



MDG 7

Ensure Environmental Sustainability

Environmental sustainability is necessary to achieve and sustain economic growth, poverty eradication, and social development. Achieving sustainability requires systematic effort to avoid undesirable environmental impacts and enhance ecosystem management. There are numerous challenges, including minimizing the effects of pollutants; ensuring efficient utilization of land and consumption of natural resources; and containing congestion in urban areas and the associated problems of transportation, waste disposal, and provision of social services. Reconciling environmental sustainability and rapid economic development that reduces poverty calls for informed policies and strategies that achieve designated goals and minimize unfavourable trade-offs.

Like all countries, Malaysia has had to grapple with environmental degradation issues. For example, urban-based economic growth has led to increased potential for pollution of the environment. However, the need to balance environmental and developmental demands to ensure that the benefits of development are not negated by the costs of environmental change has been recognized in Malaysia since the 1970s. The principles of sustainable development have progressively been integrated into national development plans and policy making. These include sector-specific policies, legislation, and obtaining approval to proceed on the basis of environmental impact assessments for major projects. Malaysia is also an active participant in reviewing environmental issues at the regional and international level and has ratified most major multilateral environment agreements.

MDG 7, on ensuring environmental sustainability, sets three targets, namely to (i) integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources; (ii) halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation; and (iii) by 2020, have achieved a significant improvement in the lives of slum dwellers. To measure progress towards these three targets, a set of indicators have been proposed; they are defined and explained in Box 7.1.

This chapter first outlines current sustainable development trends that are related to the MDG 7 targets, and then reviews the programmes that have been formulated to help achieve these targets. It concludes by pointing to some of the continuing challenges that Malaysia faces in achieving sustainable development.

Box 7.1 INDICATORS FOR MONITORING ENVIRONMENTAL SUSTAINABILITY

Six key indicators are used here to monitor the progress of the MDG to ensure environmental sustainability. These are (i) proportion of land area covered by forest; (ii) ratio of area protected to maintain biological diversity to surface area; (iii) energy use (kg oil equivalent) per \$ GDP (PPP); (iv) carbon dioxide emissions (per capita) and consumption of ozone-depleting CFCs (ODP tons); (v) proportion of population with sustainable access to an improved water source, urban and rural and (vi) proportion of urban and rural population with access to improved sanitation.

The **proportion of land area covered by forest** is defined as a share of total land area, where land area is the total surface area of the country less the area covered by inland waters, such as major rivers and lakes. Changes in forest area reflect the demand for land for other competitive uses. Forests fulfil various functions that are vital for humanity, both in terms of goods and services.

The **ratio of area protected to maintain biological diversity to surface area** is defined as nationally protected area as a percentage of the total surface area of a country. Protected areas are vital for safeguarding biodiversity, supporting local livelihoods, protecting watersheds, harbouring the wealth of genetic resources, promoting recreation and tourism industries, and providing areas for research and education, as well as fostering cultural values.

The **energy use (kg oil equivalent) per \$ GDP purchasing power parity (PPP)** is the commercial energy used, measured in units of oil equivalent per \$1 GDP

converted from national currencies, using PPP. It provides a measure of energy intensity. The lower the ratio, the better the energy efficiency.

The carbon dioxide emissions (per capita) and **consumption of ozone-depleting chlorofluorocarbons (CFCs)** (ozone depleting potentials (ODP) tons) show total amount of carbon dioxide emitted by a country as a consequence of consumption and production activities and sum of the consumption of the weighted tons of the individual substances in the group—metric tons of the individual substances multiplied by its ODP respectively. They signify the commitment to reducing carbon dioxide emissions and progress in phasing out the consumption of CFCs by the countries that have ratified the Montreal Protocol.

The **proportion of population with sustainable access to an improved water source, urban and rural**, is defined as the percentage of the population who use any of the following types of water supply for drinking: piped water, public tap, borehole or pump, protected well, protected spring, or rainwater. It monitors access to improved water sources based on the assumption that improved sources are more likely to provide safe water. Unsafe water is the direct cause of many diseases in developing countries.

The **proportion of urban and rural population with access to improved sanitation** is the percentage of the population with access to facilities that hygienically separate human excreta from human, animal, and insect contact. Good sanitation is important for the health of the urban and rural populations.

Trends in environmental sustainability

Proportion of land area covered by forest

The total land area for Malaysia is about 33 million hectares of which 19.5 million hectares or 59.5 per cent of the total land area are under forest cover. Out of the 19.5 million hectares, 14.3 million hectares are gazetted as Permanent Reserve Forests (PRF) or Forest Reserves (Sabah and Sarawak) and are managed under the Forestry Department of each state. The forest reserves are managed with the objective of maintaining the forest ecosystem in perpetuity, while allowing for the use of the forest products and services. Within these areas, there are classifications for different categories of use, such

as for timber production, water catchment, soil protection, recreation, research, and wildlife protection.

In addition to these areas, Malaysia has also gazetted a total of about 3.3 million hectares as protected areas, under the network of Wildlife Sanctuaries, National Parks, State Parks, and Wildlife Reserves scattered throughout the country. This increase is due to the gazettement of more state parks, of which the Royal Belum State Park, covering an area of about 117,500 hectares, gazetted in 2003, is the latest example.

Ratio of area protected to maintain biological diversity to surface area

Malaysia is a country that has been recognized as one of the twelve mega biologically diverse countries in the world. It is estimated that there could be over 15,000 known species of flowering plants, 286 species of mammals, 150,000 species of invertebrates, over 1,000 species of butterflies, 12,000 species of moths, and over 4,000 species of marine fish in the country. The recent discovery of a new tree species *Vatica yeechongyii* in May 2004 in Selangor and Negeri Sembilan demonstrates that the extent of diversity is still not fully known.

