

# The Ecologist

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Mother  
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## Genetic Madness

### Fox Rabies Eradication

# ELEPHANTS AND WHALES: RESOURCES FOR WHOM?

Milton M. R. Freeman and Urs P. Kreuter

This book examines issues surrounding the management and conservation of a particular category of animal, namely the "megafauna", or the largest of the land and sea mammals. The value accorded to different biotic resources varies significantly depending upon the interests and goals of the parties undertaking the valuation, and these different perceptions often come to influence management of these species. Discussion and programmes directed toward "saving" elephants and whales are particularly instructive in this regard, as these species appeal to diverse groups for markedly different reasons.

One of the main purposes of this book is to make explicit the nature of different stakeholders' conservation perceptions and strategies in respect to these culturally important biological resources. This examination will hopefully inform ongoing discussion of such important issues as sustainable and equitable wildlife and fisheries management plans, bioregionalism, and the maintenance of biodiversity.

**Selected Contents:** Elephants and Whales as Resources from the Noosphere • Economics, Politics and Controversy over African Elephant Conservation • Western Conservation Groups and the Ivory Ban • Sustainable Wildlife Use for Community Development in Zimbabwe • Science and Trans-Science in the Whaling Debate • Whose Whale is That? Diverting the Commodity Path • Conflicting Cultural Values: Whale Tourism in Northern Norway • International Attitudes to Whales, Whaling and the Use of Whale Products: A Six-Country Survey

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# Milking Mother Nature

## An Ecofeminist Critique of rBGH

Milk is the first genetically engineered food to be sold in the United States. On 5 November 1993, the US Food and Drug Administration (FDA) approved recombinant Bovine Growth Hormone (rBGH) — known in Britain as recombinant Bovine Somatotropin (BST) — for use in dairy cattle. Bovine Growth Hormone is a natural protein made by cows; rBGH, however, is a genetically engineered, synthetic version, developed and tested in laboratories and in field trials over the past 10 years by drug and chemical companies such as Monsanto, Upjohn, Eli Lilly and American Cyanamid. Injected every 14 days into dairy cows for 200 days of a cow's 335-day lactation cycle, it increases milk production dramatically.

Supporters of rBGH argue that the hormone is a naturally occurring substance; people need milk; extra milk is needed to feed the poor in the United States and in Third World countries; and increased milk production will make farmers more competitive. None of these claims provide a valid reason for using rBGH. Starting from its injection into the cows all the way through to the production and consumption of rBGH milk, and dairy and meat products, the genetically engineered hormone has a deleterious effect on the health and well-being of humans, animals and the earth. The only entities which stand to benefit from rBGH are the industrial and governmental bureaucracies which promote it.

### Bovine Machines

In the current industrial system of factory farming, cows are production machines. Kept in a perpetual cycle of gestation and lactation, their bodies wear out quickly; a cow's life span is cut from 20 to 25 years down to five years or less. Her calves are taken away from her, often only 24 hours after birth. Some are confined in small wooden crates for their short lives of 15 weeks, during which they are fed an iron-deficient diet to obtain white rather than dark meat. When they reach the optimum weight of 330 pounds, they are slaughtered for veal. All the while, the cow's milk flows to feed humans.

Cows already overproduce milk. In 1930, the average cow in the US produced 12 pounds of milk per day; in 1988, milk production was at 39 pounds per day; with rBGH injections, it is expected to reach 49 pounds per day, four times more than "natural". Because rBGH-injected cows cannot consume and digest enough grass for hyperlactation, they have to be fed a highly concentrated diet and are not allowed to graze. More vulnerable to disease, they receive more doses of antibiotics. For instance, mastitis, a bacterial infection leading to painful inflammation of the udder, increases with the use of rBGH, and both pus and antibiotic residues can pass into the milk. Cows injected with rBGH also have an increased incidence of foot and leg ailments, persistent body sores and lacerations, digestive disorders and higher body temperatures. Many farmers are already suspicious of the fact that Monsanto gives a veterinary service voucher of over \$100 with every initial order of Posilac, its brand name for rBGH.

Minnesota dairy farmer John Kurtz, who participated in a

three-and-a-half-year study on the effects of rBGH, commented that although milk production increased 18 per cent during the first lactation of cows injected with rBGH, none of the cows stayed in the herd after the second lactation because none of them conceived and 24 per cent died. rBGH-injected cows are also at greater risk of developing Bovine Spongiform Encephalopathy (BSE), commonly known as "mad cow disease", since the energy-dense food that rBGH-injected cows require often contains BSE-infected meat and bone meal.

### Implications for Human Health

Although both Monsanto and the US FDA claim that laboratory tests cannot find traces of rBGH in milk products, and that no effects of rBGH's impact on cows can be transmitted to humans, many questions still remain.

Cows injected with rBGH produce much more IGF-1, an insulin-like growth factor. The molecular structure of IGF-1 is the same in humans as in cows, increasing the likelihood of its transmission through cow milk and meat consumption. In humans, IGF-1 causes acromegaly, a disease characterized by the abnormal enlargement of the hands, feet, nose and chin. Increased levels of IGF-1 have also been linked to colon tumours and cancer, particularly breast cancer in women. According to Dr Samuel Epstein, Professor of Occupational and Environmental Medicine at the University of Illinois-Chicago, "IGF-1 is a growth factor for human breast cells, maintaining their malignancy, progression, and invasiveness." Transmission of IGF-1 from cows to humans is made even more likely by the fact that 40 per cent of the beef used to make hamburgers comes from "spent" dairy cows.

In February 1994, fast-food multinationals McDonalds and Pizza Hut announced that they would use rBGH-produced milk and meat products. This will have particular impact on the poor and working classes who do not have the economic "freedom" to "choose" organic foods — and thus on a disproportionate number of women, women-headed households, people of colour and children. People of every class and race frequent fast-food chains; but such outlets are often the *only* restaurants in small or rural communities, while in urban centres, they provide quick meals to single-parent and working families.

Several school lunch programmes have chosen to boycott rBGH milk products, because growing children are more vulnerable to hormones and chemicals than adults. An early onset of puberty is thought to be caused by the increased general use of hormones in Western societies, and girls who menstruate before the age of 12 are at a higher risk of contracting breast cancer later in life.

### Solving World Hunger?

Advocates of rBGH claim that higher milk output will increase the amount of food available worldwide. The genetically engineered hormone has already been licensed for sale

in Brazil, Mexico and South Africa, while field trials are underway in Argentina, China, Egypt, India, Malaysia, Pakistan, Tunisia, Zambia and Zimbabwe. But introducing rBGH in these countries and advocating increases in milk production may supplant cheaper, more traditional sources of food.

Many people worldwide cannot, in fact, digest cows' milk because of lactose intolerance. Moreover, the steady aggregate surplus of milk and butter for the past decade has not increased its availability to the poor. Such facts indicate that physical scarcity of milk is not a factor in world hunger.

The use of rBGH may even increase such hunger and the structures supporting it. Excessive animal consumption, as is predominant in many Western diets, is already a "protein factory in reverse." A single acre can feed 20 times as many people eating a vegetarian diet than it can feed people eating an animal-based diet. In the US, animals are fed over 80 per cent of the corn grown in the country, and over 95 per cent of the oats. This practice of feeding livestock rather than people means that less food is available for people. Already many developing countries are growing cash crops, rather than subsistence crops, leading to shortages of domestic food.

## Loss of Small Farmers

It is estimated that dairy farm income in the US will drop \$1.3 billion over the next six years because of the use of rBGH. By the turn of the century, annual losses due to the growth hormone will climb to \$546 million. Up to 30 per cent of dairy farmers may be forced out of business within three years of its legalization, a loss which will be felt not only by dairy farmers, but by entire rural communities. For each dairy farmer who goes out of business, 25 dairy-related jobs are lost.

rBGH drives small farmers out of business because of the cost of buying the hormone, the higher cost of specialized feed, and the cost of "burning out" the cows. Whereas agribusinesses, whose herds often number between 5,000 and 10,000 cows, can afford to purchase "high energy" feed in bulk, small farmers cannot. Moreover, a three per cent surplus in milk production can mean a 30 per cent decrease in the price the farmer gets, since US farmers who produce more than they did the previous year are taxed extra for overproduction.

Farmers who reject rBGH, however, are depicted by the "experts" as less sophisticated and "behind the times". Ironically, their reluctance to "adapt to technology" is seen as hastening the bankruptcy of small family farms, and the domination of large-scale, corporate agribusiness.

## Consumers Reject rBGH

An increase in milk production will not reduce costs for the consumer. The US government already spends \$1 billion annually to purchase surplus milk supplies in the form of butter. The milk support programme is estimated to have risen by at least \$65 million in 1994 alone, and is set to increase another \$116 million in fiscal year 1995. Taxpayers will pay these costs, while the drug companies profit. Moreover, 11 consumer surveys show that consumers do not want to buy milk produced with rBGH.

Opinion poll research has also revealed that consumers would not purchase products developed with a "growth hormone". Accordingly, chemical companies and research laboratories prefer to call rBGH Somatotropin or, when pressured, Bovine Somatotropin. The manufacturers' refusal to name their product for what it is is illustrated in their battle

against labelling. Consumer groups, worried about the possible human health effects of rBGH, have repeatedly requested labelling of dairy products that are rBGH-free. rBGH advocates claim that labelling will:

"have the inherent effect of causing consumers to believe that such [rBGH] products are different from and inferior to milk products from unsupplemented cows."

Monsanto has filed a lawsuit against two dairy cooperatives which label their products rBGH-free, claiming that this declaration is unfair slander against the company. It maintains that because laboratory tests cannot tell the difference between milk that is produced using rBGH and milk that is not, labelling does not tell consumers anything significant.

Consumers are right, however, to be reluctant to trust the authorities. The fact that bureaucracy, government and corporations tend to prefer profits over public accountability, health and safety can be seen from the Occupational Safety and Health Administration's assurances to US steel workers that asbestos was safe despite proven evidence linking asbestos exposure to cancer; the FDA's approval of DES, a drug given to pregnant women to prevent miscarriage but which is associated with an increased incidence of uterine and ovarian cancer among their daughters and testicular cancer among their sons; and the placing of high voltage power lines in farmers' fields, despite protests and later findings linking electromagnetic fields with cancer.

## Technology and Motherhood

Underlying the use of rBGH and other forms of biotechnology is the belief that not only must science "improve" upon nature, but that nature can and must be controlled. It is no coincidence that cows' milk is one of the first instances of biotechnological intervention: the cow, in her cycles of gestation and lactation, embodies the maternal and the "natural".

In both humans and cattle, motherhood is seen as a proper and necessary site for scientific intervention. Mothers are often told that their milk is not "good enough" for their infants so that special supplements must be given. White or wealthy mothers are induced to use reproductive technologies such as *in-vitro* fertilization and Caesarean deliveries; women of colour and poor women are subjected to compulsory sterilizations and unsafe contraceptive technologies such as Depo-Provera, Norplant® or the intrauterine device (IUD).

## Coalitions Against Oppression

An ecofeminist critique of rBGH which analyses the intersecting oppressions of humans, animals and the environment shows that the health and well-being of animals, people — in particular, farmers, women, people of colour, children, the poor and the world's hungry — and the environment are all interdependent and connected within a simple glass of milk. rBGH offers an excellent opportunity to build coalitions among those concerned with animal welfare, human health, social justice, sustainable agriculture, neo-colonialism in the Third World, consumer issues and the environment. Together, these groups can uncover the harmful and fundamentally unsustainable assumptions of the biotechnology industry and our troubled relationship with nature itself.

Greta Gaard

Greta Gaard is Associate Professor of English and Women's Studies at the University of Minnesota at Duluth.

# Ten-to-One Against Costing People's Lives for Climate Change

Just how much is a human life worth? According to one recent report by German economist Samuel Fankhauser, a person living in an industrialized country such as the United States is worth \$1.5 million, a Russian \$300,000, while an inhabitant of China or Africa is valued at \$150,000, ten times less than the US citizen.

Throughout his paper, *Global Warming Damage Costs: Some Monetary Estimates*, Fankhauser assigns the richer people in the North, together with their land, their wetlands, and their endangered plant and animal species, a value ten times that allocated to the poor in the South. Fankhauser claims that he is not ascribing moral worth to human life:

"This of course does not mean that the life of, say, a Chinese is worth less than that of an EC citizen. It merely reflects the willingness to pay for increased safety (a lower mortality risk) is higher in developed countries."

But his acceptance of "willingness to pay" as a criterion for political decision-making makes this distinction sophistical.

Fankhauser is by no means a lone economist making controversial calculations. The UN Framework Convention on Climate Change (the Climate Convention), signed at the 1992 UNCED "Earth Summit", includes a clause which states that precautionary measures should be taken in response to climate change — and that these measures should be cost-effective. Fankhauser is one of seven economists co-authoring an assessment of the "social costs" of climate change which is intended to assist UN climate change negotiators in "allocating responsibilities" under the Climate Change Convention. Fankhauser's paper was commissioned by the UK government-financed Centre for Social and Economic Research of the Global Environment (C-SERGE), headed by "green economist" David Pearce, former environmental adviser to Prime Minister Margaret Thatcher and convening lead author of the social costs assessment. The assessment is due for publication in the second half of 1995, but revised drafts are being circulated to governments for comment prior to a meeting of the Conference of the Parties (COP) to the Climate Convention, which gathers for the first time in March 1995 in Berlin.

## The Economics of Genocide

It is the attempt to determine whether or not mitigation measures are "cost-effective" that has generated the loudest outcry in the South, though not yet in the North.

Although Fankhauser's paper is the most controversial of the seven papers under review, all of them form part of a growing consensus within the world's richest countries to use cost-benefit analysis to minimize enforcement measures agreed to in the Climate Convention. All put forward the same basic argument: that income determines whether human, plant and animal lives have "value" — and "value" determines what action should be taken. This "rights by income" approach means that those countries with higher incomes will continue to determine what action, if any, will be taken to halt the effects of climate change, while the poorest countries will suffer disproportionate consequences.

The economists who have embraced this cost-benefit approach acknowledge that, as a result of growing greenhouse

gas emissions, there will be an increase, by some estimates, of tens of millions of deaths by the middle of next century, a growing tide of disease, hunger, dislocation and other hardships, particularly in poorer countries. But, they argue, these will cost less overall than curtailing our fossil fuel habits. Besides, they rationalize, just think how many hungry people could be fed with the money saved! Indeed, some economists, such as Yale economist William Nordhaus, go so far as to argue that the richer nations could profitably adapt to global warming. Such claims are now being used to add much-needed substance to the less-than-weighty arguments of the oil and coal industries which have been saying for quite some time now, "Let's wait and see".

Critics charge all authors, to varying degrees, with using a methodology that is deeply flawed to reach conclusions which are dangerously elitist. For example, Fankhauser calculates that 229,545 extra deaths will result from a global doubling of carbon dioxide levels within the next 25 to 50 years, an "insignificant" figure in comparison to the 10 million people that presently die of starvation every year. Yet his figure is an extrapolation of data generated by the US Environmental Protection Agency (EPA) — data which applies only to the US and tends to regard phenomena like heat-induced deaths and hurricane casualties as the major kinds of mortality caused by climate change. Climate-related deaths due to crop failure and starvation — by far the single largest anticipated cause of death in the Third World — are not included in EPA data. Neither Fankhauser nor any of the other economic studies determining the social costs of climate change consider this likely loss of human life in the Third World.

Yet extrapolation from present data suggests that in developing countries, there might be a total additional mortality of between 135 million and 900 million people if levels of carbon dioxide in the earth's atmosphere double, as anticipated, by the year 2030. Some scientists argue that an increasing scarcity of freshwater due to increasing temperatures could catapult the number of the dead due to climate change into the billions. For example, according to the results of a study published in *Nature* in January 1994, people in tropical and subtropical countries are likely to face more starvation and malnutrition than ever before in a warmer climate, despite the best efforts of farmers to counter the effects of rising temperatures on their harvests.

The economists' logic is thus highly selective. Aubrey Meyer, coordinator of the London-based Global Commons Institute, concludes:

"The global cost-benefit analysis now being prepared by these economists is certainly deluded, but also sinister on a scale without precedent. It is the economics of genocide."

## International Concern

These economists' reports represent the latest move in an arcane and highly technical power struggle in which the interests of the oil, gas, coal and automobile industries, and of Northern countries, are pitted against those of the rest of the world. The battle revolves around the bitter irony that

while the US and other Northern countries top the list of leading greenhouse gas emitters, it is the Southern countries — whose citizens contribute less than 30 percent of all greenhouse gases — which are predicted to suffer the most serious consequences.

Scientific concern about these consequences began to emerge as public policy with the publication of the first report by the Intergovernmental Panel on Climate Change (IPCC), under the sponsorship of the United Nations Environment Programme and the World Meteorological Organization, in January 1990. That report — written after a survey of the international scientific literature — stated, unequivocally, that human-induced changes in the global climate had begun. To avert possibly catastrophic changes on a global scale and to stabilize the rapidly-escalating concentrations of greenhouse gases in the earth's atmosphere, the IPCC advised an immediate reduction in carbon dioxide output of between 60 and 80 percent. Without this cut, it predicted that mean surface temperature would rise by 1.5°C to 4.5°C within the next century, ushering in unprecedented changes in the biosphere. (A comparable shift in temperature over a much longer time-span brought on the last Ice Age 18,000 years ago.)

There was, however, an element of uncertainty in the IPCC report: because climate change involved so many unpredictable and interactive factors — such as the impact of a volcanic eruption on cloud cover, or the interaction between methane given off by cattle and the carbon-absorbing grasses they feed on — scientific accuracy in determining when or how climate change would occur was, to all intents and purposes, impossible. Nevertheless, recent data confirm the report's view that climate change has already started:

- The eight hottest years on record have occurred since 1980;
- The number of forest fires in the 1980s, many of which were linked to higher temperatures, was greater than in any other decade of the century (see pp.220ff, *this issue*);
- Coral reefs are dying as ocean temperatures rise.

Significantly, insurance claims for natural disasters linked to the weather have jumped recently, driving several major companies out of business.

Nevertheless, the oil, coal, chemical and auto manufacturing industries seem to hold stronger sway over most Northern governments, including the US Administration, than does the IPCC. For example, one year after President Bill Clinton signed the climate change declaration on behalf of the United States (President Bush had earlier refused to sign), the administration admitted that the US was not going to be able to meet even the levels it had set for itself — reducing emissions of greenhouse gases to 1990 levels by the year 2000 — a reduction far smaller than that recommended by the IPCC. Instead, it asked industry to continue emissions reductions voluntarily.

Meanwhile, according to Greenpeace, US power companies are proposing to increase power plant capacity by 20 percent over the next 20 years, adding over 160,000 megawatts, 85 per cent of which will come from fossil fuels — a clear message to the Clinton Administration that industry will ignore both national and international pleas for voluntary action to curb greenhouse gas emissions.

## Countering Science with Economics

The implications of the first IPCC report for the future of fossil-fuel based industrial development in the North were

extremely serious. Within a matter of weeks industry had begun to marshal its response. Although a few maverick scientists rapidly gained a reputation on the lecture circuit by asserting that the greenhouse effect was a myth, most of those supporting a "business as usual" approach argued for "adaptation" to climatic conditions which they admitted might be changing.

William Nordhaus, professor of economics at Yale University, was the first to try to supplant scientific concern with economic scepticism. In February 1990, a month after the publication of the IPCC report, he announced to the annual meeting of the American Association for the Advancement of Science (AAAS) that no economic data existed to support immediate action on climate change:

"Those who argue for stronger measures to slow greenhouse warming have reached their conclusion without any discernible analysis of the costs and benefits of climatic change or control strategies. Indeed, as of early 1990, there exist no reasonably complete studies comparing the costs and benefits of different approaches to the greenhouse effect."

Over the last four years, Nordhaus and a number of other neoclassical economists, such as Pearce and Fankhauser, have taken centre stage in the debate, quoting statistics which they claim are harder and more "factual" than the climatologists' ones — and which more often than not suggest that it is cheaper to wait and adapt to climate change than it is to stop causing it.

Their views, predictably, have been adopted by the fossil-fuel industry and now appear to be gaining influence at the UN level. Nordhaus has established himself as the most outspoken proponent of this so-called "adaptationist" camp. His claims that the economic effects of climate change on the US over the next 100 years will be "negligible" are quoted widely in the media:

"My best guess, surprise-free scenarios show that in 100 years, in high income countries, the impact of climate change will be negligible, in the aggregate. The winners will be happy; the losers will be miserable."

By "happy", Nordhaus has explained he means that the "winners" will have accumulated those things which have "human value" — things people pay for — "such as education, food, whether they ski or not, whether they camp or not." As for things which are largely external to the marketplace, like coral reefs and forests, these are without "human value" because, says Nordhaus, economists can "not impute value to what coral reefs feel."

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To scientists who warn that climate changes will proceed unpredictably with devastating consequences for the US agricultural sector, Nordhaus answers that most farmers will rise to the occasion and develop new strains of "superwheat." Besides, he notes, the agricultural sector represents less than three per cent of the US Gross National Product.

## Offensive Logic

Samuel Fankhauser's contributions to the debate broadly endorse those of Nordhaus. His report credits Nordhaus, amongst other economists, "for comments and suggestions". Nordhaus in turn commends Fankhauser for doing "good work". Nordhaus admits (like Fankhauser himself) that "estimates on the value of human life are pure speculation", but he does not consider that this invalidates the exercise.

Another prominent economist involved in the assessment of the social costs of climate change is William Cline, author of the 1992 book, *The Economics of Climate Change*. Cline does not differ with Fankhauser on the varying values given to human life:

"A statistical value of human life is based on what kind of wages humans will accept for dangerous work. If you use a single value across all countries — say \$3,000,000 for one human life — you will get strange results where the GNP is very low in countries like India. One human life would be an extremely high percentage of the GNP. It's a logical *non sequitur*."

