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• Consumers or Citizens?

• Shifting the Blame for Global Warming

• Environmental Impact of the Gulf War

• Carbon Charges versus Energy Taxes



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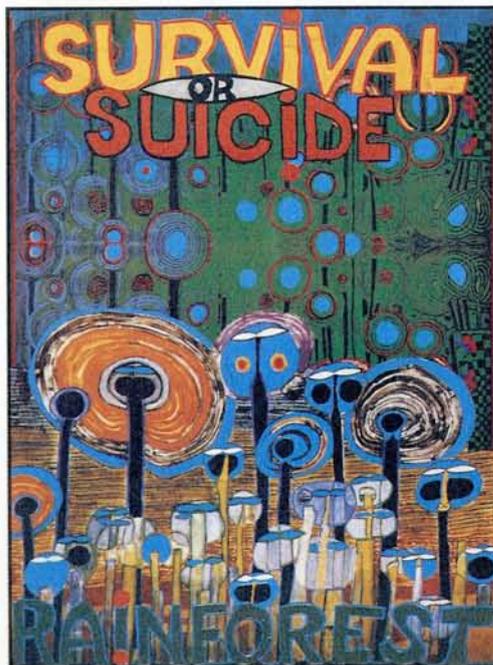
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The influential Washington-based World Resources Institute has developed a "Greenhouse Index" to show the contributions made by different countries to global warming. WRI claims that the index shows that developing and developed countries share "equal responsibility" for global warming and that the index is especially suitable as a basis for international agreements. However, WRI has used extremely questionable data and a methodology which is based on false assumptions and an incomplete understanding of the science.

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Consumers or Citizens?

A heated, but healthy, debate is now developing within the consumer movement over the implications of the Uruguay Round of the General Agreement on Tariffs and Trade. On the one hand, some of the big, traditional Northern consumer groups such as, in Britain, the Consumers' Association (CA) and the National Consumer Council (NCC), have nailed their colours firmly to the mast of further trade liberalization, primarily on the grounds that a new GATT agreement, along the lines proposed by the US, will bring lower prices, greater consumer choice and less petty protectionism. Pitted against them is a growing body of consumer advocates who represent what might be called the "new wave" of consumer thinking, their concerns going beyond the narrow issue of prices and consumer choice and confronting instead the wider implications of GATT for consumers not simply as *consumers* but as *citizens*. The International Organization of Consumers Unions (IOCU), the world umbrella body, has formerly adopted a free trade position, much of it in a series of papers prepared for it by the CA and NCC. But, if the truth be known, many consumer groups have not properly explored the implications of gung-ho free trade on environmental, public health and ethical issues, although a recent IOCU paper on food standards is a step in the right direction. The debate raises fundamental questions about the issues that consumers should be addressing in the 1990s and about the most effective ways of campaigning on those issues.

A Flawed Case

For the traditionalists, the Uruguay Round offers the opportunity to "free" consumers from protectionism. As the CA and the government-funded NCC put it in a letter to *The Times*: "We, together with other mainstream consumer organizations in this country — those with a clear remit to promote all the interests of all consumers — strongly endorse the principles of GATT and of world trade liberalization . . . We have adopted this position not because we are unconcerned about issues such as intellectual property and the Codex Alimentarius . . . but because consumers have a huge economic interest in trade liberalization. Protectionism means higher prices, less choice and ultimately fewer jobs as the world economy contracts."

In the case of farm products, it is argued that subsidies cost the European consumer an extra £120 a year in higher food prices, the Japanese consumer £220 a year and the US consumer £50 a year. By scrapping subsidies and removing barriers to trade, consumers would be able to buy cheaper food at "world prices".

Even on their own terms, such arguments are questionable. It is by no means certain, for example, that the removal of agricultural subsidies would lead to cheaper food. At present, commodity prices are kept low by a food trade war as the US and EC fight with producer countries that do not subsidize their exports, such as Australia and Argentina, for their share of the

market. The so-called "world price" for food is actually a "dumping price", kept artificially low by the export subsidies which the US and EC spend to dispose of their surpluses, to the benefit of a handful of grain traders.

Moreover, even if the price of raw food were to fall, it is dubious that this would be reflected in lower prices in the shops. The increased concentration of the food industry has permitted the biggest buyers to drive down prices to farmers, but the savings have not been passed onto the consumer: instead, the food industry has used processing technologies to "add value" to raw foods (at the cost of their nutritional value) and then sell them at inflated prices to consumers. Thus, farm incomes declined steadily throughout the 1980s, but food prices to consumers remained more or less steady in real terms. In the US, the value received at the farm gate for food sold in supermarkets and grocery stores declined six per cent from 1980 to 1987, with farmers receiving about \$90 billion of the \$380 billion spent on food — the other 75 per cent going to the food industry.

Squeezed by falling prices and rising costs, farmers currently have little option but to intensify production. With increased intensification comes increased environmental damage and increased use of farm chemicals, leading to the contamination of water supplies and food with chemical residues — in itself, an issue of consumer concern that is as important, if not more so, than the price of food. Scrapping subsidies would only make the problem worse. Even the 30 per cent cut in subsidies agreed recently by the EC would make farming unprofitable on large tracts of land in the poorer agricultural areas of Europe, with enormous social costs.

Yet the narrow focus of the traditional consumer groups upon food prices and agricultural subsidies has led to these wider issues being sidelined. Indeed, such groups would appear to be increasingly out of touch with the concerns of the majority of consumers. The NCC's own research shows that some 59 per cent of European consumers think that agriculture should receive support, whilst 84 per cent were concerned that the EC's Common Agricultural Policy benefited big and powerful agricultural enterprises rather than family farms. Such polls strongly suggest that the issue is not agricultural subsidies *per se* but rather the need to restructure CAP.

The First Wave of Consumerism

Like that other much-used term "sustainability", "consumer" and "consumerism" are in danger of losing their value as words. We are all consumers, though some can afford to consume more and others less. Yet, the assumptions made about people-as-consumers are often ludicrously simple. Whether the commodity is food or schools or deciding on life and death surgery, "shopping around" is supposed to give greater satisfaction.

Indeed, to listen to politicians or representatives of the food

industry, one might be forgiven for thinking that consumers are only or mainly concerned about price and availability of products. Psychologists long ago abandoned such simple notions of the relationship between consciousness and behaviour. A study completed last year for the Australian fruit growers, for example, showed that around 17 factors were at stake in the consumer's mind when purchasing a simple piece of fruit.

The truth is that the world has moved on from the early days of the consumer movement in the immediate post-war period. For this "first wave" of consumer advocates, the focus was on value-for-money, information and labelling. The first wave of consumerism has been brilliantly and justly successful. Yet its focus and its concerns are no longer central to the issues that consumers face today. It takes too much for granted, not least in assuming that the interests of those who control the production of consumer goods — in the main the large corporations — are broadly similar to those of consumers in the market.

The Second and Third Waves

In that respect, the cutting edge of consumer activism has long since passed to the "second wave" of the consumer movement, the best known exponent of which is the tough, investigative, anti-corporatist consumer advocate, Ralph Nader. His seminal book *Unsafe at Any Speed* exposed how a multinational car company had continued to produce and market an unsafe car, after estimating that insurance claims on accidents due to "missiting" of its petrol tank would be a cheaper option than redesigning the car. The wider thesis was that large corporations could not be trusted to look after ordinary consumers' interests. It follows that the task of the consumer group — more often described as a public interest group, a key change of emphasis — was to champion the individual: "us" versus "them".

Today, a "third wave" of consumer advocacy has emerged, born of a marriage between environmentalism and a wider sense of *citizenship*. Issues like food quality have played a key role in spawning this new consumer movement. It has taken distinct but related forms: one ethical, the other ecological. The ecological consumer asks What is the product's quality? What is its *long-term* impact, not just on the purchaser's pocket but on health, the environment, distant parts of the world?

The ecological consumer recognizes the limits of individual solutions to global problems. Heavily influenced by both the new public health and the environmental movements, this third wave questions the technological fetishism of post-war growth. It raises the question of need. Why is this process or product needed? Who says so? On what grounds? The ethical consumer is asked to buy appropriately, to invest ethically. Price is not the only or even the main criterion of successful purchasing.

The Need to Build New Alliances

The debate over GATT highlights the differences of perspective between the first and subsequent waves of the consumer movement. Which is to have priority, the interest of making products cheaper and more available or those of fair trade and environmental and public health?

In the US, representatives of the second and third waves of consumerism have tacitly been at odds with the first wave, both over GATT and over the proposed Mexico-USA-Canada Free Trade Agreement. Environmentalists too have been split, with groups such as the National Wildlife Federation tamerly lining

up behind the Bush Administration's promises, on the grounds that "nature can live with free trade" and that the President should be "taken at his word" when he says that environmental concerns are addressed in the Mexican Free Trade Agreement. Opposition to the Agreement has come from a coalition of "new wave" consumer and environment groups including Ralph Nader's Public Citizen organization, which sent members of Congress a present of some DDT to remind them how US consumers would be exposed to worse pesticide standards if free trade triumphed over public health protection.

In Australia, by contrast, a different course was set a couple of years ago. Consumer groups and environmentalists, trade unions and public health bodies met in a rolling programme of talks around the Australian Consumers' Association Food Policy Initiative of 1990-1991. As a result, a consensus was achieved, with the Australian Consumers' Association and a broad alliance now demanding that pesticide residue limits, for example, should not compromise health, consumers or the environment. That position is in sharp contrast to the Australian Government's recommendation that pesticide standards should be "harmonized" in accordance with those set by the UN Food and Agriculture Organization's Codex Alimentarius Commission. The Codex pesticide committee's latest meeting had 197 participants, of which 50 were from agrochemical companies, 14 from food companies, seven with no named or professional designation (which may or may not mean they were industry consultants) and just two consumer representatives.

Not surprisingly, perhaps, adopting the Codex standards would result in an across-the-board lowering of Australian pesticide standards. Harmonization would result in a worsening of the permitted residue limits in 121 out of the 135 cases where Australian standards are at variance with international standards.

With forces as powerful and global in their planning and reach as the corporations which stand to benefit from GATT, the consumer movement must gather all the help it can. Strategies have to be rethought — and quickly. A deal on the Uruguay Round is imminent and if it goes ahead, many of the gains made by consumer activists and environmentalists during the 1980s will be swept away. An internal report prepared for the European Commission, for example, cites several US environmental protection laws as potentially GATT-illegal since they interfere with the EC's ability to export to the US. These include the Marine Mammal Protection Act; the Fisheries Conservation Amendments of 1990, which attempt to curb drift-netting; Corporate Average Fuel Economy Standards, which lay down petrol consumption standards for US cars; and the so-called "gas-guzzler tax", which is intended to promote sales of energy-efficient cars.

Corporations may have their representatives in key committees, but at a time when more power is being transferred to them under GATT, this can — and must — be exposed. At stake is a battle for the hearts and minds of the public. To win that battle, a new style of campaigning is urgently needed — one that cuts across narrow sectoral interests, that builds alliances and, above all, that primarily appeals to the public, not as consumers, but as citizens.

Tim Lang

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Discord in the Greenhouse:

How WRI is Attempting to Shift the Blame for Global Warming

by
Patrick McCully

The latest annual report from the influential US World Resources Institute surprised many environmentalists by claiming that industrialized and non-industrialized countries share equal responsibility for global emissions of greenhouse gases. However, a close look at the raw data used by WRI, and the way in which they have interpreted it, reveals that the institute has used highly questionable estimates for the releases of greenhouse gases from developing countries and that their methodology contains some very dubious science. WRI's claim that their index is especially suitable for diplomatic purposes is entirely specious and should be rejected.

"Like a musical note, a datum of information is not a pure tone. It has harmonics of purpose, inherent noise, inaccuracies of tuning, and idiosyncrasies of performance. All data . . . are collected or estimated by someone with particular skills, certain questions in mind, a notion of an acceptable level of accuracy, a limited budget, and, sometimes, social, cultural, or political constraints."

World Resources Institute, *World Resources 1990-91*.

"The WRI conclusions are based on patently unfair mathematical jugglery, where politics are masquerading in the name of science."

Anil Agarwal, Director of the Centre for Science and Environment, New Delhi, commenting on the data on greenhouse gas emissions in *World Resources 1990-91*.

The major climate conferences which have helped to place global warming on the international political agenda have been unanimous that the industrialized world bears most of the responsibility for causing the problem. The delegates at the 1988 Toronto Conference on the Changing Atmosphere, for example, concluded that: "The countries of the industrially developed world are the main source of greenhouse gases and therefore bear the main responsibility to the world community for ensuring that measures are implemented to address the issues posed by climate change." Similarly, the Ministerial Declaration of the Second World Climate Conference held in Geneva in November 1990 stressed that "developed countries must take the lead. They must all commit themselves to actions to reduce *their major contribution* to the global net emissions". (emphasis added).

In *World Resources 1990-91*, the latest annual report of the

influential Washington-based research group, the World Resources Institute, 146 different countries are ranked according to the contribution they supposedly make towards global warming (see Table 1).¹ According to the director of the WRI's Program in Resource and Environmental Information, Allen L. Hammond, the figures show that "Sources of greenhouse gases are distributed widely around the world, with both developed and developing countries sharing major responsibility for emissions".² Hammond repeats his point several times: "Three of the six countries that are the largest contributors to the atmosphere's warming potential — the United States, the USSR, Brazil, China, India, and Japan — have heavily industrialized economies; three do not"; "Global warming is truly a global phenomenon, in both cause and effect"; and "To one degree or another, virtually all elements of human societies are involved in creating the problem. All must play a role in bringing it under control." Indeed, WRI is so eager to show "widely shared responsibility" that in the introductory chapter to their report they define the European Community as one industrialized country so they can claim that of the "ten largest emitters" in 1987, "half are industrialized and half are developing countries."³

To those who have generally assumed the industrialized world's culpability, WRI's figures may come as a surprise. But WRI have an impeccable reputation within official circles as publishers of environmental data and their conclusions are thus taken seriously by the "policymakers, resource managers, scholars, teachers and students" at whom WRI's reports are aimed.⁴ The OECD, for example, in their latest *State of the Environment* report, use WRI's data and methodology to compare the contributions the organization's member states make to global warming with those of the rest of the world.⁵

However, the "greenhouse index", which according to WRI shows the equal responsibility of developed and developing countries, is far from being an accepted way of presenting data on greenhouse gas emissions. The methodology used to inter-

pret the emissions statistics has not been endorsed by the scientific community and, indeed, has been criticized by a number of climate researchers.⁶ Anil Agarwal, an ex-member of WRI's Editorial Advisory Board, has co-authored a 36-page study which accuses the WRI report of being "entirely designed to blame developing countries for sharing the responsibility for global warming."⁷

The Numbers Game

The greenhouse index, which "facilitates comparison of national contributions to the warming potential of the atmosphere", was developed by Allen L. Hammond together with a colleague at the WRI, Eric Rodenburg, and William R. Moomaw, director of the Center for Environmental Management at Tufts University, Massachusetts. It combines into a single figure — the "index score" — a country's annual emissions of carbon dioxide, methane (CH₄) and the two most common CFCs, CFC-11 and -12, with each gas weighted according to its supposed contribution to global warming. These four gases probably account for some 80-90 per cent of the current global warming potential of the atmosphere. In an article in the January/February 1991 issue of the US journal *Environment*, Hammond, Rodenburg and Moomaw claim that:

"The method that gives rise to the index is straight-forward

and readily applied by policy-makers. Thus, the greenhouse index is ideal for diplomatic (as opposed to scientific) purposes and could serve as the basis for international agreements."⁸

WRI criticize existing methods of comparing the contributions of different gases for containing "an arbitrary element that can lead to conflicting results depending on the perspective of the analyst or country that applies them."⁹ This "arbitrary element" is chiefly the choice of time-span over which the contribution of a gas to global warming is estimated. A long time horizon favours countries whose greenhouse emissions consist disproportionately of short-lived gases such as methane; a short time horizon fails to take into account the future importance of long-lived gases such as CFCs (see Table 2). This time factor, while difficult to take account of, is of crucial importance in determining responsibility. WRI claim that they have managed to avoid choosing an arbitrary time horizon by using a method which gives the equivalent of an "instantaneous" measurement of a gas's contribution to global warming.¹⁰

The WRI index is based on two elements: first, an estimate of the proportion of the annual release of each greenhouse gas which remains in the atmosphere at the end of a given year and, second, a factor which measures the instantaneous effect of this amount of gas on the earth's energy balance. To estimate the first element, WRI use the "airborne fraction". This is calculated by dividing the annual increase in the mass of each

Table 1. The top 20 countries in the WRI Greenhouse Index for 1987.

Country	Greenhouse Gases (carbon dioxide heating equivalents: thousand tonnes of carbon)				Total	Percent of Total	Per Capita Emissions
	Greenhouse Index Rank	Carbon Dioxide	Methane	CFCs			
United States	1	540,000	130,000	350,000	1,000,000	17.6	4.2
USSR	2	450,000	60,000	180,000	690,000	12.0	2.5
Brazil	3	560,000	28,000	16,000	610,000	10.5	4.3
China	4	260,000	90,000	32,000	380,000	6.6	0.3
India	5	130,000	98,000	700	230,000	3.9	0.3
Japan	6	110,000	12,000	100,000	220,000	3.9	1.8
Germany Fed. Rep.	7	79,000	8,000	75,000	160,000	2.8	2.7
United Kingdom	8	69,000	14,000	71,000	150,000	2.7	2.7
Indonesia	9	110,000	19,000	9,500	140,000	2.4	0.8
France	10	41,000	13,000	69,000	120,000	2.1	2.2
Italy	11	45,000	5,800	71,000	120,000	2.1	2.1
Canada	12	48,000	33,000	36,000	120,000	2.0	4.5
Mexico	13	49,000	20,000	9,100	78,000	1.4	0.9
Myanmar (Burma)	14	68,000	9,000	0	77,000	1.3	2.0
Poland	15	56,000	7,400	13,000	76,000	1.3	2.0
Spain	16	21,000	4,200	48,000	73,000	1.3	1.9
Colombia	17	60,000	4,100	5,200	69,000	1.2	2.3
Thailand	18	48,000	16,000	3,500	67,000	1.2	1.2
Australia	19	28,000	14,000	21,000	63,000	1.1	3.9
German Dem. Rep.	20	39,000	2,100	20,000	62,000	1.1	3.7

Note: The emission figures are not the actual amounts emitted but the "net" emissions as calculated by WRI. WRI do not give the per capita figures in the same table.

Source: 'Climate Change: A Global Concern', in *World Resources 1990-91*, World Resources Institute, Washington, 1990.

Trace Gas	Estimated Lifetime (years)	Global Warming Potential		
		Integration Time Horizon (years)		
		20	100	500
Carbon Dioxide	*	1	1	1
Methane	10	63	21	9
CFC-11	60	4500	3500	1500
CFC-12	130	7100	7300	4500

* Due to its cycling between different reservoirs (mostly the atmosphere, oceans, vegetation and soils and plankton) the "lifetime" of CO₂ is extremely difficult to determine. The IPCC takes it to be of the order of 50-200 years.

Notes: The Global Warming Potential (GWP) of a gas is a measure of the cumulative effect on the earth's energy balance of an annual emission of that gas. The GWP of a particular gas is a function of its radiative forcing (expressed as the change in the earth's radiation budget due to a change in the concentration of the gas); its residence time (the amount of time the gas spends in the atmosphere before it is broken down or absorbed by a sink such as an ocean); and its indirect effects (the oxidation of methane, for example, produces CO, CO₂, water vapour, H₂ and CH₂O (formaldehyde), all of which also affect the climate). The indirect climatic effect of CFCs and other gases due to ozone depletion is not taken into account in these evaluations. GWPs are calculated over different "time horizons", periods into the future, in order to assess the effects of releases on different time-scales. The IPCC scientific report states that these three different time horizons "are presented as candidates for discussion and should not be considered as having any special significance." The actual lifetimes of the gases are subject to considerable uncertainty. Moreover, the future radiative forcing of the gases can vary significantly as their absolute and relative concentrations change.

Source: Houghton et al. Climate Change: The IPCC Scientific Assessment, Cambridge University Press, 1990, p.60.

Table 2. Global Warming Potentials relative to carbon dioxide following the instantaneous injection of 1kg of each gas.

greenhouse gas in the atmosphere by the global emissions of that gas due to human activities. The difference between these two figures for gases such as carbon dioxide and methane is due to the large proportion of emissions which are taken up by various "sinks". The main carbon sinks are the oceans, forests and soils. Methane is broken down in the atmosphere by chemical processes, chiefly by oxidation by the hydroxyl radical molecule (OH). For CFCs, which have no natural sinks, the amount of gas released is the same as its increase in the atmosphere and therefore its airborne fraction is one.