To ensure the protection and conservation of its biodiversity, Malaysia has created a network of protected areas that are representative of the ecosystems found in Malaysia. As previously noted, the network of protected areas for forests is covered under Wildlife Sanctuaries, National Parks, State Parks, and Wildlife Reserves and totals up to 3.3 million hectares. In addition, there is a total of about 0.2 million hectares of protected forest within the Permanent Reserve Forests.

In 1995, *Tasek Bera* became the first *Ramsar* protected area in Malaysia and is dedicated to the protection and sustainable use of freshwater ecosystems in the country. The management programme also includes the integration of sustainable use by local and indigenous communities through ecotourism activities.

Another ecosystem that has been protected for its resources is the fisheries and coral reef ecosystem. Malaysia has a total of about 40 marine parks. The fourth unique ecosystem that is represented through the protected area network is the cave ecosystem which is represented by the Gunung Mulu and Gunung Niah National Parks in Sarawak.

Energy use

Adequate energy services are essential for economic development, to raise productivity and support modern lifestyles. But the provision of energy services, especially those furnished through the combustion of fossil fuels, can have adverse environmental effects. Expanding use of fossil fuels increases emissions of carbon dioxide, impacts negatively on the atmosphere, and contributes to climatic warming. More directly, the by-products of fuel combustion, such as dust and soot, can affect productivity, health, and the quality of life.

Malaysia's largest energy resources are oil and natural gas, while hydroelectricity and coal (mainly imported) comprise the other main sources of power. Crude oil and petroleum products, which provided about 53 per cent of the total energy supply in 2000, are predicted to grow at 6.3 per cent per year during the Eighth Malaysia Plan period

(2001–5). Natural gas, which contributed 37 per cent, is projected to grow by 8.8 per cent per annum. By 2005, the contribution of crude oil and petroleum products is anticipated to decline to 50.8 per cent, while natural gas and coal are expected to increase to 39.9 per cent and 5.9 per cent respectively. Similarly, the use of renewable energy as the fifth option is expected to be intensified. This is consistent with the energy policy of reducing dependence on a single source of energy and developing alternative sources of supply.

The final consumption of commercial energy, which grew at an average annual rate of 4.7 per cent during the 1995–2000 period (Table 7.1), was attributable largely to expansion in the manufacturing and transport sectors over that five-year period (Table 7.2). The industrial sector was the largest energy consumer, utilizing over 37 per cent of the total commercial energy demand in 2000. The transport sector consumed almost as much (over 36 per cent), whereas the combined residential and commercial sector share was a little less than 13 per cent of the total (Table 7.2).

Table 7.1 Final Commercial Energy Demand by Source, Malaysia, 1995 and 2000

Source	1995		2000		Average Annual Growth Rate (%)
	PJ ²	%	PJ	%	1995–2000
Petroleum Products	676.0	72.8	804.3	68.9	3.5
Natural Gas ³	81.1	8.8	120.0	10.3	8.2
Electricity	141.3	15.2	205.0	17.6	7.7
Coal & Coke	29.8	3.2	37.8	3.2	4.9
TOTAL	928.2	100.0	1,167.1	100.0	4.7
Per Capita Consumption (gigajoules)	44.9		50.1		2.5
Energy Efficiency (RM million GDP per PJ of energy used)	239.68		291.93		4.02

Source of data: Malaysia, Economic Planning Unit, 2001a.

Notes: 1. Refers to the quantity of commercial energy delivered to final consumers but excludes gas, coal, and fuel oil used in electricity generation.

2. Joule is the unit of energy to establish the equivalent physical heat content of each energy form. One megajoule = 106 joules, one gigajoule (GJ) = 109, and one petajoule (PJ) = 1015 joules. One PJ = 0.0239 million tonnes of oil equivalent (mtoe). One toe = 7.6 barrels.

3. Includes natural gas used as fuel and feedstock consumed by the non-electricity sector.

Compared with many industrialized nations, per capita energy consumption is relatively modest but is expanding rapidly in tandem with economic development. It grew by an average of 2.5 per cent per annum between 1995 and 2000 (Table 7.1) and is expected to increase to 5.8 per cent per annum by 2005 while the overall demand for energy by 2005 is expected to increase by 7.8 per cent per annum. Energy intensity of the economy is expected to increase marginally from 5.7 GJ in 2000 to 5.9 GJ in 2005.

Through the rural electrification programme, it is anticipated that continued investment would achieve 95 per cent of rural electricity coverage in Malaysia by 2005, with Sabah and Sarawak achieving 85 per cent and 90 per cent respectively.

Table 7.2 Final Commercial Energy Demand by Sector, Malaysia, 1995, 2000, and 2005

Sector	1995		2000		2005 (estimated)		Average Annual Growth Rate (%)	
	PJ	%	PJ	%	PJ	%	7MP	8MP
Industrial ¹	337.5	36.4	432.9	37.1	650.0	38.2	5.1	8.5
Transport	327.8	35.3	422.8	36.2	642.5	37.8	5.2	8.7
Residential and Commercial	118.8	12.8	147.8	12.7	213.2	12.5	4.5	7.6
Non-Energy ²	125.4	13.5	142.8	12.2	165.2	9.7	2.6	3.0
Agriculture and Forestry	18.7	2.0	20.8	1.8	28.9	1.8	2.2	6.8
TOTAL	928.2	100.0	1,167.1	100.0	1,699.8	100.0	4.7	7.8

Source of data: Malaysia, Economic Planning Unit, 2001a.

Notes: PJ: Petajoules. 1. Includes manufacturing, construction, and mining.

