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The world economy has changed profoundly over the last 50 years. The sheer size of economic activity has increased tremendously as a result of population and per capita income growth. World population has more than doubled from 2.5 billion in 1950 to 6 billion today, at the same time as average income has risen by a factor of two-and-a-half. The cumulative effect is a six-fold rise in global GDP over just half a century. During this period, the world economy has become more integrated as a result of three factors: advances in communication and information technologies, reduced trade barriers, and reduced barriers to foreign investment. These factors have reduced the transactions costs of international commerce substantially, in turn stimulating trade directly, by allowing countries to specialize in different sectors, and indirectly, by allowing production processes to be subdivided geographically among specialized production units around the world. The net result is a 14-fold increase in trade since 1950. At the same time, industries have become more mobile, as reflected by an even more rapid growth in foreign direct investment.

The growing world economy has been accompanied by environmental degradation, including deforestation, losses in bio-diversity, global warming, air pollution, depletion of the ozone layer, overfishing and so on. (See Box 1). Part of the explanation, of course, is the sheer number of us. Six billion people obviously put more pressure on natural resources and ecological systems than 2.5 billion, and this pressure will continue to rise as we grow towards 10 billion in the next century. What is more, there is no indication that consumption per capita is slowing. On the contrary, globalization has led to an acceleration of economic growth. At the current growth trend, per capita GDP will double by 2035 and quadruple by 2070. In light of the strain already put on the environment, it is not difficult to appreciate the concern that current trends are not sustainable unless tough measures are taken to temper resource consumption and polluting emissions.

Slow progress in introducing adequate environmental taxes and regulations has in part been blamed on the multilateral trading system. There are essentially two sides to the argument, one legal and the other involving political economy considerations. As far as the *legal* argument is concerned, it is claimed that WTO rules circumscribe environmental policy-making. It is also claimed that the WTO rules provide legal cover for foreign countries to challenge domestic environmental policies that interfere with their trading rights. The *political economy* argument is that competitive pressure from the world market sometimes makes it impossible to forge the necessary political support at home to upgrade environmental standards. The perceived costs of acting alone in terms of lost investments and jobs often take the steam out of regulatory initiatives. In the worst case scenario, environmental regulations may even be bid down in the relentless competition for market share, invese relentlesuibbs often 2202 Tc 0 Tw (.) Tj 14.6159ET BT 0.8667 1 Tcare essentially two sides t

ties and too few in pollution abatement. Undefined property rights over natural resources are another cause. If anyone, without restriction, can harvest the riches of the seas, extract the resources of forests, graze animals or collect firewood on common land, or tap water freely from municipal wells, the result is often overexploitation, a phenomenon known as the "tragedy of the commons".

In some cases, the people that depend on a given resource may be able to work out between themselves a conservation-cum-distribution scheme, which may include quotas and sanctions for overuse. However, age-old common property systems sometimes crumble under the pressure of rapid population growth, social changes, and increased mobility. Equally, polluters and victims of pollution may be able to reach a mutually satisfactory solution in cases where the source of pollution is indisputable and the cost of organizing collective action among victims is low25 Tc 0.70 m9 (-) Tj -23mvf pollution ise andiffe. nd

stances, removal of trade-distorting policy measures may mitigate the underlying distortions. For example, a reduction in trade-distorting fishing subsidies, currently amounting to some $54 billion annually, would reduce overcapitalization in the industry and lessen overfishing.[1]

In order to illustrate such indirect linkages between trade and environment, the study includes five case studies on chemical-intensive agriculture, deforestation, global warming, acid rain, and overfishing. For each case, we discuss the economic incentives that drive environmental degradation, the efficiency of various policy options, and the interaction between the underlying distortions and the trade policy regime. Each case study can be seen as a prototype for a broader range of environmental issues. For example, the agricultural study is representative of a wide range of environmental problems whose effects are mainly local. Likewise, the acid rain study applies also to other pollution problems that transcend national borders, but whose effects are limited to the immediate region. The deforestation study highlights the problem of missing markets, in this case the valuable but non-marketable service provided by forests in terms of absorbing carbon dioxide that otherwise would end up in the atmosphere. The global warming study illustrates the generic problem of fostering environmental cooperation in a world with national policy sovereignty. Finally, the overfishing study illustrates difficulties in managing common natural resources.

Trade barriers are poor environmental polices

One conclusion that arises from these case studies is that environmental problems are best addressed at the source, whether they involve polluting production processes or undefined property rights over natural resources. What is more, tackling the problems by targeting some indirect linkage, such as imports or exports, may divert attention from the underlying problems. In some cases, putative trade remedies may even aggravate the problems. This may be the case, for example, with tropical deforestation, where trade barriers on forest products may increase deforestation pressure by forcing people to convert land into alternative sources for employment, such as agriculture and ranching. As a general rule, whenever we sidestep the first-best principles of environmental policy-i.e., policies directed at the source of the problem-the benefits do not only become difficult to predict, but we also impose unnecessary costs on the society. This would not just be poor economics, but potentially bad for the environment as well, by making the costs of environmental polices look higher than they actually are were we to use the most efficient instruments available.

It must be recognized, however, that while trade measures are rarely, if ever, the first-best policy for addressing environmental problems, governments have found trade measures a useful mechanism for encouraging participation in and enforcement of multilateral environmental agreements in some instances, and for attempting to modify the behaviour of foreign governments in others. The use of trade measures in this way is fraught with risks for the multilateral trading system, unless trade policy is used in this manner on the basis of prior commitments and agreements among governments as to their obligations in the field of environmental policy.

Another conclusion is that environmental standards should not necessarily be harmonized across locations,

Which countries will attract the polluting end of production?

To some extent, the answer depends on which countries will attract the polluting industry when trade is liberalized. In the public debate it is often assumed that polluting industries are likely to migrate from developed to developing countries to take advantage of lax regulations, thereby shifting the pollution problems from richer to poorer countries, and also increasing overall emissions in the world. However, this assertion does not seem to be supported by standard trade theory, nor by empirical evidence.

Polluting industries tend to be capital intensive, including such industries as chemical industries, ferrous and non-ferrous metals, pulp and paper, and oil refining. According to classical trade theory based on differences in factor endowments, these industries are more likely to conglomerate in capital-abundant developed countries, and to a lesser extent, in economies in transition and newly industrialized countries. What complicates the analysis is that the pattern of trade is determined not just by "natural" comparative advantage, but also by government policies, including environmental regulations. However, pollution abatement costs in developed countries are no more than 1 per cent of production costs for the average industry, rising to perhaps 5 per cent for the worst polluters. It is questionable, although ultimately an empirical issue, if a regulatory cost-disadvantage of a few percentage points can turn comparative advantage around. If not, trade liberalization would tend to shift capital-intensive polluting industries towards developed countries in spite of tougher environmental regulations, and not the other way round.

Indeed, data seem to reject the assertion that polluting industries are migrating from developed to developing countries, although there are of course exceptions. Developed countries' share of polluting industries has remained more or less constant (at around 75-80 per cent) in recent decades, and has even increased marginally in the 1990s.

However, even if a larger share of polluting industries is located in developed countries with tougher environmental regulations, global emissions will not necessarily decline. While countries are often willing to control emissions that primarily harm themselves (and close neighbours), such as sulphur dioxide (SO_2) and nitrogen oxide (NO_x) emissions, they are not always equally ready to accept the costs of reducing carbon dioxide (CO_2) and other emissions with a global reach. In other words, we should not have any illusions that global environmental problems can be contained with less than a concerted effort to cut emissions, regardless of the location of polluting industries.

The gains from trade are sufficient to pay for additional abatement costs

What is more interesting, perhaps, is that the income gain associated with trade could *in principle* pay for the necessary abatement costs and still leave an economic surplus. This has been shown in various economic simulations. In other words, by combining trade and environmental reforms one can find ways to raise consumption without compromising the natural environment. At least in this sense, there is no inherent conflict between trade and environment. Rather, the conflict arises as a result of the failure of political institutions to address environmental problems, especially those of a global nature which require a concerted effort to solve.

Does economic integration undermine environmental policies?

Some have argued that regulatory shortcomings are related to the globalization of the world economy, which has made industries more foot-loose and therefore more difficult to regulate. This is an argument that we shall turn to now.

Let us start by noting the inherent problem of regulating and taxing mobile resources that can "vote with their feet." One the one hand, strict regulations may drive away industries, thereby reducing jobs and income. But lax regulations carry a price in terms of a polluted environment. One solution to this dilemma, which has been pursued with some success by federal states since the early 1970s, is to move regulatory power from the local level to the central level. In theory, this solves three problems but creates a new one. It prevents destructive competition for investments and jobs among local jurisdictions, which may result in excessively low standards across-the-board. It also solves the problem with pollution that spills across jurisdictional borders, and which local communities may fail to internalize in order to keep production costs com-

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tion of the world economy been followed by increased

Is economic growth part of the problem or part of the solution?

Turning now to the issue of economic growth, numerous reports in the last decades have questioned the sustainability of economic growth. The most influential report was perhaps the *Limits to Growth*, authored by the Club of Rome, forecasting that key natural resources-in particular non-renewable resources such as fossil fuels-would become increasingly scarce over time and eventually exhausted if economic growth, as we know it, were to continue. The same report also warned that the earth's environmental carrying capacities would become overburdened by different pollutants, and possibly collapse, unless human activities were held at bay. In short, economic growth and environmental quality were viewed as being on a collision course where one would eventually have to surrender.

Three decades later, some of the earlier warnings-in particular those related to fossil fuel exhaustion-have been found to be somewhat premature. The discovery of new deposits of fossil fuel in combination with less energy demanding technologies have kept pace with demand, and the current issue is rather whether we can afford to burn these plentiful reserves because of the potential consequences on the global climate. On the positive side, relatively simple abatement technologies, such as catalytic converters on cars and scrubbers on smokestacks, have proven effective in bringing down air pollution in countries were such equipment has become mandatoryl i n c o m b i n a t i o n w i t h l e s s e n e

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economic activity. In other words, income growth, while perhaps a necessary condition for allowing countries to shift gear from more immediate economic and social con

When the international trading system was reconstructed after the Second World War, the environmental consequences of economic integration was not a primary concern. Only indirect references to the environment were included in the exception clause of GATT 1947, Article XX, which allows countries to sidestep the normal trading rules if necessary to protect human, animal or plant life or health, or to conserve exhaustible natural resources, provided that such measures do not discriminate between sources of imports or constitute a disguised restriction on international trade. In the first decades of the GATT, no references was made to the environment, neither in the general proceedings of the contracting parties, nor in any trade disputes. The issue was put on the agenda first in the early 1970s in the preparation for the UN Conference on the Human Environment, held in Stockholm in 1972. Besides mandating the GATT Secretariat to prepare, under its own responsibility, an analytical contribution to the conference,[6] the GATT Council established a Group on Environmental Measures and International Trade with a mandate "to examine *upon request* [italics added] any specific matters relevant to the trade policy aspects of measures to control pollution and protect the human environment, especially with regard to the application of the provisions of the General Agreement, taking into account the particular problems of developing countries." However, no request was made to convene this group until the beginning of the 1990s.[7]

One reason for the low environmental profile of the GATT in the formative decades was that trade was not perceived to be an environmental issue *as such*, neither O p u G A c i v e c c o g i n t N T d i d e

ermen, rather than some absolute standards that were known in advance.

While this ruling was never adopted by the GAT

tems do not begin and end at the border, nor does pollution travelling with wind and water. The point is, rather, that the commercial linkages reinforce the need to cooperate on environmental matters, especially on transboundary and global pollution problems that are beyond the control of any individual nation. This is a key message of the report.

The study is organized as follows. Section II starts out with a discussion of the underlying sources of environmental degradation which are often linked to various market and policy failures, and which in turn may be exacerbated or mitigated by international trade. This argument is elaborated in five case studies on (A) chemical-intensive agriculture, (B) deforestation, (C) global warming, (D) acid rain, and (E) overfishing. For each case, we shall set out the economic incentives that drive environmental degradation, discuss the efficiency of various policy options, and analyze the interaction between the underlying distortions and the trade policy regime. Each case study can be seen as a prototype for a broader range of environmental problems of a similar nature. For example, the agricultural study is representative of a wide range of environmental problems whose effects are mainly local. Likewise, the acid rain study would apply also to other pollution problems that transcend national borders, but whose effects are limited to the immediate region. The deforestation study highlights the problem of missing markets and linkages to other environmental problems, such as global warming. In turn, the global warming study illustrates the generic problem of fostering environmental cooperation in a world with national policy sovereignty. Finally, the overfishing case study provides an illustration of the "tragedy of the commons". Taken together, we hope that these case studies will provide a representative introduction to economic analyzes of environmental degradation, and the linkages to international trade.

