

OVERVIEW

GEO-2000

Global Environment Outlook



UNEP



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GEO-2000 and the GEO process

UNEP launched the Global Environment Outlook (GEO) Project in 1995. It has two components:

- A global environmental assessment process, the GEO Process, that is cross-sectoral and participatory. It incorporates regional views and perceptions, and builds consensus on priority issues and actions through dialogue among policy-makers and scientists at regional and global levels.
- GEO outputs, in printed and electronic formats, including the GEO Report series. This series makes periodic reviews of the state of the world's environment, and provides guidance for decision-making processes such as the formulation of environmental policies, action planning and resource allocation. Other outputs include technical reports, a Web site and a publication for young people.

A coordinated network of Collaborating Centres is the core of the GEO process. These centres have

played an increasingly important role in preparing GEO reports. They are now responsible for almost all the regional inputs, thus combining top-down integrated assessment with bottom-up environmental reporting. A number of Associated Centres also participate, providing specialized expertise. Four working groups – on modelling, scenarios, policy and data – provide advice and support to the GEO process, helping coordinate the work of the Collaborating Centres to make their outputs as comparable as possible.

Other United Nations agencies contribute to the GEO Process through the United Nations System-wide Earthwatch, coordinated by UNEP. In particular, they provide substantive data and information on the many environmentally-related issues that fall under their individual mandates; they also help review drafts.

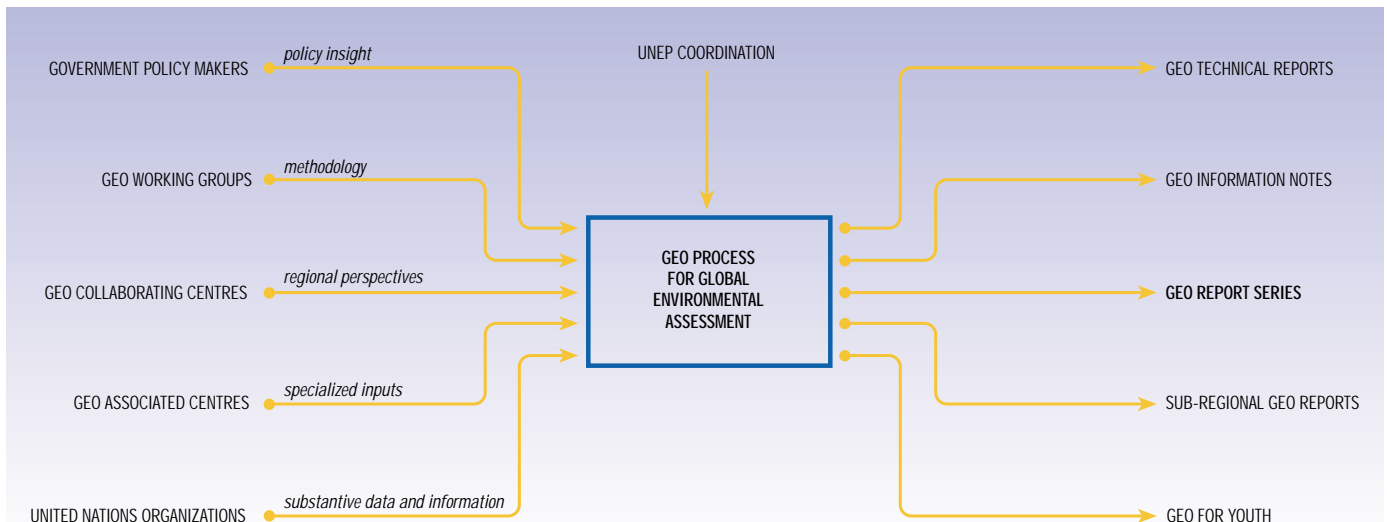
Regional consultations and other mechanisms to promote dialogue between scientists and policy-makers are an essential element of the GEO process. More than 850 people and some 35 centres contributed to the production of *GEO-2000*.

'GEO-2000 is the culmination of a participatory process involving the work of experts from more than 100 countries. Our goal ... is that by the turn of the century a truly global participatory assessment process may be in operation to keep under review the state of the world's environment, as well as to guide international policy setting. I am pleased to be able to report that we have achieved this goal with a few months to spare.'

*Klaus Töpfer
United Nations Under-Secretary General and Executive Director,
United Nations Environment Programme*

GEO-2000, page xiii

GEO project organization and outputs





Global perspectives

'The continued poverty of the majority of the planet's inhabitants and excessive consumption by the minority are the two major causes of environmental degradation. The present course is unsustainable and postponing action is no longer an option.'

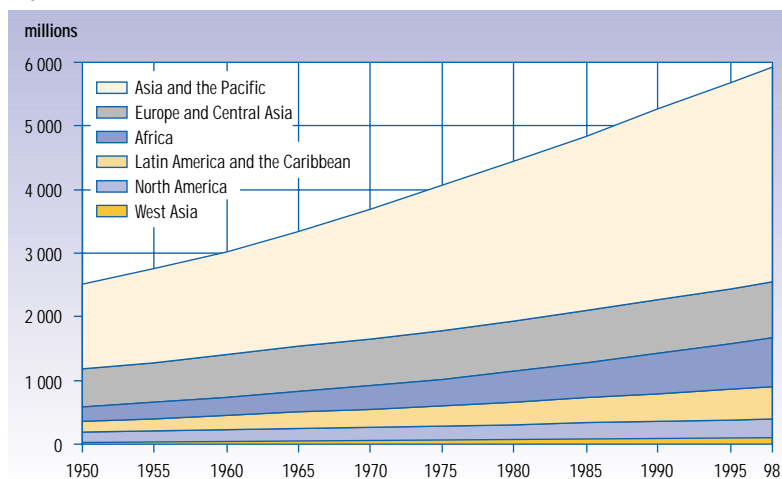
GEO-2000, page xxix

Two over-riding trends characterize the beginning of the third millennium. First, the global ecosystem is threatened by grave imbalances in productivity and in the distribution of goods and services. A significant proportion of humanity still lives in dire poverty, and projected trends are for an increasing divergence between those that benefit from economic and technological development, and those that do not. This unsustainable progression of extremes of wealth and poverty threatens the stability of society as a whole, and with it the global environment.

Secondly, the world is undergoing accelerating change, with environmental stewardship lagging behind economic and social development. Environmental gains from new technology and policies are being overtaken by population growth and economic development. The processes of globalization that are so strongly influencing social evolution need to be directed towards resolving rather than aggravating the serious imbalances that divide the world today. Resolving these imbalances is the only way of ensuring a more sustainable future for the planet and society.

World population will reach 6 000 million during 1999 – but the rate of growth has begun to slow

World population



Some statistics ...

- Average global per capita income has now passed US\$5 000 a year but more than 1 300 million people still live on less than US\$1 per day.
- Although world military expenditure fell by an average of 4.5 per cent a year during the decade 1988-97, serious armed conflicts have been accompanied by increased pressure on ecosystems.
- The private sector has enormous capacity to influence the outcome of environmental issues. In 1996, private investment was about US\$250 000 million compared to overseas development assistance of less than US\$50 000 million.
- The efforts required to meet the natural resources needs of an additional 3 000 million people in the next 50 years will be immense.
- A tenfold reduction in resource consumption in the industrialized countries is a necessary long-term target if adequate resources are to be released for the needs of developing countries.