Multiplying the airborne fraction for CO₂, for instance, by a country's estimated annual release of carbon gives, in WRI's terminology, its "net emission" of carbon for that year. This is

equivalent to allocating each country a share in the sinks of carbon dioxide proportionate to the size of that country's gross emissions (see Box, p. 160). The "net emissions" of methane and CFCs are worked out by the same method and the results multiplied by the "radiative forcing" of the gases (their effectiveness at trapping heat in the atmosphere) compared to that of CO₂. The country's "index score" is the sum of the net emissions for carbon dioxide, methane and CFCs in carbon dioxide heating equivalents. The emissions data for CO₂, methane and CFCs presented in Table 1 are therefore not the actual amounts of greenhouse gases added to the atmosphere by each country in 1987, but rather the supposed contribution which that country has made to the observed increase in the concentration of that gas in the atmosphere.

WRI's claim to have bypassed the "arbitrary element" inherent in existing methods of assessing global warming emission potentials is highly questionable. In assessing the relative contributions of greenhouse gases, assumptions about the period over which these contributions occur cannot be avoided because of, amongst other things, their very different lifetimes. In fact, the WRI method only differs from other more sophisticated techniques in the crudeness of its timescale assumptions. The lifetime considerations explicitly used in the models of other researchers are approximated by WRI by weighting each gas with the airborne fraction. The net result is that the WRI index is not an instantaneous measure at all but rather a crude measure of the cumulative effect of each year's release over the next 100 years or more.¹¹ To pretend that timescale assumptions are not present suggests at the least an incomplete understanding of the problem, if not a deliberate attempt to mislead (see notes to Table 2 for some of the technical background to the problem).



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A Short-Term Index for a Long-Term Problem

If the index is to be used for comparing annual differences in a country's contribution to global warming, the weighting given to the different gases it includes should not show a large variation from year to year. Unfortunately, the airborne fraction, according to WRI's calculations, does vary greatly. Between 1987 and 1988, the airborne fraction used by WRI for CO₂ increased from 0.44 to 0.71; that for methane increased from 0.17 to 0.26. These variations make it difficult to compare "net" emission data from different years and to calculate a country's actual "gross" emissions for any year when only the "net" figure is given. The reason the variations occur is that the annual rise

in concentration, on which the calculation depends, is only weakly related to emissions occurring in that particular year. By neglecting the major determining factor, which is the past history of emissions, WRI seriously oversimplify the science. The use of the airborne fraction is only appropriate in determining the relationship between concentration changes and emissions over a long period of historic time, and even that relationship may not reflect accurately the future link between emissions and atmospheric concentrations.

Perhaps the most damning indictment of the unsuitability of the greenhouse index as the basis for any climate negotiations unwittingly comes from WRI itself in its response to criticisms of the use of the airborne fraction by Kirk Smith of the Environ-

Environmental Colonialists

In their report *Global Warming in an Unequal World: A Case of Environmental Colonialism*, Anil Agarwal and Sunita Narain of the Centre for Science and the Environment launch a damning critique of WRI. They claim that *World Resources 1990-91* is "designed to bolster both foreign and domestic policy interests of Western nations whose governments would like to convince domestic environmentalists that their nations are not alone to blame and cannot do much locally unless they rope in the hapless Third World".

The case put forward in the CSE report rests mainly on two arguments: first, that WRI have exaggerated emissions of CO₂ from deforestation and methane from rice fields and livestock, compared to CO₂ from fossil fuels (see main article); and second that the earth's ability to absorb greenhouse gases should not be apportioned among countries according to how much they pollute, but should be distributed equally around the world on a per capita basis. CSE thus point out that India, with 16.6 of the world's population in 1990, produced only six per cent of the carbon and 14.4 of the methane which is absorbed by natural sinks worldwide. The US, meanwhile, with only 4.73 per cent of the world's population, emits 26 per cent of the carbon dioxide and 20 per cent of the methane that is absorbed by sinks every year: "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?"

Using WRI's method of apportioning "net" emissions, since India produces 12 per cent of global methane emissions it is also responsible for 12 per cent of the methane that is actually accumulating in the atmosphere. But if the CSE per capita apportioning of sinks is used, India is shown not to be responsible for any of the methane accumulating in the atmosphere — in fact, according to CSE, Indians effectively subsidize the high emissions of other countries by not using up their full allowance of sinks.

Although Agarwal and Narain's method of apportioning the earth's sinks is conceptually attractive, their calculations of national contributions are still based upon WRI's single index method and the use of the airborne fraction. Many of the criticisms of WRI's methodology in the main article therefore also apply to CSE's approach. But regardless of this, the CSE analysis does demonstrate

how sensitive the results of this kind of assessment are to basic assumptions and underlying values. WRI's league table of top polluters is altered considerably when the CSE method is used, and the net contribution to global warming of developing nations drops from 47 to 33 per cent.

Fear of the Future and Neglect of the Past

CSE are scathing about the emphasis WRI and other Western environmental groups put on controlling future increases in emissions in the Third World, while neglecting the true scale of the cuts that will be needed in the First World. For example, the conclusion which WRI draw from the low per capita emissions figures from India and China is not that citizens in India and China contribute very little to global warming: instead they are taken as an indication of "how much greenhouse gas emissions and global warming potential might grow if developing countries, in the process of development, significantly increase their per capita emissions." Yet no mention is made of projected increases in carbon dioxide emissions from the US. A report from the Congress Office of Technology Assessment predicts that, without new legislation, US carbon dioxide releases will increase by 50 per cent — a massive 614,000 tonnes of carbon — over the 25 years to 2015.

Taking the UN's projection for India's population in 2025 (a 70 per cent increase to 1,445 million), each Indian could have increased their average annual carbon emissions from 1987 levels by 3-and-a-half times and India's total carbon releases in 2025 would still be 55,000 tonnes less than those of the US ten years earlier. Similarly, China's per capita emissions could double by 2025 and yet the country's carbon emissions would be 150,000 tonnes less than those of the US in 2015.

The emphasis on hypothetical future emissions from the developing world, to the neglect of real past and present emissions from developed countries, is common among Western politicians and others who wish to avoid facing up to the changes which will have to be made in their own economies. As Agarwal and Narain rightly assert:

"... such statements, now commonplace in the West, [are] both irresponsible and highly partisan... literally amounting to blaming the victim. If anything the available figures show that the West must immediately put its own house in order."



Mark Edwards/Still Pictures

Power Station near Calcutta. While the Centre for Science and Environment are fiercely critical of WRI's emphasis on the Third World's contribution to global warming they do not attempt to justify the policies of Third World governments. "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, in which all people have equal access to the precious resources of the environment for their survival."

ment and Policy Institute of the East-West Center in Hawaii.¹² Smith gives an example of a scenario where methane emissions increase at a steady annual rate (at present they are accelerating). Because of the lifetime of methane in the atmosphere, global concentrations would rise by a greater amount each year, but the airborne fraction would fall for about 20 years. If methane emissions were to remain constant, the fraction would fall for about 60 years, while the atmospheric burden would continue to rise. Hammond and his colleagues respond that:

"The use of airborne fractions would break down in the extreme conditions that Smith hypothesizes, but these conditions bear little resemblance to the real world of the next decade or so" (emphasis added).¹³

In other words, WRI have conceived a statistical tool for use by policy-makers which may be irrelevant in little more than 10 years, while international agreements, if they are to be effective, will have to last for many decades. A similar claim is made in a letter to *Nature* from I.G. Enting of the Australian research body, CSIRO, and H. Rodhe of Stockholm University.¹⁴ Hammond *et al.* counter Enting and Rodhe's letter with the assertion that "there is unfortunately virtually no likelihood of stabilizing — let alone reducing atmospheric concentrations for any major greenhouse gas in the next 20-25 years."¹⁵ It therefore seems that WRI recognize that the validity of their index — which they hope will be used by those drawing up an interna-

tional climate convention — is dependent on the convention failing to halt the build-up of greenhouse gases.

Sources, Sinks and Unknowns

WRI make much of the claim that their method is "empirical" and therefore "links observable current results to policy actions in a concrete fashion that may be appropriate to international agreements".¹⁶ This assertion is totally unjustified. Only the global increase in atmospheric concentration can be quantified from observations of the atmosphere, and the relationship between this rise and current emissions — the determination of the airborne fraction — is an extremely uncertain matter, as described above, and hardly the empirical exercise WRI claim it to be. The other vital part of the equation, the actual global and national emissions of carbon dioxide, methane and CFCs, cannot possibly be "empirically" measured with any accuracy. On the contrary, the estimates for these emissions are based on numerous assumptions and incomplete data.

The data for CO₂ releases from the burning of fossil fuels are relatively reliable.¹⁷ However, estimates for both global and national carbon dioxide releases caused by land use changes — mostly deforestation in the tropics — vary widely. The unknown factors include the actual areas of land deforested and degraded; the amount of carbon locked up and released in these

forests and soils; the amount of carbon taken up by regrowth; and the amount of carbon which is turned into charcoal by burning and thus not released to the atmosphere.

Paul Crutzen and Meinrat Andreae of the Max Planck Institute in Mainz estimate that net carbon emissions from deforestation in 1990 could have been anywhere between 0.5 and 3.6 billion tonnes.¹⁸ WRI take global emissions from deforestation in 1987 to have been 2.8 billion tonnes, which is above the upper end of the range quoted by the UN Intergovernmental Panel on Climate Change (IPCC) of 0.6-2.6 billion tonnes per year during the 1980s.^{19,20} The use of such a high deforestation figure results in WRI's index being strongly weighted against countries in the tropics. For example, if an estimate for carbon from deforestation at the lower end of IPCC's range had been used, Laos, which astonishingly comes out top of WRI's per capita index table, would drop to below 20th place in the population-weighted table.²¹

Depressingly for climate researchers, calculations on the anthropogenic and natural sources and sinks of methane are even more beset with uncertainties than those for carbon dioxide. Table 3 shows the wide variation between estimates for the importance of the many different sources of methane.

	Lashof/Tirpak	Watson	Crutzen
Natural sources (wetlands)	115-345	100-200	165-265*
Rice production	60-70	25-170	
Domestic animals	65-100	65-100	80
Fossil fuel production	50-95	40-100	75-115
Biomass burning	50-100	20-80	15-45
Landfills	30-70	20-70	30-70
Termites	—	10-100	30*
Oceans and freshwaters	—	6-45	
CH ₄ hydrate destabilization	—	0-100	5

Table 3. Current emissions of methane by source (million tonnes).

* Combined figure.

Sources: D.A. Lashof and D.A. Tirpak (eds.) *Policy Options for Stabilizing Global Climate*, EPA, Washington, DC, 1989; R.T. Watson et al. 'Greenhouse Gases and Aerosols', in *Climate Change: The IPCC Scientific Assessment*, Cambridge University Press, 1990; P.J. Crutzen, 'Methane's Sinks and Sources', *Nature* 350, 4 April, 1991.

The production of methane from agricultural activities plays a large role in the greenhouse emissions from developing countries such as India, China and Indonesia. The figures given by WRI for methane production from rice paddies worldwide are based upon a single study of emissions from an Italian rice field. But for any individual paddy field, methane emissions depend on numerous factors such as moisture, soil type, light, crop rotation, fertilizer use and irrigation practices.²² It is therefore likely that emission rates from paddies vary widely around the world. Anil Agarwal and Sunita Narain from the Indian Centre for Science and Environment (CSE) quote preliminary data indicating that methane emissions from wet rice cultivation in India are between 3-9 million tonnes, compared to the WRI figure of 18 million tonnes.²³ On the other hand, a joint

US-Chinese team has recently concluded that emissions of methane from rice fields in China may be around 30 million tonnes per year, compared to the figure of 18 million tonnes given by WRI.²⁴

Agarwal and Narain also point out that WRI estimate that livestock in developing countries account for 60 per cent of total emissions of livestock methane. Yet in the study by Paul Crutzen from which WRI have derived their estimates of per animal emissions, the production of methane from livestock in developing countries is taken to be around half of the global total. Crutzen also considers that methane leaks from natural gas production and distribution may be almost twice the figure used by WRI.²⁵

Obviously the uncertainties summarized above affect any method of presenting data on global warming. But WRI's insistence on combining data of very different reliability in a single index means that what reliable data is available is hidden by guesstimates and assumptions. The apparent precision of WRI's league tables is in fact spurious and totally misleading.²⁶

Just One Year

While WRI criticize the "arbitrary" future time periods used in conventional methods of assessing the relative importance of different greenhouse gases, they have themselves chosen an "arbitrary" time horizon — the one year in which they assess emissions. While a one year "snapshot" of national contributions to global warming may provide an accurate baseline in the case of fossil fuel emissions (which vary relatively little from year to year) the same is not true for other sources of emissions.

The massive deforestation which took place in Brazil in 1987, for example, leads to Brazil being rated in the greenhouse index for that year as the third highest contributor to "greenhouse forcing" with 10.5 per cent of the total. The following year, mainly due to changes in financial incentives for land clearing and a wet burning season, deforestation in the Brazilian Amazon was estimated to be down by 35 per cent. Satellite data indicates that forest clearing fell by a further 40 per cent in 1989.²⁷ The 1989 deforestation figure of 2-2.4 million hectares is close to the annual average in the 1980s. The huge index score given to Brazil in *World Resources 1990-91* therefore gives a totally false indication of Brazil's long-term contribution to global warming.

As country-level data on annual deforestation rates is extremely rare, for most countries WRI uses estimates based upon an average for the 1980s. If WRI had taken a 10-year average for Brazilian deforestation, instead of what they acknowledge was an "anomalously" high figure for 1987, Brazil's index score would have been reduced from 610,000 to 200,000. Its per capita figure would have been 1.4 tonnes of "net greenhouse emissions" — compared to the WRI's 1987 estimate for Brazil of 4.3 tonnes (ranked seventh highest in the world), the US's 4.2 tonnes and the global average of 1.5 tonnes per capita.²⁸

The emphasis on annual emissions will give rise to a serious inconsistency in the near future with regard to CFC-11 and -12. Emissions from those countries which are at present large CFC producers will, it is hoped, decline rapidly over the next two decades due to the Montreal Protocol and other stronger national commitments to protect the ozone layer. The contributions which CFCs make to these countries' index rankings should therefore also decline rapidly. Yet due to their long

Helping the US Cheat on Global Warming

According to WRI, agreement on a climate convention will depend upon consensus on a single measurement of each country's total contribution to global warming. Yet most countries are prepared to accept a convention which deals with each gas in turn: only the US is strongly advocating that all greenhouse gases should be dealt with together in a "comprehensive approach" which would need a method of assessing contributions similar to the "greenhouse index".

The benefit to the US of the comprehensive approach is that it can hide its inaction on carbon dioxide behind the cuts in CFC emissions it is already committed to under the Montreal Protocol. Thus the Bush administration has responded to international criticism on its greenhouse gas policy by claiming that it will stabilize its greenhouse gas emissions by the year 2000, while simultaneously projecting a 15 per cent increase in CO₂ emissions over the same period.

This method of "double-counting" emission reductions has also enabled the British government, which has only made a conditional commitment to stabilizing CO₂ emissions over the next 15 years, to claim in its recent White Paper on the environment that "the global warming potential of Britain's emissions in 2005 should fall significantly, by approximately 20 per cent compared with levels in 1990."

Publicly, the UK appears to support the European Community line on a gas-by-gas approach to emission reductions under international climate agreements.

However a confidential document from the UK Department of the Environment, recently leaked to the press, suggests that a "phased comprehensive approach" could form a "possible developed world consensus" to greenhouse gas reductions. The document was presented to the White House by the British Environment Secretary, Michael Heseltine, as a compromise between the fully comprehensive approach favoured by the US, and the strategy of reduction targets for specific gases favoured by the EC. Under the UK suggestion, the convention would initially tackle carbon dioxide, as well as methane from the energy and waste sectors and CFCs.¹ More gases and different sectors would be dealt with as understanding of their sources and sinks and contribution to global warming progressed. The suggested compromise was rejected by the Bush administration.

Over the last few years, the US, often with tacit support from the UK, has done its best to prevent international progress on CO₂ reductions. In helping the US government towards its goal of a reduction regime based on a single index for several gases — which is extremely biased against the developing countries which have negligible CFC emissions to cut — WRI have done a grave disservice to the international environmental community.

1. The document is rather ambiguous about whether or not CFC emission reductions in line with the revised Montreal Protocol would be included in its initial group of gases.

residence times the atmospheric concentrations of CFC-11 and -12 will continue to increase for at least another three decades. The significant contributions to global warming made by developed countries' past emissions of CFCs will therefore be hidden by the use of the greenhouse index. Indeed the US is extremely keen that any international climate agreement should adopt the "comprehensive approach" of assessing the contributions made by all greenhouse gases together so that it can increase its CO₂ emissions yet claim that it is taking action on climate due to its cuts in CFCs (*see Box, above*).

Historical Responsibility

The attempt to derive an index to show for a single year obscures the most important aspect of the allocation of responsibility — the widely varying contributions which countries and regions have made to greenhouse gas emissions in the past. The index therefore exaggerates the Third World's contribution to the build-up of greenhouse gases in the atmosphere. As Florentin Krause asserts in a study for the California-based International Project for Sustainable Energy Paths:

"The history of greenhouse gas emissions shows that the industrialized countries have been and continue to be by far the major source of climate destabilization: they overwhelmingly dominate CFC emissions, clearly dominate carbon dioxide emissions, and contribute close to half of global anthropogenic methane releases . . . [furthermore] .

. . . ecological destruction in the Third World [and therefore CO₂ releases from changes in land use] is inextricably linked to the history of colonialization, as well as to persistent post-colonial patterns of inequitable trade. Over the last 200 years, industrialized countries have been actively and often forcefully integrating Third World regions into their economic cycles."²⁹

This last point of Krause's is vital: however, it is totally neglected by WRI, whose concept of "responsibility" involves only the quantity of greenhouse gases currently emitted from within a country's borders. This ignores the historical responsibility of the West, both for the bulk of greenhouse gases currently in the atmosphere, and for having forced the Third World onto its current destructive development path.

Between 1950 and 1986, 82 per cent of cumulative emissions of CO₂ from fossil fuels came from the industrialized world.³⁰ Taking into account both emissions from fossil fuels and land use changes, the industrial countries are geographically the source of over 60 per cent of CO₂ releases between 1850 and 1985.³¹ Relatively negligible amounts of CFCs, which contribute to over 10 per cent of the enhancement of the greenhouse effect since pre-industrial times and a quarter of the enhancement over the last decade, have been consumed in the Third World.³²

This concealment of historical responsibilities is of course not only relevant to the North-South divide, but also hides the large differences in historical emissions between countries within these two broad categories.

Luxury and Survival Emissions

It is disingenuous in the extreme for WRI to praise the greenhouse index for being "straightforward and readily applied by policymakers".³³ The superficial straightforwardness of the index (the reduction of a mass of different figures on the sources, sinks, radiative efficiencies and lifetimes of four gases into a single number) is only achieved by gross oversimplification. Paradoxically, in attempting to construct a "workable and realistic" method for assigning responsibility for global warming, WRI have succeeded in constructing an opaque methodology which can only lead to confusion and disagreement among those who wish to negotiate and monitor a climate convention.³⁴

Moreover, the index sidesteps one of the most important issues that negotiators will have to deal with: the issue of equity. As Anil Agarwal and Sunita Narain explain:

"... it is patently immoral to equate the emissions of carbon dioxide from American, European, or for that matter, New Delhi automobiles with the survival emissions of methane from the miniscule paddy fields or few heads of cattle owned by a poor West Bengal or Thai farmer".³⁵

Where countries are ranked according to a single figure of "total net emissions in million tonnes of carbon equivalent", no distinction between "luxury" and "survival" emissions can be made.

