Global Warming
in an Unequal World
A case of environmental colonialism

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CENTRE FOR SCIENCE AND ENVIRONMENT

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Global Warming in an Unequal World

The idea that developing countries like India and China must share the blame for heating up the earth and destabilising its climate, as espoused in a recent study published in the United States by the World Resources Institute in collaboration with the United Nations, is an excellent example of *environmental colonialism*.

The report of the World Resources Institute (WRI), a Washington- based private research group, is based less on science and more on politically motivated and mathematical jugglery[1]. Its main intention seems to be to blame developing countries for global warming and perpetuate the current global inequality in the use of the earth's environment and its resources.

A detailed look at the data presented by WRI itself leads to the conclusion that India and China cannot be held responsible even for a single kg of carbon dioxide or methane that is accumulating in the earth's atmosphere. Carbon dioxide and methane are two of the important gases contributing to global warming. The accumulation in the earth's atmosphere of these gases is mainly the result of the gargantuan consumption of the developed countries, particularly the United States.

The WRI report is entirely designed to blame developing countries for sharing the responsibility for global warming. Global warming is a phenomenon that could lead to major climatic disturbances, drying up of rain over large areas, and melting of the ice caps leading to countries like Maldives disappearing completely and India and Bangladesh losing a large part of their coastline.

The WRI report is already being quoted widely and its figures will definitely be used to influence the deliberations on the proposed, legally-binding, global climate convention. This kind of data will be used by the US government to strengthen its position, which it took during the ozone negotiations, that it will not pay for ecological reparations. The US government agreed to the paltry amounts negotiated at the London 1990 meeting for a global ozone fund only after considerable pressure from European countries, particularly the Scandinavian countries.

Many developing countries fear that the proposed climate convention will put serious brakes on their development by limiting their ability to produce energy, particularly from coal (which is responsible for producing carbon dioxide), and undertake rice agriculture and animal care programmes (activities which produce methane).

Behind the global rules and the global discipline that is being thrust upon the hapless Third World, there is precious little global sharing or even an effort by the West to understand the perspectives of the other two-thirds. How can we visualise any kind of global management, in a world so highly divided between the rich and the poor, the powerful and the powerless, which does not have a basic element of economic justice and equity. One American is equal to, god knows, how many Indians or Africans in terms of global resource consumption.

The entire debate on the prospects of impending doom is, in many ways, an excellent opportunity for the world to truly realise the concept of one world. A world which is interdependent and which cannot withstand the current levels of consumption and exploitation, especially the levels now prevalent in the West. We had hoped that Western environmentalists would seize this opportunity to force their countries to 'dedevelop' as they have used up the world's ecological capital and continue to overuse it even today. Sadly, instead, the focus today is on poor developing countries and their miniscule resource use is frowned upon as hysteria is built up about their potential increase in consumption. For instance, in the negotiations to reduce ozone destructive gases, the common refrain has been that the future potential of CFC production in India and China -- which together produce only 2 per cent of the responsible chemicals today -- constitutes a threat to global survival. As their consumption is bound to increase, the dream of every Chinese to own a refrigerator, is being described as a global curse.

The Washington-based Worldwatch Institute points out in a recent paper : ". . . there remains the extraordinarily difficult question of whether carbon emissions should be limited in developing countries, and if so at what level. It is a simple fact of atmospheric science that the planet will never be able to support a population of 10 billion people emitting carbon at, say, the rate of Western Europe today. This would

imply carbon emission's of four times the current level, or as high as 23 billion tonnes per year.[2]"

Gus Speth, WRI's president in an article in Environment magazine puts it more bluntly "Deforestation and other land use changes now account for about one-third of the carbon dioxide produced by human activity and some of the methane. If just China and India were to increase their greenhouse gas emissions to the global average per capita rate, today's global total would rise 28 per cent; if these two countries matched France's per capita rate, the total would be 68 per cent higher". Speth, therefore, concludes: "As a practical matter, developing countries expect industrial countries to take the first and strongest actions on global warming. These developing nations want to see the seriousness of the threat validated, and they conclude correctly that industrial nations are largely responsible for the problem and have the most resources to do something about it. *But carrying this argument too far could lead to a tragic stalemate*".[3]

It is constantly mentioned that the efforts of the West to check pollution and global warming could be torpedoed by a rise in coal burning in the developing world. Why should we do anything if you are also going to want cars, electricity or refrigerators is the underlining statement. Recently, the head of the environmental group of the International Energy Agency (IEA) based in Brussels -- an agency which looks after the energy interests of rich countries -- told the press that the coal use in developing countries could have very dramatic environmental implications. "The levels of coal use predicted for India and China could have a very dramatic environmental impact indeed. If developing countries keep to the sort of forecasts of coal consumption now being bandied about, they would negate any effort by Western countries to control emissions of greenhouse gases," the IEA official recently told Reuters.[4]

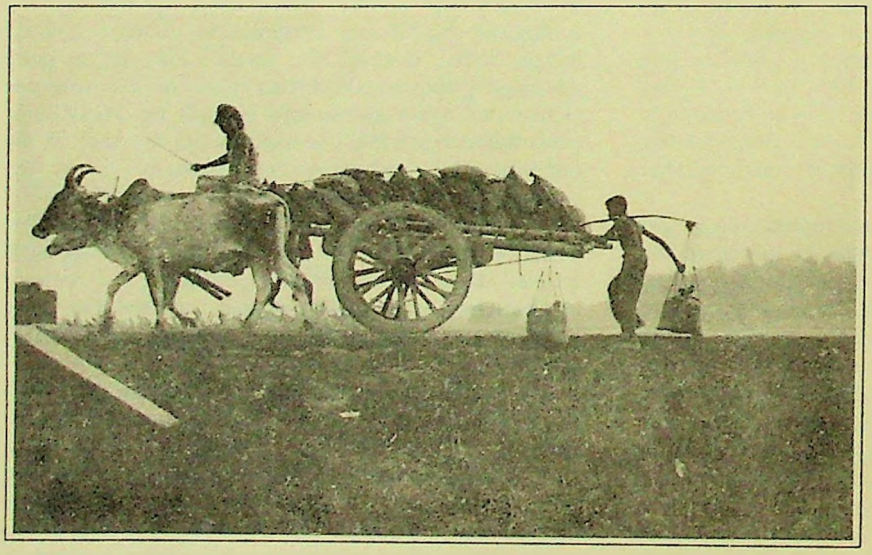
We consider such statements, now commonplace in the West, both irresponsible and highly partisan. They constitute the worst form of preaching the world has ever seen -- literally amounting to blaming the victim. If anything, the available figures show that the West must immediately put its own house in order.

And this is when Western nations themselves are talking, at most, about stabilising their current consumption of energy use or reducing them marginally. The US has in fact rejected even discussions about stabilising its consumption as US President George Bush now considers the global warming debate a mere myth. But even stabilising energy consumption means maintaining the manifold inequity in resource consumption between the developed and developing worlds. Does this mean that developing countries will be "allowed" to reach these levels or is our quota of the global atmosphere finished ?

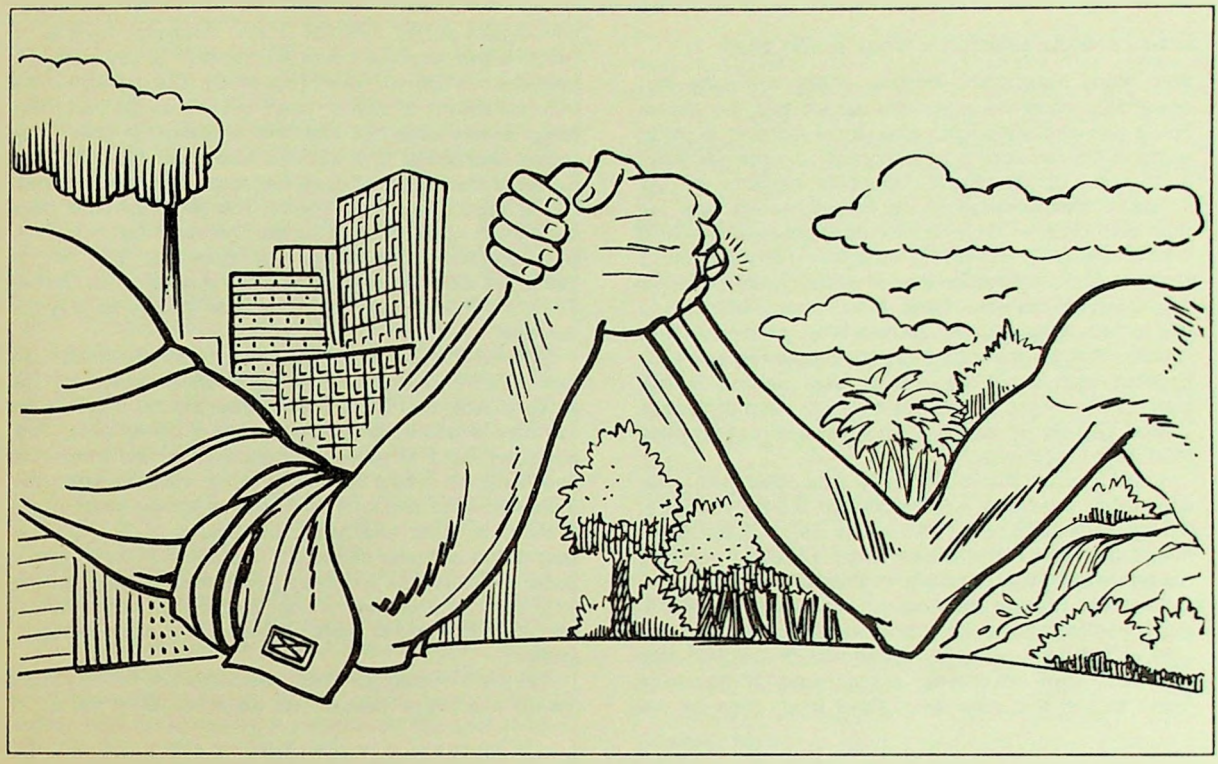
India and China today account for more than one third of the world's population. The question to be asked is whether we are consuming one-third of the world's resources or contributing one-third of the muck and dirt in the atmosphere or the oceans. If not then surely these countries should be lauded for keeping the world in balance because of their parsimonious consumption despite the Western rape and pillage of the world's resources.

The California based International Project for Sustainable Energy Paths (IPSEP) in its report on Energy Policy in the Greenhouse has warned against any trend towards "environmental colonialism in which the climate issues is inadvertently or deliberately used to reinforce traditional agendas that are in conflict with the North-South combine".[5] The report, which the British newsmagazine, New Scientist, called the first detailed formula for reducing releases of carbon dioxide by the year 2005, has argued for substantial and urgent reductions of emissions of industrialised countries, who depending on the mathematical calculations, have already either used up their entire quota of emissions to the atmosphere until 2100 or will be doing so by 1997.[6]

The manner in which the global warming debate is being carried out is only sharpening and deepening the North-South divide. Given this new found interest in the so-called



Stomach gas from cattle allegedly contributes to global warming.



Our Common Future and future generations, it is time for the Third World to ask the West, "whose future generations are we seeking to protect, the Western World's or the Third World's"?

WRI report reinforces this divide. By shifting the onus onto the developing world, it whitewashes the role and the responsibility of the West in destroying our "common future". James Gus Speth, WRI's president says diplomatically about his report, "the new information means that industrial and developing countries must work together to begin reducing emissions of greenhouse gases and we need a new era of environmental cooperation". Third World environmentalists must not get taken for a ride by this highly partisan `one worldism'.

WRI's calculations: faulty and prejudiced

The figures used by WRI to calculate the quantity of carbon dioxide and methane produced by each country are extremely questionable. *Heavy emphasis has been placed on carbon dioxide production due to deforestation and methane production from rice fields and livestock as compared to carbon dioxide production from the use of fossil fuels like oil and coal. Since developing countries are more responsible for the former, the heavy emphasis on deforestation and methane generation tends to overplay their contribution while underplaying that of the developed countries.*

Brazil, for instance, is a clear case where deforestation estimates have been overstated (see box). Even though Brazil's deforestation did peak in 1987, several Brazilian sources point out that they have reduced substantially since then. Its carbon dioxide emissions since 1987, and on average during the 1980s, are much lower than those taken by WRI to calculate carbon dioxide emissions. Similarly, in India, deforestation rates do not seem to be the same as that of the 1970s, that is, 1.5 million hectares a year – the figure taken as the yearly average by WRI for the 1980s.

According to the Forest Survey of India, deforestation rates have gone down in the 1980s. The latest assessment based on satellite imagery over a four period year between 1981-83 and 1985-87 shows that the rate of forest loss has gone down to 47,500 ha each year -- a mere 3 per cent of the earlier estimate[7]. These figures may well be an understatement as most Indian environmentalists would allege. But even if it is one-tenth of the true figure, it will be nowhere near the figures used by WRI. Increased public awareness, relatively stricter implementation of forest legislation and other measures have definitely driven down the rate of deforestation in the country compared to the 1970s. And even though there is a lot still to be done in this area, it is unlikely that India has the dubious distinction of destroying 1.5 mha of forests each year even in the 80's.

For other developing countries also, the accuracy

Brazil's deforestation : what is the truth ?

The World Resources Institute (WRI) contends that developing countries contribute almost half the greenhouse gas emissions leading to global warming. A major share of the developing world comes, according to WRI, from one country, Brazil, allegedly because of the extensive deforestation of the Amazon forest over the past one decade. Brazil's total contribution ranks third next to only USA and USSR, contributing as much as 15 per cent of the net carbon dioxide emissions of the world. Brazilians, on the other hand, have strongly objected to this unfair emphasis on deforestation as a cause of climate change, particularly as the data base on deforestation rates, unlike the rates of fossil fuel use, is very poor. And it is also possible to calculate more accurately carbon dioxide emissions from fossil fuel consumption than from deforestation.

Leaving aside the lack of good data about deforestation and its impact on climate change, a detailed look at the figures presented by WRI shows clearly that assessments of Brazil's deforestation vary enormously and may not be as high as claimed or highlighted by it.

The total area of the Amazon legally under Brazil is roughly 340 million hectare (mha) out of a total Amazonian area of 500 mha, which it shares with its neighbouring countries. There are different assessments for the rate of forest loss in this area. Most have been done by the government-owned National Space Research Institute of Brazil which has used satellite imagery to estimate deforestation in different years (see table). The estimates vary from 1.4 mha to 8 mha of forest loss in a single year. This range is very large and has been explained in WRI's own review. According to a satellite based survey by Alberto Setzer of the National Space Research Agency, deforestation in 1987 was around 8 mha. The very next year, however, when he resurveyed the area he found that deforestation had reduced drastically - by more than half. And, in 1989, the following year it had come down even further. Thus, 1987 was clearly an aberration and in no way the average.

WRI itself writes, "1987 may have been an anomalously high year for deforestation in the Brazilian Amazon". The reasons being that it was the last year that tax credits were available to land holders for clearance of the Amazon. This, obviously, lead to extensive clearance of the forests as people rushed to take advantage of this and other legislative proposals which encouraged clearance and extension of cultivation. In 1988 and 1989, tax credits were, however, suspended and later cancelled. And pushed on by international pressure, the Brazilian government started a campaign to slow down the burning. Wetter conditions over this period also helped to dampen fires and encourage regeneration.

Yet with amazing audacity, WRI takes the 1987 estimate not for one single year but as an average for the entire

Various Estimates for Forest Loss In Brazil's Amazon (as found In the WRI Report)

Year	Sources	Estimated extent of annual deforestation (mha)	Percentage of total Amazonian Forest in Brazil lost each year (%)	Estimated extent of area deforested in last decade (mha)	% of legal Amazon deforested in last decade (%)
1981-1985	FAO	1.4	0.4	14	4
1987	Alberto Setzer, National Space Research Institute (INPE), Brazil (using remote sensing)	8.0	2.4	80	24
1988	Alberto Setzer, INPE, Brazil (using remote sensing)	4.8	1.4	48	14
1989	Alberto Setzer, INPE, Brazil (using remote sensing)	2-2.4	0.6-0.7	22	7
1988	Philip Fearnside, INPE, Brazil (Linear projection based on 1978 survey)	3.5	1.0	35	10
1988	Robert Pereira da Cunha, INPE, Brazil (survey in 1988 based on 10 years data using Landsat Thematic Mapper)	1.7	0.5	17	5
1988	Recalculation using INPE data, personal communication with Prof. Jose Goldemberg, President, University of Sao Paulo	2.3	0.6	23	7

decade. For instance, its table titled Forest Resources 1980s takes 8 mha as the average annual deforestation in Brazil. This table and its assessments are later used to calculate carbon dioxide emissions. Only footnotes in miniscule type admit that this rate of deforestation is only for one year.

If Brazil had indeed lost 8 mha each year, a staggering 80 mha, or about one fourth of country's total Amazon forests, would have disappeared during the 1980s. A ten year assessment by Robert da Cunha of the National Space Research Agency found that the annual rate of loss was 1.7 mha totalling to roughly 17 mha over the past 10 years or about 5.12 per cent of Brazil's Amazonian forests. Even if, as stated by WRI, this estimate is on the low side, clearly it cannot be off the mark by as much 60 mha -- almost the size of India's total forest land. WRI has itself revised this figure after consultations with Prof. Jose Goldemberg, president of the University of Sao Paulo and put the annual rate of deforestation during the 1980s at about 2.3 mha. Then why this hoax while calculating carbon dioxide emissions ?

All this may be pardonable if it was merely an exercise in back of the envelope calculations to provoke governments into action. But when it gets used to abrogate responsibility for global warming and push for legally binding conventions, it is no longer a joke. WRI can possibly justify its action by saying that it used the assessment of forest loss for 1987 to calculate the greenhouse index for 1987. But then, this does not explain how it has used high average rates of deforestation in the case of other countries like India. Moreover, why doesn't every press statement and every contention, underline this fact ? Taking the estimate of Alberto Setzer for 1988, Brazil's contribution to the carbon dioxide emissions will go down from 1,200 million tonnes of carbon equivalent to 800 million tonnes. As a result Brazil's contribution to the net emissions of carbon dioxide to the atmosphere will go down from nearly 15 per cent to 10.5 per cent.

Taking the average annual estimate for forest loss in Amazon over the decade 1978 to 1988, the figure of carbon dioxide emissions is further reduced to 380 million tonnes of carbon equivalent. The net emissions of carbon dioxide from Brazil will then go down to only 5.6 per cent of the world's total carbon dioxide emissions. The share of developing countries of carbon dioxide and all greenhouse gas emissions will also go down dramatically.

The accuracy of deforestation estimates for other developing countries is also very uncertain. In many cases it is based on an independent estimate often originating from a paper presented at a conference or a lone survey. And while there is a tendency to overstate deforestation rates in developing countries there is also a clear case of understatement when it comes to the developed countries. There was, thus, no forest destruction or damage in any developed countries like USSR, USA or Australia.

Surely this, if nothing else, makes a mockery of WRI's claim that "global warming is a truly global phenomenon in *both* cause and potential effect". It is indeed a global phenomenon in effect -- all of us will suffer -- but caused by the wilful overconsumption of a few, particularly the society that WRI comes from.

of the forest loss estimates used by WRI to calculate carbon dioxide levels are very shaky. For instance, estimates for Myanmar (erstwhile Burma) are based on one paper estimating forest loss over 1975-81 presented in a workshop in Finland. The estimate is 5.45 times more than the FAO assessment of 1980 for Myanmar. In the case of Indonesia, a World Bank review paper on Indonesia's forest, land and water issues has been used to estimate the rate of deforestation which is 50 times more than the FAO estimate.

