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# IMPLICATIONS OF ENVIRONMENTAL MEASURES ON OIL TRADE

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Dr. Hussein ABDALLAH

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# IMPLICATION OF ENVIRONMENTAL MEASURES ON OIL TRADE

Dr. Hussein ABDALLAH

## Chapter One - Introduction

- Advocates of environmental protection link carbon dioxide (CO2) emissions to the greenhouse effect and the global warming phenomenon. It is a known fact that CO2 is emitted in large quantities as a result of natural factors which balance each other over in the long run.

Human beings, however, have also contributed to an increase in emissions of CO2. The atmospheric concentration of CO2 in the past hundred years has increased from nearly 290 to 350 parts per million, a growth rate of 20-25 per cent. Studies presented at the United Nations Conference on Environment and Development (Rio de Janeiro, 1992) indicate that the average atmospheric temperature has increased over the past hundred years by between 0.3 and 0.6 degrees centigrade. Industry and other activities between 1950 and 1990 led to an increase in carbon emissions from 1.6 billion tons to nearly six billion tons per annum. Since each ton of carbon is capable of emitting nearly 3.4 tons of CO2, the CO2 emissions had reached nearly 20 billion tons in 1990. If things are left business-as-usual, CO2 emissions may reach 27 billion tons by 2010 and 33 billion tons in 2020 (Table 1). According to some environmentalists, global temperature may rise by 2050 to such a degree that would be capable of melting the polar ice caps, causing ocean and sea levels to rise and leading to massive floods drowning the low lands.

In an effort to discredit the scientific foundation that links CO2 emission to the green house effect and global warming, some experts argue that temperature rises over the past 100 year did not coincide with periods of high CO2 atmospheric concentration. Moreover, computer-based models may agree that temperature is expected to rise in future, but they do not agree as to by how much would it be. On the other hand, simulation programs, as worked out by computers, are largely uncertain. Therefore, they should not be used as foundation for serious environmental programs such as imposing additional taxes over and above those which already burden the oil and gas consumption, the so-called "carbon tax".

The global warming theory is also challenged on the grounds that, even if temperature would increase, losses would be limited compared to those losses caused by imposing taxes on energy sources. The global warming would only slow down the rates of economic growth around the world, and losses would not exceed nearly 20% of GDP over 100 years. This should be minor losses if compared with those caused by the carbon tax. The tax effect would curb the use of energy and inflict serious losses on world economy, and greatly harm the GDP of most developing countries that are trying hard to catch up with developed nations. The tax opponents conclude that the world still needs to elaborate enough scientific evidences to define the real nature of the problem. Once this is achieved, effective remedies could be prescribed, rather than hastening with premature decisions to impose carbon taxes.

for example, people bicycle instead of driving, also influence the energy intensity of an economy and are reflected in the autonomous rate of energy use. In sum, even without implementing specific energy policies, energy intensities may gradually trend down. This is what have been the case in developed countries while energy prices have fallen.

As a result of the oil supply disruptions and price adjustment of the 1970s, energy intensity has dropped consistently among most of the industrialized nations. The continuing decrease projected in the reference case, which we will discuss in Chapter (2), is based on an expected shift away from heavy industry toward information-based service economies and the adoption of inherently more efficient technologies, even in the face of stable energy prices.

North America's energy intensity - the highest in the industrialized world- is more than twice that of industrialized Asia. Energy intensity in North America dropped sharply in the 1980s following the price increases of the late 1970s and early 1980s. It is projected to continue dropping as the economy grows more rapidly than energy demand. The energy intensity of the industrialized Annex I countries is projected to decline by about 24% between 1996 and 2020 in the reference case.

Carbon Intensity of Energy Supply is a measure of the amount of carbon used per unit of energy produced. Because energy produced from nuclear power plants and from most renewable facilities (wind, solar, and hydropower) emit no carbon and the carbon content of fossil fuels varies, fuel choice makes a significant difference in terms of the amount of CO2 emission. Coal emits the largest amount of carbon per unit of energy output, oil the next largest, and natural gas the least of the fossil fuels. For each ton of oil equivalent (toe), oil emits 0.82 ton of carbon, natural gas emits 0.63 ton and coal emits 1.05 ton of carbon. Therefore, fuel switching would contribute the most to meeting emissions reduction goals.

Carbon intensity also differs across regions and over time. However, the differences tend to be smaller than the differences in energy intensity. Before 1990, the carbon intensity for North America was the lowest of the industrialized regions. From 1990 to 1995, however, coal became a less important energy source in Western Europe with the shutting down of lignite production in Germany and hard coal production in the United Kingdom. Significant amounts of coal use are replaced by natural gas and by nuclear power, particularly in France. As a result, North America now has the highest carbon intensity among the industrialized regions, a circumstance that is expected to continue through 2020. A further problem with regard to carbon intensity in the United States is the expected loss of nuclear generation capacity, which is likely to be replaced by fossil fuel generation. Likewise, If a significant amount of Europe's nuclear capacity is retired early, reductions in carbon intensity will become more difficult.

Industrialized Asia has shown, and is projected to show, a carbon intensity similar to that for Western Europe. Japan is somewhat limited in its ability to expand natural gas use due to the relatively high cost of liquefied natural gas. The main source of non-carbon- emitting energy in Japan is nuclear power, which is projected to increase.

Hydropower, which has played a role in moderating carbon intensities in various countries, faces limited prospects for the future. Most of the best

Based on business-as-usual assumptions, a reference case (RC) is developed and used as a yardstick to measure possible changes. The RC will include the main indicators of world energy consumption and carbon emissions over the period 1990-2020. Special emphasis will be given to the sub-period 1990-2010 which is covered by Kyoto Protocol and its parameters are easier to estimate with less uncertainty.

- The RC projections, as estimated by the US Energy Information Authority (EIA) and published in March 1999, are shown in the following table (for details see Table 1) :

| | **Energy Consumption** | | | | **Carbon Emissions (mtc)**[2] | | | |
|---|---|---|---|---|---|---|---|---|
| **Total World** | 1990 | 1996 | 2010 | 2020 | 1990 | 1996 | 2010 | 2020 |
| Quadrillion Btu | 344 | 376 | 504 | 612 | 5786 | 5983 | 8018 | 9817 |
| Billion toe | 8.66 | 9.46 | 12.71 | 15.42 | Toe = 40 million Btu | | | |
| Million boe/d | 173 | 189 | 254 | 305 | Boe = 5.5 million Btu | | | |

This would result in an increase of 62% or an average annual rate of 2.1% for both world energy consumption and related carbon emissions over the period 1996-2020.

Much of the growth in energy use will occur in the industrialized world over the next two decades. Energy consumption in the developing world (defined as developing Asia, Africa, the Middle East, and Central and South America) is expected to more than double over the projection period, with highest growth rates expected in developing Asia and Central and South America. Energy use in the developing world is projected to surpass that of the industrialized world by 6% in 2020—whereas in 1996 energy consumption in the developing countries was about 40% lower than that in the industrialized countries (Table 1).

Economic recovery in the former Soviet Union (FSU) will be delayed due to recent economic crisis. Therefore, energy use in the FSU is projected to begin recovering by 2005, but even at the end of the projection period energy consumption remains below its 1990 level.

In the industrialized countries, a major issue for energy consumption is the possible impact of Kyoto Protocol, which would require reductions or limits to the growth of carbon emissions within the Annex I countries between 2008 and 2012, resulting in a combined 4% reduction in emissions relative to 1990 levels.

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988, within the framework of the United Nations, to assess the available scientific, technical, and socioeconomic information in the field of climate change.

The text of the Framework Convention on Climate Change (FCCC) was adopted at the United Nations on May 9, 1992, and opened for signature at Rio de Janeiro on June 4, 1992. The main objective of the FCCC is to achieve stabilization of the greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous damage to the climate system. The signatories agreed to formulate programs to mitigate climate

[2] Mtc = million ton of carbon

group of Annex I countries may create a bubble or umbrella to meet the total commitment of all the member nations. In a bubble, countries would agree to meet their total commitment jointly by allocating a share to each member. In an umbrella arrangement, the total reduction of all member nations would be met collectively through the trading of emission rights.

The three Kyoto " flexible mechanisms", which are : emissions trading between Annex I countries, joint implementation projects, and the CDM, may reduce the cost of compliance to the Protocol targets. Guidelines for those provisions, however, remain to be resolved at future negotiation meetings. Because the exact rules that would govern the final implementation of the Protocol are not known with certainty, the specific reduction in energy-related emissions cannot be established.

The CDM is the only one of the mechanisms which involve the participation of developing countries (DCs). It could lead to additional investment for mitigating projects and also assist DCs in undertaking climate protection measures.

At COP4, negotiation positions differed with regard to the flexible mechanisms implementation. The EU stressed that Parties must start with domestic action and that flexible mechanism should not create loopholes that weaken commitments. Hence, EU has proposed a cap on emission trading. A proposal was tabled at COP4 by the Group-77+China and the EU to combine the flexible mechanisms with a tax on the trading of carbon emission permits. In contrast, the "Umbrella Group", which includes US, Japan, Russia and others, rejected any restrictions on trade, in the form of either the proportion of emissions that may be traded or the introduction of a tax.

Climate change negotiation is placing so much emphasis on flexible mechanisms as a means to minimize costs for Annex 1 Parties. However, the implications of Kyoto Protocol on the oil-exporting countries, which provide the bulk of fossil fuels (oil and gas) should also be examined. In Chapter (6), we will discuss the potential impact of Kyoto Protocol on OPEC oil exports and oil revenue. Several scenarios will estimate revenue losses caused by mitigation policies and the options opened for OPEC to remedy adverse repercussions.

Now, the RC projection suggests that the industrialized world would account for about 30% of the world's increment in energy use between 1996 and 2010. If the Protocol's emission targets were achieved solely by reducing fossil energy use, consumption of fossil fuels in the industrialized countries would be reduced by between 30 and 60 quadrillion British thermal units (Btu) - equivalent to between 15 and 30 million barrels of oil per day.

It is more likely, however, that fuel-switching opportunities will be used and that a more modest reduction in total fossil fuel use will be required. Emissions trading and other offsets (such as reforestation) that may be allowed under the Protocol could further lower the need for fossil fuel reductions. However, the specific mechanisms for such offsets have not yet been established, as was mentioned earlier.

As Table (1) shows, world carbon emissions, according to RC, are expected to reach 8.0 billion metric tons (BMT) by 2010 and 9.8 BMT in 2020 without accounting for the potential impact of the Kyoto Protocol. In this forecast, world carbon emissions exceed their 1990 levels by 38% in 2010 and by 70% in 2020. Emissions in the industrialized world would grow over the period 1990-2020 by about 1.0 BMT, from 2.85 to 3.9 BMT.

by avoiding the technical complexities and omitting the figures which are specifically tailored for the U.S. economy.

As was mentioned earlier, the Kyoto Protocol established emissions targets for each of the Annex I countries, which includes the US, relative to their 1990 emissions levels. The target for the U.S. is 7% below 1990 levels.

The provisions of the Kyoto Protocol, including international emissions trading between Annex I countries, joint implementation projects, and the CDM, may reduce the cost of compliance in the U.S. Guidelines for those provisions, however, remain to be resolved at future negotiating meetings. Because the exact rules that would govern the final implementation of the Protocol are not yet known with certainty, the specific reduction in energy-related emissions cannot be estimated.

As a result of the economic decline that has occurred in the FSU region during the 1990s there may be 324 million metric tons of carbon permits available from the Annex I countries of FSU in 2010. Accordingly, with the higher level of credits available from the EE/FSU, Annex I countries would need to reduce emissions by only 10% from the reference case (RC) projection to meet their Kyoto Protocol targets.

The following analysis would present cases that assume a range of reductions in energy-related carbon emissions in the U.S. Each case was analyzed to estimate the energy and economic impacts of achieving an assumed level of reductions.

A reference case and six carbon emissions reduction cases were examined for the U.S. study. The seven cases are:

• Reference Case (RC) (33% above 1990 levels). This case represents the reference projections of energy markets and carbon emissions without any enforced reductions and is presented as a baseline for comparisons of the energy market impacts in the reduction cases. Energy-related carbon emissions is projected in the RC to reach 1,791 million metric tons in 2010.

• 24% above 1990 levels (1990+24%). This case assumes that carbon emissions can increase to an average of 1,670 million metric tons between 2008 and 2012.

•14% above 1990 levels (1990+14%).

• 9% above 1990 levels (1990+9%).

• Stabilization at 1990 levels (1990). This case assumes that carbon emissions reach an average of 1,345 million metric tons during the commitment period of 2008 through 2012, which is approximately at the 1990 level of 1,346 million metric tons.

• 3% below 1990 levels (1990-3%). This case assumes that energy-related carbon emissions are reduced to an average of 1,307 million metric tons between 2008 and 2012, or an average annual reduction of 485 million metric tons from the RC projections.

• 7% below 1990 levels (1990-7%).

The Protocol does not specify any targets beyond the first commitment period of 2008 through 2012. Therefore, this target is assumed to hold constant from 2013 through 2020, the end of the forecast horizon. The target is assumed to be phased in over a 3-year period, beginning in 2005, because the Protocol indicates that demonstrable progress toward reducing emissions must be shown by 2005.

As a result of the carbon prices and higher delivered energy prices, the overall intensity of energy declines in the carbon reduction cases. Energy intensity, measured in energy consumed per dollar of gross domestic product (GDP), declines (i.e., improves) at an average annual rate of 1% between 2005 and 2010 in the RC due to the availability and adoption of more efficient equipment. In the carbon reduction cases, higher rates of improvement are projected, from 1.6% per year in the 1990+24% case to triple the RC rate at 3.0% per year in the 1990-7% case.

In 2010, reductions in carbon emissions from electricity generation account for between 68 and 75%of the total carbon reductions across the cases. Electricity generators are expected to respond more strongly than end-use consumers to higher prices because this industry has traditionally been cost-minimizing, factoring future energy price increases into investment decisions. In addition, there are a number of more efficient and lower-carbon technologies for electricity generation that become economically available as the cost of generating electricity from fossil fuels increases.

In contrast, the end-use consumers are assumed to consider only current prices in making their investment decisions and to consider additional factors, not only price, in their decisions. However, in response to higher energy prices, end-users would have an incentive to reduce demand for energy sources, switch to lower-carbon energy sources, and invest in more energy-efficient technologies.

Fuel switching also accounts for much of carbon reductions. Reduction in electricity demand in response to higher electricity prices is somewhat mitigated by the change in relative prices. In 2010, electricity prices are between 20% and 86% above the RC prices across the carbon reduction cases. However, delivered natural gas prices are higher by between 25% and 147%. With a smaller percentage price increase, electricity becomes more attractive in those end uses where it competes with natural gas, such as home heating.

Since coal is the most carbon-intensive of the fossil fuels, delivered coal prices are most affected by the carbon prices. The delivered price of coal to generators in 2010 is higher by between 153% and nearly 800% in the carbon reduction cases relative to the RC. As a result, coal-fired generation, which accounts for about half of all generation in 2010 in the RC, will have a share between 42% and 12%in 2010 in the carbon reduction cases. To replace coal plants, generators build more natural gas plants, extend the life of existing nuclear plants, and dramatically increase the use of renewables.

Because of the high carbon content of coal, U.S. total domestic coal consumption is significantly reduced in the carbon reduction cases, by between 18 and 77% relative to the RC in 2010. Coal exports are also lower in the carbon reduction cases, by between 21% and 32%, due to lower demand for coal in the Annex I nations.

Total carbon emissions from the U.S. industrial sector are lower by between 7% and 28% in 2010 in the carbon reduction cases, relative to the RC. As energy prices increase, industrial consumers accelerate the replacement of productive capacity, invest in more efficient technology, and switch to less carbon-intensive fuels. In 2010, industrial energy intensity is

Consumption of renewable energy, which results in no net carbon emissions, is projected to be significantly higher with carbon reduction targets. Across the carbon reduction cases, renewable energy consumption increases by between 2% and 16% in 2010 and by between 9% and 70% in 2020. Most of this increase occurs in electricity generation, primarily with additions to wind energy systems and an increase in the use of biomass. In the carbon reduction cases, the share of renewable electricity generation is as much as 14% in 2010, compared with 10% in the RC, increasing in 2020 to 22%, compared with 9% in the RC.

In this energy market analyses, the projected carbon prices reflect the prices the U.S. would be willing to pay to achieve the Kyoto targets, without addressing the international trade in carbon permits. The macroeconomic analysis assumes that the carbon permit trading system would function as an auction run by the Federal Government, and that the U.S. would be free to purchase carbon permits in an international market at the marginal abatement cost in the U.S. The U.S. emissions target could be achieved through a combination of domestic actions, such as carbon-absorbing sinks, and the purchase of permits on the international market. Thus, two flows of funds occur : domestic and international.

On the domestic side, U.S. permits are sold in a competitive auction run by the Federal Government, raising large sums of funds from the domestic market. The collection of this money necessitates a careful consideration of appropriate fiscal policy to accompany the permit auction. Two approaches are considered in this regard: first, returning collected revenues to consumers through a personal income tax lump sum rebate and, second, lowering social security tax rates as they apply to both employers and employees. The two policies are representative of a set of possible fiscal policies that might accompany an initial carbon mitigation policy.

The second flow of funds is associated with U.S. purchases of international carbon permits and assumes that the carbon price determined in the U.S. energy market analysis is the international price at which permits would be traded[3]. The purchase of international permits represents a claim on the productive capacity of domestic U.S. resources. Essentially, as funds flow abroad, other countries have an increased claim on U.S. goods and services.

As a direct consequence of the carbon price, aggregate energy prices in the U.S. economy are expected to rise. The projected energy price increases would also affect downstream prices for all goods and services in the economy as measured by the producer price index. As a rule of thumb for the year 2010: each 10% increase in aggregate prices for energy may lead to a 1.5% increase in producer prices and a 0.7% increase in consumer prices.

