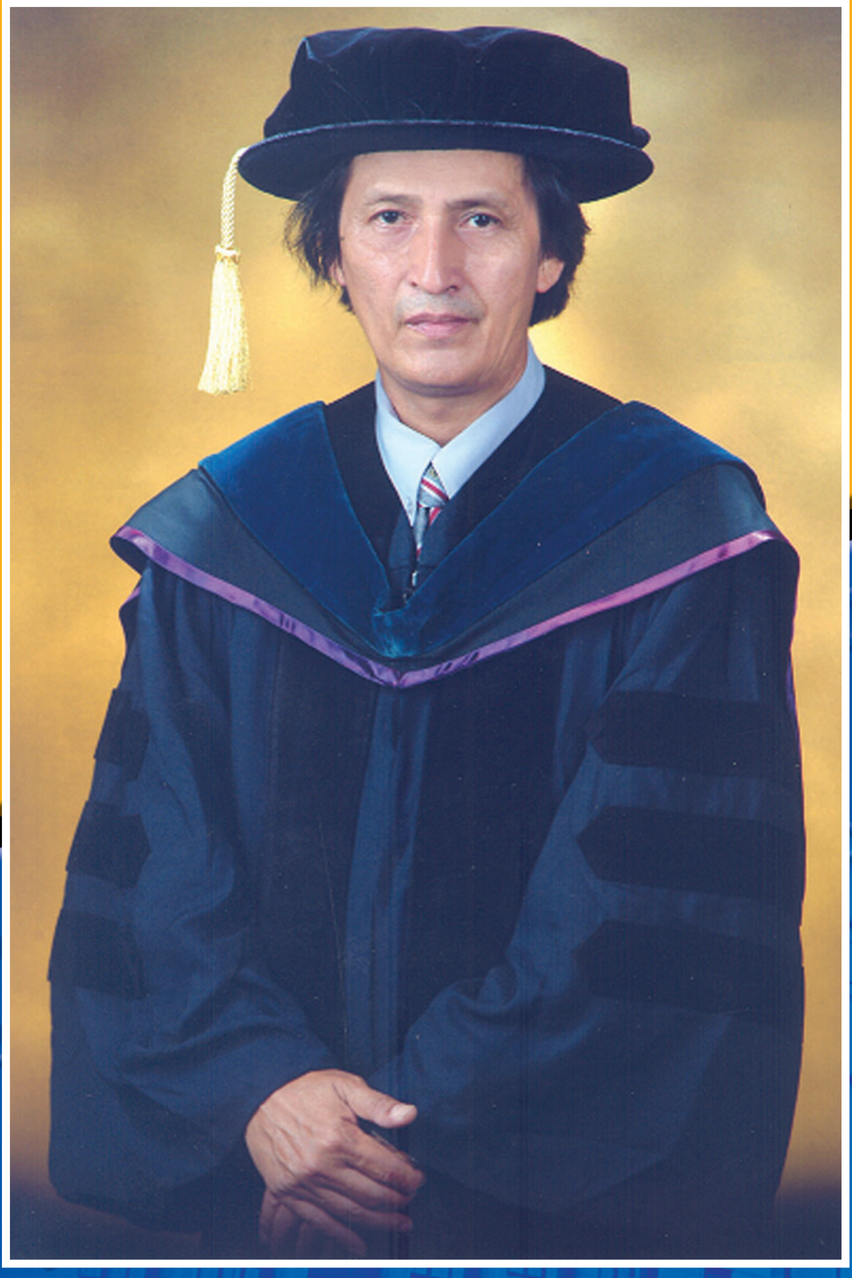
TRADE and SUSTAINABLE DEVELOPMENT

Lessons from Malaysia's Experience



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INTRODUCTION

Trade has served as the driving force behind much of a country's economic success. With a marked increase in interest on trade and environmental matters globally, developed as well as developing countries are aware not only of the imperative need to restore environmentally sound and sustainable growth, they are also concerned that trade measures could be used as new forms of non-tariff barriers (NTB) to undermine the competitiveness of their export-led growth.

Environmental externalities arise both in developed and developing countries. In developed countries, internalization of environmental externalities is to a large extent a matter of "getting the prices right", i.e. of ensuring that private and social relative prices are roughly equal. This is also important in developing countries, but here the welfare effects of policies may be just as important as the relative price effects. Better integration of trade and environmental policies would provide mutual benefits and enable trade-offs to be made between competing objectives.

The basic relation between trade and the environment is straightforward. Environmental damage is associated with the production and consumption of goods. International trade alters production and consumption, thus affecting the environment. The use of policy instruments (regulatory and economic) to protect the environment can either affect international trade and act as non-tariff barriers to trade, or create opportunities for environmentally-sound products because of an increased awareness of environmental problems. Thus, trade and environment issues can be divided into two broad categories.

One deals with the impacts of changes in trading rules and liberalization on the environment and the other with the impacts of changes in environmental regulations on international trade prospects.

As more and more countries are moving toward liberal trade regimes to enhance their economic growth and the standard of living, the question is whether such policies affect the environment negatively. Measures to liberalize trade regimes include removal of non-tariff barriers to trade, reductions in tariff rates, reductions in subsidies to exporters and competitive devaluations. Theory shows that a removal of an export tax on a product could result in a simultaneous increase production and environmental pollution.

Changes in environmental regulations through public concern for a better environment affect trade through a chain of events. Stricter environmental regulations would increase the production cost of the exporters as well as reducing the volume of trade. If environmental regulations are undertaken unilaterally, the exporters will lose competitiveness and changes in the country's trade pattern, terms of trade and foreign exchange revenue will result. Employment and growth in the countries will be affected.

The dynamics of trade and environment linkages are more complex and difficult to specify. There are methodological problems in assessing dynamic relationships between export growth, per capita incomes, technological changes, structural shifts and the market structure. The information needed to analyze the environmental effects associated with trade liberalization and to assess appropriate policy responses is also often not available, particularly in the developing countries. Economists and environmentalists increasingly agree that trade liberalization and environmental policies will generate benefits in improving allocative efficiency, correcting market and pricing failures and strengthening the realization of such goals as internalization and the Polluter Pays and User Pays Principles. While environmental regulations may have contraction effects, trade expansion can bring economic benefits which may increase per capita incomes as a means to strengthen development and simultaneously improve environmental management.

Trade liberalization and environmental protection share a common goal: enhancing social welfare by improving the quality of life. However, considerable conflicts inevitably arose over differences in approaches and emphasis. Multiple related (and unrelated) concerns have emerged in the last several years. Some of the conflicts are derived from misunderstandings between trade and environmental camps, reflecting two communities with different traditions, values and modes of operation. Other frictions reflect deeper differences over philosophical assumptions and priorities. While countries pursue environmental policies and trade negotiations for win-win solutions some could end up losing their bargaining powers and competitiveness in the world market. Nevertheless, the scope for reducing the tension between trade and environmental policies is considerable. Policy choices are available that can make trade liberalization and environmental protection mutually compatible and minimize the extent of disputes.

When the General Agreement on Tariffs and Trade (GATT) was drawn up after World War II, environmental protection was not a major issue. Indeed, the 'environment' was not explicitly referenced in the GATT. Environmental issues have grown in prominence on both the domestic and international agendas. Until recently, trade policy-makers and environmental officials have pursued their work on separate tracks. Today, environmental protection has become a central issue and cuts across every sector including trade. There is no single institution *a la* GATT/WTO charged with coordinating international environmental policy-making. Thus, decisions are made and strategies set on an ad hoc, issue-by-issue, agreement-by-agreement basis, with separate secretariats, such as UNCTAD, UNEP, UNDP, UNCED, GEF and a number of other organizations, staffing each effort. With the lack of systematic attention to international environmental issues and as the prospect of establishing a single body to coordinate worldwide efforts to protect the environment appeared slim, environmental issues have been integrated into various disciplines.

Integrating new issues into an established policy discipline is always difficult, and the effort to build environmental considerations into the international trading system is no exception. The task is even more complicated due to the lack of consensus on how best to protect the environment or on optimal regulatory strategies. This paper first reviews the major issues surrounding the trade and environment conflict. It then examines cases of voluntary initiatives in internalization of externalities in Malaysia to promote the use of production technologies which make production more sustainable.

THE GATT PRINCIPLES

The main international institution governing trade was the GATT, which came into being in the late 1940s. Its purpose was to set out rules and procedures for international trade relationships between nations. GATT was especially aimed at reducing trade barriers, constraining nations from imposing tariffs and quotas on imports or subsidies on exports, and in general to move toward conditions of free trade. One section of the GATT agreement prohibited what were called non-tariff barriers (NTBs), such as excessive inspection requirements, excessive product specifications, and the like. But there were exceptions to the rules: for example, although the environment was not mentioned explicitly, under article XX(b) and XX(g), governments were allowed to set restrictions in order to achieve the protection of human, animal or plant life or health, and the conserving of natural resources, respectively. Thus, these formed a basis for deviating from the GATT Principles in support of environmental policies.

The GATT was a somewhat complex document which included 38 articles and appended tariff schedules. However, the most fundamental GATT principle was non discrimination. The non discrimination obligation had two key components: most favored nation status (MFN) and national treatment.

The MFN provision (Article I) required each signatory to treat imported products from any other contracting party no less favorably than 'like' products imported from another GATT member country. In particular, tariff reductions extended to one trading partner must be applied to all GATT parties.

The national treatment provision (Article III) mandated that imported products be treated no less favorably than 'like' domestically produced goods once the products are in the importing country. The only valid exception to this obligation was that nations may maintain (but not raise) tariffs on imported goods.

The GATT had two other central provisions: tariffication and consultation. Under the tariffication obligation (Article XI), GATT parties were obligated to convert all trade barriers to tariffs. This conversion of quotas, non-tariff barriers, and other trade restrictions was intended to produce the most transparent possible trade regime (with any remaining barriers to international commerce visible) and made it easier to reduce remaining barriers through negotiated rollbacks of tariffs. The GATT consultation provision (Article XXII) required parties to try to settle through consultation and negotiation any trade dispute that may arise.

The remainder of the GATT agreement supported these four imperatives. The larger goal was to keep trade liberalization moving forward toward ever-lower tariff barriers and greater market access. Although there was little evidence that environmentally related product standards had been used as disguised trade barriers, economies (especially developing economies) were concerned about the potential of legislation such as the US Toxic Substances Control Act and similar legislation in other economies to act in that fashion. Whether by intent or not, regulatory product standards could have the effect of impairing market access by fragmenting markets, increasing production costs and requiring testing and verification procedures that discourage imports.

THE WORLD TRADE ORGANIZATION COMMITTEE ON TRADE AND ENVIRONMENT

The World Trade Organization (WTO) is the forum that administers the rules-based multilateral system governing international trade. A rules-based system tends to be particularly important for the weaker participants, since the stronger ones can use their economic power to achieve their ends. This explains the strong support for the WTO – and especially for its core principles of non-discrimination, predictability, stability and transparency – among developing countries and economies in transition, and the urgency with which further developing countries continue to apply for membership. The WTO is unique in combining a set of binding rules with a powerful mechanism for dispute settlement and the possibility of imposing economic sanctions to enforce compliance. The WTO is also the principal forum at which existing multilateral rules are reviewed and new rules negotiated. The negotiation process works through trade-offs between and among countries and interests. Trade-offs can only convincingly be made in the context of negotiations. Substantial trade-offs are usually achieved only during broad negotiation rounds, which greatly increase the scope for such trade-offs.

The Committee on Trade and Environment (CTE) was established by the WTO General Council in January 1995. The CTE mandate and terms of reference are contained in the Marrakesh Ministerial Decision on Trade and Environment of 15 April 1994. The terms of reference of the CTE include:

i. to identify the relationship between trade measures and environmental measures to promote sustainable development.

ii. to make appropriate recommendations on whether any modifications of the provisions of multilateral trading system are required, which must be compatible with openness, equitability and nondiscriminatory nature of the system. In particular, the recommendations must consider:

   - the need for rules to enhance positive interaction between trade and environmental measures with special consideration to the needs of (least developed) developing countries;
   - the avoidance of protectionist trade measures, and the adherence to effective multilateral disciplines to ensure responsiveness of the multilateral system to environmental objectives set forth in Agenda 21 and the Rio Declaration, in particular Principle 12;

- surveillance of
  a. trade measures used for environmental purposes,
  b. trade-related aspects of environmental measures which have significant trade effects, and
  c. effective implementation of the multilateral disciplines governing those measures.

The Work of CTE

Ten items were listed in the Marrakesh Ministerial Decision on Trade and Environment which were taken up by CTE.

1. The relationship between the provisions of the multilateral trading system and trade measures for environmental purposes, including those pursuant to Multilateral Environmental Agreements (MEA);
2. The relationship between environmental policies relevant to trade and environmental measures with significant trade effects and the provisions of the multilateral trading system;
3. The relationship between the provisions of the multilateral trading system and
   i. charges and taxes for environmental purposes
   ii. requirements for environmental purposes relating to products, including standards and technical regulations, packaging, labelling and recycling;
4. The provisions of the multilateral trading system with respect to the transparency of
   i. trade measures used for environmental purposes, and
   ii. environmental measures and requirements which have significant trade effects;

5. The relationship between the dispute settlement mechanisms in the multilateral trading system and those found in MEAs;
6. The effect of environmental measures on market access, especially in relation to developing countries (least developed, in particular), and environmental benefits of removing trade restrictions and distortions;
7. The issue of exports of domestically prohibited goods (DPGs);
8. The relevant provisions of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS);
9. The work programme envisaged in the Decision on Trade in Services and the Environment;
10. Input to the relevant bodies of appropriate arrangements for relations with inter-governmental organizations and NGOs referred to in Article V of the WTO.

The CTE has focused its efforts on the analysis of trade measures for environmental purposes (Item 1) and environmental policies and measures (Item 2). The CTE's work has helped improve the trade community's understanding of the use of trade measures applied pursuant to MEAs, and has facilitated dialogue with environmental policymakers at the national and international levels.

THE POLLUTER-PAYS-PRINCIPLE

Economists generally argue that the internalization of environmental externalities of economic activity is a necessary step towards sustainable development. Research and discussion at the OECD in the early 1970s established the polluter pays principle, which internalizes environmental costs in the production process, as the most economically efficient and most equitable approach to environmental policies. As long as damage to the environment and full resource costs are not incorporated into production costs, there will be scope to improve the efficiency of resource allocation.

However, the problem of internalization is an extremely complex one, not only in terms of the identification of instruments to be used for its implementation, but also with regards to the implications of their use at the international level. Thus, while trade and environment experts generally agree that internalization of environmental costs is a key to reconciling environmental and trade policies, it has also been argued that international competition makes internalization of resource and environmental costs more difficult because industries that internalize these costs to a greater degree compared to similar industries elsewhere suffer a competitive disadvantage. By the same token, not requiring full cost internalization constitutes, in the view of some, a trade distorting subsidy that furnishes putative grounds for countervailing duties or other measures to "level the competitive playing field".

Under the PPP, producers have to pay for the emissions, for non-compliance with environmental standards and for the use of natural resources. The PPP assumes that:

- the real additional environmental costs can be passed on to consumers (User Pays Principle/Resource Pricing/Full Resource Pricing).
- conformity with PPP does not matter whether the polluter passes on to his prices some or all of the environmental costs, or absorbs them.
- competition ensures that the consumer is not charged too much, and that producers choose efficient technologies.

The basic underlying precondition is that comparable producers are confronted with identical policy so that in a closed economy, the PPP works nicely. The major problem arises when PPP is applied to international markets, i.e. when exporters have to compete with companies operating under different policy regimes. There is no unity of policy: some producers face stiffer environmental policies while others face a more lenient policy.

Generally, the capacity of a country to pass on price increase to world market depends on:

- *the country's international market share*

  the higher its market share, the higher its degree of market power, the more likely it is that a country is able to effectuate a higher export supply price

- *the share of the product export in the country's total exports*

  the higher the export dependency rate, the riskier it is to take unilateral measures. The passing on capacity is inversely related to the export dependency factor

- *the overall price elasticity of demand for the export product*

  for all highly inelastic demand, price increases result in higher export earnings

- *the structure and intensity of competition in international market*

  when some countries increase their export volumes after a price increase, their supply reaction could prevent other countries from taking steps to internalize their production externalities.

MAJOR ISSUES

The main issue surrounding the trade-environment linkage is the concern, by both developed and developing countries that environmental issues are being used in a strategic manner to capture or protect markets.

The Position of Developing Countries

1. Fear that developed countries use environmentally related trade policies to protect their own industry
2. Fear that developed countries use environmentally related trade policies to impose environmental preferences

The Position of Developed Countries

1. Fear that developing countries strategically ignore environment to promote exports
2. Fear that environmental policies of developing countries threaten global commons

These fears are mutually supportive. For example, the developed countries fear of strategic behaviour on the part of developing countries is complementary to the developing countries fear of protectionism on the part of the developed countries. The same holds for the fear of the global commons and the imposition of foreign preferences. The difference in priorities towards environmental problems has been one of the major reasons for the present friction in international trade.

THE STATE OF MALAYSIAN TRADE AND ENVIRONMENT

Growth of Economic Activities

Malaysia's Gross Domestic Product (GDP) grew from RM48 billion in 1970 to about RM56 billion in 1980, to RM73 billion in 1990, RM211 billion in 2000 and RM262 billion in 2005, increasing at an annual average rate of 8 percent in the 1970s, 6.8 percent during the second half of the 1980s, 8.7 percent in the first half of 1990s, 4.8 percent in the second half of 1990s due to the 1997 financial crisis and 4.8 percent in the first half of 2000s (Table 1).

The economy has undergone major structural changes during the last three decades, as a result of the strong growth in the secondary and tertiary sectors. The manufacturing sector expanded from 14 percent of GDP in 1970 to 20 percent in 1980, 27 percent in 1990, 32 percent in 2000 and 31 percent in 2005, while the share of agriculture to GDP declined from 29 percent in 1970 to 23 percent in 1980, 18.7 percent in 1990, 8.9 percent in 2000 and 8.2 percent in 2005. The services sector had grown from 42 percent in 1970 to 43 percent in 1980 to 41 percent in 1990, 49 percent in 2000 and 51 percent in 2005 reflecting the role of the government and general improvement in the provision of services.