Section III surveys recent general equilibrium models of trade and environment which explicitly links sectors and countries together in a comprehensive model. It is shown that trade liberalization is likely to have a different environmental impact across countries depending on the pol-

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Environmental degradation, whether air pollution, deforestation, overfishing, global warming, or depletion of the ozone layer, is often the result of many small actions that are individually innocuous but harmful in aggregate. Ecological systems can normally withstand a degree of exploitation and pollution. For example, forests and land can withstand a degree of acid rainfall before the chemical and biological balance of the soil becomes impaired. Likewise, it is only when the emissions of carbon dioxide (CO_2) outstrip the capacity of the earth's biomass to absorb them that greenhouses gases start to build up in the atmosphere, a point that has long since passed.[12] Likewise, fish stocks can sustain some taxing of their natural growth before they decline or, if severely over-taxed, collapse. These ecological limits are not always known with certainty, nor are the effects of exceeding them. Caution is therefore called for to ensure some safety margins against possibly irreversible damage—the "precautionary principle".

At the same time, as the world's population grows in number and demands, it may become harder to respect the biological limits, let alone leave any safety margins. At the beginning of this century, the population stood at 1.6 billion. Today it is roughly 6 billion and projected to grow towards 10 billion before it peaks. Some 95 per cent of net births will be in developing countries, which have the least resources to pay for new and cleaner production technologies and pollution abatement equipment. In addition, average per capita consumption is increasing by roughly 2 per cent a year. At the current growth trend, per capita GDP will double by 2035 and quadruple by 2070. Given these considerations, it is not difficult to appreciate the concerns of the environmental community that the current trend is not sustainable.

Other observers put their faith in technological developments that would allow for continued economic growth at the same time as reducing pollution and the input of virgin resources through the use of more efficient pollution-abatement equipment, less resource-demanding production, and recycling rather than disposal. However, this more optimistic outlook will not be realized unless incentives are set accordingly. Economic incentives that influence the behaviour of producers and consumers must be aligned with the objectives of sustainable development, defined by the World Commission on Environment and Development (1987), also known as the Brundtland Commission, as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This principle enjoys widespread international recognition, and is explicitly embraced by the Marrakesh Agreement Establishing the World Trade Organization.[13]

enforce an appropriate balance between environmen

lution problems that are arguably best addressed by standards that are targeted to the specificities of the local conditions. The case is different for transboundary and global pollution problems where explicit policy coordination is perhaps the only feasible policy option.[22]

B. Deforestation

Deforestation is another issue that surfaces high on the environmental agenda. The current concern is mainly deforestation of tropical forests in developing countries, as the temperate forest cover in developed countries is constant or even slightly increasing, albeit from a very low level owing to the deforestation of the past.[23] Tropical forests make up just over half of the world's forest cover (about 1.8 billion hectares in 1990), and the share is on the decline. According to the Food and Agricultural Organization (FAO), the world lost 450 million hectares of tropical forest to logging, agricultural development and human settlements between 1960 and 1990. Asia lost almost one third, while Africa and Latin America each lost about 18 per cent.[24]

The environmental problems associated with deforestation are partly local and partly global in nature. At the local level, deforestation of hillsides and high land reduces the ground's water-retention capacity, making the lower land more prone to flooding and landslides. The landslides in Central America that occurred in conjunction with the tropical storm "Mitch" are a recent tragic example. Deforestation on a smaller scale, such as removing trees between fields, increases the rate of soil erosion by taking away natural wind-breaks. At the global level, forests bind huge volumes of CO_2. Deforestation therefore contributes indirectly to global warming by reducing the earth's "carbon sinks".[25] Another global concern is the loss of biodiversity. Deforestation of tropical forests is particularly serious in this regard, since this is where most of the earth's animal and plant species find their natural habitats.

22 Recall also that the Rio Earth Summit recognised the legitimacy of differentiated environmental standards at different levels of economic development—the principle of common but differentiated responsibilities. Principle 7 of the Rio Declaration on Environment and Development (June 1992) states the following: "States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Etp -8.ity es and high 7 0 TD 6.670em. l202 3.5 r.s 6.670

The economic forces behind deforestation can be illustrated in a simple figure based on the economic concept of opportunity cost or forgone return (see Fi

world was set equal to the amount the earth's biomass can absorb, and that emissions rights were allocated in proportion to each country's share of the earth's biomass, or rather growth in biomass. Assume further that emissions rights were tradable internationally in order to avoid relocation of factories and people from countries with a deficit in forests to countries with a surplus. Obviously, this scheme would provide owners of forests, including public forests, with a strong commercial interest in retaining the forest cover. The result would not only be a halt to deforestation (and global warming by design), but also a process of reforestation that would eventually take us to the socially optimal division of land between different categories of usage.[35]

Needless to say, this hypothetical scheme is unlikely to be put into practice because of the likely opposition from countries with a deficit in forests in relation to their CO_2 emissions. Economic inferior measures may instead carry the day, including putative trade barriers against countries engaging in deforestation.

If industrialized countries (with the deforestation period behind them) raised their trade barriers against the forest products of developing countries, would it halt deforestation? Not necessarily. Rather, any policy that depresses the return on forestry could increase the incentives to convert forests into other categories of land, and thereby speed up the rate of deforestation in developing countries.[36]

In summary, it appears that the root causes of deforestation lie partly in the pressure to convert forests into farmland to feed a growing population, and partly in the absence of markets for various services provided by forests, such as carbon-binding and biodiversity. Of course, policies encouraging forest clearing, including subsidies and tax breaks, aggravate the problem. However, few governments would presumably pursue such policies if the full value of forests could be commercialized. Furthermore, trade barriers that depress the value of forests in relation to the alternative land usage—ranching, farming, plantations—could be directly counterproductive.

C. Global warming

Global warming is caused by the increasing emissions of carbon dioxide from sources that burn fossil fuel, including energy-intensive processing industries, fossil-fuelled power plants, automobiles, and so on. Since the early 1800s, when people began burning large amounts of coal and oil, the amount of carbon dioxide in the earth's atmosphere has increased by nearly 30 per cent, and average global temperature appears to have risen between 0.3° and 0.6° on the Celsius scale. Carbon dioxide gas traps solar heat in the atmosphere in the same way as glass traps solar heat in a greenhouse. For this reason, carbon dioxide is sometimes called a "greenhouse gas." Besides carbon dioxide, human emissions of methane and nitrous oxide contribute to the process of global warming.

The terminology "global warming" is somewhat of a misnomer. It does not mean that every day or every place will be warmer. It is the *average* temperature that will go up. This will cause changes in the amount and pattern of rain and snow, in the length of growing seasons, in the frequency and severity of storms, and in sea level that will rise as the polar icecaps start to melt. In turn, this will have repercussions on farms, forests, plants and animals, as well as on the well-being of humans, including the geographical reach of "tropical" diseases such as malaria that will migrate into temperate zones. For some countries, global warming may be little more than a nuisance, while for others it is a matter of long-run survival. Do05 Tw (The oil, tc

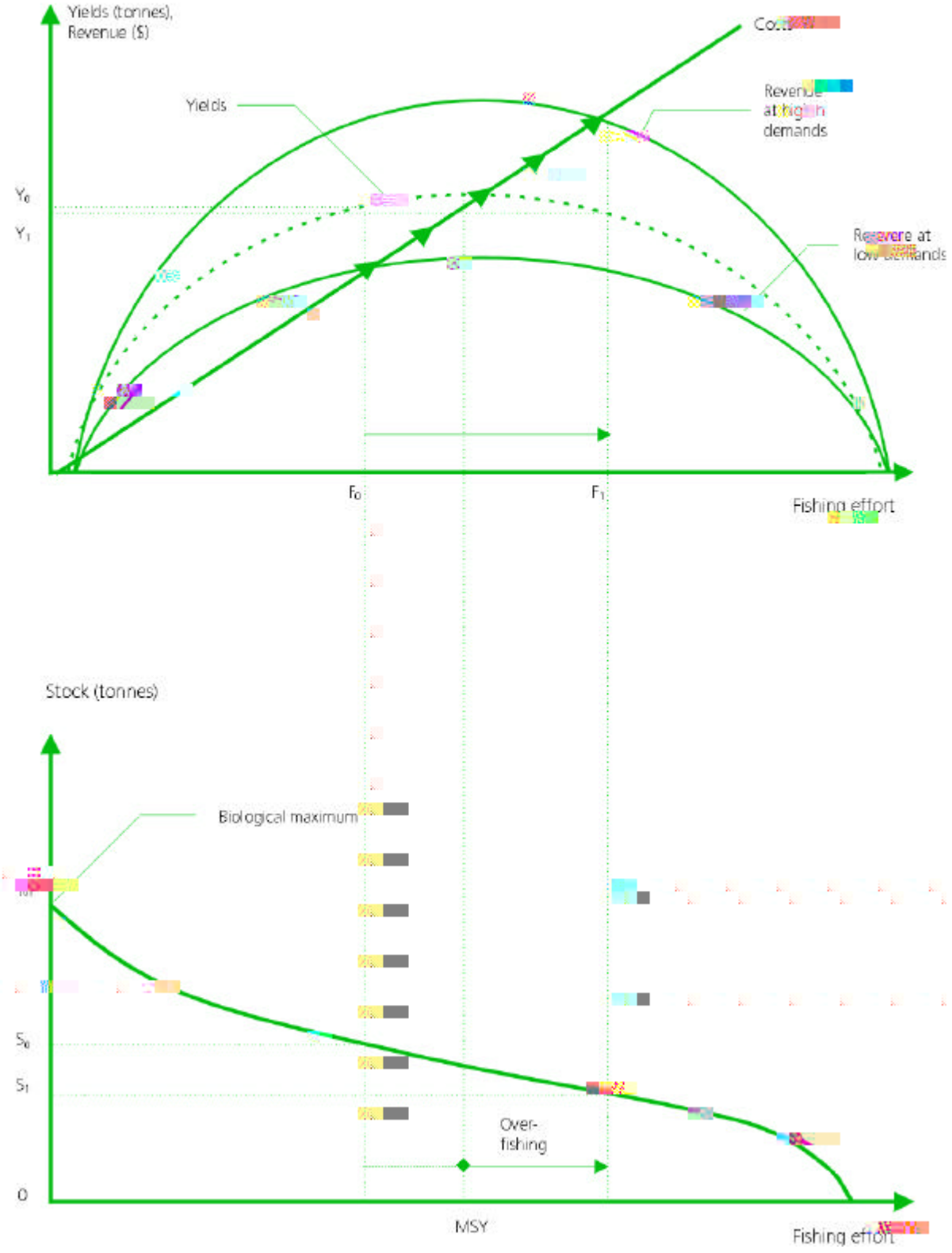
CO_2 emissions is exactly counterbalanced by the marginal costs of doing so. This initial equilibrium is depicted in the upper left corner of the policy matrix (Table 1), where

terests can be overcome between good neighbours. Another example of a successful agreement is the Air Quality Agreement of 1991 between Canada and the United States, which mandates both parties to undertake coordinated reductions in emissions of SO_2 and nitrous oxides (NO_X). Moreover, each country is required to account for the transboundary environmental effects of new production activities before granting a go-ahead.[42]

But *what* if the cooperative route is closed because of free-riding or asymmetric interests—what options remains to victim countries? One conceivable option for downwind countries would be to pay for the abatement costs of upwind countries. This happens from time to time, and may be a rational solution. For example, if it costs $10 million to reduce pollution by tightening already strict emissions standards at home (marginal abatement costs tend to rise sharply as the technical limit is approached), or $5 million to get the same effect by paying for the abatement equipment of a foreign producer upwind, why not spend the money where the pay-off is the highest? For instance, the Scandinavian countries provide both funds and technical assistance to enable poorer countries around the Baltic Sea to reduce pollution, including upgrading the safety of nuclear power plants to reduce the risk of another accident like at Chernobyl. At the same time, these policies go against the principle that the polluters, not the victims, should be responsible for cleaning up (the Polluter Pays Principle), and may fall foul of domestic public opinion. Public pressure may then mount to use the stick instead, including targeted trade barriers against countries that are deemed to have insufficient domestic environmental standards.