Interestingly, the US deforestation rate, which is zero according to WRI, is based on personal communications between WRI and the US department of agriculture. Similarly, there are, according to WRI, absolutely no land use changes leading to deforestation in any of the industrialised countries like USSR and Australia. The effects of acid rain, which has destroyed vast tracts of European and North American forests, remains unaccounted. And this is when WRI's own past reports have estimated extensive damage to these forests.[8] According to one estimate, more than a fifth of the forested area in Europe had been damaged by acid rain by 1986. This, together with North America, equalled to roughly 10 per cent of all the non-tropical forest area. Obviously, this would have an impact on climate change as some Western scientists have calculated. One estimate is that 10 per cent of temperate forests, damaged by acid rain, would together release as much as 35 billion tonnes of carbon equivalent into the atmosphere – equal to the effect of using fossil fuels for seven years at current rates.[6] The fact remains that forest loss data in the world is still extremely poor and it is difficult to use it for any set of calculations of carbon emissions to the same level of precision as fossil fuel use data.

The methane issue raises further questions of justice and morality. Can we really equate the carbon dioxide contributions of gas guzzling automobiles in Europe and North America or, for that matter, anywhere in the Third World with the methane emissions of draught cattle and rice fields of subsistence farmers in West Bengal or Thailand ? Do these people not have a right to live ? But no effort has been made in WRI's report to separate out the 'survival emissions' of the poor, from the 'luxury emissions' of the rich. Just what kind of politics or morality is this which masquerades in the name of 'one worldism' and 'high minded internationalism'?

CSE's calculations

CSE's analysis presented in this report does not question the data that WRI has used to calculate each country's production of carbon dioxide and methane, even though as argued above they definitely can be questioned. Yet CSE's analysis shows India and China cannot be blamed for any of the methane or carbon dioxide that is appearing in the atmosphere.

Methane : problems in estimating a lot of hot air

Methane is released to the atmosphere through a variety of human activities. According to the estimates in the World Resources Institute (WRI) report, almost 40 per cent is estimated to come from leakages during hard coal mining and natural gas exploration and transportation as well as from urban landfills and sewage plants. The rest comes from anaerobic fermentation in irrigated rice fields and from the enteric fermentation, or stomach gas, of livestock.

How reliable are the estimates of methane emissions from livestock or paddy fields unlike the leakages from natural gas pipelines? Animal methane production is dependent on both the type of animal and the quality and quantity of feed fed to it. Most developing country governments do not know how much and what their animals eat. In India, for instance, the available figures are at best a guesstimate, based on a few random studies of how underfed cattle forage for their survival. Then how do we find out how much the cattle, goats, and sheep of the Third World emit in terms of gases that can affect climate change ?

The WRI and the International Project for Sustainable Energy Paths (IPSEP) reports depend on a single a paper by P.J. Crutzen and others published in a journal called Tellus for their methane calculations. WRI has used precisely this one source to prepare global estimates of animal methane production based, of course, "on the specifics of each country's animal husbandry practices and the nature and quality of feed available". No details have been given as to what these specifics are.

According to the details of Crutzen's study published by IPSEP, cattle are by far the most important source for animal methane. Almost 75 per cent of all animal related methane comes from the world's 1,300 million heads of cattle. Cattle dominate in methane production not only because they eat more, but also because their digestive system is such that a larger fraction of their feed and fodder is converted to methane than other animals. According to Crutzen, each head of cattle in the world emits 45 kg of methane, on an average, every year. But the yield depends also on the quality and amount of feed each animal eats. The biggest eaters are dairy cows which receive three times their maintenance level feed. Consequently, Crutzen estimates that the average methane production in the cattle of industrialised countries is higher -- about 55 kg per animal per year -- as compared to the developing country cattle, which is about 35 kg per cattle head per year. This is partly because a large portion of Third World cattle are kept for draught purposes rather than meat or milk, and are not fattened like dairy cows. But it is not clear how Crutzen has estimated this average.

On this basis, Crutzen calculates that total animal methane production is about equally large from developed and developing countries. On the contrary, WRI calculations show that livestock of developing countries account for roughly 60 per cent of the total animal methane generated in the world. This discrepancy in the two figures originating from the same basic source is hard to explain.

The discrepancy may be the result of the cattle population estimated by Crutzen as against that taken by WRI which is from FAO. FAO puts the total cattle population in 1988 at 1,300 million but the percentage of industrialised country cattle is roughly half that of developing country cattle, which Crutzen takes as almost equal. According to FAO, industrialised country cattle numbered 404 million while developing country cattle were 860 million. In 1988, developing countries supported a total of 2,700 million heads of livestock while industrialised countries had 1,400 million. But the ratio of total cattle to livestock cattle was the same -- 30 per cent -- in both cases. So, according to WRI, with roughly 67 per cent of the world's livestock and 68 per cent the world's cattle, developing countries generated 60 per cent of the world's annual production of animal methane. Given the low methane yields of most livestock like goats and sheep and the lower average yields of developing country cattle, this does not seem right. But it is difficult to say anything concretely unless details of WRI's calculations are available.

Beef Consumption

Once it is accepted that animal methane does contribute to global warming, the obvious question lies in what ought to be done about it? Does action lie in reducing livestock herds? If so, then on what basis? According to IPSEP, one

Table 1
Natural Sinks of Greenhouse Gases

Greenhouse Gases	WRI Estimates[1]						IPSEP estimates[2]
	Total Amount Produced		Net Emissions to the Atmosphere		Amount Absorbed by the world's Environment		Natural sink available[3]
	million tonnes of the gas	million tonnes of carbon equivalent	million tonnes of the gas	million tonnes of carbon equivalent	million tonnes of the gas	million tonnes of carbon equivalent	million tonnes of the gas
Carbon dioxide	31,100	8,500	13,600	3,700	17,500	4,800	15,000
Methane	255	4,800	43	800	212	4,000	213
CFCs	772	1,400	772	1,400	Nil	Nil	Nil
Total	-	14,700	-	5,900	-	8,800	-

Notes : [1] WRI: World Resources Institute.
[2] IPSEP: International Project on Soft Energy Paths.
[3] Natural sink available = Total natural sink - Production from natural sources.

way to mitigate these emissions is indeed to reduce cattle herds and beef consumption. But, it adds, the action lies more in the industrialised countries and not so much in developing countries. Per capita meat consumption is currently six times higher in the former (78 kg/year) as compared to the latters (14 kg/year). Moreover, while per capita consumption in the developed countries has risen by 20 per cent in the last 15 years, it has stagnated in the Third World. The idea of beef reduction in the industrialised world, according to IPSEP is also realistic as people in these countries consume several times more meat than the minimum of about 30 gm per day recommended for a balanced non-vegetarian diet. A 50 per cent decrease in the per capita consumption of beef would still allow ample supplies of dairy products while reducing the total animal methane production by 40 per cent. Moreover, reduction in beef consumption would not reduce overall meat consumption very substantially. In West Germany, for instance, people consumed about 90 kg of meat per person in 1984 on average. Only 25 per cent of this meat came from cattle. But the same cattle consumed 75 per cent of the total feed and fodder and emitted 75 per cent of the animal methane.

The IPSEP report also estimates that if beef consumption was replaced by pork then methane emissions would drop dramatically as pigs produce very little methane. In that case, meat consumption would not be affected at all.

Eating less beef by the rich can, thus, lead to better health and a better atmosphere. It would also lead to better land management because beef production is particularly land intensive. As land is short in several developed countries, a great deal of the feed consumed in these countries, particularly in Europe, is purchased from developing countries where global market pressures are forcing land away from subsistence farming and into cash cropping -- a process attendant with enormous social and ecological costs. For instance, Western Europe imports more than 40 per cent (21 million tonnes) of its feed grains from the Third World. In addition, almost two thirds of the total domestic grain production of this region goes to feed these methane emitting animals. In Central America, beef production for export to the hamburger shops of the US has lead to extensive destruction of tropical forests, leading, in turn, to carbon dioxide emissions from these countries. Keeping all these factors in mind, IPSEP has, in fact, suggested that a climate tax be imposed on beef consumption in the rich countries.

Developing countries, on the other hand, cannot afford to reduce their cattle populations as in these countries cattle play a much broader set of functions than just giving meat or milk. Cattle dung fertilizes the fields and provides energy to cook food. Cattle, in fact, play a vital role in maintaining soil fertility in many developing countries. The draught power provides the farmer with a basic input for agriculture, thus, replacing the tractor. In India, for instance, the installed capacity of the animal labour force equalled the total installed capacity for electric power generation in the country in the early 1980s. In addition, the cattle provide milk, hides and meat.

Paddy Methane

Estimating methane production from irrigated rice fields is equally tricky. Estimates of methane from rice fields in the world are based on some two or three studies, and all done in the developed countries. IPSEP, for instance, depends on research done in 1984 by W. Seiler and others in Spain. WRI depends on another paper coauthored by W. Seiler in 1986 which estimates methane emissions from Italian rice paddy. These figures have then been extrapolated by WRI for developing countries.

But how exact can such an estimation be ? One, as yet unpublished study done in India shows that these figures could be well off the mark as there are various factors besides water which lead to methane generation in rice fields. For instance, the Indian study finds that methane is highly dependent on the nature of the soil.

Preliminary data collected by the Council for Scientific and Industrial Research (CSIR) has indicated that methane emissions from wet rice cultivation in India is three to nine million tonnes of methane each year as compared to the WRI figure of 18 million tonnes and the Intergovernmental Panel on Climate Change (IPCC) estimate of seven to 49 million tonnes.

Obviously, a lot more scientific work is needed before global values can be calculated and actions suggested.

As a senior UNEP official has put it, nature serves two major economic functions – one, as a source of raw materials and, two, as a sink for absorbing wastes.[9]

Ideally, the approach should have been to prepare each nation's budget of greenhouse gas emissions by taking into account each nation sources of emissions and its terrestrial sinks, that is, its forests, other vegetation and soils. This exercise would have given an idea of the true emissions of each nation. These emissions would have to be further matched with each nation's just and fair share of the oceanic and tropospheric sinks – a common heritage of humankind. Only then the net emissions of a nation that are accumulating in the atmosphere could be calculated. But nothing of this sort has been attempted by WRI.

The earth's environment has a considerable ability to absorb wastes. The ocean is an important sink for absorbing carbon dioxide produced through human activity. According to the estimates of the Intergovernmental Panel on Climate Change, the ocean absorbed, during the 1980s, carbon dioxide to the tune of 1200 to 2800 million tonnes of carbon equivalent every year. There could also be terrestrial sinks for carbon dioxide but scientific knowledge about them is still uncertain. The various model prepared worldwide for estimating the accumulation of carbon dioxide in the atmosphere reveal a substantial 'missing sink' which scientists now believe could be a terrestrial sink. The predicted amount of carbon dioxide increase in the atmosphere should be ideally equal to the amount of carbon dioxide emitted by human-

Figure 1

Total Emissions of Greenhouse Gases of Top 10 Emitting Nations (in million tonnes of carbon equivalent)

as calculated by WRI

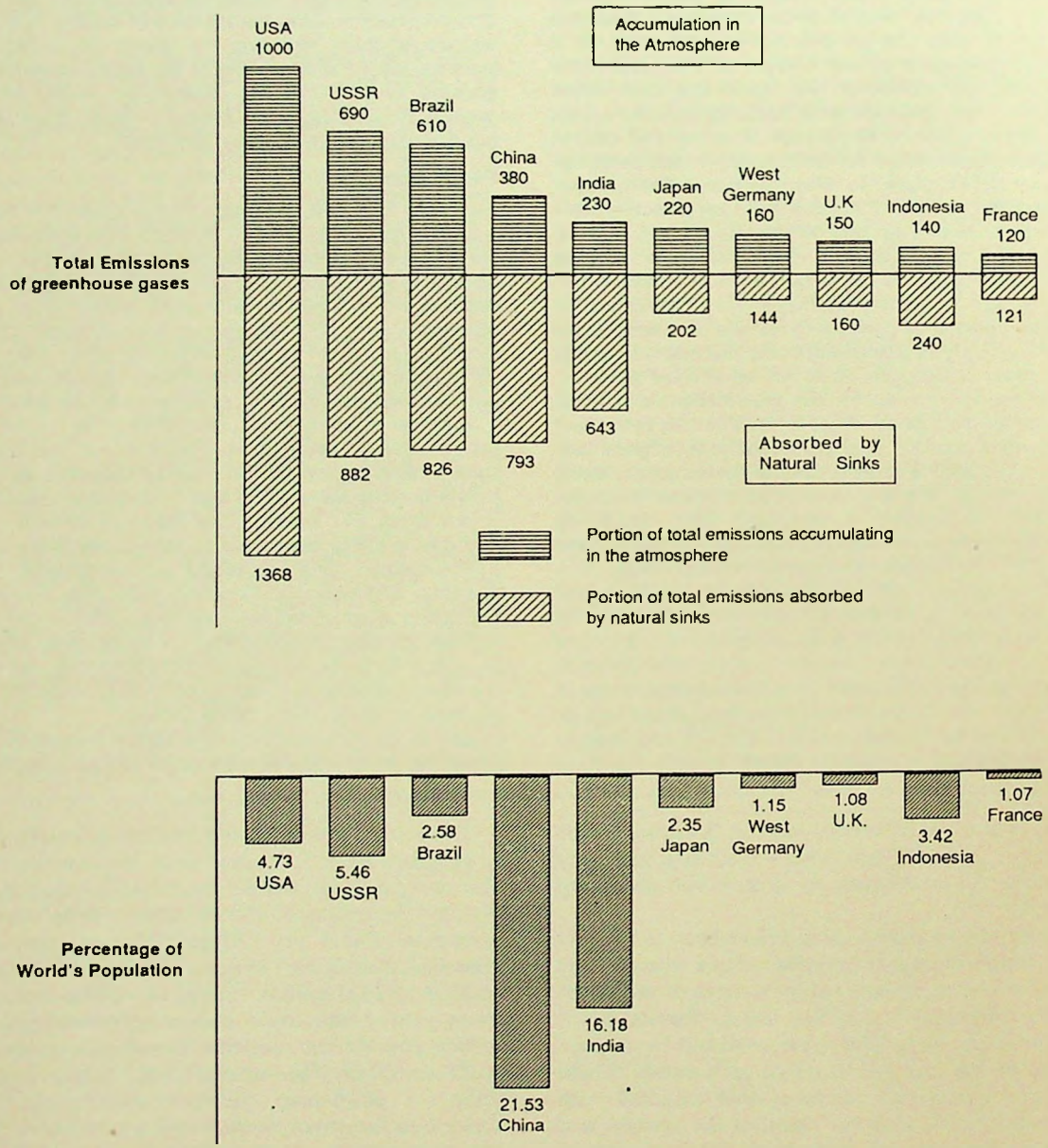
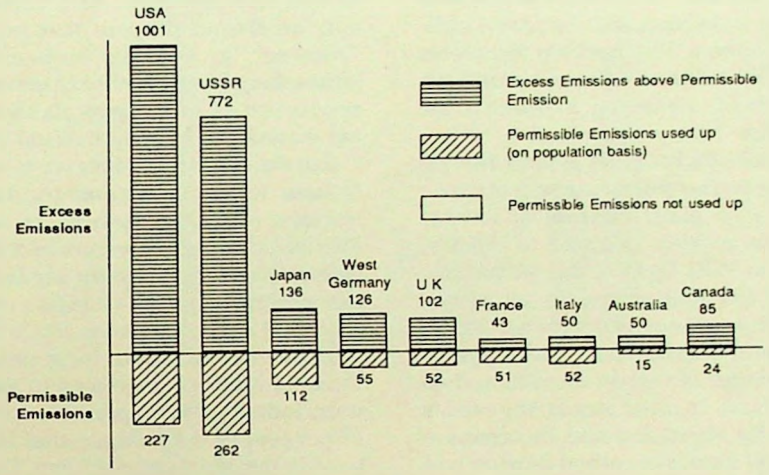


Figure 2

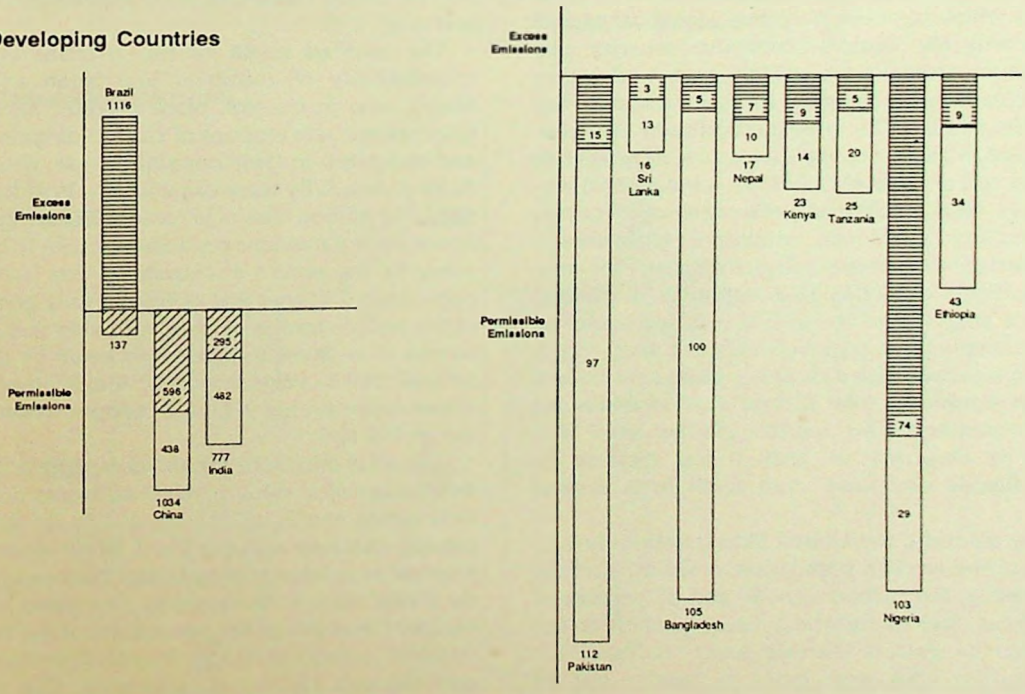
Permissible Emissions vs Total Emissions of Carbon Dioxide of select countries on the basis of population (in million tonnes of carbon equivalent)

as calculated by CSE

a) Industrialised Countries



b) Developing Countries



made sources less the amount absorbed by the oceanic sinks. But models find that instead the predicted amount is more than what is actually accumulating in the atmosphere, indicating the presence of yet another cleansing mechanism in the world. There is a growing belief that various land processes like vegetation and soil could possible account for this surplus. Some preliminary models even suggest that these terrestrial sinks could be possibly even larger than the oceanic sinks. But much of this is still unknown.

Sinks for methane are also substantial. Methane is primarily removed by a reaction with hydroxyl radicals (OH) in the troposphere. This reaction represents a sink of about 400 to 600 million tonnes per year. Soils may also be contributing in removing methane to the tune of 15 to 45 million tonnes each year.

WRI's legerdemain actually lies in the manner that the earth's ability to clean up the two greenhouse gases of carbon dioxide and methane -- a global common of extreme importance -- has been unfairly allocated to different countries. According to WRI figures, the world produces every year 31,100 million tonnes of carbon dioxide and 255 million tonnes of methane. But in reality, the increase in the atmosphere every year is only 13,600 million tonnes of carbon dioxide and 43 million tonnes of methane. In other words, the earth's ecological systems -- its vegetation and its oceans -- absorbed 17,500 million tonnes of carbon dioxide and 212 million tonnes of methane every year. Global warming is caused by overexceeding this cleansing capacity of the earth's ecological systems.

The WRI report makes no distinction between those countries which have eaten up this ecological capital by exceeding the world's absorptive capacity and those countries which have emitted gases well within the world's cleansing capacity. India, for instance, has been ranked as the fifth largest contributor of greenhouse gases in the world. *But compared to its population -- 16.2 per cent of the world's in 1990 -- India's total production of carbon dioxide and methane amounted to only six per cent and 14.4 per cent, respectively, of the amount that is absorbed by the earth's ecological systems.* How can, therefore, India and other such countries be blamed even for a single kg of the filth that is accumulating in the atmosphere on a global scale and threatening the world's people with a climatic cataclysm ? In fact, India can double its total carbon dioxide emissions without threatening the world's climate. And if it controls its deforestation, then it can increase its carbon dioxide emissions from fossil fuels several times.