Southern NGOs and economists who met in Nairobi in July 1994 were aghast at the Fankhauser document. Argentinian economist Graciela Chichilnisky argued that any "rights by

income", such as that implied in the Fankhauser document, should be moderated by concurrent responsibilities for the impacts associated with the generation of that income. Atiq Rahman, director of the Bangladeshi Institute for Advanced Studies, asserted that such policies would make "climate refugees" of most Bangladeshis. Although the Nairobi meeting was part of the preparation for the publication of the IPCC's *Second Assessment Report* in late 1995, none of the Northern economists working on the cost-benefit analysis of climate change were there to witness the outcry their calculations had generated.

The work of Fankhauser, Cline and others is being put forward by interested parties as a sophisticated intellectual rationale which downplays the immense, and perhaps incalculable, destructiveness of climate change, a threat whose ultimate consequences are as yet unknown. Whether their cost-benefit approach survives in its present, discriminatory form will depend on whether the voice of the South prevails at the Conference of the Parties. If the economics of genocide are to be frustrated, the scientific shortcomings of the IPCC economists, and more importantly, their morally-offensive "logic" need urgently to be exposed. Otherwise the world, and more specifically the poorer two-thirds of the world, will have to suffer the consequences.

Daphne Wysham

Daphne Wysham is a research fellow at the Institute for Policy Studies in Washington, DC, and coordinator of the Women's Power Project.

A letter protesting against the discriminatory economic approach of the IPCC economists is being circulated by The Global Commons Institute, 42 Windsor Road, London NW2 5DS [Fax: +44 (0)81 830 2366. E-mail: saveforests@gn.apc.org]. The letter is open for signature until the Conference of the Parties in April 1995.

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# Genetic Madness

## The European Rabies Eradication Programme

by

Ruth McNally

*Using a genetically engineered, live vaccine targeted at foxes, the European Community plans to try to eradicate rabies. Analysis of the vaccine's field trials — the largest authorized release of genetically engineered organisms to date — suggests, however, that use of the vaccine may pose more risks to the health of animals and humans than fox rabies itself.*

Rabies has always been feared. Known in medieval times as the "incurable wound", the disease is invariably fatal in humans once the virus reaches the brain. Because human infection is predominantly caused by a bite from a rabid animal — human-to-human transmission has never been documented — several countries, including Britain, have adopted stringent controls over the movement of live animals.<sup>1</sup>

However, with the creation of the Single Market at the end of 1992 which established freedom of movement of goods, services, people and capital between the 12 member states of the European Community (EC), quarantine and veterinary checks began to be seen as restrictions on free trade in animals. For cattle, pigs, sheep and goats entering Britain from other EC countries, the 21-day quarantine requirement for foot-and-mouth disease was lifted in 1992, while routine, point-of-entry veterinary checks of livestock were abandoned in 1993.<sup>2</sup>

It is feared, however, that the movement of pets accompanying their owners "moving freely" throughout the Community will spread rabies from the EC countries where the disease is endemic — France, Germany, Belgium and Luxembourg — to other, rabies-free member states. In Britain, the building of the Channel Tunnel has provoked, in the words of a British Member of the European Parliament:

"nightmare visions of foreign hordes of rabid rats, bats and foxes scuttling down the Channel Tunnel to spread pestilence and horrid death throughout the sceptred isle".<sup>3</sup>

Ruth McNally is a director of Bio-Information (International) Limited and a postgraduate of the University of the West of England.



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In response to such concerns, barrages and traps have been set up in the Tunnel, while, instead of quarantine, a system of rabies vaccination and "foolproof" certification (electronic identity chips inserted into an animal) is proposed for pets travelling from one EC country to another.<sup>4</sup> Vaccination with an inactivated rabies virus vaccine is also proposed for livestock. But pride of place in the EC rabies policy lies with a programme to create a rabies-free Europe.

### Fox Control

In Asia, Africa and parts of Latin America, the major reservoir for human rabies is dogs and cats, but in countries which have attempted to control the disease, wild animals have become the main source of human, pet and livestock infection. In the EC, the main rabies reservoir is the

red fox (*Vulpes vulpes*) which accounts for between 70 and 80 per cent of all reported cases.<sup>5</sup>

Rabies has been controlled in Europe by culling foxes. Crude estimates suggest that at least one and a quarter million foxes are killed annually in rabies control programmes.<sup>6</sup> However, on 24 July 1989, the European Council opted to eradicate the disease by immunizing wild foxes with oral anti-rabies vaccines.<sup>7</sup>

There have been several random vaccination programmes of wild foxes in Europe since 1978 using a live but weakened rabies virus contained in bait dropped from the air. The programmes have been criticized for several reasons, not least because the vaccine, although innocuous to foxes, can be pathogenic to non-target species, such as voles, mice and other small rodents, hedgehogs, badgers, wild boars, birds and pine martens, which also eat the bait and spread the virus.<sup>8</sup>

### Genetically Engineered Vaccine

Through genetic engineering, a new vaccine against rabies, V-RG, has been created, manufactured by the French company, Rhone Merieux. V-RG was developed in the early 1980s by researchers from the Wistar Institute, the first independent US biomedical research organization; the Laboratoire de Virologie in Strasbourg; and Transgene, a French company formed by one of these researchers. In 1984, Transgene obtained a patent on the vaccine, subsequently selling the rights to it to Rhone Merieux, one of the world's largest manufacturers of animal biologi

cal pharmaceuticals. In 1993, Rhone Merieux was seeking a product licence for V-RG in the United States.

V-RG's base is not the rabies virus but vaccinia, a virus of unknown origin which is not found outside vaccine institutes and research laboratories.<sup>9</sup> The vaccine is engineered by inserting a gene from the rabies virus into the genome of the vaccinia virus.<sup>10</sup> The resultant recombinant, living vaccinia virus — V-RG — expresses the rabies glycoprotein G (a part of the rabies virus's outer coating). When a fox is infected with V-RG, the vaccinia virus should replicate and express rabies glycoprotein G, stimulating the fox to develop immunity against the rabies virus.

Initial field trials of V-RG took place in Belgium in 1987 and 1988 when the genetically engineered vaccine, encapsulated in a plastic phial enclosed in an edible bait, was distributed by hand. In subsequent wider trials in Belgium and France in 1989-1990 and in Belgium alone in 1992, between 15 and 30 baits per square kilometre (km<sup>2</sup>) were dropped by helicopter over sites up to 42,000 km<sup>2</sup> in area. In total, between 1987 and 1992, an estimated 882,450 baits were dropped in Belgium and France, each bait containing one hundred million of the recombinant viruses. These experiments are the largest authorized open field releases of genetically engineered organisms anywhere in the world, both in terms of geographical area and numbers of organisms.

## Environmental Impact Assessment

The 1989-1990 and 1992 V-RG field trials were funded by the European Commission's Biotechnology Action Programme (BAP) and Biotechnology Research and Innovation for Development and Growth in Europe (BRIDGE). Several fundamental flaws mar the environmental impact assessment; these relate to the vaccine's efficacy, pathogenicity, containment, genetic stability, health risks, as well as the assessment's risk-benefit and cost-benefit analyses.

### • Efficacy

In the pre-release studies, the effectiveness of the genetically engineered vaccine was measured by giving captive foxes bait containing V-RG and then testing blood samples for the presence of antibodies against rabies. Those foxes found

to be seropositive were exposed to a rabies virus to test their resistance to infection and disease.

In these studies, when bait uptake was 100 per cent, 83 per cent of the foxes seroconverted; of these, 89 per cent were resistant to rabies, indicating an overall level of effective immunity of 74 per cent.<sup>11</sup>

In order to eradicate fox rabies in the rural areas of the field trials, however, the level of effective immunity would need to be at least 80 per cent.<sup>12</sup> Nor can it be assumed that in the wild, all the foxes will eat the bait. In fact, in the 1989-90 field trials in France, only 30 out of 59 foxes (51 per cent) tested were seropositive for anti-rabies antibodies.<sup>13</sup>

In the 1989-1990 Belgian field trials, researchers abandoned measuring antibody levels as a measure of vaccine efficacy because a sample 26 foxes from the test site were found dead, either shot by hunters or through "natural causes"; the blood samples from the dead animals were of poor quality and the data difficult to interpret.<sup>14</sup> The researchers turned instead to two other measures of V-RG's efficacy: evidence of bait uptake, and the number of reported rabies cases among wild and domestic animals in the treated area.

Bait uptake was detected by adding tetracycline to the bait to act as a "biomarker"; it could be detected in the jaw bones of animals which had eaten the bait. During the 1989-1990 Belgian field trials, the level of bait uptake among a sample of 188 foxes (only 0.04 per cent of the presumed number of foxes in the test zone) was estimated at 71 per cent, again lower than that required to eradicate fox rabies.<sup>15</sup>

In any case, using evidence of bait uptake to assess the vaccine's effectiveness assumes that all the foxes which eat the bait become immunized, an assumption which would tend to inflate the estimated efficacy of the vaccine by at least 11 per cent.

Moreover, of the 10 rabid foxes that were collected, six had eaten the bait. This result could be interpreted either as a weakness in using evidence of bait uptake as a proxy for immunity, or a failure of the vaccine. The researchers, however, maintained that the vaccine was effective in pre-release studies, and concluded that the rabid foxes must have been incubating rabies at the time of vaccination.<sup>16</sup> If unfavourable field trial results are discounted in favour of pre-

release results, why do open-field releases at all?

The researchers also argued that V-RG was effective in reducing the incidence of fox rabies in the 1989-90 target area in Belgium by citing a decline in the number of notified cases of rabies in cattle and sheep. However, other factors may also account for this decline:

### — Other vaccination programmes

In recent years, an existing, non-genetically engineered vaccine against rabies was also used in the Belgian province of Luxembourg, making it difficult to separate its effects from those of V-RG.

### — Culling

The number of foxes culled is not indicated in the data assessing the effects of V-RG. As the test zones were chosen because of their high incidence of fox rabies, it is unlikely that culling of foxes ceased altogether during the test period.

### — Cycles

The incidence of animal rabies in Belgium is cyclical with a mean period of four years. Data assessing the impact of V-RG does not seem to have taken this into account.

Indeed, recent data suggest that rabies is again spreading in Belgium, which is indicative of yet another obstacle to the eradication of rabies through fox immunization — the fecundity of foxes. A female fox has an average of four to five cubs per year, and each fox has a life expectancy of 1 1/2 to 2 1/2 years. To maintain adequate levels of herd immunity, almost all foxes would have to be immunized at as young an age as possible. This would entail dropping the vaccine-containing bait repeatedly (at least annually).<sup>17</sup> But even that would be insufficient to immunize most young foxes: in the trials, only an estimated 49 per cent of the juvenile foxes collected from the site had eaten the bait. This is probably because young foxes tend to stay in the immediate surroundings of the breeding den and are less likely to consume randomly distributed baits.

### • Pathogenicity

Although V-RG is intended for foxes, it can still be consumed by or transmitted to other animals, including humans, for whom the effects may not be the same as in foxes. The vaccinia virus is harmless to most people — it was used extensively by

WHO in its campaign to eradicate smallpox because vaccinia resembles variola, the virus which causes smallpox — but it can still cause illness and even death in some susceptible individuals. Accidental infection with vaccinia can lead to impaired vision, eczema, and neurological complications including encephalopathy, encephalitis or encephalomyelitis among babies and young children. Patients with deficient immune systems can develop complications including a rash known as “progressive vaccinia”. Between 1951 and 1960, eight cases of progressive vaccinia were reported in England and Wales after five million vaccinations; seven of the people died.<sup>18</sup> Although this is not a high incidence, many more people worldwide now have compromised immune systems than ten years ago. A relationship has also been observed between vaccination with live vaccinia virus and subsequent AIDS in a previously asymptomatic person.<sup>19</sup>

Significantly, the US Department of Agriculture has concluded that the safety of the experimental genetically engineered rabies vaccine in humans is unknown.<sup>20</sup> Although post-mortem examinations of several wild animal species exposed to V-RG did not reveal signs of pox lesions, virologists have warned that “it would be unwise to draw conclusions about human virulence from observations on experimental animals”.<sup>21</sup> The Belgian V-RG researchers, however, have stated that “the modified virus [V-RG] is safe both for the target and relevant non-target species” and that “no human risk is associated with the use of the modified virus”.<sup>22</sup>

#### • Containment

Researchers claim that “the modified virus is poorly transmitted from an animal to the other in a given ecosystem and does not spread”.<sup>23</sup> However, during the smallpox vaccination campaign, the vaccinia virus was transmitted from vaccinated humans to non-

vaccinated humans. It has also spread from vaccinated humans to other animals, for example, dairy cows, and subsequently spread within herds. Animals infected with vaccinia may spread the infection to humans, as happened in El Salvador when some 22 farmworkers were infected by cows.<sup>24</sup>

Vaccinia is generally considered to be a virus which cannot become established outside the laboratory. In India, however, a virus believed to be a variant of vaccinia used in the smallpox eradication programme has become established in buffaloes, causing a kind of buffalopox.

The genetically engineered version of the vaccinia virus may also be transmissible. Indeed, transmission of a recombinant vaccinia virus allegedly occurred in 1986 when the US Wistar Institute illegally

tested the genetically engineered rabies vaccine manufactured by Rhone Merieux on cattle in Argentina.<sup>25</sup> Some of the 17 people exposed to the inoculated animals — workers at the experimental farm where the test took place were allowed to take milk from inoculated cows<sup>26</sup> — are reported to have subsequently developed antibodies against the rabies virus.

Given the uncontrollable transmission of vaccinia from host to host and from species to species, its selection as the vector for large-scale random vaccination programmes of wild animals is highly questionable, especially since it has a broad host range itself — principally humans but also rodents, the major livestock species such as cattle, sheep, pigs, camels and buffaloes, and rabbits, elephants and monkeys. Because of this broad range of hosts, the researchers’ claim that “the genetic engineering of the virus has not changed its species specificity” is scarcely reassuring,<sup>27</sup> nor their hope that the recombinant virus may be a candidate for the large-scale vaccination of feral or domestic animals other than foxes.<sup>28</sup>

#### • Genetic Stability

Researchers also claim that “the modified virus is genetically stable”,<sup>29</sup> that is that it will not spontaneously mutate, or recombine with another virus or with the genetic material of its host.

In the process of genetic recombination, one molecule of DNA is exchanged with another. The more similar two genetic molecules or genomes are, the more likely they are to recombine or hybridize with each other.

Vaccinia is only one of a group of related orthopoxviruses, other examples of which are variola (the smallpox virus), cowpox, monkeypox, camelpox, raccoonpox, gerbilpox, (taterapox) and mousepox (infectious ectromelia). These principal orthopoxviruses have been given the status of “species”. The structure and replication of all orthopoxviruses is

*Quarantine for animals coming to Britain from abroad was introduced in 1901. Aside from an outbreak of rabies from 1918-1922, thought to have been caused by a dog or dogs brought in illegally by servicemen returning from the First World War, and two isolated cases of rabies in 1969 and 1970, Britain has remained rabies-free. Today, cats and dogs coming into the country have to be kept in quarantine for six months.*

essentially the same. No species-specific neutralizing antibodies have been found,<sup>30</sup> and there is extensive cross-hybridization between DNA fragments of the various species, clearly observed in the laboratory where orthopoxviruses hybridize with each other readily.<sup>31</sup>

The wide range of animals which can act as hosts to vaccinia, moreover, overlap with the host ranges of cowpox, monkeypox, camelpox, variola and ectromelia. Thus V-RG could be consumed by or transmitted to animals harbouring another virus with a similar structure to that of vaccinia. Genetic hybridization or recombination between the viruses might create a new hybrid virus which could spread undetected through wildlife or cross into domestic species.

A particular risk is posed by the cowpox virus of which the most commonly reported host is, in fact, the domestic cat. Cowpox may also be maintained in small wild mammals without causing the disease in them. V-RG could recombine with the cowpox virus in small mammals which eat the rabies vaccine bait, or with cats which prey on such animals. Through the cats' close human contact, the V-RG-cowpox hybrid virus could be introduced into human populations.<sup>32</sup>

Besides V-RG's homology with other orthopoxviruses, the genetically engineered vaccine also contains the rabies virus glycoprotein G gene, which shares homology with the glycoprotein G gene of wild-type rabies viruses. If V-RG bait is eaten by an animal which harbours the rabies virus, such as a fox, badger or pine marten, the two viruses could recombine.

The properties of recombinant V-RG, whether hybridized with another orthopox virus or with a rabies virus, are totally unknown. It is known, however, from cases involving viruses — Hong Kong 'flu, AIDS, seal "influenza", bovine spongiform encephalopathy (BSE)—that some newly-arisen viruses have lethal effects, can spread both within and between species, and can infect humans.

Although the first release of V-RG in Europe took place in 1987, at the BRIDGE



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*By contrast with other European countries, Britain has a high proportion of foxes living in towns and cities rather than in the countryside. If rabies were to spread to urban fox populations, would helicopters be allowed to drop onto the streets bait such as chicken heads containing a living, genetically engineered virus which may be transmissible to humans and other animals?*

meeting on biosafety in 1992, V-RG researchers from the University of Liege stated that "the eventual risk of recombination with orthopoxviruses which might exist in wildlife still needs to be investigated."<sup>33</sup> Despite such belated risk-benefit assessment, there is no prospect of a moratorium on releasing V-RG being enacted before the risk-assessment studies on its mutagenic potential for homologous recombination are completed, nor consideration of what could be done about the viruses which have already been released if V-RG is revealed to be highly mutagenic.

#### • Health Risks

The irony of the vaccination programme is the relative insignificance of Continental fox rabies for human health and the welfare of pets. This is for two reasons.

Firstly, while the dog-mediated rabies virus, which causes an estimated 30,000 human deaths every year in India,<sup>34</sup> is transmitted between different species, the strain of the virus in Europe is more selective in its host species. According to British MEP Christopher Jackson:

"the victims of a fox bite can only pass the disease back to another fox. In other words, if a fox bites a dog and gives it rabies, that dog cannot infect its [owner] with a bite. The disease may only be transmitted to another fox".<sup>35</sup>

In addition, a rabid fox is only infectious in the three days preceding its death.

Secondly, the fox population in Conti-

ental Europe is largely rural and rarely comes into contact with humans or their pets. In consequence, human deaths from rabies in the whole of Europe over the past two decades have been about one to four per year; since 1977, there have been no reported human deaths from rabies contracted within the EC — the last such case was in France in 1928.<sup>36</sup> In France, one of the European Community member countries with a "rabies problem", there are only 50 dog rabies cases per 10 million dogs.<sup>37</sup> The threat that Continental fox rabies poses to humans and their pets clearly engenders more

fear than it warrants. In fact, the use of a genetically engineered vaccine to eradicate the disease may engender more risks than fox rabies itself.

The human health risk from fox rabies would only become significant if the disease were to spread to urban fox populations. Because foxes in Britain are predominantly urban — nowhere else in Europe do they live in such close proximity to humans and their pets<sup>38</sup> — effective measures should be taken to ensure that fox rabies does not come into the country. This will not be achieved by attempting to eradicate the disease using a genetically engineered vaccine targeted at rural foxes.

#### • Cost-Benefit Analysis

Just as the risk-benefit analysis of the V-RG vaccine-bait dispersal programme is wanting, so is the cost-benefit analysis. Researchers who favour the vaccine argue that:

"The average yearly cost of rabies in Belgium (1980-89), including treatment of humans, animal diagnosis, compensation to farmers for the culling of infected livestock, and the culling of wild foxes, is estimated to be 400,000 ECUs/km<sup>2</sup>, [US\$484,400] or 88,000 ECUs [US\$106,600] per annum for the area under study. These figures do not include the cost of vaccination of domestic animals nor the salaries of civil servants. In comparison, we estimate the overall expenditure during the three campaigns [November 1989, April 1990 and

## Genetic Releases Worldwide

Worldwide, field trials of genetically engineered organisms — from viruses to plants — are increasing apace, as the biotechnology industry attempts to commercialize its products. In many instances, releases have been illegal.

According to a recent report by Greenpeace, "846 fields tests of transgenic plants were approved between 1987 and 1992 in OECD countries." Since then, the number has risen steeply and there have now been some 2,000 field trials in the US alone. In a number of instances, the fields tests have been carried out illegally:

- In 1992, a genetically engineered, live vaccine for use in fish farms was tested in Ireland. Contrary to European Union regulations, the EU Commission was not notified of the release.
- In 1986 a vaccinia-rabies recombinant virus, emanating from the Wistar Institute in Philadelphia, was smuggled into Argentina and released on an experimental farm belonging to the Pan American Health Organization. The Argentinian health authorities were not notified; the release took place without any effort at containment; and workers on the experimental farm were not informed about the risks involved.
- Eighty different genetically engineered microbes have been illegally released in India. All were exported from Japan by the International Nature Farming Research Centre (INFRC). Neither the Indian Department of Biotechnology nor the Director of the Indian Agriculture Research Institute (IARI) were informed or consulted

about the releases, which took place on crops in a number of states, including Uttar Pradesh and the Punjab. INFRC has consistently refused to divulge the identity of the microbes.

Most Northern countries have adopted controls on the release of genetically engineered organisms, although these are frequently weak and, as in the case of the Irish fish vaccine release, sometimes violated. In the case of Japan, Australia and New Zealand, controls are at present voluntary.

The overwhelming majority of countries in the South, however, have no legislation or regulations on genetic releases. Increasingly, it appears such countries are being chosen for field trials. According to Greenpeace, "unregulated field tests or development activities are known to have occurred in Belize, Burkina Faso, Cote d'Ivoire, Dominican Republic, Mali, Nigeria, Pakistan, Peru, Puerto Rico, South Africa, Syria and Zaire."

Greenpeace warns:

"It is of great concern that a situation of 'double standards' is evolving where developed countries are taking measures to protect their own environments but allowing their corporations to threaten the . . . environments of less developed countries."

Source: Meister, I. and Mayer, S., *Genetically Engineered Plants: Releases and Impacts on Less Developed Countries — A Greenpeace Inventory*, Greenpeace International, The Netherlands, 1994.