Because energy resources are used to produce most goods and services, higher energy prices can affect the economy's production potential. The loss of potential GDP measures the loss in productive capacity of the economy directly attributable to the reduction in energy resources available to the economy. Long-run costs are considered unavoidable. Short-run costs

[3] This assumption is the only available one because of the absence at the time being of an international market for permits.

income tax option moderates the impacts through a return of funds to consumers, the social security tax option has cost-cutting aspects of lowering the employer portion of the tax, which serves to reduce inflationary pressures in the aggregate economy. On the employer side, the reduction in employer contributions to the social security system would lower costs to the firm and, thereby, moderate the near-term price consequences to the economy. Since it is the price effect that produces the predominately negative effect on the economy, any steps to reduce inflationary pressures would serve to moderate adverse impacts on the aggregate economy.

The assumed rate of economic growth has a strong impact on the projection of energy consumption and, therefore, on the projected levels of carbon emissions. An assumption of a higher economic growth results from higher assumed growth in population, the labor force, and labor productivity, resulting in higher industrial output, lower inflation, and lower interest rates. As a result, GDP increases at an average rate of 2.4% a year through 2020, compared with a growth rate of 1.9% a year in the RC. With higher macroeconomic growth, energy demand grows faster, as higher manufacturing output and higher income increase the demand for energy, resulting in higher carbon emissions. As a result, carbon prices must be correspondingly higher to attain a given carbon emissions target. The higher carbon prices necessary to achieve the carbon reductions with higher economic growth have a negative impact on the economy and the energy system.

The opposite effects would be expected under the assumption of a low economic growth in the range of an average annual growth rate of 1.3%.

Total energy intensity is lower in the high economic growth case, partially offsetting the increases in the demand for energy caused by the higher growth assumption. With higher economic growth, there is greater opportunity to turn over and improve the stock of energy-using technologies. In addition, the higher carbon price induces more efficiency improvements and some offsetting reductions in energy demand, moderating the impacts of higher economic growth. With higher economic growth, aggregate energy intensity declines at an average annual rate of 1.9% through 2010, compared to 1.6% with reference economic growth. The opposite effects on energy intensity occur with lower economic growth, with the decline in energy intensity slowing from 1.6% to 1.3% between 1996 and 2010.

The rates of development and market penetration of energy-using technologies have a significant impact on projected energy consumption and energy-related carbon emissions. Faster development of more energy-efficient or lower-carbon-emitting technologies than assumed in the RC could reduce both consumption and emissions. However, because the RC already assumes continued improvement in both energy consumption and production technologies, slower technological development is also possible.

To analyze the impacts of technology improvement, a case based on high technology assumptions was developed by experts in technology engineering for each of the energy-consuming sectors, considering the potential impacts of increased research and development for more advanced technologies. This case is distinct from the more rapid adoption of advanced technologies that occurs with higher energy prices in the carbon reduction

In addition to the uncertainties concerning the final interpretation and implementation of the Kyoto Protocol, specific actions that might be taken to reduce GHG emissions in the U.S. have not been formulated. Actions taken by other Annex I countries to reduce emissions, future growth in worldwide energy consumption and emissions, and the opportunities for reducing emissions through joint implementation and the CDM are unknown, and they are likely to have important impacts on the international trade of carbon permits and the carbon permit price. This analysis assumes that auctioned permits will constrain carbon emissions and raise the price of fossil fuels, with revenues from the auction recycled to consumers either through personal income tax or social security tax rebates. Alternative carbon reduction programs and fiscal policies would be likely to change the cost of carbon reduction from the costs in this analysis. The timing of carbon reduction programs and the amount of adjustment time allowed could also be important in determining costs.

Future technology development also cannot be known with certainty and may have a significant effect on the cost of achieving carbon reductions. The technology cases in this analysis explore some of the potential impacts, but even the high technology case does not include possible breakthrough or speculative technologies. On the other hand, even the RC technology assumptions include continued development of more energy-efficient and renewable technologies, which serve to mitigate the costs of carbon reduction. Those technology improvements are likely, but not certain.

Finally, consumer response to carbon initiatives is uncertain. Because energy price changes that have occurred in the past may not provide sufficient evidence about the reaction of consumers to sustained high energy prices, changes in demand as a result of the higher carbon fees cannot be projected with confidence. In addition to price-induced changes, consumers might also respond to climate change initiatives and a national commitment to reduce emissions by adopting more energy-efficient or renewable technologies sooner than expected. Finally, public acceptance of large-scale renewable technologies or the continuation of nuclear power—both of which make important contributions to the achievement of the carbon emissions reductions at the costs projected in this analysis—cannot be known with certainty.

To conclude, it is quite obvious that in all cases, the emission limitation or reduction will necessitate the reduction of energy consumption, including oil, which means a loss of revenue for oil exporters. By how much and how can oil exporters defend their interests? this is what we will try to answer in Chapter (6).

## Chapter Four - The European Union Carbon Tax

The EU environmental legislation takes the form of Directives. These are legal instruments which are binding on the result to be achieved, such as a particular air quality level, but leaves to each member state the freedom to choose the form and method to achieve that result within its own constitutional and legislative framework. The EU policy is to approximately raise the environmental standards in the Union to the highest level that exist among

would be reduced to $0.95 in the case of hydro-electricity which has no carbon content. Solar, wind, and wave energies would be exempted.

The tax proposal was intended to be "neutral" in the sense that it would not add to the tax burden in general and, as such, it would not depress the overall level of economic activities. The ways and means to recycle the tax revenues have been briefly explained Chapter (3). In the European case, the tax neutrality concept has focused on the employment issue in order to make the tax proposal more attractive.

The EC was aware that their area only contributed 15% of total world CO2 emission. Therefore, and in order not to lose competitiveness in world markets due to increased costs, the tax proposal was conditional. It provided that EC would adopt the tax, only if other OECD countries would adopt measures that result in similar environmental and financial outcomes. It also provided that a tax exemption could be granted to domestic industries which undertake a CO2 curbing investment, and in cases where strong commercial competition is faced from countries that do not apply similar measures.

So far, the EC carbon tax proposal has been swinging among acceptance and refusal by member countries. One of the most important reasons for opposing the tax, was its negative impact on the economies of member countries. The tax would exert higher costs on domestic production and, therefore, reduce the competitiveness of exports. These would be devastating effects, considering the higher rate of unemployment and economic recession that Europe was passing through. On the other hand, the level of carbon tax, as proposed by EC Commission, would fall short of attaining the required target. A much higher level of the tax which is capable of reaching the goal, would be unrealistic.

Even, if we accept the limited environmental effect of the tax, this effectiveness would subsides when the tax is integrated within the overall tax structure and ceases to increase. The CO2 will again start increasing. The carbon tax was also strongly opposed by European industrialists. In France, industrial losses due to the tax was estimated at $1.25 billion per year. Electricity companies in Germany also opposed the tax because they heavily depend on coal for electricity generation. Likewise, the European petrochemical industries stood strongly against the tax on the grounds that, even without the tax, the industry was suffering from high energy taxes and, therefore, ranked third behind similar industries in GCC and the United States. Britain strongly opposed the tax because it believed that tax imposition is a sovereign right of each country. Accordingly, each country should be left free to adopt whatever measures it sees suitable to attain the environmental targets. The cohesion group of countries (Spain, Portugal, Greece and Ireland) which are the economically weakest among the EU members, opposed the tax because it would slow down their pace to catch up with their rich fellow members.

Against this opposition the EC commission tried to modify its carbon tax proposal in order to make it acceptable to the cohesion group. The modification used two criteria to measure the ability of tax imposition. The first, was the per capita CO2 emission, and the second was the per capita GDP. Applying the average of the two measurements in the EC during 1990 would present an index number of 100. Any member country which realizes at the initial time of imposing the tax an average of less than 85% would be

restructure their tax systems and differentiate between taxes on environmental grounds, as long as they comply with the minimum set rates. While the old approach did not interlink with existing energy tariffs in the EU countries, the new approach tends to integrate itself with existing tax structures, hoping to end up with a coordinated one.

States may choose to exempt, or tax at a lower level, renewable energy sources, biofuels, products used in pilot energy projects, the carriage of goods and passengers by rail and navigation on inland waterways.

Firms with energy costs between 10-20% of production costs will be entitled to refunds of all or part of the proportion of taxes they have paid which come to more than 10% of their production costs. Member states will have to refund all tax paid on the proportion of energy costs in excess of 10% of production costs to companies with energy costs higher than 20% of production costs.

The new proposal also restates 'the objective of tax neutrality' by calling on states to reduce the statutory charges on labor at the same time as introducing the new common system for the taxation of energy products.

The new approach further abandons the conditional feature which makes the tax application dependent on matching measures taken by other OECD countries. The new approach expected other countries to spontaneously follow the EU action without prior conditions of reciprocity.

On face, the European Commission (EU now) seems to delegate its role of tax imposition to each member country, but in essence it has preserved its right to come back in 1999 with proposals to attain the ultimate goal of coordinating all first phase efforts.

The new proposal may not have a chance to survive, since it needs the unanimous support of member states to become law.

Britain has received the new approach with much doubt, despite the fact that it was the closest to what Britain has been promoting all the way from the inception of the carbon tax proposal. The British Chancellor of the Exchequer expressed these doubts, in May 1995, when he said that the carbon tax would impair the competitiveness of European industries in world markets. In December 1998, the British Chancellor warned Franco-German attempts to push harmonisation of direct taxes after the single currency is introduced, and that Britain will block harmonisation of energy taxes on oil, gas and electricity. He insisted that a plan to introduce an EU-wide carbon energy tax, putting a levy on business use of oil, gas and electricity, will not be agreed if it is against Britain's interest. He stressed that anything proposed on tax requires a unanimous vote and that Britain is absolutely determined to continue setting taxation policy.

The European Federation of Employers' Associations (UNICE) and most energy-intensive industries such as the steel and car sectors share the view of the European chemical industry that the tax proposal threatens international competitiveness. The European Chemical Industry Council (CEFIC) points out that Europe already has energy prices that are on average 30% higher than those in the US. Related taxes put a further 7% on top, which would increase by another 6% under the new proposal. It adds that the European chemical industry has voluntarily committed itself to improving energy efficiency by 20% by 2005 from 1990 levels. The CEFIC welcomes the

Consequently, host governments which were entitled to only 50% of oil profit, got no more than 30 cents per barrel in terms of 1947 dollars.

Oil trade is characterized by an oil-rent endowment which is represented by the surplus in what the final consumer pays over total costs, including those of production, transport, refining, distribution and intermediate companies profit. The oil rent is distributed among oil exporting countries (as represented by the surplus in crude oil price over production cost termed in its narrow sense), and oil consuming countries (as represented by the duties and excise taxes imposed on oil products ex-refinery).

The legitimacy of oil producers share of rent stems from the fact that oil is a finite and depletable natural resource. Therefore, this share of oil rent is meant to partially compensate for the depletion of this precious wealth. As such, it is a price for the raw material separate from production costs. On the other hand, the producer share of rent could help raising sufficient funds to invest in exploring for and developing new fields in order to replace depleted ones, and to meet the increasing world demand for oil. The United States struck an example in the past by allowing oil companies a tax credit known as "depletion allowance" in order to enable them finance their programs of oil exploration and development.

Depending on the level of crude oil price, the distribution of oil rent would tilt one way or the other. The higher the price of oil, the larger the share of oil exporter, and vice versa.

Instead of imposing custom duties on oil imports, Western industrialized countries opted to impose heavy excise taxes on refined products consumption. These, in turn, boosted prices for the ultimate consumer in the same way custom duties would have done. Both kinds of taxes are capable of producing restrictive impact on oil consumption and import volumes, and limiting the freedom of oil trade.

With lower crude oil prices and heavy excise taxes on oil products in their domestic markets, those countries were able to seize the largest portion of oil rent, notwithstanding the right of oil-exporting countries to a greater share according to the principle of legitimacy.

The rationale behind oil taxes in consuming countries differ from case to case. The tax on gasoline raises the largest part of oil taxes and is partly directed to cover the costs of road building and maintenance. The remainder of gasoline taxes would flow as a lucrative financial source to feed public treasuries. Some oil taxes may purposely be imposed to subsidize local coal industries, as is the case in Europe and Japan. Oil taxes may also have differing rates so as to restructure energy consumption patterns. For example, environment protection may require lower taxes on unleaded gasoline, natural gas, electricity, and low-sulphur fuel oil. The tax system may also favor the consumption of domestic sources of energy in order to help support the balance of payments. One of the recent motives to impose oil taxes has been the finance of keeping strategic oil reserves, which is the case in Germany, France, Netherlands and Denmark.

In 1970, a composite barrel of refined products was sold to ultimate consumers in the European Communities at $ 11.42. Allowing for total costs, including costs of production, transport, refining and distribution as well as intermediate companies profits, would leave oil-rent in the amount of $ 6.07.

nearly 300, would show that crude oil price during the period 1986-1991 had averaged $5.90 expressed in 1973 dollars. The period 1991-1998 has likewise witnessed a trend of reduced oil prices, hence a reduced share of oil rent for oil exporting countries, in both current and real terms.

Another negative impact on oil exporters which results from increased taxes in oil consuming countries, is the separation of ultimate consumers from the positive effect of decreasing crude oil prices. As was mentioned earlier, a natural effect of reduced crude prices would be expected to result in increasing oil consumption and rising demand for oil. However, this positive effect was offset because industrialized countries were keen to boost taxes on oil products every time crude prices went down.

The explanation of policies that led to decreasing crude oil prices is beyond the scope of this paper [4]. But one of those policies, however, need to be touched upon because it is directly related to GATT. OPEC members were accused by GATT of transgressing GATT regulations and establishing a commercial cartel in order to increase oil prices and restrict free trade. Consequently the US Congress was induced to enact retaliatory procedures against OPEC members which deprived them the benefits of the Generalized System of Preference (GSP)[5]. This, in addition to other pressures, forced OPEC members to abandon, since 1986, their policy of commitment to fixed prices. Henceforth, prices were determined through market competition (market-oriented pricing) under which oil prices kept dwindling and subject to violent fluctuation.

In fact, OPEC members did not invent anything when they coordinated their oil supplies in order to guard against wasting their basic export commodity at abnormally low prices. This was earlier exemplified by some American oil-producing states (such as Texas and Louisiana) when they decreed and implemented systems and programs to limit the volume of American oil pumped into local markets in order to sustain at a certain level oil prices and producers income. Such measures are accepted in natural resources economics and policies as a tool to maintain the stability of industry.

Moreover, OPEC action was in complete consistency with Article 20 of GATT which authorizes governments to take necessary measures to preserve depletable and scarce natural resources as we will explain in Chapter (8). To put a ceiling on oil production in order to sustain a reasonable depletion rate is quite legitimate, since oil is a scarce depletable commodity. On the other hand, in order for an OPEC member to enforce OPEC resolutions, such resolution have to be unanimously voted, which means that OPEC is no more

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[4] For details of this policy, see the author's study, "OPEC and the Oil Market After the Gulf Crisis", **OPEC Review**, Winter 1991.

[5] The GATT round which was held in Tokyo, 1979, introduced a number of exceptions and privileges that could only be enjoyed by developing countries. The Generalized System of Preferences (GSP) was one important privilege according to which industrialized countries were committed to reduce their tariffs on finished and semi-finished commodities when imported from developing countries. The list of GSP included petrochemicals produced by developing countries, yet, industrialized countries often used quantity and ad valerom barriers to impede the in-flow of such products.

oil. Furthermore, demand for energy and oil, is affected by price elasticity, as well as by the degree of industrialization. Development of technology and efficiency of energy use also have an impact on demand for energy and oil. In a more complex demand model, many other factors are at force as is in the case of the U.S. model explained in chapter (3).

As shown by Table (3), the reference scenario expects world demand for energy to increase from 189 million barrels of oil equivalent per day in 1996 to nearly 254 million boe/d in 2010, and 280 million boe/d in 2015, and 305 boe/d in 2020 at an average growth rate of 2.1% per year during the period 1996-2020.

OPEC estimate of average annual rate of growth of world oil demand reflects a wide discrepancy from those of other forecasters. For the period 1997-2020, OPEC estimate runs as low as 1.3% per annum, while EIA estimate of that rate is 1.8% (Table 6). Other forecasters estimates of oil production, which is the same as oil demand, are as follows : IEA 1.9%, DRI 2.0%, PEL 1.9% over 1995-2015, and PIRA 2.0% over 1995-2010 period (Table7).

It is obvious that OPEC estimate is too low. EIA estimate, which we adopt in this chapter, reflects a close average of all available forecasts. Accordingly, world oil consumption would be expected to grow from 71.5 million b/d in 1996 to about 93.5 million b/d in 2010 and 110 million b/d in 2020, at an average growth rate of 1.8% per year.

World oil supply is subject to a number of determinants, mainly demand for oil, since supply is the response to consumer demand at market prices. However, supply may also be limited by oil productive capacity at a given moment in time. Vast oil reserves do not automatically entail an immediate increase in production, even with rising demand. Development of oil fields, including drilling of wells, piping, treatment, storage, and transmission to the tanker or refinery are complex tasks and entail a long lead time. Moreover, the size of oil reserves and productive capacity are directly dependent on investments and the technology used in those processes. Furthermore, even if productive capacity is high enough, production should not exceed the levels specified by technical considerations (MER) which guarantee the highest recovery factor and longevity of field life.

Table (7) shows various forecasts of world oil production which reflect wider discrepancies as we go further in future and among producing areas.

World oil trade is expected to grow from 37 million b/d in 1995 (and 40.4 million b/d in 1998) to nearly 66 million b/d by 2020 (Table 8). Of this tradable volume, OPEC share is expected to reach 72% (48 mb/d) in 2020. Within OPEC only six member states would be able to boost their productive capacity enough to export 42 mb/d or nearly 63% of world oil exports by 2020. These major six countries are Saudi Arabia, Iraq, Iran, UAE, Kuwait and Venezuela.

The significance of this trend is obvious in view of production and marketing policies. In case, oil importing countries decides to impose higher carbon taxes on oil consumption, thus reducing the volume of tradable oil an inflicting great losses to oil revenue, oil exporters should be able to maintain oil supply at such a level that would keep total oil revenues intact. In other words, they should not stand watching oil volumes shrinking due to environmental policies and still maintain the same level of production as high

In as much as oil consuming countries are coordinating, and will continue to coordinate, their energy policies, oil exporters, particularly the Gulf and Arabs at large, should meet these actions by reciprocity[7].

It is within this framework of market structure and expectation that we now turn to discuss the implications of environmental measure on oil trade and revenue.