On the contrary, the United States, with only 4.73 per cent of the world's population, emits as much as 26 per cent of the carbon dioxide and 20 percent of the methane that is absorbed, every year. It is the production of carbon dioxide and methane by countries like USA and Japan -- totally out of proportion to their populations and that of the world's absorptive capacity -- which is entirely responsible for the accumulation of unabsorbed carbon dioxide and methane in the atmosphere. In addition, these countries emit *large* quantities of CFCs -- chemicals which do not get absorbed at all. Japan accounts for 7.4 per cent and USA for 25.8 per cent of the world's consumption of CFCs.

Not even one tonne of CFCs released into the atmosphere can get absorbed because there is no natural sink for them. As concerned environmentalists, we should propose that no country should be "allowed" to produce such chemicals which the atmosphere has no ability to cleanse naturally and all production of such chemicals should be added to the net emissions of the individual countries.

But the WRI report does not take countries like USA or Japan to task. *On the contrary, it adopts a mathematical technique which puts the blame on several poor countries. WRI has calculated the proportion of the world's greenhouse gases produced by a country like India and has then used this proportion to calculate India's share in the quantity of gases that are accumulating in the atmosphere.*

In other words, since India produces 12 per cent of the total methane produced in the whole world in a year, India is also responsible for, according to WRI, 12 per cent of the methane that has actually accumulated in the earth's atmosphere. This technique is such that if a country like Maldives were to produce one tonne of carbon emissions, it would, in proportion to the world production which may even be as high as several billion tonnes, be held responsible for global warming.

The obvious result of this exercise is that the responsibility of countries like Japan and United States, who in the first place produce an extremely disproportionate amount of carbon dioxide or methane compared to their population size, gets substantially reduced. By these calculations, WRI has permitted 2,519 million tonnes of carbon dioxide and 35 million tonnes of methane produced by USA to be cleaned away by the earth's environment. But India, with a population 3.4 times that of USA, is only given a share of 604 million tonnes of carbon dioxide and 26 million tonnes of methane to be cleaned away by the earth's natural 'sinks'. Why should USA and other industrialised countries get such a disproportionate share of the global sink ?

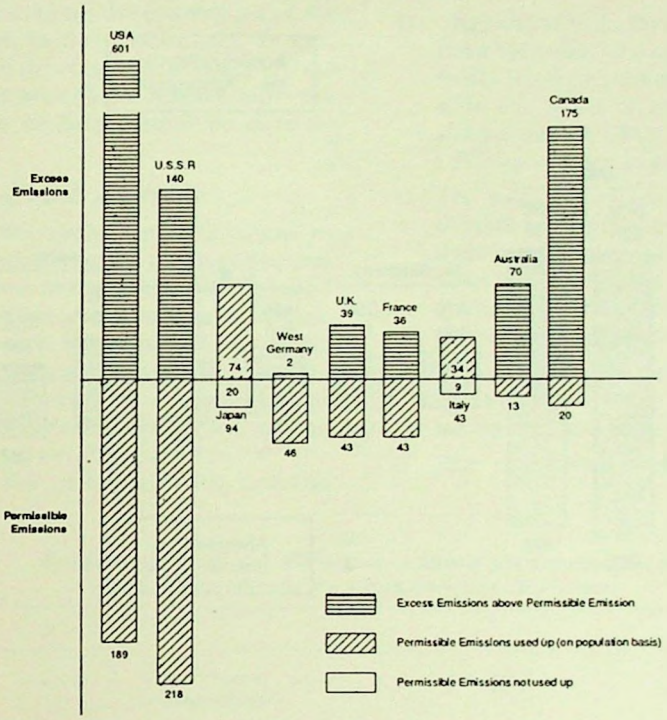
This set of calculations is, therefore, extremely unfair in an interdependent world in which all human beings ought to be valued equally. CSE is appalled by the fact that this patently anti-poor and anti-Third World report has been prepared in collaboration by United Nations agencies like the United Nations Environment Programme and United Nations Development Programmes and it has been signed by UNEP's executive director, Mostafa Tolba, and UNDP's administrator, William H. Draper III. CSE calls upon

Figure 3

Permissible Emissions vs Total Emissions of Methane of select countries on the basis of population (in million tonnes of carbon equivalent)

as calculated by CSE

a) Industrialised Countries



b) Developing Countries

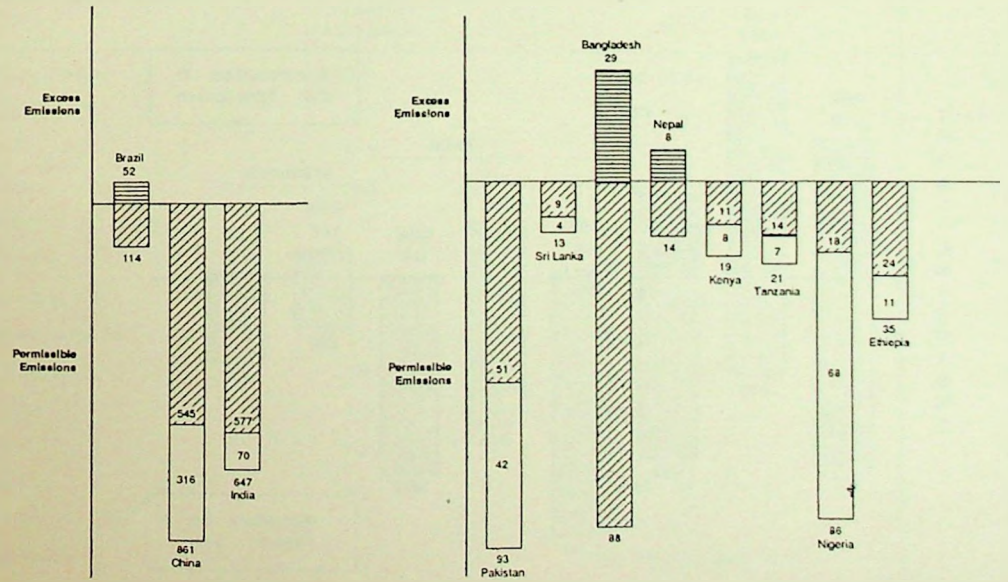
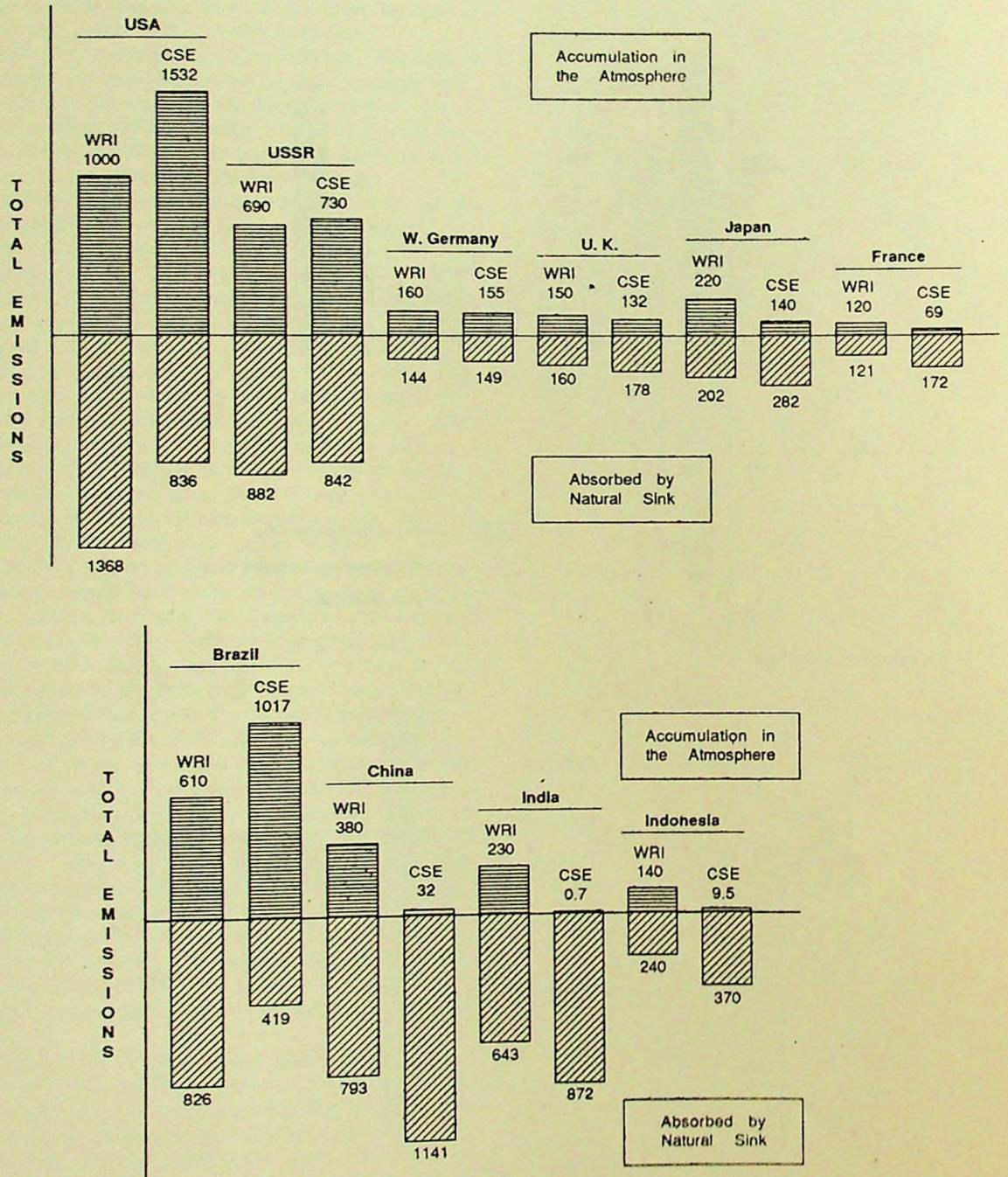


Figure 4

Comparative Figures of Total Emissions of Greenhouse Gases of WRI's Top 10 Emitting Nations (in million tonnes of carbon equivalent)

as calculated by CSE



Third World governments to take these agencies to task for sponsoring such a loaded report against the Third World, which is based on bad data, politically motivated mathematics, unjust politics and makes a mockery of human values.

We are equally appalled that the Ministry of Environment in India has not yet pointed out to the flaws in the report. By keeping quiet it is only acquiescing to and sabotaging the country's and the Third World's position in this crucial area. In fact, even worse, it does not seem to be aware of the political motivations of such global reports. How can the country's interests be safeguarded by such an agency ?

Sharing a crucial global common

How can we calculate each country's share of responsibility for the accumulation of gases like carbon dioxide and methane in the earth's atmosphere ?

It is obvious that the concept of *sustainable development demands that human beings collectively do not produce more carbon dioxide and methane than the earth's environment can absorb. The question is how should this global common — the global carbon dioxide and methane sinks — be shared amongst the people of the world ?*

Several studies on the global warming problem have argued, and we argue ourselves, that in a world that aspires to such lofty ideals like global justice, equity and sustainability, this vital global common should be shared equally on a per capita basis.

Using this principle, CSE has adopted the following methodology to ascertain the net emissions which are posing a threat to the world's climate:

1) The natural sinks for carbon dioxide and methane have been allocated to each nation on a population basis. These quantities then constitute the permissible emissions of each country. As no natural sinks exist for CFCs, no permissible shares for CFCs have been calculated.
2) The total emissions of each country of carbon dioxide and methane (as calculated by WRI) have then been compared with its permissible emissions (as calculated by CSE) to ascertain the quantity of emissions that are in excess of the permissible emissions.
3) The unused permissible emissions of countries like India and China have been traded with the excess emitters on a population basis.
4) The permissible emissions, traded from low

Table 2
Comparison of CSE and WRI figures of Annual Net Emissions of all Greenhouse bases to the atmosphere (top 15 emitters)

	WRI		CSE	
Sl. No.	Country	Net Emissions of Greenhouse gases (million tonnes of carbon equivalent)	Country	Net Emissions of Greenhouse gases (million tonnes of carbon equivalent)
1	United States	1000	United States	1532
2	U.S.S.R	690	Brazil	1017
3	Brazil	610	U.S.S.R.	730
4	China	380	Canada	252
5	India	230	Germany, Fed Rep	155
6	Japan	220	Japan	140
7	Germany, F.R.	160	United Kingdom	132
8	United Kingdom	150	Australia	112
9	Indonesia	140	Saudi Arabia	97
10	France	120	Colombia	86
11	Italy	120	Cote d'Ivoire	82
12	Canada	120	German Dem Rep	82
13	Maxico	78	Myanmar	81
14	Myanmar	77	Lao People's Dem Rep	78
15	Poland	76	Poland	77

emitting countries have been subtracted from the excess emissions of each country to obtain the quantity of each country's net emissions to the atmosphere of carbon dioxide and methane.

5) The total greenhouse gas emissions have been obtained by adding the net emissions of methane and carbon dioxide (as obtained by CSE) with the total emissions of CFCs (as given by WRI).

CSE's calculations clearly show, that there is one set of nations in the world which is emitting greenhouse gases well within its share (or, in other words, its permissible limits) whereas there is another set of countries which is exceeding its permissible limits by leaps and bounds.

Only two developed countries -- Albania and Portugal -- are within their permissible limits for carbon dioxide and 13 developed countries are within their methane limits. Industrialised countries together exceeded their permissible quotas of carbon dioxide by 2839 million tonnes of carbon equivalent, that is, 58 per cent of the excess carbon dioxide emissions. The world would have been truly worse off had the developing countries used up their entire permissible quotas. They actually provided space for about 1459 million tonnes of carbon equivalent to be released in the form of carbon dioxide out of their permissible quotas and be absorbed by the world's natural sinks. Of this space India, China and Pakistan alone provide unused permissible quotas for carbon dioxide amounting to 1015 million tonnes of carbon equivalent.

CSE has traded the natural 'sink space' left available by countries like India and China with excess users like USA and Japan in proportion to their populations and, in this way, obtained the final list of countries whose excess emissions are accumulating in the earth's atmosphere -- the true culprits of the threat of global warming to humanity. The results of this exercise are dramatic and it shows up the real dirty nations of the world. USA's net contribution of greenhouse gases which are accumulating in the atmosphere goes up from 1000 million tonnes of carbon equivalent to 1532 million tonnes of carbon equivalent. Correspondingly, USSR's contribution goes up from 690 to 730 million tonnes of carbon equivalent; and, of Canada from 120 to 252 million tonnes. While contributions of Japan, West Germany and United Kingdom go down, France and Italy no longer

Table 3
Percentage Distribution of Annual Net Emissions of Industrialised and Developing countries of all Greenhouse gases (as calculated by CSE)

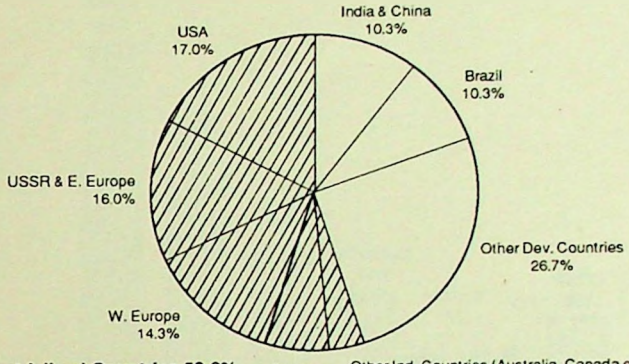
Region	Percentage of global Net Emissions (as per CSE) (%)	Percentage of global Net Emissions (as per WRI) (%)	Percentage of global Net Emissions after modifying Brazil's estimates of deforestation (as per CSE)[1] (%)	Percentage of Permissible Emissions (as per CSE) (%)
Industrialised Countries	**66.95**	**52.60**	**78.54**	**23.60**
USA	27.44	16.95	32.16	4.73
Japan	2.51	3.90	2.94	2.34
Western Europe	11.89	14.32	14.00	6.82
Eastern Europe	4.54	4.32	5.32	2.61
USSR	13.08	11.70	15.33	5.46
Australia	2.00	1.07	2.35	0.32
Developing Countries	**33.05**	**47.40**	**21.46**	**76.40**
India	0.013	3.90	0.015	16.18
China	0.57	6.44	0.67	21.53
Brazil	18.21	10.34	4.13	2.85
Asia (excluding Japan)	7.97	21.69	9.03	56.45
Africa (excluding South Africa)	3.04	4.69	3.61	11.56
Americas (excluding USA & Canada)	22.03	16.61	8.59	8.39

Note : [1] Assuming the decadal annual average of deforestation (1978-88).

Figure 5

Percentage Distribution of Net Emissions of Greenhouse Gases by Industrialised and Developing Countries

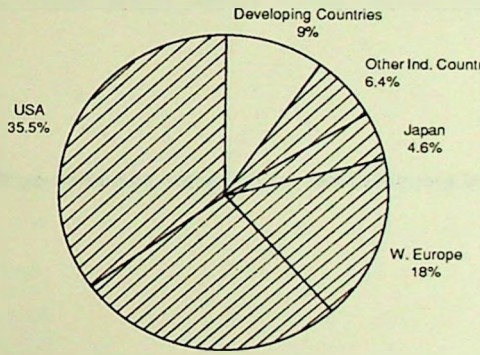
As calculated by WRI



Industrialised Countries 52.6%
Developing Countries 47.4%

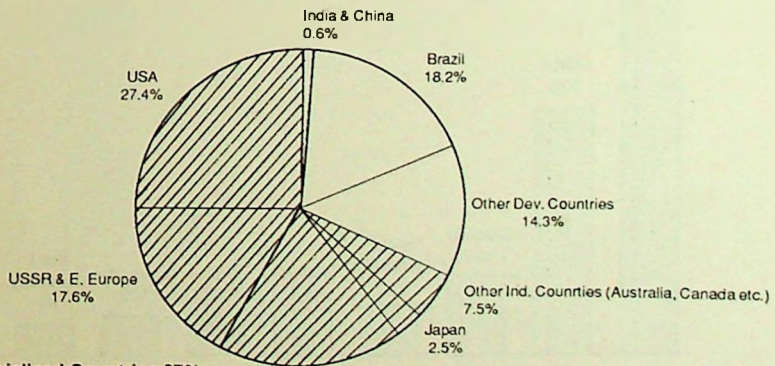
As calculated by CSE

a) Before trading permissible emissions between countries



Industrialised Countries 91%
Developing Countries 9%

b) After trading permissible emissions between countries.

