ACHIEVING OBJECTIVES OF MULTILATERAL ENVIRONMENTAL AGREEMENTS: A PACKAGE OF TRADE MEASURES AND POSITIVE MEASURES

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

ELUCIDATED BY RESULTS OF DEVELOPING COUNTRY CASE STUDIES

Edited by
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EXECUTIVE SUMMARY

The relevance of trade and positive\enabling measures in achieving the objectives of selected multilateral environmental agreements (MEAs) is reviewed in light of their contribution to strengthening environmental policy, while at the same time minimizing economic distortions. The present collection of case studies reviews these measures as they are applied through the different MEA's. The case studies refer to two MEAs - the Montreal Protocol on Substances That Deplete the Ozone Layer and the Convention on International Trade in Endangered Species (CITES). Analysis is also presented of the Basel Convention on Transborder Movement of Hazardous Wastes and Their Disposal.

These studies have been undertaken by researchers in developing countries under a project which UNCTAD is implementing in cooperation with UNEP, as part of a larger project executed by UNEP.[1] The studies show that when trade and positive measures are adopted as an integrated package they complement one another. Where one presupposes compliance, positive measures enhance national capacity in fulfilling MEA provisions. In practice, given differences between developing countries in the stage of development, technological profiles, market composition, and trade intensities, the relative emphasis on positive measures may result in non-uniform effects of trade measures.

The text on the MEA's consists of five sections. After an overview of the trade and positive measures and the case studies, section 1 looks at the application of the Montreal Protocol in Thailand, India and the Republic of Korea. It analyses the reasons that made these countries ratify the Protocol and how the package of measures has helped with and\or denied them the chance to build their competitiveness and develop sustainably. Section 2 and 3 illustrate the importance of trade and non-trade measures under the CITES and Basel Convention. The cases here are those of Thailand, Indonesia, Philippines and India. Section 4 gives the concluding remarks.

The text remarks that trade measures are usually adopted and enforced by countries, but positive measures have to be negotiated continuously. The example of the terms and conditions that accompany transfers of technology is often quoted in the case studies to show that fair and favorable conditions and financial assistance are not always forthcoming, especially from the developed world and international financial mechanisms respectively. It is therefore concluded that positive measures do help to address the environmental problem, even as certain trade measures remain ambivalent.

This collection of case studies ends with a confirmation of the belief that trade and positive measures are pivotal for filling deficiencies in national policy in implementing the MEA's. But for the full utilization of the potential of the MEA's and their measures there should be a commitment to achieving their objectives

INTRODUCTION

by Veena Jha, Ulrich Hoffmann and Rene Vossenaar

Trade measures and positive measures are designed to assist developing countries in meeting the objectives of multilateral environmental agreements (MEA's). The nature of trade effects, that become operational with the signing of selected MEAs, has been quintessential in determining the time when a country signs a particular MEA and also the efficiency of phase-out of hitherto environmentally destructive policies and practices. Positive measures help countries by improving their access to and transfer of technology, capacity building and providing finance, in keeping with the differences among countries in the stage of development, technological capacity and trade intensities.

It is usually an integrated package of both trade measures and positive measures that takes countries closer to the goals of the MEA's and thereby environmentally sustainable development. The introductory section reviews trade and positive measures through case studies with reference to two MEA's – the Montreal Protocol on Substances that Deplete the Ozone Layer (the Montreal Protocol) and the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). Reference is also made to the Basel Convention on Transboundary Movement of Hazardous Wastes and Their Disposal (the Basel Convention).

A) TRADE MEASURES

The three measures used to review the effectiveness and efficiency of trade measures are:

(a) whether and how trade measures encourage wide participation in MEAs;
(b) whether and how trade measures contribute otherwise to the achievement of the objectives of MEAs; and
(c) the e**fficiency** (i.e. cost effectiveness) of the use of trade measures and their developmental effects.

The case studies in this monograph address all or some of these questions.

The Montreal Protocol on Substances that Deplete the Ozone Layer

In the case of the Montreal Protocol, the case studies analyze both trade measures against non-parties and the trade effects on parties of consumption and production quotas. Firstly, the studies review the possible reasons behind the decisions of individual developing countries to join the Protocol, including a review of the negotiating history. Secondly, the studies examine the extent to which trade effects, pursuant to signing the Protocol, have influenced national decisions regarding the timing and sectoral composition of phase-out schemes. Thirdly, they analyse how these trade effects have influenced the efficiency of different phase-out schemes.

The case studies review the experiences of India, the Republic of Korea and Thailand. The experiences of India and the Republic of Korea are different from those of Thailand and most other developing countries in that both countries are

producers of chlorofluorocarbons (CFCs) and the production is being largely carried out by locally-owned firms. The experience of China may be similar in many respects to that of India and the Republic of Korea.

India joined the Protocol in 1992, four years after its establishment. The study on **India** (Section 1, case study 2) argues that. The major reason for India to accede to the Montreal Protocol was the expectation that sufficient funds would be made available to facilitate the use of alternative technologies in the phase-out process as well as of technologies needed for the production of substitutes. Furthermore, India assumed that these environmentally-sound technologies (ESTs) would be transferred on fair and most favorable terms. In response to India's demand for funding and technology transfer, a special replenishment of the Multilateral Fund of US$ 80 million dollars was agreed to cover the accession of India and China.

On the basis of a sectoral survey, the study argues that trade measures may have had a limited effect on the decision to join the Protocol. though less significant than positive measures. For example, the fact that the production capacity being installed exceeded the needs of the domestic market indicated that CFC producers planned to export part of their future production.[2] Without joining the Protocol, India could not have exported CFCs to other parties. Trade factors have not played a significant role in those sectors where phase-out has progressed most, i.e. the aerosol and foam sectors (particularly flexible foams), because India is self-sufficient and production is predominantly for the domestic market. The halon sector, however, is reported to have accelerated phase-out because it expected dwindling supplies on the international market.

Thus the efficiency of different phase-out schemes has not been determined by the trade effects of consumption and production quotas. For example, the study on India attributes progress in phase-out of ozone depleting substances (ODS) in the aerosols and foams sectors largely to the easy availability of substitute technologies and products at "reasonable" costs (which in some cases are even lower than those of ODS). With regard to the refrigeration and air-conditioning (RAC) sector, however, the study notes that India faces problems in producing substitutes for CFCs, particularly HFC 134a, because technologies are of a proprietary nature, and few alternative suppliers exist (see section on transfer of technology below).

The study on the **Republic of Korea** (Section1, case study 4) shows that trade measures between parties and non-parties did have relevance in influencing the country’s decision to join the Protocol. The fact that the Republic of Korea acceded to the Montreal Protocol only in 1992 would be an indication that trade measures played a smaller role than is argued sometimes.

At the time of acceding to the Montreal Protocol, the Republic of Korea was not classified as an "Article 5" country, because in 1992 its per capita consumption of controlled substances was 0.62 kilograms (kg), i.e. above the 0.3 kg limit for developing countries. Consequently, the Republic of Korea could not benefit from the 10-year grace period and had to contribute to the Multilateral Fund. Nevertheless, the Republic of Korea succeeded in reducing per capita consumption to 0.29 kg in 1993 and was reinstated as an "Article 5" country in 1994. At the Sixth Meeting of the Conference of Parties (CoP) (Nairobi, 1994), the Republic of Korea was allowed the grace period in common to Article 5 countries and was exempted from contribution to the Multilateral Fund. The Republic of Korea however accepted a resolution which recommended that countries reinstated as "Article 5" countries should abstain from relying on

financial resources from the Multilateral Fund. The study notes that acceptance of this resolution was influenced by the fact that the available funds were, in any case, considered largely insufficient to cover the Republic of Korea's phase-out costs.

With regard to trade measures under the Protocol, those related to trade in CFCs had little effect on the availability of CFCs, since the Republic of Korea was already self-sufficient in several CFCs and had the capacity to expand domestic production. Trade measures concerning products containing CFCs, had significant effects on the country's export possibilities, for example in the RAC sector. It would have been difficult to develop substitute chemicals for use in this sector, because of technical inefficiencies. The predominance of the electronics sector in the Republic of Korea's industrial sector was also an important factor.

The cost of different phase-out schemes has been largely determined by the Republic of Korea's ability to develop substitute technologies in the domestic sector. The sectors where phase-out was most rapidly achieved were aerosols and electronics, largely because of the availability of inexpensive substitutes. Several domestic policies have been aimed at promoting local development of substitute chemicals, as available substitutes were considered not to be entirely satisfactory from a technical point of view.

Thailand joined the Montreal Protocol as early as 1989 (Chapter 2). Since Thailand does not produce ODS, its entire consumption has to be met by imports. Thailand would thus have been cut off from its major suppliers of CFCs, if it had not acceded to the Protocol. Its export structure was also likely to become dependent on CFC-using sectors, particularly electronics. The case study on Thailand argues that these two factors played a key role in Thailand's decision to join the Protocol.

When acceding to the Montreal Protocol, Thailand's major uses of ODSs were in the electronics, air-conditioning, foam blowing and refrigeration sectors. Until 1993, imports of ODSs continued to increase rapidly. Since then, the volume of imports used as cleansing solvents by the electronics industry has declined by almost 95 per cent, while consumption in other sectors has continued to grow.

Sectoral priorities in phase-out were in part determined by export interests and in part by the availability of cost-effective substitutes. Several factors contributed to the successful phase-out of ODS used as solvents since 1993, particularly: (a) the availability of alternative techniques without significant cost increases; (b) the fact that 80 to 90 per cent of products using solvents were for export, principally to developed country markets (which are environmentally sensitive); (c) the fact that a high percentage of firms using solvents are foreign owned, with better access to technology and equipment.

Thailand is likely to phase-out ODS consumption well ahead of the deadlines set by the Montreal Protocol. The case study attributes this to several factors. First, there has been considerable market-driven phase-out, particularly in the electronics sector. Second, an analysis of potential future costs of various phase-out scenarios has indicated that an early phase-out was preferable; Government policies have therefore been implemented aiming at a relatively rapid phase-out.[3] Third, the large share of transnational corporations (TNCs) and joint ventures in sectors using ODS facilitated rapid phase-out.[4] The Thai study notes that voluntary arrangements involving TNCs operating in Thailand[5] also played an important role.

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

In the case of CITES, the country studies do not examine whether trade measures play a role in inducing countries to join the Convention, but rather the extent to which trade sanctions, or the threat of using trade sanctions, have induced countries to formulate domestic legislation to control trade in endangered species.[6] In general it has been observed that several species included in the CITES appendices have stabilized or increased in population size since trade measures were introduced. There are, however, a number of other species covered by CITES which continue to be threatened with extinction. In both cases, it is **difficult to directly link trade restrictions to conservation or loss of species as extinction of species is often linked to habitat loss.** Also, in some cases, species which are sustainably managed have continued to be subject to trade restrictions. The country case studies review the experiences of Thailand and Indonesia with the implementation of CITES restrictions and the resulting species conservation.

The case study on **Thailand** (Section 2, case study 1) suggests that the threat of trade sanctions may have induced the Government to implement domestic legislation aimed at permitting effective compliance with CITES obligations. CITES may have been effective in reducing illegal trade in a number of endangered species, such as snakes[7] and certain kinds of orchids. For example, domestic policy measures have resulted in a significant drop of exports of protected snakes and products of snakes.[8] The study argues, however, that in order to truly curtail widespread illegal trade in endangered species, the budget available for training and enforcement would have to be significantly increased, a prospect unlikely for Thailand and many other developing countries.

In the case of **orchids**, a Thai Government report to UNCED alleged that implementation of CITES implied losses of millions of dollars annually in orchids trade. The report argued that CITES, by prohibiting trade in wild orchids while allowing trade in artificially propagated orchids, encouraged other countries to cultivate orchids for commercial purposes while providing protection from outside competition. Thai exporters may have incurred losses in the short run, restrictions on trade in wild orchids could have contributed to the development of Thailand's artificial propagation industry, which may be much more profitable in the long run. Price declines for orchids in the 1990s were a result of market saturation and, if anything, tend to suggest that CITES restrictions are no longer restraining orchid trade.

The fact that CITES prohibits trade in wild orchids while allowing trade in cultivated flowers has resulted in certain **illegal trade**, particularly in some rare species. Orchids originating in neighboring countries and exported through Thailand may also be a source of illegal trade. Instances of illegal trade also relate to crocodiles. The possibility to export crocodiles and crocodile products from captive breeding programmes has resulted in some illegal poaching and illegal border trade. Thailand has registered programmes for captive breeding of Siamese and saltwater crocodiles.[9] While recent studies indicate that crocodiles imported from Colombia and other countries are accompanied by proper export certificates, there is still speculation that part of the crocodile trade originating in South America may be illegal.

A study on **Indonesia** reached similar conclusions. While CITES is believed to reduce trade in endangered species, significant obstacles to CITES implementation and enforcement remain. For example, low levels of public awareness; lack of knowledge on the part of authorities; poor coordination between the large number of institutions involved in CITES implementation; the excessive profit orientation of the businesses involved in wildlife trade; the fact that the size of the country renders effective control extremely difficult, and lack of funding allocated to wildlife preservation. It should also be noted that apart from international trade, habitat destruction (whether or not in combination with trade) is also responsible for species becoming endangered. Moreover, the large domestic market for wildlife products may reduce the effectiveness of trade measures in ensuring species conservation.

The Basel Convention on Transboundary Movement of Hazardous Wastes and Their Disposal

The regulation of the Basel Convention (BC) has been based on prior information and consent (PIC). Each transborder movement of hazardous waste, allows importing and exporting countries to make a decision on consenting to or opposing a shipment on the basis of information on the source, nature, composition, destination, disposal/recuperation method and the need for such waste as raw material. Most recently, PIC has been supplemented by decisions II/12 and III/1, which introduce an outright export ban on hazardous waste shipments destined for final disposal and re-use/resource recovery/recycling from Annex VII countries (the OECD, EU and Liechtenstein) to non Annex VII countries (all other Parties). This Ban Amendment of the Convention assumes the form of a multilateral export ban which is enforced by the countries of Annex VII.

The PIC procedure and decisions II/12 and III/1 have played a key role in inducing countries to become parties to the BC, albeit for opposite reasons. As Krueger[10] put it, "PIC may be seen as a compromise regulatory procedure reflecting both the economic interests of the North (by not instituting a ban) and the moral and political force of Southern arguments (by restricting more heavily than the 'powerful' would have desired)." PIC encouraged most OECD countries and the rapidly industrializing developing countries to join the Convention because the flexibility of PIC allows such countries to reduce eventual developmental costs of trade restrictions. Conversely, member countries of the Organization of African Unity (except Nigeria) deferred signing the BC because they preferred at that time the creation of their own international instrument, the Bamako Convention, which banned imports of hazardous waste from industrialized countries. Decisions II/12 and III/1 addressed this concern and have induced most African countries to meanwhile become parties of the BC.

Decisions II/12 and III/1 on a multilateral export ban drastically reduce the risk of dumping or sham recycling[11] of hazardous waste in poor developing countries. On the other hand, after the Ban Amendment comes into effect,[12] developing countries can no longer import hazardous wastes from Annex VII countries which contain valuable recoverable material.[13] It is this ambivalent character of the Ban Amendment which determines whether, for a specific developing country and specific sector/material, it is entirely beneficial or may also cause distortions. In general, one can say that rapidly industrializing countries in South and East Asia as well as South America, which embark upon a material-intensive path of economic growth, may encounter some adjustment problems in the wake

of the Ban Amendment, whereas the less and least developed countries stand to benefit from the Ban.

The drafters of the BC, and in particular the Ban Amendment, assumed a close relationship between reduced trade flows of hazardous waste and the minimisation of health and environmental risks. While true for most low income developing countries, this causality is not self-evident for all developing countries because it does not reflect the fact that:

(i) a number of developing countries play an increasingly significant role as generators of hazardous waste;
(ii) there is a high demand for secondary material in several developing countries as a result of rapid economic growth and material-intensive growth patterns; and
(iii) there is a very dynamic trade of hazardous waste (containing valuable material) among developing countries, which will not only be unaffected, but also further enhanced by the Ban Amendment.

If all hazardous waste shipments from OECD countries were destined for final disposal in low-income developing countries only, the ban would entirely be environmentally and socially beneficial. However, international trade in hazardous waste shows a different picture, where the bulk of shipped tonnage is destined for recovery and recycling in few rapidly industrializing developing countries. Most of this trade is demand- and not supply-driven. Such trade is fuelled by (i) high material intensity of growth; (ii) a domestic supply-demand gap of certain natural resources; and (iii) a propensity in the newly industrialized countries towards the use of secondary versus primary resources.

The 4th Conference of the Parties to the Basel Convention, held in February 1998, adopted Annex VIII of the Convention, which contains those wastes which are characterized as hazardous under the Convention and that are subject to the Ban Amendment. Most items which figure in Annex VIII appear to have little economic and trade significance. Their characterization as hazardous waste thus provides a good shield against dumping attempts by waste generators and exporters in developed countries.

Only about a handful of hazardous waste items in Annex VIII seem to play a significant role as source for recoverable material for about ten rapidly industrializing developing countries. Though few in number, these items[14] in Annex VIII account for the bulk of all hazardous waste shipments from OECD to non-OECD countries. Governments and other stakeholders in the concerned developing countries need to take preventive measures to reduce the adjustment costs and avoid undesirable environmental and economic effects of the trade restrictions of the Ban Amendment. Failure to act in this regard might lead to a situation in which the environmental and economic costs of the undesirable side effects of the Ban Amendment in such developing countries outweigh its direct environmental and occupational health benefits.[15] This would contradict the concept of sustainable development and several objectives of the Convention.

The study on the likely effects of the Basel Ban Amendment on recycling of used lead-acid batteries (the economically most important hazardous waste item in international trade) in the **Philippines** shows that the Ban Amendment will lead to a fragmentation of the world market for lead scrap. In OECD countries, secondary lead will be abundantly available depressing lead scrap prices. This will result in increased profitability of battery recycling and battery manufacturing in OECD countries and, through exports of new batteries, will put

pressure on the domestic battery industry in developing countries. Conversely, in non-OECD countries, lead scrap will become scarce in the medium term, pushing up prices of recoverable lead in non-Annex VII countries. Lacking or too expensive scrap feedstock will restrain activity of modern secondary lead smelters in the Philippines.

On the one hand, this will discourage licensed smelters from further upgrading environmental performance. On the other hand, feedstock shortage will induce capacity under-utilization of licensed smelters, stepping up illegal disposal of junk batteries and encouraging battery reconditioning and “backyard (s)melting” in the informal sector, which significantly aggravates environmental and occupational lead exposure. Apart from being problematic for technology transfer, the country study also cautions that the trade restrictions of the Basel Ban Amendment may not necessarily provide incentives to developing clean technologies and products aimed at prolonging battery life (and thereby reducing the generation of waste) and switching towards lead-free car batteries.

B) POSITIVE MEASURES

The use of trade measures in MEAs goes beyond the legal debate concerning their compatibility with the rules of the multilateral trading system. This debate has been an important focus of the WTO’s Committee on Trade and Environment.. **W**hile uniform trade measures are applied in these MEAs, thereby affecting all parties to the MEA, in practice they tend to have non-uniform effects, given differences between countries in the stage of development, technological profiles, market composition and trade intensities.

In looking at the costs and benefits of MEA implementation at the national level, it is crucial that analysis of trade measures is viewed within the wider picture of the effects of all measures in MEAs. The trade and environment debate has divided the instruments used in MEAs into two distinct categories -- trade measures and positive/supportive/enabling measures. In reality this terminology hides a very complex and sophisticated interplay between different types of measures. This is because developed countries have expressed the view that this terminology implies that trade measures are negative measures. While not wishing to engage in this debate on what constitutes a negative measure, this book goes by the definition of positive measures as expressed at the Commission on Sustainable development which classifies positive measures as measures such as "technology transfer, financial assistance and capacity building".

Positive measures include technical training and capacity building, the provision of financial assistance to help meet incremental costs in achieving international standards contained in MEAs, the use of other types of information exchange and environmental management assistance, embodied in the varied requirements of environmental management between exporting and importing countries. The term positive measures has been extensively used in post-UNCED analyses and intergovernmental deliberations in UNCTAD, WTO and the Commission on Sustainable Development (CSD). In all these cases, reference is made to finance, transfer of technology and capacity-building.[16] Such a list is not exhaustive. Improved market access and certain market-based instruments could also be considered as positive/supportive/enabling measures.[17] In the case studies of this monograph, the terms “positive”, “supportive” and “enabling” measures will be used interchangeably.

Trade and supportive/enabling measures are generally part of a package which is MEA, and sometimes even country-group-specific. It is therefore important to view MEAs as a package of different types of measures which work together. The term “positive”, ”supportive” or “enabling” measures is the result of a historical process of discussions on the role of and interrelationship between trade and non-trade measures in MEAs.[18]

The Need For Positive/Supportive/Enabling Measures

There are several reasons for putting trade measures into a package of positive/supportive/ enabling measures. This concerns:

- Divergent levels of development, technological profiles, market composition and trade intensities.
- Lack of information on the underlying economics behind the use of trade measures, in particular in encouraging access to and effective use of environmentally sound technologies.
- Overwhelming presence of the informal sector with little technological and financial capacity.
- Trade measures might not necessarily address the root cause of the environmental problem.

While the first reason for supportive measures is self-evident, the other three probably deserve some elaboration.

The specific impact of trade measures, in particular trade restrictions, in MEAs and their effectiveness in achieving the environmental goals have been ill studied so far. As a result, adjustment costs of trade measures and implications of distortionary or undesirable side effects are poorly understood. This is particularly regrettable in a situation where incremental costs of adjustment in implementing the trade restrictions are not wholly or partly compensated for by global environmental financial mechanisms. Under such circumstances, improvements of environmental performance only become sustainable if supported by viable economics. This is why, developing countries need assistance in studying the underlying economics behind the use of trade measures and in creating conducive economic conditions for effectively using environmentally sound technologies.

The informal sector, i.e. economic activities which are not licensed and therefore mostly outside government control, generally accounts for a significant share of total economic activities in developing countries. Even in rapidly industrializing developing countries, such as Brazil, Mexico or Thailand, estimates suggest a share of about 40-50 per cent in total economic activity. The share of the informal sector in total employment is even higher, up to 60 per cent in the rapidly industrializing developing countries. The size of the informal sector in less developed and least developed countries is even bigger.

The size of the informal sector contrasts with its technological, managerial and financial capacity. Resource efficiency is generally low, but occupational risks and environmental contamination are high. If trade measures and restrictions, directly or indirectly, lead to a situation in which activities of the formal sector are curtailed and taken over by the informal sector (mostly in order to satisfy domestic demand), there will be adverse economic and environmental effects (i.e. resource spillage/squandering and environmental pollution).[19] A mere regulatory attempt of banning such informal sector activities will not be very effective. Rather, a combination of positive/supportive and repressive

instruments will have to be devised which harnesses the economic potential of the informal sector while improving its environmental performance.

It is important to ascertain whether trade is the root cause of the environmental problem under consideration, or whether trade is a mere conveyor belt or reinforcing factor. If the latter is the case, trade restrictions are only “end-of-pipe” instruments, whereas the use of positive/supportive/enabling measures might address the root cause of the problem (perhaps consumption or production) and therefore be “front-of-pipe” instruments.

What Are The Objectives Of Positive/Supportive/Enabling Measures?

First, by giving consideration to principles such as equity and common but differentiated responsibilities, positive/supportive/enabling measures promote participation and effective international co-operation in the implementation of the provisions of MEAs. The equity argument has also been stressed in deliberations in UNCTAD, the CSD and the CTE.[20]

Second, experience shows that failure to comply with the provisions of MEAs is rarely the result of deliberate policies of parties, but rather the consequence of deficiencies in administrative, economic or technical capacities. Thus, positive/supportive/enabling measures have been considered necessary to provide "compliance assistance".[21] For example, in the case of CITES, the text of the Convention itself does not address the particular situation of developing countries and does not provide for compliance assistance mechanisms. However, over the years, in the light of special difficulties that developing countries may encounter in implementing the Convention, parties have increasingly recognised the need for positive/supportive/enabling measures.

Third, the objectives of positive/supportive/enabling measures may go beyond providing compliance assistance, i.e. by encouraging a dynamic process of continuously improving environmental performance that might go beyond the obligations under MEAs. Innovative approaches are particularly important in this context.[22] Such approaches, which complement, existing provisions, also tend to promote the involvement of the private sector and civil society in achieving the objectives of an MEA.

The case studies examine in particular national experiences on three types of positive measures, i.e. access to and transfer of technology, access to finance and capacity-building.

Transfer of Technology

Several MEAs contain specific provisions on technology transfer which may include financial mechanisms to facilitate such transfer. The Convention texts normally do not refer explicitly to different elements of technology transfer (e.g. "hardware" elements such as machinery and equipment and "software" elements such as skills, know-how and related organizational and institutional arrangements for the transfer process). Transfer of technology issues are more relevant for the Montreal Protocol and the Basel Convention. In the case of CITES, which does not contain provisions on technology transfer, capacity-building may be considered as more relevant (see below).

The Montreal Protocol

All three case studies show that technological options and availability of technology at "reasonable" cost are important in determining decisions related to phase-out in different sectors. Difficulties in accessing technologies have played a critical role in delaying phase-out in certain sectors.

The provisions in the Montreal Protocol are meant to ensure that Article 5 countries not only obtain the requisite finances for acquiring substitute technologies (Article 10), but also the expeditious transfer of the best available environmentally sound technologies under fair and most favourable terms (Article 10A). It is useful to distinguish between two categories of developing countries: (a) countries that import all their ozone depleting substances (ODS); and (b) countries that manufacture ODSs and which may have a wide range of industrial activity to use them. Countries like China, India and the Republic of Korea could already produce CFCs on their own, and wanted to be able to produce substitutes. For these countries in particular, transfer of technology is a separate issue from that of financial assistance.

In principle, the indicative list of categories of incremental costs indicates some elements of technology transfer. These include, for example, the cost of converting or retiring production facilities and establishing new facilities for manufacturing substitute chemicals and costs resulting from either the elimination of controlled substances in the manufacturing of intermediate goods or from the modification or replacement of end-use equipment. It is to be noted, however, that guidelines for funding of production facilities of substitute chemicals are still being completed by the Executive Committee. Similarly, costs of patents, designs and royalties may not always be accommodated by the funding policies of the Multilateral Fund.[23]

Since the creation of the Multilateral Fund, approximately US$ 750 million has been disbursed to 111 developing countries. In addition, as already mentioned, the predominance of TNCs in several large ODS consuming sectors has facilitated access and diffusion of relevant technologies. Examples of the above can be found in the study on Thailand. The experience of Thailand also shows, however, that ODS consumers in the refrigeration and air conditioning sector have largely preferred to delay production adjustments in the hope that technological development and market forces would reduce the cost of conversion. However, since 1996 imports of CFC-11 and CFC-12 have started to decline as a result of a ban on the use of CFCs in the production of household refrigerators and mobile air conditioners.

The experiences of India and the **Republic of Korea** with phase-out programmes are different. As mentioned above, these two countries produce ODSs themselves, and in both cases such production is undertaken largely by domestically-owned firms using indigenous technology. A primary concern in both countries is with access to and transfer of technology for the production of ODS substitutes.

Concerning the production sector, the study on **India** notes that the Multilateral Fund compensates ODS producing firms for the premature retirement of production capacity used to manufacture controlled substances. But it is more difficult to obtain funding for the establishment of new production facilities for the commercial production of substitutes, such as HFC 134a, since guidelines for funding such technology transfers have not yet been established.[24] High prices charged by technology suppliers were also quoted as an important barrier to technology transfer. The study furthermore reports difficulties in leapfrogging to second generation technologies.

In the **Republic of Korea**, high priority has been given to the indigenous development of ODS-free technologies and products, among other reasons because the local business community realized that many technologies and products available in the international market could be outdated or expensive as a result of high costs of patents and royalties.[25] Costs of patents and royalties may be high in cases where there are few technology owners, particularly since the Montreal Protocol mandates the use of specific technologies world-wide.[26]

Thus, countries such as China, India and the Republic of Korea require technologies not only for the user sectors but also for producing CFC substitutes. Studies from these countries tend to be more critical about the effects of implementation of the Montreal Protocol on trade and international competitiveness and about the adequacy of technology transfer and financial resources provided by the Multilateral Fund.

The Basel Convention

As the study on **India** notes, there are no provisions on transfer of technology under most favorable or advantageous, i.e. non-market based terms. Furthermore, unlike the Montreal Protocol, there is no adequate financial mechanism of the Convention to facilitate transfer of technology, nor are developing country Parties of the Convention able to tap global financial mechanisms, such as the Global Environmental Facility.

The provisions on transfer of technology are not binding and based on best endeavour; conversely the trade measures are mandatory. The Convention provides for exchange of information on suitable waste management technology and management systems, but the accumulated information in this regard is difficult to access and often of too general nature.[27]

The Technical Working Group of the Convention has drafted a number of technical guidelines on management of particular waste streams and relevant disposal operations. These guidelines are however very prescriptive in terms of exposure risks and general waste management practices and are mostly confined to the enterprise level. The specific technical and socio-economic circumstances in developing countries, both least developed and rapidly industrializing countries, are not fully reflected. This concerns in particular the required scale of economically viable recovery or final disposal operations and the significant role of the informal sector.[28]

There has been considerable headway in creating regional and sub-regional centers on training and technology transfer in recent years. Centers are now operational in China and Indonesia for Asia, in Senegal for French-speaking Africa, in Egypt for West Asia, in Slovakia, Russia and Estonia for Central and Eastern Europe, in Argentina, El Salvador and Uruguay for Latin America, and in Trinidad and Tobago for the Caribbean (UNEP/CHW.5/5 of 23 September 1999). These centers have the advantage of being able to focus on the specific requirements of the countries in their respective regions, taking due account of the environmental, economic and social exigencies. It increasingly becomes clear, however, that both the creation of the centers and their operation encounter serious funding challenges. The Technical Co-operation Trust Fund to Assist Developing Countries (TCTF), which is based on voluntary contributions, suffers from a chronic shortage of funds and therefore most centers have to rely on bilateral funding support for specific activities, which makes the financial base of the centers unpredictable.[29]

In general, the regional and sub-regional centres on training and technology transfer, are linked to an existing technology research and development body in the host countries. It is however open to question whether such setup can counter the disincentive for trade-induced transfer of technology to developing countries, which is created by the Basel Ban Amendment based on decision III/1.

In summary, developing countries have frequently expressed concern over lack of access to and transfer of technologies mandated in some MEAs. Apart from financial mechanisms which have been built into some MEAs, other modalities such as trade (e.g. in equipment) and foreign investment (both direct investment and joint ventures) can play a role in the diffusion of ESTs. Technology transfer is increasingly driven by market forces and international private investors. However, commitments on transfer of technology have been entered into by governments which have by and large been reluctant to exercise any leverage on the private sector. More work is needed to examine how these different modalities have contributed to the transfer of ESTs, particularly of technologies required by some MEAs and which countries have benefited from them and the extent to which technology transfer has been carried out on fair and most favourable terms.

Capacity-building

Several MEAs contain provisions for capacity-building covering issues such as training, information management, technical and scientific assistance, transfer of know-how, and institutional strengthening. Although earlier MEAs did not explicitly recognise the particular situation of developing countries, more recent MEAs contain provisions related to capacity-building to address the particular situation of developing countries and assist in the implementation of the MEAs. Capacity-building mechanisms have also been developed over the years through resolutions of the CoPs. Capacity building activities under CITES and Basel Convention include training, the development of model legislation, mechanisms to control illegal trade, the compilation of country data, and other areas.

The Montreal Protocol

The Multilateral Fund of the Montreal Protocol plays an important role in capacity-building. Its Executive Committee has approved as of July 1998 more than 2,322 projects and activities in 112 Article 5 countries valued at US$ 784 million. The Executive Committee has set up national ozone offices in approximately 97 developing countries, even though such funding is not explicitly included in the Indicative List of Categories of Incremental Costs. An ozone office is typically provided with the necessary staffing, equipment and operating budget. Please refer to paragraph 1 (a), (b), (c), (d) and especially to paragraph 2 in the indicative list, where it is specifically stated, *inter alia*. “If incremental costs other than those mentioned below are identified and quoted, a decision as to whether they are to be met by the financial mechanism shall be taken by the Executive Committee with any criteria decided by the Parties and elaborated in the guidelines of the Executive Committee”.

The study on **India** highlights the importance of training and workshops organized with financial assistance from the Multilateral Fund. Regular contacts with the national Ozone Cell have increased the industrial sector's awareness of India's phase-out plans, and substitute substances and technologies, as well as sources where ozone-free technologies and products can be procured. The extent to which developing countries have acquired sufficient expertise to

independently prepare projects and identify ESTs remains, however, an open question. The study on India also mentions that entrepreneurs complained about frequent changes in the definition of incremental costs and in the guidelines for project approval, which reduces the impact of awareness-raising activities, particularly on SMEs.

CITES and the Basel Convention

The Secretariats of CITES and the Basel Convention have been providing technical assistance, but the levels of funding have been low. Lack of financial resources can affect the extent of capacity-building activities, particularly if these fall under the purview of the relevant MEA secretariats. For example, the Basel Convention's Technical Cooperation Trust Funds to Assist Developing Countries has had a planned annual budget of only about $1.5 million in recent years. Only part of these resources have been received and capacity-building activities have often relied on bilateral assistance.

Capacity-building activities of the Basel Convention fall into the following clusters:

(i) the provision of a manual for the implementation of the Convention and an instruction manual on the control system for transboundary movements of hazardous wastes;
(ii) development of model national legislation on transboundary movements and management of hazardous wastes;
(iii) the establishment of regional and sub-regional centres on training and technology transfer; and
(iv) in particular prior to the establishment of the training and technology transfer centres, the holding of national and regional workshops on the legal, institutional and technical implementation of the Basel Convention.

Recently, a draft decision for the 5th Conference of the Parties to the Basel Convention (held in December 1999) has been circulated. This aims at refocusing the agenda of the Basel Convention for the next decade (document UNEP/CHW/C.1/4/CRP.1, tabled at the 4th session of the Open-ended Ad-hoc Committee for the Implementation of the Basel Convention in June 1999). The document acknowledges that “the development of tools to assist (developing) countries to manage hazardous and other wastes in an environmentally sound manner … requires much more attention and investment… The first decade of the Basel Convention was characterised by the elaboration and consolidation of regulations … The next stage in ensuring optimum protection of human health and the environment from hazardous wastes requires an efficient and effective practical outreach.” Capacity-building as well as technology transfer will therefore become top priorities in Convention activities. The draft decision also recognises the funding problems for such activities and highlights the need for “concrete, effective and durable solutions.” The draft decision emphasises that “there is an urgent need to bring in solutions which are both affordable and economically self-sufficient, because an indefinite financing under the restrictions of governmental budgets is not possible.” *Inter alia*, the draft decision suggests the seeking of “access to GEF and other major public funds.”

