The Ecologist

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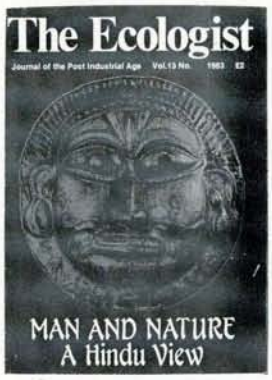
Dam Destruction — The case against Superdams



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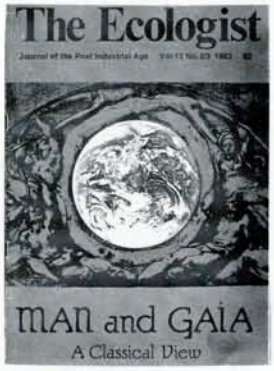

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The Ecologist

Vol.14 No.5/6 1984

Editorial

Large-Scale Dams: A Special Report

Feature Articles

Front cover painting by Terry Milonas.

Errata | Vol 14, No 4, p 156

Line 5 (left hand column) "forms of sources of knowledge" should read "forms *or* sources of knowledge".

Line 31 (right hand column) "seeks to uncover *unusual* causal connections." The word "unusual" should be deleted so that the sentence reads "seeks to uncover connections."

Dam Starvation

Commenting on the Bhopal tragedy, the *Wall Street Journal* expressed grave concern lest the disaster—which killed, according to unofficial sources, 20,000 people and maimed another 100,000 after a cloud of deadly methyl isocyanate escaped from a Union Carbide pesticide plant—led the Indian Government to turn its back on western technology. "The Indians need technology. Calcutta-style scenes of human deprivation can be replaced as fast as the country imports the benefits of the West's industrial revolution and market economics". The *Journal* went on to quote a doctor from Georgia Tech, "Of the people killed, half would not have been alive if it were not for that plant and the modern health standards made possible by the use of pesticides."

Had the Bhopal disaster involved the collapse of a large dam, the same arguments would undoubtedly have been trotted out by way of apologia. Without the dam, we would have been told, there would have been no irrigation projects, no local industries to manufacture the inputs of modern agriculture—and, therefore, greater poverty and starvation. But does that argument actually stand up? Have large-scale water projects helped to alleviate hunger? Or have they in fact compounded—and, in some cases, created— the problem?

On the face of it, there is every reason to suppose that large-scale irrigation schemes have much to offer the hungry. Certainly, irrigation agriculture is the most efficient farming system in the world, producing high yields on very small areas of land. At present, 200 million hectares are irrigated—but the UN Food and Agricultural Organisation argues that unless another 100 million hectares are brought under irrigation by the turn of the century, starvation will be widespread. Others maintain that even that rate of expansion will leave many hungry.

But setting up large-scale irrigation schemes is exhorbitantly expensive—in some areas, it costs as much as $10,000 to irrigate a single hectare of land—and in order to earn the foreign exchange to pay the bills, irrigated land is invariably used to grow cash crops for export, generally to the industrialised world. The rural poor have thus been the last people to benefit from large-scale irrigation schemes. Iran's Dez Dam, for example, was intended to provide over 200,000 acres of irrigated land to small farmers in Khuzestan. In the event, however, the land went almost exclusively to foreign-owned companies which cultivated crops for export. An executive of one of the companies involved was quite candid about how he viewed the scheme: "They develop the water and we come and farm it."

It is a story which has been repeated time and again the world over. In Senegal, over 370,000 hectares are to be irrigated under a massive scheme to develop the entire Senegal River basin. Between 75,000 and 98,000 hectares will be irrigated by the Diama Dam near the coast and a further 255,000 hectares by the Manautali Dam, 1000 kilometres upstream. Officially the scheme is intended to promote "communal rural development". In reality, the setting up of small farms in the Manautali area will have ceased by 1987; after that date, all resources are to be devoted to expanding the area under large farms. "In effect," comments Federick Mounier of the aid organisation Freres des Hommes, Terres des Hommes, "the decision has been made to favour large-scale mechanised agriculture, with its imports of fertilisers and pesticides, in order to produce crops for export. All at the expense of the individual small holder."*

As prime agricultural land is taken over for the production of cash crops so peasant farmers are invariably pushed onto marginal lands. Many now ascribe the disastrous famines which have ravaged the Sahel since the late 1960s to the expansion of cash crops and the consequent pressure on local pastoralists to graze the arid and inhospitable margins of the Sahara desert (See *Ecologist* Vol 11, No 4 1981). Moreover, the intensive nature of plantation agriculture has resulted in the over-exploitation of that land used to grow cash crops. In Africa, for example, vast tracts of land which are suitable for growing grazing grasses or trees, but little else, have been torn up to make way for cotton or peanut plantations. "The soil becomes rapidly poor in humus and loses its cohesiveness," report Frances Moore Lappe and Joseph Collins of the Institute for Food and Development Policy. "The wind, quite strong in the dry season, then easily erodes the soils. Soil deterioration leads to declining crops and, consequently, to an enormous expansion of cultivated land, often onto marginal soils." In the Sahel, many peanut-growing areas are now so over-exploited and under-fertilised that there has been a rapid deterioration in the soil quality of the region. According to the Prefect of the Maradi District of

*For a full account of the Senegal River Project, see Frederick Mounier's paper in *The Social and Ecological Effects of Large Dams, Volume* II *(Case Studies)*. Available from The Ecologist, Worthyvale Manor, Camelford, Cornwall, Price £25. To be published in the Spring.

Niger, some soils in his area "can be considered totally depleted."

The environmental degradation caused by plantations is further exacerbated where the land is under perennial irrigation. Perennial irrigation schemes invariably raise the water-table—in some cases by 3 to 5 metres a year—thus rendering arid lands particularly susceptible to salinisation and waterlogging (see Briefing Document, this issue). As the groundwaters approach the surface, they begin to evaporate. The salt contained in the water is then left behind to accumulate in the top-soil. Beyond a certain point, plant life can no longer survive and eventually the whole area becomes covered with a white saline crust. The land is effectively dead.

Over 50 per cent of the world's irrigated land now suffers from salinisation, according to FAO. Professor Victor Kovda of Moscow University puts the figure even higher, estimating that between 60 and 80 per cent of irrigated land may be salinised. A recent report claims that as much irrigated land is going out of production due to salinisation and water logging as is being brought into production through new water projects. One country which has been badly hit is Pakistan, where 25 million out of the 37 million acres under irrigation are estimated to be salinised.

What do rural peasants get in return for having their land turned into salt-encrusted desert and the food they grow exported? The answer is precious little. Unable to grow crops for themselves, they must buy food on the open market. But as more and more land is taken over for cash crops—or simply degraded to the point where it can no longer be farmed—so less food can be grown for local consumption, inevitably pushing up the price. So too the increasing costs of production as peasant farmers get hooked onto the treadmill that is modern agriculture—(those pesticides from Bhopal were not being given away for free)—further inflates the price of food. The result is widespread starvation, hunger and malnutrition.

Small wonder that millions of peasants throughout the Third World trek into the cities in search of employment every year. Few find jobs and the rest are condemned to eke out a miserable existence in the shanty towns. That is why the area around Union Cardide's Bhopal plant was so crowded—not, as the Wall Street Journal suggests, because "India's agriculture has been thriving, bringing a better life to millions of rural people. "And the Bhopal tragedy will surely be repeated in many other cities of the Third World. Indeed, "permission to pollute" is one of the major concessions granted by "developing" countries in order to persuade foreign industry to set up shop in the Third World.

Those industries—many of them powered by hydro-electric schemes—will not help the rural poor. Food not industrial goods is the commodity most needed in the Third World. And industrialisation will only lead to a reduction in the amount of land available for growing food. Like it or not, agricultural land will of necessity be lost to shanty towns, factories, office blocks, roads and the rest of the physical infrastructure of an industrial society. In that respect, the experience of Egypt is telling. According to Mohammed Kassas of the University of Cairo: "Nationwide programmes to reclaim new land, the irrigation of desert lands etc. brought a total area of 372,000 hectares under cultivation during 1955-75 but the loss of prime croplands of the fertile Nile Valley and Delta due to urban expansion was 400,000 hectares." In fact, the loss of land to industry and urban sprawl is probably very much worse than Kassas suggests—not least because the official figures take no account of the quality of the land lost. The greater part of the land which has been reclaimed from the desert is of extremely poor quality and cannot possibly compensate for the prime agricultural land which has been lost in the Nile Valley where most of the urbanisation in Egypt has taken place.

Quite apart from paving over agricultural land, urbanisation and industrialisation also leads to competition for water. The water abstracted to satisfy industrial and urban requirements results in a corresponding decrease in the water available for agriculture. Unfortunately when such competition occurs, water tends to go to the highest bidder—and industry invariably wins out. (A Californian company recently paid $1,750 per acre-foot for water in Utah where local farmers could only afford $25 per acre-foot.) That trade-off between industry and agriculture is clearly nonsensical in countries of the Third World where every scrap of food is needed to feed the burgeoning numbers of hungry people.

The central section of this double issue of *The Ecologist* has been dedicated to a review of large scale dam projects. The evidence we present in that section makes it clear that large scale water projects are not a means of feeding the world; on the contrary they are a recipe for widespread land degradation and inevitable starvation in the decades to come.

Unfortunately, to persuade Third World governments to abandon plans to build water development schemes is a lost cause. The "think big" mentality is just too firmly entrenched. The only way to prevent their construction is to appeal directly to donor governments, to development banks and to international aid agencies without whose financial help the schemes could not be built.

We therefore call upon those organisations to cut off funds for all the large-scale water development schemes that they may plan to finance, or are involved in financing, regardless of how advanced those schemes might be.

The vast concrete hulk of a three-quarters finished dam may not provide irrigation water or electricity. But, then, it will not drown ancient villages, precious forests and fertile bottomlands. Nor will it necessitate the uprooting of thousands of people to make way for its reservoir. Nor will it condemn yet more people to malaria and schistosomiasis. Nor will it systematically transform agricultural land into waterlogged and salt-encrusted desert.

Edward Goldsmith and
Nicholas Hildyard

Enemies of Society?

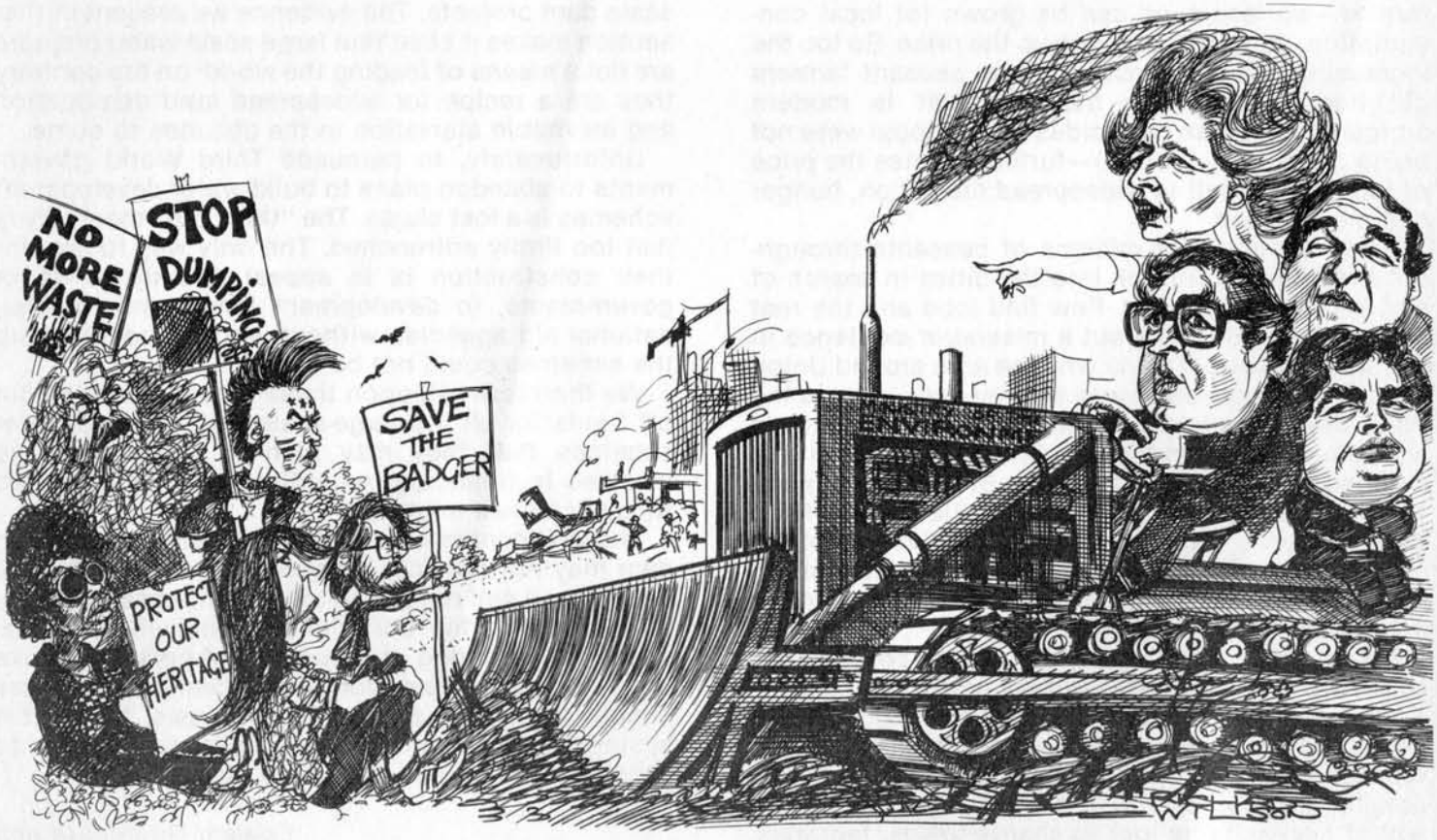
Paul Johnson refers to environmentalists as 'the enemies of society'. In general they are regarded as subversive elements living on the margins of society. It is even said by many upright citizens that the Green Party of Germany, and by extension all other Green parties including the British Ecology Party, are paid by Moscow to subvert western society.

On the other hand Mr Reagan and Mrs Thatcher and their respective administrations see themselves and are generally seen by others as patriots and conservatives. They claim to stand for tradition, for religion, for the family and for traditional moral values.

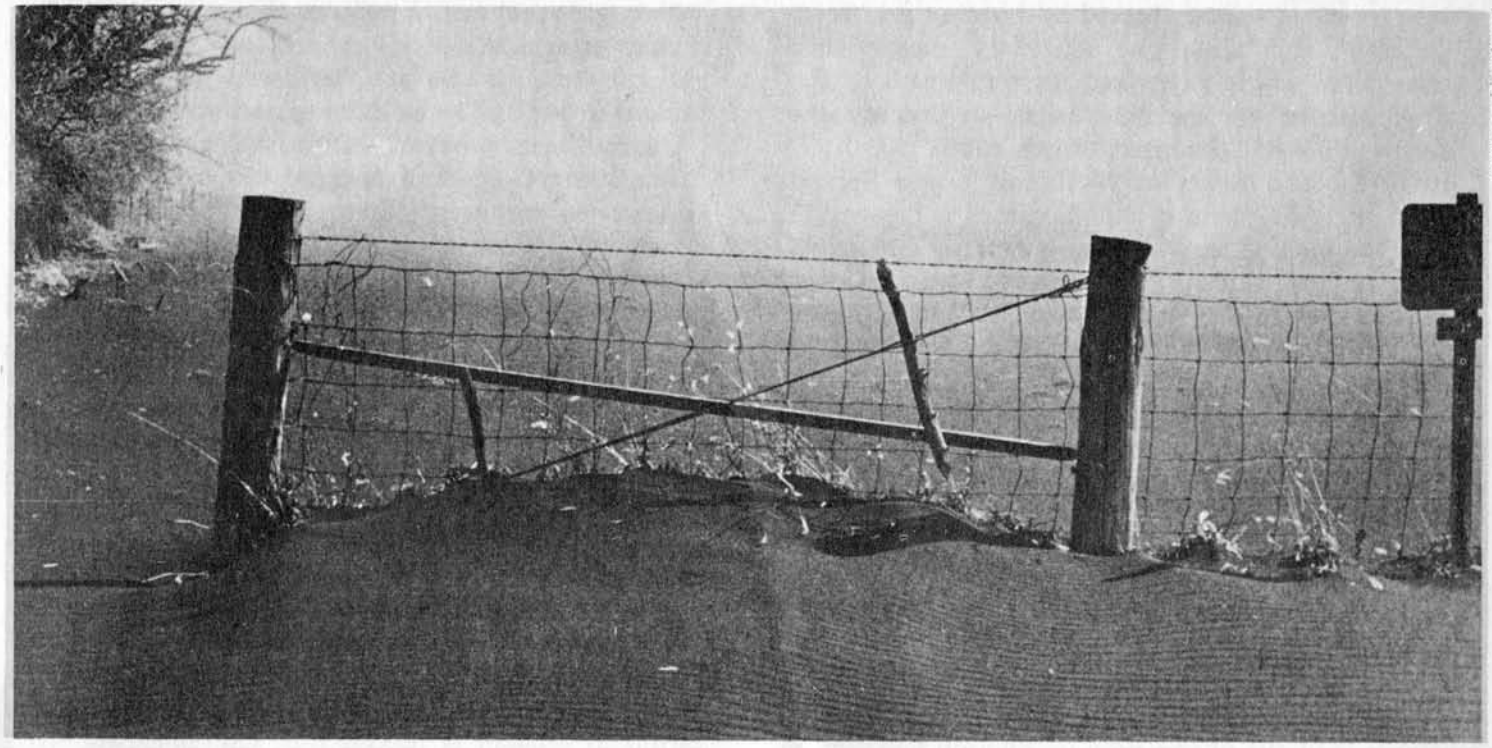
But do they really? The main feature of their very similar policies is industrialisation at any cost. Industrialisation means systematically transforming traditional society into modern society, replacing traditional villages with huge cities and housing estates, artisanal workshops with vast factories, village schools with the factory-like compounds. It means in fact promoting change away from traditional society towards a brave new world of sky scrapers, factories, computers, battery farms, etc. How can such a policy be regarded as conservative? How can a policy that by its very nature must lead to the systematic destruction of our cultural heritage, the annihilation of our forests, our hedgerows, the erosion of our soil, the extermination of our wildlife, the contamination of our rivers and of our groundwater, the transformation of a proud and self reliant people into a vast anonymous mass of increasingly alienated and unemployed people who are even more dependent for their very sustenance on the functioning of a massive centralised bureaucracy, be regarded, even by the remotest stretch of the imagination, as conservative?

Huey Johnson, ex-secretary for Environment and Resources in the California State Legislature, told a meeting of environmentalists, which I attended in San Francisco last April, that Mr Reagan has no right to be photographed, as he always is, with the Stars and Stripes in the background to make it appear that he is the true representative of conservatism and patriotism. The opposite is the case. His administration has done more to annihilate America's natural heritage than any other before it. On the contrary, it is the members of the Ecological Movement who should be regarded as the real conservatives and the real patriots. In the UK this is the only movement that seeks to preserve what this country is all about: its traditions, its architectural and artistic heritage and above all its natural environment.

Edward Goldsmith



Who are the real Conservatives?



DAVE McCLELLAND

Illinois — The U.S. Bread-Basket.

Where has all the soil gone?

by James Krohe Jr.

Intense cropping systems—the struggle to remain profitable—are eroding some of America's best soils. Soil conservation is vital, but few appreciate just how much delay is going to cost.

One need merely review the vocabulary with which six generations of Illinoisans have described the settlement of the state to understand that the European newcomers saw the land as an enemy to be vanquished. The Indians saw the prairie and forests as a benefactor, and they practised a benign tenancy of both. The white man, however, 'tamed' the wilderness, 'improved' the land, 'broke' the prairie. Like the wolf, the mosquito and the Indian, the prairie and forest were regarded as inconveniences to be eradicated.

Illinois still stands along with its neighbour states of Iowa, Indiana, and Missouri in the heart of the Cornbelt. Climate and soils in this stretch of the US Midwest have made it a feed grains factory nearly without equal on the globe. In recent years Illinois has ranked first or second among US states in its harvests of corn and soybeans, accounting for between 15 per cent and 20 per cent of US production of each crop—sales of which accounted for most of the 6 billion dollars or so which Illinois agricultural products earn its farmers in an average year.

The landscape of modern Illinois is as much an artifact of civilisation as a superhighway. Although Illinois still calls itself the Prairie State, the prairie is long gone. Of the 37,000 square miles of prairie that once covered Illinois, only about two square miles remain. Of the estimated 14 million acres of forest that once stood in Illinois, only 3.5 million acres remain. In their place is an Illinois that has been systematically ploughed, drained, paved, dammed, fenced, graded and regraded into more usable shapes.

This artifact was built, however, using the most ancient of materials. The topsoil whose fertility so amazed Europeans was the child of a happy marriage between the glacial till (200 feet thick in places) left behind by the last incursion of Arctic ice 10,000 years ago and the prairie ecosystem that took root on it. The University of Illinois' Cooperative Extension Service has catalogued 425 distinct soil types in Illinois. The best of them (321 in all) fall into one of the three categories of soils designated by the service as 'prime' because of their high grain-crop productivity. According to the US Department of Agriculture statistics, only two states (Kansas and Texas) have more prime farmland than Illinois.

Of Illinois' 36 million acres, 21.4 million (8.7 hectares) are judged to be prime soils, and close to 90 per cent of *them* are used to grow crops. That means that Illinois has approximately 19 million acres of prime cropland. For those who savour comparisons, this is an area only slightly smaller than Scotland.

When white settlers arrived in Illinois in the early 19th century, the topsoil measured roughly nine inches in thickness over much of the state. By the 1970s those nine inches (described with only slight exaggeration as the distance between Eden and the desert) had shrivelled to six, and in some parts of the state to

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nothing at all. Erosion, abetted by farming practices, had washed and blown the soil away, mostly into streams from which it worked its way south to the Gulf of Mexico via the Mississippi—a process one writer has dubbed "the great terrain robbery".

History holds a lesson for the Illinois farmer. Spread over an acre, 6.7 tons of soil becomes a paper-thin layer. (One inch of topsoil weighs roughly 150 tons.) This is an insignificant loss—unless continued over significant amounts of time. In the 1820s, corn yields on virgin prairie soils were reported to be as high as 100 bushels. By the 1870s yields were as low as 30 bushels. By the 1930s, soil scientists found that about a third of the state's land was suffering from erosion damage, a heritage of neglect so severe that farms in southern Illinois had to be abandoned because they could no longer grow enough to support the families who worked them.

Pressure to boost yields

A combination of dust-bowl-era soil conservation programmes and government programmes to take marginal land out of row-crop production had caused erosion rates to decline after the 1930s, until by the 1960s topsoil on many Illinois farms was being replaced faster than it was being lost.

Ominously, soil loss rates rose 10 per cent between 1970 and 1977. Midwestern grain farming had entered a new era in the 1970s. Other nations had a series of poor harvests, the US government ended its surplus-dampening acreage 'set-aside' programmes of the 50s and 60s. Consequently US export trade expanded. The need to absorb chronic US grain surpluses and the calamitous rise in oil prices led to pressures to harvest more and more bushels through the more intensive use of land, machinery and fertilisers. In a process repeated across the Cornbelt, more Illinois land was put into the cultivation of profitable row crops, including former set-aside land plus other marginal acreage such as pasture and woods that had never been farmed. Although the total land farmed in Illinois dropped by some 700,000 acres between 1970 and 1979, the number of acres planted in corn or soybeans jumped from 17.1 million to 19.5 million. (Because beans leave behind a thinner residue, soybean fields tend to be especially erosive; soybean acreage in Illinois increased from 1970 to 1979 from roughly 6.4 million acres to 9.8 million.)

The pressure to farm more land pushed up farmland prices to record levels; at a time when Illinois topsoil had never been worth so much money, its owners were treating it as if it were dirt. Farmers to whom a few bushels per acre meant a difference between a profit or a loss began fall-ploughing to save precious workdays in the spring. Bigger machines often are unable to follow the contour of the land, and terraces and grassed drainage ditches installed during the Depression were simply ploughed over. The result: soil erosion.

The effects of erosion became vividly evident off the farm in the '70s. The Illinois Environmental Protection Agency labelled dirt as the state's single biggest water pollution problem. Sediment is itself both a pollutant and a polluter. Farm pesticides and herbicides are carried piggyback into water supplies via soil particles. So are fertilisers, which feed the ruinous growth of algae in lakes and streams.

On the farm, erosion's effects are slower to make themselves felt. Modern mechanised grain farming is a triumph of technology over bad management. The lavish application of synthetic fertilisers (especially nitrogen) enabled farmers to compensate for losses in soil productivity caused by erosion. The Illinois EPA has estimated that past erosion has reduced the productivity of all state soil by 2.2 per cent in the last hundred years (which in turn reduced the dollar yield of that land by roughly 100 million dollars a year). Furthermore, this erosion of productivity continues to increase inexorably at an average rate of .022 per cent per year. But, in the last five years alone, average yields of Illinois corn have gone down about 2 per cent *per year*, not per century.

The Illinois EPA has further estimated that the statewide average corn yield per acre in 2010 will be 164 bushels if present erosion trends continue; while if farmland erosion is halted and, the so-called, 'best management practices' are adopted, the yield by 2010 could be 185.1 bushels, or 11 per cent higher. At the same time, if the amount of land planted in corn were to remain at the 1979 level, the difference would amount to nearly a quarter-billion bushels, which at 1981 prices would be worth about 2.6 billion dollars.

Technology has enabled us to believe that soil erosion and farmland conversion do not matter, that it might indeed be possible someday (as two Illinois agricultural economists have phrased it) "to feed the world from a single window box". But the curve that traces the postwar increased national output per acre is beginning to flatten out. Fertiliser use on corn, for instance, may be bumping into both a biological and economic ceiling, with the result that heavier applications return less and less yield increase per dollar invested. There remains the hope that new technologies, or even new plants, will keep the productivity curve on its upward arc, or that land now in desert or forest may be reclaimed for farming. For the moment, they remain only hopes.

It is not strictly accurate to call topsoil irreplaceable. The processes of plant growth, decay and regeneration which converted glacial dirt into soil continues in modern cornfields. With good land management, annual soil losses of between two and five tons per acre are considered tolerable on most Illinois soils because that much new topsoil per acre is created each year. It is at this point, when topsoil gains equal or exceed topsoil losses, that it becomes possible to talk of a 'permanent' or 'sustainable' agriculture. Soil scientists refer to this loss level as the 'T' level. As already noted, current average soil losses in Illinois are running from two-and-a-half to six times this 'T' level, largely as a result of intensive farming practices.

One should quickly point out that these are statewide averages. Much of the soil loss in Illinois, as in the rest of the Cornbelt, is occuring from a relatively few, steeply sloped acres. The most productive Illinois farmland is flat or only gently sloped—indeed, is

productive *because* it is flat or gently sloped—and thus protected by topography. It is this combination of gentle terrain and deep soils which make erosion seem at best a long-term threat on most Illinois soils. Indeed, even assuming that no new soil was being formed, a field with a topsoil layer nine inches deep could lose that soil at a rate of five tons per acre per year and not exhaust itself for 270 years. To farmers who tend to define the future in terms of the next four-year federal farm programme, that seems forever.

However, tomorrow may get here more quickly than that. For one thing, losses in soil productivity may be expected to show themselves well before topsoil layers are completely exhausted. For another, the processes of soil formation remain little understood. The five ton per acre per year T level set for most Illinois soils, for instance, may be optimistic. Critics point out that such rapid soil formation is only to be expected under ideal crop management conditions.

Then, too, soil formation rates vary considerably according to soil type, how considerably is not known with much precision. For example, erosion tends to be more severe on topsoils found atop impermeable clay subsoils than on topsoils with more water-absorbing subsoils. In the former condition rainwater does not sink into the ground but drains away from near the surface, taking topsoil with it. What is bad for topsoil is worse for plants; as topsoil layers are reduced, plants must increasingly root in a medium through which the movement of water, nutrients, and oxygen is constricted.

U.S. SOIL CONSERVATION SERVICE

Severe soil erosion near Fairview Heights, Illinois.

Subsoils clearly play a vital role in crop production. Those subsoil layers typically are replenished much more slowly than soils in the busy few inches near the surface, where plough action and the decomposition of plant remains constantly add organic matter. While intensive cultivation of coarser soils can add as much as one inch of new soil every 30 years, subsoil formation proceeds at a slug's pace—as slowly as one inch every 300 years. T levels adequate to maintain topsoil levels, in short, would not be sufficient to keep overall soil depth from shrinking over time.

Chemical run-off

In the shorter term, it is water quality, not agricultural productivity, which suffers most from soil erosion. T levels believed sufficient to protect productivity are generally thought too lenient to protect nearby streams and lakes. (Not all the soil washed into the Midwest's muddy waters comes from farm fields; stream banks are thought to be a major source, since much eroded soil does not leave the farm at all, or if it does, takes years to hitchhike, one storm at a time, to the nearest drainage ditch or streamlet.) However, since no firm relationship has yet been established between soil loss upstream and sedimentation rates downstream, it is hard to say how much too lenient those T levels might be.

As noted, mud is to the rural Midwest what smog is to Los Angeles. The effect of displaced soils on aquatic life is pronounced. When it settles, sediment obliterates natural underwater topography, covering a variegated habitat with a featureless blanket of ooze. Sediment covers sand and gravel beds vital to fish spawning cycles and provides a root medium too unstable to support aquatic plants. As plant growth slows, the amount of dissolved oxygen in the water drops. In extreme cases, the final inheritor of such a lake are the anaerobic or nonoxygen-using bacteria which feed on decaying organic matter, emiting putrid hydrogen sulphide gas as proof of their presence.

But sediment must be condemned not only for the damage it causes but for the damage it brings. When soil washes away from a farm field (or to a lesser extent, from an urban building site or a suburban lawn), it carries with it an assortment of chemicals—weed killers, fertilisers, pesticides—which have been applied to the soil and which become dissolved in runoff water or attached (adsorbed) to the soil particles themselves.

These chemical hitchhikers worry state environmental officials as much as the sediment itself, particularly as the amounts of such chemicals in use (especially on farms) continue to increase. Their concern explains the otherwise anomalous fact that the IEPA, in carrying out its part of the federally mandated water quality planning process, took the lead in farm erosion-control planning in Illinois in the late 1970s, rather than the state's department of agriculture. When the IEPA surveyed 353 Illinois lakes in 1978 it found that all of them were eutrophic (the word means literally 'rich in food'). An excess of basic plant nutrients such as nitrogen and phosphorus prompts excessive growth of aquatic plants, including algae.

This process is a part of any lake's natural history, but humans can speed it up materially. Ironically, the high turbidity of many Illinois lakes is a saving fault in that it blocks light which would feed even more vigorous plant growth.

Farm fields are presumed to be a major source of such nutrients, and eroded soil particles often are the means by which they migrate. For example, phosphorus is not very soluble in water. (Some tests have shown that less than one per cent of phosphorus applied as fertiliser leaves a field in runoff water.) But it does attach itself to fine soil particles; indeed, because most eroded soils tend to be made up of these easily transportable particles, the amount of phosphorus found in sediment can be as much as three to four times higher than that in the farm soil from which it came. In fact, there is some concern that improved erosion control might actually increase phosphorus contamination in some watersheds. There would be less soil washed away, but it would carry a higher proportion of adsorbed phosphorus, especially if farmers were to switch to certain reduced tillage methods which require that fertilisers be applied to the surface rather than incorporated into the soil.