2. Includes natural gas, bitumen, asphalt, lubricants, feedstock, and grease.

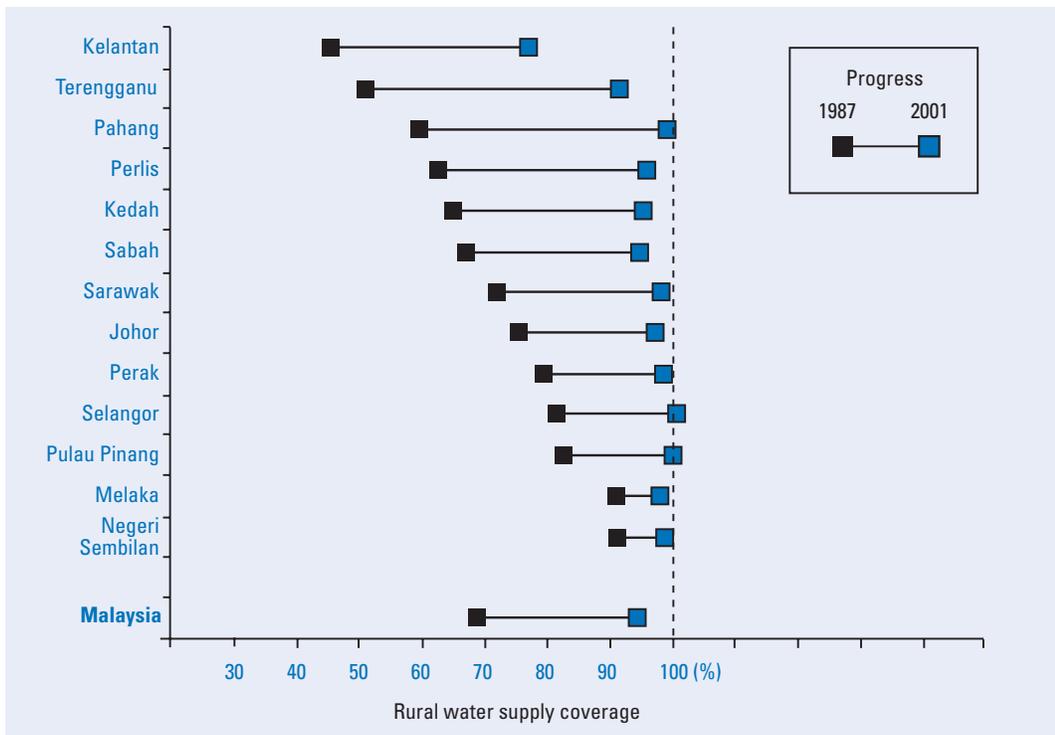
Water supply and sanitation

Comprehensive water reticulation in Malaysia assumed high priority after Independence with the primary objective of reaching as many people as possible with treated water of potable quality. This has proved to be a major task since population has grown steadily at an average annual rate of around 2–3 per cent since the 1960s and in 2000, 38 per cent of the population was still resident in rural localities. In 2000, about 98 per cent of the urban population and 87 per cent of the rural population were served with clean piped water.

The major water demand comes from irrigation for agricultural purposes and domestic and industry use with the projected increase in demand from 10.4 billion m³ and 4.8 billion m³ in 2000 to 13.2 billion m³ and 5.8 billion m³ in 2020 respectively. Providing continued treated water to the entire population in future will depend on the quality of available fresh water as well as the management and supply of treated water. Despite the abundance of fresh water in Malaysia, shortages occur in some states due to uneven distribution and demand, as well as seasonal variations. Even in the states that lag behind, the percentage of households with access to improved water sources is still high at 80 per cent in Kelantan and 90 per cent in Terengganu (Figure 7.1).

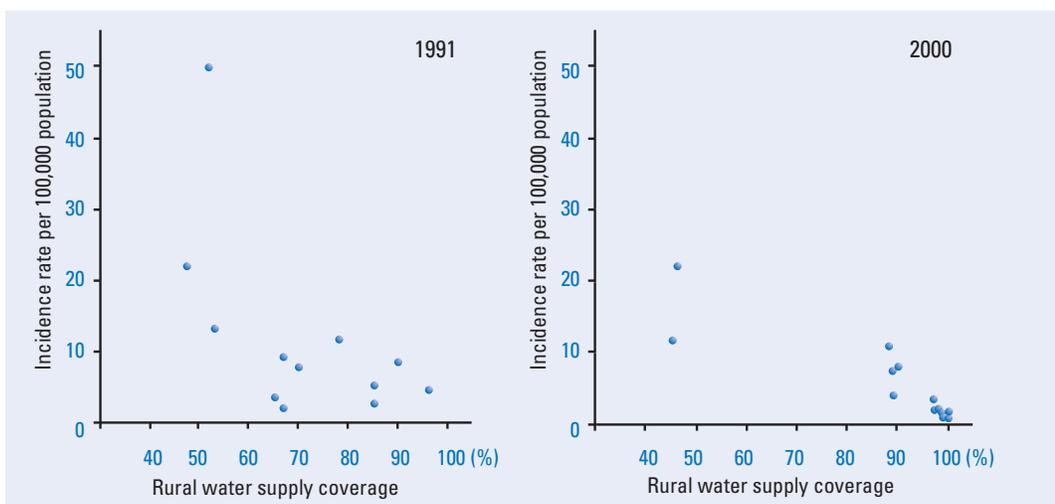
Increased access to improved water sources has been a powerful factor in improving health and reducing the spread of infectious diseases in Malaysia, especially among rural communities. As water supply coverage has increased amongst rural population, the incidence of cholera, typhoid, and dysentery has fallen markedly (Figure 7.2).

Figure 7.1 Access to Improved Water Source in Rural Areas by State, Malaysia, 1987 and 2001



Sources of data: Malaysia, Ministry of Health, Annual Report, 1987 and 2001a.