Growing economies, growing poverty ...

Since 1950, the global economy has more than quintupled in size. In terms of income, the global per capita average is now 2.6 times that of 1950 (in real terms). Average figures for income hide great discrepancies between regions, between countries, and between population groups within countries. Despite some remarkable improvements, one-quarter of the world's population remains in severe poverty.

... and the effects of lifestyles

Nearly half of all people now live in cities; an increasing number of them travel enormous distances every year by private car and in aircraft. In the developed world, technology has transformed patterns of work and family life, communications, leisure activities, diet and health. Similar transformations are under way in the more prosperous parts of the developing world.

The impacts of these changes on the natural environment are complex. The modern industrial

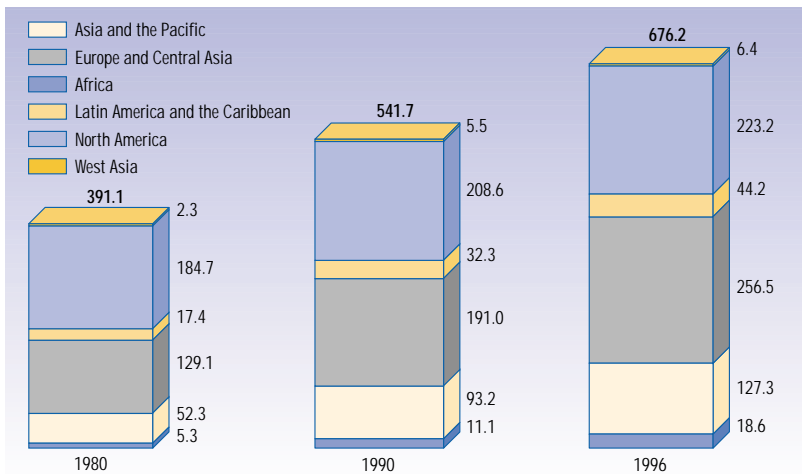
economies of North America, Europe and parts of East Asia consume immense quantities of energy and raw materials, and produce high volumes of wastes and polluting emissions. The magnitude of this economic activity is causing environmental damage on a global scale and widespread pollution and disruption of ecosystems.

In other regions, particularly in many parts of the developing world, poverty combined with rapid population growth is leading to widespread degradation of renewable resources – primarily forests, soils and water. Many people living in subsistence economies have few alternatives to depleting their natural resources. Renewable resources still sustain the livelihood of nearly one-third of the world’s population; environmental deterioration therefore directly reduces living standards and prospects for economic improvement among rural peoples. At the same time, rapid urbanization and industrialization in many developing countries are creating high levels of air and water pollution, which often hit the poor hardest. Worldwide, the urban poor tend to live in neglected neighbourhoods, enduring pollution, waste dumping and ill health, but lacking the political influence to effect improvements.

Towards the new millennium

GEO-2000 makes it clear that if present trends in population growth, economic growth and consumption patterns continue, the natural environment will be increasingly stressed. Distinct environmental gains and improvements will probably be offset by the pace and scale of global economic growth, increased global environmental pollution and accelerated degradation of the Earth’s renewable resource base.

Numbers of motor vehicles (millions)



However, trends towards environmental degradation can be slowed, and economic activity can be shifted to a more sustainable pattern. Choices for development, and levels and patterns of consumption, are shaped by human aspirations and values, and these choices can be influenced by policy intervention. Many promising policy responses are being developed and tested.

Some environmental trends over the past half-century demonstrate the potential of regulation, information and, above all, prices to encourage both more efficient and less polluting uses of energy and materials. Technology has already delivered astonishing improvements in product performance but innovation to improve resource productivity has so far lagged behind. Better public understanding of the environmental consequences of the consumer society have begun to catalyse profound shifts in purchasing behaviour and lifestyle choices. The challenge for policy-makers in the next century will be to devise approaches that encourage a more efficient, fair and responsible use of natural resources by the production sectors of the economy, that encourage consumers to support and demand such changes, and that will lead to a more equitable use of resources by the entire world population.

The number of vehicles is growing fast in all regions. Transport now accounts for one-quarter of world energy use, and about one-half of the world’s oil production; motor vehicles account for nearly 80 per cent of all transport-related energy. Transport is thus a major contributor to greenhouse gas emissions and urban air pollution

‘Environmental governance at all levels requires a new partnership between governments and civic society that can foster the eradication of poverty and an equitable distribution of environmental costs and benefits.’

GEO-2000, page 20

Annual average growth of per capita GDP (1975–95)

Africa	-0.20%
Asia and the Pacific	3.09%
Europe and Central Asia	1.54%
Latin America and the Caribbean	0.66%
North America	1.53%
West Asia	-2.93%
WORLD	1.17%



Major global trends

'GEO-2000 acknowledges the efforts being made to halt environmental deterioration but recognizes that many of these are too few and too late; signs of improvements are few and far between.'

GEO-2000, page xiii

The state of the environment

Since *GEO-1* was published in 1997, new dimensions have been added to the major environmental issues facing the planet. The situation differs from that of even two years ago. The new events or insights that have surfaced since *GEO-1* include the following.

There is an emerging recognition that there is a global nitrogen problem, with some areas receiving nitrogen compounds in quantities that lead to unwanted ecosystem changes, such as excessive plant growth. Human activities now contribute more to the global supply of fixed nitrogen than do natural processes: as *GEO-2000* stresses, 'we are fertilizing the Earth on a global scale and in a largely uncontrolled experiment'.

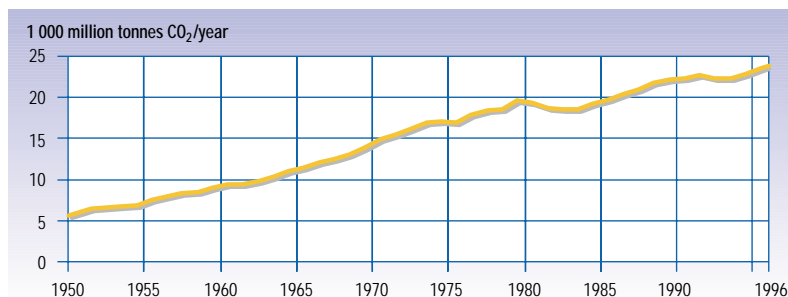
Forest fires appear to be becoming more frequent and more extensive, as a result of a combination of unfavourable weather conditions and land use that make susceptible areas more prone to burning; both forests and the health of inhabitants have been threatened over areas of millions of hectares.

There is also an increased frequency and severity of natural disasters – for example, losses from natural disasters over the decade 1986–95 were eight times higher than in the 1960s.

With 1998 the warmest year on record, climate change problems coupled with the most severe *El Niño* to date have caused major losses of life and economic damage.

Global carbon dioxide emissions continue to mount. Average annual increase over the past decade has been 1.3 per cent or nearly 300 million tonnes a year

Global carbon dioxide emissions



Some statistics ...

- Global emissions of CO₂ reached a new high of nearly 23 900 million tonnes in 1996 – nearly four times the 1950 total.
- Without the Montreal Protocol, levels of ozone-depleting substances would have been five times higher by 2050 than they are today.
- In 1996, 25 per cent of the world's approximately 4 630 mammal species and 11 per cent of the 9 675 bird species were at significant risk of total extinction.
- If present consumption patterns continue, two out of every three persons on Earth will live in water-stressed conditions by the year 2025.
- More than half the world's coral reefs are potentially threatened by human activities, with up to 80 per cent at risk in the most populated areas.
- Exposure to hazardous chemicals has been implicated in numerous adverse effects on humans from birth defects to cancer. Global pesticide use results in 3.5–5 million acute poisonings a year.
- Some 20 per cent of the world's susceptible drylands are affected by human-induced soil degradation, putting the livelihoods of more than 1 000 million people at risk.