Contaminated lakes

Pesticides tend to be less easily transported than fertilisers, but they too have been showing up in Illinois lakes. (Of the 23 pesticides in common use in Illinois, 17 move via adsorption to soil particles.) In the past, wide use of long-lived organochlorine compounds such as DDT led to much contamination. In 1977 the fish in 14 lakes and rivers were found to harbour concentrations of organochlorines (mainly Dieldrin) that were highter than the minimums considered safe by the US Food and Drug Administration, even though sales of Dieldrin had been halted several years earlier.

Most of the pesticides in use by Illinois farmers today are the relatively short-lived organophosphate type which break down chemically in water within a week or two. Still, they remain potent killers in concentrated doses. In 1980, 13 of the recorded 23 fish kills in Illinois were traced to farm chemicals, usually pesticides washed into adjacent water supplies by a heavy rain; prior to 1976 most fish kills in the state were traceable to industrial rather than agricultural sources.

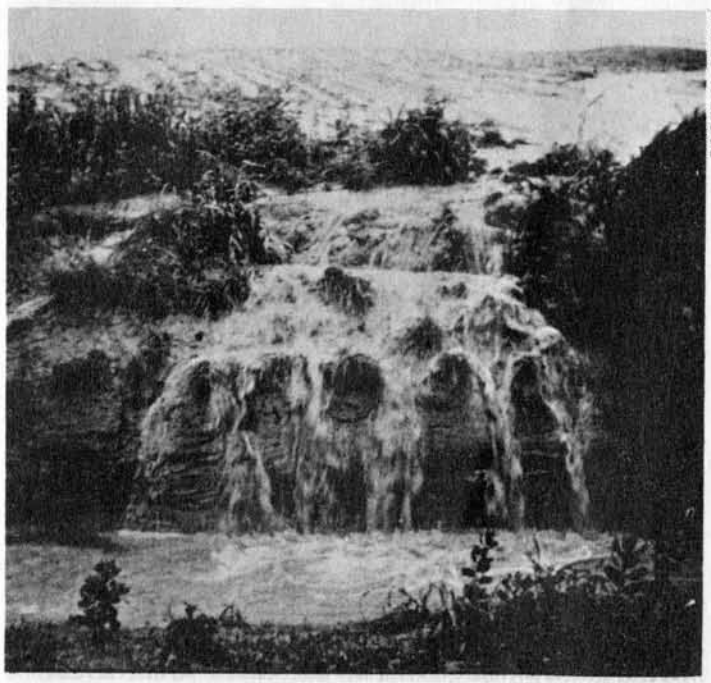
Ironically, some of the same economic forces which led to what state farm officials have called the 'mining' of the state's topsoil may force them to stop it. With fuel costs a major item in farmers' budgets, trips across fields in tractors are becoming more and more expensive. In an attempt to save energy costs, Illinois farmers are turning to one of the varieties of so-called 'reduced tillage' methods of cultivation, which typically use a chisel plough instead of mouldboard plough and rely on chemical herbicides instead of fall ploughing and mechanical cultivation to control weeds. (In the 'zero-till' systems, the field is not ploughed at all; seeds are planted right in the sod left from the previous year's crop.) The result is fewer field trips, lower fuel bills—and less soil erosion. Erosion from corn fields, for instance, can be cut by up to 50 per cent.

Dismissed as quackery a few years ago, reduced tillage is now used on an estimated 4.5 million of Illinois' farm acres and may be the next revolution in Illinois farming, equal in its impact to that of the tractor or artificial fertilisers. Conservation tillage promises to be to the 1980s what contour ploughing was in the '30s, the central tenet of a new conservation orthodoxy. It is catching on because it offers a relatively low-cost way to cut soil losses without sacrifices in productivity. Robert Walker of the Cooperative Extension Service estimates that perhaps half the cropland in Illinois that is losing soil could be adequately treated by some form of conservation tillage without significant loss in farm income.

But will saving the soil put Midwest waters at risk? Weeds are controlled mechanically using conventional tillage systems. With reduced tillage systems, however, weeds are controlled chemically, so as to preserve the protective blanket of crop residue. The result is higher herbicide use.

This is inherently inefficient, even extravagant. Some herbicide is inevitably lost to the atmosphere; much more is washed off the surface of the crop rubble with the first big rain. Indeed, while reduced tillage cuts soil erosion dramatically, the concentrations of chemicals in runoff can actually increase compared to conventionally managed fields, partly because the actual volume of rain runoff from a field is reduced, partly because those chemicals are exposed to the erosive effects of precipitation on the soil surface.

To date the US has published so-called 'concentration criteria'—maximum safe levels of chemical contamination in water supplies and aquatic habitats—for only two herbicides. (They are 2,4-D and 2,4,5-T.) No criteria have been set for the dozens of other weed killers in farm use. While lab tests show that most of these substances are no more toxic to test animals than aspirin, the potential effects of chronic, long-term exposure on animals or humans is not at all well under-



ROGER McCREDIE

Soil with its burden of chemicals washing away.

stood. Losses of herbicides to adjacent watersheds are especially large during heavy rains immediately following application. William A. Hayes, for 31 years an agronomist with the US Soil Conservation Service, told the *Journal of Soil and Water Conservation* recently that such episodes "could have disastrous consequences for surface and subsurface waters".

The anxiety of observers such as Mr Hayes is not yet shared by most state environmental officials in the Midwest. For example, Illinois' water quality monitoring programmes do not include tests for herbicides. (Persistent insecticides such as chlordane are tested for.) But the new generation of farm herbicides are officially assumed not to be persistent in the environment, so environmental agencies do not look for them.

A.G. Taylor is the assistant for agricultural programmes of the Illinois EPA. He admits that the environmental implications of rising herbicide use have triggered 'increasing concern' among his colleagues around the Cornbelt. But Taylor notes that expanding routine water quality monitoring programmes to include tests for the three dozen or so herbicides in use in Illinois would be very expensive. Besides, says Taylor, "The benefits of minimising soil erosion (through the use of reduced tillage methods) may exceed the hazards we may expect from the increasing volumes of pesticides used."

Chemical industry spokesmen remain sanguine that solutions to the problems of chemical runoff, will be found, either through improved chemicals, improved equipment, or improved farming techniques. But the fact remains that the distance between the lab and the farm field is measured in dollars rather than miles. Farmers tend to over apply both fertilisers and pesticides, inadvertently or in anticipation of weather reverses. Even if machines capable of meeting the peculiar demands of chemical application in the new cultivation systems are marketed, farmers may find it cheaper to continue to over apply chemicals rather than invest in equipment needed to do it more efficiently. In the meantime, the poisoning of watersheds with farm chemicals will proceed apace, with unknown economic and ecological costs.

The fact that solving one environment problem caused by modern farm methods may be aggravating another is the kind of irony Midwest environmental officials have grown accustomed to. Stricter controls on farm practice might help. But US farmers, like farmers around the world, are notoriously jealous of their independence, and the administrative structures of farm programmes of every kind have been built to accommodate their clientele's affection for local control and their abhorrence of regulation. The voluntary nature of erosion programmes make participation a function of economics rather than ecology. To farmers pushed onto the thinnest of profit margins by increased costs for fuel, fertilisers, equipment and loans, erosion control was simply unaffordable. Specialists from the SCS and other agencies had coplained for years about the wastage of Illinois topsoil, but their warnings were lost in a clatter of combines rushing to harvest enough corn to meet the next bank payment.

Jim Frank ran Illinois' erosion control programme in the 1970s. In a speech Frank once observed, "It remains to be seen whether a programme of voluntary education and incentives can motivate farmers to do what they know they should be doing but can't afford to do." Nearly all the proposed remedies cost farmers money in either cash outlays or lost production. Recognising this, and recognising that a voluntary programme without penalties, federal and state erosion programmes alike stipulate that cost-sharing money be made available to farmers.

Alas, federal funds are themselves something of an eroding resource in the US under Reagan's rule. The most recent estimate puts the cost of bringing soil losses on all Illinois farmland down to T levels or below by the turn of the century at nearly one billion dollars—61 million dollars a year for the next 16 years. The average annual federal cost sharing budget for Illinois during the last few years has been 6.5 million dollars.

Expanded use of reduced tillage systems has already carried Illinois a good distance toward 'T'. More expensive remedies for its more sloping fields, such as terraces, await further funding. But nearly one million acres of the state's most erosive land simply cannot be farmed for row crops without acceptable soil losses.

The only sure cure for these vulnerable lands is to take them out of row crop production. The trouble is that there are few attractive economic alternatives to row crop production. Wheat earns less than corn or soybeans, there is little cash market for hay, and few farmers keep cattle that might feed on forage crops because the beef market is depressed. One plan suggests the public purchase of 'cropping rights' to incurably eroding land. Under such a plan owners would be forbidden to plant crops but instead would plant pasture, forage or forest crops in return for cash payments in lieu of income thus lost. But money for such a scheme is not likely to be available soon. It has even been suggested that Illinois may someday levy a severance tax on farm products similar to the taxes levied by energy exporting states, to pay for repairs to the land damaged by the mining of topsoil for grain production.

To a large extent, of course, erosion is a function of a farming system that requires the intensive cultivation of maximum amounts of land; with profit margins so thin, it is produce or perish. Beginning with the Nixon administration, farmers were urged to all-out production to meet global demand for grain. Little heed was paid to the impact which the subsequent frenzy of planting had on the land, so that during the 1970s erosion and food exports rose together. It was as if the president had urged motorists to drive more during the OPEC oil embargo.

Ultimately, it is the US public which will pay for the failure to control soil erosion, in higher food prices, clogged reservoirs and the vitiation of rural economies. Pay now in cost-sharing, farmers say in effect, or pay later. But there is yet no strong constituency for soil conservation. The general public simply does not understand the costs.

Deep Ecology: A New Philosophy of our Time?

by Warwick Fox[1]

The Australian philosopher William Godfrey-Smith has remarked that "deep ecology . . . has an unfortunate tendency to discuss everything at once. Thus a social critique of deep ecology may be backed by such disparate authorities as Ginsberg, Castenada, Thoreau, Spinoza, Buddhist visionaries, and Taoist physics. With a cast of prima donnas like this on stage it is very hard to follow the script."[2] In this paper, I shall try not to "discuss everything at once" by confining my attention mainly to what I take to be the central intuition of deep ecology, and to some considerations related to that intuition. Even so, I shall still be making reference to "Buddhist visionaries and Taoist physics" for at least one compelling reason: not to refer to the parallels between deep ecology, the mystical traditions,[3] and the so-called "new physics" (i.e. post 1920s physics) might well indicate that one had *missed* the central intuition of deep ecology since, fundamentally, each of these fields of understanding subscribes to a similar structure of reality, a similar cosmology. Deep ecology's "disparate authorities" turn out to be not as disparate as they at first appear. Moreover, comparison with these other fields can, I believe, be fruitful in clarifying some of deep ecology's vaguer or more contradictory aspects.

The distinction between 'shallow' and 'deep' ecology was made in 1972 (and published the following year) by the distinguished Norwegian philosopher Arne Naess, and has subsequently been developed by a number of thinkers (most notably, Bill Devall and George Sessions) to the point where we may now reasonably refer to an intellectual 'deep ecology movement.'[4] The shallow/deep ecology distinction has generated so much discussion that it has become difficult to distil to any simple essence but, for the sake of brevity, it could be characterized by the following three points.

First, shallow ecology views humans as separate from their environment. Figure/ground boundaries are sharply drawn such that humans are perceived as the significant figures against a ground that only assumes significance in so far as it enhances humans' images of themselves *qua* important figures. Shallow ecology thus views humans as the source of all value and ascribes only instrumental (or use) value to the nonhuman world[5]. It is, in short, anthropocentric, representing that attitude to conservation that says: "We ought to preserve the environment (i.e., what lies outside the boundary) not for its own sake but because of its value to us (i.e., what lies inside the boundary)." Deep ecology, on the other hand, rejects "the (human)-in-environment image in favour of the relational, total-field image."[6] Organisms are then viewed rather "as knots in the biospherical net or field of intrinsic relations."[7] Figure/ground boundaries are replaced by a holistic or gestalt view where, in Devall's words, "the person is not above or outside of nature . . . (but) . . . is part of creation on-going."[8] This 'total-field' conception dissolves not only the notion of humans as separate from their environment but the very notion of the world as composed of discrete, compact, separate 'things'. When we do talk about the world as if it were a collection of discrete, isolable 'things' we are, in Naess's view, "*talking at a superficial or preliminary level of communication.*"[9] Deep ecology thus strives to be non-anthropocentric by viewing humans as just one constituency among others in the biotic community, just one particular strand in the web of life, just one kind of knot in the biospherical net. The intrinsic value of the nonhuman members of the biotic community is recognized and the right of these members to pursue their own evolutionary destinies is taken as "an intuitively clear and obvious value axiom."[10] In contrast, the idea that humans are the source or ground of all value ('the measure of all things') is viewed as the arrogant conceit of those who dwell in the moral equivalent of a Ptolemaic universe. Deep ecologists are concerned to move heaven and earth in this universe in order to effect a 'paradigm shift'[11] of comparable significance to that associated with Copernicus.

Second (and directly related to the above), in its acceptance of what Sessions refers to as 'discrete entity metaphysics'.[12] shallow ecology accepts by

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default or positively endorses the dominant metaphysics of mechanistic materialism. Viewing knowledge, too, as amenable to discrete compartmentalization, the shallow approach considers ethics in isolation from metaphysics with the consequence that the dominant metaphysics is usually implicitly assumed. Deep ecology, however, is concerned to criticize mechanistic materialism and to replace it with a better 'code for reading nature.'[13] This code can be generally described as one of 'unity in process.'[14] By this is indicated both the idea that all 'things' are fundamentally (i.e., internally) related and the idea that these interrelationships are in constant flux (i.e., they are characterized by process/dynamism/instability/novelty/creativity, etc). This conception of the world lends itself far more readily to organismic rather than mechanical metaphors, and thus to panpsychic or pantheistic rather than inert, dead-matter conceptions of the nonhuman world. Among Western philosophers, Spinoza, Whitehead and Heidegger are most often invoked for the purposes of articulating this vision of the world or, particularly in the case of Heidegger, for the purposes of articulating the 'letting be' mode of being most appropriate to such a deep ecological understanding of the world.[15] Deep ecology also has an enormous respect for many non-Western views since 'unity in process' and panpsychic conceptions of the world have received sophisticated elaboration in Eastern spiritual traditions and in the mythological systems of other non-Western peoples. This respect also extends to the entire sensibility or mode of being-in-the-world of some of these traditions since this often accords with the non-power-seeking sensibility of deep ecology.[16] In stressing the interconnection between ethics and metaphysics, deep ecology recognizes that an ecologically effective ethics can only arise within the context of a more persuasive and more enchanting cosmology than that of mechanistic materialism.[17]

Third, in terms of its social, political and economic project, shallow ecology tends to accept by default or positively endorse the ideology of economic growth which characterizes industrial and developing societies of all political complexions. It is thus often referred to as the 'Resource Management' or 'Resource Conservation and Development' approach. As such, it is content to operate in a reformist fashion within the 'dominant social paradigm'[18] and, often, to accept the economic reduction (i.e., the reduction of all values to economic terms) for the purposes of decision making. Deep ecology on the other hand, is concerned to address existing social, political and economic arrangements and to replace the ideology of economic growth with the ideology of ecological sustainability. It is insisted that economics (etymologically: 'management of the household') must be seen as subsidiary to ecology ('study of the household'), and the economic reduction of values is thus firmly resisted.[19] Key ideas in deep ecology's social, political and economic project include those of a just and sustainable society, carrying capacity, frugality (or 'voluntary simplicity'), dwelling in place, cultural and biological diversity, local autonomy and decentralization, soft energy paths, appropriate technology, reinhabitation, and bioregionalism. These last two perhaps require some elaboration. Reinhabitation refers to the process of relearning how to live in place, how to establish a 'sense of place', how to dwell in and care for a place. Some people are attempting to cultivate consciously this sense, under the most difficult of circumstances, by moving into areas that have been degraded by industrial 'development' and participating in the re-establishment of a rich and diverse ecosystem. Bioregions refer to areas possessing common characteristics of soils, watersheds, plants and animals (e.g., the Amazon jungle). It is argued that bioregions should replace nation-states as the fundamental geographical unit in terms of which humans think and live. The human carrying capacity for each bioregion should be determined in terms of the number of humans that can be supported living at a level of resource use that is adequate for their needs but minimally intrusive on their environment. Here, of course, lie a multitude of difficult questions for the political agenda of deep ecology. However, these questions have, in various forms, been addressed by numerous societies in the past (including a minority tradition in Western society) and are now being taken up by increasing numbers of thinkers in highly industrialized societies.

It should be clear from this summary that many writers whose work falls within the ambit of deep ecology do not necessarily describe themselves as 'deep ecologists'. A good example is Theodore Roszak who, in his 1972 book *Where the Wasteland Ends*, pointed to the same kind of distinction as Naess:

"Ecology stands at a critical cross-roads. Is it, too, to become another anthropocentric technique of efficient manipulation, a matter of enlightened self-interest and expert, long-range resource budgeting? Or will it meet the nature mystics on their own terms and so recognize that we are to embrace nature as if indeed it were a beloved person in whom, as in ourselves, something sacred dwells? . . . The question remains open: which will ecology be, the last of the old sciences or the first of the new?"[20]

However, despite this and other attempts by philosophers, historians and sociologists to distinguish between various streams of environmentalism, Naess's twelve year old shallow/deep ecology terminology seems to have stuck as the most economical and striking way of referring to the major division within contemporary environmental thought. The conceptualization of this division clearly constitutes a powerful organizing idea in terms of providing a focal point from which to view the relationships between a number of otherwise very diffuse strands of ecologically oriented thought.

The Intuition of Deep Ecology

It should be clear from my brief outline of the shallow/deep ecology distinction that many of the views held by deep ecologists go well beyond the data of ecology conceived as an empiric-analytic science. As Arne Naess said when introducing the shallow/deep ecology distinction: ". . . the norms and tendencies of the Deep Ecology movement are not derived from ecology by logic or induction. Ecological knowledge and

the life-style of the ecological field-worker have *suggested, inspired, and fortified* the perspectives of the Deep Ecology movement."[21] Deep ecologists have, therefore, taken the point made by Donald Worster in his study of the history of ecological ideas from the eighteenth century to the early 1970s:

"In the case of the ecological ethic . . . one might say that its proponents picked out their values first and only afterward came to science for its stamp of approval. It might have been the better part of honesty if they had come out and announced that, for some reason or by some personal standard of value, they were constrained to promote a deeper sense of integration between (humans) and nature, a more-than-economic relatedness—and to let all the appended scientific arguments go. 'Ought' might then be its own justification, its own defence, its own persuasion, regardless of what 'is.'

"That more straightforward stance has now and again been adopted by a few intuitionists, mystics, and transcendentalists. Most people, however, have not been so willing to trust their inner voices, perhaps due to lack of self-confidence or out of fear that such wholly individual exercise of choice will lead to the general disintegration of the moral community."[22]

Deep ecologists *are* 'willing to trust their inner voices' in the hope that the dominant social paradigm (within which the moral community is situated) *will* disintegrate—although in a creative rather than a destructive manner. Again, Arne Naess is quite explicit on these points in a recent interview in *The Ten Directions,* a magazine published by the Zen Centre of Los Angeles:

"*Ten Directions:* This brings us back to the question of information versus intuition. Your feeling is that we can't expect to have an ideal amount of information but must somehow act on what we know?

Naess: Yes. It's easier for deep ecologists than for others because we have certain fundamental values, a fundamental view of what's meaningful in life, what's worth maintaining, which makes it completely clear that we are opposed to further development for the sake of increased domination and an increased standard of living. The material standard of living should be drastically reduced and the quality of life, in the sense of basic satisfaction in the depths of one's heart or soul, should be maintained or increased. This view is intuitive, as are all important views, in the sense that it can't be proven. As Aristotle said, it shows a lack of education to try to prove everything because you have to have a starting point. You can't prove the methodology of science, you can't prove logic, because logic presupposes fundamental premisses."[23]

However, the *central* intuition of deep ecology, the one from which Naess's views on practice flow, is the first point I made in my summary of the shallow/deep ecology distinction. This is the idea that there is no firm ontological divide in the field of existence. In other words, the world simply is not divided up into independently existing subjects and objects, nor is there any bifurcation in reality between the human and non-human realms. Rather all entities are constituted by their relationships. To the extent that we perceive boundaries, we fall short of a deep ecological consciousness. In Devall's words: "Deep ecology begins with unity rather than dualism which has been the dominant theme of Western philosophy."[24]

The Intuition of Deep Ecology and Cross-Disciplinary Parallels

The central intuition of deep ecology finds a profound resonance in both the mystical traditions and the 'new physics'. For example, the 'perennial philosophy' tells us, and the meditative process is claimed to reveal, that 'Thou art That'.[25] In other words, it is claimed that by subtracting your own self-centred and self-serving thoughts from the world you come to realize that "the other is none other than yourself: that the fundamental delusion of humanity is to suppose I am here and you are out there."[26] This understanding permeates the mystical traditions and is exemplified in the Taoist advice to "identify yourself with non-distinction."[27] Likewise, the Zen teacher Chü-chih would answer any question he was asked by holding up one finger, while the contemporary Zen roshi Robert Aitken says that "we save all beings by including them."[28] The mystical traditions are simply full of differing illustrations of this same point.[29] Ken Wilber, editor of the journal *Revision* and perhaps the most significant recent integrator of Eastern and Western world-views, expresses the mystical understanding in these terms: "We fall from Heaven in this moment and this moment and this, every time we embrace boundaries and live as a separate self sense."[30] Just so, adds the deep ecologist, do we fall short of a *deep* ecological consciousness.

It is now becoming commonplace to point to the fundamentally similar cosmolgies embodied in the mystical traditions on the one hand and the 'new physics' on the other.[31] What is *structurally* similar about these cosmologies is that they reveal a 'seamless web' view of the universe. As David Bohm, the distinguished Professor of Theoretical Physics at Birbeck College, University of London, has said in an interview with the philosopher Renée Weber:

"*Bohm:* . . . the present state of theoretical physics implies that empty space has all this energy and matter is a slight increase of the energy, and therefore matter is like a small ripple on this tremendous ocean of energy, having some relative stability, and being manifest. (Thus, my suggestion of an 'implicate order') implies a reality immensely beyond what we call matter. Matter itself is merely a ripple in this background . . . in this ocean of energy . . .

Weber: This view is of course very beautiful, breathtaking in fact, but would a physicist who pressed you on this . . . find some kind of basis *in physics* for allowing such a vision to be postulated?

Bohm: Well, I should think it's what physics directly implies."[32]

Both the mystical traditions and the 'new physics' serve to generate, *inter alia,* what we might now call 'ecological awareness', that is, awareness of the fundamental interrelatedness of all things or, more accurately, all events.[33] The theoretical physicist Fritjof Capra has been quite explicit about this: "I think what physics can do is help to generate ecological awareness. You see, in my view now the Western version of

mystical awareness, our version of Buddhism or Taoism, will be ecological awareness."[34] Where the physicist, the mystic, and the deep ecologist (as philosopher) differ is in their *means* of arriving at an 'ecological awareness'. In terms of Wilber's typology of modes of inquiry, we could say that the physicist (like the 'scientific' ecologist) emphasizes 'empiric-analytic inquiry' (i.e. analysis of measurements), the mystic emphasizes 'transcendental inquiry' (i.e. contemplation), and the deep ecologist (as philosopher) emphasizes 'mental-phenomenological inquiry' (i.e. analysis of meaning: here we include such things as reflection on personal experience, the analysis of valuational arguments, and the meaning of knowledge furnished by the other two modes of inquiry).[35] However, all three modes of inquiry lead to a similar conception of the underlying structure of reality. Like the mystic and the 'new physicist', the deep ecologist is drawn to a cosmology of (in David Bohm's words) "unbroken wholeness which denies the classical idea of the analyzability of the world into separately and independently existing parts."[36]

A New Cosmology

While I refer to this view as the central *intuition* of deep ecology, I do not in any way mean that it is irrational or ungrounded. The deep ecologist who is pressed to say whether there is a basis *in ecology* for "allowing such a vision to be postulated" can reply, in the manner of David Bohm, that this cosmology is what ecology directly implies. Moreover, the deep ecologist can argue that if there is substance to the "hypothesis of emerging cross-disciplinary parallels" advocated by the neurophysiologist Roger Walsh, then the parallels between the structures of reality advanced by deep ecology, the mystical traditions and the 'new physics' are enormously significant rather than trivial coincidences or accidents of language. Briefly, Walsh's hypothesis is that we can enhance our perceptual sensitivity by the augmentation of normal sensory perception (as in science), by intellectual conceptual analysis (as in philosophy), or by direct perceptual training (as in meditation), and that:

". . . no matter how it is obtained, (perceptual) enhancement of sufficient degree may reveal a different order or reality from that to which we are accustomed. Furthermore, the properties so revealed will be essentially more fundamental and veridical than the usual, and will display a greater degree of commonality across disciplines. Thus as empirical disciplines evolve and become more sensitive, they might be expected to uncover phenomena and properties which point toward underlying commonalities and parallels between disciplines and across levels."[37]

On the basis of emerging cross-disciplinary parallels such as those I discuss above, Walsh proceeds to argue that the classical Greek and, later, Cartesian concept of the universe as "essentially atomistic, divisible, isolable, static, nonrelativistic, and comprehensible by reductionism, is in the process of replacement, not just for physics where evidence for such a shift was first obtained, but for all sciences."[38] Deep ecology throws its full weight behind this shift, and is in accord with

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Walsh that the fundamental ontology now being revealed can be described as "largely dynamic, fluid, impermanent, holistic, interconnected, interdependent, foundationless, self-consistent, empty, paradoxical, probabilistic, infinitely over-determined, and inextricably linked to the consciousness of the observer."[39]

But beyond what the data of ecology—or of science generally—seem to imply, and beyond the significance or otherwise of emerging cross-disciplinary parallels, the central vision of deep ecologists *is* a matter of intuition in Worster's and Naess's sense. That is, it is a matter of trusting one's inner voice in the adoption of a value stance or a view that can not itself be proven or disconfirmed. There is nothing alarming or even unusual in the use of intuition understood in this sense. Philosophers of science generally accept that scientific theories, let alone metaphysical systems (or 'ontic theories' as Quine calls them), are *constrained* by facts but are *underdetermined* by them. In other words, the same data can always be theorized or interpreted in a number of ways that are nevertheless *consistent* with the data. How then are we to decide between competing theories and world-views? An evaluative stance must ultimately be adopted and, for the deep ecologists, this means the promotion of, in Worster's words, "a deeper sense of integration between (humans) and nature."[40]

Ecological Justice and 'Procrustean Ethics'

In their zeal to effect this integration, deep ecologists have firmly coupled their central intuition of no boundaries in the biospherical field to the notion of 'biospherical egalitarianism—in principle.'[41] As a result, these notions tend to go everywhere together, almost as if they implied each other (although I shall argue they do not). These two ideas constituted the first two points in Naess's original seven-point outline of deep ecology, while Devall commented in his 1980 overview of the 'deep ecology movement' that "in deep ecology, the wholeness and integrity of person/planet together with the principle of what Arne Naess calls 'biological equalitarianism' are the most important ideas."[42]

'Biospherical egalitarianism' effectively refers to the equal intrinsic worth of all members of the biosphere: "the equal right to live and blossom is (taken as) an intuitively clear and obvious value axiom."[43] The 'in principle' clause is added to this value axiom because it is recognized that "any realistic praxis necessitates some killing, exploitation and suppression."[44]

The idea that, in principle, no organism possesses greater intrinsic value than any other means that two major classes of value-theory have been condemned by deep ecologists as anthropocentric. First are those theories of value whose practical application implies that the nonhuman world possesses *only* instrumental (or use) value. Traditional, mainstream Christian ethics, secular Western ethics such as utilitarianism and Kantian ethics, and modern economic theory are typically included in this class. In the second class are those recent attempts to develop a practical ecological ethics which recognizes the intrinsic value of the nonhuman world but which ascribes *differential* intrinsic value to organisms depending on their complexity and, hence, capacity for richness of experience.

Now those theories of value which fall into the first class are clearly anthropocentric in the most obvious sense—they embody that essential 'arrogance of humanism'[45] which views the nonhuman world purely as a means to human ends. But to the extent that we can describe those theories of value in the second class as anthropocentric, we are using that term in a very different sense. The second class of value-theory (often inspired by Whitehead's thought) can be considered as philosophy catching up with the biological news. Humans are not posited as the source of all value, nor is it denied that organisms possessing nervous systems of comparable complexity to that of humans (such as whales and dolphins) also possess comparable intrinsic value. Moreover, and most importantly, it is *not* assumed or implied that organisms possessing greater intrinsic value have any right to exploit those possessing lesser intrinsic value. Quite the contrary. For example, in Birch and Cobb's recent elaboration of this second kind of value theory, their central ethic is that we have an obligation to act so as to *maximize richness of experience in general*—which includes the richness of experience on the nonhuman world.[46]

Yet deep ecologists dismiss this second class of value-theory, along with the first, as anthropocentric. For example, with respect to the second class, Sessions refers to the 'pecking order in this moral barnyard' and argues that:

"The point is not whether humans do in fact have the greatest degree of sentience on this planet . . . (but that, for deep ecologists) . . . the degree of sentience is *irrelevant* in terms of how humans relate to the rest of Nature. And so, contemporary Whiteheadian ecological ethics does not meet the deep ecology insistence on 'ecological egalitarianism in principle'."[47]

I think deep ecologists tend to conflate principle and practice when they make judgements such as this. As Birch and Cobb's ethic makes clear, the second class of value theorists need have no argument with the axiom that all organisms have an 'equal right to live and blossom' *when genuine conflicts of value are absent.* And this, I think, does satisfy the deep ecologist's insistence on ecological egalitarianism *in principle.* But, as Naess points out, value conflicts can never be completely avoided in practice; the process of living entails some forms of "killing, exploitation, and suppression." To this extent, then, the degree of sentience becomes extremely relevant in terms of how humans relate to the rest of nature *if* they are to resolve *genuine* conflicts of value in anything other than a capricious or expedient manner.

The deep ecologist who is 'thoroughgoing' in confusing ecological egalitarianism in principle with ecological egalitarianism in practice is forced into the position that they might as well eat meat as vegetables since all organisms possess equal intrinsic value. In stark contrast to this position is the comment by Alan Watts that he was a vegetarian "because cows scream louder than carrots",[48] and this is, in essence, the argument of the second class of value theorists—and the view, I am sure, that deep ecologists tend to adopt *in practice.* Deep ecology thus does itself a disservice by employing a definition of anthropocentrism which is so

overly exclusive that it condemns more or less *any* theory of value that attempts to guide 'realistic praxis'. This observation explains why deep ecological theorizing has shied away from considering situations of genuine value conflict and why it has not come forth with ethical guidelines for those situations where some form of killing, exploitation or suppression *is* necessitated. Unless deep ecologists take up this challenge and employ a workable definition of anthropocentrism, they may well become known as the advocates of 'Procrustean Ethics' as they attempt to fit all organisms to the same dimensions of intrinsic value. Again, diversity is the key.