Figure 7.2 Illnesses Related to Unclean Water Usage vs Rural Water Supply Coverage, Malaysia, 1991 and 2000

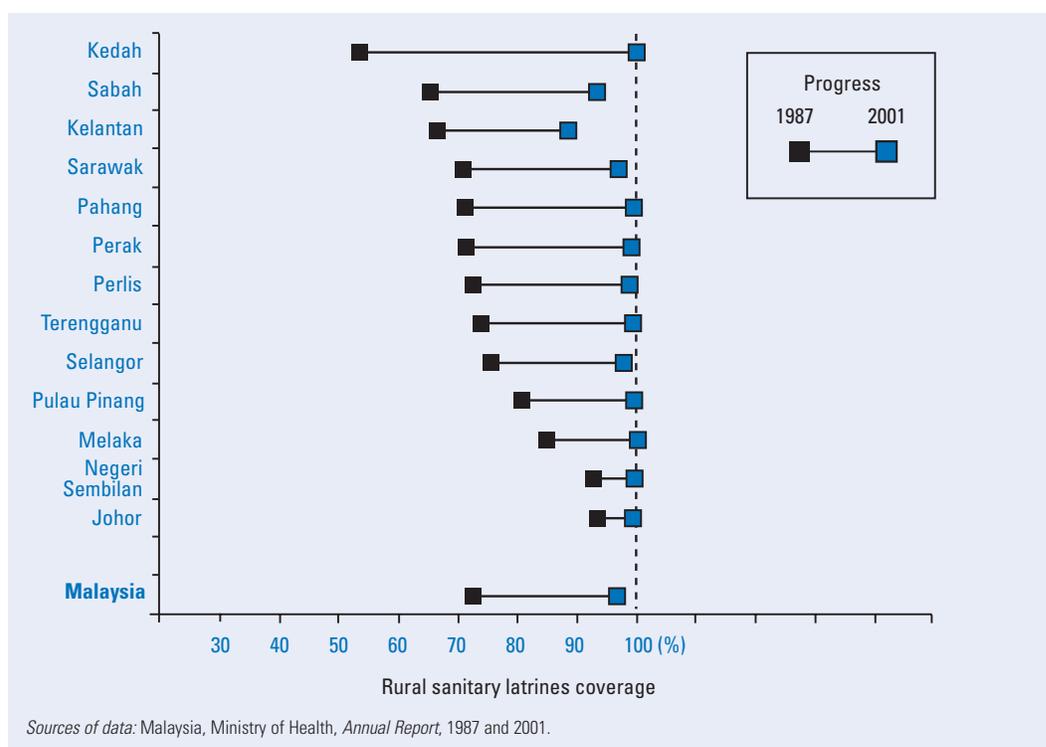


Sources of data: For illness data: Malaysia, Department of Statistics, Social Statistics Bulletin, 1991c and 2002b; for rural water supply data: Malaysia, Economic Planning Unit, 1991a and 2001a.

Note: Illnesses related to unclean water usage are cholera, typhoid, and dysentery.

Sanitation is also an important element of the infrastructure in any human settlement, both for health and environmental protection. The government has been actively promoting environmental sanitation to improve the health status of the population since the 1970s. Almost the entire urban population has been supplied with reticulated sewerage systems and septic tanks by local authorities. In rural areas, sanitary latrines had been provided for 99 per cent of the population by 2000 compared to just 83 per cent in 1990. Sabah and Kelantan still have over 90 per cent coverage despite having less coverage compared to other states (Figure 7.3).

Figure 7.3 Sanitary Latrines Coverage in Rural Areas by State, Malaysia, 1987 and 2001



In urban areas, local authorities' responsibility for the provision of sewerage services was transferred to the federal government through the Sewerage Services Act 1993 (SSA) and the provision of sewerage services was privatized. The privatization of sewerage services involved 84 local authorities during the Seventh Malaysia Plan (1996–2000). Coverage of the population served by public sewerage systems and septic tanks increased from 7.5 million in 1995 to over 12.6 million people in 2000.

Air and water pollution

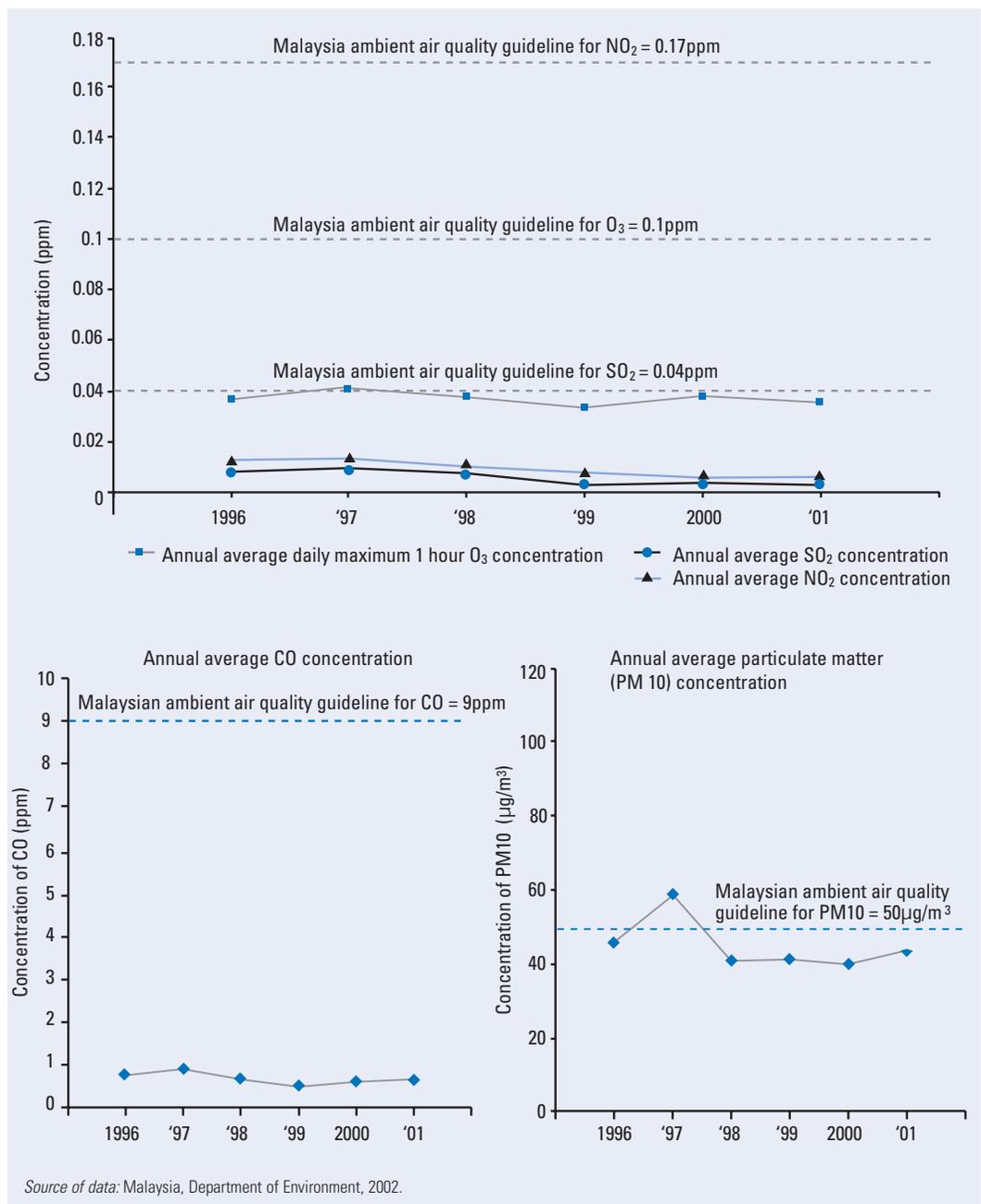
The quality of air and water directly affects the socio-economic condition of society. As a result of the rapid economic growth in Malaysia over the past two decades, air and water pollution is generally expected to become more challenging.