As funding is an important component for capacity building, the lack of it hampers adequate enforcement of domestic regulations relating to trade in endangered species. The case of Thailand shows that legal sanctions have had a limited effect on the trade in endangered species. Impediments come in the form of ineffective data collection on part of CITES authorities and inadequate emphasis on training border personnel to improve their performance in tracking down illegal trade. Indonesia faces similar problems even though CITES has had

an indirect effect in halting a drop in the populations of endangered species; and the effectiveness of positive measures is still limited.

In summary, capacity-building assists developing countries in meeting the objectives of MEAs and can generate a dynamic process of continued improvements in environmental performance which may go beyond the obligations under MEAs. In the context of the Montreal Protocol, capacity-building has been supported by the Multilateral Fund. The experience with other MEAs, however, shows that scarcity of funds can affect the extent of capacity-building activities, particularly if these fall under the purview of the relevant MEA secretariats.

Transfer of financial resources

MEAs, such as CITES and the Basel Convention, contain hardly any specific commitment on the transfer of financial resources to developing countries. Recognizing this, the respective CoPs have adopted a number of decisions on specific issues in the area of finance which, however, are not binding and are predominantly related to training and capacity-building. Recent MEAs, however, contain provisions committing developed country parties to transfer financial resources to developing countries to assist them in meeting their obligations.[30]

The two main financial mechanisms established to help with the implementation of MEAs are the Multilateral Fund (MF) and the Global Environmental Facility (GEF).[31]

The Montreal Protocol

The MF is the Montreal Protocol's specific financial mechanism while the GEF has been designated as the interim funding mechanism for the United Nations Framework Convention on Climate Change (FCCC) and the Convention on Biological Diversity (CBD). Since the creation of the Multilateral Fund, agreed contributions have amounted to around US$982 million. A budget of US$540 million was adopted for the period 1997-1999, requiring a replenishment of US$ 466 million.

The study on India claims that India has had difficulties in accessing funding from the Multilateral Fund, even though the MF has in place performance indicators relating to maximum turn around time for project submissions. As of July 1998 only about US$ 50 million had been approved for funding. It is to be noted that according to India's Country Programme, which was prepared in 1993, 66 per cent of ODS consumption was attributed to the SME and informal sectors.

The study attributes India's difficulties in accessing funding to several factors. First, several firms, in particular SMEs, had found difficulties in preparing project proposals. Others complained about the complexity of procedures and delays in submitting projects to the Executive Committee. There were also delays in making funding available. For example, of the 68 projects that had been approved, only 33 had begun to receive the corresponding funds. Second, for many Indian firms cost-effectiveness criteria[32] were complicating access to funding. SMEs were particularly affected by this criterion.[33] Third, the assembling sector has had difficulties in accessing financial assistance (for example, in the air-conditioning sector assembling activities carried out in the informal sector are quite important). Another problem mentioned is that possibilities to receive funding for the incremental costs of converting production

capacity are limited to utilized production capacity, while many firms, especially in the producing sector, are operating well below full capacity. India was granted in 1993 US$120,000 for the preparation of a survey on Indian SMEs. One project approved in 1997 for SMEs in India (US$1.4 million) included 150 beneficiary enterprises. The most recent decision regarding SMEs by the Executive Committee states:

(a) Given the fact that SME projects for low-volume consuming countries are currently fully eligible, this window should apply only to group projects from countries with annual ODS consumption of 360 ODP tonnes or more;

(b) Eligible group projects for this initial pilot programme should be in the aerosol or foam sectors only, and should include firms with annual ODS consumption not exceeding the following:

Aerosols	20 ODP tonnes/yr.
Foams: Flexible	25 ODP tonnes/yr.
Extruded polyethylene/polystyrene	25 ODP tonnes/yr.
Flexible integral skin	10 ODP tonnes/yr.
Rigid polyurethane foams	10 ODP tonnes/yr.

(c) Group projects should be at a level of US$1 million or less, and should have an overall cost-effectiveness of no more than 150 per cent of the level of current cost-effectiveness thresholds for the relevant eligible subsectors in (b) above. Such group projects should use the most cost-effective technologies reasonably available, and should consider the possible use of centralized/group use of equipment and industrial rationalization;

(d) The group project should be put forward with a government plan, including policies and regulations designed to ensure that the specific level of agreed reduction to be achieved and sustained;

(e) No single country may apply for more than US $1 million from this pilot funding window although projects from one country may cover more than one sector.

India has never brought to the attention of the Executive Committee any misgiving about slow disbursement by the implementing agencies. As far as production capacity is concerned, the end user industries usually receive compensation to replace existing capacity, e.g. if an enterprise has two fully equipped lines for the production of refrigerators, it receives compensation to replace and/or retrofit all existing equipment in the baseline. It is only in the calculation of cost-effectiveness and the amount of eligible incremental operating costs that the actual consumption of CFC and actual number of units produced are taken into consideration."

The **Thailand** study provides little information on the extent to which positive measures under the Montreal Protocol have contributed to the successful phase-out of ODSs. If one considers the number of small countries, especially in Africa, with very small enterprises, it will become obvious that no priority is given to large enterprises. At the beginning of 1997, Thailand had 53 projects approved for nearly US$ 23 million of funding by the Multilateral Fund. While this provides a significant amount of assistance, the study notes that it represents only around 5 per cent of the costs of Thailand's phase-out programme, which, according to Thailand's country programme were estimated at US$ 439 million.

Another question is who benefited from funding. In fact, the majority of companies receiving funds are large firms. Many large firms have access to substantial sources of capital and several of them may intend to phase-out ODS irrespective of the funding offered by the Multilateral Fund. However, financial assistance provided by the Multilateral Fund may have encouraged producers to take action early on.

In summary, since the creation of the Multilateral Fund, approximately 1,000 projects have been implemented in about 100 developing countries with an expenditure of about US$ 500 million. The above analysis suggests that for countries like Thailand positive measures under the Montreal Protocol, while important, may so far have been a relatively modest factor in implementing the Protocol at the national level, particularly because of the important role played by TNCs (foreign-owned capital is not entitled to funding by the Multilateral Fund) and other large firms. To the extent that further progress in phase-out will increasingly have to include the SME sector, more progress will be needed in the provision of funding for SMEs. In the case of other developing countries, positive measures may be a more decisive factor in implementing the Montreal Protocol at the national level. Progress is required in the implementation of positive measures in favour of producing countries.

SECTION 1* THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

- Thailand's experience with the Montreal Protocol
- India: effects of trade measures and positive measures in the Montreal Protocol on selected Indian industries
- India: the issue of technology transfer in the context of the Montreal Protocol

THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

By the Natural Resource Management Programme of the Thailand Environment Institute

Case Study 1 * THAILAND'S EXPERIENCE WITH THE MONTREAL PROTOCOL

International commerce has fuelled economic growth in Thailand in the last two decades. This aspect of the Thai economy should be taken into account in analysing the impacts of the Montreal Protocol on Thailand. This chapter examines the effects of the Protocol on Thailand, assessing in particular the relative roles of trade and positive measures in inducing participation and phaseout.

First, an overview is provided of the Thai economy at the time when it signed the Protocol, emphasising also the extent and patterns of ODS consumption. The study then discusses the role of trade and positive measures in inducing participation in the Protocol and compliance with the time limited phaseout goals in Thailand. The concluding section provides a summary of the Thai experience with the Montreal Protocol, highlighting the relative effectiveness of trade and positive measures and other relevant factors.

(1)OVERVIEW OF THAILAND'S ECONOMY

From the 1980's to 1997 Thailand experienced high growth rates. In the late 1980s, trade in goods containing or produced with ODS represented a substantial share in exports, accounting for close to 20 percent of total export earnings. During the last two decades, the role of trade (both exports and imports) has increased from less than half of GNP to over sixty percent. Besides being intimately linked with increasing exports, development in the economy has also been concomitant with the diversification of the export basket and transition from exports of primary commodities to the export of manufactured goods. Today, manufactured goods comprise close to three fourths of the value of Thailand's exports.

Thailand ratified the Montreal Protocol in October 1989, and subsequently ratified the London and the Copenhagen Amendments in September 1992, and February 1996 respectively. Thailand was relatively quick in ratifying the Protocol and its amendments. Ratifying the amendments speeded up the timetable within which the phaseout of ODS became effective, increasing its obligations on the number of controlled substances to be phased out. While environmental concerns were undoubtedly important, the fact that the Montreal Protocol was ratified only one year after its signature, compared for example to the Basel Convention which was ratified by the Parliament five years after its signature, reveals the importance of the Montreal Protocol for the Thai economy.

When Thailand signed the Protocol, its consumption of ODS was below 0.083 tonnes per capita for Annex A substances and 0.010 tonnes per capita for substances in Annex B, which qualified it as an Article 5 nation. As a result, besides having a grace period of 10 years in which to shift to ODS free production, Thailand also qualified for financial assistance from the Multilateral Fund.

An Overview of ODS consumption in Thailand

Thailand is not a producer of ODS. Its entire consumption of these substances is met through imports, mainly from Western Europe, Japan and the United States. The major ODS imported into Thailand included Annex A substances such as CFC-11, CFC-12, CFC-113, CFC-114, CFC-115, halon 1211 and halon 1301. Among Annex B substances, the country imported CCI(4) and 1,1,1-TCA. In addition, Thailand imported HCFC-22, HCFC-122, HCFC-123, HCFC-141b, HCFC-142 and HCFC-225 (part of Annex C) and Methyl Bromide (substance belonging to Annex E). At the time when the country signed the Protocol, the demand for ODS was rising rapidly, with the country's industrialisation and economic development . Between 1986 and 1990, for example, the total ODS import into Thailand increased from about 2,000 ODP tonnes to close to 8,000 ODP tonnes. The imported ODS were primarily used in the electronics, air-conditioning, foam blowing and refrigerator sectors. The structure of each of these sectors had an important bearing on the phaseout of ODSs.

Prior to the implementation of the phaseout measures, solvent cleansing in the electronics and precision metal sectors was the largest user of ODS in Thailand, accounting for 90 percent of the CFC-113 and Methyl Chloroform consumption in Thailand. The sector also accounted for over a third of total ODS consumption in the country. Between 80 percent to 90 percent of all goods (in value terms) using ODS solvents were exported to developed countries. Electronics in particular, was of significance, being Thailand's largest export earner, and growing at about 20% annually. (Alpha 1996; BOT: various issues). Close to 90 percent of the total production of electronics was exported.

Table 1 Extent of Consumption of ODS by Different User Sectors in Thailand (1991)

Sector	ODS Consumed	Percentage of ODS Consumption
Air Conditioners	**CFC-11;CFC12;CFC113; HCFC-22;HCFC-123**	**26%**
Fire Extinguishers	**Halon 1211; Halon 1301**	**6%**
Foam Blowing	**CFC-11; CFC-12**	**17%**
Refrigerators	**CFC-12; CFC-115; HCFC-22**	**11%**
Aerosols	**CFC-11; CFC-12; cfc-113**	**3%**
Solvents	**CFC-13; methyl chloroform**	**37%**

Source: DIW, 1993

Mobile air-conditioners (MAC), a sub-sector of the air-conditioners sector, was an important consumer of ODS, as almost all new cars and 80 percent of the existing fleet are equipped with MACs in Thailand. In this segment a higher proportion of the consumption is due to refilling leaks and repairing mechanical failures. Some of these inefficiencies could be because important users (i.e. in

the MAC sector) of ODS consists entirely of locally owned small firms. According to the latest information, between 1995 and 1997 consumption of CFC-11 and CFC-12 declined by 46 in each case from 3,000 ODP tonnes to about 1,600 ODP tonnes for CFC-11 and about 5,000 ODP tonnes to 2,700 ODP tonnes for CFC-12. The consumption of all Annex A CFC's also declined by the same percentage from about 8,250 tonnes to 4,450 ODP tonnes. Thailand's consumption of halons in 1995 of about 300 ODP tonnes also declined by 47 percent in 1997.

The refrigerator sector in Thailand consists of seven large firms, of which six are Japanese owned and one is American. The compressors used by this sector are also produced by a Japanese company and one local company. Households have been the main consumers of refrigerators, with growing economic prosperity, their demand quadrupled between 1985-91, and a third of the total production are exported. Large commercial and industrial refrigerators are also important in the total production from this sector. In the solvent sector, when the chemicals commonly used in this sector (CFC-113, carbon tetrachloride and methyl chloroform) are taken together, a reduction of 44 percent in the consumption is reported to have been achieved between 1995 and 1997. However, there has been 53 percent decline in the consumption of methyl chloroform alone in the same period, from 2237 metric tonnes (223.7 ODP tonnes) to 1,043 metric tonnes (104.3 ODP tonnes). The country's baseline (1995-97) consumption of Annex A CFC's according to the latest data is about 5,550 tonnes ODP.

In the foam sector, between 10 to 33 percent of the total production was exported. While producers of PU foams have been dominated by three large domestic companies, a number of smaller, domestically owned firms also manufacture foams. As of mid-1998 US $33.9 million had been provided from the Multilateral Fund for projects in Thailand to phaseout 3,219 ODP tonnes and 1,363 ODP tonnes had been phased out through completed projects. 47 percent and 36 percent out of the ODS consumption targeted to be phased out are from the foam and refrigeration sectors respectively. The aerosol sector and the solvent sector make up 13 percent and 4 percent respectively of the ODS to be phased out in projects funded through the Multilateral Fund. The table below shows the amounts of ODS projected to be phased out through Multilateral Fund assisted projects as of mid-1998.

Table 2 ODS Phaseouts

SECTOR	ODS TO BE PHASED OUT (ODP TONNES)	1. PERCENTAGE OF TOTAL ODS TO BE PHASED OUT	ODS PHASED OUT (ODP TONNES)
Aerosol	422.9	13%	155
Foam	1,524.6	47%	365
Refrigeration	1,155.2	36%	768.4
Solvent	116.4	4%	74.7
TOTAL	3,219.1	100%	1,363.1

Fire extinguishers consumed approximately 6 percent of the ODS used in the country at the time Thailand signed the Protocol. ODS used in fire extinguishers has three to ten times the Ozone Depleting Potential (ODP) of CFCs. As most of the hand held extinguishers (the main product consumed) were imported from Malaysia, the actual consumption of halons was estimated to be double the recorded amount. For other sub-sectors the import dependence was lower. About 40 to 50 local companies are involved in other varieties of fire

extinguisher production. In the aerosol sector (used in cosmetics, household sprays and in medical inhalers) production has been carried out by local firms which are locally owned and operated. As Table 1 shows, the industry has used mainly CFC-11, CFC-12 and CFC-113, accounting for only about 3 percent of total ODS consumption in the country.

(2)THE ROLE OF TRADE MEASURES

The Role of Trade Measures in Inducing Participation

Thailand imports all its ODS, thus the status of its suppliers in the Montreal Protocol played a significant role in inducing participation. Indeed, its major suppliers, i.e. Western Europe, Japan and the United States, were early parties to the Protocol. As a result of the trade provisions in the Protocol, ODS producers had to restrict trade with non-parties. Thus not acceding to the Protocol would have effectively eliminated Thailand's sources of import of ODS, affecting its domestic production and total export of electronics and refrigerators, important export earners for the country. In the electronics sector in particular, Thailand had built up a successful export niche. The RAC (Refrigerators and Air-Conditioners) sector was of significance in the export market and was a high export earner, though majority of the refrigerators produced in Thailand were for the domestic market.Similarly, though production in the MAC (as used in vehicles) sector was geared primarily at the domestic automobile sector, it was emerging as a significant export earner. Thus not acceding to the Protocol would have increased Thailand's vulnerability in the international market.

All together, the importance of goods produced with or containing ODS in the export composition represented one-fifth of all export earnings, coupled with losses in other sectors noted above could have negatively affected the Thai economy.

The Role of Trade Measures in Inducing Phaseout

In accordance with trade measures pursuant to the Montreal Protocol, a number of developed countries have banned the import of products using or containing ODS. Thailand has been vulnerable to these measures in sectors which have largely targeted their exports to Article 2 countries. The users of the solvent sector for instance have overwhelmingly been geared towards the international market, and in the electronics sector, the primary destination of exports has been these developed countries (mostly Article 2 countries). Fearful of losing export markets in this sector, phaseout has been effective and their ODS consumption has declined by over 95 percent. Being a major consumer of ODS when the country joined the Protocol, a haseout in this sector has reduced the overall ODP of Thailand, and after 1996, the high rates of import of ODS have also begun to decline. Thus, the overall impact of trade measures in inducing phaseout appears to have been positive.

In other sectors such as RAC where two thirds of total production caters to the domestic market, pressure to phaseout has not been experienced and phase-out has been limited. Ozone friendly refrigerator production have primarily been geared towards the export market. In fact, the early CFC-free refrigerator models in Thailand were produced exclusively for the international market. Therefore, in cases where the fear of losing markets has not played a role in inducing phaseout, efforts at ozone friendly production have been motivated by

possible trade opportunities offered by Article 2 nations in the ODS-free market for refrigerators. All domestic refrigerator as well as compressor manufacturers have received funds from the Multilateral Fund for conversion to non-ODS technology. Additionally, an umbrella project covering 83 SMEs in the commercial sector has been recently approved.

Effect of Phaseout on Trade and Competitiveness

Participation in the Protocol and subsequent phaseout in the electronics sector has meant staving off any loss of markets internationally. It is interesting to examine to what extent the cost involved in the overall phaseout process of all the ODS user sectors will impact Thailand's international competitiveness. Especially when those industries which are primarily geared to the domestic market undergo a transition to ODS-free production.

Data available so far gives no sign that ODS phaseout has negatively impacted Thailand's trade competitiveness or the growth of its export sectors. As stated earlier, the electronics industry is the only ODS using sector to have carried out a substantial phase out. Growth in the export market of this sector continues at the rate of about 30 percent annually, before and after major phaseout in the integrated circuits and other electronics circuit related items. The growth in computer exports has actually increased from less than 20 percent in the early 1990s to over 40 percent between 1993 and 1995. Hence, despite phaseout, the price factor has not inhibited exports in the electronics industry.

That the electronics sector has not incurred trade and competitiveness effects in its phaseout process can be explained by several factors. One, in most cases, the initial costs were mostly non-recurring and have been totally or partially off-set by the cheaper production costs since non-ODS technology is often cheaper than the CFC counterpart. An interview with a large producer of display tubes estimated that the cost of production per unit had actually decreased by 10 percent after conversion. A second factor attenuating trade and competitiveness effects in this sector is that the electronics sector is dominated by multinational firms with easy access to technology and financial capital. As a result, the sector is in a position to experiment with R&D and come up with appropriate ODS substitutes, having also the capacity to absorb initial outlays. Thirdly, a factor contributing to the lack of competitiveness effects was that the costs of transitioning in Thailand were similar to those encountered by competitor electronics exporting nations, thus preventing a fall in demand on account of any short term increase in prices.

In sectors such as RAC, not many phaseout measures have been implemented as yet. Exports have grown by six times between 1990 and 1995. Unlike the electronics sector, the anticipated costs of phaseout here are considered to be much higher. Fear of loss of a high growth export sector on account of a marked price increase has inhibited producers from transitioning to ODS-free production. Among refrigerator manufacturers who have effected a phaseout, the increase in prices of the final product have been between 5 percent and 20 percent. As more producers in this sector switch over in the coming years, the trade and competitiveness effects may become more significant than at present.

Other sectors experiencing an increase in prices after phaseout also expect competitiveness effects in the future. In the foam sector, for example, switching over to hydrocarbon butane was estimated to raise costs by about 20 percent as compared to ODS based production. The major cost involved in hydrocarbon use was in the initial outlays for new production equipment and for new safety equipment to handle the highly inflammable chemicals. The sector has stated

that an early phaseout would be very sensitive to price increases, since foam is a very price elastic product in the international market. Therefore, in this sector, phaseout has been deferred partially on account of the expected competitiveness effects post phaseout.

An additional factor of concern in terms of overall cost of phaseout is the fact that of the total costs, only about $298million, or two thirds has been assumed to be borne by the industrial sector, while the remaining third is expected to be shouldered entirely by the consumers. These costs relate to early retirement, retrofitting of ODS using equipment, higher costs of ODS replacements as ODS are phased out world wide and increased operating costs such as higher electricity consumption by a new line of refrigerator and air-conditioners (Widge, Radka and Dillon, 1994). In addition to these direct costs, consumers will also be expected to bear much of the costs of the industrial sector, as the bulk of cost increases will be passed along in the form of higher product prices. Experience in Thailand shows that producers of refrigerators, for example, have disguised the increased price by using methods such as adding minor new features to the ODS model and then presenting the model as a new higher quality product line.

Furthermore, according to the economic modelling done by the Thailand Country Programme, 94 percent of the total cost of transitioning, or $413million (based on assumption not related to incremental cost), was to be borne by the domestic sector, while only 6 percent was to be shouldered by the export sector (DIW, 1996). This is mainly because the higher cost phaseouts had domestic consumers as their prime market (as opposed to consumers in the export market). Therefore, while competitiveness effects may not be significant in the international market, local consumers will be forced to take on the majority of the cost increase on account of phaseout. The secondary effects on both user sector industries and consumers of their final products are yet to be calculated, but are expected to be an additional burden.

(3)EFFECTIVENESS OF POSITIVE MEASURES

The Role of Positive Measures in Inducing Participation

As an Article 5 nation, Thailand has access to financial assistance from the Multilateral Fund. At the time when the country signed the Protocol, it was most concerned about the trade aspect of the provisions, which it expected would affect the economy directly. The need for financial assistance does not appear to have been the main driving force behind acceding to the MEA. The bait of technology transfer too does not seem to have had a major impact on the Thai decision to sign the Protocol, particularly because most of the vulnerable sectors have a high share of foreign ownership, which, in turn, makes the access to alternative technology easier. In addition, because the country does not produce ODS, technology related concerns were limited.

The Effectiveness of Positive Measures in Inducing Phaseout

Estimated incremental costs for phaseout in Thailand have been calculated at $439million [34] As of July 1998, Thailand had 96 projects approved for nearly US $34 million from the Multilateral Fund (World Bank, 1997), as is indicated in Table 3.

Table 3 Projects Approved for Funding by the Multilateral Fund (July 1998)

Sector	No. of projects	ODP Eliminated	Budget US$	Cost effectiveness (US$/ODP Kg)
Aerosol	8	155	1,957,538	12.63
Foam	35	365	8,985,894	24.62
Fumigant	2	0	326,005	0
Refrigeration	20	768	14,039,454	18.28
Several*	19	0	2,755,737	0
Solvent	12	75	5,800,765	77.35
Total	96	1,363	33,865,393	

* "Several"includes technical assistance and training programmes, but not actual phaseout

***Source**: Fund Secretariat, 1998*

Although projects accounting for only about 7.7% percent of the phase-out cost estimated in the country programme, they will phase out 36% of the ODS consumption reported in the country programme. As has been discussed earlier, the solvent sector has already conducted substantial phaseout. Overall, most of the companies receiving funds so far are large enterprises, with a substantial source of capital to draw from for phaseout activity. These firms are thus in a position to conduct the switchover irrespective of the financial assistance offered by the Multilateral Fund. Only a few firms have indicated that project implementation was conditional on financial support from the MEA. However, while financial assistance may not have been critical for most phaseout programmes, the prospect of financial assistance may have resulted in accelerated phaseout among some firms.

Perhaps the most needed recipients of the Multilateral Fund assistance were those listed in the "Other" category. This includes government sponsored training workshops, funding for the initial studies of the ODS situation in Thailand and development of the Thailand Country Programme for phaseout. Training and seminars are found to be useful in several sectors. In the aerosol industry, the ban has been largely ignored due to lack of awareness of alternative technologies. The DIW, along with international agencies, has sponsored seminars and training sessions to disseminate information on new propellant technologies and safety procedures necessary when using substitute technologies. This effort is expected to improve the phaseout prospects of the aerosol sector.

In the Refrigerator sector too, phaseout has not occurred in great measure so far. Here technical co-operation efforts have been brought in to improve the possibility of a switchover. With the assistance of the World Bank Compressor Project, Thailand has been able to develop ODS free compressors. This development is expected to facilitate phaseout in the sector. So far the Executive Committee has funded projects for the total phaseout in the compressor, domestic refrigeration and medium-large size commercial refrigeration.

Another significant contribution of the Multilateral Fund has been in setting up the Thailand Country Programme. With support from the Multilateral Fund, Thailand has been able to undertake detailed computer modelling to compare costs of compliance of Annex A and Annex B ODS under different hypothetical phaseout scenarios. Building alternative scenarios have helped the country formulate a reasonable phaseout strategy which is a compromise between the technology driven option and the least cost option. The process of building alternative has aided the country in formulating regulations on the phaseout schedule for each sector. These plans could be drawn up coherently and with prevailing as well as future market conditions in mind. (Details of the ensuing regulations formulated by the government are presented in the following section.)

However, a number of areas remain where phaseout does need further financial and technical support from both the Multilateral Fund and the Thai government. One such area is the SMALL SCALE SECTOR. The question of size is important because larger firms are easy to target and have a higher capacity to co-operate in the phaseout process. Many Small and Medium sized Enterprises (SMEs), on the other hand, are not registered with the government, therefore, to access them is very difficult. [35]Lack of access to SMEs has been one of the major factors dominating lack of phaseout activity in sectors such as MAC and foam, which consist predominantly of smaller firms. Since these are also the firms lacking the financial and technological capacity to undertake phaseout independently, it is crucial that they be identified and provided with information on phaseout first, and the technical and financial assistance to do so.

Several BARRIERS inhibit the access to funds among SMEs after they are identified. one, is a bank guarantee of the firm. A bank guarantee may be required by the World Bank which is not the “Funds administrator”. No commercial bank is normally willing to guarantee firms which are considered only "semi-existent", whose future commercial viability is uncertain. As a result, SMEs may find it difficult to access financial assistance mechanisms of the Multilateral Fund.

Second, technological suitability remains an added barrier to switchover among smaller firms. For instance, in sectors where LPG is considered an effective alternative to ODS, the technology available for the conversion is suited for larger firms, and is difficult to tailor the technology to SMEs. An SME is also often not capable of effecting the changes on account of the cost factor. Therefore, future efforts on part of the Multilateral Fund will have to focus on these aspects of transitioning to ODS-free production among SMEs. The problem has been solved for small aerosol fillers through funding of contract fillers. However, SME funding window of US $10 million in 1999 will target aerosol producers.

Third, hampering the effectiveness of positive measures in Thailand are government regulations that do not encourage the acquisition of funds and new technologies. For instance, a transfer of finances from the Multilateral Fund entails corporate income tax, thereby discouraging firms from accessing the money which is due to them. Furthermore, import of ozone friendly equipment also requires the payment of import taxes. Although these duties are significantly lower than for ODS, they are still considered a deterrent to the acquisition of alternatives, acting as a disincentive in using available facilities under the Montreal Protocol.

Other factors affecting the effectiveness of the financial support on the part of the Multilateral Fund include the efficiency of the funding mechanism. A major

problem encountered is the effectiveness in inter-agency co-ordination for planning and effecting the phaseout. The administrative expenses of the implementing agencies have been considered high on account of inefficiencies, so that an inadequate sum is left for conducting the actual phaseout among firms, especially in the SME sector. According to the study, the World Bank, one of the agencies implementing the phaseout process in Thailand, has been the most cost effective. They have done so by establishing direct contact with local agencies, as opposed to direct contact between international experts and local clients. Accountability is another casualty. According to interviews conducted, stringent rules and safeguards are necessary to ensure that the appropriation of the funds are effective, serving the purpose they were meant for.

Thailand can be assisted in the process of phasing out by increasing the data base available to the country. For instance, in the halon sector, no regulatory measure has been instituted towards phaseout, mainly because of a lack of information about the structure of the industry and its practices. Similarly, in the area of potential impact of the phaseout process on secondary users and their consumers little work has been done so far. Only if further data is generated on this subject can steps be taken to smoothen the impact of phaseout among indirect users of ODS.

Another element where further work appears necessary in Thailand is in accessing the effectiveness of the implementation process. Increased awareness of the level of effectiveness of the positive measures would help improve the efficiency of the programmes in place. US $753,334 was provided by the Multilateral Fund to establish the Ozone Office, a financial intermediary was contracted by the World Bank (Financial Corporation of Thailand) which gets 3% of the cost of any project approved for the World Bank's implementation. The Multilateral Fund, as well as the Government of Sweden has funded network for that region where ozone offices of the region meet regularly. UNEP IE (Paris) has received a total of US $21.7 million for information dissemination including those of technology transfer.

More information on technology transfer is also needed in the Thai context. So far, user sectors seem to be familiar with the range of technology to choose from. Access to accurate and updated information in sectors where the alternative technologies are not certain as yet would help firms to make cost effective and appropriate technology choices.

(4)ROLE OF OTHER FACTORS IN PHASEOUT DECISIONS IN THAILAND

Factors other than trade measures and positive measures have been important determinants of phaseout in Thailand. The GOVERNMENT in Thailand, for one has played a significant role. In the area of technology transfer, for example, it has convinced foreign owned companies to enter into a voluntary agreement which provides for an accelerated transfer of available substitutes. Although no law mandating this has been drawn up, the agreement is largely adhered to, especially in the electronics sector.

Other areas where the government has been active is in banning the use of Annex C alternatives in solvents sector, and in emphasising the use of ODS-free alternatives. A ban on the use of ODS has been brought into effect in the

Refrigerator sector, and is expected to be an effective way of spurring phaseout activity in a sector which expects cost increases. In sectors where such bans are not expected to be effective, such as in the MAC sector, an active effort is being made by the government to enter into a collaboration with the US Environment Protection Agency to install recovery and recycling equipment among the smaller firms in this sector.

Besides the role of government, the level of FOREIGN OWNERSHIP and the COST OF CONVERSION have been other determinants in the level of phaseout in ODS related sectors in Thailand. For one, the equity profile of the sector has been of significance. Among solvent users, a high percentage of the firms using this ODS are foreign owned. Because such firms generally have better access to technology and equipment in their home country, it is perceived that their presence in the sector helps phaseout.

Contrarily, in the RAC sector, where although the level of foreign equity holding has been substantially higher than among the solvent sector (and therefore, alternatives are more accessible), the cost of conversion has been an overriding factor which has inhibited phaseout. The higher cost (accounting for approximately 86 percent of the total costs) is associated with substitutes in equipment in addition to the ODS themselves. . Switchover for the air-conditioner sector alone is forecast to account for about $250million, which is more than half of the total expected cost. High phaseout costs in these sectors are on account of higher prices of substitutes.

As of 1996, the cost of HFC-134a, the primary replacement for CFC-12 was over twice the cost of the ODS, and HCFC-141b was about 40 percent more expensive than CFC-11 which it replaces. According to the Multilateral Fund, however, the estimate of US $ 250 million is highly exaggerated. A recent study prepared by the World Bank informs that if all chillers in Thailand were to be replaced with more energy-efficient non-CFC chillers, US $ 90 million would be required!

In the solvent user sectors too, cost has been an important determinant of conversion. Switching to ODS free cleansing techniques are already possible without incurring an increase in costs. Several of the electronics companies surveys had in fact experienced a decline in costs after switching over to CFC-free technologies. The minor modifications of facilities which were responsible for the initial costs were off-set over time by the lower recurring cost for the solvents. Low cost alternatives have had a similar impact in the aerosol sector. Easy AVAILABILITY OF ALTERNATIVE TECHNOLOGY has also been considered a significant determinant of the degree of phaseout in Thailand. In the foam sector, for example, technological difficulties relate to lack of access to technology which is appropriate for the market share of this industry, and for the scale on which smaller firms operate. Thailand, as well as other countries, have received assistance from the Multilateral Fund to apply the most up-to-date foam technologies including those using hydrocarbons and liquid carbon dioxide as foam blowing agents. Some of the recipient enterprises are considered SME according to UNDP/UNEP definition.

Thus, the cost of conversion, level of foreign equity in a sector, the extent of government initiatives, the structure of the industry in terms of SME presence and the ready availability of alternative technology are other important factors affecting switchover, besides trade and positive measures. So far, users of ODS other than in aerosols and electronics have generally preferred to delay the transition in the hope that technical development and market forces will eventually drive down the cost of conversion.

(5)SUMMARY AND CONCLUSIONS

The country is not a producer, but a significant user of ODS, importing these substances mostly from Article 2 nations such as Western Europe, the United States and Japan. Important user sectors include RAC, aerosols, foams, solvents and fire extinguishers. While many of these sectors do cater to the domestic market, a number of them are also involved in exports, either directly or indirectly. One of the secondary users of solvents, the electronics sector, for example, has been the largest export from Thailand in recent years. All told, products which either contain or use ODS in their production account for about 20 percent of the country's exports.

Because of Thailand's significant dependence on trade, both for importing ODS for sectors which were demonstrating high rates of growth, and to subsequently retain exports among sectors which depended on ODS such as MAC, RAC and electronics, the country was relatively quick in signing the Montreal Protocol, which it signed 1989, and followed it up with a prompt ratification. The fear of trade sanctions as a non-party was thus the strongest inducement to join the Protocol.

The role of positive measures in inducing participation has been quite limited. Ffinancial assistance was not an important factor in inducing participation, perhaps because the nation is only a user and not a producer and therefore it did not expect its phaseout costs to be exorbitant. In terms of inducing phaseout too, financial assistance has not been of marked significance. Most firms would have conducted their transition regardless of financial support, as the entrepreneurs involved in phaseout so far have been large firms with a considerable financial backing. However, prospects of receiving funds may have accelerated the switchover among some firms.

Support towards training programmes and seminars run by the government has been a significant contribution towards phaseout. It should also be underlined that in sectors with a significant small scale sector presence, phaseout has not commenced as yet. Once these industries begin their switchover, the need for increased awareness creation and finances to facilitate switchover will take on a greater significance.

Factors other than trade were also found to have an impact. For one, the extent of foreign ownership in an industry was found to be linked with the level of phaseout. More importantly, the relative cost in switching over seems to be a crucial determinant in the extent of transition made. In the RAC sector, for instance, it was emphasized that while the level of foreign equity holding is very high, phaseout has not been effected, as switching over to an alternative would increase costs to the extent of 5 percent to 20 percent. Contrarily, in sectors where a phaseout has resulted in cheaper production, such as in electronics, the phaseout has been very effective.

The availability and suitability of the alternative technology has also impacted the level of phaseout in Thai user sectors. In the aerosol industry, for example, it was found that the common alternative, LPG, was not suited to SME firms which dominatethe sector.The large scale presence of SMEs created further problems relating to accessing these firms, and providing them with adequate support to switchover. The level of government regulation, the active interest it

takes in the setting up of voluntary agreements, especially with foreign firms, were also an important determinant of phaseout in nations such as Thailand.

The role of positive measures is likely to increase as sectors such as Refrigerator manufacturers, MAC and the foam industry conduct their phaseout. For one, the costs of a switchover among such firms are expected to be higher, making it attractive to access financial support in the phaseout process. In areas where the costs are higher and where the firms are largely domestic, such needs may be more pressing.