October 1990] of vaccine bait distribution (bait, helicopter and personnel costs) to be 118,000 ECUs [US\$142,900]. Because vaccination following eradication can, in principle, be interrupted or subsequently limited to the borders of the vaccinated zone, long-term maintenance of a rabies-free area by peripheral vaccination with live recombinant vaccinia virus may well be economically justifiable."<sup>39</sup>

This assessment, which omits the cost of developing the vaccine and the costs of its potential pathogenic "side-effects", assumes that the vaccine's efficacy is sufficient to eradicate rabies from wild fox populations. Even if it were, the future economic benefits do not necessarily follow. It is unlikely that culling of foxes would cease during a vaccination programme; for example, farmers consider foxes to be a pest to poultry as well as a rabies risk to livestock. If culling were to end, moreover, the numbers of foxes would doubtless increase, creating more problems for poultry farmers and higher demands on the vaccine programme. Any increase in the density of the rural fox population would require a correspond-

ing increase in the percentage of herd immunity to eradicate fox rabies.

An increase in the numbers of rural foxes could also spur fox migration to urban areas where their threat to human health is greater. To control the spread of rabies in an urban fox population, where their density would be higher than in rural areas, would require a higher level of herd immunity, roughly 95 per cent.<sup>40</sup> To maintain such a level, vaccination would have to be repeated annually or bi-annually, given the fecundity and life-span of foxes.

A more likely response to rabid urban foxes would be to cull them and to vaccinate pets — all of which would be additional costs incurred as a result of the random vaccination of wild foxes using V-RG.

### Economic Growth and Single Market Ideology

The European policy on rabies appears to be determined by the ideology of the Single European Market and the belief that genetic engineering is a key to economic growth. In fact, the utopian goal of

eradicating rabies from the EC through a genetically engineered "technological fix" will transfer the financial costs of rabies onto all of the citizens of Europe.

The profits would seem to accrue mainly to the organizations which have developed the genetically engineered vaccine over the past 12 years and which need to recoup their investment. Indeed, the desire for a larger market, and reduced research and development and licensing costs would seem to have influenced the development of a multi-purpose vaccine which can be used on several different species — cattle in Argentina, raccoons in North America and foxes in Europe have already been targeted — rather than a single-species vaccine. The logic of the market is clearly the reverse of the logic of good environmental practice.

The quest for a utopia may well create an ecological dystopia; the only beneficiaries may be the manufacturers of the rabies vaccine — or of other genetically engineered "solutions" to the pestilence which the vaccine may leave in its wake.

A version of this paper will be published as a chapter in *Animal Genetic Engineering: Of Pigs, Oncomice and Men* by P. R. Wheale and R. McNally (eds.), Pluto, London, 1995.

1. For quarantine regulation in Britain, see House of Commons Agriculture Committee, *Health Controls on the Importation of Live Animals*, Vol. 1, HMSO, London, 1994. In the United States, similar quarantine measures have reduced the incidence of rabies in dogs and cats: in 1984, the numbers of rabid dogs and cats were reported as 97 and 140 respectively while the majority of reported cases (37 per cent) were in skunks (2,082), followed by raccoons (1,820) and bats (1,038). See Wiktor, T. et al., "Rabies vaccine" in Plotkin, S. A. and Mortimer, E. A. (eds.) *Vaccines*, W.B. Saunders Co, Philadelphia, 1988.
2. As a result of increased animal imports from the EU, particularly cattle from France and The Netherlands, animal diseases have been reintroduced. Outbreaks of warble fly infestations and of brucellosis during 1993 were both traced to cattle imported from France. See Stevenson, P., *A Far Cry from Noah: The Live Export Trade in Calves, Sheep and Pigs*, Green Print, London 1994, pp.87-88. For a link between warble fly treatment and BSE, see Purdey, M., "Mad Cows and Warble Flies", *The Ecologist*, Vol. 22, No. 2, 1992, pp.52-57.
3. Jackson, C., "Mad Dogs and Englishmen", *Kangaroo News*, October 1992, p.13.
4. Wilson, J., "Rabies control", Report of the 88th Session of the Intergroup on Animal Welfare, 9 July 1992, European Parliament, Brussels, pp.4-5; House of Commons Agriculture Committee, op. cit. 1.
5. In 1992, 2,047 of the 2,769 confirmed cases of

rabies in the European Union were in foxes, 126 in cats and 90 in dogs. Within Continental Europe, an epidemic of fox-mediated rabies pushed westwards from the Polish/Russian border after the Second World War, reaching the river Elbe in 1950 and the Rhine in 1960. In 1967, it was noticed in Belgium and Luxembourg, arriving in France in 1968. The disease pushed northwards into Denmark and southwards into Switzerland during the 1960s, although it has since been eradicated in Denmark. See House of Commons Agriculture Committee, op. cit. 1.

6. Zimen, E., *The Red Fox*, Junk Books, The Hague, 1980.
7. "Council Decision of 24 July 1989 introducing Community measures to set up pilot projects for the control of rabies with a view to its eradication or prevention", Council Decision 89/455/EEC, *Official Journal of the European Communities*, No. L 233, 2 August 1989, pp.19-21.
8. The earliest open field trials took place in 1978 in Switzerland and France of a weakened strain of the rabies virus called SAD (Street Alabama Dufferin). In 1983, field trials began in Germany and subsequently in other European countries of a derivative of the Swiss vaccine, SAD B19. The intention was that foxes would eat the bait, be exposed to the weakened virus and produce antibodies which would immunize them against the virulent, wild-type of rabies virus. See Flamand, A. et al., "Eradication of rabies in Europe", *Nature*, Vol. 360, 12 November 1992, pp.115-6; Brochier, B. et al., "Large-scale eradication of rabies using recombinant vaccinia-rabies vaccine", *Nature*, Vol. 354, 19/26 December 1991, pp.520-22.
9. Baxby, D., "Vaccinia virus", in Quinnan, G. V. (ed.), *Vaccinia Viruses as Vectors for Vaccine Antigens*, Elsevier, Amsterdam, 1985, pp.3-7.
10. The rabies gene which has been inserted encodes rabies glycoprotein G. The site for its insertion is vaccinia thymidine kinase gene.
11. Pastoret, P. P. et al., "Development and deliberate release of a vaccinia-rabies recombinant virus for the oral vaccination of foxes against rabies", in Binns, M. M. and Smith, G. L. (eds.) *Recombinant Poxviruses*, CRC Press, London, 1992.
12. The formula for estimating the proportion of a target population (p) which must be effectively immunized to eradicate the infection is  $p > 1 - KT/K$ , where KT is the density of foxes necessary to maintain the endemic persistence of rabies and K is the density of foxes in the absence of rabies. For fox rabies, KT is estimated to be roughly 0.4 foxes per km<sup>2</sup>; this means that more than 0.4 foxes per km<sup>2</sup> must be effectively immunized to eradicate rabies. The density of foxes (K) in the rural area under study was estimated to be 2 per km<sup>2</sup>. Thus the proportion of the fox population which would have to be effectively vaccinated (p) must be at least  $1 - 0.4/2 = 0.8$ , or 80 per cent. For formula, see Anderson, R., "Rabies control: vaccination of wildlife reservoirs", *Nature*, Vol. 322, 24 July 1986, pp.304-5; for field study, see Brochier, B. et al. 1991, op. cit. 8.
13. Flamand, A. et al., "Monitoring the potential risk linked to the use of modified live viruses for antirabies vaccination of foxes", in Economidis, I. (ed.), *Biotechnology R&D in the EC—BAP: Part 1*, Commission of the European Communities, Brussels, 1990. In field trials in the United States of V-RG against rabies in raccoons in 1991-1993, only 45 per cent showed immunity in Virginia, fewer than 40 per cent in New Jersey, while in Pennsylvania the level of herd immunity was only 20 per cent, proportions which will not prevent the spread of the disease, let alone eradicate it. See "Rhone Merieux seeks a license for recombinant rabies vaccine", *Gene Exchange*, Vol. 4, no. 3/4, February 1994, pp.8-9.
14. Pastoret, P. P. et al., op. cit. 11.
15. Brochier, B. et al., op. cit. 8.

16. Ibid.
17. Anderson, R., op. cit. 12.
18. Kaplan, C., "Vaccinia virus: a suitable vehicle for recombinant vaccines?", *Archives of Virology*, Vol.106, 1989, pp.127-39.
19. Redfield, R. R. et al., "Disseminated vaccinia in a military recruit with human immunodeficiency virus (HIV) disease", *New England Journal of Medicine*, Vol. 316, 1987, pp.673-76. While human health experts considered the risks of vaccinia to be acceptable when smallpox was widespread, they now argue that the disease's eradication is a strong contraindication to any further immunization with vaccinia. See Dumbell, K. R., "Aspects of the biology of orthopoxviruses relevant to the use of recombinant vaccinia as field vaccines", in Quinnan, G. V. (ed.), op. cit. 9, pp.9-13. However, vaccinia is being used as a vector not just for the rabies vaccine, but for many other genetically engineered recombinant vaccines as well. See, for example, Esposito, J. J. and Murphy, F.A., "Infectious recombinant vectored virus vaccines", *Advances in Veterinary Science and Comparative Medicine*, Vol. 33, 1989, pp.195-247.
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35. Jackson, C., op. cit. 3.
36. House of Commons Agriculture Committee, op. cit. 1, p.xxiv.
37. Wilson, J., op. cit. 4.
38. See House of Commons Agriculture Committee, op. cit. 1, p.xxvii.
39. Brochier, B. et al., op. cit. 8, p.522.
40. This is calculated by Professor Roy Anderson of Imperial College, London, applying the epidemiological formula (op. cit. 12), for urban areas with dense fox populations, estimated at 7 foxes per km<sup>2</sup>,  $(1 - 0.4/7)$ . In Britain, however, which has a high urban fox population, densities as high as 17 adults per km<sup>2</sup> are common.

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# The Theory Behind Road Tolls

## New Clothes for the Road Lobby

by

Simon Fairlie

*The UK Department of Transport, faced with widespread demands from both within and outside the ruling Conservative Party for a reduction in road traffic, has seized upon toll roads as a solution. According to economic theory, toll roads provide a way of accounting for the supposed costs of traffic congestion. But in practice, "congestion pricing" opens up a Pandora's Box of potential distortions, inefficiencies, inequities and complexities. When such road-pricing is divested of its emperor's economic clothes, it is revealed as beneficial only to the information technology, motor and construction industries. The government should consider instead simpler and more equitable options.*

*"We are not going to do away with the great car economy."*

Margaret Thatcher 1990

*"The great car economy' is not a phrase I have chosen to use in my first ten weeks in this job — nor do I envisage using it in the future . . . I am happy to talk in detail to the green lobby about how they see transport policy developing and ask them how, for example, the government could persuade people to get out of their cars and use public transport."*

Dr Brian Mawhinney

UK Secretary of State for Transport

October 1994<sup>1</sup>

The statement of Brian Mawhinney upon becoming the government minister responsible for transport issues represents an astonishing victory for the "green lobby" in Britain. Within a few years, the combined forces of road protesters, environmental campaigners, concerned academics and a handful of far-sighted Members of Parliament have forced the Department of Transport (DoT) to abandon its 1989 policy of accommodating a projected doubling of traffic within about 30 years through a massive expansion of the road network. The government has already cut the programme by more than one third and has reduced the DoT's total budget for 1995 by 20 per cent. The latest nail in the coffin of this policy was the release in November 1994 of a report, two years in preparation, from the Royal Commission on Environmental Pollution advocating stringent controls on the level of traffic. While the government's multibillion pound road programme is not, in the words of Dr Mawhinney, "going to go down to fourpence-ha'penny",<sup>2</sup> the DoT cannot afford to ignore a movement that has torn its policies to shreds.

In fact, the government has already dabbled with a palette of measures to limit the growth of traffic. Petrol taxes have been increased; new planning policy guidelines advocate land-use measures to reduce the need for transport; and there has been

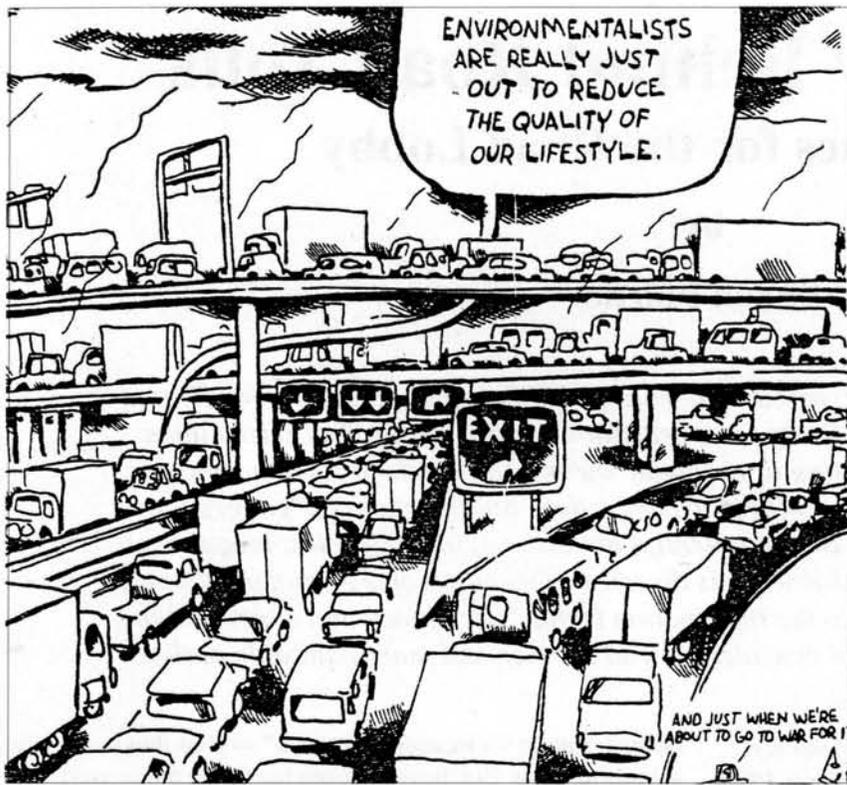
official support for measures to "calm" — slow down — traffic in built-up areas. But these solutions have been pioneered by the Treasury, the Department of the Environment and County Councils. They have not been the prime concern of the DoT, which has instead pursued a different agenda: reducing traffic congestion through toll roads and metropolitan road pricing.

In 1993, the Department published a report entitled *Paying for Better Motorways*<sup>3</sup> advocating the introduction of tolls to help pay for the construction and maintenance of motorways and other roads, policies which it has begun to try out. The Birmingham Northern Relief Road is scheduled to be a privately built and owned toll motorway. The possibility of charging drivers for the use of city streets using a "smart card" system is being examined in studies and pilot projects in Cambridge, Bristol and Edinburgh.<sup>4</sup> And in August 1994, the DoT announced that four road schemes plucked out of the roads programme are to be developed as "shadow toll-roads" — Design, Build, Finance and Operate (DBFO) projects — where no toll will be exacted, but the government will pay private contractors to construct and operate the road at a rate determined by the number of cars that travel along it. In the DoT's view, the future clearly lies with toll roads.

### The Changing Role of Toll Roads

There is nothing new about toll roads. Between 1706 and 1895, many of Britain's main roads were built and maintained by profit-making Turnpike Trusts.<sup>5</sup> The turnpike roads, so named because of the barriers of iron spikes put up at places where tolls were exacted, were introduced because local parishes — responsible for the upkeep of public roads under the first Highway Act of 1555 — were not interested in maintaining the road network to the standards required by through traffic. Many of the improvements made by engineers such as Thomas Telford and John Loudon Macadam, who introduced the tarmac road surface — were funded by the Turnpike Trusts. However, after the 1842 Rebecca Riots in South Wales, when peasants who could not afford to take their goods to market because of the tolls

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tore down the collection booths, turnpikes were gradually converted into public roads, funded through County Councils. In 1909, responsibility for constructing main roads was conferred on a central government authority, the Road Board, which ten years later came under the authority of the Ministry of Transport. Since 1919, all trunk roads in Britain, with the exception of a few bridges and tunnels across estuaries, have been paid for out of the public exchequer.

Recently, however, the financial advantages of tolling have become attractive to the DoT, whose budget has been cut by the Treasury. The Department has argued that financing roads through tolling would:

“enable the economy to benefit from a faster rate of expansion of transport capacity than would be possible if road investment were limited by the need to keep firm control over public expenditure.”<sup>6</sup>

The DoT (though not the Treasury) is anxious to reassure the road haulage industry that revenues from its road tolling schemes will be “hypothecated” — that is, ploughed back into the construction of more roads.

The impetus for the construction of toll roads, however, is not purely fiscal. There is a growing body of thought within the DoT which advocates road-user charges not so much for the relief they would provide for the exchequer as for the relief they will provide for a congested road system. Reducing traffic demand, says the DoT, “can best be achieved by imposing a price mechanism — by charging users for the costs they impose on others.”<sup>7</sup> If motorists are made to pay for some of the social and environmental costs of driving, it is argued, then they will make fewer journeys, there will be less traffic and the road system will be less congested.

## The Great Car Economists

The DoT provides a home for an obscure but highly influential

breed of analysts — traffic economists — whose job is to apply the economic laws of supply and demand to road construction and traffic control. Traffic economists developed the DoT’s controversial computer programme, COBA9, which assesses whether new roads schemes will be economically viable.<sup>8</sup> Traffic economists made the assumption in 1989 that Britain’s road traffic would double within some 30 years and used it to justify the proposed construction of a massive new network of roads throughout the country.<sup>9</sup> It is these same economists who are now arguing that toll roads and other forms of road pricing can be used to make roads and motoring more environmentally acceptable.

All environmental problems, they argue — whether it be air pollution or destruction of landscape — are caused by distortions in pricing and can be solved by charging consumers a price that reflects the true cost of the commodity. Many of these “true costs”, however, have so far proved impossible to quantify — in the words of the DoT itself, “the absence of an accepted method of valuing the environmental benefits and disbenefits of transport makes it impossible to reach robust conclusions.”<sup>10</sup>

However, there is one supposed transport cost that economists claim to be able to quantify with comparative ease: congestion costs, that is, the cost of the time lost to motorists because of the presence of each additional motorist on the road. A congested road is pictured as representing a “tragedy of the commons” where the advantages to each motorist of travelling upon it are outweighed by the delays occasioned to all the other motorists by their presence. Because motorists are not charged for the delays they inflict upon other motorists and regard the road as a “free public good”, they do not, according to the economists, make “rational decisions”.

If, on the other hand, motorists were charged the full cost of the extra congestion they caused by driving on a particular road, then they would only choose to do so if the benefits outweighed this carefully calculated cost. Some drivers would choose instead to travel by another (less-congested) route, travel by a cheaper mode of transport (bus or train), delay the trip until it could be combined with another in the same direction, or simply not travel at all. This would result in lower levels of congestion that accurately reflected the value that people attached to their wasted time.<sup>11</sup>

## Defective Analysis

It is this theory of “congestion pricing” that provides the environmental and economic rationale for the policy of road tolling and other forms of road pricing. In some ways it is a seductive argument. Its mathematical neatness makes it superficially attractive, while its underlying complexity makes it intimidating. Cleverly expounded, “congestion pricing” can look extremely convincing to policymakers and to environmentally concerned members of the public.

But though congestion pricing may look good in theory, its application is another matter. Because these costs can theoretically be calculated, it is rashly assumed that any problems can in practice be solved, primarily by technical innovations. Indeed, it

is the challenge of solving these problems through technical prowess that makes them attractive to certain interests.

To take an elementary example, any full-cost accounting of congestion costs would have to take into account the fluctuations of traffic levels that occur throughout the day and from season to season, and hence would involve a variable charge, which, if it were collected in toll booths, would cause intolerable complications and delays. It is partly for this reason that the government has postponed full-scale implementation of tolling until a remote computer-controlled system has been developed to monitor traffic levels — which is unlikely to be until after 1998.

This problem of fluctuations in traffic levels may, at first sight, appear to be a mere technical detail which does not affect the underlying impeccable logic of charging the motorist for the costs incurred in congestion. But there are other practical deficiencies associated with congestion pricing:

- it only accounts for a fraction of total costs of motoring to society and the environment;
- it can only realistically cover a fraction of the road network;
- it can only be targeted effectively at a fraction of the population.

As long as these three deficiencies remain unaddressed, any attempt at congestion pricing may compound the inefficiencies and distortions that it is designed to eliminate.

### A Fraction of the Cost

According to nearly every thorough study, congestion costs represent a relatively small part of the total costs of motor transport. True, “green economist” David Pearce has calculated that congestion costs in Britain account for £13.5 billion out of between £22.9 billion and £25.7 billion total transport costs (52 to 58 per cent).<sup>12</sup> But a study by energy consultant Charles Komanoff estimates congestion costs in the United States at \$168 billion out of \$726 billion (23 per cent) (see Box, p.218); while a German study concludes that the congestion costs of lorries in West Germany in 1987 accounted for only 2,000 million Deutschmarks out of a total of 45,960 million Deutschmarks (4 per cent).<sup>13</sup> A number of other studies of transport costs by groups ranging from the public transport lobby Transport 2,000<sup>14</sup> to the Tory Green Initiative (a wing of the Conservative Party)<sup>15</sup> take no account of congestion costs whatsoever. These differing results confirm that there is no consensus as to the costs of congestion and how to calculate them.

Moreover, charging motorists for congestion costs could lead to distortions or inefficiencies with regard to other unaccounted costs. For example, the faster speeds travelled by high-performance cars in response to the relief of congestion on main roads would be a more inefficient use of energy and might lead to higher air pollution and accident rates. The relative cheapness of night-time driving might lead to greater noise pollution.

Such distortions could, in theory, be eliminated if every single cost — air pollution, noise pollution, land use, health and safety, energy consumption, and so on — were taken into account and priced accordingly through some market mechanism. But given the complexities involved, the wide-ranging disagreements about the relative burden upon society of these



Martin Bond/The Environmental Picture Library

costs, and the lack of political will on the part of the government, the chances of this happening in the foreseeable future are zero.