Rapid urbanization and industrial growth account for the continued increase in air pollution. The sources of air pollution are from the transportation and industrial sector through the burning of fossil fuel. The increasing number of vehicles remains the main cause of the deterioration of air quality, particularly in major towns such as Kuala Lumpur. However, the Malaysian Quality of Life Index (MQLI) 2002 showed that the quality of air, measured by the Air Pollution Index (API), improved slightly to 100.6 points between 1990 (base year, 100) and 2000, though with some variations in the years and reaching its worst level in 1998 (around 85). With regard to individual pollutants, the level of all pollutants, with the exception of PM 10, are well below the Malaysian ambient quality guideline as shown in Figure 7.4. The periodic episodes of haze that coincide with the hot and dry season exacerbate the air pollution situation to critical levels, especially in the Klang Valley.

Starting from around 1970, the construction of factories to manufacture agro-based products contributed in a major way to the pollution load in Malaysian rivers. Other contributing factors were the opening up of land for housing development, rural development (especially large-scale land settlement schemes), active logging and mining activities, and general infrastructure development. Other effects of sedimentation in rivers include flooding in low-lying areas, flash floods in urban areas, depletion of aquatic life, and problems of maintaining a clean and reliable water supply.

According to MQLI 2002, water quality as reflected by the percentage of clean rivers declined over the period 1990–2000. The percentage of clean rivers fell from 53.3 per cent or 48 rivers to 28.3 per cent or 34 rivers out of 120 river basins monitored. However, the Environmental Quality Report 2001 noted that in that year, the number of clean rivers increased from 34 to 60 due to the improved status of 26 rivers which were previously in the slightly polluted category. The Environmental Quality Report 2001 stated that the main sources of water pollution are sewage from households, effluents from the manufacturing sector and agro-based industry, and livestock farms. The implementation of refurbishment works on the sewerage facilities by the existing concessionaire (with government capital expenditure) is expected to provide a more effective sewerage system that will mitigate the unfavourable impact on river quality.

Figure 7.4 Air Quality, Malaysia, 1996–2001



Emission of greenhouse gases (GHG)

Malaysia's emission of greenhouse gases (GHG) totalled 144 million tonnes of CO₂ in 1994. Net emissions, after accounting for sinks, totalled 76 million tonnes. On a per capita basis, the net emissions were equivalent to 3.7 tonnes. The CO₂ emissions from final energy use (excluding electricity) by various activities of the economy indicated that transportation contributed 49 per cent, industries 41 per cent, residential and commercial activities 7 per cent, and agriculture 3 per cent of the overall emissions.

Consumption of ozone-depleting substances (ODS)

The adoption of the Montreal Protocol in 1987 marked the beginning of a unique global effort to solve a shared environmental problem. With the fund provided by the Montreal Protocol, Malaysia has successfully coordinated, maintained, and implemented projects on ODS, including the setting up of a National Halon Bank. Malaysia's Department of Environment has won the UNEP Global Ozone Award for these efforts. Indeed, the emission of ODS in Malaysia has been curtailed more rapidly than required under the Montreal Protocol. When Malaysia ratified the agreement in 1989, its ODS consumption was 0.29 kilograms per capita. By 1997, this figure had dropped to 0.10 kilograms per capita. It is expected that, with concerted efforts in small and medium-sized industries in Malaysia, CFCs and halon will be completely phased out by the year 2010.

Access to secure tenure

The government's housing policy is to ensure that households have access to adequate housing, and that houses are of reasonable standard and affordability. Financing schemes are also made available. In 1982, the government made it a policy that private developers build at least 30 per cent low-cost houses in housing development projects. The government has assumed the leading role in providing low-cost housing, through the Public Low-Cost Housing Programme (PLCHP).

Besides PLCHP, through which units are put up for sale, the government has implemented the Integrated Public Housing Programme with the main objective of resettling squatters. The houses are rented out at a low rate of about RM124 (less than US\$33) per month. Under this programme, state governments provide suitable land while the federal government finances the construction costs. This programme, which was introduced in Kuala Lumpur in 1998, involves 24 projects comprising 34,584 units of low-cost housing scheduled for completion in 2004–5. The scheme has been extended to other major towns and involves another 29 projects (comprising a further 21,104 units to be completed by 2005) aimed at realizing the zero-squatter target. However, scarcity of suitable land and the costs of related infrastructure are proving to be constraints to the achievement of this target.