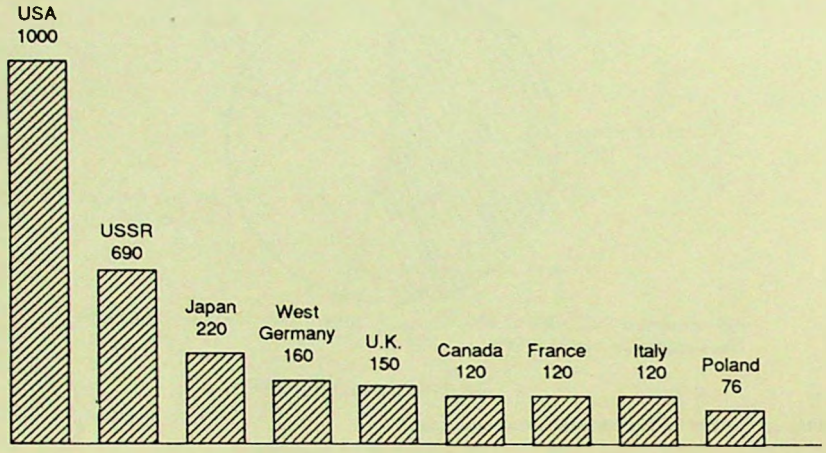


Industrialised Countries 67%
Developing Countries 33%

Figure 6

Net Emissions of Greenhouse Gases to the atmosphere of top 15 emitters (in million tonnes of carbon equivalent)

a) Industrialised countries as calculated by WRI



b) Industrialised countries as calculated by CSE

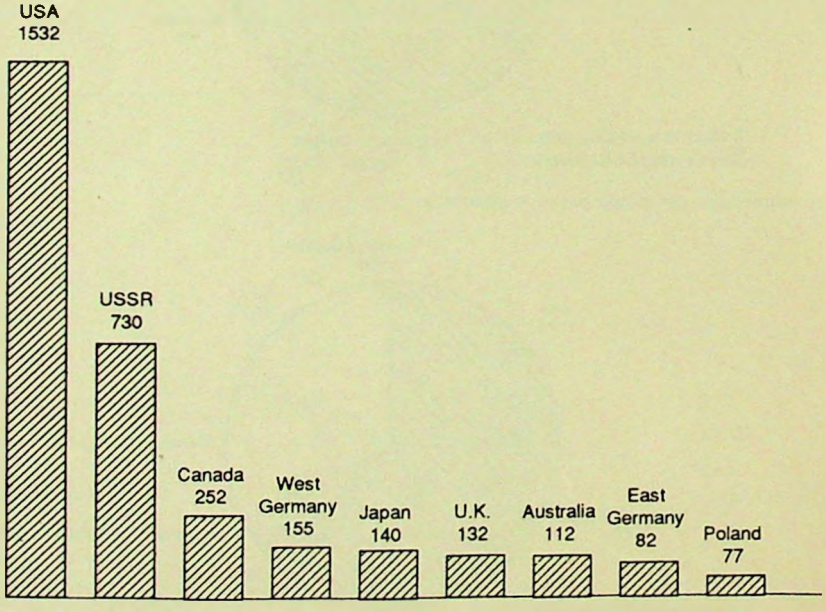
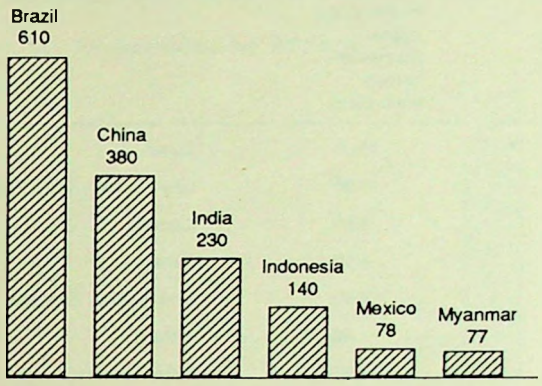


Figure 6 (Contd)

c) Developing countries as calculated by WRI



d) Developing countries as calculated by CSE

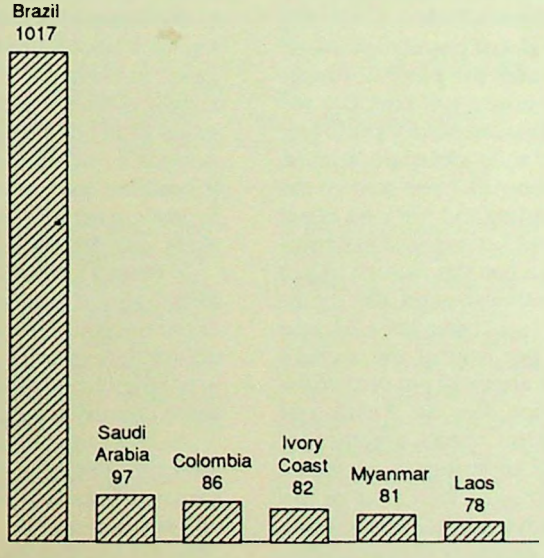


Table 4

Comparison of CSE and WRI figures of Per capita Annual Net Emissions of all Greenhouse Gases to the atmosphere

	WRI		CSE	
Sl. No.	Country	Per capita Annual Net Emissions of Greenhouse gases (tonnes of carbon equivalent)	Country	Per capita Annual Net Emissions of Greenhouse gases (tonnes of carbon equivalent)
1	Lao People's D.R.	10.00	Qatar	27.01
2	Qatar	8.80	Lao People's Dem Rep	19.06
3	United Arab Emirates	5.80	Canada	9.51
4	Bahrain	4.90	Oman	8.79
5	Canada	4.50	United Arab Emirates	8.53
6	Luxembourg	4.30	Bahrain	8.42
7	Brazil	4.30	New Zealand	7.13
8	Cote d'Ivoire	4.20	Kuwait	7.11
9	United States	4.20	Saudi Arabia	6.88
10	Kuwait	4.10	Brazil	6.76
11	Australia	3.90	Australia	6.70
12	German D.R.	3.70	Cote d'Ivoire	6.52
13	Oman	3.50	United States	6.15
14	Saudi Arabia	3.30	Luxembourg	5.62
15	New Zealand	3.20	German Dem Rep	4.94

appear in the list of top 15 greenhouse gas emitting nations. In CSE's analysis, these countries appear to be relatively efficient economies which are keeping their emissions closer to their global population share. Australia and East Germany take the place of France and Italy in the top 15 greenhouse gas emitting nations. These dirt emitting nations are clearly profligate in their emissions well beyond their global population share. Australia, with only about 0.3 per cent of the world's population, is contributing to 1 per cent of net emissions of carbon dioxide and 7 per cent of net emissions of methane. Australia is a country, which in just 200 years of its existence, has destroyed half of its forests and woodlands.[10] Just two countries, USA and USSR, which have about 10 per cent of the world's population are responsible for about 40 per cent of the world's net emissions of carbon dioxide. Again, just two countries, United States and Canada, together account for two-thirds of the net emissions of methane.

As far as developing countries in WRI's list of top 15 emitters are concerned, India, China, Mexico and Indonesia go out of the list completely. The contribution of Brazil and Myanmar goes up. China's and India's total net emissions to the atmosphere fall from 380 and 230 million tonnes of carbon to 35 and 0.7 million tonnes of carbon, respectively. India and China do not account for even 0.5 per cent of net emissions to the atmosphere where WRI claims they contribute together about 10 per cent. CFCs constitute the only gases as their net emissions. India, the CSE analysis shows, is the world's lowest net emitter of greenhouse gases in per capita terms. Similarly, Mexico's and Indonesia's contributions fall from 78 and 140 to 9.1 and 9.5 million tonnes of carbon equivalent, respectively. *In terms of net emissions of greenhouse gases to the atmosphere, one American is equal to 8150 Indians.*

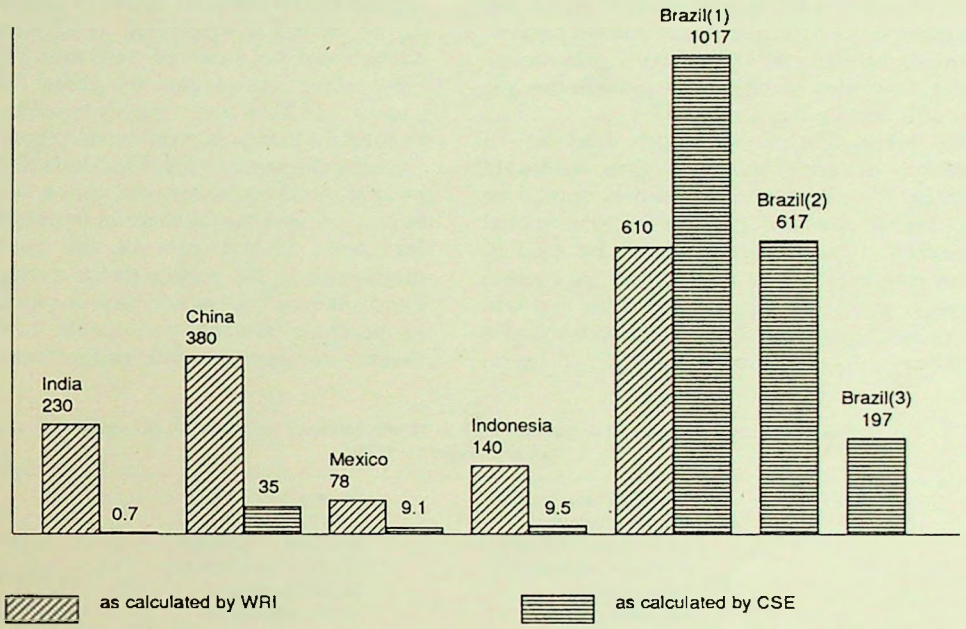
A mere 15 countries -- nine industrialised and six developing countries -- account for over 83 per cent of the net emissions of all greenhouse gases which are accumulating in the atmosphere. Action is, therefore, urgently and, should we say, desperately needed in these countries most of all.

As a group, however, the contribution of developing countries does not fall dramatically mainly because of Brazil which now accounts for over half of all the greenhouse gas emissions from the Third World. Nonetheless, the share of industrialised countries goes up from 53 per cent, as calculated by WRI, to 67 per cent -- that is, from about one-half to one-third.

Figure 7

Comparative Net Emissions of Greenhouse Gases to the atmosphere of select developing countries (in million tonnes of carbon equivalent)

As calculated by WRI and CSE



Note : 1) Brazil's net emissions using deforestation data for 1987 which shows rampant deforestation (total carbon emissions = 1200 million tonnes)
2) Brazil's net emissions using deforestation data for 1988 which shows reduced deforestation (total carbon emissions = 800 million tonnes)
3) Brazil's net emissions using annual average deforestation data for the period 1978 to 1988 (total carbon emissions = 380 million tonnes)

But when Brazil's deforestation rate is changed and taken to be the annual average for the decade from 1978 to 1988, the contribution of greenhouse gas emissions by the Third World drops to only about one-fifth of the total and the industrialised countries, with about a quarter of the world's population, account for 80 per cent of the world's greenhouse gas emissions even after receiving carbon dioxide to the tune of 922 million tonnes of carbon equivalent and methane to the tune of 549 million tonnes of carbon equivalent as tradeable permissible quotas.

Tradeable Emissions

The latest literature on management of common property resources shows clearly that an exploitation system based on gifts and a free for all inevitably leads to its degradation – the well-known 'tragedy of the commons'. In order that all those countries which are overusing or misusing the world's environment pay a price, CSE proposes a two-tier system – one set will consist of charges and another of fines – to bring rationality into the global use of the atmosphere.

In all market economies of the world, pollution control economists are now talking about the concept of tradeable emission quotas, which allow low-level polluters to trade their unused permissible emissions with high-level polluters. Overall, this system leads to better economics as it provides an economic incentive to the low-level polluters to keep their pollution levels low and an economic disincentive to the high-level polluters to reduce their emissions. Expecting everyone to adhere to a standard pollution limit does not

provide any incentive to low-level polluters to keep their pollution levels low. In other words, what the world needs is a system which encourages a country like India to keep its emissions as low as possible and pushes a country like USA to reduce its emissions fast.

CSE believes that a system of global tradeable permits should be introduced to control global greenhouse gas emissions. All countries should be given tradeable quotas in proportion to their population share and the total quotas should equal the world's natural sinks. The quantity of unused permissible emissions can be sold by low-level greenhouse gas emitting countries to high-level greenhouse gas producers at a certain fixed rate.

But any excess discharges which lead to an accumulation in the atmosphere and, thus, constitute a global threat for climate destabilisation, should be fined at a higher rate and given over to a 'global climate protection fund'. The fund can be used to assist those countries which are affected by climate destabilisation and to develop technologies that will reduce greenhouse gas emissions. These technologies can then be used by all humankind. Such a system should provide an incentive to countries like India to keep their share of greenhouse gas emissions low and force countries like USA to reduce their emissions rapidly -- and, thus, all will join the race to save the planet.

What charges should low emitters levy on high emitters for a share in their tradeable emissions ? The IPSEP study, which was carried out for the Dutch government, suggests that such the charge could be pegged at $ 15 per 1000 tonnes of carbon emitted into the air (which is equivalent to 3.7 tonnes of carbon dioxide and 0.5 tonne of methane). This amount in 1986, taking into account the global fuel mix in that year, would have been roughly equal to a ten per cent increase in that year's crude oil prices.[5]

Using the same figure, CSE finds that India would be able to charge excess emitters a sum of US $ 8.3 billion per year for its share in permissible emissions (or about 50 per cent of the country's annual investment in the power sector during the Seventh Plan) whereas USA would have to pay US $ 6.3 billion to purchase unused permissible emission quotas. Twenty developing countries together would receive

Table 5
Trade amounts and damages payable by top 15 industrialised and oil-rich net emitters (as calculated by CSE)

Country	Trade amounts payable to other Countries (at $ 15 per '000 tonnes of carbon equivalent for purchasing tradeable quotas of Permissible Emissions (million $)	Damages payable to a Global Fund (at $ 25 per '000 tonnes of carbon equivalent for Net Emissions to the atmosphere (million $)	Total Trade amounts and damages payable (million $)
United States	6,305	38,293	44,598
U.S.S.R	5,421	18,252	23,673
Canada	670	6,302	6,973
Japan	1,427	3,499	4,926
Germany, Fed Rep	730	3,868	4,598
United Kingdom	1,243	3,307	4,550
Australia	423	2,798	3,220
France	1,183	1,725	2,908
Saudi Arabia	357	2,426	2,783
Poland	670	1,929	2,599
Italy	662	1,915	2,577
German Dem Rep	192	2,050	2,242
Netherlands	374	1,439	1,814
Spain	166	1,200	1,366
South Africa	706	616	1,322
Total	20,529	89,619	1,10,149

Table 6

Amounts receivable by top 20 countries which trade quotas of Permissible Emissions of Carbon Dioxide and Methane (as calculated by CSE)

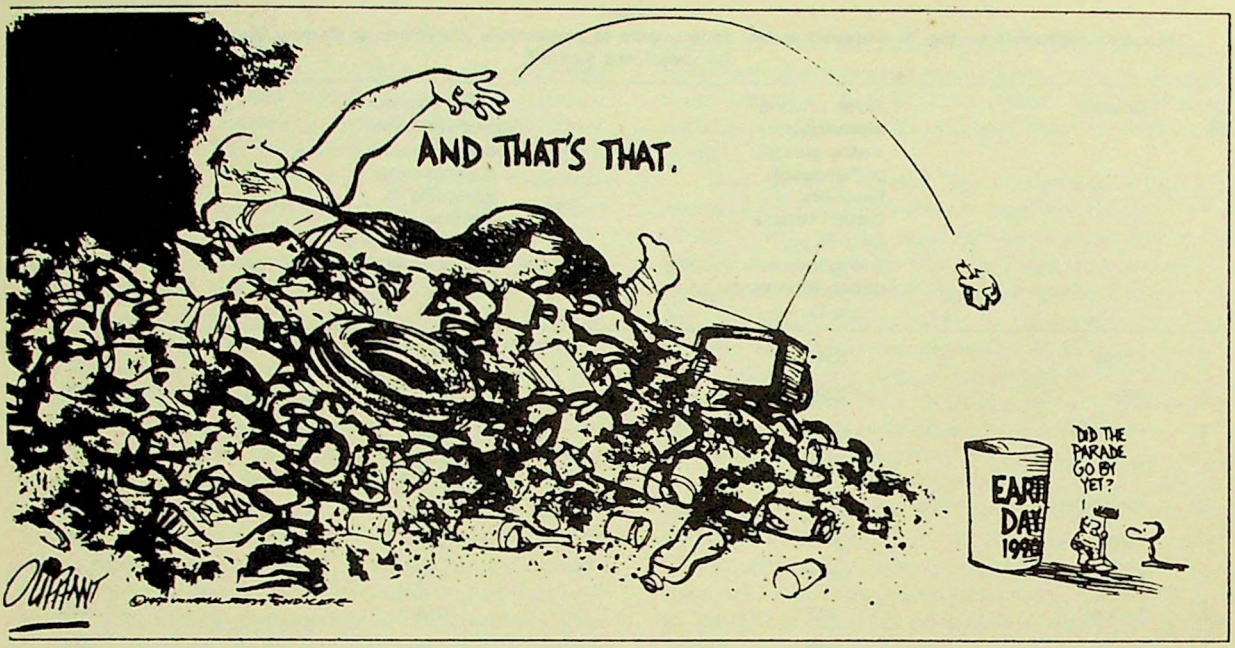
Sl. No.	Country	Trade amounts receivable for trading quotas of Permissible Emissions of Carbon Dioxide (at $ 15 per '000 tonnes of carbon equivalent) (m $)	Trade amounts receivable for trading quotas of Permissible Emissions of Methane (at $ 15 per '000 tonnes of carbon equivalent) (m $)	Total Trade Amounts recevable (m $)
1.	China	6561	4747	11308
2.	India	7228	1057	8285
3.	Pakistan	1445	638	2083
4.	Nigeria	439	1010	1449
5.	Bangladesh	1499	-434	1065
6.	Egypt	431	338	769
7.	Ethiopia	510	171	681
8.	Turkey	202	314	516
9.	Morocco	259	208	467
10.	Kenya	298	122	420
11.	Tanzania	292	106	398
12.	Uganda	215	140	356
13.	Zaire	-48	339	291
14.	Afghanistan	210	73	283
15.	Iran, Islamic Rep.	177	84	261
16.	Sri Lanka	193	59	252
17.	Mozambique	105	145	250
18.	Ghana	80	143	223
19.	Iraq	60	161	221
20.	Yemen Arab Rep	96	71	167
	Total	20252	9492	29744

about US $ 30 billion -- China $ 11.31 billion, India $ 8.3 billion, Pakistan $ 2.08 billion, Nigeria $ 1.45 billion and Bangladesh $ 1.06 billion every year.

But if the non permissible emissions that finally accumulate in the atmosphere are fined at a higher rate of US $ 25 per tonne of carbon equivalent emissions, then a Global Climate Protection Fund of about US $ 90 billion annually could be created from the contributions of developed countries and oil-rich countries like Saudi Arabia. USA alone would have to pay a sum of US $ 38.3 billion to the global fund.

IPSEP Study

It is interesting to note that the Dutch government-sponsored IPSEP study, like the CSE study, reaches the same conclusion that the onus to curtail the global warming problem lies largely on industrialised countries. The report argues that the average rate of global warming should be limited, as closely as possible, to 0.1°C per decade and, as an outer limit, to an increase of 2°C by 2100 over the present. In that case, the earth's temperature would remain within the range that human beings have seen in the period since their evolution two million years ago. This would also restrict the sea level rise to a moderate, and may be manageable, level of about 1 m whereas a rise of 5-7 m would be absolutely disastrous. This means that the maximum allowable concentration of all greenhouse gases (carbon dioxide, methane, nitrous oxide, CFCs etc.) should not exceed 430-450 parts per million



(ppm) of carbon dioxide equivalent during the next century (compared to about 400 ppm now) provided these levels decline thereafter. In other words, concentration of carbon dioxide itself should not exceed 380 ppm (compared to 338 in 1980 and 349 in 1985) while other greenhouse gases together add up to another 50 ppm of carbon dioxide equivalent. IPSEP's calculations show that this means that only a total of 300 billion tonnes of carbon (btC) can be released between 1985 and 2100 or roughly 2.6 btC each year.

Carbon dioxide is accumulating in the atmosphere both because of the burning of fossil fuels and forests. The IPSEP study argues that increased afforestation efforts and future controls on deforestation can ensure that net additions of carbon dioxide to the atmosphere because of deforestation become nil. Therefore, only energy production as the major source of carbon dioxide releases should be taken into account. The question, therefore, is how should this 300 btC global carbon emissions budget (over period 1986-2100) be shared ?

Like CSE, IPSEP also argues that global justice demands that this budget be shared on the basis of population (person-years). If the existing and projected populations of industrialised and developed countries between 1986 and 2100 are taken into account, then developed countries will exhaust their entire carbon release quota of 48 btC till 2100 by 1999 (that is, in the next seven years), if they continue to release carbon dioxide at their 1986 levels. Developing countries, on the other hand, will be able to emit carbon dioxide at their 1986 rate until 2169 AD.