How effective are trade barriers in combating transboundary pollution? From a theoretical point of view, it depends on the share of output that the domestic economy buys from a foreign smokestack industry. If the domestic economy absorbs just a fraction of the output, or none at all, one should not expect to make much of an impression. However, if the domestic economy is a large enough buyer, trade barriers against upwind producers may force the targeted firms to scale back export production and with it transboundary emissions, or, if that optio0 Tw (p) Tj 235.3937 0 TD 6.6701 Tc (-iuayssd witc 1.3532onomvail to , firr

Figure 3 Growing demand and overfishing



vidual or collective fishing quotas. The fourth and final element of the model is the assumption of perfect competition. That is, the industry consists of many small businesses without any individual market power, nor any individual incentives to conserve the resource base. Given these parameters, the industry will expand until the revenue just covers the costs.

In the first application of this model, we shall illustrate the link between overfishing and increasing demand, for example, due to population growth. The case is illustrated in Figure 3. At the outset, the industry is operating at the point where the industry cost function intersects the revenue function denoted "Revenue at low demand." At this point, revenue just equals costs and there is no tendency of either entry or exit from the industry. The fishing effort at this point is denoted

It should be stressed, however, that in both cases, the analysis only applies to the situation when the resources of the seas are not properly managed (open access). If resources *were* properly managed to restrain harvest at the point of maximum sustainable yields (with some precautionary margins if there are scientific uncertainties of how much taxation the stocks can sustain), increased demand would translate into higher prices for fishery products rather than overfishing. At the same time, the temptation for individual fishermen to cheat on the quotas by underreporting harvests increases when prices go up. Moreover, while an individual nation may be able to control cheating

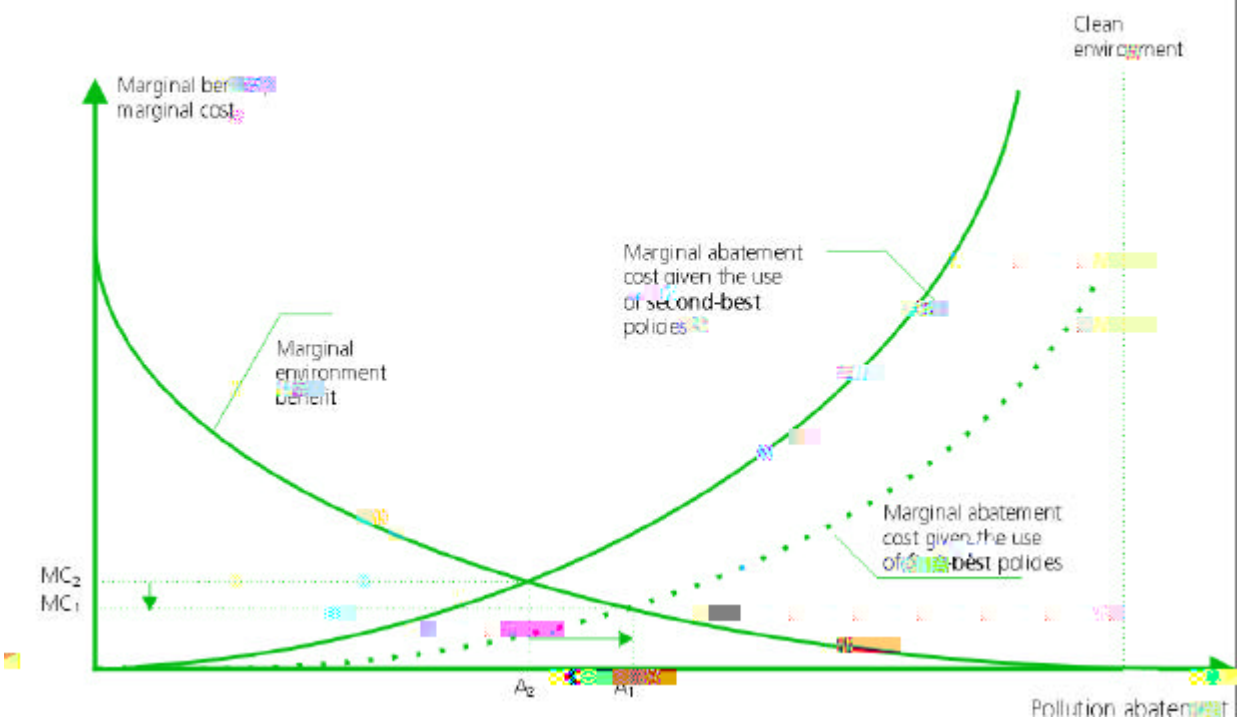
talization of the industry. According to some estimates, the gross tonnage that is trawling the seas is more than twice than what would actually be needed.[50] That is, there is an enormous overcapacity maintained by government subsidies. Thus, the removal of these subsidies would not just be to the benefit of the environment, but also to tax payers who foot the bill twice by higher taxes and less fish on their tables.[51]

Whatever the "true" subsidies may be, they are arguably part of the problem. It should be stressed, however, that it depends also on the kind of subsidies granted. Obviously, if subsidies are paid to retiring capacity rather than to expand it, subsidies may even ease the problem given the current overcapitalization of the industry. However, only a careful analysis of each subsidy program can reveal whether the effect is to expand or contract fishing capacity. A case in point is "buy-back" arrangements of worn-out fishing boats and gear that on the surface may look like a retirement scheme. However, it will only u sk-cT tonnag 2 0

ment. If no such restrictions are imposed, the end result would only be to encourage further capacity investments by reducing the investment costs of the industry.

To conclude this case study, overfishing is related to difficulties associated with the management of a common resource. When everyone is free to tap a resource without restraint, resource degradation is almost inevitable. Individual efforts to conserve the resource base is deemed to fail in a regime with open access—the "tragedy of the commons." Whilst this problem may not be serious as long as demand is low relative to the resource base, increasing demand will eventually make it imperative to introduce proper management schemes. A failure to take political action to introduce and enforce such schemes would count as a policy failure.

Figure 5: The double-dividend [illegible] efficient enviro[illegible]nmental po[illegible]s



associated with a "double-dividend," one for the economy and one for the environment.

The case is illustrated in Figure 5. If an environmental protection agency only had access to some inefficient second-best instrument, it would presumably act rationally within the given parameters and choose an abatement level equal to the point where the marginal environmental benefit equals the marginal abatement cost for that particular instrument, i.e., at point A2 in the figure. If the agency had access to a more efficient first-best instrument, it would be rational to choose a more ambitious abatement level, marked A1 in the figure. Thus, by replacing inefficient environmental policy instruments with efficient ones, the costs of pollution abatement will not just go down, but it is rational to extend abatement one step further. This simple, but fundamental principle, suggests that the search for efficient policy instruments to address environmental problems ought to be a priority for industry, for regulatory authorities, and for environmentalists alike.[52]

Of course, in order to identify the most efficient policy instrument, we must first identify what the source of the problem is. For example, in the deforestation analysis we pointed to the problems of missing market for carbon dioxide sinks provided by forests, which artificially depress the return of forests relative to, say, agriculture and ranching. The first-best solution follows, although we realize the political difficulties of setting up such markets. In any event, whenever we sidestep the first-best principles we impose unnecessary costs on society. This would not only be bad for the global economy, but potentially also for the global environment by making the costs of pollution abatement look higher than what they actually are if we would consistently use the most efficient instruments available.

It must be recognized, however, that while trade measures are rarely, if ever, the first-best policy for addressing environmental problems, governments have found trade measures a useful mechanism for enforcing multilateral environmental agreements in some instances, and for attempting to modify the behaviour of foreign governments in others. It must be stressed that the use of trade measures in this way is fraught with risks for the multilateral trading system, unless trade policy is used in this manner on the basis of prior commitments and agreements among governments as to their obligations in the field of environmental policy.

52 See Fullerton, Hong and Metcalf (1999) for a greater elaboration of this point, and supporting empirical evidence.

While a great deal can be learned about the roots of environmental degradation from a sector-by-sector analysis, this approach could overlook important interactions between the different sectors and countries, so-called general equilibrium effects. It is worth taking a closer look, therefore, at general equilibrium models of international trade in order to examine the broader effects of

ing countries, the former have a comparative advantage in capital-intensive production and the latter in labour-intensive production. If we review the data on the sectors that face the highest abatement costs in the United States, which presumably are also the inherently most polluting industries, they include industrial sectors such as pulp and paper, non-ferrous metals, industrial and agricultural chemicals, iron and steel, and petroleum refining. These sectors are among the most capital-intensive sectors of all[60] and will hence have a natural tendency to conglomerate in capital-abundant countries according to standard trade theory. It is questionable, indeed, if a cost disadvantage of 1 or 2 per cent because of higher pollution-abatement costs in developed countries will turn comparative advantages 180 degrees around.

If the classical pattern of comparative advantage prevails, that is, is not reversed because of 1 or 2 per cent higher pollution-abatement costs, the previous results are turned on their head. As shown by Antweiler, Copeland, and Taylor (1998), trade between developed and developing countries will l h p- arhtter creaausr pollutits in d because or creaauandpectriizalutitsurn

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spite of the composition effect, some air pollutants are projected to go down.[63] The reason for this is that the income-induced technique effect dominates both the scale and composition effects. The reverse is true for Asian developing countries, in which air pollution is projected to increase. This is because of the rapid expansion of economic activity, which is not moderated to the same extent as in developed countries by a positive technique effect (driven by stricter emissions regulations). In turn, this is a result of the non-linear relationship between income and pollution (see Section V for details). As far as developing countries in Africa, Latin America and Eastern Europe are concerned, air pollution is projected to go up, because of both a generally negative composition effect and a scale effect that is not completely counterbalanced by the technique effect. Finally, note that NO_2 emissions are projected to increase in all countries. The reason for this is that the turning point of the EKC (the per capita income level at which pollution starts to decrease) is much higher for NO_2 than for SO_2, SPM, and CO, respectively. Likewise, CO_2 emissions are projected to increase everywhere for the same reason (an even higher turning point).[64]

The projected increase in air pollution attributed to the Uruguay Round is estimated at between 0.1 and 0.5 per cent of base emissions. These increases should be weighted against the estimated income gain of between $200 to $500 billion. If the political will existed, a small fraction of this gain (a few percentage points according to the study) would suffice to pay for the additional abatement costs to redress the environmental impact.

Lee and Roland-Holst (1997) further demonstrate the

As observed by Levinson (1996a), "[F]or nearly a quarter century, since industrialized nations began legislating and enforcing environmental laws with substantial compliance costs, critics of those regulations have protested that stringent environmental regulations force manufacturers of pollution-intensive products overseas. Jargon such as 'eco-dumping', 'race to the bottom', and 'competition in laxity' has been used to describe a feared consequence of this phenomenon, that different jurisdictions competing to attract international businesses would create pollution havens by lowering their environmental standards below socially efficient levels." (p. 429)

The race-to-the-bottom hypothesis was initially developed in the context of local competition for investments and jobs within federal states with decentralized responsibilities for the environment. A case in point is the United States.[67] Before 1970, individual states were free to define their own standards as they saw fit. In principle, this should produce a desirable diversity of standards tailored to local conditions and willingness to pay for environmental amenities. What was right for California was not necessarily right for North Dakota, and so on, because of the huge differences in climate, ecological conditions, population density, and per capita incomes. There were essentially two reasons why the decentralized regime came under pressure. The first was the failure of the system to account for interjurisdictional pollution problems, i.e., pollution spilling over from one state to another. The second was the inability of governments to regulate mobile industries that could defeat the measures by relocating elsewhere in the country.[68] In fact, very little progress was made, and under growing pressure from the awakening environmental opinion, the US Congress concluded that a federal initiative was necessary to break the foot-dragging at the state and local levels. Starting in 1969, a series of laws was passed—among them the National Environmental Protection Act (1969), the Clean Air Act (1970), the Clean Water Act (1972) and the Endangered Species Act (1973)—which gradually shifted the initiative and regulatory authority from the local level to the federal level.

The very same arguments can and have been made with increasing frequency at the supranational level. Indeed, many pollution problems transcend national borders and some are truly global in scope, such as depletion of the ozone layer and global warming. Moreover, while capital was more mobile within countries in the past, and hence more susceptible to domestic variations in environmental standards, international mobility is gradually increasing. The average growth rate of foreign direct investment (FDI) in recent decades has been 12.5 per cent a year, roughly twice as fast as growth in world merchandise trade and five times faster than growth in world GDP.[69] The tremendous growth in FDI has been underpinned by the removal of investment barriers, especially since the mid-1980s. Virtually all developing countries today are open to FDI, and increasingly also the least-developed countries. The investment regimes of OECD countries were largely liberalized already in the 1950s and 1960s. The roll-back of investment barriers, in combination with reduced trade barriers, has increased the location options for multinational firms, which in turn has reduced, or at least, is *perceived* to have reduced the environmental policy autonomy of individual nations.

