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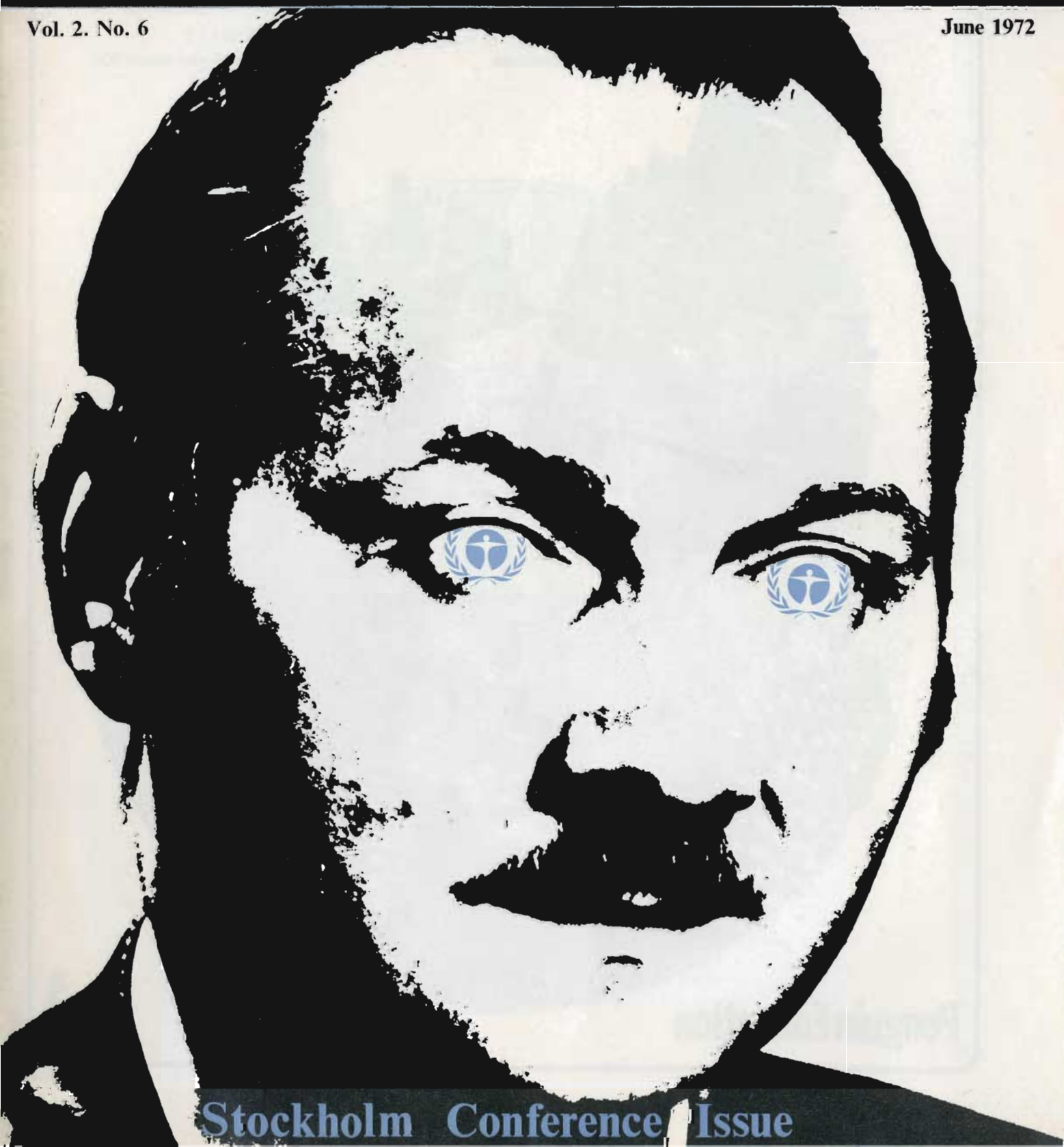
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Ecologist

Man and the environment ■ The Quality of life ■ Pollution ■ Conservation

Vol. 2. No. 6

June 1972



Stockholm Conference Issue

Published in readiness for the United Nations
1972 Stockholm Conference in June

PLANET IN PERIL?

Man and the Biosphere Today

The biosphere is that thin layer of soil, air and water covering the Earth and in which all life exists. Man's impact on this zone has increased to such a point that his short-sighted policies are threatening the very existence of mankind in decades to come.

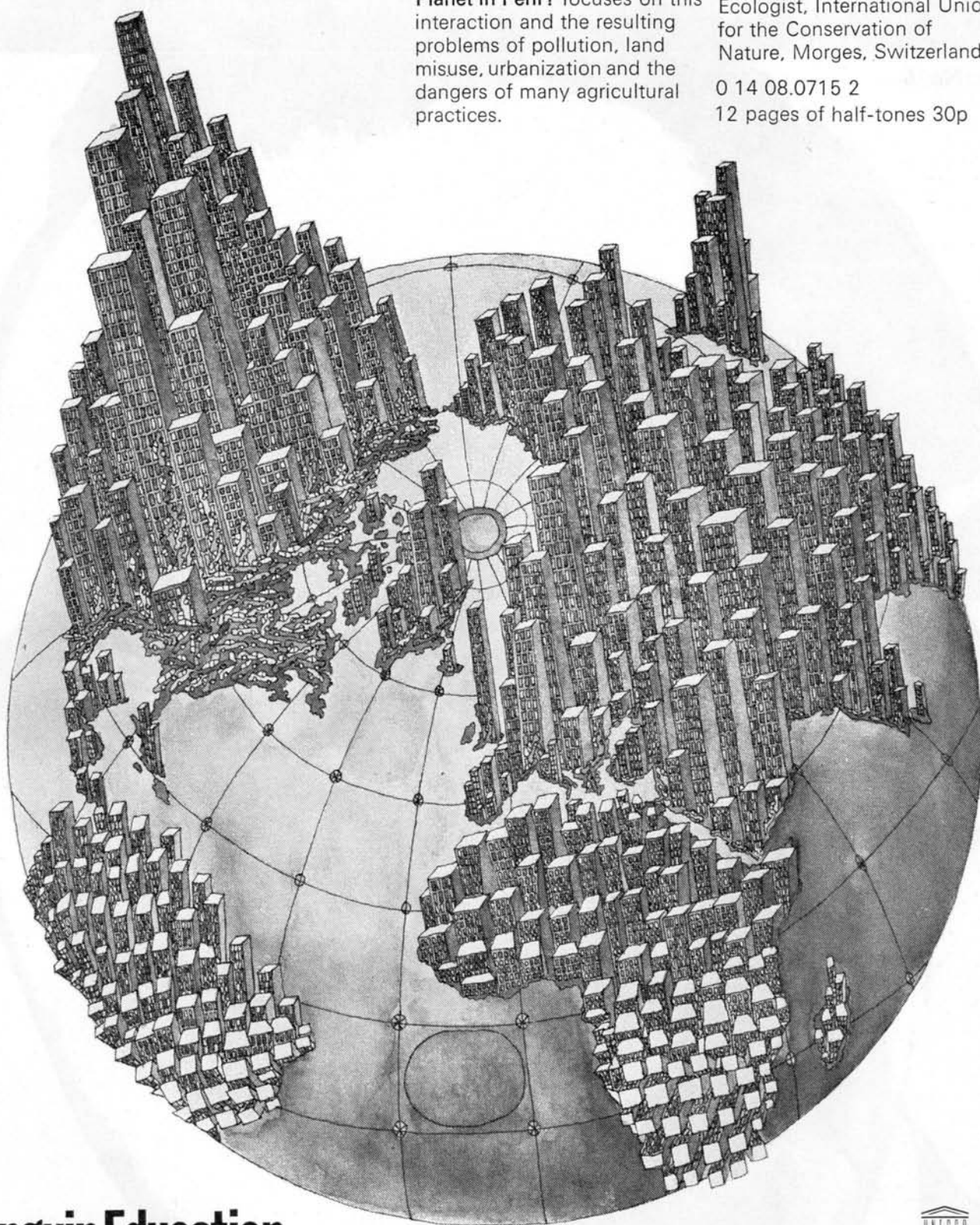
Planet in Peril ? focuses on this interaction and the resulting problems of pollution, land misuse, urbanization and the dangers of many agricultural practices.

Since 1968 the Unesco 'Man and the Biosphere' programme has been studying these problems. The author describes the main work of the programme, in preparation for the 1972 Stockholm 'Conference on the Human Environment'.

Raymond F. Dasmann, Senior Ecologist, International Union for the Conservation of Nature, Morges, Switzerland.

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12 pages of half-tones 30p



Penguin Education



The Ecologist

Vol. 2 No. 6 June 1972

The Ecologist is printed on recycled paper

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Published by Ecosystems Ltd., registered office 11 Mansfield Street, Portland Place, London W1M 0AH and distributed by the Hachette Group, Continental Publishers and Distributors Ltd., 4 Regent Place, London W1R 6BH; Telephone: 01-734 5259; Telegrams: Alibrairi London W1; Telex 25114. Subscriptions to: The Ecologist, 73 Kew Green, Richmond, Surrey. Printed by The Garden City Press Ltd., Pixmore Avenue, Letchworth, Hertfordshire, SG6 1JS.

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RICHARD
WILLSON

Editorial

The Politics of Reality

In nature, the more diverse and complex the ecosystem, the more stable it is. But the man-made world of today seeks political and social stability by the application of technologies which eradicate diversity and complexity.

So far, the imperialism of technology has not succeeded in reducing political diversity. Yet for the first time in the 4 billion-year history of the world, a single dominant species has, amid all its myriad diversities and complexities, adopted a single common goal: the manufacture of an ever-increasing number of life-easing artifacts through the application of saved earnings and technical ingenuity.

To an earth-watcher from outer space, or indeed to some remote, future historian, this sudden homogeneity of purpose might seem as unnatural as if all the oscillating atoms that make up a spoon suddenly decided to oscillate in unison in the same direction, and to cause the spoon to jump off the table. Alternatively, the distant earth-watcher, or future historian might compare man's global drive for economic development to the ordered transportation of the electrons around the spoon's atoms, magically turning the spoon's base alloy to silver or gold.

Somewhere between these two extreme images—the unnatural spasm and the beautiful transformation—lies the “reality” of man's impact on the earth. This “reality” we cannot know; to do so would require an extra-planetary detachment and an extra-temporal breadth of view. So we are destined to argue between the extremes, each claiming his perception as “reality”.

This issue of *The Ecologist* sets one, unconventional and minority view of “reality” against the conventional

majority view. In it the authors of *A Blueprint for Survival* and others examine the documentation that has been prepared by the Secretariat of the United Nations Conference on the Human Environment, and on which the members of the United Nations are asked to base their decisions on international co-operative action to protect the biosphere.

To many readers, unfamiliar with the approach adopted in the *Blueprint for Survival*, these commentaries may appear outlandish, and, of course, “unrealistic”. The alternative solutions pointed to will be described—correctly—as politically naïve. They are, of course, naïve in the political language of Stockholm. But they may be more realistic in the face of the requirements for the continued multifarious and diverse life on our planet.

Every great reforming movement lacked “political realism” until the moment when its time had come. There are signs that the time of the ecologists' view of reality is already near. Though attacked by a number of scientists, the approach of the *Blueprint for Survival* is today being given serious study and consideration by the British Government. On 14th March this year, the Prime Minister announced in the House of Commons that the Secretary of State for the Environment is holding a series of meetings with the authors of the *Blueprint*.