## Chapter Six - Implication of Kyoto on OPEC

### OPEC Reference Case

In order to examine the possible implications of Kyoto Protocol on OPEC oil production and export revenues, OPEC has built a reference scenario using its OPEC World Energy Model (OWEM). The reference case is based on business-as-usual assumption, free of the Kyoto impact. This baseline scenario adopts the following assumptions.

(1) Oil prices : based on $17 per barrel of OPEC basket price in 2000, the scenario assumes that the price will grow at an annual rate of 1.5% during medium- to long-term. The price would reach (in 1998 dollars) $19.4 in 2010 and $22.5 in 2020[8].

(2) GDP Growth : On the assumption that financial crisis in Asia and Russia will be quickly contained, world real GDP is expected to grow at a rate of 3.4% during 2000-2010 and a rate of 3.1% during 2010-2020.

For comparison, other estimates of economic growth rates over the period 1995-2020 are: 2.9% by EIA, 3.1% by IEA, 2.9% by DRI, and over 1997-2010 period 2.9% by PEL, and over 1995-2010 period 3.5% by PIRA.

(3) Energy Taxation : No major change in energy taxation which are aiming at reducing CO2 emissions is assumed. Yet, existing energy taxes are assumed to grow in line with inflation.

(4) Efficiency Improvement : Non-price energy efficiency improvements is called "autonomous energy efficiency improvement" (AEEI). It plays a central role in determining energy intensity, hence energy demand growth. Although it is subject to much uncertainty, yet an assumption of typical AEEI value ranges between 0 and 1,5% per annum. OPEC scenario adopts a value of 1% in OECD region and slightly higher rates for non-OECD regions.

According to OPEC estimate, oil intensity is expected to decline over the reference case period at more rapid rates than energy intensity, due largely to the strong growth of electricity and natural gas demand. Oil intensity as measured by tons of oil equivalent (toe) per $1000 of real GDP (1990 dollars), is expected to decline from 0.11 toe in 1997 to 0.09 toe in 2010 and to 0.07 in 2020.

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[7] For details on this topic, see : Dr. Hussein Abdallah, "Coordinated Arab Oil Policy", in the quarterly Oil and Arab Cooperation, OAPEC , Kuwait, issue 62, Summer 1992.

[8] This means that the price in current dollars should be escalated at a rate equal to inflation rate in industrialized countries, using 1998 as a base year.

paths and revenues would vary with different scenarios. Furthermore, the issue of trading in permits can be readily addressed in the context of the alternative marginal costs of abatement arising from a domestic tax policy. The degree to which the "flexible mechanisms" are used, can also be considered in light of such scenarios.

The initial scenario, "Kyoto Alone", assumes that each of the three OECD regions will impose a carbon tax that is sufficient to reach their own Kyoto emissions targets by 2010. The targets relative to 1990 level of emission are -6.5% in North America, -8.0% in Western Europe and -3.2% in OECD Pacific.

It is assumed that the tax is both revenue-and inflation-neutral, thereby minimizing economic damage from this policy. It is further assumed, in this initial scenario, that oil prices remain at reference case levels, thereby implying that the fall in oil demand resulting from the tax is entirely absorbed by OPEC in the form of lower production and no price increas. This assumption is later relaxed to explore possible optimum OPEC strategies. It is also assumed that the tax level is imposed immediately, not phased-in, another assumption which is later relaxed.

The following table shows taxes imposed to achieve Kyoto Protocol targets under different scenarios. ($(98) per ton of CO2)[10].

| Region | Kyoto Alone | OECD | Annex I trade | Global Trade |
|---|---|---|---|---|
| N. America | 67.9 | 85.5 | 39.2 | 15.3 |
| W. Europe | 128.2 | 85.5 | 39.2 | 15.3 |
| OECD Pacific | 94.3 | 85.5 | 39.2 | 15.3 |

The imposition of the Kyoto Alone level of taxes, in order to reach the appropriate abatement targets, implies a fall in OECD demand of 6.5 mb/d by the year 2010, down to 42.0 mb/d compared with 48.5 mb/d that it would have reached in the reference case (Table 9). This translates into a fall in the call on OPEC oil of close to 7 mb/d by that date, from 39.6 mb/d to only 32.7mb/d. OPEC annualized revenue losses in this case are close to $23 billion. However, given the exceptionally high tax levels in this scenario[11], it is highly unlikely that such an outcome would materialize. This is not to say that strong downward pressure on oil demand will not emerge. Regulatory measures may eventually be the key policy tool for achieving abatement targets. Nevertheless, to the extent that a price signal is to be used to achieve Kyoto emission reduction, it is clear from the above scenario that a regional tax, such as the EU Carbon Tax, is unlikely to be the prime route.

The lower cost of abatement in North America is exploited in the second scenario, Kyoto OECD where it is assumed that trade in permits is possible, but only among the three OECD regions. This scenario would generate the same aggregate emission reduction. A tax of just over $85/t CO2 would be

[10] Notice that the tax per ton of carbon has to be multiplied by a factor of approximately 3.4. For example, when the tax per ton of CO2 is $85.5, the tax per ton of carbon would be about $290.

[11] The order of magnitude of these taxes is approximately equivalent to current tax levels on the composite barrel in OECD regions.

The tax is now only $15/t CO2, and produces the lowest OPEC revenue losses of all scenarios, down to under $12 bn per annum, or about half of the losses with no trade. In this scenario, 45% of the reduction in emissions by 2010, compared with the reference case, stem from non-Annex I countries. Consequently, although Annex I oil demand is only 1.8 mb/d lower by 2010, this is matched by a further fall of 1.7 mb/d from non-Annex I countries.

These scenarios indicate that trading reduces the marginal cost of abatement by allowing access to cheaper abatement options that are not available domestically. The result is a switch in emphasis away from abatement in the OECD to either the FSU and Eastern Europe, or with mechanisms such as the CDM, to reduce emission in developing countries. This change in regional emphasis also brings with it a broad shift in attention towards reduced coal consumption. As a result, oil demand contraction is not as great as in the non-trading situation.

## Kyoto and oil price movements

The following table shows the price movement under Kyoto Alone scenario based on OPEC estimates (reference year = 2010):

| | Reference case | Kyoto Alone | High oil price | Low oil price |
|---|---|---|---|---|
| Real basket price $(98)/b | 19.4 | 18.8 | 22.7 | 11.2 |
| Discounted annual OPEC revenue $(98) billion | 144.2 | 120.9 | 144.2 | 81.2 |
| World oil demand mb/d | 87.9 | 80.6 | 79.0 | 84.2 |
| Non-OPEC production mb/d | 48.3 | 48.0 | 49.9 | 44.4 |
| OPEC production mb/d | 39.6 | 32.7 | 29.1 | 39.8 |

Maintaining reference case prices, by assuming that OPEC absorbs all of any loss in oil demand, gives rise to substantial revenue losses. The next scenario therefore considers whether OPEC could regains its reference case cumulative revenue by sustaining a higher oil price than is assumed for the reference case. Under the Kyoto Alone scenario, where each OECD region is applying the carbon tax appropriate to its own emission target, OPEC would restraint production in order to sustain crude oil price at sufficiently high levels to generate the same cumulative export revenue by the year 2010 as in the reference case. Here we see that in order to retain medium-term revenue flows at reference case level, OPEC production must fall to below 1995 levels and remain approximately flat for around five years, followed by only a gradual increase that leaves output in 2010 at 29 mb/d similar to current levels. This would produce a robust real oil price of $22.7/b throughout the period to 2010 and achieve the objective of avoiding economic damage from climate change mitigation measures, and maintain oil export revenue unaffected.

The lower price gives rise to an additional 5mb/d of world oil demand, compared with the strong price. Non-OPEC supply is down by a similar amount. Yet, the higher OPEC volume is not sufficient to compensate for the lower price. By 2010 revenue losses with softer prices are more than $60bn per annum compared with $23bn with references case prices and zero with strong prices. In this context, soft oil prices can therefore be regarded as a

have not addresses the years after 2008-12. It is therefore not easy to speculate on future emissions targets.

Despite the wide discrepancies between OPEC estimates of certain parameters and those of other forecasters as already explained, the OPEC study provides useful analytical conclusions. One major conclusion demonstrates that abatement targets of GHG emission laid down in the Kyoto Protocol is likely to cause substantial oil export revenue losses for OPEC Member Countries. Although the impact of allowing trade in emission permits reduces the severity of these losses, they remain high. Joint management of relatively high oil price with non-OPEC oil exporting countries offers the most feasible route to mitigating the severity of losses incurred, together with a full global trading system that is unrestricted by capping.

## Self-achievement of Energy Industry

Before we close this chapter, it may be useful to shed some light on the most important achievements that the energy industries have made over the past two decades. The following are examples of such achievements which introduced significant improvements in operating efficiencies and significantly reduced environmental impacts:

- Sulfur dioxide emissions in the United States have declined by nearly one-third, due in part to the shift in lower-sulfur fuels and to the installation of stack gas scrubbers. Emissions have declined in spite of the fact that utility coal use more than doubled during the same period (the growth consisting mostly of low-sulfur Western coal).
- Natural gas transmissions and distribution costs have declined (in real terms) in recent years, as a consequence of increased competition in the wake of deregulation and unbundling of services. Improved route planning and scheduling, computerization of meter-reading and billing, horizontal boring technology and other enhancements have contributed to this decline.
- Coal transportation costs have likewise declined, thanks to more powerful locomotives, railcars of lighter weight and greater capacity, more efficient loading and unloading equipment, additional sidings, double-tracking and other improvements initiated by the railroads, in addition to the economics of longer average transport distances from Western mines.
- Oil pipeline spills have been reduced dramatically. In Europe, the number of annual pipeline spills has declined an average 5% per annum over the past 23 years, while the volume spilled has declined at 3.5% per annum. This reduction has been achieved through improvements in pipeline design standards, introduction of advanced control systems and leak detection methods, and increased use of intelligence pig inspections.
- Refineries have learned to recover waste heat and otherwise reduce fuel consumption. For example, European refiners reduced specific fuel consumption between 1980 and 1990 even while they were moving to a lighter product slate and meeting new 'greener' product standards. The enhancements in product quality almost exactly offset the fuel efficiencies achieved during this period.

To conclude this chapter, it is quite obvious that the burden and costs of cleaner environment should be shared by all pollutants. Developing countries oil exporters which depend on a single depleting commodity to generate the

because of gross negligence, willful misconduct, or other specified reasons, the vessel and facilities would become entirely liable for all clean-up and compensation costs.

As preventive measure, the Act requires that all new oil tankers and oceangoing barges have double hulls to help prevent oil spills. OPA phases out the use of existing single-hull tankers so that all tankers is use in US waters must have double hulls in 20 years starting 1995. The Act also reinforces the federal authority to ensure the immediate clean-up of oil spills.

The OPA impact on the oil industry is multiple, but the most important of which are the costs associated with procurement of double-hull tankers and insurance coverage since OPA made insurance of tankers travelling in US waters a heavy financial burden. Retrofitting the existing single-hull tankers is uneconomical because it costs nearly 40% of the tanker price and there is a loss of 10-12% of the cargo capacity in retrofitted vessel.

The Clean Air Act (CAA) was enacted in 1970 and basically amended in 1990. Among other things, the Act establishes ambient standards for specific air pollutants such as carbon dioxide (co2). Among other topics, the CAA introduced new requirements for motor fuels and emissions of toxic air pollutants which represent significant impacts on the refining industry activities. The CAA rules require that, from 1995 to 1998, only gasoline of a specified cleanliness be sold in areas of high pollution, and that gasoline sold in the rest of the US cause no greater air pollution as compared with gasoline sold in 1990.

In implementing the CAA provisions, the US Environmental Protection Agency (EPA) adopted, in December 1993, a final rule entitled "Regulation of Fuels and Fuel Additives: Standards for Reformulated and Conventional Gasoline".

The rule applies to refiners, blenders and importers of gasoline. It requires that certain chemical characteristics of their gasoline conform, on an annual average basis, with defined levels. Some of these levels are fixed by the gasoline rule; others are expressed as "non-degradation requirements". Under the last rule, domestic refiner must maintain, on an annual average basis, the relevant characteristics at levels no worse than its "individual baseline", which is the annual average achieved by the refiner in 1990. For the establishment of the baseline, individual refiners must show evidence of the quality of gasoline produced or shipped in 1990 ("Method 1"). If the evidence in this respect is not complete, they must use data on the quality of blendstock produced in 1990 ("Method 2"). Failing to use Method 2, use data on quality post-1990 gasoline blendstock or gasoline ("Method 3").

Importers were also required to employ an individual baseline using Method 1 data only which was unlikely for any importer. If they could not, they were not allowed to use either of the other two methods. Instead, they had to use a statutory baseline which the US claims was derived from the average characteristics of all gasoline consumed in the U.S. in 1990 (which included the much higher quality reformulated gasoline sold in California).

Before the EPA proclaimed these rules, and as a result of public hearings and views from importers, it set a modification for importers in May 1994, but Congress denied the budget or administering it.

In their claim submitted to WTO Dispute Settlement Body, Venezuela and Brazil argued that, by imposing less favorable standards on Venezuelan

animal or plant life or health Article XX(b) three requirements had to be satisfied:

- The policy in respect of measures for which the exception was invoked fell within the range of policies designed for protecting human, animal or plant life or health;
- The inconsistent measures for which the exception was being invoked were necessary to fulfill the policy objective; and
- The measures were applied to conformity with the requirements of the introductory clause of Article XX.

The Panel agreed that a policy to reduce air pollution fell within the range excepted measures for protection of health. Also, it held that it was not the necessity of the policy goal that was in issue, but rather the necessity of the particular measure for achieving that goal – that is, whether it was necessary that imported gasoline be effectively denied the favorable sales conditions afforded by an individual baseline tied to the producer of the product.

Examining the various US arguments about the difficulties in applying the same or equivalent methodologies to foreign refineries and products, the Panel found that the US had not demonstrated that this could not be done through the use of various methods available to it. The Panel concluded that the US had not met the requirement of showing that the concerns raised by it justified a violation of Article III:4. It held also that the US had not demonstrated that there were no other measures, consistent or less inconsistent with Article III:4, that were reasonably available to it to enforce compliance with foreign refiner baselines or importer baselines based on them. The Panel found hat the imposition of penalties on importers was a sufficiently available mechanism for enforcement of standards.

As for the US argument under Article XX(d) – that its differing treatment was needed in order to secure compliance with its laws and regulations not inconsistent with GATT – the Panel found that discrimination between imported and domestic gasoline did not secure compliance with the US baseline system. These methods were not an enforcement mechanism, but simply rules to determine individual baselines. As such, they were not covered by Article XX(d).

Regarding a possible justification based on the conservation of exhaustible natural resources (Article XX(g)[14] , the Panel noted that this provision was originally intended to cover exports of exhaustible goods such as oil and coal, and its expansion to cover "conditions" could not be justified. The Panel agreed that clean air was a "resource" with a "conditions" could not be justified. The Panel agreed that clean air was a "resource" with a value and could be depleted. That this depleted resource was defined with respect to its qualities was not decisive for the Panel, and its renewability did not constitute an objection. A policy to conserve clean air was hence a policy to conserve

[14] Article XX(g) and its introductory clause read as follows : Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in the agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures... (g) Relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption.

reconfirmed that WTO Members are free to set their own environmental objectives, and that the WTO's only task is to ensure that they are implemented through GATT-consistent measures. Secondly, clean air is regarded as an "exhaustible natural resource"; its protection therefore falls under the Article XX(g) exception. Thirdly, while it was reconfirmed that in order to apply the Article XX(g) exception it is necessary to implement restrictions on domestic production or consumption as well as restrictions on imports, it was also held that this does not require identical treatment for imported and domestic products. Finally, in so far as there is no requirement to prove a causal link between trade-restrictive measures and the conservation of clean air, this will make it easier to rely on Article XX(g).

A related issue to the Venezuelan gasoline case, is the WTO Agreement on Technical Barriers to Trade. TBT Agreement was first negotiated during Tokyo Round. Its basic objective was that technical regulations, standards and conformity assessment procedures should not become unnecessary obstacles to international trade. Moreover, the application of these measures is subject to both the Most Favored Nation (MFN) and national treatment obligations. Among other obligations, is the requirement to establish an inquiry point to respond to queries and requests for information from other members.

TBT Agreement also introduced the voluntary Code of Good Practice for the Preparation, Adoption and Application of Standards. Among other objective, the Code is to harmonize standards to the greatest extent and to promote the use of international standards. Given the complexity of technical regulations and standards in oil industry, TBT Agreement would provide guidelines to ensure that such measures are not used as barriers to oil trade. It also confirms the application of national treatment to oil imports by oil importing countries. With environmental protection purposes getting increasing importance in future, the Agreement may protect oil exporters against arbitrary actions as demonstrated by the Venezuelan-US dispute case.

## Chapter Eight - WTO Implications on Oil Trade

### Committee on Trade and Environment (CTE)

As was earlier explained, the thrust of adverse impact on oil trade and revenue is expected to be caused by Multilateral Environmental Agreements (MEAs) rather than from Multilateral Trade System (MTS). The biggest environmental challenge to oil-exporting countries comes from the UNFCCC, the Kyoto Protocol as well as from negotiation during future COP meetings. The Convention, which entered into force in March 1994, contains principles and obligations, and provide "framework" for future action intended to stabilize and reduce the emissions of greenhouse gases (GHG), the primary cause of climate change. Several scenarios of how the oil trade and revenue can adversely be affected under the Kyoto Protocol have already been discussed in Chapter (6).

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The CTE endorsed multilateral solutions as the best and most effective way to address global and transboundary environmental problems. It pointed to clear complementarity that existed between this approach and that of WTO. Trade restrictions were not the only nor necessarily the most effective policy to use in MEAs. In fact, the CTE stresses that international trade and environmental policies are and should be made mutually supportive for the promotion of sustainable development.

This view has been rephrased in a recent detailed report issued by WTO in 8 October 1999, the summary of which is annexed to this study.

(5) Views CTE members differed as to whether GATT Article XX did or did not permit a member to impose unilateral trade restrictions to protect environment outside its jurisdiction or territory.