Additional problems expected are the lack of adaptability of existing alternative technologies for SMEs. Also, in sectors with a significant SME presence, difficulties with accessing such firms and financing them adequately to effect the phaseout will be higher, and financial and technical assistance will definitely be a determinant of successful phaseout. Therefore, while positive measures may not have had as significant an impact as trade measures so far, their relevance as more of Thai industries conduct their switch is likely to be more pronounced in the future.

CASE STUDY 2 * INDIA: EFFECTS OF TRADE MEASURES AND POSITIVE MEASURES IN THE MONTREAL PROTOCOL ON SELECTED INDIAN INDUSTRIES

By Shipra Das

To assess the effectiveness of trade and positive measures in the Montreal Protocol in the Indian context, the analysis is conducted at two levels. The case study examines whether the trade measures, either as a part of this MEA, or those taken pursuant to it, have contributed to India's phaseout plan.[36] In addition, this part analyses the extent of contribution of positive measures, such as access to funds in India's phaseout process. The next case study on India concentrates on the role of transfer of technology, including the significance of Intellectual Property Rights (IPRs) in the implementation of the Montreal Protocol in India.

The current chapter is largely empirical in nature, being based on detailed personal interviews with producers and users of ODS, as well as with relevant policy makers and informed members of industrial organisations in the New Delhi region, which has a concentration of both producers and users of ODS. All together, this study is based on detailed responses from 20 firms, selected on the basis of government directories and membership lists at industry associations. Two of these were CFC producers and two, halon producers. Interviews were also carried out with ten refrigerator manufacturers and six fire fighting equipment manufacturers. Additional information was obtained from the Ozone Cell, the Confederation of Indian Industries (CII), the Refrigerator and Gas Manufacturers' Association (REGMA) and from the office of the Development Commissioner for Small Scale Industries (DCSSI).

(1)HIGHLIGHTS OF THE INDIAN INDUSTRY

The context of ODS production and consumption

India became a party to the Vienna Convention for the Protection of the Ozone Layer in 1991, subsequently acceding to the Montreal Protocol in September 1992.

Before signing the Protocol, India was both a producer and a user of ODS. Its total consumption of ODS in 1991 was 10,370 metric tonnes, while the per capita consumption was less than 10 grams, qualifying it as an Article 5 nation. Besides Annex A substances, such as CFCs and halons, India also produces some Annex B ODS, namely CTC and MCF. Considering such varied production of ODS in India, policy makers viewed its commitment to ODS phaseout to be a long term one, involving a sizeable investment.

While the production of ODS in India is limited to a few domestically owned firms, the user sectors are varied and widespread, being characterised by a strong small scale and informal sector presence. In fact, it has been estimated that the small-scale sector is responsible for approximately two thirds of ODS

consumption in the country (India Country Programme, 1993). The primary use of ODS in India have been in RACs, foams, solvents, aerosols and fire extinguishers. Table 4 presents the varieties and the extent of ODS used by these sectors.

Table 4 ODS Consumption by User Sectors (1991)

SECTOR	ODS USED	METRIC TONNES OF ODS CONSUMED (%AGE OF TOTAL)
RAC	CFC-11;CFC-12	1990 (19.2%)
Foams	CFC-11;CFC-12;CFC-113	1580 (15.2%)
Solvents	CFC-11;CFC-113;CTC;MCF	4950 (47.7%)
Aerosols	CFC-11;CFC-12	1100 (10.6%)
Fire Extg.	Halon-1211; Halon-1301	750 (7.2%)

***Source**: India Country Programme, 1993.*

The context of the Indian Economy

At the time when India signed the Protocol, it was embarking on a process of liberalisation. Export expansion was viewed as an important propellant of growth, and globalisation of the Indian industry became a priority on the policy making agenda. Wishing to be a part of the global economy, the country was interested in participating in the international effort to preserve the environment through the Montreal Protocol Agreement. Another factor influencing participation in the Protocol was that the CFC production facility in India, set up around the time of accession, had been geared towards exports to the extent of about 70 percent, and the country did not wish to effectively shut out potential export markets for Indian CFCs.

The most significant reason for signing the Protocol, however, was that of being an Article 5 country and having the possibility of accessing financial and technological support in its efforts to phaseout. As a complex economy with both production and consumption of ODS, it was clear that phaseout would be essential in the long term, and that the switchover process would be financially and technologically very challenging. Therefore, access to funds and technology transfer on fair and favourable terms were expected to alleviate the economic burden resulting from participation in the Protocol. In fact, India, along with China, agreed to join the MEA only after it was agreed that the Multilateral Fund would substantially fund the transition in these countries.

(2) NECESSITY AND EFFECTIVENESS OF TRADE MEASURES

In the Indian context, the necessity and effectiveness of trade measures can be judged on the basis of whether or not these measures have led to participation in the Protocol, and whether they have been conducive to the phaseout process. The role which discriminatory trade measures play in a country acceding to the Protocol is difficult to determine. Countries rarely admit that economic

pressures forced them to participate in MEAs, but an assessment of the dependence of India on ODS related trade at the time of accession to the Protocol might provide some insight.

The Role of Trade Measures in Inducing Participation in the Protocol

India is a producer of most of the ODS it consumes, and this self sufficiency has acted as a hedge against trade measures. Only two sectors were linked significantly to trade: the CFC producers, and the users of halon 1301. While the latter met their demand for ODS entirely through imports when India signed the Protocol, the CFC producing sector, which was just coming into existence, had targeted about three quarters of its production at the international market. For the halon 1301 and its user sectors, non-accession would have resulted in the drying up of their primary raw material. Among CFC producers, not joining the Protocol would have signified the loss of most of their market.Another sector which was gearing up for exports was the RAC industry. At the time when India signed the Protocol, the sector was experiencing a growth rate of approximately 15 percent (CII, 1995). While some of the increased production was directed at the urban middle class, and the burgeoning rural population in the country, firms interviewed perceived the domestic market to be growing at a rate no greater than 10 percent. The remainder was stated to be targeted at the export market.The RAC sector had already begun exports to nations such as Zambia, Indonesia and several countries in the Middle East. Thus, the desire to retain export and import markets in the CFCs, RAC and halons respectively, could have contributed to the decision to sign the Protocol.

Effectiveness of Trade Provisions in Facilitating Phaseout

Among sectors with forward or backward linkages to the external market, only one of the user sectors, the fixed fire fighting equipment manufacturers, relying on the import of halon 1301, is considering phaseout in the near future. Due to a ban on exports of this ODS from their main supplier, Germany. An increasing scarcity of this product has pushed prices upfrom $7-$8 per kg in 1990-91, to $20-$25 in 1995-96, according to a DIFR estimate. As the supply and prices of halon 1301 become uncertain, user firms have begun to evaluate other alternatives seriously, while also exploring the possibility of recycling halons and halon banking from domestic sources. Since this sector represents only a portion of the entire halon consumption in the country (which itself is 7 percent of total ODS consumed), its significance in the national context is limited.

(3)THE NECESSITY AND EFFECTIVENESS OF POSITIVE MEASURES

Role of Positive Measures in Inducing Participation

According to policy makers, India committed itself to the provisions of the Montreal Protocol for the phaseout of ODS production and consumption with the expectation that sufficient funds and required technologies would be made available to the country in accordance with the provisions of the Protocol. Since India is a producer of ODS, any shortage of funds and appropriate alternative technology available to industry (according to one estimate the net agreed incremental cost was estimated at close to US$ 2 billion) would hamper efforts

towards phaseout. Positive measures were to compensate the country for the economic burden imposed by the switchover and India signed the Protocol onlyafter a significant increase in the size of the Multilateral Fund, emphasising the very crucial role positive measures played in inducing India to participate in the Montreal Protocol.

Effectiveness of Positive Measures in Inducing Phaseout

Several factors have to be analysed to assess the effectiveness of positive measures in inducing phaseout in India. Among these, the most significant are the effectiveness of a differential phaseout schedule, of awareness creation and most importantly, the effectiveness of financial assistance and technology transfer.

Differential Phaseout Schedule

In India, the provision of a differential phaseout schedule has had different impacts depending on whether the sector is dependent on the international market. In sectors which depend on exports of ODS, such as CFCs, and those which have depended mainly on imports, such as users of halon 1301 (the production of halon 1301 has begun in India since 1995-96), the impact of the differential phaseout provision has been quite significant. Mainly on account of trade provisions and the consequent early phaseout plans of importing countries. On the other hand, for most user sectors, which acquire their ODS from domestic sources, and cater primarily to the domestic market, such as foams, aerosols and RAC, the grace period has offered an effective means of extending their phaseout deadline. Since experimentation with alternatives can be conducted without the loss of the present market.

However, one of the regulations associated with the Protocol indicates that any new project commenced after December 1995 will not be eligible for funding from the Multilateral Fund. This has inhibited additional production of ODS among producers although expansion in production would help recover their investments into CFC based technologyTo complement the grace period, the Montreal Protocol permits non-Article 5 nations to export ODS to Article 5 nations in order to avoid a scarcity in the supply of ODS. In fact, the permissible production limit of developed countries has been increased from 10 percent of their 1986 level of production to 15 percent of the same. Both the 10 and the 15 per cent of 1986 production (CFC) level in non Article 5 countries was included in the original and amended protocol (London). According to Indian producers of ODS, such a provision has eaten into the demand for Indian CFCs, reducing their market and therefore their prospects of cost recovery on their investment made in ODS production facilities in the late 1980s and early 1990s. The resulting low capacity utilisation and high costs, is also stated to harm the domestic user industry, since much of the burden of cost recovery among CFC producers has to be borne by them.

Effectiveness of Awareness Creation

Interviews with larger firms indicated that all of them had participated in training and awareness creation workshops organised with direct funding from the Multilateral Fund, those resulting from bilateral arrangements, and those undertaken by industry organisations. Firms were also found to have regular contact with the Ozone Cell, which provided them with updated information on the MEA. Both the user and the producer industries indicated that the workshops and seminars had been informative, and provided detailed information on alternative technologies and possible sources, facilitating therefore the

formulation of concrete phaseout plans. However, because the definition of incremental costs and guidelines for project approvals were found to change frequently, firms had a tendency to doubt the long term credibility of the information. This factor was found to be accentuated among smaller firms. Therefore, awareness creation efforts, although useful, were found to be lacking in some respects.

Effectiveness of Financial Assistance

(i) Extent of Funding from the Multilateral Fund

The incremental cost for the phaseout of ODS in India has been estimated by the India Country Programme at $1.964 billion for all sectors. Of the estimated incremental costs, which was never agreed to by the Executive Committee, about US $49 million worth of proposals have been approved for funding as of July 1998. These are to be disbursed among 178 activities, out of which about 88 have begun to receive the appropriated funds as of December 1997. Where funds have been received, a switchover has already been effected, or is underway, especially among firms where the funds are considered adequate.

Table 5 Phaseout Activities (as of July 1998)

NATURE OF PROJECT	NO. OF ACTIVITIES	TARGETED PHASEOUT (METRIC TONNES)	ALLOCATED FUNDS (US$)	AMOUNT DISBURSED US$ (DEC. 1997)	ODS PHASED OUT (METRIC TONNES) (DEC. 1997)
1.Direct					
Phaseout					
Aerosol	23	646.6	2,400,671	133,486	36
Foam	74	1,930.3	17,216,104	6,970,408	545
Halon	10	1,419	1,718,844	240,266	0
Production	4	72	2,222,864	320,577	0
Refrigeration	41	1,967	19,378,756	2,856,235	3456
Solvents	9	145.27	2,324,267	1,681,957	124.97
2.Indirect					
Phaseout					
Several	20	0	3,694,953	2,997,498	0

***Source**: Fund Secretariat 1998*

However, a look at the overall picture of fund disbursal in Table 5 shows that only a small portion of the approved funds have been received by entrepreneurs so far. The flow of funds does not show a dramatic change over the previous year either, as is brought out by the following table.

Table 6: Details of Funds Received in Dec.1994 and Dec.1995 (Cumulative)

Details of Funds	Dec.	Dec. 1995
a. Funds Approved	$11.5 million	$20.00 million
b. Funds Received	$1.3 million	$3.04 million
c. No. of Activities Approved	31 projects	68 projects
d. No. of Activities Received Funds	14 projects	33 projects
e. No.of Activities Deferred/Resubmitted	6 projects	8 projects

***Source**: Ozone Cell, 1996.*

In terms of the rate of approval, there has been a substantial decline between 1994 and 1995. In 1994, 31 out of 36 projects proposed were approved, whereas in 1995, this declined to 38 out of 64 projects approved (Ozone Cell, 1996). According to the Ozone Cell, this decline in the rate of approval can be explained by the introduction of more stringent eligibility guidelines since March 1995. The records of the Fund Secretariat indicate that out of 49 projects submitted by India in 1997, 47 were approved.

Alongside, a number of other costs which are not included in the incremental cost calculation will have to be borne by the country. Some examples are the cost of additional land for project implementation, and the organisation of technical support services by industry associations (India Country Programme, 1993). It is to be noted that only India requested “land” in two projects.

Some other impediments that influence the overall effectiveness of positive measures in the Montreal Protocol are discussed below:

(ii) Delays in Funding

Among the sectors which have received funds on time, such as the foam and aerosol industries, and certain members of the halon sector, some have already completed their switchover, and some others are actively involved in doing so.

Most of the firms interviewed, however, had encountered delays and cuts in funding. For one, the procedure for sending the funding proposal was considered too indirect, since it had to go through a number of channels within India before being submitted to the Executive Committee of the Multilateral Fund. While the official time estimate for the procedure was four to six weeks, this process was stated to take no less than three months. Problems, according to policy makers, were more severe for small scale firms, which often had difficulties in even filling out the lengthy form.

Delays were also found to occur in the process of receiving funds. Four firms in the RAC sector had projects pending for close to two years, and no concrete decision had been reached as yet regarding the status of their proposal. In addition, fund cuts prescribed by the Executive Committee were considered arbitrary on some occasions. As an example, it was stated that a preliminary estimate of the cost of conversion of compressors in the RAC sector was $107

per kg. However, the cost guideline suggested by the World Bank for the conversion was a substantially lower $ 36 per kg, which was further reduced by the Executive Committee to $ 14 per kg (CII, 1996). Moreover, firms were of the opinion that technical experts, who appraised the techno-feasibility of projects for the implementing agencies, were not entirely cognisant of the circumstances prevailing in the affected sectors, leading to recommendations which were sometimes not in keeping with the adjustment needs of the firms.

Problems have also been encountered by firms interested in setting up halon-1301 recycling and banking facilities for fixed fire fighting units. This technology is essential for the country, since fixed fire fighting equipment is used by key sectors such as oil refineries, power generation and defence. Given the increasing scarcity and consequent high prices of halon-1301 in the international market, halon banking appears to be a crucial step towards bridging the gap between demand and supply. A project proposal for this was submitted to the Executive Committee, which is still pending, even though the needs of the sector are urgent. India has received a total of US$ 1,718,844 to convert nine manufacturers of fire extinguishers to ABC and CO2 agents and to prepare a halon sector strategy preparation which includes demonstration and evaluation of alternative technologies.

All the firms interviewed were of the strong opinion that without substantial support from the Multilateral Fund, phaseout in nations such as India would be very difficult. This was mainly because cash flows in the commercial market are limited, and financial institutions are unwilling to fund projects such as ODS phaseout, which are financially unviable.

(iii) The Eligibility Criteria

A number of eligibility criteria have been set up as part of the funding mechanism, and some of these inhibit phaseout in the Indian context. One such factor hampering effective phaseout is thatonly utilised capacity is eligible for financing from the Multilateral Fund. This affects especially the producers of CFCs, who are unable to utilise the capacity they had built up in the expectation of supply to non-Article 5 countries. In fact all the producers of CFCs stated that their capacity utilisation is no more than 50 percent, implying that half of their phaseout will not be financed by the Multilateral Fund. Similar experiences have been encountered by the RAC sector, which also operates well below capacity. For such sectors, a large chunk of the adjustment burden is therefore likely to fall on individual firms, without any external support from the Multilateral Fund. It is to be noted that “utilised capacity” in the context of CFC production was agreed to by the Executive Committee as are the parameters to be used in calculating the eligible compensation for closure of CFC plants (to estimate the lost profit)

The eligibility criteria also inhibit the access of several categories of firms to the Fund. In some cases,the excluded sectors are significant ODS users. The assembling industry, for instance, is ineligible for funding, although sectors such as the air conditioner manufacturing consists entirely of assembling units, with the exception of one large formal sector manufacturer. These assembling firms acquire air conditioner parts from other countries, and carry out their assembling and marketing within India. Excluding these enterprises from funding amounts to the exclusion of almost the entire sector, thereby rendering the funding process less effective. The Committee is yet to receive a project emanating from the “assembling industry”

Another such example is the fire fighting equipment sector, which is not eligible for funding. These manufacturers often depend entirely on ODS based production and the lack of financial assistance to them has significantly inhibited a switchover. The segment of the industry which is eligible, is the halon producing sector, for which ODS based production amounts to no more than 5 percent of their entire business concerns (DIFR, 1994). Financial assistance to these firms is thus not as crucial as it is for fire fighting equipment manufacturers for whom the transition is a much more serious problem. These two sectors, i.e. air-conditioning and fire extinguishers together account for about 27% of total ODS consumed in India. The "fire fighting equipment sector" is eligible for funding and India has received funds for the conversion of nine halon fire extinguisher producers!

The Promotion of and Access to Alternative Technology

Access to technology at reasonable prices is an important element of the positive measures in the Montreal Protocol. However, several factors have inhibited the effective promotion of and access to ODS free technology. This part examines the funding aspect of technology transfer. Issues relating to IPRs are discussed in greater detail in the next Chapter.

One significant problem with accessing ODS-friendly technology is that the fund liability is limited to one technology transfer fee for substitute technology per country. Considering that the affected sectors in India are varied, and set up with different technologies suited to individual budgets and demand structures, it becomes difficult for the government to judge which enterprise should be given what substitute technology. Having a blanket technology purchase may thus be suitable for only a limited number of firms, reducing the effectiveness of the funding provision. The Executive Committee decided at its 17th Meeting:

(a) To ensure that technology transfer fees wherever possible were negotiated to cover groups of projects in which conversion was to take place;

(b) To negotiate the best possible terms when the technology in question was to be used at multiple locations;

(c) To append evidence of such negotiations to the project submissions"

Another issue of concern is that the Multilateral Fund does not finance a switchover involving an upgrade of technology. In the Indian context, such a provision excludes a large number of firms, since many enterprises were set up in the 1960s and 1970s with European technology, which have not been upgraded since. In the international market, however, such technologies have become obsolete.Therefore any potential switchover would necessarily involve an updating of technology. For such enterprises, the possibility of accessing financial support in their phaseout process is thus effectively shut off. This is true only when the technology upgrade is advertent.

The most significant problem of funding a technology switchover in India relates to the development of indigenous technology**.** Given the high cost of accessing alternative technology from Article 2 countries, producers of ODS initiated a project to develop the technology for HFC 134a in India, for which financial assistance could not be obtained from the Multilateral Fund. However, the financing policies of the Multilateral Fund discouraged the funding of this project, with the result that the financial burden of developing indigenous technology for HFC 134a is being borne entirely by the ODS producers and the Indian government. This is discussed in greater detail in Part B of the study.

(4)OTHER ISSUES IN PHASEOUT

Besides trade and positive measures, other factors were found to have contributed to the decisions on phaseout. Among these were market forces, presence of multinationals in a sector, the economic viability of the alternative and the extent of small scale sector presence.
It was found that in sectors where consumers were aware of the Protocol and the imminent phaseout, the demand for ozone friendly products was greater. In turn, firms in such sectors were keen to carry out the phaseout at the earliest possible in order to retain their market. In the halon sector, for instance, the most prominent consumer is the government, which has high awareness of the Montreal Protocol and its implications. As a result, all tender notices from the government specify a preference for non-ODS based fire-fighting equipment. This has pushed firms to seriously contemplate and where feasible, effect a switch to ozone friendly production. A similar push has been encountered by firms catering to the international market.

According to the members of the industry, the presence of transnational corporations (TNCs) is also of crucial importance in the phaseout decision-making. Multinationals often have an international policy on phaseout, which is also applicable to their activities in India. In addition, where such firms are involved in exporting ODS based products from India, there exists an additional incentive to use ozone friendly technologies and products. Moreover, considering the size of the Indian market, some TNCs have preferred to use ODS free products because it enables them to establish a place in CFC free products before domestic firms do so.

Availability of economically viable alternatives remains another important issue. In the industrial refrigerator and air conditioner sector, very few firms have made decisions with respect to phaseout. This has mainly been because the sector has yet to identify a viable alternative to CFCs. Firms in this segment stated that their decision to phaseout would get accelerated as further light is shed on possible ozone friendly alternatives.

Despite information dissemination efforts, decisions on phaseout made by small scale firms has been slow, if at all. This has been attributed to their very structure, which is conducive only towards planning for the short term, resulting in an inability to incorporate more long term implications into their decision making process. Besides, due to lack of adequate maintenance, their consumption of ODS tends to be higher per unit than in larger firms (CII, 1996).

(5)SUMMARY AND CONCLUSIONS

The present study focused broadly on the effectiveness of trade and positive measures in the Montreal Protocol, in the case of India. The effectiveness of trade provisions was assessed on the basis of whether or not these measures had led to participation, and subsequently, to the phaseout of ODS. In the Indian context, most users were found to procure their ODS domestically, while also catering primarily to the domestic market. Only two sectors, namely the

producers of CFCs and users of halons were largely dependent on the external market at the time of signing the Protocol. Therefore, ODS users in India being mostly self reliant for sourcing their ODS and for their market, it reduced the relative importance of trade measures in inducing participation in the MEA has not been very significant.

On the other hand, the bait of positive measures such as the availability of funds and transfer of technology on fair and favourable terms was found to have been the main driving force behind the accession to the Protocol. India, along with China, was instrumental in calling for the creation of the MF, particularly to accommodate the needs of large producer countries, and only after the allocated funds were increased significantly did India join the Protocol, indicating the significance of funding in India's decision to participate in the MEA. This, along with the promise of technology transfer on fair and favourable terms, was expected to neutralise the economic burden of participation in the Protocol.

In terms of phaseout, trade measures were found to have limited impact. Only the user sector for halon 1301, which was imported in its entirety until 1995-96, was found to be seriously affected by phaseout commitments that the supplier countries have taken. These factors had reduced the supply of halon 1301 and had escalated its price. Phaseout decisions in other sectors in India seemed more closely linked with funding and the availability of substitutes at affordable prices. Hence, while trade measures were found to have contributed to the decision to participate in the Montreal Protocol to some extent, phaseout decisions were more dependent on other factors. It is however, likely that there will be indirect effects of trade measures on both producers and users in the future, as export markets dry up for ODS producers.

It was found that efforts at awareness creation had been reasonably successful, and that firms were basing their phaseout decisions on the information acquired from awareness creation drives. Similarly, for sectors acquiring their ODS domestically, and catering to the domestic market, a delayed phaseout deadline was found to be helpful. For sectors which depended on the external market, the effect of this measure was insignificant. The central issue of the effectiveness of positive measures, however, revolved around the paucity of funds available for phaseout activity. In sectors, such as foams, aerosols and RAC, where funds have already been made available, phaseout decisions were found to be concrete, and in many cases, well under way.

However, in the large majority of cases, the effectiveness of the funding was limited, as only one sixth of the agreed incremental costs have been received by the country so far. Interviews with producer and user firms indicated that the process for fund acquisition was long, and often the available funds were inadequate for the phaseout activity. Decisions on phaseout and long term corporate planning were affected negatively, sometimes to the extent of discouraging firms from phasing out all together.

In the absence of technology transfer on fair and most favourable terms from Article 2 countries, Indian producers have considered the indigenous development of alternative technology to be the only solution. However, here too the financial mechanism has not been effective either in facilitating a technology transfer or in financially supporting the effort at technology development within the country.

Therefore, the experience of India clearly demonstrates that positive measures were more significant in the decisions to phaseout and further compliance will be extremely difficult without adequate financial support from the Multilateral Fund.

Additional funds towards indigenous technology building and the transfer of appropriate technology are of crucial importance in the phaseout process. This issue forms the core of Part B.

CASE STUDY 3* INDIA: THE ISSUE OF TECHNOLOGY TRANSFER IN THE CONTEXT OF THE MONTREAL PROTOCOL

By Jayashree Watal

(1)BACKGROUND

Technology can be acquired in three main ways: one is through a licensing agreement involving a one-time payment or royalty over a period of time or both. The second method for acquiring technology is through a joint venture with another producer, involving a sharing of equity or another agreed upon arrangement. Another means of getting technology is through indigenous development of such a technology, where technology is researched and developed independently, without the assistance of the technology owner. In this study, technology transfer refers to both the proprietary (that is covered by IPRs) and non-proprietary knowledge regarding production processes and machinery including the transfer of actual know- how to operate these and, in the case of the first two options, to make adaptation suitable to local conditions.

Transfer of technology has been a central issue in the phaseout decisions of transition from the use of ODS in the manufacture of final or intermediate goods, to the use of substitute substances which involves changes in technologies and technological capabilities. Especially if the transition includes the domestic production of ODS substitutes themselves, as is the case in India. The acquisition of such technologies thus forms an integral part of the phaseout process and generally involves a heavy financial outflow especially when such technologies are covered by intellectual property rights.

The Montreal Protocol recognises this constraint and provides an explicit solution in Article 10, providing for the transfer of technology to Article 5 nations to enable their compliance. This mechanism is meant to meet all the agreed incremental costs on a grant or concessional basis, as appropriate. In addition, a specific provision exists which enjoins each Party to take every practical step, consistent with the programmes supported by the financial mechanism, to ensure that the best available and environmentally safe substitutes and related technologies are expeditiously transferred to Article 5 nations, and that the transfers occur under fair and most favourable conditions.

The above provisions are particularly relevant for those developing countries which are producers of ODS, such as India, Argentina, Brazil, China, Republic of Korea, Mexico, Romania and Venezuela. Among these nations, at least in China, India and Korea, such production is dominated by domestically owned firms, for whom guaranteed access to ozone friendly technology on the terms producer countries could afford has become a central issue of concern. Efforts at acquiring substitute technology has not been successful as the technologies are covered by IPRs, and are inaccessible either on account of the high price quoted by the technology suppliers and/or due to the conditions laid down by the suppliers. This would require domestically owned firms to give up their majority

equity holding through joint ventures or to agree to export restrictions in order to gain access to the alternative technology.

Financial assistance towards the acquisition of such technology has also not been effective. In fact, an interim progress report by the Executive Committee on technology transfer stated that the terms of freely negotiated transfer of technologies, including costs such as patents[37], designs and royalties, may not always be accommodated by the funding policies of the Multilateral Fund. Thus, while prices of alternative technologies are unaffordable on account of IPRs, access to these is limited due to inadequate funds domestically and lack of financial assistance from the Multilateral Fund, creating a major hurdle in transiting to ODS friendly production, especially among producer nations. For ODS producer countries with domestically owned firms, therefore, technology transfer is a distinct and crucial issue in itself requiring immediate attention.

Scope and Methodology

The present section analyses the issues relating to the transfer of technology and the role of IPRs in the implementation of the Montreal Protocol in India. The study follows the case-study approach and relies on interviews with firms, industry associations and data and information from secondary sources.

The specific questions this study seeks to answer are as follows:

1) Which sectors among the ODS producers and users have encountered difficulties in transfer of technology? What are the main reasons for these difficulties?
   a) lack of access to the technology due to IPRs and/or unwillingness of the technology supplier to transfer this?
   b) high price of the technology making it a commercially unviable option?
   c) non-availability of funding from the Multilateral Fund?
   d) non-viability due to restrictive conditions of license such as tied sales or market sharing arrangements, restrictions on exports, etc?
   e) lack of bargaining power to get the latest technology or designs?

2) What is the solution envisaged by the sector to overcome these difficulties? Is the indigenous development of technology possible?

3) Which are the sectors where the technology required is in public domain and hence easily accessible and reasonably priced? Has this factor resulted in an early phaseout?

The separate product specific case studies on the transfer of technology described in this section will be based on interviews with executives of firms, industry associations and also data and information from secondary sources.

(2)SECTOR SPECIFIC EXPERIENCES WITH TECHNOLOGY TRANSFER IN INDIA

The India Country Programme emphasises the role of the government in encouraging projects for:

- the transfer and adaptation of technology for the phaseout of ODS production and consumption;
- evaluating substitute technologies:
- reviewing arrangements for the transfer of technology: and
- assisting in carrying out the adaptation and test manufacture of non-ODS substitutes products and technologies.

However, the Programme offers no clear-cut plans for realising this role.

At the level of individual sectors, in some cases the technology is relatively simple to acquire or develop indigenously. Because these technologies and products are non-proprietary and hence easily available, at competitive prices, the transition to non-ODS based production is considered relatively easy. This has been the case in the aerosol and foam sectors in India. On the other hand, for sectors such as RAC and fire extinguishers, acquisition of substitute technologies has been found more difficult, primarily on account of IPRs such as patents and trade secrets. The Multilateral Fund, however, claims that it is not aware of difficulties encountered in acquiring technologies in the fire extinguisher and RAC sector in India.

Aerosols

The manufacture of aerosol products is relatively new in India, dating back to the mid 1980s. As Part A stated, the ODS used by this sector are CFC-11 and CFC-12. The main alternative technology is considered to be Hydrocarbon Aerosol Propellant (HAP) and is available with a public sector firm, Gas Authority of India Limited (GAIL).

Besides easy availability of the alternative, the relatively higher price of CFCs as compared to HAP has been a significant incentive for switchover in several sub-sectors in the aerosol industry. The insecticide spray segment, for instance, began a phaseout even before India signed the Montreal Protocol in order to comply with a domestic regulation, with an estimated phaseout of about 60 percent. This is due, in large measure, to a steady and continuous increase in domestic prices of CFCs, with the concomitant easy availability and low price of substitute products and technologies. (The alternative in question can be purchased at approximately Rs 40-Rs 50 per Kg, which is two to three times cheaper than the current cost of domestically produced CFCs.)

The level of safety of some of these alternatives has however been in question, and the Ministry of Environment and Forests (MOEF) is gravely concerned over the use of destenched LPG among the smaller firms. Which is cheaper than HAP (costing Rs20-Rs 40 per Kg) but has strongly inflammable properties if safety requirements are not met. Improved safety has been inhibited by the lack of awareness among smaller firms, the difficulties in reaching out to them and also because financial assistance available from the Multilateral Fund is inadequate for this purpose. Such assistance has been adequate for enterprise with lower consumption in other Article 5 countries.

Problems relating to phaseout are also expected in the Metered Dose Inhaler (MDI) sub-section. MDIs are medical aerosol products used as an essential and effective therapy for respiratory diseases such as asthma and Chronic Obstructive Pulmonary Disease. In this sub-sector, the CFC free alternative technology was not established until as late as March 1995. The alternative technology is patented and is generally accepted to be more expensive than the CFC counterpart. In the Indian context, MNCs which import the alternative technology have found the cost of the new HFC MDI to be 10 to 15 times higher

than that based on CFC, which is produced locally by a domestically owned firm. As of now, Indian patients have been shielded from the price increase because of the domestically owned technology and production of CFC based MDI.

However, emphasis has been placed on the fact that the IPR associated with substitute technology is very recent, and will remain in place until later than 2010, when Article 5 countries have to effect their phaseout. This will force a dramatic increase in the price of the inhalers. The question of price of the final product is of crucial importance as it is difficult to justify a higher price to the poorer asthma patients in developing countries on the ground that a cheaper product is being replaced by a far costlier alternative. As the latter it is ozone friendly.

Foams

In India, several varieties of foams, such as polyurethane foams, phenolic foams and extruded foams, are produced using CFCs as blowing agents. About 80 percent of the manufacturers are small enterprises. Of firms manufacturing polyurethane foams, there are an equal number producing flexible foams and those making rigid foams.

Rigid foams are used mainly as insulation in refrigerators and freezers. Several technical options are readily acceptable and available for substituting ODS technologies in this sub-sector. Amongst the zero ODP options, cyclopentane has gained a fair degree of acceptance with firms in the organised sector. Indicative cost estimates according to the current conversion plans for foam blowing in the refrigerator sector are $43million, using cyclopentane as the alternative. One large manufacturer of rigid foams has already got his project approved by the Multilateral Fund, and several others are at the stage of preparation and approval.

Another alternative to CFCs in the rigid foams sub-sector is HCFC 141b, which is widely considered to provide the best insulation value of any of the presently available technologies. In India, this alternative is attractive because the price of this substitute is declining steadily in comparison to CFCs. An additional longer term advantage of HCFC-141b is that the technology for its manufacture is a simple one, not covered by IPRs. So far, production of this alternative has not occurred due to the low demand, but producers are considering its manufacture as this substance can be used until 2040.

In the flexible foams sub-sector, there exist a number of alternatives to CFCs. Among these, methylene chloride has the distinct advantage of being cheaper than CFCs and of having certain technical advantages, although the use of this substance has to be carried out in well-ventilated areas as a safety precaution. In India, firms in the sub-sector are in the process of switching over to it, mainly on account of the economic advantages the substitute offers. At present, a number of proposals have been put up to the Multilateral Fund, and some have already received funding, making this the largest funded segment in India. As in the case of LPG and HAP, the flexible foam sector too demonstrates the case of an industry where lower costs (relative to ODS) and easy availability of alternatives has enabled a speedy and smooth phaseout. Alternative technologies and products in these sectors are invariably in the public domain and have many alternative sources of supply facilitating the phaseout process.

Refrigerators and Air-Conditioners (RAC)

The RAC sector in India uses CFC-11 and CFC-12. In the large capacity room air conditioners sub-sector, the compressor manufacturers have begun a switchover to HCFC-22, the technology of which is in the public domain and is locally produced at reasonable prices.

In other major sub-sectors especially in domestic refrigerators, commercial and industrial refrigerators and mobile air conditioners, two alternative substitutes are available: HFC 134a and hydrocarbon. It has been argued that HFC 134a is not technically suitable for use in Article 5 countries, however commercially it appears to be the most widely used substitute.[38] It is argued by the proponents of hydrocarbon technology that when even in sophisticated Article 2 nations, there are chances of contamination and failure of compressors, the safety and reliability of this technology may be even more doubtful for Article 5 countries. However, detailed information on this substitute is only available with the technology owners' subsidiaries, and not to other manufacturers. The confusion related to the suitability of this alternative has not been cleared. The Executive Committee has approved 251 projects for conversion to HFC 134a and 16 projects for conversion to hydrocarbon as refrigerants.

While a number of Indian refrigerator manufacturers are still evaluating both options, two of the major manufacturers in the sector now have a foreign collaborator who has already effected the switchover to HFC 134a in the parent company, and have therefore favoured this option in India too. Another advantage of this alternative is that receiving financing for it from the Multilateral Fund is relatively easier. Recent project proposals submitted to the Multilateral Fund show that apart from only two large Indian refrigerator manufacturers who are considering hydrocarbon option seriously, all the others are for a conversion to HFC 134a.

