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COUNTRY PROFILE



UNITED NATIONS

INTRODUCTION - 2002 COUNTRY PROFILES SERIES

Agenda 21, adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, underscored the important role that States play in the implementation of the Agenda at the national level. It recommended that States consider preparing national reports and communicating the information therein to the Commission on Sustainable Development (CSD) including, activities they undertake to implement Agenda 21, the obstacles and challenges they confront, and other environment and development issues they find relevant.

As a result, in 1993 governments began preparing national reports for submission to the CSD. After two years of following this practice, the CSD decided that a summarized version of national reports submitted thus far would be useful. Subsequently, the CSD Secretariat published the first Country Profiles series in 1997 on the occasion of the five-year review of the Earth Summit (Rio + 5). The series summarized, on a country-by-country basis, all the national reports submitted between 1994 and 1996. Each Profile covered the status of all Agenda 21 chapters.

The purpose of Country Profiles is to:

- Help countries monitor their own progress;
- Share experiences and information with others; and,
- Serve as institutional memory to track and record national actions undertaken to implement Agenda 21.

A second series of Country Profiles is being published on the occasion of the World Summit on Sustainable Development being held in Johannesburg from August 26 to September 4, 2002. Each profile covers all 40 chapters of Agenda 21, as well as those issues that have been separately addressed by the CSD since 1997, including trade, energy, transport, sustainable tourism and industry.

The 2002 Country Profiles series provides the most comprehensive overview to date of the status of implementation of Agenda 21 at the national level. Each Country Profile is based on information updated from that contained in the national reports submitted annually by governments.

Preparing national reports is often a challenging exercise. It can also be a productive and rewarding one in terms of taking stock of what has been achieved and by increasing communication, coordination and cooperation among a range of national agencies, institutions and groups. Hopefully, the information contained in this series of Country Profiles will serve as a useful tool for learning from the experience and knowledge gained by each country in its pursuit of sustainable development.

NOTE TO READERS

The 2002 Country Profiles Series provides information on the implementation of Agenda 21 on a country-by-country and chapter-by-chapter basis (with the exception of chapters 1 and 23, which are preambles). Since Rio 1992, the Commission on Sustainable Development has specifically addressed other topics not included as separate chapters in Agenda 21. These issues of trade, industry, energy, transport and sustainable tourism are, therefore, treated as distinct sections in the Country Profiles. In instances where several Agenda 21 chapters are closely related, for example, chapters 20 to 22 which cover environmentally sound management of hazardous, solid and radioactive wastes, and chapters 24 to 32 which refer to strengthening of major groups, the information appears under a single heading in the Country Profile Series. Lastly, chapters 16 and 34, which deal with environmentally sound management of biotechnology, and transfer of environmentally sound technology, cooperation, capacity-building respectively, are presented together under one heading in those Country Profiles where information is relatively scarce.

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LIST OF COMMONLY USED ACRONYMS

ACS	Association of Caribbean States
AMCEN	Africa Ministerial Conference on the Environment
AMU	Arab Maghreb Union
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
CARICOM	The Caribbean Community and Common Market
CBD	Convention on Biological Diversity
CIS	Commonwealth of Independent States
CGIAR	Consultative Group on International Agricultural Research
CILSS	Permanent Inter-State Committee for Drought Control in the Sahel
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COMESA	Common Market for Eastern and Southern Africa
CSD	Commission on Sustainable Development of the United Nations
DESA	Department for Economic and Social Affairs
ECA	Economic Commission for Africa
ECCAS	Economic Community for Central African States
ECE	Economic Commission for Europe
ECLAC	Economic Commission for Latin America and the Caribbean
ECOWAS	Economic Community of West African States
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ESCAP	Economic and Social Commission for Asia and the Pacific
ESCWA	Economic and Social Commission for Western Asia
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FIDA	Foundation for International Development Assistance
GATT	General Agreement on Tariffs and Trade
GAW	Global Atmosphere Watch (WMO)
GEF	Global Environment Facility
GEMS	Global Environmental Monitoring System (UNEP)
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GHG	Greenhouse Gas
GIS	Geographical Information Systems
GLOBE	Global Legislators Organisation for a Balanced Environment
GOS	Global Observing System (WMO/WWW)
GRID	Global Resource Information Database
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IAEA	International Atomic Energy Agency
ICSC	International Civil Service Commission
ICSU	International Council of Scientific Unions
ICT	Information and Communication Technology
ICTSD	International Centre for Trade and Sustainable Development

IEEA	Integrated Environmental and Economic Accounting
IFAD	International Fund for Agricultural Development
IFCS	Intergovernmental Forum on Chemical Safety
IGADD	Intergovernmental Authority on Drought and Development
ILO	International Labour Organisation
IMF	International Monetary Fund
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IPCC	Intergovernmental Panel on Climate Change
IPCS	International Programme on Chemical Safety
IPM	Integrated Pest Management
IRPTC	International Register of Potentially Toxic Chemicals
ISDR	International Strategy for Disaster Reduction
ISO	International Organization for Standardization
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature and Natural Resources
LA21	Local Agenda 21
LDCs	Least Developed Countries
MARPOL	International Convention for the Prevention of Pollution from Ships
MEAs	Multilateral Environmental Agreements
NEAP	National Environmental Action Plan
NEPAD	New Partnership for Africa's Development
NGOs	Non-Governmental Organizations
NSDS	National Sustainable Development Strategies
OAS	Organization of American States
OAU	Organization for African Unity
ODA	Official Development Assistance/Overseas Development Assistance
OECD	Organisation for Economic Co-operation and Development
PPP	Public-Private Partnership
PRSP	Poverty Reduction Strategy Papers
SACEP	South Asian Cooperative Environment Programme
SADC	Southern African Development Community
SARD	Sustainable Agriculture and Rural Development
SIDS	Small Island Developing States
SPREP	South Pacific Regional Environment Programme
UN	United Nations
UNAIDS	United Nations Programme on HIV/AIDS
UNCED	United Nations Conference on Environment and Development
UNCCD	United Nations Convention to Combat Desertification
UNCHS	United Nations Centre for Human Settlements (Habitat)
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNDRO	Office of the United Nations Disaster Relief Coordinator
UNEP	United Nations Environment Programme

UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNIFEM	United Nations Development Fund for Women
UNU	United Nations University
WFC	World Food Council
WHO	World Health Organization
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization
WWF	World Wildlife Fund
WWW	World Weather Watch (WMO)

CHAPTER 2: INTERNATIONAL COOPERATION TO ACCELERATE SUSTAINABLE DEVELOPMENT IN DEVELOPING COUNTRIES AND RELATED DOMESTIC POLICIES

Decision-Making: Singapore has included elements of the Regional action Plan for Environmentally Sound and Sustainable Development developed by Economic and Social Commission for Asia and the Pacific (ESCAP) into policy planning and management.

Programmes and Projects: No information available.

Status: No information available.

Capacity-Building, Education, Training and Awareness-Raising: No information available.

Information: No information available.

Research and Technologies: No information available.

Financing: No information available.

Cooperation: No information available.

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CHAPTER 2: INTERNATIONAL COOPERATION TO ACCELERATE SUSTAINABLE DEVELOPMENT IN DEVELOPING COUNTRIES AND RELATED DOMESTIC POLICIES - TRADE

Decision-Making: Legal and regulatory frameworks on air and water pollution, solid waste disposal are reviewed regularly. Market based and economic instruments are used to promote use of energy efficient equipment. Singapore has included elements of the Regional action Plan for Environmentally Sound and Sustainable Development into policy planning and management.

Programmes and Projects: See under **Information**.

Status: No information available.

Capacity-Building, Education, Training and Awareness-Raising: No information available.

Information: Singapore sends trade and investment data/information to the UN Statistical Office, the World Trade Organization, the International Monetary Fund, World Custom Organization and Food and Agriculture Organization. These organizations may publish a variety of statistical reports based on country inputs. Singapore does not keep track of all.

Research and Technologies: No information available.

Financing: No information available.

Cooperation: Singapore supports e.g. the following regional institutions: COBSEA's Trustfund and UN Environment Fund.

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CHAPTER 3: COMBATING POVERTY

Decision-Making: The Ministry of Community Development and Sports (MCDS) oversee social assistance policies and programmes for low-income families in Singapore. There is no specific legislation in Singapore governing welfare policies. However, the Ministry maintains the Public Assistance Scheme for the poor. Destitute persons are cared for in Welfare Homes under the Destitute Persons Act. The Ministry interfaces with other government ministries and agencies on issues affecting low-income families under their purview and obtains feedback on social services for these families through various mechanisms such as focus group discussions with key stakeholders. It also works closely with the National Council of Social Service (NCSS), which is an umbrella group for non-government social service agencies in Singapore.

Programmes and Projects: The Government has put in place schemes to help disadvantaged and needy families. For example, the Ministry of Education provides waiver of school fees, free textbooks and bursaries for children from needy families. The Ministry of Health provides free medical services and supplements healthcare costs for the needy through its Med fund programme. The Housing and Development Board allows needy families to pay their rental arrears by installment and those residing in purchased flats to defer or re-schedule their mortgage loan installment payments.

There is a range of government programmes/services to help lower-income families, which include the following: *Public Assistance Scheme & Special Grant:* Public Assistance Scheme (PA) and the Special Grant provide families with a monthly allowance to meet their day-to-day expenses. They assist Singapore citizens and permanent residents who are unable to work and do not have a means of support. The recipients, who are mainly elderly or disabled, are usually on long-term assistance. Other than a monthly financial grant, the recipients and their dependents are also entitled to free medical treatment at government/restructured hospitals and polyclinics. Their schools also give the school-going children supportive assistance such as waiver of fees and free textbooks.

Interim (Short-Term) Financial Assistance Scheme: The IFAS is a short-term assistance to tide families over a difficult period. Complementary help is also tapped from charitable foundations to help families unable to meet their monthly expenses due to special needs within the family.

Rent and Utilities Assistance Scheme: The Rent and Utilities Assistance Scheme provides temporary financial assistance to lower-income families staying in rental public flats to pay the rent and maintenance charges of their flats. Under the scheme, arrears owed would also be waived, and counseling services to help the family recover are provided. The school-going children are also referred to their schools for supportive assistance.

Centre-based Financial Assistance Scheme for Child Care: Lower-income families can also tap on the Centre-based Financial Assistance Scheme for Child Care (CFAC) in placing their young child in a child care programme. The CFAC provides a monthly subsidy on top of the government's Childcare Subsidy to make child care services affordable to children from lower-income families. This would enable them to have access to early childhood development programmes and build a strong foundation for formal schooling, and help the family break out of the poverty cycle in the long term.

The non-governmental agencies run programmes for various client groups, ranging from preventive and developmental programmes to remedial services. The government and/or Community Chest fund these programmes, which is the fund-raising arm of NCSS.

Status: Singapore's approach to combating poverty is in providing a supportive network of resources and services that the poor can draw on to enable them to become self-reliant. Education, training and employment are cornerstones of this effort to uplift poor families and give them a hope for a better future. The "Many Helping Hands" approach is adopted for service delivery, whereby the Government together with the voluntary, community and religious organizations develop a network of social services to assist the individual and families in need.

The Government acts as a provider and catalyst for developing the social safety net. Community groups and non-government agencies running programmes to help the needy are provided with assistance in obtaining premises, resources and funds for the administration of the services and programmes. A wide spectrum of assistance to the needy is available, including areas such as education, health, housing and employment. Housing, education and basic medical services in restructured hospitals and polyclinics are all heavily subsidized to make them affordable to most Singaporeans. Many Community Development Councils (CDCs) and grassroots organizations also provide

financial assistance schemes at the local level. The administration of the government's social assistance schemes was delegated to the CDCs, which are local centres for administration with effect from 1 Apr 01. The decentralization of the schemes will make it more convenient for the public.

Capacity-Building, Education, Training and Awareness-Raising: The delegation of the administration of the social assistance schemes involved preparatory training, recruitment of staff and infrastructure support at the CDCs. The NCSS maintains a directory of financial and social assistance schemes that it hosts on its website and monitors the situation of the programmes serving the low-income through discussions with and feedback from service providers. It organizes training courses for service providers to enhance service delivery. Every Ministry and government agency conducts its own review of schemes to help low-income families. MCDS maintains close contact with the CDCs to ensure they are updated and trained to administer the government's social assistance schemes within the specified guidelines.

Information: Brochures and information pamphlets are also available at the community level. Information on the income status of households in Singapore is provided by the 10-yearly Census Reports and occasional Special Reports issued by the Department of Statistics. In May 2000, for example, the Department issued a report entitled "Is Income Disparity Increasing in Singapore."

Research and Technologies: Research and field studies are initiated by MCDS and the relevant agencies from time to time to identify emerging needs of low-income families and to review social service gaps.

Financing: The government's social assistance schemes are either underwritten by voted funds or an endowment fund set up by the government, called the Community Assistance Fund. These schemes are complemented by local schemes of the CDCs and programmes and services run by non-governmental agencies. The CDC local schemes such as provision of groceries/provisions, food rations/vouchers, subsidized dental or medical services, are funded through community funds. In addition, the government also funds various schemes administered by other ministries to enable lower-income families to access education for their children, health care, skills retraining and other services. See also under **Programmes and Projects**.

Cooperation: The government of Singapore participates in discussions on the social safety net with other ASEAN members in fora convened under the auspices of the ASEAN Ministers on Rural Development and Poverty Eradication. These discussions facilitate greater regional cooperation and understanding in the problems of poverty.

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CHAPTER 4: CHANGING CONSUMPTION PATTERNS

Decision-Making: The Ministry of the Environment (ENV) works closely with industry, trade associations and business groups to: carry out waste minimization and recycling programmes; set up recycling plants; and divert waste for recycling. ENV encourages the setting up of environmental committees by trade associations and the private sector to spearhead and coordinate waste minimization and other environmental efforts. ENV also sets aside land at closed dumping grounds for setting up recycling plants. ENV assists hotels, hospitals, schools and offices to set up waste recycling schemes. See also under **Programmes and Projects**.

Programmes and Projects: The Economic Development Board (EDB) provides tax incentives and financial assistance schemes to encourage the adoption of energy-efficient technologies and the installation of energy-efficient equipment. The Singapore Productivity and Standards Board (PSB) promote waste minimization through the promotion of Green Productivity. In 1992, the Ministry of Environment introduced the Singapore Green Labeling Scheme (SGLS) to promote green consumerism. On 15 Jun 1999, the Singapore Environment Council (SEC) took over as the administration of the SGLS. See also under **Decision-Making**.