While international competition for investments and jobs can play out in many ways,[70] the particular concern of environmentalists is that governments will sell out their environment rather than offering, say, a tax break. Indeed, some evidence suggests that new regulations are occasionally defeated in the political arena on the grounds that they would harm national competitiveness.[71] Such defeats are fomented by the perception in industrialized countries that environmental regulations are

much leverage over host governments, a leverage that could potentially be used to challenge new environmental taxes and regulations.

Given the importance of these arguments both from a trade and an environmental perspective, it is worth reviewing carefully the evidence relating to this matter. Is it true, as many seem to believe, that stringent environmental regulations undermine the competitiveness of domestic industries? Do polluting industries relocate from developed to developing countries in order to take advantage of lax regulations? Are environmental standards bid down in accordance with the race-to-the-bottom hypothesis? Or, if not, has the globalization of the world economy been followed by increased political reluctance to address environmental problems as suggested by the regulatory chill hypothesis?

A. The competitive consequences of environmental regulations

Comparison of compliance costs with different national environmental regulations is seriously hampered by lack of data. Only the United States has regularly published data on compliance costs based on an annual survey of US industry. This survey was discontinued for budgetary reasons in the mid-1990s, however. Nor are we aware of any indexes that allow comparisons of the strint retae0 0 1.022s33 Tc -D -0.1607 Tc -0.0?.6132 Tvf US isAetaeis survey
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They do cost, but they also bring significant benefits to society and to the quality of life.

In summary, competitiveness concerns seem to have been somewhat overstated in the public debate.[77] Abatement costs in the United States, while perhaps higher than in most other countries, still only account for a few percentage points of the production costs. That is, the overwhelming share of production costs, and hence any competitiveness problem, is determined by other factors, such as wages, payroll taxes, capital costs, import tariffs on intermediate inputs, corporate taxes, and so on.[78] Of course, this is not an argument for ignoring concerns about pollution-abatement costs. On the contrary, if the costs can be reduced without compromising the environmental objective by employing modern market-based instruments instead of traditional command-and-control regulations, so much the better.[79] A natural objective for regulators, one would imagine, is to minimize the costs of achieving the environmental targets defined by society. The reason why the Porter hypothesis may hold for some industries but not for others could simply be that some industries are regulated in a more efficient manner than others.[80] Finally, and perhaps most importantly, while the debate is on costs, studies that focus on the profitability of firms have not been able to detect that superior environmental performance comes at the expense of reduced profitability. One reason, which we shall return to later, is that a good environmental profile can be a valuable market asset that allows firms to recoup pollution-abatement expenditures in the market place.

B.

petitiveness, a study by Gray (1997) cautions us that ot

outward investment from the United States in 1992, Repetto (1995) noted that although developing and transitional economies received 45 per cent of outward FDI

the process of environmental degradation. The ability of investors to locate their capital freely wherever the returns are the highest is said to produce a "race-to-the-bottom", by which is meant a vicious circle of gradually slipping environmental regulations driven by the competition between countries for international mobile investments.

We shall now take a closer look at the theoretical foundations of the race-to-the-bottom hypothesis. We shall also discuss the counter-hypothesis of a "race-to-the-top", which holds that governments, if anything, are more likely to bid up standards in a race to *prevent* the worst polluters from locating in their territory - the "not-in-my-backyard" (NIMBY) phenomenon. We shall then review the empirical evidence to determine whether if any of these theories are supported by data, or if they are just fictions that haunt the public debate with increasing frequency.

The intellectual origin of the race-to-the-bottom theory can be found in the literature on local public finance. The early concerns of this literature were not so much with the consequences for public policies of capital mobility but of household mobility. The key result is due to Tiebout (1956), who showed that the ability of people to "vote with their feet" leads to an efficient provision of public goods, that is, a level of public services that equals what people are ready to pay for. The intuition is straightforward. If local policies fall short of residents' expecta-

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Having said that, when pollution problems are of a local nature, governments may rather be inclined to deter the location of polluting plants in their own backyards, leading to a race-to-the-top in environmental standards. In other words, countries that are able to pick and choose

as the evidence of a race-to-the-bottom is concerned, Esty and Geradin (1998) cite a 1997 study by the Canadian Institute for Environmental Law and Policy, which reports that the government of Ontario has relaxed some environmental statutes in recent years so as to accommodate the commercial interests of forestry, mining, homebuilding, and agribusiness. They also point to recent amendments of German conservation laws, which are said to "give the economy a clear priority over the environment". They further cite evidence of a potential race-to-the-bottom between the United States and the European Union. In a speech given in July 1995, EU Environment Commissioner Ritt Bjeregaard criticized what she perceived as Republican-led efforts in the US Congress to relax environmental standards, which would send a "dangerous signal" to the rest of the world (implying that the European Union may have to follow suit to level the playing field). They also point to the strong lobby that is pressuring the European Union to revise its legislative framework in the areas of waste and biotechnology so as to move from Eurch are said t

G. Concluding remarks

While competitiveness concerns seem to have been somewhat overstated in the debate, and while data do not seem to support the hypothesis that investments are fleeing developed countries for developing countries with more lax standards, environmental initiatives are nevertheless defeated from time to time because of competitiveness concerns. This finding suggests that at least *perceived* regulatory autonomy has diminished alongside the removal of trade and investment barriers, which in turn underscores the need to seek cooperative solutions to common environmental problems in the world.

logical development. Other things being equal, open economies tend to grow significantly faster than closed economies.[99]

Another reason why international trade figures prominently in this debate is that policy failures in the environmental arena are claimed to be caused or exacerbated by the pressure of international competition. Specifically, the ease with which firms can move nowadays when trade and investment barriers are at an all-time low is viewed as one important reason why governments may have become more reluctant to upgrade environmental standards. Growth driven by liberalization of the world economy may then defeat the EKC in that competitive pressure may prevent environmental standards from being upgraded to the extent necessary to turn the pollution path around. Indeed, growth *per se* does not reduce pollution;

convergence of environmental standards, with a special emphasis on technology that preserves natural resources and reduces the pollution per unit of output.

A. Theoretical overview

A brief overview of the theory that underlies the EKC will help identify why it can assume the multiplicity of shapes that we observe in reality.

As mentioned before, the EKC draws its inspiration from the work of Simon Kuznets who observed that income inequality tend to become worse as a country grows out of poverty, stabilize at some middle income levels, and then gradually improve. The observation that environmental degradation may follow a similar income-dependent path was made by several economists at the beginning of the 1990s. Among them were Grossman and Krueger (1991), in a paper on the environmental consequences of NAFTA, Shafik and Bandyopadhyay (1992), in a background paper for the 1992 *World Development Report d*

may fall once a certain income level has been passed. The reason is that economic growth allows for more and more industries to reach the critical size at which the installation costs of abatement equipment can be borne with minimum impact on production costs and profits. After all, larger volumes allow fixed costs to be spread out more thinly.

Taking this reasoning a step further, we can establish a positive link between trade and pollution abatement. Since trade leads to increased specialization in the world, the size of the average production unit can be expected to increase, which in turn allows for economies of scale not just in production itself but also in pollution abatement. Put differently, without trade a country may never achieve the necessary scale economies in any production activity for it to be able to afford abatement equipment with high installation costs. Specialization and trade may therefore be part of a recipe to combat pollution.

Of course, each generation of abatement technologies has its own limitations. In other words, even if a given abatement technology exhibits increasing returns to scale, it may be necessary to install more sophisticated and presumably more costly equipment to reach an abatement target that goes beyond the limitations of the current technology. This opens up some interesting dynamic possibilities. As an economy grows out of poverty, pollution may first rise until it becomes profitable to install the most elementary and inexpensive types of abatement equipment, then fall as a result of these installations, then rise again as the scale of economic activity increases with growth until the next generation of abatement technologies becomes affordable, then fall again, and so on. Pollution may then follow a wave-like pattern in the race between increasing scales of economic activities and more advanced abatement technologies that become attainable with increasing scales. Indeed, the empirical review below will show, at least for some environmental indicators, that the EKC seems to follow an N-shaped pattern rather than the inverted U-shape. However, this may not be the end of the story. The next turn may be downward again, turning the N into an M, as the next generation of abatement equipment becomes attainable with higher production volumes and income.

Yet another factor that may explain the EKC is structural changes inherent in the development process.[105] Economic growth is a process of continuous transformation whereby certain sectors contract in relative terms (as a percentage of GDP), and possibly also in absolute terms, while others expand. A "stylized" development process may take place as follows.[106] Initially, the economy may be mainly agrarian. If the country is endowed with valuable natural resources, the next step may involve extraction of these resources combined with some basic processing. This first transitional stage is likely to be driven by demand from the world market and possibly facilitated by foreign investments (or, as in the past, colonization). The economy may then gradually move into basic manufacturing, such as textiles and clothing production on a more industrial scale, followed by more advanced manufacturing as experience and educational achievements increase. The "final" stage is presumably the post-industrialized society, with emphasis on high-technology production and services. Such a development process would gradually alter the pollution intensity and the composition of national output, so that some, but not all, environmental indicators would eventually improve.

The point is that what may appear as a relationship between income and pollution may have little to do with income *per se*, but may rather reflect underlying structural changes in the economy as the country grows richer. Take as an example the structural changes in the US economy between 1960 and 1994, as depicted in Figure 8.[107] Note the relative decline of primary production (agriculture and mining) and manufacturing as a share of GDP, counterbalanced by a relative increase in services, including public utilities and government services. These structural changes have presumably contributed to a drop in the overall pollution intensity of US output, although this assertion cannot be substantiated in figures. In contrast, other economies, such as the newly industrialized countries in Asia and Latin America, have moved in the opposite direction,[108] although this may only be a transient phenomenon. Indeed, Hettige et al. (1998) suggest that the manufacturing share of GDP typically rises until a country reaches middle-income status, peaking at some 25 per cent of GDP at a per capita income of about $5,000 to $6,000, to decline slowly thereafter to some 20 per cent of GDP at a per capita income of $20,000 or more.

Structural changes, in turn, are driven by many factors, including trade liberalization that induces specialization according to comparative advantages. As elaborated in Section III, trade liberalization changes the pattern of production in the world and so, indirectly, the pattern of pollution. From the point of view of an individual country, the local environment will benefit if expanding export sectors are less polluting on average than contracting import-competing sectors, and suffer otherwise.[109] And since one country's exportables are another country's importables, all countries cannot specialize in clean industries. International trade will therefore redistribute local pollution problems in the world from countries that have a comparative advantage in industries that are inherently less polluting to countries that have a comparative advantage in industries that are inherently more polluting. And even if an adverse composition effects may be counteracted by stricter environmental regulations induced by higher incomes, the technique effect is unlikely to neutralize both the scale and composition effects as argued by Copeland and Taylor (1994).

These arguments have some interesting implications. It is at least conceivable that the turning points that have

105 Panayotou (1993).

106 See, e.g., Syrquin (1989).

107 Data is taken from the Council of Economic Advisers, Economic Report of the President, February 1997.

108 Suri and Chapman (1998).

109 In practice, it may be difficult to evaluate if the environment actually benefited from the changing structure, since the composition of pollution also changes. What is the net benefit of, say, a 50 per cent reduction in SO_2 emissions and a 10 per cent increase in toxic waste?

been enjoyed by developed countries, if not yet in all environmental indicators, are partly a result of the contraction of polluting industries. It is not certain that the next generation of higher-income developing countries can benefit from the same structural changes that would help reduce pollution, not to mention the least-developed countries, which may be stuck with the most polluting end of production. In short, the inverted U-shaped pollution path may not necessarily hold for lagging countries or, alternatively, the turning point may come at higher-income levels because of a more polluting composition of national output.[110] Likewise, the EKC may not hold for the world as a whole because the composition effect of individual countries cannot be replicated at the global level. Someone has to produce the polluting goods as long as they are in demand, although the production location may shift from time to time as comparative advantage changes.

On the other hand, developing countries may find it easier to pass the peak of the EKC because of new technologies that were not available at the time the developed countries were at the same stage of development. The question is then if available technology will be used, and new technologies developed to fill the current gaps, which in turn puts the focus on the ability of the political process to deliver environmental policies that are up to the job.

B. Is economic growth sufficient to induce environmental improvements?

This brings us to the question of whether the EKC is an automatic process or dependent on certain policy actions. It is probably both. Part of the solution may emerge spontaneously through normal market mechanisms. For example, if the willingness to pay a premium for goods produced in an environmentally responsible way increases with income, producers may modify their technologies accordingly to tap the green market niche. However, only the most laissez-faire economists would argue that the process towards sustainable development can be left to the market alone. Most would claim that government intervention is needed to complement and steer market forces in a sustainable direction.