Act Now on What is Known

WRI claim that the index is necessary because "before nations

can agree to reduce their contributions to the potential warming of the atmosphere, they will need estimates of what those contributions are and a means of comparing relative national emissions." But the simple fact of the matter is that at present there is no need for a "comprehensive approach" or an internationally-accepted "greenhouse index". It is already known which countries are the highest producers of CFCs. Moreover, it is known that CFCs are powerful greenhouse gases and that they can, and must, be phased out — even if we were not faced with the problem of climate change. Similarly it is known that the OECD nations, Eastern Europe and the USSR are together responsible for around 70 per cent of the world's emissions of carbon dioxide from fossil fuels; that these emissions cause acid rain and photochemical smog; that the supply of this energy results in oil slicks and the ravages of opencast mining; and that ensuring the continued supply of this energy requires the fighting of horrific wars. It is also known that cutting these emissions is technically relatively easy and that a large proportion of the cuts can be made at a negative financial cost to society as a whole.³⁶

At different times since the early 1970s, these non-climate related observations have been used as arguments for drastically cutting fossil fuel use by improving energy efficiency, using renewable sources of energy and restructuring society along less energy-intensive lines. These arguments are as valid today as then. Global warming simply gives added urgency for doing what is in any case necessary.³⁷

Several countries have already committed themselves to reduce their CO₂ emissions. These countries — notably Germany, New Zealand, Australia and Denmark — have not re-



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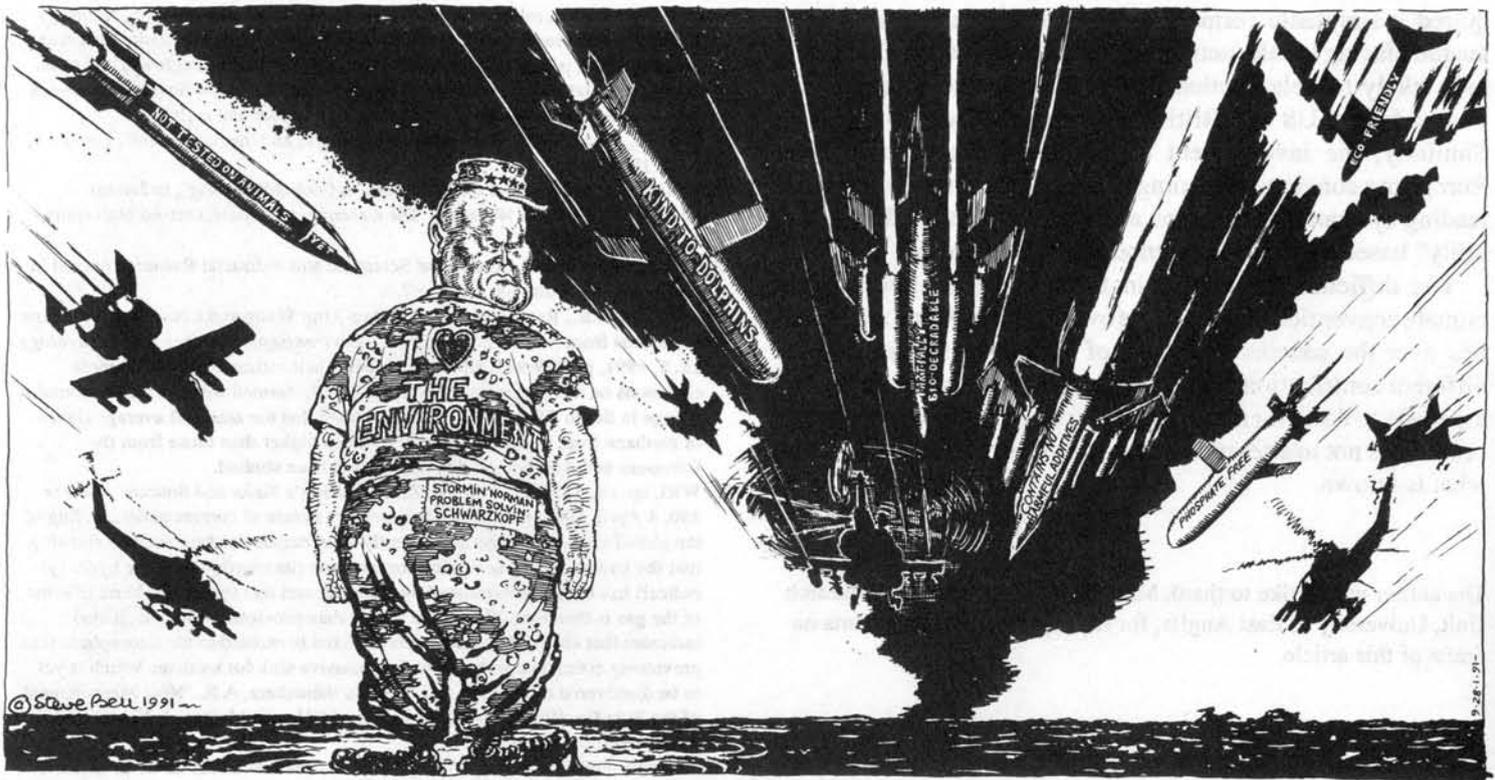
quired a simplistic formula covering all gases or an annual league placing to take action. On the contrary, such an index is only likely to delay action due to the "double-counting" favoured by the US and British governments (see Box, p.163). Similarly, the involvement of the Third World or Eastern Europe in a convention is going to depend more upon the West's leading by example than upon accusations of "shared responsibility" based on dubious science and self-interested politics.

The difficulties involved in formulating an international climate convention can hardly be overstressed. Many uncertainties over the sources and sinks of greenhouse gases and the different contributions they make to the problem remain — and are likely to do so for many years to come. But the answer to this problem is not to attempt to mask the uncertainties but to act on what is known.

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26. Accurate emission statistics are difficult to obtain even for CFCs as national data on CFC use are treated as industrial secrets by manufacturers and governments. Hammond et al. calculate each country's 1987 CFC emissions by extrapolating 1986 per capita consumption figures for 18 countries and the total for the European Community. The taking of an average per capita consumption level for the whole EC is strongly biased against the less developed EC nations. Portugal's emissions are thought to be more than four times less than those used in the calculation of the Index. Inaccuracies in the estimation of a country's CFC contribution have a huge effect upon their greenhouse index ranking, due to the strength of CFCs as greenhouse gases. If the figures which WRI believe are correct for Portugal were used, its estimated contribution to 1987 global warming would fall from 17,000 tonnes of carbon equivalent to somewhere just over 7,200 tonnes.
27. Agarwal and Narain, op. cit. 7, p.4.
28. Hammond et al.'s answer to criticisms that there is not enough accurate data on emissions for meaningful apportioning of "national accountability", is that: "even a major change in the assumptions underlying a single source of emissions does not significantly alter country rankings, if at all" (Response from Hammond et al. to letters criticizing the greenhouse index in *Environment* 33, 2, March 1991, p.44). While this is true for the top ten or so countries in the greenhouse index due to the large difference between these countries' total net emissions, it is less applicable further down the index where the countries are more bunched together. More importantly, as the examples of Brazil and Laos show, a change in emission assumptions can drastically alter per capita figures.
29. Krause et al., op. cit. 20, p.1.5-2.
30. *Ibid*, p.1.5-13. It is estimated that the industrialized world's per capita emissions of CO₂ from fossil fuels between 1950-1986 were over 11 times greater than those from developing countries (*Ibid*, p.1.5-6).
31. Watson et al., op. cit. 19, p.11.
32. Shine et al. 'Radiative Forcing of Climate', in Houghton et al., op. cit. 19, p.45.
33. Hammond et al., op. cit. 8, p.12.
34. In *World Resources 1990-91*, no figures on "gross" emissions is given in the "Special Focus" chapter on climate change — the chapter which the "policymakers, resource managers, scholars, teachers and students" at which WRI's reports are aimed are most likely to read. Only in the dense lists of tables at the back of the report are actual emission figures given, under the column headings "Anthropogenic Additions to the [Carbon Dioxide or Methane] Flux". Although the figures for CO₂ and methane are broken down by source, no totals for gross emissions of each gas for each country are given. The figures for "net" emissions are listed under the column headings "[Carbon Dioxide or Methane] Emissions". WRI's terminology is likely to confuse anyone who does not closely study the method by which they work out their figures.
35. Press release issued with Agarwal and Narain, op. cit. 7, p.5.
36. See, for example, Lovins, A. 'The Role of Energy Efficiency', in Leggett (ed.), op. cit. 22.
37. For an "emission-reduction scenario based on measures which should be adopted as they are eminently justifiable on grounds that are already established", see Kelly, M. 'Halting Global Warming', in Leggett (ed.), op. cit. 22.



The Environmental Impact of the Gulf War

by
Frank Barnaby

Discussion on the environmental effects of the Gulf War has been hampered by censorship and a lack of relevant data. However, it is clear that the war was one of the most lethal in recent history. Some 200,000 Iraqis were killed and thousands more will die as an indirect consequence of the fighting. The oil fires in Kuwait are likely to have a major impact on regional climate and the oil spills may do great damage to marine life in the Gulf. The effects of the bombing of Iraq's nuclear reactors is as yet unknown. The time has come for an international convention to protect the environment in war.

Several months after the ceasefire, assessing the human and environmental costs of the Gulf War with any precision is still exceedingly difficult for two main reasons — there is both a blanket of official secrecy about the costs and a staggering lack of relevant independent scientific measurements.¹ Consequently, we have inadequate data about:

- The effects of the war on the Iraqi population;
- The current state of the health of the Iraqis and the state of their sanitation, water supplies, medical supplies, etc;
- The rate at which oil is being consumed by the oil-well fires in Kuwait;
- The amount of oil spilt into the Gulf waters;
- The effects of the oil fires and spills on ecosystems and human health (for example, no accurate information has been released even about the numbers and types of birds killed by the oil spills in the Gulf waters);
- The degree of damage done to the bombed Iraqi nuclear reactors and details of any radioactive contamination caused by the bombing; and details of contamination from bombed chemical plants.

In the words of *On Impact: Modern Warfare and the Environment*, the recently published Greenpeace case study of the Gulf War:

“The paucity of data . . . is the result of aggressive policies of secrecy on the part of the Bush Administration and allied governments. Not only has there been direct suppression of information on the war's effects, but an

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air of total indifference exists on the part of the US government to respond to questions about the human and environmental destruction. It appears that there is a widespread effort underway on the part of the Department of Defense and the Bush Administration to downplay the environmental consequences, human and physical, of the war. It is even unknown how many Kuwaiti civilians actually died or were wounded in the invasion or occupation, or how many perished during the air and ground wars. Even the number of allied military casualties is hard to come by. The only conclusion that can be drawn is that specific political decisions are being made at the highest levels to downplay and keep information secret about the effects of the war."²²

This combination of official secrecy and lack of publicly-available scientific data is reminiscent of the situation after the Chernobyl nuclear accident. Officialdom is deliberately suppressing public debate about such sensitive issues, no matter how important it is that there should be such a debate.

The Human Costs

As tens of millions of television viewers around the world watched Iraq being systematically destroyed by high-technology weapons, and saw Iraq's inability to respond, few were left in doubt about the overwhelming superiority of the military technology of the industrialized powers. The Gulf War was a laboratory for military scientists and weapon-makers. It demonstrated for all to see that recent advances in military technology have given the armed forces extraordinary new destructive powers.

Even though the television coverage of the war was sanitized, all but the most naive realized that great destruction was taking place. Only a small percentage of the munitions used was precision guided. There was, for example, much indiscriminate bombing.

The latest statistics on casualties tell us just how destructive the war was of human life. According to the Greenpeace report, the Gulf War killed between 100,000 and 120,000 Iraqi soldiers, about half of whom died during the four days of ground fighting. In comparison, a total of 343 coalition soldiers died, 142 in non-combatant accidents. The number of Iraqi troops killed in 43 days during the Gulf

War was greater than the number killed during the eight-year Iran-Iraq War.

Between 49,000 and 76,000 Iraqi civilians have died as a result of the war, some 15 per cent directly from the coalition bombing and ground attacks. The rest have died since the end of the war, in its aftermath, in the Iraqi civil war, and during the mass movements of refugees. About 2,000 Kuwaiti citizens were killed or are still missing.

As a result of the destruction of Iraq's infrastructure, many more Iraqi civilians will die from the consequences of poor medical care, totally inadequate sanitation and nutrition, and contaminated wa-

wait's pre-war population remain scattered outside Kuwait. All in all, about six million people have become refugees as a result of the pre-war embargo against Iraq, and the Gulf War and its aftermath.

During the war itself, an average of about 2,700 people were killed each day. As the Greenpeace report points out, this is nearly three times the daily average rate during the Vietnam War. The total explosive yield of the weapons used by the coalition forces against Iraq was about 120,000 tons — equivalent to that of ten Hiroshima atom bombs. Iraqi deaths from coalition military action, therefore, averaged about one person per ton of explo-



The aftermath of allied bombing raids on fleeing Iraqis on the main road from Kuwait City to Basra. Most media images of the war portrayed a high-tech conflict fought with precision-guided weapons. Little was seen of the carnage wrought by cluster bombs, napalm and fragmentation warheads.

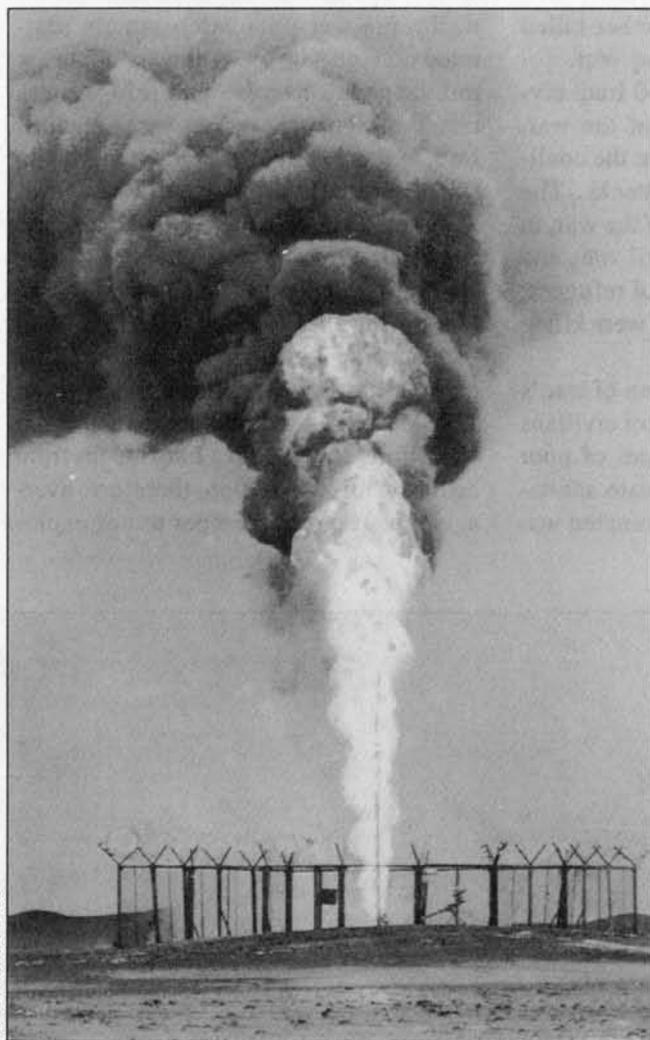
ter. More than 30,000 refugees have already died in camps; this number will continue to escalate as diseases like typhoid take hold in summer temperatures of up to 50° Celsius. Three million children under the age of five are particularly at risk from diarrhoea and malnutrition.

The total number of Iraqi deaths so far — some 200,000 — represents about 1.2 per cent of the population (for comparison, about four per cent of the Vietnamese population was killed during the Vietnam War between 1965 and 1975). During the civil war that followed the Gulf ceasefire, about 2.5 million Iraqis (mainly Kurds and Shiites), about 15 per cent of the population, fled from the Iraqi military and security forces into the mountains of northern Iraq, and into Iran and Turkey. About 70 per cent of Ku-

sive. Munitions were twice as effective as they were in the Vietnam War, where two tons of explosive were required to kill a person and four times as effective as in the Korean War.

Unlike in other recent wars, the majority (about 65 per cent) of the Iraqi deaths were military rather than civilian. While in World War I, less than 20 per cent of deaths were civilian, in World War II over half of the deaths were of non-combatants.

World War II set the pattern for later wars. Of the 20 million or so people killed in wars since 1945, about 55 per cent have been civilian. Almost all of these wars took place in the Third World, either as civil wars or wars between Third World countries. But the Gulf War was a war between a military force armed with the



Flames erupt from one of the estimated 580 oil wells blown up by the Iraqis during February. Scientists from US Government agencies which have been monitoring the fires have been instructed not to speak to the media about the possible effects of the burning wells.

sophisticated military technology of an industrial superpower and a Third World country. Consequently, the Iraqi army was decimated with conventional weapons (like fuel-air explosives, cluster bombs, and fragmentation warheads fired in salvos from multi-launch rocket systems) with a lethality comparable to that of low-yield nuclear weapons. In terms of the efficiency of killing, the Gulf War was the most lethal in history.

The Environmental Costs: Oil Fires

The Gulf War was also the most environmentally destructive in history. The most serious environmental damage arises from burning oil wells in Kuwait, set on fire intentionally by the Iraqis. According to official Kuwaiti statistics, about 600 oil wells were set ablaze, usually by ex-

ploding mines set by Iraq soon after the invasion of Kuwait. The mines were placed around and under the control and safety valves at the top of the wells. Independent estimates put the figure at about 580, which tallies with the Kuwaiti figure.

The first oil fire was started on January 16th when Iraqi artillery set an oil storage tank on fire at al-Khafji in Saudi Arabia.

Soon after the wholesale and systematic destruction of oil wells began. Most of the damage to Kuwaiti oil facilities was done during February. By the end of the war, in addition to the 580 oil wells set on fire, the Iraqis had blown up about 200 more wells, as well as storage tanks, refineries and other facilities. Nearly 100 wells flowed uncontrollably into the desert, forming lakes of oil. As of the beginning of June, 140 oil wells had been capped — about one-fifth of those which had been set alight or which were oozing oil.

The rate at which oil is burning is controversial.

According to official Kuwaiti sources, about six million barrels of oil a day flowed through the burning wells when they were all alight. Independent estimates vary somewhat but put the figure at at least three million barrels of oil a day. With reparations in mind, the Kuwaitis may well have exaggerated. To put these figures into context, the daily oil consumption of the whole of Western Europe is about 12 million barrels.

According to Texan fire-fighter Red Adair, it will take "four to five years to control the Kuwaiti fires". During this time, about \$40,000 million worth of oil will have gone up in smoke. Because most Kuwaiti oil wells are "free flowing" — the oil gushing out under its own pressure, typically about 1,000 pounds per square inch at the well-head — the fires are taking a long time to put out. Before the Iraqi invasion, Kuwait was producing oil from 360 wells out of a total

of 740 operational wells. Of the producing wells, all but 22 were free flowing.

Two hundred and ten of the producing wells were in the Burgan oil field (the world's second biggest), 71 were in the Magwa field, and 41 in the Raudhatain field. Because of the concentration of wells in the oil fields, fire-fighting is complicated considerably by the risk of re-ignition. The Burgan field, for example, contains about 390 operational wells with an average distance between them of no more than about 500 metres.

The fluid that flows from an oil well consists of crude oil, water, and gas (mostly methane). Kuwaiti crude oil is a light black oil, containing 2.44 per cent sulphur.³ A burning rate of three million barrels a day amounts to the daily combustion of 430,000 tons of crude oil. This injects about 25,000 tons of smoke into the atmosphere each day, together with 10,200 tons of sulphur dioxide, 2,550 tons of nitrogen oxide, 42,840 tons of carbon monoxide, and 285,600 tons of carbon dioxide. About 600 cubic feet of methane are released per barrel of oil. Some of the oil fires are belching out thick clouds of black smoke, others white clouds of steam, and a few, burning mainly methane, have clean flames.

The Composition of the Smoke

The British Meteorological Office sent a team of 18 scientists to investigate the composition of the cloud of smoke produced by the burning oil wells in Kuwait. The team spent 55 hours, spread over the last ten days of March, flying through the smoke cloud collecting samples of the chemicals and particles in the plume. The team's Hercules aircraft flew over the Arabian peninsula and the Gulf, at a range of altitudes and distances from Kuwait. The measurements, made with a variety of air-monitoring equipment, form the most thorough body of data on the oil smoke plume. After flying through the clouds, the Hercules was streaked with dirty oil and the blackened fuselage provided dramatic evidence of the terrible pollution in the air over the Gulf.

Dr Geoff Jenkins, the head of the Meteorological Office team, described to me the feelings he experienced while flying through the cloud: "It was a pretty horrific sight. It was unlike anything I had seen before. As we flew into the cloud it got dark very quickly, much more quickly than I had expected. It made me

realize how appalling it is for the people living in the region."

Jenkins and his team found that the most polluted area in the plume was 100 kilometres from Kuwait at an altitude of 2,000 metres. Here, the scientists found concentrations of about 1,000 parts per billion (ppb) of sulphur dioxide, 50 ppb of nitrogen oxides, and 30,000 particles of pollution dust per cubic centimetre. These levels of pollution are 50 times greater than average levels found over, say, London. Levels of sunlight in the

*A change in weather
over the Gulf while the
oil fires are raging
could allow smoke to
reach the stratosphere
and affect global
climate.*

cloud are reduced almost to zero. "There are large areas where the instruments showed no sunlight whatsoever," said Jenkins, "and this was in the middle of the day."