Such official responsiveness should encourage, but it should not mislead. There is still far too little awareness among scientific, academic and intellectual communities generally of the immense gulf between widely-endorsed views of biological and political “reality”.

Stockholm itself represents an important step toward more widespread and deeper awareness of this gulf. Indeed, in the face of the political difficulties which such awareness engenders, and the extraordinary pressures that bend governments toward the partial and the short-term view, the dialogue that has led up to Stockholm may indeed be seen as a remarkable achievement.

Nevertheless, there remains a nearly total mismatch between the goals of present intergovernmental co-operation and the necessary policy objectives for sustainable and stable societies. What stands between these goals and their fulfilment is, in a sense, the social

ecology of man himself, that part of his nature which resists the appeal of the global monoculture.

The move towards the open-ended, technological society, which is almost universally endorsed as a collective “good”, is resisted on an individual basis, because progress toward this goal appears to any one group, class or nation as the imperialism of someone else's values. Thus, while mankind has evolved the single common objective of industrial expansion and materialism, his path towards this unachievable goal is partially blocked by his insistence on cultural and political diversity.

If unending global industrial development is undesirable because it is impossible, we are led to a curious paradox. We must extend international co-operation, not as a means to industrial expansion, but to achieve common policies leading to a state of global equilibrium, which may, in the absence of the centralising impetus of industrial expansion, result in greater international diversity and decentralisation.

To achieve these policies, the common purpose of mankind—his compounded desire to satisfy material need and material greed—must also be re-examined and diversified. Our needs must be fulfilled; our greeds cannot be. Development economists have thought until now—many still think—that we can both have our finite ecological cake and eat it. The message that we cannot is the message that, although need does not necessarily create greed, the reverse is certainly true.

So the world, if it is to co-operate in assuring man's long-term survival, must concentrate not on refining the technology of the few, but in changing the values of all. Social values conducive to stability would set upper limits to greed, just as they would insist on lower limits being defined for need.

Stockholm 1972 will not stand for this. Greed is still accepted as need. Three quarters through the 20th century—at a quarter to midnight—we still treat what is finite as infinite, talking of floors but never of ceilings. But at some future Stockholm, the problem of material greed must head the agenda. If the need to stop greed is not recognised soon—and tackled internationally—some part of mankind may well survive. But he will not be so human an animal.

Introduction:

The Ecologist looks at Stockholm

"The Environmental Crisis has made us aware that the future life and well being of man depends upon the preservation of a healthy equilibrium in the natural systems which provide the essential ingredients for his life: water, air, soil, plant and animal life. These systems are fragile, finite and interdependent as parts of the complex unitary system of interacting relationships which embrace the entire globe."

The Hon. Maurice Strong,
Secretary General of the
United Nations Conference
on the Human Environment.
29th November 1971.

This issue of *The Ecologist* coincides with the convening of the first world conference on the whole human environment in Stockholm, Sweden. On June 5th, representatives from about 130 countries will assemble at the *Folkets Hus* to identify the world's most urgent environmental problems and to seek agreement on actions to deal with them. It has been widely agreed that this United Nations Conference will be one of the most important and best prepared UN Conferences ever held.

The Conference's importance is established by its subject: man's continuing survival on earth. The quality of the Conference's preparation is largely the contribution of its Secretary General, Maurice Strong, an extraordinary Canadian, who, at 42, can look back on a meteoric business career and three years in charge of Canada's official aid programme. Those experiences have proved invaluable to Strong in his Syssiphan task of seeking out consensus and drawing governments together during the 18 months since he took on the job. The end result of Strong's labours cannot, of course, be foreseen. But his energetic approach to the Conference preparations at least seems to have ensured that most of the talking has been done before the Conference, so that Governments when they meet, can concentrate on the details of an Action Plan rather than simply restating well known problems.

Strong's task has been complicated by two separate political schisms which developed during the Conference preparation. The first was inevitable from the start. The industrialised countries, anxious to limit international action on the environment as far as possible to anti-pollution measures, feared that the Conference would turn into yet another platform for poor country demands for further economic aid. The less developed countries, for their part, fear that international measures to curb pollution may prove one more handicap in the already heavily handicapped race for material prosperity.

The second schism which at the time of going to press seems likely to do far more damage to hopes for Stockholm is along the old fault-lines of East-West ideology. Just before last Christmas, the United Nations General Assembly adopted by 104 votes to 9 (with 7 abstentions) a resolution on eligibility for full participation in the Stockholm Conference which included West Germany (on the basis that it is already a member of two of the United Nations—UNESCO and WHO), but excluded East Germany, which is not yet a member of any United Nations body. Ironically, East Germany's recognition and full membership with West Germany in the United Nations, will probably be given this year. But it will be too late for Stockholm.

Meanwhile, the Russians and other East European countries have declared that they will boycott Stockholm if East Germany is not "given full voting status" there. The West (Britain and the United States had jointly put up the General Assembly resolution that excluded East Germany) was adamant that although East Germany could attend and participate, she should not vote.

This issue of membership illustrates more vividly perhaps than any of the other diplomatic evasions of Stockholm the difficulty that sovereign governments have in co-operating toward the essential, common objectives of humanity. Unless there is a last minute *volte-face*, nations representing more than a quarter of the world's industrial capacity (and hence problems of pollution and resource use), will not be present at Stockholm: the diplomatic delicacies of Herr Brandt's *Ost Politik* for the settle-

ment of the "two Germanies" questioned, are seen by governments, including the British Government, as of higher priority than the protection of the global biosphere.

This is, of course a perfect example of the prevailing political force of the specialist or anti-ecological view. It is the "tunnel vision" which sees and tries to deal with all problems as separate issues, and which, if permitted to continue, will lead our planet into irreversible biological degradation. This is why one of the main conclusions of this issue of *The Ecologist* is that the environment is too important a subject to leave to governments alone. Internationally, as well as nationally, there must be new initiatives, new groupings of interests which must prepare the ground for agreement where governments fear to tread.

Other diplomatic evasions of the Stockholm meeting—especially the omission of human population and weapons development, two central environmental problems of the earth today, are chronicled in this "Guide to Stockholm" issue. In it, the editors of *The Ecologist* analyse in depth the documentation which the United Nations Environment Secretariat has prepared for inter-governmental consideration. These commentaries, in general, support the Secretariat's view of the range and depth of the world's environmental problems, but they take issue with the prescriptions offered for their solution. They do so, however, not in any spirit of destructive criticism. In each case there is recognition of the difficulties imposed by political "realism", and in each case constructive alternative proposals are put forward.

The editors hope that the analyses offered here will prove a useful basis for consideration, by *Ecologist* readers, of this portentous environmental congress and its outcome.



Planning and Management of Human Settlements for Environmental Quality

You can't get there from here

This Report provides a very adequate diagnosis of the present crisis in human settlements.

This crisis is correctly attributed to a number of interacting factors, foremost among which is the population explosion, which "...is expected to carry world population close to 7,000 million people by the end of this century. If current trends of world population growth," the report warns, "were to continue into the next century, the already intractable problems associated with population pressure would become totally unmanageable."

Thus the Report explicitly accepts that there is a limit to our capacity to accommodate existing trends, and, what is more, that we shall be approaching this limit within the next few decades.

Rapid urbanisation, the report continues, is making the situation very much worse. Thus "viewed in isolation world population growth figures indicate an approaching crisis. But if they are examined in conjunction with population distribution figures, it becomes clear that the crisis is already upon us."

Urbanisation is proceeding at an alarming rate and "by the year 2000, about one half of the total world population will be living in urban areas compared to about one third in 1960. In the industrialised countries the percentage of urban population is expected to rise between 1970 and the year 2000 from about 65 to 80 per cent, and in the less industrialised countries from 25 to 45 per cent." The Report fully recognizes that the problems this trend is giving rise to are likely to become unmanageable. It could soon lead to a major collapse in many of the larger cities of the world which are already functioning under conditions of great hardship, and will further endanger the precarious existence of human settlements in many parts of the world."

The actual logistics of catering

materially for this vastly inflated urban population may well be beyond our capacity, for, as the Report observes, it "will require building in one generation more structures than have been built in the whole of human history."

Are we likely to achieve this? The Report admits that "for the most part efforts to control growth so that it does not exceed the capacity of urban areas to absorb it have failed." The consequences are "slums and shanty towns, pollution, congestion, noise, unemployment, poverty, the inability to dispose of waste, shortages of water and energy, and biological and general health hazards." If we cannot control the causes of these problems, then we can only expect them to get worse.

The outlook for the developing countries is grim. In South America, one third of the urban population is living in slum conditions and urbanisation is proceeding unabated.

According to Barbara Ward, in 1950, India was short of 2,800,000 housing units. In 1960 this figure had increased to 9,300,000, while in 1972 it had risen to 12,000,000.¹

Even in developed countries the situation does not give rise to much hope. H. V. Hodson writes: "In 1970 nearly 6000 families were admitted to temporary accommodation for the homeless in England and Wales—an increase of 61 per cent over the previous four years.

"In London, where the stress of housing shortage is at its worst, the number of homeless families appears to be rising at a steady rate of 13 per cent a year. The capital city... is short of between 150,000 and 200,000 family homes.

"Thus for millions of our fellow citizens of the so-called affluent societies, in respect of housing, past economic growth has been a mockery and future economic growth holds out little hope..."²

One would suppose that if any

country were capable of solving its housing problem it would be America. Not only is it the richest country in the world, but urbanisation is not occurring there anything like as rapidly as it is in many developing countries. Yet America is also fighting a losing battle.

In 1969, 1.9 million housing units were built as against the national goal of 2.6 million set by the Housing and Urban Development Act of 1968. According to conservative forecasts housing will have to be provided for another hundred million people in the next thirty years, in addition to the replacement of something like half all existing units. In the meantime, much of the building is already so badly designed and the communities whose physical infra-structure they provide are so crime-ridden that something like 20,000 housing units are being abandoned every year.

Indeed, the social problems involved are likely to be equally intractable: "...shelter is not enough...", the Report admits, "...The vast increase and migration of peoples represents one of the largest single causes of misery, insecurity and communal upheaval ever experienced by the human species."

At this point one might ask why urbanisation is occurring. The reasons are reasonably clear. First, as a result of the population explosion there are more people than can usefully be employed on the land, a tendency that is aggravated by the introduction of labour-saving agricultural machinery. Secondly, it is often official government policy further to accelerate this process in order to develop the bigger farming units required if per capita output is to be increased, and the "standard of living" is to be maximised. This is the essence of the Mansholt Plan adopted as the official policy of the European Economic Community.

Thirdly, the financial surplus from small-scale agriculture does not permit

participation in the modern pattern of consumption with its increasing emphasis on capital-intensive goods and services (motorcars, modern conveniences, holidays abroad, etc.).

Twenty-five years ago the average Frenchman spent as much as 60 per cent of his income on food. As France has become industrialised, this percentage has fallen. In the United Kingdom, it is as low as 15 per cent, and the food thereby acquired is increasingly produced by capital-intensive methods. This trend can only give rise to further urbanisation, as it is chiefly by seeking employment in large industrial centres that the rural population can hope to obtain the necessary financial surplus.

Planning

Since, as the Report implies, we are failing to accommodate existing urbanisation trends, the only sensible solution should clearly be to reverse them.

On this score the Report is fatalistic. One cannot stop progress, it is implied: instead, we must seek to accommodate its side effects, even if, as we know, this cannot in fact be done.