The composition of all sectors has also changed during the last three decades. In the agricultural sector, the share of rubber in terms of value declined from about 50 percent in 1970 to about 30 percent in 1980, 20 percent in 1990, 10.0 percent in 2000 and 10.5 percent in 2005 while palm oil output increased from 10 percent in 1970 to about 17 percent in 1980, 29.8 percent in 1990, 31.4 percent in 2000 and 36.7 percent in 2005 (Table 2). In the mining sector, crude petroleum became a major contributor to growth while tin output declined. The manufacturing sector shifted from agro based industries to the manufacture of electrical and electronic machinery and appliances, petroleum products, and processed palm oil products (Table 3).

The export sector was a significant contributor to growth; its share of GNP averaged at about 42 percent in 1970, increased to 55 percent in 1980, 72 percent in 1990, 91.5 percent in 1995, 119 percent in 2000 and 112 percent in 2005 (Table 4). The composition of exports also changed significantly. Rubber and tin, the principal earners which accounted for 33 percent and 20 percent respectively of total exports in 1970, declined to 16 percent and 10 percent respectively in 1980, and further declined to 3.8 percent and 1 percent respectively in 1990. In 2000 the share of rubber further declined to 0.7 percent and to 1.084 percent in 2005. Meanwhile, the share of tin declined to 0.1 percent in 2000 and 0.175 percent in 2005. Palm oil, which contributed 5 percent in 1970, became an important export commodity, contributing 9 percent of total exports in 1980, although it subsequently declined to 5.6 percent in 1990. In 2000 it further declined to 2.7 percent while in 2005 it climbed back to 3.6 percent. Crude petroleum, 4 percent in 1970, rose to become the leading export commodity contributing 20 percent of total exports in 1980, but declined to about 13.4 percent in 1990, 3.8 percent in 2000 and 5.3 percent in 2005. However, manufactured goods increased in importance accounting for 80.5 percent in 2005 and 85.2 percent in 2000 compared to 58.8 percent in 1990, 22 percent in 1980 and 10 percent of total exports in 1970. Among the major manufactured goods are electrical and electronic products (65.8 percent in 2000 and 72.5 percent in 2005), and textiles and wearing apparel (3.3 percent in 2000 and 2.4 percent in 2005).

The overall employment situation has been relatively stable, with a marginal decline in the rate of unemployment from 3.8 percent in 1970 to 3.6 percent in 1980, 5.1 percent in 1990, 2.8 percent in 1995, 3.4 percent in 2000 and 4.2 percent in 2005. In 1970, employment in the primary sector (agriculture and mining) formed 56 percent of total employment. In 1980 and 1990 it had declined to 44 percent and 28.3 percent respectively. In the years 2000 and 2005 employment further declined to 15.7 percent and 13.3 percent respectively. On the other hand, the secondary (manufacturing and construction) sector absorbed about 35.7 percent of labour force in 2005 and 35.8 percent in 2000. Previously, the sector absorbed 26.2 percent in 1990 compared with 19 percent in 1980 and 12 percent in 1970. The tertiary (services) sector absorbed about 51 percent in 2005 compared to 48.5 percent in 2000, 47.2 percent in 1990, 37 percent in 1980 and 32 percent in 1970.

The strong growth of the Malaysian economy was accompanied by improvements in the quality of life. Income per capita increased from about RM 895 in 1970 to about RM 3,014 in 1980, RM 6,099 in 1990, RM 13,378 in 2000 and RM 17,687 in 2005. Poverty, though declining, still exists in both rural and urban areas. In 1970, the incidence of poverty in Peninsular Malaysia was 49.3 percent. This fell to 29.2 percent in 1980, 16.5 percent in 1990, 8.5 percent in 1999 and to 5.7 percent in 2004. The incidence of poverty in rural areas also declined from 58.7 percent in 1970 to 37.7 percent in 1980, 21.1 percent in 1990, 14.8 percent in 1999 and 11.9 percent in 2004.

TABLE 1 Malaysian GDP by industry 1970 - 2005 (RM Million at 1987 prices)

	1970	1980	1990	2000	2005	Average Annual Growth Rate 2001-2005
GDP	48,422	56,414	72,980	210,557	262,029	
Primary Sector						
Agriculture, Forestry,	14,054	12,915	13,640	18,662	21,585	3.0
Livestock & Fishing	(29.0)*	(22.9)	(18.7)	(8.9)	(8.2)	
Mining & Quarrying	6,656	5,687	7,136	15,385	17,504	2.6
	(13.7)	(10.1)	(9.8)	(7.3)	(6.7)	
Secondary Sector						
Manufacturing	6,730	11,080	19,632	67,250	82,394	4.1
	(13.9)	(19.6)	(26.9)	(31.9)	(31.4)	
Construction	1,822	2,619	2,605	6,964	7,133	0.5
	(3.8)	(4.6)	(3.6)	(3.3)	(2.7)	
Tertiary Sector	19,160	24,114	29,966	102,297	133,412	6.1
	(39.6)	(42.7)	(41.1)	(48.6)	(50.9)	

Source: Ninth Malaysia Plan, 2006 - 2010,
* values in parentheses are % share of GDP

TABLE 2 Value added of agriculture and agro-based industry, 2000-2005 (RM million at 1987 prices)

	2000	2005
Agriculture	**18,662**	**21,585**
Industrial Commodities	**11,033**	**13,278**
Oil Palm	5,860(31.4)	7,915(36.7)
Forestry and Logging	3,055	3,016
Rubber	1,868(10.0)	2,264(10.5)
Cocoa	250	83
Food Commodities	**7,629**	**8,308**
Fisheries	2,493	2,389
Livestock	1,520	2,089
Padi	590	632
Other Agriculture	3,026	3,198
Agro-based Industry	**13,584**	**16,928**
Vegetable and Animal Oils & Fats	2,526	3,639
Other Food Processing, Beverages & Tobacco	4,010	4,790
Wood Products including Furniture	2,934	2,972
Paper & Paper Products, Printing & Publishing	2,293	2,640
Rubber Processing & Products	1,821	2,887
Total Agriculture and Agro-based Industry	**32,246**	**38,513**
Gross Domestic Product	**210,558**	**262,029**

Source: Ninth Malaysia Plan, 2006-2010

* values in parentheses are % share of Agriculture Value

TABLE 3 Value added of manufacturing industry, 2000-2005 (RM million at 1987 prices)

	2000	2005
Resource-Based	**28,210**	**35,990**
Vegetable, Animal Oils & Fats	2,526	3,639
Other Food Processing, Beverages & Tobacco	4,010	4,790
Wood Products including Furniture	2,934	2,972
Paper & Paper Products, Printing & Publishing	2,293	2,640
Industrial Chemicals including Fertilizers & Plastic Products	6,763	10,082
Petroleum Products including Crude Oil Refineries & Coal	4,521	5,254
Rubber Processing & Products	1,821	2,887
Non-Metallic Mineral Products	3,342	3,726
Non-Resource-Based	**37,878**	**44,662**
Textiles, Wearing Apparel & Leather	2,324	1,818
Basic Metal Industry	594	675
Metal Products	2,879	4,060
Manufacture of Machinery except Electrical	3,063	3,447
Electronics	19,863	23,043
	(29.5)*	(28.0)
Electrical Machinery	1,738	952
Transport Equipment	7,417	10,667
Others	**1,162**	**1,742**
Total	**67,250**	**82,394**
% to GDP	**31.9**	**31.4**

Source: Ninth Malaysia Plan, 2006-2010

* values in parentheses are % share of Manufacturing Sector

TABLE 4 Malaysia's key exports 1970 - 2005
(RM million at current prices)

	1970	1980	1990	2000	2005	Average Annual Growth Rate (%) 2001 - 2005
GNP	12,155	51,390	110,637	314,308	473,074	8.5
				191,287**	248,030**	5.3**
GDP	-	-	115,701	343,215	494,544	7.6
	21,548*	44,511*	79,329*	210,557**	262,029**	4.5**
Total Exports	5,163	28,172	79,646	373,270	533,790	7.4
Agriculture						
Palm Oil	264	2,515	4,421	9,948	19,036	13.9
Rubber	1,724	4,617	3,028	2,571	5,787	17.6
Cocoa	-	-	449	33	50	8.9

Table 4 cont'd

Mining						
Crude Oil	n.a.	n.a.	10,639	14,241	28,508	14.9
LNG	n.a.	n.a.	2,635	11,422	20,790	12.7
Tin	n.a.	n.a.	902	435	935	16.6
Manufactured Exports	522	6,319	46,835	317,908	429,873	6.2

Source: Seventh Malaysia Plan, 1996 - 2000, Ninth Malaysia Plan, 2006-2010.
* in constant 1978 prices, ** in 1987 constant prices.
n.a.: not available

Environmental Concerns

The 1980s (during the fourth and fifth Malaysia Plans) was characterized as the decade of development of Malaysia's resource based industries. The impacts on the environment from the wide range of activities were many and varied. While forging ahead with economic growth, however, Malaysia also took steps to protect its natural environment, exhibiting some sensitivity and foresight. The Environmental Quality Act (EQA) was passed in 1974, followed by the establishment of the Division of Environment (now Department of Environment, DOE) in 1975 with the mandate and the means to accomplish national goals in environmental protection. The EQA was a piece of legislation to prevent, abate and control pollution, and to enhance the quality of the environment. Together with its subsidiary legislation, and the establishment of the DOE, it represented an integrated approach to the management of the environment while pursuing economic development. The DOE, which administered the EQA, was empowered to gazette regulations and orders, and issue licenses to regulate the discharge of wastes.

In the 1990s, the demand for natural resources and environmental amenities continued to increase sharply because of population pressure, growth in economic activity, and production processes that are increasingly becoming more capital and technology intensive. Recognizing the incidental effects to the environment that these might cause it was realized that it would be much easier to integrate environmental considerations into economic decision-making at least in the policy formulation and planning. It was anticipated that Malaysia would continue to be among the fastest growing economies in the world, with the National Development Policy and Vision 2020 providing a policy framework to seek new areas of growth and ensure sustainability within a context that would be highly technology and skill driven, while placing greater emphasis on ethics and the quality of human development.

During the 6MP period (1991-1995), Malaysia had already introduced a number of measures to protect its environment and conserve its natural resources. All major projects were subjected to environmental impact assessment. In addition, air and water quality had been closely monitored. Measures had also been taken to conserve the country's forests through re-afforestation and banning the export of logs as well as strict control over illegal logging. These efforts to conserve and protect Malaysia's natural heritage led to an expansion of the area under permanent forest reserves, resulting in an estimated 59% of the country being under forest cover and about 72% under tree cover.

During the 7MP period (1996-2000), the government continued to balance growth objectives with environmental concerns. Environmental considerations were increasingly integrated into sectoral policies in order to ensure sustainable economic and social development. Besides acquiring the requisite technical capacity, the government implemented more efficient and cost-effective command-and-control measures to reduce and minimize pollution as well as improve the quality of life.

Environment and resource management was then guided by the proposed National Environmental Policy (launched on October 2, 2002), which aimed at promoting economic, social and cultural progress through environmentally sound and sustainable development. A Plan of Action was drawn up to operationalize the policy, which focused on the establishment of a strengthened institutional framework, enactment of relevant legislation and regulations and creation of an efficient and effective enforcement and monitoring machinery. During the Plan period, measures were undertaken to bring about better management of solid waste, toxic and dangerous substances, and radioactive waste.

The Environmental Quality Act (1974)

The passing of the Environmental Quality Act (EQA) in 1974 represented a new chapter in national efforts to improve the quality of life of the people, and 'to the prevention, abatement, control of pollution and enhancement of the environment, and for purposes connected therewith'[1]. A study of the provisions in the EQA shows that the Malaysian approach to environmental management is wide ranging in scope and is not concerned with pollution per se but with pollution that affects the beneficial use of the environment or is hazardous to the general use of the environment. Beneficial use involves 'a use of the environment or any element or segment of the environment that is conducive to public health, welfare or safety and which requires protection from the effects of wastes, discharges, emissions and deposits'[2]. The EQA further declares that pollution consists of 'any direct or indirect alteration of the physical, thermal, chemical, biological or radioactive properties of any part of the environment by discharging, emitting or depositing wastes so as to affect any beneficial use adversely, to cause condition which is hazardous or potentially hazardous to public health, safety, or welfare, or to animals, birds, wildlife, fish or aquatic life, or to plants or to cause a contravention of any condition, limitation or restriction to which a license under this Act is subject'.

The general scheme of the EQA, in relation to the preservation of the environment leans more towards controlling pollution. This 'control' of pollution is done through the mechanism of licenses issued by the DOE. The EQA authorizes the Minister to prescribe the level of 'acceptable conditions' and it is only pollution over and above this permitted level that attracts liability.

Criminal sanction is provided for in several sections of the EQA. A maximum fine of RM 10,000 or two years' imprisonment or both is imposed for offenses related to 'emitting or discharging any waste into the atmosphere, polluting or

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[1] Preamble to the EQA

[2] Section 2 of the EQA

causing or permitting to be polluted any soil or surface of any land and emitting, discharging or depositing any wastes into any inland waters' in contravention of acceptable conditions. A further maximum penalty of RM 1,000 per day is imposed for every day the offence is continued after a notice from the Director General is served on the offender requiring him to cease the act. An offender is liable to a maximum fine of RM 5,000 or one years' imprisonment and a maximum fine of RM 500 a day for every day the offence is continued for offenses related to emitting or causing or permitting to be emitted any noise greater in volume, intensity or quality in contravention of the acceptable conditions. A maximum fine of RM 10,000 or two years' imprisonment or both is also imposed on persons 'discharging wastes (whether liquid, solid, gaseous or radioactive) into Malaysian waters in such volume, composition or manner as to cause an alteration of the environment'. An offender is liable to a maximum fine of RM 25,000 or two years imprisonment for offenses relating to `the discharge or spill of any oil or mixture containing oil into any part of the sea outside the territorial waters of Malaysia if such discharge or spill will result in oil or mixture containing oil being carried, spread or washed into Malaysian waters'.

The National Environmental Policy

The policy (launched on October 2, 2002) is based on eight interrelated and mutually supporting principles:

- Respect and care for the environment
- Conservation of nature's vitality and biodiversity
- Continuous improvement of the quality of the environment and human life
- Sustainable use of natural resources and prevention of environmental degradation
- Integration of environmental considerations into decision-making processes
- Strengthening the role of the private sector

- Commitment and accountability
- Active participation in the international community

The objectives are to achieve:

- A clean, safe, healthy and productive environment for present and future generations
- Conservation of the country's unique and diverse cultural and natural heritage with effective participation by all sectors of society
- Sustainable lifestyles and patterns of consumption and production

MALAYSIAN CASE STUDIES

Case #1: **Trade and Welfare Effects of Environmental Regulations in the Palm Oil Industry** *(Ph.D. Dissertation, 1989 and Study funded by the Malaysian Ministry of Finance for Harvard Book Project 1992-95)*

In the 1960s, when rubber prices began a prolonged decline, the Malaysian Government started to encourage palm oil production. With very fast growth rates, Malaysia soon became the world's largest producer of crude palm oil (CPO). By 1980 Malaysia accounted for half of world production of CPO and three-fourth of world exports of crude and refined palm oil (RPO).[3] Palm oil played a key role in the Government's policy aimed at reducing rural poverty as well as income disparities between ethnic groups. Oil palms (Elaeis guineensis) were grown by technologically advanced estates (55 per cent of the total area

[3] Since the 1970s the Government of Malaysia has encouraged domestic palm oil refining through the introduction of a variable export duty on CPO and duty exemptions on processed palm oil. As a result, whereas in 1974 p alm oil was exported entirely as crude, in 1985, 97 per cent of Malaysia's palm oil was exported in processed form.

dedicated to oil palms), where yields were generally higher, or by smallholders (45 per cent), who had been assisted by government land development schemes. However, by 1975, CPO had become the country's worst source of water pollution. Pollution caused by the organic wastes from CPO mills was equivalent to pollution generated by a population of more than 10 million people (nearly as large as the entire population in 1975). Production of CPO increased threefold between 1975 and 1985. Extrapolating from 1975 pollution load, the population-equivalent of the industry's pollution would thus have increased to 33 million if no policies had been implemented to abate pollution. The fact that the population-equivalent of the pollution actually fell to 0.08 million people by 1985 showed the success of Malaysia's policies in this sector: high rates of growth were achieved simultaneously with significant environmental improvements. The case of palm oil in Malaysia had been cited as an example where a trade-dependent industrializing nation moved decisively against pollution in a key export industry.

During 1975-85, production of crude palm oil (CPO) in Malaysia rose from 1.3 to 4.1 million tonnes. This expansion strengthened the industry as the world's largest producer and exporter in 1980s and made it the country's second largest earner of foreign exchange by 1984. In 1989, oil palm covered about one-third of the country's cultivated area amounting to 1.95 million hectares, surpassing rubber hectarage for the first time. In 2005 the hectarage under oil palm was 4.0 million hectares. Palm oil output rose to 10.8 million tonnes in 2000 and 15.0 million tonnes in 2005 increasing at an average rate of 6.7 % per annum. Export earnings from palm oil and related products continued to increase despite less favourable prices due to higher export volume in 1980s. However, due to the tight supply of edible oils in the world market, palm oil price reached its highest level of RM1,610 per metric tonne in 2005. Currently, the palm oil industry maintains its position as the fourth largest export earner of the country after manufactured products, petroleum and liquefied natural gas (LNG). Contribution of palm oil to the GDP increased from 4.3% in 1980 to 8.4% in 1990 but decreased to 2.8% in 2000 and 3.0% in 2005.

The approach in controlling pollution from palm oil mills was largely based on the best practicable means concept with provisions for gradual integration with river basin management concept. The centrally planned pollution control regulations enforced on the industry would likely be far from a least-cost way of achieving water quality goals. The installation of in-plant measures would limit the discharge of effluents from mills to a certain extent but not necessarily eliminate the total effluents discharged into the rivers. It was usual to find situations where the water quality of some rivers continued to deteriorate despite the fact that effluents from mills were complying with discharge standards. Such situations arose because the total effluent loads discharged into the receiving waters exceeded the levels that the river could assimilate. A more efficient and sustainable approach required the establishment of national water quality criteria and standards. This would form an integral part of the concept of river basin management.

Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations

Section 51 of the EQA empowered the Minister to make regulations for the purpose of carrying into effect the provisions of the EQA. The regulation making power was exercisable after consultation with the Environmental Quality Council. A number of committees comprising representatives from relevant government agencies and the industry were appointed to develop and recommend appropriate standards for the palm oil effluents. These standards were "not only environmentally sound but also sensible within the framework of economic feasibility and available technology". It took the DOE almost two years of preparatory work and consultations before the standards were incorporated into the Environmental Quality (Prescribed Premises)(Crude Palm Oil) Regulations, 1977 (Amendment 1982)[4] which was announced on July 7, 1977.

[4] Hereinafter referred to as EQR (CPO)

Effluent control in the palm oil industry was effected through a system of licensing within the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 (Amendment 1982) (Amendment 1995). Under the licensing procedure, conditions, mainly effluent standards, were attached to each license. The regulation allowed one year for the mills to install treatment facilities and then to comply with the four stages of allowable discharge limits into a watercourse. The first stage of standards took effect on July 1, 1978. During the first year, palm oil mills were required to reduce the effluent characteristics, taking BOD concentration[5] as the key parameter, from 25,000 mg/l untreated effluent to 5,000 mg/l in 1978/79 and to 500 mg/l by 1981. These BOD limits were further reduced to 250 mg/l in 1982 and finally to 100 mg/l in 1984. In addition to the standards, effluent-related license fees were levied on the BOD load[6] discharged. Dischargers were required to pay RM100 per tonne for BOD loads exceeding the legal standard and RM10 per tonne of BOD for loads equal to or less than the standard. Each discharger also paid a non-refundable RM100 annual license-processing fee.

The regulations left the palm oil mills the option of discharging the effluents onto land subject to a fee of RM50 per 1,000 tonnes instead of into a watercourse. The amount of effluent-related fees computed for land disposal and watercourse discharge were equivalent for the standards set during the first generation. For example, a 100,000 tonnes of BOD load with a concentration of 5,000 mg/l standard of the first generation discharged into a watercourse would require the

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[5] BOD concentration is the intensity of the biochemical oxygen demand of effluent, measured by reference to the BOD of a standard unit of volume of the effluent, such as a litre; thus effluent is said to have a BOD concentration of, say, 5,000 mg/l, if its oxygen-consuming potential is such that one litre of it will, according to laboratory test, utilize, during a period of three days and at a temperature of 30 degrees Centigrade, 5,000 mg of oxygen in the process of its biochemical oxidation. Dilution of the effluent is prohibited, whether raw or treated at any time or point after it is produced at any prescribed premises without prior written authorization of the Director General.

[6] op. cit. footnote 4.

mill to pay RM5,000 (0.005 x 100,000 x RM10) effluent-related fees. If the mill were to dispose the effluents onto land the effluent-related fees were also RM5,000 (100,000 x RM0.05) regardless of the BOD concentration.

During the later generations of standards, however, effluent-related fees for watercourse discharge were substantially lower than those for land disposal. For example, a 100,000 tonnes of BOD load with a concentration of 100 mg/l standard of 1984 discharged into a watercourse would require the mill to pay effluent-related fees of RM100 (0.0001 x 100,000 x RM10) subject to a minimum of RM150 specified in the regulation compared to RM5,000 (100,000 x RM0.05) for land disposal. Thus, the regulation seemed to create an incentive for watercourse discharge over land disposal for palm oil mill effluents.

High effluent-related fees and the waiver of fees for research on effluent disposal or treatment as provided for in the regulation[7] expedited research with remarkable breakthroughs in the treatment technology. Mills which succeeded in developing technologies to reduce BOD were rewarded by being charged lower effluent-related license fees. The legislation empowers the Director General to waive partially or completely effluent-related fees payable if he "is satisfied that research on effluent disposal or treatment of a kind or scale that is likely to benefit the cause of environmental protection is being or to be carried out at any prescribed premises..." In determining the extent of the waiver the authority considered the quantity and quality characteristics of effluent discharged or to be discharged that was involved in the research. Palm oil mills were required to report the total effluent discharge, its composition and the method of disposal every three months, in addition to the annual application for an operating license.

[7] Regulations 17(1), 17(2) of Environmental Quality (Prescribed Premises) Crude Palm Oil) Regulations, 1977

Performance of the Regulations

Pollution control in the palm oil industry had been considered far from satisfactory in terms of compliance. The problems were attributed to improper management of treatment systems and the use of under-sized systems while expanding milling capacity. In 1991, out of 112 mills monitored, 75 percent were found to comply with the discharge standards for BOD of 100 mg/l. The implementation of the regulations to control pollution from the palm oil mills were encouraging, as these mills had been constructively receptive to the regulations and had progressed satisfactorily towards meeting the desirable target of 100 mg/l BOD.

The industry did incur additional costs due to the implementation of the regulation. Capital costs accounted for most of the costs associated with treatment systems. However, relative to the industry's total production costs, treatment costs were low: only 0.2% in 1983 (Chooi, 1984). Due to the nature of the world market structure for fats and oils, the increased costs of production were unable to be shifted onto the consumers. Instead, two-thirds to three-fourths of the costs were shifted upstream and ultimately borne by oil palm growers, who had no outlet for palm oil fruits aside from sales to the palm oil mills (Khalid, 1991; Khalid and Braden 1993). The regulations caused the price of fresh fruit bunches (FFB) to be much lower than they would have been otherwise due to the oligopsonistic nature of the market. Thus, environmental protection need not necessarily impair the overall competitiveness of the industry in the open economy and the industry continued to expand even when the regulations were more stringent.

Enforcement of the Regulation

During the initial years of the enforcement of the regulation, the palm oil industry regarded effluent treatment as an additional cost of production. Compliance with the discharge standard of 5,000 mg/l BOD was not mandatory during the first year of implementation both to allow sufficient lead time for the building and commissioning of treatment systems and for further development of relevant treatment technology. Many mills chose to pay the fees rather than treat their effluent to meet the standard. Out of 130 mills, 46% paid license fees of more than RM10,000; 7% paid more than RM100,000 and a total of RM3.5 million were collected. A 67.8% reduction in BOD load discharged was recorded.

During the second year of enforcement it was mandatory for mills to reduce their BOD discharge to 2,000 mg/l and the license fee was levied at the rate of RM10 per tonne of BOD. None of the mills paid more than RM10,000 in effluent-related fees during the year and a percentage reduction of BOD load discharged was recorded at 84.7%. A progressive reduction in the total BOD load discharged was recorded as more stringent BOD standards were implemented. In just two years of mandatory enforcement the total BOD load discharged had achieved a 94.2% reduction despite increases in the number of CPO mills from 131 to 147 and in the amount of CPO output from 1.8 to 2.6 million tonnes. It appeared, then, that the motivation to comply with the standard was not the fee, but rather the risk of being shut down for violating the mandatory standard. The standard deserved most of the credit for the industry's rapid reduction in the aggregate BOD load discharged.

The industry's efforts to develop even better treatment technologies were given a boost in 1980 when the government established the Palm Oil Research Institute of Malaysia (PORIM). A survey conducted by PORIM and the Rubber Research Institute of Malaysia in 1980-81 found that 90% of the 40 mills surveyed were discharging palm oil mill effluents (POME) with a BOD concentration below the fourth-generation standard (500 mg/l), and that 40% were discharging POME with a BOD concentration below 100 mg/l. These findings and other evidence of ongoing improvements in treatment technology led the DOE to announce the fifth- and sixth-generation BOD standards that called for even lower BOD levels. In concession to the industry, the DOE eliminated the standards on COD, total solids, and organic nitrogen, which the survey revealed had proved difficult for the industry to meet. By the end of 1982, 80% of the 185 palm oil mills were complying with the fifth-generation standard (250 mg/l).

Resource Recovery

The industry's ability to reduce its BOD discharge had been facilitated by not only improvements in treatment technology, but also by the development of various commercial by-products made from POME. As early as 1977, a Danish company saw a market opportunity and began marketing to mills a process to convert separator sludge into animal feed (Jorgenson, 1977). By 1982 ten large pig and poultry farms were using palm oil meal in their feed mixes. Mills that discharged POME onto land found that it had a fertilizing effect. This enabled many plantations to reduce their purchases of fertilizers, which saved one company an estimated RM390,000 per year. In 1982, three mills with tank digesters were recovering methane, 60-70% of the gases generated during anaerobic digestion, and using it to generate electricity for mill use. One analysis found that the payback period for the investment required to build an integrated fertilizer/biogas recovery system was 3.1 years. In 1984, 4 mills found uses for all their POME and consequently had zero discharge.

Lessons from the Malaysian Experience

Malaysia's Crude Palm Oil Regulations were similar to effluent charge systems implemented in other economies with respect to those being linked to standards and being motivated by objectives other than cost-effective pollution control. These were not equivalent to a pure effluent charge system. At the most, these resembled a pure charge system in the first year, when the BOD standard was not mandatory. After the first year, the motivation to comply with the standard was not the excess charge, but rather the risk of being shut down for violating the mandatory standard. It followed that the standard, not the excess charge, deserved most of the credit for the rapid reduction in the aggregate BOD load discharged.

Malaysia's experience with the regulation in the palm oil industry offered several lessons for pollution control efforts.

1. Pollution reduction and industrial expansion could occur simultaneously. The fact that an industry was economically important was not grounds for being reluctant to address its pollution problems. One reason for success in merging environmental and industry objectives was the development of effective and relatively inexpensive technology. Industry was able to develop numerous by-products from the effluent. Another reason was the industry's ability to shift the costs associated with pollution control onto the suppliers of the raw materials.

2. Effluent charges were not responsible for most of the reduction in BOD discharge. During the first year of implementation, standards were not mandatory and firms chose to pay effluent charges. After the first year of implementation, the motivation to comply with the standard was not the effluent charge, but rather the risk of being shut down for violating the mandatory standard. The effluent charges were seen as a means of reinforcing a system of uniform standards.

3. Effluent charges offered abatement cost savings compared to uniform standards but the savings could be small (Khalid, 1994). The magnitude of potential savings depended on the degree of variation in the marginal abatement costs across pollution sources. The greater the variation, the greater the scope for efficiency gains through a reallocation of resources for abatement.

4. The industry could be worse off under an effluent charge than a uniform standard. The sum of effluent charges and abatement costs under the former could exceed the abatement costs under the latter. From a social perspective, effluent charges are still better: the objective is not to minimize industry's costs, but to minimize society's. The effluent charges can be interpreted as potential compensation to the victims of pollution. Even if such compensation is not directly paid out, the revenue from effluent charges benefits society if it is used to fund monitoring, enforcement, and clean-up activities. The higher costs understandably make effluent charges less attractive to industry.

5. Effluent charges could result in local pollution problems. The simulation results indicated that some mills would discharge effluent with a BOD concentration well above historical standards if faced with only an effluent charge. Although it is possible to design a cost-effective system of "ambient charges" which vary across pollution sources and are linked to local ambient conditions, such a system is information-intensive, difficult to administer, and in essence not much different from a system of firm-specific effluent standards, which offers an environmental agency greater certainty about pollution abatement.

6. Malaysia's experience with environmental regulation in the crude palm oil industry offered no lessons about the determination of optimal pollution levels. The effluent charges and standards were not chosen by comparing marginal abatement costs and marginal abatement benefits. Information on the value of environmental benefits is limited in Malaysia.

Case #2: **The Impact of Trade Liberalization on Malaysian Environment: The Case of Electronics Industry** *(Study funded by UNCTAD, 1994-1996)*

The electronics industry dominates the manufacturing sector in Malaysia, contributing the largest macroeconomic benefits in terms of output, export earnings and employment. The electronics industry took off in the early 1970s when the government shifted its emphasis from an import substitution to an export oriented strategy to promote the country's industrial development. This was at a time when major structural changes were taking place in the electronics production sector in the United States, Western Europe and Japan, where industries in those economies needed to adjust very quickly to the intensely competitive international market and, inevitably to locate some of the operations to lower-cost production centres overseas. Malaysia, then on the threshold of its new export-led industrial program, offered an ideal location. The attractive investment climate, including a ten-year pioneer status incentive for the electronics industry, the huge reservoir of trainable labour at low cost, the establishment of Free Trade Zones (FTZs) and Licensed Manufacturing Warehouse facilities (LMWs), was one which many electrical and electronics multi-national companies found difficult to resist in their quest for greater competitive advantage.

The electrical and electronics industry is one trade-driven activity favoured for the "value-added" edge of its manufactured products over primary commodities. Indeed current statistics have shown the electronics industry to be the country's major contributor to manufacturing value-added (RM23,043 million in 2005)[8]. The downside to this is the pollution impact, which has to be adequately addressed in order to maintain an environmentally sound and

8 Op.cit. Table 3.

competitive edge of this important economic activity. Pollution from the electronics industry was addressed by retrofitting as well as in-plant approaches, dealing with waste matter and the use of ozone-depleting substances respectively.

Industry Structure

With the government taking the lead in local electronics research and development, the industry had been transformed from the assembly and testing of semi-conductors using imported technology and materials in the 1960s into three broad sectors:

- Electronic components comprising integrated circuits, discrete active components such as transistors, diodes, opto-electronic devices, and discrete passive components such as capacitors, resistors, relays, inductors;
- Consumer electronics which cover home entertainment products such as radios, TV receivers, video cassette recorders; and electronic household goods such as microwave ovens, telephone receivers; and
- Industrial electronics which include computers and peripherals, office electronic equipment, process control.

Indeed, the electronics industry is now a major component (66 percent in export value[9]) in Malaysia's manufacturing sector, due to government efforts in encouraging multinationals from the United States, Japan, Europe, Chinese Taipei, Singapore, Korea, Hong Kong and China to set up export-oriented plants in Malaysia.

[9] Source: Ninth Malaysia Plan, 2006-2010, p.110.

Structural Changes

Since its inception in the early 1970s, the electronics industry had been dominated by the electronic components sector, accounting for 80 to 85 percent of the sectoral output. In view of this, the Industrial Master Plan (IMP) recommended the restructuring of the electronic industry by giving emphasis to the consumer and industrial electronics sectors. Although the manufacture of semiconductor devices and other electronics components still predominates, the output structure of the industry has changed significantly since the mid-1980s. In 1984, the electronic components sector contributed 84 percent of the total output of the industry while the consumer and industrial electronics sectors contributed 12 percent and 4 percent respectively. By 1986 the electronic components sub-sector contributed 81.5 percent of the total output of the industry while the consumer and industrial electronics sub-sectors contributed 12.3 percent and 6.2 percent respectively. However, from 1986, considerable structural adjustments took place within the industry and in 1991 the distribution was 58 percent, 23 percent and 19 percent for components, consumer and industrial electronics, respectively. In 1993, the output structure for components, consumer and industrial electronics was respectively 43 percent, 27 percent and 30 percent. This output structure indicated the achievement of the IMP targets of 24 percent and 15 percent by the year 1995 for consumer and industrial electronics. This earlier-than-expected achievement of the targets was a clear indication of the attractive investment climate that Malaysia offered to investors.

Despite the negative growth of 24.3 percent in 2001, the electronics industry recorded an average growth of 3 percent during 2001-2005 contributing 28 percent of the total value-added of the manufacturing industry in 2005. This was largely due to the sustained demand for semi-conductors and other electronic components from the United States and the Asia-Pacific countries. The structural changes saw the trend towards high value-added and high technology projects as well as highly skilled human resource.

Exports

Malaysia had a very strong global competitive position for a range of electronics products. For many multinational companies, it had become the largest production base outside their home economies or in Southeast Asia, due to the substantial improvements in production and the processing technology. Export earnings of the electronics industry increased significantly from RM 6.6 billion in 1986 to RM 54.7 billion in 1996, recording an average annual growth rate of 29.6 percent in 1991-1995 period. Electronic components remained the major export sub-sector as semi-conductors continued to be the mainstay of exports, especially to the United States, (23.4%), European Union (10.4%) and Japan (7.4%) in 2005.

Environmental Profile of the Electronics Industry

The electronics industry encompassed, amongst others, the manufacturing of semi-conductors, chip boards and micro-chips, which consumed large quantities of acids, alkalis and oil-based chemicals. These chemicals often ended up in the wastes discharged, contaminated further by heavy metals, halogens and other toxic compounds by virtue of the processes involved. A conservative estimate from a 1986 feasibility study estimated the total amount generated from electronic factories in Malaysia at 50,000 tonnes per year, resulting in an approximately US$150 million expenditure on waste management, if managed individually. The magnitude of this figure alone justified the consideration of a centralized waste treatment system, a project which is now under implementation. In terms of regulatory control over the wastes, three sets of Regulations under the Environmental Quality Act 1974 apply, one governing atmospheric emissions, another industrial effluents, and the third dealing with toxic and hazardous components of the wastes.

In Malaysia's manufacturing industry in general, the lack of proper and efficient effluent treatment systems had been cited as one of the main reasons for non-compliance, especially in the electroplating, oleo-chemical, rubber-based and textile industries particularly with respect to meeting heavy metal, COD and BOD standards. The electronics industry, however, was one of the major industries with a high percentage of compliance (93.3 percent in 1993, 89 percent in 1995) with the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 (Table 5).

The issue of toxic waste disposal and treatment was a significant problem to be resolved. With a lack of proper treatment systems the electronics industries had been forced to store their waste materials, which were accumulating in storage within their premises. Some, as a short-term measure, had exported the wastes to other economies, especially the US, UK, Germany, Japan and Singapore, for treatment and eventual disposal. Members of the Malaysian-American Electronics Industries (MAEI) had called for the setting up of a national landfill as a top priority for environmental management. The government had commissioned a Danish firm, in joint venture with local firms, to build an Integrated Waste Disposal Facility at Bukit Nenas, Negeri Sembilan.

Used oil was one of the major liquid wastes being stored and was increasing at the rate of 5 percent per month. Efforts were then taken to progressively deplete these stocks through licensed used-oil recyclers.

The storage of 1,982 tonnes of heavy metal sludge by MAEI members constituted about 30 percent of the countrywide stockpile. It was growing at an average rate of 8.5 percent or 168 tonnes per year.