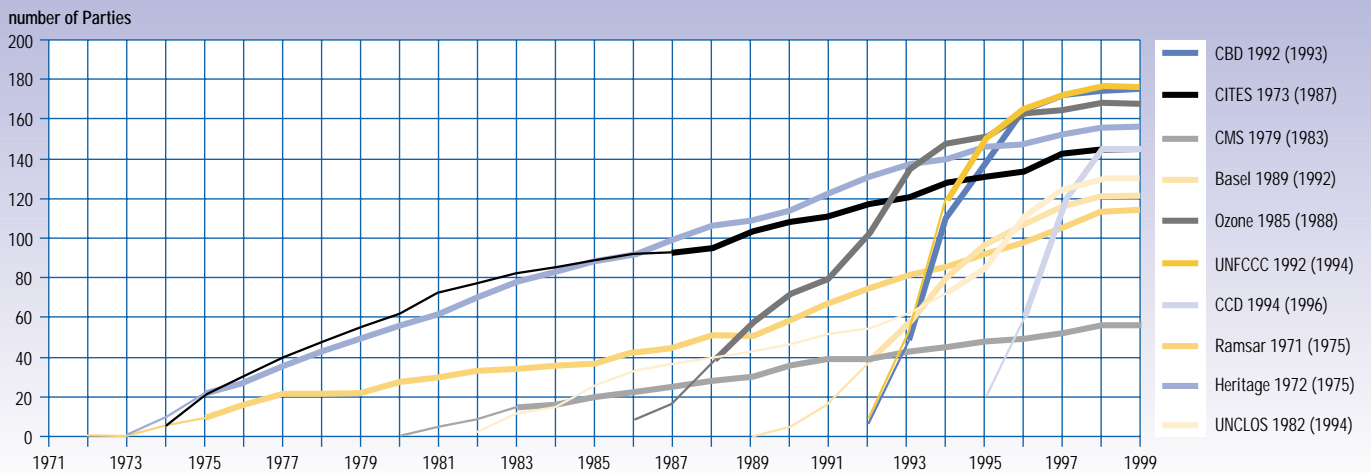
The economic and ecological importance of species invasions, an inevitable result of increasing globalization, also appears to have become more significant.

Finally, new wars have broken out which, like all wars, threaten not only the environment of those directly involved but that of neighbouring states, and those downstream on major rivers. Related to this is the environmental importance of refugees, who are forced to make unrestricted assaults on the natural environment for their survival.

Policy responses

Environmental laws and institutions have been strongly developed over the past few years in almost all countries. Command and control policy via direct regulation is the most prominent policy instrument

Growth in numbers of Parties to selected MEAs



but its effectiveness depends on the manpower available, methods of implementation and control, and level of institutional coordination and policy integration. In most regions, such policies are still organized by sector but environmental planning and environmental impact assessment are becoming increasingly common.

While most regions are now trying to strengthen their institutions and regulations, some are shifting towards deregulation, increased use of economic instruments and subsidy reform, reliance on voluntary action by the private sector, and more public and NGO participation. This development is fed by the increasing complexity of environmental regulation and high control costs as well as demands from the private sector for more flexibility, self-regulation and cost-effectiveness.

GEO-2000 confirms the overall assessment of *GEO-I*: the global system of environmental management is moving in the right direction but much too slowly. Yet effective and well tried policy instruments do exist that could lead much more quickly to sustainability. If the new millennium is not to be marred by major environmental disasters, alternative policies will have to be swiftly implemented

Multilateral environmental agreements (MEAs) have proven to be powerful tools for attacking environmental problems. Each region has its own regional and sub-regional agreements, mostly relating to the common management or protection of natural resources such as water supply in river basins and

Note: years after Convention names are those of adoption followed by (in brackets) entry into force; lines are thin before entry into force of a Convention, thick after

CBD: Convention on Biological Diversity

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

CMS: Convention on the Conservation of Migratory Species of Wild Animals

Basel: Basel Convention on the Transboundary Movements of Hazardous Wastes and their Disposal

Ozone: Vienna Convention for the Protection of the Ozone Layer and Montreal Protocol on Substances that Deplete the Ozone Layer

UNFCCC: United Nations Framework Convention on Climate Change

CCD: United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa

Ramsar: Convention on Wetlands of International Importance especially as Waterfowl Habitat

Heritage: Convention Concerning the Protection of the World Cultural and Natural Heritage

UNCLOS: United Nations Convention on the Law of the Sea

transboundary air pollution. There are also many global-level agreements, including those on climate change and biodiversity that resulted from the United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, in 1992. The growth of Parties to 10 major MEAs is shown in the graph above.

One of the major conclusions of the policy review concerns the implementation and effectiveness of existing policy instruments. The assessment of implementation, compliance and effectiveness of policy initiatives is complicated and plagued by gaps in data, conceptual difficulties and methodological problems.



Africa

'The key challenge is to reduce poverty. New approaches that put the poor at the top of the environment and development agenda could tap and release the latent energy and talents of Africans to bring about development that is economically, socially, environmentally and politically sustainable.'

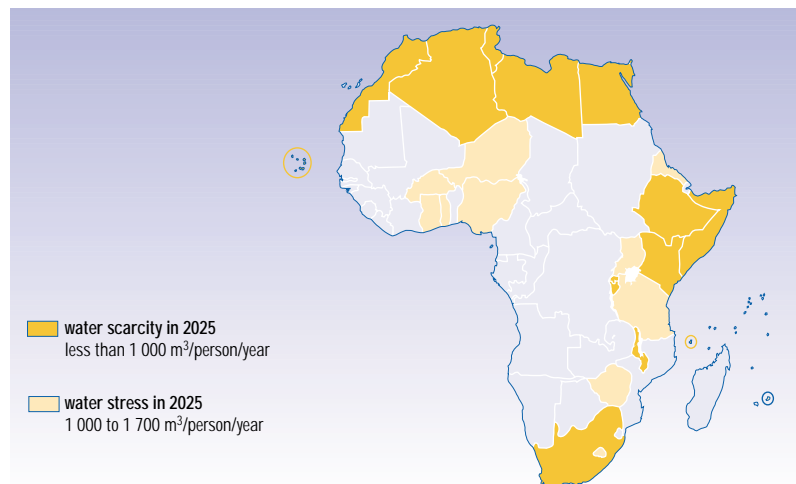
GEO-2000, page 68

Poverty is a major cause and consequence of the environmental degradation and resource depletion that threaten the region. Major environmental challenges include deforestation, soil degradation and desertification, declining biodiversity and marine resources, water scarcity, and deteriorating water and air quality. Urbanization is an emerging issue, bringing with it the range of human health and environmental problems well known in urban areas throughout the world. Growing 'environmental debts' in many countries are a major concern because the cost of remedial action will be far greater than preventive action.