In attempting to do so, the Report suggests that human settlements be planned with a view to achieving acceptable environmental conditions in the following areas: shelter, employment, the fulfilment of biological needs (by which is meant freedom from epidemic diseases, natural disasters; and adequate supplies of water, food, energy and pure air), social needs, (by which is meant education, recreation, social intercourse and privacy) and cultural needs (by which is meant cultural activities and aesthetic values, etc.)

Let us look at each of these in turn, and try to determine whether or not conventional methods, i.e. the accommodation of trends by technological means can, in fact, provide a solution.

In a decentralised society, people are for the most part capable of building their own houses. In many tribal societies professional builders are required only for the chief's house.

Urbanisation is but an aspect of economic centralisation, and the more centralised a system, the greater the degree of specialisation of its subsystems. An increased dependence on specialists requiring remuneration for

their work must reduce the society's capacity to satisfy an ever increasing demand for housing facilities.

Also, as urbanisation proceeds, supplies of traditional building materials are exhausted. Forests are cut down to provide wood pulp, and to free land for agricultural and amenity purposes. For prestige reasons, traditional building materials tend to be abandoned in favour of fashionable, modern ones. In many parts of the tropics, galvanised iron roofs, which are excellent heat conductors, are substituted for traditional roofing materials, even though, as a result, the people that they shelter are condemned to intense discomfort during the summer months. In addition, as the building industry falls into the hands of larger concerns bent on fully exploiting the economies of scale, so must there be a corresponding increase in the capital-intensity of the materials and methods used, thereby further increasing throughput, and further reducing society's capacity to provide its inhabitants with shelter.

This trend is further accentuated by a growing dependence on transport to provide materials once obtainable locally and now manufactured in centralised factories.

Increased specialisation is also contributing to the demand for housing space. Rapoport points out that as centralisation occurs, so "spaces become more separated and differentiated, the number of types of spaces increases. . . . Compare, for instance, the Japanese farmhouse, where living, stabling of horses and rearing of silkworms take place in the same space; or the village or town house, where the same applies to living, shop and workshop . . . with our own use of spaces, and separation of work and living."³ We require vast installations to manufacture the bare necessities of life like food and clothing that were once performed at the family level. Institutions of every type appear necessary for functions previously fulfilled by the family or small community, and the pressure on housing facilities increases proportionately.

This is accentuated by the disintegration of the family unit into ever smaller elements, a feature of the last stages of social disintegration in industrial societies. Mark Abrams writes that in London by 1983 "Of the total 20 million households, nearly a quar-

ter will consist of one or two persons and contain someone of pensionable age; indeed one household in every ten will consist of no more than a man or woman (usually the latter) of pensionable age living alone."⁴

This is reflected in a proliferation of households which leads to the paradoxical situation that, though the Greater London Council says that there will be a million less people living in London in 10 years' time, the housing shortage may worsen.

Thus it would appear that all observable trends are towards an ever increasing housing shortage. What solutions does the Report propose? To expand still further our urban conurbations by trying to build the houses necessary to accommodate such trends. Is this the right answer? Surely it cannot be since, as we have seen, it is precisely because these have been allowed to grow so rapidly that the housing shortage has become so acute.

Employment

The Report's second goal is to achieve acceptable environmental conditions in the area of employment. Unfortunately, unemployment appears to be increasing both in developing and developed countries.

In the former, the problem is likely to be particularly intractable. According to Mr. Wood, Minister for Overseas Development, the working population in the developing countries is expected to increase by 25 per cent in the next 10 years. This means finding 170 million jobs. How do we propose doing this? The answer is by encouraging further economic growth and thus still more urbanisation and centralisation.

At this point we might do well to note that there is no unemployment in a tribal society, nor is there in one dependent on subsistence agriculture for its livelihood. A subsistence agriculturist needs all the manpower he can get—which is why he places such a premium on the large family.

Also in such societies, jobs can be provided at a minimum real cost, i.e. the resources required to provide a job, and the corresponding environmental disruption, is minimised.

Economic growth provides jobs only by increasing the real cost of each person employed. It is only in this way that output per capita can be increased, permitting the higher

salaries associated with an increased "standard of living".

Thus in the United Kingdom today, a projected £27 million iron and steel terminal on the Clyde will provide a mere 200 jobs, at which price this country cannot afford to provide very many jobs.

As the resources necessary for providing capital-intensive employment grow scarcer and the environment becomes ever less capable of absorbing the pollution that such employment must generate, it becomes correspondingly necessary to reduce the capital outlay required to provide jobs.

The Report tacitly recognises that this is possible by advocating the encouragement of labour-intensive industries, but does not follow this line of reasoning to its logical conclusion, as this would imply reversing the trend towards increasing per capita output.

To do so would mean questioning the desirability of technological devices whose introduction into the home, the field, and the workshop have been, and still are, heralded as the incontestable signs of progress.

It would mean questioning the desirability, indeed the possibility, of increasing the "standard of living" as measured in terms of the availability of capital intensive goods and services.

It would mean questioning the need for urbanisation, previously justified on the grounds that it permits the centralisation of economic activity necessary for exploiting the capital intensive methods which we associate with progress.

All these questions we must raise if we are to develop the strategy that will provide full employment on a finite planet.

The Fulfilment of Biological Needs

The third goal suggested by the Report is the achievement of environmental conditions permitting the fulfilment of man's biological needs. This is defined as freedom from epidemic diseases, natural disasters, the provision of adequate water, food, energy and pure air. I shall deal only with the first of these requirements, since the others are dealt with separately in this issue.

The current method of combating epidemic diseases consists mainly in massive spraying programmes aimed at exterminating vectors. At the same

time modern medicine is being introduced, and systematic vaccination is taking place against the principal infectious diseases. Can these methods succeed? It is very doubtful, both on theoretical and empirical grounds, in spite of the very considerable efforts undertaken to this end.

Why should this be so? First of all, industrial society tends towards increased mobility. This favours the transmission of diseases to areas where natural controls have not had time to build up. In this way both malaria and yellow fever have been spreading in modern times.⁵ Dengue was previously limited to Africa but is now spreading to areas where it was once unknown. In the 1950's a new and more virulent form, haemorrhagic fever, was recorded for the first time in Manila and Bangkok. Later outbreaks occurred in India, Vietnam, Laos, Singapore and Malaya. What is particularly alarming is the fact that unlike the classical form of dengue it is lethal, especially to children. Mosquito-borne filariasis is also spreading in an alarming way.

These trends are being favoured by increased urbanisation which gives rise to large concentrations of people living in crowded conditions whose resistance is being reduced by poor nutrition and high pollution levels. Spraying programmes are further increasing these trends: thus the mosquito vector of filariasis, which is not particularly susceptible to insecticides, is in certain areas replacing more vulnerable species.⁵

Large-scale irrigation programmes also contribute very considerably to the spread of infectious disease. As Van der Schalie writes: "Where agricultural projects are based on irrigation, large populations now live in close relationship with stable water systems; snails invade and breed, water-contact and pollution increase, and these, in turn, produce a major upsurge in the prevalence of bilharziasis and, what is probably more serious, increases the worm load of infected persons." Thus "The tremendous, continuing increase in the incidence of bilharziasis is one more manifestation of a biological dilemma: the basic vulnerability of an artificial ecosystem. Disease and suffering for millions of people are a direct outcome of the attempt to control the processes of nature with the

simplistic solutions that modern technology offers in the form of simple, managed ecosystems in place of the intrinsically complex natural systems."⁶

But this is not all. Both by destroying the vectors of infectious disease and by introducing massive vaccination programmes, natural controls are being ineluctably destroyed. Many infectious diseases such as the common cold, measles, chicken-pox are endemic to the western world. Their effects are perfectly tolerable.

On the other hand, when these diseases are allowed to spread into areas where natural controls have not been allowed to build up, they can lead to the annihilation of entire populations, as has already occurred in certain parts of Amazonia. What we are doing is replacing complex, self-regulating controls by simple ones dependent on very precarious human manipulation. In effect we are reducing the stability of the populations vis-à-vis those of the viruses, bacteria and vectors with which, in the long run, they are forced to live.

On purely theoretical grounds, this must lead to an increase rather than a decrease in epidemic diseases and in their depredations on populations.

There are strong indications that this is already happening: Thus, Taghi Farvar writes: "...the resurgence of malaria after a temporary halt in its transmission can entail great risk for the populations involved. For example, 150,000 people died in Ethiopia in 1962 when 'plasmodium falciparum'-caused-malaria returned after a two-year interruption. The disaster was traced to an unforeseen side effect of measures to control malaria.

"The disease had been essentially non-lethal prior to 1960 due to the natural immunity of the population. This kind of immunity exists in most chronically exposed populations as a defence mechanism, which is a response to a constant parasite challenge. A year or two without the occurrence of reinfection is sufficient to destroy the immunity. Attempts at chemical eradication of the mosquitoes temporarily decreased the transmission of malaria but at the cost of the natural immunity of the populace."⁷

Populations deprived of their natural controls against infectious

diseases are becoming ever more dependent on artificial controls. They become "hooked" on DDT, vaccines and antibiotics. An example is Ceylon, where, after a 15 year spraying programme, WHO announced that malaria had been completely eradicated. However, no sooner had spraying ceased than there was a veritable epidemic—over a million cases, and a SOS had to be sent out for vast supplies of DDT.

To make things worse, insects are gradually developing resistance to DDT and such poisons. Those not completely immune require for their control ever greater doses involving ever increasing expenditures.

The sheer logistics of the problem of combatting infectious diseases by technological methods must provide a limit to their applicability. Thus there are 11 million cases of leprosy a year, and though a cure exists for this disease we are making little headway against it. This appears to be but a question of logistics: the resources required to treat all new cases in the rural areas of Central Africa where it is prevalent are simply not available.

This brings up perhaps the most important issue of all: what happens if the resources required to maintain our present commitments cease to be available? And let us not forget that last year the United States Senate threatened to cut off its aid programme to developing countries. What happens when, as pressures grow in the US on diminishing financial resources, the Senate makes good its threat? What happens if WHO is suddenly deprived of financial support, and let us not forget that the United Nations finances in general are very shaky indeed? What happens if fossil fuels and other resources required to permit the implementation of our disease-control programmes cease to be available? In the light of present global trends it is but a question of time before this occurs.

The answer is that entire populations increasingly dependent on artificial controls will be condemned to virtual annihilation by diseases against which they have been deprived of all natural protection.

In fact the engineering approach to the solution of the health problem is scientifically unsound. Its use should be limited to the control of a very limited set of diseases, whose effects

are particularly intolerable, and then only when there is a fair chance that such efforts are sustainable into the foreseeable future. In the meantime, efforts should tend towards increasing resistance to diseases, and this means, above all, introducing those basic environmental conditions: the availability of fresh water, fresh air, unpolluted foods, upon which human health really depends.

Such conditions are ever less available as our society becomes progressively more industrialised. It must therefore mean rejecting industrialisation as a prime objective and developing decentralised, rurally-based societies which are the only ones likely to remain stable, i.e. in which major discontinuities can be avoided.

Natural Disasters

Floods, earthquakes and other natural disasters are other discontinuities which can only be eliminated by increasing ecological stability. The engineering as opposed to the ecological approach to the avoidance of disaster has been conspicuously unsuccessful. The building of barrages and dams for flood control has usually given rise to ecological and social side-effects, in which the costs have outweighed the benefits.