Production of HFC 134a As an Alternative to CFCs in the RAC Sector

Given the growing importance of HFC 134a domestically and in the international market, producers of CFCs in India are very keen to acquire the technology for this alternative ,to use the vast networking of distribution they have established over the last decade within and outside the country. That they do not yet have the technology for HFC 134a is already affecting their presence in the export market, and is expected to do so increasingly as Article 5 nations phase out consumption of ODS. These producers also perceive the switchover to be urgent, as they are concerned that once producers in developed countries recover their fixed costs, they would lower their prices of HFC 134a. That Indian producers would not be able to compete either in the international or the domestic market for this alternative. However, the efforts of these producers in accessing the relevant technology has been largely futile so far, owing mainly to the high cost and the reluctance among the technology owners to sell the technology to a potential competitor.

According to a recent study done for the World Bank, all producers of HFC 134a hold at least one world-wide patent for the production and purification process associated with HFC 134a, covering aspects of some of the main synthetic routes and improvements leading to lower costs or higher yields. Even in a route off-patent, a number of patents exist covering important enabling inventions. For example, most processes require the use of catalysts which are of crucial importance and are generally covered by patents or trade secrets. Considering the recent dates of issue of most of these IPRs, their expiry date will be beyond 2010, the date by which Article 5 nations have to complete their phaseout. An additional concern is that the alternative technology has not stabilised, and

improvements are still being made in the production of HFC 134a which too will be patented in the near future.

It has been stressed that because there are only a few companies in the industrialised world that control the patents and trade secrets related to HFC 134a, developing countries would have to pay high royalty fees to produce them domestically or lose the domestic and international markets for this alternative.

In the experience of one company, the price of the technology quoted by a TNC producer of HFC 134A is a very high $25 million. Other options suggested by the supplier have been a joint venture with majority stake or export restrictions on HFC 134a produced in India. While both options have been unacceptable to the Indian producer, the cost of purchase is also considered unrealistically high. According to an estimate the highest possible price that is to be paid as technology fee alone is $8millionand not $10 million to $25million as estimated by the OORG study.[39] In addition, the producer industry has emphasised that for entrepreneurs, any investment into technology would depend on expected returns, which are very sensitive to international prices of the final product. In the above calculations, the international price has been assumed to be $4.5 per Kg (1996 prices), whereas in reality these prices have been declining and were no more than $3 per Kg in 1997. According to these lower prices, the industry sources estimate that the maximum fee that can be paid by entrepreneurs should be no more than $2million.

The vulnerability of Indian producer firms is increased by the fact that they acquired technology for CFCs only in the late 1980s, and are only in the process of recovering the cost of $1.5million for this purchase. The industry claims that the Multilateral Fund has not yet started to examine the issue of financing such a technology transfer, leaving the onus of acquiring the alternative technology to individual firms. The Executive Committee's Subgroup on Production Sector has begun reviewing projects from China seeking compensation for closure of a number of CFC producing plants. Technical audit teams have visited China and India to enable these two countries to complete their national plans for CFC production phase-out

Considering the lack of viability of purchasing the technology for HFC 134a, two Indian producers of CFCs commissioned the Indian Institute of Chemical Technology (IICT) in 1993-94 to develop bench scale technology for the synthesis of HFC 134a indigenously. This project is now in its second phase and a pilot plant is to be set-upfor scaling up the technology with the aim of making it ready for commercial use by the end of 1998. In this endeavour too, Indian companies have encountered difficulties. Financial assistance available to producer firms is limited to closure or "enforced idleness". Donor countries of the Multilateral Fund have adopted policies according to which indigenous development of technology is not funded unless the country commits to not demanding finance for the transfer of technology in this sector at any stage. Such a commitment has been considered too strong Article 5 nations such as India and China have felt forced to bear the entire burden of establishing indigenous technology, without any financial assistance from the Multilateral Fund. The Executive Committee decided at its 19th meeting that "Pending the completion of sector plans, the Executive Committee should focus on closure projects which could be considered according to interim guidelines with the understanding that guidelines on other types of projects, e.g. conversion and erecting ODS substitutes production, should be developed at a later date".

Fire Extinguishing

India has been a consumer of halons since the 1980s and the entire requirement was imported into the country up to 1990. Since 1991, India has begun to manufacture halon 1211 with indigenously developed technology. As of 1995-96, the country has been able to develop the technology for halon 1301 as well as cater to the domestic demand among user sectors in the fire fighting industry. These ODS have been quite popular in India even in highly sensitive areas like electronics manufacture on account of their effectiveness, ease of design and operation, low toxicity, non-conductivity and convenience in use. However, the popularity of this product is reducing with the increasing price of halons, especially that of halon 1301. The users of the latter halon are now limited to defence installations, power plants, aviation, etc, which are mainly under government control.

The main suppliers of these halons are two private firms who produce all types of fire equipment systems, of which halons represent no more than 15 percent, and no more than 5 percent in essential uses. Considering the decline in the demand for this substance, one producer has already stopped production while the other is considering a similar course. Switching over to non- ODS has been constrained due to lack of effective and affordable substitutes for halons along with the lack of technology for the hardware and systems designs.

In the fixed fire protection systems, India uses halon 1301 to the extent of 90 percent. A preliminary evaluation made by DIFR shows that HFC 227ea, commercially known as FM 200, is generally considered the closest substitute to halon 1301. Although this alternative is not ozone depleting, it is at least 40 percent less efficient than halon 1301, more toxic and has high global warming potential. In addition the cost of this substitute is about three times that of halon 1301 (the 1994 OORG Report of the World Bank estimates the cost to be twice as high as halon). Because of this higher cost, India has considered it important to produce the alternative domestically and has expressed an interest in acquiring the technology for producing HFC 227ea (FM 200).

The technology for this substitute is an old one and is free of patents. However, FM 200 is covered by a methods and composition patent. This patent was filed by a US company in 1995 and has a life of twenty years. The filing has been done in a number of countries including China, Korea and Russia (in India it has not been filed as Indian law does not allow such patents as yet). According to industry sources, China and Russia have successfully developed the process for FM 200 through indigenous R&D, but will be prevented from marketing the final product due to this patent.

An additional problem associated with alternative technology is that the owner of the patent imposes several restrictive conditions for FM 200. These include:

a) the components used in the fire protection systems such as cylinder, valves, piping and actuation mechanism should have the approval of the Underwriters' Laboratory (UL) or Factory Mutual (FM), USA
b) the fire protection systems design must meet the requirement of NFPA-2000 (USA) and the approval of UL and FM, USA.
c) final inspection/clearance of the fire protection system, including the various tests, following international standards, should also have the approval of UL and FM.

For the sale of hardware, only three companies in USA, UK and Australia have the required approvals. So far, no Indian firm has received permission to sell the relevant hardware.

If India were to produce FM 200, a preliminary estimate by the DIFR states that a total of $1.5million would be required from the Multilateral Fund to meet the cost of the technology transfer and license fee for the production of the alternative substances and systems just for halon 1301 sub-sector. Another $1.4million would be required for the conversion of halon portable systems to ODS free systems. It is only with this level of funding along with the requisite transfer of technology that India can produce the alternative to halon 1301.

In fact, according to the experience of Indian firms attempting to acquire the technology, finance is not the only hurdle. The owners of the patent have not been found to be interested in licensing the technology to wholly domestically owned companies and are interested only in joint ventures with a majority share holding. Indian firms, on the other hand, are not keen to divest their equity holding and their interest lies only in a purchase of the alternative technology.

In the case of HFC 227ea, as in the case of HFC 134a, there seems to be a unwillingness on the part of the technology supplier, who is also the owner of the IP, to transfer the alternative technology to India on even commercial terms. At the present stage, the only alternatives are to import the substitutes in the years to come, or to produce HFC 227ea, but by forsaking dominant control to the technology supplier. Considering the financial support position in the Multilateral Fund, the prospect of developing this technology domestically too seems a difficult option. In a situation where the alternative cannot be produced within the country, the users of halon 1301 even in strategic sectors such as defence and power plants will have to depend entirely on imports of HFC 227ea to meet their demands.

In the case of halon 1211, there exist four ozone friendly alternatives for the replacement of portable fire extinguishers:

a) **ABC powder,** which can replace about 60 percent of the existing halon used in this application. This alternative is not produced domestically, as the existing producers of halons are not interested in diversifying to this product, and while the equipment manufacturers have expressed a keenness to produce ABC powder, they do not qualify for financial support from the Multilateral Fund. Incremental cost for ABC powder production would have been eligible had India accepted to cease halon production when it requested funding for ABC production. On their own, individual equipment manufacturers are not capable of making a heavy investment into the technology for producing this alternative. In fact, this technology was offered to one large Indian firmfor $1million, at which price the project was not considered viable even if financed according to the norms of the Multilateral Fund (according to which the firm would receive only about $450,000). Thus, just as in the case of HFC 227ea, the production of ABC powder does not appear to be a feasible alternative at the present time, and any demand for this substitute would have to be imported in its entirety.

b) Another alternative to halon 1211 is **HCFC blends**. That the basic raw material for this substitute, HCFC 22 is now available in India is considered an advantage. However, this substance too has to be phased out eventually as it has ozone depleting potential. At present, no other suitable alternative is in sight and although this option can be no more than an intermediate solution, firms are considering the use of HCFC blends to retrofit existing equipment, particularly if funds come forth from the Multilateral Fund.

The remaining two alternatives are light weight CO2 extinguishers and water mist, both of which are at a very nascent stage of development even in developed countries. However, according to the Multilateral Fund, CO2 is a common technology in fire fighting and has already been employed in many developing countries. India received funding for production of CO2 fire extinguishers.

Hence the options in the halon 1211 sector are limited and require either a complete dependence on the import of an alternative or a solution which can at best be an intermediate one, neither of which is considered very stable by the industry.

(3)SUMMARY AND CONCLUSIONS

Article 5 nations such as India, where ODS is produced domestically, have to be concerned not only with the switchover to alternatives among their user sectors, but also with the transfer of substitute technology for their substantial ODS producer sector.

The Montreal Protocol recognises the concern regarding technology transfer, and offers an explicit solution in Article 10. This Article provides for a financial mechanism to facilitate both financial and technical co-operation, including the transfer of technology to Article 5 nations in order to facilitate the transition to ozone friendly production. This provision aims to cover all agreed incremental costs, and is buttressed by another provision which binds all Parties to ensure that best available ozone friendly substitutes and related technologies are smoothly transferred to all Article 5 countries, under fair and most favourable terms.

India's experience with the technological aspect of the transition away from ODS use and production demonstrates the case of an ODS producing country where this industry is dominated by domestically-owned firms, as opposed to multinationals or joint ventures. The domestic producers are emphatic about wishing to purchase the alternative technology, without losing their majority equity holding to technology suppliers. South Korea and China maybe in a similar position.

Among the affected sectors, India's experience demonstrates two distinct trends:

- where the alternative technology exists, is easily accessible, commercially viable and not covered by IPRs, the transition has been smooth.
- sectors where the technology or processes linked with it are under IPRs, with only a few technology owners, the experience has been negative and sectors associated with these technology switchovers have experienced difficulties in effecting their phaseout. Problems in transiting to ODS free production have also been encountered in sectors where the alternative technology is not yet well established or is disputed.

The sector specific case study on the aerosol industry and the foam industry reveals the former trend. In the foam sector, two clear-cut alternatives exist: cyclopentane and HCFC 141b. In the latter case, the price of the alternative is lower than CFCs, and is declining steadily. In fact, as the demand for this alternative grows, Indian ODS producers are considering the manufacture of

HCFC 141b, since the alternative technology is simple and more importantly, not covered by IPRs.

In the aerosol sector, phase out iswell underway as technology for the substitutes, Hydrocarbon Aerosol Propellants and Liquefied Petroleum Gas are available with a public sector firm and alternatives easily available and they are also cheaper than the current price of CFCs.It is estimated that one such industry, insecticide spray manufacturing, began its transition even before the Montreal Protocol was signed.

While market forces, such as the rising prices of ODS and the declining prices of ODS substitutes have played an important role in phaseout decisions, factors relating to clear cut technology options and the issue of technology transfer has been more important in the Indian context.

In MDI production, a sub-sector of the aerosol sector, alternative technology has been found only in 1995 and the patent associated with this alternative will remain valid until after 2010. Because of the reluctance of technology suppliers to sell this alternative technology to Indian producers, concern has been expressed over the dramatic price rise which will take place once the CFC based MDI have to be phased out. The price factor is a very relevant one because unless India independently develops its own novel process to produce this devise, the cost of the final product will become entirely unaffordable for the poorer patients of respiratory diseases.

The RAC sector, too, has encountered several impediments in transitioning to ODS free production. A certain amount of confusion exists in this sector on the available alternatives. While HFC 134a has been considered the primary choice in many cases, several environmental groups are of the opinion that this alternative is not suitable for Article 5 countries, and that the hydrocarbon alternative is more suitable. Lack of adequate information from the technology suppliers to assess technical and economic benefits has added to the confusion and uncertainty.

Moreover, because the technology owners are a few multinationals, the bargaining power of Article 5 nations such as India in the process of purchasing the alternative technology has been low. According to producers of ODS, technology suppliers have quoted a price of $25million, which is significantly higher than the $8million at which producers estimate the worth of the technology to be. In fact, considering the sliding prices of HFC 134a, producers are of the opinion that assuming a pay back period of 5 years, the present commercially viable price of the technology would be no more than $2million. However, further negotiations with technology suppliers have not been fruitful because the only options offered to domestic producers are export curtailment of the alternative or the provision of majority equity to the technology supplier. According to industry sources, the technology suppliers are concerned that equipped with the alternative technology, India could become a potential competitor in both the sizeable Indian market, as well as internationally.

In the case of the FM 200 sector too, the best alternative to halon1301, a similar experience has been had by domestic ODS producers. Once again, the technology is covered by IPRs, and the owners of the technology have expressed a reluctance to sell it to Indian producers. This reluctance to transfer technology has acted as a significant hurdle in the transition process

An additional problem associated with financial support in the context of technology switch is that the development of such technology domestically is not

funded unless the nation agrees to not demand finance for the transfer of technology in the pertinent sector at any stage. Such a commitment has been considered too strong, and Indian firms have preferred to self finance the development of alternative technologies.

It is clear that the unwillingness to transfer substitute technologies on fair and most favourable terms is both in order to recover R&D costs that go into the generation of technology, and also to inhibit Article 5 nations from competing with the international producers for the substitutes. While compulsory licensing provided for under Article 31 of the TRIPS can be used by Article 5 countries, such use is subject to a possible dispute, exacerbating the problems of transfer of technology at all, let alone at fair and favourable conditions.

Considering the various impediments to technology transfer, which in turn inhibit an effective switchover especially among producers of ODS, India has argued that there exists a need to impose an obligation on the owners of proprietary technologies to transfer them on fair and reasonable terms. If they cannot offer favourable terms, then such owners could be compensated separately through the financial mechanism of the Multilateral Fund, so that Article 5 nations are able to make a smooth transition to ozone friendly production. Regardless of the mechanism which is put into place, the experience of India demonstrates clearly that the transfer of substitute technology is essential among ODS producing countries (especially if the producing firms are entirely domestically owned). That some credible mechanism is necessary to assess and meet the cost of technology transfer among Article 5 producing nations.

CASE STUDY 4 * THE REPUBLIC OF KOREA AND THEMONTREAL PROTOCOL

By Korean Trade Promotion Agency

(1)BACKGROUND

Several export sectors in Korea have been related to the Montreal Protocol, as a number of exportables use or contain ODS. Because the country's development strategy has strongly emphasised export growth, the performance of ODS related products from Korea on the international market is likely to affect its development process quite directly. In this respect, the country's experience with the Montreal Protocol has been that of an economy which is intimately linked with ODS related trade.

However, a distinguishing factor is that Korea is also a producer of ODS, meaning that issues relating to technology transfer for the production of alternatives are at least equally important**.** The experience of Korea with the Montreal Protocol then demonstrates the case of a country which has both the concerns of exporter nations such as Thailand, and those of ODS producer nations such as India and China.

Why Korea Joined the Protocol

The Republic of Korea acceded to the Montreal Protocol in 1992, several years after the MEA had come into existence. However, it has followed up its commitment to the phaseout of ODS by also signing the London and the Copenhagen Amendments in 1992 and 1994 respectively. The country has thus become a party to the essential international norms for the protection of the ozone layer.

At the time of acceding to the Protocol, Korea was not classified as an Article 5 nation as its annual per capita consumption of the controlled substances was 0.62 kg per capita, exceeding the limit (0.3 kg) for developing nations. As a result, the country could not benefit from the 10-year grace period and was also expected to contribute to the Multilateral Fund. However, by 1993, Korea succeeded in reducing its annual per capita consumption of ODS to 0.29 kg, and was allowed the grace period accorded to Article 5 nations. The country was exempted from contribution to the Multilateral Fund. In addition, other support measures stipulated in Article 10 of the MEA apply to Korea.

Korea is however ineligible to receive financial support from the Multilateral Fund as it accepted the resolution of the 6th Meeting of the Parties which recommended that those nations "re-classified" as developing countries should abstain from relying on this source of finance. The available funds were, in any case, largely insufficient to cover Korea's phaseout costs.

Production and Consumption of CFCs and Other Subject Substances

Korea first started the production of CFC-12 for its refrigerants in 1977 based on indigenous technology developed by a local research institute, Korea Institute of Science and Technology (KIST). KIST, along with a private enterprise, also developed the technology for and commercialised the production of other ODS such as CFC-11. Mass production of CFC substances using indigenous technology has in fact been[40] one of this country's technological success stories.

Korea's production and import patterns of ODS reflects its long standing policy of import substitution, whereby once the alternative technology has been developed domestically, the nation concentrates on producing the importable locally. As Table 7 shows, this effort has been a successful one in Korea. The country has been increasing its production of CFC-11 and CFC-12, and the level of imports have concomitantly been reducing during the period between 1986 and 1994. In the case of halons too, while the country imported its entire requirement of this ODS until 1990, the situation has turned around dramatically since 1993, after which halon consumption has been based almost entirely on domestic production. Some of this change could also be attributed to the uncertain supply of this ODS in the international market.

Table 7 Working out the Policy of Import Substitution

DOMESTIC SUPPLY OF THE SPECIFIED SUBSTANCES (IN METRIC TONNES)		'86	'88	'89	'90	'91	'92	'93	'94
CFC-11	prodn.	-	3,396	3,106	2,075	6,350	5,880	4,984	4,633
	Import	4,405	4,392	10,327	3,313	7,014	4,719	85	85
CFC-12	prodn.	1,405	3,177	5,143	4,771	5,862	3,806	3,523	4,203
	Import	340	117	599	384	2,518	1,830	11	8
Other	Import	2,947	5,087	6,520	5,660	6,043	4,614	2,191	1,606
SUBTOTAL	Prodn	1,405	6,573	8,249	6,919	12,273	9,686	8,507	8,836
	Import	7,692	9,596	17,446	9,284	15,541	11,163	2,287	1,699
	(sub-total)	9,097	16,169	25,695	16,203	27,814	20,849	10,794	10,535
Halon 1211	prodn.	-	-	-	-	-	-	157	148
	Import	42	74	84	110	245	84	23	-
Halon 1301	prodn.	-	-	-	-	69	305	228	263
	Import	281	335	367	414	612	417	-	-
Subtotal	prodn.	-	-	-	-	69	305	385	411
	Import	323	409	451	524	857	501	23	-
	(sub total)	323	409	451	524	926	806	408	411
Total		9,420	16,578	26,146	16,727	28,740	21,655	11,202	10,946

***Source** : Korea Specialty Chemical Industry Association*

The local industries directly affected by the Protocol are producers of controlled substances, collectors and recyclers (textile, chemical, industrial machinery and steel businesses), users (electronics, precision machinery, automobiles, chemicals, pharmaceuticals, etc.) and those sectors involved in production of alternative substances (chemical, gas and industrial machinery).

Although the size of Korea's CFC market is moderate, estimated at US$49.8 million per year, the impact of ODS based production is felt over a number of related businesses, so that the size of the overall ODS related business amounts to approximately US$ 30.6 billion. This amount corresponded to 6.8% of Korean GNP (US$452.6 billion) in 1995. The sectors in question also exported products worth about US$20.3 billion, which was equal to 16.3% of the total exports of Korea (US$125 billion in 1995).

In 1995, the upper limit for the consumption of the subject substances was set at 22,425 tons (calculated in terms of ozone-depleting potential), to correspond with the limit of per capita consumption of 0.3 kg. However, only about 64% of the permitted quantity or 14,346 tons were actually consumed for the year, suggesting that factors other than legal limitations were inhibiting ODS consumption in Korea. Similarly, in 1996, the total consumption of 22,623 tons remained well below the stipulated upper limit by the Korean government.

Table 8 Consumption of Alternative Substances (1995)
(Unit : MT)

Alternative Substance	Consumption	Ratio
HCFC-22	8,605	67.9
HCFC-141b	2,045	16.1
HFC-134a	1,828	14.4

***Source** : The Ministry of Trade, Industry and Energy*

As the sectors related to ODS have grown, and as phaseout has become necessary in some sectors, Korea has experienced an increase in demand for alternative substances. Increased demand for substitutes has also been evidenced in the increased import of these substances, as is depicted in Table 9. In the case of HCFC-22, a substitute in the refrigerant sector, for instance, the level of imports has risen from 1,457 metric tons in 1992 to 3,608 metric tonnes in 1995, reflecting the increasing significance of this alternative in the Korean market.

Table 9: Recent Trends in Import of Alternative Substance (Unit : MT)

	HCFC-123	HCFC-141B	HCFC-141B	HCFC-22	HFC-134A
1992	7	27	7	1,457	7
1993	54	313	59	1,995	600
1994	94	1,143	57	1,965	1,208
1995	194	2,088	20	3,608	1,904

***Source** : Foreign Trade Statistics, Korean Customs Administration, 1996.*

Reviewing consumption status per substance, the consumption of HCFC-22 has increased most rapidly to being the most used among the alternative substances. In terms of consumption by usage, the 1995 data shows that 6,526 tons of alternative substances were used for refrigerants, which accounted for 51.5% of the total consumption of these substances. Since the alternative substances for refrigerants account for 92% of the total market, the transition away from ODS can be considered successful. However, since HCFC-22 is only a temporary substitute for ODS, another transition would need to be effected eventually in the process of switching to ODS-free production.

HCFC-141b is being consumed to the extent of about 2,045 metric tons in Korea and its demand is increasing at the rate of over 25 percent annually. This alternative substance is used mostly for foaming, as an alternative for the controlled CFC-11. By 1997, it was projected to account for about half of the total local HCFC-141b market, and thereafter, the market share of locally produced HCFC-141b is expected to rise further. However, as in the case of HCFC-22, because this substance also shows an ozone-depleting potential, it will also have to be phased out eventually.

HFCs may be the final solution to CFCs, because their ozone-depleting potential is almost zero. In most cases, this substance is used as a refrigerant for automobile air conditioners in Korea. As the demand for automobile refrigerant and its supplements continue to rise in this country, it is estimated that the consumption of HFCs will increase by more than 20% every year.

In sectors where alternatives are yet to stabilise, such as in the cleaning agents industry, the switchover to non-ODS is very limited, with their consumption estimated at no more than 204 tons.

(2) THE ROLE OF TRADE MEASURES

The Role of Trade Measures in Inducing Participation

When Korea acceded to the Protocol, exports were a very important component of its development plan. As the country's dependence on exports for overall economic growth had increased considerably over the 1980s, any significant curtailment in its exports would directly impact its development plan. In particular, the electronics sector, being Korea's largest export, would be affected in case of non-accession. About 40.5% of the local electronic products (in terms of production) are affected by the Montreal Protocol, while 42.4% of the total electronic exports are subject to the control of the protocol.[41] Another significant ODS user, the chemicals sector, too has depended to a considerable extent on the export market, and would have faced a significant shrinking of market in case of non-accession. This sector accounts for about 10 percent of Korea's GNP, and approximately 6 percent of total exports from the country.

Thus, it is likely that trade measures would have played an important role in inducing accession. However, the fact that Korea did not demonstrate a quick responsiveness to the MEA, despite its considerable dependence on exports (including those in ODS-related products) seems to indicate that other factors too may have played a role in the participation process. One reason could be due to the fact that while Korea was an importer of a few ODS, much of its CFC consumption was met through indigenous production. This self sufficiency in the production of ODS, and the fact that the local enterprises were concerned about the financial burdens associated with the Montreal Protocol, may have delayed signing the Protocol.

The Role of Trade Measures in Inducing Phaseout

While the study does not explicitly discuss the role of trade measures, the fear of losing export markets appear to have played a role in phaseout activity in Korea. Apart from the electronics sector, which is strongly linked with exports,

the three most significant producers are taking appropriate action such as substitution of CFCs in the air-conditioners and referigerator sectors. Such a phaseout is of significance because the electric and electronic industries have been major consumer of ODS. At the same time, due to their wide forward links with other sectors in the Korean economy, the importance of phaseout is higher.

In addition, among refrigerator manufacturers, non-CFC production has been focussed on the export market as developed country markets have ceased to demand ODS based products. Therefore, trade considerations seem to have also pushed this sector into producing in an ozone friendly fashion. The recent introduction of eco-labels for ODS free refrigerators is also stated to increase the supply of non-ODS based refrigerators in the domestic market.

In the survey conducted by the study, 8 out of the 26 exporters stated that they had experienced difficulties in exporting their ODS based products. A switchover was the only way to retain external markets and therefore, export oriented firms were already transitioning to ODS-free production.

Among sectors of the economy not linked to exports, factors such as availability of efficient and affordable alternatives, the cost of switching over and the significance of Small and Medium sized Enterprises (SMEs) have been additional issues affecting phaseout decisions.

Trade and Competitiveness Effects

Recent experience with phaseout activity in Korea has demonstrated difficulties in compliance, and in several cases it is anticipated that cost increases or lack of efficient substitutes could result in competitiveness effects as increased phaseout activity is undertaken in the country.

In home refrigerators, for example, a huge amount of capital and significant R & D efforts are required to develop ODS-free refrigerants. It has been found that a leading home refrigerator maker spent more than 130 million dollars over 3 years to build a new plant producing non-CFC refrigerators. Such scales of expenditure will clearly be out of bounds for SMEs in the sector. These firms are thus likely to either face a shutdown or atleast significant competitiveness impacts when they conduct their switchover.

In addition, in the production of non-CFC refrigerators, it has been found that the material cost alone rises about 30% when HFC-134a and HCFC-141b are used as refrigerant and foaming agent, respectively. One company carrying out its transition has had to invest close to US$ 13.8 million in order to change 3 main model production lines.

Besides cost, an additional concern is the lack of alternatives available to some ODS users. In the electronics sector for one, an appropriate alternative to ODS based cleaning agents is yet to be found. While a few substitutes have been experimented with, these are considered significantly less efficient as compared to the ODS based cleaning agent, CFC-113. In several cases, a deterioration in the quality and performance of the parts cleaned has also been encountered. Such a deterioration in quality coupled with the increased costs associated with a switchover is stated to result in serious difficulties among Korea's electric & electronics parts exporters. At present, most firms are keen to remedy the problem by collecting and recycling the controlled substances used. But to do so, the price of a cleaner recycling system amounts to US$ 0.13-0.26 million. This price is high in itself, but is likely to be even more onerous for SMEs, who

consume only a small quantity of cleaning agents and cannot afford to install such expensive facilities.

An additional problem encountered by the electronics sector is that on account of a large variety of electric and electronic parts, firms cannot easily exchange information with one another on alternative substances or technologies. The majority of them are also unable to collect necessary information in a systematic way. Once again, this problem is likely to be exacerbated among smaller firms in the sector.

In the **foam sector** too, cost increases have been encountered in the process of phaseout. One firm specialized in the production of polyurethane, has carried out a replacement of CFC-11 by HCFC 141b resulting in a cost increase of 10%. An additional 7% cost hike has been incurred due to the increased use of urethane to lower the insulation problem encountered in switching over. (Cost increases are likely to continue as the sector invests in R&D aimed at improving the efficiency of ODS-free alternatives.) According to this firm, an increase in price of 17% would result in a significant loss of profits, while not switching over could reduce the international market for their products.

In some cases, the phaseout being carried out involves a shift to hazardous alternatives as the safer substitutes to ODS are too expensive. The aerosol sector is a case in point. In this industry, LPG (Liquefied Petroleum Gas) or DME (Di-Methyl Ether) continue to be used in aerosol products in Korea, though they are deemed hazardous if sufficient precautions are not taken. Some low ozone-depleting substances from the HCFC and HFC families have been developed as alternatives, their prices are ten-times higher than LPG and DME, deterring their use. The control of LPG and DME is inevitable in the future, at which point the sector will have to face dramatically increased costs on account of the expensive alternatives.

The above problems were accentuated for SMEs. In the survey conducted by the study, very few of the smaller firms had detailed information on the phaseout schedule. In addition, it was found that the larger businesses had a more realistic notion of the repercussions of the Protocol and the significance of the imminent phaseout. They also had greater information on substitutes to ODS.

In terms of preparation for phaseout as well, SMEs seemed to be lagging behind. 9 large businesses out of 24 have already begun to implement their countermeasure programs, and only 3 large businesses have yet to design their responses to the Protocol. In contrast, 8 out of 17 small and medium businesses are at the stage of designing their countermeasures, which suggests that SMEs are responding far more slowly than larger firms.

Cost increases too were found to be greater for smaller firms. While the larger firms tended to find the cost increase to be about 20 percent or less, the majority of smaller firms found the cost rise to be higher than 20 percent. This may be explained by the economies of scale enjoyed by larger firms.

The survey indicated that larger businesses tended to concentrate more on developing alternative substances or changing production processes, smaller firms were more inclined towards shutting their business down, or concentrating on products which were not covered by the Protocol. It was found that only about 15 percent of smaller firms had accomodated the changes leading to a switchover so far. Additional factors such as greater difficulties in acquiring information and greater technological and financial barriers are likely to have

contributed to the competitiveness problems these firms had faced and expected to face in the future.

(3)THE ROLE OF POSITIVE MEASURES

Role of Positive Measures in Inducing Participation

It is clear that in terms of inducing participation, trade measures may have played a significant role in Korea. However, because Korea is a producer country, the need for acquiring technologies for the production of alternatives is likely to have also contributed to the decision to sign the Protocol.The country has followed a policy of import substitution through technological strengthening during its development process and availability of alternative technology would thus facilitate the transition to ODS-free production using domestically produced alternatives, and be in keeping with the development philosophy of the country.

Effectiveness of Positive Measures

In the Korean context, positive measures have meant a delayed phaseout schedule and the ability to access transfer of environmentally sound technologies on "fair and most favourable terms." However, the country is ineligible for financial assistance from the Multilateral Fund.

The fact that Korea acquired the 10-year reservation grace period for effecting its phaseout has been helpful for Korean enterprises to prepare appropriate response strategies. In the survey conducted for this study, it was found that only 26.3% of firms have begun to implement their phaseout in 1996 (the majority of these are large firms), whereas the rest are scheduled to implement their transition after the year 2000. This fact reflects the relevance of the grace period in the Korean context.

However, in industries where a trade link exists, the grace period has been ineffective. In Korean electric and electronic businesses, for instance, **phaseout** decisions have been guided by export market stipulations, propelling the sector to phaseout ahead of schedule.

The Impact of IPRs on Transfer of Technology in Korea

Most of the current applications for patent rights in the context of CFCs, have been submitted to the Patents office in Korea by foreign firms, are mainly to patent technology for the production of HCFC-141b and HFC-134a. Most of these applications are for process patents relating to agents or synthesis conditions and will expire only after the phaseout deadline for Korea, implying that the local producers of HCFC-141b and HFC-134a will have to pay heavy royalties for their use during their phaseout.

The experience so far bears out the fact that the rates of royalty demanded by technology owners for using patented technologies are very high. In the opinion of Korean firms, the exorbitant high royalties are an expression of a lack of intention to transfer the alternative technology on the part of technology owners.

Table 10 Annual Royalty Payments for Foreign Environmental Technologies Introduced
(Unit : case, million dollars)

DIVISION	'62-'89	1990	1991	1992	1993	1994	TOTAL
Number of Total Technologies	6,206 (3,821)	738 (1,228)	582 (1,290)	533 (872)	707 (943)	523 (1,256)	9,289 (9,410)
Environmental Technologies	107 (18.9)	8 (0.7)	13 (4.0)	14 (3.5)	25 (11.9)	36 (21.4)	203 (60.4)
Percentage (%)	1.7 (0.5)	1.1 (0.06)	2.2 (0.3)	2.6 (0.4)	3.5 (1.3)	6.9 (1.7)	2.2 (0.6)

***Source**: Ministry of Finance(MOF), Ministry of Environment(MOE)*
Note: Number in parentheses is the royalty payment for the year

In addition to the high prices to be paid for acquiring alternative technology, Korean businesses are also at a disadvantage due to the various unfavorable conditions to Korea in a technology transfer agreement with their foreign partner. Among 168 Japanese technologies introduced into Korea in 1994, 15 (8.9%) were not allowed to be consigned to a third party, and 13 (7.7%) were granted on a non-exclusive basis and on the condition that improved technologies should be shared between two parties during the contract period. Seven (4.2%) were prohibited to be used for export products and 3 (1.8%) were granted on the condition that the licensee not deal in competitive products or technologies. Among the 209 US technologies introduced to Korea in the same year, 16 (7.7%) were conditional upon the sharing of the improved technologies, 12 (5.7%) were granted on a non-exclusive basis and 10 (4.8%) were not allowed to be consigned to a third party. These conditions have been reported to inhibit the effective transfer of technology, and have been considered unreasonable at times by Korean firms.

Although there is the option of applying for a compulsory license in TRIPs, in case the owners of patented technologies refuse to transfer their technologies, this recourse is generally very time consuming due to many stringent procedures and conditions. For instance, if the technology for the primary alternative substance (for example, HCFC) is required for the production of the secondary alternative (for instance, HFC), the country could resort to the compulsory licensing. One of the requirements for this procedure is that the invention claimed in the second patent (HFC technology) shouldl involve an important technical advance of considerable economic significance in relation to the invention claimed in the first patent (HCFC technology). However, there are no specific guidelines for defining “important technical advance” or “considerable economic significance.” Therefore, in practical terms, it is difficult to utilize the compulsory licence clause of the TRIPs Agreement, especially for SMEs who have limited negotiating abilities. Thus, to improve the prospects of a technology transfer, the varied and stringent conditions for the compulsory license described in article 31 would have to be modified.