Status: No information available.

Capacity-Building, Education, Training and Awareness-Raising: The annual Clean and Green Week campaign often includes efforts to raise the awareness of issues related to sustainable consumption. The government has also worked closely with the community to educate the public to be less wasteful in their consumption patterns and to reuse and recycle waste, wherever possible. The Consumers Association of Singapore is the main consumer grouping that aims to look after the interests of consumers. The Singapore Environment Council acts as an umbrella organization for environmental NGOs in Singapore and seeks to promote environmentally responsible behaviour among the population.

Information: Information on waste minimization and recycling is available on the Ministry of the Environment's website.

Research and Technologies: No information available.

Financing: See under **Programmes and Projects**.

Cooperation: See under the heading **Cooperation** in various chapters of this Profile, including chapters **4-ENERGY, 4-TRANSPORT, and INDUSTRY**.

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CHAPTER 4: CHANGING CONSUMPTION PATTERNS - ENERGY

Decision-Making: The Ministry of Trade and Industry is responsible for energy resources. The key ministries and bodies involved in the issues related to climate change and sea-level rise are the Ministry of the Environment, Ministry of Trade and Industry and Attorney-General's Chambers. A national inter-agency committee on energy efficiency comprising government ministries, statutory boards and academics from the universities has been formed to review and study issues related to improving energy efficiency on a national basis. The process of national decision-making for issues related to energy resources involves members from the Government, business, industry and the science and technology community.

A National Energy Efficiency Committee (NEEC) was formed on 1 April 2001 succeeding the inter-agency committee on energy efficiency (IACEE) formed in 1998. The key thrusts of the NEEC were as follows: to promote energy conservation through the efficient use of energy in the industrial, building and transportation sectors; and to promote the use of cleaner energy sources such as natural gas and renewable energy sources. The NEEC comprised the government, statutory boards, academia and private sectors.

Codes of practice on energy conservation include Singapore Standard CP 24: 1999, Singapore Standard CP 13:1999, and Singapore Standard CP 38:1999. The Government jointly with the industry drew up the codes of practice and standards. Unlike the Building Control Regulations, compliance with the codes of practice is voluntary. The national policy relating to energy resources covers issues on pricing, energy conservation, efficiency in energy production, and diversification in fuel supplies. Government legislation for energy conservation in buildings comes under the Building Control Regulations, 1989. The energy conservation requirements under the Building Control Regulations stipulates that the building envelope overall thermal transfer value (OTTV) of an air-conditioned building shall not exceed 45 W/m².

Programmes and Projects: The Singapore Green Label Scheme, administered by the Ministry of the Environment, is a voluntary scheme for consumer appliances such as computers, air-conditioners, refrigerators, etc, to be awarded the green label for efficient use of resources.

See also under **Decision-Making** in this chapter, **Programmes and Projects** in Chapter 4, and **Status** in Chapter: INDUSTRY of this Profile.

Status: Almost all of Singapore's energy needs are imported. With the current technologies in renewable energy development, the potential for increasing energy supply through renewable energy is relatively small. The main issues relating to climate change and sea level rise in Singapore are the total dependence on imported fuels for energy needs, and the limited scope to develop renewable energy sources. The aim is to stay competitive and to contain growth in greenhouse gas emissions through using resources in an efficient way.

Capacity-Building, Education, Training and Awareness-Raising: the Energy Market Authority (EMA) jointly with the polytechnics and universities conducts Energy management courses. These courses are targeted mainly at working technical staff and professionals. Workshops and seminars and talks are also organized for the different sectors of the industry on a regular basis. The annual national 'Clean & Green' week, held in the month of November every year, also raises the awareness of issues related to sustainable development and energy efficiency. Other campaigns and programmes include: a two-day energy conservation awareness programme conducted for school children, on an on-going basis; periodic Save Energy Campaigns and educational programmes aimed at promoting energy conservation; establishment of a permanent exhibition open to the public in the Electricity Efficiency Centre; and the Energy Audit, an on-going service provided by the EMA (Energy Conservation Branch) to promote energy efficiency in the corporate sector.

Information: The kinds of information available to decision-makers and planners include Energy audits and surveys of industry sectors, and energy balance data. The relevant information is made available through various reports and publications. Plans are underway to develop benchmarks on electricity usage to enable consumers to know whether they are using electricity efficiently.

Research and Technologies: There is limited scope for development of renewable energy source in Singapore. Only commercially proven and viable technologies are considered. In addition to this consideration decisions are made based on economic cost-benefit and environmental impact analyses.

Financing: Until recently, power generation was solely a government-owned development and operation. The financing was thus from the national budget. The private sector can now develop and operate power plants. Industries can also generate their own power if they wish to. The private sector seeks its own source to finance the venture. The costs for implementing plans for adaptation to sea-level rise are borne by the developers and included in the cost of development. The individual developers, most of which have their own source of funding, finance activities related to climate change and sea level rise.

Cooperation: Singapore is involved in the Energy Working Group (EWG) of the Asia Pacific Economic Cooperation (APEC), and ASEAN Ministers on Energy Meeting. See also under **Status** of Chapter: INDUSTRY of this Profile.

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CHAPTER 4: CHANGING CONSUMPTION PATTERNS - TRANSPORT

Decision-Making: The Ministry of Communications and Information Technology (MCIT) oversees the development and regulation of the following sectors: Civil Aviation and Air Transport; Maritime and Ports; Land Transport; Info-communications and Postal Services; and Meteorological Service. The ministry sets the strategic and policy direction, while operations and regulatory works are carried out by an autonomous department and five statutory boards. They include: the Meteorological Service Singapore (MSS); the Civil Aviation Authority of Singapore (CAAS); the Land Transport Authority (LTA); the Maritime and Port Authority of Singapore (MPA); the Public Transport Council (PTC); and the Info-communications Development Authority (IDA). MSS provides weather information and advice to the public and weather stations in the region.

The Land Transport Authority of Singapore (LTA) Act provides LTA regulatory powers for its functions and matters under its purview. The LTA Act and the Street Works Act allows LTA to plan, design, construct, manage and maintain roads in Singapore. In addition, the LTA Act and the Rapid Transit Systems Act allows LTA to plan, design, construct, manage, operate and maintain the rapid transit systems. The Rapid Transit Systems Act also empowers LTA to regulate and license parties for the operation of rapid transit systems. The Parking Places Act allows LTA to provide parking places for motor vehicles, and to license and regulate the use of parking places. The Road Traffic Act is the main legislation governing the registration and use of vehicles. Singapore does not have a vehicle manufacturing industry. The rules, standards and guidelines are derived mainly from those of the more technologically advanced vehicle manufacturing countries such as Japan, the USA and the EC countries. To ensure that the rules and standards can keep up with new vehicle technologies, Singapore monitors closely the regulations and standards of the above-mentioned countries. Singapore legislation and regulations relating to public transport services include the Public Transport Council Act which allows PTC to approve bus routes, regulate bus service standards and approve public transport fares.

Singapore legislation and regulations relating to air transport include: the Air Navigation Act; the Civil Aviation Authority of Singapore Act; the Tokyo Convention Act; the Hijacking and Protection of Aircraft Act; the Carriage by Air Act; Air Navigation Order; the Air Navigation (Licensing of Air Services) Regulations; the Air Navigation (Investigation of Accident) Regulations; the Air Navigation (Aviation Security) Order; and the Civil Aviation Authority of Singapore (Aerodrome) Regulations. The legislation and regulations listed above give effect to the Chicago Convention and its Annexes, Tokyo Convention, Hague Convention, Montreal Convention and Warsaw Convention.

Singapore legislation and regulations relating to maritime transport include: the MPA Act; the Merchant Shipping Act; the Prevention of Pollution of the Sea Act, and the Merchant Shipping (Civil Liability; and Compensation for Oil Pollution) Act. The regulations set by the MPA on maritime safety and prevention of marine pollution are in accordance with the provisions of international maritime conventions to which Singapore is party.

The Info-communications Development Authority of Singapore Act (“IDA Act”) provides for the formation of IDA. The Telecommunications Act and the Postal Services Act provide IDA with the licensing and regulatory powers in respect of telecommunication and postal matters. Other Singapore legislation and regulations relating to the infocomm sector include the Telecommunication (Dealers) Regulations, the Radio-communication Regulations, the Telecommunication (Class Licenses) Regulations, the Telecommunication (Postal Services) Regulations, the Telecommunication (Class License for Postal Services) Regulations, the Telecommunication (Internal Wiring) Regulations, the Telecommunication Authority of Singapore (Composition of Offences) Regulations and the Radio-communication (Certificates of Competency for Ship Station Operators) Regulations.

For the infocomm sector, industry and other relevant interest groups such as non-governmental organizations, workers’ unions, etc are consulted for major policy changes, whenever possible. The public is also encouraged to provide their feedback through the community feedback forums. In the case of land transport, 14 members appointed to sit on the Public Transport Council come from various sectors society – professionals, grassroots and community organizations, unions, the academia, government and public transport operators.

Programmes and Projects: Concerning land transport, Singapore is now working towards the completion in 2002 of two further extensions to Mass Rapid Transit (MRT) network, the Changi Airport Line (CAL) and the North-East MRT Line (NEL). A Medium Rapid Transit System, called the Circle Line (CCL) to be completed in 2006, is also being planned to serve sub-regional centres, and the new commercial centre at the Marina area. Singapore has

also embarked on the construction of Light Rapid Transit (LRT) systems in public housing estates to serve as feeders to the MRT network. The first LRT project, the Bukit Panjang LRT, was completed in 1999. Sengkang LRT and Punggol LRT are scheduled for completion in 2002 and 2004 respectively. The rapid transit network will be extended to 149 km on the completion of these projects in 2006. In addition, the bus system is continually being upgraded with better network coverage and integration, newer vehicles, improved passenger information system, upgraded interchanges and bus stops, and advanced GPS Automatic Vehicle Monitoring. A contactless smart card ticketing system will be introduced next year to provide greater convenience to commuters. The infrastructural plans for air transport include the redevelopment of an existing Cargo Agent Building to be completed in 2002, and the development and construction of a third passenger terminal to be completed in 2006. See also under the heading **Status** in this chapter and Chapter: **INDUSTRY** of this Profile.

Status: The main focus of the ministry is to bring about cost-effective world class transportation and info-communications services and gateways to enhance our economic competitiveness and quality of life in a Knowledge-Based Society. It strives to make Singapore an international civil aviation and maritime centre and info-communications hub for the region.

Located at the crossroads of Asia, Singapore is an ideal platform for companies with regional or global ambitions to launch or expand their business operations in the region. In the area of land transport, Singapore seeks to improve public transport by expanding the rapid transit network and provide quality public transport choices, build a comprehensive road network and harness technology to maximize its capacity and manage the demand for road usage. In the area of air transport, we seek to make Singapore a global aviation hub and deliver efficient and quality service to customers. In the area of maritime transport, we seek to maintain Singapore's position as a leading hub port and to develop Singapore into a premier international maritime centre. With regards to infocomm, Singapore offers an attractive and open telecommunications market and seek to establish Singapore as a leading infocomm hub in Asia.

Singapore is linked to 145 cities in 50 countries by over 3400 weekly scheduled flights. Air services are provided by 64 airlines, of which 3 are local carriers. The Port of Singapore is the focal point for some 400 shipping lines with links to some 750 ports in 130 countries worldwide. While port and terminal operations in Singapore are run by local corporations, other port and maritime services are provided by a mixture of local and foreign companies. Singapore is fully integrated in the international telecommunications network. There are four analogue and four fibre-optic submarine cables linking Singapore directly to 33 countries. In addition, Singapore, together with 90 other international telecommunication administrations in Southeast Asia, Middle East and Western Europe signed the construction and maintenance agreement in Jun 97 to implement a new sub-sea, digital lightwave superhighway known as the SEA-ME-WE 3 cable system. Singapore also has earth stations to access Intelsat, Inmarsat, Apstar, Palapa, AsiaSat, PanAmSat and other satellites to provide international telecommunication services.

National telecommunications facilities are adequate in Singapore. For improving internal telecommunications facilities in the short- and medium-term, Singapore launched Singapore ONE (One Network for Everyone), the world's first nation-wide broadband multimedia network that delivers interactive, multimedia applications and services to the workplace, the home and the school. Currently, over 190 interactive broadband applications and services are available on Singapore ONE. This is consistent with the plans to become a fully intelligent island. Singapore is also fully integrated in the international telecommunications network.

Capacity-Building, Education, Training and Awareness-Raising: MCIT officers attend conferences and seminars worldwide to scour the world for best practices that we can adapt to the Singapore's context. For example, LTA officers attended the American Public Transit Association (APTA) Conference and other seminars organized by international organizations such as APEC and ASEAN. LTA also sends officers for postgraduate studies on transport planning. The statutory boards also organize conferences, seminars and workshops to train, inform and update policy makers/industry representatives on the latest developments in their respective industries. For example, seminars and workshops organized by CAAS at its Singapore Aviation Academy and by MPA are open to personnel of the relevant industries. The main channel to raises awareness of issues related to sustainable development in transportation and communications is through media and public relations campaigns.

Information: Relevant information on transport and telecommunications are available electronically at the Ministry's and the respective Statutory Boards' websites e.g. statistics on vessel arrivals and port throughput are

available on the MPA website (www.mpa.gov.sg). Some of the information is also published for sale to the public e.g. Air Transport Statistics by CAAS. Statistics are also gathered by the Department of Statistics (DOS) and the Urban Redevelopment Authority (URA).

Research and Technologies: Singapore is generally supportive of using new systems/implementing solutions that use environmentally-sound technologies. Decisions related to the choice of technologies are determined by suitability of the technology, cost effectiveness and efficiency.

Financing: This sector is usually internally funded through operational surpluses.

Cooperation: Singapore participates in various regional fora (ASEAN, APEC, WTO, etc.) which are aimed at improving air and maritime transport services and for reducing their costs. These fora are generally useful and have greatly facilitated regional cooperation in transport. See also under **Status** in Chapter: INDUSTRY of this Profile.

