	13.86	13.89	15.92	15.57
Brazil	17.09	17.24	14.08	18.80	15.52
Other Latin America	12.57	9.67	11.46	12.04	12.75
Central America & Caribbean	30.14	18.32	27.73	22.57	25.15
World	**1.15**	**1.48**	**0.87**	**1.25**	**1.29**
BRIICS	**0.83**	**1.57**	**0.35**	**1.79**	**1.14**
ROW	**6.10**	**6.13**	**3.36**	**6.57**	**6.16**

Source: Env-Linkages/IMAGE model analysis.

Table A.39. Policy simulation 8: ambitious structural reforms adopted by developing countries

Percentage change from baseline in 2030

	GDP	Cons.	Exports	Land	CO_2
OECD	**0.15**	**0.30**	**-0.46**	**-1.59**	**0.22**
North America	0.33	0.41	-0.15	-1.39	0.24
US & Canada	0.00	0.16	-0.87	-1.63	-0.06
Mexico	4.56	4.24	4.56	-0.23	4.26
Europe	-0.05	0.20	-0.63	-0.86	0.18
Pacific	-0.03	0.07	-0.58	-2.22	0.24
Asia	-0.03	0.08	-0.61	-0.71	0.39
Oceania	-0.06	0.03	-0.40	-2.25	-0.28
Other developed & transition countries	**0.00**	**0.22**	**-0.43**	**-0.22**	**0.03**
Russian Federation	0.00	0.14	-0.36	-0.27	-0.09
EECCA and other countries	0.00	0.29	-0.47	-0.18	0.20
Developing countries	**9.30**	**10.91**	**9.69**	**3.43**	**9.04**
East and Southeast Asia and Oceania	2.43	1.98	2.81	2.53	1.45
China	0.00	0.25	-0.40	-0.03	0.22
Indonesia	0.00	0.12	-0.36	0.06	0.34
Other East and Southeast Asia	8.55	4.90	7.85	10.40	7.12
India	0.00	0.29	-1.36	-0.15	-0.27
Other South Asia	0.00	0.26	-0.92	-0.78	0.38
Middle East	49.11	49.98	56.55	14.28	54.42
Africa	9.48	9.68	9.42	3.45	14.05
Northern Africa	5.10	5.26	5.88	1.85	4.66
Sub-Saharan Africa	12.64	13.05	11.58	3.53	21.09
Other Africa	4.51	4.26	4.39	2.34	4.57
South Africa	42.62	50.22	41.25	13.09	40.40
Other Southern Africa	6.49	6.11	7.90	3.01	6.08
Latin America	11.48	13.32	11.06	3.38	7.29
Brazil	13.67	16.43	14.12	0.67	13.30
Other Latin America	9.62	11.09	8.92	4.15	3.59
Central America & Caribbean	12.87	14.98	12.28	7.37	7.36
World	**2.76**	**3.03**	**3.67**	**1.58**	**4.41**
BRIICS	**2.24**	**3.64**	**0.84**	**-0.72**	**1.38**
ROW	**15.49**	**14.92**	**15.97**	**0.84**	**17.96**

Source: Env-Linkages/IMAGE model analysis.

Table A.39. Policy simulation 8: ambitious structural reforms adopted by developing countries (continued)