Enabling environment

Malaysia's national policy on sustainable development is based on a balanced approach whereby environment and development complement each other. The principles of sustainable development were introduced in the Third Malaysia Plan (1976–80) and have been reiterated in subsequent development plans. The Eighth Malaysia Plan (2001–5) states that “emphasis will be placed on addressing environmental and resource issues in an integrated and holistic manner. Steps will be taken to identify prudent, cost-effective, and appropriate management approaches that yield multiple benefits in order to ensure that development is sustainable and resilient ... Steps will be taken to strengthen the database for environmental decision making by introducing the use of sustainable development indicators to better ascertain impacts and plan remedial actions.” Hence, national development and sector strategies explicitly address environmental protection and management issues. National frameworks, such as strategies for sustainable development, guide policies for natural resource management in light of the country's specific resources and concerns.

As elsewhere in industrializing and urbanizing countries, economic growth in Malaysia has been accompanied by pollution issues. However, Malaysia began monitoring these problems at a relatively early stage in the process of industrialization. The Department of Environment was established in 1974 to provide overall supervision of the Malaysian environment. A national system of monitoring stations for air and water quality was established in the late 1970s. Activities with significant impact on the environment, such as land and agricultural development, are increasingly subject to rigorous environmental impact assessments.

International treaties

Malaysia, being part of the global community, has signed various international agreements since the 1970s. The first of these international conventions was the Convention of International Trade in Endangered Species of Wild Flora and Fauna (CITES), which was signed in 1977. This was followed by the United Nations Convention on the Law of the Sea (UNCLOS) in 1982 and the Convention on Biological Diversity (CBD) in 1992.

In 1987, Malaysia signed the Montreal Protocol, which commits the nation to phasing out ODS. In 1993, it signed the United Nations Framework Convention on Climate Change (UNFCCC) and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. In 1994, Malaysia signed the International Tropical Timber Agreement (ITTA) and the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat. The latest environment-related agreement Malaysia was involved in is the ratification of the Cartagena Protocol on Biosafety in 2003.

Programmes

Forest certification

In 1994, Malaysia signed the International Tropical Timber Agreement (ITTA), which brought the matter of sustainable forest management into sharp focus. Central to this agreement is the 'Year 2000 Objective', whereby ITTA producer countries made commitments to draw their exports of tropical timber and tropical timber products from sustainable managed sources by the year 2000. To ensure the successful achievement of this commitment, the Malaysian government allocated substantial resources to improve the management of the forests, which led to the formation of the Malaysian Timber Certification Council (MTCC) and the development of stakeholder consultation to formulate the Malaysian Criteria, Indicators, Activities, and Standards of Performance (MC&I) for Forest Management Certification.

In January 2001, MTCC launched its certification scheme and currently has a total of about 4.1 million hectares certified. In addition, three other areas have been certified under the international certification scheme—the Forest Stewardship Council (FSC). The total area certified under the FSC comes to about 77,000 hectares. In April 2004, MTCC announced that it will begin to utilize the new standards in January 2005.

Area protected to maintain biological diversity

Under the Convention on Biological Diversity (CBD), Malaysia has conducted a country assessment of its biological diversity resources and has also since developed a National Policy on Biological Diversity. Both Sabah and Sarawak have taken the CBD a step further and have proceeded to formulate their own laws and legislation to manage biodiversity in the state. Sarawak enacted the Sarawak Biodiversity Centre Ordinance 1998 and the Sarawak Biodiversity (Access, Collection, and Research) Regulations 1998 which provided for the establishment of the Sarawak Biodiversity Centre. In Sabah, the Sabah Biodiversity Centre was established in 2001, for the purpose of managing and protecting the wealth of the state's biological diversity.

In December 2001, Malaysia set up the National Biodiversity–Biotechnology Council to coordinate the management of biodiversity at both state and federal level. As a follow-up to the Meeting of the Parties of the Cartagena Protocol on Biosafety, Malaysia is currently formulating the National Biosafety Bill.

Malaysia's commitment to the protection of freshwater ecosystems is further demonstrated by the gazetting of four sites to be protected under the Ramsar Convention which brings the total Ramsar Wetland Sanctuary in Malaysia to 48,745 hectares.

The government of Malaysia also commissioned a study to assess the hill stations in Peninsular Malaysia and to recommend measures for the sustainable development of the highlands in July 2002. The result was the completion of the National Highlands Conservation and Management Strategy in November 2003. The government is in the

process of commissioning another study to formulate a strategy for the highlands of Sabah and Sarawak. The strategy will look at providing guidelines that will lead to the formulation of the National Highlands Policy. The implementation of the recommendations in the reports will be overseen by the Cabinet Committee on the Coordination and Development of Highlands and Islands. These guidelines will assist state governments to incorporate better practices in land use planning for the highlands, which will impact on the water catchment areas.

The concept of integrated water resource management (IWRM) is already adopted in the government's Third Outline Perspective Plan (OPP3) and will be incorporated into any new development under the Eighth Malaysia Plan. The creation of the new Ministry of Natural Resources and Environment is lauded as a positive move to ensure that the nation's water resources will be planned, managed, and conserved by one organization.

In February 2004, during the seventh COP meeting of the CBD, the governments of Malaysia, the Philippines, and Indonesia signed a Memorandum of Understanding to take up joint leadership in the conservation planning and management of the Sulu-Sulawesi Marine Ecoregion as part of these countries' national and international commitments towards CBD and the Johannesburg Plan of Implementation adopted at the World Summit on Sustainable Development (WSSD).

The government of Malaysia has also recognized the importance of marine protected areas in Malaysia and has developed a project proposal for the strengthening of the marine parks system in Peninsular Malaysia. This project will look at addressing threats originating from the development of islands and increasing control of activities in and around the marine park area. The goal of this project is to ensure proper conservation and sustainable use of the marine biodiversity in the three marine parks, as well as sustainable island development.