The stocks of some organic wastes, such as M-Pyrol were gradually depleting since they had high commercial reclaim values. Solder dross also did not cause significant problems as most members were able to engage licensed solder reclaimers to handle this high valued waste.

TABLE 5 Environmental Quality (Sewage and Industrial Effluent) Regulations 1979
Parameter limits of effluent of standards A & B

Parameters	Unit	Standard	
		A*	**B**
Temperature	°C	40	40
pH Value	-	6.0 - 9.0	5.5 - 9.0
BOD5 at 20oC	mg/l	20	50
COD	mg/l	50	100
Suspended Solids	mg/l	50	100
Mercury	mg/l	0.005	0.05
Cadmium	mg/l	0.01	0.02
Chromium, Hexavalent	mg/l	0.05	0.05
Arsenic	mg/l	0.05	0.10
Cyanide	mg/l	0.05	0.10
Lead	mg/l	0.10	0.5
Chromium, Trivalent	mg/l	0.20	1.0
Copper	mg/l	0.20	1.0
Manganese	mg/l	0.20	1.0
Nickel	mg/l	0.20	1.0
Tin	mg/l	0.20	1.0
Zinc	mg/l	1.0	1.0
Boron	mg/l	1.0	4.0
Iron (Fe)	mg/l	1.0	5.0
Phenol	mg/l	0.001	1.0
Free Chlorine	mg/l	1.0	2.0
Sulphide	mg/l	0.50	0.50
Oil and Grease	mg/l	Not Detectable	10.0

* This standard applies to the industrial and development projects which are located within catchment areas.

Environmental Compliance

Emissions to the atmosphere in the form of smoke, dust, particulates, gases and fumes, came under the purview of the Environmental Quality (Clean Air) Regulations 1978, whereby the installation and operation of any equipment giving rise to these emissions were regulated. Department of Environment statistics revealed rather satisfactory compliance of the Electrical and Electronic group at 97 percent with regards to Clean Air regulations (Environmental Quality Report 1995). Given that the electronics industry comprised the better half of this group, being mostly multinational companies adequately installed with emission control equipment, it followed that atmospheric pollution from the electronic manufacturers was relatively small. This was substantiated by the fact that no complaints received by DOE on air pollution arose from electronics factories.

For discharges into watercourses, the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 imposed standards of discharge (as shown in Table 4 above). Again, the Electrical and Electronics industry achieved 89 percent compliance in 1995, which was to be expected as industries within the sector concerned invariably possessed their own treatment systems for non-toxic effluents. Effluents at Motorola Semiconductors, as a case in point, were recycled for use in its air conditioning chillers and for watering greenery on the premises. Table 6 shows a typical electronic waste composition, which dictates the type of wastewater treatment to be employed.

TABLE 6 Categories of wastes from electronics manufacturing

Type	Percentage by Mass	Some Treatment Processes Involved
Mineral Oil	1.7	Activated-clay Absorption, Filtration, Oil recovery, Incineration
Solvent	11.6	Distillation, Recovery, Incineration, Landfill
Organic	4.5	Aerobic, Anaerobic, Desludging, Landfill, Fertilizer recovery
Inorganic	18.4	Chemical coagulation, Flocculation, Redox Neutralisation, Sludge fixation, Landfill
Sludge	46.9	Chemical fixation, Physical Stabilisation, Landfill

Source: Unpublished Information from Malaysian-American Electronics Industries

To handle toxic and hazardous wastes, the Environmental Quality (Scheduled Wastes) Regulations 1989, which covered the generation, storage, handling, transport and disposal of scheduled wastes, requires notification of all matters concerning such materials to the Director General of the Environment, and the obtaining of written permission. Categories of wastes classified as "scheduled" include the oily wastes, solvent-based waste (halogenated and non-halogenated), organic-based chemical wastes and inorganic wastes typical of the electronics industry. Before the completion of the centralized facility, all toxic and hazardous wastes not treated on the premises were required to be stored safely on-site. From enforcement records, toxic and hazardous wastes storage from the electronics industry had so far not experienced any major problems.

Case #3: **Malaysia's Participation in the Montreal Protocol** *(Study funded by UNCTAD, 1994-1996)*

The Montreal Protocol of the Vienna Convention was signed in September 1987, with the first concrete step taken to protect the ozone layer, i.e. a 50 percent reduction in the production and consumption of specified chlorofluorocarbons (CFCs) by the year 1999 and a freeze on the consumption of halons. The Protocol had many innovative features: it allowed for continuous scientific and technical assessment of ozone depletion. The heart of the Protocol was that it sets out a reduction schedule to phase down the global consumption of the five most damaging CFCs, namely,

CFC-11 (Trichlorofluoromethane),
CFC-12 (Dichlorodifluoromethane),
CFC-113 (Trichlorotrifluoroethane),
CFC-114 (Dichlorotetrafluoroethane) and
CFC-115 (Chloropentafluoroethane)

and three extinguishing agents called Halon namely,

Halon 1211 (Bromochlorodifluoromethane),
Halon 1301 (Bromochlorodifluoromethane) and
Halon 2402 (Dibromotetrafluoroethane).

The Protocol focused on implementation of control measures on ozone depleting substances (ODS). As nations adopted the Montreal Protocol in September 1987, new scientific findings indicated that the Protocol's control measures were inadequate to restore the ozone layer. The parties to the Protocol declared their intention to phase out ODS by the year 2000 at their first meeting in Helsinki in 1989. It was recognized that developing countries could experience difficulties implementing the Protocol, and so were given a ten-year grace period, as well as technical and financial assistance. The Protocol laid down trade restrictions in order to prevent the export of ODS to countries which did not commit themselves to the objectives of the Protocol. The Protocol was revised in two ways: it could be adjusted and/or amended. Adjustments concern control measures for substances already included in the Protocol. Amendments on the other hand referred to new substances or the alteration of provisions other than control measures on substances already included.

The Montreal Protocol had discriminatory trade provisions designed to limit the relocation from signatory to non-signatory countries of industries using or producing CFCs. Because these trade provisions were designed to protect environmental resources which clearly did not fall within the national jurisdiction of the parties involved, and because they discriminate between parties and non-parties to the agreement, they might well be thought to conflict with the GATT Most Favoured Nation principle. This matter had never been tested in the GATT/WTO since no country had complained. But the potential for confrontation was a matter of increasing concern and uncertainty for governments.

Malaysia did not produce chlorofluorocarbons (CFCs) or halons but imported these to service its industrial and consumer needs mainly from the United States, United Kingdom and Japan. The consumption of CFCs in Malaysia was broken down into the following categories of use:

- Commercial and residential refrigeration and air conditioning.
- Mobile air conditioning.
- Solvent cleaning and degreasing in engineering and electronics sectors.
- Production of plastic foam and foam insulation products.
- Aerosol propellants.
- Fire protection system and fire fighting.
- Other miscellaneous uses.

As a developing economy defined by the first Meeting of Parties to the Protocol and with the estimated consumption level of the controlled substances less than 0.3 kg per capita on 27 November 1989 (when the Protocol came into force), Malaysia qualified for the special situation of developing economies under Article 5 of the Protocol. Under this Article, developing economies with consumption of the CFCs and halons less than 0.3 kg per capita were exempted from the control requirements for a period of ten years.

Policy Response

With the proactive role of Malaysia on environmental issues, the government had formulated policies including legal, administrative, voluntary measures, financial and technical assistance as well as phase-out investment projects to restrict the use of controlled substances ahead of the time frame granted. The government prepared its country program and the National Action Plan in 1991, a joint effort between the government and the industry. The country program and the National Action Plan, which were largely industry generated, gained acceptance by the government and industries themselves, thus eliminating unnecessary bureaucratic delay and confrontation that might arise without adequate consultation.

Malaysia received about US$ 4.2 million for the period 1991-93 in financial assistance from the Multilateral Fund of the Montreal Protocol to cover the phase out of ten Ozone Depleting Substances (ODS) investment projects, institutional strengthening for the Department of Environment, and technical assistance, including the organization of conferences and workshops.

The first legal initiative was the enforcement of the Customs Duties Order 1988, which was amended by the Customs Duty (Amendment) (No. 35) Order 1989, dated 14 December 1989. With this amendment, the import inventory was updated and arrangements were made for the monitoring of the import of controlled substances listed in Annex A of the Montreal Protocol.

The Fire Services Department issued an Administrative Order in June 1990 prohibiting the use of Halons and had since stipulated the use of carbon dioxide as the extinguishing medium in all new installations except for specific applications. Malaysian Industrial Development Authority (MIDA) also issued some guidelines in 1992 discouraging the use of CFCs in new manufacturing operations.

Under the EQA 1974, the Environmental Quality (Prohibition on the Use of Chlorofluorocarbons and Other Gases as Propellants and Blowing Agents) Order 1993 was gazetted on 25 October 1993 which prohibited:

- the use of any controlled substance as propellant in aerosol industry and in portable fire extinguishers with effect from June 1, 1994;
- the use of any controlled substance as propellant in aerosol in any pharmaceutical product with effect from January 1, 1999;
- the use of any controlled substance as blowing agent for extruded polystyrene foam, thermoformed plastic packaging, molded flexible polyurethane foam with effect from July 1, 1995;
- the use of any controlled substance as blowing agent for rigid polyurethane foam with effect from January 1, 1999;
- the use of combustible petroleum gas or other combustible as propellant in aerosol with effect from January 1, 1999.

The Application Permit (AP) system which was implemented on April 7, 1994 required companies intending to import ODS in Annexes A and B to obtain permits from the Ministry of International Trade and Industry (MITI). The Advisory Committee on the AP (comprising representatives of MITI, DOE, Customs Department and MIDA) set import quotas for companies on the basis of their historic use of controlled substances, and of priority uses established under the Country Program.

Also in 1994, the DOE issued guidelines on Control Measures for the Protection of the Ozone Layer to assist enterprises in the phase out program. The Customs Duty (Amendment) Order 1994 (Schedule II) was issued in 1995 to monitor the import of controlled substances listed in Annex C and Annex E of the Montreal Protocol. The Amendment also monitored trade with economies that are non-parties to the Montreal Protocol. Fiscal measures aimed at providing incentives to investment in ozone friendly technologies included:

- duty exemption on imports of non-ODS technology particularly CFC and Halon recovery technologies;
- new manufacturing investment using environmentally friendly technology as well as non-ODS technology is subject to reduced tax regime up to 30 percent;
- duty exemption on imports of HCFC134a.

Table 7 provides an overview of consumption of ODS in Malaysia by sector, over the period 1989-1993.

TABLE 7 ODS consumption by sector

User Sector	Substances	1989	%	1990	%	1991	%	1992	%	1993	%
Solvent Cleaning	CFC113	1441	19.32	1244	15.13	1100	11.99	800	9.17	370	4.03
	MTC	2348	31.48	3057	37.18	2701	29.43	2829	32.42	2620	28.52
Foams	CFC11, 12	590	7.91	696	8.46	870	9.48	1088	12.47	1360	14.80
Car air conditioning	CFC12	894	11.99	1012	12.31	1126	12.27	1171	13.42	1276	13.89
Residential & small commercial air-conditioning	HCFC22	1296	17.37	1309	15.92	2439	26.57	1809	20.73	2600	28.30
Refrigeration & large commercial air-conditioning	CFC11, 12	485	6.50	320	3.89	378	4.12	435	4.99	495	5.39
Aerosols	CFC11, 12, 113, 114	180	2.41	350	4.26	300	3.27	300	3.44	300	3.27
Fire fighting	HALONS	201	2.69	207	2.52	231	2.52	263	3.01	137	1.49
Agriculture	METHYL BROMIDE	24	0.32	28	0.34	33	0.36	30	0.34	30	0.33
TOTAL		**7459**		**8223**		**9178**		**8725**		**9188**	

Note: Data in this table are provided by DOE, Chemical Suppliers, Major Users and Chairmen of Working Groups

* Q represents quantity; percent refers to percentage of industry-wide consumption per year.

Country Programme on Phasing Out ODS

As shown in Table 7, ODS consumption in Malaysia in 1993 was reported in the solvent cleaning sector (32.5 percent), foams (14.8 percent), mobile air-conditioning (13.9 percent), residential and small commercial air-conditioning (28.3 percent), refrigeration and commercial air-conditioning (5 percent), aerosols (3.3 percent), fire-fighting (1.5 percent) and agriculture (0.3 percent). The solvent cleaning sector used CFC113 for the cleaning of electronic parts and Methyl Chloroform (MTC) for the cleaning of metal parts and as a solvent in correcting fluid. Carbon tetrachloride (CCl4) was not commonly used as an industrial or commercial solvent in Malaysia due to its known carcinogenicity. There was no regulation in Malaysia prohibiting the use of CFC113, MTC and CCl4. Phasing out of these ODS was largely voluntary by electronics firms. While many large companies had already begun phasing out of these ODS, small and medium-sized enterprises (SMEs) had yet to do so, due mainly to financial considerations and application complexities.

In the foam sector, CFC11 and CFC12 were the main ODS used. Between 1989 and 1993 the sector had been growing in terms of ODS use. The government had gazetted an Order under the Environmental Quality Act, 1974 prohibiting the use of CFCs in foam making with different effective dates depending on the types of foam manufactured, the latest effective date being January 1999. With the phasing out program, the estimated consumption by industries had begun to decline in 1994. Alternatives for blowing agents include HCFC141b, Methylene Chloride and water blown CO2, which was the mostly used substitute.

HCFC22 was used as a refrigerant for residential and small commercial air-conditioning and CFC11 and CFC12 for refrigeration and large commercial air-conditioning. Alternatives to CFC11 and CFC12, such as HFC134a and HCFC141b were available. No cost-effective technology had been found to replace HCFC22 and thus its consumption was expected to rise. Regulations did not prohibit use of ODS in this sector.

The main refrigerant used for the mobile air-conditioning and refrigerated transport sector was CFC12. Consumption of ODS in this sector, which included users of vehicular air-conditioners and refrigerated transport including cars, air-conditioned buses, coaches, trucks and ships, had shown an increasing trend since 1989 to 1993. The sector was divided into two sub-sectors reflecting the breakdown in the needs for ODS in the two types of market based on the equipment (i.e. original equipment market and replacement equipment market) in use. While new vehicles had been switching to the use of HFC134a as the refrigerant in their air-conditioning units, the use of CFC12 in the original equipment market (OEM) was expected to decline. The consumption of CFC12 in the replacement equipment market (REM) would remain more or less the same unless the air conditioners were retro-fitted to use HFC134a, and/or HCFC22 / HCFC124 / HFC152a blends. Alternatively, CFC12 could be recovered (during servicing) and recycled. No regulation prohibiting the use of CFC12 in this mobile air conditioning and refrigerated transport sector was available in Malaysia. Since the production of CFC12 was stopped by the end of 1995 in developed economies, users in Malaysia would face critical shortage if no steps were taken to use alternative refrigerants. Car air-conditioner manufacturers had been informed by their suppliers that the availability of CFC12 could not be arranged after 1995.

In the fire-fighting sector Halons 1301 and 1211 were widely used while Halon 2402 was rarely used. Halon 1211 was used mostly in portable extinguishers. In fixed extinguishing systems where the room was intended to be flooded with the extinguishing medium, both Halon 1211 and 1301 were used. Halon 1301 was more widely used than Halon 1211 since it had no toxic effect on humans. The main usage of Halons was for electrical installations where conventional water systems were less appropriate or when space and weight were of critical importance as in an aircraft. Thus, the major users in Malaysia were Tenaga Nasional Berhad for their transformers and switch-gears in sub-stations, Syarikat Telekom Malaysia for their telecommunication switching centres, Petroleum Nasional Berhad in their petrochemical industries, and the Ministry of Defence for their equipment and installations. The phasing out of Halon production in developed economies in 1993 had created a supply shortage in Halons in Malaysia and the price had rocketed. Carbon dioxide had been used as a substitute for Halons in fire extinguishers as well as fixed installations, while CO2 and chemical powders have been used in portable extinguishers. Other alternative systems evaluated by the Fire Services Department included pre-action water sprinkler system, fine water mist system and inert gas system. In addition, major chemical producers were conducting research for substitutes which could replace Halons in existing fire-fighting installations.

Products classified under aerosols included insect sprays, personal care products, household products, medical products, automotive products, spray paints and industrial products. In some aerosol products, CFC11 and CFC12 were commonly used as propellants while CFC113 and CFC114 as solvents. Some HCFC22 were also being used as a substitute for CFC11 and CFC12. Insect sprays had been the first to convert to using non-ODS, i.e. hydrocarbon as propellant. Spray paints had also begun to use Dimethyl Ether, which appeared to be an ideal substitute. However, due to its flammability, it was not used for other aerosol products. It was estimated that 60 percent of aerosol manufacturers, especially of insecticides, had converted to hydrocarbons.

In the agriculture sector, the most commonly used ODS was Methyl Bromide. In Malaysia, Methyl Bromide was used in four basic areas: soil fumigation (5 percent); structure treatment (36 percent); commodity treatment (55 percent); and quarantine treatment (4 percent). Methyl Bromide was also used as a broad-spectrum pesticide and played a critical role in the export of agricultural products.

Economic Impacts of CFC Phase-out on Malaysian Industries

The use of trade restrictions promoted in the Montreal Protocol may hamper the industrial growth of many developing economies. The Protocol mandated that parties ban the import and export of controlled substances from or to non-parties. As the major producers had cut back production, CFCs had become scarce and expensive and substitutes were not readily available. Some industries had reported difficulties in obtaining supplies, and the cost had gone up by some 30 percent.

Despite concerns on increasing costs and the loss of competitiveness by the industries, production of refrigerators and air-conditioners in Malaysia grew at a remarkable rate during the early 1990s. The values of production had consistently increased in line with the increase in the cost of raw materials. Evidence suggested that the increases in the cost of production were passed forward to consumers in terms of higher prices, or that technology was available to produce increasingly more output through increasing productivity. This was shown by the share of input cost to the value of output, which had remained fairly constant at about 70 percent. Similarly, the share of labour cost to the value of output had remained constant at about 6 percent over the years.

In other words, despite the increase in the cost of compliance to the Montreal Protocol, industries were able to shift the burden onto consumers as well as to develop productivity-enhancing technology through the various government incentives and encouragement. The structure of the industry had much bearing to the effect. The industry was made up of only few multinational corporations, such as Matsushita, Sharp-Roxy and Sanyo for refrigerators and Carrier, National, Hitachi and Sanyo for air-conditioners. These few corporations had a generally larger consumer base in a wide global market.