(6) As regards the relationship between the MTS and taxes and charges for environmental purposes, measures such as border tax adjustment to energy products were discussed. The WTO allows border tax adjustment, since taxes can affect the competitiveness of domestically produced goods relative to products from other countries. Product tax can be levied on imported products (at the same rate as on domestic like products), whereas an exemption or remission of taxes can be granted for products to be exported. Key questions that arise in the context of the trade and environment debate relate to the treatment of "like" and "competing" products, and the extent to which border tax adjustments should be allowed. With regard to the first point, under the WTO rules (Article III:2, first paragraph), countries cannot impose a higher tax on an imported product than on a domestic like product. However, different tax rates may be applied to products which are not "like" products. With regard to whether border tax adjustments can apply to taxes on inputs – WTO rules allow the adjustment of a specific tax if the taxed input is physically incorporated in the product in question (e.g. carbon content of fuels). A common interpretation of the WTO rules is that taxes on non-incorporated inputs (e.g. carbon-dioxide emissions during production), as well as taxes on production processes, are generally not eligible for adjustment.

So far, this particular matter has not had a high profile in the CTE discussions. Yet, there are concrete proposals by a number of WTO Members that favor the application of this type of tax – not only to products (currently permitted, provided that it is not discriminatory) but also to those production processes in which fossil energy is used as an input. The CTE has concluded that further work is needed in this issue.

(7) The CTE also discussed how the removal of trade restrictions and distortions such as high tariffs, tariff escalation, non-tariff measures, export restrictions and subsidies could benefit both MTS and environment.

Until now, CTE discussions have centered on the agriculture sector, but a proposal on the energy sector has also been tabled.

In what follows, we provide the argument against those who may challenge the legitimate right of oil-exporting countries to regulate and conserve oil which is a depleting natural resource:

## Oil Export Restrictions and Barriers to Market Access

Although GATT rules eliminate quantitative restrictions on both exports and imports, yet, GATT provides general exceptions to these rules. One of

characterized by transparency through a wide spectrum of electronic communication. There is neither boycotting or discrimination against any buyer, nor price setting through group coalition.

(7) The production curb applies equally to both exports and domestic consumption as required by Article XX(g). However, even if domestic oil consumption is given priority over export, Article XX(I) deals with this situation. This Article justifies measures involving restrictions on exports of domestic materials necessary to ensure essential quantities of such materials to a domestic processing industry during periods when the domestic price of such materials is held below the world price as part of a governmental stabilization plan; provided that such restrictions shall not operate to increase the exports of or the protection afforded to such domestic industry, and shall not depart from the provisions of this Agreement relating to non-discrimination.

(8) As to the problem of dual-pricing which has been challenged by the EU and US as being a distorting element to free trade, there is a different definition of the whole process of supplying domestic oil needs. An integrated national oil company usually undertakes the whole integrated process from the well to the ultimate consumer. Therefore, crude oil which is directed to local markets enters the integrated industrial process as an intermediate input priced at cost. There is no posted price for such oil to be compared with international prices. The only known price would be that of each final oil product at the ultimate consumer's end. Such prices may or may not include local taxes which are permissible according to GATT and are not comparable among various local markets.

(9) As to the problem of dual-pricing, oil exporters should be encouraged to conserve domestic oil consumption through price adjustment. This would both cover the second condition of Article XX(g) on the one hand, and on the other hand, help energy conservation which is a prerequisite for an overall economic reform.

(10) We further suggest that in calculating the so-called lower energy prices in domestic oil exporters markets, the Purchasing Power Parity (PPP) should be used rather than the dollar rate of exchange. This may prove that what is considered dual pricing and subsidized energy prices at local markets are not in fact so.

(11) One of the major barriers to market access for crude oil in general and oil products in particular, is the heavy duties and excise taxes which oil consuming countries impose on oil products ex refineries. In the EU, such taxes have been increased every time the price of crude oil goes down. When the price of oil crashed in 1986 from $28 per barrel to $13, European oil taxes went up from $22 to $30 per barrel and continued to climb to reach nearly $70 at present.

(12) Since these excise taxes are equally imposed on both imported and domestic oil, they are not discriminatory and are allowed according to GATT. However, in many consuming countries domestic oil may be negligible or non-existent. Therefore, there may be a future possibility to challenge such taxes on a case by case basis, specially when WTO tries to widen its coverage and extends its rulings further into national economies as expected. This would be the more so if major oil consuming countries go ahead with their plans to

impacts. In this case, measures should be based, as far as possible, on international consensus, with the full participation of all countries concerned.

(3) Also related to environmental policies is the problem of internalization of environmental costs, and the application of the Polluter Pay Principle. The application of the latter suggests a greater and more explicit recognition of the environmental costs associated with energy production and consumption. To the extent that this leads to higher prices for energy consumers, this will lead to a reduction in energy demand. Moreover, in so far as carbon-based fuel are regarded as imposing higher environmental costs, and are therefore taxed higher, than other energy sources, there will also be a shift in patterns of energy consumption towards more "benign" energy sources, especially renewable. There may also be a shift in relative pricing (and therefore demand) as between different fossil fuels. For example, natural gas may be seen as less environmentally harmful than coal and oil, and thus taxed more favorably.

(4) As was explained in Chapter (6), the energy industries, including oil, have undertaken great achievement to enhance efficiency and environment. The industry still has a great role to play in this direction, particularly with regard to more efficient operation and cleaner oil products. Subsidies to promote adaptation of existing facilities to new environmental requirements are permitted under GATT. Subject to certain conditions, up to 20% of the cost of adaptation would be considered a non-actionable subsidy.

Related to this issue is the role that can be played by technical assistance and transfer of technology in tackling environmental problems at their source. Oil industry should, therefore, support recommendations for easier access to and transfer of environmentally sound technology. This would help oil industry upgrade its operations and products and avoid unnecessary trade restrictions on these products.

Finally, the CTE is expected to move from the stage of consultation to negotiation. This transition will pose the greatest challenge to developing countries between now and the forthcoming ministerial conference. Developing countries must concentrate their efforts during this stage on defending their interests, especially in terms of requests for technical and financial assistance from industrialized countries, which will help the developing world adapt its industries and consumption patterns to the specifications and standards set by these countries. The industrialized countries, on the other hand, must abstain from imposing taxes or arbitrary trade restrictions, such as the carbon taxes, on exports from developing countries under the pretext of environmental protection.

policy harmonization and collective management of common resources is perhaps the only effective policy option.

(5) The environmental repercussions of trade are theoretically ambiguous, and depend on three interacting factors: (i) trade-induced changes in industrial composition, and hence the pollution intensity of national output, (ii) changes in the overall scale of economic activity, and (iii) changes in production technology. The net outcome is undetermined. Sweeping generalizations about the linkages between trade and environment, whether positive or negative generalizations, must therefore be rejected.

(6) The gains from trade are sufficient to pay for additional abatement costs. 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 income and 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.

(7) The competitiveness effects of environmental regulations are minor. The direct cost of pollution control in the OECD is minor, just a few percentage points of production costs for most industries. No corresponding estimates are available for developing countries. The "Porter hypothesis" holds that regulatory pressure, just like competitive pressure, encourages industrial innovations that make production both leaner (less energy and resource demanding) and cleaner, thereby offsetting the direct compliance costs. The empirical evidence partly supports this hypothesis, although it would be wrong to conclude that environmental regulations do not cost anything. They do cost, but they also bring significant benefit to society and the quality of life.

(8) Environmental leaders are not less profitable. Studies that have compared the profitability of firms in the same industry have not found much evidence that environmental leaders pay a price in terms of reduced profitability. For several reasons, environmental leaders can often recoup costs in the marketplace. Firstly, a growing number of consumers are willing to pay a premium for "green labels." Secondly, firms that accord with the environmental management standards promulgated by the International Organization for Standardization (ISO 14000) seem to enjoy certain competitive advantages, including lower liability insurance, less regulatory oversight, and increased access to customers.

(9) Polluting industries are not migrating from developed to developing countries to reduce environmental compliance costs, although there are of course exceptions. While it is certainly true that developing countries are net recipients of foreign direct investment, the composition of investments they receive is not biased towards polluting industries, but rather to labor-intensive

countries is low incomes. Countries that live on the margin may simply not be able to afford to set aside resources for pollution abatement, nor may they think that they should sacrifice their growth prospects to help solve global pollution problems that in large part have been caused by the consuming life style of richer countries. If poverty is at the core of the problem, economic growth will be part of the solution, to the extent that it allows countries to shift gear from more immediate concerns to long run sustainability issues. Indeed, at least some empirical evidence suggests that pollution increases at the early stages of development but decreases after a certain income level has been reached.

(14) Yet, economic growth is not sufficient for turning environmental degradation around. Trade enters into this debate because it is one cylinder that propels the engine of growth. However, there is no guarantee that environmental degradation will turn around with increasing income by compelling necessity. If economic incentives facing producers and consumers do not change with higher incomes, pollution will continue to grow unabated with the growing scale of economic activity. In other words, income growth, while perhaps a necessary condition for allowing countries to shift gear from more immediate economic and social concerns to more long term sustainability issues, is not sufficient to reverse environmental degradation. Environmental polices must be brought to bear.

(15) Not all kinds of growth are equally benign for the environment. Economic growth requiring ever more inputs of natural resources is obviously not as benign for the environment as economic growth driven by technological progress that saves inputs and reduces emissions per unit of output. This kind of growth will not necessarily emerge spontaneously, but may require economic incentives that steer development in a sustainable direction.

(16) Accountability and good governance is critical. The importance of a democratic political process cannot be underestimated in this regard. Governments that are not held accountable for their actions, or rather inaction in this case, may fail to deliver the necessary upgrading of environmental polices. Comparing countries at the same income level, pollution tends to be worse in countries with skewed income distribution, a high degree of illiteracy, and few political and civil liberties. Moreover, these "political access" variables considerably weaken the relationship between per capita income and environmental quality. This confirms that environment upgrading is not so much dependent on income levels per se, but rather on institutional and democratic reforms that tend to go hand in hand with increased income, and which are necessary for allowing ordinary citizens to articulate their preferences for environmental quality and influence the political decision-making process.

(17) Good governance is also needed at the international level. One of the disturbing conclusions of the empirical literature is that the turning points of global environmental problems, such as global warming driven by CO2 emissions and other greenhouse gases, are estimated at considerably higher incomes than more localized problems. One interpretation of this is that

**Table 1 - World Energy Consumption and Carbon Emissions**
(Units = Quadrillion Btu for energy and million metric tons for emission)

| Region | Energy Consumption | | | | Carbon Emissions | | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1996 | 2010 | 2020 | 1990 | 1996 | 2010 | 2020 |
| **Industrialized** | **183** | **203** | **240** | **263** | **2850** | **2980** | **3535** | **3907** |
| **EE/FSU** | **74** | **52** | **61** | **70** | **1290** | **842** | **935** | **1024** |
| **Developing** | | | | | | | | |
| Asia | 51 | 75 | 128 | 178 | 1065 | 1474 | 2426 | 3377 |
| Middle East | 13 | 17 | 27 | 35 | 229 | 283 | 434 | 555 |
| Africa | 9 | 11 | 16 | 19 | 178 | 198 | 270 | 325 |
| C & S America | 14 | 18 | 33 | 48 | 174 | 206 | 418 | 629 |
| **Total Dg** | **87** | **121** | **203** | **279** | **1646** | **2161** | **3547** | **4886** |
| **Total World** | **344** | **376** | **504** | **612** | **5786** | **5983** | **8018** | **9817** |
| million toe | 8663 | 9461 | 12705 | 15417 | Toe = 40 million Btu | | | |
| million boe/d | 173 | 189 | 254 | 305 | Boe = 5.5 million Btu | | | |

**Table 2 - Effects of Kyoto Protocol on Carbon Emission in Annex 1 Countries, 2010**
Carbon Emission Units = million metric tons (mmt)

| | Carbon Emissions | | | Change of Kyoto | | |
|---|---|---|---|---|---|---|
| **Region and Country** | 1990 | 2010 RC | 2010 Kyoto Target | From RC (mmt) | From 1990 % | From RC % |
| **Total Annex1 Industrialized** | **2772** | **3408** | **2586** | **-822** | **-7** | **-24** |
| U. S. | 1346 | 1790 | 1252 | -538 | -7 | -30 |
| Canada | 126 | 162 | 118 | -44 | -6 | -27 |
| Western Europe | 936 | 1021 | 862 | -160 | -8 | -16 |
| Japan | 274 | 322 | 258 | -64 | -6 | -20 |
| Australasia | 90 | 113 | 97 | -16 | 7 | -14 |
| **Total EE/FSU** | **1290** | **935** | **1309** | **374** | **1** | **40** |
| FSU | 991 | 666 | 990 | 324 | 0 | 49 |
| EE | 299 | 270 | 320 | 50 | 7 | 18 |
| **Total Annex 1 Countries** | **4062** | **4344** | **3895** | **-449** | **-4** | **-10** |

**Table 4- World Energy Consumption, by Region & Fuel, Reference Case**
(Units = Quadrillion British Thermal Units)

| Region and Fuel | History | | Projection | | | %Change |
|---|---|---|---|---|---|---|
| | 1990 | 1996 | 2010 | 2015 | 2020 | 96-2020 |
| **Total Industrialized** | **182.7** | **202.5** | **240.4** | **251.6** | **262.8** | **1.1** |
| Oil | 78.7 | 85.7 | 100.2 | 104.5 | 108.9 | 1.0 |
| Natural Gas | 35.5 | 44.0 | 60.8 | 67.7 | 73.7 | 2.2 |
| Coal | 37.2 | 35.8 | 38.3 | 39.1 | 40.0 | 0.5 |
| Nuclear | 16.3 | 19.8 | 19.2 | 17.0 | 15.5 | -1.0 |
| Other | 15.0 | 17.2 | 21.9 | 23.3 | 24.8 | 1.5 |
| **EE/FSU** | **73.6** | **52.4** | **61.0** | **65.3** | **69.8** | **1.2** |
| Oil | 21.0 | 12.0 | 13.4 | 13.9 | 14.4 | 0.8 |
| Natural Gas | 26.0 | 21.7 | 30.2 | 34.0 | 38.7 | 2.4 |
| Coal | 20.8 | 13.0 | 11.1 | 10.2 | 9.1 | -1.5 |
| Nuclear | 2.9 | 2.8 | 3.0 | 3.1 | 2.7 | -0.2 |
| Other | 2.8 | 2.9 | 3.4 | 4.1 | 4.9 | 2.3 |
| **Developing Countries** | **87.4** | **120.6** | **202.8** | **238.2** | **279.2** | **3.6** |
| Oil | 35.2 | 48.1 | 76.8 | 89.2 | 101.3 | 3.2 |
| Natural Gas | 10.5 | 16.5 | 39.8 | 51.9 | 65.1 | 5.9 |
| Coal | 32.5 | 43.9 | 66.6 | 75.5 | 89.2 | 3.0 |
| Nuclear | 1.1 | 1.5 | 3.0 | 3.5 | 3.6 | 3.6 |
| Other | 8.1 | 10.6 | 16.5 | 18.2 | 20.0 | 2.7 |
| **Total World** | **343.8** | **375.5** | **504.2** | **555.1** | **611.8** | **2.1** |
| Oil | 134.9 | 145.7 | 190.4 | 207.5 | 224.6 | 1.8 |
| Natural Gas | 72.0 | 82.2 | 130.8 | 153.6 | 177.5 | 3.3 |
| Coal | 90.6 | 92.8 | 116.0 | 124.8 | 138.3 | 1.7 |
| Nuclear | 20.4 | 24.1 | 25.2 | 23.6 | 21.7 | -0.4 |
| Hydro and Others | 25.9 | 30.7 | 41.9 | 45.6 | 49.7 | 2.0 |
| **Total World** (real units) | | | | | | |
| Oil (million b/d) | 66.0 | 71.5 | 93.5 | 101.8 | 110.1 | 1.8 |
| Natural Gas (trillion c/f) | 73.0 | 82.2 | 129.0 | 150.9 | 173.8 | 3.2 |
| Coal (million short ton) | 5263 | 5167 | 6381 | 6845 | 7568 | 1.6 |
| Nuclear (billion kWh) | 1905 | 2280 | 2390 | 2241 | 2068 | -0.4 |

**Table 8- World Oil Trade, Reference Case, 1995 and 2020**
(Units = Million Barrel per Day)

| Exporting Region | Oil Imports by OECD Region | | | | Rest of | Total |
|---|---|---|---|---|---|---|
| | N. America | W. Europe | Asia | Total | World | World |
| | 1995 | | | | | |
| OPEC | | | | | | |
| Arab Gulf | 1.8 | 3.4 | 4.2 | 9.4 | 6.0 | 15.4 |
| North Africa | 0.3 | 1.9 | 00 | 2.2 | 0.1 | 2.3 |
| West Africa | 1.0 | 0.6 | 0.1 | 1.7 | 0.4 | 2.1 |
| South America | 1.6 | 0.3 | 00 | 1.9 | 0.7 | 2.6 |
| Indonesia | 0.1 | 00 | 0.5 | 0.6 | 0.1 | 0.7 |
| Total OPEC | 4.8 | 6.2 | 4.8 | 15.8 | 7.3 | 23.1 |
| Non-OPEC | 4.1 | 5.5 | 1.3 | 10.9 | 3.1 | 14.0 |
| Total Oil Imports | 8.9 | 11.7 | 6.1 | 26.7 | 10.4 | 37.1 |
| | 2020 | | | | | |
| OPEC | | | | | | |
| Arab Gulf | 3.4 | 3.5 | 5.6 | 12.5 | 24.7 | 37.2 |
| North Africa | 0.3 | 1.9 | 0.1 | 2.3 | 0.3 | 2.6 |
| West Africa | 1.7 | 0.9 | 0.3 | 2.9 | 0.2 | 3.1 |
| South America | 2.8 | 0.7 | 0.1 | 3.6 | 0.7 | 4.3 |
| Indonesia | 00 | 00 | 0.2 | 0.2 | 0.1 | 0.3 |
| Total OPEC | 8.2 | 7.0 | 6.3 | 21.5 | 26.0 | 47.5 |
| Non-OPEC | 7.0 | 6.5 | 0.7 | 14.2 | 4.3 | 18.5 |
| Total Oil Imports | 15.2 | 13.5 | 7.0 | 35.7 | 30.3 | 66.0 |