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CHAPTER 5: DEMOGRAPHIC DYNAMICS AND SUSTAINABILITY

Decision-Making: The Prime Minister’s Office oversees demographic issues. A Ministerial Committee on Marriage and Procreation coordinates replacement level population policy in Singapore. A Working Committee, consisting of senior bureaucrats, supports the Ministerial Committee in its policy deliberations. The Ministry of Community Development and Sports provides the secretariat support for both the Committees. The Ministerial and Working Committees, through various feedback channels, consistently consult various interest groups, volunteer welfare organizations, religious groups, women’s groups and the public to ensure that its policy recommendations to the Government are consensual, effective and timely. Numerous legislation and regulations have an indirect impact on the demography of the population.

Programmes and Projects: Studies reveal that many Singaporeans want to get married and have children, but face obstacles in doing so. To correct the trend of sub-replacement fertility, and to supplement a range of benefits and schemes introduced in 1987, the Government introduced a package of measures in 2000. The package of measures, both old and new, that is in place now to help people realize their familial goals is as follows:

Paid Maternity Leave – Full pay leave of eight weeks is granted. The employer pays the maternity benefit for the first and second child, whereas the Government pays for the third child.

Children Development Co-Savings Scheme (or Baby Bonus) – A two-tiered co-savings scheme where the Government and parents co-invest in early childhood development.

Childcare Subsidy – The Government provides a subsidy for centre-based childcare, both full- and part-time.

Home ownership – The Government allows young couples to stagger the required down payment for public housing, making it easier for them to start a family.

Family Friendly Civil Service – The Government is a lead family-friendly employer. It offers marriage leave, paternity leave, paid child sick leave, no pay childcare leave, part-time employment, telecommuting and various forms of flexible work arrangements.

Work-Life Unit – The Government has set up an outfit to promote family-friendly work practices in the private sector, and build capacity in them to introduce such practices.

Tax System – There are various tax rebates and relief available to ease the financial responsibilities of families.

Opportunities for Interaction and Socializing – To increase such opportunities among the young, the Government invests in hostels in tertiary institutions and encourages programmes that bring people together.

Social Development Unit and Social Development Service – The Government has set up the two outfits to promote marriage among graduates and non-graduates respectively through various programmes and initiatives.

Public Education and Empowerment – The Government, through its partnership with the people and voluntary sector, provides the knowledge and resources to prepare couples for marriage, keep the marriage strong and promote good, responsible parenting.

Dysfunctional families – Various Government and non-government programmes and services are in place to preserve and support the family, as well as protect its members.

Also see under **Capacity-Building, Education, Training and Awareness-Raising**.

Status: The vision of Singapore’s population policy is to create a total social environment conducive for marriage, family formation and preservation. To accomplish the vision, the Government identifies and helps remove the obstacles its people face in getting married and starting a family. The Total Fertility Rate was on the increase for a few years after the first package of measures was introduced in 1987, but started to decline thereafter. It is premature to evaluate the success of the additional measures introduced in 2000.

Capacity-Building, Education, Training and Awareness-Raising: A Public Education Committee on the Family (PEC) has been set up to work with the Ministerial Committee on Marriage and Procreation. It focuses on promoting positive values and attitudes towards marriage and procreation. Through the employment of five Work Groups and six Action Groups, the PEC aims to identify comprehensively the issues that Public Education can address and to maximize the effectiveness of its delivery to the different target audiences.

In addition, a “Family Life Ambassador” (FLA) programme has been launched to actively involve the community, employers, civic groups and individuals in promoting marriage, procreation and the building and multiplication of strong and stable families. FLAs will bring family programmes and resources to workplaces and meetings in a manner and time suitable for their specific target groups.

Information: No information available.

Research and Technologies: No information available.

Financing: The Government provides part of the funding for the various programmes and initiatives through direct subsidies and development grants.

Cooperation: No information available.

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CHAPTER 6: PROTECTING AND PROMOTING HUMAN HEALTH

Decision-Making: The Ministry of Health plans and formulates health policies at the national level. The Health Promotion Board (HPB), a statutory board under the purview of the Ministry of Health, is responsible for spearheading health education, promotion and prevention programmes and for creating a supportive health environment. The statutory responsibility of ensuring a safe and wholesome food supply in Singapore lies with the Food Control Department (FCD) of the Ministry of the Environment (ENV) and the Agri-food and Veterinary Authority (AVA) of the Ministry of National Development (MND). FCD is responsible for the formulation, review and implementation of food laws in Singapore via control of imported processed food and food sold at retail outlets, licensing of food factories and supermarkets, and upgrading of food factories. FCD covers the safety and specification standards of all imported foods (other than primary produce), locally manufactured food and retail food, and the safety of food contact materials. The Agri-food and Veterinary Authority of Singapore is responsible for ensuring the safety of primary food, and protecting the health of people, animals, fish and plants through advanced technology in agriculture, fisheries, veterinary sciences and the life sciences. The two agencies liaise closely to maintain a high standard of food hygiene and safety in Singapore.

The Agri-food and Veterinary Authority of Singapore (AVA) protects the health of Singaporeans by ensuring that imported and locally produced primary foods in Singapore are safe for consumption, and protecting the public against zoonoses (diseases of animals transmissible to humans). The Joint Coordinating Committee on Epidemic Diseases (JCCED) comprising senior officials from Ministry of Health (MOH), Ministry of the Environment (ENV), Agri-Food and Veterinary Authority (AVA), Ministry of Defense (MINDEF), National University of Singapore (NUS), Tan Tock Seng Hospital (TTSH) and the Singapore General Hospital (SGH) is the national body responsible for the formulation and evaluation of infectious disease prevention and control programme in Singapore.

The Occupational Safety and Health Division (OSHD) of the Ministry of Manpower comprises the Occupational safety Department (OSD), Occupational Health Department (OHD), Occupational safety and Health Training and Promotion Centre (OSHTC) and Work Injury Compensation Department (WICD). The mission of the Division is to safeguard the safety and health of workers, maintain a proactive work injury compensation system and work towards establishing Singapore as a country renowned for Occupational Safety Health (OSH) Best Practices. OSHD works closely with its key partners which include representative's from the unions, employer organizations, academia, other government agencies such as the Ministry of the Environment, Ministry of Health, Singapore Productivity and Standards Board and various industry groups. The surveillance and control of vector-borne, food-borne and environment-related diseases come under the jurisdiction of ENV. Legislations related to the surveillance and control of these infectious diseases include the Infectious Diseases Act, Environmental Public Health Act and Control of Vectors and Pesticides Act as well as their subsidiary regulations.

The objective of the Factories Act is to provide protection for workers employed in factories and other workplaces as defined under the Factories Act. The Factories Act has been amended in March 2000 to introduce new provisions to enhance the framework for self-regulation and requiring classes of factories to implement measures such as: setting up of Safety Management System and carrying out periodic safety audits; appointing competent persons to act as safety co-coordinators to promote the safe conduct of work within the factories; appointing a competent person approved by the Chief Inspector to conduct periodic safety inspections; and sending employees for relevant safety and health courses.

Programmes and Projects: The food safety programme enables inspection to be focused on problematic food establishments to ensure food sanitation and hygiene through source tracing, and seizure and destruction of implicated unsafe food and closes down establishments that consistently supply substandard food. The other key food control programmes to ensure food safety include: food factory licensing and upgrading; Control of imported processed food; Monitoring of emerging and re-emerging food safety issues; Information research for the updating of food laws and for surveillance planning; and Serve as Codex Contact Point for Singapore.

In the area of environment-related diseases, ENV has implemented an indoor air quality (IAQ) programme, culminating in the establishment of Guidelines for Good Indoor Air Quality in Office Premises in 1996, as well as a national surveillance programme for legionella bacteria in cooling towers, water fountains and other man-made

water systems in 2000. A dengue virus sentinel surveillance system to monitor the changing circulating serotype was also introduced in 2000.

Under the medical surveillance programmes, employees who are exposed to specific health hazards at work, such as noise, lead, and trichloroethylene are required to undergo compulsory pre-employment and periodic medical examinations under the Factories (Medical Examinations) Regulations. The objectives are to ensure these employees are fit for the work and to detect any early signs of over-exposure/disease. Under the Health Hazard Control Programme, the Factories (Noise) Regulations and the Factories (Permissible Exposure Levels of Toxic Substances) Notification were introduced in 1997 to control noise hazard and to stipulate the permissible exposure levels of toxic substances respectively. OHD runs two occupational health clinics at the Ministry of Health's primary health care clinics. This enables employees to have better access to occupational health care and to facilitate faster notification of work-related diseases. In addition, there are joint hospital-based specialist clinics for occupational skin, deafness, lung diseases and musculoskeletal disorders.

The HPB focuses on programmes that promote health, prevent disease, and reduce ill health and disability and for Singaporeans to stay healthy for as long as possible. A variety of child and youth and adult health promotion programmes are implemented on an ongoing basis. A comprehensive school health programme promotes good health and reduces illness among the school going population. The School Health Service provides health screening, immunization, basic dental care and health education to school children through school based programmes. The National Myopia Programme was formulated in response to the high rate of myopia among Singapore school children by means of school-based vision screening of pre-school and school children, referral to refraction services and health education for students, parents and teachers.

The Adult Health Promotion Programmes include: National Healthy Lifestyle Programme which provides the public with the knowledge and skills necessary to lead a healthy lifestyle and create a supportive social and physical environment for healthy living; Nutrition Programme comprising of public education, creating a supportive environment for healthier eating, setting nutrition standards, guidelines and administering a nutrition labelling programme; Workplace Health Promotion Programme; Community Health Screening programme to detect diabetes, hypertension and high blood cholesterol in people aged 50 years and above to prevent or minimize the risk of severe disabilities and complications; National Smoking Control Programme; AIDS Education Programme; and Breast & Cervical Cancer Programme. See also under **Status** and **Research and Technologies**.

Status: High safety standards are maintained through an integrated system of accreditation, import regulation, inspection and testing. We review and develop food policies and standards and keep track changing global trends. A multi-pronged approach has been taken to address occupational safety and health issues at the national level. This involves setting and enforcing occupational safety and health standards, promoting self-regulation in industry, training of employees, supervisors, managers, safety and health personnel, promoting best practices in occupational safety and health, as well as inculcating an occupational safety and health culture in the population.

FCD is the Codex Contact Point for Singapore. The department serves as the link between the Codex Alimentarius Commission, Member Countries, the local food industries, consumer organizations, concerned government agencies/organizations and non-government organizations to facilitate exchange of information. The Codex Contact Point studies the standards/guidelines established by Codex Alimentarius Commission with the aim to update the Singapore Food Laws.

To maintain the current high standards of food safety and freedom from major animal and plant diseases such standards, our food safety and animal and plant health programmes will be continually reviewed, refined and updated to ensure that they stay relevant and effective. FCD has established an early alert system an effective source tracing and a food recall system to prevent unsafe imported food from reaching the local consumers. The daily monitoring of food safety issues published on the websites of major food authorities and news agencies supports the early alert system. With the department's continued effort to promote self-regulation in the food industries, every factory and supermarket have appointed a food hygiene officer to ensure that good manufacturing/retailing practices are adhered to. FCD has also required manufacturers to implement quality control programmes and encouraged them to adopt the HACCP System to enhance food safety. To foster a closer working relationship with the food industry, the FCD has initiated the publication of a joint newsletter entitled Food News with the Singapore Confederation of Industries and Singapore Food Manufacturers' Association.

Continued surveillance efforts have contributed to a very low incidence of food-borne and vector-borne diseases in the last 10 years. The incidence rate for typhoid and hepatitis A was less than 0.5 and 1 per 100,000 populations, respectively and Singapore remains free from indigenous poliomyelitis, diphtheria and Japanese encephalitis.

The present Factories Act in Singapore provides for the safety, health and welfare of persons working in premises defined as “factories” which are traditionally the manufacturing, construction, shipbuilding and ship-repairing industries where the more hazardous work processes are carried out. To protect our workforce in non-industrial sectors, the Ministry is looking into enacting a new piece of legislation to cover all workplaces, including industrial establishments that are covered under the existing Factories Act. There is a need to instill an OSH culture in our workforce. The school curriculum is a good place to start, as students are future workforces. Public education to employers, workers and society in general would ensure an informed and enlightened public. There should be more publicity given to OSH in the mass media such as newspapers, television and even advertisement in the MRT, buses, and taxis. It will lay the foundation for a safety and health conscious worker who is responsible for his own safety and health at work.

The infant mortality rate remained low at 3.3 per 1,000 live-births in 1999. These were four maternal deaths in 1999 giving a maternal mortality rate of 0.09 per 1,000 live and still-births. The average life expectancy at birth for all Singaporean in 1999 was 77.7 years. Cancer, heart disease and cerebrovascular disease remained the major causes of deaths in Singapore. Together, these diseases accounted for over 60% of all deaths among Singaporeans.

Capacity-Building, Education, Training and Awareness-Raising: AVA conducts seminars and workshops for the food and farming industries to improve the standard of their products, to create food safety awareness, and to promote voluntary compliance and good agricultural practices. In addition, pamphlets and newsletters are published and distributed to the industry to enable them to upgrade their standards and also to keep abreast with the latest developments in food control, animal and plant health policies and practices. FCD conducts regular seminars and workshops for food manufacturers and regular dialogue sessions with the food retailers and importers to improve the standard of their products, to create food safety awareness, and to promote voluntary compliance. In addition, pamphlets, guidebooks and newsletters are published and distributed to the food industries to educate them to achieve factory and food excellences. These publications also, help the industries to keep abreast with the current developments in the Singapore Food Regulations, food control policies, and emerging food safety issues.

To develop new capabilities to deal with emerging and reemerging infections, an Environmental Health Research Centre will be set up by the end of year 2002 to build up research capabilities to bridge the gap between operational knowledge and strategies. A GIS-based Central Surveillance System is also being developed to monitor disease incidences and unusual trends. OSHD conducts a wide range of training courses and seminars on occupational safety and health. This is carried out by OSHD’s Occupational Safety and health (Training and promotion) Centre (OSHTC). The training courses designed to meet the safety training needs for management staff, occupational safety and health professionals, supervisors and workers in industry. In the area of OSH promotion OSHTC regularly organizes campaigns, seminars, conferences, workshops, talks and exhibitions to highlight specific safety and health issues and to generally instill safety consciousness increase awareness amongst managers, supervisors and workers on the importance of safety and health at work. A quarterly newsletter “OSH News” as well as other publications on occupational safety and health is distributed to industry free-of-charge.