Restricting the supply of a resource to protect the environment could bring serious consequences to economic activity. Besides raising resource costs, downstream activities could be affected by loss of income, loss of jobs, and raising product prices that would ultimately be borne by consumers. This study had shown that the environment-related policy variable took the form of input restriction while raising the resource price. The Montreal Protocol had demonstrated the linkage between resource policies and their trade impacts. Although in the study, the magnitude of the impacts could not be ascertained due to insufficient data, it was believed that the impact was small, and so producers could pass on the increase in costs to consumers.

Industry Response to ODS Phase-out

Industries were invited to submit their phase out strategies to the government setting out their proposed timetable for phase out, the major problems faced, the measures that would be taken to implement phase out and the estimated costs of investment. The user sector action plans were prepared through the Industry Working Groups and submitted to the National Steering Committee. Individual agreements on phase out dates were reached with the national operators of all multinational companies based in Malaysia. The seven Industry Working Groups were given voluntary support in working towards the objectives of the Protocol. Reports submitted by these working groups formed the basis for preparing the country's strategy for Ozone Layer Protection (Malaysian Strategy) prepared by DOE in June 1992 to reduce and eliminate the consumption and emissions of ozone depleting substances.

In the Mobile Air-Conditioning and Refrigeration sector, the first reduction in consumption was expected by 1996 based on the 1989 base-year for calculation purposes. Evidences showed that in actual fact, ODS consumption in this sector in 1993 had increased by 43 percent over the base-year. The commercially available alternative to CFC12 was the HFC134a which was at that time the most suitable replacement in new car air-conditioning applications. As new car models were expected to be fitted with car air-conditioners using HFC134a by 1996, consumption of CFC12 in the Original Equipment Market was expected to decline substantially. About 50 percent of the cars manufactured or locally assembled were already using non-ODS system. These included car models such as Proton Wira, Perodua (Kancil), Toyota Corolla, Honda Accord, Volvo, Mercedes Benz, BMW and Daihatsu Charade G202 which were already fitted with air-conditioners using HFC134a.

In the Replacement Equipment Market of the sector, the use of HFC134a as the alternative to CFC12 had encountered several problems. Conversion of the car air-conditioning system from using CFC12 to HFC134a required some equipment modification. Depending on the model and age of the cars the cost of retro-fitting an existing system from using CFC12 to HFC134a varied from RM600 to RM2,000 (US$240 to 800). For a retrofitted unit, the cost of servicing doubled although the consumption of the refrigerant was only 75 percent of that before retrofitting. Since after 1995 the availability of CFC12 could not be assured recovery, and recycling of CFC12 for service purposes were encouraged within the country. The Executive Committee of the Montreal Protocol Multilateral Fund had approved a total sum of US$910,000 to finance the purchase of some 200 units of recovery and recycling equipment as well as for training and certification of car air-conditioners service and maintenance operators and public awareness programs. The workshops where the equipment was installed were required to contribute towards the Mobile Air-Conditioning Trust Fund for training and systems maintenance after the project was completed in 1995. Each set of recovery equipment costs between US$2,000 to 3,000. Ten sets of the recovery units had been installed at training centres operated by major car assemblers for training purposes. Even with recovery and recycling, this refrigerant was still required to replace losses through leakage from components like compressors, condensors, hoses and valves.

Case # 4: **International Pressures on Tropical Timber** *(Study funded by IRPA 1991-1995)*

Timber, comprising both saw logs and sawn timber, was Malaysia's third largest commodity export in 1993, after petroleum and palm oil. Apart from "commodity timber", Malaysia exported timber products, such as plywood/ veneer, mouldings and furniture. Since independence, forest utilization facilitated the process of industrialization and poverty eradication, but Malaysia's economic development had become much less dependent on its forest base. Development and industrial policy now promote the manufacturing of timber products, rather than export of "commodity timber".

The volume of exports of commodity timber decreased from 20.4 million m^3 in 1990 to 9.3 million m^3 in 1993, which was entirely due to a fall in saw log exports. This decrease could be attributed to both domestic and external policies. With regard to domestic policies, both environmental regulations and Malaysia's development and industrial policies played a role. Domestic environmental regulations aimed at sustainable forest management (under the National Conservation Strategy[10]) caused a reduction in logging areas, and hence in the volume of timber production. Indeed, the production of saw logs fell from 50 million m^3 in 1991 to 37.3 million m^3 in 1993. Apart from environmental policies, national development and industrial policies aimed, through export taxes and other measures, at discouraging exports of timber as a commodity in favour of

[10] The National Conservation Strategy included an action plan on sustainable management of Malaysia's forests. Some aspects of this plan included: (a) a decline in logging areas; (b) a reduction in the number of logging permits or licenses; (c) production quotas in accordance with recommendations by the International Tropical Timber Organisation (ITTO); (d) progressive reduction of annual coupes in the framework of Malaysia's 5 year Plans; (e) stiffer penalties for illegal logging; (f) stronger enforcement; and (g) EIAs for forestry activities.

high-value-added manufactured exports.[11] These policies were, at least in part, responsible for the reduction in the share of production destined to exports from 85 per cent in 1980 to 25 per cent in 1993.

External factors, such as unilateral measures and consumer concerns over deforestation also had adverse effects on exports. Studies had pointed out that unilateral measures constitute non-tariff barriers to trade, in particular where such measures targeted only tropical timber. Unilateral measures included bans or restrictions on the use of tropical timber, mandatory and voluntary labeling requirements and campaigns.

Studies listed Austria, Belgium, Germany, Hong Kong, the Netherlands, Switzerland and the United Kingdom, among those implementing or contemplating unilateral measures. Such measures had also been implemented by local authorities, including municipalities. Austrian legislation concerning labeling of tropical timber was eventually revoked after Malaysia had taken up this issue in the GATT Council.

The significance of the effects of external environmental requirements depended to a large extent on the geographical distribution of timber exports as well as Malaysia's response to external developments. In the case of saw logs, Malaysia's principal export markets were Japan, the Republic of Korea and Chinese Taipei (together these economies accounted for 86 per cent of the value of Malaysia's exports in 1993). These economies had not implemented environmental regulations affecting timber trade.

[11] The government had adopted the following measures: log exports from Peninsular Malaysia were restricted in 1975, and completely banned as from 1985; raw rattan exports from Peninsular Malaysia were banned in 1989; an export levy was imposed on certain type of sawn timber and veneer in 1990; a temporary ban, effective January 1993, was imposed on log exports from the state of Sabah (the primary purpose of the ban was to ensure the availability of logs to local saw mills).

In the case of sawn timber, however, some of Malaysia's export markets (notably the Netherlands) had implemented or indicated intent to implement measures which may affect trade in timber. The pilot study on timber certification, which began in mid -1996, was carried out under the Malaysia-Netherlands Joint Working Group. The Malaysian Timber Industry Board and Netherlands Timber Trade Association were the focal points for the study. In the study, timber products such as sawn timber would be subjected to the timber certification process, following which the "certified" timber products would enter the Keurhout Hallmark System implemented in the Netherlands to track these products to the final end-use. The pilot study had provided "experience and information" which would be useful in planning and implementing the proposed timber certification scheme for Malaysia.

Malaysia's response to developments in overseas markets had been, first, to organize campaigns to oppose unilateral measures. Second, Malaysian industry had responded by diversifying export markets, including by switching from markets where unilateral measures were emerging to other markets. Malaysia's policy to encourage domestic higher value-added activities could also be seen as one form of market substitution. Finally, the responses consisted of adaptation, i.e. altering production methods to suit requirements of external markets. In this context, timber certification was increasingly seen as a marketing tool that could help to gain access to green markets. In practice, unilateral measures in overseas markets had not significantly affected Malaysia's timber exports. This was at least partially due to the responses mentioned above.

Eco-labeling for Timber and Timber Products

International initiatives focused on eco-labeling or certification of sustainable forest management, covering tropical as well as temperate and boreal timber and to be based on multilaterally agreed principles.[12] There were several proposals for the introduction of eco-labels for timber; and various definitions of sustainably managed forests had been proposed. Some of them refer to the concept of "sustained yield", meaning that harvesting should not exceed the forest's growth rate. Other definitions were wider, covering also water quality, bio-diversity and non-wood forest products. Some definitions included social issues in relation to forest management. Timber certification was seen by Malaysian industry as a useful marketing tool in greener markets, provided that labeling was applied to all types of timber and based on internationally agreed criteria for sustainable forest management. Malaysia had attempted, though unsuccessfully, to get the International Tropical Timber Organisation (ITTO) to include temperate and boreal forests in addition to tropical forests under the International Tropical Timber Agreement. The ITTO had set the target year of 2000 as a date beyond which all trade in tropical timber would be from sustainably managed forests. It had been estimated that RM 2.9 billion would be required by the Forestry Departments in Peninsular Malaysia, Sabah and Sarawak to implement measures to comply with the requirements of the Malaysian Criteria, Indicators, Activities and Management Specifications for "Forest Management Certification" by the year 2000.

Malaysia's position was that labeling must fulfill the following conditions:

- Labeling must be applied to all types of timber. Temperate and boreal timber account for almost half of the world's forest cover and almost 90 per cent of world timber trade.

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[12] In this context, the third session of the Commission on Sustainable Development (CSD) decided to establish an open-ended ad hoc Intergovernmental Panel on Forests to pursue consensus and formulation of coordinated proposals to promote the management, conservation and sustainable development of all types of forests. Trade and environment relating to forest products and services, including the issue of voluntary labelling and certification and its impact on developing economies, is listed among the issues for priority action by the Panel.

- Labeling must be based on internationally agreed standards and criteria for sustainable development and not merely on standards developed by one or a few economies.
- All actions not consistent with the foregoing should be revoked or abrogated.

Case #5: **Trade and Sustainable Cocoa Production** *(Study funded by the Netherlands Ministry of Development Cooperation/Vrije Universiteit, Amsterdam, 1994-1995)*

Cocoa is mainly produced in the developing countries in the tropical regions. Africa, the traditional producer, contributed about 60 percent of the world supply followed by central and south America with about 25 percent. Production in recent years has been changing with the emergence of new producers in South East Asia such as Malaysia and Indonesia. In terms of production shares, Cote d'Ivoire, Brazil and Ghana have maintained the top three positions. Other major producers include Malaysia, Indonesia, Nigeria and Cameroon. Good weather, adoption of high technology and economic restructuring in the developing countries, especially in Africa, has greatly increased the world cocoa supply. The average growth rate over the last decade is recorded at 4.3 percent per year.

The industrial and developed countries are the major cocoa consumers. The major final consumers are Western Europe, followed by Americas, Asia and Oceania, Eastern Europe and Africa. In terms of individual countries, the largest final consumers are the United States, Germany, United Kingdom, and France. In recent years, the world cocoa consumption has maintained an upward trend. The growth rate has, however, tended to be less than required to keep pace with production, despite the low prices prevailing for most of the period.

The Cocoa Economy

The price of cocoa is highly volatile. This volatility induces wide fluctuations in the export revenues of the main cocoa producing countries such as Cameroon, Cote d'Ivoire and Ghana. The degree of price volatility, measured by Root Mean Square Deviation and MacBean Index, was respectively 34.1 and 18.5 (Fatimah and Mad Nasir, 1992). These volatility indicators for cocoa were among the highest as compared to other major agricultural commodities such as palm oil and natural rubber.

Cocoa prices mainly responded to cocoa supply and demand factors. International prices tend to follow a long-term pattern linked to the cocoa cycle, which had been estimated to be over 20 years. During cocoa boom periods there was a supply surplus that results in falling and then stagnating prices. Consequently, low prices due to overproduction generally had a negative impact on harvesting, encouraging farmers to switch to other crops, a factor which again permitted world prices to rise. The cocoa cycle was thus characterized by boom and bust effects.

Prices experienced an important increase in the 1970s, which encouraged production in countries such as Malaysia and Indonesia. However, since the beginning of the 1980s prices had declined. In spite of a modest recovery in the mid 1990s, international cocoa prices were low compared to those prevailing in the 1970s (Fig. 1).

US$ per tonne

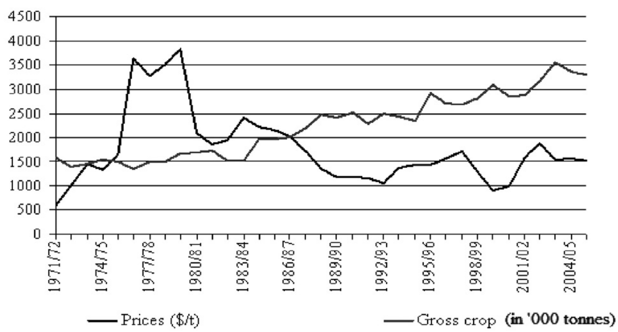

FIG. 1 World prices and production of cocoa (from 1971/72 to 2005/06)

Source: UNCTAD based on the data from International Cocoa Organization, quarterly bulletin of cocoa statistics

The world price of cocoa had fallen each year since 1983/84. The nominal daily prices then averaged US$2,412 per tonne. Most of the changes leading to this scenario had stemmed from the supply side; and not many changes had contributed to it on the demand side. The prolonged period of structural surplus had increased the level of stocks each year. Global cocoa production increased albeit at a much slower rate than in the past. This was due to the level of new plantings of the mid- to late 80s coming into maturity. The slow production growth was caused by poor farm management due to lower prices. After mid-90s the low level of new plantings, and replantings, as well as crop diversification resulted in a global production decline in some countries.

Market Structure

The performance of the cocoa industry was largely determined by its structure in relation to the degree of competition, barriers to entry and product differentiation. Imperfect structure leads to inefficient competition and pricing among the firms.

The world cocoa market structure is oligopolistic-oligopsonistic in nature. There are few numbers of traders and manufacturers. The main cocoa traders were ED&F Man, Rayner, ACLI and Hutton. The main cocoa manufactures which control about 60-80% of the market in 1990s were Cadbury-Schweppes, Nestle, ED&F Man and Rowntree. Today, the main manufacturers and distributors of cocoa and chocolate products for the chocolate confectionery and other food industries are Cargill, Archer Daniels Midland and Barry Callebaut. Some smaller firms with the same product lines are Schokinag Schokolade Industrie, Guttard Chocolate Company, Blommer chocolate Company and World's Finest Chocolate. The market of industrial and specialty chocolate is extremely concentrated (Fig 2). As a matter of fact, Barry Callebaut company owns more than half of the global market.

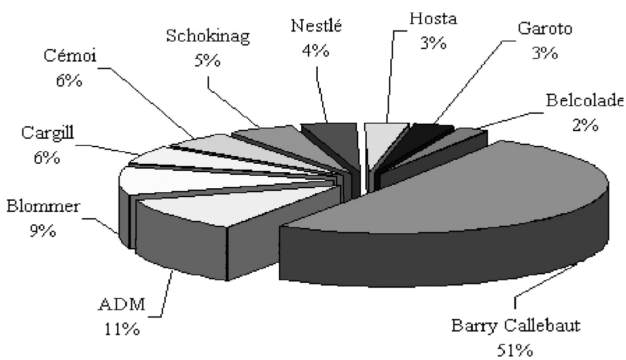

FIG. 2 Leading companies for the production of industrial and speciality chocolate in 2003

Source: UNCTAD based on the data from Barry Callebaut

Cocoa is grown principally in West Africa, Central and South America and Asia. In the early 1970s production was concentrated in Ghana, Nigeria, Côte d'Ivoire and Brazil, but it has now expanded to areas such as the Pacific region, where countries like Indonesia had shown spectacular growth rates in production. In order of annual production size, the eight largest cocoa-producing countries at present are Côte d'Ivoire, Ghana, Indonesia, Nigeria, Brazil, Cameroon, Ecuador and Malaysia (Fig. 3). These countries represent 90% of world production.

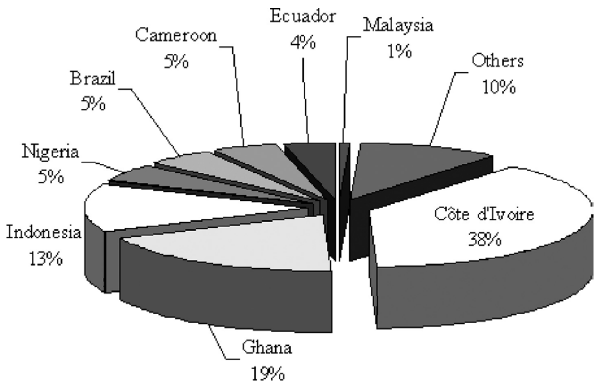

FIG. 3 Leading cocoa producers (2005/06 crop year forecasts)

Source: UNCTAD based on the data from International Cocoa Organization, quarterly bulletin of cocoa statistics

Generally, the leading producers are also the leading exporters. The notable exceptions had been Mexico and Colombia, whose exports had been appreciably lower than their respective production levels, reflecting the sizeable volume of domestic consumption in these countries. Although countries like Brazil and Malaysia are main producers, they were not necessarily large exporters due to the size of their processing industry, which absorbed local production. In Latin America for example, the Dominican Republic exported more cocoa beans than Brazil. There was evidence of the high degree of concentration among exporting countries, with the leading country (Cote d'Ivoire) accounting for nearly a third of world exports, and the top five countries accounting for 76.7 percent.

Although cocoa is largely produced in developing countries, it is mostly consumed in industrialized countries in Europe, North America, Japan and Singapore. Latin American countries had as their main export destination the United States, while Africa sold most of its cocoa to Europe. Asia mostly imported from Indonesia or Malaysia or from Ecuador and other South American countries. For cocoa, the buyers in the consuming countries were the processors and the chocolate manufacturers. A few multinational companies dominated both processing and chocolate manufacturing. Fig. 4 represents the main consumers of cocoa, based on the apparent domestic cocoa consumption, which is calculated as grindings plus net imports of cocoa products and of chocolate products in beans equivalent.