**Table 9- Kyoto Effects on OPEC's Oil Revenues and Production**
**( Reference Year = 2010)**

| Item | Reference | Kyoto | Kyoto | Kyoto | Kyoto |
|---|---|---|---|---|---|
| | | Alone | OECD | Annex I | CDM |
| Annual OPEC revenue | | | | | |
| Discounted at 5% $98 bn | 144.2 | 120.9 | 121.1 | 130.0 | 132.5 |
| OPEC annual losses $bn | | -23.3 | -23.1 | -14.2 | -11.7 |
| **Oil requirement mb/d :** | | | | | |
| OECD | 48.5 | 42.0 | 41.6 | 46.2 | 47.9 |
| FSU/EE | 6.6 | 6.3 | 6.3 | 5.2 | 5.5 |
| Total Annex I | 55.2 | 48.3 | 47.9 | 51.4 | 53.4 |
| Rest of the world | 32.7 | 32.3 | 32.5 | 32.6 | 31.0 |
| **Total World** | **87.9** | **80.6** | **80.4** | **84.0** | **84.4** |
| **Oil Production mb/d :** | | | | | |
| OPEC | 39.6 | 32.7 | 32.4 | 35.9 | 36.3 |
| Non-OPEC | 48.3 | 48.0 | 47.9 | 48.1 | 48.1 |
| OPEC market share % | 45.1 | 40.5 | 40.4 | 42.7 | 43.0 |

**Table 6- Comparison of World Oil Demand, Reference Case, 1990-2020**
(Units = Million Barrels per Day)

| Region | OPEC Estimate | | | EIA Estimate | | |
|---|---|---|---|---|---|---|
| | 1997 | 2010 | 2020 | 1996 | 2010 | 2020 |
| North America | 22.7 | 25.5 | 26.8 | 22.0 | 27.4 | 30.2 |
| Western Europe | 14.3 | 15.9 | 16.7 | 13.7 | 15.3 | 16.0 |
| Japan & Australasia | 6.7 | 7.1 | 7.7 | 7.1 | 7.5 | 8.3 |
| **Total Industrialized** | **43.6** | **48.5** | **51.2** | **42.7** | **50.1** | **54.5** |
| **EE/FSU** | **5.7** | **6.7** | **7.5** | **5.7** | **6.4** | **6.9** |
| FSU | 4.2 | 4.8 | 5.4 | 4.4 | 4.7 | 5.2 |
| EE | 1.5 | 1.9 | 2.1 | 1.3 | 1.7 | 1.7 |
| **Developing Countries** | **24.1** | **32.7** | **40.3** | **23.1** | **37.0** | **48.7** |
| **Total World** | **73.4** | **87.9** | **99.0** | **71.5** | **93.5** | **110.1** |
| Of which OPEC share | | 39.6 | 51.2 | | 41.5 | 53.5 |
| OPEC Share % | | 45.1 | 52.0 | | 44.4 | 49.0 |

**Table 7 - Comparison of World Oil Production Forecasts**
(Units = Million Barrels per Day)

| Year and Forecaster | OPEC | FSU | Rest of World | Total |
|---|---|---|---|---|
| 2000 | | | | |
| OPEC | 29.8 | 7.5 | 38.9 | 76.2 |
| EIA | 31.0 | 7.6 | 38.0 | 76.6 |
| DRI | 31.0 | 6.2 | 37.8 | 75.0 |
| PEL | 30.3 | 7.5 | 37.5 | 75.3 |
| PIRA | 28.8 | 7.1 | 41.3 | 77.2 |
| BTA | 31.0 | 7.4 | 36.8 | 75.2 |
| 2010 | | | | |
| OPEC | 39.6 | 10.0 | 38.3 | 87.9 |
| EIA | 41.5 | 10.5 | 41.2 | 93.2 |
| DRI | 36.2 | 7.0 | 50.1 | 93.3 |
| IEA | 43.8 | 10.2 | 38.7 | 92.7 |
| PEL | 39.4 | 10.8 | 41.1 | 91.3 |
| PIRA | 37.8 | 10.5 | 46.5 | 94.8 |
| BTA | 44.4 | 10.5 | 39.0 | 93.9 |
| 2020 | | | | |
| OPEC | 51.2 | 10.7 | 37.1 | 99.0 |
| EIA | 53.5 | 13.6 | 42.7 | 109.8 |
| DRI | 47.5 | 7.5 | 58.2 | 113.2 |
| IEA | 49.0 | 9.4 | 31.5 | 89.9 |
| BTA | 57.1 | 14.1 | 43.5 | 114.7 |

OPEC = Organization of Petroleum Exporting Countries
EIA = International Energy Agency
DRI = Standard and Poor's DRI, "World Economic Outlook"
IEA = International Energy Agency
PEL = Petroleum Economics, Ltd.
PIRA = PIRA Energy Group
BTA = BTA Alex. Brown

**Table 3- World Total Energy Consumption, Reference Case, 1990-2020**
(Units = Quadrillion British Thermal Units)

| Region | History | | Projection | | | %Chang |
|---|---|---|---|---|---|---|
| | 1990 | 1996 | 2010 | 2015 | 2020 | 96-2020 |
| **North America** | **99.7** | **111.6** | **134.9** | **141.3** | **147.5** | **1.2** |
| United States | 83.9 | 93.3 | 110.8 | 115.5 | 119.9 | 1.0 |
| **Western Europe** | **60.0** | **64.0** | **74.6** | **77.9** | **81.5** | **1.0** |
| **Japan & Australasia** | 23.0 | 26.9 | 30.9 | 32.4 | 33.9 | 1.0 |
| **Total Industrialized** | **182.7** | **202.5** | **240.4** | **251.6** | **262.8** | **1.1** |
| **EE/FSU** | **73.6** | **52.4** | **61.0** | **65.3** | **69.8** | **1.2** |
| FSU | 58.5 | 39.8 | 44.7 | 47.8 | 51.1 | 1.0 |
| EE | 15.2 | 12.6 | 16.3 | 17.5 | 18.7 | 1.7 |
| **Developing Countries** | **87.4** | **120.6** | **202.8** | **238.2** | **279.2** | **3.6** |
| Asia | 51.4 | 74.5 | 127.6 | 151.0 | 177.9 | 3.7 |
| Middle East | 13.1 | 17.3 | 27.0 | 30.6 | 34.7 | 2.9 |
| Africa | 9.2 | 11.1 | 15.5 | 17.1 | 18.9 | 2.3 |
| C.& South America | 13.7 | 17.7 | 32.6 | 39.4 | 47.7 | 4.2 |
| **Total World** | **343.8** | **375.5** | **504.2** | **555.1** | **611.8** | **2.1** |
| Total in million toe | 8663 | 9461 | 12705 | 13987 | 15417 | 2.1 |
| Total in million boe/d | 173 | 189 | 254 | 280 | 305 | 2.1 |
| **Of which oil is (m b/d)** | **66.0** | **71.5** | **93.5** | **101.8** | **110.1** | **1.8** |
| **Share of oil percent** | **38** | **38** | **37** | **36** | **36** | |

**Table 5- World Total Oil Consumption, Reference Case, 1990-2020**
(Units = Million Barrels per Day)

| Region | History | | Projection | | | %Change |
|---|---|---|---|---|---|---|
| | 1990 | 1996 | 2010 | 2015 | 2020 | 96-2020 |
| **North America** | **20.4** | **22.0** | **27.4** | **28.8** | **30.2** | **1.3** |
| United States | 17.0 | 18.3 | 22.7 | 23.7 | 24.7 | 1.2 |
| **Western Europe** | **12.5** | **13.7** | **15.3** | **15.6** | **16.0** | **0.7** |
| **Japan & Australasia** | 6.2 | 7.1 | 7.5 | 7.9 | 8.3 | 0.7 |
| **Total Industrialized** | **39.0** | **42.7** | **50.1** | **52.3** | **54.5** | **1.0** |
| **EE/FSU** | **10.0** | **5.7** | **6.4** | **6.6** | **6.9** | **0.8** |
| FSU | 8.4 | 4.4 | 4.7 | 4.9 | 5.2 | 0.7 |
| EE | 1.6 | 1.3 | 1.7 | 1.7 | 1.7 | 1.0 |
| **Developing Countries** | **17.0** | **23.1** | **37.0** | **42.9** | **48.7** | **3.2** |
| Asia | 7.6 | 11.9 | 18.5 | 21.8 | 24.3 | 3.0 |
| Middle East | 3.9 | 4.8 | 7.5 | 8.5 | 9.8 | 3.0 |
| Africa | 2.1 | 2.4 | 3.5 | 4.1 | 4.7 | 2.8 |
| C.& South America | 3.4 | 4.0 | 7.4 | 8.5 | 10.0 | 3.9 |
| **Total World** | **66.0** | **71.5** | **93.5** | **101.8** | **110.1** | **1.8** |

people do not care much about global warming and climate change. They would rather accept the consequences (on behalf of their children and their children's children) than the costs of curbing emissions. Another reason for governments foot-dragging is weak political institutions at the international level. Indeed, one reason why the WTO has become the focal point for environmental disputes is that the WTO has an integrated adjudication mechanism backed by trade sanctions as the ultimate enforcement tool.

(18) Trade could play a positive role. Trade could play a positive role in this process by facilitating the diffusion of environment-friendly technologies around the world. Of course, this would require that countries are ready to scrap trade barriers on modern technologies and suppliers of environmental services to reduce the cost of investing in clean technologies and environmental management systems. A new round of trade liberalization negotiations could make a contribution here. Another potential contribution of such a round would be to address subsidies that harm the environment, including energy, agricultural and fishing subsides. This would yield a double dividend by benefiting the environment and the world economy at the same time.

(19) The way forward is multilateral environmental cooperation. During an OECD meeting of Environment Ministers, one Minister noted that "his country, along with most others, had committed itself at the 1992 Earth Summit in Rio to the pursuit of sustainable development. However, whenever he tries to promote the behavioral and technological changes necessary to move in that direction, i.e., when he attempts to internalize the costs of environmental pollution and resource degradation, he is branded a 'green protectionist' outside his country, and a destroyer of national competitiveness at home."

industries that are less polluting on average. What the data tell us is that, to the extent developed countries are exporting their dirty industries, they are exporting them to each other, not to less developed economies. This suggests that environmental regulations are at most of secondary importance for international investment decisions.

(10) Multinational firms are moving towards a policy of standardized technologies for all their production plants in the world. The reason is simple. It is less costly to duplicate the home technology than to modify the process in each country. What is more, the choice of technology is not just based on current standards, but on what is expected in the future. It makes commercial sense to install state-of-the-art technology at the time an investment is made rather than retrofitting abatement equipment at a later stage at a much greater expense. Finally, multinationals are becoming more sensitive to the reputation they earn in the market place, at least those multinational firms that are based in countries with an active environmental community. Market forces often reward good environmental performance, including financial markets that react negatively to environmental mishaps. It has not always been this way, but the tide has changed in recent years. Much of this advance is thanks to the relentless efforts of non-governmental organizations around the world that have made consumers sensitive to the environmental profile of products and producers.

(11) Yet, environmental measures are sometimes defeated because of competitiveness concerns. Market forces cannot be entrusted to solve all problems themselves. Governments must do their part by regulating polluting and resource degrading activities appropriately. This creates a difficult political dilemma. If policy makers and voters think that domestic industry is crumbling under environmental regulations at the expense of domestic investments and jobs, it may be difficult to forge the necessary political support for new regulatory initiatives. And this problem may become worse still when trade and investment barriers are removed, since industries then become more mobile and more difficult to regulate.

(12) How serious is this problem? It would clearly be a serious problem if competitiveness concerns prevented environmental standards from being raised to appropriate levels, or if governments were compelled to build in protectionist elements in environmental regulations to "compensate" industry for alleged adverse competitive effects. However, competitiveness concerns could potentially be a positive force if governments that find it difficult to act individually for political reasons seek cooperative solutions to environmental problems. The growing number of multilateral environmental agreements (MEAs which are currently some 216) may be one indication of the trend in that direction. That is, initiative may have to shift from the national to the supranational level. Admittedly, however, international cooperation in these matters is not easy to achieve unless governments are convinced of its urgency.

(13) Is economic growth, driven by trade, part of the problem or part of the solution? One reason why environmental protection is lagging in many

## ANNEX
## WTO General View on Trade and Environment

On 8 October 1999, the WTO has released a detailed report under the title "Trade Liberalization Reinforces The Need For Environmental Cooperation". Since the report reflects the general WTO attitude toward trade and environment, it may be useful to summarize, in the following, its main findings, starting with its overall conclusion which reads:

> "In short, trade is really not the issue, nor is economic growth. The issue is how to reinvent environmental polices in an ever more integrated world economy so as to ensure that we live within ecological limits. The way forward, it would seem to us, is to strengthen the mechanisms and institutions for multilateral environmental cooperation, just like countries 50 years ago decided that it was to their benefit to cooperate on trade matters."

In support of this final conclusion, the WTO report emphasize certain findings, the most important of which are:

(1) Environmental degradation is driven by market and policy failures. While trade itself may be associated with environmental problems, such as pollution arising through the transportation of goods, most problems occur during production, consumption, and/or the disposal of waste products. Appropriate regulations and taxes can ensure that environmental impacts are accounted for by producers and consumers – the "Polluter Pays Principle". However, governments may not only omit to correct market failures, they may also aggravate the problems through subsidies.

(2) Trade would raise welfare if proper environmental policies were in place. Without adequate environmental policies, trade can prejudice environmental quality. Trade liberalization may mitigate the underlying environmental distortions. For example, a reduction in fishing subsidies, amounting to some $54 billion annually, would reduce overcapitalization in the industry and lessen overfishing.

(3) Trade barriers are poor environmental policies. Environmental problems are best addressed at source, whether they involve polluting production processes or undefined property rights over natural resources. Some governments have found trade measures a useful mechanism for encouraging participation in and enforcement of multilateral environmental agreements in some instances, and for modify the behavior of foreign governments in others. However, the use of trade measures in this way is fraught with risks for the multilateral trading system, unless accompanied with rules agreed by all parties.

(4) Environmental standards should not necessarily be harmonized. This conclusion refers only to local pollution problems that are best addressed by standards targeted to the specificities of the local conditions. Neither poor nor rich communities (countries) are well served by setting standards at the average. The case is different for transboundary and global problems where

impose further taxes under the pretense of environment protection, i.e., the so-called carbon-taxes.

(13) Some oil exporters have tried to own and run refining and distribution facilities in major oil consuming countries in order to avoid barriers to markets imposed by those countries. However, the experience may not be attractive enough since refining margins have been on the down trend over past years. Moreover, stringent environmental restrictions would require intensive investment to upgrade such refineries. We recommend that such investment, if available should be directed to build modern grass-root refineries at home and use collective negotiating power to exports refined products.

**Other environmental issues**

Apart from the specific work of the CTE, a number of other trade-environment issues are relevant to oil-exporting countries.

(1) Eco-labeling is an environmental-related issue which has been discussed in the TBT Committee in parallel with those held in CTE and the two committees held a joint meeting on this subject. With regard to eco-labelling, energy policies often employ information-based instruments. The use of such instruments may result in de facto discrimination against some sources of energy, such as fossil fuels. Well designed eco-labelling programs could be effective instruments of environmental policy to develop environmental awareness of consumers and assist them in making informed choice. However, multiplication of eco-labelling schemes with different criteria could affect preferences in domestic markets and limit market access for overseas suppliers. In this respect, it is suggested that transparency should be increased and respect given to the TBT Agreement and its Code of Good Practice.

At the first triennial review of the TBT Agreement, in 1997, there was agreement on some measures which should be taken to improve the transparency of, and compliance with the Code of Good Practice. These measures are directly related to eco-labelling programs.

(2) A related issue is the question of harmonization of standards. This leads directly to the issues of the development of international standards at the multilateral level with the full participation of all countries concerned (including developing countries), and the avoidance of unilateral imposition and extraterritorial application of domestic law.

The WTO Agreement on Technical Barriers to Trade encourages, but does not require, countries to use international standards for product standards and regulations. However, uniform product standards may not be optimal on environmental and political grounds. It thus follows that a balance has to be struck between the advantages that harmonization yields in terms of trade and transparency, and the environmental advantages that flow from allowing legitimate differences in national standards. In general, it would seem reasonable to prefer harmonization where no good reasons for differences exist or where differences in standards may cause trade distortions. The objectives of free trade and the desire to set standards at the national level can be reconciled through mutual recognition of standards.

In the case of process standards, harmonization would seem justified for process and production methods which have transborder environmental

such general exceptions is applicable to oil and gas, though with some differences of opinions. As Article XX(g) of 1994 GATT states : nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures relating to the conservation of exhaustible natural resources if such measures are effective in conjunction with restrictions on domestic production or consumption.

- Some analysts are of the view that since oil exporters provide oil to domestic industry at prices lower than those prevailing on the world market (subsidized), then the second condition of the Article which requires restrictions being extended to domestic consumption is not met.

However, in support of what could be an oil exporter views, we suggest the following argument:

(1) WTO members who have effective commercial weight have successfully been able to push through their own interpretation of GATT provisions. The GATT rules are open to conflicting interpretations, and therefore, are subject to manipulation. We strongly recommend that oil exporters establish, within OPEC Secretariat or elsewhere, a permanent core group of high level experts who are capable of thoroughly studying in depth the complex issues of GATT and Oil. The group will study the overall as well as case by case problems that are expected to arise under WTO and provide the oil exporters negotiators and decision-makers with proper guidelines and recommendations to benefit from during WTO negotiation.

(2) As was earlier explained, major oil exporters, mainly the Gulf plus Venezuela, are expected to supply nearly two thirds of world oil trade by 2020. Therefore, they should try to create an oil core group within WTO members. Not necessary under a formal institution, the Core senior experts and officials could exchange experiences and form a collective and coordinated position during WTO negotiation, including those within CTE.

(3) In trying to push the positive interpretation of GATT Article XX(g), one may benefit from the dispute settlement case of the Venezuelan gasoline exports to the United States. A WTO member who adopts measures to conserve his natural resource is not obliged to prove by empirical test that these measures are capable of achieving the conservation goal. No causality test is required in such cases. Therefore, an oil exporter is only required to state that he sets a production ceiling in times of unusually low prices in order to avoid wasting oil resources and preserve a reasonable rate of oil depletion. With this statement the first condition of Article XX(g), which is the conservation goal, will be fulfilled.