In addition, the presence of these patents makes the process of indigenous technology development more difficult. Generally, those who have developed a technology tend to apply for the widest possible protection of it under the patent rights system. As a result, if a local business wishes to develop an alternative substance, it has to ensure that its technology does not conflict with any existing

patent rights. A case in point was a local refrigerator manufacturer who spent US$16 million over 3 years in a bid to develop a new compressor for an alternative refrigerant. However, the firm encountered a conflicting patent from a Japanese compressor maker, and had to extend its project for another year just to ensure that the new compressor developed by the enterprise did not conflict with this patent.

Moreover, considerable time, effort and finances have to be spent to check for any conflicting patent right. Depending on the specific case, it costs between US$1,300 to US$1,500 and takes between two and three weeks to get such information. Even then, obtaining sufficient information can be a problem. Thus, the process of developing their own compressor was an arduous and an expensive one.

(4)DOMESTIC LEGAL STRUCTURE TO FACILITATE COMPLIANCE

In order to implement the provisions of the Montreal Protocol, Korea enacted "The Act of Control on the Production, etc. of Specified Substances for the Protection of the Ozone Layer" in April, 1991. The purpose of this law is to control the production and consumption of specified substances as per the MEA, to promote the development and consumption of alternative substances, and to control the discharge of specified substances.

In accordance with the above law, in the case of production, a license has to be acquired from the Minister of Trade, Industry and Energy, at least 3 months in advance. Quotas for production can also be imposed by this minister. For imports, an approval is required from the Ministry of Trade, Industry and Energy. Once again, the minister has the option of limiting ODS related imports, to ensure compliance with the Montreal Protocol. In addition, those who wish to distribute the controlled substances are expected to submit to the minister of Trade, Industry and Energy a detailed sales plan for approval. Another legal requirement is that distributors, producers and importers of ODS related products report their performance to the government on an annual basis.

"The Council for Adjustment of Supply and Demand of Specified Substances"[42] is responsible for approving the quantities of production and consumption as well as sales plan on requests from producers or dealers in accordance with the limits. These limits are jointly determined by the Ministry of Trade, Industry and Energy and the Ministry of Environment with the aim of keeping the per capita consumption of ODS below the level of 0.3 kg. The law also aims to lower the limits of production and consumption of those substances which are totally prohibited.

Additional legal stipulations include measures to promote the access to alternative technology. For one, any foreign business that owns relevant technologies and invests its capital directly into Korea would be supported by incentives such as tax exemption/reduction and longer-term rent in the foreigners' special industrial complexes.

To encourage indigenously developed technology a fund has been raised to promote the development of alternative substances and to control the discharge and use of specified substances effectively. The fund is raised from the

producers and importers of the specified substances as well as those who import goods containing the substances, and is managed and operated by the Korea Specialty Chemical Industry Association (SCIA). An additional contribution to the fund is made by consumers who pay charges based on the price of 1 kg CFC multiplied by the ozone-depleting potential per substance. The charges range from $0.048 to $0.9 for 1kg.

The pool of funds so created is aimed at the development of alternative substances or their uses. The development of facilities for controlling the discharge and use of specified substances, global cooperation programs for the implementation of the international ozone layer protection protocols, education or information programs to promote the use of alternative substances, etc.

So far, the fund has been primarily used for two purposes. One is for the development of CFC substitute substances and the second is as loans for ODS related enterprises wishing to transition to ozone friendly production. The loans are conferred for activities such as - technology development/equipment installation for the use of alternative substances, equipment installation for the production of alternative substances, technology development/equipment installation for reduction in the use of specified substances, equipment installation for destruction, recycling, reuse of ODS and equipment installation for upgrading efficiency in using specified substances.

From 1992, when the fund began to be used, until the August of 1996, a total US$ 21.6 million has been contributed to finance the above. A total of 76 business projects have been financed during this period; 37 for technology development, and 39 for investment in facilities; A significant effort has also been made to accommodate SMEs, and so far, smaller businesses have accounted for 67% of the 76 projects that have been financed by the fund.

While the prime purpose of the Fund is to support related businesses in their transition to ODS free production, a "Specified R&D Project" has been undertaken with the purpose of supporting R&D activities, including the development of alternative technologies to CFC. The adoption of such a strategy has been of prime importance in the Korean context.

For one, considering the size of the Korean market for production and consumption of ODS, indigenous development of alternatives are expected to help effect the phaseout at reasonable costs. This is also in keeping with Korea's long standing policy of import substitution, especially in technology related to major exports. In addition, just as the demand for CFCs has had a huge potential for growth, especially in Korea’s major export sectors, so is the demand for ODS alternatives expected to expand as the country effects its phaseout. Most important, however, is the fact that local development of alternative technology is imperative considering that transfer of such technology from foreign sources has not happened in accordance with the provisions of the Montreal Protocol.

Due to these factors, the KIST has been assigned the task of developing alternatives indigenously. This institute is supported by the Ministry of Trade, Industry and Energy and the Ministry of Science and Technology. Under this project, the latter has allotted some of its budget resources for the development of CFC alternative technology since 1990, when the Montreal Protocol came into the national policy making agenda. The total budget for the 6-year project has amounted to US$ 13.5 million. The Ministry of Science and Technology contributed US$ 6.9 million from their budget under “Specified Technology Development Project,” whereas the Ministry of Trade, Industry and Energy contributed US$ 3.0 million from the Fund.

In addition to KIST, private businesses such as Ulsan Chemical Co. participated in the first-stage project under the supervision of the Ministry of Science and Technology and the Ministry of Trade, Industry and Energy. For the purpose of commercialization of the newly developed technology, the Korean government established a separate enterprise[43] in 1992.

The first-stage project consists of 6 research programs for the development of HCFC-22, HCFC-141b, and third-generation CFC-alternative substances. During this stage, alternative substances began to be developed on a full scale. An HCFC-22 plant of 7,500 ton annual capacity and an HCFC-141b plant of 12,000 ton annual capacity have already been completed for commercial production by Ulsan Chemical Co.[44] Basic designs for HFC-134a and HFC-152a plants are also ready.

Table 11 Performances of the First-Stage CFC-Alternative Development Projects (as of June, 1996)

PROGRAM	PERIOD FOR RESEARCH	MAJOR PERFORMANCE	PARTICIPANT BUSINESS
HCFC-22	Dec. 24, 1990 - Dec. 23, 1991	A plant of 7,500 ton annual capacity has been completed for commercial production.	Ulsan Chemical Co.
HCFC-141b	Dec. 24, 1990 - Dec. 23, 1991	A plant of 12,000 ton annual capacity has been completed for commissioning.	Ulsan Chemical Co.
HFC-134a	Dec. 24, 1990 - Nov. 6, 1995	A basic design for a commercial plant of 10,000 ton annual capacity has been completed.	Hankook Sinhwa Co.
HFC-152a	Dec. 24, 1990 - Nov. 6, 1996	A basic design for a commercial plant of 5,000 ton annual capacity has been completed.	Hankook Sinhwa Co.
HCFC-123/125	Dec. 24, 1990 - Nov. 6, 1996	A pilot test and basic design work is underway.	Hankook Sinhwa Co.
A Third-Generation New Material	Dec. 28, 1991 - Nov. 6, 1995	A performance test system for candidate substances has been developed. Various candidate substances have been synthesized. A basic design for a HFC-32 plant of 5,000 ton annual capacity has been completed.	

Source : *The Ministry of Trade, Industry and Energy*

However, although in technological terms, the first-stage project has been considered successful, its economic validity is still unproved. In addition, the market for the CFC-substitutes has not increased to the extent anticipated. This is mainly because the alternatives are not as technically efficient as CFCs and nor do they apply to as wide a variety of uses as their ODS counterparts. The price of substitute substances have also shown a downward trend reflecting increasing international competition among these alternatives. The recent trend in price (US$ per ton) of CFCs substitutes in Korean imports is as follows:

Table 12 Prices of CFC Substitutes in Korean Imports (1992 – 96)

	1992	1993	1994	1995	1996
HCFC-123	10,119	9,503	6,656	6,469	7,005
HCFC-141b	4,156	3,576	2,798	2,554	2,316
HCFC-142b	6,813	4,254	3,599	3,356	2,645
HCFC-22	2,254	2,360	2,085	2,203	2,580
HFC-134a	15,000	7,800	5,427	4,922	4,422

***Source**: Foreign Trade Statistics, Korean Customs Administration*
Note: Prices for 1996 were calculated based on import performance during the first half of the year.

Moreover, since the successfully developed alternatives, HCFCs, are only intermediate substitutes, the Korean government has designed a second-stage project whereby a total of 5 programs will be implemented beginning from 1996 until 1999 by the CFC Alternatives Technology Center of KIST, Technology Institute of Ulsan Chemical Co. and other private institutes. The total budget for this project is estimated to be US$ 9,443.6 thousand which consists of government fund amounting to US$ 9,195.1 thousand and private participation of US$ 223.7 thousand.[45]

(5)SUMMARY AND CONCLUSIONS

The Korean experience demonstrates the case of an export oriented CFC producing economy. In addition, because Korea is also a producer of ODS, issues relating to the transfer of environmentally sound technologies too have been of significance.

Trade has played a substantial role in Korea's development strategy. Some of this trade is ODS based, and is thus linked to the Montreal Protocol, notably in the electronics and the chemicals sectors. In the former industry, over 42 percent of the exports are affected by this MEA. Besides its individual importance as the largest export sector in the Korean economy, electronics is also linked widely to other sectors in the country. The chemicals industry too is associated with a variety of sectors in the economy, although in absolute terms, its role has been limited to about 6 percent of the total exports.

It is then clear that trade measures taken against Korea would have hampered ODS related imports and exports, thereby diminishing the prospects for export growth and development. However, the fact that the country did not accede to the Protocol until 1992, indicates that the urgency of avoiding a reduction of the

export markets, on which the economy has considerable dependence, may not have been the only factor guiding accession.

In terms of positive measures, Korea enjoys only some of the support provided to developing countries in their phaseout process. Because the nation consumed more than the threshold level of 0.3kg per capita, it was initially not classified as an Article 5 nation at all. As the level of consumption was brought within the limit, the country became classified as part of the Article 5. Consequently, Korea now enjoys a delayed deadline for phaseout, like other Article 5 nations. The provision pertaining to the transfer of environmentally sound technologies on fair and most favourable terms also applies to this country. However, in terms of financial assistance, this country does not qualify for support from the Multilateral Fund.

Although it is not clear whether the delayed deadline acted as a sufficient incentive to participate, the prospects of acquiring alternative technology is likely to have acted as a significant inducement in signing the Protocol. Since much of Korea's ODS based production, consumption and most importantly, exports, has grown to depend on the indigenous production of these substances, the prospect of acquiring technology which would help phaseout, and help retain external markets is likely to have contributed to Korea's decision to sign the Protocol. Thus, the positive measure relating to transfer of technology may have been a significant factor in inducing participation.

In terms of phaseout, the study states that firms in the export sector are conducting this switchover on account of stipulations from the importing partners. Cases in point have been the refrigerator and the electronics sectors. In the export sectors, it is indicated that difficulties have been encountered by those firms which have not conducted their phaseout. Thus, measures taken pursuant to the Protocol in import markets do seem to have induced phaseout among export firms, although other factors such as easy availability and relative costs of alternatives also appears to have been of significance.

On the other hand, **positive measures** do not appear to have contributed to any great extent towards phaseout. The delayed deadline has helped in the process of formulating coherent strategies, especially among larger firms. However, the provision of transfer of technology has not been effective in the Korean context, mainly on account of lack of actual technology tranfer to produce alternatives. This problem has infact been considerable, and firms which have contemplated acquiring the technology have encountered a number of problems. The most important is that the most alternative technologies are patented and the prices quoted by technology owners as royalty are very high. Among Korean firms, these exorbitant prices have been viewed as a lack of intention to tranfer technology.

In addition to the high prices to be paid for alternative technology, an additional concern with respect to the transfer of technology has been the unfavourable conditions imposed while concluding an agreement with a foreign partner. In a number of cases, the technologies have been offered on the condition that they will not be consigned to a third party. In addition, conditions have also pertained to non-exclusivity and that the technology be shared between two parties. More importantly, some firms have been prohibited from export, and some conditions also related to the fact that the licensee did not have the possibility of dealing in competitive products or technologies. Therefore, both the cost and the conditions for acquiring the alternative technology have been difficult for Korean firms, and have acted as a significant barrier in the production of alternative substances which would help the country in

transitioning to ODS free production.

The fact that most of the alternative technologies have patents will expire after the phaseout deadline implies that the country will have to spend considerably on importing alternatives, since alternative technology cannot be easily produced in the domestic market. Moreover, if producer firms do not wish to be shut down in the phaseout process, they will have to acquire the alternative technology by paying the royalties demanded and adhere to all conditions put up by technology owners. This is likely to have a significant impact on the transition among producer firms, and in turn on user firms.

Although the TRIPs agreement permits compulsory licensing under strict conditions, this measure has been considered too time consuming, requiring also a number of stringent procedures which are difficult to fulfill.

On account of the difficulties associated with the transfer of alternative technology, Korea has launched a serious effort to develop this technology indigenously. However, while the technologies for HCFC have already been commercialised, it is found that placing substitutes on the market can meet with difficulties too. For instance, the study notes that the price and quality factors of substitutes on offer from foreign producers can be more attractive, reducing the commercial prospects of domestically developed alternatives. Therefore, the early starter advantage which foreign producers have inhibits the effective commercialisation of domestic alternatives. This is perhaps one of the reasons why although Korea has developed the technology for HFCs, the substitute is yet to be commercialised.

Besides the relative importance of trade and positive measures, the Korea study also emphasises the importance of other factors in phaseout, such as the availability of alternatives, the role of the government and the size of the firm. In several sectors, problems have been encountered due to the lack of viable alternatives.

The lack of availability of alternatives at low cost is another factor impeding effective phaseout in the Korean context. Among aerosol producers, it was found that although alternatives such as LPG and DME were available, their inflammability made them unsuitable as substitutes. The safer alternatives are about ten times more expensive than LPG and DME. Therefore, no viable and safe alternative exists in the aerosol sector, which in turn affects the degree of effective phaseout.

The study also brings out the significance of the SMEs presence in some sectors in the phaseout process. A survey conducted by the study demonstrates that such firms are more seriously affected by the phaseout process. In areas of cost of conversion, awareness of the details of phaseout, and in terms of financial and technological capacities in general, such firms were found to be more disadvantaged. Thus, among SMEs, phaseout decisions are still at a nascent stage.

The most important aspect which distinguishes Korea from other developing nations is the level of effort put into indigenous technology development. The urgency of developing substitute technology has induced the country to undertake an elaborate programme funded by the government, the private sector and by consumers. The development of alternative technology and the commercialisation of the same is the final goal of this project.

So far, the effort has successfully yielded the technology of HCFC 141b, which

has also been commercialised. In addition, as a result of these efforts, the financial and technological burden of trials and errors associated with new technologies are not being borne by individual firms. Additional support has included educational or public relation programs for protection of the ozone layer and promotion of alternative substances. In addition, a domestic mechanism has also been created to assist firms in their phaseout process. SMEs too have benefitted from this programme and, so far smaller businesses have accounted for 67% of the 76 projects that have been financed by the fund for their development of alternative substances or their uses since 1992.

Thus, the Korean example brings out in detail the problems relating to the effective transfer of environmentally sound technologies and demonstrates the case of a country where government and private entities are attempting to make up for the lack of effective support from positive measures in the Protocol. It is emphasized that such efforts have been rendered less effective on account of the strict protection of intellectual property rights.

SECTION 2 * CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA (CITES)

- Thailand's experience with CITES
- The experience of Indonesia with CITES

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES (CITES)

By the Natural Resources Management Programme of the Thailand Environment Institute

CASE STUDY 1 * THAILAND'S EXPERIENCE WITH CITES

This chapter focuses on the experience of Thailand with CITES. It analyses in particular the extent to which trade sanctions have induced Thailand to formulate domestic legislation to comply with CITES. The effectiveness of these legislation in curbing illegal trade in CITES listed species is also analysed. In addition, the study discusses the steps necessary to reduce illegal trade in endangered species in Thailand, concentrating in particular on the role of increased financing and capacity building.

(1) HIGHLIGHTS OF TRADE IN ENDANGERED SPECIES IN THAILAND

Background

The location of Thailand, extending across two major bio-geographical sub-regions, has provided the country with rich wildlife resources. Thailand contains 8 percent of the world's known plant species, 10 percent of the world's bird species, 5 percent of the world's reptile species and 3 percent of the world's amphibian species, while Thai waters contains 10 percent of the total fish species worldwide (OEPP, 1996; Gray, Piprell and Graham, 1994).

Table 13 Total Number of Species Found in Thailand & Number of Endangered Species

	PLANTS	MAMMALS	BIRDS	REPTILES	AMPHIBIANS	FRESH WATER FISH
Total No. of Species	15,000	284	915	313	107	552
Total No. Of Endangered Species	68	26	34	9	0	13

***Sources**: OEPP 1996, World Conservation Monitoring Centre, 1992 and Gray, Piprell and Graham, 1994.*

Considering the relevance of trade in endangered species in Thailand, this country was an original member of CITES and signed the convention as early as 1973. However, ratification of the agreement took 10 years, and CITES officially came into effect in Thailand only in April 1983. Unfortunately, trade in wildlife has remained an important source of income for the country, and continues in many species despite Thailand being a member of CITES. CITES has a membership of 143 nations which are party to the Convention.

Comment: why unfortunately - only if trade is unsustainable or illegal.

While trade in wildlife is far less important than trade in products such as textiles or electronics, it is nonetheless of significant economic importance to the country. Over the years**,** demand for wildlife has put significant pressure on Thailand's rich wildlife resource, as a result of which a number of species of plants and animals are stated to have been traded unsustainably. According to internationally accepted estimates, 140 identified species (about evenly divided between plants and animals) are presently considered threatened (WCMC 1992).

Although the international market is a major source of demand for CITES listed species in Thailand, the demand from the domestic market exacerbates problems associated with compliance. Because endangered species are a rarety, they often form a collector's item and command a high price. This factor increases the prices of such products and further encourages their supply in some cases, illegally. The domestic and international demand for endangered species is for a variety of uses.

In the case of flowers, pets, tusks and carved ivory, in particular, it has been found that ornamental use of these products acts as a status symbol, both within and outside the country. Their use as traditional Asian medicines is a source of demand for endangered species resulting in the trade of tiger, bear and reptile parts. In these products, Thailand is a net exporter. As food too, some endangered animals are considered delicacies resulting in the heavy cross border trade with Laos, Korea and Myanmar in heads and paws of Asian bears, and other trade in exotic and high value animals. Another source of trade (both exports and imports) is in the apparel sector where clothes and other fashion goods made from crocodile and some species of snakes, are high value products with a substantial demand. Export of wildlife for purpose of research is also responsible for a small share trade in protected species.

Extent of Trade in Endangered Plants and Animals

Estimating levels and patterns of trade in protected wildlife is difficult, not only because of the reportedly large illegal trade, which goes undocumented, but also because Thai records of CITES listed trade has often been sketchy and incomplete, especially during the period before 1992. Trade data presented here are based primarily on figures given in the annual trade reports submitted by Thailand to the CITES Secretariat, supported by information from annual reports of other nations which cited Thailand as a source of wildlife, and from independent research reports on Thailand's wildlife trade.

Plants

Thai trade in plant-life is largely centered around export of orchids, both whole plants and cut flowers. Orchids account for over 99% of all CITES-listed plant exports, also making Thailand the world's largest orchid exporter. Overall, orchid

trade has been rising, and in 1994, for instance, accounted for close to US$35million, rising dramatically from US$8million in 1986 (Luxmoore, 1989 & Alpha Research, 1992, 1993, 1995). Artificially propagated specimens are increasingly produced in Thailand andare responsible for majority of the exports of protected plants, as trade in these products are not subject to the same restrictions as plants found in their natural habitat. This provision has permitted for a booming of commercial flower cultivation in Thailand. However, the number of wild specimens legally exported from Thailand is still significant. In 1992, for instance, Thailand approved the export of close to 430,000 plants of species listed under CITES (Department of Agriculture, 1993).

Thailand also has a very large domestic market for orchids, and protected wild species are allegedly sold in central Bangkok, Thailand's largest concentration of domestic trade of protected species. In international trade, the actual extent of wild orchid smuggling is unknown, but it is believed to be widespread, with Thailand also acting as a funneling point through which neighboring nations export their orchids (Luxmoore 1989 and Department of Agriculture, 1996).

The two primary import markets for Thai orchids are Japan, which accounts for nearly half of Thai orchid exports, and the United States, which buys roughly 15-20% of it (Handley 1992a and Department of Agriculture 1993-1996). Collectively the EU is also an important market for buyer of orchids, accounting for 20-25% of total exports, with Germany, France and the Netherlands being the primary European purchasers. South Korea, Taiwan, and Canada have also been some important markets for orchids (ibid).

In the case of orchids, a Thai government report to UNCED alleged that implementation of CITES implied losses of millions of dollars annually in orchid trade. The report argued that CITES, by prohibiting trade in wild orchids but allowing trade in artificially propagated orchids, encouraged other countries to cultivate this plant for commercial purposes while providing protection from outside competition. This has been disputed by the CITES secretariat, which holds that while Thai exporters may have incurred losses in the short term, restrictions on trade in wild orchids has contributed to the development of Thailand's artificial propagation industry, which is significantly more profitable in the long run.

Overall, the effects of trade measures between parties is difficult to judge. For instance, very significant price increases for many types of orchids during the 1980s can, to a large extent, be attributed to restrictions on trade in wild orchids. Thus, increased value added of artificially propagated orchids made up for reduced quantity in exports of wild orchids. But a subsequent declines in prices of orchids in the 1990s were a result of market saturation. This seems to suggest that CITES restrictions are no longer inhibiting orchid trade. In addition several other efforts have been made to regulate trade in orchids:

1. There are efforts made by the Plants Management Authority to regulate the market;
2. confiscations made on export;
3.4. fines imposed on irregularities by exporters;
4.5. the existence of a national nursery registration system;
5.6. the existence of a reference collection of live orchids at the Management Authority Office in Bangkok to check exports;
6. that all exports are checked by the Management Authority at their office;
7. that Management Authority staff in 1997 (and also in July 1993 for six months) has been sent to Kew 9. Gardens in the United Kingdom for training;
80. in 1994 the Management Authority published a special identification guide

for wild versus artificially propagated Pahiopedilum;
9. a special poster has been prepared for the identification of the Appendix I Dendrobium.
10. Also there is an intention to ban trade in all wild orchids from Thailand. Since the end of the “ban” reporting requirements are well met for plants.

Animals

Thailand also has been very active in the import, export, and re-export of animals. Trade in snake and crocodile skins, and apparel have dominated this sector, accounting for 99% of Thailand's recorded trade in CITES-listed animals (Luxmoore 1989, Department of Agriculture 1993-1996 and RFD 1993-1996). Small amounts of serum from protected reptiles are also exported for their medicinal use in making anti-venoms; however, this amount is insignificant in terms of overall reptile trade.

During the 1990s, the bulk of the trade in unprocessed snake skins was exported to other developing nations, principally Mexico, although some industrialized nations, such as the US, also purchased whole skins as well. Most manufactured products made from snake skin went to industrialized countries such as Japan, the US, and the EU nations, principally France and Italy, and to other Asian nations, such as Hong Kong (RFD 1993-1996).

Thailand has registered captive crocodile breeding programs for the Siamese crocodile, *Crocodylus siamensis,* and the Salt-water crocodile, Crocodylus porosus, both of which are listed in CITES Appendix I (Jenkins and Broad 1994). Crocodiles listed on Appendix I, but which have been bred in captivity at CITES-registered farms are treated as Appendix II-listed species in terms of the trade restrictions applied to them (Luxmoore 1992), thus, allowing for commercial exports of these species from Thailand.

Most of the crocodile skins and crocodile-derived exports, however, are from Caiman crocodiles, *Caiman crocodilus,* listed in Appendix II of CITES, which are obtained primarily from Columbia and Venezuela, or from Singapore which acts as an entrepot for wildlife trade. Minor trade has also occurred in Chinese and Mississippi alligators and other crocodile species, although not for commercial purposes. The provisions of Article III of the Convention specify that specimens of Appendix-I species may not be imported for primarily comemrcial purposes. However, nothing is said about the purpose of the export.

Thailand has also had a history of trade in other reptile species, including **monitor lizards**. Between 1983 and 1987, Thailand had an official reservation with CITES for the Clouded Monitor, which is listed in CITES Appendix I. By taking a reservation on a species, Thailand was to be treated as a non-party to CITES with respect to the designated species, and was legally entitled to trade this species with non-parties and with other members who had reservations for this species. Which, in the case of the Clouded Monitor lizard, was only Japan. Reptile trade also included the Water Monitor, *Varanus salvator, listed* in Appendix III of CITES, and reportedly in the Yellow Monitor, *Varanus flavescens, an* Appendix I species not native to Thailand (Luxmoore 1989).

Trade records from the 1980s show that there was much inconsistency between reported trade involving Thailand for these species (Jenkins and Broad 1994). Since the retraction of Thailand's reservation on the Clouded Monitor, reported trade in these species has declined to zero. Illicit trade in monitor lizards still continues, and cross-border trade, in particular, is widely observable; however, mass commercial trade in these species probably no longer occurs.

Thailand's trade in protected birds has been one of the more noted aspects of Thai wildlife trade. It is also one of the few major areas of CITES-listed wildlife trade, outside of border-trade with its land-linked neighbors, in which Thailand is a net importer of specimens. However, exports of these birds are very prevalent in Thailand, and are considered extremely lucrative. For example, the export of zebra doves is estimated to earn close to US$4million annually (Corrigan 1992). Thailand's recorded annual exports of protected birds, which totalled in the thousands during the mid- 1980s, has, however, dropped significantly since.

Legally recorded Thai imports of CITES-listed birds range from a few hundred per year to over 2,000 in 1995 (RFD 1996). The major suppliers are the Netherlands and the Philippines. In both cases, the majority of the birds were listed as being bred in captivity and in general were sold either for purely commercial terms or for captive breeding programs in Thailand. Illicit trade of protected birds within Thailand and across borders is expected to be common, and protected species can be found for sale at some border and provincial markets as well as within Bangkok's Chatuchak weekend market (Srikosamatara *et al* 1992, TRAFFIC 1993, and personal observation 1997).

Thailand has also traded whole specimens or parts of several species of CITES listed mammals with other Asian countries, including, *inter alia,* Tiger, Asian Sun Bear, Malaysian Black Bear, Rhinoceros, rare birds and tortoises (see for example, Srikosamatara *et al* 1992 and TRAFFIC 1993). In addition, the country has also been a supplier and conduit for primate trade, sought after by private collectors, as well as research institutions in the West.

In the case of Asian elephants, despite a long-standing legal protection, illicit trade is still common in Thailand. Illegal import of Asian elephant also occurs via Thailand's neighbours, sometimes for use in the logging industry. While significant in terms of species conservation, in economic terms legitimate ivory trade is less important. Even in the boom year of 1988, revenues from ivory exports amounted to less than US$ 10,000 (Alpha Research 1992). Although all ivory trade must be registered by law, illegal export of elephant ivory is still common, and several shops catering to tourists offer carvings of both Asian and African elephant ivory, without any documentation.

(2) ROLE OF TRADE SANCTIONS IN ENFORCEMENT OF CITIES IN THAILAND

Background toTrade Sanctions

Although a member of CITES since 1983, Thailand had no legislation in place to enforce CITES requirements, prior to 1992. The existing laws governing the collection/capture and trade of wildlife in Thailand were the Plant Act (1975) (also sometimes referred to as the Seed Act) and the Wild Animals Reservation and Protection Act (WARPA 1960, as amended in 1972). This legal structure provided protection only for species listed in these acts, and the lists did not conform to those of the CITES Appendices. Furthermore, under WARPA, even the protection provided to listed animals was limited to restricting the hunting of designated animals and offering protection for animals in wildlife sanctuaries and national parks. Limitations on some trade were occasionally put in place, in certain types of reptiles, orchids (TCGE 1992), and primates (TDR1 1987) for instance, when they became particularly objectionable to the international

community; however, such actions were rare, inconsistent, and lacking a solid, transparent legal framework. Therefore, effectively, the local laws had little connection with CITES provisions and their enforcement. In addition, the Thai authorities in charge of implementing CITES had no legal backing to do so.

After Thailand ignored several warnings from the COPs and Standing Committees about its performance in the trade of endangered species, the Secretariat and the Standing Committee of CITES urged Parties to immediately take all possible measures to prohibit trade with Thailand in any specimens of species included in the CITES Appendices (TRAFFIC 1991). The recommendation was made and remained in effect for a year. In response to the threat of elimination of all endangered wildlife trade, which would have cost Thailand tens of millions of dollars in orchids and snake-skins alone, Thailand passed new versions of both the Plant Act and WARPA in early 1992.

The new version of WARPA restricted all trade in wildlife except for that from captive- breeding programs, and the new Plant Act stated that the import and export of conserved plants are limited only to those receiving a permit to do so. The new legislation also increased the maximum fines and jail terms for illegal wildlife trade. The new legislation also provided for a legal backing to the authorities in charge of implementing CITES. In addition, as of 1992, all CITES-listed species are protected under Thai law. Alongside, an effort was also made to train the staff manning transit points outside of Bangkok. As a result of these actions, the threat of trade sanctions by CITES member Parties was withdrawn.

Impact of the New Legislation on Compliance with CITES

The impact of the new legislation has been favourable in some cases. Various types of endangered pythons, which dominated Thailand's exports in the 1980s, continue to be exported, but at levels much lower than in the previous decade. This reduction in exports of the endangered reptiles has been attributed to the fact that officials have ceased granting hunting permits for protected species of snakes (Luxmoore 1989). Thus allowing Thai exporters of snake skins and snake skin products only to clear their stocks to permit better supervision of the snake products export industry. A similar reduction in the illegal trade of some varieties of endangered orchids has also been reported.

Unfortunately, changes in domestic legislation have been insufficient in minimizing endangered wildlife trade in many species. For instance, studies of wildlife trade across the Thai-Laos border conducted one year before and one year after the new legislation was put in place demonstrate that cross-border trade in much of protected wildlife continued unabated (Srikosamatara et al 1992, TRAFFIC 1993). Reports of illegal wildlife from Cambodia, Myanmar, and Malaysia also indicate that these trade routes continue to exist (TRAFFIC 1993, Department of Agriculture personal transmission 1996). In addition, large shipments containing dozens of protected birds, reptiles, and mammals seized at Bangkok's port facility in 1996 indicate that despite Thailand's efforts and the enforcement of CITES, the country still remains a transit center for international shipments.

A number of LOOPHOLES have been found by illegal traders which have inhibited the effectiveness of the legal structure attempting to uphold CITES provisions. For one, the new law which required that owners of wildlife register their possessions, and bans any new acquisition of protected species, has not been very effective. Any individual can keep up to two specimens of any protected wildlife provided they were acquired prior to 1992. Traders have taken

advantage of this loophole, registering the animals under the names of relatives and friends. Ineffective monitoring has contributed to the problem.

Another loophole which has abetted illegal trade in endangered species is that a large amount of cross-breeding and cloning of species makes it difficult even for trained authorities to identify and distinguish between different types of orchids. In addition, the fact that trade can be legal for certain artificially propagated plants but illegal for wild plants of the same species, has left the door open for smugglers, who can pass wild collected orchids off as cultivated flowers. In view of the fact that many cultivated varieties of orchids can take up to 10 years to bloom, considerations of short term profit make it even more attractive to poach wild orchids

Thus, despite the success of artificial propagation and captive breeding programs, which have made possible the legal commercial trade of species endangered in the wild, there continues to be black markets for wild specimens, which can be passed off as legal. While it is not possible to estimate any reliable sale figures, the existence of black markets seem to indicate that private marginal benefit of risking is far higher than that of marginal cost, including the probability of being caught.

As with orchids, protected reptiles raised under breeding programs can be exported legally. It is widely believed, however, that much of the recognized and documented trade in such animals may actually be illegal, with specimens obtained in contravention of CITES regulations.

Many of the imported Caiman crocodiles and/or skins have also been shown to be illegally traded (Luxmoore 1989). As they are listed in Appendix II, import permits by Thai authorities are not required, only export permits from the country of origin. A study from 1989 stated that most of the imports of Caiman crocodile skins into Thailand in the 1980s were from Columbia and Venezuela, neither of which had issued export permits to Thailand (ibid). More recent figures, however, show that imports were accompanied with proper export certificates from Columbia and other exporting nations (WCMC, personal communication 1997 and RFD 1993-1996). However, speculation still exist as to whether the certificates are genuine and legal (Jenkins and Broad 1994).

Similarly, loopholes have been found with the provision that exports of CITES Appendix I-listed species are permitted for research and captive breeding programs. By claiming to be for research or for zoos, traders have obtained CITES protected wildlife species from Thailand and have sold them on the lucrative export market. One publication from 1990 documented that Thai animal dealers have been known to ship endangered wildlife directly to zoos in Poland. In Poland they are accepted on credit, quarantined and then reshipped to buyers in western countries with new certificates of origin stating that the species were bred in captivity (The Nation 1990).

International trade in endangered species has also been circumvented by bringing consumers into Thailand instead of shipping the animals out. Korean nationals for instance have come on organized trips which include meals of bear paws offered by restaurants in Thailand (Srikosamatara *et al* 1992).

Corrective Steps Required to Improve Compliance

Perhaps the most important factor in the continuation of wildlife trade is the lack of adequate enforcement. Despite articles in the new 1992 wildlife legislation which raised the maximum potential fines and jail terms from US$ 200 and/or

six months in prison, to US$ 1,600 and/or four years imprisonment, the penalty has been kept minimal**,** which is insufficient to deter traffickers. A report from 1990 noted that a gibbon could fetch a price of up to US$ 16,000 on the international market, or 80 times the maximum financial penalty. Since the changes in the laws in 1992, the differential has dropped to only 10 times the maximum financial penalty, but remains an inadequate incentive for compliance.

The staff responsible for implementing CITES too, has been insufficient in number, under-trained, and lacking the necessary technical and financial support, much of the staff lacks the necessary expertise to correctly identify protected species, especially at border-crossings (Thitiprasert and Jesdapipat 1997).

Inadequate funding has been another major shortcoming in the implementation process. For the first several years after joining CITES, the staff did not even have an adequate budget for essential equipment such as computers for keeping track of wildlife permits and transfers. As a result, annual reports detailing CITES trade in Thailand were incomplete, inaccurate, and sometimes were not submitted at all.

A reorganisation of institutions involved in improving compliance with CITES is also necessary. For example, both the enforcing authorities of CITES and customs officials have legal authority to enforce customs laws relating to border trade in endangered species. However, while the latter are empowered to detain any suspects, officers of the Department of Agriculture, Department of Fisheries and RFD do not have such authority. Improving the co-ordination between all the concerned agencies would be much more effective in improving monitoring.