The smoke has so far reached an altitude of about 6,000 metres, where it is trapped by warmer air above it. To have a global impact, the smoke would have to reach the stratosphere at 15,000 metres or so. If smoke particles and gases were to reach the stratosphere, they would circulate around the globe, interfere with global weather patterns and damage the ozone layer. An appropriate change in weather over the Gulf while the oil fires are raging could, of course, allow smoke to reach the stratosphere and affect the global climate. In this context, it should be noted that during the summer months, the precipitation over Kuwait is virtually zero and with high temperatures the smoke may well rise further into the stratosphere.

Global climatic effects may be improbable.^{4,5} (The oil fires are adding to the atmosphere about two per cent extra carbon dioxide to worldwide emissions. This will not significantly contribute to global warming but is unfortunate at a time when the international community is trying to control carbon dioxide emissions.) However, the possibility cannot be discounted that the mass of smoke will be blown by the southern Gulf wind to the Indian sub-continent and interfere with

the monsoon circulation system, influencing the duration of the monsoon. This could affect the rice crops in South East Asia, reducing the food supplies of hundreds of millions of people.

Acid Rain and Crops

Certainly, the regional effects of the pollution from the oil fires will be very severe indeed. In Kashmir, some 3,000 kilometres from Kuwait, skiers in the Himalayas were amazed to come across an area of oily snow, black with soot, two inches thick. This black covering could absorb enough solar energy to melt the snow prematurely, producing serious flooding and changing the local climate. Black rain has fallen in Iran, Afghanistan, and deep into Turkey.

The most serious regional effect of the oil fires will be on food production. Because the smoke cloud is absorbing much of the solar energy, surface temperatures under the cloud are significantly reduced. Regional temperatures in Kuwait are between 10 and 15 degrees Celsius lower than normal and are reduced by a somewhat lesser extent within a radius of 1,000 kilometres. The drop in day-time temperatures could seriously affect crop yields.

But agriculture will be more seriously affected by acid rain. The sulphur dioxide and nitrogen oxides being injected into the atmosphere by the oil fires will fall back to earth as acid rain. The rate of production of, for example, sulphur dioxide by the oil fires is about twice the rate of sulphur dioxide pollution in the UK. Some four million tons of acid rain are likely to fall in the Gulf region in concentrations equal to some of the worst cases of acid rainfall in Europe and North America. Soils in the Gulf region are much less resilient to acidity, so that the effects of the acid rain on agriculture will be much worse. Crop yields will be considerably reduced for one and perhaps two seasons. The acid rain will also contaminate water supplies throughout the region.

The health impact of the Kuwaiti oil fires is already severe. For example, Kuwaitis with bronchitis and other respiratory diseases find their condition seriously aggravated by the air pollution. People with asthma are suffering more severe attacks and many new cases of asthma are occurring. Some of the hydrocarbons and other chemicals produced by the burning oil are carcinogenic and the



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incidence of cancer is likely to be increased. It is hardly surprising that doctors in Kuwait are advising those with chronic respiratory problems not to return to the country.

Oil Spills

Oil spillage into the waters of the Gulf during the Gulf War is yet another threat to the ecology of what was already one of the world's most endangered seas. The Gulf is a small, very shallow, very salty and almost land-locked sea, 1,000 kilometres long and 300 kilometres wide. Its only outlet is into the Indian Ocean, through the 62-kilometre wide Straits of Hormuz. The maximum depth of the Gulf is only 165 metres and its average depth is 35 metres.

During the war, it is estimated that between 2.5 and 3 million barrels of oil were intentionally and unintentionally spilled into the Gulf waters, although the exact volume is not yet known. It may be as much as four million barrels.

There were three major spills during January and February. In the Khafji area, Iraqi artillery shells hit a storage tank; a major spill came from the Sea Island Terminal at Mina Al Ahmadi in Kuwait; and another came from the Iraqi offshore terminal at Mina Al Bakr. These major spills followed other lesser — but still significant — spills. For example, the bombing by coalition aircraft of two Iraqi tankers in the northern Gulf spilt considerable amounts of oil into the sea.

The processes undergone by oil spilt into the sea has been described as follows: spreading and drifting, evaporation, bio-degradation, photo-chemical oxidation, sedimentation on the sea floor, absorption, penetration, and migration onto beaches.⁶ The most volatile components of the oil (mainly benzene, toluene, and xylene) soon evaporate so that the density and viscosity of the oil increases.

The Gulf was highly polluted before the Iraqi invasion of Kuwait. It is, in fact, one of the world's most polluted seas. Untreated sewage, industrial wastes and discharges from desalination plants are major pollutants, in addition to oil spills. Moreover, in 1983, during the Iran-Iraq War, Iranian wells in the Nowruz and Ardeshir off-shore fields spilled about two million barrels of oil into the Gulf. The Ixtoc I blow-out, until the Gulf War the world's biggest spill, released 3.3 million barrels over a period of nine



Saudi policeman holding the oil-soaked body of a cormorant. During the war, up to four million barrels of oil may have been spilt into the already extremely polluted waters of the Gulf.

months into the Bay of Campeche in the Gulf of Mexico. The Exxon Valdez released 240,000 barrels of crude oil into Prince William Sound, Alaska. The spills during the Gulf War may thus be the world's worst.

The environmental impact of the oil spills into the Gulf waters has yet to be predicted. Because the Gulf has little outflow, it has little capability to flush out the pollution so that the impact will be long-lasting.

Before the war, Gulf fisheries were a major multi-million dollar industry and are of considerable local significance. This industry, which employs many thousands, is now threatened. Apart from fish, other species threatened with severe damage include dugons (already vulnerable), dolphins, green and hawksbill turtles (already on the endangered list) and many species of birds.

Ingestion of contaminated food is a major hazard to wildlife but perhaps the most serious long-term threat to the ecosystems comes from the destruction of oxygen-producing plants and algae on the sea-bed. Marine life and other species depend on sea-grasses, coral reefs and intertidal areas of mangroves. The coastal areas contain the most sensitive ecosystems. The coral reefs are particularly vulnerable, being close to tolerance limits.

The adverse effects of the oil spillage on birds in the Gulf, particularly wintering waders, breeding sea-birds and migrants, are also of major concern. About two million birds winter in the Gulf, feeding and breeding there. Within a month of

the first war-related oil spills, some 20,000 birds had been killed, including cormorants, grebes, flamingoes and herons.⁷

The Bombing of Iraq's Research Reactors

On January 23rd, 1991, it was announced that US bombers had destroyed two Iraqi reactors at the country's nuclear research establishment at al-Tuwaitha, some 20 kilometres north of Baghdad. The two small research reactors were mainly used to produce radioactive isotopes for medical purposes. One, sold to Iraq by France in 1980, had a thermal power output of 800 kilowatts; the other, supplied by the Soviet Union in 1968, had an output of 5,000 kilowatts.

Other Iraqi nuclear facilities were also bombed. From information publicly available, the only other nuclear facilities in Iraq were a uranium mine, in the Gara mountain region near the border with Turkey, and an establishment, said to be near Mosul, in which Iraqi scientists and engineers were experimenting with components for use in gas centrifuges to enrich uranium. Enriched uranium can be used as the fissile material for nuclear weapons.

The Iraqi reactors were fuelled with highly-enriched uranium, sold to Iraq by France and the USSR. As the fuel in the reactor cores was consumed, radioactive fission products were produced. The amount of radioactivity in the cores of the reactors when they were bombed depends

on how long the batch of fuel had been in the reactor. If the fuel had been in for about a year, then the amount of radioactivity would have been about one three-hundredth of that released during the Chernobyl accident.

In addition to the fission products, radioactive isotopes would have been produced by the neutron bombardment of materials in the reactor cores. The amount produced depends on the age of the reactor. The amount of radioactivity induced

The Bush Administration greatly exaggerated Iraq's nuclear-weapon capability in its attempts to mobilize US public opinion in favour of the War.

in the core of the 20-year old Soviet reactor would have been considerable.

We do not know if any of the radioactivity in the bombed reactors was released into the environment. If some was released, people living near al-Taiwatha (which is close to a built-up area) may be exposed to radiation from radioactivity deposited on the ground. They may also have ingested radioactive isotopes, exposing them to radiation from the isotopes in their bodies in addition to the external radiation. Exposure to such radiation may increase the incidence of cancer and the risk of genetic mutation in offspring.

The two radioactive isotopes in the reactor cores of greatest danger to human health are caesium-137 and iodine-131. Caesium-137, a very long-lived isotope, decaying by one-half in 30 years, is deposited in bone. Iodine-131 has a half-life of seven days, and is taken up by the thyroid. Once in the organs, the radioactive caesium and iodine will give off radiation and exposure to this radiation may induce cancer in the organs. The thyroids of children, being small, are particularly at risk from damage by radioactive iodine.

An Iraqi Nuclear Bomb?

The evidence is that Iraq was trying to develop the capability to enrich uranium

for use as the fissile material in nuclear weapons. Natural uranium is enriched by increasing the amount of the isotope, uranium-235. For use in nuclear weapons, the uranium should contain at least 60 per cent of U-235. Natural uranium contains only 0.7 per cent of U-235.

It takes a large number of gas centrifuges to enrich enough uranium for a nuclear weapon. In fact, 1000 centrifuges have to be operated continuously for a year to enrich enough uranium for one nuclear weapon. On average, because of maintenance problems, three centrifuges are needed to keep one operating continuously. To produce enough enriched uranium to manufacture a militarily significant nuclear force of, say, 20 nuclear weapons in a period of two years would require 30,000 centrifuges.

A programme of building the centrifuges, producing the enriched uranium and designing and manufacturing 20 nuclear weapons would have taken the Iraqis between 5 and 10 years. The evidence is that the Iraqi centrifuge programme was in a very primitive stage. They have the plans for a centrifuge but were still trying to develop the components for one, specifically the rotors. There was, in short, virtually nothing worth bombing.

The bombing of Iraq's reactors undermines the already shaky Non-Proliferation Treaty (NPT) to which Iraq is a party. Although the intention to acquire nuclear weapons may violate the spirit of the Treaty — which pledges a non-nuclear-weapon state party to the Treaty not to manufacture or otherwise acquire nuclear weapons, and not to seek or receive any assistance in the manufacture of nuclear weapons — Iraq was not in violation of the letter of the Treaty. It should be noted that the Bush Administration greatly exaggerated Iraq's nuclear-weapon capability in its attempts to mobilize American public opinion in favour of the War.

The NPT requires that Iraq is visited regularly by inspectors from the International Atomic Energy Agency (IAEA) to ensure that no nuclear material is diverted from peaceful to military uses. The Tuwaitha establishment was visited by Agency inspectors in November 1990. They were particularly interested in the highly-enriched uranium supplied to Iraq by the French and Soviets as reactor fuel. The French supplied 12.3 kilograms of 93 per cent enriched uranium. Exactly how much the Soviets supplied is controversial although Iraqi Foreign Minister Ahmed Hussein has said that it amounted

to 33 kilograms of 80 per cent enriched uranium.⁸ This uranium could be used to manufacture a nuclear weapon. The inspectors reported that the enriched uranium was all there, and in the form in which it was originally supplied. None had been used to fabricate a nuclear weapon.

Other Long-Lasting Environmental Impacts of the War

So much attention has been focused on oil fires that the other environmental impacts of the war have not received the attention they deserve. An example is the disruption of the desert by military activities. As Egyptian geologist Farouk El-Baz points out, the war has disrupted the surface of Kuwait's desert to such an extent that the rate of sand storms is likely to double, causing sand dunes to encroach on towns, farms and roads.

Great damage was done to the vegetation and the surface of the desert by massive carpet bombing by coalition aircraft, by movements of large numbers of armoured vehicles, and by the large-scale use of bulldozers to make trenches and

The aftermath of the Gulf War may be the right moment to mobilize political and public opinion in favour of the adoption of a comprehensive and unambiguous environmental law of war

anti-tank barriers. According to El-Baz, an expert in deserts, as much as a quarter of Kuwait's land mass has been disrupted. As far as long-term damage is concerned, desert disruption may be more serious than the oil fires and spills. The effects may last for decades.

A New International Regime to Protect the Environment in Armed Conflict

The Gulf War demonstrated yet again the need to evolve a new legal instrument to

protect the environment in armed conflict. We need to outlaw both the deliberate abuse of the environment as a weapon of war and the destruction of the environment by powerful modern weapons. Existing relevant international conventions include: the 1925 Geneva Protocol, prohibiting the use in war of asphyxiating, poisonous, or other gases, and the use of bacteriological methods of warfare; the 1977 Protocol I on the Protection of Victims of International Armed Conflicts, additional to the 1949 Geneva Convention Relating to Protection of Victims of Armed Conflicts, prohibiting the use of methods and means of warfare that are intended or may be expected to cause widespread, long-term and severe damage to the natural environment; the 1977 Environmental Modification Convention, prohibiting the hostile use of environmental modification techniques which cause widespread, long-lasting or severe damage to the environment; and the 1980 Inhumane Weapon Convention, restricting the use of a few specific weapons, such as remotely delivered mines and incendiary weapons.

This list looks impressive but the Conventions are ambiguous and unclear and neither comprehensive nor authoritative enough, in themselves, to constrain significantly military activities in armed conflict. The relevant articles in the 1977 Protocol, for example, are so general as to be susceptible to self-interpretation; they can be interpreted to mean what one wants them to mean, with the result that they are often interpreted to suit the interests of

the interpreter. It is virtually impossible to judge which activities are violations of the existing international instruments.

The aftermath of the Gulf War, with its horrendous environmental destruction fresh in everyone's mind, may be the right legislative moment to mobilize political and public opinion in favour of the adoption of a comprehensive and unambiguous environmental law of war, including realistic means of enforcement, with perhaps an international tribunal to judge violations.

At a conference at King's College, London, on 3rd June, 1991, held to discuss the tenets on which a new convention to protect the environment in war should be based, Greenpeace proposed the following:

- Military interests should not be permitted to overrule environmental protection;
- The environment needs to be protected in all armed conflict, not just in war;
- No armed conflict should be permitted to damage the environment of a third party;
- Military action should be ruled out if the environmental consequences are unknown or expected to lead to severe damage;
- Each party should be held responsible for the environmental damage it has caused during armed conflict;

- The use of weapons of mass destruction must be banned;
- The environment should not be used as a weapon and weapons aimed at the environment must be banned;
- The indirect effects of warfare on the environment should be covered by the treaty;
- The destruction of or damage to installations that can release dangerous radioactive or poisonous substances should be forbidden;
- And nature parks and reserves and areas of special ecological importance should be classified as demilitarized zones.

The most effective way forward, in the first instance, may, however, be to prohibit the use of specific weapons that do unacceptable damage to the environment. This could be most simply done by strengthening existing conventions.

The decade of the 1990s is the United Nations' decade of international law, intended to promote the supremacy of international law in the conduct of international relations. The evolution of an environmental law of war would be a most appropriate exercise to start the decade.

It should not be forgotten that military activities in peacetime — such as large-scale manoeuvres and weapon testing — can also damage the environment. The time is ripe to mobilize public opinion and lobby politicians to press for the legal protection of the environment in war and peace. The right legislative moment may not come again for a long time.

Alternate Communication Forum

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A VALLEY REFUSES TO DIE

(U-matic/Colour/English/Hindi/Gujarati 44mts.)

The Narmada Valley Project has been called the biggest planned environmental disaster in the world. While increasing discontent is reflected in the struggles of people affected by the project, construction of the dams are going ahead. The film portrays the protest of the people through interviews with villagers and tribals.

VHS copies of this film are available from the Alternate Communication Forum at the rate of Rs. 500 for individuals and Rs. 1000 for organisations. Cost abroad is US\$100 (including courier service charges).

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Ecological Taxes, Energy Policy and Greenhouse Gas Reductions: A German Perspective

by
Reinhard Loske

The main political parties in Germany are agreed that energy-related greenhouse gas emissions can and should be reduced with the use of taxes. The ruling coalition is, rhetorically at least, in favour of a charge on carbon dioxide emissions. However, a comprehensive energy tax is more desirable as this can take account of the wider non-climate impacts of energy use and encourage energy saving rather than the substitution of one energy source with another.

Over the past two years there has been an intense debate between the political parties in West Germany over the use of taxes to achieve environmental goals. Although the Green Party has for some time advocated ecological taxes, it was not until early 1989, when the Social Democrats published an election manifesto proposing "eco-taxes" (mainly on petrol), that the issue was seriously taken up by the other political parties. From spring 1989 until the fall of the Berlin Wall in November of the same year, the eco-tax debate was at the top of the political agenda in the Federal Republic.

At first, the Conservative and Liberal parties (CDU and FDP) slated the eco-tax proposals as a sign of the Social Democrats' "typical preference for state interventionism", claiming that their own opposition to the taxes was in defence of "people's interests". But this point reflected tactical rather than ideological concerns and a few months later the governing CDU-FDP coalition parties proposed eco-taxes of their own.¹

Political Use of Ecological Taxes

All the main political parties in Germany now want to increase energy prices, but with different methods and politically-motivated aims. The CDU has proposed a charge on CO₂ emissions, therefore indirectly favouring nuclear energy and low-CO₂ fuels like natural gas. The CDU Minister for the Environment, Klaus Töpfer, has recently announced that the initial charge will be DM10 per tonne of emitted carbon dioxide.² Under German tax law, revenues from a CO₂ charge must be spent on measures which will assist reductions in CO₂ emissions.

The FDP wants a climate protection tax to encourage the switch from high- to low- or non-carbon fuels. This is partly due to their opposition to the German hard coal mining industry which is subsidized to the tune of DM10 billion per year. To the Liberals, the CO₂ problem is just one more reason to reduce pit mining in Germany. The Liberals want to use the proceeds from a CO₂ tax to reduce direct taxation.

In their 1989 manifesto, the SPD proposed a "revenue neutral" tax reform, including an additional tax of 50 pfennigs per litre of petrol. The manifesto largely ignored emissions from industry and power stations, mainly due to the concentration of coal mines and power plants in

the SPD-controlled Länder of Nordrhein-Westfalen and Saarland. The Social Democrats recently made clear that they favour a general energy tax rather than one restricted to taxing CO₂ emissions.

The Green Party wants a general tax on primary energy (coal, oil, gas and uranium, but excluding renewables) combined with emission taxes. They fear that a carbon tax would favour nuclear power. The Greens want the revenues raised by

Source of Energy	Percentage Tax Increase
Leaded Petrol	37.3%
Unleaded Petrol	36.7%
Diesel	22.7%
Fuel Oil	42.9%
Natural Gas	38.5%

Figure 1. Tax increases passed by the government in March 1991.

an energy tax to be used in favour of energy efficient technologies and renewable energy sources.

The most recent example of how the eco-tax idea can be misused for political purposes is the "tax increase programme" passed by the coalition government in March 1991. The core element of the programme is an increase in energy prices.

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Figure 1 gives details of the different tax increases. Although the government parties attacked taxes on petrol as "anti-social" during the last election campaign, and although they rhetorically favour low-CO₂ fuels like natural gas, they increased taxes on petrol by 37 per cent and on gas by 38.5 per cent. The motive for the tax increases lay in the need to raise tax revenues rather than in any environmental concerns. As soon as budget interests came into play, other intentions were forgotten.

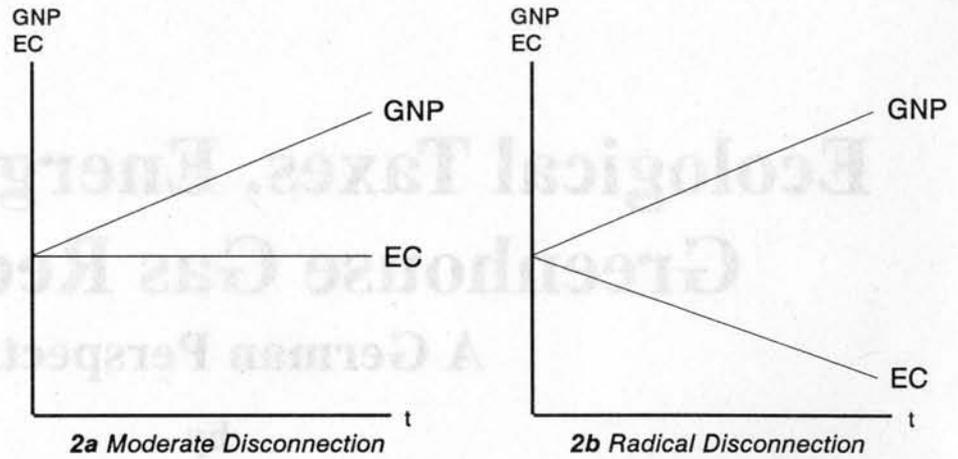


Figure 2a shows the moderate disconnection of Gross National Product (GNP) from Energy Consumption (EC) over time (t) in West Germany between the early 1970s and the mid-1980s. While GNP grew, energy consumption remained more or less constant due to increasing energy prices, technical progress and a lukewarm government energy policy. The popular idea of widening the gap between GNP and EC even further can be called "radical disconnection" (see 2b). It is extremely unlikely that this can be obtained by simply increasing energy prices. If the barriers to efficiency are not removed and if the physical structure of GNP is not adapted to ecological needs, disconnection will remain insufficient with regard to global warming.