A good starting point for a discussion on the policy dimension of the EKC is the insightful but technically difficult paper by Jones and Manuelli ro335tomatic process o

"benevolent social planner" (through the imposition of environmental taxes or regulations) with recurrent direct voting on environmental policies, whereby the preferences of the median voter effectively determine the outcome.

Interestingly, the policies chosen by the benevolent social planner generate a standard inverted U-shaped EKC. When a country is poor, growth considerations take precedence over environmental concerns. However, as the economy grows out of poverty, pollution taxes or regulations are introduced at some stage and start to bend the pollution trajectory. At a sufficiently high level of income, pollution taxes or regulations have become so stringent that they encourage investments in sufficiently clean production technologies to start reducing the overall level of pollution. In short, an inverted U-shaped pollution path occurs naturally if environmental policies are determined by an enlD -tollution. In short, an invert2ce2meno5.39-

Table 8: Estimated turning points for the environmental Kuznets curve (US$)

	SO_2	SPM	NO_x	CO	CO_2	CFCs
Air Pollution						
Cole et al. (1997)	6'900	7'300	14'700	9'900		12'600
Grossman and Krueger (1993)	4'100					
Holtz-Ekin and Selden (1995)					35'400	
Moomaw and Unruh (1997)					12'800	
Panayotou (1995)	3'000	4'500	5'500			
Panayotou (1997)	5'000					
Selden and Song (1994)	10'700	9'600	21'800	19'100		
Shafik (1994)	3'700	3'300				

	Faecal coliform	BOD	COD	Arsenic	Nitrates
Water pollution					
Cole et al. (1997)					15'600
Grossman and Krueger (1995)	7'800	7'600	7'900	4'900	

	Global	Latin America	Africa
Deforestation			
Antle and Heidebrink (1995)	2'000		
Cropper and Griffiths (1994)		5'400	4'800
Panayotou (1995)	800		

	Heavy metals	Toxic intensity
Others		
Hettige et al. (1992)		12'800
Rock (1996)	10'800	

Source: This table is based on Table 2 in Barbier (1997).

capita income. Their results also hinted at the possibility that the emissions may eventually turn upwards again at around $12,000 to $15,000. Since Mexico's per capita income just so happened to be at the estimated downward turning point, the additional growth impetus from NAFTA could conceivably push Mexico over the top and initiate a process of improved environmental performance.

This thought-provoking, not to say controversial, study has been followed by a huge number of empirical studies that have partly confirmed, partly contradicted, and partly qualified Grossman and Krueger's findings. One lesson from this literature is that the existence of an eventual turning point depends almost entirely on the type of emission reviewed, making any generalizations about the EKC hypothesis problematic. The turning points range from a couple of thousand dollars per capita to incomes that are yet to be seen anywhere in the world, as shown in Table 8.

Another finding is that pollution, after declining for a while at middle-income levels, may turn upward at higher incomes. For example, Kaufmann et al. (1997) note that after passing the $12,500 per capita GDP mark, SO_2 emissions may once again start to increase. Based on this and other studies, including the original study by Grossman and Krueger, several observers have noted that the inverted-U shaped curve more accurately resembles an "N"-shape for many environmental indicators. However, as argued in the theoretical review, this may not be the

end of the story. The next turn in the pollution path may be downward again, so that the N becomes an M as the next generation of abatement technologies becomes attainable with increased production and higher incomes. Essentially, there is no knowing if this process will eventually converge and, in that case, if the ensuing emissions will be within the bounds of the carrying capacity of local and global ecosystems.

A third insight of the empirical EKC literature is that

Table 9: The relationship between income and various environmental indicators

Environmental indicator	Inverted U-shape	Increasing	Decreasing	Constant	N-shape
Air pollution					
SO_2	CRB, GK1, GK2, S, SS, P1, P2		CJM		
SPM	CRB, P1, S, SS	V	CJM, GK1		
Heavy particles			GK2		
Smoke	GK2				
Dark matter	GK1				
NOx	CRB, P1, SS		CJM		
CO	CRB, SS		CJM		
CO_2	CRB, HS	S			MU
CFCs	CRB				
Greenhouse gases			CJM		
Air toxics			CJM		

torical case studies, certain candidates spring to mind, for example, North Korea and the Republic of Korea, East Germany and West Germany, or Eastern Europe and Western Europe more generally. Unfortunately, no such studies seem to be available. Rather, what most researchers have managed so far is to include an "openness" indicator in standard cross-country EKC regressions in order to say something about the impact on the pollution path of the trade policy stance followed by a country.

Earlier studies using this approach, including Grossman and Krueger (1991) and Shafik and Bandyopadhyay (1992), did not find much impact of the trade policy stance *per se*. The openness indicator was generally statistically insignificant, although not for all environmental indicators. For example, Grossman and Krueger found that the ambient SO_2 levels tend to be lower in cities located in countries conducting more trade, while the other air-quality indicators—suspended particle and dark matter pollution—did not seem to have any significant association with trade.

Another study by Lucas, Wheeler and Hettige (1992) found that the toxic (pollution) intensity of GDP had a positive correlation with Dollar's (1990) index of trade distortion.[116] Although this index does not say which sectors are protected, the fact that the toxic intensity of GDP is closely linked to the manufacturing share of GDP suggests that the Dollar's index is correlated with the protection of the manufacturing sector. The way we interpret this finding is not that protection *per se* is associated with a high degree of pollution, but rather that protection of the manufacturing sector is. This conjecture is also supported by the finding that the total emissions of toxic substances eventually decline with higher incomes, partly because the manufacturing share of GDP tends to decline as a country grows richer.

The study by Rock (1996) suggest that open economies are more polluting than closed economies, even when differences in the manufacturing share of GDP have been accounted for. That is, comparing countries with the same income level and the same manufacturing share of GDP, he finds that the more open economies tend to be more polluting. On the basis of this finding, the author argues that the recipe for economic development advocated by the World Bank and others (i.e., development based on trade and economic integration) has a high price in terms of environmental degradation, which even if it is not permanent, is at least transitional until developing countries have passed the peak of the EKC. Put another way, growth-promoting development strategies must include an environmental element to be sustainable in the long term.

Suri and Chapman (1998) analyze the impact of growth, international trade, and structural change on the turning point of the EKC for commercial energy consumption and so, indirectly, pollution related to energy consumption, including CO_2 emissions. They find that growing exports of manufactured goods are a key source of energy consumption in rapidly industrializing countries in East Asia and Latin America. The mirror image was observed in developed countries, where growing imports of manufactured goods has contributed to a slowing of the demand for energy. In short, trade has changed the composition of GDP in a more energy-intensive way in rapidly industrializing developing countries and in a less energy-intensive way in mature industrialized countries. Moreover, the authors argue that, as a result, the turning point of the EKC for energy has drifted upward in industrializing countries, and also in the world as a whole. The reason for this is that developing countries use less energy-efficient technologies, apply generally lower energy taxes and, in some cases, offer energy subsidies to spur industrialization.[117]

The study by Antweiler, Copeland, and Taylor (1998) is also relevant in this context, although they do not set out to estimate the EKC *per se*. Their objective is to quantify the underlying mechanism by which trade affects the environment, specifically, through the composition, scale and technique effects. The study focuses on the relationship between openness to trade and changes in ground level SO_2 concentration in a data set covering 44 countries from 1971 to 1996. They find that a 1 per cent increase in the share of trade in GDP reduces SO_2 concentration by some 0.7 per cent for the average country. At the same time, countries that are induced to specialize in SO_2-intensive production may still see higher emissions. Again, trade changes the location of production and thus indirectly also the distribution of pollution in the world.

In summary, empirical evidence suggests that the composition effect of trade can influence the shape and relevance of the EKC. Structural changes in the global economy in the last decades may have shifted some manufacturing industries from developed countries into rapidly industrializing developing countries, and this in turn has influenced the pollution path of both groups of countries.[118] Since traditional manufacturing industries are generally more polluting than high-technology and services production, the structural changes may have helped developed countries to pass the peak of the EKC, if not yet in all environmental indicators. At the same time, the upward-sloping segment of the EKC for industrializing developing countries may have become steeper and the peak possibly higher because of a more polluting composition of their national output. In short, while trade spurs economic growth, thereby possibly shortening the time before appropriate environmental policies are introduced, the composition effect of trade will make the transition over the EKC peak easier for some countries and more difficult for others.

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lands between 1980 and 1990 found that technological change driven by higher energy taxes and stricter regulations is the key to improved environmental performance. Structural changes in the composition of national output added some further reductions in air pollution in Germany and subtracted some potential reductions in the Netherlands (Table 10). Thus, when the dust has settled, environmental degradation is perhaps not so much about trade, but rather about misplaced economic incentives that allow producers and consumers to pollute without bearing the full social costs of their actions. These policy

Having said this, it should be noted that global warming and depletion of the ozone layer are rather recent public concerns. It is at least conceivable, not to say plausible, that the varying turning points that have been estimated for different kinds of pollutants have a tendency to fall within the income range of the leading countries at the time the specific problems became an issue of intense public debate. For example, there may be nothing either special or natural about a turning point for CFCs at $12,000 to $18,000; it just happened to be the income range of the leading countries (which have also assumed the fastest phase-out commitments) at the time the Montreal Protocol was signed in 1987. Accordingly, although we find estimates of a turning point for CO

VI. Concluding Remarks

One of the greatest challenges facing mankind at the inception of the 21st century is how to accommodate a growing population and material aspirations in developed and developing countries without compromising the natural environment. This challenge is compounded by the vast difference in living standards in the world, and hence differences in immediate policy priorities. It is also compounded by the fact that many environmental problems are transboundary or global in nature, and hence beyond the control of any individual nation.

The frustration in some quarters with the slowness of the political process in responding to these challenges has partly been blamed on the multilateral trading system. Part of the argument is that the legal provisions of the WTO circumscribe the tools available for environmental policy making, including trade measures to encourage participation in and enforcement of multilateral environmental agreements. The other part of the argument is that international trade, by increasing the mobility of industries, undermines the regulatory power of individual nations. Both of these arguments deserve to be taken seriously, although this study shows why trade measures are nearly always a poor policy response to environmental degradation.

The removal of economic borders imposes new demands for cooperation among governments on environmental issues. At the same time, countries would be interdependent in an ecological sense even if they did *not* trade. Ecological systems do not begin and end at the border, nor does pollution traveling with wind and water. The point is, rather, that the removal of economic borders and the associated increase in mobility of industries, has made cooperation more urgent by reducing the regulatory automony of individual nations. The perceived costs of acting alone in terms of lost investments and jobs often take the steam out of new regulatory initiatives.

But this need for cooperation goes far beyond what the WTO is capable of delivering by itself, especially since environmental problems and international trade are only indirectly linked. At the same time, the cooperative model of the WTO, based on legal rights and obligations, could potentially serve as a model for more structured environmental cooperation among nations. Today, international cooperation on the environment finds expression through a multitude of organizations and conventions, not always coherently linked together. Of course, to find the appropriate forms for a new global architecture of environmental cooperation may take some time, and will have to account for a broad spectrum of interests and opinions, including inputs from civil society.

Meanwhile, even with its current mandate, the WTO can do a few important things for the environment. The most obvious contribution would be to address the remaining trade barriers on environmentally-friendly production technologies and environmental services in order to reduce the cost of investing in clean production technologies and environmental management systems. Another potential contribution would be to seek reductions in subsidies that harm the environment, including energy, agricultural, and fishing subsidies.

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ANNEX I:
TRADE AND ENVIRONMENT IN THE GATT/WTO
Background Note by the Secretariat[1]

INTRODUCTION

1. At the start of the seventies, GATT contracting parties recognized the need to address in the GATT environmental issues as they relate to trade. The Group on Environmental Measures and International Trade, set up in 1971, was the first institutional framework created to that effect within the GATT. Some twenty years later a group of countries, considering that it was important for contracting parties to gain a better understanding of the interrelationship between environmental policies and GATT rules, requested the activation of the 1971 Group. The work programme of the GATT also included the issue of domestically prohibited goods, which had been raised by some developing countries at the beginning of the eighties.

2. At the end of the Uruguay Round, Trade Ministers adopted the Decision on Trade and Environment which anchored environment and sustainable development issues in WTO work. They set up the Committee on Trade and Environment and assigned to it a broad mandate, covering virtually all aspects of the trade and environment interface. Work in the Committee has contributed to build up communication between trade and environment experts at both the national and international levels.