The HPB works in collaboration with public, private and community organizations to develop and sustain national efforts to promote health and to get technical expertise and resources. HPB works closely with the Ministry of Education on development of curriculum, and training of teachers to provide them with the necessary knowledge and skills to teach health topics or conduct health promotion programmes in schools. The nutrition programme collaborates with food importers, wholesalers, retailers and manufacturers.

Information: More information on food control in Singapore can be obtained from the following website: <http://www.env.gov.sg/>. More information on our food safety and animal and plant health programmes can be obtained from AVA’s website: <http://www.ava.gov.sg>. Information on the infectious diseases situation is made available through QED’s annual report, its monthly Epidemiological News Bulletin as well as through its website. To promote awareness of the occupational safety and health in Singapore, the public can access the Ministry of Manpower’s web site, <http://www.mom.gov.sg>, for information, such as accident and disease statistics, hazard alerts, legislative requirements, OSH guidelines and publications. The public can also make enquiries at the Ministry One-Call Centre, which is supported by a knowledge-based system.

A variety of communication channels are utilized to impart health education messages. These include broadcast over television, radio and cinemas, print advertisements in local newspapers and magazines, outdoor advertisements such as on buses, taxis, trains and electronic billboards, and a website on health lifestyle. The public can also call HealthLine, a telephone health information service. HPB has also set up a health education centre called HealthZone that includes a hands-on interactive exhibition and classrooms with multi-media teaching aids. HPB also produces a wide range of health education materials such as booklets, posters, and exhibition panels, slide-sets, videos and CD-ROMs.

FCD carries out food safety assessments to assess the public health risk associated with microbiological and chemical hazards in food. The assessments are essential for estimating the dietary exposure of the local population to chemical hazards, for the revision of the Singapore Food Laws and the development of food safety strategies to minimize hazards. The department also conducts trend analysis using the food surveillance data captured in the computer system. The analysis helps the department to determine the frequency of sampling and the mode of control measures, and to plan surveillance programmes.

Research and Technologies: AVA's laboratories employ advanced technologies and equipment to carry analytical tests and disease diagnosis. Efforts in R&D are focused on developing new technologies and farming systems and methods that can increase productivity and produce safer foods. Such R&D projects are usually carried out in collaboration with industry, academia and research institutes.

OHD together with the Institute of High Performance Computing is conducting a collaborative one-stop virtual engineering simulations (COVES) project. This \$700,000 project will develop and trial test an integrated, on-demand, multi-agency collaborative system which could be used to predict exposure to hazardous chemicals, visualize and simulate spread of fire, smoke movement, dispersion of pollutants, and building ventilation designs using state-of-the-art computational fluid dynamics technology via remote Internet access. Studies have been conducted on the health risks of workers exposed to various hazards, such as silica, lead, cadmium, cobalt, tungsten carbide, benzene, trichloroethylene, and other organic solvents.

The HPB conducts surveys to measure awareness of health promotion activities and also adopts evidence-based approaches to programme evaluation. It has established database systems for purposes of tracking and analysis of information for policy decisions. Initiatives are underway to collaborate with key stakeholders to develop culturally appropriate anthropometric standards for school children and to establish a Body Mass Index (BMI) and percent body fatness that is appropriate to the Singapore population. See also under **Capacity-Building, Education, Training and Awareness-Raising**.

Financing: AVA's programmes are funded by the Singapore government through a grant-in-aid provided by the Ministry of Finance through the Ministry of National Development. FCD receives active financial support from ENV and the Ministry of Finance (MOF). The department has greatly increased its budget on food sampling and inspections with the aim of enhancing food safety and achieving high standards of food hygiene. As compared with 1998, the percentage of expenditure has increased by 16% in 2001. About 87% of this operating expenditure is used on laboratory analyses and food sampling. OSHD has a staff strength of 212 with an annual running cost expenditure of about \$16.2 millions. All the health promotion programmes are funded by the government.

Cooperation: AVA participates actively in the activities of Codex Alimentarius Commission, OIE and IPPC. As the national representative on agriculture, AVA also plays an active role in the meetings and programmes of the ASEAN Ministers on Agriculture and Forestry (AMAF), and provides technical assistance to regional countries in a spirit of exchange of cooperation. FCD participates actively in regional and international activities in harmonization of food control standards and approaches. These include Codex Alimentarius Commission, Asia Europe Meeting (ASEM) and various ASEAN Committees. Development of Mutual Recognition Agreements to facilitate trade in the food sector under Asia-Pacific Economic Cooperation (APEC) is also being pursued. The principles of equivalence are addressed at these fora.

In the area of international cooperation, QED maintains close ties with public health authorities in the region. Regional training and consultancy services were provided through the Institute of Environmental Epidemiology (IEE), a WHO Collaborating Centre for Environmental Epidemiology established on 1 June 1995. IEE also collaborates with overseas institutions to administer training and research programmes through Memoranda of Understanding.

As a World Health Organization (WHO) Collaborating Centre for Occupational Health, the Department conducted practical attachment programmes for trainees in occupational health. We received a total of 76 visitors both local and overseas. The Department is also the designated body for Singapore in the ILO International Occupational Safety and Health Hazard Alert System and the WHO Prevention and Control Exchange (PACE) Programme on health hazards. It is also the National Centre for Singapore in the ILO International Occupational Safety and Health Information Centre (CIS) Network. OHD also conducts practical training under the sponsorship of ILO and Singapore-ASEAN Co-operation Programme. Some of the training courses are conducted overseas, such as those organized through the Singapore International Foundation and WHO. Singapore participates in regional and international meetings and conferences on the promotion of health. Singapore also participates in the negotiating meetings on the Framework Convention in Tobacco Control.

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CHAPTER 7: PROMOTING SUSTAINABLE HUMAN SETTLEMENT DEVELOPMENT

Decision-Making: The Ministry of National Development (MND) and its statutory boards, the Urban Redevelopment Authority (URA) and the Housing Development Board (HDB), are primarily responsible for the planning and development of Singapore. Other statutory boards under MND involved in sustainable human settlement development are the Building and Construction Authority, which oversees the construction industry, and the National Parks Board, which manages the parks and open spaces. URA, as the central planning authority in Singapore, works with other government agencies such as HDB, to draw up plans that aim to provide a variety of housing and living environments to meet the different needs, affordability and aspirations of Singaporeans. Inputs of various government agencies, such as the Ministry of Environment, Land Transport Authority, National Parks Board, etc. are incorporated to ensure that developments are well-integrated with the environment, transportation and other infrastructure. The private sector and the general public are consulted as part of the process.

Under the Concept Plan 2001, a long-term land use plan drawn up in collaboration with different agencies, a variety of housing and other land use needs will be provided to cater for and to sustain a 5.5 million population. As part of the long-term plan, more housing will be provided within existing towns to make best use of existing infrastructure. As a result, land in the outskirts can be kept as land banks for future needs. HDB's public housing programme ensures that Singaporeans have access to affordable, good quality housing.

Programmes and Projects: One of Singapore's public housing projects won the United Nations World Habitat Award 1991 as an outstanding project that offers a practical and imaginative solution to housing problems. Apart from new housing projects, older public housing estates are progressively upgraded to maintain the quality of the living environment. Buildings are also being retrofitted with elderly-friendly facilities. In the construction industry, energy-efficient building designs are encouraged and recognized through national awards. Training Programmes ensure that construction workers are equipped with skills.

Status: Environmental protection controls have been factored into land use planning to ensure that developments are properly sited and are compatible with surrounding land uses. For all new developments, approvals are required from the Ministry of the Environment on factors such as environmental health, drainage, sewerage, air and water pollution control and hazardous and toxic waste disposals, etc. The implementation of government land sales and public housing building programme is reviewed regularly to take into account the economic climate, resources and future trends. Despite the scarcity of land in Singapore, land has consciously been set aside for parks and nature areas. Buildings with historical or architectural significance have also been conserved, often with new, economically sustainable uses. Singapore's high-intensity development lends itself well to high-occupancy transport systems such as mass rail transit. The existing rail network will be expanded to cover more of the island, and make public transport more convenient. Traffic management measures such as electronic road pricing are also in place to manage car usage and road congestion. Housing areas are planned with facilities, such as schools, shops and community facilities, to build self-sustaining communities.

Capacity-Building, Education, Training and Awareness-Raising: Consultation sessions and dialogues are held with the public and the professionals on specific developments, as well as proposed long-term strategies and directions. There are also public galleries with exhibits to educate the public and school children on urban planning and housing issues. Seminars and workshops are organized to train, inform and update policy makers as well as industry representatives on the latest developments in their respective industries. The government agencies also attend conferences and visit other cities overseas to learn from them.

Information: Statistics and detailed information on the private residential, commercial and industrial sectors are made available on the Internet (<http://www.ura.gov.sg>). Information on land use planning (e.g. development guide plans, development control guidelines, etc.) is also published.

Research and Technologies: HDB develops and utilizes building technology such as prefabrication construction techniques to improve productivity and efficiency, as well as increase the quality of the materials used. Research is also done in collaboration with the university on improving building designs to make them more buildable.

Financing: Land use planning and the public housing programmes are mainly financed through the National Budget. Some fees are also collected for services provided e.g. development application fees, government land sales etc.

Cooperation: Currently, Singapore has established government-to-government links as well as private sector led networks such as the Architects Regional Council Asia (ARCASIA) and the Asia Pacific Cities Summit. Singapore is also involved in the Urban 21. These networks promote cooperation and mutual learning among cities in areas such as the environment, urban planning and promotion of the arts.

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CHAPTER 8: INTEGRATING ENVIRONMENT AND DEVELOPMENT IN DECISION-MAKING

Decision-Making: Being a small country, there is only one level of government, i.e. the national level. The Ministry of the Environment was set up in 1972 with the task of protecting and improving the environment. The ministry has the capacity to ensure compliance with its laws and standards. The administrative and enforcement capacity of the ministry has been strengthened over the years by integration of functions, reorganization, redeployment of resources and adopting state-of-the-art monitoring techniques. Bodies responsible for natural and environmental disasters are: the ministries of Home Affairs, Defense, Communication, and the Environment, Maritime and Port Authority, Port of Singapore Authority, Civil Authority of Singapore, and various other agencies. Depending on the issues at hand, the relevant groups are invited to participate in the formulation of policies or to provide feedback on proposed policies. Various channels have been employed and these include setting up formal committees, organizing forum or specific feedback sessions and regular dialogue sessions.

Regulations and guidelines to help prevent, reduce and cope with natural and environmental disasters are encompassed in various planning, maritime and environmental laws. Codes of practice are established by the government in consultation with industry and the academia. There is an established process to review codes of practice to take into account development in technologies and international standards or law in the relevant areas. By and large, domestic laws are reviewed with the aim to make them more consistent with new international laws and standards. At the same time, global environmental issues, such as protection of the ozone layer, global warming, preservation of biodiversity and endangered species and pollution of the sea began to take on a higher prominence. Commitments under international conventions and protocols were beginning to have an impact on Singapore's businesses and industries. It was clear that a new approach was needed to keep to the path of sustainable development.

A major review of policy was carried out at the end of the eighties, and the result was the Singapore Green Plan (SGP) released in 1992. The SGP is the national environmental master plan that sets out the strategic directions Singapore would need to further improve the living environment and raise public health standards. It covers the core areas of environmental management, infrastructure development and public health. It also identifies six additional strategic areas that require greater attention and inter-agency coordination. These are environmental education, environmental technology, resource conservation, clean technologies, nature conservation and environmental noise management. As a follow-up to the SGP, a set of action programmes was formulated under the six strategic areas in Oct 1993. Lead agencies to implement the action programmes were identified and implementation of the SGP has been underway since then. The successful implementation of programmes in the Singapore Green Plan has helped to keep Singapore's environment clean and green even as Singapore made further progress in its economic development over the past decade.

As circumstances have changed, a review has been initiated to keep the SGP relevant. Three focus groups have formed to help to develop a draft for the revised SGP. This will be followed by a public consultation phase before the revised SGP is published. The revised SGP will tentatively be released at end 2002.

Programmes and Projects: Programmes that seek to prevent, reduce or cope with natural and environmental disasters are being planned and implemented to avoid a disaster if it is possible, or to minimize the risk if a potential risk cannot be eliminated totally, through planning and technical controls and then at the operational level. See also under **Decision-Making** and **Status**.

Status: The SGP programmes have been implemented. The significant aspects of the SGP on environmental infrastructure, public health and environmental management as well as the action programmes under the six new areas have been successfully implemented well. Overall, the objectives have been achieved. Even as Singapore made further progress in its economic development, we have managed to keep our environment clean and green.

- Our air and water quality meets international standards.
- Our public health standards are high despite Singapore being situated in a region endemic of tropical diseases.
- We have also successfully raised the level of awareness of our people on environmental issues.

Singapore does not consider itself to be particularly vulnerable to natural disasters. Singapore is not on any earthquake or volcanoes belt. Typhoons, hurricanes or tidal waves are rare. Singapore has taken all possible measures to avoid or minimize the risk of environmental disasters such as smoke haze and oil spill. To address the

vulnerability, the activities include are mainly in prevention, monitoring and taking mitigating measures to minimize the effects and damages. These are being done on our own and in cooperation with the region and the international community. Public exercises are conducted regularly to raise and maintain awareness. Heightened awareness among the community has led to greater involvement across a wide sector of the community from primary schools to residents' associations and the general public. This has led to numerous environmental activities being held and higher expectations of a good living environment.

Capacity-Building, Education, Training and Awareness-Raising: See under **Status** .

Information: No information available.

Research and Technologies: No information available.

Financing: No information available.

Cooperation: No information available.

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CHAPTER 9: PROTECTION OF THE ATMOSPHERE

Decision-Making: The key ministries and bodies involved in the issues related to climate change and sea-level rise are the Ministry of the Environment and Attorney-General's Chambers. As circumstances have changed, a review has been initiated to keep the SGP relevant. Three focus groups were formed to help develop a draft for the revised SGP. This will be followed by a public consultation phase before the revised SGP is published. The revised SGP will tentatively be released at end 2002.