(4) The fact that such ceiling decision is taken after consultation with other oil exporters (members or non-members of OPEC) does not make any difference. Since OPEC decisions should be unanimous, OPEC is only a consultation forum and the decision to set a ceiling on oil production by any member is completely determined by his national sovereignty over natural resources which is an indisputable right.

(5) In as much as oil exporters do, oil consumers also consult and adopt collective plans in many forums, most important of which is the International Energy Agency (IEA).

(6) This interpretation of Article XX(g) could further be supported by the fact that an oil exporter who sets a production ceiling makes oil available to all buyers who are ready to pay a price determined by market forces and is

protectionist devices as was demonstrated by the Venezuelan-US gasoline case (Chapter 7).

Within WTO an open-end Committee on Trade and Environment (CTE) was established by a Ministerial Decision issued at Marrakech Conference in April 1994. The main target of this decision is to avoid contradictions between MEAs and MTS in the context of promoting sustainable development.

The decision entrusted the CTE with two specific functions: (1) to identify the relationship between trade and environmental measures in order to promote sustainable development, and (2) to make recommendations on whether any modifications to the MTS are required. In addition, the decision sets out a number of tasks for the CTE to address and provide a report to the first biennial meeting of the Ministerial Conference. At that conference (held in Singapore in December 1996), the report of the CTE was adopted, together with a Ministerial Declaration which included a reference to trade and the environment. The Declaration called upon CTE to continue its work on all items in its agenda. Therefore, it was decided to roll over the work program to the post-Singapore period, drawing on the work undertaken by that date.

The CTE Singapore Report covered a number of topics that are relevant for oil-exporting countries. The Report, together with further follow up work of the CTE, reflect the following views that were subject to consensus by the CTE members:

(1) The competence of MTS was limited to trade policies and trade-related aspects of environmental policies.

(2) WTO members were committed not to introduce WTO-inconsistent or protectionist trade restrictions or countervailing measures to offset adverse effects of environmental policies.

Under this item, a WTO member could challenge a decision by an oil exporter to set up a ceiling on oil production in order to sustain oil price at such a high level as to maintain oil revenue if oil export volumes were reduced pursuant to environmental taxes.

This is one of the scenarios that were discussed in Chapter (6), and we will soon present the argument which an oil exporter could use to defeat such challenge.

(3) Governments had the right to establish their national environmental standards in accordance with their needs and priorities. Moreover, they are not obliged to relax their existing national environmental standards or enforcement in order to promote their trade. However, since discussions of the Conference of the Parties to the FCCC have not yet specifically authorized the use of trade measures to achieve environmental targets, it is too early to judge whether national governments would use such measures to meet their emission targets as mandated by Kyoto Protocol.

This is also a principle that was confirmed by the Appellate Body in the US-Venezuelan case discussed in Chapter (7), and we will soon explain how an oil exporter could use it to support his argument.

(4) On the issue of relationship between MEAs and MTS, the CTE members agree that no need for the time being to modify WTO provisions in order to provide increased accommodation in this area. The WTO provisions already provide broad scope for trade measures to be applied pursuant to MEAs in a WTO-consistent manner.

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natural resource. The Panel found, however, that while the U.S. was free to regulate air quality, the treatment of chemically identical products had no direct connection with this objective.

In its concluding remarks, the Panel observed that it was not its task to examine generally the desirability or necessity of the environmental objectives of the Clean Air Act or the gasoline rule. Under the GATT, WTO Members were free to set their own environmental objectives, but were bound to achieve these through measures that were GATT-consistent, especially with respect to the relative treatment of the domestic and imported products.

In sum, the Panel concluded that the baseline establishment methods in the U.S. gasoline rule were inconsistent with Article III:4 of the GATT and could not be justified by any of the Article XX exceptions. It recommended that the Dispute Settlement Body request the U.S. to bring its rules into conformity with its GATT obligations.

On 20 February 1996 the U.S. submitted an appeal to the Appellate Body of the WTO. On 22 April 1996, the Appellate Body issued its report on the interpretation of GATT Article XX(g), but leaving the Panel's conclusions intact. The Appellate Report, together with the Panel Report as modified, was adopted by the Dispute Settlement Body on 20 May 1996, including the recommendation that the dispute Settlement Body request the U.S. to bring its baseline establishment rules into conformity with its GATT obligations.

Some additional clarifications about how Article XX(g) should be interpreted were offered by the Appellate Body. In its view, the clause "if made effective in conjunction with restrictions on domestic production or consumption" does not require identical treatment of domestic and imported products. In the case in question, in order to invoke article XX(g), it was essential to prove that restrictions on the "cleanliness" of imported gasoline were established in the light of corresponding measures on domestic production. The Appellate Body also clarified that the same clause in Article XX(g) is not intended to establish an empirical "effects test". In other words, once the US had proceed that the measures concerned imposed restrictions in respect to both imported and domestically produced gasoline, it did not have to prove a casual link between the measures and the conservation of clean air.

The Appellate body stressed, however, that to rely on the exception of Article XX(g), it was necessary to meet the specific requirements of that paragraph, as well as the requirements imposed by opening clauses of Article XX. This means that the measures falling within the exceptions in Article XX must be applied reasonably, with due regard to both the legal duties of the party claiming the exception and the legal rights of the other parties concerned.

The Appellate Body reconfirmed that Article XX contains provisions designed to permit important state interests – including the protection of human health and the conservation of exhaustible natural resources (such as clean air) – to be protected. WTO Members have the autonomy to determine their own environmental policies and objectives, and to implement the corresponding legislation. With respect to WTO, that autonomy is limited only by the need to respect the rules of the GATT and associated agreements.

The findings of the WTO, as modified by the Appellate Body, may give rise to additional difficulties for oil-exporting countries. First, it was

gasoline (as compared with those applied to domestic products and gasoline imported from certain countries) the regulation violated the GATT Article III (national treatment) and Article I (MFN treatment), as well as Articles 2.1, 2.2 and 12 of the WTO Agreement on Technical Barriers to Trade[13]. Venezuela also claimed that apart from any technical breach of trade rules, the gasoline rule has nullified and impaired its GATT benefits under article XXIII:1(b).

The U.S. argued that the gasoline rule could be justified under the exceptions in Article XX, paragraph (b), (d) and (g), and did not come within the scope of Article 2 of the TBT Agreement. The European Union and Norway made submission to the Panel as interested third parties.

Venezuela also expressed concern that application of the gasoline rule could justify the fears of many countries about the use of purported environmental measures as disguised restrictions on international trade. It stressed that it was not seeking to avoid legitimate regulations for environmental protection, but merely wanted its gasoline to be subject to the same rules as gasoline produced in the U.S. and third countries.

The WTO Dispute Settlement Body, at a special meeting on 10 April 1995, agreed to establish a dispute settlement panel to examine the complaints of Venezuela and Brazil. The Panel held that imported and domestic gasoline were like products; it also held that under the differing baseline establishment methods, imported gasoline was effectively accorded less favorable treatment than domestic gasoline, in violation of Article III:4. The Panel rejected the US' argument that the requirements of Article III:4 were met because imported gasoline was treated similarly to gasoline from similarly situated domestic parties. Such an interpretation, it said, would be contrary to the ordinary meaning of the Article and would mean that imported and domestic goods could no longer be assured of equal treatment on the objective basis of their likeness as products, but rather would suffer from: highly subjective and variable treatment" according to extraneous factors. This, the Panel said, would create great instability and uncertainty in the conditions of the competition as between domestic and imported goods in a manner fundamentally inconsistent with the object and purposes of Article III of the GATT.

The Panel also rejected the U.S. argument that the statutory baseline criteria it applied to imports resulted in treatment "on the whole" no less favorable than that accorded to domestic gasoline under individual baselines. It stated that this view of "equivalence" amounted to accepting that less favorable treatment in one instance could be offset by correspondingly more favorable treatment in other instances – a balancing was not supportable in Article III:4.

Dealing with the U.S. agreements with respect to the Article XX exceptions, the Panel stated that in order to justify a departure from GATT obligations on the ground that a measure was necessary to protect human,

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[13] Venezuela did not make any claim on the basis of Article 12 of the TBT Agreement (Special and Differential Treatment of Developing Countries Members), thus rejecting the notion that it was seeking privileges for its gasoline. It stated that while it was not asking for the Panel to rule under Article 12, it did point out that the discriminatory treatment was particularly objectionable in the light of that provision.

bulk of their revenue, and which are not among the heavy pollutants, should receive a special treatment. In recognition of the difficulties that environmental policies may create for oil exporting countries, the FCCC explicitly states the need to take account of the interests of economies that are "highly dependant on the income generated by the production, processing and export... of fossil fuels" and of countries that "have serious difficulties in switching alternatives" (Articles 4.7 and 4.10).

The FCCC further provides that developed country parties must promote, facilitate and finance as appropriate, the transfer of, or access to, environmentally sound technologies - particularly to or for developing country parties, so as to enable them to implement the provisions of the Convention. They must also support the development and enhancement of endogenous capacities and technologies of developing country parties. Financial assistance to be provided, on an interim basis, through the Global Environmental Facility(GEF).[12] Although the GEF is independent of the FCCC, the latter is to decide on the policies, program priorities and eligibility criteria of the GEF's climate change projects. So far, there has been disagreement among the Convention parties about the practical terms for technology transfer and the level and mechanisms of funding.

## Chapter Seven - The U.S.-Venezuelan Gasoline Case

The development of environmental laws is a very complicated process in the U.S. Public interest group interact with industrial trade groups, to work with congressional leaders in developing legislation. Before a law is developed, a congressional committee holds hearings on the environmental subject where all interested groups present scientific data, and provide testimonials. Once the new environmental law is passed, the appropriate regulatory agency develops regulations that achieve the goals and objective of the law. For example, the Clean Air Act (CAA) and the Clean Water Act (CWA), which have significant impact on oil industry, are regulated and supervised by the US Environmental Protection Agency (EPA).

Other environmental regulations with minor impacts on oil industry are : The establishment by CWA of higher technology standards for pollution abatement equipment, the Resource Conservation and Recovery Act (RCRA) that introduced regulations for underground storage tanks and hazardous waste characterization procedures. Removal and replacement of refineries underground storage tanks as well as segregation and enhancement of process water pretreatment are examples of projects conducted to comply with RCRA.

The Oil Pollution Act of 1990 (OPA), among other purposes, established new limitations on liability for damages resulting from oil pollution, created a fund for the payment of compensation for such damages. The OPA increased the oil spill liability of tankers and facility owners and operators over previous levels. A special fund financed by the oil industry through a 5 cents-per-barrel tax on domestic and imported oil is used to provide additional compensation for damages above the value specifies by the law. However, if a spill occurs

[12] The GEF is an international funding mechanism operated jointly by the World Bank, UNEP and UNDP.

more potent threat to revenue flows than climate change mitigation measures.

The above is one of the option opened for OPEC to maintain its oil revenue by adopting a firm price strategy consistent with significant production restraint. Given the world increased dependence on Arab oil, and that fewer number of oil exporters will be able to provide two thirds of world oil exports, the maintenance of oil revenue should not face much difficulty. However, to include non-OPEC in this strategy represents another aspect of market management as an option for limiting the damage from climate change mitigation measures. While an OPEC strategy to sustain firm prices results in free-rider gains for non-OPEC oil exporters, softer prices result in revenue losses for non-OPEC exporters.

One of the recent studies confirms that a weak oil price, caused by carbon tax measures, would result in revenue losses for non-OPEC oil exporters by 39%, compared with a fall of 25% for OPEC. This may provide the incentive for non-OPEC to exercise production restraint, together with OPEC.

In the above firm price scenario, leading to OPEC retaining its cumulative revenue, OPEC production by 2010 is down by over 10 mb/d (from 39.6 mb/d to 29.1 mb/d) compared with the reference case. If we now assume that both FSU and developing country oil exporters were to become part of the oil price maintenance strategy, then OPEC oil production could grow swifter and still be consistent with the firm oil price. OPEC production is now only 16% below reference case levels by 2010, while FSU + DC production is about 9% lower. This joint maintenance of a firm oil price reduces OPEC losses to just $3 bn annually while the non-OPEC group has higher revenue than the base case, to the order of $1 bn per annum . This qualitative result could of course be affected by alternative assumptions concerning the relative burden of restraint by OPEC and non-OPEC and the minimum acceptable output from OPEC in the short-to-medium term. Nevertheless, the idea of joint production restraint could lend some plausibility to the idea of using market management to defend oil export revenue that would otherwise be eroded by climate change mitigation policies.

Finally, the assumption of a swift introduction of taxes is a useful way of distinguishing the various long term properties of the energy market and therefore addressing the effect of trading and oil price movements. However, replacing this assumption by the one where the tax is phased in is not likely to have a substantial bearing upon the effects on the market by 2010, since the Kyoto targets would still be the same.

Nevertheless, the assumption that taxes are introduces in one lump sum is not realistic, given the expected necessary size of tax identified above. Taxes would have to be even higher if phased in, since they would have fewer years to have an impact in time for the Kyoto period. For example, if the tax is phased in individually in each OECD region over the period 1999-2010 it would have to be between 60 and 100% higher by 2010 than in the Kyoto Alone scenario with full implementation by 1999. This servers to further question the degree to which taxation will be applied, as well as to underline the probable importance of flexible mechanisms in achieving Kyoto targets.

The more likely gradual introduction of price signals to achieve a target which is only a decade away, raise the question of what the impacts of climate change mitigation measures beyond 2010 will be. International negotiations

sufficient to achieve the target abatement. At this level, North America undertakes more abatement than is actually required of it from the Kyoto Protocol, while Western Europe reduces emission by less than the target. OECD pacific emits only marginally more than in the previous scenario. These discrepancies are the basis for the trade in permits, with North America the seller to Western Europe of permits for over 100 mt of carbon. This is, indeed inconsistent prospect, given the contrary negotiation positions of these regions, where North America is apparently the most keen to purchase permits. This is a key area for future research as to define whether substantial trading in emission is a feasible mechanism in the longer term.

This significant amount of potential trade within the OECD has no major additional implications for OPEC. By 2010, annualized revenue losses are close to the $23 bn arising from Kyoto Alone scenario with no trade. The loss of oil volume in one region will be balanced by a gain in another while the total loss of OPEC production will be the same as in the Kyoto Alone scenario.

The OECD scenario is also not likely to materialize, because of both the conflict with national and regional positions. The potential for trade between all Annex I Parties, including the Former Soviet Union (FSU) and Eastern Europe (EE), seems to be the most likely one. Both the FSU and Eastern Europe are involved in abatement efforts, and this results in more trade in permits. Once full Annex I trade is allowed, the cost imposed upon carbon falls even further down to just below $40/t CO2. In this scenario, North America purchases of permits still account for less than 50% of its total commitment, while Western Europe uses trading to satisfy close to 70% of its abatement target. Thus the position of the West European countries of insisting on limiting the extent to which flexible mechanisms should be used to satisfy commitments (through capping), is contrary to their economic interests. This is the region that would have the greatest demand for permits relative to its own targets.

With full Annex I trade, OPEC annualized revenue losses are down to $14bn (discounted at 5% per annum), compared with $23 bn with no trade. OECD oil demand falls by only 2.3 mb/d, with a slightly smaller fall of 1.5 rnb/d coming from the FSU/EE. Thus, allowing trade in carbon emissions has a less negative impact upon OPEC export revenue.

The issue of capping the use of flexible mechanisms, therefore, has a direct bearing on OPEC economic interests. Setting a limit of 50% in the context of the previous full Annex I trade scenario would only affect Western Europe, since this would limit its permit purchase to 50% instead of 70%. The other two OECD regions would in any case be expected to purchase less than this limit. With such a cap, OPEC losses would be to the order of $1 bn per year greater than if full trade is allowed. A cap of 30% increases the additional losses to around $2 bn annually. Reducing the limit to 10% increases the additional losses to around $6 bn per annum.

The final scenario is allowing full Global Trade to achieve the Annex I targets laid down in the Kyoto Protocol. Although full emissions trading is not foreseen in the Kyoto Protocol, the CDM can be seen as the means of involving developing countries in some of the carbon trade. This scenario is therefore intended to provide a qualitative assessment of the possible implications for OPEC of this mechanism.

The following figures compare world annual growth rates (%) of intensities and demand for both energy and oil over different periods:

| | Intensities | | | Demand | | |
|---|---|---|---|---|---|---|
| | 97-2000 | 2000-10 | 2010-20 | 97-2000 | 2000-10 | 2010-20 |
| Energy | -1.5 | -1.5 | -1.5 | 1.1 | 1.9 | 1.6 |
| Oil | -1.3 | -1.9 | -1.9 | 1.2 | 1.4 | 1.2 |

(5) Other assumptions are made about alternative energy sources, such as nuclear energy, hydro-electricity and fuel cells. The details of these assumptions are beyond the scope of this paper.

Table (7) compares OPEC estimates of world oil production, based on the above assumptions, with six other forecasts. Large discrepancies may be noted in the total figures, specially for the year 2020. Larger discrepancies are noticeable among estimates of producing regions. An average estimate of OPEC production in 2010 ranges around 40 million b/d with a low of 36 million b/d and a high of 44 million b/d. For 2020, OPEC production ranges around 50 million b/d with a low of 47 million b/d and a high of 57 million b/d.

## Effect of Kyoto on OPEC

As was earlier explained, negotiation at COP3 in December 1997 resulted in the adoption of the Kyoto Protocol, in which Parties in Annex I agreed to lower overall emissions of greenhouse gases (GHG) by 10 to 5.2% below 1990 levels, between 2008 and 2012, with the year 2010 as the average target date.

In order for Kyoto Protocol to come into force it should be ratified by at least 55 Countries, incorporating Annex I Parties which account for at least 55% of 1990 Annex I emissions. Talk of tax reform in some parts of Europe suggests a possible eventual combination of employment and environment policies. As was explained in the Chapter (4), there are few signs of a formal tax proposal in EU to deal with the Kyoto targets. The U.S., on the other hand, has shown that it would have substantial obstacles to overcome if it were to contemplate the imposition of new taxes on any significant scale[9]. This, together with appeal of lower-costs, accounts for US enthusiasm for emissions permit-trading. This would of course place an additional cost on the use of carbon-based fuels in much the same way as would a carbon tax. Yet, the payment would be in line with the trading philosophy (such as the successful sulphur dioxide trading system in the U.S.) and would not lie so visible as a tax.