Percentage change from baseline in 2030

	Total Demand (volume)				
	Iron & Steel	**Elect.**	**Minerals**	**Pulp, paper, pub.**	**Chem.**
OECD	**-0.10**	**-0.17**	**-0.28**	**0.20**	**-0.13**
North America	0.33	-0.04	0.34	0.36	0.21
US & Canada	-0.74	-0.14	-0.82	0.06	-0.27
Mexico	4.94	3.74	4.57	4.54	4.48
Europe	-0.63	-0.24	-0.78	0.06	-0.46
Pacific	-0.08	-0.32	-0.93	0.01	-0.36
Asia	-0.11	-0.30	-0.69	-0.01	-0.37
Oceania	0.62	-0.47	-1.47	0.19	-0.29
Other developed & transition countries	**0.04**	**-0.14**	**-0.24**	**0.27**	**0.05**
Russian Federation	0.04	-0.21	-0.60	-0.03	-0.16
EECCA and other countries	0.03	-0.03	-0.15	0.34	0.11
Developing countries	**5.77**	**9.51**	**3.29**	**8.61**	**6.67**
East and Southeast Asia and Oceania	1.67	1.95	0.69	2.17	1.81
China	0.14	-0.06	-0.13	0.21	-0.20
Indonesia	0.36	0.16	-0.31	-0.60	-0.17
Other East and Southeast Asia	7.74	5.59	8.46	10.33	8.76
India	0.39	0.18	-0.43	0.13	-0.45
Other South Asia	0.07	0.33	-0.35	0.42	-0.32
Middle East	68.83	52.39	65.27	59.03	63.08
Africa	14.58	14.17	9.40	12.70	11.85
Northern Africa	8.57	5.50	5.78	6.29	6.12
Sub-Saharan Africa	21.50	18.18	13.39	17.24	16.89
Other Africa	6.10	5.90	5.65	5.37	4.92
South Africa	68.64	33.02	39.50	45.57	51.06
Other Southern Africa	6.13	5.17	6.20	7.85	6.33
Latin America	14.14	10.97	9.56	15.41	13.52
Brazil	17.17	18.03	14.12	22.83	16.05
Other Latin America	10.93	4.78	7.12	11.35	11.83
Central America & Caribbean	13.36	8.60	11.49	13.59	13.05
World	**2.66**	**3.05**	**1.85**	**2.52**	**2.51**
BRIICS	**1.31**	**2.69**	**0.84**	**3.16**	**1.70**
ROW	**13.60**	**12.91**	**5.97**	**12.67**	**11.87**

Source: Env-Linkages/IMAGE model analysis.

Table A.40. Policy simulation 9: more ambitious environmental policies in developing countries

Percentage change from baseline in 2030

	GDP	Cons	Water demand	Trans demand	CO_2
OECD	**-0.06**	**-0.14**	**-0.02**	**-0.13**	**0.02**
North America	-0.14	-0.35	-0.04	-0.29	-0.14
US & Canada	-0.14	-0.36	-0.04	-0.30	-0.14
Mexico	-0.01	-0.04	-0.02	-0.07	-0.11
Europe	0.01	0.12	0.14	0.06	0.33
Pacific	-0.01	-0.02	0.00	-0.03	-0.11
Asia	-0.01	-0.02	-0.01	-0.03	-0.09
Oceania	-0.01	0.05	0.05	-0.01	-0.17
Other developed & transition countries	**0.06**	**0.60**	**0.08**	**0.42**	**0.12**
Russian Federation	0.01	0.04	0.02	-0.02	-0.10
EECCA and other countries	0.06	1.09	0.10	0.67	0.44
Developing countries	**0.25**	**1.27**	**1.11**	**0.80**	**0.93**
East and Southeast Asia and Oceania	0.00	-0.07	-0.04	-0.08	-0.06
China	-0.01	-0.10	-0.04	-0.05	-0.05
Indonesia	0.02	0.00	0.00	-0.05	-0.06
Other East and Southeast Asia	0.00	-0.02	-0.02	-0.06	-0.09
India	-0.02	-0.02	-0.03	-0.07	-0.11
Other South Asia	0.00	0.01	-0.03	-0.07	-0.14
Middle East	0.54	4.99	3.19	4.11	5.67
Africa	0.02	0.06	0.00	0.00	-0.03
Northern Africa	0.01	0.03	0.04	-0.01	-0.03
Sub-Saharan Africa	0.03	0.08	-0.01	0.01	-0.03
Other Africa	0.05	0.14	-0.01	0.04	0.04
South Africa	-0.01	-0.01	0.03	-0.02	-0.06
Other Southern Africa	0.01	0.02	-0.05	-0.03	-0.04
Latin America	0.48	2.85	2.28	2.58	5.36
Brazil	0.03	0.00	-0.07	0.01	-0.10
Other Latin America	0.63	5.42	5.54	4.49	7.06
Central America & Caribbean	0.01	0.01	-0.02	-0.02	-0.42
World	**-0.02**	**0.17**	**0.23**	**0.10**	**0.41**
BRIICS	**-0.01**	**-0.05**	**-0.04**	**-0.04**	**-0.07**
ROW	**0.24**	**2.16**	**1.42**	**1.63**	**2.23**

Source: Env-Linkages/IMAGE model analysis.