Singapore has adopted a multi-pronged approach to reduce and eventually phase out the consumption of ozone-depleting substances (ODS). The Ministry of the Environment (ENV), acting as a focal point between government agencies, is responsible for formulating strategies and policies to control the use of ODS in industries. The Ministry of Trade and Industry, through the Trade Development Board, administers a Tender and Quota Allocation System to cap the consumption of ODS in accordance with guidelines set by the Protocol. The system ensures an equitable distribution of the controlled supply of ODS to registered distributors and end-users. The government and the private sector have collaborated in various activities under this programme. The strategy adopted in Singapore is to take no-regrets measures such as promoting energy efficiency. As a long-term measure to alleviate flooding, all development of land would need to comply with a requirement of a minimum platform level that is above the predicted flood level. Low-lying areas thus have to be raised in order to meet the requirement before the land can be built upon. The requirement is imposed during the planning process.

Programmes and Projects: The key programmes that address issues related to climate change and sea-level rise are the following: to switch from fuel oil to natural gas; to promote energy efficiency in both supply and demand sides; to provide an efficient and comprehensive public transportation to curb growth in vehicle population and use, waste minimization programmes; and programmes to encourage the corporate sector to integrate environmental concerns into their businesses. To keep carbon dioxide emission level as low as possible, action programmes have been formulated to promote energy efficiency and resource conservation. Power generation is from fuel oil and natural gas and accounts for about half of the carbon dioxide emission. To improve efficiency, combined-cycle technology is being introduced wherever it is technically feasible to do so. To reduce waste generation, resource conservation programmes have been put in place with the aim to minimize use of energy, water and other raw materials. Financial and technical assistance schemes have also been made available to help industries switch to non-ODS substitutes or alternatives. See also under **Status** and under **Programmes and Projects** in Chapter: **Industry** of this Profile.

Status: Coastal and low-lying areas would be affected by a sea level rise, if preventive or adaptive measures are not taken. The long-term measure to alleviate flooding is to require all developments of land to comply with a minimum platform level that is above the predicted flood level. Low-lying areas thus have to be raised in order to meet the requirement before the land can be built upon. The main issues relating to climate change and sea level rise in Singapore are the total dependence on imported fuels for energy needs, and the limited scope to develop renewable energy sources. Singapore recognizes that resources need to be efficiently managed to strike a balance between competitiveness and greenhouse gas emissions.

Capacity-Building, Education, Training and Awareness-Raising: The Singapore Productivity and Standards Board (PSB) provides technical consultancy to small and medium enterprises wishing to switch to ozone-friendly processes under the Local Enterprise Technical Assistance Scheme.

Information: See under **Programmes and Projects** in Chapter: **Industry** of this Profile.

Research and Technologies: No information available.

Financing: The costs for implementing plans for adaptation to sea-level rise are borne by the developers and included in the cost of development. Activities related to climate change and sea level rise are financed by the individual developers, most of which have their own source of funding.

Companies which require financial assistance can seek grants through the PSB which administers the Local Enterprise Finance Scheme and also approach the Economic Development Board for the Investment Allowance Scheme.

Cooperation: The Montreal Protocol (1987) was acceded to on 5 January 1989, and the London Amendment (1990) was acceded to on 2 March 1993. The latest report to the Montreal Protocol Secretariat was prepared in 1995. The United Nations Framework Convention on Climate Change was signed on 13 June 1992. Singapore participates in the IPCC programmes and meetings. Singapore has Regional Firefighting Arrangement for Sumatra on haze.

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CHAPTER 10: INTEGRATED APPROACH TO THE PLANNING AND MANAGEMENT OF LAND RESOURCES

Decision-Making: The Urban Redevelopment Authority (URA), under the Ministry of National Development (MND) is the national planning authority. It handles every aspect of planning from strategic long-term planning to day-to-day development control.

URA draws up and regularly reviews the Concept Plan, the Master Plan and Development Control guidelines to guide developments island-wide. The Concept Plan is the strategic land use plan which balances our land needs and constraints. It includes provisions for long-term land-intensive uses such as housing and infrastructure as well as development strategies. It is drawn up through coordination with various government agencies. The Concept Plan is then translated into the detailed Master Plan, which indicates the land-use on every plot of land. Development control decisions are guided by the Master Plan zoning, and will have to meet general guidelines set out to safeguard the amenity of the environment. Coordination among responsible bodies for land use and management is facilitated by various standing committees and panels. The Chief Planner of URA chairs a Master Plan Committee comprising representatives from various government agencies to coordinate and resolve land use issues. The Master Plan Committee was formed in the 1960s.

The public is consulted extensively at different stages of the land use planning process. Before the Concept Plan is finalized, public feedback is sought on the key proposals. Before the gazette of the Master Plan, a public exhibition is held to obtain feedback and suggestions from the public. These suggestions are incorporated into the plan where possible. The URA Development Control Division has frequent dialogues with professional bodies to review rules and guidelines to ensure that they stay relevant. The integrated approach ensures consistency, transparency and long-term sustainability with regards to land use.

Programmes and Projects: See under **Status**.

Status: The Concept Plan is reviewed once every 10 years, the Master Plan once every 5 years, and development control guidelines regularly to ensure that the plans remain relevant to changing technology and trends. It ensures that the long and short term plans for the city is sustainable. In addition, planning studies are carried out on how land can be optimized. Examples of such studies and projects include integrated development for community facilities, and higher intensity housing, commercial and industrial developments. This saves land, reduces travel cost and time, and capitalizes on infrastructural investments, thus making it more environmentally sustainable.

The Concept Plan 2001 has recently been completed. The plan is drawn up based on a population scenario of 5.5 million. The plan advocated high density housing and industrial developments especially around Mass Rapid Transit (MRT) stations, and a focus towards developing infill areas in already developed areas instead of opening up new ones. The plan also advocated a new focus on retaining and enhancing built and natural identity on our island. Planners now face the challenge of translating the broad direction set out by the Concept Plan 2001 into detailed Master Plan to be gazetted in 2003.

Capacity-Building, Education, Training and Awareness-Raising: Planners regularly attend talks and conferences, and conduct overseas trips to learn from other cities. The URA also offers scholarships to train urban planners and architects in their fields. The public is informed of our latest plans through exhibitions and press release. The URA also has a public gallery for school children and overseas visitors to introduce them to Singapore's vision, the planning constraints and principles.

Information: The GIS-based Integrated Land Use System (ILUS) is a land use information system that helps the planning authority to manage land. Singapore is a small country. It is easy to ascertain land conditions through site inspections, soil tests and topological surveys. The Master Plan provides information on zoning and development intensity. It is published in print and CD Rom. This and many other planning documents e.g. the Concept Plan are available for sale and on the URA web site at www.ura.gov.sg.

Research and Technologies: Since 1999, development applications can be submitted electronically to URA through the Electronic Development Application System (EDA). The system allows developmeters to submit text files and CAD drawings, and get them 'signed' and 'approved' online.

Financing: Planning work is financed mainly from the national budget, and partly from revenue generated through services provided, e.g. development application fees.

Cooperation: URA regularly conducts and hosts visits to/from overseas planning agencies such as Hong Kong, Malaysia, Japan, China, Indonesia, Thailand and Mexico. We also host many groups from developing countries under the Singapore Technical Cooperation programme organized by the Ministry of Foreign Affairs.

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CHAPTER 11: COMBATING DEFORESTATION

Decision-Making: No information available.

Programmes and Projects: Although Singapore does not have as such a national forest programme, under the context, which is commonly understood, nevertheless, the Singapore Green Plan has identified 19 nature areas that represent different ecosystems in Singapore and action programmes have been implemented to survey their biodiversity and monitor their health status. There is a mechanism whereby nature conservation considerations are incorporated into the planning and development processes. The Singapore Green Plan promotes the “Recycle, Reuse, Reduce” practice.

Status: The forests of Singapore are not commercially exploited for timber or other timber products nor are there any indigenous people foraging in the forests of Singapore for their subsistence. The natural areas of Singapore are, hence, conserved primarily for ecological, educational, recreational, and scientific purposes. Paper is recycled by commercial companies.

Capacity-Building, Education, Training and Awareness-Raising: No information available.

Information: Singapore submitted her “First National Report Under the Convention on Biological Diversity” in December 1997 to the Secretariat of the Convention on Biological Diversity (CBD).

Research and Technologies: No information available.

Financing: No information available.

Cooperation: Singapore has not participated in the IPF process.

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CHAPTER 12: MANAGING FRAGILE ECOSYSTEMS: COMBATING DESERTIFICATION AND DROUGHT

Decision-Making: No information available.

Programmes and Projects:

Status: No information available.

Capacity-Building, Education, Training and Awareness-Raising: No information available.

Information: No information available.

Research and Technologies: No information available.

Financing: No information available.

Cooperation: No information available.

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CHAPTER 13: MANAGING FRAGILE ECOSYSTEMS: SUSTAINABLE MOUNTAIN DEVELOPMENT

Decision-Making: No information available.

Programmes and Projects: No information available.

Status: No information available.

Capacity-Building, Education, Training and Awareness-Raising: No information available.

Information: No information available.

Research and Technologies: No information available.

Financing: No information available.

Cooperation: No information available.

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CHAPTER 14: PROMOTING SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT

Decision-Making: The Agricultural Policy is implemented by: the Agri-food & Veterinary Authority of Singapore (AVA); a Statutory Board under the Ministry of National Development and it forms an integral part of the AVA's overall food policy of ensuring a continued resilient supply of safe primary food in Singapore. AVA is the national authority dedicated to safeguarding the health of people, animals, fish and plants through advanced technology in agriculture, fisheries and veterinary science. The National Agricultural Policy of Singapore aims to develop the limited agricultural areas, both land and sea, to produce prime quality food and to serve as benchmarks on quality and pricing for imports and exports (i.e. export of ornamental fish and plants).

Programmes and Projects: Integrated pest management is practiced in the farms. (e.g. netted vegetable production and hydroponics to reduce the use of pesticides in the vegetable production). Singapore's agro-technology parks were built following its Ministry of Environment's anti-pollution guidelines. All land in Singapore is utilized according to its National Master Plan. About 1500 ha of land is reserved for our Agrotechnology Park Development while 500 ha is reserved for our Marine Aquaculture Park development.

Status: Agriculture is of very limited significance to the Singapore economy, representing only 0.1 per cent (S\$217mil) of GDP, estimated at S\$159 billion (US\$91 billion) in 2000. Agriculture products include vegetables, eggs, fish, milk, and ornamentals, namely orchids and other ornamental plants, and ornamental fish. Approximately 90 per cent of food consumed in Singapore is imported. In 2000, the total value imports for primary produce was S\$2.6 billion. Singapore is an island city state consisting of a total land area of 647 sq km. With limited land and sea resources for agriculture, Singapore's agricultural developments take place mainly in allocated areas, called Agrotechnology Parks on land and Marine Aquaculture Parks at sea. These Parks are developed and managed by AVA, and cover a total of 2,000 ha, with 1,500 ha for Agrotechnology Park development and 500 ha for Marine Aquaculture Park development.

Agrotechnology is the application of modern science and technology to large-scale, intensive farming so as to optimize use of resources and increase yield and productivity in the farm. It is the aim of AVA that, in the long-term, Singapore could develop to become a regional Agrotechnology Center focusing on tropical and urban agriculture. There are six Agrotechnology Parks, with 334 farms occupying some 928 ha (2000 figures), producing vegetables, eggs, fish, milk, as well as ornamental plants and fish. Usually the Parks have a mix of farms. This is to minimize spread of disease specific to a single type of species of plant or animal and to minimize environmental impact and pollution. Adjacent to the Lim Chu Kang Agrotechnology Park, a 10 ha Agri-Bio Park has been established, which is dedicated to agri-biotechnology investments. The Marine Aquaculture Parks are for marine fish farming, there being five Parks with 89 floating fish farms producing both finfish and shellfish. AVA regulates the number of floating farms in each Park so as to prevent water stagnation and poor water quality within the farming site.

The agricultural products, with the exception of the ornamentals, are destined for domestic consumption, which is relatively high, in terms of per capita consumption. Example: per capita consumption of chicken is 37 kg, pork 18 kg, fish 25 kg, vegetables 80 kg, and fruits 85 kg (2000 figures). Agriculture activities in Singapore can be broadly classified into 12 categories, viz, as follows: a) *Aquaculture*: Foodfish Production in floating cages at sea; Foodfish Production on land-based ponds/tanks; and Ornamental fish production in ponds/tanks. b) *Animals*: Hen's Egg Production; Production of duck, quail and other game birds; Farming of dairy cattle and goats; Farming of Frog and Crocodile; and Breeding of Exotic Birds. c) *Plants*: Vegetable Production; Fruit Growing; Orchid and Ornamental Plants Production; and Aquatic Plant Production.

Capacity-Building, Education, Training and Awareness-Raising: The Government has initiated extension services to farmers and education programmes for the public on the activities of the Agrotechnology Parks. To further increase public awareness, Agro-Tourism tours have been organized to the Agrotechnology Parks for members of the public.

Information: Information is available at <http://www.ava.gov.sg>

Research and Technologies: Officially launched in April 1995, the Institute of Molecular Agrobiolgy (IMA), which is funded by the National Science and Technology Board (NSTB), conducts R&D work in agricultural biotechnology at the genetic and molecular levels < <http://www.ima.org.sg> >. Also see under **Status** .

Financing: No information available.

Cooperation: No information available.

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CHAPTER 15: CONSERVATION OF BIOLOGICAL DIVERSITY

Decision-Making: National Parks Board, Ministry of National Development is responsible for biological diversity. The designated land planning agency obtains the views and feedback from all the concerned parties before making decisions on land-use. National Parks Act, Parks and Trees Act, Endangered Species (Import and Export) Act, The Wild Animals and Birds Act and The Control of Plants Act address the issues of biological diversity. The Singapore Green Plan documents Singapore's approach to environmental management, of which nature conservation is one component.

Programmes and Projects: The following main activities and programme are underway: formulation of policies on nature conservation; access to genetic resources and biosafety; identification and safeguarding representative ecosystems; survey; stocktaking and monitoring biodiversity of indigenous species; restoration ecology projects; setting up of databases on biological diversity; and, coordination and identification of scientific research projects that are pertinent to the documentation and management of biodiversity, and awareness and conservation education programmes targeted at schools and the general public. See also under **Status**.