Although many African countries are implementing new national and multilateral environmental policies, their effectiveness is often low due to lack of adequate staff, expertise, funds and equipment for implementation and enforcement. Current environmental policies are mainly based on regulatory instruments but some countries have begun to consider a broader range, including economic incentives implemented through different tax systems. Although cleaner production centres

By the year 2025, 25 African countries will be subject to water scarcity or water stress

Water stress in Africa



Some statistics ...

- Africa is the only continent on which poverty is expected to rise during the next century.
- An estimated 500 million hectares of land have been affected by soil degradation since about 1950, including as much as 65 per cent of agricultural land.
- As a result of declining food security, the number of undernourished people in Africa nearly doubled from 100 million in the late 1960s to nearly 200 million in 1995.
- Africa lost 39 million hectares of tropical forest during the 1980s, and another 10 million hectares by 1995.
- Fourteen African countries are subject to water stress or water scarcity, and a further 11 will join them by 2025.
- Africa emits only 3.5 per cent of the world's total carbon dioxide now and this is expected to increase to only 3.8 per cent by the year 2010.

have been created in a few countries, most industries have made little effort to adopt cleaner production approaches. However, some companies and even local enterprises have recently voluntarily adopted precautionary environmental standards.

There is growing recognition that national environmental policies are more likely to be effectively implemented if they are supported by an informed and involved public. Environmental awareness and education programmes are expanding almost everywhere, while indigenous knowledge receives greater recognition and is increasingly used. Environmental information systems are still weak.

There is fairly high interest in many of the global MEAs, and several regional MEAs have been developed to support the global ones. The compliance and implementation rate is, however, quite low, mainly due to lack of funds.



Asia and the Pacific

Asia and the Pacific is facing serious environmental challenges. High population densities are putting enormous stress on the environment. Continued rapid economic growth and industrialization are likely to cause further environmental damage, with the region becoming more degraded, less forested, more polluted and less ecologically diverse in the future.

Some statistics ...

- There is great pressure on land resources in the region in which some 60 per cent of the world population depends on 30 per cent of its land area.
- About one million hectares of Indonesia's national forests have been destroyed by fires that burned for several months from September 1997. More than 3 million hectares of Mongolian forests were burnt in 1996.
- Increasing habitat fragmentation in Southeast Asia has depleted the wide variety of forest products that used to be the main source of food, medicine and income for indigenous people.
- Expansion of coastal settlements, industrial growth and increased fishing activities have placed enormous and uncontrolled pressures on coastal ecosystems and have degraded marine and coastal resources.
- Demand for primary energy in Asia is expected to double every 12 years while the world average is every 28 years.

Water supply is a serious problem. Already at least one in three Asians has no access to safe drinking water and freshwater will be the major limiting factor to producing more food in the future. Energy demand is rising faster than in any other part of the world. The proportion of people living in urban centres is rising rapidly, and is focused on a few urban centres. Asia's particular style of urbanization – towards megacities – is likely to increase environmental and social stresses.

Widespread concern over pollution and natural

resources has led to legislation to curb emissions and conserve natural resources. Economic policies are beginning to be used for environmental protection and the promotion of resource efficiency. Pollution fines are common and deposit-refund schemes are being promoted to encourage reuse and recycling.

In most countries, domestic investment in environmental issues is increasing. A major thrust is on water supply, waste reduction and waste recycling. Environment funds have been established in many countries and have contributed to the prominent role that NGOs now play in environmental action.

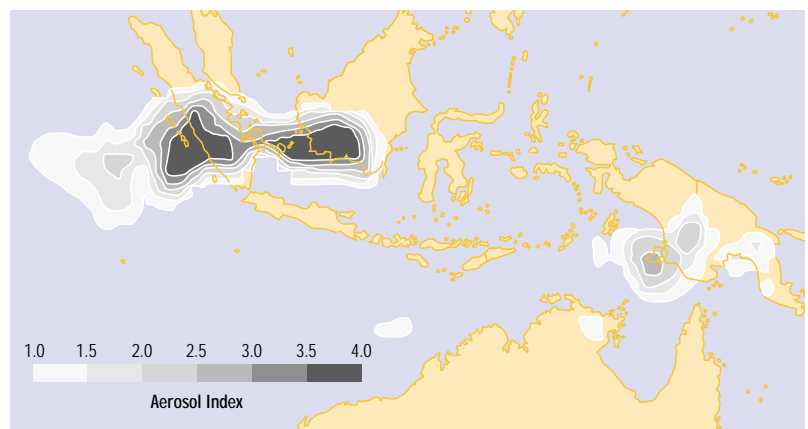
One of the greatest challenges is to promote liberal trade yet maintain and strengthen the protection of the environment and natural resources. Some governments are now taking action to reconcile trade and environmental interests.

There is fairly high interest in many of the global MEAs, and several regional MEAs have been developed to support the global ones. The compliance and implementation rate is, however, quite low, mainly due to lack of funds.

'Rapid industrialization and economic growth have changed virtually every dimension of life, especially in East and Southeast Asia. Yet, by many measures – of health, education, nutrition, as well as income – the quality of life within the region remains poor for most people.'

GEO-2000, page 72

Smoke haze over Indonesia on 19 October 1997



Forest fires caused widespread damage in the region during 1997/98



Europe and Central Asia

'A striking difference between Western Europe and the rest of the region is in life expectancy ... During the past five years, the health situation in Eastern Europe has worsened, most markedly with a significant drop in life expectancy for men.'

GEO-2000, page 100

In Western Europe, overall consumption levels have remained high but measures to curb environmental degradation have led to considerable improvements in some, though not all, environmental parameters. Road transport is now the main source of urban air pollution, and overall emissions are high. In the other sub-regions, political change has resulted in sharp though probably temporary reductions in industrial activity, reducing many environmental pressures.

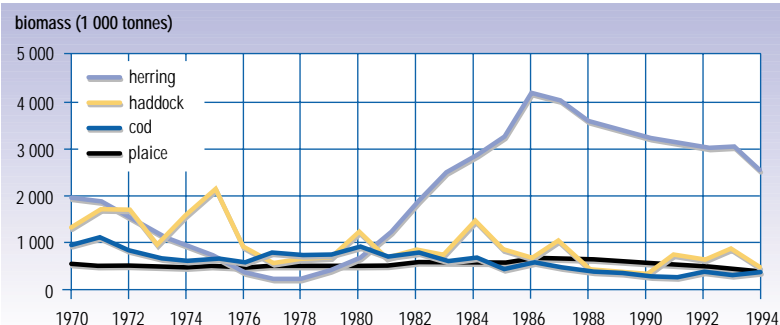
More than half of the large cities in Europe are overexploiting their groundwater resources, and significant groundwater pollution by nitrates, pesticides, heavy metals and hydrocarbons has been reported from many countries. Marine and coastal areas are also susceptible to damage from a variety of sources.

Regional action plans have been effective in catalysing national and local action. However, some targets have yet to be met and plans in Eastern Europe and Central Asia are less advanced than elsewhere because of weak institutional capacities and the slower pace of reform.

Public participation in environmental issues is considered satisfactory in Western Europe, and there are positive trends in Central and Eastern Europe. Access to environmental information has significantly increased with the formation of the European Environment Agency and other information resource

Some North Sea fish stocks are at historically low levels and most are overexploited

North Sea fish stocks



Some statistics ...