On account of the thriving cross border trade with nations such as Cambodia, Laos and Myanmar, there is also a need for capacity building towards increased border patrols and inspections of border markets. Problems with implementing this include lax enforcement by the Thai authorities in charge of the wildlife protection laws in the border regions (TDRI 1987, Luxmoore 1989, The Nation 1990, Bangkok Post 29 July, 1996). Equally important is the ineffective enforcement of trade regulations on the other side, which permits a very low or no marginal cost in carrying out illegal trade. There is thus a clear need for more financial assistance towards capacity building to improve the monitoring infrastructure as well as database available to the government in order to formulate effective mechanisms for compliance, both within Thailand and among its neighbours.. Such capacity building activities require both technical assistance and finances to do so.

Financial concerns also affect captive farming efforts in the country since the cost of captive farming has been shouldered entirely by private breeders without government assistance. High costs of such cultivation may have acted as an incentive towards illegal trade in Thailand, especially considering the long gestation period of captive breeding in some species of wild orchids. An establishment of a trust fund may be useful for the private investment for encouraging sustainable captive farming.

One positive development in Thailand is cooperation between non-governmental organizations and the Thai CITES management authorities. Recently, for instance, a program was announced whereby the Thai authorities and NGOs are cooperating to mark off the wildlife section of the local weekend market, to post information regarding illegal wildlife trade, and to man a permanent information booth regarding the sale of wildlife (Anaseeda 1997). Such programs may be of substantial service to understaffed wildlife protection authorities.

There certainly is a potential constructive role that local, as well as international, NGOs can play in strengthening the implementation of CITES in Thailand. The database available with a number of NGOs, for example, is valuable, and could be used in understanding the nature of illegal trade and in making strategies for increased compliance with CITES. NGOs can also be brought into closer participation in assisting with effective monitoring at the grassroot level. To make them effective in these tasks, NGOs and their network would have to be trained and funded adequately.

According to the government sources, however, financial support from the Secretariat has been unreliable, and sporadic, even though there is a provision for transfer of funds. So far, Thailand has funded its activities out of its own coffer and with donations from international sources such as DANCED. The amount of budget often varies, depending on the type and nature of activities being proposed and the policy of funding agencies, as well as competition from other demands. In order to truly curtail wide-spread illegal trade in endangered species, however, a much larger budget for increased manpower and training would be needed, a prospect unlikely for Thailand, and many of CITES developing nations membership. Unless this shortcoming of the present set up is altered reliably, countries such as Thailand will continue to encounter serious problems with enforcement of CITES

(3)SUMMARY AND CONCLUSIONS

While Thailand has been party to CITES since 1973, it ratified the MEA only ten years later. This was perhaps the first indicator of the difficulties associated with stopping trade in endangered species in a developing country with a rich bio-diversity which was in demand in international and domestic markets.

That Thailand did not have an adequate legal infrastructure to enforce this MEA in the initial years perhaps exacerbated the extent of illegal trade in endangered species in the country. In many cases, the trade, both in the domestic market as well as internationally, was blatant, not receiving sanction on account of the lucrative nature of the transactions. Overall, however, the main problems were the fact that domestic law relating to wildlife preservation were different from CITES requirements, and no additional input was undertaken in the legislation to include the provisions of this MEA into domestic law. In addition, CITES enforcement authorities were also not backed by the law to reduce trade in CITES listed species either in the domestic market, or in the thriving international trade for these products.

Considering the extent of illegal trade in CITES listed species, a threat of trade sanctions from member Parties of the MEA was imposed on Thailand in 1991. Considering the importance of legal trade in animals and plants here, Thailand undertook a massive operation to improve the legislation associated with trade in endangered species. Existing laws now included CITES listed species, and enforcement authorities were provided with a legal backing to carry out their designated tasks. In addition, the country carried out a capacity building exercise to improve the monitoring abilities of the authorities working at transit points outside Bangkok. Thus, the threat of trade sanctions was effective in the expanding of domestic laws to incorporate the provisions of CITES.

In some cases, the new legislation helped reduce the extent of illegal trade in

endangered species. However, for the majority of products, any decline in trade has been market dictated, and not on account of CITES provisions, asithe case of wild orchids., A number of loopholes in the existing provisions have helped in the continuing trade in endangered species. For example, the provision that captive breeding of endangered species is permitted for trade whereas those from their natural habitat are not, has led to considerable trade in orchids in particular. Since it is difficult for even experts to distinguish between a plant grown through captive breeding, and one from its natural habitat, enforcement of trade in the latter has been elusive. The long gestation period of captive cultivation in some species of orchids, and the relatively low cost of poaching, has further abetted illegal trade in the protected varieties of orchids.

To close in the loopholes associated with the present legislation, it is first necessary to increase the penalty associated with illegal traffic in endangered species. So far, the marginal benefit of poaching and illegal trade is much higher than the marginal cost of being caught and of paying a penalty.

Furthermore, lack of specific and adequate funding for enforcement of domestic regulations relating to trade in endangered species needs to be addressed to improve compliance with CITES. More effective data collection on the part of local CITES authorities would help in discerning the major problem species and geographic regions which need to be prioritised. In this respect, greater co-ordination with customs officials and grassroots and international level NGOs would be effective. In addition, greater emphasis needs to be laid on training of border personnel to improve their performance in tracking down illegal trade. Here too, greater capacity building efforts are necessary.

Overall, the Thai experience shows that the threat of trade sanctions by CITES Parties has been effective in ensuring the formation of stringent laws to enable compliance with the MEA. However, in order to truly contain widespread illegal trade in endangered species, the budget available for training and enforcement would have to increase substantially. So far, the lack of prospects of increased availability of finances in a nation with many competing needs, has reduced the possibility of further compliance with CITES. Only if adequate capacity building and financial assistance is provided to the country, either from the CITES secretariat or from international aid agencies can the effectiveness of the monitoring mechanism be rendered more efficient. In the future, thus, positive measures to complement the trade provisions in CITES are likely to be most effective in ensuring compliance.

CASE STUDY 2 * THE EXPERIENCE OF INDONESIA WITH CITES

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(1)BACKGROUND

This chapter aims to analyse the effectiveness of the trade measures in the CITES agreement on Indonesia. Issues relating to the implementation of this agreement in Indonesia also form an important theme of this study. Based on the findings, the study puts forward policy recommendations to the government of Indonesia and other involved institutions to help improve the implementation of CITES in the country.

In terms of methodology, this paper is empirically based, using both primary and secondary data. Primary data was generated during field visits and through interviews with pertinent decision-makers. Secondary data was acquired mainly from agencies implementing the CITES agreement. To assess whether CITES has been an effective instrument in helping species reach a sustainable level, information about species populations is necessary. Unfortunately published information about CITES trade in Indonesia is very limited, especially details relating to illegal trade in endangered species which allegedly exceeds legal trade. Thus, although incomplete, the present study is based almost exclusively on information concerning legal trade.

Little is also known about the size and practices of the domestic market, but according to some experts, domestic trade is considerable and contributes greatly to the overexploitation of wildlife in Indonesia. Further, because of the lack of documented scientific data concerning the exact numbers and types of species inhabiting Indonesia, this study may not be wholly representative of the real situation.

Highlights of Indonesia's Experience with Trade in Endangered Species

On March 28, 1979, Indonesia became a member of CITES. Indonesia is one of the two richest countries in the world in terms of biological diversity accounting for between 15% and 25% of the world's total number of species (Conservation Indonesia, Volume 10. Number.3). Indonesia also has the highest number of vertebrates threatened with extinction. Data obtained from a 1995 study of bird species too bring out the gravity of the situation (Shannaz, 1995). In Indonesia today, its 1539 species of birds are threatened by a decrease in numbers, some even with extinction. Recent data show that 4 species of birds (3.8%), fall within the critical category of being threatened with extinction, making Indonesia the country with the highest number of species of birds under this category. 16 species (15.4%) fall within the Endangered category (UNEP, 1993). In fact, 17 per cent of the world's 104 species of bird threatened with extinction are native to Indonesia.

For some species, this risk of extinction may be the direct result of Indonesia's trading operations as the country is one of the world's largest exporters of wildlife. Detailed information concerning the state of international trade in endangered species and export earnings from this trade is not available, but the study does estimate that such exports amount to only about US$6million, which is not a significant portion of total exports, i.e. legal and illegal.

For the majority of endangered species, destruction of their habitats, which dramatically lowers species populations, coupled with over-exploitation of these species, is stated to be the main factor causing their numbers to plummet to their current low levels.

Mechanism for the implementation of CITES in Indonesia

The provisions laid down in CITES require that each member state divides the organization of CITES into two authorities: the Scientific Authority, and the Management Authority. In Indonesia, the Scientific Authority has been conferred to LIPI (the Indonesian Institute of Sciences), while the Management Authority rests with the Director General for Forest Protection and Nature Conservation (PBPA) at the Department of Forestry.

As a part of its organization, the Department of Forestry maintains a Regional Forestry office in each province staffed by the Department's personnel. Managerial aspects are handled by the Director General for Forest Protection and Nature Conservation (Direktorat Jenderal PHPA), assisted by the personnel of the regional PHPA (Head of the Office for the Conservation of Natural Resources, or KSDA). This chain of command is also an integral part of the issuing of export licenses.

Regulations and Law Enforcement

Taxes Related to Trade in Wildlife

This section discusses regulations concerning mandatory levies payable to the government, the mechanism for implementing CITES, and the enforcement of CITES regulations.

Decree of the Minister of Forestry No. 442/Kpts-11/1990, states that firms or individuals who capture, transport (within Indonesia and overseas), or despoil wildlife shall be subject to a levy of 6% of a fixed price. However, the effectiveness of this regulation is hampered by the fact that the fixed price has remained unchanged since 1979.

An additional problem is the utilisation of the funds so gathered for wildlife conservation. 70% of the proceeds from this levy is apportioned to the district government, and the remaining 30% to central government coffers. Of the district government apportionment, 30% is used to fund developments in the conservation of natural biological resources in the province, and 40% for development at district/provincial level. Of the 30% apportioned to central government, half is deposited in the state treasury account at the Bank Indonesia Headquarters as profit. The remaining 15% is set aside each budget year for establishing fauna and flora habitats and populations, the costs of which are entered in the Work Proposal or DRK. Therefore, a mere 45% of the total proceeds from this levy are used for conservation.

Also, it is not entirely clear how the small funds available are used. Interviews

with Scientific Authority personnel revealed the absence of a special budget for the scientific study of fauna is essential, and should be provided for from these funds. The means of creating effective funding including the possibility of a "user pays system" has been under discussion. However, no significant changes have occurred in the funding priorities, and the situation continues to require considerable attention.

Furthermore, the levy demonstrates the problem of arriving at a sound appropriate formula for fixing the percentage of the fee to be directly related to the endangered species. A formula which reflects the scarcity value of the species in question is preferable. The rarer the species, the higher the levy imposed for trading in that species should be. In addition, aesthetic, cultural, and scientific aspects also need to be considered in fixing the levy.

Legislation relating to trade includes a special export license bearing the CITES mark, with the aim of controlling the volume of exports, by ensuring that quotas are not exceeded. To monitor this procedure, each customs check point for exports and imports is monitored by the Department of Forestry.

The transfer of license ownership also appears to hamper monitoring. Although this has no overall bearing on the CITES program, if this practice continues, it could result in the less than sound business practice of 'license' trading. Observation indicates that such practice could be prevented through fixing quotas for individual firms, and any firm unable to fill its quota would have its quota reviewed. This indicates the relevance of proper supervision in the corporate set-up.

One of the most significant problems with respect to implementation is the fact that in Indonesia, infringements of law concerning trade of endangered species are not considered criminal, but rather fall under common law. To date, no regulation specifically addresses infringements of environmental regulations. Field observation indicates that this loophole provides opportunities for illegal trade- as the perceived threat of punishment associated with smuggling is not a sufficient deterrent. These opportunities arise partly from:

1. A lack of knowledge on the part of customs officials involved concerning 'biological' aspects, and the names of rare species listed in CITES. Several customs posts also lack adequate facilities for quarantine and confiscating.

2. Suspected collusion between firms and CITES authorities in the field, customs officials and some groups of retailers may hamper the implementation of this MEA.

Regulation Related Directly with CITES

The Presidential Decree referred to in the previous section has been followed up with a number of Decrees enacted in the interests of implementing CITES in Indonesia. Decree of the Minister of Forestry No. 556/Kpts-11/89 concerns the Issue of Licenses for Trapping/Procuring, Selecting, Breeding, and Domestic and Overseas Transportation of Fauna and Flora and/or Their Elements. This Decree was later split into two Decrees of the Director General: PHPA Decree No. 25 and PBPA Decree No. 541.

The Department of Forestry recently also issued Decree of the Minister of Forestry No. 771 which puts limits on exploitation of forests in line with sustainability. The perceived impact of this Decree is that the population of

some species under threat of becoming extinct, has risen and has become replenished.

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Field studies revealed that as yet no specific penalties are imposed for infringements of the regulations covering trade in endangered species.
In addition, it has been considered that the process for providing licenses for domestic trade needs to be strengthened further. Although such trade is not directly associated with CITES, free exchange of endangered species domestically tends to facilitate illegal trade in the international market. In addition, considering the extent of the domestic market, there is no gainsaying that a more stringent approach to domestic trade would also be beneficial to the overall objectives of CITES.

(2)THE ROLE OF TRADE MEASURES

The Role of Trade Measures in Inducing Participation

Indonesia has been one of the largest exporters of wildlife. The destination of these exports indicates a dependence of wildlife trade on Parties to CITES, thereby highlighting the significance of trade measures in inducing participation in this nation. Although the trade figures that follow are for 1995, they are indicative of the situation when the country acceded to CITES.

Indonesia exports a fairly wide variety of insects. These Appendix II species are exported either in the form of live or dead pupa specimens. In 1995, Indonesia exported 220 live and 8067 dead specimens. Japan is the single largest destination for Indonesian insect exports, accounting for close to 73 percent of total exports of this species.

In fish exports too, of the over 4,000 Asian Arowana *(Seleropages formosus)* exported in 1995, 82 percent was destined for Japan. Singapore, Brunei, and Hongkong comprised three other importing nations. Neither the Indonesian government nor CITES sets a quota for Arowana specimens, since those exported are the results of captive breeding.

Among plants, in 1995, Indonesia exported seven species of plant listed in CITES: Agar Wood, Common Tree Fern, Dendrobium Jelita Pink, Dendrobium Puspitasari, Dendrobium Jakarta Molek, Anggrek Hybrida, and Orchid Hybrid. Agar Wood and the Common Tree Fern made up the chunk of these exports. Singapore was the major export market for Agar Wood, accounting for almost 80 percent of the market share. In addition to importing 5,390kg of Agar Wood, Taiwan also accounted for 19,260kg or 19% of Common Tree Fern exports. Three other importers of Agar Wood were Saudi Arabia with 4,181kg, Korea with 75kg, and Kuwait at 15kg. Japan dominated imports of Common Tree Fern, comprising 54% of the market, or 22,524 kg. Importing just 500 kg of Agar Wood, Japan also bought Dendrobium Jelita Pink, Dendrobium Puspita Sari, Dendrobium Jakarta Molek, Anggrek Hybrida and Orchid Hybrid.

In terms of trade in birds, Indonesia exported 1,365 live birds in 1995 to 13 different countries in fairly equal proportions. Singapore, the largest importer, accounted for 277 specimens. Indonesian reptiles, both live and skins, are also traded internationally to 32 different countries. With a total of 10,400

specimens, or 40% of a total 25,766, China is the largest importer of live reptiles. Most skins-17,344 pieces, or 27% of the total have been exported to Japan.

In Corals, the total volume of Indonesia's coral exports stood at 862,446 pieces and 30,250 kg in 1995. The most popular of 73 species traded, Base Rock *(Order Scieractinia)* was traded to the extent of 372,985 pieces in 1995.

Overall, members of CITES such as the USA and Japan account for much of the legal trade in endangered species from Indonesia. European nations such as the UK, France, and the Netherlands are other importers of note, which are also parties to CITES. Thus, non-accession would have meant an immediate loss of these markets, a fact which is likely to have contributed to the decision to participate in the MEA. However, the magnitude of legal trade, which amounts to less than 1 percent of total exports, indicates that the significance of trade measures may have been limited in the Indonesian context.

The study states that the potential for increasing the volume of trade in existing markets and the possibility of opening new markets for trade may have been important contributors to the decision to sign the agreement. In addition, the economic benefits associated with wildlife trade, even though concentrated in a few hands, may also have acted as inducements to participate in CITES.

Role of Trade Measures in Inducing Compliance

While trade measures appear to have played a role in inducing protection of endangered species in Indonesia, their impact is not clear. The only comment made on this subject is the fact that after signing CITES, Indonesia has been gradually improving its practices with respect to endangered species.

The sheer size of the country, with its vast expanses of water and thousands of islands makes effective patrolling in these areas almost impossible. This fact coupled with the economic necessity of trading in endangered species and the ignorance of the environmental ramifications of such activities in the public at large, makes it even more difficult to ensure compliance.

Destruction of the habitats of endangered species is reported to exacerbate the problems of compliance in Indonesia. According to one study, the main causes of the destruction of the habitats of endangered species (birds of paradise, and other fauna) in Central Yapen Nature Reserve are hunting, clear cutting by logging companies, and clearing of land for agricultural and horticultural purposes and for the trans-Yapen highway (Maturbongs, 1994). Once again, economic concerns at the grassroots level have affected the survival of wildlife in Indonesia.

Another factor inhibiting the effectiveness of CITES in Indonesia is the considerable domestic market for these species. With the fourth largest population in the world there is undoubtedly a huge demand for animal products within Indonesia, for food, medicine, pets and other uses. As this trade remains largely unmonitored, it leaves a loophole for smugglers, thereby reducing the level of compliance which could have emerged on account of trade measures.

(3)EFFECTIVENESS OF POSITIVE MEASURES

While there is no concrete indication that positive measures induced participation in CITES in Indonesia, the study quotes the example of one case, where it was found that even though listed under Appendix I, *Cacatua goffini* is no longer endangered. This improvement has been attributed to conservation measures carried out since 1988 (Shannaz, 1995). The Chattering Lory and Wallace's Hanging Parrot species have, on the other hand, been moved from the endangered to the threatened category. Hence, it is difficult to determine the effectiveness of positive measures taken to curb trade in endangered species.

Funding has been stated to be an important reason inhibiting the formation of effective positive measures to support compliance activity. For instance, the Indonesian government, through the National revenue and expenditure budget (APBN), provides subsidies for the general conservation of forest. Funds allocated specifically for endangered species comprise only the tiny proportion of the APBN funds allocated for nature reserves and wildlife preservations and are deemed insufficient for inducing compliance with CITES. Thus, government funding holds little hope for achieving the aim of sustainability.

An additional difficulty hampering effective compliance in the context of positive measures is that only a small segment of the general public in Indonesia is truly aware of the consequences of trading in endangered species. The limited information available and the lack of accompanying education mean that the public has very low awareness of the ecological significance of endangered species. In addition, because a significant portion of Indonesian society still exists on the poverty line, the main priority remains the fulfilling of daily needs, rather than environmental concerns which do not affect them immediately and nor do they improve their standard of living.

Thus, for increased protection of endangered species, positive measures are required to raise the public's awareness (among government officials, enterprises, consumers and the public at large) of the importance of protecting the environment, and more particularly, endangered species.

Another factor inhibiting the effectiveness of measures aimed at compliance is the vested interests in trade in wildlife. An analysis of market structure, for example, reveals a very high concentration of control in a few hands. The analysis based on data for the volume of exports of insects, fish, mammals, plants, birds, reptiles, and corals by exporter reveals that in most species, the market is very highly concentrated with a few exporters. One of the few sectors where a monopoly or an oligopoly is not evident is the reptile export sector in Indonesia, where both live reptile specimens and skins are traded through numerous companies, each holding a relatively similar market share. Among coral exporters too, the market share is evenly distributed among among 15 firms.

Exports of insects are more typical of the problems associated with exports from Indonesia. In fact, one exporter of insects controls close to 82 percent of the market. Among mammals too, one firm alone contributes to 66 percent of the market share in the export of live mammals. Of the species of fish listed in CITES, Indonesia exports live specimens of the Asian Arowana. One firm dominates the market, exporting half of the total amount sent to the international market. The other five exporters of Asian Arowana accounted for 25 percent of the market share (1020 specimens), 8 percent, 4 percent, and

about 2 percent.

On the other hand, the numerous companies involved in the export of Agar Wood reflect the popularity of this plant as an export commodity. The largest market share is with a firm which controls 28 percent of total Agar Wood exports. Exports of Common Tree Fern reached 41,784 kg in 1995. Two firms, UD. Surya Perkasa dan PT. Pratama Sido Abadi control the market with 43 percent and 34 percent respectively of total exports. In cross-bred plants, one firm, DPP PAI, enjoys a 100% monopoly on the export of 4 species: Dendrium Jelita Pink, Dendrium Puspita Sari, Dendrium Jakarta Molek, and Anggrek Hybrida. The market for Hybrid Orchid is wholly controlled by CV Foresta Orchid. Among bird exporters, Fa Hasco led the market with a 51 percent of the market share.

Thus, it is evident that in most export sectors relevant to CITES, the market structure is either a monopoly or an oligopoly, indicating that a few firms are very powerful in the trade in endangered species. Such vested interests are likely to deepen the difficulties associated with effective monitoring in poorer nations like Indonesia.

Strengthening of Human Resources

Several aspects of human resource development are relevant in the context of compliance with CITES. Their strengthening, both through domestic efforts and through international co-operation remains one of the most significant factors requiring attention.

In Indonesia, infrastructure, effective monitoring and enforcement agencies set up to deal with the domestic animal trade are lacking. Because of this, illegal trade in endangered species abounds, usually involving smuggling through small or unmonitored harbours and other departure points.

Birds, for example, prove popular among black marketers as is evident from the long list of CITES birds freely traded in several markets in Java and Bali. Data from a 1996 Animals for Conservation (KSBK) survey reveals that endangered species continue to be traded openly within Indonesia. For instance, one species, *Cacatua goffini,* categorized as under threat of extinction (Appendix 1) continues to be freely traded in relatively large quantities in more than six markets in the above region. Three other Appendix I species, *Cacatua moluccensis, Probosciger aterrimus and Haliaeetus leucogaster* are traded in smaller numbers, but are nevertheless popular in a number of markets in Java and Bali. This phenomenon illustrates the distinct lack of monitoring of trade in rare birds, although it is true that some of the larger markets in Jakarta do have Department of Forestry monitoring posts. Greater effort is thus required in bringing monitoring up to the required level.

In addition, the quality of data available for accessing the nature of illegal trade is entirely missing. While the register kept by the Jakarta KSDA Sub-Unit on endangered species confiscated over the past few years does provide some indications as to the magnitude of the problem, the actual extent of it can only be guessed approximately. There is a need for further work in this area to improve an understanding of extent and nature of illegal trade so that effective solutions may be found to it.

Training is also necessary to improve the awareness of the impact of unsound transportation facilities on wildlife. The present method of transporting endangered species destined for the domestic market involves the caging of

specimens in sub-standard conditions and in excessive numbers, thus increasing the risk of death. Each cage carries more than safe numbers of animals, to minimise the cost of transportation. Increased awareness among transporters, along with effective means of regulating such agents (transportation for domestic trade is presently not regulated in the same way that transportation for international trade) is likely to make the trading process more sustainable.

Extent of Ineffective Bureaucracy

Although the Department of Forestry, in its role as Management Authority for CITES, has set down procedures for trade in endangered species, it is questionable whether these procedures are effective and efficient in supporting the objectives of CITES. Field observation indicates several reasons for this: the lack of organisational coordination; the profit orientation of businesses involved in the trade in endangered species; and the lack of knowledge on the part of officials involved in the implementation of CITES, as well as insubstantial law enforcement.

According to the field survey conducted by the study, another major problem associated with the implementation of CITES has been the leaks within the institutions conducting monitoring activity. In addition, the lack of mechanisms to determine the rarity of the endangered species hampers the process of fixing appropriate taxes on trade associated with such species. Here, greater effort is required to train the authorities fixing such taxes so that the cost of trading in wildlife reflect their rarity.

In terms of determining export quotas too, research reveals that coordination between the Management Authority and the Scientific Authority is lacking. In its role as the Scientific Authority, the LIPI is charged with carrying out the applied research needed to fix the quotas, but insufficient funding makes it difficult for this task to be carried out independently. Frequently it is traders themselves who estimate the populations of endangered species, making the process an unreliable one. Hence, enhanced funding also appears crucial in the process of making the bureaucracy associated with CITES more effective.

Raising Trapper Income

As has been stated earlier, the economic incentive for engaging in poaching of endangered species is an important aspect inhibiting compliance. If some of the basic economic problems which lead to such activities at the grassroots level can be tackled, then the effect on endangered species would certainly be a positive one. However, it must be kept in mind that profits associated with trade in such species are generally enjoyed by a few firms through a heavy mark up, ranging from about 68 percent to about 900 percent. Therefore, positive measures aimed at trappers must be accompanied by legal measures to curb the incentive to trade at the firm level.

Areas of further research on endangered species are:

- strengthening of institutional infrastructure to prevent the loss of genetic diversity;
- the maintenance of the stability and natural flow of the ecosystem;
- level of effectiveness of the bureaucracy;
- providing stability in the income of trappers;
- strengthening human resources to provide greater education in areas relevant to CITES; and finally,
- emphasis on ecotourism are all ways of improving upon the present situation of depleting wildlife in Indonesia.

(4)CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Several conclusions of a general nature can be drawn from the results of research concerning the implementation of CITES in Indonesia.

That Indonesia signed CITES just five years after its ratification indicating the significance of trade in endangered species in this country. Indeed, Indonesia is one of the most important exporters of wildlife, and the destination of its exports are primarily to Parties to CITES. Thus, it is possible that trade measures did act as an inducement to participate in this MEA.

Analysing the effectiveness of trade measures on compliance with CITES is difficult on account of a lack of accurate trade data relating to illegal trade. As a preliminary finding, it seems that trade measures in CITES have had an indirect role in reducing or halting a drop in the populations of endangered species. Unfortunately populations have yet to return to sustainable levels, indicating that trade measures alone are definitely not sufficient to induce compliance with this MEA.

While some positive measures have been put into place, their effectiveness too has been limited so far. The success of funding activity on the part of the government to promote conservation has been hampered by the paucity of actual finances. Although efforts at captive breeding seem quite successful for certain species, they do not guarantee sustainability of these species in the wild, since the species are bred for trade, not for releasing into their natural habitats.

Monitoring activity too has been insufficient in curbing illegal trade in endangered species. The size of the country renders effective control of trade, both domestic and international, in endangered species very difficult. In addition, insufficient research into trade in endangered species, and subsequent training of monitoring personnel in accordance with the information also inhibits their efficiency.

Furthermore, the current legal structure imposes levies on exporters which are not in line with the scarcity value of the endangered species in question. This implicitly encourages more than sustainable trade in wildlife. Rectifying the problem has been difficult because there remains a dearth of research on the populations and value of endangered species in Indonesia. Within the various development programs too, there is as yet no method of assessing the socio-economic value of endangered species which can be used for appropriate evaluations of these species. Although the Scientific Authority is charged with this task, it is restricted by, among others, lack of funding and expertise.

In the Indonesian context, economic considerations of trade in endangered species may also have contributed to the problems in implementation. Much of the export activity rests in the hands of a few individuals, who enjoy very high rates of profit. The concentration of vested interests could be a contributor to the problems in implementing CITES.

Recommendations

The above conclusions have policy implications for the government, the implementing agencies of CITES and those involved in the trade in endangered species.

A reorganisation of the work mechanisms of the organisations responsible for implementing CITES in Indonesia, particularly the Management and Scientific Authorities, is necessary. The bureaucratic and fiscal mechanisms of the Scientific Authority require strengthening to make it professional and self-sufficient.

Bearing in mind the extent of illegal trade in endangered species, international co-operation is also necessary to address the problem of monitoring and sanctions on an international basis. Ideally not only producer countries would be monitored, but such activities should also span all nations involved in distribution of this commodity. Given that domestic trade in endangered species is outside the scope of CITES and is substantial, there exists a need to adopt the conventions contained in CITES, or similar ones tailored to the needs of Indonesia, to supervise domestic trade in endangered species.

The inability to collect appropriate data regarding trade also makes the process of monitoring more difficult. It also inhibits the formation of appropriate laws for the protection of endangered species. Appropriate training to increase the effectiveness of law makers and monitoring personnel in their respective tasks associated with CITES would be an essential step forward.

Awareness creation concerning the importance of environmental protection for sustained development is also necessary. It may help in curbing the considerable domestic demand for endangered species. If coupled with appropriate support measures (to reduce the economic benefits of poaching, for instance), awareness creation could be an effective means to ensure compliance with CITES.

It must also be emphasised that the link between commerce and the environment is not one of trade-off, but rather of mutual support. This relationship needs to be clarified in an environment-related economic mechanism which prioritises sustainable development and environmental protection.

Finally, upholding regulations is vital for the future implementation of CITES in Indonesia. If the above positive measures are consistently applied along with a strengthened legal structure, effective implementation of CITES could become a reality in this country. International support in areas of funding and towards human resource development activities such as effective monitoring and research and training for improved knowledge of endangered species would all work towards making the entire system in Indonesia one that is conducive to compliance with CITES.

SECTION 3 * THE BASEL CONVENTION ON TRANSBOUNDARY MOVEMENTS OF HAZARDOUS WASTES AND THEIR DISPOSAL

- The case of used lead-acid batteries in the Philippines: the need for supportive/enabling measures to encourage environmentally sound and economically viable management of lead

- The case of used lead-acid batteries in India: the effectiveness of provisions on transfer of technology to developing countries in the Basel Convention.

THE BASEL CONVENTION ON TRANSBOUNDARY MOVEMENTS OF HAZARDOUS WASTES AND THEIR DISPOSAL

CASE STUDY 1 * The Case of Used Lead-acid Batteries in the Philippines: The Need for Supportive and Enabling Measures to Encourage Environmentally Sound and Economically Viable Management of Lead

By Ulrich Hoffmann

(1) Introduction

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is one of the MEAs which regulates or restricts the export of domestically prohibited goods or dangerous substances from developed to developing countries. Many developing countries, in particular in Africa, have fought a long time to put a halt to waste trafficking from OECD countries, including under the guise of sham recycling (i.e. waste shipments destined for final disposal, but declared as input for recycling operations).

The drafters of the Basel Convention, and in particular the Ban Amendment,[46] therefore assumed supply-driven movements of hazardous waste and a close relationship between reduced trade flows and the minimization of health and environmental risks, in particular in developing countries. While this is largely true for many low-income developing countries, this causality is not likely to hold for rapidly industrializing developing countries. These countries play an increasingly significant role as generators of hazardous waste and have high demand for secondary material due to high rates of economic growth and material-intensive growth patterns. These countries also import large amounts of waste containing recoverable material from other developing countries.

If all hazardous waste shipments from OECD countries were destined for final disposal in developing countries only, the trade restrictions of the Ban Amendment would entirely be environmentally and socially beneficial. However, many reviews of international trade in waste come to the conclusion that the bulk of hazardous waste shipments from Annex VII countries are destined for recovery and recycling in a few rapidly industrializing developing countries,[47] including the Philippines. Most of this trade is demand- and not supply-driven. More specifically, it is not high disposal fees or the explicit prohibition of final disposal in OECD countries which are propelling such trade, but rather a high material intensity of growth, a domestic supply-demand gap of several natural resources and a propensity towards the use of secondary material instead of more expensive primary resources in the rapidly industrializing countries.[48] This is why, recuperation of such materials is an issue of proper natural resource management as much as a problem of sound management of waste.

It is obvious from the above that the uniformly applied trade ban under the Basel Ban Amendment will have very different economic and environmental effects in many rapidly industrializing developing countries compared to the low income and least developed countries. This chapter will show that carefully designed packages of supportive or enabling measures are required to assure that the distortionary effects of the Ban Amendment in rapidly industrializing developing countries are minimized and do not complicate sustainable natural resources management, including environmentally sound resource recovery. Furthermore, such packages of measures are also required to facilitate access to and effective use of environmentally sound technologies as well as meet, in a cost-effective way, the objectives of the Basel Convention.

(2)THE DYNAMICS OF LEAD DEMAND IN RAPIDLY INDUSTRIALIZING DEVELOPING COUNTRIES

Lead demand in the rapidly industrializing developing countries of Asia has been growing by some 10-15 per cent annually in the last 10 years. Although the recent economic crisis in Asia has temporarily reduce this growth the fundamentals underpinning lead demand, in particular vehicle population growth and the need for power supply backups, remain unchanged. Most rapidly industrializing developing countries are not producers of primary lead and do therefore meet demand from domestically recovered lead, supplemented by imports of primary and secondary lead. About 75 per cent of the lead is used for lead-acid batteries, mostly in vehicles. Against this background, sound management of lead waste is an integral part of effective and sound management of lead as an important natural resource.

Decision III/1 and the subsequent decision IV/9 of the Basel Convention consider used lead-acid batteries, the principal form of lead scrap worldwide, as hazardous waste, which is subject to the multilateral export ban from Annex VII countries (OECD, EC, Liechtenstein) to all other countries. What are the effects of this trade ban on natural resource management of lead in the Philippines and what is the effect of the ban on the dissemination and effective use of environmentally sound processing technology and the development of less polluting and less waste intensive products?

The case of used lead-acid batteries has been selected because scrap vehicle batteries are among the economically most important hazardous waste items with a very significant international trade volume. Second, the Philippines is among the handful of developing countries accounting for the bulk of Southern imports of scrap lead batteries. Third, lead recovered from scrap batteries is a perfect substitute for primary lead. Finally, vehicle and stationary batteries are the principal product of the lead industry, accounting for almost 70 per cent of worldwide lead consumption.[49]

(3)VEHICLE BATTERY-RELATED SUPPLY AND DEMAND OF LEAD IN THE PHILIPPINES AND THE ROLE OF SCRAP IMPORTS

As part of the analytical phase of a joint project of UNCTAD and UNDP, with the technical support of the International Lead Management Center (ILMC), the lead supply and demand for starter, lightening and ignition batteries of vehicles (SLI batteries) for the period 1995-96 was estimated in volume terms, using production and consumption figures provided by the Department of Trade and Industry and the private sector. According to these estimates[50], SLI batteries-related supply and demand of lead can only be brought in balance by an inflow of 12 thousand tons of lead bearing battery scrap and imports of refined (primary) lead and lead alloys in the order of 2 thousand tons. Imports of battery scrap have met about 35-40 per cent of lead demand in recent years. It is important to understand the reasons for the domestic supply-demand gap of lead in order to determine whether the gap can be closed by domestic means without resorting to imports of scrap batteries. What are the principal causes of the domestic supply-demand gap?

There are three key causes for the supply-demand gap:
- the very high rate of growth of vehicle population in the Philippines;
- the significance of the informal sector in battery reconditioning and recycling; and
- the volume of scrap batteries which remains uncollected.