Cross-disciplinary analogies may add emphasis to the above. When the 'new physicist' considers matter as a ripple on a tremendous ocean of energy, this conception of 'unity in process' does not then imply that, at any given moment, all ripples are of equal magnitude. In terms of cosmic time, these ripples are continuously rising and falling, but at any given moment real differences exist. Likewise, the mystic's conception of 'unity in process' does not deny that, at any given moment, some forms are more significant expressions of pure consciousness than others—notwithstanding the knowledge that, from the aspect of eternity, all forms are fleeting. In fact, the notion of a hierarchy of states of mind/being, with greater value being ascribed to the higher states, is central to all mystical traditions. Similarly, the deep ecologist's conception of 'unity in process' need not imply that, at any given moment, all 'knots' (i.e. organisms) in the 'biospherical net' are constituted of equally complex relations. To the extent that value inheres in complexity of relations, and to the extent that complexity of relations is evidenced in the degree of an organism's central organization (and therefore capacity for richness of experience), then organisms are entitled to moral consideration commensurate with their degree of central organization (or capacity for richness of experience) for the duration of their existence—as transient as that may be in terms of evolutionary time.

In pursuing their central intuition of 'unity' (i.e. of no boundaries in the biospherical field), deep ecologists have possibly lost sight of the significance of the 'in process' aspect of their 'unity in process' metaphysics. Attention to this latter aspect suggests that any process continuously produces impermanent, uneven distributions (i.e., different values) of various attributes (and in the process of the world these attributes may be money, information, complexity of relations, and so on). If this were not so then we would have no process but a perfectly uniform, homogenous and, therefore, lifeless field. The only universe where value is spread evenly across the field is a dead universe.[49] Recognizing this, we should be clear that the central intuition of deep ecology does not entail the view that intrinsic value is spread evenly across the membership of the biotic community. Moreover, in situations of genuine value

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conflict, justice is better served by *not* subscribing to the view of ecological egalitarianism. Cows do scream louder than carrots. As Charles Birch and John Cobb have remarked: "Justice does not require equality. It does require that we share one another's fate."[50] There is, however, a shallow and a deep sense of sharing one another's fate. The shallow sense is simply that of being subject to the same forces. It does not involve caring. The deep sense, intended by Birch and Cobb, involves love and compassion. It involves the *enlargement of one's sphere of identification.* The lesson of ecology is that we do share one another's fate in the shallow sense since we all share the fate of the earth. The message of deep ecology is that we ought to care as deeply and as compassionately as possible about that fate—not because it *affects* us but because it *is* us.

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1. Revised version of a paper delivered to the "Environment, Ethics and Ecology Conference", Australian National University, 26-28 August, 1983. A considerable number of people have read this paper in its original version and offered detailed criticisms, comments, and/or encouragement. In particular, I am grateful to Robin Attfield, Baird Callicott, John Cobb, Bill Devall, Brian Easlea, Jeremy Evans, Patsy Hallen, Judy Lockhart, Arne Naess, John Seed, George Sessions, Swami Shankarananda, Michael Zimmerman and, especially, Charles Birch.
2. Godfrey-Smith, W. Environmental philosophy. *Habitat*, June, 1980, 24-25, p24.
3. Where I refer to the "mystical traditions", Aldous Huxley uses the phrase "perennial philosophy", while the neurophysiologist Roger Walsh refers to the "consciousness disciplines". (See: Huxley, A. *The Perennial Philosophy*, New York: Harper Colophon Books, 1970 (originally 1944); Walsh, R. Emerging cross-disciplinary parallels: suggestions from the neurosciences. *The Journal of Transpersonal Psychology*, 1979, 11:175-184; and Walsh, R. *Towards an Ecology of Brain*, New York: Spectrum Publications, 1981). Huxley, Walsh and I are referring to a similar, if not identical, corpus of knowledge, the authors of which are commonly referred to as "mystics".
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14. Roszak, T. *Where the Wasteland Ends: Politics and transcendence in post-industrial society.* London: Faber, 1973, p400.
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16. Roszak (ibid.) describes the sensibility of ecology in its "subversive", or deeper, aspect as: "wholistic, receptive, trustful, largely non-tampering, deeply grounded in aesthetic intuition".
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19. On the commensurability and incommensurability of economic and other values, see Godfrey-Smith, 1979, op. cit.
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22. Worster, D. *Nature's Economy: The roots of ecology*, San Francisco: Sierra Club Books, 1977, p 336-7.
23. Naess, 1982, op.cit., p11-12.
24. Devall, 1980, op. cit. p309. The ecologist Paul Shepard speaks eloquently to this point: "Ecological thinking . . . requires a kind of vision across boundaries. The epidermis of the skin is ecologically like a pond surface or a forest soil, not a shell so much as a delicate interpenetration" (Sessions, 1979, op. cit. p8).
25. This phrase derives from the Sanskrit formulation "tat tvam asi" and is rendered "That art Thou" by Huxley (op. cit.) and "Thou art That" in Juan Mascaro's translation of *The Upanishads* (Harmondsworth: Penguin 1965).
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31. Some books either on, or which embody, this theme include David Bohm's *Wholeness and the Implicate Order* (London: Routledge and Kegan Paul, 1980); Fritjof Capra's *The Tao of Physics* (Glasgow: Fontana, 1976); Michael Talbot's *Mysticism and the New Physics* (New York: Bantam Books, 1981); and Gary Zukav's *The Dancing Wu Li Masters: An overview of the new physics* (Bungay, Suffolk: Fontana, 1981). Despite this recent spate of books, it would be a mistake to assume that reference to the parallels between the cosmologies of physics and the mystical traditions is a "New Age" phenomenon. Oppenheimer explicitly pointed to such parallels in 1954 (*Science and the Common Understanding*, London: Oxford University Press) as did Bohr in 1958 (*Atomic Physics and Human Knowledge*, New York: John Wiley). That being said, for an erudite critique of the *dangers* involved in drawing such parallels see Wilber's essay entitled "Physics, Mysticism and the New Holographic Paradigm" in: Wilber K. (ed) *The Holographic Paradigm and Other Paradoxes: Exploring the leading edge of science*, Boulder: Shambhala, 1982. (Reprinted in: Wilber, K. *Eye to Eye: The quest for the new paradigm*, New York: Anchor Books, 1983). Against Wilber's criticisms, however, one should balance Walsh's observations on the *significance* of these "emerging cross-disciplinary parallels" (see Walsh, 1979 and 1981, op. cit.).
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36. In: Capra, 1976, op. cit., p141-2.
37. Walsh, 1979, op. cit., p175.
38. ibid., p176
39. ibid., p180.
40. Worster, 1977, op. cit., p337. Mary Hesse argues that "we can observe by hindsight that in the early stages of a science, value judgements (such as the centrality of (humans) in the universe) provide some of the reasons for choice among competing underdetermined theories" (*Revolutions and Reconstructions in the Philosophy of Science*, Brighton, Sussex: Harvester, 1980, p190). For deep ecologists the situation is just the opposite: value judgements such as the *lack* of centrality of humans in the universe provide some of the reasons for choice among competing underdetermined theories (and here I include metaphysical views or "ontic theories").
41. Naess, 1973, op. cit., p95.
42. Devall, 1980, op. cit., p310.
43. Naess, 1973, op. cit., p96.
44. ibid., p95.
45. Ehrenfeld, D. *The Arrogance of Humanism*, Oxford: Oxford University Press, 1981.
46. Birch and Cobb, 1981, op. cit.
47. Sessions, 1979, op. cit., p18. The phrase "a pecking order in this moral barnyard" comes from John Rodman who used it in his insightful critique of Peter Singer's "Animal Liberation" and Christopher Stone's "Should Trees Have Standing?" See Rodman, J. The liberation of nature? *Inquiry*, 1977, 20:83-145,p93.
48. Aitken, 1982, op. cit., p81.
49. In a slightly different context, Wilber (1983, op. cit., p295) argues that statements like "all is one" or "all is Brahman" typically give rise to a false picture of the universe that reduces all diversity and multiplicity to "uniform, homogenous, and unchanging mush" or to "uniform, all-pervading, featureless but divine goo."
50. Birch and Cobb, 1981, op. cit., p165.

Intuition, intrinsic value and Deep Ecology

Arne Naess replies

Which are the basic intuitions of deep ecology? How are they to be verbalised? How can we use them as guiding stars when formulating our policies? How can we avoid situations where we think we are agreeing or disagreeing over fundamentals when in fact we are employing such different styles of language that comparison is difficult or simply inappropriate?

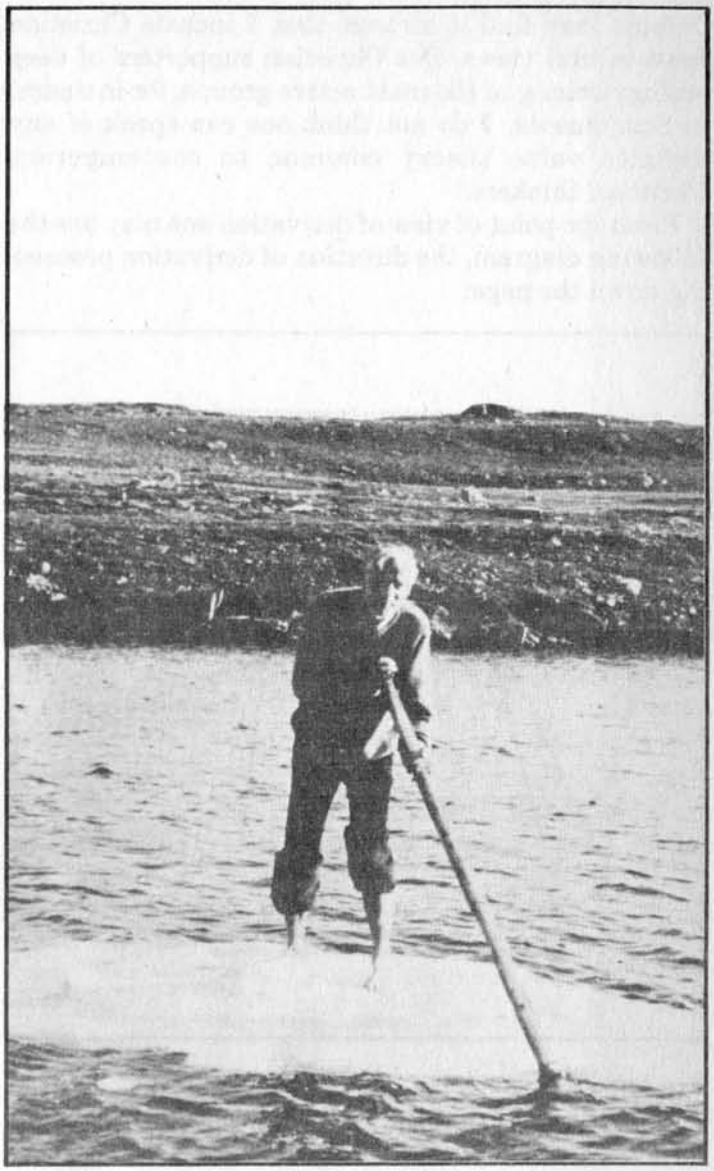
These are the kind of abstract—or 'higher order' questions that are raised by a philosophical discussion of the deep ecology movement. However, the movement is not mainly one of professional philosophers and other academic specialists, but of a large public in many countries and cultures. As an academic philosopher I find the questions important, but as a supporter of the movement I do not consider them central. We may discuss them in a relaxed way, noting the richness of somewhat divergent and even incompatible answers with equanimity.

The following are some reflections elicited by the excellent article of Warwick Fox dealing with some of those questions. I coined the terms 'deep' and 'shallow' ecological movement, but my intention was not to monopolise those terms. Instead I welcome some diversity in expression of the basic attitude and intuitions of deep ecology. Consequently the following comments are not meant to sound dogmatic.

Fox quotes Godfrey-Smith who says that "deep ecology . . . has an unfortunate tendency to discuss everything at once. Thus a social critique of deep ecology may be backed by such disparate authorities as Ginsberg, Castenada, Thoreau, Spinoza, Buddhist visionaries, and Taoist physics. With a cast of prima donnas like that on stage it gets very hard to follow the script."[1]

In order to facilitate discussion it may be helpful to distinguish a common platform of deep ecology from the fundamental features of philosophies and religions from which that platform is derived. We can then express the deep ecology platform as a set of norms and hypotheses (factual assumptions).[2] The fundamentals, if verbalised, are Buddhist, Taoist, Christian or of other religious colours, or philosophic with affinities to basic views of Spinoza, Whitehead, Heidegger or others. The fundaments are mutually more or less incompatible or *at least difficult to compare in terms of cognitive contents.* The incompatibility does not affect the deep ecology platform adversely.

The common platform within the deep ecological movement is grounded in religion or philosophy. In a loose sense it may be said to be derived from the fundamentals. Because these are different the situation only reminds us that a set of very similar or even identical conclusions may be drawn from divergent premisses. The platform is the same, the fundamental premisses differ.



Arne Naess — on thin ice?

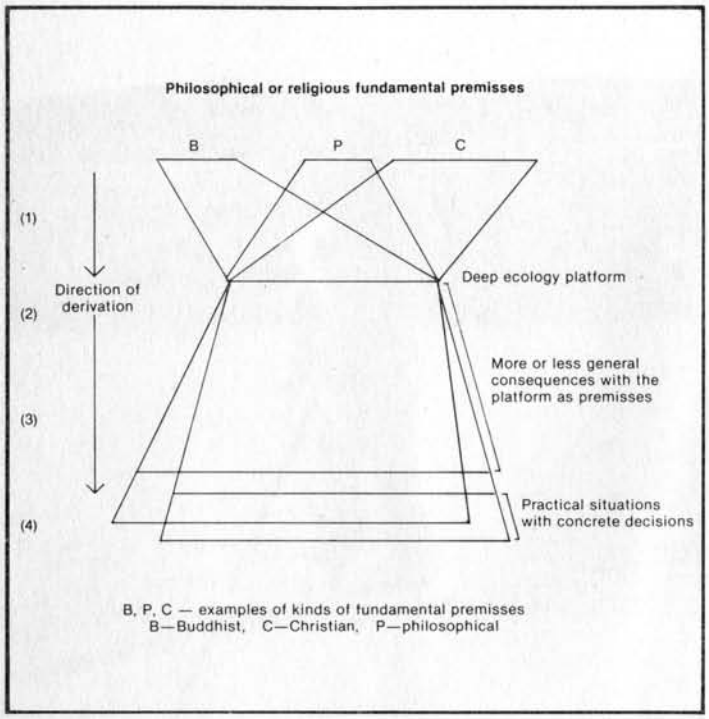
In order to clarify the discussion one must avoid looking for one definite philosophy or religion among the supporters of the deep ecological movement. Fortunately there is a rich manifold of fundamental views compatible with the deep ecological platform. Furthermore, there is a manifold of kinds of consequences derived from that platform.

The discussion must take four levels into account: (1) verbalised fundamental philosophical and religious ideas and intuitions; (2) the deep ecological platform; (3) the more or less general consequences derived from the platform—life styles and general policies of every kind; and (4) descriptions of concrete situations and decisions made in them.

It is a characteristic feature of deep ecological literature that it contains positive reference to a formidable number of authors belonging to different traditions and cultures.[3] These references are not made in order to trace complete agreements, but primarily to make tentative suggestions of deep similarities of views. Spinoza, to mention only one single great author, obviously entertained some opinions far removed from those of deep ecology. And his terminology is practically impenetrable for us today. Nevertheless his texts are inexhaustible sources of inspiration for some deep ecologists.

Some may find it strange that I include Christian fundamental views. But Christian supporters of deep ecology belong to the most active groups, for instance, in Scandinavia. I do not think one can speak of any definite value theory common to contemporary Christian thinkers.[4]

From the point of view of derivation one may use the following diagram, the direction of derivation proceeding down the page:



In this figure, B, P and C are not made largely overlapping chiefly because of the difficulties of formulating agreements and disagreements in relation to texts written in religious language.

Warwick Fox seems to think that different behaviour towards different kinds of living beings is difficult to justify without acknowledging different degrees of intrinsic value to different kinds of "organisms". But I accept certain established ways of justifying different norms dealing with different kinds of living beings. They do not necessitate grading that particular intrinsic value living beings have simply as living being. Mine is an attitude I cannot avoid, perhaps an intuition of some sort, which makes me proclaim that value to be ungraded. But to proclaim the existence of that value does not logically nor otherwise necessitate a norm of equal behaviour towards all living beings. There is room for vast differences. There is no pressure to introduce grading of the particular intrinsic value I am speaking about. Such grading does not fit the attitude and intention at hand.

Some intrinsic values may be graded. The value Warwick Fox speaks about may be graded. We probably do not speak about the same intrinsic view. A personal testimony:

I have injured thousands of the little arctic plant *salix herbacea* during nine years of stay in the mountains, and I shall continue stepping on them as long as I live. But I have never felt the need to justify such behaviour by thinking that they have less right to live and blossom, or less intrinsic value as living beings, than certain other living beings, including myself. It is simply not possible to live in certain mountains without stepping on these plants, and I maintain that it *is* justifiable to live there. When I behave as I do I can at the same time admire these plants, acknowledge their equal right to live and blossom with my right. At least not less and not more. Perhaps it is a better formulation to say that living beings have a right, or an intrinsic or inherent value, or value in themselves, that is *the same* for all of them. In so far as we speak of differences in value we do not speak of the value I have in mind.

What I now have done is to try to verbalise one rather deep intuition. But attempts to express such intuitions in words may mislead the speaker or writer, and they certainly very often mislead the listeners or readers, for instance they can sound "too sure". There are other intuitions as well as thousands of differences of attitude reflecting differences of valuation. If there is a question whether to place my foot on a *salix herbacea* rather than on the small, overwhelmingly beautiful and somewhat less common *gentiana nivalis*, I certainly, obviously and deliberately, place it on the former.

The abstract term 'biospherical egalitarianism in principle' and certain similar terms which I have used, do perhaps more harm than good. They suggest a positive *doctrine,* and that is too much. The importance of the intuition is rather its capacity to counteract, the perhaps only momentary, but consequential, self-congratulatory and lordly attitude towards what seems less developed, less complex, less miraculous.

A rich variety of acceptable motives can be formulated for being more reluctant to injure or kill a living being of kind A than a being of kind B. The cultural setting is different for each being in each culture, furthermore there are few general norms, only vague guidelines.[5] One factor: *felt nearness,* determines largely our capacity to identify ourselves with a sort of being, to suffer when they suffer. One cannot put forth ethical rules of conduct without taking such feelings and our limited capacities seriously. If it is *difficult to avoid* killing A because of its smallness, whereas killing B is easily avoided, we tend to protect B rather than A. Indeed we live with an obvious diversity of obligations. We have special obligations towards our own children: in most cultures any animal may be killed in order to feed one's starving child. Obligations toward species that have been members of our life community for long periods are greater than toward accidental visitors. Furthermore, we have the relevance of suffering: Is the suffering of A less than that of B? Has A the capacity of suffering?

The simple thing I try to convey here is that an ethics concerning differences between non-human living beings is of a comparable level of complexity to ethics concerning different people and groups with whom we have to do.

An intuitive concept of life

I prefer the term 'living being' over the term 'organism'. The intuitive concepts of life sometimes cover a stream, a landscape, a wilderness, a mountain,

an arctic 'waste'. The intuition has not much to do with biology or neuro-physiology as sciences. Intrinsic value as posited by the intuition is influenced, but not decisively, by "biological news", for instance news about whales' "comparable nervous system complexity to humans".[6]

The kind of intuition I speak about I take as being common to supporters of the deep ecological movement. It is not easy to verify this, however, because of terminological or even conceptual divergencies.

References

1. Warwick Fox, see article in *The Ecologist* (this issue).
2. See example Arne Naess "Notes on the Methodology of Normative Systems", *Methodology and Science,* 10, 1977, pp 64-79.
3. Cp. the 70-page review by George Sessions in R.C. Schultz and J.D. Hughes (Eds) *Ecological Consciousness,* Univ. Press of America, 1981.
4. The kind of trend in value theory I feel at home with when speaking about intrinsic values and intuitions is that of Max Scheler and Nicolai Hartmann. Cp. Max Scheler, *Der Formalismus in der Ethik und die materiale Wertethik,* 1913-1916, *The Nature of Sympathy,* transl. 1954. Nicolai Hartmann, *Ethik* 1926. Christian theologians within the deep ecology movement include: Ole Jensen, *Caught in the Violence of Economic Growth,* Kbh. 1976, Gunnar Breivik, "Society in Equilibrium—a Theological Valuation", in H. Olsen, Ed., *Toward a Society in Equilibrium,* 1978, a work edited by Nordic Protestant Churches. (Titles are translated into English.)
5. More about the relevance of tradition and culture in Arne Naess's "Self-realization in Mixed Communities of Humans, Bears, Sheep, and Wolves", *Inquiry,* 22, 1979, pp 231-241.
6. Warwick Fox, see article in *The Ecologist* (this issue).

On guiding stars to Deep Ecology

Warwick Fox answers Naess

In his comments on "The Intuition of Deep Ecology", Arne Naess asks: "Which are the basic intuitions of deep ecology? How are we to verbalise them?" How can we use them as guiding stars when formulating our policies?"[1] I dealt with some of these questions in my article, as Arne Naess notes. However, my concern there was primarily with the first two questions, which relate to the *content* of deep ecology. Here, it seems appropriate to take up an aspect of the third question. I want to consider how these basic intuitions are (and should be) used as guiding stars in advancing a distinctly deep ecological variety of environmental philosophy. That is, I am concerned with the differences between the *structure* of deep ecological thought and that of "normal" environmental philosophy. These differences are brought out by a consideration of the valuable four-levelled model of the structure of deep ecological philosophy outlined in Arne Naess's comments. But, first, it is necessary to clarify the way in which I believe Naess's systematisation of deep ecological philosophy should be understood.

Arne Naess's systematisation illustrates the relationship of deep ecology's basic principles or its "platform" (level 2), to various possible philosophical and religious "fundamental premisses" on the one hand (level 1) and various possible theoretical and practical "consequences" on the other (levels 3 and 4). Although this systematisation is presented in terms of "fundamental premisses", "consequences", and a direction of "derivation" from levels (1) to (4), this should *not* be taken to mean that a sentence at one level is held to follow by virtue of necessity or probability from sentences at a previous level i.e., Naess is not proposing a deductive or an inductive system. As he comments himself, it is only in a "loose sense" that the deep ecology platform "may be said to be derived from fundamentals".[2] Just as, in Naess's earlier words, "the norms and tendencies of the Deep Ecology movement are not derived from ecology by logic or induction",[3] neither are they derived by (deductive) logic or induction from fundamental philosophical or religious premisses.

Naess's previous work suggests that, in the kind of very general world-view systematisation that he has in mind, the notion of "derivation" simply means "making more precise".[4] (An instance of making a sentence more precise is referred to as a "precisation".) One sentence is more derived than another in this sense (i.e. more precise) if the range of interpretations it can admit is a subset of the range of interpretations that the other sentence can admit. In other words, derivation or preciseness is a matter of delimiting a range of possible interpretations. For example, we might proceed from a fundamental (i.e. level 1) religious or philosophical premiss such as "All is One" or the Spinozist idea that "there is only one 'substance' " and, in the sense described, "derive" the (more precise) central "plank" in the deep ecology "platform" that "there are no boundaries in the biospherical field", or that "all entities are constituted by their relationships" (level 2). Further precisation might express the realisation that "the sense of oneself as a skin encapsulated ego is not in accord with this 'seamless web' ontology" (level 3). This process of Self-realisation might then lead to a much greater degree of personal identification with one's "surroundings" and, thus, an extension to "others" of the same care and concern previously reserved for one's egoic self.

None of the steps in the above example is held to follow by necessity (deductive inference) or probability (inductive inference) from sentences at a previous level. All we have (in logical terms) is a chain of precisations flowing in one or many possible directions of interpretation. We could have easily started from the same vague, general fundamental premiss and proceeded to develop a chain of precisations in a very different direction of interpretation. Thus, the "direction of derivation" shown in the diagrammatic illustration of Naess's systematisation should be understood as referring to both the level of precisation and the direction of interpretation. The greater the level of precisation the more evident the direction of interpretation (or what Naess has previously referred to as the "definiteness of intention").

What is the value of trying to provide a systematisation of deep ecology (or any other fairly comprehensive view) when the connecting links between fundamental premisses (level 1) and practical consequences (level 4) are as weak as that of "possible interpretation"? An important answer must be that such a systematisation emphasises the continually-being-forgotten fact that our most sophisticated and precise, non-trivial (i.e. non-tautological) reasonings are always embedded or grounded in a very general "underlying perception of *the way things are.*"[5] This emphasis, this continual reminding, constitutes the most significant and distinctive *structural* feature of deep ecological thought.[6]

In contrast to the deep ecologists, the vast majority of environmental philosophers pursue environmental *philosophical* discussion almost entirely at the level of environmental *ethics.* Although the extent of this "ethical reductionism" can hardly be overemphasised, it is, in fact, rarely even commented upon since this seems the "natural" way to conduct environmental philosophy. If environmental philosophy were a science then environmental ethical discussion constitutes what Kuhnian philosophers of science would call "normal science".[7] Janna Thompson, one of the few commentators to draw attention to what I have termed the ethical reductionism of normal environmental philosophy, argues correctly, I believe, that "the self-imposed limitations of ethical discourse" prevent most environmental philosophers from asking "the crucial question, namely, where do these new ethical attitudes come from?"[8] Deep ecologists, on the other hand, are characterised by their concern with this crucial question of the underlying or deeper bases of our ethical attitudes and theories. Naess's systematisation is a clear illustration of this concern. But, again, we could ask: What is the point in being so concerned about the underlying bases (level 1) of our ethical theories (level 3) and practices (level 4) if the logical relationship between these bases, theories and practices is no stronger than that of "possible interpretation"? The answer lies in the realm of psychology rather than logic. While a fundamental premiss does not logically determine the direction of interpretation into which it is pressed, it will nevertheless be more conducive (in psychological terms) to some directions of interpretation rather than others. The "All is One" example, above, is a case in point. There are obvious and compelling psychological rather than logical reasons as to why a person is likely to theorise and behave quite differently depending on whether their "underlying perception of the way things are" is of the world as coextensive with themselves versus radically separate, a mother versus an enemy, enspirited versus inert matter-in-motion, and so on.

Deep ecologists agree with Birch and Cobb's insight that "human beings are more deeply moved by the way they experience their world than by the claims ethics makes on them."[9] Thus, where contemporary environmental philosophy is dominated by the question "How do we construct an adequate environmental ethic?", deep ecology asks the question "How do we cultivate a deep ecological consciousness?" The former question looks to conceptual answers, the latter to experiential answers. In seeking to change the way in which we experience the world, deep ecologists place their *primary* emphasis upon changing our "underlying perception of the way things are" (i.e. changing our ontology) rather than upon what we might term the "conceptual fix" approach of "bigger and better" ethics. This attempt to shift the *primary* focus of environmental philosophical concern from ethics to ontology clearly constitutes a fundamental or revolutionary challenge to normal environmental philosophy.[10] It is (and should be) deep ecology's guiding star.

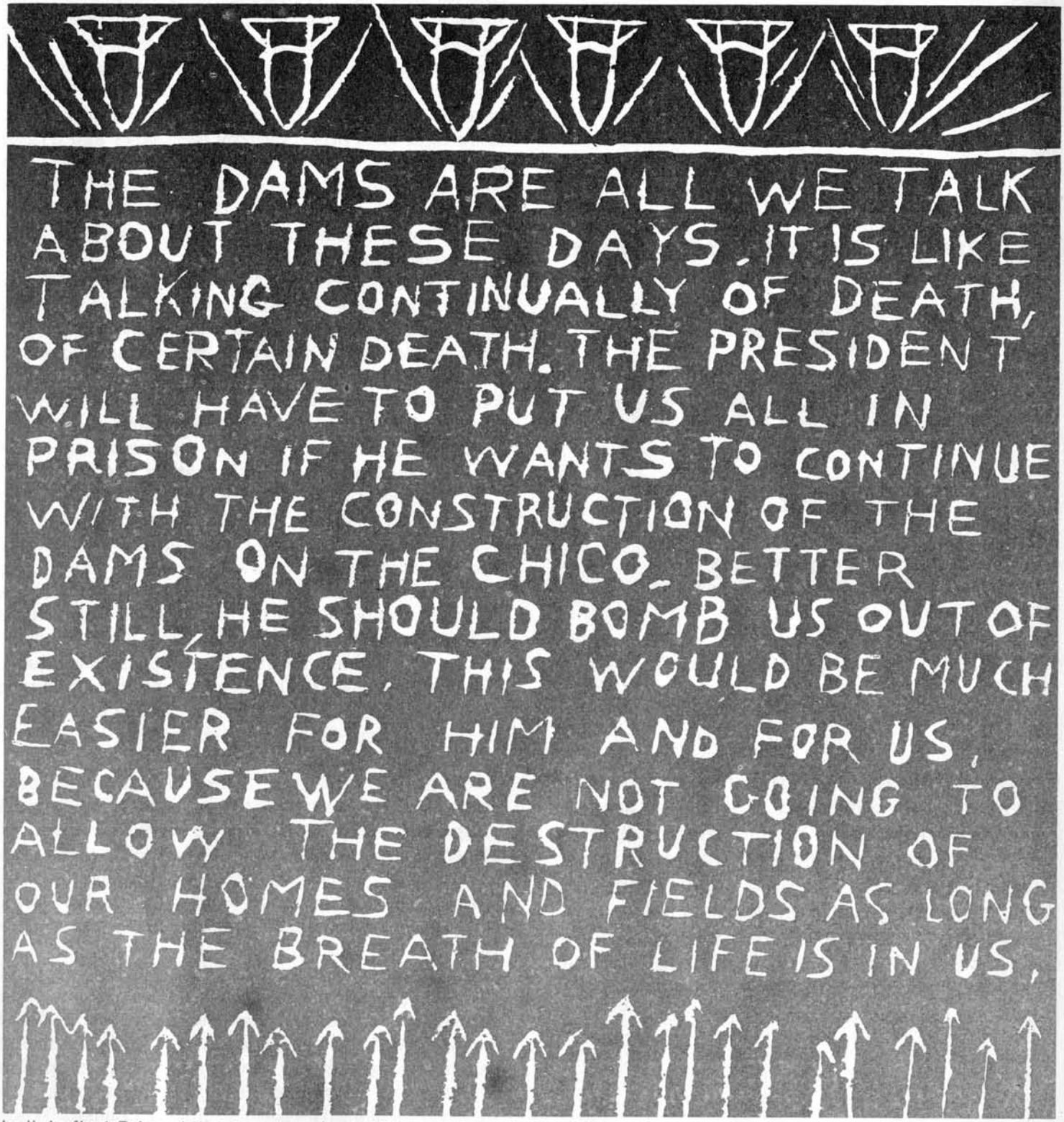
Notes

1. Naess, A. Intuition, intrinsic value and deep ecology: comments on an article by Warwick Fox. *The Ecologist* (this issue).
2. ibid.
3. Naess, A. The shallow and the deep, long-range ecology movement. A summary. *Inquiry,* 1973, 16:95-100, p 98.
4. This paragraph and the following one draw on Arne Naess's *Interpretation and Preciseness* (1953), *Communication and Argument: Elements of applied semantics* (1966), *The Pluralist and Possibilist Aspect of the Scientific Enterprise* (1972), and Notes on the methodology of normative systems *Methodology and Science,* 1977, 10:64-79. (The three books are published by the University Press, Oslo.)
5. This phrase is used by Seymour Feldman in his introduction to Spinoza's Ethics (Baruch Spinoza, *The Ethics and Selected Letters,* S. Shirley (trans.) and S. Feldman (ed.), Indianapolis: Hackett, 1982, p 9.) Pertinent to the present discussion of Naess's systematisation of deep ecology, Feldman writes:

   "Some of the great systematic philosophers of the past proceeded to philosophise from an underlying perception of *the way things are*—an intuition, to use one of Spinoza's key terms, of the way everything hangs together. This fundamental insight gives birth to a system, which represents the unfolding of the ramifications and consequences of that intuition."