The IPSEP study further points out that it is important to take into account the fact that developed and developing countries have been pushing out carbon dioxide into the atmosphere at vastly different rates for a long time. If this *historical inequity* is taken into account, and the permissible global carbon emissions budget of 428 bt from 1950 till 2100, instead of the 300 btC global carbon emissions budget between 1986 and 2100, is distributed between industrialised and developing countries, then developing countries can continue to emit carbon dioxide at their 1986 rate till 2241 AD. **But industrialised countries had already exhausted their entire quota by 1986. In other words, they ought to stop all carbon dioxide emissions right away.**

The recent report of the South Commission also states categorically that though the "protection of the environment is a matter of global concern calling for global measures . . . the manner in which the North is attempting to define the issues introduces an element of potential North-South conflict. . . . the North is in effect demanding that the South should give priority to environmental protection over development objectives. It is also attempting to put in place mechanisms for Northern monitoring and control over development policies in the South that could have environmental implications. This is unacceptable on several counts. *Singling out developing countries as a main source of the threat to the global environment obscures the fact that the ecological stress on the global commons has in large part been caused by the North.* The North, with only 20 per cent of the earth's population, accounts for 85 per cent of the global consumption of

non-renewable energy. The North has already used much of the planet's ecological capital. It will have to take important measures to adjust its pattern of production and consumption in order to mitigate the clear threat to the earth's environment. It will also have to reduce its consumption of certain key natural resources, such as non-renewable fossil fuels, to accommodate the industrialisation and economic development of the South[11]"

The IPSEP report concludes that the call of the 1988 Toronto World Conference on the Changing Atmosphere to reduce world emissions of carbon dioxide from energy production by 20 per cent by 2005 AD "should be understood as a target for industrialised countries". By 2015, they should reduce their carbon release levels by 50 per cent and by 2030, 75 per cent.

While endorsing the IPSEP conclusion, CSE would like to point out that it does not, however, mean that developing countries should not undertake steps to make a better world. Deforestation should definitely be controlled and afforestation rates should match the rates of wood use and burning. As an environmental pressure group, CSE firmly believes that there are a variety of reasons – like poverty, injustice and inequality -- that demand that governments of developing countries promote environmentally-harmonious development strategies, and in which all people have equal access to the precious resources of the environment for their survival. But it also believes that it is immoral for developed countries to preach environmental constraints and conditionalities to developing countries. They must first set their own house in order.

Impact of Western media

The manner in which the WRI report has been flashed across the world raises serious questions about the role of the Western mass media. It is strange that the IPSEP report received no publicity as compared to the WRI report even though the IPSEP study was undertaken by well-known energy analysts. IPSEP's main authors were Floretin Krause, an energy analyst at the Lawrence Berkeley Laboratory in the US, and Wilfrid Bach, a climatologist who is a member of the West German parliament's special commission on preventing global warming.[6]

The media blitz of the WRI report has been so powerful that even several Indian commentators and environmentalists have accepted the report unquestioningly and have called upon the Indian people to accept their share of the blame.[12] India's Doordarshan even showed, on its prime time news programme, the press conference in Washington DC at which the WRI data was released. It did not care to ask Indian scientists about the veracity of the data, as one of them complained at a recent CSE meeting.

Lack of Third World research

The entire episode also emphasises the fact that Third World nations must undertake their own re-

The Third World: sink for the West's dirt

Solutions for global warming are becoming more and more ludicrous. The latest is to plant trees in the countries of the Third World to fix the dirty carbon thrown out into the air by Western nations to that the West can continue to expand its fleet of cars, power stations and industries while the Third World grows trees.

The first such schemes started in the US. A power generating company, Applied Energy Services of Arlington, Virginia which is building a power plant in Connecticut has entered into an agreement with a US voluntary agency to plant trees, not in the US but in Guatemala. The company has meticulously calculated that the new 180 megawatt power plant will emit 387,000 tonnes of carbon each year during its 40 year life. And that planting 52 million trees will absorb this dirt. It has undertaken a project with the international relief and development agency, CARE to plant trees in Guatemala and "help" the poor farmers. It will pay US $ two million for this exercise. A UNEP magazine even describes this dubious exercise as " an interesting scheme to attempt to reverse or balance the greenhouse effect of its powerhouse emissions".[1]

This concept has now been accepted by the government of Netherlands. It has budgeted as much as US $ 0.5 billion to plant 250,000 hectares of trees in Bolivia, Peru and Colombia. These "Carbon sink forests" will offset the six million tonnes of carbon dioxide which will be emitted by the two new coal fired electricity plants to be built between Amsterdam and Rotterdam.[2]

Charity is also good business for the Dutch as it costs 12 times more to plant trees at home as compared to poor developing countries.[2] Otherwise why not plant trees in the developed world. In fact, according to one estimate if 75 per cent of the non forested land in the US was under forests it would be enough to fix all the excess emissions of carbon dioxide in the air every year.[3]

The fate of the Third World in this garbage business is now clear. As far as the West is concerned it can live to fix its carbon or plant cheap trees or dispose its toxic wastes as has been the case in the past. A World Bank staff paper has even given this garbage business a high sounding new name; "intergenerational compensation project".[4] Whose generations are they talking about ?

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search in this crucial area. They cannot depend on Western institutions to present a true picture of the global situation and safeguard their interests. The manner in which the methane and carbon dioxide emissions of several developing countries have been calculated is itself open to questions. The data base on contributions from deforestation, irrigated rice farming and livestock management is still poor. It is vital that a reliable system of measuring deforestation annually on a global and national basis is developed urgently.

Political sagacity and farsightedness

But most of all, the Third World today needs farsighted political leadership. For the first time, the Western world and its environmental movements are arguing that we have to manage the world as one entity. But the same Western politicians -- from Margaret Thatcher to George Bush -- who talk so glibly about an interdependent world show no interest in the travails of the Third World. Through quotas, embargoes and subsidies to their own farmers, and through emerging biotechnology, they consistently depress Third World commodity prices. The West has never been prepared to pay the true ecological costs of the goodies it consumes -- from bananas, tea, coffee and cocoa to prawns.

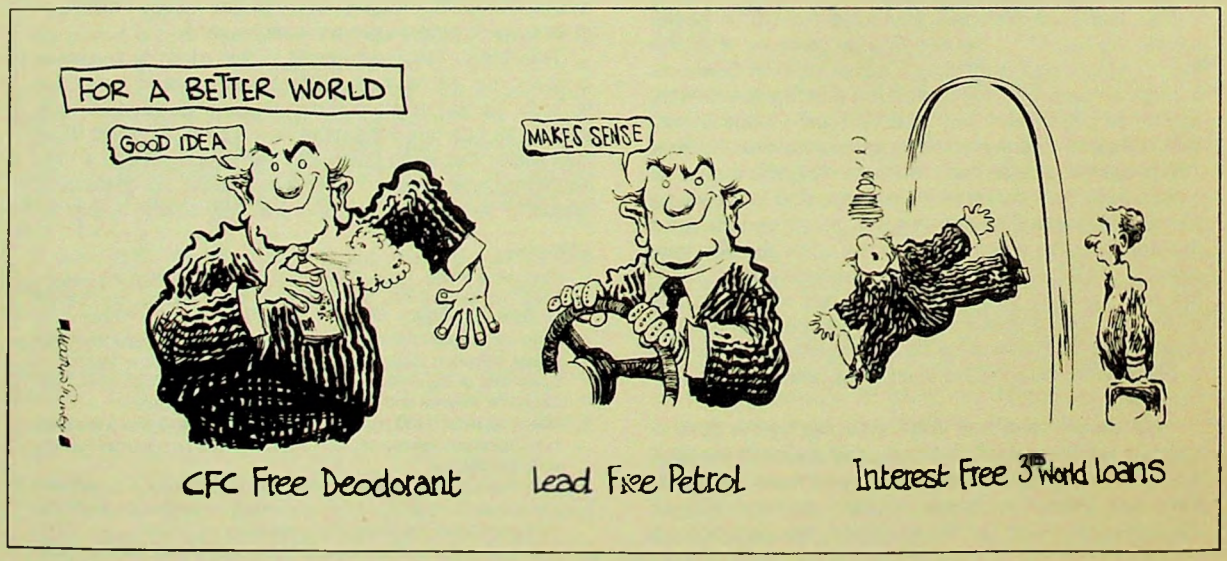
All over the world, there is growing consciousness about 'Green Economics' and the need to incorporate ecological costs of production into national income and wealth accounts. But what is the point of doing this in a developing country if the rich and powerful consumers of the world are not prepared to pay the true cost of their consumption ? *That is not an economic issue but an intensely political issue.*

In fact, a close look at WRI's figures on a lot of what this American institution calls Third World greenhouse gas emissions (resulting from for example, natural gas transport and exploration or deforestation) essentially arise out of not Third World consumption but Western consumption. For example, Algeria's methane emissions are directly related to its export of natural gas to Europe.

Now that five per cent to 15 per cent of the vote in Western countries goes to green issues, Western politicians are falling over themselves, including those with extremely conservative and erstwhile anti-environment credentials, to portray themselves green and capture the green vote. For many of them international environmental issues are easier to divert attention away from domestic environmental issues. Margaret Thatcher did not have a particularly great record on the domestic environment front but she waxed eloquent about saving the ozone layer. Third World politicians and environmentalist must beware of such Western politicians ready to shed crocodile tears.

They must insist with Western leaders that global environmental concerns cannot be chosen on an adhoc basis by the rich and powerful actors in the world. We too believe that the world is one and we welcome this belated realisation within the all-powerful, all-consuming West. But if issues like climate change have to put on the global agenda, then it is equally important to put environmental problems like desertification, land and water degradation, and deteriorating terms of trade of biomass products that are discounting the future of both present and future generations in the Third World, on the global agenda. The global environmental agenda, as it is being framed by the West, must be questioned. *The agenda itself has become politics.* Global citizenship demands global caring and sharing not global hysteria and fiats.

Given the East-West detente, and the growing power of the global market system, it is unlikely that



the Third World can ever disassociate itself from it. The Third World, therefore, has to fight and insist upon better terms of trade, acceptance of its own ecological concerns, and a fair share in the global environmental commons. Third World politicians cannot afford to negotiate badly and cheaply or in ignorance and, thus, forsake the interests of their future generations for some Meryl Streep-kind of mushy environmentalism that is today being beamed into India's homes in the name of environmental education.

Environmental issues are discussed regularly now at all summits of Western leaders, the so-called Group of Seven. It is high time that Third World leaders showed the courage, imagination and understanding to come together -- possibly in the form of a Third World forum on international environmental issues -- to understand and present their developmental issues in the new environmental language and context. They cannot simply sit back and oppose the West's agenda. Their inaction will not be able to withstand the Western media blitz. They have to propose an agenda of their own -- an agenda that responds to the economic, political, cultural and resource realities of the Third World. If presented in environmental terms, there is a definite possibility that the youthful green lobbies in the West which today criticise the Third World, could become its allies. The Third World leadership must now present its own concept of a sustainable future to win the support and the hearts and minds of the green youth across the world -- in the Third World itself and in the West.

All this will demand enormous steadfastness and personal costs from Third World leaders and environmentalists and an effort to understand the environmental roots of their own countries. The Western media will fete any Third World politician who is prepared to speak on environmental issues as the Westerners do and accept their brand of high-sounding but, as yet, hypocritical 'one worldism'. There will be no dearth of TV appearances and programmes, newspaper interviews, invitations to international conferences, Western style money, and personal name and fame across the globe. But it is equally easy to sell out the interests of the future generations of the Third World in the glib name of global environmentalism and global charity. For the poor it will remain a harsh and vicious world which is not prepared to give them a fair place.

Action in India

None of this means that India should not regenerate its environment or that it should not be efficient in its use of energy. This will also be our best defence against any possible impact of global warming. As only if the diverse ecosystems of India are functioning at the optimum levels of productivity, the effects of the expected changes in the global climate will become somewhat manageable. But if, as today, our land and water resource base remains highly stressed and degraded and even normal conditions constitute a near crisis situation, climatic perturbations will throw the society into a state of total emergency.

But to carry out this strategy to improve land productivity and meet people's survival needs development strategies will have to be ecosystem-specific and holistic. It would be necessary to plan for each component of the village ecosystem and not just trees -- from grasslands, forest lands and crop lands to water. To do this, the country will need much more than just glib words about people's participation or wastelands development. It will demand bold and imaginative steps to strengthen and deepen local democracy by creating and empowering democratic and open village institutions. Only then will the people get involved in managing their environment. It will mean dismantling the inefficient and oppressive government apparatus and changing laws so that people can act without waiting for a good bureaucrat to come along. As laws exist, planting trees on government wastelands can land villagers in jail. The government is the biggest and the worst land and water owner in the country.

Those who talk about global warming should concentrate on what ought to be done at home. The challenge for India is thus to get on with the job at hand and leave the business of dirty tricks and dirtying up the world to others. In this process, we will help ourselves and may be even, the rest of the world. ❑

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Appendix 1

Total Emissions of Greenhouse Gases as calculated by WRI

Country/ Continent	Population	Anthropogenic Additions to the Carbon Dioxide Flux (c.1987) ('000 tonnes of Carbon)						Total Carbon Dioxde ('000 tonnes of carbon equivalent)	Anthropogenic Additions to the Methane Flux (c.1987) ('000 tonnes of methane)				Total Methane ('000 tonnes)	Total Methane ('000 tonnes of carbon equivalent)	1986 CFC Use Equivalent Carbon dioxide heating effect ('000 tonnes of Carbon)
		Cement	Solid	Liquid	Gas	Flaring	Land Use Change		Solid Waste	Livestock	Hard Coals	Wet Rice	Pipeline Leakage			
WORLD	5273.93	140000.00	2300000.00	2300000.00	900000.00	50000.00	2800000.00	8238659.00	44000.00	76000.00	16000.00	66000.00	53000.00	255610.00	4785711.00	1358128.00
AFRICA	644.80	6600.00	74000.00	64000.00	16000.00	11000.00	390000.00	558068.00	1800.00	9000.00	910.00	1700.00	4500.00	17998.00	336971.29	42000.00
Algeria	25.40	880.00	820.00	5800.00	9000.00	2800.00	X	19300.00	52.00	150.00	0.00	X	3700.00	3902.00	73056.00	4100.00
Angola	10.00	48.00	0.00	450.00	81.00	660.00	5500.00	6739.00	20.00	120.00	X	6.00	X	146.00	2733.52	X
Benin	4.70	41.00	0.00	99.00	0.00	0.00	2500.00	2640.00	9.00	42.00	X	1.00	X	52.00	973.58	X
Botswana	1.30	0.00	420.00	0.00	0.00	0.00	700.00	1120.00	2.00	110.00	X	X	X	112.00	2096.94	X
Burkina Faso	9.00	0.00	0.00	120.00	0.00	0.00	4200.00	4320.00	16.00	120.00	X	11.00	X	147.00	2752.24	X
Burundi	5.50	0.00	4.00	41.00	0.00	0.00	(2)	45.00	11.00	25.00	X	2.00	X	38.00	711.46	X
Camaroon	11.20	0.00	1.00	1600.00	0.00	0.00	34000.00	35601.00	22.00	150.00	0.00	8.00	X	180.00	3370.09	X
Cape Verde	0.40	0.00	0.00	9.00	0.00	0.00	X	9.00	1.00	1.00	X	X	X	2.00	37.45	X
Central African Rep	2.90	0.00	0.00	71.00	0.00	0.00	3500.00	3571.00	6.00	58.00	X	4.00	X	68.00	1273.14	X
Chad	5.70	0.00	0.00	56.00	0.00	0.00	4200.00	4256.00	12.00	170.00	X	7.00	X	189.00	3538.59	X
Comoros	0.50	0.00	0.00	13.00	0.00	0.00	X	13.00	1.00	3.00	X	5.00	X	9.00	168.50	X
Congo	2.00	8.00	0.00	420.00	1.00	46.00	3200.00	3675.00	3.00	4.00	X	1.00	X	8.00	149.78	X
Cote d'Ivoire	12.60	89.00	0.00	1300.00	0.00	0.00	100000.00	101389.00	23.00	41.00	X	110.00	X	174.00	3257.75	2000.00
Djibouti	0.40	0.00	0.00	72.00	0.00	0.00	X	72.00	1.00	9.00	X	X	X	10.00	187.23	X
Egypt	54.10	1400.00	800.00	16000.00	2300.00	0.00	X	20500.00	110.00	200.00	X	230.00	460.00	1000.00	18722.71	5100.00
Equatorial Guinea	0.40	0.00	0.00	19.00	0.00	0.00	250.00	269.00	1.00	0.00	X	X	X	1.00	18.72	X
Ethiopia	46.70	34.00	0.00	700.00	0.00	0.00	7800.00	8534.00	84.00	1200.00	X	X	X	1284.00	24039.96	X
Gabon	1.20	19.00	0.00	660.00	90.00	610.00	1800.00	3179.00	3.00	1.00	X	X	X	4.00	74.89	X
Gambia, The	0.90	0.00	0.00	49.00	0.00	0.00	200.00	249.00	1.00	12.00	X	4.00	X	17.00	318.29	X
Ghana	15.00	37.00	2.00	780.00	0.00	0.00	7500.00	8319.00	31.00	49.00	X	17.00	X	97.00	1816.10	2400.00
Guinea	6.90	0.00	0.00	260.00	0.00	0.00	8700.00	8960.00	13.00	69.00	X	200.00	X	282.00	5279.80	X
Guinea-Bissau	1.00	0.00	0.00	33.00	0.00	0.00	3000.00	3033.00	2.00	9.00	X	52.00	X	63.00	1179.53	X
Kenya	25.10	180.00	67.00	1100.00	0.00	0.00	1600.00	2947.00	46.00	530.00	X	8.00	X	584.00	10934.06	X
Lesotho	1.80	X	X	X	X	X	X	0.00	X	X	X	X	X	0.00	0.00	X
Liberia	2.60	12.00	0.00	170.00	0.00	0.00	7500.00	7682.00	5.00	4.00	X	47.00	X	56.00	1048.47	410.00
Libya	4.50	370.00	1.00	4600.00	1900.00	420.00	X	7291.00	9.00	47.00	X	X	360.00	416.00	7788.65	X
Madagascar	12.00	5.00	10.00	220.00	0.00	0.00	23000.00	23235.00	23.00	380.00	X	430.00	X	833.00	15596.02	X
Malawi	8.40	10.00	19.00	110.00	0.00	0.00	16000.00	16139.00	16.00	36.00	X	9.00	50.00	111.00	2078.22	X
Mali	9.40	3.00	0.00	100.00	0.00	0.00	2100.00	2203.00	18.00	300.00	X	38.00	X	356.00	6665.28	X
Mauritania	2.00	0.00	4.00	860.00	0.00	0.00	X	864.00	4.00	130.00	X	2.00	X	136.00	2546.29	X
Mauritius	1.10	0.00	52.00	270.00	0.00	0.00	X	322.00	2.00	2.00	X	X	X	4.00	74.89	X
Morocco	25.10	520.00	1200.00	3800.00	45.00	0.00	X	5565.00	53.00	220.00	4.00	1.00	X	278.00	5204.91	X
Mozambique	15.70	61.00	46.00	210.00	0.00	0.00	7000.00	7317.00	33.00	49.00	0.00	38.00	X	120.00	2246.72	X
Niger	7.10	5.00	48.00	150.00	0.00	0.00	1600.00	1803.00	14.00	210.00	0.00	6.00	X	230.00	4306.22	X
Nigeria	113.00	480.00	79.00	6900.00	1900.00	6200.00	58000.00	73559.00	220.00	610.00	1.00	150.00	X	981.00	18366.98	18000.00
Rwanda	7.20	0.00	0.00	99.00	0.00	0.00	290.00	389.00	14.00	30.00	X	1.00	X	45.00	842.52	X
Senegal	7.40	51.00	0.00	580.00	0.00	0.00	2900.00	3531.00	15.00	97.00	X	16.00	X	128.00	2396.51	1200.00
Sierra Leone	4.20	0.00	0.00	150.00	0.00	0.00	990.00	1140.00	8.00	14.00	X	70.00	X	92.00	1722.49	X
Somalia	7.60	0.00	0.00	260.00	0.00	0.00	990.00	1250.00	13.00	580.00	X	1.00	X	594.00	11121.29	X
South Africa	35.20	1700.00	67000.00	9300.00	0.00	0.00	X	78000.00	630.00	980.00	880.00	0.00	X	2490.00	46619.54	5800.00
Sudan	25.20	27.00	0.00	870.00	0.00	0.00	27000.00	27897.00	50.00	1000.00	X	1.00	X	1051.00	19677.57	X
Swaziland	0.80	0.00	120.00	0.00	0.00	0.00	X	120.00	2.00	23.00	X	X	X	25.00	468.07	X
Tanzania	27.30	41.00	3.00	520.00	0.00	0.00	4800.00	5364.00	50.00	560.00	0.00	120.00	X	730.00	13667.58	X
Togo	3.50	50.00	0.00	75.00	0.00	0.00	690.00	815.00	7.00	17.00	X	4.00	X	28.00	524.24	X
Tunisia	8.20	460.00	66.00	2300.00	400.00	28.00	X	3254.00	17.00	64.00	X	X	X	81.00	1516.54	1300.00
Uganda	18.40	3.00	0.00	190.00	0.00	0.00	2200.00	2393.00	36.00	200.00	X	10.00	X	246.00	4605.79	X
Zaire	36.00	54.00	210.00	700.00	0.00	0.00	35000.00	35964.00	79.00	52.00	1.00	120.00	X	252.00	4718.12	X
Zambia	8.50	51.00	280.00	410.00	0.00	0.00	4200.00	4941.00	14.00	86.00	3.00	4.00	X	107.00	2003.33	X
Zimbabwe	9.70	0.00	3600.00	590.00	0.00	0.00	4100.00	8290.00	19.00	200.00	20.00	X	X	239.00	4474.73	1500.00
NORTH & CENTRAL AMERICA	421.30	16000.00	470000.00	680000.00	280000.00	6300.00	90000.00	1542300.00	18000.00	10000.00	3900.00	700.00	27000.00	59995.00	1123268.83	400000.00
Barbados	0.30	27.00	0.00	210.00	12.00	0.00	X	249.00	1.00	1.00	X	X	X	2.00	37.45	130.00
Canada	26.50	1700.00	26000.00	52000.00	29000.00	1400.00	0.00	110100.00	1700.00	760.00	150.00	X	7800.00	10410.00	194903.38	36000.00
Costa Rica	3.00	71.00	0.00	660.00	0.00	0.00	15000.00	15731.00	6.00	92.00	X	6.00	X	104.00	1947.16	490.00
Cuba	10.30	480.00	120.00	8600.00	12.00	0.00	49.00	9261.00	24.00	240.00	X	83.00	X	347.00	6496.78	1800.00
Dominican Rep	7.20	150.00	0.00	1600.00	0.00	0.00	99.00	1849.00	14.00	77.00	X	48.00	X	139.00	2602.46	1200.00
El Salvador	5.30	83.00	0.00	470.00	0.00	0.00	180.00	733.00	13.00	35.00	X	2.00	X	50.00	936.14	860.00
Guatemala	9.20	180.00	0.00	770.00	0.00	0.00	10000.00	10950.00	19.00	97.00	X	2.00	X	118.00	2209.28	X
Haiti	6.50	27.00	0.00	160.00	0.00	0.00	26.00	213.00	12.00	61.00	X	5.00	X	78.00	1460.37	X
Honduras	5.10	54.00	0.00	460.00	0.00	0.00	9800.00	10314.00	9.00	89.00	X	3.00	X	101.00	1890.99	350.00
Jamaica	2.50	34.00	0.00	1600.00	0.00	0.00	58.00	1692.00	5.00	14.00	X	0.00	X	19.00	355.73	420.00
Mexico	88.60	2700.00	5700.00	58000.00	14000.00	1200.00	32000.00	113600.00	180.00	1500.00	42.00	22.00	4500.00	6244.00	116904.59	9100.00
Nicaragua	3.90	14.00	0.00	560.00	0.00	0.00	17000.00	17574.00	8.00	75.00	X	11.00	X	94.00	1759.93	610.00
Panama	2.40	48.00	4.00	700.00	0.00	0.00	5400.00	6152.00	5.00	55.00	X	13.00	X	73.00	1366.76	400.00
Trinidad and Tobago	1.30	43.00	0.00	740.00	2100.00	1900.00	87.00	4870.00	3.00	3.00	X	0.00	X	6.00	112.34	640.00
United States	249.20	9800.00	430000.00	540000.00	240000.00	1800.00	6000.00	1227600.00	16000.00	7000.00	3700.00	510.00	15000.00	42210.00	790285.48	350000.00
SOUTH AMERICA	296.60	6700.00	16000.00	92000.00	27000.00	3700.00	240000.00	385400.00	620.00	13000.00	100.00	850.00	2300.00	17235.00	322685.86	34000.00
Argentina	32.30	860.00	1000.00	17000.00	10000.00	1300.00	X	30160.00	70.00	3100.00	2.00	18.00	540.00	3730.00	69835.70	5500.00
Bolivia	7.30	41.00	0.00	840.00	160.00	78.00	6800.00	7919.00	15.00	220.00	X	14.00	50.00	299.00	5598.09	X
Brazil	150.40	3500.00	10000.00	38000.00	1500.00	540.00	1200000.00	1253540.00	320.00	7500.00	37.00	490.00	510.00	8857.00	165827.02	16000.00
Chile	13.20	200.00	1300.00	5100.00	450.00	98.00	X	7148.00	29.00	180.00	8.00	6.00	130.00	353.00	6609.12	2200.00
Colombia	31.80	810.00	3400.00	7200.00	2300.00	240.00	120000.00	133950.00	68.00	890.00	53.00	180.00	110.00	1301.00	24358.24	5200.00
Ecuador	10.80	270.00	0.00	3600.00	36.00	220.00	39000.00	43126.00	22.00	140.00	X	21.00	X	183.00	3426.26	1700.00
Guyana	1.00	0.00	0.00	280.00	0.00	0.00	340.00	620.00	2.00	12.00	X	14.00	X	28.00	524.24	X
Paraguey	4.30	20.00	0.00	430.00	0.00	0.00	7400.00	7850.00	8.00	190.00	X	6.00	X	204.00	3819.43	X
Peru	22.30	270.00	160.00	5600.00	340.00	94.00	45000.00	51464.00	45.00	190.00	1.00	36.00	X	272.00	5092.58	X