A Testing Ground for Eco-Taxes?

Despite these distortions of the eco-tax concept, there are many arguments for using economic instruments to reduce CO₂ and other energy-related greenhouse gas emissions:

- Carbon dioxide emissions, which are responsible for around half of global warming, mainly result from the combustion of fossil fuels. In contrast to sulphur dioxide, dust or nitrogen oxides they cannot be reduced by "end-of-pipe technologies" like filters or catalytic converters.³ Reducing CO₂ means burning less fossil fuels, which in turn means saving energy, which in turn implies structural change. The traditional instruments of pollution control (such as emission standards and regulations) are inadequate. Economic instruments encourage the most efficient methods of reducing these emissions;
- The greenhouse effect is a global problem: in principle it is not important *where* emissions of CO₂ are reduced; it is only important that they are reduced. Economic instruments can encourage cost-effective reductions in CO₂ emissions from a comprehensive range of sources;
- Carbon dioxide emissions cannot be reduced by conventional pollution control regulations;
- The almost linear relationship between CO₂ emissions and fuel use means that economic instruments can be applied directly to the fuels; there is no need for sophisticated emission measurement technology. Moreover, governments are already experienced in taxing fuels;

	CO ₂ Charge	Non-Renewable Energy Tax
Character of strategy	mainly <i>substitution</i>	mainly <i>conservation</i>
Basis	climate impacts of CO ₂ , specific carbon content of fuels	all environmental impacts of energy consumption and production
Signal	1. go to low- or non-CO ₂ -fuels 2. save energy	1. save energy
Winners	natural gas, nuclear energy, renewables	renewables
Losers	lignite, hard coal (oil)	all fossil fuels, nuclear energy
Encouragement of R&D in end-of-pipe-technologies?	yes	no

Figure 3. Differences between CO₂ and non-renewable energy taxation.

- In Western Europe and elsewhere, climate policy is taking shape within a framework of clear reduction targets on the national and international levels. The German government has recently announced a target of reducing CO₂ emissions by 25 per cent by the year 2005, taking a base-year of 1987. The EC has adopted a policy target of stabilizing CO₂ emissions by the year 2000 at their 1990 levels.

Concrete reduction targets enable the efficient use of economic instruments.⁴

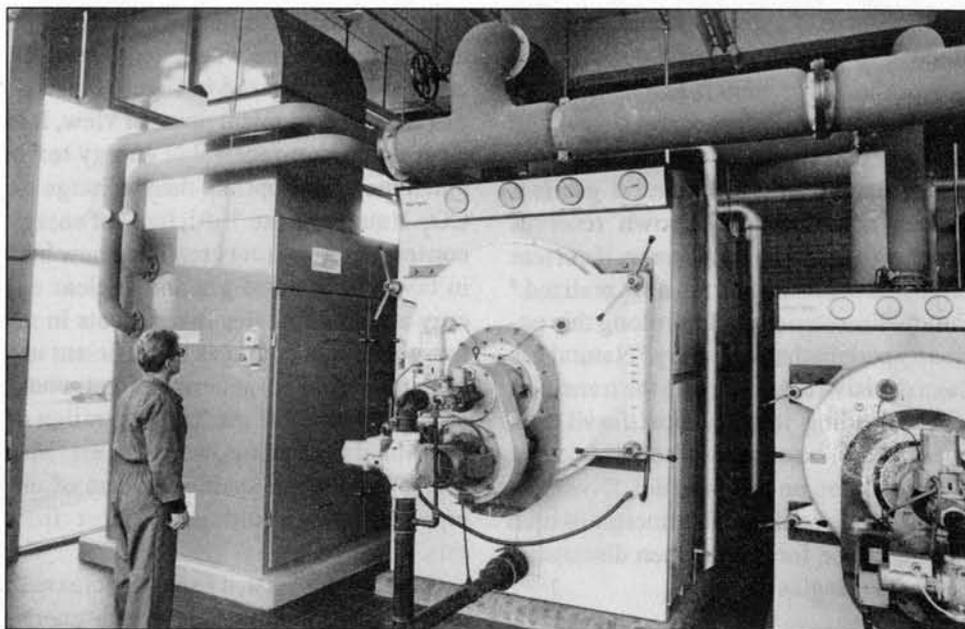
Objections to Eco-Taxes

The main objection to using the price mechanism to reduce energy-related greenhouse gas emissions concerns the elasticity of demand for energy. The demand for a good or a service is said to be

elastic if it responds in close relationship to changes in its price. The demand for energy services such as cooking, heating, lighting and cooling is regarded as relatively inelastic as the energy consumer has only marginal opportunities to react to increasing prices. For instance, it is unlikely that consumers will switch off their fridges, have cooked meals only once a week or reduce the temperature of their living rooms. At best they will take account of higher prices when buying a new fridge or by deciding to insulate their homes, but the resulting cuts in energy use will take time to be realized and may not be particularly significant.

Price increases will therefore have some effect on energy demand, because they will stimulate the use and development of energy efficient technologies, but this will not result in the deep and rapid cuts in CO₂ required to stabilize global climate. For example, between 1973 and 1985, the price of oil increased by around 500 per cent in real terms. Yet, despite this drastic increase, total energy consumption in the Federal Republic remained more or less unchanged. This is often praised as a "disconnection of economic growth and energy consumption", because GNP grew by 35 per cent in the same period. In fact, it shows the limits to reducing energy consumption while continuing conventional economic growth (see Figure 2). The potential to cut CO₂ emissions cannot be fully realized if energy policy is limited to increasing prices. Price increases have thus to be combined with other measures including:

- The promotion of combined heat and power generation by national, regional and local governments. This could drastically improve the average efficiency of electricity production;
- The provision of incentives for the use of renewable energy;
- The strengthening of decentralized structures of energy supply to make possible more local participation and self-determination in energy policy;
- Extensive energy counselling to create energy consciousness at the consumer level;
- Establishing energy agencies to promote investments in energy saving projects;
- The introduction of linear price rates



Combined heat and power plant. In a conventional large thermal power plant over 60 per cent of the energy used to power the turbines is wasted. In a small CHP plant the "waste" heat is put to good purpose in providing hot water and space heating in domestic and industrial buildings. CHP schemes can use energy with an efficiency of as much as 80 per cent. They also tend to reduce the centralized hold of the electricity supply industry as they are best operated by municipal authorities or other local enterprises.

for electricity and natural gas to make energy conservation more profitable (the present degressive price structure favours heavy consumers and discourages investments in energy saving);

- The introduction of efficiency standards for household appliances and home insulation.

This list, itself incomplete, shows that changing energy laws and regulations, controlling and restricting market power, introducing standards and norms, counselling and creating public awareness are all integral parts of an ecological energy policy. If this framework is constructed properly, the price mechanism might indeed become the central element of a future energy conservation strategy.

Carbon Taxation

In principle there are at least four ways of cutting carbon dioxide emissions:

- Reducing the quantity of energy services required;
- Reducing carbon emissions by end-of-pipe technologies, although this is only a theoretical possibility at present (see Reference 2);
- Increasing energy efficiency on both the supply and demand sides;

- Substituting high-carbon fuels by low- or non-carbon fuels.

Taxing CO₂ emissions is mainly a substitution strategy: as the carbon content of different fossil fuels varies, so the carbon tax on different fuels should vary. If the specific carbon content of natural gas is taken as 1.0, the relative content of oil is 1.52; of hard coal 1.74; and of lignite 2.1. The CO₂ charge on lignite would therefore be twice as high as the charge on natural gas.

The main winner from this strategy would be natural gas, due to the decrease in its relative price. A second winner could be nuclear energy, because it is misleadingly claimed not to produce any CO₂ (see Nigel Mortimer, 'Nuclear Power and Carbon Dioxide', *The Ecologist*, Vol. 21, No. 3, for an analysis of indirect CO₂ emissions from the nuclear industry). The producers of end-of-pipe technologies might also profit from this kind of emission charge. The renewables — sun, wind and water — would also of course benefit.

A key argument against taxing CO₂ is that this reduces the environmental consequences of energy use solely to its climatic impact. If a comprehensive environmental impact assessment was carried out it would show that nuclear energy has no role to play in a future energy strategy: uranium mining, low level radiation, the disposal of radioactive wastes and the

consequences of a possible accident would all have to be taken into account.

Another argument against charges based on CO₂ emissions is that this would be likely to lead to a rapid increase in the use of natural gas. But natural gas is a limited resource with known reserves which will only last for 40 years if current projected consumption rates are realized.⁵ Future discoveries could prolong this period by perhaps half a century.⁶ Natural gas has a decisive role to play in the transition period leading into the post-fossil age, but it would be short-sighted to become too dependent on just one fuel. Diversification is an ecological principle which should not be forgotten when discussing energy strategies.

Taxing Energy

Taxing energy rather than CO₂ promotes conservation, not substitution. A general increase in energy prices (except on renewables) would stimulate energy conservation in all energy-using sectors; make renewable energy sources more financially competitive in relationship to both fossil and nuclear sources; and would leave unchanged the position of nuclear

energy in relation to gas, oil and coal. The main differences between energy and CO₂ taxes are summarized in Figure 3.

From an ecological point of view, it is clear that a non-renewable energy tax is much more appropriate than a charge on CO₂. It supports the "fifth fuel" of energy conservation without creating a new bias in favour of natural gas and nuclear energy and it stimulates investments in renewables. It encourages the efficient use of hard coal in co-generation and would thus accelerate the market penetration of combined heat and power systems. Municipal and small-scale suppliers of energy services would profit most from this.

Last but not least, a general increase in energy prices could help create energy awareness. For what is needed is not just a degree of switching between coal and gas or nuclear energy, but a more fundamental transformation: leaving the fossil-nuclear age behind us and approaching the solar age.

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Guatemala: The Clamour for Land and the Fate of the Forests

by
Marcus Colchester

Guatemala has one of the most severely distorted political and agrarian structures in Latin America. Its economy is dominated by the production for export of a limited number of cash crops, grown on extensive lands held by a tiny minority of farmers. The skewed landownership pattern has devastating environmental consequences, making all too clear how deforestation is an expression of social injustice. Poor people, denied access to the fertile soils in the valleys and western lowlands, are forced to clear their fields on marginal lands inappropriate for agriculture. Yet, half of the agricultural land, held by the land-owning minority, is almost unused. The case for land reform is overwhelming.

“The clamour for land, is without any doubt, the loudest, most dramatic and most desperate cry that is heard in Guatemala. It breaks forth from the chests of millions of Guatemalans who yearn not only to possess land, but to be possessed by it . . . the serious problem of land ownership lies at the very base of our situation of injustice . . . whereby the very structure of Guatemalan society stands on the shoulders of the vast majority of Guatemalans for the benefit of a small minority.”

Collective Pastoral Letter of the Bishops of Guatemala,
February 1988.

Guatemala's export-orientated economy was imposed by violence at the time of conquest. The Spanish moved to assert control over Guatemala in 1524 in a bloody conflict which endured for 20 years until the Indians were finally subdued by the steel, arquebuses and horses of the *conquistadores*. Within a few years the ruling classes of Indians had been all but eliminated and the colonial society emerged divided in two, with a yawning economic, cultural and political divide separating the peasant Indians from their “*ladino*” masters of Spanish or mixed descent.

The main concern of the colonists was not so much acquiring land as securing cheap labour. In a context of “land plenty”, and with an Indian population that was almost entirely self-reliant, the recruitment of Indian labour could only be effectively achieved by force. The violent subjugation of the Indians was thus essential to the imposition of the export-orientated economy that the metropolitan centre required. The extent to which the

Indians resisted, by all possible means, this enforced assimilation into the market economy has not been sufficiently appreciated. One indication of its depth may be gauged from the fact that there has been, on average, one Indian rebellion every 16 years since 1524.

Gradually, as an export economy developed — mainly in sugar, indigo, cochineal and cacao — the settlers began to establish large plantation estates. Labour remained the main preoccupation of the ruling class and to avoid competition for this scarce resource rights to own large plantations were severely limited. When land was sold, the number of Indians that went with the land was always mentioned.

Independence Without Freedom

By the end of the 18th century, the pattern of land concentration was already well established with, according to one estimate, up to one-third of the population dependant on migrant labour.¹ The declaration of independence from Spain in 1821 only intensified the pressure on the peasantry. No longer subject to the strict trade regulations of the colonial metropolis, a rising class of would-be landowners pressed inexorably for greater access to land.

The drive to acquire land was further boosted by the coffee boom which started in the 1870s. As the market for indigo and cochineal declined, farmers, switching over to coffee, found they required far greater amounts of land and a much larger workforce than previously. The exponential growth of the trade in coffee, which grew best at higher elevations, directly affected the highland valleys occupied by the majority of the Indians, who were progressively dispossessed of their most fertile lands. To facilitate the take-over of Indian land, the law was changed to allow the sale of “national” lands as private property. Nearly

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a million acres of nominally unclaimed lands passed into private possession in this way between 1871 and 1883.²

The process was bitterly resented by the Indians. As one attested:

“You have ordered us to leave our lands so that coffee can be grown. You have done us an injustice . . . You ask us to leave our land where our grandfathers and fathers were born . . . Is it because we do not know how to grow coffee? You know very well we know how . . . Are we not the ones who sow the coffee on the *fincas*, wash it, harvest it? . . . But we do not want to grow coffee on our lands. We want them only for our corn, our animals, our wood. And we want these lands where our grandfathers and fathers worked. Why should we leave them?”³



Krystyna Deuss

Toltecs reconnoitring the Mayan coast; from the Temple of the Warriors, Chichen Itzá. It is estimated that the population of Guatemala at the time of conquest may have equalled that of today. Early historical sources make clear that the Indians kept aside extensive areas of forests, and later grasslands, as fallow land as well as for grazing and fuelwood collection.

The Agro-Export Boom

The turn of the century saw the first foreign companies investing in agriculture in Guatemala, beginning a pattern of domination that has continued ever since. Leading the way in this process was the United Fruit Company (UFCO) of the United States, which commenced negotiations in Guatemala in 1899. In 1901, banana cultivators were granted tax exemption for exports and,

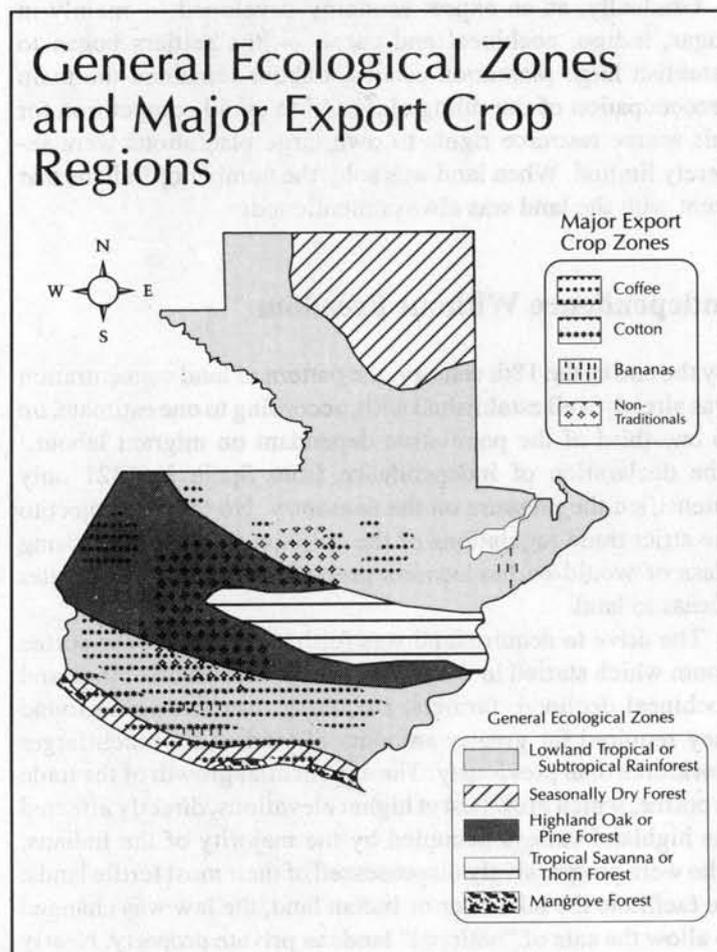
in 1906, UFCO signed its first contract. In exchange for a grant of 69,000 hectares of prime agricultural land, it guaranteed to construct the railroad it would anyway need to export its bananas.⁴ By the 1930s, UFCO was the largest employer, landowner and exporter in all Guatemala, with control of the country's only railroad and Caribbean port.

As the process of land concentration proceeded and as rural populations rose, the problem of labour scarcity gradually receded. Land scarcity and not labour scarcity became the dominant preoccupation of the Central American agrarian economy from about the 1920s. Throughout the rest of this century, the amount of land available to the Guatemalan peasantry has declined in conjunction with a huge expansion in the area of land under export crops. Between 1950 and 1977, the land under coffee expanded from 162,000 to 270,000 hectares, while that under bananas leapt from 17,000 to 59,000 hectares in the same period.⁵ Cotton production expanded from 2,000 tons on 5,000 hectares in 1948 to 78,000 tons on 89,500 hectares in 1967. By 1979 production of cotton was up to 146,000 tons. The area used for sugar production also escalated from 32,000 hectares in 1961 to 85,000 hectares in 1977. The national cattle herd doubled from about one to two million between 1947 and 1974. In sharp contrast, the land devoted to producing the peasants' staple, maize, actually declined in the 30 years between 1948 and 1978, from 538,000 to 522,000 hectares.

As the problem of labour shortage has receded, the livelihood of estate workers has worsened. In a buyers' market, and without effective legal or trades union protection, their real wages have declined making survival ever more precarious.

Economic Consequences

Today Guatemala's dependence on agro-exports remains almost as great as ever. Agriculture, which accounts for a quarter of the GDP, generates two-thirds of export income.⁶ Foreign



Size	Farms		Area	
	Number	Percentage	Thousand ha.	Percentage
< 0.7 ha.	166,732	31	55.4	1
0.7-1.4	121,351	23	115.1	3
1.5-6.9	180,385	34	508.0	12
7.0-44.9	49,409	9	781.0	19
45.0-900.0	13,177	2	1,817.5	43
> 900	482	0.09	903.2	22

Table 1. Distribution of farm sizes in Guatemala, 1979.

Source: Censo Agropecuario 1979, cited in James Dunkerley, *Power in the Isthmus*, Verso, London, 1988.

	Coffee	Cotton	Sugar	Cardamom	Bananas	Beef
Value (US\$m, 1980)	464	166	69	56	45	29
Total farms	97,679	331	16,854	12,267	23,133	117,595
Percentage Production on units > 92 ha.	83	100	95	68	83	70
Number of farms	3,651	331	1,250	645	1,900	8,166
Percentage Production on units > 1840 ha.	19	38	41	13	3	22
Number of farms	188	49	91	82	31	337

Table 2. Agro-export production by farm size.

Source: Censo Agropecuario 1979.

investment and development assistance alike have been shaped by a strong policy bias against the domestic agriculture sector. The almost exclusive emphasis on increased financial incentives for the development of export-orientated agriculture, has discouraged the production of basic foodstuffs intended for domestic consumption.

Nor has the Guatemalan economy sought to redistribute the benefits accruing to the agricultural élite to the rest of the population by taxation and the provision of services. Thus, whereas agro-exports have enjoyed over a century of tax exemptions and fiscal incentives, the burden of tax at 8.8 per cent of GDP remains one of the lowest in the world.⁷

Low wages, and extreme poverty among the great majority of the population, have meant a grave lack of disposable income. In turn, this absence of domestic consumers has put severe limits on the development of local industry for either goods or services. A model of growth based on import substitution has not been possible, although the Guatemalan economy has benefited to some degree from the creation of the Central American Common Market.

The lack of a viable domestic industrial base to invest in, has had yet further devastating consequences for the economy, as capital has fled overseas to find secure investment. It is estimated that in the first five years of the 1980s alone, US\$1.1 billion left the country.⁸

Presently, Guatemala is in the grip of a severe financial crisis,

brought on to a large extent by its excessive dependence on agro-exports whose value in real terms has fallen drastically over the past half century. By the mid 1980s, GDP was six per cent below its 1980 level. The country's external debt increased to US\$2.5 billion by 1987.⁹

To overcome this economic impasse, the medicine prescribed by the World Bank is more of the same. Guatemala, the Bank argues, has no choice but to "increase the mobilization of domestic resources" to further expand its trade in agricultural products. Further large-scale irrigation projects funded by private capital for agro-export production are recommended. For its part, the Inter-American Development Bank is already lending money for irrigation schemes. Further land alienation and impoverishment will be the inevitable consequences.