   In the present context, I use the word "ontology" as equivalent to Feldman's "underlying perception of the way things are". A metaphysical system would refer to the detailed working out or "unfolding" of the "ramifications and consequences" of an ontology.
6. The most important feature of deep ecology's *content* being, to adopt Feldman's language (see note 5), the fundamental intuition or the underlying perception that everything does, indeed, hang together.
7. Kuhn, T. *The Structure of Scientific Revolutions,* Chicago: University of Chicago Press, 1970. On this point it is noteworthy that the only journal exclusively "dedicated to the *philosophical* aspects of environmental problems" is called *Environmental Ethics.* Excellent as they often are in their own right, the journal's contents nevertheless reflect the ethical reductionism implied in the tension between its avowed concerns and its title.
8. Thompson, J. Preservation of wilderness and the Good Life. In: R. Elliot and A. Gare (eds) *Environmental Philosophy,* St Lucia, Queensland: University of Queensland Press, 1983, p 89.
9. Birch, C. and Cobb, J. *The Liberation of Life: From the cell to the community,* Cambridge: Cambridge University Press, 1981, p 177.
10. The primacy of ontological over ethical concerns in deep ecology suggests that the notion of "biospherical egalitarianism in principle" can be understood as follows. Certain "underlying perceptions of the way things are" (or ontologies) are more conducive than others to a general attitude or orientation of "letting be", "living and letting live", or "sparing and preserving" (in Heidegger's phrase). However, such a general attitude or orientation is *just that*—a general *attitude or orientation.* It is not an ethical system. It does not offer specific guidance in those situations where "sparing and preserving" is difficult or impossible. It operates at a lower level of definiteness than an ethic. Arne Naess (see note 1) seems to agree when he comments that "biospherical egalitarianism . . . suggest(s) a positive *doctrine,* and that is too much." Biospherical egalitarianism rather refers to the attitude underlying specific ethical decisions and practices. Perhaps Aldo Leopold was getting at the same idea when he defined conservation as what a person thinks about while chopping wood or deciding what to chop (*A Sand County Almanac,* Oxford: Oxford University Press, 1949).

Dam Destruction



India's first Prime Minister, Jawaharlal Nehru, once dubbed large dams "Temples of Progress". Most people would accept that view without question. But dams have not only brought irrigation water and hydro-electricity to the Third World, they have also brought massive ecological destruction and social upheaval.

Recently, the Wadebridge Ecological Centre published the first volume of a three-part study on the social and environmental effects of large dams. In this special issue of *The Ecologist*, we reproduce two chapters from that first volume. The authors, Edward Goldsmith and Nicholas Hildyard, argue that large-scale dams are inevitably destructive and that the majority of them are built for purely political reasons. We also include a briefing document highlighting the adverse effects of dam projects.

But we begin this section with a case study documenting the destruction already caused by Sri Lanka's vast Mahaweli Project. The project, when completed, is intended to transform Sri Lanka into Asia's next Singapore — a thriving industrial economy where poverty and malnutrition will be banished. In fact, the project will uproot thousands of people and severely degrade the environment. One dam — the Victoria Dam — was closed last April. But others have still to be completed. It is vital that a halt be called to any further construction.

Sri Lanka's Mahaweli Scheme

The Damnation of Paradise

by
L. Alexis

In the desperate search for a large-scale technological solution to Sri Lanka's increasing food and employment requirements, the government has embarked on a multi-billion dollar, five dam project that will threaten ecological stability in a large portion of the country's interior and is already causing social problems. Numerous critics have spoken out against the scheme, but the state appears unwilling to listen.

In 1977, the United National Party (UNP) came to power in Sri Lanka. Led by J. R. Jayawardene, a career politician, the party promised to transform the country into the next Singapore of Asia. Free trade zones were to be set up and the agricultural sector modernised. Proclaiming that "jobs, jobs, jobs" were his final objective, Jayawardene even called upon the Western nations to send Sri Lanka their "robber barons" to assist in the country's development. "Let them fight each other, destroy each other and let the fittest survive – all for the benefit of Sri Lanka," he told Parliament. Aggressive market economics and an unyielding committment to technological development would, it was claimed, raise Sri Lanka from poverty to a budding industrial power.

The lynch-pin of the UNP's whole strategy was a single, massive development scheme – the Accelerated Mahaweli Ganga Hydroelectric Irrigation Project. The idea of the project was not new: previous governments had also planned to dam the Mahaweli. But Jayawardene and the UNP were more ambitious: instead of building the project over thirty years – as previously planned – it was announced that the scheme would be completed in just six years.

As originally conceived, the scheme involved the construction of fifteen dams and reservoirs along Sri Lanka's longest river and richest agricultural valley. The amount of work involved would have been enormous, calling for the storage of some six million acre feet of water. Eleven of the reservoirs were to have included power stations near the dams. Another power station was to have been built on a transbasin canal. The installed electrical output of all the proposed power stations would have been some 500 megawatts. It was estimated that the project would meet one half of the nation's electricity needs by 1990.[1]

In order to complete the Mahaweli project within six years, the UNP were forced to scale down the original programme. Five dams were to be built instead of fifteen. Even so, the project was still a massive undertaking – especially when one considers that Sri Lanka is the eighteenth poorest country in the world, with a gross national product per family of just $230 in 1979.[2]

The 'reduced' scheme called for the employment of 175,000 people in construction activities. The subsequent settlement scheme was to absorb 300,000 people directly into agriculture and a further 150,000 people into agricultural service jobs. Over one million people would be moved into the project area, one-sixteenth of the entire population of Sri Lanka.[3] When completed, the five dams would impound 3,271,470 acre-feet of water. In 1978, the dams were expected to cost some $1.25 billion.[4]

The Government gave several reasons for its decision to speed up the project. According to Gamini Dissanayake, the Minister responsible for the overall implementation and administration of the Mahaweli programme:

> "It is because of the employment potential, high propensity to irrigate thousands and thousands of acres of land and, in the interim period, to provide employment in various fields to large numbers of unemployed youths that we decided that we cannot

wait to implement the Mahaweli Ganga Scheme over the 30-year period."[5]

It was also argued that the population of Sri Lanka was expected to climb to 23 million by the year 2000 and that to invest immediately in the project would therefore protect the nation from greater costs in the future due to inflation.

At times, there was an almost messianic fervour in the Government's vision of post-Mahaweli Sri Lanka. Again, in the words of Dissanayake: "It is our firm conviction that when the dust, kicked up by the Accelerated Programme, settles down and all the work on the Programme is successfully completed, our people who have been dogged by the recurring problem of unemployment, soaring food and fibre prices, compounded by the need to import same and the dearth of sufficient energy for the growing industries, will be able to close a sad chapter of dependence and open a new one, marking an era of fulfilment which will uplift their living standards and improve their quality of life."[6]

Opposition to the Project

Even at its earliest stages, the project was not without its critics. In 1978, the most vocal of these, Gamini Iriyagolle, an attorney and civil servant who had been responsible for negotiations in 1969 to develop the earlier proposal, published an 88-page critique. He pointed out that the 1968 plan produced by UN agencies (UNDP/FAO), upon which the scaled down five dam project was to be based, was woefully inadequate. Iriyagolle wrote:

> "The plan was an outline rather than a plan, except for phase 1 which was prepared in somewhat more detail. The true position was, and still is, that while the location and dimensions of the major construction units were identified at reconnaissance level, the acreages to be newly developed were mere arithmetical figures allocated to each vast irrigation area. Neither the lands nor the proposed channel systems (other than the four high-cost transbasin canals) within each area were even roughly located."[7]

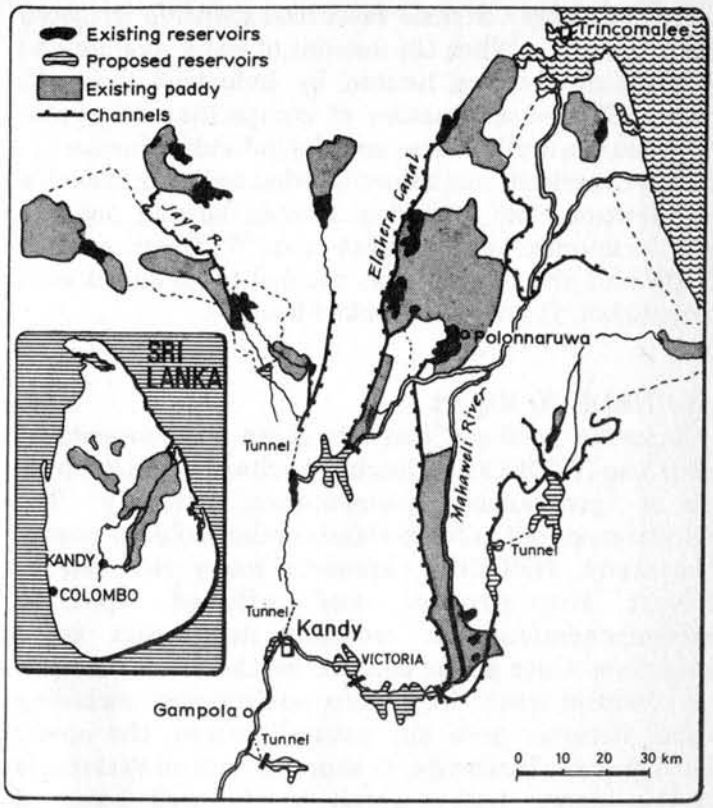
Iriyagolle continued,

> "The project territory itself changed between the start and the end of the UNDP/FAO study. The changes were significant from every point of view but how or why they occurred . . . has never been explained."

He noted later that, "According to the UNDP/FAO study itself, the work on phases II and III was only of a 'reconnaissance character' and was only a 'preliminary study'"[8].In effect, Sri Lanka was seeking financiers and beginning a major construction programme with little more than an outline study of the project as a whole.

Professor B. A. Abeywickrema, a respected Sri Lanka university scientist, was another critic. In particular, he was concerned with the environmental consequences of clearing forests and intensifying agriculture in the project area. Prior to the beginning of the accelerated programme, he wrote:

> "The success of this scheme would depend on a regular supply of water. Now in the Mahaweli, the upper catchment area, the most important tributary of the Mahaweli lies in the central hill country at an



elevation of 4,000 to 8,000 feet. Some of these areas receive a rainfall of over 200 inches per annum. The upper catchment above Polgolla covers only about 11 percent of the total catchment area, but it contributes to over thirty percent of the total run off. Now most of this area has steep slopes with high erosion patterns, and effective soil and water conservation in this region is an essential requirement for the development of the project area. If there is high erosion, the reservoirs will be silted up in no time. Secondly, the rapid run-off will make the water disappear in no time after the rains and the dry weather flow will be reduced and this has to be guarded against.

Maintaining the natural forest cover is the most effective guard against erosion and excessive run-off. Unfortunately this is not possible because the upper catchment area happens to be the most productive and economically important region in the island. Already about 80 percent of this is under cultivation or under some use. Only about 8 percent is now under forest and about 10 or 20 under grassland. But the forest area is said to have been 22 percent just a little over 20 years ago in 1956 and, according to the Conservator of Forests, from 22.2 percent in 1956 it has now come down to about 8 percent. This is a serious matter. Fortunately for us during the last few months there has been a ban on the deforestation of this area."[9]

Iriyagolle and Abeywickrema have been followed by numerous other critics. Sri Lanka biologist, Ranil Senanayake (Ph.D., University of California) became concerned when there were a series of announcements about the possible lease of the soon-to-be-irrigated lands to multi-national firms. He noted that this would lead to a new type of agriculture similar to that practised on the government-run estates and plantations. Two forms of agriculturalists were emerging. "The first, the multinational agribusiness having a much greater economic and political strength than the second, the individual Sri Lankan farmer. The multinational growers will demand regular supplies of

water to maintain their resource-expensive irrigated plantations . . . When the amount of water available to agriculture becomes limited by industrial draw-off, there will rise a situation of competition for water between the agribusiness and the individual farmer . . . global experience has shown us what happens in such a competition. The individual farmer, lacking political and economic power loses out."[10] Despite such criticisms, the Government decided to go ahead with the project. It has never looked back.

The NEDECO Report

Once the 'go-ahead' had been given, the Government called up NEDECO, a Dutch consultancy firm, to draw up a 'programme-implementation' strategy. The Government of the Netherlands underwrote the cost of the study. NEDECO expressed many reservations about the project and offered specific recommendations for reducing its impact to a minimum. Once again, concern for the forest emerged as a central issue. "A healthy environment including clear streams, pure air, natural forests, the scenic beauty of the landscape, in short all natural systems is not a luxury but essential to the well being of mankind."[11] The report then discussed some of the possible consequences of clearing 650,000 acres of existing forest land for irrigation. "The ecosystem in these areas will change drastically, but this is the option chosen."[12] Concern was also expressed for the chemical pollution which would come with more energy-intensive agriculture. It was recommended that the government ". . . exercise the strictest control over the use and distribution of agro-chemicals and reduce their application to the limits of absolute necessity."[13] The NEDECO report also noted that the last remaining undisturbed habitat for wildlife would be lost. It was noted that even if a "maximum" amount of land was left for wildlife, large numbers of plants and animals would be removed by the project.[14]

There were concerns for the health of new settlers moving into the project area due to the spread of water-borne disease, contamination of drinking water, and exposure to other diseases. At least four diseases are transmitted by mosquitos in Sri Lanka; malaria, filariasis, dengue, and haemorrhagic fever. Water borne illnesses include: cholera, enteric fever, hepatitis, ameobic dysentery, and polio. The report urged that drinking water be boiled; latrines be provided; and safe wells be dug.[15]

The TAMS Report

An environmental assessment report was prepared by the American consulting firm of Tippetts, Abbett, McCarthy, Stratton (TAMS) and was released in October 1980. It was noted in the four volume report that to obtain the project's intended long-term benefits, ". . . a commitment of resources is required which will result in a number of adverse environmental impacts, some of which would in all likelihood be unavoidable."[16] The firm then listed some of these negative impacts or, put another way, some of the environmental 'costs' of the project:


K. GOLDSMITH

Dr L.W. Mediwake, an outspoken critic of the Mahaweli scheme. His own land will be flooded by the Victoria Dam.

- Due to clearing, as well as timber and fuelwood needs, a substantial portion of the present forest will be removed;
- Large numbers of animals and plants—many of them either endangered species or found only in Sri Lanka—will be destroyed;
- The habitat of most wildlife species in the project area will be severely reduced, thus further jeopardising the future of endangered species;
- High-quality wildlife habitats comprising 5,600 hectares in the Somawathie Sanctuary and about 15,000 hectares in the northern part of the 'System C' resettlement area will be eliminated;
- About 6,400 hectares of additional high-quality wildlife habitat will be lost in the Mahaweli Ganga floodplain. Breeding and feeding grounds for some fish species, waterfowl and migratory birds will be lost. Livestock grazing areas will also be reduced;
- The water table will rise considerably, necessitating the provision of drainage channels;
- Return flows will lead to a deterioration in water quality downstream;
- Pesticide usage will be increased with subsequent biomagnification throughout the food chain;
- Organic production and energy cycles in estuarine systems will be altered, with a detrimental effect on aquatic life;

- The migratory routes of fish will be blocked;
- More than 25,000 people will have to be resettled since their homes will be flooded by the proposed reservoirs;
- Crop losses of 10 percent will occur due to the combined effects of weeds, insects, diseases and rats;
- Birds and large mammals will also cause crop damage, especially in high-quality habitat areas. Elephants may cause physical harm to settlers or their families.[17]

To get a clearer picture of the tremendous effects that the Accelerated Mahaweli Project is having upon the Mahaweli Ganga's numerous, complex, ecological systems, let us trace the course of the river, examining some of the impacts caused by each of the projects in the overall scheme.

The Three Peneplains

Geologically, Sri Lanka can be divided into three peneplains (plains of erosion) which help deliniate the Islands' biogeographic regions.[18] The third peneplain, which ranges from about 7,000 to 8,000 feet above sea level, provides the upper catchment basin for the Mahaweli waters. Due to extensive plantation crops, the natural montane cloud forest now covers less than 8 percent of the area. Deforestation has already caused massive soil erosion – and that, in turn, is likely to cause the premature silting up of the new reservoirs and irrigation canals.[19] According to informed sources, no siltation studies have been done on the Mahaweli Ganga.

There is then a 3,000–4,000 feet step down to the second peneplain where over 90 percent of the high and riverine forest cover has been already felled for tea, rubber and coffee plantations. The natural forest in this region is the home of 35 endemic species of fauna which are mostly confined to the river valleys. These valleys are rapidly being cleared prior to inundation.

The Kotmale and Victoria reservoirs of the Accelerated Mahaweli Project are both located on the second peneplain. More than 13,000 acres of land in this region will be drowned by these reservoirs.

The Kotmale Dam

The Kotmale Valley is where the first dam is being built. In 1979, when construction work began, the plan was to build a 350 foot high, rock filled dam with a generating capacity of 200 megawatts.[20] Subsequently the size of the dam was scaled down to 285 feet. The dam will now produce 134 megawatts of electricity.[21]

This dam is being constructed by the Swedish construction agency SKANSKA, which was awarded the contract without any competitive bidding.[22] Kotmale dam was going to be completed in 1984. However, after discovering limestone caverns beneath the original site, the entire project was moved 200 metres downstream. Now the expected completion date is February 1985.[23]

How a major hydroelectric dam could have been sited in such an unsuitable place is still uncertain. Pat Sadler, the chief resident engineer of the scheme, has said, "There's been a lot of geological studies done on this project in the past, but no-one appeared to have co-ordinated the results of them and drawn the appropriate conclusion."[24] As another engineer put it, "The original site was not an obvious choice."[25]

A 1954 report – commissioned in 1947 after heavy rains washed away 200 villages and caused serious landslides in the Kotmale Valley – states:

> "In the Kotmale Valley we have a rather unusual combination of geological, structural, and topographical features which give rise to a strong tendency towards slope failures. Over these features man has no control. But superimposed on these are a different set of conditions for which man is responsible and which have increased the potentialities for slope failures inherent in the area. These are in the main: (1) Removal of forest cover on the upper slopes of catchments, and from talus debris at the foot of scarp faces; (2) Inefficient drainage of steep slopes under plantation; (3) Ponding of water for paddy cultivation on terraces above unstable slopes."[26]

A 1979 report on the geology of the Kotmale area also warned against earth slides. The report states, "An investigation of the stability of the sides of the reservoir is necessary, in particular to the dam on the left bank. Slides of overburden and weathered rock are most likely to occur from the rim of the reservoir, and rock slides are a possibility. Slides are most likely to occur after heavy rains, and also after a sudden drawdown."[27]

A 1981 report details similar problems at the newly chosen site;

> "The panel identified a variety of adverse geological features such as unstable soil and rock masses in the reservoir area, solutioned and cavernous limestone in the reservoir and below the dam site and deep and irregular weathering of rock or faults. The potential problems considered were reservoir landslides, leakage of water either into adjacent valleys or beneath the dam, sliding stability of the dam under varying conditions and the potential for piping around the foundation."[28]

In June of 1982, a major earthslip occurred after heavy rains, threatening the entire project.[29] After several tense days when the earthslide was monitored round-the-clock, some measures (including rock bolting and excavation) were taken to reduce the danger of the slide. Should an earthslip occur after the reservoir is filled – an ever present possibility – the consequences would be severe.

Construction 'mishaps' such as those described above have played havoc with the costs of the project. According to a 1981 World Bank report on Sri Lanka, "Of all the projects in the Mahaweli Programme the cost of the Kotmale project has risen the most since 1979." The report attributes this "to the delay in implementation caused by the shifting of the dam site and continuing design changes."[30]

A survey, undertaken in 1979 to determine the effect of the dam on those areas which would be submerged, revealed that 1,410 acres of paddy would be flooded, along with 3,742 acres of highlands; that 13,000 people would have to be moved; and that Rs. 29 million would have to be paid out in cash compensation for damage to private property other than land.[31]

The NEDECO Report estimated that the economic

losses due to inundation would be 20 million rupees. However, the inundation of archeological sites and of natural reserves has not been valued separately.[32]

The Polgolla Diversion

The water leaving the reservoir will be conveyed 4.5 miles via an underground tunnel to the power generators, rejoining the Mahaweli Ganga at the Atabage Oya.

From here the Mahaweli continues its descent until it reaches the Polgolla diversion. This project was completed prior to the Accelerated Programme in 1976. The waters diverted here were designed to provide hydro-power from the Ukkuwela Power Station and provide irrigation water for the 'H' settlement area.

The Victoria Dam

The Mahaweli Ganga then flows through one of Sri Lanka's most fertile valleys, the Dumbara Valley. More than 7,000 acres of this valley will be flooded by the Victoria Reservoir. This prime agricultural and densely populated valley has been a settled area for many centuries and more than 6,000 families will be uprooted.[33]

An article printed in 1980 by a long time resident of the Dumbara Valley, Dr. L. W. Mediwake, D.Sc. (Bonn University), stated,

> "In the entire history of Sri Lanka's dam construction work, whether medieval, colonial, or post colonial, never has a project been undertaken which would destroy so much existing highly-developed productive wealth, and dislocate so many thousands of families, at a time when rebuilding and reconstruction is at its most expensive level."[34]

It is the British taxpayers who are helping to fund the £180 million Victoria hydroelectric dam. In 1980, the British Government agreed to give Sri Lanka £100 million for the Victoria Project, to be paid in five annual instalments of £20 million a year.[35] The 385-foot double curvature arched dam will straddle the Mahaweli Ganga near Sri Lanka's second largest city, Kandy. Since construction began in 1980, the Victoria Dam has been plagued by mishaps, including the discovery of large cavities under the foundation, a landslip, a tunnel cave-in, and a number of deaths of construction workers.[36]

Disregarding all costs, the present government has been pressuring the English contractor, Balfour, Beatty, and Nuttal, from the very beginning to complete the Victoria Project by 1984. "This is the top priority scheme in the country," explains Colonel Ivan Samarawickrema, Secretary to the Minister of Mahaweli Development. "The president has emphasised that Victoria must finish on time."[37]

In the attempt to complete the Victoria Dam project in four years, Balfour, Beatty, and Nuttal (BBN) has followed the dangerous practice of simultaneously excavating the foundation and constructing the dam upwards. The *New Civil Engineer* reported, "To have any hope of meeting the programme, BBN had to do both simultaneously. This introduced the difficult and dangerous practice of blasting and removing rock over the heads of men working below."[38]

No British contractor has built a double curvature arched dam before, therefore BBN has been relying on the technical advice of the Swiss contractor, Losinger, whose engineers were amazed by the programme. "They said we were crazy to start from the bottom, but to keep to schedule there was no option," stated BBN's Planning Manager John Melville.[39]

These and other dangerous practices have already resulted in the deaths of forty workers. There were 990 accidents which kept site workers from work for three days or more during 1981.[40]

The main purpose of the Victoria Project is to generate power as none of the water that is discharged from the tunnel sluice gates and the spill will irrigate any new lands. Only after the waters enter the Randenigala reservoir – lower downstream – will be used for irrigation purposes.[41] Three seventy megawatt generators are being installed.

The creation of the Randenigala reservoir in the Dumbara Valley will either flood or isolate five ancient Buddhist temples and numerous other Buddhist, Hindu and Muslim places of worship.[42]

Unlike the sparsely populated Kotmale area, the Victoria Reservoir will destroy 3,000 acres of land cultivated with paddy, tobacco, vegetables and other food crops; 2,000 acres cultivated with mixed fruit, cocoa, coffee, coconut, spices, tubers, and soft wood in village gardens and homesteads; and 2,000 acres in big and small estates of cocoa, coffee, pepper, rubber, coconut, sugarcane and other soft wood.[43] Thus, an already developed area, with infra-structure such as roads, industries, etc. will be lost in order to generate hydroelectricity.

The reservoirs of the Kotmale and Victoria dams will drown much of the remaining natural forest in the area, destroying both wildlife and potentially valuable medicinal herbs and trees. The reduced forest cover will result in a drastic decline in the number of animal species and in the loss of a large amount of genetic information. This could result in inbreeding and, ultimately, extinction.[44]

Conservation groups are urging the Government to declare a wildlife reserve on the second peneplain. The list of animals which are threatened includes wild cats, palm civet, flame backs, flying squirrels, the loris and a large number of unique amphibians, notably the limbless lizard.[45]

The Randenigala Project

From the Victoria Reservoir, the river descends through a unique blend of first and second peneplain forest. The fauna endemic to this area include the fish *Labeo fisheri* or "green mountain Labeo". This habitat will be partially inundated by the Randenigala Reservoir.

The West Germans are helping finance the Randenigala hydroelectric and irrigation project. This 308 foot rock filled dam with a generating capacity of 125 megawatts is located directly below the Victoria dam.

Construction began in 1982 on the Rs. 4.5 billion project. The Federal Republic of Germany is giving Sri

K. GOLDSMITH

The entrance to the village built to house construction workers at the Victoria Dam. Sri Lanka's President Jaya Wardene closed the dam in the Spring of 1984. Eventually the dam's reservoir will hold back 730 million cubic meters of water, flooding much of the fertile Dumbara valley.

Lanka a concessionary loan of DM 400 million over a five year period.

The World Bank and the IMF advised Sri Lanka not to proceed with the Randenigala project because it could overstrain the economy and contribute to the ever higher inflation rate. Determined to take advantage of the West German loan offer, however, the Sri Lankan government decided to go ahead with the project.[46]

In 1979 when the NEDECO report examined the object of the dam, they reasoned that there would be adequate electricity available to meet the needs of Sri Lanka until 1988 without constructing the Randenigala dam.

"Although . . . it has been shown that with the construction of the Kotmale and Victoria power facilities, demand can be satisfied up to early 1988, new capacity not being required before that time, it is not certain that the Randenigala would then be the best next proposition."[47]

However, the Mahaweli Authority of Sri Lanka disagreed with the NEDECO report about the need for electricity. In a 1979 letter to the representative of USAID in Sri Lanka, the Director-General of the Mahaweli Authority, Mr. N. G. P. Panditharatne said, "We have a minor disagreement with NEDECO about when Randenigala Dam and its power component will be required. NEDECO estimates that it will be needed by 1988. We believe the pace of development in Sri Lanka will see this dam required in 1986 – in fact we need the power now."[48]

Certainly the policies of any government can encourage or discourage the use of electricity. The Government's trade liberalisation policy has done much to *create* a demand for more electricity – not least by encouraging energy intensive consumer industries to set up shop in Sri Lanka.

The Randenigala project will inundate 5,350 acres of land. In 1979, the value of the land which would be flooded was put at Rs. 5 million.[49]

The TAMS report recommends that "three islands totalling 70 hectares which rise within the reservoir be made into wildlife reserves." The report noted, however, that even this measure would be "inadequate to mitigate wildlife problems arising from the dam construction at Randenigala."[50] The dam is expected to be completed in 1986.

The Madura Oya Project

Directly downstream from Randenigala, another reservoir is planned at Rantembe.

Below Rantembe, a new anicut at Minipe is being constructed to bring part of the Mahaweli irrigation waters through the Right Bank Canal which eventually connects up with the Madura Oya. The rest of the waters are diverted into the existing Minipe Yoda Ela and any remaining waters flow through the river's natural course to Trincomalee.

The Madura Oya reservoir has already been completed and more than 12,000 acres of land began flooding in October of 1982. The construction of a rock filled dam and reservoir across the Madura Oya on the eastern side of the Mahaweli basin has already inundated 6,000 hectares of tropical dry evergreen

Salinisation is already a problem in at least one new irrigation scheme.

forest roughly up to the 300 foot contour level.[51]

The Canadian Government has loaned 76 million Canadian dollars to help fund the Madura Oya project. The United States Government is spending 95 million US dollars to finance the downstream development of System 'B'. Construction began in 1980.

The likely environmental impact of the project was studied by the Canadian group of consultants – ACRES International Ltd. Their reports emphasise the irreplaceable loss of large areas of forest habitat, diverse in wildlife fauna and flora. In the ACRES report, the damage caused by this extensive deforestation is described; "The clearance of such large areas of forest will result in the destruction of the habitat of a large number of animals. Particularly affected will be the larger, forest dwelling mammals such as the elephants, leopards, deer, monkeys, etc., since their space requirements are larger."[52]

According to the ACRES report at least 58 species of mammals are likely to be resident in System 'B'.[53] This report also estimates that 92 of the 427 bird species in Sri Lanka may nest in this area. ACRES suggests that ". . . the capture and sale of wildlife is the mitigating measure for wildlife protection."[54]

In December 1979, TAMS issued a preliminary environment assessment of the Madura Oya project. Much of the information contained in this document never appeared in the final TAMS report. Among other things, the preliminary report noted;

> "The project area has a considerable and variable wildlife population residing within the large areas of undeveloped land comprising villus, grass-lands and several forest types. Vertebrate fauna consists of several species of fish, amphibians, reptiles, many bird species, and large mammals including elephant, leopard, bear, primates, deer, sambhur, and a number of endemic species."[55]

The section of the Madura Oya which will become a reservoir will lose its river fish population. The TAMS report says, ". . . the section of the Madura Oya which will be inundated by the reservoir apparently supports mostly small, non-economically important species which will not survive the transition from river to lake habitat. At present, it is unknown whether any of these river species which will be eliminated are endemic forms."[56]

The preliminary TAMS report states that ". . . the single most serious problem which threatens the survival of this unique wildlife is extensive destruction of its habitat."[57] Despite the creation of wildlife parks and sanctuaries, it is certain that many species will not survive. "It must be recognised that the proposed system cannot contain the majority of those displaced and further, that care must be taken to not supersaturate, i.e. exceed carrying capacity, by attempting to force excess numbers of displaced wildlife in to the system. Supersaturation of a reserve by large herbivores can be expected to result in habitat damage."[58]

At the spot along the Madura Oya where the engineers decided the dam should be built, a fourth century A.D. sluice gate was excavated. The ancient Sri Lankans had also chosen this same point to impound waters for sustainable tank irrigation.

By the time the original tract of the Mahaweli Ganga reaches the tidal lowlands, its flow rates are expected to be reduced by at least 50 percent. NEDECO warns that salt water intrusion may occur; ". . . with little flow on the river salt water intrustion is likely to become a problem."[59] This also means that the villus (seasonally inundated marsh areas) will be reduced by half.

At present, the villus cover an estimated 4,000 to 12,000 hectares.[60] Villus support the greatest animal biomass density of all the habitats found within the Accelerated Programme Area.[61]

The first peneplain riverine high forest is distinct from the rest of the dry zone forest. Many species of plants and animals are confined to this habitat. The annual flooding and the close proximity of a water source allows for the existence of many species that would find the dry zone forest inhospitable.

The annual flooding and depositing of silt have also created ideal conditions for the growth of *Beria Cordifola*. This tree yields a timber held in high esteem by Singhalese craftsmen and is used almost exclusively for coach works. The trees have their greatest concentration in the riverine forests of the Mahaweli. Today, the last major stand is found in the area around the Somawathie Sanctuary.

The Resettlement Scheme

The waters from the massive reservoirs described above will be used for irrigating new settlement schemes. Though the Minister of Mahaweli Development said in parliament in 1979 that 350,000 acres would be ready for settlement by 1983, no new acreage has been irrigated by the Accelerated Scheme.[62] It is now expected that, by 1986, 50,000 acres will be ready for settlement. According to a May 1982 government publication, only those who are displaced by the reservoirs will be settled. "The downstream development that is being attempted is the barest minimum required for settling the people whose homesteads will go under water after completion of the dams."[63]

Families are resettled into a cluster pattern of housing, with 100–125 families comprising each hamlet. Settlers employed in farming are given 2.5 acres of irrigated land and half an acre for the homestead. As many as 10,000 families will be moved from their traditional villages and ancestral homes in the uplands which will be flooded by the new reservoirs. Thousands of other families will be from the lowland areas, where the new settlement colonies are being constructed.