Contd.

Country/ Continent	Population	Anthropogenic Additions to the Carbon Dioxide Flux (c 1987) ('000 tonnes of Carbon)						Total Carbon Dioxide ('000 tonnes of carbon equivalent)	Anthropogenic Additions to the Methane Flux (c 1987) ('000 tonnes of methane)				Total Methane ('000 tonnes)	Total Methane ('000 tonnes of carbon equivalent)	1986 CFC Use Equivalent Carbon dioxide heating effect ('000 tonnes of Carbon)
		Cement	Solid	Liquid	Gas	Flaring	Land Use Change		Solid Waste	Livestock	Hard Coals	Wet Rice	Pipeline Leakage		
Suriname	0.40	7.00	8.00	330.00	0.00	0.00	350.00	695.00	1.00	2.00	X	35.00	X	38.00	711.46	68.00
Uruguay	3.10	55.00	1.00	890.00	0.00	0.00	X	946.00	8.00	460.00	X	13.00	X	481.00	9005.62	540.00
Venezuela	19.70	730.00	130.00	12000.00	12000.00	1100.00	18000.00	43960.00	40.00	450.00	0.00	12.00	960.00	1489.00	27878.11	3200.00
ASIA	3100.53	60000.00	770000.00	480000.00	90000.00	19000.00	870000.00	2289000.00	8700.00	23000.00	5500.00	62900.00	8300.00	108330.00	2028230.90	120000.00
Afghanistan	16.60	14.00	120.00	550.00	320.00	92.00	X	1096.00	42.00	270.00	1.00	100.00	X	413.00	7732.48	X
Bahrain	0.50	0.00	0.00	2100.00	2300.00	0.00	X	4400.00	1.00	0.00	X	X	70.00	71.00	1329.31	160.00
Bangladesh	115.60	42.00	34.00	1500.00	1800.00	0.00	1900.00	5276.00	230.00	1400.00	X	4600.00	X	6230.00	116642.47	X
Bhutan	1.50	0.08	1.00	8.00	0.00	0.00	220.00	229.00	3.00	13.00	X	18.00	X	34.00	636.57	X
China	1135.50	24000.00	480000.00	84000.00	7300.00	810.00	X	596110.00	2500.00	4400.00	4200.00	18000.00	X	29100.00	544830.79	32000.00
Cyprus	0.70	120.00	110.00	870.00	0.00	0.00	X	1100.00	2.00	6.00	X	X	X	8.00	149.78	X
India	853.40	5000.00	110000.00	35000.00	3200.00	1700.00	140000.00	294900.00	1800.00	10000.00	830.00	18000.00	180.00	30810.00	576846.52	700.00
Indonesia	180.50	1600.00	2200.00	21000.00	3400.00	6700.00	220000.00	254900.00	360.00	430.00	9.00	4900.00	400.00	6119.00	114564.25	9500.00
Iran, Islamic Rep	56.60	1700.00	1100.00	26000.00	8400.00	2500.00	X	39700.00	100.00	540.00	4.00	250.00	1100.00	1994.00	37333.68	9000.00
Iraq	18.90	1400.00	1.00	8600.00	520.00	2700.00	X	13221.00	36.00	130.00	X	25.00	X	191.00	3576.04	3000.00
Israel	4.60	280.00	2500.00	5300.00	21.00	0.00	X	8101.00	120.00	22.00	X	X	X	142.00	2658.62	5400.00
Japan	123.50	9500.00	75000.00	140000.00	23000.00	24.00	X	247524.00	2400.00	260.00	80.00	1200.00	X	3940.00	73767.47	100000.00
Jordan	4.30	310.00	0.00	2400.00	0.00	0.00	X	2710.00	6.00	10.00	X	X	X	16.00	299.56	X
Kampuchea	8.20	0.00	0.00	120.00	0.00	0.00	4800.00	4920.00	17.00	83.00	X	840.00	X	940.00	17599.34	X
Korea, Dem People's Rep	22.90	1100.00	36000.00	2800.00	0.00	0.00	X	39900.00	47.00	42.00	200.00	430.00	X	719.00	13461.63	X
Korea, Rep	43.60	3500.00	23000.00	20000.00	1200.00	0.00	X	47700.00	96.00	83.00	120.00	630.00	X	929.00	17393.40	5400.00
Kuwait	2.10	140.00	0.00	4500.00	4100.00	360.00	X	9100.00	4.00	8.00	X	X	580.00	592.00	11083.84	1800.00
Lao People's Dem Rep	4.10	0.00	0.00	56.00	0.00	0.00	85000.00	85056.00	10.00	66.00	X	240.00	X	316.00	5916.38	X
Lebanon	3.00	120.00	0.00	2200.00	0.00	0.00	X	2320.00	5.00	4.00	X	X	X	9.00	168.50	X
Malaysia	17.33	390.00	360.00	7700.00	2300.00	610.00	38000.00	49360.00	36.00	37.00	X	320.00	50.00	443.00	8294.16	2500.00
Mongolia	2.20	27.00	1800.00	670.00	0.00	0.00	X	2497.00	4.00	250.00	3.00	X	X	257.00	4811.74	X
Myanmar	41.70	53.00	79.00	730.00	600.00	27.00	150000.00	151489.00	89.00	450.00	0.00	2300.00	X	2839.00	53153.77	X
Nepal	19.10	14.00	62.00	150.00	0.00	0.00	6700.00	6926.00	38.00	490.00	X	660.00	X	1188.00	22242.58	X
Oman	1.50	0.00	0.00	4500.00	1100.00	320.00	X	5920.00	3.00	14.00	X	X	640.00	657.00	12300.82	X
Pakistan	122.70	930.00	1800.00	6700.00	4700.00	420.00	770.00	15320.00	220.00	1500.00	10.00	970.00	X	2700.00	50551.31	X
Philippines	62.40	480.00	1200.00	8200.00	0.00	0.00	68000.00	77880.00	130.00	230.00	6.00	1800.00	X	2166.00	40553.38	X
Qatar	0.40	41.00	0.00	580.00	2500.00	0.00	X	3121.00	1.00	1.00	X	X	480.00	482.00	9024.34	X
Saudi Arabia	14.10	1300.00	0.00	32000.00	12000.00	1000.00	X	46300.00	26.00	59.00	X	X	4800.00	4885.00	91460.43	6600.00
Singapur	2.70	210.00	11.00	7600.00	0.00	0.00	X	7821.00	6.00	2.00	X	X	X	8.00	149.78	3700.00
Sri Lanka	17.20	81.00	0.00	1000.00	0.00	0.00	1700.00	2781.00	37.00	110.00	X	340.00	X	487.00	9117.96	X
Syrian Arab Rep	12.50	570.00	1.00	6700.00	99.00	190.00	X	7560.00	23.00	100.00	X	X	X	123.00	2302.89	X
Thailand	55.70	1200.00	2100.00	10000.00	2200.00	0.00	94000.00	109500.00	120.00	470.00	X	4500.00	X	5090.00	95298.58	3500.00
Turkey	55.60	3000.00	18000.00	16000.00	150.00	0.00	X	37150.00	110.00	980.00	18.00	26.00	X	1134.00	21231.55	9200.00
United Arab Emirates	1.60	340.00	0.00	4700.00	7100.00	1900.00	X	14040.00	3.00	8.00	X	X	X	11.00	205.95	2300.00
Viet Nam	67.20	210.00	3700.00	1200.00	0.00	0.00	58000.00	63110.00	140.00	220.00	28.00	2800.00	X	3188.00	59687.99	X
Yeman Arab Rep	8.00	100.00	0.00	810.00	0.00	0.00	X	910.00	15.00	57.00	X	X	X	72.00	1348.03	X
Yemen, People's Dem Rep	2.50	0.00	0.00	1500.00	0.00	0.00	X	1500.00	5.00	22.00	X	X	X	27.00	505.51	X
EUROPE	497.20	33000.00	550000.00	440000.00	170000.00	5100.00	0.00	1198100.00	9200.00	9200.00	2300.00	220.00	6300.00	27102.00	507928.33	480000.00
Albania	3.20	120.00	1000.00	1300.00	200.00	0.00	0.00	2620.00	47.00	47.00	X	2.00	X	96.00	1797.38	X
Austria	7.50	620.00	3900.00	7700.00	2600.00	0.00	0.00	14820.00	150.00	160.00	X	X	X	310.00	5804.04	9100.00
Belgium	9.90	790.00	8900.00	13000.00	4100.00	0.00	0.00	26790.00	210.00	140.00	28.00	X	X	378.00	7077.18	12000.00
Bulgaria	9.00	770.00	18000.00	12000.00	2900.00	0.00	0.00	33670.00	X	200.00	1.00	9.00	X	210.00	3931.77	1600.00
Czechoslovakia	15.70	1400.00	46000.00	13000.00	5200.00	0.00	0.00	65600.00	250.00	300.00	130.00	X	X	680.00	12731.44	2700.00
Denmark	5.10	270.00	8500.00	7300.00	810.00	6.00	0.00	16886.00	100.00	170.00	X	X	X	270.00	5055.13	6300.00
Finland	5.00	220.00	4800.00	8800.00	820.00	0.00	0.00	14640.00	97.00	96.00	X	X	X	193.00	3613.48	6100.00
France	56.20	3200.00	21000.00	56000.00	14000.00	0.00	0.00	94200.00	1100.00	1500.00	82.00	7.00	1500.00	4189.00	78429.42	69000.00
German Dem Rep	16.60	1600.00	71000.00	13000.00	4300.00	0.00	0.00	89900.00	300.00	360.00	X	X	X	660.00	12358.99	20000.00
Germany, Fed Rep	60.50	3400.00	79000.00	73000.00	26000.00	0.00	0.00	181400.00	1200.00	920.00	440.00	X	X	2560.00	47930.13	75000.00
Greece	10.00	1800.00	7100.00	7200.00	70.00	0.00	0.00	16170.00	200.00	140.00	X	10.00	X	350.00	6552.95	12000.00
Hungary	10.60	560.00	8800.00	6200.00	5300.00	0.00	0.00	20860.00	170.00	150.00	12.00	6.00	220.00	558.00	10447.27	1900.00
Iceland	0.30	15.00	61.00	420.00	0.00	0.00	0.00	496.00	5.00	11.00	X	X	X	16.00	299.56	170.00
Ireland	3.70	190.00	3800.00	2900.00	840.00	0.00	0.00	7730.00	70.00	360.00	0.00	X	X	430.00	8050.76	4500.00
Italy	57.30	4900.00	15000.00	63000.00	19000.00	0.00	0.00	101900.00	1100.00	590.00	X	100.00	20.00	1810.00	33888.10	71000.00
Luxembourg	0.40	42.00	1000.00	990.00	210.00	0.00	0.00	2242.00	7.00	41.00	X	X	X	48.00	898.69	450.00
Malta	0.40	0.00	130.00	250.00	0.00	0.00	0.00	380.00	8.00	1.00	X	X	X	9.00	168.50	X
Netherlands	14.80	420.00	7300.00	7300.00	21000.00	45.00	0.00	36065.00	290.00	350.00	X	X	2200.00	2840.00	53172.49	18000.00
Norway	4.20	230.00	840.00	6900.00	840.00	3500.00	0.00	12310.00	82.00	76.00	3.00	X	510.00	671.00	12562.94	1200.00
Poland	38.40	2200.00	110000.00	11000.00	5500.00	0.00	0.00	128700.00	600.00	800.00	960.00	X	X	2360.00	44185.59	13000.00
Portugal	10.30	790.00	1900.00	5800.00	0.00	0.00	0.00	8490.00	200.00	100.00	1.00	17.00	X	318.00	5953.82	13000.00
Romania	23.30	1900.00	21000.00	13000.00	22000.00	460.00	0.00	58360.00	370.00	560.00	44.00	23.00	X	997.00	18666.54	X
Spain	39.30	3200.00	17000.00	25000.00	1600.00	38.00	0.00	46838.00	770.00	450.00	80.00	42.00	X	1342.00	25125.87	48000.00
Sweden	8.30	300.00	3000.00	12000.00	150.00	0.00	0.00	15450.00	170.00	110.00	0.00	X	X	280.00	5242.36	6300.00
Switzerland	6.50	540.00	460.00	9000.00	870.00	0.00	0.00	10870.00	130.00	120.00	X	X	X	250.00	4680.68	10000.00
United Kingdom	56.90	1800.00	71000.00	52000.00	31000.00	1100.00	0.00	156900.00	1100.00	950.00	540.00	X	1800.00	4390.00	82192.69	71000.00
Yugoslavia	23.80	1200.00	19000.00	11000.00	3200.00	0.00	0.00	34400.00	460.00	420.00	2.00	5.00	X	887.00	16607.04	8200.00
U.S.S.R	288.00	19000.00	370000.00	340000.00	300000.00	5100.00	0.00	1034100.00	4400.00	8100.00	2600.00	320.00	3700.00	19120.00	357978.17	180000.00
OCEANIA	25.10	960.00	36000.00	26000.00	9800.00	27.00	2700.00	75487.00	1100.00	2900.00	680.00	59.00	1100.00	5830.00	109153.38	25000.00
Australia	16.70	810.00	35000.00	21000.00	7900.00	0.00	0.00	64710.00	1000.00	1900.00	670.00	52.00	770.00	4392.00	82230.13	21000.00
Fiji	0.70	13.00	12.00	130.00	0.00	0.00	X	155.00	2.00	7.00	X	6.00	X	15.00	280.84	130.00
New Zealand	3.40	120.00	1200.00	2600.00	1900.00	27.00	0.00	5847.00	64.00	960.00	11.00	X	370.00	1405.00	26305.40	3500.00
Papua New Guinea	4.00	0.00	1.00	640.00	0.00	0.00	2700.00	3341.00	9.00	6.00	X	X	X	15.00	280.84	X
Solomon Islands	0.30	0.00	0.00	37.00	0.00	0.00	X	37.00	1.00	1.00	X	1.00	X	3.00	56.17	X