- In Western, Central and Eastern Europe, sulphur dioxide emissions were halved between 1985 and 1994 but Europe still produces approximately one-third of global greenhouse gases.
- Soil acidification, erosion, salinization and waterlogging remain serious problems in many parts of the region.
- Pollution of land by excessive use of fertilizers and pesticides and by contaminants such as heavy metals, persistent organic pollutants and radionuclides is widespread.
- Forest area in Western and Central Europe has grown by more than 10 per cent since the 1960s – but nearly 60 per cent of forests are seriously or moderately damaged by acidification, pollution, drought or forest fires.
- Most stocks of commercially exploited fish in the North Sea are in a serious condition – the North Sea fishing fleet needs to be reduced by 40 per cent to match fish resources.
- Per capita waste production in Western Europe has risen 35 per cent since 1980; whilst recycling is increasing, 66 per cent of waste still ends up in landfills.

centres in Europe. The level of support for global and regional MEAs, in terms of both ratification and compliance, is high.

There has been significant success, particularly in Western Europe, in implementing cleaner production programmes and eco-labelling. In the European Union, green taxation and mitigating the adverse effects of subsidies are important priorities.

The transition countries need to strengthen their institutional capacities, improve the enforcement of fees and fines, and build up the capacity of enterprises to introduce environmental management systems. The major challenge for the region as a whole is to integrate environmental, economic and social policies.



Latin America and the Caribbean

Two major environmental issues stand out in the region. The first is to find solutions to the problems of the urban environment – nearly three-quarters of the population are already urbanized, many in megacities where air quality threatens human health and water shortages are common. The second issue is the depletion and destruction of forest resources, especially in the Amazon basin, and the related threat to biodiversity.

The region has the largest reserves of cultivable land in the world but soil degradation is threatening much cultivated land. On the plus side, many countries have substantial potential for curbing their contributions to the build-up of greenhouse gases, given the region's renewable energy sources and the potential of forest conservation and reforestation programmes to provide valuable carbon sinks.

During the past decade, concern for environmental issues has greatly increased, and many new institutions and policies have been put in place. However, these changes have apparently not yet greatly improved environmental management which continues to concentrate on sectoral issues, without integration with economic and social strategies. The lack of financing, technology, personnel and training and, in some cases, large and complex legal frameworks are the most common problems.

Most Latin American economies still rely on the growth of the export sector and on foreign capital inflows, regardless of the consequences to the environment. One feature of such policies is their failure to include environmental costs. Economic development efforts and programmes aimed at fighting poverty continue to be unrelated to environmental policy, due to poor inter-agency coordination and the lack of focus on a broader picture.

An encouraging aspect is the trend towards regional collaboration, particularly on transboundary issues. For example, a Regional Response Mechanism for natural disasters has been established with telecommunication networks that

Some statistics ...

- During the 1980s Central America increased agricultural production by 32 per cent but doubled its consumption of pesticides.
- The natural forest cover continues to decrease in all countries. A total of 5.8 million hectares a year was lost during 1990–95, resulting in a 3 per cent total loss for the period.
- Habitat loss is a major threat to biodiversity in this region, which contains 40 per cent of the Earth's plant and animal species; it is estimated that 1 244 vertebrate species are now threatened with extinction.
- A large decrease in the marine fisheries catch is expected as a result of the 1997–98 *El Niño*.
- Many cities have severe air pollution. In São Paulo and Rio de Janeiro, air pollution is estimated to cause 4 000 premature deaths a year. Waste disposal is also a major urban problem.

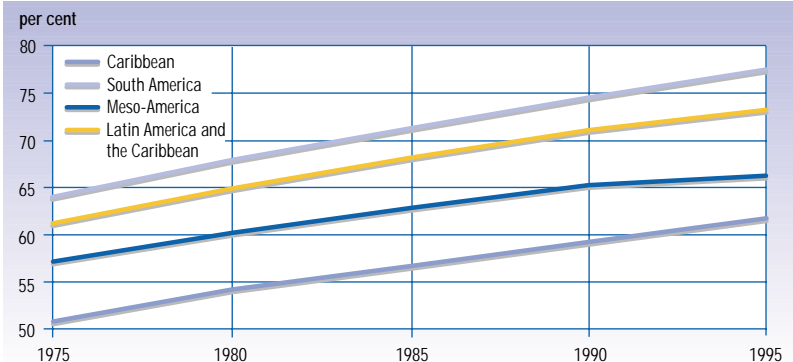
link key agencies so that they can make quick assessments of damage, establish needs and mobilize resources to provide initial relief to affected communities. There is considerable interest in global and regional MEAs, and a high level of ratification. However, the level of implementing new policies to comply with these MEAs is generally low.

'The expected triumph of free-market reforms over poverty has yet to be delivered. On the contrary, the number of people below the poverty line had reached 160 million by 1995.'

GEO-2000, page 121

Meso-America and South America have highly urban populations. Urbanization levels are expected to reach 85 per cent by the year 2025

Urban population





North America

'The North American region is at a critical environmental cross-roads: important decisions have now to be made that will determine whether the region's economic activity and patterns of production and consumption will become more sustainable.'

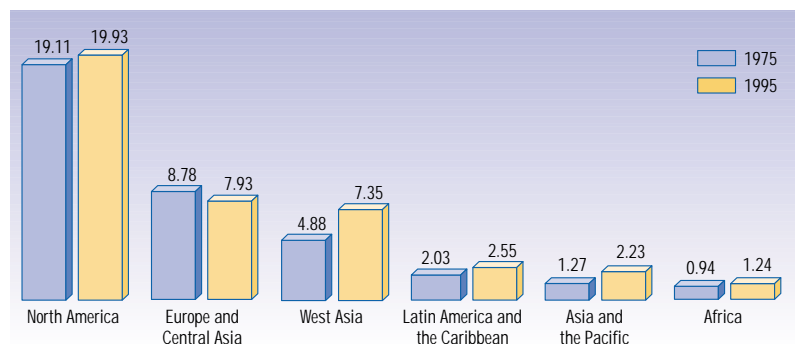
GEO-2000, page 154

North Americans use more energy and resources per capita than people in any other region. This causes acute problems for the environment and human health. The region has succeeded, however, in reducing many environmental impacts through stricter legislation and improved management. Whilst emissions of many air pollutants have been markedly reduced over the past 20 years, the region is the largest per capita contributor to greenhouse gases, mainly due to high energy consumption. There is continuing concern about the effects of exposure to pesticides, organic pollutants and other toxic compounds. Changes to ecosystems caused by the introduction of non-indigenous species are threatening biodiversity. Many coastal and marine resources are close to depletion or are being seriously threatened.

The environmental policy scene is changing in North America. In Canada, most emphasis is on regulatory reform, federal/provincial policy harmonization and voluntary initiatives. In the United States, the impetus for introducing new types of environmental policies has increased and the country is developing market-based policies such as the use of tradeable emissions permits and agricultural subsidy reform. Voluntary policies and private sector initiatives, often in combination with civil society, are also gaining in importance. The

The North American region is the largest per capita contributor to greenhouse gases, mainly due to high energy consumption

Annual per capita carbon dioxide emissions (tonnes/year)



Some statistics ...

- Emissions of CO, VOCs, particulates, SO₂ and lead have been markedly reduced over the past 20 years.
- Fuel use is high – in 1995 the average North American used more than 1 600 litres of fuel (compared to about 330 litres in Europe).
- The oxygen-depleted 'dead zone' that now appears off the US Gulf Coast each summer – at the peak of fertilizer run-off from the Corn Belt – is the size of New Jersey.
- Fish stocks off the east coast have nearly collapsed. The Atlantic finfish catch declined from 2.5 million tonnes in 1971 to less than 500 000 tonnes in 1994.
- Global warming could move the ideal range for many North American forest species some 300 km to the north, undermining the utility of forest reserves.

region is generally active in supporting and complying with regional and global MEAs.