The most visible result of this model of agricultural development has been that the country has been divided up into recognizable zones of land use. To the south, the coastal plains are dominated by cotton, sugar and cattle ranches, giving way in the piedmont and the southern valleys to the coffee estates (*see* Map).

In the highlands, where two-thirds of the country's population lives, the economy is dominated by the

small subsistence plots of the Indians, whose huts can be seen dotting the hillsides alongside tiny stands of maize and beans. Even here, in the uplands, the more fertile areas have been taken over by large farms growing highland coffee, cardamom and new crops like carnations.

Land Concentration

The visible zoning of crops is complemented by a much more fundamental differentiation of the agrarian economy, according to who owns the land, and the invisible contrasts are as stark as the crop choice that results from them. For, as the United States Agency for International Development (USAID) has noted, the inequalities of land distribution in Guatemala are the most pronounced in all Latin America.¹⁰

As Table 1 reveals, the vast majority of the agricultural area of Guatemala is held by a tiny minority, with just over two per cent of farms enclosing 65 per cent of the land. No more than 482 farms occupy 22 per cent of the cultivated land in Guatemala. It is these farms which produce the bulk of the country's agro-exports (*see* Table 2).

Yet not all of the large estates are efficient enterprises exploiting all the land available to them. On the contrary, fully half of all farms over 50 hectares are, according to USAID, seriously underused. Such unused agricultural land which, in

The Environmental Impact of Unequal Land Distribution

Historically, the main environmental impact of Guatemala's agro-export economy was felt in the piedmont and the plains of the south coast where forest was cleared for establishing plantations on the fertile volcanic soils.

Extensive areas of forest have also been cleared along the Caribbean coast for establishing banana plantations, and in the Motagua valley for growing rice and tobacco.

Forest loss in these areas accelerated considerably in the post-war period with the massive expansion of cattle ranching. In the 1960s, with the northern extension of the agricultural frontier, rates of forest loss leapt exponentially.

Today, Guatemala's forest cover is down to between 27 and 42 per cent of the national territory, reduced from 77 per cent in 1960. Forest loss may now be proceeding at as much as 1,080 to 1,620 km² per year.

The main pressures on the forests come from conversion for agriculture and ranching, especially on the northern frontier, and fuelwood collection, notably in the highlands. According to the recent Tropical Forestry Action Plan for Guatemala, 90 per cent of all deforestation is caused by colonization, eight per cent by fires and two per cent by commercial logging. In addition, some 6.8 million cubic metres of firewood are burned annually, without necessarily causing the loss of forest cover.

However, the role of logging in forest loss is higher than these figures reveal. As in tropical forests elsewhere, in Guatemala logging plays a crucial catalytic role in deforestation, opening up forest lands to settlers who clear and burn the forests first penetrated by logging roads. Ranching follows close behind this pioneering agricultural frontier, as squatters are displaced by those whose political connections enable them to secure title to the land.

Soil Erosion

Guatemala's soils are extremely vulnerable to forest loss. In the western areas, the highly fertile soils are largely made up of unconsolidated volcanic ash, while in the east the much less fertile soils under tropical forests are susceptible to rapid leaching and laterization. According to USAID, 25-35 per cent of Guatemala's soils have already been seriously eroded or degraded. The Chixoy dam, which produces 70 per cent of the country's electricity and cost over US\$1,000 million to build — equivalent to 39 per cent of the national debt — is now suffering such severe silting caused by forest loss in the watershed area that its lifespan has been reduced by 45 years.

The deforestation of Guatemala's watersheds is also having a noticeable impact on the country's climate and river flow. Many parts of Guatemala now report longer dry seasons, and flash flooding and drought are also increasingly reported. River siltation is also reducing the rivers' carrying capacity, exaggerating the problem of flooding during the wet season.

Although the attention of environmentalists has focused on the critical problem of deforestation on the agricultural frontier and in the watersheds, the continued expansion of the agro-export economy in the lowlands is also a matter

for concern. Much of this expansion has been aided by loans from the multilateral development banks.

Tobacco production has been particularly damaging, not just because it requires the clearance of forest to establish the plantations but also because fuelwood is required for smoking and drying the crop. Another major concern has been the downstream effect of pesticides.

In the past 30 years, Guatemala has lost some 92 per cent of its mangroves, mostly due to charcoaling and pesticides. The mangroves serve as spawning and nursery areas for crustaceans, molluscs and finfish and produce enormous amounts of nutrients that provide the food base for adult marine species: an estimated 90 per cent of Guatemala's commercially important fish come from mangrove forests.

Hopeful Sign?

Perhaps the only hopeful sign within Guatemala is the increasing awareness of the environmental crisis facing the country. The last few years have seen a growth of non-governmental activity focused on the environment.

New government agencies have been created to develop policies to deal with these problems. So far the solutions proposed remain straightjacketed by existing political priorities, but, just by seeking out the underlying causes of these problems, government planners have been forced to acknowledge the determining role of skewed land distribution in natural resource degradation.

An initiative of the Christian Democrat Government has been to secure legally large portions of the national territory as protected areas for conservation. The Government has noted the need to give local communities a stake in these areas and a place in their planning and management. An interesting test case of this resolve is the Sierra de las Minas Biosphere Reserve established in 1990.

The 236,000 hectare area is a microcosm of the Guatemalan dilemma. While its mountainous spine retains an impressive diversity of forests and animals, the northern flanks of the Sierra have been settled, over the past half century, by tens of thousands of K'ekchi Indians who have been displaced by the expansion of logging, ranching and cardomom cultivation in the Northern Transverse Zone. The poor soils on the steep mountainsides make stable agriculture almost impossible, so that the Indians are obliged to clear new areas once their old plots become exhausted. At the same time, two-thirds of the area has been secured as private property by largely absentee landlords.

The Foundation which has promoted the Reserve clearly recognizes that it cannot be made viable without, on the one hand, buying up the privately owned lands of the rich and, on the other hand, acquiring other areas of fertile valley land outside the reserve, or in the "Buffer Zone", to resettle the Indians. The case demonstrates, with startling clarity, the fact that, in Guatemala, the conservation of natural resources is inextricably linked to the need for a redistribution of land.

all, totals some 1.2 million hectares should be classified as *tierras ociosas* ("empty lands") and be made available for redistribution. Instead, it is maintained by the large landowners for speculative purposes and remains unused for lack of capital investment.

The effect and, some would say, the purpose of this extravagant pattern of land holding is to ensure a ready availability of labour for work on the estates. This has severe environmental consequences (*see* Box). Indeed, there is an inverse relationship between land capability and intensity of land use: the better lands, held by the rich, are under-used while the poorer lands are over-exploited. Even where large land-holdings are exploited, land-use patterns are inappropriate and wasteful. The extensive cattle ranches on the rich soils of the Pacific coast, for example, could be far more productively used.¹¹

At the opposite extreme are the 88 per cent of the farms, squeezed onto a mere 16 per cent of the land area, which are considered too small to provide for the needs of a family.¹² These plots are not only marginal in size but also occupy the poorer soils, mainly in the highlands.

Seriously compounding the problem of plot size is the fact that ownership or continued access to the land is not secure. Some 22 per cent of farms in Guatemala are held by squatters with very limited rights.¹³ This has important environmental implications, for as Jefferey Leonard notes "small farmers, already at or near subsistence level are reluctant to make any capital or labour investments to improve the lands that they cultivate in cases where their tenure is uncertain."¹⁴ The lack of land security has caused a breakdown of land conservation techniques, with the traditional practice of terracing fields being abandoned over large areas, leading to escalating rates of soil erosion. Ensuring land security to the rural peasants would be an important step towards improving upland agriculture.

Since the majority of the small farms cannot by themselves provide a living, many peasants have to find off-farm employment to support themselves. Added to this, it is estimated that there are over 309,000 landless labourers over 20 years old without permanent employment.¹⁵

Every year, up to half a million peasants, mainly Indians, migrate to the south coast in search of seasonal employment on the estates.¹⁶ Here, in conditions of unimaginable deprivation and for minimal wages, the migrants work to harvest crops for export to the supermarkets of the north. The poisonings due to the massive use of pesticides compound the people's misery.

Ranching for Export

As in many other parts of Latin America, Guatemala has experienced a massive expansion of cattle raising in recent years. This has been made possible by the rapid extension of the road network after the war, much of it financed by international loans or by oil exploration, as well as by the installation, at the end of the 1950s, of modern abattoirs and facilities for refrigerated transport.

According to one estimate, between 1960 and 1978 grazing land increased in area by 2,125 per cent.¹⁷ Most of the meat produced has been for export and has been priced out of reach of the ordinary Guatemalan. Indeed, despite, or rather because of this expansion in beef exports, between 1960 and 1974 per capita consumption of beef in Guatemala fell by 50 per cent.¹⁸

Yet the overall contribution of beef to export receipts, in



Alistair Jones

Seasonal migrant workers on the export crop plantations are housed in buildings (galeras) without walls or beds, where the levels of malnutrition, child mortality and ill-health are higher even than for the rural population as a whole.

relation to the huge areas of land devoted to pasture, is very small. Stocking rates of the mainly unimproved pastures on the large ranches is extremely low, at about 1.9 cattle per hectare.¹⁹ Meanwhile, there is growing evidence that small-scale production of beef on mixed farms, where cattle can be partly fed on crop residues, is much more efficient.

Ranching has expanded, in particular, in the previously forested areas of the Petén and the Northern Transverse Zone, where the average yield of beef is only 10 kilograms per hectare per annum. As James Nations notes, "even this meagre production plummets after 7-10 years, when soils are so degraded and weeds so prolific that production is no longer viable."²⁰

Ranching is not only greedy for land and destructive of forests, it also creates very few jobs. Data from the neighbouring Chiapas area in Mexico suggest that ranching occupies only one worker per 100 hectares which corresponds to six worker days per hectare per year. In comparison, beans require 37 worker days per hectare per year, rice 60 and coffee 130.²¹ Yet, for the rancher, beef is an attractive proposition and its advantages are enhanced by the fact that the Government provides credits for the conversion of forest lands for agriculture and ranching. Moreover, tax levied on unused lands is higher than for land under production.²²

Colonizing the Frontier

The 1960s saw the beginning of a major new growth area in the Guatemalan economy. Led by oil exploration, nickel mines and hydroelectric projects, the military governments pushed for the opening up of the forested northern frontier.

Guatemalan President General Kjell Laugerud Garcia gave particular impetus to the development of the *Franja Transversal del Norte* (Northern Transverse Zone), a vast swathe of territory stretching from the Mexican border across to Guatemala's narrow Caribbean outlet at the port of Puerto Barrios. Here, as George Black puts it, "in virgin territory the army set about creating a new geographical power base, far away from the traditional centres of agrarian power."²³

The excuse for opening up this territory was to provide lands

Farmers tending their staple crop of maize. The clearance of hillside forests for agriculture results in disastrous rates of soil erosion. It has been estimated that by the mid-1980s, Guatemala had lost 40 per cent of the productive capacity of its soils due to inappropriate land use.



Guatemala Committee for Human Rights

for the poor and landless peasants of the highlands. The Government thus embarked on a series of ambitious colonization programmes as an alternative to land reform in the more fertile lands to the south. By 1985, the Government had resettled some 60,000 people in the Northern Transverse Zone and close to 100,000 more were slated to follow in the next few years.²⁴ According to one estimate, the programme has been converting some 30,000 hectares of forest a year to peasant agriculture — a rate that will ensure the destruction of the remaining forest in just 25 years.²⁵

The colonization programme, which is overseen by the Government's Agrarian Transformation Institute (INTA) has attempted to promote the establishment of viable middle-sized farms of cardamom, coffee, cacao and rubber, either as peasant cooperatives or as commercial farms under USAID guidance.²⁶ It has been strongly criticized on numerous counts.

INTA has not even attempted to ensure that it is the poor who most benefit from the programme. On the contrary, as the World Bank itself has noted, far from assisting the rural poor, the INTA programme has actually resulted in a "substantial distribution of large blocks of land to persons from the middle and upper income classes."²⁷ Peasants established with only provisional land titles have also proved easy prey for eviction, thus intensifying the process of land concentration in the zone.²⁸ Moreover, as Indian lawyers note, the bureaucratic procedures present very serious obstacles to illiterate and poor peasants who may not speak Spanish and who lack the necessary documentation.

INTA's authority did not extend into the Petén, the vast forested area in the north of Guatemala. Here the majority of the land was held by the State and the area was entrusted to the army-run Empresa Nacional de Fomento y Desarrollo Economico del Petén (FYDEP). FYDEP, which had almost exclusive control of the natural resources of the Petén between 1959 and 1987, also began a parallel programme of land distribution that was hailed as a solution to the peasants' problems.²⁹ Some land, nearly all of very poor quality, was handed out to smallholders, but the majority of titles were granted to the political and military élite to create further cattle ranches. As a result of FYDEP's programme, the number of people in the area increased from 27,000 in 1964 to 200,000 by 1984. The result of the ranching and settlement has been the elimination of at least one-third of the Petén forest, which in 1960 still covered some 36,000 square kilometres.³⁰

Consequences for the Poor

With a present population of around 8.7 million people growing at 3.5 per cent per year it is estimated that Guatemala's popula-

tion will double within the next 22 years.³¹ The unequal development process and the lack of land and livelihood it has brought for the peasantry, translates into unimaginable poverty and hardship for the majority of Guatemalans. The dismal statistics which follow only begin to convey this suffering and misery.

According to a 1982 UNICEF study, no other Central American country is poorer than Guatemala. Guatemala, the study found, had the lowest "physical quality of life index" in Central America. Government figures admit that by the end of 1985 as many as 86 per cent of families were living below the official poverty line and 55 per cent were classed as "extremely poor". USAID estimates that 60 per cent of the population is living in absolute poverty.³² Rates of malnutrition reflect these figures. A national survey in 1980 found that only 27 per cent of all children between six months and five years showed normal physical development.³³ Nationally, infant mortality rates were recorded at 80 per 1000 in 1984, while locally the rates are far higher, reaching up to 160 per 1000 in the Indian areas of the highlands, according to a USAID study in 1982.³⁴

In 1985, 46 per cent of the population were without access to any form of health care, with the State public health system reaching only 22 per cent of the population. Other services and facilities are as poor. Less than half of Guatemalan homes have toilets and only 54 per cent have piped water supplies. The housing shortage in 1985 was estimated at 650,000 units for a population of only eight million people. Social security benefits reach only 0.2 per cent of the people, while 42 per cent of the working population have had no formal education at all.³⁵ Many conclude that the standards of rural subsistence are lower now than they were in the colonial period 350 years ago.³⁶

Population and Distribution

It is commonly asserted that the basic problem in Central America is that population has expanded faster than the economy can keep up, and that, moreover, the rapid increase in the rural population is the principal cause of "minifundismo" as peasant plots have had to be further and further subdivided to provide the people with some kind of living. Although the growth of population has undeniably aggravated the situation, neither assertion stands up to close scrutiny.

In the first place GDP has kept ahead of population. For example, between 1949 and 1982 *per capita* GDP for Guatemala increased from \$220 to \$353 (in 1950 US dollar values).³⁷ In the same way, overall *per capita* food production in Guatemala increased well ahead of population growth, rising by 32 per cent between 1960 and 1980. However, the bulk of these gains were made in increases in export crops. By contrast *per capita* cereal production fell by 10.1 per cent between 1975-1981.³⁸ Table 3 shows in more detail this skewed growth in the agrarian economy.

Similarly, land alienation rather than subdivision has been a major factor impoverishing the rural poor. In the last 25 years, despite the substantial increase in the overall number of small farms of under seven hectares, the total area of land held in such units has declined from 37.5 to 16 per cent of the total agricultural area.³⁹

Another cause of increasing poverty and landlessness has been the growing tendency of large landowners to expel peasants formerly allowed to live on the estates as feudal workers. These "*mozos colonos*" provided free labour to farm owners in

Years	Food Crops percentage	Agro-Exports percentage	Total Population percentage
1950-1960	2.1	9.7	4.1
1960-1970	3.8	5.1	3.6
1970-1980	3.0	7.8	2.8
1950-1980	3.0	7.5	3.5

Table 3. Growth in population and agricultural production, 1950-1980.

Source: James Painter, *Guatemala: False Hope, False Freedom*, LAB, London, 1989.

exchange for the right to cultivate land. However, with mechanization, and as labour has become more widely available, landholders are increasingly expelling these workers, not least for fear they will lay claim to the lands that they cultivate.⁴⁰

Land Reform in Guatemala

Ever since the Mexican revolution, two related legal concepts have been at the centre of land reform legislation in Latin America: land could be owned as private property but it had to be used for the benefit of the community; and rights to lands that were "unused" ("*tierras ociosas*") could be forfeited because the land was not fulfilling its "social function".

These principles were incorporated into Guatemalan law and even the constitution in the reformist post-war period and laid the ground for the only real attempt at land reform in Guatemala's history. The reform was promoted under the Agrarian Reform Law of 1952, by which, in the short period between 1952 and 1954, some 603,615 hectares of private lands were expropriated. This land, together with a further 280,000 hectares of public lands, was redistributed to an estimated 78,000 to 100,000 peasants.⁴¹

It is important to recognize the limited nature of the reform that was undertaken. The redistribution did not apply to any land

that was being cultivated; no properties under 90 hectares were affected, even where the land was unused. Moreover, as is now generally agreed, far from being part of a slow slide towards communism (as the US charged), the land reforms were undertaken principally as an attempt to modernize agriculture and to replace the feudal agrarian economy with a capitalist system. No landowners were expropriated without recompense. On the contrary, compensation, totalling US\$8.3 million, was paid for expropriated lands on the basis of declared taxable value.⁴²

All the same, considering the short time period in which the reform was undertaken, it was a substantial land transfer, especially in the Guatemalan context. Indeed, more land was redistributed between 1952 and 1954 than in all the following 30 years.⁴³

Potentially as significant for the future of the Indian communities, the Arevalo Government in 1945 had also passed a new law designed to secure the rights of rural communities to their lands. Under this Law of Supplementary Ownership, land tenure title was recognized on the basis of proven use of land rather than the dubious titles procured by landowners over the past century. The law, however, was never properly implemented and was annulled at the end of the reform period in 1954.

The land redistribution provoked an inevitable reaction from the landed elite whose monopoly of power was being directly challenged. Yet, it was only when the land reform also challenged the power of foreign companies that the process ran aground. Among the lands slated for expropriation were 387,000 acres of unused lands held by the United Fruit Company. This threat to US interests was unacceptable to Eisenhower, who promptly set about undermining the democratically-elected Arbenz Government.

The story of how the US Government, in support of the United Fruit Company, intervened in 1954 to topple Arbenz has been amply recounted elsewhere.⁴⁴ The consequences of the CIA-engineered coup have also been well documented. It ushered in an era of severe political repression. The military, which had long been a significant player in Guatemalan politics, extended and deepened its power and economic control.⁴⁵

At the same time, the landed elite was once again given free rein of the agrarian economy. Nearly all the land redistributed in the Arbenz land reform was confiscated by the State. Indeed, by January 1956, only 0.4 per cent of the beneficiaries under the land reform retained their land.⁴⁶ Much of the land was returned to the original landowners: the peasants, if they were lucky, became landless workers on the estates. Reversing Arbenz's nationalist modernization programme, the new regime opened the country up to further foreign investment, while endorsing the continuing trend to diversify agro-exports.

Most important of all, the new Constitution affirmed the principle of private property and, in common with all subsequent constitutions, had the effect of closing all possibility of legal land expropriations to achieve land reform. Guatemala's most recent Constitution has altogether eliminated the notion of land having a social function.⁴⁷

Nevertheless, Guatemala does, technically at least, still have a land reform programme. Decree 1551, the Agrarian Transformation Law, which was passed in 1961, provides a mechanism for the expropriation of *tierras ociosas* of over 100 hectares. Once unused land is identified and the owner informed of this by INTA, the law allows the owner a further two years to put it under production. Only then may peasants interested in cultivating the land request use. Negotiations are then undertaken to pay

compensation, not on the basis of tax declarations but on evaluations carried out jointly by the owner and INTA officials.