It is, therefore, highly questionable whether large carbon taxes will be implemented in Annex I countries in an attempt to reach Kyoto emission targets. Nevertheless, it is useful to analyze scenarios that assume the imposition of carbon taxes.

Given the Kyoto Protocol targets, the signals that are transmitted through the aggregate and relative energy price movements allow a specific assessment of the potential implications for each fossil fuel. This, of course, would be of interest to OPEC Member Countries which alternative production

[9] The original Clinton proposal for a Btu tax was criticized, due to concern about large job losses, and even the subsequent diluted tax option of 4.3 cents on transportation fuels alone was never passed by Congress.

as before. This would be the more so, since excise taxes in consuming countries account for the largest portion of price paid by ultimate consumers (nearly 70% in W. Europe). It would be only legitimate for oil exporters to at least sustain their share of oil rent and let oil importing countries balance the equilibrium by relevant reduction in their heavy taxes.

According to the same reference scenario, oil exports of non-OPEC is expected to rise from 14 million b/d in 1995 to nearly 18.5 million b/d by 2020, but their share of the market would decline from 38% to 28% over this period.

From the above, we may conclude that world dependence on Arab oil will be on the rise. The Arab oil exporters will be in a position strong enough to control the flow of oil exports during the second decade of the 21st Century. Given the fact that oil is the single and most important Arab export commodity, for now and over the foreseeable future, the need to examine its role under WTO and Kyoto Protocol will be further elaborated in Chapter (6).

**Arab Coordinated Policies**

As explained earlier, world demand for oil will grow from its current level of 72 million b/d to reach nearly 94 million b/d by 2010, and 102 million b/d by 2015 and 110 million b/d by 2020. OPEC's share of world supply, which is to match world demand, is expected to rise from 39% at present to nearly 45% in 2010 and 50% in 2020 (Table 6). In light of these forecasts, OPEC must plan on expanding its productive capacities to meet growing world needs, while preserving reasonable and stable levels of price in real terms.

Investments of nearly $160 billion are necessary to develop the productive capacity of Gulf OPEC members, including Iran, in order to nearly double it by 2020. This would require, of course, that oil revenues should be sustained at a level stable enough to provide the necessary finance. Consequently, environmental measures which could negatively affect oil export volume or oil price, would jeopardize the capacity expansion projects and adversely affect oil consumers.

The financial positions of the Gulf region have weakened as a result of the deterioration in oil prices during recent years. This state of affairs may require that multinational oil corporations, which have their headquarters in OECD countries, be invited to take part in financing and providing advanced technology in upstream activities. This may explain why industrialized countries are insisting that GATT include clauses which grant their corporations equal treatment as national companies with respect to their investment in developing countries. The on-going negotiation and discussion within WTO and OECD around the issues of investment, competitiveness and the right of establishment reflect this trend. Whatever is the outcome of these negotiations, which should be guarded and participated in by oil exporters, the return of oil multinationals should be on the basis of such arrangements as production-sharing agreements which avail the upper hand to host countries.

International Energy Agency experts perceive that rapidly growing demand for oil in the Third World, particularly in Asia-Pacific, could trigger sharp competition among oil consumers. Considering that only six OPEC countries are expected to provide nearly tow thirds of world oil exports by 2020, IEA experts have advised industrialized countries to take necessary measures to secure their future needs of oil and natural gas, which will be subject to the same conditions as oil.

than a consultation forum in the same manner, or may be less, like the International Energy Agency which is established by OECD countries. Therefore, to set up a ceiling on oil production as a means to conserve this depletable natural source in times of exceptionally low prices, even in consultation with other oil producers, should not be interpreted as creating a commercial cartel restrictive of free trade. Had it been true that OPEC members were forming a commercial cartel, how would it be possible to explain the downward trend in oil prices starting in the early 1980s, and their crash in 1986, as well as the erosion of their current and real values henceforth?

**World Dependence on Arab Oil**

Arab oil exporters enjoy an excellent collective negotiating power in international oil markets. At present, they provide nearly 18 million b/d to the world oil market, or 45% of world oil exports which reached 40.4 million b/d in 1998. This percentage even rises if we count only oil exports to the most important consuming region and exclude movements of oil within each region.

As for the future, market fundamentals indicate that the world is expected to become increasingly dependent on Arab oil. The level of economic activities and the rates of economic growth are the most crucial factors in determining both supply and demand for oil. A close relationship exists between the growth rates of demand for energy and oil on the one hand, and the growth rates of Gross Domestic Product (GDP) on the other.

World GDP average annual rates of economic growth have recently been estimated as follows[6] :

2.9% by EIA over the period 1995-2020, reference case
3.1% by IEA over the same period
2.9% by DRI over the same period
2.9% by PEL over the period 1997-2010
3.5% by PIRA over the period 1995-2010
An average of the above estimates would yield an annual rate of %3.1.

The EIA reference case expects energy consumption to grow at an average rate of 2.1% per annum. Income/energy elasticity would be estimated at nearly two thirds, worldwide. This means that for every increase in world GDP by 1%, world energy consumption will grow by nearly 0.67%, which is consistent with the above estimates.

In addition to change in GDP, demand for energy in general, and for oil in particular, is affected by other factors, such as the price of oil products which are subject to heavy taxation as was previously explained. Such taxes have a negative effect on oil consumption, hence, on the volume of imported

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[6] EIA = Energy Information Authority
IEA = International Energy Agency
DRI = Standard and Poor's DRI, "World Economic Outlook"
PEL = Oil Economics, Ltd.
PIRA = PIRA Energy Group

The oil exporting countries only got $1.42 or what amounts to 23% of this rent, while governments of consuming countries got $ 4.65 or 77 % of rent.

Under the umbrella of 1973 October War, oil exporting countries recovered their freedom to determine oil prices and production volumes. The price of crude oil was quadrupled from nearly $ 3 to $11.65. Consequently, the distribution of rent tended to tilt in their favor. In 1975, the price of a composite refined barrel jumped in EC markets to $27.90 and the rent increased to $18.90. Therefore, the share of oil exporting countries rose to 52% and that of the consuming countries fell to 48%. In 1980, oil rent peaked and was distributed 64% (or $34.30) to oil producers, and 36% (or $18.95) to governments of oil consuming countries. A barrel of refined products was selling at $65.50 to ultimate consumers in that year.

Crude oil prices began a downward trend during the first half of 1980's, first in gradual steps and then in a crash which brought the price down from $28 in 1985 to an average of $13 in 1986. At this point, the European governments did not permit the saving in crude oil price to pass to ultimate consumers. If they did, the natural outcome would have been a remarkable jump in demand for oil. On the contrary, they hastened in boosting oil taxes from $22.50 in 1985 to nearly $30 in 1986. The tax hikes continued thereafter to reach $52 in 1991 and $66 in 1995. As we explained in Chapter (4), the EC proposal of a carbon tax comes as a heavy burden on top of existing tax structure that is already biased against oil and in favor of coal which is more polluting than oil .

The price of crude oil (as represented by OPEC basket price, cif Europe) continued to decline after the Iraqi defeat, from $19.33 in 1991 to $18. 22 in 1992 to $16.07 in 1993 and to $ 15.53 in 1994. The revival period of this price in 1996-1997 was short-lived because the price of oil crashed again during 1998 and early 1999 to a level of $12 per barrel which amounts in real terms to no more than $4 dollars in terms of 1973 dollars. With the exclusion of oil production costs, the producers share of the rent would be nearly $11 in 1988 and $14.55 during 1991-1992 and $ 12.35 in 1993. Thus, rent distribution has been reversed again to the extent that the share of oil producers would not exceed 20% during the 1990s.

The addition of nearly $20 per barrel to cover the costs and profits of intermediate companies which, also, originate from the OECD countries, would put the price of a refined barrel in Europe in the range of $92-94 during the period 1990-1992 and nearly $106 in 1996.

Japan is not much different from Europe, since the price of refined barrel in Japan has reached $107 in 1993 bringing the rent to nearly $47 and its distribution in the ratio of 74% for Japan's government, and 26% for oil exporting countries. The only exception of this tax pattern within OECD is the United States where the price to ultimate consumers stood at $43 in 1993. The government taxes averaged $13.11 or 52% of what could be considered as oil rent.

Viewed from another perspective, the OECD countries are the major trade partners of OPEC countries. Oil is almost barter traded against OECD commodities and services. Therefore, the terms of trade between the two groups would actually reflect the development of the real price of oil over time. In other words, the exclusion of inflation effect, as represented by the price index of OECD export which rose during the period 1973-1991 from 100 to

Commission's exemptions but points out that some are left to member states' discretion which allow certain freedom of maneuvering.

The French Minister of Economy also said that the tax would complicate the EU efforts to curb CO2 emission, not to mention its lack of flexibility because it is designed to become mandatory by 2000.

On the other side, some EU members,(Germany, Italy and Denmark) were strongly in favor of the new tax proposal.

In fact, some countries, such as Netherlands, Germany, Denmark and Belgium have already added to their tax structures a new tax labeled " carbon tax ".

To conclude this issue of carbon taxes, the IEA has recently expressed the need to harmonize excise taxes as a means to combat environmental pollution. In its report on carbon tax, IEA states that in order to simultaneously secure energy flow and achieve the environmental targets, the existing energy tax structures in OECD should be harmonized. The IEA further states that existing energy taxes mainly aim at realizing financial objectives. Moreover, existing energy taxes overload those who use oil in the least polluting applications, while the tax incidence is lower on those who use the most pollutant fuels, such as coal and fuel oil. The IEA warns against the adoption of a carbon tax and simply add it to the existing tax structure without harmonization or modification. Such simple adoption of a carbon tax would inevitably inflict distorting effects and serious negative results on the economy. The IEA report also questions whether the harmonization process should be introduced within the framework of the tool (tax) or within the target (curbing the polluting emission). The IEA question closely elates to the Japanese approach. The Agency report, finally, stresses the difficulties facing the overall coordination of energy taxes in all member countries. On top of these difficulties, comes the keen desire of each country to preserve its competitive position in world markets, and, therefore, the conditional clause becomes of great concern.

## Chapter Five - The Framework of Oil Market

In order to examine the impact of environmental measures on oil trade and revenues, we will try, in this chapter, to briefly explain the main features of the existing oil market.

### Oil Taxes and Prices

Oil was not explicitly excluded from GATT 1947, but the principal trading parties to GATT, mainly OECD members, treated oil as if it was. Their main goal was to keep the precious source of energy flowing to feed their energy-hunger economies after WW II and to avoid problems that may cause unnecessary oil interruption. Under a seemingly "Gentleman Agreement", Western multinational oil companies pushed Arab oil production from one million barrels per day (b/d) in 1950 to nearly 20 million b/d by early 1970s. The Western Oil Cartel also reduced the price of oil from $2.18 per barrel in 1947 to $1.80 in 1960 where it was kept frozen at this level until 1970. By contrast, the price index of OECD exports, which are practically barter traded with oil, jumped during the same period from 100 to 300. This meant that the real price of oil, valued in 1947 dollars, has gone down to only 70 cents.

allowed to postpone the imposition of tax. The actual calculation of the double measure had shown the following results in percentage points: Portugal 40, Greece 59, Spain 66, Ireland 83, Italy 92, France 95, UK 105, Netherlands 111, Belgium 117, Germany and Denmark 129 each, Luxembourg 250.

The tax would be put in effect, where it was postponed, as soon as CO2 emission reaches 50% of the allowable increase to the year 2000 as communicated by each member country to the EC during March 1993. For the cohesion group, this allowable increase was expected to be 20% in Ireland, 25% in Spain and Greece, 30-40% in Portugal.

With this modification, the EC tried to persuade the cohesion group and win their support by letting them postpone the tax for several years. Moreover, this group was permitted to increase CO2 emission up to the average of total EU member countries. Nevertheless, the EC modification failed to make the proposal acceptable to all EU members. The proposal was nearly shelved early 1994, specially after the resignation of the energy commissioner who was strongly pushing the idea.

Just before the EU summit meeting in Assen, December 1994, Mr. Jack Delor, who headed the EC Commission for 10 years, tried to push the carbon tax once more to the agenda. In his effort to reinforce the tax rationale, he said that it would not only help protecting the environment, but it could also raise financial funds to alleviate unemployment in member countries. He further advocated the idea that the tax receipts would be left to each member country to dispose of. In such a way, the receipts will be reinjected into domestic economy where positive effects could be defused through income tax reduction, investing in environment-protecting projects, upgrading energy efficiency, or reducing unemployment. With such redirection of tax receipts, the depressing impact of the carbon tax could be balanced in addition to its positive environmental effect.

Again, the tax proposal was knocked out when, in December 1994, it was decided to remove it from the agenda.

Few months later, the EU experts tried to present the tax proposal in a more attractive approach. Instead of a unified tax for all EU members, the new approach would give the freedom to each member to apply differing tax rates to differing fuels. One important feature of the new proposal was to reach a harmonized system of energy taxes in the whole EU by the turn of century. In order to attain this target, a three-phase program was envisaged. The first phase would extend over the period January 1996 to 31 December 1999 during which each member country would freely apply whatever energy taxes it sees capable of achieving the coordinated target. Early in 1999, the EU Commission would present a report of what has been realized during the first phase, and further suggest proposals as to how the third phase would be achieved. The third phase starts in January 2000 and aims at establishing a coherent system of coordinated energy tax structure for all energy sources all over the EU area

The clever drafting of the new EU proposal allows member states certain freedoms, since it entrusts each member country with determining its own tax rates with the ultimate target to establish a consistent overall tax structure by the end of third phase.

While the old approach was based on a fixed rate for each source of energy for all EU members, the new proposal calls on member states to

member states. The resulting harmonized standards represent floors and states can implement stricter standards but cannot fall below them.

The European Energy Charter which received the blessing of the European Security and Cooperation Conference in December 1991, provided that prices as well as other measures should be used to protect environment and reduce pollution risks. The environment protection had further gained support by the Framework Convention on Climate Change (FCCC) adopted by the United Nations Conference on Environment and Development held in Rio de Janeiro, June 4, 1992.

In a separate action, the European Commission (EC) presented, in May 1992, to the EC Council a number of proposals that aimed at upgrading energy efficiency, in general, and curbing the CO2 emission, in particular. With the expectation that CO2 would increase by nearly 11% in the EC area during 1990-2000, the EC proposals included a program called " **Alterer** " to double renewable energy sources and to treble electricity consumption as well as boosting the bio-fuel in the transportation sector. The proposals also included a "**Save**" program to enhance energy conservation and to upgrade energy efficiency, specially in building design, industry, thermal insulation, and periodical auditing of energy-consuming equipment such as automobiles and boilers. The program also provided that consumers should pay the real value of energy they consume. The " **Thermie** " program which started in July 1990 aimed at technological improvement in general through the execution of nearly 230 projects costing $850 million over 5 years ending 1994.

The **Carbon Tax** proposal was the most important one worked out by the EC Commission to stabilize CO2 emission in the area by 2005 at its level of 1990. The proposal aimed at taxing energy sources that emit CO2 at a rate which is related 50% to energy content and 50% according to carbon content. For each ton of oil equivalent (toe), oil emits 0.82 ton of carbon, natural gas emits 0.63 ton, and coal emits 1.05 ton. Each ton of carbon is then capable of emitting nearly 3.4 tons of CO2. The carbon emissions as a result of human activities during the period 1950-1990 had jumped from 1.6 billion tons per year to nearly 6 billion tons, causing a CO2 emission of nearly 20 billion tons in 1990.

The EC proposed tax would start at a rate of $3 per a barrel of oil, $2.63 per a barrel of oil equivalent (boe) in the case of natural gas, and $3.4 per boe of coal. The tax rate would, thereafter, increase by one third of the initial rate every year until it reaches $10 in oil, $11.33 per boe of coal, and $8.77 per boe of natural gas.

It is worth noting that the 50-50 formula represents a bias in favor of coal against oil and natural gas. If the carbon tax was totally based on carbon content, which is the main reason of environmental protection, a ton of coal of standard quality would pay $61 as tax. On the other hand, if the tax was totally based on energy, the tax payment would be $49 per ton. According to the 50-50 basis, the tax would be an average of $55 per ton of coal which is translated into a subsidy to coal by $6 or 10% of the tax. For natural gas, there is a penalty of around 15% of the tax.

The EC carbon tax proposal would also apply to electricity where the carbon 50% would follow the energy source used in electricity generation, and the energy 50% would follow the quantity of electricity actually generated. Based on this formula, the tax would start at $2.62 per each 1000 kWh and

cases. It is also possible that further technology improvements could occur beyond those in the high technology case if a very aggressive research and development effort were established.

The low technology case assumes that all future equipment choices are made from the end-use and generation equipment available in 1998, with new building shell and industrial plant efficiencies frozen at 1998 levels. Comparison of high and low technology cases with a case based on reference technology assumptions demonstrates the importance of technology improvement. Because faster technology development makes advanced energy-efficient and low-carbon technologies more economically attractive, the carbon prices required to meet carbon reduction levels are significantly reduced. Conversely, slower technology improvement requires higher carbon prices.

In the high technology case, total energy consumption in 2010 is lower. Delivered energy consumption in both the industrial and transportation sectors is lower as efficiency improvements in industrial processes and most transportation modes outweigh the countervailing effects of lower energy prices. In the residential and commercial sectors, the effect of lower energy prices balances the effect of advanced technology, and consumption levels are at or near those in the reference technology case. In the generation sector, coal use for generation is 40% higher than with reference technology assumptions, due to efficiency improvements and the lower carbon price.

In the low technology case, the converse trends prevail. In 2010, total energy consumption is higher than in the case with reference technology assumptions. Delivered energy consumption is higher in the industrial and transportation sectors and lower in the residential and commercial sectors, suggesting that industry and transportation are more sensitive to technology changes than to price changes, and the residential and commercial sectors are more sensitive to price changes. With the higher carbon prices in the low technology case, coal use is further reduced in the generation sector, and more natural gas, nuclear power, and renewables are used to meet the carbon reduction targets.

There are, however, certain uncertainties in the above analysis. The RC projections represent business-as-usual forecasts, given known trends in technology and demographics, current laws and regulations, and the specific methodologies and assumptions used by the EIA. Because EIA does not include future legislative and regulatory changes in its RC projections, the projections provide a policy-neutral baseline against which the impacts of policy initiatives can be analyzed.