Public participation has been at the heart of many local resource management initiatives. Environmental policy instruments are increasingly developed in consultation with the public and the business community. Participation by NGOs and community residents is increasingly viewed as a valuable part of any environmental protection programme.

Increasing accountability and capacity to measure the performance of environmental policies is an overarching trend. Target setting, monitoring, scientific analysis and the public reporting of environmental policy performance are used to keep stakeholders involved and policies under control. Access to information has been an important incentive for industries to improve their environmental performance.

Despite the many areas where policies have made a major difference, environmental problems have not been eliminated. Economic growth has negated many of the improvements made so far and new problems – such as climate change and biodiversity loss – have emerged.



West Asia

The region is facing a number of major environmental issues, of which degradation of water and land resources are the most pressing. Groundwater resources are in a critical condition and major environmental problems are likely to occur in the future unless improved water management plans are put in place.

Some statistics ...

- Most land is either desertified or vulnerable to desertification. Large areas have been affected by salinization, alkalinization and nutrient deposition.
- Groundwater resources are in a critical condition because the volumes withdrawn far exceed natural recharge rates.
- Some 1.2 million barrels of oil are spilled into the Persian Gulf annually. The level of petroleum hydrocarbons in the area exceeds that in the North Sea by almost three times and is twice that of the Caribbean Sea.
- Air pollution has risen to alarming levels, especially in cities of more than one million inhabitants.
- The oil-producing countries generate from 2–8 times more hazardous waste per capita than does the United States.

Land degradation is a serious problem, and the region's rangelands are deteriorating, mainly as a result of overstocking what are essentially fragile ecosystems. Drought, mismanagement of land resources, intensification of agriculture, poor irrigation practices and uncontrolled urbanization have also contributed. Marine and coastal environments have been degraded by overfishing, pollution and habitat destruction. Industrial pollution and management of hazardous wastes also threaten socio-economic development. Over the next decade, urbanization, industrialization, population growth, abuse of agrochemicals, and uncontrolled fishing and hunting are expected to increase pressures on the region's fragile ecosystems and their endemic species.

The command and control approach, through legislation, is still the main environmental management tool in almost all states. However, several new initiatives are being taken to protect environmental resources and control pollution. In addition, many enterprises such as refineries, petrochemical complexes and metal smelters have begun procedures for obtaining certification under the ISO 14 000 series. Another important approach to resource conservation has been a growing interest in recycling scarce resources, particularly water. In many states on the Arabian Peninsula, municipal wastewater is subjected at least to secondary treatment, and is widely used to irrigate trees planted to green the landscape.

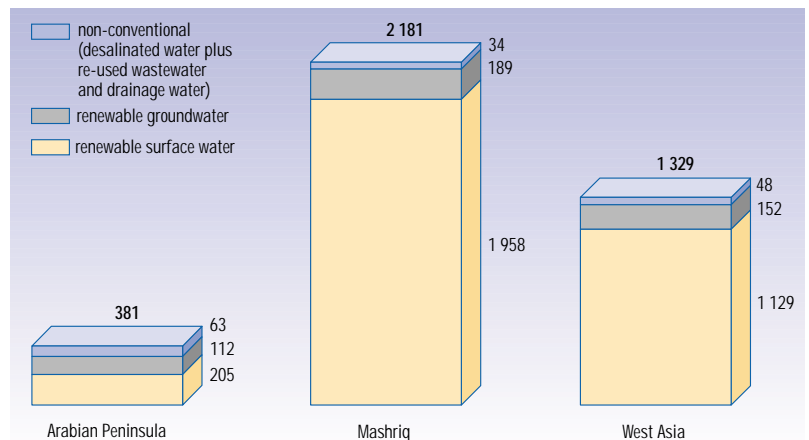
Success in implementing global and regional MEAs in the region is mixed and commitment to such policy tools quite weak. At a national level there has, however, been a significant increase in commitment to sustainable development, and environmental institutions have been given a higher priority and status.

'The region's population is growing much more rapidly than the pace of development of water resources. Consequently, per capita availability is decreasing. Of the 11 countries in the region, 8 already have a per capita water use of less than 1 000 m³ a year, and four use less than half of that.'

GEO-2000, page 167

Renewable water supplies in the Arabian Peninsula are well below the critical 1 000 m³/capita value used to indicate chronic water shortage

Renewable water resources, 1995 (m³ per capita)





The Polar Regions

'The consequences of an increase in global temperatures and local changes in precipitation and snow cover are not fully understood but could be leading to the melting of polar ice caps, ice shelves and glaciers, the retreat of sea ice, sea-level rise, and the thawing of permafrost.'

GEO-2000, page 176

The Arctic and Antarctic play a significant role in the dynamics of the global environment and act as barometers of global change. Both areas are mainly affected by events occurring outside the polar regions. Stratospheric ozone depletion has resulted in high levels of ultraviolet radiation, and polar ice caps, shelves and glaciers are melting as a result of global warming. Both areas act as sinks for persistent organic pollutants, heavy metals and radioactivity, mostly originating from other parts of the world. The contaminants accumulate in food chains and pose a health hazard to polar inhabitants. Wild flora and fauna are also affected by human activities. For example, capelin stocks have collapsed twice in the Arctic since the peak catch of 3 million tonnes in 1977. In the Southern Ocean, the Patagonian toothfish is being over-fished and there is a large accidental mortality of seabirds caught up in fishing equipment. On land, wild communities have been modified by introductions of exotic species and, particularly in northern Europe, by overgrazing of domestic reindeer.

In the Arctic, the end of Cold War tensions has

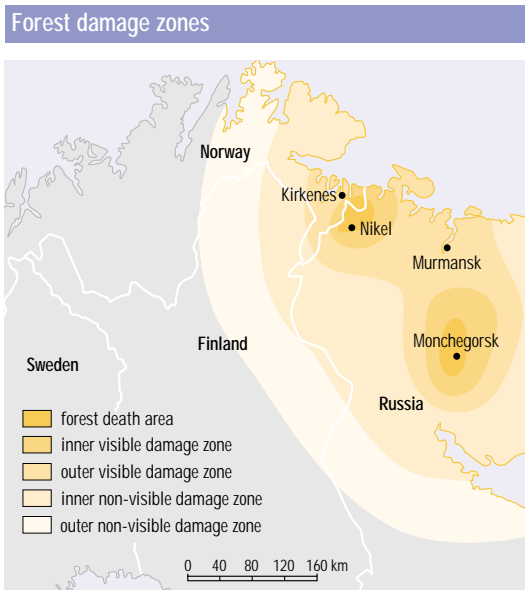


The Patagonian toothfish, *Dissostichus eleginoides*, is being severely overfished

Some statistics ...