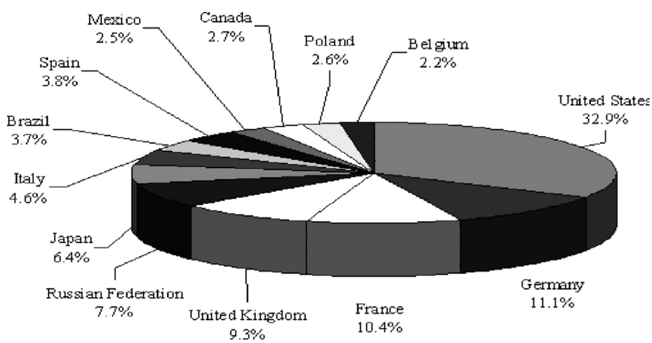

FIG. 4 Main consuming countries in 2004/05

Source: UNCTAD based on the data from International Cocoa Organization, quarterly bulletin of cocoa statistics

There was also a substantial degree of concentration among the major importing countries, although on a much lower scale compared with exporting countries. The United States was the dominant importer with a market share of 32.9 percent. The top five countries accounted for 71.4 percent, and the top ten countries accounted for 92.4 percent of world imports.

International Cocoa Agreement

The unstable cocoa price had become the main concern of both the producers and the consumers. The situation had led to the establishment of the International Cocoa Agreement (ICCA), the first of which was agreed in 1972. The agreement came into effect on the October 1, 1973 after more than 16 years of negotiation. The object of the agreement was to reduce the wide fluctuations in the price of cocoa and to establish a minimum price. To date, six agreements have been implemented, the last one being signed in 2001.

The Agreement includes 40 member countries of the International Cocoa Organization (ICCO), both exporters and importers of cocoa and one inter-governmental organization (the European Union). As of January 2001 the following countries were members of ICCO:

Exporting members: Benin, Brazil, Cameroon, Côte d'Ivoire, Dominican Republic, Ecuador, Gabon, Ghana, Grenada, Jamaica, Malaysia, Nigeria, Papua New Guinea, Peru, Sao Tome and Principe, Sierra Leone, Togo, Trinidad and Tobago and Venezuela.

Importing members: Austria, Belgium-Luxembourg, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Russian Federation, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom, European Union.

Externalities in Cocoa Production

Externalities in cocoa production are in general similar to many cocoa producers. Of the externalities identified, only the use of agro-chemicals such as fertilizers, insecticides, pesticides and fungicides could pose problems to the environment and are the major concerns to the producers and environmentalists alike. However, they are applied at minimum levels. Farmers in Ghana, for example, do not apply fertilizers except for demonstration and research purposes. Leaves litter provide enough nutrients to cocoa trees planted under thinned forests. Farmers are taught how to control pests and diseases through biological control, minimum use of insecticides, shade and canopy manipulation. The sweatings (fruit juice) and wastes from cocoa pod husks have already found uses and studies are undertaken to determine its viability as commercial products. Each stage of cocoa production, from planting to primary processing involves environmental externalities.

Options and Constraints in Sustainable Cocoa Production Systems

Cocoa production could move either towards plantations or towards smallholdings. The future depends on price structures, which respond to market forces, to the availability of new technology for the management of the crop, to the results of scientific research and finally to innovation.

Under traditional smallholder systems the ecology is diverse, plots tend to be randomly arranged, are smaller and are influenced to a greater extent by the biological diversity adjacent to them and within them. High levels of sanitation are rarely practised to any great extent and agricultural chemicals are seldom used. The environmentally friendly smallholder sector seems much more promising provided that prices show some improvement from the levels in the early 90s. Technology for smallholders must also advance in the areas of adequate yield potential under farmer management systems, particularly for low input systems which rely on integrated pest management involving a high degree of biological control of the major pests and diseases. Better planting material would be most helpful in achieving this.

Some 90 per cent of world cocoa production is grown on family holdings of two hectares or less. Establishment of cocoa trees has been traditionally under thinned forest shade, following logging and a few years of food crop production. Added value may be generated by the use of multi-purpose shade trees, improved establishment systems using cash crops, the use of legumes to enhance nitrogen nutrition during and after establishment and integrating cocoa with non-cocoa crop enterprises. The added value of other products from the cocoa trees, such as animal feed from cocoa pods and human food from the fermentation sweatings, could be an important economic incentive to production. Farmer inputs have been minimal. The main cost to the farmer is his own labour in harvesting, fermenting and sun-drying the crop in the absence of major pest and disease outbreaks. Weeding is only required during the establishment period or when canopies are thinned by heavy pruning. Nutrients are recycled through the development of leaf litter under the cocoa canopy and a healthy biological degradation into organic matter. The opportunity cost of keeping the land under cocoa could be high, especially when prices are low and the price of food crops in the markets are high. In Ghana in the 80s this resulted in much cocoa being abandoned, or even uprooted, and being replaced by food crops (Smith, 1994).

Plantation cocoa sector seems to be an uncertain one. Many commercial cocoa plantations have been established in Brazil, Malaysia, Indonesia and parts of the Pacific, but all have their problems and it has proved difficult to produce cocoa beans of the quality routinely produced by West African smallholders. Cocoa plantations have seldom proved to be a consistently good investment for the plantation companies or their shareholders. In Tawau, Malaysia (which is the country's largest cocoa area) some 1,753 ha of cocoa were replaced with oil palm in 1993. One hectare of cocoa returned RM800 a year as compared to RM3,300 a year from a hectare of oil palm at the Bal Plantations in Sabah. In plantation operation, all inputs including capital, infrastructure, administration, labour and its welfare and materials are fully costed and charged against revenue from sales. Since high capital expenditure is not required for traditional primary processing of cocoa beans, processing on a commercial scale does not add any material value to cocoa as produced on a small-scale by peasant farmers, in contrast to other major perennial plantation crops such as oil palms, rubber and coffee, all of which require a capital intensive processing facility. Thus, the need for large-scale fermentation and drying facilities by large plantations necessitates additional costs.

The Cost of Internalization

Studies in Brazil, Cote d'Ivoire, Nigeria and Malaysia revealed that the greatest potential source of environmental pollution in cocoa production and processing was the use of pesticides followed by the use of fertilizers. However, the use of pesticides in all these countries was still within acceptable limits. Only pesticide misuse in the form of lack of proper training for workers engaged in spraying, or provision of protective clothing, and the inadequate labeling and disposal of containers were serious. No efforts have been made to quantify the adverse effects on the environment and on the health of farmers to be considered in the pricing of cocoa beans. Despite a considerable decline in the application of pesticides during the 80s in Brazil, a commensurate decline in yields was not evident. In Malaysia, the use of pesticides, insecticides and fungicides was not a significant factor affecting the production of cocoa. The use of fertilizers in cocoa production in the major cocoa producing countries was very minimal. Cocoa farming systems were in some sense sustainable, due to their high relative ground cover and the recycling of organic matter as a means of maintaining soil fertility. There were in fact environmental benefits in the *cabruca* system in Brazil chiefly in the form of retention of a range of species representative of the threatened Atlantic Forest. In Malaysia, cocoa plantations were established on logged-over forests or intercropped with coconut and fruit trees for smallholders thus providing recycled nutrients to be shared between the crops.

To produce cocoa in a manner consistent with eco-friendly objectives requires investments in soil erosion prevention programmes, development of cost-effective biological control and integrated pest management system, research and development on clonal materials, cultural practices and rehabilitation, and farmers education and extension services. These require huge sum of investment by the government besides strengthening of the Environmental Protection Agencies. To compensate adequate soil management, disease prevention and maintenance of production infrastructure, cocoa growers in Brazil estimated to require international prices of at least US$1,700 or 13.33% above the minimum price of US$1,500 which just cover variable costs at average productivity. In Malaysia, a 10% reduction in the use of agro-chemicals by smallholders would require an additional cost of 15.6% above the cost of production under conventional production method. Thus, with the cost of production estimates of US$1,200-1,700, one would expect that the price of cocoa beans must be at least US$1,367 - 1,936 per tonne in international markets to just cover the variable costs. It was evident that the cost of internalization of externalities up to a possible level in cocoa production was small in the range of 10 to 16% of the private costs of production. While production of cocoa responded to the variations in cocoa prices through changes in the use of agricultural inputs, internalization costs associated with its production externalities was relatively small.

Each producer had different cost structure such that internalization of production externalities might result in higher cost of production for some countries but reduced cost for others. An integrated pest management (IPM), for example, when initially implemented would require additional labour, and despite a reduction in expenses for chemicals, might increase the cost of production due to the labour charges. In some countries with low wages, however, IPM practices would instead lower the cost of production. This was evidenced by the reduction in the cost of production by 77% in Indonesia. In Malaysia, one-third of the cost of production was accounted for by the labour for combating the cocoa pod borers in estates in Sabah.

Trade Effects of Sustainable Production: Simulation Results

Evaluating the economic impacts of an international commodity-related environmental agreement for cocoa involved two major steps. In the first step, a production function was estimated and the cost of an alternative technology quantified. Efforts to internalize environmental externalities increased the cost of production through the production function, estimated approximately at 15.6 percent (Khalid et.al., 1995). In the second step, a market model was developed and estimated. A conservative 14 percent increase in the cost of production due to internalization was chosen for simulation (though the difference was marginal) after taking account of expert opinions that only less than 10 percent reduction in agro-chemicals was plausible given their already low level of usage and the Brazilian estimate of 13.3% increase in price to compensate for sustainable production.

The structural equations of the Malaysian model are presented in Table 8. The Malaysian model was then simulated over a fifteen-year period, 1980-1995, to generate base solutions (Table 9). Simulation of the model was conducted by increasing the cost of production by 14 percent. As expected, the production of cocoa beans declined. However, the reduction in production was only marginal, i.e. 2.08 percent (Table 10). This was due to the inelastic response of the production to the cost of production. The inelastic response was quite common for perennial crops because investment in perennial crops like cocoa involved a long gestation period. Thus, once cocoa trees were planted, they became a fixed investment and as long as the market price was above the average variable cost, cocoa would be harvested. The effects on exports, domestic consumption and imports were also very marginal, at around 0.07, 0.58 and 1.14 percent, respectively.

TABLE 8 Estimated structural equations of Malaysian cocoa

Production

$$PRCB_t = 36129.306 \underset{(2.482)}{+ 4.696\,PC_t} \underset{(-3.198)}{- 6.464\,PC_{t-1}} \underset{(-0.661)}{- 0.679\,PC_{t-2}} \underset{(4.255)}{+ 7.998\,PC_{t-3}}$$

$$\underset{(2.491)}{+ 5.513\,PC_{t-4}} \underset{(-4.464)}{- 196.180\,RSS1_{t-3}} \underset{(-1.001)}{- 1.774\,COSPC_t} \underset{(-1.988)}{- 3.247\,COSPC_{t1}}$$

$$\underset{(-1.374)}{- 2.003\,COSPC_{t-2}} \underset{(23.032)}{+ 0.786\,PRCB_{t-1}} \underset{(9.570)}{+ 60268.738\,DUM}$$

$R^2 = 0.996$ $h = -0.014$

Domestic Demand

$$DDCB_t = -11193.923 \underset{(1.265)}{- 0.559\,PC_t} \underset{(2.323)}{- 1.578\,IMPC_t} \underset{(9.272)}{+ 0.729\,MPI_t}$$

$R^2 = 0.858$ D.W = 1.740

Import Demand

$$IMCB_t = 2207.72 \underset{(-2.789)}{- 0.030\,IMPC_t} \underset{(2.884)}{+ 0.003\,MPI_t} \underset{(-4.392)}{- 847.241\,XCR_t} \underset{(12.868)}{+ 1239.44\,DUMI_t}$$

$R^2 = 0.936$ D.W = 1.883

Domestic Price

$$PC_t = -959.677 \underset{(19.164)}{+ 1.126\,EXPC_t}$$

$R^2 = 0.973$ D.W = 1.852

Export Demand

$$EXCB_t = -70005.579 \underset{(-1.312)}{- 3.792\,EXPC_t} \underset{(16.940)}{+ 80.850\,WGDP_t} \underset{(1.408)}{+ 14501.225\,XCR_t}$$

$R^2 = 0.975$ D.W = 2.049

Export Price

$$EXPC_t = 656.639 \underset{(-0.081)}{- 0.0014\,STCB} \underset{(11.660)}{+ 1.894\,WPC_t} \underset{(3.367)}{+ 0.281\,EXPC_{t-1}}$$

$R^2 = 0.970$ $h = 0.495$

where,

$PRCB_t$ = production of cocoa beans	$IMPC_t$ = import price of cocoa beans
$DDCB_t$ = domestic demand of cocoa beans	MPI_t = Malaysian producer price index
$IMCB_t$ = import of cocoa beans	XCR_t = exchange rate
$EXCB_t$ = export of cocoa beans	$EXPC_t$ = export price of cocoa beans
PC_t = domestic price of cocoa beans	$WGDP_t$ = world income
$COSPC_t$ = cost of production	WPC_t = world price of cocoa beans
$RSS1_t$ = price of rubber	STCB = Malaysian stocks of cocoa beans

Note: Number in parentheses are t-values

TABLE 9 Historical simulation results of Malaysian cocoa

	PRCB	EXCB	DDCB	IMCB	EXP	PC
RMSPE	0.093	0.073	0.112	0.096	0.070	0.076
U	0.050	0.052	0.066	0.052	0.030	0.031
Um	0.034	0.000	0.011	0.022	0.009	0.036
Us	0.073	0.012	0.032	0.053	0.004	0.119
Uc	0.893	0.988	0.957	0.925	0.987	0.845

Note: Um - fraction of error due to bias
Us - fraction of error due to different variation
Uc - fraction of error due to different covariation

TABLE 10 Average simulated values of endogenous variables with an increase in production cost

Variables	Baseline Values	Simulated Values	% Change
PRCB	154072.58	150864.58	-2.082
EXCB	112062.93	111976.79	-0.076
DCCB	39844.92	39615.22	-0.576
IMCB	496.54	490.88	-1.140

The reduced quantity in the Malaysian production and quantity exported was inserted in the world market model. The model was then simulated without and with reduction in the Malaysian cocoa production. The simulation results indicated that there were no changes in the world cocoa prices (Table 11). Since Malaysian export price was very much dependent on the world price, there was also no change in the Malaysian export price. Thus, if Malaysia alone were to implement the environment friendly production practices, it would incur additional cost of production without additional increase in output prices.

TABLE 11 Estimated structural equations of world cocoa

Production

$$WPRCBt = -324.899 + \underset{(2.184)}{0.017\ WPC_t} + \underset{(2.261)}{0.026\ WPC_{t-1}} - \underset{(-1.166)}{0.0167\ WPC_{t-2}}$$

$$- \underset{(-0.116)}{0.001\ WPC_{t-3}} + \underset{(2.377)}{0.025\ WPC_{t-4}} + \underset{(1.166)}{0.028\ WPC_{t-5}} + \underset{(2.113)}{0.706\ WPRCB_{t-1}}$$

$R^2 = 0.940$ D.W = 2.029

Demand

$$WKOC_t = 1290.676 - \underset{(-2.839)}{0.083\ WPC_t} + \underset{(9.673)}{0.328\ WY_t}$$

$R^2 = 0.949$ D.W = 1.823

Price

$$WPC_t = -988.617 - \underset{(2.325)}{0.679\ WSTOK_t} + \underset{(1.861)}{1.115\ WKOC_t} + \underset{(8.443)}{0.630\ WPC_{t-1}}$$

$$+ \underset{(4.987)}{128.121\ DUM}$$

$R^2 = 0.869$ D.W = 2.076

where,

$WPRCB_t$ = world production of cocoa beans

$WKOC_t$ = world consumption of cocoa beans

WPC_t = world price of cocoa beans

WY_t = world income

$WSTOK_t$ = world stock of cocoa beans

Note: Number is parentheses are t - values

Problems and Obstacles in International Negotiations

As that of the GATT, in practice decision-making process was undemocratic. Most of the nations, and even more the developing nations, were sidelined while the final outcome was determined principally by the two majors, the United States and the European Union, through bilateral negotiations outside the multilateral process, and sometimes in conjunction with Japan. Because of this the Third World Network had called upon countries in the South to oppose attempts to bring in new issues like environment, labour standards and human rights into the WTO agenda. The Network was of the view that inclusion of these issues was being sought not for advancing the cause of the environment or human rights but with the objective of reducing the competitiveness of the South. A major reason why environmental policies and standards of OECD countries were perceived to be potential barriers to trade of developing countries was that in formulating them, the characteristics of production or production processes used in developing countries were generally ignored. Aware of these issues, the exporting countries should be in a position to act positively to the challenges in the negotiation process with a carefully negotiated mandate. In terms of the mandate, exporting countries should be promised an expanded market access and thus increased export earnings for their commodities, in return for their agreement to incorporate the requirements for ecologically sound development proportionate to their natural resource endowments, levels of pollution, waste and absorptive capacities, systems of production, labour and capital intensities and levels of development.

When Malaysia attained a production level that put her at par with Ghana, although still well below those of Cote d'Ivoire and Brazil, Malaysia was interested in cooperating with other world cocoa producers to resolve problems afflicting the cocoa market. Malaysia joined the Cocoa Producers Alliance (CPA) and the International Cocoa Organization (ICCO) to participate in international endeavours to protect and advance the interest of commodities and in the South-

South co-operation where commodities featured significantly in the well being and economic performance of countries of Asia, Africa and Latin America. The CPA comprised of 12 cocoa producing countries in Africa and Latin America. With the growing importance of production from countries in the Asia-Pacific region, the participation of Malaysia and such other countries concerned in CPA would provide a stronger base for co-operation in overcoming problems facing the cocoa industry. The founding members of CPA in 1962 at Abidjan were Brazil, Cameroon, Ghana, Ivory Coast and Nigeria, and in 1963 Togo joined, followed by Gabon in 1975. The CPA was born out of continuing frustration of the hope by producers of securing meaningful co-operation from consumers for the stabilization of world cocoa prices, the talks concerning which started in 1956.

The International Cocoa Agreement (ICCA), which came into effect on October, 1972, began talks in 1963. The fifth International Cocoa Agreement signed at a special meeting in February 1994, convened by UNCTAD saw the withdrawal of Indonesia from the agreement, while USA and the Russian Federation were the major consumers non-signatory to the agreement. Consuming countries that have signed the agreement represented 55% of the world imports. Given these situations, international agreements are difficult to negotiate. Negotiations on International Commodity-Related Environmental Agreement (ICREA) for cocoa could not be any easier and with voluntary participation, it can be imagined that some of the major producers and consumers would be left out.