Attempts to reduce famine by the industrialisation of agriculture are backfiring (see Peter Bunyard "Resource Management" elsewhere in this issue).

Our understanding of seismological phenomena has not, so far, been sufficient to predict the occurrence of earthquakes in time to remove populations from the affected areas.

On the other hand, there is every reason to suppose that the ecological approach to these problems would yield far more positive results. Thus it can be shown that many of the natural disasters that the Report is concerned with are not natural at all. Floods tend to be caused by deforestation, and the restoration of natural forest cover would do more than anything else to prevent them. Such a measure, if associated with the expansion of labour-intensive forest industries, would have the additional advantage of not causing unpleasant social and ecological side-effects.

The Bengal flood was responsible for the death of approximately half the people killed in so-called natural

disasters in 1970. The Delta of the Ganges is an area notoriously susceptible to floods, which throughout history have occurred at regular intervals. It is only in recent times that this area has been inhabited to any appreciable extent. Without the present population density as the result of increasing population pressure the death toll would have undoubtedly been considerably lower.

The Report cites the devastation caused by earthquakes. It fails to mention, however, that while it is difficult to isolate the cause of each individual earthquake, there are serious grounds for believing that large scale technological interferences are giving rise to earthquakes on a scale that has not yet been gauged. The explosion of underground nuclear devices has probably already given rise to earthquakes, as has the building of man-made lakes associated with large-scale irrigation schemes. Thus something like 50 to 60 local earthquakes are said to have occurred as a direct result of the building of the Kariba Dam.

It is surely only reasonable to desist from the sort of activities likely to give rise to floods and earthquakes, rather than employ dubious methods and commit even scarcer resources to reducing their impact on populations and ecosystems.

Once more we must conclude that the only sensible course of action must be to reverse present trends rather than persist in a vain attempt to accommodate them.

The fourth and fifth goals that the Report suggests that we set ourselves is the achievement of acceptable environmental conditions in the area of social and cultural needs. I shall deal with these together, as in terms of a functional (and hence ecological) analysis, they are indissociable; culture being but a mechanism developed to ensure the control of a social system—to guide it along its optimum course, that which will maintain it in a stable relationship with its environment.

It is increasingly accepted that the level of human misery can be gauged in terms of certain pathological manifestations, such as crime, delinquency, drug addiction, alcoholism etc., which appear with the disintegration of social structures. The satisfaction of man's social and cultural needs would thus consist in creating the con-

ditions in which these manifestations would be reduced to a minimum.

Let us look more closely into the principles involved. As I have written elsewhere,⁸ it is a feature of all natural systems, including social ones, that they develop by differentiation, which means that at each stage the functions previously fulfilled in a general way become fulfilled in a more differentiated one. The new parts that ensure this extra differentiation have thus come into being for a specific purpose, for which, in the case of social systems, they have been designed genetically and culturally.

Differentiation occurs because environmental challenges require it, or, more precisely, because a system must become more differentiated if it is to remain stable in the face of new environmental challenges.

On the other hand, once these challenges have disappeared, the extra differentiation is no longer necessary and the parts developed to ensure it become redundant.

It is this "redundancy" that must give rise to human misery, which simply means that a man is happy in the fulfilment of his natural functions and unhappy when his social and physical environment renders their fulfilment impossible, i.e. when he has become redundant. Thus a man needs to drink, eat, walk, work and struggle (and the last of these activities is by no means the least important).

He needs to court his mate, marry her, love her, protect her and provide for her. She in turn needs to be married, loved, protected and provided for. She also needs to work so as to provide a warm and aesthetically pleasing home. Both of them need children and they in turn require all these things which, in a stable society, their parents obtain maximum satisfaction in providing.

The small community

But a man is not only a differentiated member of a family but also of a small community. I say small, because there is an optimum and also a maximum size for any system including a social one. When this is reached, a system can only continue to grow by associating with other systems at which point a new level of organization is said to have been attained. The maximum size of any system is largely determined by the

extent to which the bonds holding it together can be extended.

A community appears to be held together by a set of bonds that are but extensions of those which hold a family together. Malinowski⁹ was the first to show that no other bonds can be exploited for this purpose. In each different culture the members of a community are unconsciously classified in terms of the way they are associated with the different members of the family—hence the elaborate kinship terminology developed by primitive societies. Unfortunately these bonds cannot be extended to include more than a very small number of people. It is for this reason that a stable community is made up of countless small groups or associations that are closely interwoven with each other.

Thus, in a primitive society, a man is at once a member of a maternal and a paternal kinship group. He is also probably a member of an age grade, of an economic association of some sort, of a secret society, of a military group etc. It is his position as a member of each of these groups which provides him with his "status" or identity as a differentiated member of his social system. In an unstable society whose social structure has disintegrated, he has no such identity. He is lost in a vast anonymous mass of humanity. It is this lack of identity which is normally referred to as alienation: it is that terrible feeling of loneliness when surrounded by a vast number of people that is so much worse than loneliness in a desert. It is when a society grows too fast or its mobility increases in such a way that the bonds do not have time to develop, that its essential social structure breaks down, that development occurs by multiplication rather than differentiation and that alienation inexorably sets in.

To combat the symptoms of human misery by technological means is a vain pursuit. America spends something like \$20 million a year in crime control, i.e. on burglar alarms, armoured cars, etc., and to little avail since the crime rate is still increasing exponentially. At the same time, the only method our politicians have devised for combating poverty in industrial slums is by continually increasing welfare payments of all sorts. These, too, appear to be counter-

productive.

Poverty is not just the deprivation of material goods, it is above all a state of aimlessness and demoralisation, caused by social deprivation. It appears to be a concomitant of industrial growth and of political and economic centralisation, and cannot, therefore, be combated by technological means.

Those responsible for the design of human settlements must not plan for an inevitable oecumenopolis. If it is inevitable, then there is no hope for man. Instead, they must design shelter and settlements that can provide an appropriate physical infra-structure for healthy human communities.

This they cannot do by working "in vacuo". They must learn something of man's psychological and social requirements as well as of his basic physical needs. Only by studying this cross-culturally will they realise that healthy villages, towns and cities are not just conglomerations of housing units arranged in that pattern that will facilitate transport, and otherwise contribute to capital-intensive economic activity. They are much more than that: they provide the infrastructure of complex and very delicate social systems.

Rethinking their shape, their size and their design must be part of a conscious programme to subject short-term utilitarian considerations to the wider requirements of social and ecological stability. Without such a programme there can be little hope for man on this fast deteriorating planet.

Edward Goldsmith

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Comments on Transport Aspects

A Wasted Opportunity

"Transport and communications have emerged as the vital factors in land development in and between all but the most primitive settlements."

One cannot but agree with the opening to the transport section of this paper. Transport is indeed vital. And the problems it poses are of fundamental importance for the survival of human settlements.

Transport is a key element in the moulding of urban forms. The size and shape of a city are related to the modes of transport available to its inhabitants. Los Angeles could not be as it is today without first having had its railways and now that they are gone, its elaborate system of freeways and a population affluent enough to afford a high level of car ownership. The older cities of England are shaped by the fact that over most of their history the only way of moving about them was on foot. York, Bath or London can never be adapted to the motor car. They can only be gradually destroyed and replaced with something different.

If transport, therefore, is showing signs of disorder; if it is seen increasingly as a destructive and negative influence rather than one that enhances city life; if its modern expression is at the expense of the values of civilised urbanity, then something is deeply wrong with our cities. There is an incompatibility between form and function. Transport is the movement of people and goods: it is the essence of urban functioning. It is the circulatory system of the city. If the transport system becomes malignant the whole urban body is at risk. Unfortunately this is the state of most of the world's major cities today.

Treatment of symptoms is notoriously suspect. By concealing the real virulence of basic disorders it allows them to worsen beyond cure. Improve-

ment of the pollution characteristics of exhaust fumes, reduction of noise levels, creation of pedestrian streets as suggested in this paper are admirable in their way. But they are no more than the treatment of symptoms. The real causes are rooted deep in the attitudes and policies of modern planning. It is these which need to be extirpated if any true cure is to be found.

Commercial Efficiency

Modern planning policies stimulate two, at first sight contradictory but in reality complementary, tendencies: concentration of facilities and urban sprawl. Encouragement is given to comprehensive development schemes which, in the interests of commercial efficiency, concentrate shopping, recreational and other facilities. This leads to their elimination at a local level and the eventual disappearance of local communities. It increases car ownership and car use. It breaks down any sense of place and community identity. Those able to afford it begin to drive everywhere; the poor, unable to drive and left without facilities, drift into ghettos and slums.

Urban sprawl follows. Because people will be committed to driving wherever they live, it matters less and less where in fact they live. The suburbs spread amorously around the city. High roads and village centres, the remaining areas of character are gradually destroyed to provide traffic facilities for the ceaseless movement of those who live nowhere.

Modern planning does not even regard this as a disadvantage. A steady and limitless increase in mobility is its guiding principle. And it envisages no practical limit to this process. Britain, for instance, is expected to cater for 35 million vehicles, three times the present level, by the end of the century. The absurdity of

this does not seem to shake the planner's faith in his desire to maintain current development trends. He remains immune to any suggestion that there will be problems of resources, that the quality of life will be affected, that there is a limit to the amount of traffic our beauty spots and coastal resorts can take without being destroyed. In his simple world mobility is all and it must be increased.

An example may be taken from the planning of London. In the elaborate calculations of the London Transportation Study, which produced the proposals for the Ringway system of motorways, increased movement, *whatever the reason for it*, is counted as a benefit for Londoners. It appears on the credit side of the balance sheet that is drawn up to justify the motorway proposals.

Centralisation

The demand for transport is largely the result of the apparently inexorable tendency towards ever-increasing economic centralisation. According to our present system of accounting this is justifiable on economic grounds. However, if the resulting transport costs were taken into account, there would be less economic justification for replacing the workshop by the factory, the village store by the supermarket. Not only do we fail to regard transport as a cost, but we are actually taught to consider it as a net gain. If, for instance, some centralisation maniac, in the interests of economies of scale perhaps, managed to concentrate all the lavatories of Greater London at a central point so that everyone had to travel there and back a couple of times a day, the resulting travel would figure as a benefit to Londoners. Obviously it is not a benefit of any kind. The whole crazy arrangement would be to the manifest disadvantage of everyone.

Nevertheless, because of the basis on which London's traffic is planned, the planners would solemnly count every such journey as a benefit.

The example is extreme, but then so is the disorder in our cities. It is rooted in the planning system which sees increased movement, however forced by necessity or trivial in intent, as an absolute good and a measure of increasing well-being in a community. It may not have led us yet to the great central lavatory; but we have strategic shopping centres, hypermarkets, leisure centres and so on, either with us or on the horizon. All of them mean a loss of local communities, increased car use, pollution, road deaths, motorways and cities sprawling ever further across the landscape.

There is a need, an urgent need, for a radical revision of modern planning policies. New, comprehensive and realistic planning criteria need to be substituted for those in operation today. They will not include such impossible and self-defeating objectives as universal mobility. Nor will they direct planners on courses which patently lead to a destruction of the physical and sociological structure of urban existence. The new policies will have as their criterion of success the well-being of human beings rather than the sum total of iron on wheels kept in motion. Because of this they will involve a break with the conventions of the past. They will require a patient and possibly painful re-education of professional planners and public alike.