Status: Inventory and monitoring of indigenous species and competing land use demands are the main issues relating to biodiversity management in Singapore. About 5 % of the land area is naturally vegetated. A biological survey of the Nature Reserves that comprise of the largest area under natural vegetation has just been completed. The data collected is currently being used to identify management priorities and form the basis for future research and monitoring. Inputs on nature conservation are considered in the planning and development processes. Participation of community groups for the protection and conservation of biological diversity is encouraged through the activities, such as: Clean and Green Week; National Youth Achievement Award; school curriculum-based and extra-curriculum activities; extension courses by the School of Horticulture (SOH); activities by the Singapore Environment Council; the National Parks Board's Adopt-a-Park Programme; and Reforestation Programme which involves schools and youth organizations. The major constraints to effectively implement programmes on biodiversity are related to competing demands for very limited resources, and insufficient staff.

Capacity-Building, Education, Training and Awareness-Raising: Campaigns or other efforts to raise awareness of issues related to sustainable development and biodiversity resources include Clean & Green Week and the Singapore Environment Council's programmes and activities, e.g. Earth Day celebrations. See also under **Status**.

Information: Singapore has biological diversity, socio-economic and present land use data, and proposed land-use information for decision-makers and planners working in the area of biodiversity resources. See also under **Status**.

Research and Technologies: Biosafety is a field in which Singapore is active for development, transfer and use of environmentally sound technologies. Safety to human health is accorded top priority when decisions on choosing technologies are made.

Financing: This sector is financed by the national budget. Private sector cooperates in partnership for some projects.

Cooperation: Singapore is Party to Convention of Biological Diversity, Convention on International Trade of Endangered Species, and Association of Southeast Asian Nations (ASEAN) Working Group on Nature Conservation. Other international cooperation includes ASEAN Regional Centre for Biodiversity Conservation (ARCBC), and ASEANET (Southeast Asian Loop of BioNet). Benefits of the cooperation include harmonized policies can be adapted (e.g. biosafety, access to genetic resources)

CHAPTERS 16 AND 34: ENVIRONMENTALLY SOUND MANAGEMENT OF BIOTECHNOLOGY AND TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGY, COOPERATION AND CAPACITY-BUILDING.

Decision-Making:

Technologies: Ministry of the Environment as well as the National Science and Technology Board (NSTB) under the Ministry of Trade and Industry are responsible for the promotion and transfer of Environmentally Sound Technologies (ESTs).

Biotechnologies: No information available.

Programmes and Projects:

Technologies: The Productivity and Standards Board actively promote the adoption of ISO 14000 by industry.

Biotechnologies: See under **Programmes and Projects in Chapter 35** of this Profile.

Status:

Technologies: No information available.

Biotechnologies: No information available.

Capacity-Building, Education, Training and Awareness-Raising:

Technologies: NSTB actively encourages our young to develop an interest in science and technology which encompasses environmental technology. ETI regularly conducts seminars on ESTs for industries. Examples of such seminars include industrial applications of membrane separation technologies, life cycle assessment for manufacturers, and wastewater works, upgrades for improved performance and sludge minimization.

Biotechnologies: No information available.

Information:

Technologies: Sectoral reports are produced once every two to three years on status of Environmental Technology cluster in Singapore.

Biotechnologies: No information available.

Research and Technologies:

Technologies: The Environmental Technology Institute (ETI) work with both public and private institutions on R&D related to environmental technologies. The institute is funded by the NSTB. The ETI will partner with industry in addition to the universities on research and development in various technologies, of which EFT is one. Research grant are provided to business and Industry to encouraged research and development in ESTs. The ETI would identify relevant technologies applicable to the industry and would then work with industry to implement these technologies.

Biotechnologies: No information available.

Financing:

Technologies: The NSTB funds R&D in various technological areas including EST. Besides the NSTB, the government of Singapore provides funding for to the Scientific and Technology Community to undertake research and development in ETSS. For example, the NSTB had provided seed funding for the Environmental Technology Enterprise at the National University of Singapore and the Water Resources Centre at the Nanyang Technological University as well as full funding for the Environmental Technology Institute.

Biotechnologies: No information available.

Cooperation:

Technologies: NSTB is a participant on environmental technology projects under the APEC umbrella.

Biotechnologies: No information available.

CHAPTER 17: PROTECTION OF THE OCEANS, ALL KINDS OF SEAS, INCLUDING ENCLOSED AND SEMI-ENCLOSED SEAS, AND COASTAL AREAS AND THE PROTECTION, RATIONAL USE AND DEVELOPMENT OF THEIR LIVING RESOURCES.

Decision-Making: The Maritime and Port Authority of Singapore (MPA) is responsible for marine environment protection from shipping activities. MPA adopts a comprehensive approach towards the protection of Singapore's marine environment, based on prevention and preparedness. The key ministries and bodies involved in the issues related to climate change and sea-level rise are the Ministry of the Environment, the Ministry of Trade & Industry and Attorney-General's Chambers.

When considering whether or not to accede to a particular convention, the MPA holds consultations with relevant agencies and organizations, which could include Non-Government Organizations, Unions, Business and Industry, and other government agencies.

The regulations set by the MPA on maritime safety and prevention of marine pollution are in accordance with the provisions of international maritime conventions to which Singapore is party. The Prevention of Pollution of the Sea Act gives effect to the provisions of Annexes I, II, III and V of the MARPOL 73/78 convention. The Merchant Shipping (Civil Liability and Compensation for Oil Pollution) Act 1998 gives effect to the provisions of the CLC92 and Fund92 convention. The national policy towards the prevention of pollution of the marine environment is based on enhancing safety of navigation, legislation to ensure that ships are designed, equipped, operated and managed to prevent pollution of the sea, based on internationally adopted regulations, and strict enforcement of the legislated rules. The MPA has established the Marine Emergency Action Procedure (MEAP) to deal with marine emergencies, including oil spills. The MEAP sets out the roles of various other agencies involved in such emergencies. Maintaining the highest standard of preparedness includes detailed contingency plans to deal with the different marine emergencies that could occur, regular exercises to ensure the smooth operation of these plans, adequate compensation to ensure the sustainability of our efforts to protect the marine environment from spills, through accession to the CLC92 and Fund92 conventions, and continuous learning to improve our knowledge of the most effective and efficient methods and technology used in the protection of the marine environment.

Programmes and Projects: Enhancing safety of navigation Singapore works closely with the neighbors, Indonesia and Malaysia, to develop measures to enhance safe navigation in the Malacca and Singapore Straits. For example, from December 1998, the STRAITREP, a mandatory ship reporting system, is being implemented for ships using the Straits. The introduction of STRAITREP, which is provided for under the International Convention for Safety of Life at Sea (SOLAS) will contribute towards navigational safety, efficiency of navigation and the protection of the marine environment in the Straits. Singapore conducts regular oil spill combat exercise which involves other government and private sector agencies. It also conducts joint oil spill combat exercise with the neighboring countries.

Status: Coastal and low-lying areas would be affected by a sea level rise, if preventive or adaptive measures are not taken. The long-term measure to alleviate flooding is to require all developments of land to comply with a minimum platform level that is above the predicted flood level. Low-lying areas thus have to be raised in order to meet the requirement before the land can be built upon. To combat climate change, Singapore is taking no-regrets measures such as promoting energy efficiency. As a long-term measure to alleviate flooding, all development of land would need to comply with a requirement of a minimum platform level that is above the predicted flood level. Low-lying areas thus have to be raised in order to meet the requirement before the land can be built upon. The requirement is imposed during the planning process.

Capacity-Building, Education, Training and Awareness-Raising: MPA participate actively in various local and international fora relating to the capacity building for the prevention of pollution and the protection of the marine environment. To raise awareness on issues relating to the oceans and seas, MPA has conducted various seminars and conferences on subjects such as the Accession and Implementation of the 1992 Civil Liability and Fund Conventions, and Shipping and the Oceans: Protection of the Marine Environment (in celebration of World Maritime Day and the International Year of the Ocean).

Information: The MPA has patrol crafts within the port waters and Port State Control inspectors to ensure that ships within Singapore's waters comply with our national laws and regulations. In this respect, MPA is also assisted by other government agencies such as the Republic of Singapore Navy and the Police Coast Guard. In addition, MPA has upgraded its oil modeling system to a more advanced PC-based system that is able to predict the spread and fate of spilled oil.

Research and Technologies: MPA has been working with tertiary institutions and research organizations on projects such as oil spill and sediment transport among others. MPA is also working with the Centre for Remote Imaging, Sensing and Processing (CRISP) to develop applications of satellite remote sensing for the monitoring of oil spills. Decisions related to the choice of technologies are determined by suitability of the technology, cost effectiveness and efficiency.

Financing: Oceans sector is financed usually internally through operational surpluses.

Cooperation: Singapore ratified the United Nations Convention on the Law of the Sea on 17 November 1994. In addition to the Law of the Sea, Singapore is party to the following IMO conventions on maritime safety and prevention of marine pollution: SOLAS74, COLREG72, LOADLINES66, STCW95, SAR79, MARPOL73/78, CLC92 and FUND92. Singapore cooperates with other ASEAN countries and Japan under the Project on Oil Spill Preparedness and Response (OSPAR) in the ASEAN sea area, which was initiated by Japan. Under the project, Japan granted ASEAN countries 1 billion Yen to purchase oil spill equipment to reinforce the national stockpiles in the region. An OSPAR Management Committee, comprising of the ASEAN countries and Japan, was established to monitor and assess the management and usage of the equipment supplied and to continue the forum on oil spill matters in the region. Singapore also cooperates with Indonesia and Malaysia to combat oil spills in the Straits of Malacca and Singapore. Relating to climate change and sea level rise issues, Singapore participates in the IPCC programmes and meetings. See also under **Programmes and Projects**.

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CHAPTER 18: PROTECTION OF THE QUALITY AND SUPPLY OF FRESHWATER RESOURCES: APPLICATION OF INTEGRATED APPROACHES TO THE DEVELOPMENT, MANAGEMENT AND USE OF WATER RESOURCES.

Decision-Making: In Singapore, the Public Utilities Board (PUB) is the comprehensive water authority responsible for management of the entire water cycle, including supply of potable water to the nation, its sewerage and drainage systems. It is a statutory board established under the Public Utilities Act, 2001 with the mission of securing an adequate supply of water for the nation at affordable price. PUB is under the purview of the Ministry of the Environment that is responsible for providing, regulating and maintaining all national environmental activities to sustain the quality of public health and support the nation's economic growth. In the development of water resources, PUB works closely with other national agencies such as Urban Redevelopment Authority (planning and conservation authority), Housing and Development Board (public housing authority) and Ministry of the Environment. Singapore adopts an integrated approach to national land-use and urban planning. In the management of water resources, PUB uses the World Health Organization's Guidelines for Drinking Water as the standard to monitor the quality of its potable water. The Singapore Standards CP 48:1989 – Code of Practice for Water Supply is used by architects, professional engineers and licensed plumbers in their water service works. The Sewerage and Drainage Act and Regulations are the main legislation for wastewater management and control. The Code of Practice on Surface Water Drainage stipulates the engineering requirements for surface water drainage for new developments. Where applicable, the equivalent British Standards, ISO and other international standards are adopted.

Programmes and Projects: On water demand management, Singapore has a comprehensive water conservation programme to manage water demand to an acceptable level. Demand management is achieved through proper water accounting, control of unaccounted-for water and adoption of water conservation measures. A water contingency plan is also in place as part of the overall national emergency policy, to cope with prolonged dry weather condition and any unforeseen circumstances that could lead to supply disruption.

The construction of a Deep Tunnel Sewerage System is well under way to meet the long-term plans for the management of wastewater. The Deep Tunnel Sewerage System would eventually replace the water reclamation plants and pumping installations thereby releasing land for other developments. PUB has been developing the use of advanced membrane technology to produce high-grade water from treated effluent as an additional source of water to augment local resources. The use of high-grade water is also in line with PUB's conservation efforts as large customers who require water of high purity in their processes, such as the wafer fabrication plants, can switch from potable water to high-grade water. Treated effluent is also used to produce industrial water which is supplied to industries for non-potable purposes.

PUB's on-going drainage development programme includes flood alleviation projects, stormwater projects for new developments and improvements to cater for increased stormwater runoff. A drainage maintenance programme ensures that the existing drains and canals are kept in free-flowing conditions and free from silt and debris. Flotsam removal facilities are installed along the main rivers at strategic points to preserve their cleanliness.

PUB is looking into tapping the marginal catchments to augment local water resources. It is also proceeding with the development of the first desalination plant in Singapore. Offshore sources are also being studied.

Singapore's water pricing policy is based on cost-recovery and support of water conservation objectives. There are fiscal incentives to promote water conservation in industry and monetary penalties to discourage wasteful use of water. The water tariff structure comprises two broad categories: domestic (households) and non-domestic (industrial and commercial). The water conservation tax, which is a percentage of water charges, is imposed. The water tariff is a uniform flat rate for all consumption except for households, which consume more than 40 cubic metres per month, which are charged a higher rate. The tariff is structured to fully recover water costs and to reinforce the message that water is precious from the first drop. See also under **Status**.

Status: PUB builds new drains and canals to reduce flooding in flood-prone areas, provide drainage outlets for new developed areas and channel stormwater to reservoirs and collection ponds. Wherever possible, the space occupied by drains is integrated with other physical infrastructure to optimize land use. Smaller canals and drains are constructed as covered drains and integrated into development, where feasible. For the bigger canals and rivers,

they are developed into aesthetic waterways with jogging and cycle tracks in park connectors along the river banks. There are 22 tide-gates and three drainage pumping stations across the island to protect low-lying areas against tidal inundation. 14 impounding reservoirs have been developed to capture surface runoff from forested nature reserve to unprotected water catchments and even urbanized areas. Singapore's effort to optimize its limited water resources has led to the creation of large impounding reservoirs in several tidal estuaries to collect stormwater from unprotected catchments. The catchments are deemed unprotected in that development is permitted, although strictly controlled.

Singapore has also developed an urban stormwater collection scheme to collect storm runoff from new towns as a source of raw water. The use of unprotected water sources necessitates stringent control on land use. Activities that could possibly pollute water resources are not permitted. The anti-pollution control extends to the management of wastewater disposal island-wide. All premises in Singapore are provided with sewage systems and wastewater is disposed of by an independent system that is separate from the drainage system. Wastewater is treated to a very high standard before disposal or re-use.