3. The environment was not, as such, a subject of negotiations during the Uruguay Round. At the beginning of the eighties, the need to protect the environment was not as high on the political agenda of governments and no attempt was made to put this subject on the agenda of the Round. Environmental considerations were, nevertheless, not totally absent from the preoccupations of negotiators and are reflected in various WTO instruments. This Note also briefly summarizes trade disputes which concerned issues related to human or animal health, or the environment.

4. Over the past few years, steps have been taken to increase transparency of WTO activities. The derestriction of WTO documents has been facilitated and all derestricted documents are now readily available on the WTO homepage. Moreover, the Director-General and the Secretariat have taken various initiatives to improve the dialogue with civil society.

II. WORK IN THE GATT ON ENVIRONMENTAL ISSUES

A. GROUP ON ENVIRONMENTAL MEASURES AND INTERNATIONAL TRADE

1. Preparatory Work for the 1972 Stockholm Conference

5. During the preparatory work for the Conference on the Human Environment, which took place in 1972 in Stockholm, the GATT Secretariat was requested by the Secretary-General of the Conference to make a contribution. In response to this request, the Secretariat prepared on its own responsibility a study entitled "Industrial Pollution Control and International Trade".[2]

6. The study focused on the implications of the General Agreement for contracting parties' industrial pollution control policies and measures. It examined the application of the provisions of the General Agreement to measures taken by governments to control industrial pollution and the special responsibility in this area that they had to ensure that the efforts of governments to combat pollution did not result in the introduction of new barriers to trade or impede the removal of existing barriers. It was, therefore, perhaps worth considering whether it would not be useful for the CONTRACTING PARTIES to set up a flexible mechanism which could be used at the request of contracting parties if the need arose".

[3]

8. In the discussion that followed, several representatives expressed agreement that the GATT had certain responsibilities in dealing with the implications of industrial pollution control on international trade. Many of them supported the idea of establishing a standing mechanism for the purpose. There was, however, some divergence of views on the nature

14. The EFTA countries also suggested that, like other international bodies, GATT might make a contribution to the 1992 United Nations Conference on Environment and Development (UNCED).[11]

15. Several delegations supported the proposal to convene the 1971 Group, considering the GATT could not remain outside the debate which had commenced, but had to be part of it. Other delegations were of the view that such an initiative was premature and that one should await the outcome of the UNCED. Some also considered that priority should be given to concluding the Uruguay Round. The appropriateness of the mandate of the 1971 Group was also raised. While some agreed that one should start pragmatically with the existing mandate, others considered that this mandate did not encompass the general issue of the interlinkages between trade and environment.

16. In view of the differences which existed on the proposal for the convening of the Group, the Council decided to request the Chairman of the CONTRACTING PARTIES, Ambassador R. Ricupero (Brazil), to conduct informal consultations, in particular to reflect upon whether the existing mandate of the group was the most appropriate.[12] In April 1991, Ambassador

environment and to accelerate sustainable development in developing countries. Also, the special concerns that had been raised by the UNCED about the need to improve market access for developing countries' exports, particularly by reducing tariff and non-tariff impediments, including tariff escalation, and to improve the functioning of commodity markets were well recognized."[25]

28. The CONTRACTING PARTIES further invited the Committee on Trade and Development and the EMIT Group to focus on the relevant sections of *Agenda 21* and report to the Council on the progress they were making in that area.[26] The review took place in a special session of the Council in February 1994. Contracting parties generally considered the successful conclusion of the Uruguay Round to be an important step towards creating the conditions for sustainable development. They considered that trade liberalization and the maintenance of an open, non-discriminatory trading system were key elements of the follow-up to the UNCED. They noted that work that had already been undertaken in the GATT on trade and environment, both in the EMIT Group and the CTD, could be considered as follow-up to the UNCED. Contracting parties also agreed that further UNCED follow-up should await the decision of Ministers at their forthcoming meeting in Marrakesh on 12-15 April 1994 regarding the future work programme on trade and environment.[27]

B. THE ISSUE OF DOMESTICALLY PROHIBITED GOODS[28]

1. Historical background

29. The subject of exports of "domestically prohibited goods" ("DPGs") was included in the GATT's work programme at the 1982 Ministerial meeting as a result of concerns expressed by some developing countries regarding the export of products whose domestic sale was either prohibited or severely restricted in order to protect human health or safety, or the environment. The Ministerial Declaration adopted at the 38th Session of the CONTRACTING PARTIES held at Ministerial Level therefore encouraged contracting parties to notify GATT, "to the maximum extent feasible, of any goods produced and

33. The Working Group met between September 1989 and June 1991.[35] At the first meeting, the Working Group, noting the request to have regard to the work of other international organizations, agreed to invite, as observers to its meetings, representatives from UNEP, FAO, WHO, the UN Secretariat, the ILO, the UN Centre for Transnational Corporations, the OECD, the ITC, and the International Atomic Energy Agency. Throughout the work of the Working Group, these representatives provided technical expertise and advice to delegations, to the Chairman and to the Secretariat.

34. Several contracting parties submitted proposals to the Working Group.[36] The Chairman subsequently presented a working paper containing a Draft Decision on Trade in Banned or Severely Restricted Products and Other Hazardous Substances, which was based on the two proposals presented by Cameroon and Nigeria on one hand, and by the European Community on the other, and took into account comments by other delegations. This Draft Decision was the subject of discussion in the Working Group, both at the technical and drafting level and the text was revised to meet the requirements and advice of delegations and technical experts. Despite intensive efforts which continued into June 1991, a final version of the text could not be agreed.

35.

Item 7: "the issue of exports of domestically prohibited goods"

Item 8: "TRIPs"

Item 9: "Services"

Item 10: "appropriate arrangements for relations with non-governmental organizations referred to in Article V of the WTO and transparency of documentation".

2. The Sub-Committee on Trade and Environment

38. Pending the establishment of the CTE, the Marrakesh Decision stipulated that work on trade and environment should be carried out by a Sub-Committee of the Preparatory Committee of the WTO. The Sub-Committee on Trade and Environment (SCTE) met in the course of 1994 under the chairmanship of Ambassador L. F. Lampreia (Brazil). It based its work on the terms of reference established by the Marrakesh Decision, while building on the work previously accomplished in GATT bodies, such as the EMIT Group or the Working Group on Domestically Prohibited Goods.[41]

39. With respect to its work programme, the SCTE focused on the first, third and sixth items, building whenever possible on the work of the EMIT Group. Under item 1, the Sub-Committee examined the use of trade measures for environmental purposes, particularly those applied in the context of multilateral environmental agreements and those applied specifically to non-parties to those agreements. Delegations began reviewing the potential advantages and disadvantages of *ex ante* and *ex post* approaches to establishing the relationship of these measures to the provisions of the multilateral trading system. With regard to item 3, delegations began reviewing the use of environmental taxes, in particular in the context of GATT disciplines on border tax adjustment, and examined further environmental regulations and standards, notably those related to eco-labelling, on the basis of the work that had already been undertaken on this subject by the EMIT Group. Under item 6 of the work programme delegations highlighted for further examination issues such as the effects of tariff escalation, non-tariff barriers and trade distorting subsidies on the environment, export diversification and its relationship to environmental protection, market opportunities for environmentally friendly products particularly from developing countries, and the importance of technology transfer, technical and financial assistance in pursuit of sustainable development.

40. The SCTE transmitted its working documents and reports to the WTO's Committee on Trade and Environment.

3. Work of the Committee on Trade and Environment

41. As stipulated in the Marrakesh Ministerial Decision on Trade and Environment, the General Council of the WTO established the Committee on Trade and Environment (CTE) at its first meeting, held on 31 January 1995. It was agreed that the CTE would be open to all Members of the WTO and would report to the first biennial WTO meeting of the Ministerial Conference, when its work and terms of reference would be reviewed, in the light of recommendations by the Committee

recommendations if any".[45] The CTE Report to the Singapore Ministerial Conference was adopted on 8 November 1996, with the understanding that it "did not modify the rights and obligations of any WTO Member under the WTO Agreements".[46] As noted by the Chairman, this statement made it possible for a number of delegations to join the consensus and approve the report.[47] The Report contains a brief introductory section which sketches the CTE's establishment and outlines its work programme; a second section presents the discussions and describes the documents submitted by delegations; the third section includes the conclusions and recommendations.[48]

46. At Singapore, Trade Ministers endorsed the Report and directed the CTE to continue its work under its current mandate:

"The Committee on Trade and Environment hae a.3(T9(r)16.i)-1(ta)10.1l,Wrdliit(c)antnm9(r)16.ic-1(r).7((e)-2.4(bute)-2.4(3(Trr)1

the only nor necessarily the most effective policy instrument to use in MEAs: adequate international cooperation provisions, including financial and technology transfers and capacity building, were often decisive elements of a policy package for an MEA.

52. The CTE also examined carefully some characteristics of the trade measures used in MEAs. It concluded in particular that problems were unlikely to arise in the WTO over trade measures agreed and applied among Parties to an MEA. However, concerns were expressed regarding measures applied to MEA non-signatories. The Report stated that, in the negotiations of a future MEA, particular care should be taken over how trade measures might be considered for application to non-parties.

53. Regarding the relationship between WTO dispute settlement procedures and those found in MEAs, the report recognized that WTO Members had the right to bring disputes over the use of a trade measures taken pursuant to MEAs to the WTO dispute settlement system. However, disputes arising over the use of a trade measure applied pursuant to an MEA between two WTO Members which were both signatory to an MEA should be resolved through the dispute settlement mechanism available under that MEA.

54. The CTE report stressed in several instances the importance of ensuring policy coordination between trade and environment experts. First and foremost, policy coordination had to take place at the national level, in order to prevent governments from entering into conflicting obligations in different treaties they were signatories to: this was best done at the negotiating and drafting stage. At the international level, the report encouraged cooperation between the WTO and relevant institutions.

55. The "unilateral" trade measures taken for environmental purposes were also under scrutiny. Most of the delegations which intervened in the CTE on this issue considered that GATT Article XX did not permit a Member to impose unilateral trade restrictions, that were otherwise inconsistent with its WTO obligations, for the purpose of protecting environmental resources that was outside its jurisdiction. Another opinion expressed in the CTE was that nothing in the text of Article XX indicated that it only applied to protection policies within the territory of the country invoking the provision.

56. A number

Secretariat contributed to the analysis by preparing a background paper, outlining for each sector the most prevalent trade restrictions and distortions, as well as the environmental benefits associated with their elimination.[52]

72. A second cluster contains the items related to the linkages between the multilateral environment agenda and the multilateral trade agenda (i.e. items 1, 5, 7 and 8). Discussions under *items 1 and 5* focused on the interaction between WTO rules and MEAs containing trade provisions, and various ways of accommodating the two sets of rules. In this respect, the CTE held two informal sessions with a number of Secretariats of multilateral environmental agreements relevant to its

(b)

96. Governments are encouraged to harmonize their SPS requirements, i.e. to base them on international standards, guidelines or recommendations developed by international organizations, such as the joint FAO/WHO Codex Alimentarius Commission, the International Office of Epizootics and the International Plant Protection Convention. Governments are, nevertheless, entitled to set more stringent national standards in case the relevant international norms do not suit their needs; however, the SPS measures must be based on a scientific justification or on an assessment of the risks to human, animal or plant life or health. The procedures and decisions used by a country in a risk assessment will be made available upon request by other countries. The Agreement explicitly recognizes the right of governments to take precautionary provisional measures when scientific evidence is lacking, while seeking further information.

97. SPS measures must be applied in a non-discriminatory manner, although adapted to the health situations of both the area from which a product comes and the area to which it is destined. When governments have at their disposal various alternative measures, which are economically and technically feasible, they should choose measures which are not more trade restrictive than necessary to achieve the desired level of protection.

98. In order to increase transparency of SPS measures, governments are required to notify other countries of those measures which restrict trade and to set up so-called "enquiry points" to respond to requests for more information. The SPS Committee provides WTO Members with a forum to exchange information on all aspects of the implementation of the SPS Agreement, review compliance with it and maintain cooperation with the appropriate technical organizations. When a trade dispute arising over the use of a SPS measure involves scientific or technical issues, the Agreement stipulates that the panel should seek advice from experts.

5. The Agreement on Agriculture

99. In general, reducing domestic supports and export subsidies should lead to less intensive and more sustainable production with reduced use of agricultural inputs like pesticides and fertilisers, leading to improvements in the environment.