### A Fraction of the Network

A second set of problems derives from the fact that, given foreseeable technology, congestion pricing through road tolls will be applicable to only a small portion of the road network. As long as this remains the case, a proportion of those intending to travel by road will make a “rational” decision not to drive upon the tolled network because of the price, followed by an “irrational” decision to drive along an alternative route that is, in all probability, longer, slower or more congested.

This “diversion” effect of road pricing has been pointed out by numerous critics, including the House of Commons Select Committee on Transport. The Committee was influenced by a report carried out by Gloucestershire County Council for the DoT, which showed that as many as 2,700 extra motor vehicles travel through Gloucester every day to avoid tolls upon the Severn Bridge. Although diversion rates will depend on the level of the toll, in some cases they are expected to be as high as 30 per cent.<sup>16</sup> The DoT itself estimates that, even with very low toll rates of 1.5 pence for cars and 4.5 pence for goods vehicles, there is likely to be a diversion rate of around 10 per cent at peak periods.<sup>17</sup>

The dynamics of diversion involve other factors besides the “rational” economic decisions of travellers. Toll operators and concessionaires of Design, Build, Finance and Operate projects will have a direct interest in inducing traffic to use their roads. Road signs will function as advertisements for competing travel systems — though the extent to which they will be controlled by the public or private sector is not yet clear. Toll road owners will also, according to the banking group Lovell White Durrant, have to influence:

“developers (in site developments so that traffic will naturally use the road), service providers (to ensure that petrol stations, refreshments, breakdown services etc. are avail-

able) and the DoT itself (to avoid the construction of other modes of transport)."<sup>18</sup>

In other words, even though these toll roads are supposedly designed to ease congestion by deterring traffic, the private companies operating them will have a direct interest in attracting vehicles to maximize profits.

The reciprocal relationship between road use and urban development means that any significant shift in traffic levels from one road network to another may have far-reaching consequences. John Adams of London University has warned of the possible effects of introducing road pricing measures in metropolitan areas:

"Transport and land use interact. A policy which promotes the growth of traffic, squeezes it out of town by road pricing and builds more capacity to accommodate it in the suburbs and countryside, will produce low-density sprawl that is unserviceable by public transport. It will lock us into dependency on the car."<sup>19</sup>

Precisely what forms of road-related development lie in store will depend upon what kinds of roads are tolled. But since inter-urban and peri-urban toll roads will be used by the wealthier sections of the population, they will tend to attract up-market developments. If metropolitan road pricing — charging motorists for using city streets — is accompanied by a tolled motorway system, it is not difficult to imagine a two-tier distribution system: one where car-oriented, out-of-town consumer centres, sited close to toll roads, are serviced by fleets of "just-in-time" lorries running along congestion-free motorways, while urban districts become the domain of poorer, non-car owners, serviced by an inferior and, quite possibly, more expensive range of shops.

## A Fraction of the Population

A third distortion caused by road pricing relates to the assumption that it is actually the user who pays the charges. However, a large amount of traffic on the strategic roads likely to be tolled consists not of "private individuals" but of goods vehicles or company cars associated with industry.

Any suggestion that congestion costs in the form of tolls will serve as a "rational" incentive for industry to reduce its use of road transport is largely fantasy. The massive profits accumulated by the denationalized telecommunications giant, British Telecom, (£2.75 billion in 1993-4), were derived to a great degree from commercial organizations unconcerned about paying peak (or "congestion") daytime rates, since these are accounted as overheads and passed on to the consumer. Similarly, except in a small number of cases where regular diversions away from the tolled network may give a company a competitive edge, the costs of road pricing are likely to be regarded as a transport overhead and passed on to consumers. Poorer private motorists, faced not only with paying for their own use of the motorway, but possibly also (through increased retail prices) for the unabated use of the motorway system by industry, will be levered off the network.

This tendency will be reinforced by the fact that any time savings gained by the reduction of congestion on a toll road will be of considerably greater financial value to commercial traffic than they will be to private motorists. This is accounted for in the DoT's cost-benefit analysis computer programme, COBA9,

which assesses the working motorist's time to be worth about four times as much as that of the non-working motorist.<sup>20</sup> Any measure which removes "low-value" private cars from the network, leaving it less congested for "high-value" working vehicles, will be highly attractive to the DoT, since it will render the road more "economic". In this sense, toll roads are not only being built *by* the commercial sector: they are being built *for* it.

## Paradoxes of Congestion

In theory, some of these three problems could be resolved by tolling the entire road system (and the rest of the transport network) and by instituting a large number of other market mechanisms that directly target social and environmental costs such as air pollution, global warming, road deterioration, noise pollution, landscape destruction and so on. In practice, however, such total accounting would (as the DoT admits) be completely arbitrary and involve formidable improvements in computer technology, pervasive monitoring of individual activity, and accounting systems of staggering complexity.

But in addition to these theoretical and practical considerations, there is a further question: is congestion really an "externality"? The delays caused by congestion are largely inflicted upon other motorists — the motoring "fraternity" — rather than upon society as a whole. In this sense, delays caused by congestion can be viewed simply as part and parcel of the process of motoring.

Charging motorists for the delays they inflict upon other motorists is analogous to charging bus passengers for the time they spend getting on and off a bus. This time involves a delay for every other passenger on the bus. According to the theory of congestion charging, the fuller the bus, the greater the collective delay caused by each passenger, and the higher the fare should be. On the other hand, as long as the bus is running on time, it can be argued that no delay has been occasioned to anyone. Bus passengers are simply paying for an estimated time of arrival and decide whether or not to catch the bus according to that timetable. Similarly, it could be argued that motorists are normally able to anticipate the levels of congestion on a stretch of road, to estimate their time of arrival, and to make "rational" decisions according to the "timetable" that that road imposes.

Further difficulties arise when the effects of congestion in one mode of transport upon the flow of another mode are analysed. For example, every extra passenger mounting a bus could be said to cause a delay for motorists or cyclists stuck behind that bus. On the other hand, if a percentage of these bus passengers decided instead to travel by car, they would very likely cause even more congestion. Charging bus passengers for the congestion costs inflicted upon motorists could thus, paradoxically, increase this congestion.

Vehicle congestion is still more complex because it does not necessarily impose a net cost upon other modes of transport. In terms of time delays, vehicle congestion in cities severely affects buses, has a lesser effect upon bicycles, has little effect upon trains and often facilitates pedestrian movement. Traffic congestion exacerbates air pollution, but can reduce pedestrian accident rates and improve pedestrian and residential access. Ironically, vehicle congestion may actually act as a benefit for some non-motorists.

Congestion may even be of benefit to motorists themselves. It is increasingly being argued that traffic congestion at a

# The Global Turnpike

Road tolling and the theory of congestion pricing dominate modern traffic policy, not only in Britain but also worldwide. Pioneered by the World Bank, these ideas have permeated European policy through vigorous lobbying from industrial interests. Road pricing is now a dynamic international movement, the flagship of the free-market economic response to environmental degradation.

The possibility of charging the motorist for some of the extensive social and environmental costs of road transport was first considered by the Department of Transport in 1964 in its document *Road Pricing: The Economic and Technical Possibilities*, but little was put into practice.

In the 1980s, however, free market economists propagated the theory that the motorist should be made to pay for environmental costs. By the end of the decade, the theory had been taken up by industry lobbyists, and finally found its way into mainstream government policy in the early 1990s when environmental costs became an overriding consideration.

The European Round Table (ERT), a group of some 40 top European company heads, has been one of the most influential advocates of toll roads. In 1989, it published *Need for Renewing Infrastructure in Europe*, a report which vigorously advocated greater private sector involvement in transport infrastructure. The report argued that: "assessment and collection of user charges is necessary . . . The agreement on the modality of collecting revenues from the use of infrastructures will facilitate the intervention of the private sector."

An updated version of this report was subsequently reprinted in the 1993 OECD publication *Infrastructure Policies for the 1990s*. The OECD, which represents, among other bodies, the European Commission, did not attribute the article to the ERT.

About the same time, the ERT recruited Nigel Brookes of Trafalgar House, a British company with substantial interests in toll roads. Trafalgar House has been the main contractor for the Dartford Bridge, Britain's first, modern privately-funded toll road completed in 1992, and for a highly-contentious toll bridge in Lisbon; it is also involved in a consortium with the wife of Indonesia's President Suharto to build toll roads in Java; and it is leading the consortium for the Birmingham Northern Relief Road.

In its 1991 publication, *Missing Networks*, the ERT argued the economic case for road user charges at greater length. The following year, in *Growing Together: One Infrastructure for Europe*, it tackled some of the questions that still undermine the uneasy relationship between government and prospective toll road companies — how can sufficient equity finance (as opposed to debt finance) be raised, and who will bear the considerable risks involved? The document suggested that to provide sufficient equity, the European Development Bank should set up a commercial investment affiliate, analogous to the World Bank's International Finance Corporation (IFC); and that the risks should be insured by a European organization modelled on the World Bank's Multilateral Investment Guarantee Agency (MIGA).

That the ERT should look to the World Bank for guidance is not surprising. Since the early 1980s, the Bank had been doing a considerable amount of work on road pricing, and has published reports on toll-road projects in Latin America and South-East Asia. The Bank's 1994 annual World Development Report, *Infrastructure for Development*, announced a radical shift towards private sector funding through foreign direct investment and "project financing" by independent consortia. The main agencies the Bank considered suitable for assisting such investment were the IFC and MIGA. The report notes that of 150 private infrastructure projects studied in a 1993 survey:

"transportation projects, mainly toll roads, dominated the numbers and values of projects in high-income and developing countries. The more than two-thirds share of transport projects in middle-income countries reflected the extensive toll road programmes in Argentina, Malaysia and Mexico."

Toll road and road pricing projects are also underway or proposed in Thailand, China, Indonesia, Hong Kong, Poland, Hungary, Portugal, Israel, Norway, Germany and the United States. It is clear from *Infrastructure for Development* that the World Bank expects to see toll roads constructed worldwide. The UK Department of Transport's new policy is thus not an independent initiative, but part of a coordinated movement to establish an electronically-regulated global turnpike network.

specific point in the road network can result in corresponding — or even greater — relief from congestion elsewhere in the road network, and is, therefore, a reason to lower traffic forecasts. A DoT advisory group is presently reviewing the National Road Traffic Forecasts — those which predicted a doubling of traffic in 30 years — since "the Department is increasingly accepting that traffic levels will, in reality, be held down by congestion as roads reach their operating capacity".<sup>21</sup> The recently published, DoT-commissioned, SACTRA (Standing Advisory Committee on Trunk Road Assessment) report estimates that new roads, by relieving congestion, actually generate traffic;<sup>22</sup> according to Committee member Dr Philip Goodwin of Oxford University's Transport Studies Unit, a new road generates an average 10 per cent more traffic the moment it opens. Relief of congestion in one area causes correspondingly greater potential for congestion over the whole network — or, inversely, congestion at one key point helps to keep traffic levels down throughout the rest of the network.

The dynamics of this process have been studied by Dr Goodwin, who maintains that traffic flow is regulated by a series of bottlenecks — minor points of congestion — along the system. If these bottlenecks are eliminated by the construction of by-passes, flyovers or similar schemes, traffic will increase and much more serious hold-ups are likely to occur at bottlenecks further along the system. The solution, maintains Goodwin, is to reintroduce smaller bottlenecks throughout the system so as to reduce traffic levels to a figure substantially below the overall operating capacity of the road.<sup>23</sup>

## Benign Congestion

Dr Goodwin's analysis turns the entire question of congestion on its head, and suggests an apparently radical solution to traffic problems: slowing down traffic to speeds below the operating capacity of the road. This would ensure a more regular — and

probably, on average, faster — flow of traffic throughout the road network.

In fact, traffic engineers, consciously or unconsciously, have been applying such measures for some time now. Zebra (pedestrian) crossings, traffic calming measures (such as road bumps and gateways), priority bus lanes, and (in the US) lanes reserved for cars carrying passengers are all designed to slow down “undesirable” vehicles — in effect, to cause congestion for them — and to provide corresponding benefits for pedestrians, cyclists, public transport users or car-sharers.

The calibrated spread of devices such as these across the trunk road network and in cities, together with the diversion of funds currently spent on road building into the public transport network, would discourage motorists and help to reduce traffic levels. Prospective motorists, faced with a socially-mediated traffic flow rather than a commercially-operated freeway, would then base their decisions on the criterion of whether the car-journey warranted the time spent, rather than on whether they happened to have enough money to afford the toll.

## Elementary Solutions

In addition to taking measures to slow down traffic, there are a number of straightforward solutions available to policy makers to reduce traffic levels.

For example, a 1993 Department of the Environment revision

of its guidelines concerning planning policy advocated land-use measures that would reduce the need for transport.<sup>24</sup> The planning guidance report, which aims to “influence travel demand for different purposes”, advocates siting residential, work, shopping and entertainment facilities within easy reach of each other. Conservative MP Sir Geoffrey Pattie has remarked how the opening of the London orbital M25 motorway has induced work journeys of “staggering” lengths for commuters who might “work south of Guildford but live in the north of Essex”. Such pointless journeys could be discouraged by a combination of traffic restraint measures and sensible land-use policies.

Petrol taxation also offers a solution that is far simpler to apply than road pricing. The Treasury announced in 1993 that petrol taxes would be increased annually by five per cent annually. As John Adams has remarked:

“Road pricing should restrain traffic everywhere. The mechanisms for doing it are simple, effective and already in place: taxes on fuel and motor vehicles.”<sup>25</sup>

But petrol taxes, although convenient, are inequitable. Like toll roads, they invite wealthier people and industry to buy the right to inflict transport costs on society. Under present social conditions, where facilities — shops, offices, hospitals, schools and so on — are oriented towards motor use, an increase in taxation sufficient to account for transport costs would involve considerable dislocations for poorer people — possibly even the need

## The Hidden Costs of US Road Transport

A considerable number of studies estimating the costs of road transport in Europe have been published. Although they reach a variety of conclusions, they confirm that the unaccounted costs of motor transport — however hard they may be to pin down — are nonetheless real and considerable. Recently a similar breakdown of the external costs of road transport in the United States has been carried out by energy consultant Charles Komanoff. He estimates that the annual transport costs borne not by drivers but by the US public are as follows:

- **Accidents: \$49 billion.** This sum represents the proportion of the \$346 billion costs of vehicle accidents not covered by insurance or borne by motorists themselves.
- **Congestion: \$25 billion.** This is the amount borne by pedestrians, cyclists and bus passengers, while motorists inflict another \$143 billion worth of congestion costs upon each other.
- **Air pollution: \$63 billion.** This sum reflects the costs of illness and death caused by pollution and other effects such as crop loss.
- **Land use: \$65 billion.** Roads consume land for their exclusive use and often degrade the surrounding environment severely. The figure is reached by calculating the tax revenues foregone on half of all land used by roads.
- **Energy costs: \$60 billion.** These include the costs of carbon emissions from petrol insofar as they may exacerbate global warming, and the costs of “maintaining American military hegemony over oil exported to America.”
- **Noise pollution: \$26 billion.** This includes the costs of stress, sleep loss, impaired activity from street

noise and vibration damage to buildings and other structures.

This study is one of the most thorough and thoughtful attempts yet to apply full-cost accounting to US road transport. It proposes a range of fiscal mechanisms to charge for these different costs: road pricing (for congestion costs); carefully calibrated “smog fees” (for the costs of air pollution); charges based on axle-weight and distance travelled (to cover noise, accident and land use costs); increased petrol taxes (to account for energy and military costs); and fees and fines (to capture certain accident, noise and policing costs). In addition, a number of other ingenious mechanisms are suggested, such as charging the full rental costs of land used for parking and redistributing the proceeds to non-drivers.

Advocates of full-cost accounting, however, have been criticized for proposing solutions based on the assumption that people have a right to cause environmental damage and to take (by force if necessary) a disproportionate proportion of the world's resources, as long as they can afford to pay the costs.

A contrasting solution is to restrict road vehicles to activities that cause a minimum of damage to the environment and to other people — by imposing speed restraints, reducing road and vehicle size, restricting oil consumption to modest and equitable levels and similar measures.

The debate about transport issues in the next few years will be fought out between these two polar positions. The work of those who have identified and estimated the costs involved has mapped out the area of struggle.

Information from *Pollution Taxes for Roadway Transportation* by Charles Komanoff, *Pace Environmental Law Review*, Pace University, White Plains, New York (forthcoming).

to move house or to change job — while a wealthier section of the population would be able to afford continued car use on an overbuilt road network without disruption.

Petrol quotas, an alternative to petrol taxation, could represent each citizen's annual allocation of petrol and could be tradeable on the open market.<sup>26</sup> They are an easily enforceable mechanism with the potential to spread the costs of traffic reduction more equitably than taxation and according to the laws of supply and demand — yet they allow the government to regulate the consumption of petrol and hence the flow of traffic on the road system rather than merely anticipate it.

Devices such as petrol taxation, petrol quotas, traffic-calming, land-use measures and reinvestment in public transport are all obvious ways of "persuading people to get out of their cars" which are not obfuscated by economists' concerns with "full-cost pricing" and "rational decisions". They are elementary policy options for societies that have made the political decision to limit traffic growth in order to obtain other benefits. It is, in part, the very simplicity of these mechanisms that makes them unattractive to economists, industry and engineers.

## Toys for the Boys

The bottomless complexity of congestion pricing and road tolling demands an infrastructure comprising a range of economic concepts that remain largely meaningless to the general public — "required rate of return", "long run marginal cost", "hypothecation" and "additionality" — and a broad menu of revolutionary technological devices such as "transponder tags", "smart cards", "cruise controls", "satellite location systems" and "rate selector buttons".

The government has invited tenders from industry to develop a computer-based system to monitor traffic, allocate charges and identify offenders for which some 70 companies have put forward proposals. So far, the government has indicated only that the expense of establishing this infrastructure for motorways and some trunk roads would be "substantial", though both the Institute of Highways and Transportation and the Chartered Institute of Transport have described it as "enormous".<sup>27</sup> If road-pricing were to be generalized to include the entire road system — as full-cost accounting would require — then the costs of this technology and its invasion into people's lives would be phenomenal.

The development of this gadgetry would provide plenty of work for the DoT economists, and important investment opportunities for the information technology, motor manufacturing and road construction industries. Stripped of its "emperor's clothes" of elegant economic theory, however, the road toll agenda looks uncomfortably like a case of naked profiteering — jobs for the boys. Dr Mawhinney, after his appeal for advice from the green lobby, has an obligation to examine whether all this expense is really justified — or whether the road pricing system that it will implement is founded upon nothing more than a fairy-tale logic propagated by a clique of pensionable DoT economists.

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# Finger on the Carbon Pulse

## Climate Change and the Boreal Forests

by

Kevin Jardine

*Unless levels of greenhouse gases in the atmosphere are quickly stabilized, global warming is likely to reduce between 50 and 90 per cent of the world's existing boreal forests to patchy open woodland or grassland within the next 30-50 years. There is growing evidence that this decline is already underway: higher temperatures combined with clearcutting and replacement plantations have sparked larger and more frequent forest fires, storms and insect attacks, whilst many trees are succumbing to temperature-related stress. If the decline continues, the logging, burning and rotting of boreal forests could release of billions of tonnes of carbon into the atmosphere as carbon dioxide, accelerating the rate of climate change — and causing a runaway greenhouse effect.*

For millions of years, a naturally-occurring "greenhouse effect" has played a crucial role in the earth's climate. Greenhouse gases in the atmosphere, such as carbon dioxide and methane, have trapped solar heat near the earth's surface. Without this greenhouse effect, the earth's average temperature would be 18°C below zero and the earth a lifeless, frozen wasteland.

For at least 160,000 years before the Industrial Revolution, atmospheric concentrations of carbon dioxide (CO<sub>2</sub>) never exceeded 300 parts per million (ppm). Since 1850, however, carbon dioxide levels have risen by about 25 per cent, primarily due to the burning of fossil fuels and widespread deforestation; methane (CH<sub>4</sub>) levels have increased by 100 per cent; and nitrous oxide levels by 15 per cent.<sup>1</sup> In 1992, carbon dioxide levels reached 355 ppm. Some degree of climate change is thus already inevitable.

Without urgent action by industry and governments, however, levels of carbon dioxide in the atmosphere may rise to more than 600 ppm in less than 50 years. At this concentration, there is a very real and dangerous risk of catastrophic climate change, with profound implications for both the environment and human health. Such change could be exacerbated by "positive feedbacks", whereby one aspect of climate change reinforces another. A warmer climate, for example, could cause huge quantities of methane to

be released into the atmosphere from the frozen soils of the Arctic tundra which would contribute still further to the warming process. Such a runaway greenhouse effect — which a significant minority of scientists think is not only possible but probable, given current trends — would result in rapid and unstoppable increases in global temperatures.<sup>2</sup>

### "Missing Carbon"

Research suggests that, over the last century, about 320 billion tonnes of carbon have been released into the atmosphere as a result of the burning of fossil fuels and deforestation. But less than half of this, some 130 billion tonnes, has remained there. According to a recent analysis by Jorge Sarmiento of Princeton University, 90 billion tonnes has been taken up by the oceans through general diffusion.<sup>3</sup> Where the remaining 100 billion tonnes has gone is the subject of controversy, but it is thought that much of it has been absorbed by forests, in particular by boreal forests. A recent literature survey concluded that the boreal forest absorbed an annual average 0.7 billion tonnes of carbon during 1980-1990, making the boreal forest the largest, single, net terrestrial sink for carbon.<sup>4</sup>

There are alarming signs, however, that this carbon sink is in decline. The boreal forest is about to turn from being one of the world's largest carbon sinks into one of the world's largest carbon

sources, causing dramatic climate changes.<sup>5</sup>

### Clearcut Forests

As in the tropical forests, logging and clearance for agriculture are rapidly depleting the boreal forests of the North. Corporations such as Mitsubishi, Daishowa, Weyerhaeuser, Noranda and Repap have the rights to clearcut large areas of Canada's boreal forest; Weyerhaeuser and Hyundai have begun logging in Siberia, which has the largest amount of boreal forest on earth.