Among the aims and objectives of ICCA was to provide an appropriate forum for the discussion of all matters relating to the world cocoa economy. Thus, trade and environmental concerns related to the industry could be dealt within ICCA to expedite discussions on the issues and to avoid duplication of establishing a secretariat, though ICREA should not be rejected pre-emptively. ICCA and ICREA may not be mutually exclusive but industry experts believe that ICREA can be absorbed within ICCA.

Case #6: **Trade and Sustainable Pepper Production** *(Study funded by Fundamental Research Grant 2003)*

Pepper is grown predominantly in the state of Sarawak which accounts for 98% of Malaysia's production. Malaysia is now the sixth largest pepper producer in the world after Vietnam, India, Indonesia, Brazil and China with an annual production of about 20,000t in 2005. In terms of export, Malaysia ranks fifth with an annual export volume of 18,000t (IPC, 2006). Sarawak pepper is well-known for its consistency and reliable quality in the international market. Pepper prices have always been volatile.

Though pepper export only contributes trivially to the national economy, its economic and political significance in the state of Sarawak is profound. Pepper cultivation is mainly carried out by the rural poor smallholders. Pepper is in fact the most important cash crop in Sarawak, providing employment to some 74,710 families in the state (DOA Sarawak, 2005).

Pepper farmers have involved in its cultivation for years, as such they were used to their traditional methods of cultivation which depended heavily on chemical inputs. Thus, to promote eco-friendly pepper production in Malaysia, a public policy to educate and change the mindsets of these illiterate pepper farmers is imperative. One of the feasible policy options might be to enact stricter environmental regulations through raising the costs of chemical inputs used by pepper farmers so that the farmers were induced to produce only eco-friendly pepper products that comply with international environmental standards or meet the food safety requirements set in the global arena.

The objective of this study was to evaluate the export market competitiveness of adopting eco-friendly pepper production in Malaysia. Simulation analysis was carried out using the modified version of Larson et al's. (2002) methodology to examine the impacts of the proposed policies to induce a reduction or even total elimination of the use of chemical inputs on pepper production in Malaysia so that practical policy options for the development of a viable and competitive pepper industry in Malaysia can be implemented. The sample period of 1980-2004, included periods of high pepper prices, which prevailed between 1985 and 1989 and during the Asian financial crisis period in 1997-2000.

Results of our simulation are presented in Tables 12 and 13. Scenarios 1, 2 and 3 reflect the increase of chemical input prices of 10 percent, 50 percent and 100 percent respectively during the periods of high and low profitability. The higher the increase in the chemical cost, the greater would be the reduction in the production and export of pepper, ceteris paribus. A similar price increase in chemical input was seen to have greater impact on black pepper relative to white pepper. When stricter environmental regulations were imposed by government which would cause chemical input to become more expensive, producers will normally react by reducing the use of the relatively more costly chemical inputs or even totally eliminate their use. This is particularly true if the input price had increased substantially and significantly. The increase in cost of chemicals would encourage farmers to be more judicious in utilizing their limited resources and also to be more efficient in their production process.

However, when pepper farmers were induced to produce cleaner- and safer-to-consume pepper products due to the increase in chemical cost, this subsequently caused a higher price being fetched in the international market for the higher quality pepper produced in Malaysia. By taking into consideration the export price adjustment, the simulation results suggest that a 10% increase in the chemical cost alone would increase black pepper production by between 0.47-0.62% and black pepper export by 0.50-0.65% and it would increase white pepper production by 0.20-0.33% and white pepper export by 0.20-0.34%. After taking into account the export price adjustment, a 50% increase in the chemical cost alone, however, would increase the black pepper production by 2.37-3.11% and black pepper export by 2.48-3.25% and it would cause an increase of 0.98-1.64% and 1.01-1.68% for white pepper production and white pepper export respectively. In addition, an increase in chemical cost by 100% would induce 4.74-6.22% more black pepper to be produced and 4.96-6.50% more to be exported whereas it would induce 1.97-3.27% additional white pepper to be produced and 2.01-3.35% additional to be exported.

Disparities in the impacts of stricter environmental regulations on pepper production and export for white as contrasted to black pepper before the export price adjustment could be explained by the fact that black pepper farmers are mostly very poor farmers. Whenever there is an increase in the chemical input cost, they must reduce the use of chemical input drastically in their production process, which would subsequently cause a greater reduction in the black pepper production and export as compared to white pepper production and export.

Despite that, after taking into account the export price adjustment, the impacts of stricter environmental regulations were seen to give more significant positive effects on black pepper production and exports compared to white pepper. This showed that a genuine improvement in black pepper quality would occur if government were to impose stricter environmental regulations since white pepper had already been considered as cleaner products relative to black pepper because of its additional processing. Thus, it was clearly seen from the simulation analysis that imposing stricter environmental regulations by increasing the cost of chemical inputs used by pepper farmers to promote eco-friendly pepper production did not threaten the export competitiveness of our pepper industry. Indeed, it will enhance the export market competitiveness of the pepper industry in Malaysia and the effect is particularly significant in the black pepper production and export than in the white pepper production and export.

TABLE 12 Simulation results for Malaysian black pepper case study

	Notation	High profitability			Low Profitability		
		Scenario 1 (10%)	Scenario 2 (50%)	Scenario 3 (100%)	Scenario 1 (10%)	Scenario 2 (50%)	Scenario 3 (100%)
Basic Information:							
Output	Yb	Black Pepper	Black Pepper	Black Pepper	Black Pepper	Black Pepper	Black Pepper
Regulated/Affected input	X	Chemical	Chemical	Chemical	Chemical	Chemical	Chemical
Supply elasticity**	η_{Yp}	2.0771	2.0771	2.0771	2.0771	2.0771	2.0771
Input cost share	-Sx	-0.1975	-0.1975	-0.1976	-0.1975	-0.1975	-0.1975
Profitability factor	1/(1+_)	0.7260358	0.7260358	0.7260358	0.95238095	0.95238095	0.95238095
Return to scale factor	η^c_{XY}	2.00	2.00	2.00	2.00	2.00	2.00
Basic model results:							
Cross price elasticity	η_{Yw}	-0.59568	-0.59568	-0.59598	-0.78139	-0.78139	-0.78139
Policy scenario: a 10% increase in chemical cost	(dw/w)x100	10.00			10.00		
Policy scenario: a 50% increase in chemical cost	(dw/w)x100		50.00			50.00	
Policy scenario: a 100% increase in chemical cost	(dw/w)x100			100.00			100.00
Percentage change in black pepper production	dY/Y	-5.9568	-29.7840	-59.5981	-7.8139	-39.0693	-78.1385
Export share of total production	E/Y	0.90	0.90	0.90	0.90	0.90	0.90
Percentage change in black pepper export	dE/E	-6.6187	-33.0933	-66.2201	-8.6821	-43.4103	-86.8206
With export price adjustments:							
Domestic demand elasticity	η_{Bp}	0.091080	0.091080	0.091080	0.091080	0.091080	0.091080
Domestic consumption as share of total production	B/Y	0.10	0.10	0.10	0.10	0.10	0.10
Export demand elasticity*	η_{Dp}	0.16	0.16	0.16	0.16	0.16	0.16
Exports as a share of total production	E/Y=D/Y	0.9	0.9	0.9	0.9	0.9	0.9
Export price elasticity	η_{pw}	0.30961	0.30961	0.30976	0.40613	0.40613	0.40613
Final supply elasticity with respect to input price	Ω_{Yw}	0.04740	0.04740	0.04743	0.06218	0.06218	0.06218
Final export elasticity with respect to input price	η_{Ew}	0.04954	0.04954	0.04956	0.06498	0.06498	0.06498
Final % change in output	dY/Y	0.47403	2.37016	4.74271	0.62181	3.10907	6.21813
Final % change in exports	dE/E	0.49537	2.47685	4.95620	0.64980	3.24902	6.49803

Notes: * This elasticity estimate is borrowed from the study done by Julie and Kanbur (1993)

** This elasticity estimate is computed from this study

TABLE 13 Simulation results for Malaysian white pepper case study

Basic Information:							
Output	Yw	White	White	White Pepper	White	White	White
Regulated/Affected input	X	Chemical	Chemical	Chemical	Chemical	Chemical	Chemical
Supply elasticity**	η_{Yp}	2.7186	2.7187	2.7188	2.7189	2.7190	2.7191
Input cost share	-Sx	-0.1975	-0.1975	-0.1975	-0.1975	-0.1975	-0.1975
Profitability factor	1/(1+_)	0.5457326	0.5457326	0.5457326	0.90909091	0.90909091	0.90909091
Return to scale factor	η^{c}_{XY}	1.10	1.10	1.10	1.10	1.10	1.10
Basic model results:							
Cross price elasticity	η_{Yw}	-0.32232	-0.32233	-0.32234	-0.53698	-0.53700	-0.53702
Policy scenario: a 10% increase in chemical cost	(dw/w)x100	10.00			10.00		
Policy scenario: a 50% increase in chemical cost	(dw/w)x100		50.00			50.00	
Policy scenario: a 100% increase in chemical cost	(dw/w)x100			100.00			100.00
Percentage change in white pepper production	dY/Y	-3.2232	-16.1165	-32.2342	-5.3698	-26.8501	-53.7022
Export share of total production	E/Y	0.90	0.90	0.90	0.90	0.90	0.90
Percentage change in white pepper export	dE/E	-3.5813	-17.9072	-35.8158	-5.9665	-29.8335	-59.6691
With export price adjustments:							
Domestic demand elasticity	η_{Bp}	0.12283	0.12283	0.12283	0.12283	0.12283	0.12283
Domestic consumption as share of total production	B/Y	0.10	0.10	0.10	0.10	0.10	0.10
Export demand elasticity*	η_{Dp}	0.16	0.16	0.16	0.16	0.16	0.16
Exports as a share of total production	E/Y=D/Y	0.9	0.9	0.9	0.9	0.9	0.9
Export price elasticity	η_{pw}	0.12579	0.12579	0.12579	0.20954	0.20954	0.20954
Final supply elasticity with respect to input price	Ω_{Yw}	0.01966	0.01966	0.01966	0.03275	0.03275	0.03275
Final export elasticity with respect to input price	η_{Ew}	0.02013	0.02013	0.02013	0.03353	0.03353	0.03353
Final % change in output	dY/Y	0.19659	0.98295	1.96590	0.32748	1.63741	3.27481
Final % change in exports	dE/E	0.20127	1.00633	2.01266	0.33527	1.67635	3.35270

Notes: * This elasticity estimate is borrowed from the study done by Julie and Kanbur (1993)

** This elasticity estimate is computed from the study

LESSONS FROM THE EVIDENCE

Many studies have concluded that the trade and competitive effects of environmental control can be small and need not have serious economic consequences. However, the effects can be felt substantially on the individual industries. Empirical evidence shows quite clearly that the competitive effects on trade of environmental controls are highly industry-specific. Even then, the costs of meeting environmental requirements are affordable by the industries. Similarly, the environmental effects of liberalized trade can be industry-specific. Obviously, domestically-driven expansions of polluting industries are excluded in the studies on trade and environment. The transport sector, for example, could be very polluting in a country, but since it enters trade indirectly via transportation costs in traded goods, the effects of controlling pollution in this sector have been excluded because intuitively, they are very small.

The methodologies used to evaluate the trade and environment linkages differ not only among countries but also among issues. However, in most country case studies on trade and environment some primary data have been collected. The main findings of each country differ and these set a wider scope of research that is on-going on the trade-environment linkages.

Our case studies offer several lessons for developing economies.

- First, active development strategies aimed at eradication of poverty and economic development can run parallel with, and complementary to, efforts to increase the quality of life through preventive environmental management. Sustainable development cannot be achieved-especially in the developing countries-without substantial economic growth and changed patterns of investment (Khalid, 1989).
- Second, economic development and environmental quality control can occur simultaneously without seriously affecting growth and trade. Increases in production costs can be incorporated into the prices of goods where

consumers are willing to pay higher prices for environmentally-friendly produced goods. Increases in the costs of production can also induce technological innovation which increases productivity. At the same time, not all economic growth supports sustainable development. Indeed, the apparent disregard of the trade policy community for the sometimes harmful effects of trade-generated growth is one of the sources of tension with the environmental and development communities (Khalid, 1989).

- Third, the trade effects of environmental control can be small and need not have serious economic consequences (Khalid and Braden, 1993). Resources can be reallocated to next best alternative uses so that the welfare loss can be minimized.
- Fourth, the efficiency and efficacy of pollution control policies and programmes suited for each country can alleviate environmental problems associated with trade liberalization. Trade liberalization and sustainable development are not unavoidably incompatible. Trade liberalization can advance sustainable development goals, just as it can retard their achievement. The difference depends on how policies in the respective areas are crafted, and how negotiations in the respective areas are linked. The lack of linkage-or even sustained dialogue-between the different policy arenas has led to trade policies that inadequately support-and sometimes undermine-sustainable development.
- Finally, the small and medium scale enterprises (SME) are those which could be most vulnerable to environmental standards because their access to capital and technologies are limited.

Recent studies have supported much of our earlier findings and recommendations. The controversy often exists between researchers on the effects of stricter environmental regulations on trade competitiveness. For instance, Panayatou (2000) has highlighted that developing countries could ill afford the adverse effects of tightening environmental regulations through increases in production cost and corresponding reduction in profitability and competitiveness of the export commodities (Khalid, 1989). However, Porter and van der Lindel (1995) asserted that environmental regulation can induce firms to innovate cleaner technologies to reduce cost of production and thus increase competitiveness in a dynamic world (Refer ISIS, 1996: The Montreal Protocol). This argument is further supported by studies done in Australia which concluded that environmental reforms do not affect the competitiveness of the agriculture sector in Australia (Randy & Anderson, 2000; Khalid, 1993). Nevertheless, Jaffe et al. (1995) stated that the impact of environmental regulation on trade competitiveness may differ according to structural or market characteristics of the industries concerned (Khalid and Braden, 1993). Besides that, according to Larson et al. (2002), no generalization can be made about the effects of environmental regulations on exports (Khalid, 1991). The effects would critically depend on the magnitude of the policy change, the share of the importance of the regulated input in production cost, supply response, and demand elasticities and the possibility for efficiency improvements. Small policy changes affecting inputs that account for a small portion of overall costs of products that have relatively inelastic export demand will have minor effect on export, vice versa (Larson et al., 2002; Khalid and Braden, 1993). Thus, due to the economic, social, ecological and institutional diversity of the nations of the world, Malaysia needs to work out its own policy implications based on its own empirical studies to evaluate the export market competitiveness of national producton.

CONCLUSION

Environmental issues transcend national boundaries through goods traded in the international markets. Internalization of environmental externalities of economic activities is a necessary step towards sustainable development. However, internalization is not only related to the identification of instruments to be used for its implementation, but also to the implications of such use at the international level.

Lessons from the theoretical aspects and empirical work on international trade and environment are deliberated by government agencies, non-governmental organizations, businesses and tertiary institutions at domestic and international levels. Studies have shown mixed results indicating that generalizations on the trade impacts of environmental regulations are unwise. Thus, trade and environment linkages remain an issue which calls for a continuous study and political economic solution in the short term.

Malaysia is a trade-dependent industrializing country which could offer several useful lessons for implementation of pollution control without impairing economic growth. Industrial expansion and pollution reduction have occurred simultaneously. Even as pollution controls have intensified, the economy has grown consistently at about 8 percent annually and the country's position as one of the top 20 leading exporters keeps on elevating. One reason for the general success is technology; with the country's vision of achieving developed country status, efficient technologies are acquired through research and development efforts both by government and industry. Technology is central to the issue of internalizing externalities and constitutes an integral part of any strategy to promote more sustainable patterns of development. New technologies are now available which can provide a wide range of solutions to the recognized problems of the environment.

Another reason for the parallel success in the country's efforts in pollution reduction and economic growth is the strong cooperation between the government and the industry. Environmental regulations have been formulated with inputs from various sectors of the economy including business and industry. The enforcement of environmental regulations has sometimes been gradual within a specified time frame, taking into account the best available technology and the welfare of the producers. While the regulations do provide some flexibility in the form of waivers by application of contravention licenses in specific cases, the stringency of standards has not been compromised, and the enforcement of collection of due penalties such as fees and fines, with court action where necessary, confirm the government's seriousness in environmental matters. The government's roles as a regulator and facilitator are understood by the industry. Thus industries turn to the government when problems arise which could not be handled individually; examples are the setting up of a national landfill and a national waste treatment facility.

A third reason for the country's success is the effective internalization of externalities through international sources of finance. The costs of switching to environmentally-sound technologies can be fixed or variable. In the case of fixed costs, changing technologies entail an adjustment cost such as that of researching and developing new techniques, the physical cost of new machinery or training for the new clean technology. One of the ways to overcome or internalize this cost can be through the provision of subsidies or financial incentives to encourage producers to voluntarily make the switch to the new technology. The main problem with this approach is the lack of funds. Malaysia has benefited from acceding to the Vienna Convention and the Montreal Protocol by receiving some US$ 4.2 million for the period of 1991-93 in assistance from the Multilateral Fund of the Montreal Protocol to cover the phasing-out of ten ODS investment projects, institutional strengthening, and technical assistance.

Many environment-related trade (ERT) instruments being formulated over the last three decades may have the potential to be classified as non-tariff barriers (NTB) to trade and pose significant impacts for developing countries. Multilateral environmental agreements, such as the Montreal Protocol and the Basel Convention may have trade restrictions which contravene the liberalized trade principles of GATT/WTO. Other trade instruments are increasingly being used to achieve environmental objectives at the national and international levels. Proposals to use trade measures to promote external environmental objectives, such as sustainable resource use in other countries, are increasing. Trade measures may have a role to play in influencing the price of imports to more accurately reflect their resource or environmental costs.

Malaysia has depended very much on the existing legal and institutional arrangements for the implementation of its environmental policy objectives and strategies. In addition to the National Environmental Policy and the Environmental Quality Act, 1974, Malaysia has had more than 35 environment-related legislations since the early 1920s when various water enactments were passed. These pieces of legislation contain provisions or references that were related to environmental control. Malaysia's Vision 2020 envisages an economic development framework where environmental conservation and protection are continually assured. It warns against `growth fixation', the danger of pushing for growth figures oblivious to the need to ensure sustainability and to improve the quality of life.