Note :Certain totals given above do not match those given in the WRI report because of the extensive rounding off done in the WRI report

Appendix 2

Permissible Emissions of Carbon Dioxide and Methane (on a population basis) (as calculated by CSE)

Country/ Continent	Percentage of World's Population	Permissible Emissions of Carbon Dioxide ('000 t of Carbon equivalent)	Actual Emission of Carbon Dioxide Emissions of . ('000 t of Carbon equivalent)	Less (+) or Excess (-) Methane Carbon Dioxide over Permissible Emissions ('000 t of Carbon equivalent)	Permissible Emissions of Emissions of ('000 t of Carbon equivalent)	Actual Emission of Methane ('000 t of Carbon equivalent)	Less (+) or Excess (-) Methane over Permissible Emissions ('000 t of Carbon equivalent)
Algeria	0.48	23119.24	19300.00	3819.24	19266.03	73056.00	-53789.97
Angola	0.19	9102.06	6739.00	2363.06	7585.05	2733.52	4851.54
Benin	0.09	4277.97	2640.00	1637.97	3564.97	973.58	2591.39
Botswana	0.02	1183.27	1120.00	63.27	986.06	2096.94	-1110.89
Burkina Faso	0.17	8191.86	4320.00	3871.86	6826.55	2752.24	4074.31
Burundi	0.10	5006.13	45.00	4961.13	4171.78	711.46	3460.32
Cameroon	0.21	10194.31	35601.00	-25406.69	8495.26	3370.09	5125.17
Cape Verde	0.01	364.08	9.00	355.08	303.40	37.45	265.96
Central African Rep	0.05	2639.60	3571.00	-931.40	2199.67	1273.14	926.52
Chad	0.11	5188.18	4256.00	932.18	4323.48	3538.59	784.89
Comoros	0.01	455.10	13.00	442.10	379.25	168.50	210.75
Congo	0.04	1820.41	3675.00	-1854.59	1517.01	149.78	1367.23
Cote d'Ivoire	0.24	11468.60	101389.00	-89920.40	9557.17	3257.75	6299.41
Djibouti	0.01	364.08	72.00	292.08	303.40	187.23	116.18
Egypt	1.03	49242.16	20500.00	28742.16	41035.13	18722.71	22312.42
Equatorial Guinea	0.01	364.08	269.00	95.08	303.40	18.72	284.68
Ethiopia	0.89	42506.63	8534.00	33972.63	35422.19	24039.96	11382.24
Gabon	0.02	1092.25	3179.00	-2086.75	910.21	74.89	835.32
Gambia, The	0.02	819.19	249.00	570.19	682.65	318.29	364.37
Ghana	0.28	13653.09	8319.00	5334.09	11377.58	1816.10	9561.48
Guinea	0.13	6280.42	8960.00	-2679.58	5233.69	5279.80	-46.12
Guinea-Bissau	0.02	910.21	3033.00	-2122.79	758.51	1179.53	-421.03
Kenya	0.48	22846.18	2947.00	19899.18	19038.48	10934.06	8104.42
Lesotho	0.03	1638.37	0.00	1638.37	1365.31	0.00	1365.31
Liberia	0.05	2366.54	7682.00	-5315.46	1972.11	1048.47	923.64
Libya	0.09	4095.93	7291.00	-3195.07	3413.27	7788.65	-4375.37
Madagascar	0.23	10922.48	23235.00	-12312.52	9102.06	15596.02	-6493.95
Malawi	0.16	7645.73	16139.00	-8493.27	6371.44	2078.22	4293.22
Mali	0.18	8555.94	2203.00	6352.94	7129.95	6665.28	464.67
Mauritania	0.04	1820.41	864.00	956.41	1517.01	2546.29	-1029.28
Mauritius	0.02	1001.23	322.00	679.23	834.36	74.89	759.46
Morocco	0.48	22846.18	5565.00	17281.18	19038.48	5204.91	13833.57
Mozambique	0.30	14290.24	7317.00	6973.24	11908.53	2246.72	9661.81
Niger	0.13	6462.46	1803.00	4659.46	5385.39	4306.22	1079.16
Nigeria	2.14	102853.31	73559.00	29294.31	85711.09	18366.98	67344.11
Rwanda	0.14	6553.49	389.00	6164.49	5461.24	842.52	4618.72
Senegal	0.14	6735.53	3531.	3204.53	5612.94	2396.51	3216.43
Sierra Leone	0.08	3822.87	1140.00	2682.87	3185.72	1722.49	1463.23
Somalia	0.14	6917.57	1250.00	5667.57	5764.64	11121.29	-5356.65
South Africa	0.67	32039.26	78000.00	-45960.74	26699.38	46619.54	-19920.16
Sudan	0.48	22937.20	27897.00	-4959.80	19114.33	19677.57	-563.23
Swaziland	0.02	728.17	120.00	608.17	606.80	468.07	138.74
Tanzania	0.52	24848.63	5364.00	19484.63	20707.19	13667.58	7039.62
Togo	0.07	3185.72	815.00	2370.72	2654.77	524.24	2130.53
Tunisia	0.16	7463.69	3254.00	4209.69	6219.74	1516.54	4703.20
Uganda	0.35	16747.80	2393.00	14354.80	13956.50	4605.79	9350.71
Zaire	0.68	32767.43	35964.00	-3196.57	27306.19	4718.12	2288.07
Zambia	0.16	7736.75	4941.00	2795.75	6447.29	2003.33	4443.96
Zimbabwe	0.18	8829.00	8290.00	539.00	7357.50	4474.73	2882.77
Barbados	0.01	273.06	249.00	24.06	227.55	37.45	190.11
Canada	0.50	24120.47	110100.00	-85979.53	20100.39	194903.38	-174803.00
Costa Rica	0.06	2730.62	15731.00	-13000.38	2275.52	1947.16	328.35
Cuba	0.20	9375.12	9261.00	114.12	7812.60	6496.78	1315.82
Dominican Rep	0.14	6553.49	1849.00	4704.49	5461.24	2602.46	2858.78
El Salvador	0.10	4824.09	733.00	4091.09	4020.08	936.14	3083.94
Guatemala	0.17	8373.90	10950.00	-2576.10	6978.25	2209.28	4768.97
Haiti	0.12	5916.34	213.00	5703.34	4930.28	1460.37	3469.91
Honduras	0.10	4642.05	10314.00	-5671.95	3868.38	1890.99	1977.38
Jamaica	0.05	2275.52	1692.00	583.52	1896.26	355.73	1540.53
Mexico	1.68	80644.27	113600.00	-32955.73	67203.56	116904.59	-49701.02
Nicaragua	0.07	3549.80	17574.00	-14024.20	2958.17	1759.93	1198.24
Panama	0.05	2184.50	6152.00	-3967.50	1820.41	1366.76	453.65
Trinidad and Tobago	0.02	1183.27	4870.00	-3686.73	986.06	112.34	873.72
United States	4.73	226823.40	1227600.00	-1000776.60	189019.50	790285.48	-601265.98
Argentina	0.61	29399.66	30160.00	-760.34	24499.72	69835.70	-45335.98
Bolivia	0.14	6644.51	7919.00	-1274.49	5537.09	5598.09	-61.00
Brazil	2.85	136895.02	1253540.00	-1116644.98	114079.18	165827.02	-51747.84
Chile	0.25	12014.72	7148.00	4866.72	10012.27	6609.12	3403.15
Colombia	0.60	28944.56	133950.00	-105005.44	24120.47	24358.24	-237.78
Ecuador	0.20	9830.23	43126.00	-33295.77	8191.86	3426.26	4765.60
Guyana	0.02	910.21	620.00	290.21	758.51	524.24	234.27
Paraguay	0.08	3913.89	7850.00	-3936.11	3261.57	3819.43	-557.86

Contd.

Country/ Continent	Percentage of World's Population	Permissible Emissions of Carbon Dioxide ('000 t of Carbon equivalent)	Actual Emission of Carbon Dioxide Emissions of ('000 t of Carbon equivalent)	Less (+) or Excess (-) Methane Carbon Dioxide over Permissible Emissions ('000 t of Carbon equivalent)	Permissible Emissions of Emissions of ('000 t of Carbon equivalent)	Actual Emission of Methane ('000 t of Carbon equivalent)	Less (+) or Excess (-) Methane over Permissible Emissions ('000 t of Carbon equivalent)
Peru	0.42	20297.60	51464.00	-31166.40	16914.67	5092.58	11822.09
Suriname	0.01	364.08	695.00	-330.92	303.40	711.46	-408.06
Uruguay	0.06	2821.64	946.00	1875.64	2351.37	9005.62	-6654.26
Venezuela	0.37	17931.06	43960.00	-26028.94	14942.55	27878.11	-12935.56
Afghanistan	0.31	15109.42	1096.00	14013.42	12591.19	7732.48	4858.71
Bahrain	0.01	455.10	4400.00	-3944.90	379.25	1329.31	-950.06
Bangladesh	2.19	105219.84	5276.00	99943.84	87683.20	116642.47	-28959.26
Bhutan	0.03	1365.31	229.00	1136.31	1137.76	636.57	501.19
China	21.53	1033539.20	596110.00	437429.20	861282.67	544830.79	316451.88
Cyprus	0.01	637.14	1100.00	-462.86	530.95	149.78	381.17
India	16.18	776770.02	294900.00	481870.02	647308.35	576846.62	70461.73
Indonesia	3.42	164292.23	254900.00	-90607.77	136910.19	114564.25	22345.94
Iran, Islamic Rep	1.07	51517.67	39700.00	11817.67	42931.40	37333.08	5598.32
Iraq	0.36	17202.90	13221.00	3981.90	14335.75	3576.04	10759.71
Israel	0.09	4186.95	8101.00	-3914.05	3489.12	2658.62	830.50
Japan	2.34	112410.47	247524.00	-135113.53	93675.39	73767.47	19907.93
Jordan	0.08	3913.89	2710.00	1203.89	3261.57	299.56	2962.01
Kampuchea	0.16	7463.69	4920.00	2543.69	6219.74	17599.34	-11379.60
Korea, Dem People's Rep	0.43	20843.72	39900.00	-19056.28	17369.77	13461.63	3908.14
Korea, Rep	0.83	39684.99	47700.00	-8015.01	33070.83	17393.40	15677.43
Kuwait	0.04	1911.43	9100.00	-7188.57	1592.86	11083.84	-9490.98
Lao People's Dem Rep	0.08	3731.85	85056.00	-81324.15	3109.87	5916.38	-2806.50
Lebanon	0.06	2730.62	2320.00	410.62	2275.52	168.50	2107.01
Malaysia	0.33	15773.87	49360.00	-33586.13	13144.90	8294.16	4850.74
Mongolia	0.04	2002.45	2497.00	-494.55	1668.71	4811.74	-3143.02
Myanmar	0.79	37955.60	151489.00	-113533.40	31629.67	53153.77	-21524.10
Nepal	0.36	17384.94	6926.00	10458.94	14487.45	22242.58	-7755.13
Oman	0.03	1365.31	5920.00	-4554.69	1137.76	12300.82	-11163.06
Pakistan	2.33	111682.31	15320.00	96362.31	93068.59	50551.31	42517.28
Philippines	1.18	56796.87	77880.00	-21083.13	47330.73	40553.38	6777.34
Qatar	0.01	364.08	3121.00	-2756.92	303.40	9024.34	-8720.94
Saudi Arabia	0.27	12833.91	46300.00	-33466.09	10694.92	91460.43	-80765.50
Singapore	0.05	2457.56	7821.00	-5363.44	2047.96	149.78	1898.18
Sri Lanka	0.33	15655.55	2781.00	12874.55	13046.29	9117.96	3928.33
Syrian Arab Rep	0.24	11377.58	7560.00	3817.58	9481.32	2302.89	7178.42
Thailand	1.06	50698.49	109500.00	-58801.51	42248.74	95298.58	-53049.84
Turkey	1.05	50607.47	37150.00	13457.47	42172.89	21231.55	20941.34
United Arab Emirates	0.03	1456.33	14040.00	-12583.67	1213.61	205.95	1007.66
Viet Nam	1.27	61165.86	63110.00	-1944.14	50971.55	59687.99	-8716.44
Yemen Arab Rep	0.15	7281.65	910.00	6371.65	6068.04	1348.03	4720.01
Yemen, People's Dem Rep	0.05	2275.52	1500.00	775.52	1896.26	505.51	1390.75
Albania	0.06	2912.66	2620.00	292.66	2427.22	1797.38	629.84
Austria	0.14	6826.55	14820.00	-7993.45	5688.79	5804.04	-115.25
Belgium	0.19	9011.04	26790.00	-17778.96	7509.20	7077.18	432.02
Bulgaria	0.17	8191.86	33670.00	-25478.14	6826.55	3931.77	2894.78
Czechoslovakia	0.30	14290.24	65600.00	-51309.76	11908.53	12731.44	-822.91
Denmark	0.10	4642.05	16886.00	-12243.95	3868.38	5055.13	-1186.75
Finland	0.09	4551.03	14640.00	-10088.97	3792.53	3613.48	179.04
France	1.07	51153.59	94200.00	-43046.41	42627.99	78429.42	-35801.43
German Dem Rep	0.31	15109.42	89900.00	-74790.58	12591.19	12356.99	234.20
Germany, Fed Rep	1.16	55067.48	181400.00	-126332.52	45889.57	47930.13	-2040.57
Greece	0.19	9102.06	16170.00	-7067.94	7585.05	6552.95	1032.10
Hungary	0.20	9648.19	20860.00	-11211.81	8040.16	10447.27	-2407.12
Iceland	0.01	273.06	496.00	-222.94	227.55	299.56	-72.01
Ireland	0.07	3367.76	7730.00	-4362.24	2806.47	8050.76	-5244.29
Italy	1.09	52154.82	101900.00	-49745.18	43462.35	33888.10	9574.25
Luxembourg	0.01	364.08	2242.00	-1877.92	303.40	898.69	-595.29
Malta	0.01	364.08	380.00	-15.92	303.40	168.50	134.90
Netherlands	0.28	13471.05	36065.00	-22593.95	11225.88	53172.49	-41946.61
Norway	0.08	3822.87	12310.00	-8487.13	3185.72	12562.94	-9377.21
Poland	0.73	34951.92	128700.00	-93748.08	29126.60	44185.59	-15058.99
Portugal	0.20	9375.12	8490.00	885.12	7812.60	5953.82	1858.78
Romania	0.44	21207.81	58360.00	-37152.19	17673.17	18666.54	-993.37
Spain	0.75	35771.11	46838.00	-11066.89	29809.25	25125.87	4683.38
Sweden	0.16	7554.71	15450.00	-7895.29	6295.59	5242.36	1053.24
Switzerland	0.12	5916.34	10870.00	-4953.66	4930.28	4680.68	249.61
United Kingdom	1.08	51790.74	156900.00	-105109.26	43158.95	82192.69	-39033.74
Yugoslavia	0.45	21662.91	34400.00	-12737.09	18052.42	16607.04	1445.38
U.S.S.R.	5.46	262139.40	1034100.00	-771960.60	218449.50	357978.17	-139528.66
Australia	0.32	15200.44	64710.00	-49509.56	12667.04	82230.13	-69563.09
Fiji	0.01	637.14	155.00	482.14	530.95	280.84	250.11
New Zealand	0.06	3094.70	5847.00	-2752.30	2578.92	26305.40	-23726.49
Papua New Guinea	0.08	3640.83	3341.00	299.83	3034.02	280.84	2753.18
Solomon Islands	0.01	273.06	37.00	236.06	227.55	56.17	171.38
WORLD	100.00	4800000.00	8238659.00	-3438659.00	4000000.00	4785711.24	-785711.24

Appendix 3

Annual Net Emissions to the atmosphere of Carbon Dioxide (as calculated by CSE)

Sl. No.	Country	Excess emisssions of carbon dioxide over permissible limits ('000 t of carbon equivalent)	Permissible emissions of carbon dioxide obtained through tradeable quotas ('000 t of carbon equivalent)	Net emissions of carbon dioxide to the atmosphere ('000 t of carbon equivalent)	Percentage of total net emissions of carbon dioxide inthe world (%)
1	Brazil	1116644.98	115868.85	1000776.13	29.10
2	United States	1000776.60	191984.82	1192761.42	34.69
3	U.S.S.R.	771960.60	221876.52	550084.08	16.00
4	Myanmar	113533.40	32125.87	81407.53	2.37
5	Colombia	105005.44	24498.87	80506.58	2.34
6	Cote d'Ivoire	89920.40	9707.10	80213.30	2.33
7	Germany, Fed Rep	126332.52	46609.48	79723.04	2.32
8	Lao People's Dem Rep	81324.15	3158.66	78165.50	2.27
9	Canada	85979.53	20415.72	65563.81	1.91
10	Poland	93748.08	29583.54	64164.54	1.87
11	German Dem Rep	74790.58	12788.72	62001.86	1.80
12	United Kingdom	105109.26	43836.02	61273.24	1.78
13	Japan	135113.53	95144.97	39968.56	1.16
14	Czechoslovakia	51309.76	12095.35	39214.41	1.14
15	Australia	49509.56	12865.76	36643.80	1.07
16	Ecuador	33295.77	8320.37	24975.40	0.73
17	Saudi Arabia	33466.09	10862.70	22603.39	0.66
18	Malaysia	33586.13	13351.11	20235.01	0.59
19	Romania	37152.19	17950.43	19201.77	0.56
20	South Africa	45960.74	27118.24	18842.50	0.55
21	Bulgaria	25478.14	6933.64	18544.50	0.54
22	Cameroon	25406.69	8628.53	16778.16	0.49
23	Thailand	58801.51	42911.54	15889.98	0.46
24	Peru	31166.40	17180.02	13986.38	0.41
25	United Arab Emirates	12583.67	1232.65	11351.02	0.33
26	Netherlands	22593.95	11401.99	11191.96	0.33
27	Nicaragua	14024.20	3004.58	11019.62	0.32
28	Venezuela	26028.94	15176.97	10851.97	0.32
29	Costa Rica	13000.38	2311.21	10689.17	0.31
30	Denmark	12243.95	3929.06	8314.88	0.24
31	Finland	10088.97	3852.02	6236.95	0.18
32	Italy	49745.18	44144.18	5601.00	0.16
33	Kuwait	7188.57	1617.85	5570.72	0.16
34	Norway	8487.13	3235.70	5251.43	0.15
35	Belgium	17778.96	7627.01	10151.95	0.15
36	Bahrain	3944.90	385.20	3559.69	0.10
37	Oman	4554.69	1155.61	3399.08	0.10
38	Liberia	5315.46	2003.05	3312.41	0.1
39	Singapore	5363.44	2080.09	3283.35	0.10
40	Madagascar	12312.52	9244.85	3067.67	0.09
41	Hungary	11211.81	8166.29	3045.53	0.09
42	Trinidad and Tobago	3686.73	1001.53	2685.21	0.08
43	Qatar	2756.92	308.16	2448.76	0.07
44	Austria	7993.45	5778.03	2215.42	0.06
45	Panama	3967.50	1848.97	2118.53	0.06
46	Malawi	8493.27	6464.77	2028.50	0.06
47	Honduras	5671.95	3929.06	1742.88	0.05
48	Luxembourg	1877.92	308.16	1569.76	0.05

Contd.