Even if clearcutting is followed by replanting, plantations contain less carbon than old-growth stands. Consequently, logging on this scale causes a net release of carbon into the atmosphere. A recent analysis of the forest-carbon balance in Canada has found that logging companies are cutting more than the net increase in forest biomass, thereby reducing the forest's capacity to absorb carbon.<sup>6</sup> Exposed soil on clearcut land may decompose more rapidly, releasing yet more carbon.<sup>7</sup>

Clearcutting also creates profound changes in forest microclimates. Studies in Montana in the US show that cleared forest floor is exposed to more than three times as much radiation from the sun as the floor of an old-growth forest, and almost twice as much as a partially-cut site where smaller trees have been left in place.<sup>8</sup> Exposure sends surface tempera-

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tures soaring and dries out the soil. Tree seedlings are exposed to intense temperature, moisture and regenerative stress.<sup>9</sup> In such conditions, the survival rates of shade-loving seedlings such as spruce and fir are drastically reduced.

Even when tree planting is successful on a clearcut site, the result is a monoculture which is more prone to disturbances, particularly insect attack and fire, than diverse old-growth forests. As forest entomologist Tim Showalter explains:

“Old-growth forests with their very complex variety of different plant species are internally resistant to most problem insects.”<sup>10</sup>

Because the trees in plantations are all the same age, they create a dense, even canopy which allows fires to spread rapidly. In contrast, a diverse old-growth forest contains a more uneven canopy and scattered forest openings that reduce the likelihood of a large-scale fire.<sup>11</sup>

## Fire, Storms and Insect Outbreaks

Many of these problems will be exacerbated by climate change. Average global temperatures have risen about 0.5°C over the last century,<sup>12</sup> and the seven hottest years since records began 140 years ago all occurred after 1980.<sup>13</sup> These temperature increases have been most dramatic not near the equator but at high latitudes.<sup>14</sup> Higher than average temperatures have already sparked larger and more frequent fires throughout the boreal forests, and the number of storms and damaging insect outbreaks has increased. These disturbances have been accompanied by a decline in conifer populations throughout the southern band of boreal forest.

### • Fires

Historical patterns of fire in boreal forests indicate that fire burned through tree stands about once every 50 to 100 years in Alaska and western Canada, once every 130 years in eastern Siberia, and once every 200 years in eastern Canada.<sup>15</sup> The warmer weather experienced since the 1960s — in the boreal forest of north western Ontario, the average air temperature has risen by 2°C<sup>16</sup> — has brought a dramatic increase in both the frequency and extent of fire damage. In 1989, the worst fires on record scorched western



*Charred remains of boreal forest in Siberia which is becoming cattle pasture. Warmer weather has increased the frequency and severity of forest fires in Canada, Alaska and Russia.*

Canada and the area east of James Bay in Quebec. Since 1976, the area burned in Canada was six times higher than the trend over the previous century would have predicted: in the alpine and temperate forests of the western US, it was nine times higher.<sup>17</sup> Fire frequency has also increased since 1975 in Alaska; and in Russia, researchers report a sharp increase in the area of forest burned since 1985.<sup>18</sup> Only in Finland has there been a decrease in the frequency and area of boreal forest fires.<sup>19</sup>

Fire frequency affects the distribution of tree species in the boreal forest. In cooler, moister areas with more than an average of 100 years between fires, fir and spruce tend to dominate. When fires occur more frequently — between every 50 and 100 years — faster growing, more fire-tolerant pines prosper, particularly aspen and birch. When fire returns more than once every 10 years, no tree species can sustain itself, and the area becomes grassland.<sup>20</sup> Increased temperatures caused by climate change could lead to more frequent fires, resulting in rapid shifts in boreal species and forest decline.

One study concludes that climate change would increase Canada's annual fire severity rating by about 46 per cent.<sup>21</sup>

### • Storms

Warmer temperatures can increase the frequency and intensity of lightning and storms,<sup>22</sup> exacerbating the impact of fire and other disturbances. NASA scientists Colin Price and David Rind predict that a

doubling of carbon dioxide levels would lead to a 26 per cent increase in lightning strikes.<sup>23</sup> Lightning is already the major cause of large forest fires: in Alaska, for instance, lightning strikes are responsible for 38 per cent of forest fires.<sup>24</sup>

Warmer weather could increase the intensity and frequency of windstorms, which could fan small ordinary forest fires into roaring infernos.<sup>25</sup> Average wind speed in the central boreal forest of northwestern Ontario has already increased by 50 per cent.<sup>26</sup> Windstorms can also lead to blowdowns and generate large amounts of fuel for future fires or enough dead wood and damaged trees to encourage a bark beetle outbreak. Wind can also spread insects over long distances, contributing to pest outbreaks. Conversely, fires and insect outbreaks can increase the impact of a windstorm by creating exposed breaks in the forest.

### • Insect Outbreaks

Insects play a vital role in boreal ecology, decomposing dead vegetation and serving as food for birds and small mammals. In healthy diverse forest stands, insect outbreaks usually reduce the severity of fire by eliminating older and diseased trees. However, where the diversity of the forest ecosystem has been reduced as a result of logging and plantations, insects such as bark beetles, the Siberian silkworm and the spruce budworm can increase rapidly, devastating millions of hectares of forest.

The life cycles of the spruce budworm

moth (*Choristoneura fumiferana*) and the spruce bark beetle (*Ips typographus*) are strongly influenced by climate, the numbers of both increasing during warmer, drier weather. Adult bark beetles, for example, hibernate in forest debris or the bark of wind-fallen trees, only emerging when the temperature is above 20°C. In northern Europe, they do not emerge from hibernation until late May or early June and produce one generation of offspring in a single season.<sup>27</sup> But in warmer areas

curs if the temperature is less than 10°C.<sup>31</sup> A major restriction on the budworm's range are the cool temperatures in the northern boreal forest, which do not allow the larvae to develop into moths fast enough to escape the autumn freeze.

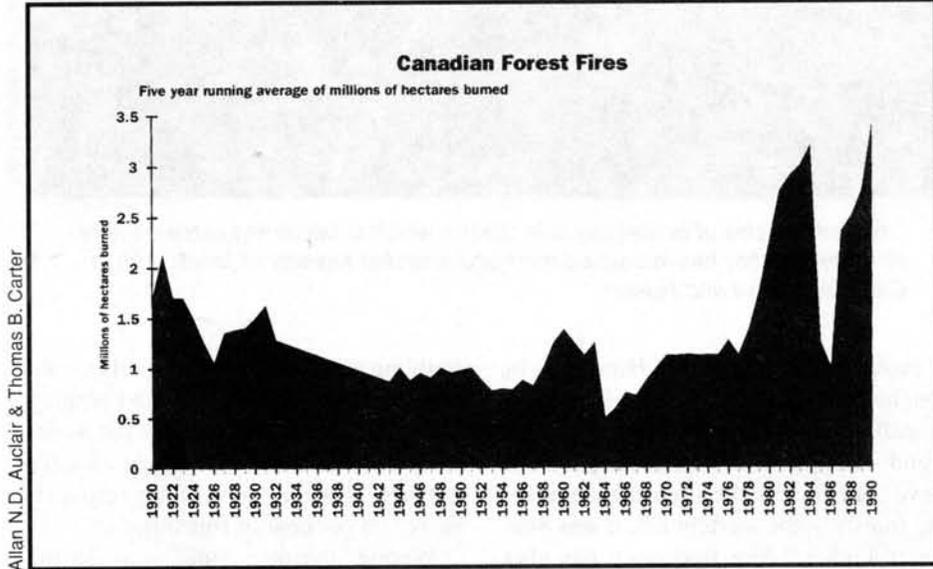
In recent years, however, unusually large outbreaks of spruce budworm have devastated wide areas of Canada's boreal forests. The next outbreak, predicted by the year 2000, could affect 100 million hectares of forest. Such a huge infestation

If a tree loses more water than it can absorb through its roots, it will dehydrate and die. Night temperatures play a crucial role in relieving moisture stress, but if they are too high, trees can die.<sup>32</sup>

Spruce, pine and fir respond to moisture stress by closing tiny pores called stomates on their leaves or needles. However, the stomates are also the pores which absorb carbon dioxide during photosynthesis. Thus, if the stomates close, photosynthesis stops and the tree may starve.

Higher temperatures may also disrupt the regeneration of boreal forests. Many boreal species are dormant during the autumn, and require a long period of winter chilling before warmer temperatures trigger new growth. A reduced period of chilling can significantly increase the time required for budburst.<sup>33</sup> Rapid development of the pollen and seed cones under high spring temperatures can lead to abnormal and incomplete cones with little pollen and infertile seeds. As a result, high spring temperatures can lead to reproductive failure.<sup>34</sup>

In addition, boreal seeds germinate only within a specific range of soil temperatures. Black spruce seeds, for example, germinate between 15°C and 28°C. If the soil temperature falls below 15°C, the processes that cause germination come to a halt, but if they rise above 28°C, bacteria and fungi can attack and consume seeds. The probability of germination also declines rapidly for higher temperature.<sup>35</sup>



Allan N.D. Auclair & Thomas B. Carter

Allan N.D. Auclair & Thomas B. Carter

of Europe, bark beetles emerge earlier, allowing two to sometimes three generations of beetles to develop each year.

Once bark beetle populations grow to a certain size, they can overwhelm almost every mature tree in the vicinity, healthy or otherwise. Outbreaks can last for many years and collapse only when every tree within reach has been killed, or cold weather kills off the beetles.<sup>28</sup>

The life cycle of the spruce budworm moth is similarly dependent on appropriate climatic conditions. To reproduce, female moths can fly up to 600 kilometres to lay their eggs, usually flying in the early evening in July, but only if the temperature is above 18°C.<sup>29</sup> Cool evening temperatures discourage flight and induce the moths to lay their eggs only in their immediate surroundings. The hatched larvae soon deplete their food supply and any potential pest outbreak then collapses. Warm summer evenings, however, may cause the outbreak to spread the following year.

The number of eggs laid by a budworm moth is largely determined by the average temperature: at 25°C, 50 per cent more eggs are laid than at 15°C.<sup>30</sup> The rate at which the eggs develop is also closely tied to temperature. Feeding rarely oc-

could dramatically accelerate the decline of spruce and fir in the southern band of the boreal forest.

#### • Stress

The ability of trees to recover from disturbances such as fire, storms and disease depends on the stress they are subject to. Stress comes from three main sources: temperature, moisture levels and reproduction, each of which is profoundly influenced by climate. In particular, high temperatures and dry soil can slow or halt regeneration so that a forest is replaced by shrubs or grassland.

Temperature affects the rate of respiration and photosynthesis. Healthy trees grow by accumulating carbon through photosynthesis at a faster rate than they lose carbon through respiration and other processes. An increase in air temperature can accelerate the rate of both. At high temperatures, the rate of respiration surpasses that of photosynthesis, causing a tree to lose carbon and eventually die.

Moisture stress may also be increased through higher temperatures. Trees extract water and nutrients through their roots, and lose water through transpiration. Evaporation of forest soils and transpiration depend heavily on temperature.

### Can the Forest Survive?

The recent changes in the frequency of fires and storms and the incidence of disease and stress observed in boreal forests appear to be associated with a relatively small global warming. Yet the International Panel on Climate Change, the body of experts set up under the UN Climate Convention, predicts temperature rises three to nine times greater than this in the next few decades, if the levels of carbon dioxide in the atmosphere increase to double those of pre-industrial concentrations.

Past changes in the earth's climate caused profound changes in the location and extent of the boreal forest. Before the ending of the last Ice Age some 18,000 years ago, huge ice sheets covered most of Canada, northern Europe and western Siberia, reaching down into Ohio in North America and as far as northern Poland in Europe. The boreal forest was located

much further south than it is today, although pockets survived in icy shelters on the peaks of mountains that rose above the ice sheets.<sup>36</sup>

When the earth warmed between 17,000 and 8,000 years ago, the boreal forest shifted northwards. As the climate became hotter and drier, the forest in Kansas and Nebraska was replaced by grassland. In eastern Siberia, the cool mixture of forest and tundra gave way to bands of vegetation, with boreal forest bounded to the south by temperate broad-leaved forest and grassland. The forest also grew onto land left by retreating glaciers, and in some places reached the shores of the Arctic Ocean.<sup>37</sup>

These changes, though immense when measured over millennia, happened at a far slower rate than the rate of climate change expected over the next few decades — a projected rate at least 15-30 times faster than any previously known.<sup>38</sup>

Assuming a doubling of pre-industrial carbon dioxide levels, recent research by climatologists predicts that existing boreal forest cover could decline by between 50 to 90 per cent.<sup>39</sup> While the models predicted that some new forest would move into the northern tundra, this new growth would cover a smaller area than the forest displaced to the south, reducing the total size of boreal forest and thus its capacity to act as a carbon sink.<sup>40</sup>

The decline of much of the southern boreal forest is likely to be driven by increases in drought and fire frequency. Warmer winters may lead to earlier springs with longer periods of warm weather giving more time for snow to melt and evaporate, leading to drier summers and drought.

Two areas of the boreal forest are especially prone to drought: the region to the east of Lake Baikal in Siberia, and the western Canadian provinces of Alberta, Saskatchewan and Manitoba. Fire would rapidly accelerate the conversion of such drought-stricken forest to grassland.

In southern areas of the boreal forest, conifers will suffer from more insect outbreaks and increased competition from temperate, broad-leaved species such as maple and oak. A study of boreal forest around Stockholm predicts the complete disappearance of spruce due to warm winters,<sup>41</sup> while a similar study of eastern North America shows a retreat of spruce to the shores of Hudson Bay and part of northern Quebec.<sup>42</sup>

Climate change is likely to drive the southern boundary of the boreal forest

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***“Assuming a doubling of pre-industrial carbon dioxide levels, recent research by climatologists predicts that existing boreal forest cover could decline by between 50 to 90 per cent.”***

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northwards much more rapidly than the migration rates of temperate trees, such as maple and oak. As a result, much of the southern boreal forest may be reduced to a degraded ecosystem of shrubs and scattered stands of aspen and birch.<sup>43</sup>

Although some climate-vegetation models suggest that boreal forests will shift 500 kilometres or more to the North in less than a century, this would mean that the forest would have to move at a rate of 5,000 metres per year or more — more than 10 times the historic migration rates of most boreal species. Indeed, the fossil pollen record shows that past migration rates were far slower. Spruce, for example, has responded to past climate change by expanding its range by 80-500 metres per year. Fir has moved about 20-300 metres per year, while pine has moved more rapidly at about 1,500 metres per year. Thus, it may take the boreal forest several centuries to expand as far north as some models predict. Should an ozone hole develop over the Northern hemisphere, as it has over the Southern, the northward expansion of the boreal forest is likely to be delayed by exposure to ultraviolet radiation because it reduces seedling growth.<sup>44</sup>

### **The Carbon Pulse**

Thus increased stress and disturbances are likely to destroy existing boreal forest much more quickly than new boreal forest can expand into tundra, or than temperate forest can expand into former boreal areas. As a result, many studies project that as forests die back, there will be a massive net release of carbon into the atmosphere — a “carbon pulse” — of as much as 225 billion tonnes of carbon, almost one-third of all the carbon now in the earth’s atmosphere.<sup>45</sup>

The release of such a carbon pulse could lead to a runaway greenhouse effect. An unknown factor is the peatlands which cover one fifth of the boreal forest and store almost two-thirds of its carbon — 419 billion tonnes.<sup>46</sup> Peatlands are currently a minor net carbon sink, absorbing about 45 million tonnes of carbon each year, but are also a significant source of another greenhouse gas, methane. While rising temperatures could dry out southern peatlands and reduce methane emissions, warmer conditions could also melt tundra and permafrost in the north, releasing huge quantities of methane into the atmosphere. Fire could also release large amounts of carbon from dried-out southern peatlands.

### **Reduce Emissions**

The only effective and direct way to prevent the potentially catastrophic decline of the boreal forests due to climate change is by stabilizing the climate. This means sharply reducing anthropogenic greenhouse gas emissions by phasing out the use of fossil fuels — the main source of atmospheric carbon — and lowering energy consumption; by curbing deforestation and implementing ecologically-defined logging practices; and by banning the use of other greenhouse gases such as the halocarbon CFCs and HCFCs.

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# Evicted!

## The World Bank and Forced Resettlement

by

Alex Wilks and Nicholas Hildyard

*Fifteen years ago, the World Bank introduced a mandatory policy covering the resettlement of people evicted by the development projects it funds. A recent internal review, however, reveals that the policy is being routinely ignored in almost all respects. The number of people displaced by Bank projects is not adequately assessed or minimized; only half the projects include plans to resettle those evicted; and the implementation of these plans is lax. Overall, the Bank can only point to one project out of its entire portfolio where those evicted have regained their previous standard of living — and even this is disputed by those evicted.*

In 1992, some 30,000 forest dwellers and peasant settlers in Uganda were expelled without warning from a strip of land between the Kibale Forest Reserve and the Queen Elizabeth National Park. They lost most of their livestock and belongings so that a wildlife corridor could be created between the Reserve and the Park. The expulsions took place under the Kibale Forest and Game Corridor Programme, part of a forestry rehabilitation project co-financed by the World Bank and the European Community. Joy Ngoboka, one of those evicted, described the scene:



*A shanty quarter of Manila in the Philippines. The World Bank lowers rather than improves the living standards of those it evicts who tend to be among the poorest sections of society — landless labourers, urban squatters, cultivators with customary rather than legal tenure, indigenous peoples, ethnic minorities and pastoral groups.*

“We were chased out on the first day. I didn’t know anything was happening until the police ran into my compound. They all had guns. They shouted at me, told me to run. I had no chance to say anything. They came at us and we ran, they came so violently. I was frightened for the children — I had eight children with me — but we just ran off in all directions. I took my way and the children took theirs. Other people were running, panicking, even picking up the wrong children in the confusion. I lost everything. I had 31 cows and some goats and hens . . . 20 cows

were killed and the rest taken. They burned everything, even the bed and furniture and the kitchen. We’re poor now.”<sup>1</sup>

Every year, millions of people in the Third World are forcibly displaced to make way for dams, roads, urban redevelopment, power plants, other infrastructure projects and, as in the case of Joy Ngoboka, wildlife parks. Much of the money to pay for these projects is channelled through the major multilateral development banks, of which the World Bank is by far the largest. Dams account for 63 per cent of World Bank-funded displacement, while transport, water supply and urban projects account for 28 per cent.<sup>2</sup>

### Flouting the Rules

In 1980, the World Bank became the first major development agency to issue a policy on involuntary displacement,<sup>3</sup> introduced largely in response to the resistance it had encountered from people affected by its projects and because of pressure from NGOs in the North and South. Yet a recent internal review — *Resettlement and Development: The Bankwide Review of Projects Involving Involuntary Resettlement 1986-1993* — makes it clear that the policy is being systematically flouted by Bank staff.

Since 1980, four basic requirements are supposed to have guided all Bank-funded projects involving forcible resettlement.

- **Baseline surveys of affected people have to be conducted.** Yet *Resettlement and Development* notes that only “forty-four per cent of . . . projects with resettlement [in the period 1986-1993] included baseline surveys.”<sup>4</sup>
- **A resettlement plan aiming to restore lost incomes must be in place.** But “almost half of all active projects involving resettlement have gone to the Board [of Executive Directors] without

Alex Wilks compiles and writes the Campaigns section of *The Ecologist*; Nicholas Hildyard is a co-editor of the *The Ecologist*.

resettlement plans prepared by Borrowers and appraised by the Bank."<sup>5</sup>

- **Timetables for resettlement have to be coordinated with civil works construction.** But "explicit timetables, synchronized with civil works, were found to be missing from more than half of the ongoing projects."<sup>6</sup>
- **A budget for resettlement has to be included in the project.** In practice, however, "cost analysis and financial planning for resettlement are often inadequate and financial obligations unclear, and resettlement operations frequently suffer from lack of funds."<sup>7</sup>

## Society Torn Apart

*Resettlement and Development* is clear about the effects of eviction:

"When people are forcibly moved, production systems may be dismantled, long-established residential settlements are disorganized, and kinship groups are scattered. Many jobs and assets are lost. Informal social networks that are part of daily sustenance systems — providing mutual help in childcare, food security, revenue transfers, labour exchange and other basic sources of socio-economic support — collapse because of territorial dispersion. Health care tends to deteriorate. Links between producers and their consumers are often severed, and local labour markets are disrupted. Local organizations and formal and informal associations disappear because of the sudden departure of their members, often in different directions. Traditional authority and management systems can lose leaders. Symbolic markers, such as ancestral shrines and graves, are abandoned, breaking links with the past and with peoples' cultural identity. Not always visible or quantifiable, these processes are nonetheless real. The cumulative effect is that the social fabric and economy are torn apart."<sup>8</sup>

Women's lives tend to be more disrupted than men's:

"since they are more likely to earn their living from small businesses located at or near their residences. Women may also be affected disproportionately in rural areas since they

are more often dependent on common property resources. For example, gardens may more frequently be on unregistered land than fields owned by men."<sup>9</sup>

In addition, compensation tends to be paid only to heads of households, who are often assumed to be men, thus "converting the collective assets of the family to cash in male hands."<sup>10</sup>

## Chronic Miscalculation

The World Bank has consistently overlooked, downplayed or underestimated the number of people displaced by the projects it funds. The *Resettlement and Development* Review states that during 1986-1993, the Bank underestimated the numbers affected by its projects by 47 per cent — some 625,000 people.<sup>11</sup> It now speculates that Bank-funded projects threaten two million people.<sup>12</sup>

In the case of the Andhra Pradesh Irrigation II project in India, the Bank claimed in 1986 that 63,000 people would be uprooted: in 1994, the figure was revised to 150,000. Again in India, the 1982 estimate for the Singrauli I and II power projects stated that not one person would be displaced; the Bank's latest figure is 49,000.<sup>13</sup>

For the Kiambere hydropower project on Kenya's Tana River, the original project appraisal in 1984 "guessed a figure of 1,000 people on both sides of the riverbank, of which an unspecified number of people might have to be resettled",<sup>14</sup> while a 1987 survey showed that "the real size of the affected population was 6,000." As a result, both the size and quality of landholdings available to those evicted were reduced, and family incomes fell by 82 per cent.<sup>15</sup>

For Africa as a whole, a regional working group reviewing World Bank-funded displacement admits:

"Given the inadequacy of the baseline data and the uncertainty of the numbers, it would be meaningless to speculate as to the number of resettled people."<sup>16</sup>

Even where reasonably accurate figures do exist, they tend to take account only of people directly displaced by projects, excluding those who, for instance, lose land or livelihoods as a result of "subsidiary projects" (such as compensatory afforestation schemes or irrigation works associated with dams) or through "secondary displacement" (that is, displaced

people displacing others).