- Commercial forestry has depleted and fragmented boreal forests, especially in the European Arctic. Regeneration is very slow because of the harsh climate.
- Some of the highest values of cadmium ever recorded in birds have been found in ptarmigan from northern Norway and the Yukon Territory in Canada.
- Radioactive isotopes occur widely in Arctic marine sediments as a result of fallout from atmospheric weapons testing, military accidents and discharges from European reprocessing plants.
- Conservative estimates put the annual albatross mortality from fishing in the Southern Ocean at 44 000; similar problems exist in the Arctic.
- The reported legal catch of Patagonian toothfish in the Antarctic was 10 245 tonnes whereas the illegal catch was estimated at more than 100 000 tonnes in the Indian Ocean sector of the Southern Ocean alone.
- Exploitation of large gas and oil reserves in the Arctic has been responsible for environmental damage from blowouts, tanker spills and leakages.

led to new environmental cooperation. The eight Arctic countries have adopted the Arctic Environmental Protection Strategy which includes monitoring and assessment, environmental emergencies, conservation of flora and fauna, and protection of the marine environment. Cooperation amongst groups of indigenous peoples has also been organized. The Antarctic environment benefits from the continuing commitment of Parties to the Antarctic Treaty aimed at reducing the chance of the region becoming a source of discord between states. The Treaty originally focussed on mineral and living resources but this focus has now shifted towards broader environmental issues. A similar shift is expected in the Arctic, within the broader context of European environmental policies. In both polar areas, limited financial resources and political attention still constrain the development and implementation of effective policies.



Extensive damage to the boreal forest in northeast Russia has been caused by sulphur and heavy metal emissions from industrial sites



Future perspectives

Issues for the 21st century

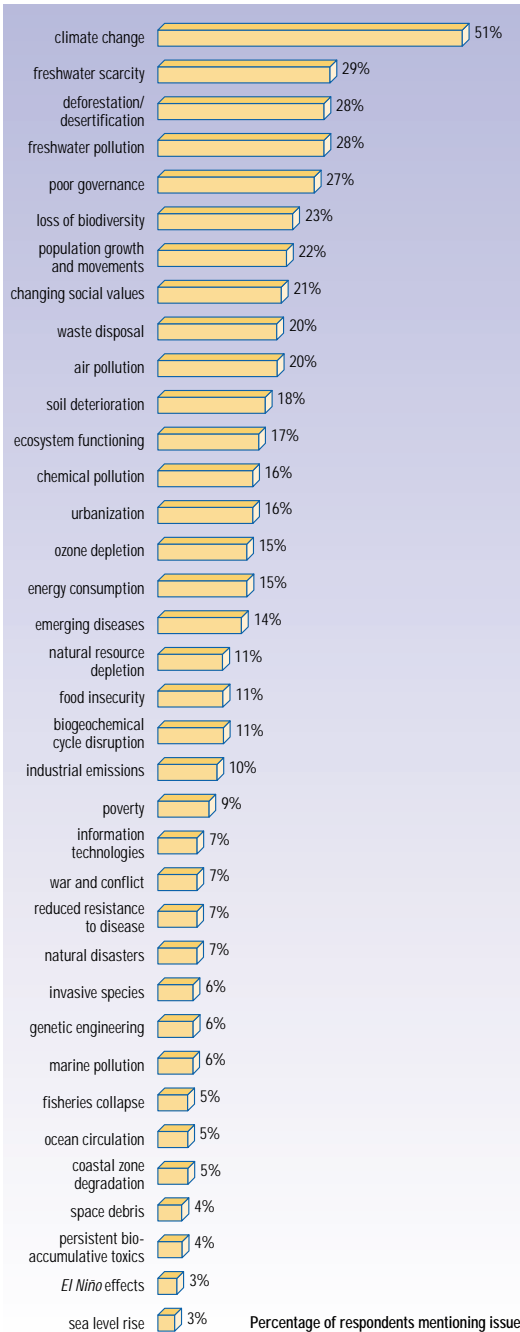
Environmental issues that may become priorities in the 21st century can be clustered in three groups – unforeseen events and scientific discoveries; sudden, unexpected transformations of old issues; and already well-known issues to which the present response is inadequate.

The Scientific Committee on Problems of the Environment of the International Council for Science conducted a special survey for *GEO-2000* on environmental issues that may require attention in the 21st century. The survey was conducted among 200 scientists in 50 countries. Most of the responding scientists expect that the major environmental problems of the next century will stem from the continuation and aggravation of existing problems that currently do not receive enough policy attention.

The issues cited most frequently are climate change, and the quantity and quality of water resources. These are followed by deforestation and desertification, and problems arising from poor governance at national and international levels. Two social issues, population growth and changing social values, also received considerable attention. Many scientists emphasized that the interlinkages between climate change and other environmental problems could be important. This includes the emerging scientific understanding of complex interactions in the atmosphere-biosphere-cryosphere-ocean system – which could lead to irreversible changes such as shifts in ocean currents and changes in biodiversity.

The emphasis on interlinkages is not surprising. It has been repeatedly shown that sectoral policies taken in isolation do not always yield the desired results. One reason is that sectoral policies can solve one problem while aggravating others, particularly over a long time frame. Although the existence of interlinkages between environmental problems is now better known, we still lack understanding of exactly how the issues are linked, to what degree they interact

Major emerging issues identified in the SCOPE survey



Climate change was the most cited issue in the SCOPE survey although, taken together, water scarcity and pollution ranked higher

'Present day actions have consequences that reach far into the future. Conversely the "future" is playing an increasing role in the present. The future impacts of today's decisions are becoming more and more prominent in current-day policy making.'

GEO-2000, page 334

Environmental focus of the region-specific alternative policy studies

Africa	Land and water resource management
Asia and the Pacific	Air pollution
Europe and Central Asia	Energy-related issues
Latin America and the Caribbean	Use and conservation of forests
North America	Resource use, greenhouse gas emissions
West Asia	Land and water resource management

and what the most effective measures are likely to be. One such issue that is identified throughout *GEO-2000* is the need to integrate land- and water-use planning to provide food and water security.

Alternative policies

Since current policies will not lead to a sustainable future, at either the regional or the global level, region-specific studies were undertaken for *GEO-2000* to investigate possible alternative policies. Each regional study focused on one or two specific issues selected on the basis of regional challenges identified in *GEO-1* (see table above).

In each study, several alternative policy responses were identified to address the issues at hand. Each of the selected responses has been implemented elsewhere with success. The results confirm that, in principle, the knowledge and technological base to solve environmental issues are available, and that if these alternative policies were implemented immediately and pursued with vigour they could indeed set the world on a more sustainable course.

A number of key conclusions emerge from the alternative policy studies.

'The studies identified sets of alternative policies which could adjust trends in the regions towards a more sustainable course. However, even some of the more positive scenarios produce results which fall short of acceptable limits.'