The Mahaweli Authority plans to educate the farmers in new farming methods. "It should be stressed that the eventual success of the Scheme will depend mainly on the adoption of new practices by the farmers . . . Changing the farmer's traditional outlook is a problem which should not be underestimated."[64]

The type of settlement planned is radically different from traditional Sri Lankan villages.

Most of the farmers will be changing from subsistence to commercial farming. "It should be noted that the experience of the majority of peasant farmers is limited to a traditional system of paddy growing which is orientated towards a subsistence rather than a market economy."[65]

The infrastructure of the new settlement schemes reflects a committment to commercial agriculture. ". . . For agriculture to be developed on a very highly commercial basis and using modern methods of technology the services and backup services will have to be equally matched. In other words the service sector pertaining directly to agriculture – availability of draught power, marketing aspects, storage aspects, communication aspects and extension aspects – will have to be amplified to ensure a higher level of agriculture."[66]

The new settlement schemes will contain banking facilities, fertilizer and pesticide stores, tractor repair, bureaucratic agencies and Western medical care. These represent an entirely new framework for the Sri Lankan settlers. The traditional system had a sustainable agriculture based on kinship.

> "In a new settlement scheme there is a greater difference of roles than in a traditional village. By and large, there would be exclusive farmers, officials, traders, financiers, service-suppliers (barbers, physicians, tractor operators, cycle repairers, etc.) who are specialists in their own functions. These services become purchased services and farmers would become the clientele for the other specialists. The transactions are in cash and not on barter terms or a product sharing basis, nor influenced by other social obligations which flow from such relations as patronage, kinship and tenancy."[67]

Re-locating traditional families – indeed whole villages – into artificial social environments creates a number of problems. Many of these were foreseen before the project began. The 1969 UNDP/FAO final reports for instance, states: "Adequate provision should also be made in each settlement for common grazing and woodland. The village community would be responsible for the proper use and maintenance of the common areas allocated to them to provide sufficient pasturage for their livestock and to supply firewood."[68] Under the heading 'Land Tenure', the report says: "It is also stressed that no fragmentation of holdings be allowed."[69]

Other feasibility studies have highlighted other problems which are likely to be encountered in the new settlement schemes:

- *Water Management* – "Studies have found that in major settlement projects in the Dry Zone the actual use of water per acre is nearly twice that of estimated requirements."[70]

- *Concentration of capital.* Reviewing past settlement and irrigation schemes in Sri Lanka, the TAMS report warns: "The resulting social stratification in colonization schemes reveals a large proportion of poor and indebted settlers, and a few *de facto* larger landowners who may also have occupations as traders, wholesalers and contractors."[71]

Chronic undernutrition is widespread amongst those who have been resettled.

- *Second generation employment* – Inheritance laws state that the land holding cannot be fragmented and thus only a single child becomes the legal inheritor. ". . . This regulation poses a problem for a large proportion of second generation settlers who are disinherited and therefore are legally landless."[72]

- *Public health* – The NEDECO report recommends; "In the areas to be developed for human exploitation and habitation, the occurrence of (temporary) stagnant water should be avoided to prevent the spreading of diseases.
  – Wells for drinking water should be sunk away from irrigation or drainage canals, to allow filtering of water.
  – Strict control on the use of pesticides and insecticides should be exercised. The quality of drinking water should be monitored.
  – House spraying against mosquitoes should be done regularly and different insecticides are to be used alternatingly, to avoid immunity of the mosquito population.
  – A vigorous innoculation campaign is recommended against communicable diseases, especially for settlers, moving into new areas."[73]

- *Salinisation.* The TAMS report notes: "Insufficient drainage facilities can promote soil salinity problems especially in the intermediate topographic areas between the upland soil areas and the lowland areas. Any upland area where the downward movement of drainage water through the soil profile is restricted is an area where the risk of a soil salinity problem is relatively high, especially when long-term year around irrigation is considered."[74]

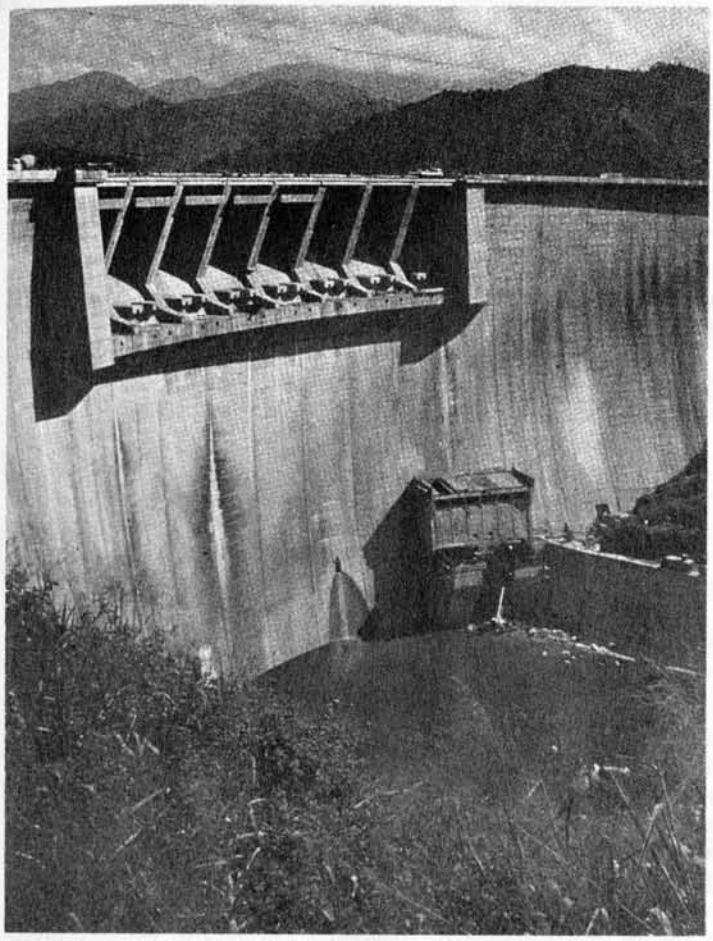
The H Area Scheme

The Mahaweli Authority is experimenting with different settlement designs in area H. This area is part of the Polgolla Diversion which was completed in 1976. The Mahaweli Authority has helped settle 22,000 families on 54,000 acres of land. The experience of settler families in these areas will help guide future settlement patterns.

To date the experience of H area settlers has not been an altogether happy one. Among other problems, the settlers have had to contend with:

- *Water Shortages.* During 1980, there were shortages of irrigation water in the Yala season – that is, the growing period associated with the South-West monsoon. Those shortages resulted "from drought" and from a failure to save "adequate water in the previous Maha season". (Maha is the growing season associated with the North-East Monsoon). Further water shortages occurred during the 1983 Yala.[75]

- *Poor Soils.* Large sections of the soils in the H area are not cultivatable. A study of 87 settler families found that "only 45 percent of the settlers in the sample received good quality land for cultivation."[76]



The Victoria Dam—funded by Britain to the tune of £180 million

● *Grazing land shortages* — "There is a lack of buffaloes for ploughing due to the absence of pasture lands and scrub jungle which was available earlier for the herds."[77]

● *Malnutrition* — Acute undernutrition in the H area is very high, "Chronic undernutrition is widely prevalent in the Mahaweli Area (pre-school population) . . ."[78]

To get a clearer picture of how the H areas were functioning, I visited the H-5 area in June of 1983, and interviewed several settler families. Each of the farm families expressed similar concerns. Before the settlers had arrived, I was told, all the jungles had been cut down and the land bulldozed. Since the topsoil was scraped away by the bulldozing machines, the farmers said they must now use large quantities of chemical fertilizer. Moreover, the absence of tree cover not only means no shade from the hot Dry Zone sun, but no harvestable trees such as coconut, jak, mango etc. Farmers also complained that there was only one season of irrigated agriculture when they had been promised two, which keeps the farmers in debt to the bank. Finally, the farmers all agreed that the soils were getting salinized.

The H-5 area has a supervised credit scheme implemented by Hatton National Bank. "Under this scheme, credit is released in stages to meet the requirements of land preparation, procurement of seed, fertiliser, agro-chemicals and finally harvesting."[79] Two of the farmers I interviewed said they would like to go back to their traditional farming methods but said the bank would not extend credit to traditional farmers.

Conclusion

In the desperate search for a large-scale technological solution to Sri Lanka's increasing food and employment requirements, the government has overlooked many low-cost, low-impact schemes. Indeed, the saddest aspect of the Mahaweli Scheme is that it is unnecessary. There exists an alternative strategy for increasing food production while preserving the traditional ways of life.[80] Since ancient times, Sri Lanka has been famous for her ancient irrigation systems. Even today, a majority of the remaining 15,000 water storage tanks could be de-silted. Furthermore, the peasants' traditional Buddhist ethic promotes a lifestyle which emphasises spiritual rather than material development.

The Sri Lankan Government, however, has opted to take the country into a very different future — a future that can only bring further widespread ecological and social destruction. At the very least, we can expect the following problems to dog Sri Lanka:

● *Increased waterborne disease* — When there is a regulated flow of the Mahaweli Ganga the endemic river fishes which normally eat mosquito larvae may not survive. An increase in malarial diseases could occur; Schistosomiasis could be inadvertently transferred to Sri Lanka from the middle eastern countries, where several hundred thousand Sri Lankans are employed;

● *Water shortages* — These are already occurring in the H system.

● *Salinization* — H area farmers already complain that their soils are becoming salinized. Similar irrigation schemes in other parts of the world are losing as much as 50 percent of the lands due to salinization and waterlogging.

● *Deforestation* — Since less than ten percent of the upper catchment basin is forested, erosion is a very serious problem. The small amount of research devoted to studying the likely siltation rate of the reservoirs now being constructed is very alarming. If these large resrvoirs were to silt up in say ten or twenty years, what would have been gained?

● *Geology of Kotmale Valley* — If the Kotmale Valley were ever to tumble an earthslide into a full reservoir, the repercussions would be severe;

● *Monetary cost* — The cost of the scaled down project is now estimated at more than three billion US dollars. It is now necessary to grow export crops on the irrigated lands to pay off the huge foreign debts. Since 1978, the Sri Lankan rupee has been devalued nearly 500 percent;

● *Flora and fauna* — The loss of a wide diversity of species is inevitable;

● *Corruption* — Some questions have been raised as to the extent of bribing that has occurred. Estimates run as high as 30 percent of the total project costs.

Small wonder that many are now calling for a halt to the project. It is a call we must support. For if the full programme is allowed to go ahead, the future for Sri Lanka is grim indeed.

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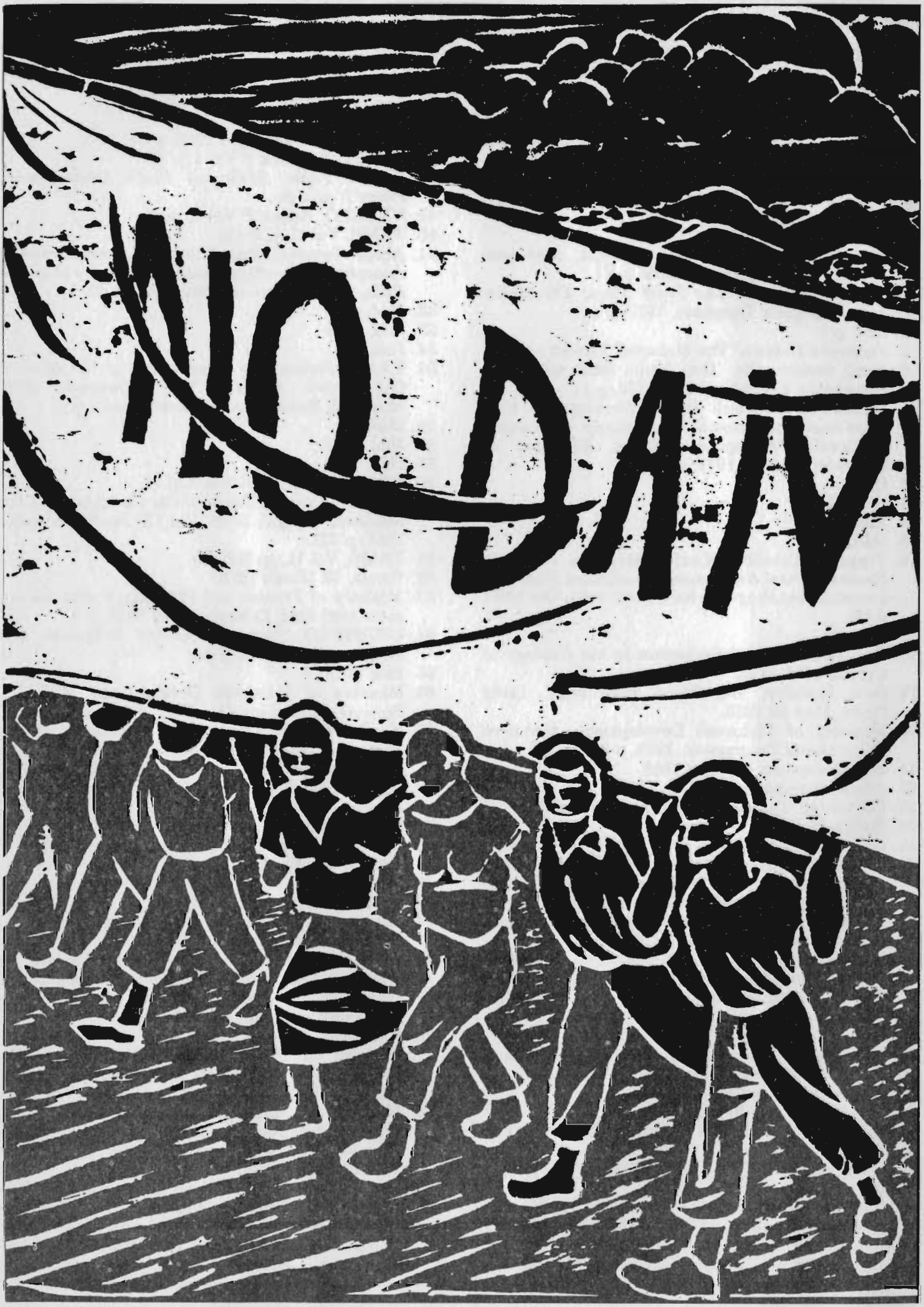

NO DAM

The Myth of the Benign Superdam

by
Edward Goldsmith and Nicholas Hildyard

Are dams inevitably destructive? Some critics have argued that if stringent conditions are laid down before a dam is authorised, the devastation of the past decades could be avoided. A careful consideration of the suggested conditions, however, shows that few, if any, dams could pass the test.

Can there be satisfactory large-scale water development schemes? On the basis of the empirical evidence, the answer to that question is a resounding 'No'. Yet it is still assumed, implicitly at least, by even the most active and outspoken critics of large dams that if the site is geologically and ecologically appropriate and if sufficient precautions are taken, it is still possible to put up large water development schemes with relative impunity.

Four such critics are: Brent Blackwelder of the Washington-based Environmental Policy Institute; Philip Williams, a hydrologist and principal of Philip Williams and Associates, San Francisco; Barbara Bramble of the National Wildlife Federation, Washington DC; and Bruce M. Rich of the Natural Resource Defence Council, also in Washington DC.

Between them, those critics make some thirteen different, though closely related, recommendations as to the conditions which should be satisfied before a dam is authorised. Those recommendations are all very sensible but they raise a fundamental – and as yet unanswered – question; namely, how would their adoption affect the world's increasingly ambitious dam building programme? Let us try and answer that question by considering the recommendations separately.

No Dams Without Assessment

The first recommendation – made by Bramble, Blackwelder and Rich – is that *no dam should be built until an adequate assessment of its likely environmental effects has been undertaken and made available to the public.*[1,2,3] Clearly, such an assessment would only be of use if it could be made by an objective body. But can an objective body really be found? And would such a body even have the courage to advise the government, if need be, not to build a particular dam?

Countless environmental assessments have been made of water development schemes – though usually only after governments concerned have become committed politically and economically to building them. However, very few, if any, such assessments have actually concluded that a scheme *should not be built at all.* Indeed, the record makes it quite clear that the main motivation for commissioning environmental assessments is to rationalise decisions which have already been made. Invariably, those decisions are largely unconnected to a scheme's capacity to achieve its overt goals: rather, they are based on political and economic considerations of an often dubious nature.

Dams for the Poor?

The second recommendation – this time by Williams – is that *water-development projects should only be undertaken if they can be shown "to benefit large sectors of the population instead of the urban elite"*[4]. That condition is extremely unlikely to be satisfied – particularly in the Third World. Such projects cannot benefit the people whose homes and land are flooded to create a dam's reservoir; nor those in the immediate vicinity of a dam, most of whom will see their land taken over by plantations and eventually degraded into little more than a salt desert; nor those who will fall victim to the inevitable outbreak of water-borne diseases. Nor will it be the rural peasants of the Third World who benefit from the manufactured goods produced by the industries which a dam powers; not only are peasants unable to afford such goods but, once in the cash economy, they are often unable even to buy the food they need to survive.

The only people likely to benefit from major water development projects are thus the affluent few who can afford to obtain water for domestic use; those industrialists

who obtain water and electricity for their factories; those plantation owners who get the bulk of the irrigation waters; the donor governments abroad whose industries put up the dams and provide most of the equipment used to build them; and, finally, those local politicians who reap the short-term political capital to be gained from the project – quite apart from any bribes and 'commissions' which may come their way.

Supporting Labour-Intensive Industries

The third recommendation – made by Williams – is that *the scheme should favour labour-intensive rather than capital-intensive economic activities.*[5] Again, this is a recommendation which is unlikely to be observed: indeed, if it were, then all large-scale water development projects would have to be abandoned. Labour-intensive agriculture does not require water from large-scale irrigation works nor does labour-intensive manufacturing require hydro-electricity from large dams. Moreover, large-scale water development projects are *only* economic if they are farmed by capital-intensive agricultural enterprises which are fully competitive on the world market. Large-scale dams are thus quite incompatible with labour-intensive development projects.

No Export Crops

The fourth recommendation – proposed again by Williams – is that *future water development schemes should permit the production of food crops for feeding the local population rather than for growing export crops.*[6] This is not possible for very much the same reasons that labour-intensive farming is not possible. Firstly, peasants producing food for local consumption cannot afford to farm land irrigated by massive water development schemes: it is quite simply too expensive. Secondly, the foreign exchange needed to pay the interest on the loans contracted to finance a dam (and, more important still, to finance further development projects) can only be earned by exporting crops. Invariably, therefore, the land irrigated by large-scale water development schemes ends up being taken over by plantations producing crops for export – and that inevitably means that less food is available for local consumption. To observe this fourth recommendation would thus mean foregoing nearly all future large-scale water development schemes.*

No Damage to Public Health

The fifth recommendation – made by Blackwelder – is *not to build schemes which "would compromise public health and safety in ways that would be viewed as unacceptable to the people affected."*[7,8] This recommendation cannot conceivably be observed. An increase in the incidence of water-borne diseases appears an inevitable concomitant of water development schemes. Indeed, the title of a talk by Letitia Obeng of UNEP – "Starvation or Bilharzia?" – is indicative of the view held by many authorities that bilharzia (or schistosomiasis) is an unavoidable consequence of our attempt to feed the starving millions by putting up vast irrigation schemes. Professor Gilbert White even tells us:

> "The invasion by schistosomiasis of irrigation schemes in arid lands is so common that there is no need to give examples. *The non-invasion of schemes in a region where the disease exists is exceptional.*"[9]

Efforts to control such diseases by the use of molluscicides, nematocides, insecticides and other biocides, have been singularly unsuccessful. Moreover, since many of those biocides are either known or suspected carcinogens and mutagens, their routine use over a long period will almost certainly give rise to other equally serious health problems.

Respecting Heritage Areas

The sixth recommendation – made by Bramble, Rich and Blackwelder – is that dams and other water development schemes should not be built if they *adversely affect national parks, heritage sites, areas of scientific and educational importance, tropical rainforests or areas inhabited by wild animals threatened with extinction.*[10,11,12] The destruction of such valuable natural assets is almost inevitable where dams are concerned. Moreover, since the number of suitable sites for building dams is limited – a problem which will increase as the most obvious sites are used up – so dams will be built in areas which are less and less suitable. As that happens, the likelihood of one of the areas blacklisted by Bramble and his colleagues being selected as a dam-site must increase.

Safeguarding against Siltation

The seventh recommendation – Blackwelder's – is that dams *should only be built where it can be guaranteed that they will not silt up within a hundred years.*[13] Although it is possible to observe that recommendation in temperate areas, it is very much more difficult to do so in the tropics where rivers carry high quantities of silt. Indeed, on the basis of the experience of the last thirty years in the tropics, it would seem almost impossible to build dams whose reservoirs do not silt up prematurely.

To satisfy Blackwelder's recommendation would thus require – at the very least – the reafforestation of the whole catchment area of those rivers which are to be dammed – and not with shallow-rooting pines but with trees which reconstitute, as closely as possible, the original native forests. Significantly, the World Bank is beginning to insist on the reafforestation of watersheds: to date, however, the Bank has only recommended the planting of pine and eucalyptus – never, to our knowledge, native trees. We see little reason to suppose, therefore, that Blackwelder's recommendation will ever be observed.

Can Salinisation be Avoided?

The eighth recommendation – by Blackwelder and Rich – is that dams should not be built *when their associated irrigation schemes are likely to lead to the salinisation of agricultural land.*[14,15] Unfortunately, the building of large dams in hot dry areas almost invariably leads to

*The same is also true of any other form of capital-intensive agriculture. For this reason alone, the Green Revolution, which involves substituting modern technological agriculture for traditional labour-intensive agriculture, cannot conceivably provide a means of feeding the poor of the Third World.

waterlogging and salinisation. Professor Aloys Michel of the University of Rhode Island, for example, warns that "waterlogging or salinisation, or both problems, will inevitably arise in all but the truly exceptional surface water irrigation system . . ."[16]

Professor Victor Kovda of Moscow University feels the same way. "During many centuries and even millenia," he writes, "only areas having a free outflow of groundwater as in Tashkent and Samarkand *have not undergone salinisation or waterlogging.*" In other words, "increasing salinity in irrigated soils on arid lands is *practically universal.*"[17]

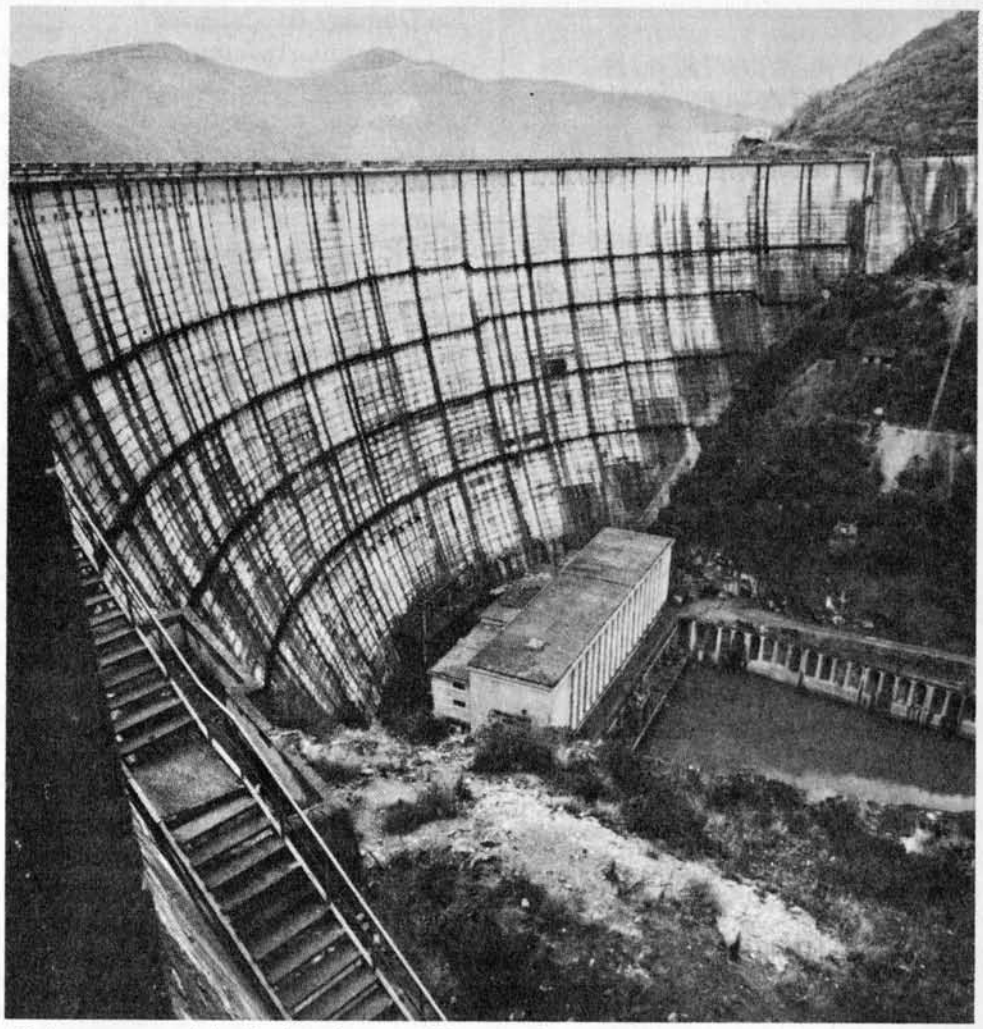
As salinisation inevitably builds up, it seems probable that almost all the land put under irrigated agriculture since the war will eventually have to be abandoned, possibly in the next decades. Effective methods for reducing salinisation (such as the lining of irrigation canals and building horizontal drains) are too expensive and are rarely adopted on any scale; others — such as the reduction of the amount of land under irrigation to make water available for flushing out salts or the observation of long periods of fallow — would so reduce economic output as to be impractical under a regime of capital-intensive market-oriented agriculture.

Sustainability

This brings us to the ninth recommendation — proposed by Williams — that the emphasis of funding should be "*towards sustainable long-term resource enhancement rather than short-term resource exploitation.*"[18] Simply on the basis of the predictable premature siltation of reservoirs and the salinisation of the land which dams serve to irrigate, large water development schemes cannot — by any stretch of the imagination — be regarded as *sustainable.* In fact, it would be difficult to imagine any development schemes that more clearly involve "short-term resource exploitation."

No Harm to Tribal Peoples

The tenth recommendation — by Blackwelder and Rich — is that



MAZINGIRA

"If dams were only built when they could be certain to provide water on a sustainable basis and without incurring intolerable social and ecological costs, then very few would ever be built."

dams should not be built "*if they displace indigenous peoples from their homes and destroy their cultures*", or at least, as Rich puts it, where they "*would displace or strongly disadvantage indigenous peoples or other vulnerable social minorities unless compensation is provided to ensure that the affected people are made no worse off, and preferably better off, than before the project.*"[19,20] The cultural pattern of indigenous people is highly adapted to survival in the natural environment in which they live. To flood that environment and force the original inhabitants to live elsewhere — generally, as we have seen, in degraded (and degrading) conditions — is thus, among other things, to force them to live in an environment to which their culture does not adapt them. Inevitably, their society disintegrates; invariably, too, those who have been resettled are slowly transformed into an aimless and rootless proletariat. To observe this eleventh recommendation would thus mean to desist from building dams in areas inhabited by indigenous peoples.

No Design Faults?

A further recommendation by Blackwelder — the eleventh in our list — is that dams which "*have significant engineering or safety problems*" should not be built.[21] This, of course, would rule out building dams in areas with any sort of seismic activity or in areas subject to landslides. Even then, however, the safety of a dam could not be guaranteed. Dr. Jean-Pierre Rothé and Dr. David Simpson, both of whom have undertaken considerable research into the association between dams and earthquakes, agree that it is impossible to establish the exact conditions under which large dams can trigger off earthquakes. Indeed, it appears that dams can cause earthquakes even in areas where no seismic activity has ever been recorded.

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>
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>
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>
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>
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>
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No Damage to Fisheries

The twelfth recommendation – by Blackwelder – is that dams should not be built *where they are likely to inflict significant damage on estuarine or ocean fisheries.*[22] All dams, however, *must* affect estuarine nurseries and fisheries by depriving them of the nutrients contained in the silt which the dams prevent from flowing downstream. Moreover, the upstream abstraction of water for irrigation and urban and industrial uses also increases the salinity of the water flowing into estuaries. That water is also invariably contaminated by the toxic wastes (in the form of fertiliser and pesticide run-off and industrial effluent) which are an inevitable concomitant of both modern intensive agriculture and modern industry. It follows that this twelfth recommendation is again unlikely to be observed.

Protecting Water Quality Downstream

Finally, it is recommended – by Rich – that dams should not be built if they are likely *to harm "significantly" the environment of a neighbouring country without its full consent.*[23] Unfortunately, no fewer than 214 rivers or lake basins in the world are shared by more than one country; 57 in Africa, 40 in Asia, 48 in Europe, 33 in North and Central America and 36 in South America. Moreover, the territory of a very considerable proportion of the total area of many countries falls within such international basins: 80 per cent of more than 10 African countries and 100 per cent of another 10, for instance, and over 80 per cent of at least 5 Asian countries and 100 per cent of another 2. Whenever several countries are situated along the same river basin, the water supplies available to the population of those living downstream must – as a result of the abstraction of water upstream for irrigation, domestic and industrial purposes – become scarce, salty and contaminated with agricultural and industrial wastes. To observe Rich's recommendation would thus mean desisting from building dams on any of the world's large international rivers.

Conclusion

If water schemes were only built where they satisfied the above recommendations – if, in other words, dams were only built when they could be certain to provide water on a sustainable basis and without incurring intolerable social and ecological costs – then *very few, if any, would be built.*

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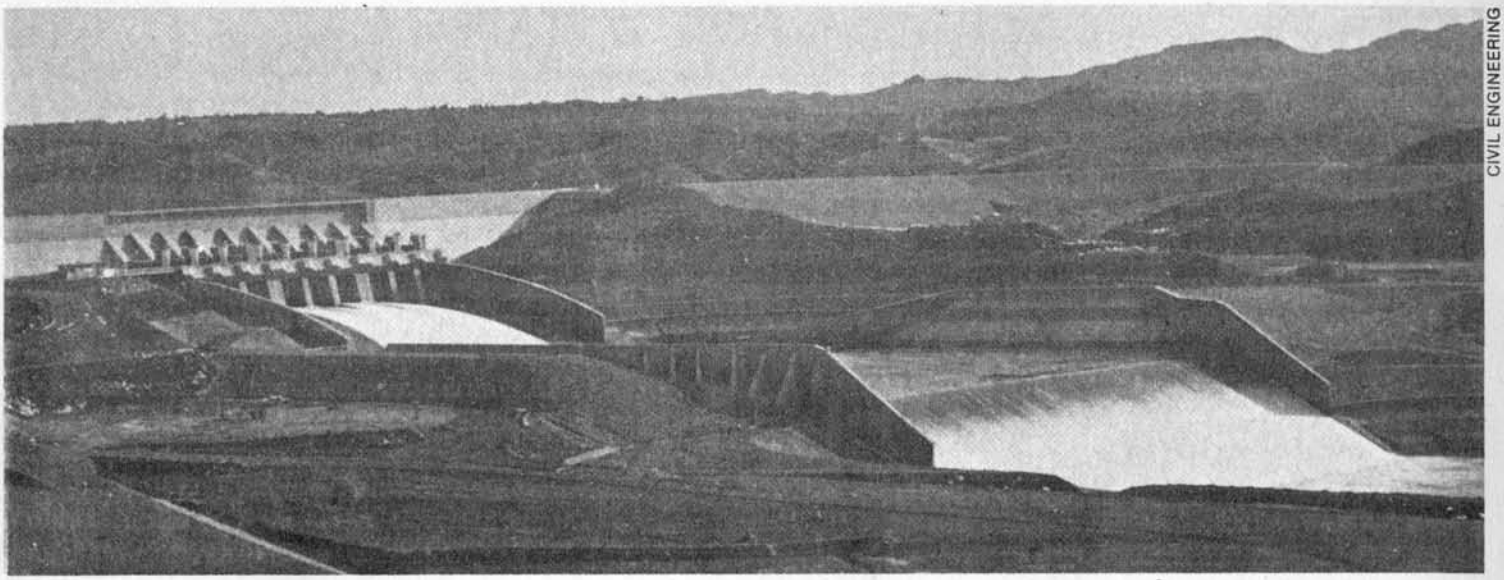


CIVIL ENGINEERING

The Politics of Damming

by
Edward Goldsmith and Nicholas Hildyard

Dams are never built in a political vacuum. For politicians they mean votes and prestige. To criticise dam projects is thus to face an uphill battle against the power of the state—one that is nearly impossible to win.