The 1985 appraisal for the Sardar Sarovar dam in India overlooked an estimated 140,000 farmers who will lose land not to the dam itself but to the project's massive network of canals.<sup>17</sup> In addition, people who live downstream of dams often have to abandon their homes because of loss of fisheries, of irrigation due to seasonal flooding, or of other benefits previously provided by the river whose flow has been modified. A study extending 200 kilometres downstream from Kainji Dam in Nigeria found that catches of fish and dry season harvests of yams and other crops declined by more than half after the river had been closed by the dam.<sup>18</sup>

## Lack of Appraisal

The World Bank's resettlement policy stipulates that resettlement plans must be prepared before a project is approved. But *Resettlement and Development* reveals that only "an average of about 55 per cent of Bank-assisted projects could claim to have appraised full resettlement plans."<sup>19</sup>

The Bank agreed in 1985 to lend \$450 million for the Sardar Sarovar project without assessing the number of people who would be displaced, nor whether they could be rehabilitated. Nearly 10 years later, there has still not been a comprehensive survey, but critics calculate that about one million people will be moved.

When relocation plans are prepared, minimal care seems to go into them. In one urban redevelopment project in Bangladesh, for instance, the proposed resettlement site was "under several feet of water and no technical analysis of its potential suitability for resettlement had been performed."<sup>20</sup> In some cases where projects are nearing completion, so little account has been taken of resettlement that the Bank now admits that "it is unrealistic to expect much to be accomplished [for the evicted] so late into project implementation."<sup>21</sup>

## Last to Know

In many cases, communities first learn about a development project when eviction notices are pinned up in their villages or when surveying teams come to examine their area.

One example is the \$363 million Angat Water Supply Optimization Project in the Philippines, which is co-funded by the World Bank and the Asian Development Bank and which will evict over 19,000 people. During survey work on one aqueduct, residents who had been told nothing about the project:

"asked the surveyor what the survey was about; the answer they got was 'We are simply doing a listing'."

According to one resident, Nelly Horbana:

"We were only given one week after the notification reached us that we were going to be evicted. Then the bulldozer came. Unfortunately, I was by myself as my husband was out for work. I was pregnant at the time and I almost had a miscarriage. My child and I had to do the dismantling of our house."<sup>22</sup>

Even when timely notice is given of an impending eviction, those wishing to challenge a project face formidable problems. People have first to obtain and make sense of hundreds of pages of project documents which are often "classified", housed in government departments in the capital city (or in the Bank's Washington headquarters), and invariably written in official jargon and generally in a foreign language.

## Dismissing Local Knowledge

When "local participation" is invited, it is primarily with a view to making the eviction process easier. Little consultation of any kind takes place and halting the project is never an option that local people can choose. As the Review notes, "affected and host communities are not adequately participating in the resettlement process."<sup>23</sup> Instead, project appraisals and supervision rely on "expert" knowledge. The "experts" are normally Bank staff or consultants, whose prime focus is the project's potential economic and technical performance, rather than its social and environmental impact. *Resettlement and Development* concedes:

"Many engineering consulting firms, responsible for the technical design of major infrastructure projects worldwide, routinely display obliviousness to the adverse social implications of the designs they propose . . . Consulting firms often still fail to incorporate resettlement skills, especially local expertise, into their design teams, nor do they prepare resettlement components with the



Anthony Cullen

*Villagers demonstrate in Bombay against the evictions and resettlement caused by the Sardar Sarovar dam on the Narmada river. As in many cases of forced eviction, those who oppose resettlement are frequently intimidated, harassed, arrested, beaten and even shot.*

same rigour as the engineering components".<sup>24</sup>

As a result, the Review notes that:

"most relocation timetables were driven by construction timetables . . . rather than resettlement needs. They did not link displacement to plans for preparing new resettlement sites."<sup>25</sup>

Such lack of consultation can lead to project failure. In China's Daguangba Multipurpose project, a water development programme, "failure to involve local people in selecting housing designs led to a near universal rejection of the contractor-built houses."<sup>26</sup>

## Lack of Compensation

*Resettlement and Development* admits that "long delays in paying compensation are common"<sup>27</sup> and that, in some cases, no payments are made at all.

At Ghana's Kpong hydroelectric project, "governmental shortfalls meant that compensation was never paid to the 7,000 affected people and their host communities."<sup>28</sup> Commenting on the Bank's overall record in Nepal, the Review notes "an average delay of ten years between property expropriation and compensation payment."<sup>29</sup>

In Indonesia, the Kedung Ombo dam required the relocation of 5,268 families from 20 villages. Of these, 3,800 refused to join a government transmigration programme to the outer islands because the compensation offered was "substantially

less than the cost of replacing their lost assets."<sup>30</sup>

When some farmers took legal action against the Indonesian government over their poor compensation from the Bank-funded plan, which amounted to only 500-800 rupiah [25-40 US cents] per square metre of land, the Indonesian Supreme Court ruled in 1993 that the government had to pay 50,000 rupiah for each square metre.<sup>31</sup>

## Downgrading Living Standards

The Bank's 1980 resettlement policy stipulates that:

"where displacement is unavoidable, the objective of Bank policy is to assist displaced persons . . . to improve or at least restore former living standards and earning capacity."<sup>32</sup>

*Resettlement and Development*, however, finds that "less than 30 per cent" of those projects where a resettlement plan existed had "made income restoration a primary goal."<sup>33</sup> In the majority of cases, Bank staff have no idea what happens to displaced people nor whether or how they are compensated. *Resettlement and Development* concludes:

"Although the data are weak, projects appear often not to have succeeded in reestablishing resettlers at a better or equal living standard and . . . unsatisfactory performance persists on a wide scale."<sup>34</sup>

Such findings are confirmed by other departments within the World Bank. In 1993, for example, the Operations Evaluation Department (OED) conducted a study on resettlement in India where the Bank estimates that 974,000 people are threatened with eviction. It concluded:

"The overall record is poor to the extent of being unacceptable."<sup>35</sup>

For Latin America, a 1990 regional review was:

"unable to find a single study of a Bank-financed project which quantitatively demonstrated that a resettlement population had been adequately rehabilitated in terms of income, health or other social welfare measures."<sup>36</sup>

Overall, *Resettlement and Development* could cite only one project, the Khao Laem hydroelectric project in Thailand, for which "incomes for all households rose after resettlement."<sup>37</sup> In fact, close scrutiny of the 1993 OED study on which this conclusion is based reveals that resettlement at Khao Laem was far from successful.<sup>38</sup> Between 12-20 per cent of the displaced families, who were ethnic Karen, never received land or house plots in the resettlement sites because the government does not recognize non-Thais as legal residents;<sup>39</sup> of the families who did get land, one-fifth had left the resettlement sites by the time of the OED survey, and were therefore not included;<sup>40</sup> while 81 per cent of those who were left "considered themselves economically worse off than before resettlement."<sup>41</sup>

## Higher Costs

Incorrectly assessing how many people will be displaced usually leads to major problems in project implementation, including "project delays, resource shortfalls [and] compensation disputes."<sup>42</sup>

An assessment of 123 projects in Asia found that up to 30 per cent were delayed because of land acquisition and resettlement problems, the average delay being about two years.<sup>43</sup>

Such delays not only affect displaced people but also reduce the economic viability of the projects themselves. *Resettlement and Development* notes that:

"Projects in Africa, such as the Cameroon Urban II, have been halted because counterpart compensation funds failed to materialize and local residents refused to be resettled. Such delays and cost overruns have contributed to driving down the economic rate of return of several projects to very low levels."<sup>44</sup>

The review warns that "failing to account adequately for resettlement can exaggerate a project's attractiveness and, in extreme cases, can encourage economically marginal projects to proceed when alternative investments would have been superior."<sup>45</sup>

## The "Flexible" Migrant

*Resettlement and Development* is far from being the first review of the World Bank's policy on resettlement. Other reviews in 1983 and 1986 also revealed major shortcomings in policy implementation, but little has changed.<sup>46</sup> Indeed, despite the words of concern in *Resettlement and Development*, many Bank employees consider the disruption caused by forced resettlement as a minor inconvenience. Some even maintain that there are advantages in displacing large numbers of people. As a working group assessing involuntary resettlement in China states:

"The growth of the economy has been aided by the development of a relatively mobile, low cost source of labour — the so-called 'floating population' . . . [which] is in the vanguard of labour market reform. Those individuals must find their own jobs and have no tenure beyond their contract period. All of China is moving toward this model to allow the flexibility and incentives needed to enhance labour's contribution to continued development."<sup>47</sup>

## The Pressure to Lend

Such thinking goes a long way towards explaining the disregard shown by the Bank to those displaced by its projects. But the continuing, systematic abuse of those evicted also points to deep-seated structural faults within the Bank as an institution. *Resettlement and Development* confirms a 1992 leaked report by the Bank's Portfolio Management Task Force, led by Willi Wapenhans, which made it clear that "the Bank's pervasive preoccupation with new lending" takes precedence over all other considerations.<sup>48</sup> According to the Task Force:

"a number of current practices — with respect to career development, feedback to staff and signals from managers — militate against increased attention to project performance management."<sup>49</sup>

Appraisals of projects tend to be perceived "as marketing devices for securing loan approval (and achieving personal recognition)", with the result that "little is done to ascertain the actual flow of benefits or to evaluate the sustainability of projects during their operational phase."<sup>50</sup>

Such institutional priorities and management structures have encouraged staff to flout internal policy directives — such as those on resettlement — and borrower governments to ignore loan conditions. Unsurprisingly, the "credibility [of loan agreements] as binding documents has suffered" and "evidence of gross non-compliance [with Bank legal covenants is] overwhelming."<sup>51</sup>

## Insignificant Changes

The Bank claims that new institutional initiatives, such as increasing access to information and creating an "independent inspections panel" to which those evicted by projects can submit their grievances, will ensure that the Bank can no longer ignore social and environmental concerns in its projects. Whilst the introduction of independent and effective scrutiny of Bank projects is welcome, these initiatives fall far short of what is needed. The Inspection Panel, as currently constituted, will be neither independent nor effective:

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- The Executive Directors of the World Bank can arbitrarily block investigations into complaints.
- The Panel can only make recommendations. It cannot demand compliance or compensation, which will be determined by the Executive Directors.
- Procedures are ambiguous and do not specify whether complainants will be able to comment on the response of Bank staff to their complaints.
- Successful complaints will result only in corrective action by the Bank, rather than compensation to communities affected.<sup>52</sup>

The Panel's reports, moreover, will only be made public — even to the complainant — after the Board of Executive Directors and Bank management have considered them, giving Bank staff the opportunity to downplay controversial findings.

## No Change at the Bank

Meanwhile, the wide-ranging institutional reforms Wapenhans suggested to overcome "the pressure to lend" have not been implemented. No steps have been taken to introduce measures — including penalties and incentives that would affect career advancement — to hold the Bank's task managers and their superiors responsible for complying with Bank guidelines. On the contrary, the Bank is proposing to reissue its Operational Directives — including the policy on resettlement — in a simplified form, stripped of their mandatory procedures.

Clearly, such institutional problems will not be solved either by an Inspection Panel or by yet another review of the Bank's record on evictions and resettlement. Indeed, the attention that previous reviews drew to the problems surrounding resettlement quickly waned. The lessons are clear: the World Bank will not change without significant and sustained pressure from the public, concerned groups and parliamentarians. Without such pressure, the Bank will continue to fund projects which displace the poor into even greater poverty, often for projects which are economic as well as social disasters.

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Patrick McCully

A resettlement site for some of those evicted by the Sardar Sarovar dam.

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# Border Troubles

## Free Trade, Immigration and Cheap Labour

by

Peter Andreas

*Increasing illegal immigration from Mexico to the US has provoked calls within the US for tougher border controls so as to create a "fortress America". By casting illegal immigration as a law-enforcement problem requiring a law-enforcement solution, US policy-makers and pundits have successfully diverted attention from the underlying causes of illegal immigration — notably the demand for cheap labour in the US and the ruinous impact of current development policies on livelihoods within Mexico.*

As old walls have been torn down with the end of the Cold War, governments are scrambling to build new ones. These new walls are being put up not between geopolitical blocs, but between lands of affluence and lands of poverty. The perceived threat is not a military invasion, but an immigrant one.

In the United States, the quintessential nation of immigrants with a population of 257 million, there is a growing "nativist" backlash against new arrivals from developing countries. Most immigrants to the US arrive and stay legally, but national attention has focused on an estimated three million who do not, with hundreds of thousands more entering illegally each year. Tension over illegal entry is highest along the 1,945-mile border between the United States and Mexico, where the US Border Patrol currently apprehends about one million illegal entrants a year, fifteen times more than 30 years ago.

Border controls are inherently limited and fail to address the underlying causes of illegal immigration. Indeed, for decades, US immigration policies have failed to take account of the forces within Mexico that push people to move to the US; the demand from the US which pulls them; and the growing industrialization of the border itself. As a result, such policies have increased the movement of illegal migrants.

### Unleashing Migratory Forces

The push factors in Mexico that spur immigration are assumed to be obvious: high levels of poverty; "overpopulation"; and economic stagnation. The remedy is also assumed to be obvious: economic development through foreign investment; export promotion; and market reform. In the 1960s, the United States supported the industrialization of the Mexican side of the border on the grounds that it would help reduce illegal immigration by providing employment within Mexico. Similarly, in the 1980s, the Reagan administration argued that the Caribbean Basin Initiative would help stop the flow of illegal migrants. More recently, the Clinton administration used analogous arguments in its support of Mexico's sweeping market reforms and the North American Free Trade Agreement (NAFTA), which came into force between the US, Mexico and Canada in 1994.

US Attorney General Janet Reno, who has overall responsibility for law enforcement, promised that NAFTA "will help me to protect our borders", warning that if the agreement failed:

"effective immigration control will become impossible . . . [and illegal immigration] is only going to get worse. I don't have numbers, but every bit of logic . . . would confirm it."<sup>1</sup>

Reno's logic, however, is not very logical. In important respects, NAFTA and other current economic initiatives produce precisely the opposite of their intended effects.

In the short-term, rapid and disruptive economic change unleashes migratory forces. In nineteenth-century Europe, for example, massive demographic movements from Europe to the US and Australia were fuelled by industrialization and the rise of a market society. As one analyst on immigration patterns points out that:

"Traditional societies send few emigrants, but the disruption of traditional ways spurs emigration. As countries industrialize, formerly rural workers, now more rootless, begin to think of the next step — emigration."<sup>2</sup>

Rather than deterring emigration, border industrialization has encouraged migration from the interior of Mexico to the border zone, which, in turn, has encouraged immigration into the United States. In particular, as the number of export-assembly plants (*maquiladoras*) along the California-Mexico border has quadrupled in the last decade, so illegal immigration has risen. Indeed, even those economists who argue that NAFTA will eventually curb illegal immigration concede that, at least in the short-term, such immigration is likely to increase.

Of the broader market reforms underway in Mexico, the single most dramatic stimulus to emigration is the liberalization of agriculture. In the past, the Mexican government provided price supports for beans and rice and restricted the sale of communal farm lands. But as part of the new economic strategy introduced in the mid-1980s, these lands can now be sold and subsidies have been cut. Under NAFTA, moreover, cheaper US agricultural imports are expected to flood into the country. These processes will displace millions of small-scale farmers and exacerbate rural unemployment. Crowded urban areas such as Mexico City will be hard pressed to accommodate them, so "El Norte" will be the logical destination for many. An estimated one third of new entrants to the labour force in Mexico's

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western region end up in the United States.

The "export" to the US of some of Mexico's unemployed reduces poverty and pressures on urban areas at home. Remittances from immigrants in the US — an estimated \$3 billion per year — are one of Mexico's largest sources of foreign exchange and clearly important for poorer households. Mexican politicians routinely travel to the US to persuade their constituents to keep sending the money back to their home towns. Economically and politically, the emigration "safety valve" is thus of critical importance to Mexico.

## Establishing Roots

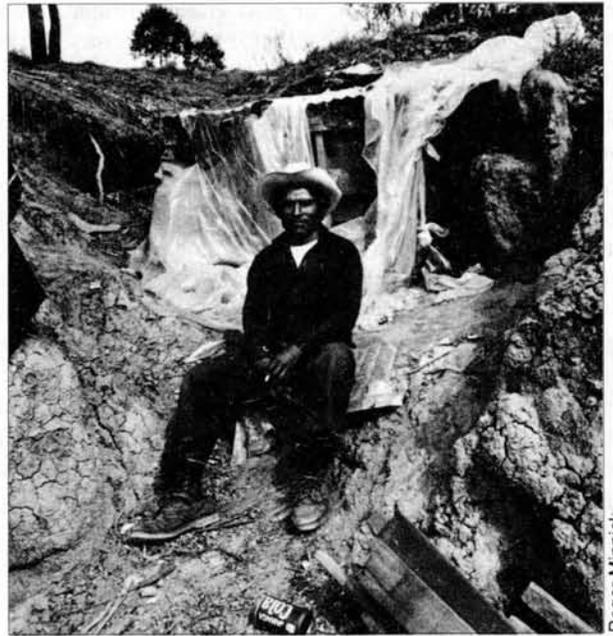
Besides attempting to stem the flow of migrants from within Mexico, US officials have long concluded that measures within the US to curb the "pull" of illegal immigration are also necessary. The variety of strategies employed over the years — guest-worker programmes, employer sanctions and limited legalization of immigrants — have either been ineffective or have generated consequences which are often opposite to those intended.

One of the first attempts to regulate the flow of people across the US-Mexican border was the *bracero* programme, a guest-worker scheme in operation between 1942 and 1964. Designed to assure agribusiness interests in the Southwest of the US a cheap source of labour and to absorb those workers who would otherwise enter the country illegally, the *bracero* programme provided more than 4.5 million individual contracts for temporary employment over two decades.

The promise of guaranteed employment, however, attracted far more migrants than the programme could handle. But having made the long trip from Mexico's interior to the border, the new arrivals were not going to turn around and go back. Thousands stayed in the US illegally, while many guest workers on temporary contracts ended up staying permanently, a process which created stable migratory networks. Far from containing migration, the *bracero* programme helped to entrench it and encouraged a symbiotic relationship between migrants and employers.

When the *bracero* programme was stopped in 1964, all that changed was the status of the Mexican workers from legal to illegal. Employers had come to rely on this cheap and flexible supply of labourers and continued to welcome them. They had little to fear from the US government, since the hiring of illegals was not in itself illegal. Immigration increased in the decades after the programme was abandoned; by the early 1990s, two out of five farmworkers in the United States were migrants, a majority of them Mexican. In California, Mexican farmworkers comprise an estimated 40 per cent of the agricultural labour force. The use of migrant labour has now spread from California and Texas across the country. One Michigan farmer provides a telephone number which workers from one village in Mexico's Michoacán province can call free to find out when to turn up for work.<sup>3</sup>

In 1986, the US government, under pressure to tackle rising illegal immigration, passed the Immigration Reform and Control Act (IRCA), which introduced employer sanctions for the first time as well as a limited amount of legalization. Immigrants who could prove that they had been resident in the United States since before 1982 were allowed to become legal workers. With three million immigrants "legalized", US officials hoped a supply of legal workers would saturate domestic demand, while



Roger Minnick

*A dug-out house in southern California. An estimated two-thirds of migrant farm workers do not have homes, but live and sleep in the fields in which they work, despite the widespread use of pesticides. One third of US farm labourers work in fields without drinking water, hand washing facilities or toilets. The life expectancy of migrant farm workers is estimated to be 49 years of age, 20 years below the US national average. Although employers keep farm workers on low wages and in abysmal housing and abject poverty, migrant workers are viewed by many as "welfare scroungers" (in fact, less than one per cent of farmworkers receive any form of welfare), "contaminating" the US with "the stench of urination, defecation, narcotics, savagery and death." In November 1994, Law 187 was passed in California under which illegal immigrants and their children are denied public schooling and non-emergency medical treatment and health workers and teachers are required to report "suspected aliens". The new law aims not to deport illegal immigrants but, in the words of one commentator, "to preserve a bloated supply of cheap labour while reducing the fiscal cost of its reproduction to near zero." It has provoked widespread protests in California and Mexico and is being contested in the courts.*

employer sanctions would inhibit the hiring of illegal ones.

Again, however, IRCA reforms not only failed to reduce immigration levels but, in some respects, were counterproductive. Many Mexicans who had gone to the United States just once and returned to Mexico went back to the US to claim their legalization papers. As with the earlier *bracero* programme, those who are now legally allowed to work provide a more permanent base for the social networks that facilitate the arrival of new immigrants. Within just a few years of the IRCA's passage, whole Mexican villages were "virtually emptied of adult men . . . as Mexicans streamed north."<sup>4</sup>

Employer sanctions, meanwhile, have been carelessly enforced and widely abused. Less than 0.5 per cent of US workplaces have been inspected since the sanctions were initiated. As one senior immigration official remarked:

"There are 7.2 million employers out there. In their lifetime, they're never going to see an immigration officer unless they stand up and scream that they've got a factory full of illegal aliens."<sup>5</sup>

Changes in the US economy itself have further strengthened the "pull" for immigrants. Until recently, illegal immigrants worked primarily in agriculture, but the restructuring of urban manufacturing and the growth of the service sector have drawn large numbers of immigrants to urban areas. For example, some 90 per cent of those employed in the Los Angeles garment industry are illegal immigrants. The trend throughout the US towards employing casual labour rather than permanent staff has made hiring of workers more flexible and eased restrictions on employers, resulting in lower, direct and indirect, labour costs.<sup>6</sup> The fastest growth over the next decade is predicted to be in the low-skill, low-pay jobs that have been filled by illegal immigrants.