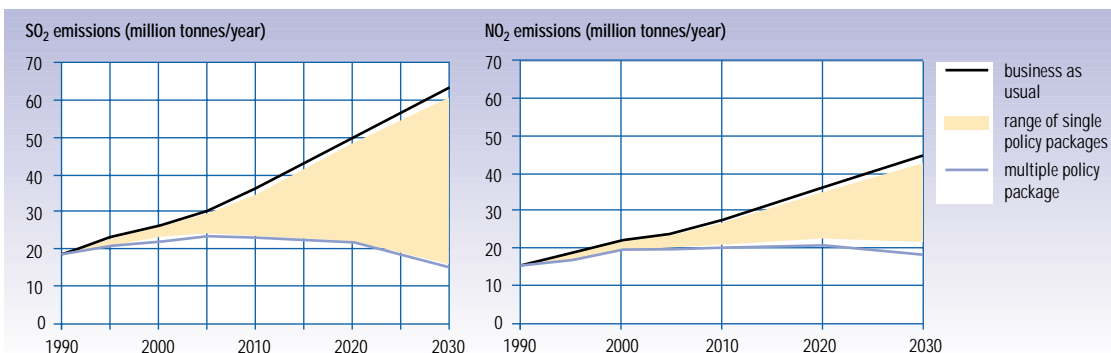
GEO-2000, page 343

The Asia and Pacific alternative policy study investigated the reduction in emissions of sulphur and nitrogen oxides under different scenarios. These included business as usual, single policy packages such as the introduction of clean technologies, efficient transportation and fuel switching, and a combination of all three called the multiple policy package

- There is a clear need for integrated policies. For example, in Latin America a broad intersectoral approach is advocated to achieve sustainable forest development. In Europe and Central Asia, combined strategies to deal with acidification, urban air pollution and climate change could lead to an optimal use of opportunities for energy efficiency and fuel switching.
- Market-based incentives, particularly subsidy reforms, have a role to play in all regions. Reform of unnecessary subsidies can encourage the more efficient use of resources such as energy, and thus help reduce pollution and degradation.
- Effective institutional mechanisms are essential. Too many institutions are weak and plagued with limited mandates and power, small financial resources and few human resources.
- A main obstacle to successful policy implementation is lack of money. Attention is drawn to the crucial point that environmental management usually needs financing.

The regional studies highlight major gaps in our knowledge and experience when it comes to analysing and directing macro-economical processes relating to the environment. A number of issues, including trade and financial flows, were not addressed because of a lack of relevant information and knowledge. There is an urgent need to improve understanding of the effects of economic and social developments on the environment, and vice versa.

Sulphur and nitrogen dioxide emissions, continental Asia, different scenarios





Outlook and recommendations

Outlook

There have been some remarkable environmental successes over the past few years (see, for example, box below). However, while there used to be a long time horizon for undertaking major environmental policy initiatives, time for a rational, well-planned transition to a sustainable system is running out fast. Full-scale emergencies now exist on a number of issues:

- The world water cycle seems unlikely to be able to cope with the demands that will be made of it in the coming decades.
- Land degradation has reduced fertility and agricultural potential. These losses have negated many of the advances made through expanding agricultural areas and increasing productivity.
- Tropical forest destruction has gone too far to prevent irreversible damage. It would take many generations to replace the lost forests, and the cultures that have been lost with them can never be replaced.
- Many of the planet's species have already been lost or condemned to extinction because of the slow response times of both the environment and policy-makers; it is too late to preserve all the biodiversity our planet once had.
- Many marine fisheries have been grossly over-exploited, and their recovery will be slow.
- More than half of the world's coral reefs are threatened by human activities. While some may yet be saved, it is too late for many others.
- Urban air pollution problems are reaching crisis dimensions in many of the megacities of the developing world, and the health of many urban dwellers has been impaired.
- It is probably too late to prevent global warming as a result of increased greenhouse gas emissions; in addition, many of the targets agreed on in the Kyoto Protocol may not be met.

'The global system of environmental policy and management is moving in the right direction but much too slowly. Inspired political leadership and intense cooperation across all regions and sectors will be needed to put both existing and new policy instruments to work.'

GEO-2000, page 364

Recommendations

One of GEO's tasks is to recommend measures and actions that could reverse unwelcome trends and reduce threats to the environment. *GEO-2000* therefore concludes with recommendations made by UNEP after consideration of the findings of the *GEO-2000* assessment. These recommendations are focused on four areas.

Filling the knowledge gaps

GEO-2000 shows that we still lack a comprehensive view of the interactions and impacts of global and inter-regional processes. Information on the current

Some key environmental successes

- The ozone layer is expected to have largely recovered within half a century as a result of the Montreal Protocol.
- The first international steps – the United Nations Framework Convention on Climate Change and its Kyoto Protocol – have been taken to tackle the issue of global climate change.
- The public is now much more concerned about environmental issues. Popular movements in many countries are forcing authorities to make changes.
- Voluntary action taken by many of the world's major industries is reducing resource use and eliminating waste. The happy discovery that what is good for the environment can also be good for business may do much to reverse trends for which industry itself was originally largely responsible. This 'win-win' situation bodes well for the planet.
- Governments in developed regions have been markedly successful in reducing air pollution in many major cities. Innovative legislation has been introduced, and the goal of zero emissions in several important areas is no longer considered utopian.
- Deforestation has been halted and reversed in parts of both Europe and the North America.
- Local *Agenda 21* initiatives have proved an effective way of developing and implementing sustainable development policies that involve communities and political agencies alike.

'UNEP believes that increased and concerted policy development and action in these four "cross-cutting" areas would do much to break the stalemate which currently prevails on too many pressing environmental issues.'

GEO-2000, page 364

state of the environment is riddled with weakness. There are few tools to assess how developments in one region affect other regions, and whether the dreams and aspirations of one region are compatible with the sustainability of the global commons.

Another serious omission is the lack of effort to find out whether new environmental policies and expenditures have the desired results. These knowledge gaps act as a collective blindfold that hides both the road to environmental sustainability and the direction in which we are travelling. Actions are recommended in four areas:

- improving environmental data and information;
- evaluating policy performance;
- assessing the links between trade and environment; and
- assessing how far international financial flows meet *Agenda 21* targets.

Tackling root causes

Means must be found to tackle the root causes of environmental problems, many of which are unaffected by strictly environmental policies. Resource consumption, for example, is a key driver of environmental degradation. Policy measures to attack this issue must reduce population growth, reorient consumption patterns, increase resource use efficiency and make structural changes to the economy. Ideally, such measures must simultaneously maintain the living standards of the wealthy, upgrade the living standards of the disadvantaged, and increase sustainability. This will require a shift in values away from material consumption. Without such a shift, environmental policies can effect only marginal improvements.

Actions are recommended in three areas:

- reducing environmentally-damaging subsidies without causing social or economic hardship;
- improving energy conservation; and
- encouraging the adoption of improved production technologies.

Taking an integrated approach

Changes are needed in the ways we think about the environment and in the ways in which we manage it. First, environmental issues need to be integrated into mainstream thinking. Better integration of

environmental thinking into decision-making about agriculture, trade, investment, research and development, infrastructure and finance is now the best chance for effective action. Secondly, environmental policies that move away from strictly sectoral issues to encompass broad social considerations are the most likely to make a lasting impact. Thirdly, there is a need for better integration of international action to improve the environment – particularly in relation to regional and multilateral environment agreements. Actions are recommended in three areas:

- integrating the environment into mainstream thinking;
- adopting integrated environmental management; and
- improving international coordination.

Mobilizing action

Solutions to environmental issues must come from cooperative action between all those involved – individuals, NGOs, industry, local and national governments, and international organizations. The need to involve all the parties concerned is emphasized throughout *GEO-2000*. Specific examples include the increasing role of NGOs in multilateral agreements, the involvement of stakeholders in property rights issues, and the leading role played by some manufacturing and resource industries in setting ambitious but voluntary environmental targets. Actions are recommended in five areas:

- increasing public participation in environmental action;
- strengthening the role of community groups and NGOs;
- encouraging industry, particularly small and medium-sized enterprises, to set environmental targets;
- stimulating action by national governments; and
- increasing support for and the coordination of international organizations.



Further information

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