A USAID study of the process concludes that it is inadequate for carrying out the ostensible goals of the law, and "has the principal effect of protecting owners of unused lands from expropriation. In reality, INTA has not expropriated any appreciable area of cultivable land since the law was approved."⁴⁸ INTA has instead focused its attentions on the colonization of the agricultural frontier, where new land holdings have been established on nominally unoccupied state lands. INTA has put considerable effort into taxing these smallholders, while doing little to tax owners of unused lands. The USAID study concludes, "Decree 1551 has provided a legal basis to facilitate the extraction of funds from peasants with scarce resources, while making it more difficult to recover taxes on unused lands."⁴⁹

Given such obstacles to land reform, development agencies,



Joe Fish

National Guardsmen outside telephone company headquarters during a strike by workers. The ruling élite's reaction to calls by trade unions and peasant movements for political and agrarian reform was to launch a murderous campaign of repression.

especially USAID, have proposed an alternative programme to provide peasants with a cash income from their tiny fields through intensive horticulture. By growing "non-traditional crops", such as broccoli, snow peas, cauliflower, melon, strawberries and flowers, it is believed that peasant economies can be transformed from what is perceived as the inefficient production of subsistence crops, into viable mini-farms producing high value crops for the export market. The proposal has the added benefit, from the economic planners point of view, of providing valuable foreign exchange for Guatemala's flagging economy.

Environmentalists have condemned the development programme. The crops depend on intensive applications of fertilizers and pesticides, whose impact on the fragile upland soils have not been adequately assessed. Pesticide poisonings in the uplands have been on the increase in recent years. Evidence is accumulating that the initial high yields cannot be sustained without increasing costly chemical inputs. The crops, which depend on high applications of water, also risk depleting water tables.

Further doubts about the scheme have also been raised. Some fear that the transition from subsistence crops to store-bought food may have a negative impact on diet, as the wide variety of

crops grown in the traditional "milpa" system are replaced with a limited range of processed foods. Others doubt the wisdom of making marginal farmers dependent on the vagaries of the market, especially as the middlemen will reject any blemished crops which are not saleable to the fussy consumers in the supermarkets in the USA.⁵⁰ Making marginal farms dependent on such high overheads puts them at risk of bankruptcy with the smallest piece of bad luck. As in many other parts of the world, the result may be to accelerate the process of land concentration as peasants are forced to sell off their lands to extract themselves from debt.

Popular Demands and Government Response

Ever since the coup of 1954, the political space for land reform within Guatemala has been severely limited. The political process has become increasingly dominated by the military, who operate in a somewhat uneasy alliance with the landowning élite. On one thing, however, they are all agreed, land reform is unmentionable and its promotion is still considered tantamount to communism. The pattern of political killings that became established in the 1960s continues to this day, a fact which seriously hampers the development of alternative policies both within Government and in the public domain.

Yet the need for a change in agrarian policy in Guatemala is seen as so pressing by some sectors of the population that it continues to be advocated against all the odds. Most vociferous of the voices for change has been the *Comite de Unidad Campesina*, which was formed in the 1970s as a rural workers' union and which has remained a vital force in Guatemalan politics. Central to CUC's demands has been the need for a structural change in Guatemalan society with land reform as the key to achieving this. The same position is held by the *Unidad de Accion Sindical y Popular*, which believes that land reform is a prerequisite for democracy and peace in the country.

The Government's reaction to the calls for agrarian change, which have also been made by the various exiled and underground groups, has been to unleash terror on its own people rather than countenance political reform. From the end of the 1970s, the killing of political opponents in Guatemala has become commonplace. Death squads and disappearances are a feature of daily life. Indiscriminate counter-insurgency during the early 1980s left a terrible toll of 100,000 killed, 40,000 disappeared, 400 Indian villages destroyed and 1,000,000 peasants displaced as internal refugees. Some 200,000 Guatemalans fled the country during these years and nearly 46,000 have still to return. In this climate of fear, the popular movements' demands are now mainly limited to reestablishing basic civil rights and abolishing conscription into the militia.

Since the mid-1970s, the Catholic Church has been increasingly outspoken about the need for change in the country's social and political order. In 1988, the Bishops issued a Pastoral Letter, *The Clamour for Land*, which squarely placed the blame for much of the society's ills on skewed land distribution.

The Church demanded new land laws to secure title to those who work the land and allow its redistribution. It called for special measures to provide land to those who had been relocated or forced to flee by the civil war and for an integrated agricultural development package that would protect peasants from exploitative middlemen and provide for their direct involvement in marketing. Changes in taxation, extension pro-

grammes, technical training and credit schemes were also demanded. Above all, the Church insisted on protection for peasant organizations and respect for their human rights.⁵¹

One of the few academics prepared to speak out on the issue within Guatemala is Leopoldo Sandoval, who has repeatedly and cogently argued the need for land reform. Sandoval argues that Guatemala needs not only a redistribution of land, but the development of a new agrarian order in which cooperatives would play a key role. He believes that the promotion of effective participation by the peasantry in the taking of decisions that affect their interests is crucial for the overall democratizing of the political process.⁵² Such an integrated reform would call for changes in land tenure; systems of credit, marketing and technical assistance; the production and supply of agricultural inputs; types of agrarian enterprise; agrarian legislation; public administration and land use planning.

Sandoval puts supply of the domestic need for basic foodstuffs as a high priority. "The food security of the population requires a substantial change in the present use of land; the best arable land of Guatemala must pass from export crops towards products for internal consumption, especially for the production of food, of which there is presently a great deficit."⁵³

Sandoval has also addressed the difficult question of whether there is, indeed, enough cultivable land in Guatemala to adequately meet the needs of the rural poor. His calculations take as their guide the estimate that a family can adequately meet its needs, and cultivate on its own with traditional technology, an area of between 3.5 and 7 hectares. On this basis, Guatemala would need to redistribute between 2 million and 4.6 million hectares to provide land for all the landless unemployed over 20 years of age and secure adequate lands for those families presently with smaller plots.

Achieving such a reform might just be feasible in Guatemala, though even meeting the lower figure would imply the redistribution of most remaining public lands, calculated at 571,342 hectares, and the redistribution of about 1.5 million hectares of privately owned land. It needs to be noted that not all this public land is thought suitable for agriculture by environmentalists. The inflationary effect of such a major transformation in the agrarian economy is also a serious consideration.

The international development agencies have neither looked in such detail at the possibilities of reform nor been so outspoken about the need for it — despite rhetorical acknowledgment of the importance of land reform.

Many Guatemalans had hoped that the election of a civilian government in 1985 would bring change from within, opening the way for further democratic reforms and a commitment to finding a way out for Guatemala's poor. But if they hoped that the Christian Democrat government would initiate a programme of agrarian reform they have been disappointed. The position of the ruling minority, in the face of almost continuous resistance and discontent from the oppressed majority, is maintained by repression and brutal violence. Yet the economy of Guatemala is in deep recession and a change in development strategy is urgently needed, not just to fulfil the needs of the poor but also to promote a more dynamic internal market of goods and services. There is a growing realization, too, that the continued expansion of agro-exports at the expense of both the poor and the environment is both economically and environmentally unsustainable. The longer that Guatemala delays in bringing about change, the more painful its transition to a more balanced and stable agrarian economy will be.

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Resisting the Development Monoculture

DOMINATING KNOWLEDGE: Development, Culture and Resistance, edited by Frédérique Apffel-Marglin and Stephen A. Marglin, Clarendon Press/WIDER Studies in Development Economics, Oxford, 1990.

The last 40 years can be called the age of development. Like a towering lighthouse guiding sailors towards the coast, "development" stood as the idea which orientated emerging nations in their journey through post-War history. "Development" has provided the frame of reference for that mixture of generosity, bribery and oppression which has characterized the policies of the industrialized nations toward the Third World.

Today, the lighthouse shows cracks and is starting to crumble. Delusion and disappointment, failures and crimes have been the steady companions of development and they tell a common story: the signals from the lighthouse lead astray. Over the years, piles of technical reports have been accumulated which show that development often does not "work"; the promises have proven to be empty. Moreover, stacks of political studies have demonstrated that development is "unjust"; social polarization thrives wherever you look. The authors of this book, however, go beyond this kind of analysis: they deal neither with development as technical performance nor with development as class conflict, but with development as a particular form of knowledge.

For development is much more than just a socio-economic endeavour. It is also a perception which shapes reality, a myth which comforts societies, and a fantasy which unleashes passion. In short, it is a world-view which occupies and colonizes the mind. Since dominions which rely only on brute force generally do not last, it is probably correct to say that the essence of any power lies in its hold over people's imagination. Anyone who wants to understand the dominion of the West over the rest of the world after World War II, has to investigate the style of knowledge which is spread by development. From that point of view, development implies, first of all, a cultural clash: any intervention in its name implicitly assumes a superiority of Western outlooks over traditional certainties, just as popular resistance against development is often sustained by trust in indigenous ways of knowing.

Dominating Knowledge is a collection of essays which focus on the relationship between knowledge and power in the development process. This approach is an exception: most books which try to demystify development get stuck in the socio-economics of underdevelopment. This book, however, attempts to fly higher: it surveys the epistemological assumptions implicit in the development idea, and highlights the clash between traditional and modern knowledge in a number of highly illustrative cases. The contributions to the volume come out of several years' study on development as the epoch-specific form of Western hegemony, carried out by a group of scholars hosted by WIDER, the economic research institute of the United Nations University.

Dominating Knowledge offers many angles from which the conflict between traditional and modern ways of knowing can be observed. For instance, it is eye-opening to follow how Stephen Marglin takes apart the conventional wisdom that development, whatever else it does, at least furthers freedom by expanding choices. Tariq Banuri, in pinpointing the "impersonality postulate of modernity", brings into the open one of the hidden axioms of development which implicitly casts a shadow of inferiority on any culture. How that axiom works its way down to a village like Vadi in Maharashtra, is told by Arjun Appadurai, who shows how the increasing market integration of agriculture has unsettled the social cosmology which is lived out through the webs of personal ties in the village.

In a brilliant study on ways of dealing with small-pox, Frédérique Apffel-Marglin confronts the hardest piece of Western arrogance — medical knowledge. She throws light on forms of inoculation embedded in community rituals and religious ceremonies and illustrates what happened as extensive vaccination was introduced. Ashis Nandy and Shiv Visvanathan follow a similar track; they point to the long history of Indian responses to Western medicine which anticipated the contemporary critique of medicalization in the Northern countries. All the essays expose how development knowledge wields power by creating a style of perception which highlights selected aspects of reality and casts into oblivion indigenous modes of relating to the world.

After reading the book, one begins to suspect that it is not the failure of development which is to be feared, but its success. What would a completely developed world look like? We do not know, but most certainly it would be both boring and fraught with danger. The worldwide simplification of languages and gestures, dreams and desires turns the world into a place deprived of adventure and surprise. Moreover, as the monoculture spreads, viable alternatives to the industrial growth society are eroded. As a result, our capacity to meet an increasingly difficult future with creative responses has been crippled. In that sense, the last 40 years have considerably impoverished the potential for cultural evolution. Is it exaggerated to say that what we need most in the uncertain times to come are the knowledge and the experiences of those who have navigated without the guidance of the lighthouse called development?

Wolfgang Sachs

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A Green Epitaph?

A GREEN HISTORY OF THE WORLD, by Clive Ponting, Sinclair-Stevenson, London, 1991, £17.95 (hb), 432pp. ISBN 1-85619-050-1.

Aged 10, I could recite the names and dates of all the kings and queens of

England. At 20, having taken A-level history, I knew all about the Council of Trent and the War of Jenkin's Ear, but I had never heard of the Scottish clearances, nor of the systematic annihilation of native Tasmanians. I had only a faint idea what teak and charcoal were; and Jethro Tull was just a rock group.

Had I been shown a book like *A Green History of the World*, I might have been more knowledgeable, and more interested. Clive Ponting's book is not a parade of warring kings and contentious Popes, nor is it a panegyric upon the rise of democracy. It is a thorough exposition of how human expansion has changed the face of the Earth.

Ponting begins his book on Easter Island. In the 18th century, when Europeans first arrived on this isolated rock, they found 3000 natives, eking out a precarious cannibal existence in a scrubby landscape, devoid of trees, but littered with *Ahu*: ceremonial platforms bearing 20 foot high stone idols erected by their ancestors. These could only have been constructed by a prosperous civilization, and could only have been moved with wooden rollers: double evidence of an ample supply of trees. A congenial ecology allowed time for cultural pursuits, and clans vied with each other to erect the largest statue.

Suddenly the trees ran out. We suspect it was sudden, because many completed statues are left stranded in the quarry. As the landscape deteriorated, life became more desperate, and clans competed, not by building *Ahu*, but by toppling those of

their adversaries. Escape from the island was impossible, as there was no wood for boat-building. When the Europeans arrived, the natives did not know how, why, or by whom the *Ahu* had been erected; history was dead.

The world is a self-contained island, and humanity is now poised at that critical point at which the Easter Islanders found themselves when the deforestation threatened to become irreversible. Ponting's book describes the stages that have led us to this point: the development of agriculture, deforestation and the extermination of species, the rise and fall of civilizations as they expanded beyond sustainable limits, the establishment of European supremacy, the population explosion, the precarious affluence of the developed world, and the threat of global warming and desertification. He achieves this by assembling, in a readable sequence, an astonishing array of facts and figures.

This is no *Weltanschauung*; there are no grandiose or controversial theories. Nor is it distinguished by depth or insight, an elegant turn of phrase or discriminating wit. This is the work, not of an Oxbridge don, nor of a crusading journalist, but of a "retired" civil servant.

It is none the worse for that. Ponting's writing acquires passion through sheer weight of facts. The chapters on the extinction of species, and the extermination of native tribes, are as sad as the dead-pan recital of a list of war victims.

It acquires vitality, too, from the variety of his facts. I now know, for example, that goats killed 22 of the 33 species of

native plants on St. Helena; that the prickly-pear cactus was introduced to Australia in 1839 to provide hedges, but it refused to conform, and started creating six foot high barriers at its own discretion over an area of six million acres; that the Japanese transformed the art of war, in 1904-5, by becoming the first recorded army to lose more men to the enemy than to disease; that in 1908 there were over 250 car manufacturers in the USA, and that in 1936 General Motors, Standard Oil and Firestone "formed a new company, called National City Lines, whose purpose was to buy up alternative transport systems, and close them down. By 1956 over 100 surface rail systems in 45 cities had been purchased and closed."

All these facts would be mere environmental trivia if they were not woven into a pattern of evolution. Ponting achieves this skilfully enough. He painstakingly paints a picture of the present that is hard to deny: humanity at the apex of a historical trajectory, whose arc has been fully described in the parable of the Easter Islanders.

Were there, one wonders, any visionaries on Easter Island? Could nobody see that the trees would run out? Were there perhaps a few perceptive individuals who were dismissed by the majority as was Cassandra? Or did everyone realize, but just carry on in the same routine, knocking out statues in the quarry until the last log was consumed by termites?

Compare today. The British Conservative party, in its programme to establish a "national curriculum" for schools, has

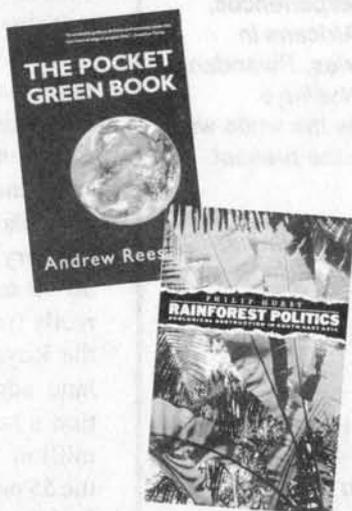
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tried to clamp down on the spread of "ideas" in the discipline of history. The teaching of history, they maintain, should consist of "facts"; a litany of dates of kings, battles and religious disputes. Clive Ponting's book consists mainly of "facts", but not, one suspects, of the kind that would be readily absorbed into the Minister of Education's academic inventory. The schemings of schismatic Popes have always been judged more important than the migrations of goatherds.

It would be encouraging to think that Ponting's book, among others, will widen the scope of history teaching, so that the coming generation will be more fully aware of the problems that face us. One fears, however, that teachers will continue to commemorate the charlatans of textbook history, just as the Easter Islanders carried on chipping away at their idols to the bitter end.

Simon Fairlie

Simon Fairlie is a stonemason, freelance writer and environmental activist based in Salisbury, England.

What To Do About Global Warming

GLOBAL WARMING: The Greenpeace Report, edited by Jeremy Leggett, Oxford University Press, Oxford and New York, 1990, £5.95 (pb), 554pp. ISBN 0-19-286119-0.

Guides to the greenhouse effect, of varying merit, now abound. At one extreme, a plethora of "popular" accounts tries (not always successfully) to present the message of global warming in terms even the scientifically illiterate can understand; at the other, a book from Cambridge University Press contains the actual scientific papers from the Intergovernmental Panel on Climate Change that were the input to last year's Second World Climate Conference. But the Greenpeace report is unique. It not only provides an overview of the scientific position, every bit as up-to-date as the IPCC report, but goes beyond any other book that I know in setting out clearly the policy responses that will be required if global warming is to be brought under control. Indeed, the dis-

ussion of policy issues occupies two-thirds of the book — which is entirely as it should be, now that the scientific consensus has been so clearly established.

The first third of the Greenpeace report explains the science behind climate change, with contributions from authors such as Stephen Schneider, Mick Kelly and George Woodwell. But all this is, in a sense, merely throat-clearing before the main presentation. Time and again, when I give talks outlining the greenhouse threat, the response from the audience is "OK, we're convinced; but what can we do about it?" This report tells you. The role of energy efficiency in curbing global warming; the contribution from motor vehicles; the mistaken propaganda over the potential for nuclear electricity; Third World issues; and much more. The names of the contributors read like an environmental roll of honour, and include Amory Lovins, Susan George, Bill Keepin and Jose Goldemberg. If you know those names, you will know, in a sense, what to expect. But you will never have seen their various messages put together more coherently within a single volume.

This, for those who seek silver linings, is the one good thing about the greenhouse threat. It provides a focus and an urgency for all those things, like energy saving, reforestation, appropriate devel-

opment help to Third World countries and "alternative" economics, that you know, in your heart, make sense anyway. Even if there were no greenhouse threat, if we did all the things this book recommends the world would be a better place.

The bottom line of the Greenpeace message is that we do, indeed, know *what* to do, and we have the required technological skills to act, if the political will is there. Why not buy a copy and send it to your local Member of Parliament?

John Gribbin

John Gribbin's own contribution to the *plethora of popular books on global warming* is *Hothouse Earth* (Black Swan, 1990).

Who Should Control the Forests?

KEEPERS OF THE FOREST: Land Management Alternatives in Southeast Asia, edited by Mark Poffenberger, Kumarian Press, West Harford, 1990, US\$24.95, 289pp.

Repeated studies of the tropical forests of Southeast Asia have shown them to be in a precarious and fast-vanishing condition. This collection of papers is no exception. It pins a large part of the blame for this ecological disaster on an intransigent adherence to a 19th century model of forest management which has proved incapable of responding sensitively to changing economic and political circumstances, and which has persistently marginalized and impoverished local peoples. State technocracies, administered by bureaucrats far from the forests, have failed dismally to manage sustainably the forest entrusted to their care.

In Indonesia, the Forest Department controls some 74 per cent of the national territory, putting it in conflict with some 30-40 million people who live in or directly from the forests. The 7,000 staff of the Royal Forestry Department in Thailand administer 40 per cent of the nation's land area, where there are some 6 million "squatters". In the Philippines, the 55 per cent of the country classified as forest reserves is inhabited by some 18 million people. The underlying thesis of

White Paradise: Hell for Africa?

by
Nsekuye Bizimana

On the basis of his experiences, and those of other Africans in industrialized countries, Rwandan ethno-veterinarian Nsekuye Bizimana shows how the white way of life contributes to the present misery of Africa.

The book is written in a simple, direct and humorous style. It was published in German in 1985, in French in 1987 and in English in 1989.

Available from Edition Humana, Grainauer Straße 13, 1000 Berlin 30, Germany

Paperback, 246pp. £8.

Keepers of the Forest is that the resulting conflict between state land management policies and local forest use systems is a major cause of deforestation in Southeast Asia.

In the face of increasing "encroachment" and deforestation, the knee-jerk response of most forestry agencies has been to reinforce state control, even, as advocated by some western conservationists, to the total exclusion of local communities. Yet this solution, by ignoring local needs and rights, only stores up more problems for the future.

The importance of this book is that it carefully, and in detail, presents the argument for an alternative approach, based on the evaluation of a large number of actual examples of both conventional and innovative systems of forest management. The first section of the book examines the evolution of conflicts of interest brought about by centralized forest management in Java, the Philippines uplands and northern Thailand.