The private companies in the country are aware of the impact of their manufacturing process on the environment and are gearing their activities to adopt a pro-active approach. They are training their workers to be more aware and conscious about environmental issues. They also provide information on environmental conservation activities to the public, including school children in line with their responsibility to the community. Many companies have adopted annual environmental auditing procedures focusing on management systems and standard operating procedures to ensure they comply with environmental standards. SMEs, a majority of which are under-capitalized and use low technology, face many problems including the disposal of hazardous and toxic wastes. Since they are widely dispersed, it has become extremely difficult for authorities to educate them on pollution control measures and to adopt environmentally friendly methods. Many of them are unaware or seem to ignore the regulatory requirements under the EQA by persistently failing to comply with environmental regulations.

Investment promotions and approval processes in Malaysia take environmental considerations into account before licenses are awarded. This ensures that environmentally damaging industries are not allowed to locate in Malaysia. The majority of foreign investments approved were for the electrical and electronics industry, the chemicals industry, and the textiles industry. In general, the industries dominated by domestic investment registered the lowest degree of compliance with sewage and effluent regulations while the electrical and electronics industry which is dominated by foreign multinationals registered the best performance in terms of compliance with environmental regulations.

Information on environmental regulations and environmental responsibilities of investors are freely available, through official publications of MITI, MIDA, and the DOE. Once they have been approved to operate in the country, all investors need to comply with Malaysia's Environmental Quality Act 1974 or negotiate environmental performance criteria if they request contravention licenses.

The extent of investment diversion from Malaysia resulting from the stringency of environmental standards is highly complex. Investment location decisions are usually determined by a host of factors including political stability, availability of raw materials and other inputs, markets, the availability of labour and skills, investment incentives, and infrastructure. The pollution-intensive industries in Malaysia are dominated largely by domestic rather than foreign investors, except in the petroleum and coal products industry and the beverages industry. Relocating to other countries where environmental costs are lower seem to be a temporary measure as other countries would, with some certainty, also impose stringent environmental measures.

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BIOGRAPHY

Prof. Dr. Khalid Bin Abdul Rahim was born on January 22, 1953 in Muar, Johor. He is the fourth of eight siblings and eldest son of Hj Abdul Rahim Bin Hj Rais (1918-present) and Hajjah Yang Binti Hj Jamil (1928-present). His father was a Johor Religious School Teacher from 1941 to 1973 who received awards of Guru Berjasa in 1989 and recently the Anugerah Maulidur Rasul from the Persekutuan Guru-guru Melayu Johor (2007). He is the grandson of Hj Rais Wastiar, also known as Tok Uban (1854-1944) who was the Naib Kadhi of Muar District and the Imam of Kampung Tanjung Selabu.

He received a headstart in his primary education at Ismail School (One) 1960-1965. His secondary education was at Muar High School (1966-1970) where he was a group leader of the boys scout and a school prefect. His college education began at the College of Agriculture Malaya (1971-1974). He left for the United States to pursue his studies at Louisiana State University and obtained his Bachelor of Science there in 1976. His Master of Science degree was from the University of Kentucky in 1978. He came back to join UPM in 1979 as a lecturer and left for the United States again for his Ph.D. He obtained his Ph.D. at the University of Illinois at Urbana-Champaign in 1989.

Khalid received the Outstanding Ph.D. Dissertation Award from the Department of Agricultural Economics, University of Illinois in 1989. He received an Award from the Tun Razak Foundation for the Best Written Contribution on Malaysian Economy in the Theses and Dissertations category cashing in RM25,000 in 1993 which was presented by the then Prime Minister of Malaysia, Tun Dr. Mahathir Mohamad. In 2004, he received the Best Paper Award at the First International Borneo Business Conference, at Kota Kinabalu. In 2005 he received a silver medal award from the Agricultural Economics Association of Malaysia (PETA) and another silver medal from the UPM Inventions, Research and Innovation Exhibition.

Khalid was a lecturer from 1979, Associate Professor in 1995 and Professor in 2002. He was a Visiting Fellow to the Institute of Strategic and International Studies (ISIS Malaysia) from 1994 to 1996. He was the Coordinator of Environmental Economics from 1994 to 1996 in the Network of Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP) for the United Nations Environment Programme (UNEP).

He was appointed one of the Key Writers for the UNICEF/Scott Wilson monograph project on Malaysia's Millennium Development Goals (MDG) focusing on MDG-7, that is, for Ensuring Environment Sustainability from 2003 to 2004.

In 2003 Khalid was appointed as a member of the Regional Task Force on Economic Valuation for the UNEP/GEF Project on Reversing the Degradation Trends of Coastal Environmental Resources in the South China Sea, a project which runs through 2008. In 2006, he was appointed as a member of the Regional Scientific and Technical Committee for the same UNEP/GEF project. Currently, he is the Chairman of the Regional Task Force on Economic Valuation for the same UNEP/GEF project, elected at the recent meeting at Batam in January this year.

Prof. Dr. Khalid has a list of International Consultancies to his credit:

- He received US30,000 from the Netherlands Department of Cooperation through Free University of Amsterdam to study on the Feasibility and Appropriateness of International Commodity Related Environmental Agreements (ICREA) for the World Cocoa from 1994 to 1995.
- US20,000 from the United Nations Commission on Trade and Development (UNCTAD) in Geneva to study on Malaysia's Trade and Environment Linkages from 1994 to 1996.
- US14,000 as the Coordinator of Environmental Economics in the Network for Environmental Training at Tertiary Level in Asia and the Pacific (NETTLAP) from 1994 to 1996 from UNEP in Bangkok.

- Travel Award and Honorarium from UNEP for expert group meeting on Economic Valuation in Nairobi, Kenya in 1994.
- Travel Award and Honorarium from OECD Secretariat in Paris for a dialogue between OECD and Dynamic Non-member Countries in 1995.
- US18,500 from the United Nations Development Programme to study Malaysia's position on Trade and Environment within ASEAN Sub-Programme in 1996.
- Travel Award and Honorarium from UNCTAD as a Resource Person at the Sub-regional Workshop on Environmental Management of Natural Resource-based Sectors in Hanoi in 1996
- US8,000 from United Nations Economic and Social Commission in Asia and the Pacific (ESCAP) to study the Integrating Environmental Considerations into the Economic Decision Making Processes for Malaysia from 1996-1997.
- CAD20,000 from Canadian International Development Agency (CIDA) through the Economy and Environment Programme for South East Asia (EEPSEA) to study a Comparative Assessment of Environmental and Resource Accounting for 4 ASEAN countries from 1997 to 1998.
- Travel Award and Honorarium from USAID as a Resource Person in the Philippines Workshop on Environment and Natural Resource Accounting (ENRA) in 1998.
- Travel Award and Honorarium from Asia and the Pacific Economic Cooperation (APEC) to study the Feasibility of Cooperation in Trade and Environment in Beijing in 1999.
- Travel Award and Honorarium for Expert Group Meeting on Trade and Environment for Developing Economies in Geneva in 2000.

- Honorarium for writing a book on Environmental Economics for Malaysian Universities from Denmark International Development Agency (DANIDA) and Malaysian Universities Consortium on Environment and Development (MUCED) in 2002.
- Honorarium for Key Writer in monograph project on Malaysia's Millennium Development Goals from the United Nations Children's Fund (UNICEF) and Scott Wilson in 2003 to 2004.
- US13,000 to study the literature on Economic Valuation of Coastal Environmental Resources in Malaysia from 2006-2008.
- Travel Awards for being the member of the Regional Task Force on Economic Valuation for the UNEP/GEF South China Sea project from 2003 to 2008.

At the National level Khalid was a member in several Consultancy projects including for:

- PETRONAS GAS Sdn Bhd. from 1987 to 1995
- Sarawak Land Consolidation and Rehabilitation Authority (SALCRA) from 1989 to 1990
- Johor Development Authority (KEJORA) from 1983 to 1984.
- Ministry of Trade and Industries from 1983 to 1984.
- Sarawak State Government from 1981 to 1982.

Khalid has been a member of the ad hoc Review Panel for several Environmental Impact Assessment (EIA) studies, the significant high profiled ones include:

- The Bakun Hydro-Electric Power project, 1995
- The Penang Hill Resort project, 1990
- The Johor Sungai Linggui Reservoir project, 1990

- The Manjung District Land Reclamation and Deep Water Terminal project in Bagan Datoh, 1997
- The Olak Lempit Industrial Zone, 2005

Khalid has a list of publications, the popular ones which are mostly cited internationally are:

- In 1991: The Environmentalist in U.K.
- In 1993: The Journal of Agricultural Economics in U.K.
- In 1997: A Chapter in a Book published by Harvard University Press, Boston.
- In 2001: A Chapter in a Book published by Greenleaf Publishing Limited in U.K.
- In 2002: A Chapter in a Book published by Elgar Publishing Limited in U.K.
- In 2005: A Chapter in a Book published by the Resources for the Future in Washington
- In 1999: A Chapter in a Book published by the United Nations in New York
- In 1994: A Chapter in OECD Documents published in Paris.

In terms of administration, Khalid has been:

- Head of Marketing and Trade Policy Laboratory, Institute of Agricultural and Food Policy Studies (IKDPM) from July 2005 to May 2006.
- Head of the Hospitality and Recreation Department, Faculty of Economics and Management from June 2006 to January 2007.

Currently, Professor Dr. Khalid is the Deputy Dean (Academic and Internationalization) of the Faculty, whose appointment started on February 2, 2007.

List of Inaugural Lectures

1. Prof. Dr. Sulaiman M. Yassin
   The Challenge to Communication Research in Extension
   22 July 1989

2. Prof. Ir. Abang Abdullah Abang Ali
   Indigenous Materials and Technology for Low Cost Housing
   30 August 1990

3. Prof. Dr. Abdul Rahman Abdul Razak
   Plant Parasitic Nematodes, Lesser Known Pests of Agricultural Crops
   30 January 1993

4. Prof. Dr. Mohamed Suleiman
   Numerical Solution of Ordinary Differential Equations. A Historical Perspective
   11 December 1993

5. Prof. Dr. Mohd. Ariff Hussein
   Changing Roles of Agricultural Economics
   5 March 1994

6. Prof. Dr. Mohd. Ismail Ahmad
   Marketing Management: Prospects and Challenges for Agriculture
   6 April 1994

7. Prof. Dr. Mohamed Mahyuddin Mohd. Dahan
   The Changing Demand for Livestock Products
   20 April 1994

8. Prof. Dr. Ruth Kiew
   Plant Taxonomy, Biodiversity and Conservation
   11 May 1994

9. Prof. Ir. Dr. Mohd. Zohadie Bardaie
   Engineering Technological Developments Propelling Agriculture into the 21st Century
   28 May 1994

10. Prof. Dr. Shamsuddin Jusop
    Rock, Mineral and Soil
    18 June 1994

11. Prof. Dr. Abdul Salam Abdullah
    Natural Toxicants Affecting Animal Health and Production
    29 June 1994

12. Prof. Dr. Mohd. Yusof Hussein
    Pest Control: A Challenge in Applied Ecology
    9 July 1994

13. Prof. Dr. Kapt. Mohd. Ibrahim Haji Mohamed
    Managing Challenges in Fisheries Development through Science and Technology
    23 July 1994

14. Prof. Dr. Hj. Amat Juhari Moain
    Sejarah Keagungan Bahasa Melayu
    6 Ogos 1994

15. Prof. Dr. Law Ah Theem
    Oil Pollution in the Malaysian Seas
    24 September 1994

16. Prof. Dr. Md. Nordin Hj. Lajis
    Fine Chemicals from Biological Resources: The Wealth from Nature
    21 January 1995

17. Prof. Dr. Sheikh Omar Abdul Rahman
    Health, Disease and Death in Creatures Great and Small
    25 February 1995

18. Prof. Dr. Mohamed Shariff Mohamed Din
    Fish Health: An Odyssey through the Asia - Pacific Region
    25 March 1995

19. Prof. Dr. Tengku Azmi Tengku Ibrahim
    Chromosome Distribution and Production Performance of Water Buffaloes
    6 May 1995

20. Prof. Dr. Abdul Hamid Mahmood
    Bahasa Melayu sebagai Bahasa Ilmu- Cabaran dan Harapan
    10 Jun 1995

21. Prof. Dr. Rahim Md. Sail
    Extension Education for Industrialising Malaysia: Trends, Priorities and Emerging Issues
    22 July 1995

22. Prof. Dr. Nik Muhammad Nik Abd. Majid
    The Diminishing Tropical Rain Forest: Causes, Symptoms and Cure
    19 August 1995

23. Prof. Dr. Ang Kok Jee
    The Evolution of an Environmentally Friendly Hatchery Technology for Udang Galah, the King of Freshwater Prawns and a Glimpse into the Future of Aquaculture in the 21st Century
    14 October 1995

24. Prof. Dr. Sharifuddin Haji Abdul Hamid
    Management of Highly Weathered Acid Soils for Sustainable Crop Production
    28 October 1995

25. Prof. Dr. Yu Swee Yean
    Fish Processing and Preservation. Recent Advances and Future Directions
    9 December 1995

26. Prof. Dr. Rosli Mohamad
    Pesticide Usage: Concern and Options
    10 February 1996

27. Prof. Dr. Mohamed Ismail Abdul Karim
    Microbial Fermentation and Utilization of Agricultural Bioresources and Wastes in Malaysia
    2 March 1996

28. Prof. Dr. Wan Sulaiman Wan Harun
    Soil Physics: From Glass Beads to Precision Agriculture
    16 March 1996

29. Prof. Dr. Abdul Aziz Abdul Rahman
    Sustained Growth and Sustainable Development: Is there a Trade-Off 1 or Malaysia
    13 April 1996

30. Prof. Dr. Chew Tek Ann
    Sharecropping in Perfectly Competitive Markets. A Contradiction in Terms
    27 April 1996

31. Prof. Dr. Mohd. Yusuf Sulaiman
    Back to the Future with the Sun
    18 May 1996

32. Prof. Dr. Abu Bakar Salleh
    Enzyme Technology: The Basis for Biotechnological Development
    8 June 1996

33. Prof. Dr. Kamel Ariffin Mohd. Atan
The Fascinating Numbers
29 June 1996

34. Prof. Dr. Ho Yin Wan
Fungi. Friends or Foes
27 July 1996

35. Prof. Dr. Tan Soon Guan
Genetic Diversity of Some Southeast Asian Animals: of Buffaloes and Goats and Fishes Too
10 August 1996

36. Prof. Dr. Nazaruddin Mohd. Jali
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21 September 1996

37. Prof. Dr. Abdul Rani Bahaman
Leptospirosis-A Model for Epidemiology, Diagnosis and Control of Infectious Diseases
16 November 1996

38. Prof. Dr. Marziah Mahmood
Plant Biotechnology - Strategies for Commercialization
21 December 1996

39. Prof. Dr. Ishak Hj. Omar
Market Relationships in the Malaysian Fish Trade: Theory and Application
22 March 1997

40. Prof. Dr. Suhaila Mohamad
Food and Its Healing Power
12 April 1997

41. Prof. Dr. Malay Raj Mukerjee
A Distributed Collaborative Environment for Distance Learning Applications
17 June 1998

42. Prof. Dr. Wong Kai Choo
Advancing the Fruit Industry in Malaysia: A Need to Shift Research Emphasis
15 May 1999

43. Prof. Dr. Aini Ideris
Avian Respiratory and Immunosuppressive Diseases- A Fatal Attraction
10 July 1999

44. Prof. Dr. Sariah Meon
Biological Control of Plant Pathogens: Harnessing the Richness of Microbial Diversity
14 August 1999

45. Prof. Dr. Azizah Hashim
The Endomycorrhiza: A Futile Investment?
23 Oktober 1999

46. Prof. Dr. Noraini Abdul Samad
Molecular Plant Virology: The Way Forward
2 February 2000

47. Prof. Dr. Muhamad Awang
Do We Have Enough Clean Air to Breathe?
7 April 2000

48. Prof. Dr. Lee Chnoong Kheng
Green Environment, Clean Power
24 June 2000

49. Prof. Dr. Mohd. Ghazali Mohayidin
Managing Change in the Agriculture Sector: The Need for Innovative Educational Initiatives
12 January 2002

50. Prof. Dr. Fatimah Mohd. Arshad
Analisis Pemasaran Pertanian di Malaysia: Keperluan Agenda Pembaharuan
26 Januari 2002

51. Prof. Dr. Nik Mustapha R. Abdullah
Fisheries Co-Management: An Institutional Innovation Towards Sustainable Fisheries Industry
28 February 2002

52. Prof. Dr. Gulam Rusul Rahmat Ali
Food Safety: Perspectives and Challenges
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53. Prof. Dr. Zaharah A. Rahman
Nutrient Management Strategies for Sustainable Crop Production in Acid Soils: The Role of Research Using Isotopes
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Productivity Driven Growth: Problems & Possibilities
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Immunodiagnosis and Vaccination for Brugian Filariasis: Direct Rewards from Research Investments
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56. Prof. Dr. Syed Tajuddin Syed Hassan
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57. Prof. Dr. Dahlan Ismail
Sustainability of Tropical Animal-Agricultural Production Systems: Integration of Dynamic Complex Systems
27 June 2002

58. Prof. Dr. Ahmad Zubaidi Baharumshah
The Economics of Exchange Rates in the East Asian Countries
26 October 2002

59. Prof. Dr. Shaik Md. Noor Alam S.M. Hussain
Contractual Justice in Asean: A Comparative View of Coercion
31 October 2002

60. Prof. Dr. Wan Md. Zin Wan Yunus
Chemical Modification of Polymers: Current and Future Routes for Synthesizing New Polymeric Compounds
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Is the KLSE Efficient? Efficient Market Hypothesis vs Behavioural Finance
23 November 2002

62. Prof. Ir. Dr. Radin Umar Radin Sohadi
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21 February 2003

63. Prof. Dr. Shamsher Mohamad
The New Shares Market: Regulatory Intervention, Forecast Errors and Challenges
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