### The Balloon Effect

The border between the United States and Mexico is notorious for its porousness, even though in recent years, the United States has significantly strengthened its border control. Funding for the Border Patrol jumped 82 per cent between 1986 and 1991 from \$164 million to \$299 million. The IRCA almost doubled the number of Border Patrol agents in 1986 from 2,500 to about 4,800. In July 1993, President Clinton proposed another 12 per cent increase in the number of agents, which was upped again in February 1994 by 30 per cent.

US border-control strategists maintain that "prompt apprehension and return to country of origin is a positive deterrent to illegal entry and related violations."<sup>7</sup> But most would-be immigrants, if caught, simply try again; as one young Mexican told the Border Patrol agent who caught and handcuffed him as he attempted to cross the border, "It doesn't matter how many times you catch me. I'll be back."<sup>8</sup>

Not only is the effectiveness of border control questionable, but there is growing evidence that, like economic initiatives, intensified border enforcement has some contradictory effects. Many illegal immigrants make regular trips between the United States and Mexico, but often stay in the US only long enough to earn a fixed amount of money. Stricter border control, however, induces them to stay longer; the more difficult it is to cross the border, the more expensive the journey becomes. As border controls are tightened, illegal immigrants rely on "coyotes" — professional smugglers — to take them across to the US for a fee. The current rate to be transported to Los Angeles is about \$700 per person. This fee must be paid even if the border crossing is not successful.

In effect, tighter border controls may reduce the number of trips made by illegal immigrants but they increase the incentive to cross the border and, once across, to stay longer. Moreover, by forcing illegal immigrants to depend more on smugglers, border enforcement has helped to create a profitable and increasingly sophisticated business in "human trafficking". Each tactic by the Border Patrol — such as deeper and longer ditches and stronger and higher fences — has been countered with new tactics by the smugglers.

Immigration officials nonetheless continue to place their faith in border controls, insisting that the problem lies not in the strategy *per se* but in the lack of resources to implement it.

While better training and equipment may indeed make the policy more efficient, however, they do not make it more effective. In an effort to prove the effectiveness of border enforcement, the Border Patrol in El Paso, Texas, initiated "Operation Blockade" in September 1993 in which more than 450 agents worked overtime to cover a 20-mile stretch of the border. Illegal crossings in the area plummeted. One Border Patrol agent declared, "We've proven it works, that it's feasible, and that it's desirable. I think it will work anywhere that you're willing to commit and dedicate the resources."<sup>9</sup> But suppressing the flow in one area simply redirects it elsewhere; new crossing points for illegal immigrants emerged on both sides of the El Paso "blockade". "We call it the balloon effect", comments one Border Patrol agent. "You squeeze it here; it just goes over there."<sup>10</sup>

Free trade policies have simply compounded the difficulties. Efforts to "seal the border" are limited by the high levels of transborder commerce, which will only increase under NAFTA. Officials are torn between the conflicting goals of suppressing illegal flows and supporting legal ones. As legal flows increase, it becomes more difficult to "weed out" the illegal ones. About 1,700 trucks cross the bridge over the Rio Grande from Juarez in Mexico to El Paso every day. One Customs official in El Paso conceded that "most trucks that go through customs go through almost unimpeded". Under NAFTA, Mexican truckers will eventually be able to travel anywhere in the United States and Canada — and trucks can carry illegal immigrants and drugs as easily as legal goods.

### Bring in the Military

Despite the limits and flaws of past and present US policies to stem illegal immigration, the current political climate favours policy escalation rather than re-evaluation, and lax border control has been considered the main target. Republican Senator Alan Simpson states:

"The first duty of a sovereign nation is to control its borders. We do not . . . Uncontrolled immigration is one of the greatest threats to the future of this country."<sup>11</sup>

His sentiments echo those voiced by former CIA director William Colby in the late 1970s:

"The most obvious threat [for the US] is the fact that . . . there are going to be 120 million Mexicans by the end of the century . . . [The Border Patrol] will not have enough bullets to stop them."<sup>12</sup>

The increase in the illegal drug trade has reinforced such "fortress America" sentiments and has been used to justify the introduction of military and National Guard units along the border. As a result, drug and immigration control have become increasingly intertwined. One former army officer has even suggested that, with the military looking for a new job in the post-Cold War era:

"a more easily accomplished mission for existing forces would be patrolling the borders. It is, of course, absurd that the most powerful nation on earth cannot prevent a swarming land invasion by unarmed Mexican peasants. The US Army is entirely capable of plugging the holes permanently, and border duty would be excellent military training."<sup>13</sup>

## Green Fields, Brown Skins

In the US, crops such as corn, wheat, soybeans and cotton are largely mechanically cultivated and harvested, but perishable fruits and vegetables still require large numbers of workers, most of whom are migrants and seasonal. Of an estimated two million hired farm workers in the US, 90 per cent are ethnic minorities. Of these, Mexicans are the largest group, comprising 75 per cent of the agricultural workforce.



Barry Lewis/Network

The fruit and vegetable crops harvested by migrant workers are sprayed heavily with pesticides. As a result, pesticide poisoning is the second largest occupational health problem for farm workers after accidents. The death rate in agriculture is 66 per 10,000 compared with the industrial average of 18. An estimated 1,000 farm workers die each year as a direct consequence of pesticide exposure. In California, the richest agricultural producer in the US with the highest proportion of migrant workers and ethnic minority residents, farm workers' illness and injury rates are the highest of any occupation in the state.

Ironically, environmental and consumer campaigns against pesticides have, in many instances, increased the hazards for farm workers. The main target of such campaigns has not been pesticides *per se* but pesticides which persist either in the environment or as residues on

food, such as the organo-chlorines DDT, chlordane and lindane. With regulation, these have been replaced by organophosphate pesticides which, though "non-persistent", are much more hazardous to those who are directly exposed to them. Food products thus contain lower residues but only because it is permissible to poison thousands of migrant farm workers and their communities. As ecologist Ivette Perfecto points out, "less

acutely poisonous chemicals were eliminated because they poisoned everyone, including the people with political power. More acutely poisonous chemicals were substituted because they only poisoned people of colour".

The impact of minority farm workers' exposure to toxic chemicals is exacerbated by poverty. Farmworkers are six times more likely to develop tuberculosis than other employed adults. Malnutrition makes children vulnerable to diseases such as dysentery, hepatitis and typhoid. Such issues, however, have largely been ignored by the "sustainable agriculture" movement — perhaps because the impetus for "sustainable agriculture" was generated in part by white farmers losing their land during the 1980s. Little attention has thus been paid to "sustainability" from the non-white farm workers perspective, for example, to issues such as labour rights, immigration, housing or health.

### The Logic of Escalation

Behind the bureaucratic logic of escalating border enforcement is a deeper political logic. Embedded in the current immigration debate are deeply-held beliefs about the "immigrant problem" which limit the range of acceptable solutions. The guiding assumption is that the influx of illegal immigrants results from excessive US generosity and lax border enforcement. As illegal immigrants are presumed to be free-riding on US hospitality, it is maintained that they can be controlled by replacing the "Welcome" mat with a larger "Do Not Enter" sign along the border. California Senator Dianne Feinstein is blunt: "The day when America could be the welfare system for Mexico is gone. We simply can't afford it."<sup>14</sup> She conveniently does not mention that California relies on Mexican labour, that few illegal immigrants are unemployed and that the majority pay taxes. Indeed, as one Congressman recently remarked:

"We will catch a few [illegal immigrants], round them up, and send them back, but not too many, because then who will do the work?"<sup>15</sup>

It is this economic reality that is being pushed into the shadows by the current immigration debate. Rather than confront the awkward predicament that it poses, US policymakers have chosen to focus on border control, maintaining the fiction that illegal immigration is primarily a law-enforcement problem that requires a law-enforcement solution.

### A National Identity Crisis

Meanwhile, economic recession is leading to a rising anti-immigrant sentiment. Opinion polls suggest that US citizens believe prosperity is waning, and few want to share it with new arrivals. But national anxiety runs deeper than economic insecurity. Misgivings over changes in the economy underscore a deeper sense of national disillusion and identity crisis, causing a "bunker" mentality and inflaming xenophobic tendencies.

The Los Angeles riots in 1992 and the World Trade Centre bombing in 1993 reinforced this mentality. As Arthur Helton of the Lawyers Committee on Human Rights comments, "If you . . . see the icon of the Statue of Liberty dissolving and being replaced by the World Trade Centre after it was bombed, you get a sense of the negative direction of the discussion [on immigration] in the United States."<sup>16</sup> Many immigrants were involved in the Los Angeles uprisings and riots, which may have exacerbated the public's perception of them as a problem rather than as exploited.

More broadly, nativist sentiment is spurred by cultural and demographic changes in the US. For instance, the proportion of the population born abroad was 5 per cent in 1970, nearly 8 per cent in 1990, and is expected to be more than 10 per cent by the turn of the century. In Los Angeles County, nearly 33 per cent of the population is foreign-born, up from 11 per cent in 1970. Latinos, now 28 per cent of California's population, are likely

to be the majority by 2040.<sup>17</sup> Some demographers predict that rates of immigration for the next three decades will be 1.5 million per year — double that of the 1980s.

However, it is not simply the number of immigrants that is perceived as a threat, but also the persistence of distinct national identities. Whereas earlier generations of immigrants were depicted as striving to assimilate into the dominant culture, recent immigrants are more likely to retain the cultural and linguistic traditions of their country of origin. A resident of Fountain Valley, California said: "The recent migrants are not immigrants. They are Mexicans living in America."<sup>18</sup>

One consequence of these changes is that "the old American 'melting pot' is now cooking a variegated stew, each of whose ingredients maintains a singular taste."<sup>19</sup> Indeed, a more exact description of the United States itself may be a "multicultural regime" rather than a genuine nation-state.<sup>20</sup> The extent to which the "melting pot" metaphor fits the US experience has always been more imagined than real, but its powerful image helped sustain the collective imagination of a national community. Now it is an image in question.

## Neither US nor Mexico

One hundred and fifty years ago, it was Mexico which tried to curb US immigration into its northern regions. The battle of the Alamo was, in a sense, a bloody attempt at immigration control. Mexico won the battle but lost the war. After 1848, these regions became part of the sovereign territory of the United States.

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White settlers, many of them European immigrants, moved west to occupy the newly-acquired lands. Today, while the political boundaries remain, the direction of migration has been reversed, with vast numbers of Mexicans populating these regions. The irony has not escaped Mexicans, many of whom consider this massive demographic movement to be a legitimate reconquest by peaceful, even if not legal, means.

The boundaries at stake are not territorial, but cultural and economic. Oscar Martinez, who has studied the border region, notes that:

"Demographically, economically, linguistically, and culturally, the US border area is functionally an extension of Mexico, and in a similar fashion, the Mexican border zone is an extension of economic, social, and cultural influences from the United States."<sup>21</sup>

The region is neither distinctly American nor Mexican, but a unique combination of the two — "Amerexico."<sup>22</sup> While economic and social integration deepens, however, political authority remains fragmented, unable to overcome national boundaries. Creating and sustaining truly effective political mechanisms for dealing with cross-border issues first requires recognition and acceptance — rather than the current state of denial — of the multiple interdependencies that bind the United States and Mexico together. Rather than the unilateral defence of national sovereignty, the realities of such interdependence should form the framework for any immigration policy.

This article is an edited version of "The Making of Amerexico: (Mis)Handling Illegal Immigration", which appeared in *World Policy Journal*, 1994.

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## War Against Nature

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**ENVIRONMENT UNDER FIRE: Imperialism and the Ecological Crisis in Central America** by Daniel Faber, Monthly Review Press, New York, 1993, \$16.00 (pb), ISBN 0-85345-840-5

Human misery and environmental deterioration generally exist together. In few regions of the world, however, do economic and political structures so clearly yield environmental crises as in Central America. Drawing on over eight years of research, organizing and writing about the region's social and environmental crisis, Daniel Faber provides an alarming but detailed account of the root causes of the environmental and human problems in Central America — every major ecosystem is at risk; two-thirds of the rain-forest has been destroyed; soil, water and the food chain have been contaminated by pesticides; the number of people is growing rapidly; per capita food production is declining; and environmentally-related infectious diseases are increasing.

The roots of Central America's environmental and social crises are centuries old, beginning with the attack on indigenous peoples and the environment when Spain entered what is now Panama in 1509. Faber chronicles this early history, characterized by the enslaving of Indian labour to mine gold and silver, the introduction of cattle, cacao and sugar, and the killing of over 10 million indigenous peoples by 1650.

After the Central American countries, led by local elites, won independence from Spain in the early nineteenth century, they followed a path of export-led

development, expanding coffee and banana production in particular. But by the early twentieth century, the "coffee and banana republics" of Central America were heavily influenced by a neo-colonial power, the United States. Large estates throughout the region were owned either by local elites or US corporations; by 1918, for example, 75 per cent of banana lands in Honduras were owned by three companies. These owners continued to force peasants off fertile land, deforest large tracts for coffee, bananas and cattle, and coerce small farmers into labouring on large estates.

Expansion of the capitalist export sector continued after the Second World War with the aid of the World Bank and the United States Agency for International Development (USAID). They assisted the consolidation not only of this small but wealthy sector of a few landowners monopolizing most of the region's productive lands and natural resources, but also of the vast, poor sector.

Faber graphically demonstrates how environmental problems in Central America have been exacerbated by militarization, in particular, the numerous wars directly or indirectly promoted by US foreign policy over the last few decades. The US has conducted counter-insurgency campaigns in El Salvador and Guatemala, spent over one billion dollars in helping to bring about the "contra" war in Nicaragua, enabled Honduras to become an "armed camp" for military operations in other countries, and sent in 26,000 troops to bomb and invade Panama in 1989. Since 1980, war-related deaths in the region have totalled 175,000.

The environmental impact has been grave, as the ecological conditions needed just for subsistence have been destroyed. Both the Salvadorean and Guatemalan militaries, for instance, followed Vietnam style "scorched earth" policies by deforesting and burning entire regions. Massive displacement of peasants hastened environmental decline.

Faber is convincing in his argument that the centuries-old features of foreign domination, repression, poverty, peasant displacement, and extraction and export of natural resources for foreign markets still exist in Central America and have yielded the present social and environmental crisis. Given such a bleak scenario, what is needed?

Faber's list of regional remedies include: redistribution of export estate land to small farmers; redirection of technical

assistance and financial credit from wealthy landowners to small farmers and workers; massive reforestation projects; toxic cleanup campaigns and regulation of harmful pesticides from foreign chemical companies; habitat recuperation and the creation of national parks; watershed production; progressive taxation and social programs; pollution control; improved quality of life for the subsistence sector; and increased international support from governments and the global environmental movement — in short, a massive social transformation.

In this, Faber is asking much of the region's governments, United States policy makers and the environmental movement. The US, he says, should be less interventionist in Central America militarily, economically, and even in development aid. Yet, paradoxically, the US should be *more* interventionist in supporting the sort of policies that Faber outlines.

While I agree with Faber in his suggestions of remedies, I wish he had devoted more space in this excellent volume to the courageous efforts of countless grassroots popular organizations throughout the region. Many have detailed proposals for long-term, sustainable agricultural development. For instance, the Committee for Sustainable Technology in El Salvador has drawn up a sophisticated programme of technical assistance, sustainable development projects and environmental reclamation, while the Union of Salvadoran Ecologists has produced a 500-page document outlining solutions to the problems as Faber describes them. The National Peasant Union of Honduras, meanwhile, engages in land recoveries and concrete proposals for land redistribution to peasant farmers.

"Experts" on Central America already exist in the popular movements. Both their strategies and Faber's should be employed immediately to turn around the environmental disaster and human misery that affects much of the region today. As Faber notes, the "circle of poison" — a reference to the pesticides banned in the US but used on crops grown in the region for export to the US — affects us all.

Lois Ann Lorentzen

Lois Ann Lorentzen teaches Environmental Ethics at the University of San Francisco. Her research takes her frequently to Central America.

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## Consensus or Conflict?

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**CONFLICT RESOLUTION: Cross-Cultural Perspectives**, edited by Kevin Avruch, Peter Black and Joseph Scimecca, Greenwood Press, Westport, 1991, £40.50 (hb), 244pp. ISBN 0-313-25796-5.

"Conflict resolution" emerged in the late 1970s and 1980s as a way to deal with the confrontational politics of the 1960s' and 1970s' protest movements, such as the civil rights movement in the United States and the limits to growth movement worldwide. "Sustainable development" is perhaps the most ambitious conflict resolution project of all time, and for this reason, *Conflict Resolution* is an important book for environmentalists. The anthology questions the prevalent assumption that "conflict is bad and in need of explanation, while its opposite is valued behaviour that needs no explanation", and considers ways in which views of conflict and harmony are socially and culturally determined.

According to Joseph Scimecca, the roots of conflict resolution as a profession lie in industrial and international relations, peacemaking efforts by religious leaders, and the search for alternatives to the legal system. Each of these developments came out of a wider social context of protest.

Conflict resolution began as part of this challenge to traditional power, but was quickly appropriated by those being challenged. It presented a way for the establishment to manage new sources of conflict when the old forms of authority were no longer effective. Scimecca says that within industrial relations, the emphasis is on "resolving conflicts so that work and interactions can proceed smoothly in organizations" rather than focusing on "the conditions that produced the conflict in the first place . . . conditions that ultimately may be harmful to the individual".

In her essay on harmony models, Laura Nader points out that whereas in the 1960s social groups, such as indigenous peoples, consumers and women, employed "the adversarial legal mode" to obtain their rights, in the 1970s such confrontation was replaced by alternative dispute resolution concerned more with efficiency than with justice. It smothered critics in a

blanket of consensus, homogeneity, conformity and agreement:

"The harmony model of the 1970s and 1980s is a kind of cultural soma that tranquilizes potential plaintiffs who increasingly agree to consent to treatment by means of mediation or who are told 'Don't be negative'."

The ideal of harmony, so prevalent in the West today, became a "powerful form of direct and indirect control" which can be used to suppress criticism. It locks out those who continue to protest and discourages disagreement among those who have accepted a seat at the negotiation table. Confrontation can destroy the trust and assumption of shared goals which negotiation requires, jeopardizing the whole process of conflict resolution. Aiming for consensus, the process reinforces the status quo; radical change is unlikely to emerge when any change has to be agreed to by all parties.

Trends towards conflict resolution are evident in the public debate about environmental issues. Environmentalists in the 1970s who challenged government, developers and business interests and engaged in direct action have been eclipsed by modern "professional" environmentalists who negotiate with government, work with industry and show a positive, constructive face to the public. Willingness to make deals, accept trade-offs and tone down confrontation grants entry into the decision-making process. Director of Friends of the Earth, Hong Kong, Linda Siddall, says that:

"while confrontation may have been the only posture available to environmentalists in the 1970s, times are changing and so too are industrial attitudes."

Environmentalists, however, are the junior and weaker partners in such deals; their value lies in their presence, which confers green credentials on products or delivers votes. Ironically, the need for such credentials has been forced on policymakers and businesses by attention-grabbing confrontations highlighting environmental problems and the role of government and industry in creating them.

Differences of power between disputants, argues Kevin Avruch in his introduction to *Conflict Resolution*, tend to be overlooked by the "peacemakers". By placing themselves above the argument, they themselves exercise power, imposing their view of the situation and its

resolution on the antagonists. Avruch argues that designers of alternative dispute resolution procedures tend to make unwarranted assumptions about people — for example, that they set out to maximize their own self-interest. In addition, the expected mode of behaviour for conflict resolution negotiations — rational, calm, logical and unemotional — does not sit well with those who feel passionately about their cause. This leads to those who challenge the status quo being labelled "emotional" and "irrational".

Thus, the exercise of power by conflict managers, or those who employ them, can involve a deliberate attempt to suppress criticism and disempower people by labelling confrontational protest as undesirable behaviour, a tactic which is increasingly employed with environmental issues. Government authorities, economists and advisers have sought to resolve environmental conflicts by imposing their definition of the problem and setting the agenda for debate.

Mainstream environmental groups, not wishing to appear uncooperative and anti-development, do not debate the merits of economic growth, for example, while business groups push it as a social priority. Although differences in values — moral, ethical and spiritual as well as market values — often lie at the heart of environmental conflicts, decisions concerning environmental issues are reduced to economic balancing acts in which value is reduced to its dollar equivalent.

The cleverly-constructed notion of "sustainable development" with its emphasis on harmonious consensus in environmental decision-making, combined with the incorporation of the environment into the market system, has dissipated the imperative that environmental deterioration once had for social and political change.

This is illustrated by the Ecologically Sustainable Development (ESD) process in Australia. Individuals representing a range of organizations sat down together to examine ways of achieving sustainable development in nine different industry sectors. The participation of two mainstream groups, the Australian Conservation Foundation and the World Wide Fund for Nature, gave the impression that the government was taking the environmental future of Australia seriously, while radical environmentalists were deliberately marginalized.

Even so, the consensus recommendations of the ESD working groups were

watered down and the sustainable development process put on a backburner once environmental concerns disappeared from the media headlines.

In contrast to establishment-style conflict resolution, activism provokes public debate as people oppose the dominant paradigm, lie down in front of bulldozers and speak out publicly against social institutions. Activists seek to foster a sense of urgency and crisis so that people will demand change; they assist such change by providing communities with information, exposing the inadequacies of the existing system and building networks.