Table A.41. Policy simulation 10: package 1

Percentage change from baseline in 2015

	GDP	Cons	CO_2	Export volumes
OECD	**0.03**	**-0.29**	**0.03**	**2.44**
North America	0.01	-0.55	-0.22	3.89
US & Canada	0.00	-0.56	-0.21	3.98
Mexico	0.07	-0.40	-0.30	3.27
Europe	-0.02	-0.17	0.20	1.15
Pacific	0.20	0.29	0.49	3.99
Asia	0.24	0.31	0.59	4.18
Oceania	-0.20	0.18	0.08	2.72
Other developed & transition countries	**0.12**	**0.89**	**0.38**	**0.08**
Russian Federation	0.12	0.23	0.01	0.26
EECCA and other countries	0.12	1.47	0.89	-0.03
Developing countries	**0.36**	**2.19**	**1.38**	**0.06**
East and Southeast Asia and Oceania	-0.01	0.39	-0.01	0.75
China	-0.06	0.42	-0.04	1.09
Indonesia	0.19	0.32	0.11	0.95
Other East and Southeast Asia	0.06	0.35	0.08	0.25
India	0.02	0.22	0.00	1.12
Other South Asia	0.16	0.32	0.05	2.24
Middle East	1.28	5.85	7.28	-0.42
Africa	1.12	3.91	1.71	-2.14
Northern Africa	0.05	0.10	-0.01	0.07
Sub-Saharan Africa	1.92	6.95	2.86	-3.67
Other Africa	2.55	8.46	7.39	-4.48
South Africa	0.08	0.33	-0.15	0.62
Other Southern Africa	2.78	11.07	5.00	-6.15
Latin America	0.58	3.56	4.44	-2.54
Brazil	0.07	0.62	0.07	1.37
Other Latin America	1.08	6.13	8.89	-6.48
Central America & Caribbean	0.12	0.87	-0.14	1.15
World	**0.11**	**0.27**	**0.64**	**1.53**
BRIICS	**0.00**	**0.38**	**-0.11**	**1.03**
ROW	**0.71**	**3.36**	**3.27**	**-0.76**

Source: Env-Linkages/IMAGE model analysis.

Table A.42. Policy simulation 11: package 2

Percentage change from baseline in 2015

	GDP	Cons	CO_2	Export volumes
OECD	**-0.09**	**-0.18**	**-1.99**	**-0.47**
North America	0.01	0.04	-1.38	-0.85
US & Canada	0.02	0.06	-1.49	-0.95
Mexico	-0.09	-0.25	0.10	-0.16
Europe	-0.26	-0.58	-2.73	-0.24
Pacific	-0.06	-0.09	-2.44	-0.48
Asia	-0.07	-0.07	-2.54	-0.43
Oceania	-0.04	-0.20	-2.02	-0.83
Other developed & transition countries	**-0.02**	**-0.16**	**-0.04**	**0.02**
Russian Federation	-0.05	-0.20	-0.02	-0.01
EECCA and other countries	0.02	-0.13	-0.07	0.04
Developing countries	**-0.01**	**0.08**	**-0.03**	**-0.31**
East and Southeast Asia and Oceania	-0.01	-0.05	-0.08	-0.06
China	0.01	0.00	-0.09	-0.12
Indonesia	-0.17	-0.27	0.20	-0.19
Other East and Southeast Asia	-0.01	-0.08	-0.11	0.05
India	0.01	0.04	0.01	-0.02
Other South Asia	0.02	0.05	0.41	-0.03
Middle East	-0.77	-1.75	-0.81	-0.76
Africa	0.80	2.88	1.26	-2.51
Northern Africa	-0.13	-0.52	-0.18	0.16
Sub-Saharan Africa	1.51	5.60	2.22	-4.33
Other Africa	1.96	6.62	5.42	-5.09
South Africa	0.03	0.16	0.00	0.29
Other Southern Africa	2.32	9.64	4.47	-7.34
Latin America	-0.03	-0.15	0.25	0.14
Brazil	-0.01	-0.01	0.33	0.10
Other Latin America	-0.06	-0.26	0.27	0.09
Central America & Caribbean	0.00	-0.05	0.02	0.27
World	**-0.07**	**-0.13**	**-0.95**	**-0.40**
BRIICS	**-0.01**	**-0.02**	**-0.03**	**-0.09**
ROW	**-0.02**	**0.11**	**-0.03**	**-0.45**

Source: Env-Linkages/IMAGE model analysis.

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MEASURING THE IMPACT OF POLICIES

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This report is an innovative contribution to providing the quantitative input sound decision making needs. It presents scenarios showing numerical results of changes to individual policies as well as policy packages implemented simultaneously by OECD and developing countries. The results can be used to anticipate the outcomes of decisions and implement the appropriate set of policies. The scenarios also show how policy combinations could substantially improve both economic and environmental outcomes together, confirming the need for policy coherence.

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