All of the population is served with potable water and modern sanitation. All water supplied by PUB is treated to drinking water standards. All wastewater is collected and treated before discharge into the sea. Widespread flooding is no longer a major problem in Singapore. The water supply comes from both local sources and neighboring Johor, Malaysia. Careful and integrated land use planning and a policy that all wastewater must be discharged into sewers have helped to safeguard these water catchments from pollution. Close monitoring of the quality of the waterways and reservoirs is carried out to assess the impact of urbanization and the effectiveness of water pollution control measures. In addition, daily chemical and bacteriological tests are carried out to ensure that treated water meets the guidelines for drinking water quality set by the World Health Organization. PUB also has a programme to locate and repair leaking mains. A computer-based system captures information on leaks, conditions of existing pipelines and customers' feedback. The information is used for planning the rehabilitation and replacement of mains. The total wastewater treatment capacity for treating waste water is 1,387,000 cubic metres per day. The capacity for recycling waste water to industrial water is 125,000 cubic metres per day. All water supplies are metered.

Capacity-Building, Education, Training and Awareness-Raising: PUB has put in place a comprehensive water conservation plan to encourage industries to conserve water. The PUB Training Centre collaborates with other public and private training centres to conduct a series of management and technical courses for water service workers to enable them to acquire the necessary knowledge to help them in their work. PUB visits large customers to carry out water audits of their installation as well as advise them on water conservation. PUB also encourages large customers to appoint water controllers to audit and monitor their consumption closely. Education and sustained publicity on water conservation are carried out to highlight to Singaporeans the need to conserve water and adopt water-saving habits as a way of life.

Information: Information on the Public Utilities Board is available at PUB's website: <http://www.pub.gov.sg>.

Research and Technologies: Singapore takes advantage of the rapid technological advances and explores how new water technologies can best be applied to augment its water supply. Private sector participation on the development of new sources is encouraged. Seawater desalination and reclamation of wastewater using membrane technology are two key initiatives. Cost, security and reliability of supply have been the main considerations in the use of new technologies. However, with new technology producing superior filters and membranes at lower cost, it is now economically attractive to adopt desalination and water reclamation on a large scale. This will help supplement the existing water sources.

Financing: PUB is a self-funding statutory board. PUB has invested about S\$833 million in water transmission and distribution infrastructure. The water tariffs ensure that annual water sales will fully recover the cost of supplying the water including a reasonable return on investments. The capital and recurrent costs of constructing and maintaining the drainage and sewerage systems are financed by the Government and partially recouped from the users through waterborne fees and sanitary appliance fees. Some S\$4 billion has been invested in the sewerage and drainage infrastructures. See also under **Cooperation**.

Cooperation: PUB is a member of the International Water Association, the International Desalination Association and the Water Supply and Sanitation Collaborative Council. PUB has close links with the Asian Development Bank and ESCAP to jointly organize training seminars for their developing member countries. PUB has also worked with the World Bank to provide technical assistance for some of the water supply projects funded by the Bank.

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CHAPTER 19: ENVIRONMENTALLY SOUND MANAGEMENT OF TOXIC CHEMICALS, INCLUDING PREVENTION OF ILLEGAL INTERNATIONAL TRAFFIC IN TOXIC AND DANGEROUS PRODUCTS.

Decision-Making: The Ministry of the Environment (ENV) is responsible for the control of the import, transport, storage and use of hazardous substances, which include toxic chemicals. ENV also assesses and evaluates the hazard and pollution impact of new industries, which uses hazardous substances to ensure that they do not pose unmanageable health and safety hazards or pollution problems. A new industry can only be set up if it is sited in an appropriate industrial estate and can comply with pollution control requirements.

ENV administers the Environmental Pollution Control Act (EPCA) and EPC (Hazardous Substances) Regulations, which regulates the import, sale, use, storage and transportation of hazardous substances which includes toxic chemicals. ENV issues licenses for the import and sale of hazardous substances, and permits for the use and storage of hazardous substances while imposing conditions and standards for the proper storage and management of hazardous substances. ENV also issues approval for the transport of hazardous substances that exceed the stipulated limits. In granting the transport approval, ENV specifies requirements for road tanker design standards, packaging standards, allowable load limits, transport route and timing, and emergency response plans to deal with accidental spillage. These measures are to ensure the safe transportation of hazardous substances. ENV serves as the National Designated Authority participating in the interim prior informed consent (PIC) procedure to try out the PIC system under the Rotterdam Convention to prevent indiscriminate dumping of hazardous chemicals/pesticides listed in the Convention in developing countries.

Programmes and Projects: The Safety Audit Scheme introduced in Oct 1996, serves as guidelines for industries, which handle and store large quantities of hazardous substances. The scheme helps industries to identify and rectify weaknesses in their management systems and practices in the handling and use of hazardous substances. It has reduced the hazards and risks to workers, public and the environment from any accidental releases of hazardous substances from these industries. The chemical industry has adopted the Responsible Care Programme to complement ENV's regulatory control to move towards self-regulations on environmental sound management of hazardous substances.

Status: Singapore has put in place the necessary institution, legislative framework and mechanism for environmentally sound management of hazardous chemicals.

Capacity-Building, Education, Training and Awareness-Raising: ENV conducts courses to train its own staff on sound management of hazardous substances. ENV also conducts courses and seminars on sound management of hazardous substances for professionals and companies. All drivers of road tankers and vehicles are required to undergo a special training course organized by ENV, the Singapore Port Institute and the Fire Safety Bureau to equip them with the necessary skills to deal with emergency situations. Course modules cover safety requirements and precaution and first aid. All drivers are required to undergo a half-day refresher course once every three years.

Information: Information on management of hazardous substances In Singapore is available at www.env.gov.sg

Research and Technologies: Industries and tertiary institutions undertake joint research and development of technologies on sound management of hazardous substances.

Financing: Singapore has adopted the polluter pay principle on sound management of hazardous substances. Industries will have to invest on proper facilities and management practices for the sound management of hazardous substances.

Cooperation: Singapore continues to be pro-active in the exchange of information and experiences on environmental sound management of hazardous substances.

Singapore is a signatory Party to international conventions related to environmental sound management of toxic chemicals such as Rotterdam Convention, Stockholm Convention and Chemical Weapon Convention. Singapore is committed to supporting such global environmental initiatives.

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CHAPTERS 20 TO 22: ENVIRONMENTALLY SOUND MANAGEMENT OF HAZARDOUS, SOLID AND RADIOACTIVE WASTES.

Decision-Making:

Hazardous Wastes: The Ministry of the Environment (ENV) is responsible for the environmentally sound management of hazardous wastes in Singapore. ENV screens all new industries to ensure that all hazardous wastes generated can be soundly managed and disposed of in Singapore. ENV also controls the export, import and transit of hazardous wastes controlled under the Basel Convention. The Hazardous Waste (Control of Export, Import and Transit) Act and its regulations were enacted and came into operation on 16 Mar 1998 to fulfill Singapore's obligations under the Basel Convention. Any person who wishes to export, import or transit any hazardous waste listed under the Basel Convention will have to apply for a permit from ENV. ENV also administers the control of the collection, treatment and disposal of hazardous wastes, which is governed by the Environmental Public Health (Toxic Industrial Waste) Regulations.

Solid Wastes: Ministry of the Environment is responsible for solid waste management. The following regulations and codes of practice have been developed for solid waste management: Environmental Public Health Act and its Regulations; Code of Practice on Environmental Health; and Code of Practice for Licensed General Waste Collectors. See also under **Programmes and Projects**.

Radioactive Wastes: No information available.

Programmes and Projects:

Hazardous Wastes: The ENV issues licenses to private companies, which set up treatment and disposal facilities in designated industrial estates to collect and treat hazardous wastes from industries. ENV also requires these licensed hazardous waste collectors to obtain approval to transport hazardous wastes exceeding specified quantities.

Solid Wastes: The ENV has set targets to slow down the rate of waste generation and has introduced a series of programmes to meet the targets. The Ministry works closely with industry, trade associations and business groups to promote and enhance efforts on waste minimization. Land has also been set aside at a disused landfill site for the setting up of recycling plants. ENV has required the public waste collectors to tie up with ENV-registered waste recycling companies to implement nation-wide household door-to-door recycling programme. In this programme, residents living in HDB flats and landed properties are given recycling bags to contain recyclables such as waste paper, drink cans, glass/plastic bottles etc to keep recyclables. Collection of recyclables is carried out every fortnight. Residents are informed of the collection dates in advance. On collection dates, residents just need to place recycling bags at their doorsteps for collection. See under **Programmes and Projects** in Chapter: **Industry** of this Profile for more information on Singapore's recycling programme.

In line with the programme to conserve resources, electricity is generated from the four incineration plants and ferrous metals recovered for recycling. The Singapore Productivity and Standards Board (PSB) promote waste minimization through the promotion of Green Productivity. The Singapore Green Labelling Scheme (SGLS) was launched by the Ministry of the Environment on 19 May 1992 to promote green consumerism. On 15 Jun 1999, the Singapore Environment Council (SEC) took over as the administration of the SGLS. An Advisory Committee comprising representatives from private sector, organizations, academic institutions and government agencies sets the criteria to grant the right for a product to display the Green Label. The Green Labelling Scheme helps consumers to identify environmentally friendly products and enable them to exercise their choices more objectively in order to influence producers and suppliers to take into account the protection of the environment when producing goods. The Scheme applies to a wide range of products, but exclude foods, drinks and pharmaceuticals. It does not apply to services and processes. See also under **Capacity-Building, Education, Training and Awareness-Raising**.

Radioactive Wastes: No information available.

Status:

Hazardous Wastes: Singapore has put in place the necessary institution, legislative framework and mechanism for environmentally sound management of hazardous wastes and control of export, import and transit of hazardous wastes listed under the Basel Convention.

Biohazardous wastes from hospitals and polyclinics are segregated and stored in color-coded plastic bags, which are then placed into special containers for disposal in special high temperature incinerators.

Solid Wastes: The main issues relating to waste management in Singapore are: increasing amount of waste generated; and, increasing cost of waste disposal. The major constraints include the limited land availability for waste disposal, i.e. incineration plants and landfills and weak secondary markets for recycled products. Illegal disposal of waste may lead to pollution of watercourses including freshwater supplies.

An offshore landfill and the fourth incineration plant were constructed and had commenced operation in 1999 and 2000 respectively. Instead of building more disposal facilities, the Ministry of the Environment's key thrust is to reduce waste at source and to recycle as much waste as possible. About 2.80 million tons of solid waste was collected in 2000, half of which was from domestic and commercial sources, and the other half from industrial sources. About 87% of this waste was disposed of at the four refuse incineration plants and the rest at the offshore sanitary landfill site.

Dedicated incinerators for hospital wastes are built and operated by the private sector on a commercial basis. Singapore monitors the transport by ship of hazardous, toxic and nuclear materials through your seas.

Radioactive Wastes: Singapore monitors the transport by ship of hazardous, toxic and nuclear materials through your seas.

Capacity-Building, Education, Training and Awareness-Raising:

Hazardous Wastes: ENV conducts courses to train its own staff on sound management of hazardous wastes. ENV also conducts courses and seminars on sound management of hazardous wastes for professionals and companies.

Solid Wastes: An interagency task force, comprising the Ministry of the Environment, the Economic Development Board, the Jurong Town Corporation, the Trade Development Board, the Productivity and Standards Board and the National Science and Technology Board, was formed to look into developing strategic framework and action plans to speed up the development of the waste recycling industry in Singapore, and to develop Singapore into a Centre of Excellence for Waste Recycling in ten years' time.

The Waste Management and Recycling Association of Singapore were formed on 12 Sep 2001 to promote and enhance the professionalism and development of the waste management and recycling industry in the country. The Ministry is working closely with the Association to promote: waste reduction; reuse; recycling; and recovery. The government has also worked closely with the community retail to educate the public to be less wasteful in their consumption patterns and to reuse and recycle useable materials. The annual Clean and Green Week campaign includes efforts to raise awareness of issues related to waste minimization. Regular workshops and briefings are held to keep industries updated on new developments in management of hazardous wastes. The Consumers Association of Singapore is the main consumers' grouping that aims to look after the interests of consumers. The Singapore Environment Council acts as an umbrella organization for environmental NGOs in Singapore and seeks to promote environmentally responsible behaviour among the population. Centre for Environmental Training (ENV) - conducts Solid Waste Collection Course for licensed general waste collectors and their employees (drivers and crew). PSB conducts seminars and workshops on Green Productivity and ISO 14000 for industry.

Radioactive Wastes: No information available.

Information:

Hazardous Wastes: Information on hazardous waste management is available at www.env.gov.sg.

Solid Wastes: The available national waste information includes: quantity of waste disposed of by industrial sector and residential sector, and estimated quantity of waste being recycled for each type of waste. The information is available in the annual report of the Ministry and the Ministry's website.

Radioactive Wastes: No information available.

Research and Technologies:

Hazardous Wastes: Industries and tertiary institutions undertake joint research and development of technologies on treatment and disposal of hazardous wastes.

Solid Wastes: The National University of Singapore and the Nanyang Technological University conduct R&D on reuse of solid wastes. See under **Research and Technologies** in Chapter: INDUSTRY of this Profile.

Radioactive Wastes: No information available.

Financing:

Hazardous Wastes: Singapore has adopted the polluter pay principle on treatment and disposal of hazardous wastes. Industries will have to invest on hazardous waste treatment and disposal facilities. Private companies with treatment and disposal facilities charge industries for the collection, treatment and disposal facilities.

Solid Wastes: The capital investments and recurrent costs of the municipal solid waste disposal facilities are financed by the government and the users.

Radioactive Wastes: No information available.

Cooperation:

Hazardous Wastes: Singapore continues to be pro-active in exchange of information and experiences on hazardous waste management with the ASEAN countries through bilateral and regional environmental programmes.

Solid Wastes: No information available.

Radioactive Wastes: No information available.

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CHAPTERS 24 TO 32: STRENGTHENING THE ROLE OF MAJOR GROUPS

Women: No information available.

Children and Youth: No information available.

Indigenous People: No information available.

Non-governmental Organizations: No information available.

Local Authorities: No information available.

Workers and Trade Unions: No information available.

Business and Industry: No information available.

Scientific and Technological Community: No information available.

Farmers: No information available.

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CHAPTER 33: FINANCIAL RESOURCES AND MECHANISMS

Decision-Making: No information available.

Programmes and Projects: See under the heading **Financing** in the various chapters of this Profile.

Status: See under the heading **Financing** in the various chapters of this Profile.

Capacity-Building, Education, Training and Awareness-Raising: No information available.

Information: No information available.

Research and Technologies: No information available.