Conventional Planning

Unfortunately nothing of the kind is attempted in this paper of the Secretariat. The level of discussion is entirely that of conventional planning, albeit of a conscientious kind. The depredations of highway engineers are acknowledged. There is a growing awareness of the total failure of current methods to do anything except make the situation worse. But the reaction is to question the details, to look for palliatives, to improve the implementation of current plans, but never to question their basic assumptions or overall applicability.

The same myopia manifests itself in another way. Hurricanes, floods, tidal waves, earthquakes, volcanoes take an appalling toll of human life in the undeveloped areas. Urban settlements are particularly vulnerable because of

their concentrations of population. The paper points out: "Latest figures indicate that one million people died, directly or indirectly, from natural disasters during the last decade" and gives over a whole annexe to detailing the measures which should be taken to prevent or mitigate the worst effects of natural disasters.

This concentration on the effects of natural disasters is partly the condescension of the developed countries towards the underdeveloped that sees in their disasters something worse than their own. But it stems more from a genuine blindness as to what we are actually doing in the cities of the developed world. In the same decade that natural disasters, directly and indirectly, claimed their million victims, one and three quarter million* people died as a direct result of motor accidents. Overwhelmingly this carnage was a feature of life in the developed countries but the authors of the paper have completely failed to see it or note its significance.

A man is as dead beneath the wheels of a truck as he is engulfed in a tsunami. Of course we should make available to those less fortunate whatever skills we have in mitigating the worst effects of natural disasters. But we should look closely at the transport systems we have developed for ourselves and recognise that they constitute a man-made and continuing disaster without historical or natural precedent. We serve the underdeveloped countries ill if we pretend these systems we hold up for emulation and even give aid and advice in installing are anything but bringers of death and destruction on a scale that dwarfs the worst of nature.

Mobility and Slums

The old ways of urban planning have led us to the edge of disaster. In the smell and noise and dirt and danger about us we see the result of allowing them. In the devastated hearts and malignantly sprawling suburbs of America, in the crime, fear and social disorder of contemporary urban life, is the achievement of current planners and the incarnate result of the plan-

ning values they hold. They have believed in mobility as an end in itself, a gain for society whenever, wherever and wherever it occurs. We must turn that philosophy on its head and look to the quality of existence and the true needs of people in cities. For a start we might well define mobility as an index of disorder, a measure of the extent to which people and things are in the wrong place.

It is not just the environmental quality of urban settlements, it is their future existence which is at stake. Increasing levels of traffic will worsen the situation. Even the present levels cannot be sustained.

Moreover, we must never forget the question of resources. The evidence points incontrovertibly now to rising fuel and energy costs for as long forward as anyone can see. There is unlikely ever to be anything as cheap and plentiful as oil. And we are running out of oil. The next few decades will see profound changes in its availability and price. A city depending on cheap transport for its existence will find itself facing difficulties of a fundamental kind.

We must begin, now and as a matter of high priority, to reduce traffic levels both in and between our cities. This implies a total transformation of the planning ethos. Anything which increases the need for mechanical transport in a city must be seen as representing a failure of planning rather than a benefit to the community. We have a choice between devising methods by which we can achieve this in a controlled way and pretending urban problems will go away if we dab vaguely at their symptoms. The problems certainly will not go away. The ultimate reckoning, if we continue with present policies, is certain. Deluding ourselves it will not happen will only make it that much more painful.

The UN is uniquely qualified for radical investigation of urban problems on a global scale. It can be above the prejudice and vested interest of planners in individual countries. It could employ the men of talent and the men of vision able to break free of the sick, tired, discredited planning doctrines of today. This conference paper was an opportunity to be bold and radical. We are all the worse for the fact that it opts entirely for the timid and the conventional.

Gerald Foley

* The UN Demographic Year book for 1969 gives motor accident statistics for the latest year they were available from each country. Figures for 1966, '67, '68 indicate a world motor accident death rate of about 188,000 per annum.



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Hamish Hamilton

Environmental Aspects of Natural Resource Management

Planet-Eating

While it is heartening to see the UN Secretariat's Report on the *Environmental Aspects of Natural Resource Management* showing such an all-round awareness of many of the major environmental problems, they have been quite unable, it seems, to jump to any proper conclusions as to how the problems are to be solved.

In essence the Secretariat's recommendations are the same as those proposed by Jeremy Bray in a recent Fabian Pamphlet *'The politics of the environment'*, in which he calls for a pollution control service to monitor the environment as well as to recommend standards for controlling industrial effluents, and for a study of all strategic resources—with recycling and diminished consumption in mind. Like Anthony Crosland before him he is convinced that "the continued growth of GNP is needed to meet the human needs in all nations, including provision for a rapidly expanding population for the next 50 to 100 years."

Not much wiser than Dr. Bray, the UN Secretariat does consider "the possibility of redirecting or modifying growth itself", but then goes on to counter this sweeping generalisation by proposing that the objective of slowing down the rate of growth of energy consumption—which is closely associated with higher levels of economic development and material well-being—"should in no way be applied in a manner which would slow development in the majority of nations still requiring more energy."

Developing Countries

While this last statement is undoubtedly a sop to persuade the developing nations that the chest-beating environmentalism of the industrial nations is not a plot to exclude them from their share of the cake—and Brazil has already expressed itself

bitterly on this point—it indicates a clinging to a system that is no longer viable and is, according to Dr. Sicco Mansholt, President of the EEC Commission, on the way to local collapse. The point is, and it obviously has to be emphasised over and over again, long before the developing nations will have achieved a level of development anything like that of today's industrial nations, many of the strategic resources they will need for this development will long since have run out, despite 100 per cent recycling (were that possible). And with such growth there's every reason to believe that worldwide pollution and degradation would occur on a hitherto unprecedented scale.

By trying to appease the developing countries' avowed desire for growth at any price and the industrial nations' total commitment to growth, the Secretariat has got itself entangled in conventional strategies which are totally unsuitable for the problems in hand. Thus, although its appraisal of the environmental problems is not all bad, it has not suggested alternatives to the present life-style of the industrial nations. Instead its recommendations are a green light for governments to continue their growth policies so long as they clean up and monitor as they go along. A typical recommendation on mineral resources, for example, is that "countries should develop land-use regulations that will permit mineral extraction, and subsequently mined-land reclamation, prior to the advent of other economic activity that would preclude mining, except for those cases where mining would destroy other resources deemed to be of greater aesthetic, cultural, or economic value." Apart from positively encouraging mineral extraction this awkward statement would seem to allow for every expediency.

In effect such a recommendation is

unbelievably naive; for if growth is encouraged the pressures on governments to extract minerals, even from protected areas such as the National Parks of Britain, will be exceedingly high once resource shortages become serious. According to Anthony Tucker in the *Guardian* (April 11, 1972), the Department of Trade and Industry has approved 66 out of 100 applications for mineral explorations in north Wales, north-west England and west Scotland: all scenically beautiful areas. If Britain, with a Department of the Environment, can be so heedless of the aesthetic qualities of the areas in question, what can one expect from developing countries where aesthetics are likely to figure a long way down the list of priorities? And, as Anthony Tucker states, "mining is transient, yet irreversible. Like a deep wound, it leaves a scar which may be fearful or tolerable depending on the nature of the wound and on the skill of the treatment." Moreover, as resources are depleted and mining companies turn to poorer and poorer grade ores the scars they will leave behind them will become more and more indelibly inscribed on the landscape.

With today's pressure of population bearing down on the globe it's obvious that agricultural land is a most important resource. But what is the best way of using it? The UN Report has again steered a perilously compromising course; for on the one hand it points out that a highly mechanised and industrialised agriculture is resulting in all manner of harmful side effects, including soil breakdown, fertiliser run-off, and waste disposal problems, while traditional agriculture "has long been a major factor in maintaining and improving local natural resources and the environment"; and on the other it claims that agricultural development

has resulted in "immeasurable benefits" resulting primarily "from the use of higher-yielding varieties and breeds, fertilisers, pesticides and other agrochemicals, improved land-use planning and management practices and, in some areas, better supply of irrigation water and changes in land tenure systems . . ."

Having said as such about modern agricultural methods the Secretariat then recommends governments to pursue policies which will lead to sound agricultural practices. Research comes first, of course, followed by an intensive programme to recycle farm wastes, to replace pesticides wherever possible with biological control methods and to implement methods that "conserve" the soil. "Farmers", the Report says, "should be trained in the safe use of pesticides and in integrated pest control techniques, including such management practices as proper selection, dosage, and timing and waste disposal techniques. Bodily damage to users might therefore be minimized."

It's quite obvious that the sort of farmer they have in mind bears little relation to the great majority of farmers now tilling the soil throughout the world. And when one takes into account that more than half the world's population is still working the land, the idea that all these people can be trained in scientifically sophisticated techniques is ludicrous to say the least. It would perhaps be a project more worthy of attention if such techniques were proven in the field—in fact the majority of them rarely work to plan except under rigorous laboratory conditions.

Labour and Productivity

The question, and it seems to have been missed by the UN researchers, is how best can the population *still* on the land be employed. The answer is much simpler than many people think, and it derives from a number of careful analyses of the most consistently productive agriculture that there is. Oscar Lewis, for example, studied two methods of agriculture currently being practised in Mexico, very often side by side with each other. One method involved manpower and aside from solar radiation no other input of energy. The other method involved beasts of burden. It is often thought that using a horse-, ox- or tractor-drawn plough increases the fertility of



The new House of Parliament, Stockholm. Photo by Swedish National Travel Assocn.

the soil by turning over a substantial quantity of soil. In fact the opposite tends to be true and usually the highest fertility is carried in the first few inches of topsoil. Thus hoeing rather than ploughing produces the highest yields, all other factors being equal. In his study Oscar Lewis found that "hoe culture yields are equal to the best yields in plough culture and are generally about twice as high as the average yields of plough culture."

The Japanese wet-rice farmers are some of the most productive farmers in the world, and using hoes rather than machines or beasts of burden are able to obtain yields of around 50 bushels per acre. Wet-rice farming in the United States is equally productive but only after large inputs of nitrogen fertiliser and the use of tractors and other machinery. Professor Fred Cottrell, in his book *Energy and Society* has calculated the relative efficiencies of the Japanese and American wet-rice farmers, adding up all the inputs of energy in each case and comparing these figures with the actual yields of rice. The answer, though not surprising, has enormous implications, for it turned out that the Japanese were able to produce their crop three times more efficiently than the Americans—even though Dr Cottrell took no account of the energy costs involved in manufacturing and maintaining the farm machinery, nor in obtaining the basic materials such as iron ore and petroleum oil. Thus the Japanese, relying purely on their

own strictly limited resources, were able to feed the same number of people from a cultivated acre of land as can the Americans depending on huge imports of energy and of other raw materials.

Most hoe-culturists, being poor, tend to get pushed on to marginal lands. Under such circumstances it is hardly fair to compare their yields with those obtained by farmers wealthy enough to use modern intensive methods. But, although their cause has been ignored by agronomists, hoe-culture farmers comprise the greatest single challenge to the green revolution. Indeed, with the same low inputs of energy (but a lot of sweat and toil) the hoe farmer will obtain the same relatively high yields year in and out. By comparison the farmer who resorts to methods involving machinery, fertilisers and pesticides is fighting a constant battle against rising costs, deterioration of soil and diminishing returns. His is undoubtedly an unstable condition.