Energy

Malaysia's energy policy has evolved over the years, instigated largely by the 1973 world oil crisis. The National Petroleum Policy, formulated in 1975, aims at regulating the oil and gas industries to achieve overall economic development needs. The National Energy Policy (1979) identifies the following major objectives: (i) to ensure adequacy, security, and cost-effectiveness of energy supply; (ii) to promote efficient utilization of energy; (iii) to discourage wasteful patterns of energy consumption; and (iv) to minimize any negative environmental impacts in the energy supply chain.

With regard to the energy supply objective, policy initiatives have aimed at extending the life of domestic depletable energy resources and, at the same time, diversifying away from oil dependence to other energy sources. The National Depletion Policy of 1980 was aimed at safeguarding the depleting oil and natural gas reserves by imposing production limits. In 1981, the government adopted the four-fuel strategy to reduce the economy's overdependence on oil. The strategy aims for a balanced energy mix of oil, gas, hydroelectricity, and coal. Diversification from oil has been mostly towards natural gas, which is not only an indigenous energy resource but is also a more environmentally friendly one.

Malaysia's Energy Plan (2001–10) highlights:

- adequacy and security of fuel supply as well as greater utilization of natural gas by the power and non-power sectors;
- development of renewable energy, particularly for power generation;
- efficient utilization of energy through the introduction of new regulations and amendments to present laws;
- adequacy of electricity supply, as well as improvement in productivity and efficiency; and
- expansion of rural electricity coverage.

Energy efficiency and renewable energy. Malaysia has established special institutions to spearhead research and development and education and training in energy efficiency and renewable energy. *Pusat Tenaga Malaysia* (PTM) was set up to coordinate and manage energy-related R & D programmes, as well as to promote energy efficiency and renewable energy in Malaysia. Similarly, the Centre for Education and Training in Renewable Energy and Energy Efficiency (CETREE) in *Universiti Sains Malaysia* conducts training and carries out public awareness dissemination activities, including designing renewable energy and energy efficiency modules for teaching in schools and universities.

One of the pioneer programmes executed by Pusat Tenaga Malaysia is the Malaysian Industrial Energy Efficiency Improvement Project (MIEEIP), which aims to prove the technical and financial viability of energy efficiency projects for the industrial sector. A total of eight new technology demonstration projects will be implemented for the eight industrial subsectors targeted by the MIEEIP as the most energy-intensive sectors. On the other hand, the implementation of demand-side management measures like retrofitting and district cooling programmes, changing energy use patterns, and appliance labelling will be intensified. This includes the ongoing programme, 'Building Energy Audits in government and related agencies', within the overall Malaysian Energy Management Programme (MEMP).

With the announcement of renewable energy (RE) as the 'fifth fuel' in Malaysia by the government, it is expected that about 5 per cent of total electricity generation or about 600 MW of installed capacity will be from RE by the end of 2005. The Small Renewable Energy Power (SREP) Programme was officially launched in 2001. Two landmark power purchase agreements were signed to facilitate the entry of renewable energy (biomass and biogas) into mainstream energy development in Malaysia.

In line with this, and with the assistance of PTM, the Biomass-based Power Generation and Cogeneration in the Malaysian Palm Oil Industry project was started. Studies have shown that palm oil mills produce substantial wastes or biomass that could be turned into a potential energy resource.

While Malaysia, as a developing country, is not committed to reduce its greenhouse gas emission under the UNFCCC and the Kyoto Protocol, it has taken advantage of the provisions of the Clean Development Mechanism (CDM) under the Kyoto Protocol to increase its renewable energy sources. It is the policy of the government that CDM projects give priority to renewable energy projects. Therefore, through the CDM, Malaysia could benefit from the investments made in emission reduction projects

which will contribute to the overall improvement of the environment. To enhance the country's participation in the CDM, a National Committee on CDM has been set up at the Ministry of Natural Resources and Environment to evaluate and endorse the projects for submission to the CDM Executive Board.

Incentives. Currently, there are some fiscal incentives available to encourage the use of renewable energy and to improve energy efficiency. Companies providing energy conservation services can apply for pioneer status with tax exemption of 70 per cent of statutory income for a period of five years or an investment tax allowance (ITA) of 60 per cent on the qualifying capital expenditure incurred within a period of five years. In addition, they will be given import duty and sales tax exemption for equipment used in the related project, which is not produced locally. Equipment purchased from local manufacturers is given sales tax exemption.

For companies which incur capital expenditure for conserving energy for their own consumption, the incentives provided are accelerated capital allowance on related equipment that can be fully written off within a period of one year and import duty and sales tax exemption for equipment used in energy conservation.

To encourage the generation of energy using biomass that is renewable and environmentally friendly, companies that undertake such activities are eligible for pioneer status or ITA. For the purpose of this incentive, 'biomass sources' refer to palm oil mill/estate waste, rice mill waste, sugar cane mill waste, timber/sawmill waste, paper recycling mill waste, municipal waste and biogas (from landfill, palm oil mill effluent [POME], animal waste, and others), while energy forms refer to electricity, steam, chilled water, and heat. To further promote the use of renewable energy, the above incentives are also extended to the use of hydropower (not exceeding 10 MW) and solar power.

Water supply and sanitation services

The formation of the National Water Resources Council (NWRC) in 1998 was to improve management and ensure better distribution of water resources among various river basins both within and between states. The NWRC promulgates guidelines on catchment management to ensure long-term sustainability of water resources. With the completion of a National Water Resources Study in 2000, a National Water Master Plan was formulated to ensure efficient water management through to 2050.

The establishment of the new Ministry of Energy, Water and Communications will enable the government to better coordinate the management of water resources and waste water for the nation. The Ministry will be responsible for coordinating the distribution channels for water resources and waste water.