Sl. No.	Country	Excess emisssions of carbon dioxide over permissible limits ('000 t of carbon equivalent)	Permissible emissions of carbon dioxide obtained through tradeable quotas ('000 t of carbon equivalent)	Net emissions of carbon dioxide to the atmosphere ('000 t of carbon equivalent)	Percentage of total net emissions of carbon dioxide inthe world (%)
49	Ireland	4362.24	2850.50	1511.74	0.04
50	Sweden	7895.29	6394.36	1500.93	0.04
51	Korea, Dem People's Rep	19056.28	17642.26	1414.01	0.04
52	Guinea-Bissau	2122.79	770.40	1362.39	0.04
53	Gabon	2086.75	924.49	1162.27	0.03
54	Paraguay	3936.11	3312.74	623.37	0.02
55	Israel	3914.05	3543.86	370.19	0.01
56	Congo	1854.59	1540.81	313.78	0.01
57	New Zealand	2752.30	2619.38	132.92	0.00
58	Suriname	330.92	308.16	22.76	0.00
59	Libya	3195.07	3195.07	0.00	0.00
60	Mexico	32955.73	32955.73	0.00	0.00
61	Indonesia	90607.77	90607.77	0.00	0.00
62	Guinea	2679.58	2679.58	0.00	0.00
63	Sudan	4959.80	4959.80	0.00	0.00
64	Bolivia	1274.49	1274.49	0.00	0.00
65	Guatemala	2576.10	2576.10	0.00	0.00
66	Zaire	3196.57	3196.57	0.00	0.00
67	Mongolia	494.55	494.55	0.00	0.00
68	Argentina	760.34	760.34	0.00	0.00
69	Central African Rep	931.40	931.40	0.00	0.00
70	Iceland	222.94	222.94	0.00	0.00
71	Cyprus	462.86	462.86	0.00	0.00
72	Malta	15.92	15.92	0.00	0.00
73	Switzerland	4953.66	4953.66	0.00	0.00
74	Greece	7067.94	7067.94	0.00	0.00
75	France	43046.41	43046.41	0.00	0.00
76	Korea, Rep	8015.01	8015.01	0.00	0.00
77	Yugoslavia	12737.09	12737.09	0.00	0.00
78	Viet Nam	1944.14	1944.14	0.00	0.00
79	Spain	11066.89	11066.89	0.00	0.00
80	Philippines	21083.13	21083.13	0.00	0.00
	WORLD	4898845.23	1460178.16	3438667.07	100.00

Appendix 4

Annual Net Emissions to the atmosphere of Methane (as calculated by CSE)

Sl. No.	Country	Excess Emisssions of Methane over permissible limits ('000 t of carbon equivalent)	Permissible Emissions of Methane obtained through tradeable quotas from other countries ('000 t of carbon equivalent)	Net Emissions of Methane to the atmosphere ('000 t of carbon equivalent)	Percentage of total net Emissions of Methane in the world (%)
1	United States	601265.98	228350.77	372915.21	47.46
2	Canada	174803.00	24282.89	150520.11	19.16
3	Saudi Arabia	80765.50	12920.33	67845.17	8.63
4	Australia	69563.09	15299.95	54263.14	6.91
5	Algeria	53789.97	23274.92	30515.05	3.88
6	Netherlands	41946.61	13559.24	28387.38	3.61
7	New Zealand	23726.49	3114.96	20611.53	2.62
8	Argentina	45335.98	29597.63	15738.35	2.00
9	Oman	11163.06	1374.50	9788.56	1.25
10	Qatar	8720.94	366.53	8354.41	1.06
11	Kuwait	9490.98	1924.30	7566.68	0.96
12	Norway	9377.21	3847.89	5529.32	0.70
13	Kampuchea	11379.60	7513.95	3865.65	0.49
14	Uruguay	6654.26	2840.64	3813.62	0.49
15	Thailand	53049.84	51039.88	2009.96	0.26
16	Ireland	5244.29	3390.39	1853.91	0.24
17	Mongolia	3143.02	2015.94	1127.09	0.14
18	Bahrain	950.06	458.17	491.89	0.06
19	Libya	4375.37	4123.51	251.86	0.03
20	Luxembourg	595.29	366.47	228.82	0.03
21	Suriname	408.06	366.53	41.53	0.01
22	Botswana	1110.89	1110.89	0.00	0.00
23	U.S.S.R.	139528.66	139528.66	0.00	0.00
24	Bangladesh	28959.26	28959.26	0.00	0.00
25	France	35801.43	35801.43	0.00	0.00
26	Venezuela	12935.56	12935.56	0.00	0.00
27	Hungary	2407.12	2407.12	0.00	0.00
28	Somalia	5356.65	5356.65	0.00	0.00
29	Mexico	49701.02	49701.02	0.00	0.00
30	Denmark	1186.75	1186.75	0.00	0.00
31	Nepal	7755.13	7755.13	0.00	0.00
32	Czechoslovakia	822.91	822.91	0.00	0.00
33	Guinea-Bissau	421.03	421.03	0.00	0.00
34	Austria	115.25	115.25	0.00	0.00
35	Madagascar	6493.95	6493.95	0.00	0.00
36	Guinea	46.12	46.12	0.00	0.00
37	Iceland	72.01	72.01	0.00	0.00
38	Bolivia	61.00	61.00	0.00	0.00
39	Lao People's Dem Rep	2806.50	2806.50	0.00	0.00
40	Sudan	563.23	563.23	0.00	0.00
41	Romania	993.37	993.37	0.00	0.00
42	Paraguay	557.86	557.86	0.00	0.00
43	Colombia	237.78	237.78	0.00	0.00
44	Poland	15058.99	15058.99	0.00	0.00
45	Viet Nam	8716.44	8716.44	0.00	0.00
46	Germany, Fed Rep	2040.57	2040.57	0.00	0.00
47	United Kingdom	39033.74	39033.74	0.00	0.00
48	South Africa	19920.16	19920.16	0.00	0.00
49	Mauritania	1029.28	1029.28	0.00	0.00
50	Brazil	51747.84	51747.84	0.00	0.00
51	Myanmar	21524.10	21524.17	0.07	0.00
	World	1672753.21	887034.04	785719.17	99.98

Appendix 5

Per capita Annual Net Emissions to the atmosphere of Carbon Dioxide (as calculated by CSE)

Sl.No Net	Country	Per cap ita Annual Emissions of Carbon Dioxide to the atmosphere (tonnes of carbon equivalent)
1	Lao People's Dem Rep	9.06
2	Bahrain	7.12
3	United Arab Emirates	7.09
4	Brazil	6.65
5	Cote d'Ivoire	6.37
6	Qatar	6.12
7	Luxembourg	3.92
8	German Dem Rep	3.74
9	Costa Rica	3.56
10	United States	3.25
11	Nicaragua	2.83
12	Kuwait	2.65
13	Colombia	2.53
14	Czechoslovakia	2.50
15	Canada	2.47
16	Ecuador	2.31
17	Oman	2.27
18	Australia	2.19
19	Trinidad and Tobago	2.07
20	Bulgaria	2.06
21	Myanmar	1.95
22	U.S.S.R.	1.91
23	Poland	1.67
24	Denmark	1.63
25	Saudi Arabia	1.60
26	Cameroon	1.50
27	Guinea-Bissau	1.35
28	Germany, Fed Rep	1.32
29	Liberia	1.27
30	Norway	1.25
31	Finland	1.25
32	Singapore	1.22
33	Malaysia	1.17
34	United Kingdom	1.08
35	Belgium	1.03
36	Gabon	0.97
37	Panama	0.88
38	Romania	0.82
39	Netherlands	0.76
40	Peru	0.63
41	Venezuela	0.55
42	South Africa	0.54
43	Ireland	0.41
44	Honduras	0.34
45	Japan	0.32
46	Austria	0.30
47	Hungary	0.29
48	Thailand	0.29
49	Madagascar	0.26
50	Malawi	0.24
51	Sweden	0.18
52	Congo	0.16
53	Paraguay	0.14
54	Italy	0.10
55	Israel	0.08
56	Korea, Dem People's Rep	0.06
57	Surinam	0.06
58	New Zealand	0.04

Appendix 6

Per capita Annual Net Emission to the atmosphere of Methane (as calculated by CSE)

Sl. No	Country	Per capita Net Emissions of Methane to the atmosphere (tonnes of carbon equivalent)
1	Qatar	9.06
2	Oman	7.12
3	New Zealand	7.09
4	Canada	6.65
5	Saudi Arabia	6.37
6	Kuwait	6.12
7	Australia	3.92
8	Netherlands	3.74
9	United States	3.56
10	Norway	3.25
11	Uruguay	2.83
12	Algeria	2.65
13	Bahrain	2.53
14	Luxembourg	2.50
15	Mongolia	2.47
16	Ireland	2.31
17	Argentina	2.27
18	Kampuchea	2.19
19	Suriname	2.07
20	Libya	2.06
21	Thailand	1.95

Appendix 7

Annual Net Emissions of all Greenhouse Gases to the atmosphere (as calculated by CSE)

Sl. No.	Country	Net Emissions of Carbon dioxide ('000 t of Carbon equivalent)	Net Emissions of Methane ('000 t of Carbon equivalent)	Net Emissions of CFCs ('000 t of Carbon equivalent)	Net Emissions of all Greenhouse gases ('000 t of Carbon equivalent)	Comulative share of world total (%)
1	United States	808791.78	372915.21	350000.00	1531706.99	27.40
2	Brazil	1000776.13	0.00	16000.00	1016776.13	45.65
3	U.S.S.R.	550084.08	0.00	180000.00	730084.08	58.72
4	Canada	65563.81	150520.11	36000.00	252083.92	63.24
5	Germany, Fed Rep	79723.04	0.00	75000.00	154723.04	66.01
6	Japan	39968.56	0.00	100000.00	139968.56	68.52
7	United Kingdom	61273.24	0.00	71000.00	132273.24	70.89
8	Australia	36643.80	54263.14	21000.00	111906.94	72.89
9	Saudi Arabia	22603.39	67845.17	6600.00	97048.56	74.64
10	Colombia	80506.58	0.00	5200.00	85706.58	76.17
11	Cote d'Ivoire	80213.30	0.00	2000.00	82213.30	77.64
12	German Dem Rep	62001.86	0.00	20000.00	82001.86	79.11
13	Myanmar	81407.53	0.00	0.00	81407.53	80.57
14	Lao People's Dem Rep	78165.50	0.00	0.00	78165.50	81.97
15	Poland	64164.54	0.00	13000.00	77164.54	83.35
16	Italy	5601.00	0.00	71000.00	76601.00	84.72
17	France	0.00	0.00	69000.00	69000.00	85.96
18	Netherlands	11191.96	28387.38	18000.00	57579.34	86.99
19	Spain	0.00	0.00	48000.00	48000.00	87.85
20	Czechoslovakia	39214.41	0.00	2700.00	41914.41	88.60
21	Algeria	0.00	30515.05	4100.00	34615.05	89.22
22	China	0.00	0.00	32000.00	32000.00	89.79
23	Ecuador	24975.40	0.00	1700.00	26675.40	90.27
24	South Africa	18842.50	0.00	5800.00	24642.50	90.71
25	New Zealand	132.92	20611.53	3500.00	24244.45	91.15
26	Malaysia	20235.01	0.00	2500.00	22735.01	91.55
27	Belgium	10151.95	0.00	12000.00	22151.95	91.94
28	Thailand	15889.98	2009.96	3500.00	21399.94	92.32
29	Argentina	0.00	15738.35	5500.00	21238.35	92.68
30	Bulgaria	18544.50	0.00	1600.00	20144.50	93.02
31	Romania	19201.77	0.00	0.00	19201.77	93.34
32	Nigeria	0.00	0.00	18000.00	18000.00	93.74
33	Cameroon	16778.16	0.00	0.00	16778.16	94.04
34	Kuwait	5570.72	7566.68	1800.00	14937.39	94.31
35	Denmark	8314.88	0.00	6300.00	14614.88	94.57
36	Venezuela	10851.97	0.00	3200.00	14051.97	94.82
37	Peru	13986.38	0.00	0.00	13986.38	95.07
38	United Arab Emirates	11351.02	0.00	2300.00	13651.02	95.32
39	Oman	3399.08	9788.56	0.00	13187.64	95.55
40	Portugal	0.00	0.00	13000.00	13000.00	95.79
41	Finland	6236.95	0.00	6100.00	12336.95	96.01
42	Greece	0.00	0.00	12000.00	12000.00	96.22
43	Norway	5251.43	5529.32	1200.00	11980.76	96.44
44	Nicaragua	11019.62	0.00	610.00	11629.62	96.65
45	Austria	2215.42	0.00	9100.00	11315.42	96.85
46	Costa Rica	10689.17	0.00	490.00	11179.17	97.05
47	Qatar	2448.76	8354.41	0.00	10803.16	97.24
48	Switzerland	0.00	0.00	10000.00	10000.00	97.42
49	Indonesia	0.00	0.00	9500.00	9500.00	97.59
50	Turkey	0.00	0.00	9200.00	9200.00	97.76

Contd.

Sl. No.	Country	Net Emissions of Carbon dioxide ('000 t of Carbon equivalent)	Net Emissions of Methane ('000 t of Carbon equivalent)	Net Emissions of CFCs ('000 t of Carbon equivalent)	Net Emissions of all Green-house gases ('000 t of Carbon equivalent)	Cumulative share of world total (%)
51	Mexico	0.00	0.00	9100.00	9100.00	97.92
52	Iran, Islamic Rep	0.00	0.00	9000.00	9000.00	98.08
53	Yugoslavia	0.00	0.00	8200.00	8200.00	98.23
54	Ireland	1511.74	1853.91	4500.00	7865.65	98.37
55	Sweden	1500.93	0.00	6300.00	7800.93	98.51
56	Singapore	3283.35	0.00	3700.00	6983.35	98.63
57	Israel	370.19	0.00	5400.00	5770.19	98.74
58	Korea, Rep	0.00	0.00	5400.00	5400.00	98.83
59	Egypt	0.00	0.00	5100.00	5100.00	98.92
60	Hungary	3045.53	0.00	1900.00	4945.53	99.01
61	Uruguay	0.00	3813.62	540.00	4353.62	99.09
62	Bahrain	3559.69	491.89	160.00	4211.59	99.17
63	Kampuchea	0.00	3865.65	0.00	3865.65	99.24
64	Liberia	3312.41	0.00	410.00	3722.41	99.30
65	Trinidad and Tobago	2685.21	0.00	640.00	3325.21	99.36
66	Madagascar	3067.67	0.00	0.00	3067.67	99.42
67	Iraq	0.00	0.00	3000.00	3000.00	99.47
68	Panama	2118.53	0.00	400.00	2518.53	99.52
69	Ghana	0.00	0.00	2400.00	2400.00	99.56
70	Luxembourg	1569.76	228.82	450.00	2248.58	99.60
71	Chile	0.00	0.00	2200.00	2200.00	99.64
72	Honduras	1742.88	0.00	350.00	2092.88	99.68
73	Malawi	2021.87	0.00	0.00	2021.87	99.71
74	Cuba	0.00	0.00	1800.00	1800.00	99.74
75	Zimbabwe	0.00	0.00	1500.00	1500.00	99.77
76	Korea, Dem People's Rep	1414.01	0.00	0.00	1414.01	99.80
77	Guinea-Bissau	1352.39	0.00	0.00	1352.39	99.82
78	Tunisia	0.00	0.00	1300.00	1300.00	99.84
79	Senegal	0.00	0.00	1200.00	1200.00	99.87
80	Dominican Rep	0.00	0.00	1200.00	1200.00	99.89
81	Gabon	1162.27	0.00	0.00	1162.27	99.91
82	Mongolia	0.00	1127.09	0.00	1127.09	99.93
83	El Salvador	0.00	0.00	860.00	860.00	99.94
84	India	0.00	0.00	700.00	700.00	99.96
85	Paraguay	623.37	0.00	0.00	623.37	99.97
86	Jamaica	0.00	0.00	420.00	420.00	99.98
87	Congo	313.78	0.00	0.00	313.78	99.99
88	Libya	0.00	251.86	0.00	251.86	99.99
89	Iceland	0.00	0.00	170.00	170.00	99.99
90	Suriname	22.76	41.53	68.00	132.28	100.00
91	Barbados	0.00	0.00	130.00	130.00	100.00
92	Fiji	0.00	0.00	130.00	130.00	100.00
	WORLD	3438660.44	785719.24	1358128.00	5582507.68	

Appendix 8
Per capita Annual Net Emissions all Greenhouse gases to the atmosphere (as calculated by CSE)

Sl.No	Country	Per capita Net Emissions of all Greenhouse gases to the atmosphere (tonnes of Carbon equivalent)
1	Qatar	7.01
2	Lao People's Dem Rep	9.06
3	Canada	9.51
4	Oman	8.79
5	United Arab Emirates	8.53
6	Bahrain	8.42
7	New Zealand	7.13
8	Kuwait	7.11
9	Saudi Arabia	6.88
10	Brazil	6.76
11	Australia	6.70
12	Cote d'Ivoire	6.52
13	United States	6.15
14	Luxembourg	5.62
15	German Dem Rep	4.94
16	Netherlands	3.89
17	Costa Rica	3.73
18	Nicaragua	2.98
19	Denmark	2.87
20	Norway	2.85
21	Colombia	2.70
22	Czechoslovakia	2.67
23	Singapore	2.59
24	Trinidad and Tobago	2.56
25	Germany, Fed Rep	2.56
26	U.S.S.R.	2.54
27	Ecuador	2.47
28	Finland	2.47
29	United Kingdom	2.32
30	Bulgaria	2.24
31	Ireland	2.13
32	Poland	2.01
33	Myanmar	1.95
34	Belgium	2.24
35	Switzerland	1.54
36	Austria	1.51
37	Cameroon	1.50
38	Liberia	1.43
39	Uruguay	1.40
40	Algeria	1.36
41	Guinea-Bissau	1.35
42	Italy	1.34
43	Malaysia	1.31
44	Portugal	1.26
45	Israel	1.25
46	France	1.23
47	Spain	1.22
48	Greece	1.20
49	Japan	1.13
50	Panama	1.05
51	Gabon	0.97
52	Sweden	0.94
53	Romania	0.82
54	Venezuela	0.71
55	South Africa	0.70
56	Argentina	0.66
57	Peru	0.63
58	Iceland	0.57
59	Mongolia	0.51
60	Kampuchea	0.47
61	Hungary	0.47
62	Barbados	0.43
63	Honduras	0.41
64	Thailand	0.38
65	Yugoslavia	0.34
66	Suriname	0.33
67	Madagascar	0.26
68	Malawi	0.24
69	Fiji	0.19
70	Cuba	0.17
71	Jamaica	0.17
72	Chile	0.17
73	Dominican Rep	0.17
74	Turkey	0.17
75	El Salvador	0.16
76	Senegal	0.16
77	Ghana	0.16
78	Nigeria	0.16
79	Iran, Islamic Rep	0.16
80	Iraq	0.16
81	Tunisia	0.16
82	Zimbabwe	0.15
83	Congo	0.16
84	Paraguay	0.14
85	Korea, Rep	0.12
86	Mexico	0.10
87	Egypt	0.09
88	Korea, Dem People's Rep	0.06
89	Libya	0.06
90	Indonesia	0.05
91	China	0.03
92	India	0.0008

Appendix 9
Reasons why certain developing countries figure in top 20 list of net emitters

Country	Main Greenhouse Gas Involved	Reason
Brazil	Carbon Dioxide	Land Use Change (Deforestation)
Saudi Arabia	Methane	Pipeline Leakage (Consumption by West)
Colombia	Carbon Dioxide	Land Use Change (Deforestation)
Cote d'Ivorie	Carbon Dioxide	Land Use Change (Deforestation)
Myanmar	Carbon Dioxide	Land Use Change (Deforestation)
Lao People's Dem Rep	Carbon Dioxide	Land Use Change (Deforestation)
Algeria	Methane	Pipeline Leakage (Consumption by West)
China	CFCs	
Ecuador	Carbon Dioxide	Land Use Change (Deforestation)