Green Revolution Backlash

But the green revolution can be indicted on other, equally serious grounds. In India traditionally more than 100 people share, and have been making a living out of, no more than 150 acres. The land is therefore intensively cultivated by hand, aided to some extent by beasts of burden. To turn this land over to modern methods of agriculture can only be done successfully if labour is replaced

by machines, and it is only worth using machines if the acreage is big enough. In *Energy and Society* Professor Cottrell points out that to transform farms in India from their traditional size to farms of no bigger than 25 acres each on average would put 30 million people off the land. And in the 1950s 30 million people would have made up half the total work force of the United States. The conclusion is obvious. To allow the green revolution to take over all the millions of smallholdings of Asia would result in an uncountable number of unemployed and unemployable people drifting hopelessly to the cities. Ironically the resources of fossil fuels and fertilisers are not sufficient on a global scale to permit such expansion of the green revolution, even if its protagonists wanted it.

All the time the vested interests behind modern agriculture are becoming more powerful and spreading their sphere of influence. It therefore becomes increasingly difficult for the small farmer, who cannot compete with either the battery farmers in the industrialised nations, or with the new barons of the green revolution in the developing nations. Ultimately the farmers, whom the Report admits "have learned to live with nature without ever having heard of an ecosystem", are pushed off the land altogether.

If the Secretariat has failed to reach the right conclusions on agricultural resources it is because it did not follow up the social implications of modern methods of farming. Indeed its recommendations would have made more sense if they had been made with the small farmer in mind, in helping him for instance to get a good price for his surpluses, and in advising him how to make the best use of water resources, both for irrigation and for the production of power. Instead, they advocated the imposition of a cumbersome, inefficient and environmentally-destructive agro-industry to fill a role it is incapable of assuming.

Of course the Secretariat is in an impossible position, because on the one hand it is trying to protect the environment and on the other it is tacitly supporting the destructive forces that lead to environmental degradation. The assumption all along, and it applies particularly to the other natural resources studied in

the report, is that by careful monitoring followed up by adjustment, one can have one's cake and eat it. Thus governments are asked "to undertake both basic and applied research for improved forest planning and management," and then to follow this up with "forest policies and planning as part of an overall policy for the rational and integrated use of natural resources."

From its report it's obvious that the Secretariat appreciates the value of forests in sustaining a healthy environment. But how, if they support growth, especially in the developing countries, can they expect their recommendations to carry any weight? Brazil alone cuts down millions of hectares of trees every year, and nothing will stop that wholesale destruction of a unique resource except an entirely new attitude towards development. And there was no indication of such an attitude in the UN report.

Technological solutions?

Like many people today the Secretariat has taken refuge behind science and technology. All problems can be solved, it suggests, so long as nations subscribe to the concept of "integrated resource management", which simply means that whenever man is set on disturbing one element in the environmental system he is well advised to have first researched into the impact on the remaining components of the system.

Integrated resource management is a lofty concept and even if governments were more than willing to apply it, it presupposes a vast body of knowledge about the environment and the very subtle interactions between its components, whether inanimate or living. For the most part that knowledge is lacking, and even if it were available no two experts would agree as to its implications, until perhaps too late. That is not to suggest that studies should not be made of the environment; quite the reverse. But to imply that monitoring the environment will bring man to his senses is perhaps expecting too much.

Usually, man modifies his behaviour only when the crisis is upon him. And although one must give the Report credit for calling on international and national action to save endangered species, it would be most surprising if it

hadn't done so. Nevertheless one can only hope that the recommendation for a 10-year moratorium on whaling is taken up.

The Secretariat has also expressed concern for wildlife in general and has called for the establishment and maintenance through trained personnel of national parks and similarly protected areas. The intention is undoubtedly good, but with the developing nations—which have by far the greatest heritage of wild species—all scrabbling frantically to get on the growth bandwagon, one wonders how effective the recommendations are likely to be. The memory of the atrocities committed by the Indian Protection Service in Brazil on the very people it was paid to serve is still all too fresh.

The issues are broadly the same for each of the main categories of natural resources discussed by the UN researchers. Thus whether it is agricultural land, forest, water, wildlife or minerals, exploitation will continue, more or less unchecked, while each nation struggles to achieve a standard of living measurable in materialistic goods. But even if development were able to proceed without environmental degradation there is absolutely no guarantee that the global reserves of many of the most important natural resources would be sufficient for bringing the developing nations up to modern standards. All the evidence points to the opposite conclusion. Thus, using such reputable sources as the United States Bureau of Mines to indicate the known global reserves of minerals, Professor Dennis L. Meadows and his colleagues at MIT point out that at the present rate of growth in industry and development throughout the world many of the essential minerals will run out within a very short time, even with recycling.¹ To make their predictions still more disturbing the MIT researchers have estimated the longevity of the major non-renewable natural resources at five times the known reserves. Under such circumstances aluminium will last 55 years, copper 48, nickel 96, petroleum 50, zinc 50, the platinum group 85, etc. With so many vital resources likely to run out before a century has gone by it's difficult to share John Maddox's optimism that ingenious substitution will provide the answer. The editor of *Nature* has, for example, suggested

that when copper runs out aluminium will do instead. A look at the figures is enough to bring one back to earth. And after aluminium? Magnesium from sea water?

Energy

Those who believe that economic growth provides the only solution to the afflictions of poverty, lack of food and basic inequality, are unshakeable in their faith in technology. A favourite argument follows the well-worn lines that man's ability to tap a virtually unlimited source of energy in nuclear power—whether breeder or fusion—will provide him with the means to expand his resources by several orders of magnitude. Sea water can thus be split by electrical energy into hydrogen for fuel and for synthesising ammonia for nitrogen fertilisers; low-grade ores can be used when before they might have been too unproductive; and recycling of resources, in particular of scarce metals, can be carried out on a grand scale.

Even the Secretariat finds itself a little doubtful as to the consequences of pursuing the high-energy society on a world-wide scale and it asks governments with a high per capita use to "consider the opportunities for reducing the growth of energy consumption as one of the alternatives in minimising all the costs—direct, environmental and cultural—of economic development."

Since the protagonists of the industrial society usually request more rather than less energy in the conviction that it "provides the power to progress", any suggestion that there should be a reduction in energy is rebutted in no uncertain terms. But what would happen if all humanity could be elevated to a westernised standard of living. Dr Alvin Weinberg, of Oak Ridge National Laboratory, has done the essential calculations. He estimates that the world will need a total of 24,000 giant nuclear reactors in operation at any one time to get the world up to the "desired level." And once one is up to that level some 15 reactors will have to come into operation each week to replace those that have worn out.

The quantities of water to cool these plants and work the turbines will far exceed the available resources of

fresh water and Dr Weinberg has suggested floating the power stations in "nuclear parks" off-shore. He hasn't discussed what happens to the intensely radioactive derelict hulks, although he does admit there may be problems disposing of the billions of curies of radioactive waste generated each year.

Such a programme will generate huge heat losses to the environment and Amory Lovins, of *Friends of the Earth*, London, reckons that the 60-fold increase in energy use prescribed by Dr Weinberg will raise the earth's surface temperature by 0.3°C. Enough, says Lovins, to melt the ice cap.

The "desired level" of Dr Weinberg is taken as the present United States' energy consumption. The question one has to ask is whether the professed aims of alleviating poverty, malnutrition, and inequality through such a high energy use, have already been achieved in the United States. If they haven't, as hardly seems the case, then it is some evidence that a high-energy consumer society may not solve man's basic problems.

But it's hard to take Weinberg's futuristic fantasy seriously on other grounds. For one thing it takes man perilously close to the limits, and if it seems that the Meadows' analysis of resource availability is too pessimistic, it must be remembered that his figures are based on the premise that the entire world is trying to catch up with the industrial nations. His figures, therefore, are valid, not necessarily today, when such a large proportion of the world is behind in terms of development, but tomorrow, when they are nearer achieving their goal. The goal is thus an illusion—it cannot be reached. Nevertheless the myth prevails that all the fundamental problems of the world will somehow evaporate by means of the enlightening path of economic growth and progress.

It's strange how the growth-protagonists forget that a power-station dependent society will be at the mercy of its technocrats.

Alternatives

In its *Blueprint for Survival* The Ecologist calls for alternatives; in particular, self-sufficient communities. Dr Bray is against such self-sufficiency, as "any attempt at self-sufficiency on the

part of developed countries", he says, "would restrict the growth of the developing countries." History it seems is already proving Dr Bray wrong. Not only are the developing countries finding themselves up against restrictive trade practices and price-rigging, invariably to the advantage of the industrial nations, but the one developing country which has achieved any degree of equality in the face of a rapidly expanding population is China, and it is China's declared intention to be self-sufficient at practically every level of society. "Industrialisation cannot be grafted on to a country like a foreign body", a Chinese official recently said in an interview in the *Guardian* (April 5, 1972). "It must grow within the country at grass-root level." And since he was an official, one must give him credit for expressing the party line.

Some people have challenged the *Blueprint* is for development, and for that it is against development of any kind, and instead advocates a return to a former age. That is not true; the *Blueprint* is for development, and for the use of technology to achieve it, but the development must emerge from the people themselves—at the grass-root level if you like—within the context of readily-available resources, and it must be of a type consistent with the maintenance of healthy self-regulating societies, not of a type that destroys them and leads to the growth of amorphous mass societies. In other words, economic growth must be subordinated to social needs, not the reverse as is the case today.

Unless the UN Conference is prepared to discuss ways and means of achieving this kind of grass-root development, few, if any, of the Secretariat's recommendations are likely to make much difference to the future quality either of the environment or of life in general. One can only hope that some delegates are beginning to see the light. If not, the fringe conference held by the alternative society on the outskirts of Stockholm—with demonstrations of alternative technologies in action—are likely to prove the main attraction in June.

Peter Bunyard

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Identification and Control of Pollutants of Broad International Significance

Canute and the Pollutants

The first chapter of this report gives an admirable summary of man's relationship to the biosphere, and concludes with the warning, "Now, however, large-scale modifications of the biosphere are appearing, within time spans that are crucially brief in relation to the pace of the evolutionary process. The long-term consequences of such man-made changes are hard to predict... Man is beginning to realise that the Earth's ability to deal with pollution is not unlimited, and that the systems that support life are already being overtaxed in certain areas." Early in the next chapter the main causes of the trouble are identified: "the size of the human population, the rate of production and consumption, and the level and use of technology", and the stage seems set for a study of how these causes, all of which lie within human control, are to be dealt with.

Unfortunately, at this point considerations of physical reality meet those of political reality, and come off second best, so that by Chapter IX the report ends on a dying fall with admonitions to governments to be "especially mindful" of activities which might affect the climate, and to use the best (economically?) practicable means for pollution control, with due regard, of course, for possible effects on international trade.

In this sequence, the report displays in somewhat more florid form (since it is an international document) the characteristics of various national reports on the environment. It deserves study, therefore, for exemplary

reasons, and also to determine whether any of its recommendations can be of use when due allowance is made for the limitations under which its authors worked.

Implicit Assumptions

The effect of political considerations on environmental studies is to impose restrictive terms of reference designed to safeguard particular interests from attack; these interests may be material or may consist of value judgements. Since these restrictions are seldom explicitly stated, the reader may be misled into believing that the authors have considered a wider range of possibilities than is actually the case, and that their final recommendations are objective and impartial.

The central assumptions of the present report are that it is possible for the developed countries to continue economic growth, that the underdeveloped countries can eventually develop along similar lines, and that no special priority need be given to halting population growth in either set of countries. Those who have examined the physical implications of these assumptions are becoming convinced that they are inconsistent with a sustainable future on a finite planet. However, since to abandon belief in continued growth would raise divisive issues, technical assessments of the environmental situation are usually distorted, and this report is no exception.