The dynamics of vehicle population

Whereas registration of new vehicles in the period 1990-1998 stagnated in the US and Japan and declined by 7 per cent in Western Europe, it increased by almost 80 per cent (some 10 per cent annually) in the Philippines. As the bulk of newly registered vehicles in the Philippines are domestically assembled,[51] high rates of vehicle population growth lead to high SLI battery demand growth. Battery demand-relevant changes in vehicle population have been in the order of some 10-12 per cent per annum in 1991-1998. Converted into standard battery units and reflecting average battery life, this generated an annual rate of growth of lead demand of over 10 per cent.

The available battery scrap in a year is a function of the consumption volume of new vehicle batteries one average life time of a standard battery ago, i.e. 1.5 to 2 years in the Philippines. As can be seen from Annex Figure 1, the volume of domestically generated battery scrap in 1998, for instance, is determined by the battery consumption volume in 1996. However, as outlined in the previous paragraph, between 1996 and 1998, battery demand increased by some 20-25 per cent, creating a supply-demand gap of the same magnitude. Differently phrased, even if all domestically generated scrap batteries had been collected in the Philippines in 1998, demand would still have outstripped supply by about 20-25 per cent.

The significance of the informal sector in battery recycling

The informal sector consists of battery reconditioners, which replace defective battery cells, and “backyard smelters”, which recover up to about 40 per cent of the lead content of battery cells jettisoned by reconditioners.[52] It is estimated that battery reconditioners collect almost a third of the domestically generated scrap batteries in the Philippines.

Battery reconditioning and cottage lead (s)melting with their low lead recovery rate have a four-fold negative implication. The more domestically generated scrap batteries end up among battery reconditioners, “backyard” (s)melters and “antiquated” small smelters:

(i) the more acute the risk of spillage (deliberate or otherwise) of the

electrolyte, dilute sulfuric acid, and thus caused environmental pollution;

(ii) the higher the emissions of sulfur dioxide gas and related environmental damage by small smelters, which in general do not conduct a well controlled desulfurization process;

(iii) the higher the risk of human and environmental lead contamination caused by emissions from unregulated lead (s)melting and final disposal of the sludge of scrap batteries; and

(iv) the bigger the gap between domestic supply of recovered lead and demand for lead for SLI battery production.

It is the latter which exerts the pressure on battery recyclers in the formal sector to bridge the domestic supply and demand gap by imports of used lead acid batteries or refined (primary) lead.

Uncollected scrap batteries

About 10 per cent of domestically generated scrap batteries are estimated to currently remain uncollected in the Philippines.[53] However, despite a well spread and well managed collection infrastructure by the formal sector, logistical efforts and transport costs are high and the informal sector is shaving off a significant share of the domestic battery scrap supply.[54]

(4)LIKELY REACTION TO THE TRADE RESTRICTIONS OF THE BASEL BAN AMENDMENT

First, at the beginning and on a transitional basis, imports of scrap batteries from OECD countries will entirely be replaced by imports of battery scrap from other developing countries. Over time, however, battery scrap supply from other developing countries will become tight, exerting pressure on the principal licensed battery recyclers to enhance domestic collection of scrap batteries and thereby make inroads into the scrap reservoir of the informal sector as well as get access to currently uncollected jettisoned batteries.

Although the licensed battery recyclers already operate a geographically well-spread collection system, this is not a sufficient condition for siphoning away a significant part of battery scrap currently appropriated by the informal sector. Without government intervention and support, it is unlikely that the formal recycling sector will gain access to a quantity of domestically-generated battery scrap sufficient to gradually replace a large part of imported scrap batteries. As long as the demand for inexpensive new batteries, sold under specific payment conditions, cannot be met by licensed battery manufacturers in the Philippines or by imported batteries, it is improbable that licensed battery recyclers make sufficient inroads into scrap feedstock currently appropriated by battery reconditioners and “backyard” (s)melters.

Second, even if licensed battery recyclers managed to gain access to domestically generated battery scrap and lead-bearing residues currently untapped by the principal recyclers, the resulting lead content of the total feedstock would only allow a capacity utilization below the break-even point of profitability. Either supplementary battery feedstock would have to be siphoned away from small licensed smelters (which would imply a sectoral concentration of recycling capacity) or battery scrap imports from other developing countries would have to be stepped up (or a combination of both). Any problem in smooth domestic feedstock substitution or in sourcing from other developing countries

would aggravate the capacity utilization problems and make uneconomic recycling of scrap batteries. Low capacity utilization, however, would provide little incentive to the licensed recyclers to invest in equipment which enhances the environmental and occupational performance of the plants.

Third, in the light of (i) the current low level of capacity utilization among licensed secondary lead smelters caused by feedstock shortage and (ii) the historically low level of international prices of lead, the cost advantage of lead recovery from scrap vehicle batteries versus refined (primary) lead has virtually disappeared. Any further complication of scrap sourcing in the wake of the Basel Ban Amendment will encourage the use of imported refined (primary) lead, which in turn discourages scrap collection by licensed smelters and drives increasing parts of domestically generated battery scrap underground into the arms of the informal sector.

While the Basel Ban Amendment was primarily designed to ensure that hazardous wastes generated in OECD countries were not being exported to developing countries for indiscriminate dumping and sham recycling, it is likely to have some other positive environmental effects. In particular it has the potential to enhance the average rate of lead recovery in the Philippines and thus reduce the amount of lead which is currently lost into the environment. However, the extent to which this occurs is primarily dependent upon two factors:

(i) whether the input substitution response of licensed battery recyclers primarily takes the form of increased use of imported refined (primary) lead or enhanced domestic collection of lead scrap, and;

(ii) the extent to which there is a shift in production between the “formal, modern” smelters and the more environmentally-damaging smelters, in particular in the informal sector.

Unless some pro-active measures are taken by the Philippine government, the Basel Ban Amendment will particularly hard hit the formal recycling sector, which is the most efficient in lead recovery from scrap batteries and also has the best environmental and occupational health performance. Scrap batteries have only been imported by licensed lead smelters and were required to meet domestic lead demand and allow a capacity utilization which is economically viable. The Basel Ban Amendment will gradually increase lead scrap prices for licensed recyclers (both at domestic level and for lead scrap from other developing countries) which will oblige them to either reduce capacity utilization or resort to imported primary lead.

This has the following environmental and economic implications:

Environmental effects

- Less vigorous collection and recycling of scrap batteries by licensed recyclers, which will increase the volume of jettisoned batteries in the country.
- Encouragement of the activities of the informal sector, leading in particular to more spillage of electrolyte and lead contamination due to inefficient lead recovery.
- No incentive and lacking profitability to significantly extend battery life as a key tool for reducing waste generation.
- No incentive to use environmentally sound technologies and further improve the environmental performance of licensed battery recyclers.
- Under prevailing trends of historically very low international prices of lead and abundant supply of lead scrap, producers of new vehicle batteries in

OECD countries have little incentive to develop lead-free batteries and invest in extending battery life under tropical conditions.

Economic implications

- The very existence of a modern battery recycling industry,[55] which has not only entirely met Philippine demand, but generated export earnings, is put in jeopardy by higher feedstock prices and competition from OECD battery manufacturers.
- There will be a drastically higher import bill for the required resources (currently, battery scrap imports amount to $3 million; primary lead imports of the same volume would cost $8 million; new battery imports equivalent to currently domestically produced vehicle batteries would cost $60 million). In addition, there would be a loss in export revenue of manufactured batteries of up to $13 million.
- There may also be significant public costs for entirely or partly setting up a domestic collection and export system for scrap batteries along the lines of Singapore.

(5) DEVISING A COMPREHENSIVE NATIONAL STRATEGY FOR SUSTAINABLE MANAGEMENT OF LEAD

Annex Figure 2 illustrates the major components of a comprehensive national strategy for sustainable lead management, which aims at (i) narrowing the domestic supply-demand gap; (ii) making battery recycling both environmentally and economically sustainable; and (iii) meeting the objectives of the Basel Convention.

The proposed strategy has two main thrusts:

(a) the downsizing of the informal sector and its integration into the collection infra-structure for the formal recycling industry aimed at enhancing collection of domestically generated scrap batteries (and avoiding social conflict);
(b) optimizing collection of scrap batteries and enhancing the environmental performance of licensed smelters.

Regarding the informal sector, a twin stick and carrot policy is required to gradually downsize the sector and simultaneously integrate it into the collection- and servicing infra-structure of licensed recyclers. The twin approach should particularly avoid social hardship and employment problems as well as temporary shortage of reconditioned batteries required for meeting a certain demand. Furthermore, there is ample evidence that suggests that a regulatory (only stick-confined) approach is unlikely to be very effective in the light of the nomad character of the informal sector and the high profitability of unlicenced battery reconditioning and “backyard” (s)melting.

The repressive facet of the approach falls into a command and control segment and market-based tools**.** The command and control measures include stricter control of operating permits; closure of particularly problematic “backyard”

(s)melters in densely populated areas; and legislation that requires that only whole, undrained scrap batteries are collected and delivered to secondary smelters. Economic instruments need to be employed to gradually dry out demand for reconditioned batteries.

This can be done, on the one hand, by investing into research and development for prolonging battery life. The longer the life of a battery, the smaller the incentive to buy a reconditioned battery that might only last a couple of months, even at just one-third of the price of a new battery. As this cannot be achieved in the short term, the licensed battery manufactures should be enabled to produce an inexpensive battery line which competes with the bulk of reconditioned batteries. Besides a competitive price, such batteries need to be sold under attractive payment conditions which take account of the cash flow problems of many ordinary Filipinos.

The constructive approach towards the informal sector falls into a short- and medium-term strategy. In the short term, a collaborative approach can be pursued to enhance environmental and occupational performance of the reconditioners and "backyard" (s)melters based on low cost measures. This may range from improving housekeeping, over the free distribution and collection of acid storage drums, to the wearing of protective clothing as well as changes in occupational behaviour. In the medium term, efforts should be made to integrate reconditioners and backyard (s)melters into the collection and servicing infra-structure of the formal sector. Besides information campaigns and the collaboration of licensed smelters, this will require some financial incentive and support to meet transition costs.

As far as the formal recycling sector is concerned, the restructuring aims at reducing collection and recycling costs in tandem with an improvement of the environmental performance of battery recycling.

One thrust for reducing collection and transport costs is the geographical relocation of some small smelters**.** The current concentration of most recyclers on the densely populated northern island of Luzon causes significant transport costs for the 20 per cent of scrap batteries which are collected elsewhere in the Philippines in the light of the huge geographical spread of the country. The biggest recycling company, PRI, and several thus relocated small smelters could form consortia in which locally collected battery scrap from PRI's collection points and independent battery dealers is toll smelted by small smelters and then shipped as unrefined lead ingot to the main PRI smelter for further refining. This would significantly reduce shipment costs and could also be done at a scale which is conducive to the use of more environmentally sound technology. The consortium approach would also satisfactorily deal with management and disposal of the battery electrolyte.

Another possible basket of measures for enhancing domestic battery collection and reducing collection costs is the introduction of a nation-wide deposit-refund system and the imposition of a battery tax. A deposit-refund system aims at enhancing collection volume; it does not reduce collection costs. If combined with an information or awareness campaign, as already practiced by PRI autonomously, it may significantly reduce the tonnage of uncollected jettisoned batteries. The introduction of a (collection) tax on sales of new batteries aims at internalizing part of the collection costs and thus reduces costs of secondary smelters for the procurement of domestically generated battery scrap. As the imposition of the tax involves many parties, such as secondary smelters, battery manufacturers, battery retailers, scrap dealers, and importers of new batteries,

the system might require the forging of a consortium, as done in Italy and Sweden.

The deposit-refund system and a battery tax have been pretty effective instruments in a number of developed countries. The low income and the widespread cash flow problem of many battery buyers in developing countries are important in determining the usefulness of these tools and the magnitude of the fees employed in this regard. If deposit and tax levels on new batteries, for instance, were set too high, they would most likely encourage higher sales and production of reconditioned batteries – a counterproductive incentive. Also, both instruments will incur transaction costs. For all these reasons, it might be worth considering operating a well-attuned deposit-refund system, supplemented by direct public financial support to reduce collection costs of certified recyclers (for example in the form of a subsidy per collected scrap battery). The public financial support could be fulled by a minor surcharge on gasoline taxes or vehicle sales taxes.

Optimizing scrap battery collection should go in tandem with efforts to enhance the environmental and occupational performance of the licensed secondary lead smelters. This includes, on the one hand, end-of-pipe pollution containment and in-process minimization of material losses, and, on the other hand, the deployment of new, clean process technologies which, besides improving the environmental record, also need to reduce production costs. In this regard, it needs to be borne in mind that investment into pollution abatement technology, in general, and new process technology, in particular, will only be made by the private sector, if the economic sustainability of recycling is assured. This is why environmental and economic sustainability are inseparably inter-linked.

Enhancing environmental performance falls into a short- and medium-term approach. In the short term, improvement of management and process control can enhance environmental performance. In the medium term, new process technology will have to be considered. In this regard, a careful review of the technological and economic potential of the recycling facilities is required. If, for example, a number of small smelters indeed had no valid environmental compliance certificates and an analysis of their technical potential revealed that an upgrading was hopeless, such facilities should be closed by the government.

(6)POSSIBLE POLICY APPROACHES AND SUPPORTIVE MEASURES TO IMPLEMENT THE COMPREHENSIVE NATIONAL STRATEGY FOR SUSTAINABLE LEAD MANAGEMENT

As shown in Annex Figure 3, there are principally three policy packages that could be employed by the government to implement a comprehensive national strategy with a view to enhancing sound recycling of used lead-acid batteries; better management of lead as a natural resource, including eco-efficiency of the material and minimization of generation of lead waste; and mitigating the economic, social and environmental adjustment costs of the Basel Ban Amendment.

The first conceivable policy package is based on significant public regulation, intervention and financial support. The second policy scenario would require far less government intervention and financial support, but implies a high capacity utilization of licensed smelters and thus the generation of sufficient private profit

which can be re-invested in research and development and the enhancement of environmental performance. The third policy basket is a blend of package one and two, which can cushion "extreme" economic circumstances, without jeopardizing the objective of making battery recycling environmentally and economically sustainable.

a) Significant government intervention and financial support

This policy package is based on the assumption that the domestic supply-demand gap of lead for SLI battery manufacturing is only imperfectly bridged by imports of battery scrap from other developing countries. The secondary smelters in the formal sector therefore suffer from low capacity utilization and low profitability. Imports of refined (primary) lead and new batteries are resorted to in order to bring lead supply and demand in balance.

In order to enhance collection of domestically generated scrap batteries by licensed recyclers, the following regulatory measures may be taken:

- mandatory return of scrap vehicle batteries to licensed battery dealers;
- strict control of operating permits of recycling facilities;
- regular control of environmental performance of recycling facilities; and
- trade and auctioning of scrap batteries shall be limited to operators with a valid license.

In addition, the government might consider the introduction of a carefully calibrated deposit-refund scheme for enhancing collection volume and the imposition of a tax on new batteries, which can be used for lowering collection costs of licensed recyclers. To be effectively levied, administered and used, the battery tax may require the forging of a consortium by the government or in a government-assisted way, rallying smelters, battery manufacturers, importers, and scrap traders. As mentioned above, such battery tax may be replaced by direct public financial support fueled by a surcharge on gasoline or car sales taxes.

To undermine demand for reconditioned batteries, the government may have to provide significant financial support to (i) research and development into new batteries with an extended life under tropical conditions;[56] and (ii) enable licensed battery manufacturers to produce and sell an inexpensive battery line, which competes with reconditioned batteries. Besides subsidizing production, there will also have to be provisions for running a credit scheme, which offers very attractive sales conditions to cope with the cash flow problem of many Philippine customers. There will also be the need to financially support the transformation of battery reconditioners and "backyard" (s)melters into collection and service points for licensed secondary lead smelters.

As far as the facilitation of the restructuring of the formal sector is concerned, the geographical relocation of some small modern smelters may have to be financially eased. In the light of the low capacity utilization and therefore investment reluctance of the formal recycling sector, public financial support will also be required for more costly process improvements and the deployment of new process technology. In this regard, tax and duty free import of equipment might be one measure to be considered by the government.[57]

The overall amount of public financial support inversely correlates with the level of international lead prices. This policy package is likely to be the most effective, but also the most inefficient, i.e. expensive.

b) Allowing high capacity utilization at licensed smelters and battery manufacturers

This package of policy measures aims at allowing a high capacity utilization among licensed secondary smelters and battery manufacturers so that generated profits can be reinvested into:

- enhancing collection;
- R&D into prolonging battery life and thereby reducing waste generation;
- the production of an inexpensive battery line;
- process improvement for pollution abatement; and
- the use of new process technology.

Such reinvested private profit by licensed recyclers substitutes for public financial support under policy package one. Profits tend to increase with capacity utilization because overheads, such as salaries and wages, maintenance costs, pollution control and abatement costs as well as depreciation remain unchanged, thus lowering production costs per unit of refined lead output (overheads account for about a quarter of production costs of the principal Philippine recyclers). The higher the capacity utilization and the international price of refined lead, the lower the need for public financial support.

The government may however still have to provide some supplementary regulation and public financial support. The former concerns the imposition of mandatory return of used lead-acid batteries to licensed battery dealers and strict control of operating and scrap trading licenses, whereas the latter implies support to battery reconditioners and "backyard" smelters for easing their gradual integration into the collection infra-structure of licensed smelters and the sales and service infra-structure of licensed battery manufacturers. The government may also consider the use of some economic instruments for enhancing collection of domestically generated scrap batteries, such as a well-calibrated deposit-refund scheme and the imposition of a battery tax, or alternatively surcharges on gasoline and car sales taxes.

Although this policy package will enlarge the collection volume of domestically generated battery scrap for licensed smelters, in the light of the dynamics of vehicle population, domestic lead supply will still fall short by at least about 20 per cent of meeting demand for SLI battery manufacturing. Furthermore, to achieve a high capacity utilization among the principal recyclers and battery manufacturers, additional supply of lead will most likely be required. As closing the domestic supply and demand gap by imports of refined (primary) lead or new batteries is undesirable, both from an environmental and economic point of view (as outlined above), imports of battery scrap will be required.

Some of this imported tonnage may have to come from sources in OECD countries as battery scrap shipments from other developing countries become too expensive. The government may therefore have to consider the option of concluding bilateral agreements with Annex VII countries to allow certain recyclers the import of battery feedstock from OECD countries. Such agreements should be confined to recycling facilities which meet OECD environmental and occupational performance standards, based on regular verification and certification.

c) Combination of approaches one and two

This package of policy measures should be regarded as partial shield for assuring the continuity of the implementation of the comprehensive national strategy for

sustainable lead management against the worst whims of international lead prices and economic recession in Asia.

To avoid any misunderstanding, the economic rational for recycling, i.e. being more cost-efficient than primary lead extraction, cannot be uncoupled from the medium-term trend of international lead prices. Therefore, the government can only provide some assistance so that the drive towards environmentally sound recycling and management of lead as a natural resource is not jeopardized by brief periods of very low international lead prices. From a conceptional point of view, the related government support could be counter-financed by an additional import tax being put onto lead-bearing products and refined (primary) lead.

(7)Conclusions

The strategy proposed in this paper and the policy approaches for its implementation are currently being discussed by a multi-stakeholder policy forum, jointly organized by UNCTAD and UNDP. The policy forum will make recommendations to the Philippine Government on the most suitable policy package as well as the need for supplementary foreign assistance and technical support in this regard.

The policy forum will avail itself of the support of the Sub-regional Center on Training and Technology Transfer of the Basel Convention in China and the International Lead Management Center, an information clearing house and technical assistance body of the world's lead industry. With the assistance of UNCTAD, the policy forum will also discuss specific areas and forms of South-South co-operation on facilitating the choice of policy instruments and resolving technical issues for prolonging battery life.

The preparatory discussions for the Policy Forum have revealed a number of general conclusions on the issues outlined above, which can be summarized as follows:

First, it is unlikely that trade restrictions are very effective for goods, commodities or materials which have an inelastic demand. Trade restrictions in such cases may only encourage illegal trade and informal sector activities to meet demand.

Second, unless significant parts of the adjustment costs of trade restrictions (i.e. incremental costs discounting for any national benefits) are compensated for by financial mechanisms of the Basel Convention or global financial mechanisms, adjustment measures for complying with the trade restrictions of the Basel Ban Amendment have to be environmentally sound and economically viable.

Third, currently there is no guarantee that a country, such as the Philippines, after having made and paid for a complex adjustment process to comply with the trade restrictions of the Basel Ban Amendment (and ultimately being on a par with the environmental performance in a specific sector in OECD countries), can indeed graduate into the "developed country" group and thus be exempted from further trade restrictions. This is why, clear and legally binding clarification on the use of Article 11 agreements and scientific criteria for joining the group of Annex VII are required, if arbitrary and unjustifiable trade restrictions should be avoided.

Fourth, there is a real risk that trade restrictions, as illustrated in the case of the Philippines, may undermine otherwise viable industries in developing countries those environmental performance could be further improved. This may put in jeopardy the achieved level of self-sufficiency in the concerned product/resource and its sustainable management. As a result, there may be a higher dependence on imports of manufactures (i.e. new batteries) from developed countries.

Finally, unless the transfer of environmentally sound technologies is funded by global or bilateral financial mechanisms, economic incentives determine the choice and effective use of environmentally sound technology. Prescriptive approaches on technology transfer are therefore unlikely to be effective.

Annex Figure 1

Domestic Supply-demand Gap of Lead
Due to High Growth of Vehicle Population

CASE STUDY 2 * The Effectiveness of the Provisionson Transfer of Technology to Developing Countries in the Basel Convention: The Case of Used Lead-acid Batteries in India

By Ajay Raychaudhari and Ulrich Hoffmann

This paper examines access to environmentally sound technologies (ESTs) and the conditions of their dissemination under the Basel Convention. The analysis is based on a specific case: recycling of used lead-acid vehicle batteries. The case is selected as it concerns both small and medium-sized enterprises, including in the informal sector, as well as large scale recycling enterprises in the formal sector.

(1)General objectives of the Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal has the following objectives:

- That all hazardous-waste generation should be reduced to the minimum volume and qualitative risk attainable, taking into account environmental, technological, social and economic aspects.
- That hazardous wastes must be disposed of as close as possible to the site of generation; in this respect, the term disposal under the Convention concerns both resource recovery and recycling as well as final disposal of the wastes.
- That every state has the sovereign right to ban the import of hazardous wastes.
- That there should be no export of hazardous waste to a country that has banned imports of these materials.
- That hazardous wastes should not be exported to a state that does not have the capacity to manage the waste in an environmentally sound manner.
- That trade in hazardous wastes with non-party states is prohibited.
- That transboundary movements of hazardous wastes are subject to a system of prior (written) informed notification and consent.
- That Parties consider that illegal traffic in hazardous wastes is criminal and that such illegal shipments have to be taken back by the exporting country, disposed of in an environmentally sound way or alternative arrangements sought, if sound disposal is impossible.

Most recently, the system of prior informed notification and consent has been supplemented by decisions II/12 and III/1, which introduce an outright export ban from Annex VII countries (the OECD, EU, and Liechtenstein) to non-Annex VII countries (all other Basel Parties) on hazardous wastes shipment both destined for final disposal and re-use/resource recovery/recycling. This so-called “Ban Amendment” of the Convention assumes the form of a multilateral export ban which is enforced by countries of Annex VII.

(2)PROVISIONS ON TRANSFER OF TECHNOLOGY IN THE BASEL CONVENTION

The general provisions related to transfer of technology (ToT) in the Convention can be summarized as follows:

- There are no provisions on ToT under most favourable or advantageous, i.e. non-market based terms. Furthermore, unlike the Montreal Protocol, there is no adequate financial mechanism of the Convention to facilitate ToT, nor are developing country Parties of the Convention able to tap global financial mechanisms, such as the Global Environmental Facility.
- The provisions on ToT are not binding and based on best endeavour; conversely the trade measures are mandatory.
- The Convention provides for exchange of information on suitable waste management technology and management systems, but the accumulated information in this regard is difficult to access and often of too general nature.[58]
- The Technical Working Group of the Convention has drafted a number of technical guidelines on management of particular waste streams and relevant disposal operations. These guidelines are however very prescriptive in terms of exposure risks and general waste management practices and are mostly confined to the enterprise level. The specific technical and socio-economic circumstances in developing countries, both least developed and rapidly industrializing countries, are not fully reflected. This concerns in particular the required scale of economically viable recovery or final disposal operations and the significant role of the informal sector.[59]
- There has been considerable headway in creating regional and sub-regional centers on training and technology transfer in recent years. Centers are now operational in China and Indonesia for Asia, in Senegal for French-speaking Africa, in Slovakia, Russia and Estonia for Central and Eastern Europe, and in Argentina, El Salvador and Uruguay for Latin America (UNEP/CHW/C.1/4/9). These centers have the advantage of being able to focus on the specific requirements of the countries in their respective regions, taking due account of the environmental, economic and social exigencies. Most of the activities of these centers have however only recently been launched so that a review of their effectiveness is premature. It increasingly becomes clear, however, that both the creation of the centers and their operation encounter serious funding challenges. The Technical Co-operation Trust Fund to Assist Developing Countries (TCTF), which is based on voluntary contributions, suffers from a chronic shortage of funds and therefore most centers have to rely on bilateral funding support for specific activities, which makes the financial base of the centers unpredictable.[60]

In the light of the above, it can be noted that the Ban Amendment of the Basel Convention outphases transboundary movement of hazardous wastes from North to South. The provisions of the Convention, however, do only imperfectly deal with access to and dissemination of ESTs in resolving waste management problems, in particular in such developing countries that are rapidly industrializing and thus have a high demand for material, including valuable material recovered from waste. ToT requires an economic interest in the effective use of the acquired technology. The Basel Ban Amendment and its severe trade restrictions on some importable recoverable material, however, may undermine this economic interest and it is open to question whether the Regional and Sub-regional Centers on Training and Technology Transfer can effectively overcome this handicap.

(3)THE CASE OF RECYCLING OF USED LEAD-ACID BATTERIES

Lead-acid batteries are one of the scrap items, which are classified as hazardous by the Basel Convention and thus subject to the export ban from OECD to developing countries pursuant to decision III/1. However, imports of lead battery scrap have already virtually come to a halt in the wake of several recent decisions of the Delhi High Court self-imposing a ban on such shipments by India.

Dissemination and effective use of ESTs are inseparably linked to the business and investment prospects of a sector. This is why a review of ESTs will be prefaced by a short overview of the structure and business prospects of the lead-acid battery recycling industry in India.

The structure of the Indian lead-acid battery recycling industry

There are three major licensed manufacturers of new batteries:

- Exide Industries
- Tudor India Ltd
- Amara Raja Batteries

About fifteen manufacturers are in the medium- and small-scale sectors. Furthermore, there are several hundred battery reconditioners in the informal sector. The manufactured batteries are destined for automotive, stationary and traction applications. The total battery production is about nine million equivalent standard units of 12 volt 88 ampere hour capacity. Sector wise, the production breakdown is as follows:

Large sector production: about 55% of total production
Medium/small sector production: about 45% of total production

Lead demand and supply

According to available data, 70 per cent of the total lead volume is consumed by the battery industry. Other important consumers of lead are chemicals (20 %), cable sheathing (5%), others (5%). In a study undertaken by Tata Consultancy Services in 1997, it was noted that per capita annual consumption of lead in India is 0.3 lbs against 0.6 lbs in China, and 13.3 lbs in the United States. The demand for 1999-2000 is estimated at about 150,000 tons.

Table 14 Total production of refined lead in India, including lead content of alloys (in metric tons)

	1994	1995	1996	1997
Production of refined lead from primary sources				
	60000	62000	67000	60000
including lead in alloys				
Secondary lead	24000	26000	25000	19000
(produced by smelters from scrap/waste/residues)				

Table 15 The demand-supply gap for lead, as worked out by MGK Menon Committee on Management of Hazardous Waste in 1997 (in metric tons)

	1998-99	1999-2000
Total lead required by battery industry		
	90000	100000
Total lead required for other applications		
	48000	54000
Total demand	138000	154000
Total supply	80000	60000[61]
Supply-demand gap	- 58000	- 94000

At the turn to the next millennium, the domestic supply-demand gap will reach a magnitude equivalent to more than 60 per cent of total consumption. The supply-demand gap can be bridged in two ways: India can import primary or secondary lead and/or it recovers more domestic secondary lead. The latter is more desirable from an economic and environmental point of view, because there is still a production cost advantage of lead recovery versus the use of imported refined primary lead and scrap battery recycling can resolve the waste disposal problem. Furthermore, a significant part of the imported primary lead would soon end up as scrap in the country and, unless collected and properly recycled, would be a major source of environmental contamination.

Currently, the lead smelters in the formal sector only recycle about one-fifth of the estimated 100,000 tons of domestically generated vehicle battery scrap. As a consequence, large parts of battery scrap end up in the informal sector, i.e. among battery reconditioners and backyard (s)melters, or remain uncollected and therefore are a serious source of lead and dilute sulfuric acid spillage into the environment.

The INFORMAL SECTOR is not only very effective in collecting scrap batteries, but also in acquiring scrap from scrap dealers. Battery reconditioners and backyard (s)melters, which do not pay taxes and have insignificant costs for pollution abatement or occupational safety, tend to offer very high purchasing prices for battery scrap. Under conditions of a virtually closed domestic market, the domestic supply-demand gap has driven up Indian battery scrap prices to between two and three times the international level of battery scrap prices, which currently are at about US$150 per metric ton.

The informal sector therefore poses a two-fold problem for licensed battery recyclers:

- there is a quantitative shortage of scrap feedstock, which is difficult or impossible to bridge by resorting to scrap imports; and
- the level of domestic prices of battery scrap is so high that it wipes out any production cost benefit versus lead produced from primary sources.

These two problems cause capacity under-utilization at licensed recycling plants, which, in turn, discourages investment into new technology, be it end-of-pipe or clean process technology. It also prevents battery manufacturers from conducting research and development on prolonging battery life and thereby reducing the volume of generated battery waste. Unless these problems are resolved, it is unlikely that the licensed Indian battery recycling companies have a sufficient economic interest in deploying new technology, in particular clean process technology, even if they had easy access to such technologies.

Apart from resolving the feedstock shortage and scrap price problems, licensed battery recyclers also have to prepare themselves for meeting quickly rising battery demand and processing an ever increasing battery scrap heap caused by very high growth of the Indian vehicle population in the next few years. Even if fully utilized, currently installed recycling capacity will soon no longer match battery demand and scrap supply volume. The industry will therefore have to expand and this will provide ample opportunity for the use of less-polluting, more energy-efficient and more cost-effective technologies.

Table 16 Projected vehicle population growth in India[62]

Year	two wheeler	three wheeler	cars	jeeps	light utility vehicles	Tractors	Total
90-91	14,046,764	763,513	2,542,705	470,590	1,744,211	1,232,896	20,800,679
95-96	21,948,767	1,123,641	3,402,273	686,302	2,338,430	1,876,005	31,375,418
00-01	35,318,944	1,755,705	5,081,690	1,108,620	3,348,835	2,922,187	49,535,982

Suitable recycling technologies for India

The conventional method of recovery of lead from scrap batteries involves pyro-metallurgical methods having the following stages:

- Conversion of scrap batteries into battery scrap by a mechanical process followed by heavy media separation.
- Smelting of the scrap to get impure metal by a pyro-metallurgical step involving smelting the charge blended with about 5% reducing agent (coke).
- The lead sulfate and oxide are reduced to lead, but oxidizing all other impurities. The product is a low antimony melt, containing less than 1% antimony and a furnace slag containing about 80% primary lead and oxides.
- The slag generated is tapped and blended with metallic iron and reprocessed in the furnace. The iron de-sulfurizes the charge by reducing the lead sulfate to lead oxide. Carbon further reduces the oxide to metallic lead.

Ongoing research is being carried out at the National Metallurgical Laboratory and at the Indian Bureau of Mines towards :

- meeting and improving the environmental standards;
- increasing levels of productivity and product quality;
- recovering other metals and products; and
- minimizing solid and waste disposal.

All currently used recycling technologies in India are conventional. Their pollution control measures have however been considerably improved. Newer technologies, which are environmentally more friendly and may also be economically more attractive, are currently tested overseas. However, none of the big secondary lead smelters worldwide has used such technologies at large scale.

The newer technologies attempt replacing the pyro-metallurgical processing route by electrochemical and hydro-metallurgical processes. These processes can considerably reduce current pollution levels. However, a careful choice of the technology has to be made depending upon various factors such as accessibility, economic viability and environmental performance. Several recent reviews of internationally developed new technologies have recommended three processes

as being particularly suitable for consideration under Indian circumstances :

- KHD Wet Mechanical Process
- Plombrec process
- Placid process

The Placid process, developed by Tecnicas Reunidas in Spain, appears to be the best suited for large-scale Indian Recyclers. In this process, lead is leached in warm slightly acidic brine to form soluble lead chloride. Pure lead is then won from the lead chloride electrolyte on the cathode of an electro-winning membrane cell and is collected. Hydrochloric acid is reformed in the cell and returned to the leaching bath. The net consumption of the reagent in the process is minimal. The reaction of the battery paste (lead oxide & lead sulphate) with brine yields sodium sulphate besides lead chloride. This is easily converted to gypsum by adding milk of lime.

The process is therefore very flexible and capable of treating all forms of lead bearing residues such as battery pastes, drosses, ashes etc. More than 99.5 per cent of the lead is dissolved in the leachate and the current efficiency in electro-winning is almost 100 per cent. As a result, the recovery rate of lead from the waste material is almost 100 per cent.

Although the Placid process can be implemented on a stand alone basis, there are technical and environmental as well as economic advantages in combining it with a pyro-metallurgical process.

The hard, antimonial lead in grids and other metal parts can be treated in the existing pyro-metallurgical facility, whereas the battery paste is fed into the Placid process. The cements created in the purification circuits of the Placid line can be further processed in the pyro line, whereas the fumes, drosses and slags created by the pyro line can be fed into the Placid line for further lead extraction. Overall, the amount of waste that must be disposed of is at most half as big as what is currently discharged by a conventional pyro-metallurgical line and the lead recovery exceeds 99 per cent.

The **environmental merits** of such approach can be summarized as follows:

- The gypsum formed in the Placid process contains up to 1.5% lead, but classification tests have shown it is not hazardous.
- The only gas released from the Placid Process is oxygen.
- Lead is wetted in every part of the process – and there is no generation of dust.
- With the reduced temperature of operation in the combined process the need for high temperature is eliminated and consequently this leads to reduced air borne lead pollution.

The **economic advantages** are as follows:

- The energy consumption is 1,300kwh per ton of lead, compared to 1,400 to 2,000 kwh for pyro-metallurgical processing.
- The operating cost of a Placid plant is lower than its pyro-metallurgical equivalent and with a combined Placid/Pyro process the operating cost is likely to be halved.
- Production and capital cost estimates have been made based on an annual capacity of 25,000 tons of refined lead output. Given the lower pollution control and abatement costs of the placid process, plant size is much more flexible than under pyro-metallurgy where a minimum capacity of about 15,000 metric tons of refined lead output per annum is required.