100. The Agreement on Agriculture provides for the long-term reform of trade in agricultural products and domestic policies. It increases market orientation in agricultural trade by providing for c(ov)9.dMn74easng orad -oroesner l0.1(r)18.1(eas11.3(Tc

rights, restrictions on investment and movement of natural persons. The characteristics of regulatory mechanisms, including environmental regulations, and their effects on trade in environmental services were also addressed.[68]

9.

Canada - Measures Affecting Exports of Unprocessed Herring and Salmon,
adopted on 22 March 1988, BISD 35S/98

125. Under the 1976 Canadian Fisheries Act, Canada maintained regulations prohibiting the exportation or sale for export of certain unprocessed herring and salmon. The United States complained that these measures were inconsistent with GATT Article XI. Canada argued that these export restrictions were part of a system of fishery resource management destined at preserving fish stocks, and therefore were justified under Article XX(g).

126. The Panel found that the measures maintained by Canada were contrary to GATT Article XI:1 and not justified under either Article XI:2(b) or Article XX(g).

Thailand - Restrictions on Importation of and Internal Taxes on Cigarettes,
adopted on 7 November 1990, BISD 37S/200

127. Under the 1966 Tobacco Act, Thailand prohibited the importation of cigarettes and other tobacco preparations, but authorized the sale of domestic cigarettes; moreover, cigarettes were subject to an excise tax, a business tax and a municipal tax. The United States complained that the import re-2( )13.3(jug.6(r)1)3ce326(c)8.tndr e ined y x Th G reesr14(ed 0(s)7(h88(t,1.8(d)1.1(

136.

United States - Import Prohibition of Certain Shrimp and Shrimp Products,
adopted on 6 November 1998, WT/DS58/AB/R (Appellate Body) and WT/DS58/R (Panel)

145. Seven species of sea turtles are currently recognized. Most of them are distributed around the globe, in subtropical and tropical areas. They spend their lives at sea, where they migrate between their foraging and their nesting grounds. Sea turtles have been adversely affected by human activity, either directly (exploitation of their meat, shells and eggs), or indirectly (incidental capture in fisheries, destruction of their habitats, pollution of the oceans).

146. The US Endangered Species Act of 1973 ("ESA") lists as endangered or threatened the five species of sea turtles occurring in US waters and prohibits their take within the United States, within the US territorial sea and the high seas. Pursuant to the ESA, the United States requires that US shrimp trawlers use "turtle excluder devices"[74] (TEDs) in their nets when fishing in areas where there is a significant likelihood of encountering sea turtles. Section 609 of Public law 101-102, enacted in 1989 by the United States, provides, *inter alia*, that shrimp harvested with technology that may adversely affect certain sea turtles may not be imported into the United States, unless the harvesting nation is certified to have a regulatory programme and an incidental take rate comparable to that of the United States, or that the particular fishing environment of the harvesting nation does not pose a threat to sea turtles. In practice, countries having any of the five species of sea turtles within their jurisdiction and harvesting shrimp with mechanical means must impose on their fishermen requirements comparable to those borne by US shrimpers, essentially the use of TEDs at all times, if they want to be certified and export shrimp products to the United States.

147. India, Malaysia, Pakistan and Thailand complained that the prohibition imposed by the United States on the

153. The *Trade and Environment Bulletin* is available on request at the Information and Media Relations Division of the WTO, or can be consulted on the WTO homepage at http://www.wto.org.

B. SYMPOSIA WITH NON-GOVERNMENTAL ORGANIZATIONS

154. Since 1994, the WTO Secretariat has organized yearly (with the exception of 1995) a Symposium on Trade, Environment and Sustainable Development. These symposia, which are held under the Secretariat's own responsibility, are generally attended by participants representing environment, development, consumer NGOs, industry interests, academics, as well as WTO Member governments. Voluntary financial assistance provided by some WTO Member countries or by private institutions has facilitated the participation of developing country NGOs.

155. The main objectives of the symposia are to keep civil society informed of the work underway in GATT/WTO on trade and environment, and to allow experts in the field to examine and debate the inter-linkages between trade, environment and sustainable development. The symposia were all organized on the same pattern: presentations from invited panellists on specific topics were followed by an informal debate among all participants. Various themes, covering the different facets of the trade and environment relationship, were on the agenda of each symposium, for instance, the synergies between trade liberalization and the environment, the relationship between multilateral environmental instruments and the WTO, the work of the CTE, WTO relations with civil society, etc. No attempt was made to summarize views or to identify consensus positions.

C. NEW INITIATIVES TAKEN BY THE D

problems of policy coordination do occur, it is important to ensure that they are resolved in a way that does not undermine internationally agreed trade rules and disciplines that governments have spent the past seven years reinforcing through the Uruguay Round negotiations.

11. It is clearly important to ensure that the multilateral trade rules do not present an unjustified obstacle to environmental policy-making. An important point is the considerable extent to which the GATT rules already accommodate trade measures used in conjunction with environmental policies to protect national environmental resources. A review of the extensive use that is being made of trade-related environmental measures by contracting parties to protect their domestic environmental resources gives testimony to that fact. Furthermore, an open, secure and non-discriminatory trading system underwritten by the GATT rules and disciplines can facilitate environmental policy-making and environmental conservation and protection by helping to encourage more efficient resource allocation and to generate real income growth.

12. In what follows, I report on the Group's discussions on each of its agenda items and on UNCED follow-up.

Agenda Item 1: Trade provisions contained in existing multilateral environmental agree-6.1(tor[(T)37ing)1entw[(e

20. The spirit of mutual confidence and cooperation which has prevailed in the discussions has enabled the Group to move forward in line with the dictum of not rejecting any notion out-of-hand, nor taking any concept at face value. While the Group clearly continued to focus on an analysis of the underlying issues, a number of delegations expressed views on different approaches for addressing a possible conflict.

21. It has been noted that it is already possible to consider in GATT the treatment of trade provisions contained in MEAs on a case-by-case basis, notably through the waiver provisions contained in Article XXV. This builds on the view that the GATT already provides considerable scope for using trade measures for environmental purposes, and reflects doubts that trade measures which would exceed the limitations of existing provisions are likely to prove efficient or effective policy tools for use in MEAs as well as concerns about disturbing the balance of rights and obligations conferred by the GATT on its contracting parties. Where doubts exist about the probable compatibility of trade measures in MEAs with the provisions of the GATT, or where it proved necessary to move deliberately outside those limits, recourse could be taken to the waiver provisions of Article XXV.

22. The merit of this approach has been described in several ways. One is that the scale of the remedy fits the problem. There has not, to date, been any challenge under the GATT to the trade provisions of an MEA, and having recourse to a waiver would provide a measured, case-by-case response to any problems that might arise in the future. Under this approach, multilateral consensus would be established on the merits of each case; it could be presumed that if an MEA reflected a genuine multilateral consensus it would find broad support among GATT contracting parties and there need be little, if any, uncertainty about the chances of securing a waiver for it. The waiver approach would avoid the need for GATT contracting parties to elaborate and agree upon general criteria to apply to the use of trade provisions in any future MEA. It would not focus on an MEA but on the trade measures included in it. Finally, the onus to demonstrate and convince others of their case would remain the responsibility of those who were seeking the waiver. In the view of some delegations, therefore, this would be a response, in line with the time-honoured GATT tradition of flexibility, which through a combination of tolerance and safeguards would enable other objectives to be effectively realised without compromising the balance of rights and obligations accruing to contracting parties from the GATT system. The value of the GATT to contracting parties would not be reduced because they would play a positive role in determining the waiver.

23. A number of doubts have been raised about this approach. One is that it is a case-by-case approach, which might fail to provide negotiators of MEAs with the necessary degree of predictability or security that there would not be a GATT

circumstances that may arise in the negotiation of future MEAs while limiting the risk that trade measures in an MEA would

trade effects has been described as one of several "filters" through which the adequacy of existing transparency obligations might be examined. Further analytical work is needed in this area before the issues can be brought fully into focus in the Group.

Agenda Item 3: Trade effects of new packaging and labelling requirements aimed at protecting the environment.

49. Discussions in the Group on this agenda item have been enriched by the provision by delegations on an individual and goodwill basis of information that reflects their own national experiences with these measures, both in terms of the environmental objectives that are being pursued and the trade effects that some countries are experiencing. Given the technical nature of the subject matter under this agenda item, the information has been particularly valuable. A co-operative approach to the sharing of information between governments on their environmental objectives and the development of their policies in this area can help to prevent trade problems from arising.

50. The environmental objectives or advantages of the measures involved have been described during the course of discussions in order that the Group should benefit from a full overview of the trade and environment interface in this area. A

Packaging requirements

58. Discussions have focused on the trade effects of two types of packaging requirements: those that stipulate what kinds of packaging can (or cannot) be used in a particular market, and those that prescribe the recovery, re-use, recycling or disposal of packaging once it has served its original purpose.

59. GATT is relatively familiar with the first type. Many technical regulations lay down product characteristics that must be fulfilled if a product is to be assured of market access, and experience with them gained through the operation of the TBT Agreement has permitted a relatively thorough understanding of their potential trade effects. Particular attention has been paid in the Group to recycled content requirements for packaging. Several delegations have expressed concern over their potential for restricting trade in both packaged goods and packaging material from countries where recycled material is not readily available or is costly, and questioned whether these measures need also be applied to imports, in view of their limited effectiveness in achieving the stated environmental objectives of reducing pressure on waste disposal facilities in the countries imposing them. Doubts have also been expressed by some delegations about using trade measures to reduce the resource-intensity of packaging, both because of questions this raises about one country imposing its environmental standards on another, and the danger of presuming that the same resource endowments and constraints apply to all countries.

60. GATT is less familiar with the second type of packaging requirement. These are applied not only through technical regulations and standards but also through economic measures such as deposit refund schemes, taxes, charges, and fees for accessing waste handling systems in the country of destination.

61. A number of recurring themes have arisen in the discussions on these measures. One is whether, *a priori*, conclusions of general application can be drawn about the likely trade effects of different categories of measures, such as market-based instruments or command-and-control regulations. It has been suggested that some generalisations might be possible, for example in terms of whether the measures impact primarily on market access or on the conditions of competition within a market. However, it would appear that the particular market circumstances in which the measures operate, the precise way in which they are applied, and other factors too can influence their trade effects to a considerable extent; in that respect, further case-by-case examination of different measures and their trade effects would seem to be indicated as the most effective way for the Group to move forward with its analysis.

62. A second theme relates to the observation that since domestically produced goods usually generate the most important proportion of local packaging waste, it is natural for packaging requirements to be chosen and formulated with the most common forms of domestically generated packaging waste and with domestic waste disposal facilities and priorities in mind. Domestic industry has in some cases been assigned a key role in standard setting and in implementing recycling

90. The work of the Group has been characterised by the shared view of delegations regarding the importance of making trade and environment mutually supportive. The new task assigned it - to examine the principles and propositions enumerated in Section B of Chapter 2 of Agenda 21 in accordance with its mandate and competence as part of an international effort and to give them appropriate operational effectiveness - will require more dedicated work by contracting parties and continued imaginative input by delegations.

91. In an attempt to present as complete a picture as possible of GATT activities on environment, while outside the competence of this Group, I have taken the liberty to attach the recent TNC Decision to draw up a work programme on environment adopted at the time of conclusion of the Uruguay Round ... .

92. In presenting this account of the Group's work in 1993, I wish to take this occasion to thank delegations and members of the secretariat for their patience and support.

to pursue shared goals, and in the development of a mutually supportive relationship between them due respect must be afforded to both.

172. The relationship between the provisions of the multilateral trading system and trade measures for environmental purposes taken pursuant to multilateral environmental agreements is multifaceted. Finding the right balance to describe and address this relationship in the CTE has proved to be a very demanding task, particularly given the varying nature of the issues involved in each MEA.

173. 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. Trade measures based on specifically agreed-upon provisions can also be needed in certain cases to achieve the environmental objectives of an MEA, particularly where trade is related directly to the source of an environmental problem. They have played an important role in some MEAs in the past, and they may be needed to play a similarly important role in certain cases in the future.

174. The CTE recognizes that the evolving relationship between MEAs and the multilateral trading system is complex and that different questions may emerge. In this respect, the following points have been noted in the course of discussions in the CTE:

(i) Trade measures have been included in a relatively small number of MEAs. There is no clear indication for the time being of when or how they may be needed or used in the future. Up to now, there has been no GATT or WTO dispute concerning trade measures applied pursuant to an MEA.

(ii) A range of provisions in the WTO can accommodate the use of trade-related measures needed for environmental purposes, including measures taken pursuant to MEAs. That includes the defined scope provided by the relevant criteria of the "General Exceptions" provisions of GATT Article XX. This accommodation is valuable and it is important that it be preserved by all.