The principal distortion is usually the selection of pollution as the main matter for concern, since at first sight it lends itself most easily to correction

by purely technical means, but it is also possible to direct the study of pollution itself so as to keep off sensitive territory. The following procedures are helpful in this respect. Rather than examine the disquieting global trend of steadily increasing pollution, certain areas (clean air; drinking water free from pathogenic organisms) can be selected, with the implicit or explicit assumption that if these problems can be dealt with, all problems of pollution will similarly yield to technological skill and the growth-orientated politician's art of the possible. Related to this is a belief that all problems can be solved by the application of cures, rather than by tackling the problem at source, and that these can be effected in as short a time as necessary. It is also assumed that the solutions that are applied will not generate equally intractable problems, and that, if in doubt, we should expect the most favourable possible outcome. When it appears that no solutions will be effective beyond some





future date (for example, the provision of food for a growing population), the time scale of the study will be appropriately, if arbitrarily, curtailed. For any problems that survive all these treatments, the final catch-all recommendation remains: more research.

All these devices can be found in this report, and some of its conclusions are astounding. It is assumed, for example, (para. 13) that the developing countries will be able to deal with pollution, as their own industries expand, by "drawing on the experiences of the more industrialised countries", although these have just been blamed, rightly, for the present situation of increasing pollution. The idea that the developing countries will be willing to retard their industrialisation by applying controls that the overdeveloped countries have failed to use beggars the imagination.

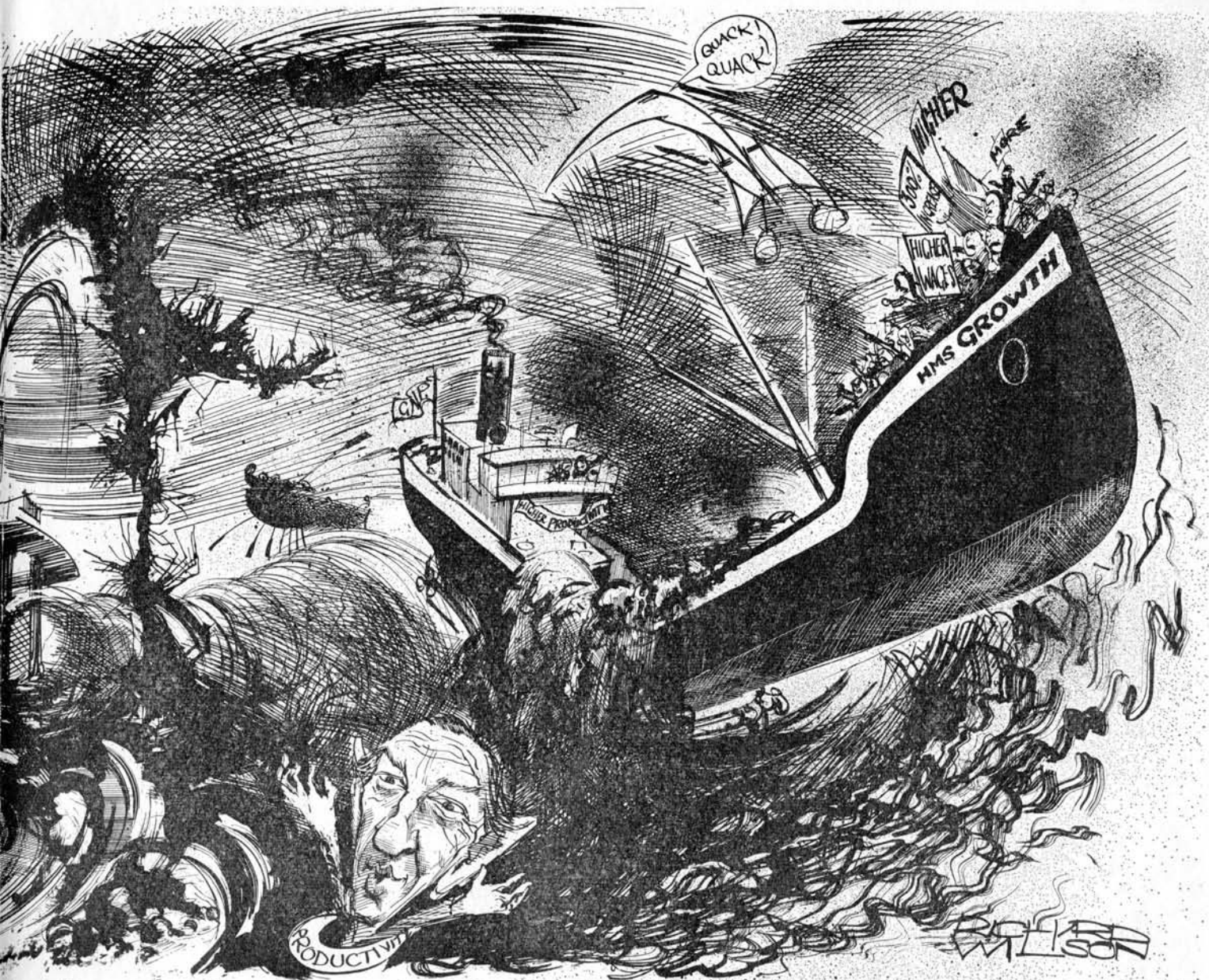
Nuclear Hazards

Equally bizarre is the claim (para. 46) that the hazards of nuclear fission reactors "either have been or can be reduced to very satisfactory levels", the authors presumably having forgotten that earlier (para. 33) "fission by-products, their transport and disposal, will cause increasing concern in the near future." There is, in fact, no presently available solution to the problems of these long-lived wastes, and the MIT report, *Man's Impact on the Global Environment*,¹ expressed grave concern about them. To have been frank on this, however, would have discredited the whole concept of world-wide industrialisation, and to do this would have been, no doubt, politically impossible. Consequently, what may well be the worst pollution hazard of all escapes with barely a mention.

The report is also devious in its

comments on technological advance—another sensitive area. Thus, para. 24 states: "it is important that the awareness of industrial activity as the main cause of pollution should not lead to a fear of technological advance. Technology makes it possible for us to identify many of the more insidious forms of pollution...", yet both the desirability, not to mention the feasibility, of this process still remains to be proved. Technological advance is often used as almost synonymous with expanding industrial activity and the meaning of the passage becomes hopelessly blurred. However, by this time one hardly expects the report to say "Since industrial activity is the main cause of pollution, it should be stabilised, while the technology of pollution detection and control is pushed ahead." This would transgress too many accepted ideas.

In the whole of the first section of



the report, which deals with the physical nature of the pollution problem and the characteristics of the major recognised pollutants, the paucity of our knowledge emerges clearly. We do not have islands of ignorance in a sea of knowledge, but islands of knowledge in a sea of ignorance, and indeed this is recognised by the report. Whether we are concerned with pollution in general (para. 21), effects on climate—"man's activities may add a powerful destabilising factor to the interplay of the natural forces that determine the climate" (para. 44), or effects on the oceans—"...makes predictions about the likely effects of contaminants on the physical, chemical, and biological characteristics of the sea difficult" (para. 54), the picture of the behaviour of *Homo Sapiens* which emerges is one of brute force and bloody ignorance.

How unfortunate, but how charac-

teristic, therefore, that having stated the two possible attitudes to a pollutant (guilty until proved innocent, or innocent until proved guilty), all the report does is to look forward to the debate between them as a "fruitful and essential part of the whole decision-making process..." (para. 18), without emphasising what is at stake.

Externalities

Much of Chapter V deals with economic and legislative matters. The difficulties arising from social costs, or externalities, of economic activity are recognised, as are the major and unsolved problems of incorporating environmental issues into cost-benefit analysis. The really difficult problem of discounting the future, and bringing future social costs or risks into the reckoning, goes unmentioned, and the impression is left that refinements of

conventional cost-benefit analysis can somehow solve present problems of evaluation if sufficient technical skill goes into them. To admit that cost-benefit analyses always incorporate stated or unstated political and ethical judgements would challenge the underlying assumptions of value-free technology. It would thus be completely alien to the spirit of the report. An outraged shout of "Good God, you're talking about whether man survives or not" in this context would sound like a disturbance in church, and would doubtless be dismissed as mere emotionalism.

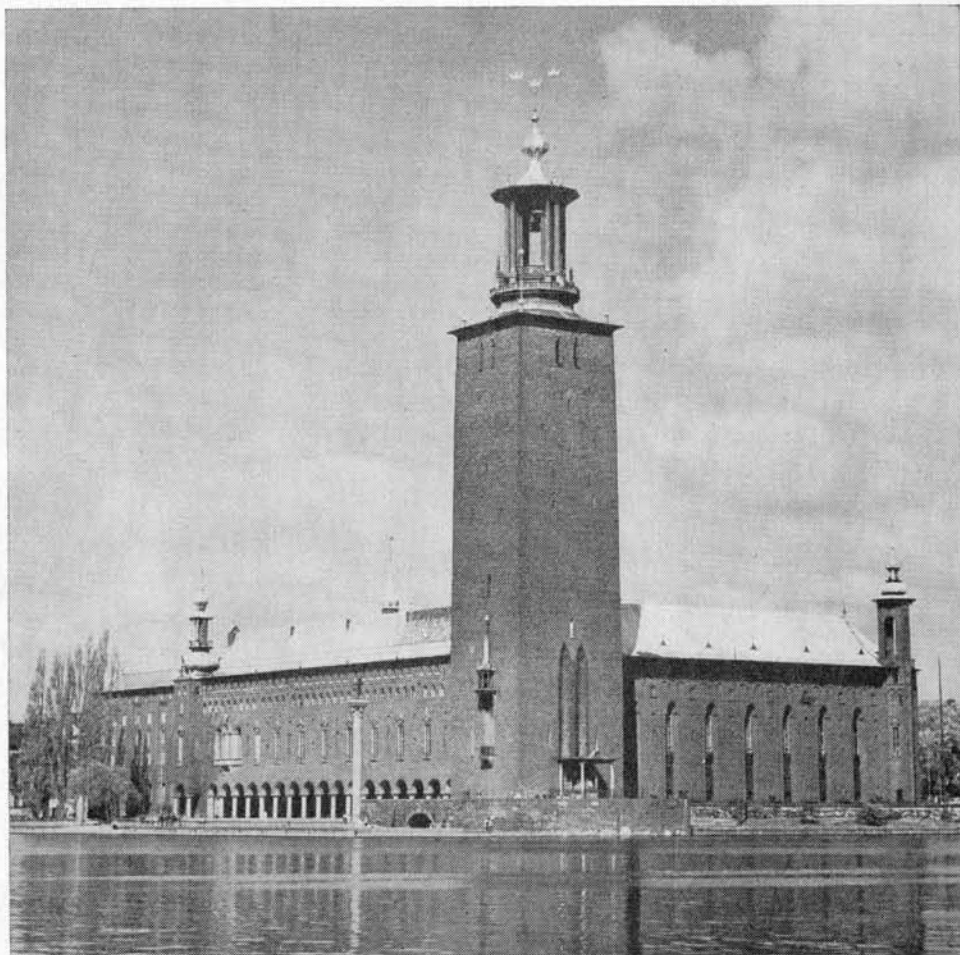
Chapter VI, on international co-operation, repeats the overall pattern of the report, opening with a clear statement of the global problems, and proceeding, *diminuendo*, through increasingly restricted questions of the setting of technical standards and the facilitation of international trade.