Cooperation: No information available.

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CHAPTER 35: SCIENCE FOR SUSTAINABLE DEVELOPMENT

Decision-Making: The National Science and Technology Board (NSTB), an agency of Singapore’s Ministry of Trade and Industry are responsible to promote and develop Science and Technology. The Board supports research institutes and centres, including the Environmental Technology Institute (ETI). Its task is to undertake research and development (R&D) in environmental technologies, including EST related R&D. The NSTB also provide funding to the Institute of Molecular Agribiology (IMA), which was recently amalgamated with the Institute of Cell and Molecular Biology (IMCB) as well as the Tropical Marine Science Institute (TMSI). Work conducted at these institutes adds to the development of EST, such as: the protection of our marine resources; the increasing of the yield of plants; and hence, the reduction of destruction of the land, water resources, etc.

Programmes and Projects: The Tropical Marine Science Institute (TMSI) in NUS has received funding from NSTB to undertake a programmed called “Marine Environment Monitoring, Impact, Assessment and Enhance.” Resulting from earlier NSTB funding, TMSI has developed into the national node for multi-disciplinary integrated marine scientific research organization. The latest funding initiative aims to develop Singapore’s capability in managing, and improving the marine environment. The Genetic Modification Advisory Committee (GMAC) of Singapore has been set up since 1999 to oversee and advise on GM (genetic modification) research and GMO (genetically modified organisms) release in Singapore. The release of GMOs into the market and environment may have an impact on the environment in terms of biodiversity and biocontamination. As such, the multi-agency taskforce, which includes key representatives from the Agri-Food & Veterinary Authority (AVA), Ministry of Environment (ENV), National Parks Board (NParks) and other major research institutes dealing with GM research, will provide their inputs and advice each time decisions need to be made regarding the release of GMOs into the environment.

Status: Projects undertaken at the ETI, IMA, TMSI, NUS and NTU are ongoing. New R&D projects are funded regularly. However, one of the main constraints is how to increase the level of interest in companies and the general public interested in issues of sustainable development.

Capacity-Building, Education, Training and Awareness-Raising: Science and technology is promoted to the young irrespective of gender. They are encouraged to develop an interest in science and technology, which encompasses environmental technology. The Science Centre, which also received grants from the NSTB, the Technology centres at NUS, NTU and ETI are all easily accessible to public and private institutions. Singapore has a very vibrant scientific community. There are more than 13,000 research scientists and engineers (RSE) in Singapore. Currently the number of RSE per 10,000 workforce stands at around 70. There are two major universities in Singapore providing undergraduate and postgraduate training. The universities together with the NSTB’s institutes conduct R&D in ESTs. These institutes and centres regularly conduct seminars on ESTs for industries. Examples of such seminars included industrial applications of membrane separation technologies, life cycle assessment for manufacturers, and wastewater works, upgrades for improved performance and sludge minimization. Additionally, the NSTB’s sister agency, the Productivity and Standards Board also actively promotes the adoption of ISO 14000 by industry.

Information: Available on via www.nstb.gov or directly through the ETI, IMA, TMSI, etc.

Research and Technologies: No information available.

Financing: The NSTB funds joint public research and in many cases in-conjunction with private enterprises. NSTB’s Science and Technology 2005 Plan covers many technological areas of which ESTs are one. See also under **Decision-Making** and **Status**.

Cooperation: No information available.

CHAPTER 36: PROMOTING EDUCATION, PUBLIC AWARENESS AND TRAINING

This issue has been covered under the heading **Capacity-Building, Education, Training and Awareness-Raising** in the various chapters of this Profile.

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**CHAPTER 37: NATIONAL MECHANISMS AND INTERNATIONAL COOPERATION FOR
CAPACITY-BUILDING IN DEVELOPING COUNTRIES.**

This issue has been covered either under Chapter 2 or under the heading **Cooperation** in the various chapters of this Profile.

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CHAPTER 38: INTERNATIONAL INSTITUTIONAL ARRANGEMENTS

This issue deals mainly with activities undertaken by the UN System.

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CHAPTER 39: INTERNATIONAL LEGAL INSTRUMENTS AND MECHANISMS

This issue has been covered under the heading **Cooperation** in the various chapters of this Profile.

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CHAPTER 40: INFORMATION FOR DECISION-MAKING

This issue has been covered either under **Chapter 8** or under the heading **Decision-Making** in the various chapters of this Profile.

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CHAPTER: INDUSTRY

Decision-Making: The Ministry of Trade and Industry is responsible for developing Singapore into an advanced and globally competitive knowledge economy, with manufacturing and services as its twin engines of growth. The Ministry works closely with statutory boards such as the Singapore Productivity and Standards Board (PSB), the Economic Development Board (EDB) and the National Science and Technology Board (NSTB) to formulate and implement economic master plans for industry development, investment promotion and enterprise development.

Programmes and Projects: PSB offers several programmes to improve the operations of our small and medium enterprises (SMEs). The Good Housekeeping and Waste Elimination Programme helps SMEs to eliminate various types of waste at the workplace, such as redundant processes, workflow, materials and transportation. In addition to administering the ISO9000, ISO14000 and ISO14001 Certification Schemes, PSB has also introduced the Green Productivity Programme, which encourages organizations to improve their productivity and environmental performance by applying resource conservation techniques and methodologies. Another scheme is the ODS-Free Process Verification Scheme, which verifies that companies' manufacturing processes and products do not contain Ozone Depleting Substances (ODS) classified according to the Montreal Protocol 1992 Amendment. The Resource Productivity Feasibility Study Grant administered by EDB and the Jurong Town Corporation (JTC) encourages companies to identify potential areas for automation, land intensification and water recycling.

Status: Land and resources are scarce in Singapore and it is important to protect them for future generations. Singapore has always aimed to promote economic growth while protecting the environment. Sustainable development is achieved by ensuring that industries in Singapore adhere to international environmental standards put in place. Steps have been taken to promote the use of cleaner fuels for transportation and energy consumption, and plans are in place to increase recycling rate. The EDB is promoting environmental technology and seeks to develop this relatively new sector as a competitive advantage to grow the key manufacturing industries in Singapore.

Singapore is encouraging cleaner means of power generation. For example, gas pipelines from Malaysia and Indonesia now provide natural gas to Singapore. Natural gas is cleaner and will allow Singapore's power plants to generate electricity more efficiently and reduce air pollution. Singapore is also looking into the development of new clean energy sources/mechanisms such as fuel cells. Singapore's roads will be used as a test-bedding site for hydrogen-powered fuel cell cars. Singapore will be the first country in Asia, outside Japan, to introduce this emission-free and noise-free car.

The Singapore Public Utilities Board recycles used water and supplies it as industrial water to industries for non-potable use. With new technology advances, some of it developed locally, Singapore is now able to recycle used water into ultra-clean water, known as NEWater. NEWater has been found to be even purer than drinking water and will be supplied to Singapore's wafer fabrication plants by the end of 2002. Plans are also underway to have seawater desalination facilities augment Singapore's water supply. To date, about 271 companies in Singapore have achieved the ISO14001 Certification standard and about 40 companies have been verified to produce products and processes free of ozone-depleting substances.

Capacity-Building, Education, Training and Awareness-Raising: Singapore launched the SINERGY programme or "Singapore Initiative in Energy Technology" on 30 May 2001. This is a joint initiative supported by the EDB, the Land Transport Authority (LTA), and Ministry of the Environment (ENV). The objective is to provide a collaborative platform for industry players to undertake technology development and demonstration projects in the area of clean energy, for both stationary power and transportation applications. The government will establish the necessary regulatory framework, provide potential incentives for development activities and create a common infrastructure for all partners. This is part of Singapore's overall plans to become a compelling hub in clean energy technologies, with world-class capabilities in research, test-bedding and manufacturing.

Information: Information on the various schemes and programmes to help companies carry out conservation measures is readily available in publications, websites, videos and posters.

Research and Technologies: The Environmental Technology Institute was set up in 1996 by the NSTB, focusing on research and development in waste-water, solid waste treatment, environmental management tools and environmental services. The National University of Singapore and Nanyang Technological University also have strong capabilities in waste-water treatment with a focus on membrane technology.

Financing: Companies are encouraged to obtain ISO 14000 certification to improve environmental management within their facility. To assist small and medium enterprises in setting up an environmental management system, the PSB's Local Enterprise Technical Assistance Scheme (LETAS) provides financial grants of up to S\$40,000. To encourage the use of energy-efficient equipment and highly efficient pollution control equipment, the expenditure for such equipment is allowed full depreciation in the first year. This means that the qualifying expenditure on such equipment can be written off completely against the taxable income of the enterprise in the year following the year of purchase.

Cooperation: See under **Status**.

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CHAPTER: SUSTAINABLE TOURISM

Decision-Making: Singapore Tourism Board (STB) is responsible for sustainable tourism at the national level. Other agencies responsible for the planning and management of sustainable resources in Singapore include: the Urban Redevelopment Board (URA); National Parks Board (NParks); and the National Heritage Board (NHB). Local authorities are involved in the decision-making in consultation with the private sector.

There is no legislation to ensure sustainable tourism. Inter-governmental alliance is a key component in synergizing government's efforts. Under STB, sustainable tourism comes under the larger strategic framework called the Tourism 21 blueprint. STB's development strategies address sustaining cultural and social responsibility and conservation of the national heritage. The Tourism 21 specifically addresses the creation of thematic zones, community-based tourism development and development of nature-based tourism. In recognition of the limited natural vegetation resources in Singapore, the Nature Conservation Working Committee of the Singapore Green Plan decided that eco-tourism should not be indiscriminately promoted. Thus, STB's marketing efforts have focused on niche marketing, targeting at the educational market segment to cultivate a new generation of visitors with better appreciation of nature and culture.

Programmes and Projects: Besides nature parks and reserves, Singapore has developed agrotourism as part of sustainable tourism development. Agrotourism is an example of Singapore's successful application of intensive agrotechnology into a land scarce tropical environment. Many of the farms utilize eco-sensitive processes and are ISO certified for environmentally managed operations. Agrotourism showcases farming operations which include the breeding of birds that are CITES (Convention of International Trade in Endangered Species) certified, aeroponic environmentally and pesticide-free vegetables, ornamental fish farms and orchid farms.

See also under **Status**.

Status: Singapore is renowned as a City within a Garden where the urban landscape has been synonymously interwoven with green spaces for the enjoyment of visitors and locals. They can experience various eco-tourism trails ranging from rainforests, mangrove swamps, and marine environments to offshore islands, with diverse tropical floral and fauna. There are about 4,600 hectares of nature reserves, parks and open recreational spaces conserved for nature lovers to explore. Among the famous nature trails in Singapore include the Bukit Timah and Sungei Boloh Nature Reserves. Singapore is also looking at the sustainable development of its Southern Islands where a balance can be struck between preserving nature and meeting the recreational needs of visitors.

Sustainable tourism development also encompasses the preservation of historical and cultural sites in a country. Singapore attaches particular importance not only to the preservation but revitalizing of such sites as they are part of our heritage and help define what Singapore is. Only by enhancing the distinctive Singaporean character of these sites can we attract and create more memorable experiences for visitors to the country. Some of the priority sites that STB is looking to revitalize include Chinatown, Little India, Albert Mall, Orchard Road and the Singapore River.

Based on a study done by WEFA in conjunction with WTTC, tourism is a true economic driver in Singapore, where it is expected to generate 12 percent of gross domestic product and 9.5 percent of employment in 1996. The outlook for the next decade is equally strong with the industry expected to grow 55.5 percent in size (real term) to S\$41.8 billion (nominal) of gross output. Also, by 2006, Singapore's travel and tourism is expected to increase by 41,000 jobs, equivalent to 9.9 percent of total employment. Tourism development has played a positive impact on sustainable tourism pertaining to the revitalization and preservation of Singapore's cultural heritage to residents and visitors. Specific examples can be seen from the continuous product reformulation of heritage areas such as Chinatown, Little India, and Kampong Glam etc. New conservation developments include agrotourism, conservation of Chijmes, and opening of Asian Civilisation Museums 1 & 2 and identification of a Heritage Trail. Examples of activities which are geared towards sustainable tourism, eco-tourism and nature-based tourism include tour of Pulau Ubin, bird watching in Sungei Buloh Nature Reserve, trekking and nature walking in Bukit Timah Nature Reserve.

Capacity-Building, Education, Training and Awareness-Raising: The Singapore Confederation of Industries and Singapore Hotel Association have formed environmental committees to spearhead their environmental

programmes. STB conducts a training programme called “Exploring the Nature Trails of Singapore” for tour guides that teaches them about flora and fauna in Singapore. This training involves bringing the guides round to tourist natural areas in Singapore e.g. Fort Canning, Botanic Gardens, Bukit Timah Nature Reserve, Sungei Buloh and Pulau Ubin. There are also on-going efforts undertaken by authorities like STB, Nparks and the National Arts Council to generate visitors to nature areas through various activities. Some of these activities include NPark’s Concert in the Park, Ballet under the Stars programme and using Fort Canning Park as the venue for Singapore’s Festival of Arts. Such programmes have led to increasing public awareness of nature areas in Singapore.

The Visitor Centres at Sungei Buloh, Pulau Ubin and Bukit Timah showcase exhibits and provide information on the area’s natural environment, flora, fauna and natural habitats. Information educating visitors to respect the natural environment is also available at the Visitor Centres. The National Parks Board has produced several leaflets on its parks and nature-reserve areas such as Sungei Buloh and Pulau Ubin. In STB’s marketing brochures, Singapore’s “clean and green” reputation has been highlighted. STB also stresses that Singapore is a gateway to a culturally diverse region that is rich in flora and fauna.

Information: Brochures published by the National Parks Board and the Singapore Tourism Board address sustainable tourism. The National Parks Board carries out mapping and inventorying of natural resources and ecosystem characteristics in tourist areas. System on monitoring the frequency of visitors is planned to be put in place.

Research and Technologies: STB has encouraged hotels in Singapore to put in place initiatives like environmental management systems and ISO certification. Many hotels have on their own initiative embarked on environmentally friendly programmes such as water and energy conservation and waste minimization. These hotels include, among others, the Inter-Continental Singapore which received a Distinction Award at the prestigious Green Globe Achievement Awards in 1998.

Financing: No information available.

Cooperation: APEC as a model sustainable tourism product in Singapore highlighted The Sungei Buloh Nature Park.

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