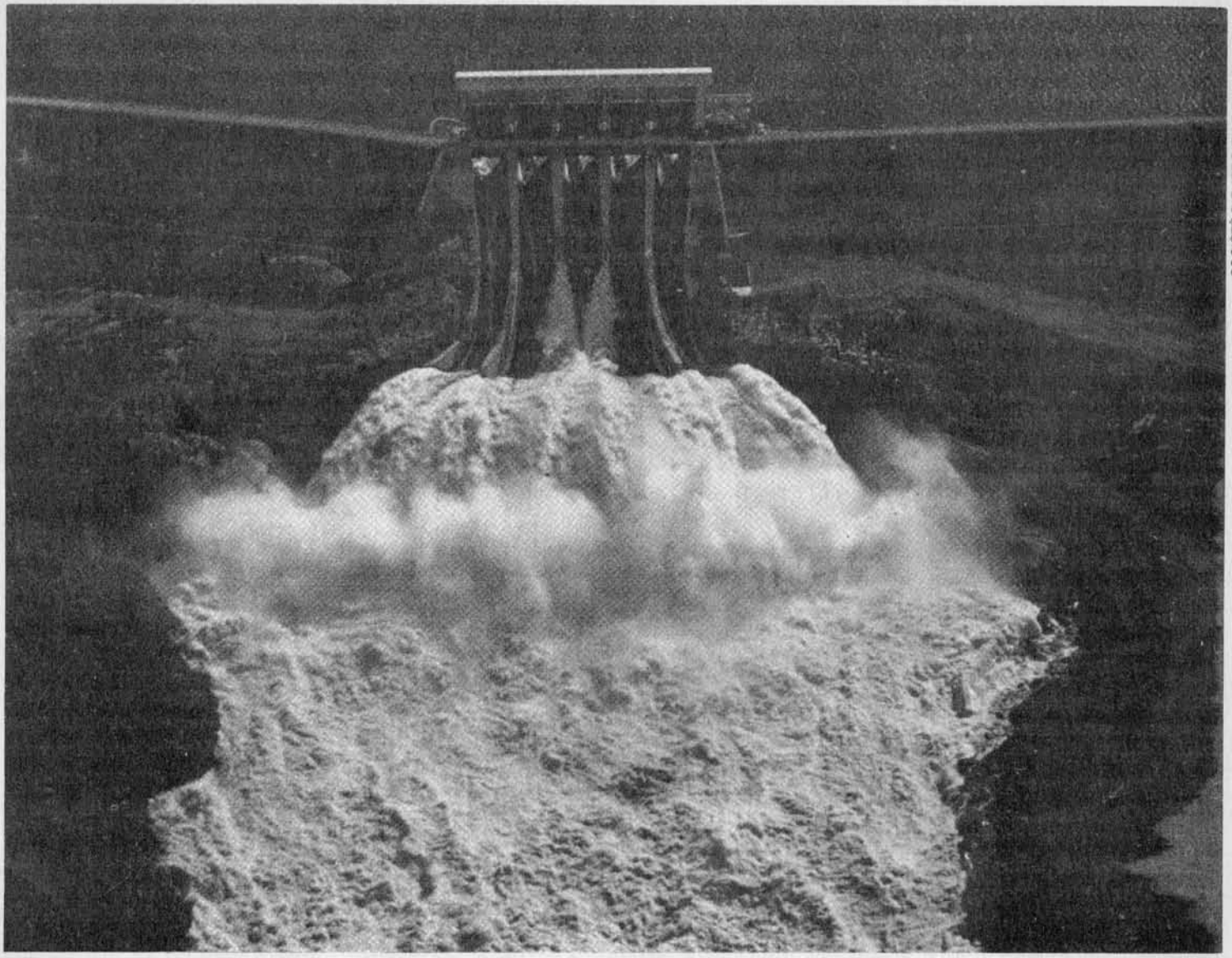
Time and again we find that dams and other large-scale water projects have been given the go-ahead on the basis of the most cursory ecological appraisals. In some cases, the appropriate studies were undertaken only *after* building work had begun. We can only conclude that governments and international development agencies alike attach little importance to the ecological and social problems caused by large dams. The following examples suffice to make the point.

● **James Bay, Canada.** The go-ahead for Quebec's giant James Bay scheme was given before *any* ecological or economic cost-benefit studies had been undertaken. Such an omission is staggering. As originally planned, the project involved: "The building of 10 of the world's largest dams, 2 new airports, a new ocean port, 60 miles of dikes, 11 or more electrical generating stations, 500 miles of new roads into the wilderness, the diversion of the Nottaway and Broadback Rivers into the Rupert River through an elaborate tunnel system and the 'development' of the Eastmain and La Grande still farther to the North."[1] Yet, despite the scale of the operation and its potential environmental impact, the Government of Quebec based its decision to push ahead with the project on just two engineering reports. Those reports, claims Walter Taylor in a special issue of *Survival* magazine, "did not mention social or ecological considerations — not even in passing — and provided only a crude 'guestimate' of costs and benefits."[2]

Nor were those vital considerations given any attention in a subsequent report by a joint Federal and Provincial Government Task Force, set up to advise on the project. Indeed, the Task Force was at pains to distance itself from dealing with either the ecological or economic issues. By way of excuse, it commented:

> "It is understood that the decision to proceed has been taken. This report, therefore, does not reflect any personal or collective reservations held by the Task Force members as to whether society really needs the project, whether there are more economical or less environmentally disturbing ways of harnessing energy resources to meet Quebec's future needs, or whether society should strive to restrain its electrical demands rather than increase its supply. *It was assumed that these fundamental questions had been adequately considered by the authorities prior to making the decision to proceed.*"[3]

Quite how the Task Force came to make that assumption it is hard to know. Only a year before the Task Force reported — and only a few months before the James Bay decision was taken — the provincial government's own economic planning board had argued that the feasibility of the scheme had still to be proved and that millions of dollars worth of studies would be needed before work could begin. There is no evidence that such millions of dollars were in fact spent. Moreover, the assurances of government ministers that ecological studies had been undertaken prior to the James Bay decision are hard to reconcile with subsequent studies — notably one by Quebec-



SOCIETÉ D'ENERGIE DE LA BAIE JAMES

Hydro – which admitted that little was known about the ecology of the 144,000 square miles to be developed under the scheme. Indeed, Dr. K. A. Kershaw – a plant biologist at McMaster University – was subsequently to state: "I have no hesitation in saying that we do not have any biological knowledge of this area worth a damn and I would be prepared to go into court and swear it under oath."[4]

● **Tana River, Kenya.** No studies were undertaken on the ecological effects of the Kindaruma and Kamburu dams on Kenya's Tana River before construction work began. The feasibility studies for the dams only mentioned the likely ecological effects. And, by the time studies were commissioned – under the auspices of Dr. B. Lundholm of Sweden's Secretariat for International Ecology and R. S. Odingo of the University of Nairobi – work had progressed on the dam to such an extent that it "was impossible to establish a baseline study of the area."[5] Indeed, the Kamburu construction site was already populated by some 2,000 permanent residents and an estimated 2,000 migratory workers.

● **Helmand Valley, Afghanistan.** The introduction of modern canal irrigation to the Helmand Valley of Afghanistan was undertaken without any consideration of the possibility that the land might become salinised. Ten years after the start of the project, 5 million acres out of 23 million acres had been lost to salinisation and water-logging, with a further 50,000 to 100,000 acres passing out of production annually from the same causes. Commenting on that loss of land, Aloys A. Michel, then Professor of Geography at the University of Rhode Island had the following to say: "The only remarkable points in the Helmand experience are that disaster struck so quickly and that the reasons for it were so obvious. Any engineer or planner should have seen them from the design stage, and some did. But, instead of re-designing the project . . . or substantially increasing the size of individual holdings or lowering the water allowances from the start, the project was implemented in defiance of reality."[6]

● **Selingue, Mali-Guinea.** According to Brian Johnson of the International Institute for Environment and Development (IIED), the sole environmental study of West Africa's Selingue dam – on the Mali-Guinea border – dealt "briefly with the tourist potential of the reservoir, its possible harm to water quality in the region and seismic stability."[7]

A report, prepared at the time construction began, noted that the dam authorities were unable to answer such fundamental questions as to how they intended to inhibit siltation; whether or not there were plans to

◀ The spillway of one of the 200 dams under construction in northern Quebec as part of Canada's James Bay project, a massive scheme designed to provide up to 25,000 MW of hydro-electric power (the equivalent of 25 nuclear power stations), mainly for export to the United States. Critics point out that no environmental impact studies were commissioned—the plan was given the go-ahead with only a crude 'guestimate' of costs and benefits.

clear the forest in the area prior to flooding; what the ecological consequences were likely to be of not undertaking such clearance; or what measures were being taken to provide for the resettlement of the 9,500 people who would be displaced by the dam.

The report also noted that the feasibility study prepared for the dam gave no 'back-up information' to support 'the brief assertions' it made as to possible environmental effects; and more seriously, that a paragraph warning that the growth of marsh plants and algae might have a detrimental effect on fisheries, had been 'apparently struck out'. Indeed, the author of the report comments: "It appeared that, because of the immense pressure from the Government of Mali to have the dam closed and the first turbine operating by August, 1980, various corners (especially those affecting the environment) were being cut."[8]

In particular, the report argues that "massive eutrophication of parts of the lake appears to be a possibility", but that studies on the growth of algae had simply been ignored; that "little was being done to inform the villagers of the plans for the area"; and that, despite evidence that the fish in the lake would need to be able to travel upstream in order to spawn, "no provision was being made for a fish ladder or elevator". Small wonder that Brian Johnson warns: "Portents of environmental disaster still hang heavy over Selingue."

Politics or Oversight?

The above examples clearly demand an explanation. One correct, but platitudinous view is that we cannot reasonably expect full and detailed studies for every dam – not least because the full range of ecological and social effects can never be studied in sufficient depth to resolve every uncertainty. As Professor Barton Worthington put it to the 1970 'Careless Technology' conference: "In developing countries, at least, *there will never be enough funds or enough scientists* to cover all aspects of information needed for thorough prediction . . ."[9]

In some instances, Barton Worthington clearly has a case. But lack of funds will hardly suffice to explain the James Bay example. There, after all, we are not talking about research which has been overlooked or skimped for financial reasons: we are talking about a vast project which was sanctioned and constructed with little or no research into possible ecological and social effects.

What, then, of the second school of thought: namely that misplaced optimism and wishful thinking lead government and industry alike into minimising the problems they are likely to encounter? Here, again, we run into difficulties – not least the clear evidence that industry is often unwilling to learn the lessons of the past and, indeed, that it is quite prepared to ignore the advice of its own experts if that advice is contrary to what it wants to hear.

Thus, it is not for nothing that Aloys Michel remarks in respect of the Helmand Project: "The saddest thing about the Helmand experience is that it will probably be repeated, if not in Afghanistan, then in Iran or Iraq . . ."[10] The reasons, as Michel sees them, are clear enough:

> "Many irrigation engineers have had the wisdom to recognise, and the courage to state, that provision of an artificial drainage system is an inescapable concomitant of providing an artificial irrigation system. But the time dimension of irrigation usually acts to ensure that only the storage and distribution components are initially provided . . . *.Ingrained optimism and the tendency to procrastinate make yielding to this temptation all the easier, as does the fact that system designers are often driven to underestimate costs or to include disposable items in order to obtain administrative, legislative or voter approval for their schemes on the proven theory that once ground is broken the project will have to be completed. Furthermore, the engineer, planner, contractor, bureaucrat or politician may be looking for a short-term personal or professional gain.* By the time the omission of a drainage system begins to damage crops, he has usually moved on to another project or another constituency or has retired. These factors would seem to apply in all modern societies regardless of their ideological orientation."[11]

Michel's views are echoed by John Waterbury who argues in his book *The Hydropolitics of the Nile Valley,* that "policy-making groups and external creditors *prefer* an incomplete picture, for then the unanticipated can be written off to incomplete information and poorly defined responsibilities."[12] Indeed, he goes further and suggests that "the process of resource planning in developing countries is wilfully fragmented" – precisely because planners wish to avoid future responsibility for any disasters. Thus he writes:

> "Planners and policy makers limit their responsibility by limiting their range of vision and by retreating into narrowly defined competences. Sectoral and time horizons are constricted as far as possible. Each specialized agency seeks a closely defined mission and relies upon the information of other relevant agencies in designating targets. If the information is erroneous or not forthcoming and if targets are missed, the blame can be shifted on to other quarters.
>
> Similarly, to launch a project at time X is relatively costless, for its benefits or shortcomings will not accrue until time Y, well after its originators have passed from the scene. *When the shortcomings do become apparent, the incumbent policy makers can justifiably place the blame upon their predecessors.* Short of criminal neglect no one is held to account except the society itself.
>
> All too often, bilateral and multilateral aid-granting bodies comply with this pattern of 'planning' for roughly similar motives. *Their raison d'etre is to move funds, and prudent inactivity will not win their administrators any plaudits or promotions.* Thus they operate with the information provided them or seek to supplement it on the strength of lightning surveys whose conclusions are – not infrequently – foregone. *Here again, fragmentation of the field of analysis serves as a defense mechanism to limit responsibility for what*

may or will go wrong. A top-ranking official in the UN World Food Council commented on this, saying, 'There is a lot to be gained from not knowing what is going on.' There is, then, a natural collusion between the administrators of aid programs and the formulators of programs and projects they wish to aid. Developing societies are alone held responsible for the inefficiencies engendered by this collusion."[13]

Dams and the Political Rat Race

Waterbury's observation that "prudent inactivity will not win . . . any plaudits or promotions" raises a problem which is frequently glossed over in the literature. *Put simply, no dam is built in a political vacuum.* On the one hand, there are those who must design, plan and construct the dam: and, on the other there are the politicians who will sanction and approve its construction. Both are as subject to the psychological pressures of their jobs as the rest of us: the desire to impress colleagues, the fear of 'rocking the boat' and the urge to win promotion and recognition – all these are important influences.

So, too, politicians are keenly aware of the need to 'nurse' their power base (be it 'the electorate' in democratic countries or 'the party' in non-democratic states) whilst the large dam-building agencies themselves are equally aware of the need to lobby for future projects in order to increase their own power and prestige. To an extent, those 'political' pressures are openly acknowledged. What is adamantly denied, however, is that the actual decision to build a dam is ever determined by such considerations.

Waterbury, however, is less sanguine. Indeed, he is quite explicit in his view that political considerations are generally paramount when it comes to approving dam projects:

> "The fact is that as a rule the politically determined decision comes first and it is exceedingly difficult thereafter to nurture the informed and dispassionate debate requisite to assessing long-term costs."[14]

On what evidence does Waterbury base that conclusion? Below we consider in more detail his study of the political decisions that led to the building of the Aswan Dam.

The Aswan Experience

Had it not been for the success of the 1955 Free Officers' coup, which ousted King Farouk of Egypt and brought Colonel Gamal Adb el-Nasser to power, it is arguable that the Aswan High Dam would never have been built. For although the idea of the dam had been touted around Egypt's ministries since 1948, its originator – Adrien Daninos, an engineer of Greek and Egyptian parentage – had generated little support for the scheme. Not that the Egyptian government was adverse to the idea of providing over-year storage of the Nile's flood waters: rather, it was the sheer size of the reservoir which Daninos envisaged – a reservoir capable of storing the entire annual flood of the Nile – that provoked the scepticism of the critics.

In fact, even Daninos himself admitted to fears that the reservoir would silt up before its time. Others, notably the irrigation expert H. E. Hurst (whom Waterbury has since described as "the Nile's most authoritative twentieth century student"), were deeply concerned that evaporation rates would be so high that any potential storage gain from such a large reservoir would quickly be cancelled out. Still others warned that if the Nile's silt was impounded along with its waters, the result would be river-bed erosion on a dramatic – and disastrous – scale.

In the years after Nasser seized power, however, few dared to voice such criticisms. The mood was so solidly pro-Aswan that is was a brave man who stood out against the scheme. Some did – to their cost, as we shall see – but the majority preferred to bend with the prevailing wind. Even Hurst (by then a member of the committee which reviewed the Aswan scheme for the new regime) was soon insisting that the problems of evaporation could be overcome by proper design. Nor did the mood change when the side-effects of the dam became apparent. As Professor Ali Fathy – one of the few who stood his ground over the dam – was to comment: "It became clear that competent technicians in government circles were collectively determined to overlook any signs of the deterioration of soil fertility . . . even as a hypothesis. This was the result of what might be called 'the High Dam Covenant', a psychological state born of political and other circumstances which has cloaked the project from its very inception."[15] Indeed, one senior official summed up the atmosphere by quoting the *Rubayyat of Omar Kayyam*: "When the King says it is midnight at noon, the wise man says behold the moon."[16]

Increasing Vulnerability, Increasing Fears

What then caused the new King to see the moon at mid-day? And why had his courtiers opted so decisively for the Aswan High Dam? Although a degree of perennial agriculture was known in Egypt even in the Ptolemaic period, it was not until the early nineteenth century that there was a widespread switch from seasonal to year-round farming. Until then, the pattern of agriculture in the Nile Delta remained much as it had done for the previous 6,000 years. Every summer, as the Nile's waters began to rise, off-take channels were dug in the fields to take the waters into large basins – sometimes as big as 80,000 feddans.* Once these basins were filled, the water would be allowed to stand for up to 60 days, soaking deep into the earth and depositing the layer of silt which would replenish the alluvial soils. Excess water was then drained back into the Nile and cultivation began, the harvest taking place in May and the land then being returned to fallow until the next flood in September.

The switch to perennial agriculture radically changed that cycle. With two crops being grown a year, the problems of waterlogging and salinity soon made themselves apparent. To a degree, those problems were alleviated by introducing new cropping patterns (in particular a longer fallow period) and by complex networks of drainage. Even so, in 1882, MacKenzie Wallace was to record "white nitrous salts covering the soil and glistening in the sun like

* One Feddan= 1.038 acres

untrodden snow."[17] Indeed, as early as 1908, the problem had become so acute that the first of many subsequent committees was set up to study the effects of salinity of Egypt's soils: it concluded that areas then under cotton should be reduced by two-thirds to minimise further destruction.

But if perennial agriculture brought with it the twin evils of salinity and waterlogging, it also instilled a new fear in the minds of Egyptians — a fear which was to grow with time and become almost an obsession as the century wore on. Waterbury points out: "As the economy moved beyond subsistence and into production for world markets, it lost its tolerance for poor agricultural performance and its capacity to absorb bad years. Some time after World War I, the need for predictability in all elements of the Nile ecosystem became of paramount concern."[18] A low flood could cut Egypt's agricultural production by half, whilst a high flood could "destroy the basins and leave the flood-plain pockmarked with pestilential swamps."

The Need to Secure Water Supplies

It was to alleviate that vulnerability that, in 1902, Sir William Garstin of the Egyptian Public Works Department first proposed the idea of over-year storage of the Nile's flood waters. His scheme, the Century Storage Scheme, was grandiose in the extreme. "The essential elements of the strategy," writes Waterbury, "were to increase seasonal storage capacity at Aswan, to utilise the Wadi Rayyan depression of Fayyum (formerly ancient Lake Moeris) to siphon and store excess flood waters downstream from Aswan, to build a discharge regulator at the outlet of Lake Mobutu in order to use it for over-year storage and release, and most important, to cut down the water losses through evaporation in the Sudd swamps."[19]

Until the arrival of Nasser, it was Garstin's scheme which was most favoured by the Egyptian authorities. But the scheme had an immediate — and obvious — drawback to Nasser and his Free Officers: it left Egypt at the mercy of those states which controlled the Nile upstream. Moreover, three of those states — Kenya, Uganda and the Sudan — were under the direct rule of Britain, a country with whom relations were extremely strained. (Recall that this was the time of Suez). The fear was clear enough: namely that Britain would attempt to put pressure on Egypt by interfering with her water supplies.[20]

Hardly surprising then that Waterbury considers the "sense of vulnerability and the attendant fears of the downstream states (in the Nile Valley)" to be central to "all the decisions affecting the choice of projects and technology used to master the river."[21] Thus he writes: "No other major river valley is shared by so many autonomous actors, and no other downstream state is so utterly dependent for its livelihood as Egypt is upon its river. The acute awareness of the juxtaposition of these geopolitical factors is at the heart of Egypt's psychological response to all that goes on upstream."

Given those fears, the decision to opt for Aswan is perhaps understandable. Here, after all, was a scheme which (in theory at least) would provide over-year storage within Egypt's borders. To Nasser and the Free Officers, the opportunity was one which could not be lost. A hint of the extent to which they undoubtedly felt threatened by the vulnerability of their water supplies can be garnered from a speech given years later by President Sadat. In 1978, he warned: "We depend upon the Nile 100 per cent in our life, so if anyone at any moment thinks to deprive us of our life we shall never hesitate (to go to war) because it is a matter of life or death."[22]

J. ALLAN CASH AND BRUNO BARBEY/MAGNUM

"Nasser, the universal provider." Egypt's mood at the time the Aswan Dam was built was one of almost messianic euphoria. Crowds would run through the streets of Cairo chanting, "Nasser, Nasser, we come to salute you: after the Dam, our land will be paradise."

In Pursuit of Prestige

If the desire to secure Egypt's water supplies was one politically determined motive for building the Aswan High Dam, another lay in the sheer prestige of embarking on such a grandiose scheme. As Waterbury puts it:

> "The specific decision regarding the High Dam must . . . be set in the general context of a new and unknown regime seeking to establish its credibility and to signal its citizens, and make known to the nations abroad that it was prepared to do what no previous regime had dared contemplate or advocate to promote the country's well-being . . .
> There is no evidence that the conspirators had given any consideration to the High Dam Scheme before coming to power. Indeed, it is unlikely that they had even heard of it before it fell, somewhat fortuitously, into their laps. But once before them, the project's political advantages, as well as its economic strengths, became immediately apparent. *Politically, it had the advantage of being gigantic and daring, thrusting Egypt into the vanguard of modern hydraulic engineering.* Moreover, during its construction and after its completion, it would be highly visible and fittingly monumental."[23]

Those motives were, to become increasingly dominant over the early years of the dam particularly in view of the deteriorating relations between Nasser and Britain. Indeed, after Suez – and the end of any hope of British finance for the project – "Nasser and his associates could no longer regard the dam as simply a big engineering project, but rather came to hold it up as the symbol of Egypt's will to resist imperialist endeavours to destroy the revolution."[24]

The mood of defiance translated itself into almost messianic fervour, both on the part of Nasser himself and on the part of the Egyptian people. Thus, crowds would run through the streets of Cairo, chanting, "Nasser, Nasser, we come to salute you: after the Dam our land will be paradise."[25] As for Nasser, he promised that the largest lake ever shaped by human kind" would prove "a source of everlasting prosperity." He talked glowingly of the achievement that the dam represented: "Here are joined the political, social, national and military battles of the Egyptian people, welded together like the gigantic mass of rock that has blocked the course of the ancient Nile."[26]

In such an atmosphere, Waterbury argues, it was not surprising that the dam "came to symbolise a national patriotism, and therefore any criticism of it was thought of as subversive or even treasonous . . . Technical criticism – at least in public – became tantamount to aiding and abetting the enemy."[27]

Suppressing Criticism

Nonetheless, there were critics brave enough to speak out. The most notable of these was undoubtedly Dr. Abd. al-Aziz Ahmad, a past chairman of the State Hydroelectric Power Commission and a technical consultant to the Ministry of Public Works. Ahmad's chief concern was that evaporation and seepage losses at Aswan would be far greater than predicted and would effectively cancel out any gains from storing such a large volume of water. He calculated that high winds at the reservoir site could increase annual evaporation losses by as much as 4 billion cubic metres (m^3). In addition, Ahmad argued that seepage losses – if they followed the same pattern as at the Old Aswan Dam – would be considerable. "Assuming the reservoir's life storage capacity to be 100 billion m^3," reports Waterbury, "Ahmad estimated that for the first 20 years, total losses due especially to seepage and the long period of rock saturation, and to evaporation, would be 124 per cent of reservoir capacity . . . After thirty years, losses would reach a stable state of 17 per cent a year. *At that level, losses would cancel out all the High Dam's expected gains.*"[28]

Clearly, Ahmad's views were not ones that the authorities wanted to hear. One can imagine the anger, therefore, when it was learnt that Ahmad had presented his findings to a meeting of the British Institute of Civil Engineers – a decision which, says Waterbury, led the regime to see Ahmad "as being in league with its enemies." Ahmad was never forgiven for his indiscretion: when, in 1964, a committee voted to award him the State Prize for Outstanding Achievement, the decision was vetoed from on high. Three years later Ahmad died, still in disgrace.

Ahmad's death, however, did not put an end to the argument over seepage and evaporation losses – an argument which still rages today. Although it appears likely that his figures were on the high side, it is widely accepted that official estimates of evaporation losses were (and still are) far too low. Thus, it is claimed that, on average, 9 billion m^3 is lost annually to evaporation, with a further 2 billion m^3 being lost to seepage. In reality, evaporation losses could be as high as 15 billion m^3, whilst seepage losses could reach 5 billion m^3 a year. That last figure is based on the calculations of two Egyptian engineers Taher Abu Wafa and Aziz Hanna Labib. Such is the discrepancy between their figures and those put out by the Egyptian government that Waterbury is led to comment: "Either they are wrong (and both gentlemen were top officials in the High Dam Authority) or the figures released for public consumption are being doctored."[29]

Ahmad was one critic whose fears have been largely vindicated; Professor Ali Fathy is another. Unlike Ahmad, however, Fathy was never ostracized by the regime. Nonetheless, the authorities showed themselves singularly unwilling to take his criticisms seriously. Thus, when he warned of the dangers of riverbed scouring, a committee set up to study the problem dismissed his fears as exaggerated. So too, his warnings about the effect on soil fertility of depriving the Delta of the Nile's silt were ignored.

In raising such issues, Fathy was not putting forward any new theory. Indeed, the dangers of both riverbed scouring and silt deprivation had been known for many years. In 1908, for instance, Sir William Willcocks wisely remarked: "It will be an evil day for Egypt if she forgets that, though basin irrigation with its harvest of corn has given way to perennial irrigation with its cotton fields, the lessons which basin irrigation has taught for 7,000 years cannot be unlearned with impunity. The rich muddy water of the Nile flood has been the mainstay of Egypt for many

generations, and it can be no more dispensed with today than in the past."[30]

That, however, was not the view of the authorities. From the very outset, it was argued that the benefits of the silt previously deposited by the Nile's flood could easily be matched by chemical fertilisers. The result has been a dramatic – and now crippling – rise in Egypt's fertiliser bill: thus, from 1952 to 1964 consumption of nitrogenous fertiliser leapt from 648,000 tons to 1·2 million tons, whilst phosphate consumption rose from 92,000 tons to 322,000 tons.[31] What those fertilisers cannot replace, however, are the other trace elements in the silt and the organic matter it contains; nor, more important still, can they replace the soil being lost to the more intensive agricultural practices rendered possible by perennial irrigation. Indeed, in 1974, Sayyid Marei, Minister of Agriculture since 1952 and Chairman of the 1974 World Food Conference, was to tell a parliamentary committee: "I say in all candour, as loudly as possible, I am worried, extremely worried, because of the threat to the fertility of our soils."[32]

Lack of Drainage

One aspect of the problem which particularly alarmed Marei was the lack of drainage at sites where land had been reclaimed. Marei himself maintains that he warned his colleagues that the only possible result of reclamation without drainage would be increased salinisation but, he claims, his warnings went unheeded. What is certain, however, is that those reclamation schemes which lacked drainage proved disastrous for Egypt. Thus, a recent FAO study found that over a third of Egypt's agricultural land is now afflicted with salinity whilst some 90 per cent of cultivated land has problems with waterlogging. Hardly surprising, for in 1975 less than 3 million feddans had any drainage of any kind.

That the Egyptian government was able to ignore the advice of one of its most prominent politicians is testament enough to its capacity for self-deception. Just as it did not wish to hear about the problems of soil fertility, evaporation, riverbed scouring or seepage, so it was quite unwilling to listen to talk of waterlogging and salinisation. Small wonder, then, that Waterbury ends his study of the hydropolitics of the Nile Valley with the following observation:

> "The political decision (to build a dam) frequently embodies a symbolic package that is designed to catch people's imagination at home and abroad, to arouse the populace, to set collective goals and thus to find in motivational terms a substitute for war. This is an atmosphere fundamentally inhospitable to the niggling of conscientious technocrats who may be seen as front-men, witting or unwitting for the regime's enemies. Their sincerity will be in question. This has been the case in Egypt, where the sense of national cohesion and even consensus about national goals and leadership is far more pronounced than in many, if not most, Third World countries. *But who would publicly stand up today to question the wisdom of sowing the desert with new cities or trying to make the Sinai green and populous?*"[33]

It is a good question for, as we shall see in the next section, the political motives which led to the building

"To challenge dams is to challenge a fundamental credo of our civilisation"

of Aswan – are symptomatic of most dam building projects.

Power-Broking, Pork Barrel and Corruption

From the Aswan example, we may draw out three general factors that dominated the dam's history. First, the political and psychological fears that were the initia spur to seeking over-year storage in Egypt itself. Second, the messianic fervour which infected both the Nasser regime and the general public. And, third, the unwillingness to contemplate criticism.