Results from any model or analysis are highly uncertain. By their nature, energy models are simplified representations of complex energy markets. The results of any analysis are highly dependent on the specific data, assumptions, behavioral characteristics, methodologies, and model structures included. In addition, many of the factors that influence the future development of energy markets are highly uncertain, including weather, political and economic disruptions, technology development, and policy initiatives. Recognizing these uncertainties, EIA has attempted in this study to isolate and analyze the most important factors affecting future carbon emissions and carbon prices. The results of the various cases should be considered as relative changes to the comparative baseline cases.

might be avoidable if price changes can be accurately anticipated or if appropriate compensatory monetary and fiscal policies can be implemented.

However, a macroeconomic adjustment cost may also be reflected by frictions in the economy due to higher prices of the carbon mitigation policy. In the long run, higher energy costs would reduce the use of energy by shifting production toward less energy-intensive sectors, by replacing energy with labor and capital in specific production processes, and by encouraging energy conservation. Although reflecting a more efficient use of higher-cost energy, the gradual reduction in energy use would tend to lower the productivity of other factors in the production process.

The loss of potential GDP plus the purchase of international permits represent the long-run, unavoidable impact on the economy. The total cost to the economy is represented by the loss in actual GDP plus the purchase of international permits. The loss in actual GDP for the economy is the sum of the loss in potential and the adjustment cost.

The ultimate impacts of carbon mitigation policies on the economy will be determined by complex interactions between elements of aggregate supply and demand, in conjunction with monetary and fiscal policy decisions. As such, cyclical impacts on the economy are bound to be characterized by uncertainty and controversy.

However, raising the price of energy and downstream prices in the rest of the economy could introduce cyclical behavior in the economy, resulting in employment and output losses in the short run. The measurement of losses in actual output for the economy, or actual GDP, represents the transitional cost to the aggregate economy as it adjusts to its long-run path.

Now, fiscal policies that accompany carbon reduction policies may need some elaboration. Collection of money from a permit auction system necessitates a careful consideration of appropriate fiscal policy to accompany the carbon reduction policy. As was mentioned before, two fiscal policies are used to return collected revenue back to the economy: a cut in personal income taxes and a cut in social security taxes. In both cases, the Federal deficit is maintained at the RC levels. The personal income tax cut essentially returns collected revenues to consumers, helping to maintain personal disposable income. Like the personal income tax cut, the social security tax cut returns collected funds to the private sector of the economy, ameliorating the near-term impacts of higher energy prices. Although consumers and businesses still would face much higher relative prices for energy than for other goods and services, disposable income is maintained near RC values to the extent that funds flow back to consumers.

In the fiscal policy settings, higher prices in the economy place upward pressure on interest rates. The Federal Reserve Board seeks to balance the consequences of higher energy prices on the economy with possible adverse effects on output and employment. Adjustments to the Federal funds rate would be designed to moderate the possible impacts on both inflation and unemployment, and to return the economy to its long-run growth path. Monetary policy is, thus, instrumental in balancing inflation and unemployment impacts.

The choice of the accommodating fiscal policy is also key to the assessment of the ultimate impacts on the economy. While the personal

reduced from 7.6 thousand Btu per dollar of output in the RC to between 7.4 and 7.1 thousand Btu in the carbon reduction cases.

In both the residential and commercial sectors, higher energy prices encourage investments in more efficient equipment and reduce the demand for energy. Total carbon emissions in the residential sector are reduced by 11% in the 1990+24% case and by 45% in the 1990-7% case, relative to the RC. Space heating and cooling account for the largest share of the change in energy demand.

In the commercial sector, total carbon emissions are lower by between 12% and 51% in the carbon reduction cases, compared to the RC. Similar to the residential sector, most of the reduction in the commercial sector occurs for space conditioning - heating, cooling, and ventilation.

The average price of gasoline in 2010 across the carbon reduction cases is between 11% and 53% higher than the projected RC price. Carbon reductions in the transportation sector in 2010 range from 2% to 16%, primarily as the result of reduced travel and the purchase of more efficient vehicles. The relatively low carbon reductions for transportation result from the continued dominance of oil, although some increase in market share is projected for alternative-fuel vehicles. Improvements in average fuel efficiency are slowed by vehicle turnover rates. Although the use of oil declines relative to the RC, it increases slightly as a share because most oil is used in the transportation sector, where fewer fuel substitutes are available.

Oil consumption is lower in all the carbon reduction cases than in the RC, by between 2% and 13%. Because of lower oil demand in the U.S. and in other developed countries that are committed to reducing emissions under the Kyoto Protocol, world oil prices are lower by between 4% and 16% in 2010, relative to the RC price of $20.77 per barrel.

In 2010, net crude oil and oil product imports are lower by a range of 3% to 22% relative to the RC. Consequently, the dependency of the U.S. on imported oil is reduced from the RC level of 59% to 53% in 2010.

In 2010, natural gas consumption is higher than in the RC, by a range of 2% to 12% across the carbon reduction cases. Increased use of natural gas in the generation sector is only partially offset by reductions in the end-use sectors. Later in the forecast period, continued growth in natural gas consumption for electricity generation is mitigated by the increasing use of renewables and nuclear power, particularly in the more stringent carbon reduction cases. As a result, in 2020, natural gas use does not necessarily increase with higher levels of carbon reductions.

As a result of higher demand, the average wellhead price of natural gas in 2010 is higher in all the carbon cases than in the RC, by a range of 2% to 30%. Although meeting the levels of production that may be required will be a challenge for the industry, sufficient natural gas resources are available.

Nuclear power, which produces no carbon emissions, increases with carbon reduction targets by between 8% and 20% in 2010, relative to the RC. Although no new nuclear plants are assumed to be built in the carbon reduction cases, extending the lifetimes of existing plants is projected to become more economical with higher carbon prices. In the more stringent carbon reduction cases, most existing nuclear plants are life-extended through 2020.

There are three ways to reduce energy-related carbon emissions: (a) reducing the demand for energy sources, (b) adopting more energy-efficient equipment, and (c) switching to less carbon-intensive or non-carbon fuels.

To reduce emissions, a carbon price is applied to the cost of each fuel relative to its carbon content at its point of consumption.

Electricity does not directly receive a carbon fee. However, the fossil fuels used for generation receive the fee, and this cost, as well as the increased cost of investment in generation plants, is reflected in the delivered price of electricity. In practice, these carbon prices could be imposed through a carbon emissions permit system.

In this analysis, the carbon prices represent the marginal cost of reducing carbon emissions to the specified level, reflecting the price of carbon permits purchase from other countries or to induce carbon reductions in other countries. A complete analysis of permit trade and other flexible mechanisms to reduce carbon emissions internationally are not yet in place. Therfore, the projected carbon prices do not necessarily represent the international market-clearing price of carbon permits or the price at which other countries would be willing to offer permits.

To develop these projections, the EIA used the National Energy Modeling System (NEMS) which is an energy-economy modeling system of U.S. energy markets. The production, imports, conversion, consumption, and prices of energy are projected for each year through 2020, subject to assumptions on macroeconomic and financial factors, world energy markets, resource availability and costs, and technological choice criteria, costs and performance characteristics of energy technologies, and demographics. NEMS is a fully integrated framework, capturing the interactions of energy supply, demand, and prices across all fuels and all sectors of U.S. energy markets. Unknown technologies are not likely to be developed in time to achieve significant market penetration within the time frame of this analysis. With such analytical complexity and comprehensiveness of this model, it would be very helpful to grasp many of the interacting and interfacing forces which are not available otherwise. The specific figures which relate to the U.S. economy are not of significance to our purpose which is to get an insight view at the forces in place. However, some of the figures will be cited to show the order of magnitude of the investigated effect.

Higher energy prices, as a result of carbon prices, alter the characteristics or availability of energy-using technologies in some sectors. Higher energy prices also induce more rapid adoption of more efficient or advanced technologies, because consumers would have more incentive to purchase them.

In 2010, the carbon prices projected to achieve the carbon emissions reduction targets range from $67 per metric ton (1996 dollars) in the 1990+24% case to $348 per metric ton in the 1990-7% case (these are the two cases which determine the upper and lower ranges of the possibility; the upper being the reference case and the lower being the Kyoto target).

The more stringent carbon reduction is, the more rapidly escalating the carbon price. On the other hand, the carbon price is expected to decline as cumulative investments in more energy-efficient and lower-carbon equipment increase. These investments would reduce the demand for carbon permits, offsetting growth in energy demand and moderating the carbon prices.

In the developing countries, carbon emissions are projected to grow more quickly over the same period from 1.65 to 4.9 BMT. The rapid increase is expected to be caused both by rapid economic growth, accompanied by growing demand for energy, and by continued heavy reliance on coal, especially in developing Asia where China and India account for nearly 90% of coal consumption.

As Table (2) demonstrates, the achievement of emission targets proposed under the Kyoto Protocol in 2010 would have to be 24% lower than those currently projected for the industrialized Annex I countries. In the United States and Canada, meeting the targets by 2010 would require reductions of 30% and 27%, respectively, from projected emissions.

In contrast, emissions in Eastern Europe (EE) and FSU are much lower now than they were in 1990. At 1.3 BMT in 1990, and 0.84 BMT in 1996, carbon emission in EE/FSU are expected to reach 0.94 BMT in 2010 and 1 BMT in 2020.

If energy consumption in the countries of the FSU grows as projected in the reference case (Table 1), carbon emissions will remain about 33% below the levels allowed under the Protocol (which requires no reductions from 1990 emissions levels).

In Eastern Europe, where countries are allowed to increase emissions in 2010 to 7% above their 1990 levels, emissions will still be about 18% below the required targets. The Kyoto targets for Bulgaria, Hungary, Poland, and Romania, which currently account for some 66% of all emissions from Eastern European countries, were allowed to use base years other than 1990. As a result, the Kyoto target for total carbon emissions for Eastern Europe in 2010 would be 320 million tons.

By 2010, the FSU lower use of energy consumption would result in carbon emission of only 666 million metric tons (Table2). This would contribute 324 million metric tons of tradable emissions units available for purchase by the industrialized Annex I countries to use as credits in meeting their Kyoto Protocol targets. Accordingly, with the higher level of credits available from the EE/FSU, Annex I countries would need to reduce emissions by only 10% from the RC projection (from 4344 to 3896 million tons of carbon) to meet their Kyoto Protocol targets.

Likewise, Annex 1 countries emissions, according to RC and without Kyoto, are expected to grow by only 7% ( from 4062 to 4344 million tons of carbon) during 1990-2010. The 27% decrease in emissions expected for the EE/FSU offsets the 23% increase projected for the industrialized Annex I countries.

## Chapter Three - Implication of Kyoto Protocol to U.S.

At the request of the U.S. House of Representatives Committee on Science, the Energy Information Authority (EIA) performed an analysis of the Kyoto Protocol, focusing on the potential impacts of the Protocol on U.S. energy prices, energy use, and the economy in the 2008 to 2012 time frame. This Chapter is intended to briefly outline the fundamental features of this study as a model of what could happen in other regions or countries. In order to capture the most important concepts, we will try to simplify the presentation

change, and to adopt national policies to return emissions of GHG to their 1990 levels.

The first and second Conference of the Parties (CP1 and 2) in 1995 and 1996 agreed to address the issue of GHG emissions for the period beyond 2000, and to negotiate quantified emission limitations and reductions for the third Conference of the Parties.

On December 1 through 11, 1997, representatives from more than 160 countries met in Kyoto, Japan, (COP3) to negotiate binding limits on GHG emissions for developed nations. The resulting Kyoto Protocol established emissions targets for each of the participating developed countries - the Annex I countries - relative to their 1990 emissions levels. The targets range from an 8% reduction for the European Union (or its individual member states) to a 10% increase allowed for Iceland. The target for the U.S. is 7% below 1990 levels.

Non-Annex I countries have no targets under the Protocol, but the Protocol reaffirms the commitments of the FCCC by all parties to formulate and implement climate change mitigation and adaptation programs.

In order for Kyoto Protocol to come into force it should be ratified by at least 55 Countries, incorporating Annex I Parties which account for at least 55% of 1990 Annex I emissions. As of March 15, 1999, 83 countries had signed the Kyoto Protocol; but none of the Annex I countries had ratified it by that date.

When the Protocol enters into force, the emission targets for the developed countries would have to be achieved on average over the commitment period 2008 to 2012. This would have profound effects on the use of energy in the industrialized world. The GHG covered by the Protocol are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The aggregate target is based on the carbon dioxide (CO2) equivalent of each of the GHG.

Several provisions of the Protocol allow for some flexibility in meeting the emissions targets. Emissions trading among the Annex I countries is allowed by Article 17 of the Protocol, but no rules for trading were established. The Conference of the Parties has by far convened 4 times, the last of which (COP4) was held in Buenos Aires in November 1998. It is required to establish principles, rules, and guidelines for trading at a future date.

Additional carbon permits may also be available, depending on the "carbon price" that is established in international trading. An offset that could provide an alternative to reducing fossil fuel consumption is permitted by the concept of "joint implementation" and the "clean development mechanism". These two concepts could generate certified emission reductions which are transferable to an Annex I country to meet its emissions target.

Pursuant to Article 6 of the Protocol, Joint Implementation projects are permitted among the Annex I countries, allowing a nation to take emissions credits for joint projects that reduce emissions or enhance emissions-absorbing sinks, such as forests and other vegetation, in other Annex I countries.

The Protocol also establishes in Article 12, a Clean Development Mechanism (CDM), under which Annex I countries can take credits for projects that reduce emissions in non-Annex I countries. In addition, any

available sites in the industrialized countries have been exploited, The renewable energy sources of the future are most likely to be wind, solar (especially solar photovoltaics), and closed-loop biomass. Although the use of these non-carbon- producing energy sources has increased only slightly in recent years, binding limits on carbon emissions such as those specified in the Kyoto Protocol could greatly enhance their economic prospects.

- Natural gas is considered the most likely substitute for the lost nuclear capacity because it is the cleanest of the fossil fuels and would minimize the impact on carbon emissions.

Despite projections of decreasing energy intensities and relatively stable carbon intensities, total carbon emissions from the industrialized nations are projected to grow, with GDP growth rates exceeding the rates of reduction in energy intensity. Growth is expected to be particularly strong in North America, where relatively robust economic growth and flat carbon intensity more than offset reductions in energy intensity. Smaller increases are projected for Western Europe and industrialized Asia. For the industrialized nations as a group, GDP growth is expected to be the most significant factor underlying the increase in carbon emissions.

The challenges of energy use and environmental quality facing the industrialized countries differ from those for the developing world. The industrialized countries have depended in their economic development on the availability of relatively low-cost fossil fuels. Given the amount of capital invested in the infrastructure, policies that modify underlying sources of energy inputs and end-use patterns will require time for turnover of existing capital stock. The principal challenge then, to the industrialized countries, is to implement policies that protect the global environment while allowing for flexible adjustment of their energy systems.

The developing world, while seeking to grow economically, is confronted with the environmental lessons learned from the industrialized countries process of economic growth. Within developing countries, much of the infrastructure that would support an industrialized economy is not yet in place. This presents an advantage in terms of identifying development paths that will allow greater scope for alternative energy sources and patterns of end-use consumption as new capital stock is put in place.

The following chapters will examine the link between energy use and emissions of carbon dioxide in the context of reduction scenarios such as those proposed under the Kyoto Protocol. Implications of environmental measures for oil exporting countries will be examined and policy options recommended as to how they can maintain their oil revenue in face of adverse repercussions.

## Chapter Two - The Energy/Carbon Reference Case

The real environmental threat to oil and gas industry stems from multilateral environmental agreements (MEAs) rather than from Multilateral Trade System (MTS). The Kyoto Protocol is by far the most important MEA. The MTS are represented by the WTO and GATT Agreements, including the ongoing negotiation and discussions within the Committee on Trade and Environment (CTE).

The focus of international debate in recent years has been on the Framework Convention of Climate Change (FCCC), the Kyoto Protocol, and the Conferences of the Parties the last of which (COP-4) was held in Buenos Aires, November 1998—all under the auspices of the United Nations Intergovernmental Panel on Climate Change.

The Kyoto Protocol, which we will later discuss in detail, if ratified, calls for quantifiable goals for carbon emissions from the Annex I countries[1]. Without the Kyoto agreement, emissions are projected to increase by 38% between 1990 and 2010.

In the coming decades, global environmental issues could significantly affect patterns of energy use around the world. Levels of energy-related carbon emissions depend on economic growth, the amount of energy consumed per unit of economic activity, and the mix of non-fossil and fossil fuel sources used to produce energy for end-use consumption.

If carbon emissions are to be stabilized or reduced worldwide, there must be declines in energy intensity as well as substitution of less carbon-intensive fuels for more carbon-intensive fuels.

Not all industrialized countries, which are committed by Kyoto Protocol to reduce emission, are in equal positions with regard to carbon reduction programs. They differ in energy intensity, the carbon intensity of fuels used to meet energy demand, and the availability of low-carbon or non-carbon fuels for future energy supplies. The degree of flexibility built into any carbon reduction approach, could have a substantial effect on implementation.

Two factors, in combination with the level of economic activity, determine the energy-related carbon dioxide emissions of a given country at a given point in time. These are energy intensity and carbon intensity of energy supply.

Energy intensity is a measure of the output of an economy in relationship to its energy inputs, and it is influenced by the energy efficiency of existing capital stock, such as electricity generation facilities, end-use equipment, and vehicles. The energy efficiency of the capital stock is in turn influenced by the relative prices of energy and other inputs to the economy, such as capital and labor. The more expensive energy is in relation to other inputs, the more incentive there is to invest in energy-efficient technologies and in the research and development that leads to efficiency improvements. Conversely, if energy prices decline and remain low, there is less incentive for research and development or investment in energy-efficient technologies. If energy is a large portion of a consumer's budget, there is a greater incentive to pay attention to energy use and costs.

A factor called the "autonomous rate" of energy use accounts for changes in energy intensity that are not attributable to price effects. Other factors that can influence energy intensity include changes in standards for energy-using appliances and equipment. Such changes are not also reflected in the price of the energy source. Changes in tastes and preferences where,

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[1]Those were: Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, European Union, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, UK and USA.