The government's decision in 1993 to privatize servicing of the sewerage system represented a major shift in sewerage management policy. Since its commencement in 1994, the private consortium, Indah Water Konsortium (IWK), has provided sewerage services to the public by operating and maintaining sewage treatment plants, network, desludging septic tanks, and treating sludge. The total population served by IWK has increased from less than 4 million in 1994 to over 14 million in 2001, or more than

threefold in eight years. The government's move to take over new sewage plants from the developers will increase the coverage of the population served by the concessionaire to about 14.4 million people by 2005. The Eighth Malaysia Plan (2001–5) projects spending of a total RM1.5 billion on sewerage, of which RM1.2 billion is for new sewage treatment plants and RM300 million for refurbishment.

Water and air quality and ozone-depleting CFC consumption

The introduction of the Environmental Quality Act 1974 saw the beginning of environmental quality regulations aimed at controlling and preventing air and water pollution in Malaysia. In the 1970s, one of the major causes of water pollution was attributable to agricultural activities and agro-based industries, including the processing of palm oil and rubber. Close cooperation between the government agencies, private sector, and research institutions, innovative and agreeable regulations like the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Order 1977 and the Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Order 1978 resulted in drastic reductions in the water pollution load from these industries. In fact, success in this area has led to Malaysia becoming a leading country in the transfer of these environmental technologies to other developing countries with such industries.

For other industries, especially manufacturing, a command-and-control approach has been adopted with imposition of stiff penalties and fines through the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979, Environmental Quality (Clean Air) Regulations 1978, and Environmental Quality (Scheduled Wastes) Regulations 1989. The Kualiti Alam Integrated Schedule Waste Treatment plant, which began operations in 1998, is expected to provide proper disposal of scheduled wastes in Malaysia. Though current industry feedback seems to be quite negative about the charges set by Kualiti Alam, industries have generally welcomed this effort, and the government is taking measures to improve the use of this plant by the SMIs, including setting up transfer stations.

Beginning with the Environmental Quality (Clean Air) Regulations 1978, the Department of Environment has continuously made efforts to control air pollution in Malaysia. The latest regulation to be implemented is the Environmental Quality (Control of Emission from Motorcycles) Regulations 2003.

A series of regulations was also set up to meet Malaysia's commitment to the Montreal Protocol. This includes the Environmental Quality (Prohibition on the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) Order 1993, the Environmental Quality (Halon Management) Regulations 1999, the Environmental Quality (Refrigerant Management) Regulations 1999, and the Environmental Quality (Delegation of Powers) (Halon Management) Order 2000. These regulations provided the framework which guided the phasing out of ODS use in the industries involved.

Fiscal incentives have been provided by the government to encourage the industries to use environmentally sound technologies. These provide for a special allowance at an initial rate of 40 per cent and an annual rate of 20 per cent (to be written off within a period of three years) for capital expenditure on related machinery and equipment. Fiscal

incentives are for companies that are waste generators and wish to establish facilities to store, treat, and dispose of their wastes, either on-site or off-site; and for companies undertaking waste-recycling activities. There are also funding facilities available at the Small and Medium Industries Development Corporation (SMIDEC) for SMIs to undertake environmentally related activities.

Future challenges

Strengthening coordination

While the legislation and regulations are in place for moving towards sustainable development, the institutional, human, and financial resources to enforce these measures act as constraints. This is particularly evident where, for example, national-level legislation has to be implemented by state agencies. Hence, steps are being taken to strengthen coordination and optimize the use of available resources in ensuring sustainable development.

Implementing access and benefit sharing

The National Biodiversity–Biotechnology Council has been tasked with providing guidance and coordination for the management of Malaysia's biodiversity resources. In the utilization of biodiversity resources, there is a need to develop legal requirements to ensure that there is access to, and benefit sharing of, these resources, including equitable benefits for traditional knowledge.

Ensuring sustainable forest management

In Malaysia forestry comes under the jurisdiction of the respective state governments which determine allocations of public forest harvesting rights and management priorities. The challenge is to ensure that national policies are implemented uniformly at state level. State Forestry Departments will need to adopt strategies of sustainable forest resource management which are innovative and imaginative through enhanced human resource development, and treating environment as an integral part of management in order to ensure maximum economic and social benefits are derived from managing forest resources based on a set of internationally agreed criteria and indicators.

Ensuring sustainable energy management

As Malaysia moves inexorably towards developed nation status, energy requirements are certain to increase. The country will therefore require substantial financial resources to develop additional generation, transmission, and distribution capacity. Malaysia has substantial hydroelectric resources with many advantages, but developing hydroelectric capacity is extremely capital-intensive and often has socio-economic and environmental impacts. There is also an allocation problem due to the

availability of hydroelectric resources in Sabah and Sarawak while the greater demand for energy is in Peninsular Malaysia.

The country is expected to become a net oil importer around 2010, and gas and coal are already being imported. Effective transfer of appropriate energy technologies would enable Malaysia to harness unique domestic renewable energy sources, improve energy efficiency, increase self-sufficiency, and later, export these energy technologies.

Maintaining a sustainable water supply and equitable resource allocation

Malaysia is developing a National Water Policy. A common policy would promote integrated development, equitable allocation of resources, a uniform regulatory framework and a set of water standards, harmonized water tariffs, greater cost recovery, and overall environmental integrity.

Reducing water and air pollution

Reducing pollution from household sewage would provide a major improvement in the quality of the country's rivers. Similarly, effluents from manufacturing industries should be minimized, especially by exercising greater control over the pollution from SMIs. In this respect, collaboration between the Department of Environment and local authorities is anticipated.

In addressing the air pollution issue, more rigorous enforcement is required to address emissions from vehicles, industries, and also open burning activities.

Biotechnology opportunities

Biotechnology may potentially offer new possibilities for boosting the production of food, medicines, energy, specialty chemicals, and other raw materials. However, the potential risks to animal and human health, as well as to the environment, must be studied and well managed, preferably within a national biosafety framework.