- Operating costs have been estimated at about US$160 per ton of lead.
- The pay back period is approximately 3 ½ years.

Further development of the Placid Process by Tecnicas Reunidas has led to the development of the Plint Process ('Plint' standing for "Placid Intermediary") without any requirement for electro-winning.

In the Plint process, the leachant is converted to a solid charge (Lead Hydroxide) required for the Smelting Furnace. The leaching residue is gypsum, a marketable product. The waste acid from the batteries is used in the process itself, thus virtually eliminating all landfill problems. There are no pollutants originating in this process.

Lead recovery from wastes is around 99.8%, with a purity of lead produced at 99.9 %. The energy requirement is at 30 kwh per ton of lead produced, at an expected investment level of USD2.5 - 3.0 million (excluding the pyro-metallurgical line) for an output level of 6000 metric tons per year .

Comparing Placid with Plint, against the levels of investment, and the energy requirements, it is felt that the Plint process could be the ideal choice for the small and medium enterprises under conditions prevailing in India. It may even motivate clusters of informal sector units to group together and collectively opt for this technology.

An important issue is the accessibility of the Placid and Plint technology. Having learnt from past experiences on industrial piracy, the consortium owners of the Placid and Plint process seem to be unwilling to agree to an outright sale of the process. Indian smelters would therefore have to consider a joint venture with the owners of the Placid and Plint process. This would limit the use of the process where it is probably most needed.

The creation of joint ventures may however avoid the payment of royalties. If they had to be paid, it would require that the Indian recyclers generate sufficiently high profits, which is far from certain under current market prices for battery scrap in India.

(4)ENVIRONMENTALLY SOUND TECHNOLOGIES REQUIRE A PACKAGE APPROACH

In screening new eco-friendly technologies, one should not lose sight of the fact that ESTs as an issue need to be put into a package of measures which, besides measures at company level, will have to be based, at least in part, on restructuring the lead recycling industry aimed at optimising resource management costs.

Addressing the problems caused by battery reconditioners and backyard (s)melters in the informal sector takes a medium- and short-term strategy. In the short term, assistance needs to be provided for improving their environmental and occupational performance, based on low cost technology and information campaigns. The National Metallurgical Laboratory in Jamshedpur is working in such direction and, if required, further assistance can be provided by the International Lead Management Centre and UNCTAD, which are currently conducting a similar project in the Philippines.

In parallel, a medium-term approach has to be launched which may be based on a combination of constructive and repressive measures. The repressive measures concern several clusters of activities. One cluster undermines battery demand which is currently met by the informal sector. This includes the production of a low price battery line which can compete with the bulk of reconditioned batteries. Furthermore, the development of batteries with a much longer life will also progressively discourage consumers from buying reconditioned batteries. In addition, the government will have to take and enforce some regulatory measures to restrain the activities in the informal sector. This concerns the closure of units operating in vulnerable environments, such as inner city areas. Furthermore, reconditioners and backyard (s)melters without a valid operating permit shall be banned from bidding at scrap battery auctions.

It is important that regulatory and economic measures are taken in tandem, because a tight regulatory and enforcement approach is in itself unlikely to be very effective in the medium-term.

The constructive approach towards the informal sector concerns the gradual conversion of reconditioners and backyard (s)melters into collection and servicing points for licensed secondary smelters. In this context, it is also worth considering the formation of a collection consortium, rallying the licensed secondary lead smelter, battery manufacturers and scrap dealers. The consortium could review the need for a collection tax being imposed on new battery sales to cover part of the collection and transport costs of scrap batteries as well as to allow improvement of collection infra-structure.

The formal recycling sector is likely to be very reluctant to accept a prescriptive approach on the kind of new technology to be employed by individual companies. Such decisions will be taken by the companies on the basis of their investment plans, technical expertise, current environmental performance and access to relevant information through international corporate parternships. Besides the measures outlined above, the government can encourage the use of new technologies by offering some special incentives, such as duty-free import of related capital goods and their exemption form purchase and sales tax.

Besides the technological and economic aspects of the use of ESTs, there is also the need to launch an awareness campaign among the general public. Unlike most OECD countries, India does not have any awareness programme highlighting the dangers of dumping or improper treatment of discarded vehicle and other batteries. Efforts should be made in the following directions:

- Awareness programme about the harmful effects of batteries if discarded as waste.
- Educating people about the recoverable elements of batteries and safety precautions that should be taken in battery manufacturing or in lead recovery operations.
- Education programmes could commence as part of school education programmes & advertising on radio, television and newspapers. Ultimately this should be enforced by a statutory government regulation.

(5)CONCLUSIONS

The provisions on access to and dissemination of ESTs to developing countries in the Basel Convention have not yet had any bearing on reduction, management and recuperation methods of vehicle battery waste in India. This is particularly problematic in the light of the fact that India has already self-imposed an import ban on battery scrap. The sub-regional center on training and technology transfer for South Asia, envisaged to be located in India at the Asian and Pacific Centers for Transfer of Technology of ESCAP in New Delhi, is not yet operational.

Development, dissemination and effective use of ESTs should not be uncoupled from the business and investment prospects in the respective industrial branch. Effective use of ESTs further requires that such technologies are flexible enough to be tailored to different production capacities and very volatile international commodity prices, the most important production cost item. Prescriptive approaches on the transfer and use of ESTs therefore are unlikely to be very effective.

The use of ESTs by the principal battery recyclers is a function of available capacity and its utilization in the wake of a restructuring of the industry; scrap feedstock supply is the most critical variable in this regard. In essence, the development, dissemination and effective use of ESTs has to be part of a package of measures for restructuring the recycling industry, to make recycling ecologically and economically viable.

Collection of scrap batteries by the formal recycling sector needs to be significantly improved. This requires foremost a coherent policy of regulatory and market-based instruments towards downsizing the battery reconditioners and backyard (s)melters in the informal sector and their gradual integration into the collection infra-structure of the licensed battery recyclers. In the short term, informal sector units need technical advice on inexpensive ways of improving their environmental and occupational health performance.

There is a need for developing a comprehensive awareness programme emphasizing the environmental and associated health problems caused by uncollected or unsafely treated scrap batteries.

The demand prospects for new vehicle batteries in the medium-term are very good. Most battery manufacturers and secondary lead smelters therefore will have an interest in using ESTs. Shortage of scrap feedstock and very low international lead prices might however require some government support for facilitating capital goods imports. Depending on the pace of improvement of domestic collection of battery scrap, there might be the need for some import of lead, either in primary or secondary form, to bridge the domestic supply-demand gap and drastically reduce domestic prices of lead scrap.

The Placid/Plint process, the most attractive new technology currently available, might only be accessible under very specific conditions. It remains to be seen whether these conditions are acceptable to Indian recyclers.

SECTION 4 * CONCLUSIONS

CONCLUSIONS

Both **TRADE MEASURES AND POSITIVE MEASURES** have been encouraging participation in MEAs. However, the relative importance of each of these policy instruments is difficult to judge, because they form part of a package of measures which together determine a country's decision. It should also be noted that many factors play a role in a country's decision whether or not to participate in MEAs. For example, developing countries may be guided by their interest to be partners in mainstream developments in terms of technological progress, capacity-building, financial flows, and emerging requirements of international markets which have an impact on trade and investment. These are important issues from a development perspective. It has also been noted that two different aspects of policy instruments need to be considered, i.e. accession on the one hand and successful implementation on the other. For example, whilst trade measures may be effective in encouraging participation, they may be insufficient in ensuring successful (i.e. effective and efficient) implementation.

It has been noted that packages of measures may need to be implemented.[63] Such packages of measures may contain both measures aimed at compliance control and enforcement, on the one hand, and positive/supportive/enabling measures, on the other. In most developing countries, the latter are required to enhance national capacity in implementing MEA provisions. Furthermore, positive/supportive/enabling measures can reduce adjustment costs of trade measures and counter their distortionary effects .

Some important differences between provisions on trade restrictions and positive/supportive/ enabling measures could be highlighted.

First, while trade provisions are generally enforced, the implications of non-implementation of positive/supportive/enabling measures (e.g. commitments in the area of technology transfer) for the parties which have these obligations relating to technology transfer, financial assistance, or capacity building are not fully clear. Similarly, while trade provisions kick off immediately and without further negotiations, the full and timely implementation of positive/supportive/enabling measures needs to be continuously negotiated.

Second, the country studies point out that the effectiveness of trade measures in achieving environmental objectives is uncertain and depends on many factors.[64] These include the participation of developing countries in world trade. Positive/supportive/enabling measures tend to directly address the root cause of the environmental problem and/or deficiencies in national capacity in implementing MEA provisions.

In the case of the **MONTREAL PROTOCOL**, case studies on three Article 5 countries suggest that while trade measures may have induced Thailand to join the Protocol, they do not appear to have played a critical role in the case of India. They would also have played an important role in the case of the Republic of Korea, but grace period with respect to the phase out appears to have been equally important to the Korean Republic. With regard to the implementation of the Protocol at the national level, in all three cases, the timing, sectoral composition and cost-effectiveness of phase-out plans have been largely

determined by technological options and cost of phase-out rather than by the effects of consumption and production quotas on trade between parties.

The country studies also examine the role of positive measures. For countries like Thailand, positive measures under the Montreal Protocol, while important, may have been only a relatively modest factor in implementing the Protocol at the national level. In the case of other countries, such as India, however, positive measures was a more decisive factor in implementing the Montreal Protocol at the national level.

Experiences with **CITES** indicate that while trade measures, or the threat of using such measures, may have been effective in reducing illegal trade in a number of species, positive measures are needed to overcome obstacles to CITES implementation and enforcement at the national level.

In the case of the **Basel Convention**, recent provisions on trade measures have yet to be implemented, making it difficult to judge their effectiveness and efficiency. Concerns have focused on the possible effects on resource recovery and recycling in rapidly industrializing developing countries. This could particularly relate to used lead-acid batteries, copper and zinc compounds as well as waste mineral oils. The studies on lead in the Philippines and India highlight the need to combine sustainable natural resource management with sound waste management. This could be achieved on the basis of a comprehensive national strategy, which includes the full use of positive/supportive/enabling measures.

It is important to examine and improve the effectiveness of provisions on positive measures. Some MEAs contain provisions requiring periodic review of the effectiveness of their financial mechanism, and on appropriate actions to be taken, where necessary, to improve effectiveness. [65] In other cases, mechanisms have been set up by the CoPs. For example, in the case of the Montreal Protocol, the issue of technology transfer has been extensively discussed within the Protocol's Open Ended Working Group. It should nevertheless be noted that systematic information is lacking.

To the extent that positive measures have been effectively implemented, they appear to have contributed to implementation of commitments at the national level. In many cases, capacity-building projects have been successful and have helped to set in motion a process resulting in improved conditions for the implementation of MEAs. Positive measures have also helped to promote broad participation and international co-operation in implementing the provisions of MEAs.

Another issue is the extent to which positive measures have contributed to promoting equity and sustainable development. The scope of positive measures in existing MEAs tends to be limited to assisting developing countries in complying with their obligations under the MEAs. By and large, such positive measures have environmental objectives, paying less attention to other sustainable development objectives. Thus, whilst positive measures have contributed to achieving the environmental objectives of MEAs, there are indications that the distribution of incremental costs between developed and developing countries may not have been equitous. A substantial part of national implementation has been market-driven or based on voluntary measures. In many cases, however, the effects on trade and competitiveness are unknown. Also, the distribution of positive measures, such as financial support, may have been skewed in favour of large firms, which tend to have easier access to

finance and technology. Small and medium-sized enterprises may have more difficult access to positive measures.[66]

Positive/supportive/enabling measures are increasingly becoming a common feature of MEAs, and their effective implementation is important for the further development of the international environmental agenda. There are nevertheless some indications that the potential of positive measures is not fully realized. Some questions may need to be addressed;

(a) how should effective measures be designed and what innovative approaches are feasible;
(b) how can the effective implementation of commitments by developed countries be enhanced (e.g. by generating political support and mobilizing resources);
(c) what is required to enable fuller use on the part of beneficiary developing countries (e.g. in terms of technical assistance for project formulation, addressing information gaps or facilitating access of SMEs to finance and technology).
(d) From a development perspective, it is also important to examine how positive measures can have spin-offs on the sustainable development process.
(e) mechanims for making the transfer of technology provisions in MEAs more effective and linking it with the achievements of objectives of MEAs.

NOTES

[1] The project is a response to an invitation by the Commission on Sustainable Development (CSD). The CSD, at its fourth session, invited UNCTAD and UNEP, "... to undertake further analysis on the issue of trade and environment, including policy instruments in MEAs, in particular positive measures, taking into account the specific context of each MEA, with a view to promoting sustainable development" (paragraph 3(d)). Further, the CSD recalled "the invitation ... to UNCTAD and UNEP, ... to examine the effects of trade measures in MEAs on the achievement of environmental goals and on trade and competitiveness of developing countries and countries with economies in transition and how positive measures can assist those countries in meeting their obligations under the agreements" (paragraph 3(e)).

[2] It is noteworthy that India's CFC producing sector was just starting production around the time that India acceded to the Montreal Protocol

[3] The Government of Thailand established an Ozone Layer Protection Unit operating with the Department of Industrial Works (DIW), which is itself within the Ministry of Industry. Furthermore it designated the Industrial Finance Corporation of Thailand, an independent financing agency, to manage financial assistance from the Multilateral Fund. An independent agency was chosen because of the expected large number of projects to implement Thailand's phase-out.

[4] A study on Malaysia draws similar conclusions. The study suggests that the phase-out of ODS has had relatively little effect on trade and competitiveness. It attributes this to a number of reasons, such as (a) the strong cooperation between the Government and industry has helped to identify cost-effective approaches for ODS phase-out, based on the incorporation of sector-specific elements into a national strategy; (b) the use of a combination of approaches in setting industry phase-out targets, including regulations, voluntary measures, investment incentives and capacity-building; (c) technological development; (d) the structure of ODS-using industries, in particular the predominance of affiliates of TNCs; and (e) international finance provided by the Multilateral Fund. The study mentions that the Fund contributed US$ 15.3 million between 1991 and June 1995. Source: Institute of Strategic and International Studies (ISIS): Trade and Environment Linkages: A Malaysian Case Study. Kuala Lumpur, Malaysia, May 1995

[5] For example, a trilateral conference was held between DIW, the Japanese Ministry of International Trade and Industry (MITI) and the United States Environmental Protection Agency (EPA) in which all parties urged companies operating in Thailand, but based either in Japan or the United States, to adopt phase-out schedules for their Thai operations similar those in their home country. Attention focused on the electronics sector. The Agreement also provided for accelerated transfer to Thailand of available substitute technologies. The Agreement is still largely adhered to, particularly in the electronics sector.

[6] There is a need to distinguish between different types of trade measures used in CITES. Trade measures and sanctions for non-compliance are substantially different from permits and quotas between parties which allow for limited trade in a number of species depending on the appendices in which they are listed.

[7] All CITES-listed species are now protected under Thai law.

[8] Officials ceased to grant hunting permits for protected snakes and exports of snake products were allowed only to clear stocks.

[9] These crocodiles are listed in Annex I, but CITES allows commercial exports of these species when bred in captivity in CITES-registered farms (under the conditions for Annex II). Most of Thailand's exports, however, are Caiman crocodiles (listed in Annex II) obtained primarily from Colombia and Venezuela. Annex II species do not require import authorizations in Thailand, only an export permit from the country of origin is required.

[10] Krueger, J., *Regulating transboundary movements of hazardous waste: the Basel Convention and the effectiveness of the prior informed consent procedure*, Working Papers of the International Institute for Applied Systems Analysis, Laxenburg, No. 96-113, September 1996, p. 13.

[11] The export of hazardous waste destined for final disposal under the guise of recycling.

[12] In accordance with Article 17 of the Convention, the Ban Amendment has to be ratified by three quarters of the Parties present at the time of the adoption of the amendment (i.e. 62 Parties) in order to enter into force. As of the beginning of December 1999, 16 State Parties (six of them developing countries) and the European community had ratified the Ban Amendment.

[13] Though subject to further clarification by Parties, as matters stand at the moment, countries continue to have the possibility to conclude bilateral or multilateral agreements on trade in hazardous waste under the Ban Amendment in accordance with Article 11 of the Convention. The Technical and Legal Working Groups of the Convention are charged with developing guidance elements for such agreements.

[14] This particularly concerns used lead-acid batteries, zinc compounds, waste oils and old computer boards.

[15] Enhanced domestic collection and recuperation of scrap batteries, for instance, and reduced human and environmental exposure to lead.

[16] An UNCTAD Expert Meeting on Positive Measures to Promote Sustainable Development, Particularly in Meeting the Objectives of Multilateral Environmental Agreements was held in Geneva, from 3 to 5 November 1997. The report of the Expert Meeting is contained in documents TD/B/COM.1/9 and TD/B/COM.1/EM.3/3 (Geneva, 11 November 1997), which can be downloaded from UNCTAD's homepage www.unctad.org).

[17] The term "positive" measures is sometimes objected to because trade measures pursuant to MEAs would, by definition, be considered as "negative" measures. For example, the CITES secretariat has observed that, in the context of this Convention, quotas could be considered as positive measures since they create opportunities to trade in species which otherwise are not allowed to be traded for commercial purposes. Quotas have been introduced to provide some flexibility in the process of listing and associated trade control measures. Quotas, which had not been foreseen by the original CITES negotiators, allow the down-listing from "Appendix I" (trade is essentially banned for commercial purposes) to "Appendix II" status when populations of a specific species are adequately managed or when scientifically-based national export quotas are set and then approved by the CoP. For example, quotas have been established for Nile crocodiles allowing exports from 15 East and Southern African countries.

[18] See also: Vaughan, S. and A. Dehlavi, *Policy effectiveness and Multilateral Environmental Agreements, UNEP*, Environment and Trade Series, paper No. 17, Geneva, 1998, pp. 22-26.

[19] These adverse effects are generally difficult to document, because the informal sector is outside statistical coverage or only coarsely estimated. This may lead to the deception that as environmental pollution by the formal sector declines, the overall situation has improved.

[20] "Adequate international cooperation provisions, including among them financial and technological transfers and capacity-building, as part of a policy package in MEAs are important and can be indispensable elements to facilitate the ability of governments, particularly of developing countries, to become Parties to an MEA and provide resources and assistance to help them tackle the environmental problems which the MEA is seeking to resolve and thus to implement the provisions of the MEA effectively, in keeping with the principle of common but differentiated responsibility". WTO, Report (1996) of the Committee on Trade and Environment, para. 173. PRESS/TE 014, 18 November 1996.

[21] On the concept of compliance assistance, see: Beyerlin, Ulrich and Thilo Marauhn, Law-making and law-enforcement in international environmental law after the 1992 Rio Conference, Research reports of the Max Planck Institute for Comparative Public Law and International Law, No.4, Heidelberg, 1997.

22 Innovative approaches to positive measures may be politically attractive in the light of existing budget constraints and their potential to reduce the costs of achieving the environmental objectives of an MEA. Innovative approaches focus on instruments or mechanisms that address specific interests and concerns of parties or stakeholders, make creative use of market-based mechanisms and harness new sources of finance for positive measures. Innovative approaches include such mechanisms as partnership arrangements for funding and technology transfer, multi-stakeholder and integrated approaches or tradeable carbon emission permits and promote the involvement of the private sector and civil society in achieving the objectives of an MEA.

23 Report submitted by the Executive Committee on Technology Transfer under the Multilateral Fund to the seventh meeting of the Conference of Parties. “The participatory approach espoused by the Fund in the transfer of technology has always enabled the enterprises of Article 5 countries to choose, with the advice of the implementing agencies, the technology preferred and negotiate the terms of their transfer, including such costs as patents, designs and royalties. While it is the prerogative of the enterprises to negotiate such terms, the results of such negotiations may not always be able to be accommodated by the funding policies of the Multilateral Fund.” A real example to illustrate this: a domestic refrigerator manufacturer in an Article 5 country submitted a project proposal to the Executive Committee, which included US$450,000 in technology transfer fee. Upon examination of the request, part of the fee was requested for CFC-12 technology transfer, which is ineligible. The cost was subsequently adjusted to eliminate the ineligible items and the balance was granted to the enterprise.

24 The study also expresses concern over transfer of technology issues in the case of FM 200 (a substitute for halons) and methyl dose inhalers (MDIs). The costs of MDIs based on hydrofluorocarbons (HFC MDIs) are likely to be 10 to 15 times those of CFC MDIs. The Executive Committee decided at its 19th meeting (May 1996) – with the concurrence of India (a member of the Executive Committee): “That pending the completion of sector plans, the Executive Committee should focus on closure projects which could be considered according to interim guidelines with the understanding that guidelines on other types of projects, e.g. conversions and erecting ODS substitutes production, should be developed at a later date”. (Decision 19/36)

25 The "Alternative Substances Development Centre" was developed under the Korea Institute of Science and Technology (KIST). In the first stage, alternative substances have been developed and capacity installed for the large-scale production of HCFC-22 and HCFC-141b. Basic designs for HFC-134a and HFC-152a have also been completed. However, since some of these substances are now also controlled, the government of the Republic of Korea has designed a second stage to be implemented by the Alternative Substances Development Centre between 1997 and 1999.

26 In a recent UNCTAD Expert Meeting, some experts noted that intellectual property rights (IPRs) may confer a double advantage to technology owners in the particular case of MEAs that set time-bound environmental targets: on the one hand by granting monopoly rights through patent protection, and, on the other hand, by generating a large and pressing demand for their technologies through the conditions established by the MEA. In this context, some suggested that financial mechanisms could play a role in filling the gap between the interests of technology owners and the requirements and abilities of licensees. Two suggestions by some experts in this regard were the creation of a technology rights bank under the financial mechanism of the Montreal Protocol and/or the involvement of the producing TNCs in the initial stages of negotiations.

27 Under Article 13, Parties have the obligation to transmit to each other annually, through the secretariat of the Convention, “information on measures undertaken for development of technologies for the reduction and/or elimination of production of hazardous wastes” (Article 13, 3,(h)). However, although the Convention secretariat developed a standardised questionnaire for Parties to be used for information transmission pursuant to Article 13, according to several documents on information transmission for the period 1994 to 1996 (UNEP/CHW.C.1/3/14, UNEP/CHWQ/C.1/3/Inf.4, UNEP/CHW/C.1/4/18), only about a hand full of Parties reported on efforts to achieve a reduction in waste generation and relevant technical information in this regard. Only Australia and Canada have recently made such information publicly accessible on the internet (Australia: www.ubavie.gv.at/info, Canada: www.ec.ca/cceb1/eng/ps12-3/htm).

[28] The informal sector often accounts for 40-70 per cent of recovery and final disposal operations in developing countries.

[29] For the first two years of operation, the operational costs for the centers were estimated at almost $6 million, which compares with an average annual size of the TCTF of some 1.65 million dollars for 1999-2000, of which only up to $250 thousand could be used by the centers (UNEP/CHW/C.1/3/Inf.11 and UNEP/CHW/C.1/3/6) and some 1.5 million dollars were provided by OECD donors and Argentina in support of the centers on a bilateral basis.

[30] Examples are Article 10 of the Montreal Protocol, Article 4.3 of the FCCC and Article 20.2 of the CBD.

[31] In the case of the GEF, from its inception in 1991 until June 1996, the total amount of authorised funding for projects in the GEF work programme was US$ 1,231 million. Of this amount, US$ 837 million were committed and US$ 337 million were disbursed.

[32] UNEP/OzL.Pro.7/10, paragraph 16 reads as follows: "According to the Indicative List of Incremental Costs, the most cost-effective and efficient option should be chosen for ozone-friendly technology. Since the purpose of transfer of technology under the Fund is to move away from ODS-based technology, the ultimate criterion on eligibility would be a technical determination of what is essential for the conversion of ODS-based technology to ozone-friendly technology. Any intended upgrade either in terms of sophistication or in capacity would be the responsibility of the concerned enterprise". Paragraph 17 adds: "Another important consideration in treating the transfers of technologies negotiated by enterprises is the equity to be considered under the Fund between different projects from the same country or different countries".

[33] In a recent communication to the CTE, the secretariat of the Multilateral Fund noted that "Novel approaches to eliminate the use of ODS in SMEs have been adopted by the Executive Committee. They include approval of any conversion project in a country where ODS consumption is 360 tonnes or less without due regard to its cost-effectiveness", WT/CTE/W/60, para. 24, 8 September 1997.

SECTION 1 * THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

CASE STUDY 1 * THAILAND'S experience

[34] See country case study.

[35] SMEs which do not apply for government assistance may not be registered with the government.

CASE STUDY 2* INDIA: effects of trade measures and positive measures in the Montreal Protocol on selected Indian industries

[36] Measures which were mandated by the Protocol included basically trade measures against non-parties. To meet their quota restrictions those countries which had to phase out CFCs earlier than Article 5 countries could use trade restrictions even amongst parties. These would fall in the category of trade measures taken pursuant to the Protocol.

CASE STUDY 3* INDIA: the issue of technology transfer in the context of the Montreal Protocol

[37] "The participatory approach espoused by the Fund in the transfer of technology has always enabled the enterprises of Article 5 countries to choose, with the advice of the implementing agencies, the technology preferred and negotiate the terms of their transfer, including such costs as patents, designs and royalties. While it is the prerogative of the enterprises to negotiate such terms, the results of such negotiations may not always be able to be accommodated by the funding policies of the Multilateral Fund."

38 NGOs in India have campaigned against the use of HFC 134A.

39 See OORG study on alternative pricing.

40 Among the developing nations classified under Article 5 (1) of the Montreal Protocol, 7 nations are producing the subject substances: Korea, Argentina, Brazil, China, India, Mexico and Venezuela. In the 4 nations excluding Korea, China and India, CFC production is localized by US, European or Japanese businesses.

41 Total production and export of the Korean electronics industry amounted to 63.7 and 43.6 billion dollars in 1995 respectively.

42 The Council for Adjustment of Supply and Demand of Specified Substances consists of specialists, representatives of relevant industries as well as government officials from the Ministry of Trade, Industry and Energy and the Ministry of Environment, Ministry of Finance, Ministry of Home Affairs, Ministry of Science and Technology. Five government officials are appointed by each of the Ministers listed above. The Minister of Trade, Industry and Energy can appoint members (not more than 15) from businesses and specialists.

43 The major investors of Hankook Shinwha are Korea General Chemical Corporation (65% of its whole share) and Ulsan Chemical Co. (35%). Since Korea General Chemical Corporation is a government invested company, Hankook Shinwha was also launched as a public enterprise. But from 1995, the privatization of Hankook Shinwha Co. is underway and is expected to be completed in 1997.

44 The production line of HCFC-141b is convertible to produce CFC-11.

45 The figures were calculated using average exchange rate of '96, W/US$ = 804.78.

SECTION 3* The BASEL CONVENTION ON TRANSBOUNDARY MOVEMENT OF HAZARDOUS WASTES AND THEIR DISPOSAL

CASE STUDY 1* The case of used lead-acid batteries in the PHILIPPINES: The need for supportive/enabling measures to encourage environmentally sound and economically viable management of lead

46 The Ban Amendment (decision III/1) introduces an outright export ban on hazardous waste shipments destined for final disposal and re-use/resource recovery/recycling from Annex VII countries (the OECD, EU and Liechtenstein) to non Annex VII countries (all other Parties). This ban will be supplement the generally applied system of Prior Notification and Consent currently used by the Convention. The Ban Amendment assumes the form of a multilateral export ban which is enforced by the countries of Annex VII.

47 For more information in this regard, see: UNCTAD/ICME, A statistical review of international trade in metal scrap and residues, Part I, II and III, Geneva/Ottawa, 1995 and 1996. Secretariat of the Basel Convention, *Generation and transboundary movements of hazardous wastes and other wastes, 1995 and 1996 statistics*, Geneva, May and June 1999; OECD, *Transfrontier movements of hazardous wastes, 1989-1990 and 1991 statistics*, Paris, 1993 and 1994.

48 For more information in this regard, see: Johnston, N., The implications of the Basel Convention for developing countries: the case of trade in non-ferrous metal-bearing waste, *Resources, Conservation and Recycling*, Vol. 23(1998), pp. 1-28.

49 ILZSG, Principal uses of lead and zinc, 1989-1994, London, 1996, p. 8.

50 The lead supply and demand flow charts are part of one background paper of the project, entitled "Requirements for environmentally sound and economically viable management of

lead as important natural resource and hazardous waste in the wake of trade restrictions on secondary lead by decision III/1 of the Basel Convention: The case of used lead-acid batteries in the Philippines". The paper is available at UNCTAD's Trade and Environment website www.unctad.org/trade_env/index.htm

51 Net imports of vehicles (which are equipped with new batteries) account for only 5-10 % of newly registered vehicles per annum in the Philippines. This low percentage is mainly the result of local content requirements.

52 40% of the lead in a SLI battery is in metallic form, whereas 60 % is in lead oxide form. Only the former can be recovered by "backyard smelters".

53 Only about 17 per cent of the populated areas of the Philippines are not covered by the collection infrastructure of the formal battery recycling industry. This is a remarkable percentage in the light of the fact that the Philippines is an archipelago of some 7100 islands.

54 Battery reconditioners are able to offer very attractive scrap purchasing prices because they do not pay taxes and have insignificant or no environmental or occupational health costs.

55 The biggest battery recycling company in the Philippines, named Philippine Recyclers Inc. (PRI), operates a modern pyro-metallurgical plant, bought as turn-key project in the US at the beginning of the 1990s. The plant accounts for 70-80% of the recycling capacity of all licensed Philippine recyclers. Economic and environmental performance have significantly been improved in recent years. PRI has been among the first Filipino-owned companies which got ISO 14001 certified (there are less than a handful of lead smelters worldwide which have got this certificate so far).

56 In this regard, there is room for regional or South-South co-operation, which may significantly reduce R&D investment requirements per country.

57 A scheme on tax and duty free import of equipment expired on 31 December 1997. According to information provided by staff of the Department of Trade and Industry, the Department attempts to get back such incentives for environmental projects. There is the proposal to include such scheme in the Senate and House of Representatives bills that deal with environmental legislation, e.g. the proposed Clean Air Act and Solid Waste Act.

CASE STUDY 2* The case of used lead-acid batteries in INIDA: the effectiveness of provisions on transfer of technology to developing countries in the Basel Convention

58 Under Article 13, Parties have the obligation to transmit to each other annually, through the secretariat of the Convention, "information on measures untertaken for development of technologies for the reduction and/or elimination of production of hazardous wastes" (Article 13, 3,(h)). However, although the Convention secretariat developed a standardized questionnaire for Parties to be used for information transmission pursuant to Article 13, according to several documents on information transmission for the period 1994 to 1996 (UNEP/CHW.C.1/3/14, UNEP/CHWQ/C.1/3/Inf.4, UNEP/CHW/C.1/4/18), only about a hand full of Parties reported on efforts to achieve a reduction in waste generation and relevant technical information in this regard. Only Australia and Canada have recently made such information publically accessible on the internet (Australia: www.ubavie.gv.at/info, Canada: www.ec.ca/cceb1/eng/ps12-3/htm).

59 The informal sector often accounts for 40-70 per cent of recovery and final disposal operations in developing countries.

60 For the first two years of operation, the operational costs for the centers were estimated at almost $6 million, which compares with an average annual size of the TCTF of some 1.65 million dollars for 1999-2000, of which only up to $250 thousand could be used by the centers (UNEP/CHW/C.1/3/Inf.11 and UNEP/CHW/C.1/3/6). Some 1.5 million dollars were provided by OECD donors and Argentina in support of the centers on a bilateral basis.

61 The Government of the Indian state of Andhra Pradesh ordered the closure of the Vishakapatnam lead smelter of Hindustan Zinc Corporation for environmental reasons in

July 1999. This smelter had a production capacity of 20,000 tons per year, which reduced Indian production of refined lead from primary sources by one third. American Metal Market, No. 138, Vol. 107 (20 July 1999).

62 *Techno-market survey on recovery from industrial waste "scrap batteries"*, Technology Information and Assessment Council (TIFAC) of the Indian Department of Science and Technology, New Delhi, September 1997, p. 74.

SECTION 4 * CONCLUSIONS

63 A recent OECD study on the use of trade measures in three MEAs (CITES, Montreal Protocol and the Basel Convention) comes to similar conclusions: "The analyses indicate that inadequate attention has generally been given to the need for human, financial and technical resources to make trade measures, such as bans or prior informed consent systems, work. Unclear definitions and complex administrative requirements make this a much bigger task. Trade measures will be more effective if the Parties, especially developing countries, have the financial and technical capacity to properly implement and enforce them … This highlights an important point in the discussion of trade measures and MEAs. Trade measures should not be seen in isolation from other related policies. Often they are part of a broader package of reinforcing policy instruments. Sometimes trade provisions make other regulations more effective, and sometimes other instruments are needed to make trade-based regulation more effective. The effectiveness of trade measures in achieving environmental objectives should not therefore lose sight of the bigger policy picture." OECD, *Trade measures in Multilateral Environmental Agreements: Synthesis report of three case studies* (COM/ENV/TD(98)127/FINAL), Paris, February 1999, pp. 5.

64 The above-cited OECD study lists factors which contribute to and limit success of trade measures. Ibid. pp. 6-7. In general, the study recommends that trade measures should be carefully designed and targeted to the environmental objective. This should include:

- Prior assessment of potential environmental and economic ramifications of trade measures, particularly those that are highly restrictive such as bans;
- Potential difficulties, such as illegal trade and inadequate technical and institutional capacity in some countries, should be taken into account from the beginning;
- The current dynamism and continuous improvement present in MEAs should continue, with policy instruments, including trade measures, being adjusted and made more flexible as appropriate;
- Trade measures, which treat classes of countries in different ways, should be based on clear environment-related criteria;
- Trade and environment policy officials should work in close co-ordination in national capitals, and the WTO, UNEP and MEA secretariats should continue to develop their dialogue on these issues.

Ibid. p. 6.

65 For example, the FCCC commits developed country parties to report details on measures in the areas of finance and transfer of technology, to the CoPs. Article 12, paragraph 3, stipulates that each developed country Party shall incorporate (into their communication of information related to implementation) "details of measures taken in accordance with Article 4, paragraphs 3, 4, and 5."

66 In a recent UNCTAD Expert Meeting on Positive Measures to Promote Sustainable Development, Particularly in Meeting the Objectives of Multilateral Environmental Agreements, several experts noted that small and medium-sized enterprises may have difficulties in taking full advantage of positive measures. Among the difficulties cited are lack of finance, lack of technologies appropriate for SMEs and lack of information available to SMEs. Many experts recommended that ways and means be explored to enhance the fullest possible use of positive measures by SMEs, such as flexibility in the application of cost-effectiveness criteria, technical assistance and specific incentives (see TD/B/COM.1/9 TD/B/COM.1/EM.3/3).

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