Although the details are specific to Aswan, those three features are common to many other dams around the world. The messianic element, for instance, is clearly evident in the James Bay project, launched under the slogan 'The World Begins Tomorrow'. So too, President Nkrumah of Ghana promised that the Volta Dam would rescue the Ghanaians from being "hewers of wood and drawers of water for the West" and lead them instead into a new industrial age where "economic modernisation relieves the working man . . . of some of the less necessary forms of drudgery."[34]

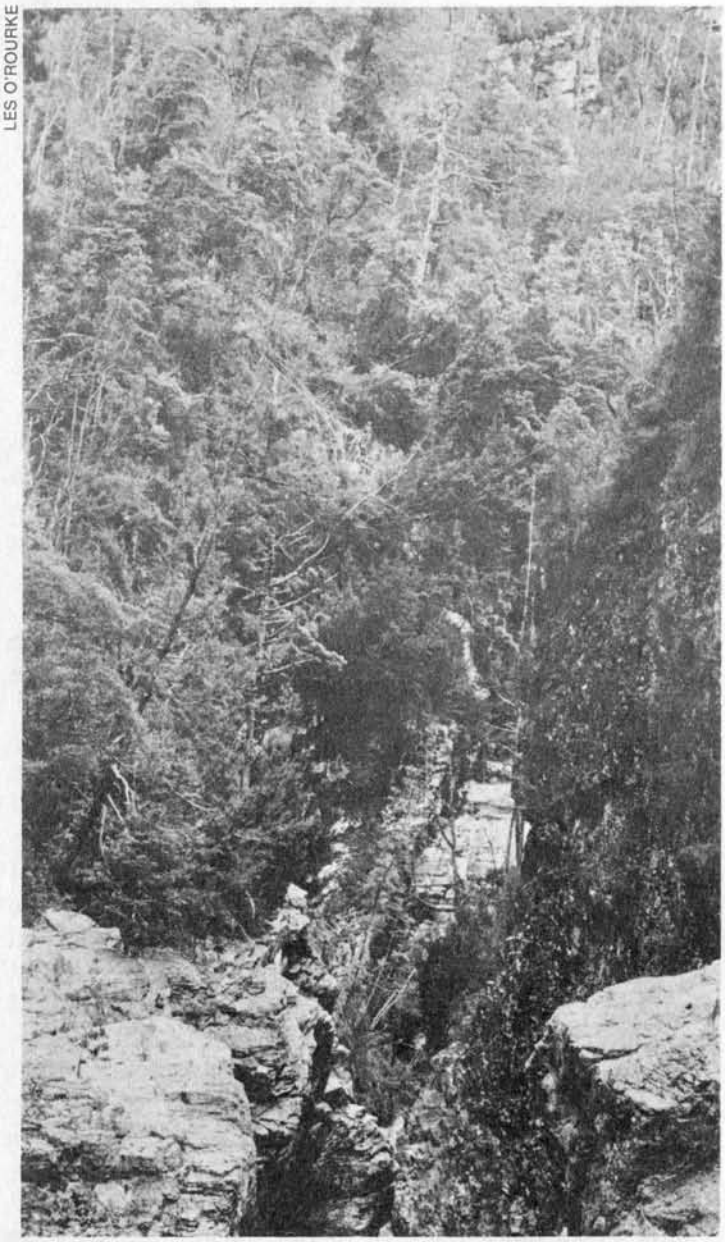
If millenarism is a constant feature of many large-scale dam projects, the political motives which influence their construction can be many and varied. In some cases, however, they are starkly obvious. It is hard to resist the conclusion, for instance, that the principal motive for Guyana proposing to dam the Upper Mazaruni River lay in a complex border dispute between Guyana and Venezuela which centred on the Mazaruni Basin. In 1970, a moratorium was signed in which it was agreed that neither party in the dispute would take unilateral action to strengthen its claim. Thus, it is suggested, by trying to develop the area, Guyana hoped to establish a presence strong enough to undermine Venezuela's position in any future negotiations.[35]

There is little doubt, too, that the primary motive for the Sudanese government's plan to push ahead with the building of the Jonglei Canal after the ending of the civil war in the Southern Sudan lay in the desire to consolidate its victory and complete the integration of the North and South. Indeed, the Commissioner for the project was quite specific as to the canal's political advantages: "Historically, the rift between North and South has increased in the past because of the lack of communications. The Sudd has always been a barrier. And that is why the Sudanese in the northern part tend towards the Middle East rather than Africa. Our link with Africa and with the South in particular was weakened because of the difficulty of communication."[36] But, whilst the Commissioner saw the Jonglei Canal as an instrument of reconciliation, others were less sanguine. Indeed, rumours that the area would be colonised by Northerners (and particularly Egyptians) led to riots in 1974.

So too, it is difficult to explain the inordinately long transmission lines which are being built to supply Zaire's Shaba mines with electricity in anything other than political terms. At present, the mines are run on electricity imported from neighbouring Zambia. Plans are afoot, however, to supply power from dams on the Zaire-Congo river, some 1,700 kilometres away. Once the necessary transmission line is completed, the government's control over the rich and independently-minded Shaba province will be considerably increased. As Warren Linney and Susan Harrison point out: "If Shaba tries for independence, the electricity can be cut off."[37]

Politicking on Capitol Hill

Such overt politicking is by no means confined to developing countries. In the industrialised world, too, political considerations provide the rationale for many dams. For the most part, those considerations are eminently parochial. Put simply: dam projects win votes. To begin with, any new project automatically thrusts the sitting member of Congress or Parliament into the limelight. As George Pring, a one-time researcher at the Washington-based Environmental Defence Fund, points out: "The average congressman can re-dedicate the same dam for four or five consecutive elections. First, he dedicates the ground breaking. Then he dedicates the land purchases. Then he comes back and dedicates the flood abutments. And then he dedicates the flagpoles. A congressman's future in many parts of the country, as the saying goes, is written in concrete."[38]



LES O'ROURKE

Irenabyss Chasm, on the Franklin River, Tasmania. The Franklin Dam would have destroyed a large part of this World Heritage Area. The hydroelectric authorities in Tasmania have been described as "a state within a state".

Perhaps more important still, opposition to a dam upsets what has become known in America as the 'pork barrel'. The term is reputedly derived from the custom amongst slavers of occasionally providing their slaves with a barrel of preserved pork; on such occasions, those with the longest reach and the most determined disposition inevitably had the most to eat. The handing out of choice federal contracts is now seen by many to be run on the same principles. As George Laycock, author of *The Diligent Destroyers,* comments: "The pork barrel has become a way of political life. Politicians . . . often believe they can equate their worth to their home districts with the amount of money they send back from the federal treasury. Although there are other cuts of pork, such as post office buildings, the choice ones are the impressive big water projects scattered from Maine to Hawaii. The individual congressman has his eye on the project closest to his heart, which is to say, nearest to his voting booth. He might sense that projects within the bill are a waste of federal funds, but he is reluctant to argue against his fellow-congressmen's favourite dam or canal. To do so is to jeopardize the other's support for his own pet project."[39]

The key to understanding why the pork barrel system still holds sway — and, indeed, why it is so carefully nurtured by the politicians themselves — lies in the nature of the bits of 'pork' being doled out. In effect, they are free gifts from the federal government — vast sums of money which promise to generate localised economic growth. For farmers, the prospect is of cheap supplies of water; for local estate agents, there is the vision of new housing developments; whilst for the unemployed there is the possibility of new jobs. That those benefits are often not forthcoming is irrelevant: what is important is that each new project brings with it the *promise* of an economic bonanza. Small wonder, then, that politicians are so eager to bring home their bits of 'pork'.

The horse-trading that goes with pork-barrel politics — and the influence it brings — inevitably breeds corruption. By its very nature, that corruption is hard to document: nonetheless, informed sources confirm that it is widespread. Indeed, we may assume with confidence that support for numerous water projects the world over has only been won by the lure of a numbered Swiss bank account. In that respect, it is worth noting a remark made by Representative Michael Meyers, one of those US congressmen involved in the so-called Abscam scandal. In conversation with a group of businessmen whom he assumed to be representatives of an interested foreign power (but who were, in fact, FBI undercover agents)

Falsifying the Figures

Expertise is as saleable a commodity as gold. The old adage that 'he who pays the piper calls the tune' is as apt today as when it was first coined. Indeed, the record of the hydro-industry is littered with examples of cover-ups in order to justify projects that should really never have been built. There are nearly as many ways to distort the truth as there are dam proposals. A few of the most prevalent are:

Falsifying Cost-Benefit Studies

President Jimmy Carter cited an investigation of the Army Corps of Engineers' practices carried out by the U.S. General Accounting Office (GAO):

"A recent GAO analysis of the Sprewell Bluff Dam project on the Flint River in Georgia indicated vividly the fallacies in existing Corps of Engineers analysis procedures. Construction costs were underestimated, extremely low interest rates were assumed, nearby lakes were ignored, population projections were exaggerated, environmental damage was concealed, power production estimates were based on overloaded generator ratings, no archaelogical losses are included, and major recreation benefits were claimed in spite of official opposition from state and federal recreation agencies."

Reviewing the Final Environmental Statement (FES) submitted by the US Bureau of Reclamation in support of its *GARRISON DIVERSION PROJECT*, the Washington-based Institute of Ecology concluded that the scheme, had "no economic justification". Under the scheme, a 77-mile open channel and a string of dams are being built in order to channel the waters of the Missouri River into a massive reservoir for the purpose of irrigating some 250,000 acres. Yet as Onno Kremer, vice-chairman of the Manitoba Environmental Council, reports in the Canadian journal *Alternatives*, those 250,000 acres already "support a prosperous agriculture" and to irrigate them it will be necessary to "convert 220,000 acres of farmland and wetlands to drains, ditches, service roads and other facilities." Indeed, the Institute of Ecology estimated that the project would in fact "*reduce* cropland by 8,148 acres, grassland by 39,172 acres and woods by 6,276 acres." Moreover the irrigation costs were likely to be so high that they would "amount to a subsidy of $122,000 per person or $469,771 per farm."

Over-Estimating the Benefits of Flood Control

A planned $17.7 million dollar flood control scheme in Hendry County, Florida, will benefit just 21 farmers. Of those 21, 13 will receive most of the benefits — and four of those are large corporations, owning 61 per cent of the 34 square miles to be protected. Moreover, two landowners have expressly stated that "they are against the current project because it would overdrain their land and they would rather have their land in its present state." Ironically, the project is considered necessary in order to mitigate the flood damage caused by an earlier Corps' scheme.

Over-Estimating the Lifetime of Dams

Sedimentation is a major factor in reducing the projected, useful life of a dam. In India, for example, dams are known to silt up between three and — in the case of the Nizamgara Dam — 17 times faster than expected. Nonetheless, it is clearly in the interest of a dam builder to estimate the longest life possible for a dam — thus spreading the initial high construction costs over a longer period, and hence reducing the proportion of those costs which are charged annually. Indeed, by extending the claimed useful life of a dam, a poor cost-benefit ratio can be transformed into a more favourable ratio.

The Use of Unrealistic Discount Rates

Until 1971, the discount rate used to evaluate US water projects was often as low as 3.125 per cent. That level was set in 1962 under Senate Document 97 and, even at the time, bore no relation to then interest rates, let alone their likely future value. When, in 1971, the rate was revised, the US Water Resources Council — "recognising both the objectives of subsidising water resource projects and the objectives of an efficient combination among and between federal and non-federal investment activities" — set the new rate at 7 per cent rather than the 10 per cent it acknowledged to be the rate of return of non-federal investments.

It is also important to recognise that whilst unrealistically low discount rates are used for the water projects themselves, unrealistically *high* discount rates are employed to evaluate the ecological benefits that eventually will be destroyed. This is of particular relevance in the Third World. Indeed, as the Nairobi-based Environment Liaison Centre points out: "The use of a discount rate over time seems unrealistic for such rehabilitative projects as timber and food production or the conservation of wildlife and scenic areas. These resources carry only a slight risk of becoming worthless or obsolescent through technological advancement, changes in the weather, or fashion in contrast to machinery, chemical factories, or dam projects. *With a growing world population, the risk that soil, water and air will be valued any less in 50 years is almost zero.*"

David Rothenberg

Meyers was asked about his influence with the State Department. Though poorly expressed, his reply (taped by the FBI) was explicit enough: "There's a million deals. It's a trading game down in Washington . . . Going onto the Appropriations Committee in January, this makes me a very important guy."[40] In particular, Meyers mentioned that some congressional committees "who have key members who are involved in State are interested in something from the Appropriations Committee, where they need funding for a dam." The implication is clear: if Meyers played the game, he could win the necessary influence at the State Department.

The extent to which the US Congress is beset by such corruption is hard to gauge. Direct bribery is probably the exception: more typically, agribusiness, engineering consultants and construction unions have made 'campaign contributions' to Congressmen seeking re-election, thereby hoping to secure a dam project.

In the Third World, bribery and corruption are openly acknowledged to be part and parcel of most industrial contracts — including water projects. One informed source who has had dealings with certain West African governments, reports that in order to even *see* a minister, it is necessary to deposit a briefcase full of money with the appropriate secretary. Only then will an appointment be arranged. Meanwhile, in Sri Lanka, another source reports that one third of the aid money intended for the Mahaweli scheme has gone in bribes.

Politics makes for Bad Decisions

It need hardly be said, however, that institutionalised corruption — whether in the form of bribery or pork-barrel politics — makes for poor decisions. Take, for example, the plans to bring water to the Western and South Western United States. The massive demand for water in the area has already led to a precipitous fall in groundwater reserves, to rivers running dry and to widespread salinsation. According to David Sheridan:

> "Present rates of irrigation in some parts of south-western Nebraska will cause water level declines of almost 50 per cent between 1978 and the year 2000. In Nebraska, an average of over 300,000 acres of irrigated corn (for grain) has been established each year since 1973. Half of all the existing irrigation projects in the western part of the state are expected to experience water shortages in 20–25 years."[41]

Indeed, Sheridan argues that in many areas of the arid Western United States, "human systems are exceeding the carrying capacity of their natural life support systems." Nonetheless, it is unlikely that any sensible conservation measures will be introduced voluntarily. The reason lies in the availability of federal pork. No-one, least of all the farmers in the area, want to be told that they must limit their use of water: instead, they see the solution lying in the massive water projects which the politicians promise to build with federal funds. Sheridan cites the city of Tucson's response to its dwindling groundwater supply as typical of the problem. Thus, he writes: "Limiting water consumption . . . would seem to be the logical solution, but it apparently has not been politically feasible. Many of the people who have moved to this desert oasis from parts of the country with much wetter climates and have brought with them water consuming habits such as lawn watering that are ill-suited to the desert. More importantly, to limit water use is to limit economic growth, and many vested interests in the area – developers, construction companies, financial institutions – have a big stake in continued economic growth. So, instead of conserving water or doing without more water, cities such as Tucson look to the federal government to provide inexpensive water."[42]

States within States

If the eagerness of politicians to bring home the pork is one side of the dam-building coin, the power of those institutions which build and plan dams and other water projects is the other. Handling vast budgets, and enjoying considerable political power themselves, they are well-versed in the art of lobbying. For example, George Laycock recalls how one civil servant, working for the US Corps of Engineers, went about 'handling' a congressman he wished to interest in a project. The civil servant told a biologist from the US Fish and Wildlife Service: "We maintain dossiers on each member of the Appropriations Committee. When one of these congressmen came to New Orleans recently, we were ready for him. One of our people took a friend of his to dinner in Washington just to learn more about him. We found out that he was a diabetic. So, when he arrived in New Orleans, his air-conditioned limousine was already equipped with a refrigerator stocked with everything he might need, including insulin."[43]

Whatever the means used to obtain its influence in congress, the US Corps of Engineers – together with the Bureau of Reclamation – undoubtedly wields considerable political power on Capitol Hill. When in 1979, President Carter tried to put through a bill which would have created a new department, the Department of Natural Resources, and made it responsible for reviewing water projects, his efforts were stymied by the Corps and its allied agencies. Later, in 1980, Carter was forced to lift his presidential veto on a proposed bill which would have sanctioned $4,200,000,000 worth of water projects – a bill he had previously called 'a travesty, wasteful, destructive and expensive'.[44]

Elsewhere we find agencies which are equally powerful. Thus, Tasmania's Hydro-Electric Commission (HEC) has been accused of being a state within a state. "For more than fifty years," writes Peter Thompson of the Australian Conservation Foundation, "the Commission has played a virtually unchallenged role as Tasmania's economic, social and land-use planner. It has been an organisation operating in a power vacuum, created by a succession of parliaments which have never insisted on the public accountability of the HEC*."[45]

Thompson is not alone in expressing that view of the Commission. Other, more official, bodies have also voiced growing concern at the power now enjoyed by the HEC. Thus, in 1980, Tasmania's own Directorate of Energy noted with alarm that the Commission was 'sounding out' potential customers for its hydro-electric power without referring to other government departments. "*It would seem that the Hydro-Electric Commission has been permitted, in the absence of adequate policy guidance, to act as a de facto, and largely autonomous, economic planning agency. This is indisputably not its role.*"

Earlier, in 1974, a committee of inquiry into the HEC's plans to flood Tasmania's Lake Pedder expressed harsh criticisms of "the limited scope of the Commission's planning objectives and evaluation criteria . . . and the narrow scope of the Commission's professional expertise." Indeed, the Committee of Inquiry argued:

> "It appears to be a close knit and tightly disciplined organisation and might be considered the archetype of the kind of government instrumentality (which has been) described as a 'guild authority'. Such organisations are common amongst public works agencies in Australia, particularly in the water resources field. They tend to internalise expertise to avoid independent review of their proposals, to discourage public knowledge of their activities, and to have limited (generally single purpose) objectives. Because of their staffing structure and the nature of their charter, such organisations are ill equipped to handle problems which involve multi-objective planning environmental considerations or inter disciplinary co-operation. (Some organisations react) by drawing within themselves and refusing to acknowledge that problems outside their own field or expertise exist. The Hydro-Electric Commission was one such organisation in 1967. The experience of this Committee suggests that it is still very much so."[46]

That view of the commission has been amply born out in the ten years since the Committee of Inquiry sat. Indeed, nothing could better illustrate the HEC's tunnel vision and unwillingness to accept criticism than its reaction to the international outcry over its plans to dam the Franklin River. It was not until the High Court of Australia ruled that the area (which had been included in the World Heritage List as an area of outstanding natural beauty) should be preserved that the HEC agreed to halt work on the dam.

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*For a full account of the politics of dam-building in Tasmania, see the papers by Thompson and by Crabbe in Volume II: *Case Studies*. Available from Worthyvale Manor, Camelford, Cornwall. Price £25 (Institutions), £15 (Individuals). To be published in Spring 1985.

Conclusion

Such outright disregard for international opinion is exceptional. Nevertheless, the determination shown by the HEC to build the Franklin River Dam is symptomatic of a more general tendency within the industry to push ahead with projects apparently regardless of the case against them.

The record makes it quite apparent that figures have frequently been falsified in order to win approval for projects which – on the basis of any objective analysis – would never be sanctioned, let alone constructed. Indeed, it would appear that those who stand to gain politically and financially from the building of a large dam are willing to go to inordinate lengths to ensure that it will be built.

Among other things, they are willing purposefully to mislead those who must be persuaded of the dam's desirability and viability before the go-ahead to build it will actually be given. This they do by grossly exaggerating the dam's likely benefits and seriously underestimating its probable costs – in particular its social and ecological costs which, as we have seen, are often totally ignored.

The power, prestige and financial resources of the politicians, bureaucrats and industrialists involved in dam projects greatly facilitates that deceit – as does the credulity and apathy of the public. Moreover, unlike the authorities, those who oppose dams – often local tribal or peasant leaders, obscure academics or youthful environmentalists – have meagre financial resources and little credibility. To add to their difficulties, they must also confront the entrenched belief that large-scale water development schemes are an essential part of the process of economic development – a process which we have been taught to see as the only means of combating poverty and malnutrition, and of assuring health, longevity and prosperity for all. To challenge dams is thus to challenge a fundamental *credo* of our civilisation.

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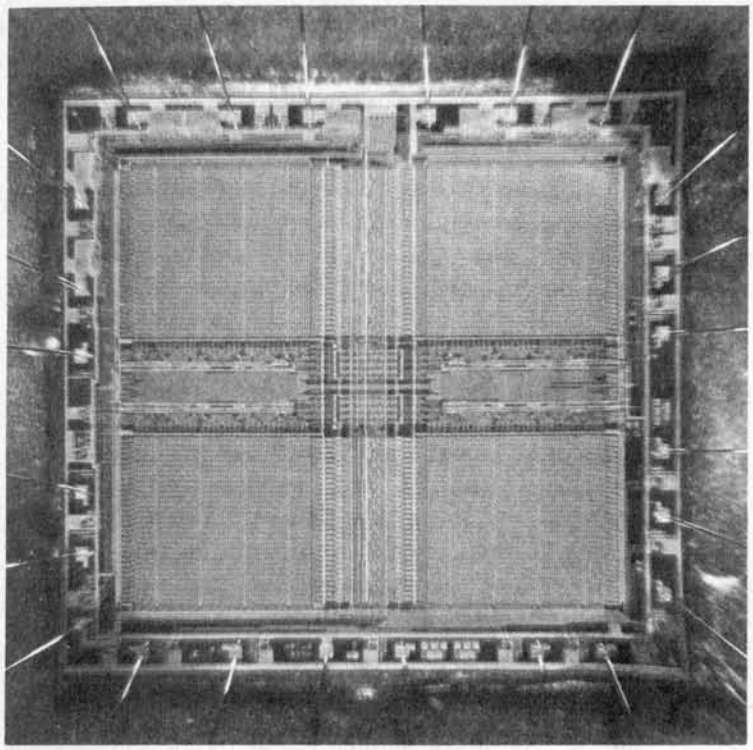

Information—Yes, But Where Has All Our Wisdom Gone?*

by Henryk Skolimowski

The modern fetish for collecting information is creating an overinformed yet woefully unenlightened Society.

Since everybody talks about the information society, surely it must be around. But I do not see any Information Society worthy of the name *society*. Like Diogenes I have searched with my Lantern in various nooks and crannies for signs of the existence of the Information Society as a new social form. My search has proved disappointing.

Well, yes, I see a lot of computers around. But this does not make a new type of society. I hear a lot of loose talk about the information revolution. But this does not make a new society either.

If we live in the information society, why are we so poorly informed? The President is not informed. We are not informed—at least as to how to live our lives. Evidently more is required than bits of information which we can store in computers. All those billions and zillions of tit-bits, stored in computers, can help us but little.

In my humble opinion what is involved and what is required is judgement, wisdom, enlightenment. You do not make your judgement sharper and more mature by acquiring more bits of information. You do not make your judgement wiser by acquiring more bits, of whatever sort. You make your judgement wiser by becoming a wiser person. You do not acquire more enlightenment by acquiring more computer programmes. You acquire enlightenment by becoming an enlightened person—not a reservoir of information (for encyclopaedias serve this purpose) but a source of light. In all the three instances: of judgement, of wisdom, of enlightenment we deal with new qualities.

The information society deals only with quantity. The information society does not know the meaning of quality; computers do not, at any rate. Hence the Information Society (based on computer information) cannot help us to acquire quality: of judgement, of wisdom, of enlightenment. Whatever number of computers you take, they cannot make a new society.

To conceive a new social design, or to invent a new society is a task much more difficult than splitting the atom or inventing the steam engine. During the last millenium, especially the last two centuries, western civilization has shown its prowess in technical inventions. We cannot claim the same power of inventiveness in the social realm.

The social legacy of technological change is something that we should really ponder over. I am talking about those social innovations that came in the wake of technological change, or were induced by it, in recent times. It would appear that the only new social innovation of the technological society is the shopping mall and suburbia. They were created inadvertantly. They happened by default. The shopping mall functions in a way similar to that of the well in traditional societies: it draws people from the entire surrounding area. But there is a difference. While the traditional well was a vital centre for the exchange of information, of sharpening of wits, and a real social school for living, the shopping mall is a monument to non-communication, it dulls the mind by the appalling uniformity of goods, and is a school of alienation.

Suburbia is like the village in olden times. But while the village taught self-reliance and fostered gregariousness and conviviality, suburbia teaches isolation, dependence on gadgets, and prepares the ground for appeasement by drugs. Technological change has produced undesirable social mutants: the atomised family and the isolated individual who is in touch with the world by touching buttons but

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cannot be touched by his neighbours or be in touch with himself.

It seems that there is a law that governs technological change: *the more sophisticated technology becomes the more it disengages us from life.* The question is whether the recent developments in electronics and computers are an exception to this law. Are we closer to life and to *ourselves* as the result of the information revolution? Will we be closer to life if each of us possesses a personal computer? One of the Atari directors, Marcian E. Hoff Jr. informs us that *"The Personal Computer is a Wonderful Solution Looking for a Problem."*

Yet, many people behave, or at least say, that computers in the 1980s will be what drugs were in the 1960s—an extension of the self. The other day I heard Timothy Leary—the high guru of the 60s—expanding this very view. And so completely was he sold on the idea that computers are smarter than us, and that we are entering the phase of complete symbiosis with them, that I was taken aback—until the interviewer asked Leary the question: "We seem to have an abundance of information. But wisdom seems to be in short supply. Will computers supply us with wisdom?" To which question Leary responded without hesitation: "Yeah, yeah. In five years we shall have wisdom programmes. For 39 dollars you will be able to buy a wisdom programme and play a wisdom game with the computer." At this point I knew it was all rubbish. If you think that you can buy a wisdom programme, you do not know what wisdom is all about; and perhaps you never will if you accept it on the computers terms.

Thus there is a great deal of loose talk and often plain rubbish going on about the greatness of the coming age of the computer. When I listen carefully to those exaggerated claims, often just laughable, I am persuaded (in my soul at least) that if the information society means buying wisdom programmes, going underground to live closer to nature (as Isaac Asimov advocates), having everything done for you by computers and robots—then I want no part of it. *I want society that engages me with life, not eliminates me from it.*

The columnist Sydney I. Harris put it so well when he said: "The real danger is not that computers will begin to think like men, but that men will begin to think like computers."

Perhaps we have already started doing that. Hence all this loose talk about the coming greatness of the Information Society.

Freedom

In what sense and to what degree can computers make us freer? The possession of information does not make you free. Do we communicate better with each other when we have computers at our disposal? Hardly. The essence of human exchange is the capacity to empathize with the innermost states of other human beings as well as an exchange of emotions, visions, things that make us uniquely human; the kind of things that cannot be easily, if at all, translated into objective bits of information.

Let us assume that each of us possesses a personal computer which helps us with *everything* we do. Would this represent an extension of our freedom? I respectfully submit that it would not. On the contrary it would curtail our freedom. Let me explain.

Freedom is equivalent to the ability of exercising choices not outlined for you but chosen by you. Freedom is the privilege of being at one with your human nature. The more structured the environment the less choices (in the genuine sense) we posses. The computerized environment will be highly structured; one of the most structured in history. So structured will it, in fact, be that from the standpoint of traditional freedom, *a perfectly computerized environment will be a form of electronic prison.* Every exchange will have to be performed according to the rules of the computers; no room for spontaneity, improvisation, quirkiness, the unexpected, the unstructured. As Ivan Illich says:*"Whatever structurally does not fit the logic of machines is effectively filtered from a culture dominated by their use."* How can you talk about freedom in such circumstances?

Furthermore, you cannot have freedom without exercising responsibility. You cannot exercise responsibility if everything is done for you. Freedom is the capacity to act when your action springs from responsibility. Your responsibility is annihilated when you are an appendage to computers and robots; and so is your freedom.

Let us look at the concept of responsibility in the context of the Information Society, and see whether the Information Society is likely to enhance our responsibility, or on the contrary, stifle it. Responsibility is one of the most peculiar concepts of our language, and of our moral universe. It is very hard to define; even harder to live without. There is no logical necessity, or even natural necessity to assume responsibility. Yet we render ourselves less than human when we do not assume it. Responsibility is one of those invisible human forces—like will power—for which there is no logical or natural necessity, but without which human history is inconceivable.

In the consumer society we want to escape from responsibility assuming that without it our lives will be easier and better; whereas in fact our lives become shallower and cheaper. Like faith, responsibility enhances the variety of our existence— when we possess it, or diminishes us when we lack it. What blood is to the body, responsibility is to the spirit.

To be a human being is to live in the state of responsibility. When we are unable to be responsible, we are, in a sense, annihilating our status as human beings. Those chosen by the gods are those who possess a sense of responsibility bordering on obsession, like the Buddha or Jesus. Forsaken by the gods are those who are void of the sense of responsibility—even for their own lives. Great spiritual leaders of mankind, as well as great social and political leaders, are stigmatized with the enhanced sense of responsibility.

The sense of responsibility is not limited to the great of this world. It is known to everybody. For what is the awareness of "the wasted life" if not the recognition that each of us is

a carrier of responsibility which goes beyond the boundaries of our little egos and our daily struggles.

Responsibility seen in the larger cosmic plan is a late acquisition of evolution. It comes about as consciousness becomes self-consciousness, and furthermore, as self-consciousness (in attempting to refine itself) takes upon itself the moral cause: the burden of responsibility for the rest. Responsibility so conceived is a form of altruism. The tendency to escape from responsibility is a purely biological impulse, a self-serving gesture, a form of egoism. Therefore, those two tendencies, the altruistic (accepting the responsibility for all), and egoistic (escaping from it into the shell of our own ego), are continually fighting each other within us. And each of us knows the agony of this fight.

When we observe the lives of great men and women, the lives that are outstanding and fulfilled, we cannot help noticing that they were invariably inspired by a great sense of responsibility. Those who sacrificed themselves in the name of this responsibility did not have the sense of a wasted life. Their example is received as something noble and inspiring. The sense of responsibility is now built into our psychic structure as an attribute of human existence, and a positive force.

To be human is to live in the state of responsibility. However, through the systematic separation of human beings from the cycles of nature, as well as through the process of delegating important decisions to experts, contemporary technology has been systematically disengaging us from life. Our lives have been made increasingly disconnected, atomized and trivialized. This particular aspect of present technology makes it more detrimental to the future of the human race than any particular technological disaster. (I am, for the moment, disregarding the destruction of eco-habitats and human societies through excessive reliance upon the machine.)

Responsibility and technology must, at this time of history, be considered *vis-a-vis* each other. Technology which systematically deprives us of responsibility (by delegating everything to experts), represents the victory of evil. For if everything is done for us, if we cannot exercise our responsibility, we are no longer human. Responsibility is the cornerstone of our status as human and spiritual beings.

You can now clearly see what my arguments are aiming at: to show that in so far as the Information Society (epitomised in the computers) takes over and deprives us of responsibility, and dwarfs our status as human beings. It is a pity, and indeed a blindness of our times, that the proponents of the computerised age never address themselves to this problem.

Wisdom Society

All society worthy of the name 'society' is human society, is society for us, humans, and not for smooth functioning of efficient computers. It may have dawned on some of us that what I am advocating is not so much the Information Society as the *Wisdom Society*. Our dilemma has been beautifully summarised by T.S. Eliott who said, some 50 years ago: "Where is the life we have lost in living? Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?" We need wisdom in order to be responsible. We need wisdom to manage our information. At present we have a super abundance of information which we are unable to digest. *As a society we are over-informed and under-enlightened.*

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He is an Associate Editor of The Ecologist *and his main interest lies in the developement of a post-industrial ethic and a post-industrial society.*

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Books

Agricultural Development: Changing Directions.

ENVIRONMENTAL MANAGEMENT IN TROPICAL AGRICULTURE, Robert J.A. Goodland, Catherine Watson and George Ledec. Westview Press, Bolder, Colorado. 1984.

This is a very comprehensive, yet concise,study by a group of people who have obviously had considerable experience in the field of tropical agriculture. All three authors work in the Office of Environmental Affairs of the World Bank in Washington, D.C.. Robert Goodland is a tropical ecologist of note, having held professorships at several universities (including McGill) and having published widely on ecological issues mainly in South and Central America. His highly authoritative ecological impact assessments of large scale water projects in Brazil and elsewhere are already well known. Catherine Watson, the second author, is a researcher and George Ledec is a research assistant.

The book is divided into four parts, plus an epilogue. The first part discusses the environmental problems associated with such food crops as rice, maize, sorghum and cassava. The second section deals with the ecological impact of growing cash crops, including coffee, tea, cocoa, sugar cane, tobacco and forest trees. The third section considers large and small livestock schemes, and freshwater and marine fisheries. The fourth section is devoted to such issues as the use of biocides, the benefits of integrated pest management, the problem of tsetse fly control in livestock projects, the environmental hazards of perennial irrigation, the use of energy, the problems of weed control, the need to preserve genetic diversity and the problems of soil erosion.