(iii) In the context of the consideration of the inclusion of specifically agreed-upon trade provisions in MEAs, mutual respect should be paid to technical and policy expertise in both the trade and environment areas.

(iv) In practice, in cases where there is a consensus among Parties to an MEA to apply among themselves specifically mandated trade measures, disputes between them over the use of such measures are unlikely to occur in the WTO.

(v) In the negotiation of a future MEA, particular care should be taken over how trade measures may be considered for application to non-parties.

(vi) Policy coordination between trade and environment policy officials at the national level plays an important role in ensuring that WTO Members are able to respect the commitments they have made in the separate fora of the WTO and MEAs and in reducing the possibility of legal inconsistencies arising.

175. In order to enhance understanding of the relationship between trade and environmental policies, co-operation between the WTO and relevant MEAs institutions is valuable and should be encouraged. The CTE recommends that the WTO Secretariat continue to play a constructive role through its cooperative efforts with the Secretariats of MEAs and provide information to WTO Members on trade-related work in MEAs. As noted in the CTE's conclusions under Item 10 of its work programme, observer status for relevant MEAs in WTO bodies, as appropriate, can play a positive role in creating clearer appreciation of the mutually supportive role of trade and environmental policies. Requests from the appropriate bodies of MEAs for observer status should be considered in this light. The CTE should also consider extending invitations to appropriate MEA institutions to attend relevant discussions of the CTE.

176. As described in Section II of this Report, views differed on whether any modifications to the provisions of the multilateral trading system are required under this Item of the work programme. This matter should be kept under review and further work under this Item should be carried out drawing on the work undertaken to date.

177. The CTE notes that both the WTO and MEA dispute settlement mechanisms emphasize the avoidance of disputes, including through parties seeking mutually satisfactory solutions.

178. The CTE recognizes that WTO Members have not resorted to WTO dispute settlement with a view to undermining the obligations they accepted by becoming Parties to an MEA, and the CTE considers that this will remain the case. While WTO Members have the right to bring disputes to the WTO dispute settlement mechanism, if a dispute arises between WTO Members, Parties to an MEA, over the use of trade measures they are applying between themselves pursuant to the MEA, they should consider trying to resolve it through the dispute settlement mechanisms available under the MEA. Improved compliance mechanisms and dispute settlement mechanisms available in MEAs would encourage resolution of any such disputes within the MEA.

179. The CTE recognizes the benefit of having all relevant expertise available to WTO panels in cases involving trade-related environmental measures, including trade measures taken pursuant to MEAs. Article 13 and Appendix 4 of the DSU provide the means for a panel to seek information and technical advice from any individual or body which it deems appropriate and to consult experts, including by establishing expert review groups.

ITEM 2: The relationship between environmental policies relevant to trade and environmental measures with significant trade effects and the provisions of the multilateral trading system

180. A number of trade-related environmental policies and measures not covered elsewhere in the work programme have been discussed in a preliminary way under this Item. Further examination and analysis of these policies and measures in the CTE will be required, including analysis of their effects on trade.

181. There has also been some discussion of the use by governments at the national level of environmental reviews of trade agreements, and of the relationship and compatibility of general trade and environmental policy-making principles. No conclusions have been drawn so far on either of these issues. Further work will be required on this Item in the CTE.

ITEM 3(A): The relationship between the provisions of the multilateral trading system and charges and taxes for environmental purposes

182. Scope exists under WTO provisions for Member governments to apply environmental charges and taxes. The CTE has undertaken so far a preliminary examination of some of these issues under this Item. Further work on this Item is needed.

ITEM 3(B): The relationship between the provisions of the multilateral trading system and requirements for environmental purposes relating to products, including standards and technical regulations, packaging, labelling and recycling

183. The major part of the CTE's work so far under this Item has involved examination and analysis of voluntary eco-labelling schemes/programmes, including those based on life cycle approaches, and their relationship to WTO provisions and to the Agreement on Technical Barriers to Trade (TBT) in particular. Well-designed eco-labelling schemes/programmes can be effective instruments of environmental policy to encourage the development of an environmentally-conscious consumer public. The CTE noted that Chapter IV of *Agenda 21* encouraged the expansion of environmental labelling and other environmentally-related product information programmes designed to assist consumers in making informed purchasing decisions. The CTE also noted that eco-labelling schemes/programmes have raised, in certain cases, significant concerns about their possible trade effects.

184. Increased transparency can help deal with trade concerns regarding eco-labelling schemes/programmes while it can also help to meet environmental objectives by providing accurate and comprehensive information to consumers. The CTE felt that an important starting point for WTO Members to address some of the trade concerns raised over eco-labelling schemes/programmes is by discussing how to ensure adequate transparency in their preparation, adoption and application, including affording opportunities for participation in their preparation by interested parties from other countries. The transparency provisions contained in the TBT Agreement, including the Code of Good Practice for standardizing bodies contained in Annex 3 of the Agreement provide a reference point to the further work of the CTE in enhancing transparency of eco-labelling schemes/programmes.

185. As stated above, the CTE's discussion on eco-labelling has focused primarily on voluntary eco-labelling schemes/programmes and in particular on the transparency of such schemes/programmes. Without prejudice to the views of WTO Members concerning the coverage and application of the TBT Agreement to certain aspects of such voluntary eco-labelling schemes/programmes and criteria, i.e. those aspects concerning non-product-related PPMs, and therefore to the obligations of Members under this Agreement regarding those aspects, the CTE stresses the importance of WTO Members following the provisions of the TBT Agreement and its Code of Good Practice, including those on transparency. In this context, the CTE underlines the particular importance of ensuring fair access of foreign producers to eco-labelling schemes/programmes.

186. The CTE will conduct further work on all issues contained under this Item, including with respect to developing countries and least developed countries. Such further work could involve cooperation with the Committee on TBT and take into account the work of other international fora, for instance UNEP, UNCTAD, OECD, ITC and ISO, as appropriate.

ITEM 4: The provisions of the multilateral trading system with respect to the transparency of trade measures used for environmental purposes and environmental measures and requirements which have significant trade effects

187. WTO transparency provisions and mechanisms are not an end in themselves. However, they fulfil an important role in ensuring the proper functioning of the multilateral trading system, in helping to prevent unnecessary trade restriction and distortion from occurring, in providing information about market opportunities and in helping to avoid trade disputes from arising. They can also provide a valuable first step in ensuring that trade and environment polices are developed and implemented in a mutually supportive way. The CTE considers transparency to be an important aspect of all Items of its work programme where the relationship of WTO provisions to specific trade-related environmental measures is receiving attention.

188. The CTE recognizes that trade-related environmental measures should not be required to meet more onerous transparency requirements than other measures that affect trade.

189. The CTE concludes that no modifications to WTO rules are required to ensure adequate transparency for existing trade-related environmental measures. Nevertheless, the CTE should keep under review the adequacy of existing transparency provisions with respect to trade-related environmental measures, including the results of the work of the Working Group on Notification Obligations and Procedures and whether the Committees and Councils dedicated to individual WTO Agreements consider there is any need to review the transparency provisions of those Agreements in particular instances and whether compliance with the provisions is viewed as satisfactory.

190. The CTE notes that some WTO Members are dealing with some notifications differently, both in terms of their understanding of which types of environmental measures require notification, and under which WTO provisions. Such a situation needs to be improved through joint efforts by Members to clarify the understanding of the notification requirements concerned.

191. The CTE suggests that Members consider requests for additional information on measures notified under the WTO, or more generally supply information to Members, especially developing country Members, about market opportunities created by environmental measures.

192. In the meantime, the CTE recommends that the WTO Secretariat compile from the Central Registry of Notifications all notifications of trade-related environmental measures and collate these in a single database which can be accessed by WTO Members. The database could contain information where available for each notified measure: its nature/title; objective(s); product coverage; relevant WTO provisions and MEA provisions; and a description of how it operates. This database should be kept updated.

193. The CTE welcomes the efforts of other inter-g12.a2.6()sa th ,esati(S)1t6(es)5.4(lc)7.3(eu)126.7(of 2f.a0.8(al)ar es)6.1.h13.3(i

provisions, in particular Article XIV(b). An invitation by the CTE to Members to submit any further information in this regard remains open.

211. Further work in the CTE on this Item is necessary before it could be in a position to draw any conclusions on the relationship between services trade and the environment, or on the relevance of inter-governmental agreements on the environment and their relationship to the GATS in the context of sustainable development.

ITEM 10:

ANNEX IV

COMMITTEE ON TRADE AND ENVIRONMENT

1995, 1996, 1997, 1998, mid 1999

DOCUMENT	SUBJECT/TITLE OF DOCUMENT
WT/CTE/W/1	Environmental benefits of removing trade restrictions and distortions - Note by the Secretariat
WT/CTE/W/2	Communication from Chile
WT/CTE/W/3	Communication from the Secretariat - WTO report to third session of the Commission on Sustainable Development on 11-28 April 1995
WT/CTE/W/4	Approaches to the relationship between the provisions of the multilateral trading system and trade measures pursuant to multilateral environmental agreements - Note by the Secretariat
WT/CTE/W/4/Corr.1	Corrigendum - paragraph 20
WT/CTE/W/5	Item 4: The provisions of the multilateral trading system with respect to the transparency of trade measures used for environmental purposes and environmental measures and requirements which have significant trade effects - Note by the Secretariat
WT/CTE/W/6	A description of International agreements and instruments dealing with trade in domestically prohibited goods and other hazardous substances - Note by the Secretariat
WT/CTE/W/7	UNCED follow-up: Results of the third session of the Commission on Sustainable Development - Note by the Secretariat
WT/CTE/W/8	Environment and TRIPs
WT/CTE/W/8/Corr.1	Corrigendum - page 37
WT/CTE/W/9	Environment and Services
WT/CTE/W/10-G/TBT/W/11	Negotiating History of the coverage of the agreement on technical barriers to trade with regard to labelling requirements, voluntary standards, and processes and production

DOCUMENT	SUBJECT/TITLE OF DOCUMENT
WT/CTE/W/24	Communication from Argentina on Item 6 of the Committee's work programme - The environmental benefits of removing trade restrictions and distortions, including tariff escalation, subsidies, state trading, and excessively high tariffs
WT/CTE/W/24/Corr.1	Corrigendum - Para.23(a)

DOCUMENT	SUBJECT/TITLE OF DOCUMENT
WT/CTE/W/52	Item 6: the fisheries sector - Submission by New Zealand
WT/CTE/W/53	GATT/WTO dispute settlement practice relating to Article XX, paragraphs (b), (d) and (g) of GATT
WT/CTE/W/54- WT/COMTD/W/30	Statement by Prime Minister Goh Chok Tong of the Rep. of Singapore at the 19th Special Session of the UN Gen. Assembly on Tuesday 24 June 1997 - Communication by Singapore
WT/CTE/W/55	Recent trade-related developments in the Basel Convention - Communication from the Basel Convention Secretariat
WT/CTE/W/56	Results of the UN General Assembly Special Session to review the implementation of Agenda 21
WT/CTE/W/57	The Montreal Protocol and trade measures - Communication from the Secretariat for the

DOCUMENT	SUBJECT/TITLE OF DOCUMENT
WT/CTE/W/83	EC comments on WT/CTE/W/67 – Note by the European Community
WT/CTE/W/84	Communication from the Secretariat of the Intergovernmental Forum on Forests (IFF)
WT/CTE/W/85	Cluster on MEAs - It. 8 - Response of India to comments by US on WT/CTE/W/65
WT/CTE/W/86	Recent developments in multilateral environmental agreements (MEAs)
WT/CTE/W/87	Communication from the Secretariat of the International Commission for the Conservation of Tunas (ICCAT)
WT/CTE/W/88	Communication from the Secretariat of UN/ECE Convention on Long-Range Transboundary Air on POPs
WT/CTE/W/89	Communication from the Secretariat of the International Tropical Timber Organization
WT/CTE/W/90	Communication from the Secretariat of the Basel Convention on the Control of …
WT/CTE/W/91	Communication from the Secretariat of UNEP Chemicals (IRPTC)
WT/CTE/W/92	Communication from the Secretariat of the Convention on Biological Diversity (CBD)
WT/CTE/W/93	Industrial Principles for Sustainable Development - Communication from Brazil

DOCUMENT	SUBJECT/TITLE OF DOCUMENT

ANNEX V
World Trade Organization

(a) charges and taxes for environmental purposes

(b) requirements for environmental purposes relating to products, including standards and technical regulations, packaging, labelling and recycling;