The second and third parts describe, on the basis of concrete examples, what an alternative community-based approach actually implies in terms of changes in the way of thinking in forestry bureaucracies, in systems of land tenure and in community empowerment. The examples also present challenging conclusions: community control promotes long-term management planning; agroforestry schemes mimic biological diversity better than monocultural tree farms; recognition of tribal tenure secures protected areas.

The book may be especially appreciated because it does not make exaggerated claims. While demonstrating persuasively that the community-based approach is institutionally workable, undoubtedly meets local needs better than classical forestry and is, ecologically speaking, relatively benign, Poffenberger is careful *not* to claim that these are proven examples of sustainable resource use. Time will be the judge of that, but the book leaves us in no doubt that the community approach is preferable to the environmental degradation and social marginalization over which state forestry has presided for 200 years.

Marcus Colchester

Dr Marcus Colchester is an anthropologist. He works for the World Rainforest Movement.

BOOKS DIGEST

Books which are covered in the digest may be given full-length reviews in forthcoming issues.

- **NO LIFE WITHOUT ROOTS: *Culture and Development***, by Thierry G. Verhelst, Zed Books, London, 1990, £8.95/\$15 (pb), £29.95/\$49.95 (hb), 189pp. ISBN 0-86232-849-7.

In this important book, Verhelst critiques the ethnocentric bias of both the theory and the practice of development aid and calls for a "common commitment towards the defence of peoples' right to be different". He shows how the poor in the Third World often resist development as a "Trojan horse of Westernization". "It is not the privileged and often very Westernized minorities that carry the hope of the Third World, but the great mass of the poor, the oppressed, the exploited."

- **TINKER, TILLER, TECHNICAL CHANGE: *Technologies from the People***, edited by Matthew S. Gamsler, Helen Appleton and Nicola Carter, Intermediate Technology Publications, 103-105 Southampton Row, London, 1990, 278pp. ISBN 1-85339-061-5.

A collection of case studies showing that "technical assistance" usually fails in poor communities in the Third World, not because the people are resistant to change, but because the "experts" fail to understand the motivations of local innovators. The preface to the book begins with a sentence which should be memorized by all those working in the development industry: "The process of development assistance has to tackle the problems of ignorance, backwardness, helplessness and resistance to change — not amongst the rural poor but amongst the development agencies themselves."

- **FROM FEAST TO FAMINE: *Official Cures and Grassroots Remedies to Africa's Food Crisis***, by Bill Rau, Zed Books, London, 1991, £8.95/\$15 (pb), £29.95/\$49.95 (hb), 213pp. ISBN 0-86232-927-2.

Rau places the current crisis in Africa in its wider historical and economic perspective, and traces its origins back to the colonial exploitation of the 19th century. Rau finds grounds for optimism in the creative responses of the continent's poor, who are withdrawing from the formal market and developing innovative and informal networks of trade and production.

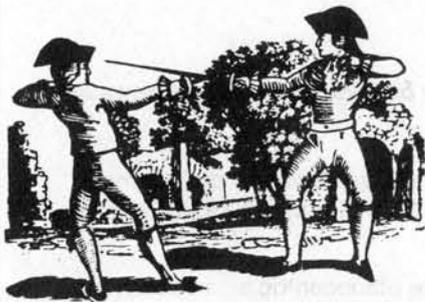
- **DEMOCRATIZING DEVELOPMENT: *The Role of Voluntary Organizations***, by John Clark, Earthscan, London, 1991, £9.95 (pb), 259pp. ISBN 1-85383-087-9.

John Clark of Oxfam gives a good overview of the changing role and growing importance of NGOs in grassroots "development work" and official policy-making. However, his call for a "structural transformation" of policies and institutions, based on the awful acronym DEPENDS (Development, Economic growth, Poverty alleviation, Equity, Natural resource base preservation, Democracy, and Social justice) is, to say the least, unconvincing.

- **GREENWAR: *Environment and Conflict***, edited by Olivia Bennett, Panos Institute, 9 White Lion Street, London, 1991, £7.95 (pb), 156pp. ISBN 1-870670-23-X.

Eleven writers from the Sahel present case studies showing how environmental degradation, famine, war, government repression and international economic policies are inextricably linked in a downward spiral of suffering. The book is especially enlightening due to its analyses of the effect of modern weapons and "development" upon traditional relations between pastoralists and settled peoples. The use of legends and proverbs, and interviews with farmers, bandits, nomads and refugees sets *Greenwar* apart from the usual development and environment literature.

Patrick McCully



Letters

Controversy Over Sea-to-Land Transfer

Dear Sir,

The article by Tim Deere-Jones ('Back to the Land: The Sea-to-Land Transfer of Radioactive Pollution', Vol. 21, No. 1, January/February 1991) raises several environmental issues relating to the nuclear power programme of the United Kingdom, in addition to sea-to-land transfer of radioactivity. All these issues have given rise to a substantial literature, and in many cases thorough investigations have evaluated the environmental risks. However, Dr Deere-Jones has chosen to refer to controversies rather than their resolution. He has covered this field by reference to only some two dozen publications, and did scant justice to the hundreds of reports and papers from universities, public enquiries, government departments and independent environmental agencies as well as the industry itself.

I will not here fall into the trap of addressing too many topics in a small space. The article includes many misrepresentations and errors of fact, and it would be tedious to your readers to refute them all here. Instead we present some aspects of the study of sea-to-land transfer in sea spray, which was, apparently, the intended main topic of Deere-Jones' article.

The investigation of this process was initiated in the late 1970s by scientists at Harwell who had observed an enrichment of many non-radioactive trace elements in sea spray over the North Sea. With no challenge from environmental pressure groups, they began an extensive study of the mechanisms involved in transport of radioactive elements in sea spray, and soon found signs that it had increased plutonium concentrations in soil in a narrow strip along the Cumbrian coast (Ameri-

cium-241 was introduced into the study a few years later). Their measurements have included seawater, beach sand and mud, sea spray in air and the deposition of sea spray, soil and vegetation. The measurements have included some hundreds of locations in Cumbria and on the other coasts of the Irish Sea. For the most part, concentrations have been so low that the most sensitive methods of sampling and analysis have been necessary to enable the radioisotopes of plutonium and ^{241}Am to be detected. From these notes, it will be evident to your readers that the scientists did not use one or two "mischosen sites" as Deere-Jones alleges, but made measurements at a wide range of locations in an attempt to ensure that representative results were obtained.

A central issue in evaluating sea-to-land transfer is the enrichment of radionuclides in sea spray, and Deere-Jones rightly draws attention to its importance. However, he did not have the benefit of access to recent publications on the topic.^{1,2} In the past, enrichments have variously been calculated using concentrations in unfiltered and in filtered seawater. Substantial enrichment has only been observed for radionuclides that are adsorbed strongly by sediment. Since a very large fraction of these radionuclides are held on suspended particles in near-shore seawater, the enrichments calculated by referring concentrations in sea spray to those in filtered seawater are much higher than those using unfiltered seawater as the basis. Thus, the very high enrichments quoted in some shoreline sea spray studies are a consequence of the method chosen for expressing results and do not imply greatly increased sea spray concentrations. Recent results improve our understanding of the influence of environmental variables on the enrichment process.³ Enrichments in sea spray measured at the shoreline are generally smaller than those measured in bubbling experiments off-shore, and the complete body of data available does not support Deere-Jones' implication of "even greater enrichment factors observed at the shoreline".

By the mid-1980s a sufficient description of the problem had been achieved to allow development of a model to begin. The programme is still continuing, with improvements both in the understanding of the mechanisms of transfer in sea spray and in their representation in the model. The recent review article by McKay and Pattenden describes the current situation. The programme has now resulted in over

30 reports and journal articles, of which Dr Deere-Jones quoted just two. As is customary in such calculations, pessimistic values of transfer parameters are included in the model where realistic values, based directly on field measurement or mechanistic understanding, are not available. Thus the results must be expected to overestimate doses to the population by an unknown amount. However the model predicts doses to the most exposed occupants of Seascale, the closest coastal community to Sellafield, of less than four per cent of the ICRP limit of 1mSv per year, even at the time of peak discharges in 1973.⁴

Yours sincerely,

J.A. Garland

Environmental Physics Group
AEA Technology
Harwell Laboratory
Oxfordshire OX11 0RA

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2. McKay, W.A., Walker, M.I. and Cloke, J. 'Transfer of Radionuclides from Sea to Land', Department of Environment Report No. DoE/RW/90.094, 1990.
3. Ibid.
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Dear Sir,

The article by Tim Deere-Jones has the superficial appearance of a scientific document, i.e. meeting certain standards of impartiality and balance in the evidence presented and the judgements. It does not attempt to achieve this, but it presents highly emotive opinions unsupported by evidence, and it makes so many errors of fact and mis-quotations that it would be boring to readers to refute them all individually. Tim Deere-Jones can, of course, hold any opinions he pleases, but to imply that they are supported by scientific evidence is misleading.

In order to redress the balance a little, a few facts may be mentioned. The principal research study of the sea-to-land transfer of artificial radioactivity in Cumbria has been undertaken since 1978 by the Harwell Laboratory, partly funded by the Department of the Environment and British Nuclear Fuels plc, later joined by the Ministry of Agriculture, Fisheries and Food. During

this investigation, well over 30 scientific reports and research papers have been published on different aspects of the subject. The main principles of the transfer mechanism are now well understood and the quantities and distribution of the various radionuclides transferred have been broadly established. Only some details need further study to complete the picture. A recent review article by McKay and Pattenden (see previous letter Reference 1) describes the present situation.

Deere-Jones makes much of the limitations of the muslin screen and high-volume air sampler techniques, which are among those used in the Harwell studies. It is true that these techniques, like all others, have their limitations. What is important is to understand the limitations of these or any other techniques used in field sampling experiments and to take account of them in the interpretation of the results obtained. The muslin screen tends not to collect small airborne particles or droplets and the air sampler tends not to collect large ones. The combination of the air sampler and deposit collector has been found to provide a good indication of the sea-to-land transfer, and core samples of soil show the deposits which have accumulated over time.

The radiation dose to the population from the radioactivity transferred from sea-to-land in Cumbria has been assessed using computer-based models by Howorth and Eggleton (see previous letter Reference 4). It is estimated that members of the "critical group" of the population received about 0.035 milliSievert per year due to transferred plutonium and americium in 1973, the peak year, and about 0.020 mSv/y in 1987. The effects of other radionuclides are much less. These dose rates must be compared with the ICRP-recommended principal limit of 1 mSv/y, and the estimated average dose to the UK population from all sources of radiation (87 per cent natural) of 2.5 mSv/y.¹ Thus the radiation doses due to the effect are insignificant.

However, from the viewpoint of environmental science, the effect is of some interest. The radionuclides have acted as tracers of a natural phenomenon which would probably not have been observed without their presence. In coastal seas with a high concentration of fine-grained particulate material suspended in the water column, some of this material gets moved to the water surface by rising bubbles, which subsequently burst and eject into the air droplets enriched in particulate. Some of these are raised by turbulence and blown overland by onshore winds, where they are

deposited on the ground and other surfaces. Thus a mechanism exists to select muds and clays in sea sediments, which are initially brought mainly from the land by river outfalls, and return them to the land. They could, for example, contribute to the transformation of dunes into fertile soils. This is an aspect of the mechanism which may interest readers of *The Ecologist*, but which was not mentioned by Deere-Jones.

Yours faithfully,

Norman Pattenden
73B Essex Street
Newbury
Berkshire RG14 6RA

Reference

1. Hughes, J.S., et al. 'Radiation Exposure of the UK Population — 1988 Review', NRPB Report R227, 1989.

Tim Deere-Jones Replies . . .

Following are some comments on the letters from Garland and Pattenden.

My article commented on the lack of study of man-made radioactivity at the inland extremes of estuarine systems. I referred to a statement from the Institute of Oceanographic Science that estuarine muds and silts were likely to contain the highest concentrations of man-made marine radioactivity. I also cited the study by the Radioactive Survey for the People of Wigtownshire where official MAFF monitoring ignored the local estuary, which at its inland extreme showed 17 times greater levels of Americium-241 than the MAFF sampling site.

In response, Garland reiterates the Atomic Energy Authority claim to have ensured that representative results were obtained. In support, he refers to sampling of a wide variety of environmental materials and sites. However, since he makes no mention of sampling of silts, muds or sea-to-land transfer at the inland extreme of estuaries, we must assume that no such work has been done and that I am justified in claiming that those areas of greatest concentration are being ignored and that the sites used are indeed "mischosen" if they are intended to give an accurate representation of potential dose rates to all coastal populations.

Garland refers to two very recent publications. From his comments it seems that the most relevant point of these new publications is the reassessment of the methods chosen for expressing results. This allows him to claim that enrichment factors in shoreline sea spray are generally smaller

than those measured in "bubbling experiments offshore". However, Garland fails to note that these "bubbling experiments" were observations of an effect created by artificially generated aerosols, not observations of natural processes.¹ Nor does he take account of the fact that enrichment factors depend upon the quantity of particulate load (and associated adsorbed radioactivity), and bubble flux in surface waters. Both particulate load and bubble flux are far greater in inshore waters and breaking surf than they are in the open seas where AEA have conducted their bubbling experiments. To attempt to compare the two sets of observations, and to suggest that bubbling experiments alone prove that open sea, offshore conditions create more potential airborne radioactivity than the natural processes on the coastal surfline is a mistake. There is still every reason to suppose that there will be greater enrichment factors at the shoreline than in the open sea.

Garland also deals with the development of computer modelling of sea-to-land transfer and the assessments of the radiological consequences and points out that where realistic values are not available, pessimistic values are included in the model. He therefore claims that the results must overestimate actual doses to the population. Although AEA may make pessimistic assumptions for those factors that they admit ignorance of, there are areas where they believe, quite wrongly, that they have the full information. For example, the inland extremes of estuarine systems — the maritime areas with the greatest potential for sea-to-land transfer — remain ignored. There will be no input (pessimistic or otherwise) for this parameter, because AEA have already stated that representative results have been obtained despite the absence of this most important information. It is quite obvious then, that modelling of sea-to-land transfer is yet in its infancy, and until such vital omissions have been remedied, any computer-derived modelling estimates should be considered with the utmost caution.

Pattenden claims that the combination of muslin screen and high volume air sampler gives a good indication of the sea-to-land transfer of radioactivity. This is simply not true. Muslin screens are considered to be "no more than 20 per cent efficient" at sampling in wind speeds of less than force five, and much less efficient in greater windspeeds, when the material stretches and porosity increases.² Pattenden offers no references to show that the inefficiency of screens has been accurately quantified

in wind speeds above or below force five. While describing how muslin screens are used for the collection of larger airborne particles and high volume air samplers to collect small particles, he omits to mention that screens are deployed in or on the surfline of an open coast, while high volume samplers are used at inland sites (frequently several miles away from the screens). Thus the devices are measuring different phenomena, at different locations. Each device has differing and unquantified inefficiency ratings. Neither device is ever situated in those estuarine environments likely to give rise to the greatest levels of sea-to-land transfer. It is certain that such a regime does detect sea-to-land transfer of radioactivity taking place, but it is equally sure that it cannot do so with anything that can justifiably be called an accurate representation of the phenomenon or the likely dose rate to coastal populations.

Pattenden also refers to the computer model and says that this model estimates a "critical group" dose rate for what he calls the "peak year" of 1973. While the mid-1970s may have been the peak period for discharges into the marine environment, it is erroneous to imply that it is the expected peak period for sea-to-land transfer of sea-borne radioactivity. For example, the peak period for Americium generation in the Irish Sea (as a result of discharges of Plutonium-241 which peaked in the 1970s) is

currently expected to be towards the end of the 21st century.³

Peak sea-to-land transfer times will depend not only on radioactivity production in the marine environment, but also on the occurrences of sediment loading, onshore wind, water column movements and storm conditions and subsequent bubble fluxes in any given sea area. Pattenden's implication that the flawed computer model estimates for dose rates for 1973 show that radiation doses due to sea-to-land transfer are insignificant, is therefore mistaken on several counts.

References

1. Walker, M.I., et al. 'Actinide Enrichment in Marine Aerosols', *Nature* 323, 6084, 11 September, 1986.
2. Pattenden et al. 'Studies of Environmental Radioactivity in Cumbria Part 5. The Magnitude and Mechanism of Enrichment of Sea Spray with Actinides in West Cumbria', Report No. R10127, AEA Research Establishment, Harwell, 1982.
3. *First Report of the House of Commons Environment Committee*, HMSO, London, 1986.

Liberation and Cubanization

Dear Sir,

In recent issues *The Ecologist* has described the way in which the FAO, World Bank, IMF and GATT have been peddling destructive policies through the impressive-sounding pronouncements of their highly-rewarded experts. All this has become thoroughly familiar to us here in New Zealand.

For some time successive New Zealand governments have followed the policies which have been formulated and sold by such groups. The policies were presented as a home-grown variety, known as Rogernomics, but are similar to those of Reaganomics or Thatcherism. It is the same wolf no matter what the clothing.

Since New Zealand is an agricultural country there has been no starvation. But we are vulnerable elsewhere, and one-third of the manufacturing sector has vanished in just three years. New Zealand had developed a degree of self-sufficiency in production, but that is now going. The debate on appropriate energy technologies was short-circuited in the late 1970s by the introduction of a 'Think Big' (borrow big) policy, and some worthwhile recycling industries have gone, not being able to compete with cheap imported goods. Much of

our collective goods (airline, shipping corporation) have been sold, and more is coming on the market. With a change of government the process has moved on further into the social field, with significant cuts in welfare payments to the poor and no increase in taxation for the wealthy despite the considerable tax concessions which they have received in the past six years. One excuse for this reprehensible behaviour is the need to placate the international financial market, since the country is up to its eyeballs in debt and the bankers look with favour on a country which maltreats its poor.

New Zealand has been well and truly caught in a debt trap (otherwise referred to as the poverty trap, and described in dependency theory). It is an old process, whereby those with excess capital inveigle a country into borrowing beyond their means and then force their policies (and an ongoing dependency on further loans) onto the unsuspecting victim.

A country cannot solve its environmental, social or economic problems unless it has control of its own policies. This must include control over trade. Here is a problem which is central to the "liberation ecology" called for in a recent *Ecologist* editorial (Vol. 21, No. 1, January/February 1991). How can indebted nations — New Zealand as well as the Third World — escape becoming "Cubanized"? To control and limit trade will be to contravene GATT, and to refuse to pay the crippling debts could bring reprisals from the wealthy nations.

There is a need for a sound theoretical understanding of both the problem and possible solutions. In New Zealand there is an excessive reliance on imported gurus and over-imaginative "new economic orders"; none of which reflects realistically the actual conditions in the country. Yet the experiences of the past and the discussions of the lessons to be drawn from these can provide the guidance required.

Will *The Ecologist* follow up its excellent series of articles on GATT, the World Bank and the FAO with an issue on "liberation ecology" and related matters (which might include summaries of dependency theory and the UNCTAD Global Negotiations as well as an exploration of the experiences of socialist governments which have faced the problems of international domination)?

Yours faithfully,
John Robinson
21 Oxford Street
Martinborough
New Zealand

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ENVIRO ASIA '91.7-10 November 1991, World Trade Centre, Singapore. Submission of camera-ready manuscript by 30th Sept. 91. For more information or clarification please contact Ms Ng Siu Wai. Tel: 380 7438 or Mr Ho Kah Keh. Tel: 380 7422, Singapore. (Fax: 65 286 5754).

Wessex Institute of Technology; Symposium on BOUNDARY ELEMENTS AND FLUID DYNAMICS, 7-9 April 1992, Southampton, UK. International Conference on COMPUTER MODELLING OF SEAS AND COASTAL REGIONS.

Southampton, UK, April 27-29, 1992. Re. information on papers please contact: Miss Sally Croucher, Computational Mechanics Institute, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO4 2AA, UK. Tel: 0703 293223 and Fax: 0703 292853.

DIARY DATES

COUNTRYSIDE RECREATION CONFERENCE. 25-27 September 1991 Umist, Manchester. Our Priceless Countryside - Should it be priced? For details contact Janet Hickling, School of Advanced Urban Studies, Rodney Lodge, Grange Road, Bristol, BS8 4EA, Tel: 0272 741117.

CONTROL OF OIL POLLUTION COURSE, 20-25 October 1991 at Warren Spring Laboratory, Stevenage, Herts. Details from Miss Caroline Little, Conf. Officer, The Institute of Petroleum, 61 Cavendish Street, London W1M 8AR, UK. Tel: 071 636 1004.

THE OTHER NUCLEAR FUEL CYCLE. Sponsored cycle ride 7-14 September 1991 from Dounreay Nuke plant to Sellafield (approx 600 miles). Further information and registration forms from: The Other Nuclear Fuel Cycle, Quarry Head, Fyvie, Turriff, Aderdeenshire AB53 8LX. Tel: 06514 809.

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