Negotiation can diffuse that sense of crisis. The public may get a false sense of confidence that "there is no need to worry" since environmentalists are leading government in the right direction. Negotiation can achieve small reforms in policy, save patches of wilderness, reduce industrial emissions and stop some development projects. Negotiation cannot change the basic structure of industry and government nor the political and economic arrangements which lead to environmentally destructive actions. Sustainable development represents small-scale reforms, not radical change. It is a strategy to adjust the system, not to overhaul it.

Sharon Beder

Sharon Beder is a lecturer in Science and Technology Studies at the University of Wollongong, and author of *The Nature of Sustainable Development*, Scribe Publications, Newham, Victoria, 1993.

## Global Nightmares

**GLOBAL DREAMS: Imperial Corporations and the New World Order**, by Richard J Barnet and John Cavanagh, Simon and Schuster, New York, 1993, \$25.00/£16.99 (hb), 480pp. ISBN 0-671-63377-5

The cigarette is the most widely distributed consumer product in the world. It is also the most profitable and the most deadly. Smoking causes an estimated three million deaths worldwide each year. Over two hundred million of today's children will be killed by tobacco by the second quarter of the next century.

Philip Morris Inc, the world's largest distributor of cigarettes, produced about

11 per cent of the 5.5 trillion cigarettes sold in 1991 and has cornered more than 40 per cent of the US cigarette market; its Marlboro cigarette is the most popular brand in the world. Richard Barnet and John Cavanagh write:

"There is no simple explanation for the phenomenal success of the global tobacco industry in marketing a lethal product that leaves a trail of disease, misery, and rising health-care costs across the world . . . Philip Morris and its five global competitors who dominate the world [tobacco] market have large sums to advertise and push their wares, to curry political support, to court potential adversaries, to do conspicuous good works, and to sponsor entertainment, culture and sporting events across the planet."

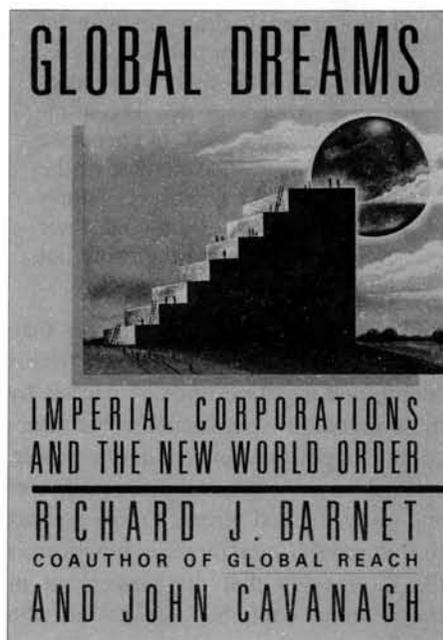
This is just part of Barnet and Cavanagh's devastating exposé of five corporations — Philip Morris, Bertelsmann, Sony, Ford and Citicorp — each examined in the context of the particular business activity in which it is a dominant player.

Sony and Bertelsman are the focus of "Global Cultural Bazaar" competing with Philips, Time Warner, Matsushita and Disney in the entertainment and information business. Philip Morris occupies centre stage in the "Global Shopping Mall", as it interacts — whether competitively or collusively — with other giant corporations such as RJR Nabisco, Nestlé and HJ Heinz in deciding what people around the world will eat, drink, smoke, wear and otherwise enjoy.

The "Global Workplace" examines a network of factories, workshops, hospitals and restaurants with participants as far-ranging as Levi-Strauss, Nike, Texas Instruments, Toyota and, as the focal point, the Ford Motor company.

The "Global Financial Network" puts the spotlight on Citicorp, a planetary financial services company built on the foundations of the National City Bank, now known as Citibank.

Although Barnet and Cavanagh explain that their book "is not an exposé of rapacious corporations, corporate greed, or corporate corruption", they have dredged up plenty of evidence of corporate mischief-making that has, directly or indirectly, led to illness, injury and death for millions of people and wreaked widespread environmental destruction as corporate heads have indulged in extensive criminal activity of various forms. Throughout they provide some fascinat-



ing vignettes and evocative images of the brave new world of transnational capitalism.

For example, when David Edwards, supervisor of foreign exchange operations in Citibank's Paris office, became suspicious that tax evasion and currency trading violations were going on around him, he reported his concerns to his boss. For his troubles, Edwards was fired for acting "in a manner that is detrimental to the best interests of Citibank" — but took with him informal bank documents, including the bank's manual on how to cover up illegal currency transactions.

Edwards handed the incriminating documents to the US Securities and Exchange Commission (SEC), the government agency which regulates corporations such as Citibank. During a prolonged SEC investigation, Citibank argued that the use of off-the-books transactions, bogus transfers and double sets of accounts were "routine". The SEC decided to take no further action since "the shady practices accorded with 'reasonable and standard business judgement'".

Such a classic example of corporate impunity illustrates what Barnet and Cavanagh call "the most disturbing aspect" of the political power and mobility of global corporations — their "undermining [of] the effectiveness of national governments to carry out essential policies on behalf of their people."

The authors observe that the executives of these global giants have a capacity for global thinking "far more developed than that exhibited by most officials of national governments". But such executives:

"do not appear to draw much on the long-term social or political consequences of what their companies make or what they do. The combined negative impact of corporate activities on the job market or the environment or education or family life is regarded as beyond their power to address and therefore not within their province".

Barnet and Cavanagh provide more than 400 pages of compelling evidence of this "combined negative impact" caused by these repositories of immense but unaccountable political and economic power.

Besides some internal inconsistencies and minor factual errors, a more serious limitation of *Global Dreams*, however, is the impression that the juggernaut of transnational capitalism crushes all who stand in its path and try to resist. Except for a few references to steps that are being or could be taken to curb corporate power — for example, in the area of global finance and the banking crisis in the US — Barnet and Cavanagh wait until the last two paragraphs to note that resistance to globalization:

"is happening much faster than most of us realize. More and more people who are bypassed by the new world order are crafting their own strategies for survival and development, and in the process of spinning their own transnational webs to embrace and connect with people across the world."

Corporate power can be confronted. Resistance to globalization is gathering momentum in communities and on the factory floors in the US and many other countries around the world. While *Global Dreams* is essential reading for all who would understand how their lives are being affected by the enormous global reach of corporate power, it is a pity that the authors did not give more attention to what they themselves call "the great question of our age" in the concluding paragraph of the book:

"Whether people, acting with the spirit, energy and urgency our collective crisis requires, can develop a democratic global consciousness rooted in authentic local communities."

Ward Morehouse

Ward Morehouse is President of the Council on International and Public Affairs and co-author of *The Bhopal Tragedy and Abuse of Power: The Social Performance of Multinational Corporations*.

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## Vegetarian Food for Thought

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**THE HERETIC'S FEAST: A History of Vegetarianism**, by Colin Spencer, Fourth Estate, London, 1993, £20.00 (hb), 389pp. ISBN 1-85702-078-2

Many vegetarians find it hard to comprehend how anyone expressing concern for the survival of the planet can eat meat. Consequently, much writing on the subject tends to be slightly threatening or slanted so that non-vegetarians feel either guilty or angry. Books on the subject, therefore, are not often read by the unconverted — especially not for pleasure. Such a fate should emphatically not apply to *The Heretic's Feast*, for Colin Spencer has written an absorbing, thoroughly researched and scholarly history of the religious and philosophical influences that have affected human eating habits since 600BC.

He identifies three main conditions that lead to vegetarianism. The first, which surfaces in one guise or another in most vegetarian philosophies, is the belief that eating flesh interferes with the development of the spirit. Some movements endorsing this belief also recommend abstaining from all stimulants such as alcohol, coffee, and sometimes sexual activity, leading to a diet which at its most severe hardly differs from that of the ascetics.

Spencer finds little evidence that the followers of these tenets were concerned for animals, a second condition for being vegetarian. Contrasting them with those who believe that all living creatures have a soul and are to be honoured, especially since any one of them might be the reincarnation of an ancestor. By killing and eating animals, humans could be devouring their own kind.

The third condition for not eating meat relates largely to modern practices such as factory farming which understandably cause anger and indignation, although the barbaric methods used are by no means approved of by all the farmers forced by economic circumstances to practise them. Intensive stock rearing, the cruelties involved in exporting live animals and the horrors of the present-day abattoir are all taken up by today's anti-meat lobby, as is the more ecologically disgraceful situation wherein farmers of the Third World

are manipulated into growing crops, not to feed themselves, but to feed cattle and pigs which will in turn become beef and bacon for richer countries. All vegetarian ideologies, however, believe that a diet without meat is healthier than one with it.

In the West, protesters against the iniquities of factory farming are probably the fastest growing segment of a rapidly-increasing vegetarian lobby. But as Spencer points out, many vegetarians have a sneaking admiration for vegans because theirs is the logical diet for anyone concerned with animal welfare. Unless they eat no animal-derived products at all, modern vegetarians need to argue their case carefully. Is it not absurd to forswear the wearing of leather shoes, but to augment the diet with dairy products and eggs? Can farmers be expected to rear all the calves resulting from the need for milk rather than slaughtering them? Could the poultry industry provide enough eggs for everyone to eat in place of meat without increasing the already intensive rearing of laying hens?

*The Heretic's Feast* provides fascinating insights into the lives and thoughts of the many distinguished people (mostly men) who have embraced what was for a long time known as the Pythagorean diet after one of its earliest promoters. Some of them are sympathetic and tender; others, like Adolf Hitler, do little to enhance the idea that vegetarians are more humane or more spiritually advanced than the rest of us.

Besides describing the various origins of vegetarianism, Spencer considers the effects of war and famine, painting an illuminating picture of the influences that shaped the counter-culture of the 1960s and 1970s. He comes right up-to-date with accounts in Britain of salmonella poisoning, listeria and "mad cow disease" (BSE) with figures and statistics which explain the current increase in vegetarianism. Never dull, *The Heretic's Feast* is worth serious consideration, for in the current worldwide economic turmoil, who can say that vegetarianism may not become a necessity in the future?

Ruth Lumley-Smith

Ruth Lumley-Smith is a former managing editor of *The Ecologist* and was joint editor of *The New Ecologist*.



## Carbon Disulphide & MND

We have read an article in your magazine written by Mark Purdey, "Anecdote and Orthodoxy: Degenerative Nervous Diseases as Chemical Pollution" (*The Ecologist*, May/June 1994) which suggests there is a linkage between occupational exposure to carbon disulphide and the development of motor neurone disease. The case is quoted of a former employee at our Cellophane manufacturing plant in Bridgwater, Somerset, who has developed motor neurone disease, and elsewhere reference is made to laboratory work which is claimed to support the writer's thesis.

Two references are quoted as providing technical support to the writer's argument. Work by Dr Rosemary Waring and her team at the School of Biochemistry, Birmingham University, as described in Chapter 21 of *Motor Neurone Disease*, Chapman and Hall, 1994, was quoted. Specifically, the article states "work by Dr Waring into solvents containing sulphur has *strongly implicated* (my emphasis) exposure to carbon disulphide and disulfiram, a solvent used in the rubber industry, as potential causal factors in MND". In fact, the reference quoted does not mention carbon disulphide at all.

There is reference to alicyclic tetrahydrothiophenes which are considered possible causes of "the *slight excess* (my emphasis) of MND cases in workers in industrial rubber moulding plants". In fact, Dr Waring's paper suggests the more likely source of sulphur containing cell toxins to be vegetables such as the cabbage and onion families.

We have spoken to Dr Waring and read her the relevant sections from the article in *The Ecologist*. She confirmed that Chapter 21 in the *Motor Neurone Disease* book summarizes her current thinking. She stated that her team had not evaluated carbon disulphide as a possible

causal factor in Motor Neurone Disease and that the views attributed to her in *The Ecologist* article were incorrect.

The second reference is to pages 107-8 of the US Department of Health, Education and Welfare publication, *Occupational Diseases, A Guide to their Recognition*. No publication reference date was quoted. Our copy of this book is dated June 1977. Pages 107-108 do not mention Motor Neurone Disease or carbon disulphide.

We are, of course, most sympathetic towards Mr Malcolm Rich, our former employee, whose case was quoted in the article. However, we are unaware of any evidence to support his belief that his disease is a consequence of his seven years working at Cellophane. He has never discussed this issue with the management of our Bridgwater plant.

A leading UK neuro-toxicologist professor, John Kavanaugh, has reconfirmed this week that no evidence exists of any linkage between working with carbon disulphide and Motor Neurone Disease.

Carbon disulphide is used as a solvent in the manufacture of Cellophane. We have stringent controls on the amount which escapes to atmosphere which are monitored by the government's Health and Safety Executive. The levels of carbon disulphide in our workplace are below those prescribed for safe working, and this is endorsed by biological monitoring in which the levels of the urinary metabolite, 2-Thiothiazolodine-4-Carboxylic Acid in all exposed employees have been found to be well below half the permitted level.

The article states three other former employees have also suffered Motor Neurone Disease. We have no knowledge of this and have not been able to establish any basis for the assertion.

**Lindsay Fortune**  
**Head, Health, Safety and Environment**  
Courtaulds plc  
PO Box 111  
72 Lockhurst Lane  
Coventry CV6 5RS, UK

### Editors' Note

*Dr Rosemary Waring has supplied The Ecologist with a number of abstracts on carbon disulphide toxicity providing some evidence for damage to motor neurones. She comments that as the standard time from diagnosis to death of MND is approximately two years, most of the cases would be missed except by the most determined investigators. For copies of these abstracts, please send a stamped addressed envelope to the editorial office of The Ecologist.*

## Hydro-Quebec at James Bay

Hydro-Quebec welcome the opportunity to answer the questions raised in the Campaigns feature of the March/April 1994 issue of *The Ecologist*. Hydro-Quebec's primary mission is to serve the electricity needs of all the people of Quebec. This winter, the temperature dropped to  $-60^{\circ}\text{C}$  in the north of the province where the Cree and Inuit live. The temperature in Montreal remained a constant  $-30^{\circ}\text{C}$  below for weeks on end. Hydro-Quebec kept all its customers warm. In order to do so, Hydro-Quebec used the top limits of its generating capacity. This can hardly be described as serving the needs of "power hungry" US and southern Canadian consumers.

What is known as the "James Bay Project" is in fact a number of distinct projects divided among three different complexes located hundreds of kilometres apart. Phases I and II of the La Grande complex, located 1,450 kilometres northwest of Montreal, are commonly referred to as James Bay I. Work on Phase I began in 1973 and was completed in 1985. Phase II of the La Grande complex was launched in 1986 and is to be completed by 1995.

James Bay also refers to the Grande Baleine (Great Whale) project and the proposed Nottaway-Broadback-Rupert (NBR) project. Great Whale is located 250 kilometres north of the La Grande complex, while NBR is located south of La Grande. The NBR project, however, is still decades away.

In April 1971, the Quebec government announced its intention to develop some of the rivers running into the James Bay. This began a process that would lead to the settlement of claims made by the territory's indigenous inhabitants. The James Bay and northern Quebec Agreement was signed in November 1975 by all parties concerned including the Grand Council of the Cree, and the Northern Quebec Inuit Association. The thirty chapters of the Agreement deal with every aspect of the organization, reorganization and good government of a territory of 410,000 square miles.

This document covers the land regime, through Cree and Inuit self-government provisions, administration of justice, health and social services, environment and future development, to hunting, fishing and trapping rights and an income security programme which last year paid out \$CAN14.2 million to 1,312 Cree families wishing to pursue these activities. Only a

single chapter deals with Hydro-Quebec. The Agreement guarantees the Cree and Inuit effective equal representation with government appointees on bodies mandated to determine the scope and nature of environmental impact. There are over 600 guidelines alone for the Great Whale Project. Today, Cree and Inuit controlled Boards of health and Social Services provide comprehensive care. Nowadays, the Cree population is growing at 3.5 per cent per year, more than twice as high as other Quebecers. More Cree is spoken by Cree in Quebec than in the whole of the rest of Canada because under the Agreement, Cree is the language of education up to the age of seven.

Hydroelectricity is an environmentally friendly means of providing Quebec's energy needs. Since 1972, Quebec has registered a net drop of 17 per cent in carbon emissions, whereas in the same period carbon emissions in the US and the rest of Canada rose respectively by 19 and 55 per cent. Moreover, Hydro-Quebec relies primarily on energy efficiency programmes and improvements in its systems performance to meet new energy

needs. Between now and the year 2006, energy needs are expected to increase by an average 2.2 per cent per year. The goal of Hydro-Quebec's Energy Efficiency Programme launched in 1990 is to reduce the forecast growth in demand for electricity in Quebec by 25 per cent by the year 1999.

We would like your readers to understand the natural environment of the region. For all but 77 days per year, the temperature is below freezing. Wildlife is very sparse. Because of the reservoirs, there are now far more fish, because water does not flow as quickly through lakes as through rivers. Since 1975, the number of caribou in northern Quebec has risen from 200,000 to 700,000. The vastness of the frozen reservoirs provides them security from predators.

Mercury levels are constantly monitored, and are dropping quickly. The Cree Board of Health and Social Services of James Bay does not impose any restriction on the consumption of non predatory fish in most water bodies affected by developments. More than 95 per cent of lakes on Cree lands are not effected by the hydroelectric projects. They contain

ample fish resources subsistence of Crees pursuing a traditional way of life, currently one third of the population.

Information about the Great Whale Project is open and available to all. We publicize all our Environmental Impact Studies through public hearings. There is a Public Registry with an enormous data base to which the public has open access. Before construction, Hydro-Quebec projects undergo thorough assessments and environmental impact studies. In the case of the Great Whale Project, the studies have been conducted over a period of 20 years and have included hundreds of independent specialists. Indigenous populations directly participate in the environmental studies and all information must be submitted to the government before any development is approved.

**Myriam Truchon**  
**chargée d'affaires**  
**Bureau Europe**

Information on Hydro-Québec  
Hydro-Québec  
c/o Judith M Steiner & Associates  
18 Wood Lane  
London N6 5UB, UK

## APPOINTMENTS

We are looking for

# Advisors for Environmental Policy and Planning

for future projects in various developing economies and in Eastern Europe

**Tasks:** The successful candidate shall be required to provide advisory services to partner countries wishing to establish environmental institutions. They shall also be required to assist in the design and implementation of environmental programmes. Their key fields of activity shall focus on the introduction of procedures and instruments geared to protecting the environment (EIA, tolerance levels, standards and legislation), the assessment and

monitoring of environmental pollution and advising industry on green issues.

**Qualifications:** Candidates will be qualified to degree level (natural sciences or technical subject; Public Administration/Political Science), have at least 10 years' practice-oriented professional and management experience in relevant institutions, administrative bodies or companies. Other requirements include: fluency in English and excellent knowledge of one other major language. Basic proficiency in German would be an advantage.

**We**, the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, operate globally on behalf of the Federal Republic of Germany and other Governments' counterpart institutions, assisting and advising on the implementation of development projects.

Interested candidates are requested to send a detailed CV, quoting reference K 402 to the following address:

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Postfach 5180, D-65726 Eschborn.



## DIARY DATES

27-29 January 1995: **GATHERING of active environmental groups** at Yr Enfus, 32b Cowbridge road East, Canton, Cardiff. To bring together environmental action groups from around the Severn Estuary and further afield to share ideas. Tel: Luke, 0222 383363 or Tom, 0272 733259.

23 February 1995: **RENEWABLE ENERGY: WHAT CAN IT DO FOR THE ENVIRONMENT?** UK Section of the International Solar Energy Society, Royal Institution, Albermarle Street, London W1. The aim of the conference is to debate how renewable energy technologies affect the environment. For more information, contact Conference Secretariat, 192 Franklin Road, Birmingham B30 2HE, UK. Tel: 0121 459 1248, Fax: 0121 459 8206.

10-16 March, 1995: **INTERNATIONAL SYMPOSIUM FOR SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT** in Europe. For more information, contact Helge Christie, N-2540 Tølga, NORWAY. Tel: +47 6249 6039, Fax: +47 6249 6096.

25-30 July 1995: **XIV CONFERENCE OF WORLD FUTURES STUDIES FEDERATION, Nairobi, Kenya.** Contact F. Ochieng-Odhiambo, c/o Kenya National Academy of Sciences, PO Box 39450, Nairobi, KENYA. Tel: +254 (2) 721345, Fax: +254 (2) 721138.

## COURSES

**YOU MAY ALREADY** be sufficiently well experienced to qualify for a **University Degree BSc, MSc or PhD** based upon your life experience and qualifications. Please write for a brochure to Dr A. Peel-Bayley, Dean of Studies, Trinity College and University, Ctra de Mijas, Km5, 29650 Mijas, Malaga, SPAIN, quoting reference EC-KW.

**EARTH CARE DESIGNS** is running various courses in 1995: Introduction to Permaculture; Ecological & Self-Build Housing; Full Permaculture Design; Teacher Training for Permaculture; Advanced Design. For more information, contact Chris Hoppe, Bushy Cottage, Mill Lane, Steep, Petersfield, Hampshire GU32 2DL, UK. Tel: 0730 231507; Fax: 0705 595834.

## CALL FOR PAPERS

The **1995 Conference on Environmental Pollution**, 15-22 July 1995, in St Petersburg, Russia. This is a forum for contact between scientists from Russia and other CIS states, and the rest of the world. Papers are invited on aspects of air, water and land pollution, monitoring, control and remediation, ecology, ecotoxicology, conservation and teaching. There will be a social programme of visits to cultural sites around St Petersburg, and other persons accompanying delegates may attend at a reduced rate. Accommodation will be on board a cruise ship. Contact: Linda R Wood, Pollution Research Unit, Dept. of Biological Sciences, Napier University, 10 Colinton Road, Edinburgh, EH10 5DT, UK. Tel: 031 455 2226/2326, Fax: 031 452 8023.

## PUBLICATIONS

**GREENWARD: THE STEPS FROM HERE TO SUSTAINABILITY**, by Roy Cattran. A radical and visionary picture of how a sustainable society might work. 316pp, £14.95, United Writers Publications Ltd, Ailsa, Castle Gate, Penzance, Cornwall, TR20 8BG, UK. Tel/Fax: 0736 65954.

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