Intercropping for Nitrogen

Each chapter contains valuable information, much of which may be new even to those readers with some knowledge of tropical agriculture. We learn, for instance that for economic reasons no artificial fertiliser is available in the developing world for the cultivation of maize, sorghum and millet—this in spite of the fact that these crops "feed directly millions of people". The authors show us how the yields of millet can be increased dramatically through fertiliser use. In trials in the south of the Sahara, nitrogen increased millet yields from 100 kilogrammes per hectare (kg/ha.) to 1,500 kg/ha, when combined with potassium and phosphorous. In ideal conditions, NPK can still further increase yields to 2000 kg/ha so long as there is 125 mm of soil moisture in the growing season.

In fact, the lack of artificial fertiliser is not the disaster it might at first appear. Traditional farmers introduce the nitrogen they require in their soils by intercropping with legumes. "Thus, in Colombia, 98 per cent of the bean crop is grown in association with maize: in tropical Latin America as a whole, 60 per cent of the maize is associated with other crops, usually legumes." In addition, the authors report, "the yields of four successive maize plantings intercropped with a legume but without nitrogenous fertiliser were comparable with yields from maize grown with nitrogenous fertiliser." "Experiments in Africa, India, Thailand, and the Philippines show that, especially on low nitrogen soils, yields from millet-legume and sorghum-legume mixtures are regularly 20 to 60 per cent greater than those obtained from comparable pure strands."

Unfortunately, the use of biocides on maize and even on sorghum is increasing. This is a very undesirable trend. As the authors point out, "The global area under maize, sorghum, and millet cultivation is so vast when compared, for example, with the area under biocide-intensive cotton cultivation, that the amounts of chemicals involved in even moderate biocide applications on these crops will become enormous if these trends continue."

Cassava—An Invaluable Crop

The chapter on Cassava and other root crops is of considerable interest. Cassava or Manihot (*Manihot esculenta*) is one of the world's major staple foods. In 1976, 100 million metric tons were harvested. It is particularly valuable in that it can "withstand drought, brief periods of flooding, generally low soil fertility, and light management." In addition "in terms of calories produced per unit area per unit time, cassava is one of the most productive of all crops. Yields of 10-20 tons per hectare (t/ha) per harvest are commonly reported under field conditions, whereas yields of 77 t/ha per harvest or about 211 kg/ha/day are possible under experimental conditions. This is more than one third greater than calorie production from rice grown under optimal conditions."

The cassava root tuber is mainly digestible starch with 0.5-1.5 per cent protein, which is quite low. However "if the starchy root is mixed with yeasts and ptyalin (as in human saliva), the partially digested gruel product contains improved levels of vitamins and amino acids." Significantly, in many traditional societies people have taken advantage of this culinary fact and consume much of their cassava as fermented gruel which is referred to in Nigeria as 'gari' and in Guyana as 'cassiri'. In addition cassava foliage has a very high protein content and is often eaten by traditional people.

Sugar Cane and Energy

A wide variety of chemicals which are currently obtained from petroleum can be obtained from sugar cane. But growing sugar cane as a substitute for petroleum brings numerous problems. As the authors point out: "Where sugar is required for food or the land is needed for other food crops, human nutritional tradeoffs have to be addressed. Under current practices, the social impact is severe. Large cane growers in Brazil, for example, purchase land from small food growers. This increases the price of agricultural land and forces small farmers to more marginal and distant land. The result can be higher food prices and inflation. Furthermore, the amount of useful ethanol energy produced only slightly exceeds the amount of energy consumed in production. In a large (50 million gallons per year) modern factory, about 70,000 BTU are required to produce one gallon of ethanol containing only 76,000 BTU. If a new technology can remove the 8 per cent ethanol from the 92 per cent water, only then will real progress be made."

Tobacco: A deadly crop

The chapter on tobacco is also of great interest. The adverse health effects of smoking tobacco are well known: however it is not generally realised how damaging the cultivation of tobacco is to the soil on which it is grown. Tobacco deprives the soil of nitrogen and other nutrients more rapidly than almost any other crop (see Table). In addition it is one of the crops on which biocides are used most heavily.

Depletion of Soil Nutrients by Tobacco and Other Crops (loss in kg/ha)

Harvest of one ton per ha	Nitrogen N	Phosphorus P_2O_5	Potassium K_2O
Tobacco	24.4	14.4	46.4
Coffee	15.0	2.5	19.5
Maize	9.8	1.9	6.7
Cassava	2.2	0.4	1.9

Source: Van Wambeke, 1975.

As the authors note: "Vast quantities of biocides are applied to tobacco crops virtually throughout its seven to eight month growing season. Most of these biocides are toxic: some are carcinogenic. Besides being hazardous to users, these chemicals can contaminate village water supplies. Although most western governments either ban or severely restrict the use of obsolete persistent organochlorine biocides, their use in developing countries continues. For example, Aldrin is widely supplied by the international tobacco monopoly in Kenya. Warnings are printed in two of Kenya's 15 languages (Swahili and English). Even if the user can read and understand the warnings, it is not easy to 'avoid contaminating rivers', nor to 'wash with soap and water after use'. Most users have never seen a physician, and certainly are not able to consult one 'immediately' as advised on the label."

But this is not all. Tobacco has to be cured and this usually involves using large amounts of wood. "On a global scale, the fuelwood requirements for producing flue-cured tobacco contribute substantially to the serious and growing problem of deforestation in developing countries. Of the estimated 5.66 million tons of tobacco produced each year, at least 2.5 million tons are flue-cured, using fuelwood. About 55 cubic meters of stacked wood are needed to cure each ton of flue-cured tobacco, and some 82.5 million cubic meters per year of roundwood are harvested for this purpose. Since most wood for tobacco curing is harvested from the wild (rather than from sustained-yield fuelwood plantations), it is reasonable to conclude that worldwide, the equivalent of some 1.2 million hectares of open forest each year is stripped of wood for tobacco curing. WHO estimates that 12 per cent of the trees cut down each year worldwide are used for tobacco curing. This harvest is far in excess of rates of natural forest regrowth. For every 300 cigarettes made in the developing world, one tree is burned."

Cotton: Maximising Yields, Maximising Destruction

The pressure to increase cotton yields—in some areas, it is only economic to grow cotton if yields of 1000 kg/ha can be obtained, which is twice the average yield in the United States—has caused severe ecological problems in the tropics. To obtain such yields, perennial irrigation is required— and that not only favours the transmission of such water-borne diseases as malaria and schistosomiasis but also invariably leads to waterlogging and salinisation. Moreover, heavy applications of nitrogen are necessary which, under irrigation, can lead to serious contamination of groundwaters. The authors note: "On well-drained heavily fertilised soils, large quantities of nutrients (especially nitrates) leach downward and enter local water bodies. Assuming a soil absorbtion rate of 50 per cent for the applied nitrogen and an application rate of 220 kg N/ha, perhaps as much as 100 Kg of nitrogen is lost into the drainage from each hectare. Similarly high levels of nutrient runoff into watercourses have resulted in eutrophication and, when combined with biocide residues, the destruction of fisheries."

Cotton also depletes the soil of its nutrients very quickly. In addition, like tobacco, it requires the use of massive amounts of biocides. In fact, "More biocides are used in cotton production than in any other crop. Cotton cultivation receives by far the bulk of biocides used in developing countries. Even in the United States, cotton absorbs 47 per cent of all insecticides used. The frequent and heavy application of biocides on intensively cultivated cotton and the resulting serious major health and environmental effects are well described in the literature. Since the early 1970s, of the many Central Americans who have been poisoned by biocides, hundreds have died and thousands more suffer from subclinical intoxication."

Significantly, cotton can be successfully grown "using traditional methods under rainfed conditions with only about 1 metre of rain per crop. Yields are low, averaging 300 kg/ha in Northern Nigeria. However, since little fertiliser and biocide is used, there is little pollution of the drainage water or human health hazard."

Fisheries-The value of Mangrove Swamps

The authors start off their chapter on marine fisheries by noting the destruction wrought by modern fishing techniques. "As a result of today's highly sophisticated fish-harvesting technology, industrial fishing fleets are now increasingly able to upset the marine food chain, deplete fish populations, and overwhelm traditional fishing industries." The destruction is all the more tragic when one considers that nearly one-third of the fish harvested is fed to livestock.

The section on mangrove swamps is particularly interesting. The authors tell us that research carried out in West Bengal indicates that potential shrimp yields of 1000 tons per annum could be obtained from 44,000 hectares of tidal mangrove swamps. In addition, mangrove swamps are very effective in preventing salt water intrusion—a problem in many coastal areas. The authors argue that "Investment in mangrove reforestation and protection would not only benefit certain marine populations but also would provide such functions as shore stabilisation, flood control, and the sustained production of wood and other products for domestic and commercial uses."

A Salutary Warning

In the epilogue, the authors point to the limitation of their study. All they claim to have done is to outline "various relatively minor options for environmental improvement that make little fundamental change in the prevailing conventional style of tropical agriculture." They hope that "these realistic options will be found useful to designers wanting to reduce any environmental problems." They are being very modest. This book could not be of greater value; indeed, it must be regarded as a handbook for environmental management in tropical agriculture. The authors end up by pointing to "the growing and, to us, compelling body of opinion that major changes in agricultural development strategies are essential and overdue." Such changes, they acknowledge, "will be politically difficult and cannot be accomplished overnight. However, they appear inevitable if large-scale disaster is to be avoided." A salutary warning indeed, coming as it does from such an experienced team. Let us hope that those responsible for funding today's development projects read this book—and act on it.

Edward Goldsmith

A Question of Climate

CLIMATE AND DEVELOPMENT, Edited by Asit K. Biswas, Natural Resources and the Environment Series, Volume 13, Tycooly, Dublin, 1984.

This is a short book (146 pages) containing five chapters. Two are by the editor, Asit Biswas, one being on 'Climate and Development', the other on 'Climate and Water Resources'. H.E. Landsberg of the University of Maryland contributes a chapter on 'Climate and Health', and India's well known authority on agriculture, M.S. Swaminathan, now of the International Rice Research Institute in the Philippines, writes on 'Climate and Agriculture'. The final chapter—'The Effects of Climate Fluctuations on Human Populations, A Case Study of Mesopotamian Society'—is by Douglas Jackson and Harvey Gould of Clark University, Massachusetts.

The theme of the first chapter by Biswas is that it is much harder for countries in the tropics to develop than it is for countries in temperate areas—the reason being that climatic, biotic and soil conditions in the tropics make it very difficult to achieve an agricultural surplus.

Biswas has already written on this theme, notably in a book edited by himself and his wife Margaret Biswas and published by John Wiley in 1977. We reproduced an extract from the book in *The Ecologist*, Vol.9, No.6.

In the present book, Biswas points to the failure of development policies in the Third World. He writes, "The euphoria of the past has given place to despondency, confusion and stalemate. The developers are still there, and so are the development theorists and planners. But they all concede that development is not as easy as they thought it to be and that there is no panacea for underdevelopment. It is realised that the road to development is tortuous: that development is not economic growth alone, and that many of the issues which were debated in the past, were not the real issues when seen in the light of the problems being faced by the less developed countries today."

Few things illustrate the failure of development policies better than the extent to which once agriculturally self-sufficient Third World countries have now become totally dependent on western food imports. The point is well made by Biswas: "Developing countries, in aggregate, were net exporters of grain in the 1950s. At the end of the First Development Decade, the surplus situation had turned into a net deficit. Developing countries as a whole imported 42 million tons of grain in 1970, and this further increased to 80 million tons by 1979. Estimates of total grain import needs by the end of the Third Development Decade in 1990 currently range from 125 to 150 million tons."

Biswas goes on to quote Maurice J. Williams, Executive Director of the World Food Council who refers to "the inadequate rate of increase in food and agricultural production in the developing countries, the continuing rise in their food imports, the deterioration in their food self-sufficiency, and the lack of evidence of any reduction in the incidence of hunger and malnutrition . . ." Much of this failure can be attributed to the application of agricultural methods which have been developed in temperate areas and which are totally unsuited to the tropics. Examples include the deep ploughing of rice paddies in Java and Burma; the ludicrous 3.25 million acre groundnut scheme in Tanzania which had to be abandoned because the soil was unsuitable for the cultivation of groundnuts; broiler production in the Gambia; and the cultivation of marginal lands "which should never have been farmed" in many African, Asian and Latin American countries.

Among those climatic features which make tropical countries so unsuited to western-type agriculture are the uneveness of the distribution of rainfall during the year; the unpredictability of rainfall (many famines have occurred as a result of the failure of the monsoon rains to start at the right time); the high kinetic energy of the tropical rainstorms which favours soil erosion; the vulnerability of the soil to wind-erosion during the hot dry season; and particularly high kinetic energy cover at the end of the dry season which leaves the soil unprotected during the rainy season.

Another problem is the poverty of micro-organismic life in the soil. "High temperatures, long periods of drought, intense ultraviolet radiation and particularly high kinetic energy rainfall, which destroys the granular structure of the soil, decrease the activity of soil micro-organisms so that there is little possibility in open land for the stable organic content of the soil to build up: indeed there is a tendency for it to be destroyed." This means that the organic content of tropical soils tends to be low which makes them still more vulnerable to erosion.

A further problem is the vast biological diversity of ecosystems in the tropics. This means that the number of potential pests is high and pest control is thereby very much more difficult than in temperate areas. The accompanying table makes this clear.

Comparison of crop diseases in tropical and temperate climates (Swaminatham, 1979)

	Number of diseases reported	
Crop type	Tropics	Temperate zone
Rice	500-600	54
Corn	125	85
Citrus	248	50
Tomato	278	32
Beans	250-280	52

Biswas nonetheless believes that development can take place in the tropics, indeed he seems to regard it as very necessary, although he does not tell us how the problems he describes are to be overcome.

Landsberg's chapter on Climate and Health is a little academic and difficult to read. The first part seems to be concerned with the effect of temperature itself on the human metabolism and on disease. The section dealing with infectious diseases is perhaps the most interesting.

Swaminathan's chapter, 'Climate and Agriculture', describes the effects of drought and other climatic hazards on tropical agriculture. He also lists the different crop varieties which have been developed by the International Rice Research Institute for cultivation in the tropics. He considers these to be superior to traditional varieties.

All in all, this is a very useful book, the chapters written by Asit Biswas being the most interesting. The theme of the first Biswas article is of critical importance in determining future development policies in the Third World.

Edward Goldsmith

Climate and Gaia

THE COEVOLUTION OF CLIMATE AND LIFE By Stephen H. Schneider and Randi Londer. 563 pages. San Francisco: Sierra Club Books. $25.

Like most inhabitants of the British Isles, I have an interest in weather and climate that borders on the morbid and introspective. It was a special delight therefore to have my meteorological hypochondria titillated by the abundant climatic wisdom of this book; there was even a map showing our small islands to be unique in having a greater constancy of rain than anywhere else in the world. Although few here would doubt this, it is good to have experience independently confirmed.

There is much more to *The Coevolution of Climate and Life* than this, however. Stephen H. Schneider and Randi Londer have written one of the most readable science books I have seen. Some of its success comes from the skillful juxtaposition of the recondite with the familiar; the reader is never lost in strange scientific territory without a guide. Some of the guides the authors provide are likely to remain with me as friends for quite some time. For instance, I shall not forget the speculation that Eric the Red was a property developer who named a dubious piece of the Arctic "Greenland" in an early real estate swindle or how Columbus came to be the first to observe that forests could sustain the beneficence of rain on an arid island.

The Coevolution of Climate and Life is authoritative about climatology. Those who are familiar with the home computer will have some inkling of the impressive skills needed to develop programmes that can plausibly describe in full detail the climate of a model world complete with oceans, mountain ranges and polar ice as these authors do. And their writing is very professional throughout. I was particularly taken by the beauty of the writing in the chapter on models. The word "model" has become soiled from overuse, and it was good to have it cleaned and refreshed, in a short piece of history about a King of Sweden who had a grand warship built only to have it turn turtle and sink on its maiden voyage. Had the naval architects made a model of the ship, its fatal instability would have been revealed.

For the lack of a model, history was changed.

But for all its easy and enjoyable reading, this book is much more than popular science. With courage and great patience, Mr Schneider, who is deputy director of advanced study at the National Center for Atmospheric Research in Colorado, and Miss Londer, a science jounalist, take on the challenge of explaining in understandable English the theory and practice of climatology. They then show how this knowledge and experience can be used to predict the consequences of the many changes we are making on our planet. Indeed, a considerable part of the book is about how climate affects people and how people affect climate.

I hope politicians and environmentalists will read it. It must be exceedingly difficult to weigh the conflicting advice that is given about deforestation and other land abuse, the increase of carbon dioxide in the atmosphere, acid rain and climatic consequences of nuclear warfare. Politicians might be tempted to take comfort in the thought that a week is a long time in politics and climatic problems are long term and can be safely left to be dealt with by the next Administration. But there is not much comfort here. One clear message of the book is the suddenness of climatic change; the onset of a glaciation could come within a few years. The rate of growth of energy use is another topic that interests climatologists and politicians, and it was good to see the radical view of the energy analysts Amory and L. Hunter Lovins, who predict a near zero growth rate, compared with the conventional— should one say nostalgic?—wisdom that growth will persist.

The authors have expressed their own clear views about climatology and put those of others in a reasoned context. I differ from them, however, over their account of the coevolution of life and climate. On coevolution, they seem to be expressing a consensus of the views of some friendly advisers; like the report of a committee, their presentation is limited to the expression of the highest common factor.

No one doubts that life is affected by the climate.But it is equally true that the climate is affected by life. The presence of life on land surfaces and in the oceans massively affects the rate of rock weathering and limestone deposition, and these two great biological enterprises are the regulators of atmospheric carbon dioxide and thus of the climate. These two propositions seem so obvious as to be trite, yet geochemists still try to explain the evolution of the Earth as if there were no life on it, and in a like way biologists still explain evolution as if the environment was always by chance just right for life. Earth and life scientists alike misuse the lovely word "coevolution" to describe their limited views of the Earth's evolving. They seem to have in mind some vague informal association between life and the environment, and each group assumes that the difficult details have been covered by the other. In fact, "coevolution," as they use it, is little more than a hand-waving attempt to persuade us that the relationship between life and the Earth is purely platonic.

Much more probably, life and the environment evolved together as a single tightly coupled system that Lynn Margulis of Boston University and I have called the Gaia hypothesis (Gaia was the Greek goddess of the earth). This is not what Mr. Schneider and Miss Londer call it; for then it is teleology, yet, it is a hypothesis that can be, and has been, tested by the accuracy of its predictions. It may be important to resolve this difference about the true nature of the relationship between life and the climate. In equilibrium the system will effectively resist perturbation. But if it is stressed to nearly the limit of its capacity to regulate, then it may fail catastrophically and the climate may jump to a new and stable steady state. There are signs that the regulation of climate and carbon dioxide are near such a limit. As the authors write, "left to her own devices, Nature will continue to nudge the earth toward the next ice age."

Mr Schneider and Miss Londer have written a fair-minded book, and the foregoing remarks about the Earth's life system are not so much criticism as a difference of opinion. The greater and important part of the book is about climate, and here the professionalism of the authors presides and the quality of thought and writing rises to an authoritative level. *The Coevolution of Climate and Life* is a lively, inspiring and most important book that will surely be a valued source and the stimulus of many a conversation.

James Lovelock

Who's Turned?

THE TURNING POINT, Fritjof Capra, Wildwood House, 1982, Price £3.50.

In the two years since Fritjof Capra's *The Turning Point* first appeared in print, it has sold over 300,000 copies. Clearly the world is ripe for such a comprehensive assessment of the problems of our time that still manages to display a tone of optimism. Capra's great strength is that he can write simply yet informatively—one leaves the book with a feeling that there is hope, that we live in an important time, as old, mechanistic, self-contained ideas are being replaced by new, interwoven strands that embrace the "systems view of life". One is left with a sense of fortuitous pride for living in so lucky an age. This is the main weakness of the work: this new age, which Capra claims has already begun, appears too easy, too flawless, and we forget the great dangers we actually face.

Capra's previous work, *The Tao of Physics*,emphasized the impending convergence between the conclusions of contemporary theoretical physics and those of the great Eastern religious philosophies. Though the basic observations were sound, the significance was marred by a general watering down of the great idea of both East and West. We were left with the complacent simplicity of the maxim "all is one"—a page of equations is placed side-by-side to a page of Sanskrit text; subatomic particle tracks are superimposed upon the Dance of Shiva, creating a slightly hokey quality. What are we to make of all this? So what if science finally approaches contemplative religion? Capra remarks in the final pages that *neither* are reflected in our contemporary society. The first book's strongest statement occurs at its end:

> I believe that the world-view implied by modern physics is inconsistent with our present society, which does not reflect the harmonious interrelatedness we observe in nature. To achieve such a state of dynamic balance, a radically different social and economic structure will be needed: a cultural revolution in the true sense of the word.

And where will this revolution come from?, asks any reader who has followed Capra thus far. *The Turning Point* seeks to provide the answer. So from the start it has a practical aim, and it is a far more thought-provoking and relevant book than its predecessor. Its answer, in a word, is the systems approach: there are many individual answers, but all must work together. Through interaction and the fostering of mutual development, rather than amalgamation and reduction to a single truth, the various progressive approaches in medicine, economics, science, psychology, and soft energy will together form a rising culture that will overcome the mechanistic compartmentalized paradigm under which our society presently operates.

The book is divided roughly in two, with the first half tracing the history of mechanism as a philosophy and guiding principle, explaining how the idea of man as machine flows from Descartes to all the mainstream intel-

lectual enterprises of the following three hundred years. Capra shows how mechanism rose from a novel idea to an almost religious paradigm, providing the basis for a complete dissection of the world in all senses of the term. The second half shows what steps have been taken in recent years to move beyond this paradigm, highlighting the independent efforts of economists such as E.F.Schumacher and Hazel Henderson and the various efforts in the field of holistic medicine.

The model of how these many distinct innovations will push toward a common goal is borrowed from the physics—the Bootstrap Approach of Chew and Bohm, the essence of which is that there are no particles without relationships to other particles, no isolated elements without movement, no dancer without the dance. So, not one of these alternatives makes sense without the others: they exist only as interconnected nodes of a network that must be greater than the sum of its parts.

None of this is especially new, but it is the compilation of so much into a single and readable book that is unequalled anywhere else. Capra himself is the first to realize this: "As I wrote the book, I came to feel very strongly that the systems view I advocate in it also applies to the book itself. None of its elements is really original, and several of them may be represented in somewhat simplistic fashion. But the ways in which the various parts are integrated into the whole are more important than the parts themselves. The interconnections and interdependencies between the numerous concepts represent the essence of my own contribution. The resulting whole, I hope, will be more than the sum of its parts."

The language of the book is clear and accessible to all, and it really should be on everyone's bookshelf. I shall merely mention, what I feel to be, several especially strong points, and several sections that could stand improvement through clarification or a change in emphasis.

Perhaps the most valuable chapter is entitled "The Systems View of Life", which summarizes the ecological nature of the systems approach. The understanding of unceasing motion interacting towards stability comes from an observation of nature itself, uncoloured by mechanistic assumptions. The organisation implied by the traditional pyramid of life, he writes, is based on our power-hungry hierarchical systems, so it has fostered a tendency to justify authoritarian social structures with examples from nature. Capra turns this symbol roughly on its end and encourages the adoption of the idea of the Tree of Life, where the cells, tissues and organs are branches leading to the trunk of the organism. But, "as a real tree takes its nourishment from both its roots and its leaves, so the power in a systems tree flows in both directions."

Always dynamic, never static. Always balanced, never favouring one direction over another. It seems so perfect. This general air of easiness about the book suggests that we will be able to sit back and watch all this change happening. But who really believes change will be easy? It can only come about with the hard work and determination of all. Capra has written to us as potential observers of the movement, not as participants. He never suggests how we can get involved.

There is so much emphasis on the successes of the new physics, and the sensibility of the Bootstrap Approach, that we are encouraged to believe that science has already changed for the better. But, as any thoughtful physicist will tell you, his field is by no means free of the problems of compartmentalisation that face all academic disciplines today. Consider the sharp division between theoretical and experimental physicists in institutions today; many theorists feel their work has jumped so far away from empirical reality that it has lost itself in the far reaches of the fantastic. Physics itself is clearly not the answer to our troubles, though it can be part of the inspiration.

Capra's solutions do not always match the problems he has set out to solve. There is much on holistic health for the individual, but few recommendations for the health of society. And the question of alternative science is passed over, as if there is nothing *there* that could use a change. How do the arts fit in? Are changes in the creative expression of our situation necessary to encourage the tide? Perhaps this is an area that is beyond even Capra's vast knowledge of the situation. But why does 'deep ecology' appear only several pages before the end, as if tacked on surreptitiously? More integration is required. But these are small points, that suggest another book may be forthcoming and welcome.

The basic strength of *The Turning Point* is its optimistic thesis: that the systems view will thrive and develop because it encourages diversity yet integration of independent small-scale solutions, rather than some all-encompassing strategy. This message should be heard by all.

But no turning point will come gently, and certainly not out of thin air. Only from the past can the future learn, only then will the rigid fortress of mechanism topple. We must never imply that we can jump on a raft and float the stream toward enlightened change, but we do have the power to build the boat and chart its course. If it flows smoothly, it is because we are proceeding cautiously and not jumping to coclusions nor ignoring the complexities of life itself.

David Rothenberg

The Greening of Germany?

PROGRAMME OF THE GERMAN GREEN PARTY, London: Heretic Books, 1983; £1.50.

This edition of the German Green Party's political programme makes a very important political document available to the English speaking reader for the first time. Heretic Press has to be congratulated for rising to the task. The translation (by Hans Fernbach) is accurate and very readable. What is missing is a contents page, and also an index as it is rather difficult to find one's way through the programme, especially if one is looking for a position on a particular issue.

The text which is published here is know in Germany as the "Programme of Saarbrücken": it was, in all its essential parts, passed at the second congress of the Green Party in March 1980 in Saarbrücken, and has remained the main platform of the Greens to the present day.

The programme consists of five main parts: the Preamble, Economy and Work, Foreign Policy and Peace Policy, Environment and Nature, and Individuals and Society. It is very densely written, and it would be impossible to summarise it in a few paragraphs. But there are a number of salient points which merit attention.

The Saarbrücken congress was a highly contentious event, and the present programme contributed eventually to the resignation of Herbert Gruhl and others from the Green Party. There were very many different issues which were passionately fought over.

The controversy over policy reflected a deep ideological split within the party. The Green Programme of Saarbrücken diverts from the "limits to growth" school of ecologists of the early 1970s who saw the population explosion, the scarcity of resources and other limits to industrial expansion as a danger for survival— all other social conflicts being of secondary importance.

The programme of the Greens charges "destructive economic growth", governed by the "interests of big capital" and "pure greed and profit", as responsible for the crisis of industrial society. There are two main manifestations of this crisis, one is ecological, the other economic. The

programme's prime aim is to develop policies which tackle both the economic and ecological causes of the crisis.

The programme contains plenty of references to the ecological crisis which is mainly understood in terms of the destructive effect of industrialism, most prominently symbolised by the development of nuclear energy. The programme calls for an end to unlimited industrial growth and the exploitation of nature. Renewable energy and other environmentally benign, "alternative" technologies have to replace the destructive ones. Large companies have to be broken down, the economy decentralised. At this stage, an old socialist idea is introduced: the new, small economic units are to be controlled by "economic and social councils"—a form of direct democracy and self-determination. The ecological principle is thus supplemented by that of "grass roots democracy".

There is also a third principle prominent in the programme, that of social responsibility. The Greens have expressed their deep concern about unemployment and the destruction of the welfare state. The programme suggests a long list of measures to preserve and extend the welfare state and, in particular, to remove discrimination against women, disabled persons, and other minorities. Equality and the redistribution of wealth are seen as central objectives.

The 1980 programme is not very detailed on economic policy, but in January 1983 a more comprehensive economic programme was adopted by the federal delegate conference at Stuttgart.* It is a pity that this more recent and very important, document has not also been translated and published together with the 1980 programme.

The 1983 document makes an even more forceful case for a green policy to fight unemployment and preserve the welfare state. Unemployment is interpreted as another outcome of destructive industrialism in which centralised technologies not only threaten the ecological balance but also destroy jobs on a large scale. A stop to nuclear energy and other large-scale developments (such as motorway construction) would not only save the environment but also make available huge public funds for an alternative public investment programme into environmentally benign technologies. Those technologies could provide jobs in unalienated, satisfying work. The Stuttgart document also contains a financial budget which is totally missing in the Saarbrücken programme. With the halt to public investment into large-scale and environmentally destructive technologies, and a severe cut of military expenditure, the Greens think sufficient financial resources could be mobilised to bring about full employment and to guarantee social service and welfare payments. In addition, the Greens are proposing high taxation for high income groups.

There are two kinds of criticism which have been put forward against the Greens' programme. Firstly, all the main political parties have argued that the Greens' wish to preserve and extend the welfare state is illusionary if at the same time they want to close down a series of major industries. In effect, their programme would remove the economic base on which the welfare state is built. The Greens would thus have to choose between implementing their social policies and pursuing their ecological programme.

The second type of criticism comes from various groups and individuals both in and outside the Greens who are unhappy about the stress on unemployment and social welfare. Some simply feel that the Greens look more and more like a left-socialist party with the ecological element becoming a mere appendage. Others, such as Herbert Gruhl and Rudolf Bahro, point out that the ecological measures required to guarantee human survival would necessarily lead to a sharper break with the present system than that envisaged by the Greens—and that a breakdown of the welfare state would be unavoidable. They thus accept the first argument in principle, but turn it around: precisely because the welfare state can only be preserved in conjunction with watered-down ecological policies, the resolution of the ecological crisis is impossible without the welfare state's demise.

In evaluating the position of the German Greens, one has to note that their programme has attracted support from many different quarters, and that much of the success of the party is due to the fact that it has acquired a broad social and political base. Its tough stand on unemployment and welfare issues has been central to this success, and has meant that unemployed youth and, increasingly, also trade unions, see the Greens as the political representatives of their concerns.

In setting out the three principles of ecology, grass roots democracy, and social responsibility, *The Programme of the Greens* pinpoints the breadth of 'Green' concern. At the same time, there is no question that it leaves a few fundamental questions unanswered. Anybody trying to implement this programme would be faced with some hard choices.

Wolfgang Rudig

*SINNVOLL ARBEITEN—SOLIDARISCH HANDELN: GEGEN ARBEITSLOSIGKEIT UND SOZIALABBAU (Bonn: Bundesgeschäftsstelle Die Grünen, 1983)

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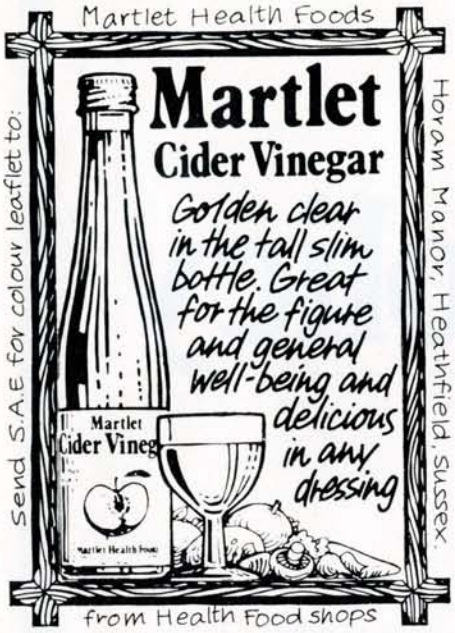

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FIRST ISSUE: January 1984

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