The rest of the report is concerned mainly with delineating the areas where action is thought to be needed, with a more detailed account of marine pollution, and with specific recommendations for action. The overwhelming emphasis is on international co-operation in monitoring pollution and studying its effects. Unfortunately, there is no attempt to demonstrate that such studies are conceivably capable of analysing a situation in which the amount and nature of pollutants are changing rapidly, and, having analysed it, producing recommendations for action that can be put into effect in the time available. Granted these changes, as well as the synergism of pollutants and the complexity of the target systems, there is no reason to believe that present or foreseeable techniques will permit effective analysis of effects on human health, the atmosphere, or terrestrial ecosystems, to mention three areas in which studies are recommended. One can only conclude that research and monitoring are preferred to restraints on industrialisation because of their acceptability, rather than their contribution to the solution of the problem.

The final recommendations are of surpassing vagueness. The first one, for example, enjoins governments to "be especially mindful of activities in which there is an appreciable risk of effect on climate, and carefully evaluate the likelihood and magnitude of climatic effects... before embarking on such activities." Would this include burning coal and oil? In general, it is fair to say that all the recommendations could be accepted without change in basic policy and without major expense by all nations. It is hard to believe that such painless measures will suffice to avert the dangers mentioned in Chapter I.

Hope for the Future

Does this mean that the report is useless or worse, and its recommendations irrelevant? Surprisingly, perhaps, the answer is no. In man's present predicament, there are no ways out that do not involve risks and further heavy demands on the resilience of the biosphere. We may not wish to start from here, but we have no alternative; there is a population of 3,700 million (soon to be much more) to get through the next few centuries without disaster, and to manage this will mean



Stockholm Town Hall. Photo: Swedish National Travel Assocn.

developing a whole new spectrum of low-impact technologies. During this time we shall need to know as much as possible about what we are doing to the planet if we are to make the right decisions and leave as many options as possible for our descendants in the millennia ahead.

To do this will need monitoring and other studies, as proposed in the report. Consider one example. If nuclear fission is ruled out on the grounds that it produces wastes needing management for thousands of years, coal (of which there are large reserves) will be an important source of energy. Since burning coal merely amounts to returning carbon to the biosphere after an absence of several hundred million years, there is no intrinsic objection to this. What is needed is to make sure that the release of carbon dioxide is slow enough to allow substantial equilibration with the oceanic reservoir, and to prevent the liberation of excessive amounts of sulphur dioxide, mercury, etc., on combustion. All this will need continuous monitoring and control.

It may just be possible to manage this, and all the other inevitable impacts of technology, if demand is kept

to the necessary minimum by reducing population size, consumption of energy and raw materials, and environmental pollution and destruction. To believe that it can be done if our demands steadily increase, and the size and complexity of effects on the biosphere run ahead faster than our monitoring and research can follow it, is absurd.

The trouble with this report, then, is not that most of its recommendations are wrong, but that they only have any chance of being effective within a context of changed economic and technological objectives. The recommendations for setting up monitoring facilities particularly deserve support—indeed, they do not go far enough—but any impression that they will solve the problems without radical change should be firmly resisted. If this is understood (although one fears it will not be at Stockholm), the report will represent a useful contribution to Man's belated attempts to find out what he is doing to his home.

John Davoll

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Educational, Informational, Social and Cultural Aspects of Environmental Issues

Too frightening for the children?

The elements of a proper appreciation of the difficulties confronting mankind are all stated clearly enough in the first chapter dealing with the need for action: the population element, the social problems generated by the concentration of populations into large cities, the destruction of indigenous cultures, the environmental impact, the external effects of economic projects and even a welcome recognition that the priority given to productivity "leads to the depreciation and even the disappearance of the productive capital itself which in many cases—and this tends to be forgotten—is neither renewable nor replaceable." (45a).

Systems analysis

From this analysis there follow the Objectives of Action which are: to maintain and restore the biosphere; to improve the quality of life; to promote the development of the "whole man", the sense of responsibility and solidarity, and the emergence of environmental ethics. The discussion of these may be summed up in their words: "The ills of the environment are more than the price paid for progress; they are probably the symptoms of a deep seated crisis in the evolution of modern societies." (72), and again: "The achievement of a good environment is bound up with the achievement of greater social justice, of less inequality between men and between nations, and of a guarantee that the dignity of every man will be respected..." (73). It is greatly to be hoped that these fine words will be

applied to hard cases.

So the Report proceeds to consider the means available for carrying these generalities into action, and here we begin with an important statement which says: "Since the environment is a system of relationships all forms of action should be planned on the basis of systems analysis, by interdisciplinary methods—the only means of grasping reality as a whole. This means that a *continuous social diagnosis* must be instituted in order to support essential action..." (74, my italics).

Unfortunately the authors have allowed the last two words of their title "environmental issues" to prevent them from "grasping reality as a whole" in their recommendations and it is the greatest pity that they did not interpret the word environment to mean the whole of reality. Instead they have adopted some unexpressed limitation which excludes such matters as population and resources from their recommendations. In consequence all these are vitiated and blunted by the partial view of reality they feel constrained to take.

What, for example, can we make of the following statement which refers to the developing countries? "There can be no question of limiting economic growth, which remains essential in order to secure for the population of these countries the *minimum of material well-being* that is the first prerequisite of any good environment. It would be unjustified and unjustifiable to urge the imposition of *any limitation whatsoever* on the quest for this well-being on the grounds of dan-

ger to the global environment." (46, my italics). As a protest against the present grossly inequitable distribution of wealth this is understandable; but it does not fit in with the systems approach. If some particular minimum of material well-being, which is otherwise thought to be desirable, is shown by the analysis to cause one of the critical environmental problems referred to in *Man's Impact on the Global Environment (SCEP)*¹ to become acute then it will be excluded precisely because it would endanger all material well-being. Thus the two passages in italics conflict. But what is more serious is that their partial view of reality prevents the authors from saying that population and resource depletion are much more obvious limitations on, "minimum material well-being."

Cultural Parameters!

The continuous social diagnosis is "to progress towards the establish-



ment of economic, social and cultural indicators as an aid to the planners and developers in their efforts to take into account the necessities of the environment." Very properly they admit that some indicators may not be quantifiable and we naturally turn for help about the nature of those that are to the precise recommendations for national and international action. Here, however, the language is defeating: "The setting of standards and criteria for the quality of life, after a forward looking study, *inter alia* by enquiry, of the socially desirable minima for certain social, economic and cultural parameters and indicators of the environment." (para. 110). Some cultural parameter must have slumped badly when that was written! So we still don't know what these parameters may be or whether they will be of a kind that will be useful to any proper systems analysis. What is far more important is that we still do not know whether the authors accept that the carrying capacity of the land, the finite nature of national and global resources, and population projections should be among these parameters.

The output of the continuous social diagnosis together with outputs arising from the other five reports are to be fed into an International Referral Service which is thought of as an extension of the International Computing Centre at Geneva, and it is much to be hoped that these other information flows will make good the deficiencies noted above. The impression gained on reading the recommendations is that the Service will act chiefly as an information bank. It is crucial that the Service should be much more than this and should be organised to make possible that kind of analysis of the information which will produce a global picture with some predictive power. As the MIT work has shown, the need for continuous and more precise work of this kind is urgent and the UN would be a suitable body to organise it. Much as we may feel the limitations inherent in computer procedures, it still remains an essential means of identifying the limits of growth, of testing what solutions are possible and of discovering what time we have in which to adopt them. Any policy which fails to recognise the strict limits to material growth is potentially disastrous. Thus another look needs to

be taken at this whole business of collecting the right information and making the best predictive use of it.

Education

Some very pertinent things are said on education: "Again, since the environment is a system of complex relationships involving a wide range of factors, teaching it should lead, not to the establishment of yet another discipline, but to the pluridisciplinary approach which teachers now acknowledge as necessary." (81), and: "It must be emphasised that teachers should be, not the repositories of a new 'environmental science' but instructors and research workers convinced of the need for the interdisciplinary approach already mentioned." (89). This point also comes through clearly in the recommendations for national action and the responsibility is put upon the UN to provide technical assistance. The point is important for us in this country because one can already see the beginnings of a movement to establish "yet another discipline".

Unfortunately the Report does not accept the need to move toward a "stable society" and there is, therefore, no corresponding section on the need to educate people on what the future holds in store for them. For the developing countries this involves a recognition of the limits to the material advancement they can hope to achieve, and for the developed countries a recognition that the end of material progress is very close and that we must turn to a society that seeks its further development in quite other directions. Considerable changes of life style will be required as the richer and poorer countries make a common convergence upon the creation of stable societies all over the world, and these changes will only come about smoothly if people are prepared for them. To do this needs a quite considerable educational effort which will specifically include the need to reduce the average family size to two as soon as possible. It is here, in the sphere of education, that the authors' failure to "grasp reality as a whole" is so maddeningly apparent. It is clear from their initial analysis that they understand that population, resources, environment and the associated social questions form one complex whole. Yet they appear, from their total

silence on them, to think that population and resources are not suitable subjects for the young. This is a grave disservice. Here if nowhere else they should have broken out of their self-imposed limitations.

We get the same frustration in the section on conservation and creation. The discussion says: "...a large share of resources require dynamic protection. This applies, in particular, to over-exploited species, rare and outstanding natural habitats, landscapes and monuments, and *minerals and fossil fuels of which only limited quantities are available.*" (121, my italics). The actual recommendation for international action (124) becomes the "conservation of the world's natural resources and cultural heritage (monuments, groups of buildings and sites; wetlands of international importance; island ecosystems still undisturbed by man; species of wild animal, plants, etc)": the fossils fuels and minerals have dropped out.

This is a confused and confusing document. To be useful it should have recognised the need to move from our present unstable phase of expansion to a world of stable communities living within the limitation of available renewable resources. It should then have examined the educational, informational, social and cultural changes needed to bring us safely through the transition and to establish the kind of intellectual and social life that does not make excessive demands on limited resources. This is a task that urgently needs to be done and it is a great pity that the opportunity has been missed.

Sam Lawrence

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Development and Environment

The Problem that Need not Exist

It was a leading Labour Party politician who warned conservationists assembled for one of the first public meetings to be held by the Committee for Environmental Conservation (CoEnCo) in London, that the conservation movement was in danger of becoming middle class and elitist. He suggested that having established for themselves a high standard of material comfort, and the wealth to enable them to buy what release and relief they required from the more severely adverse environmental effects the creation of their wealth had caused, its members feared the extension of access to their amenities to the working community as a whole. Not only would such an extension erode the difference in status between the two groups, the pressure of additional numbers would erode the amenities themselves.

The middle class audience resented the suggestion. This was predictable and although he repeated it elsewhere he did not press it hard. Yet the fear he expressed is a haunting one and many people share it. Where it relates to the preservation of areas for the enjoyment of a privileged minority the fear is understandable.

There is a close parallel between the relationship of rich to poor within nations and between rich and poor nations. The fear expressed by the British politician finds many echoes in non-industrial countries as they react to the wave of concern about the environment that is growing so rapidly in the rich, industrialised countries. They fear that in their efforts to repair and improve their internal environments, the rich countries will establish trade barriers to exclude products of an "environmentally inferior" agricultural or manufacturing process, and that the success of such a protectionist policy would, or could, lead to the means becoming ends in themselves

as the rich found a way of preserving the quality of their own environment while at the same time preserving their economic advantage. They resent the implication that, although the environmental crisis was caused by the rich countries, they must join in clearing up the mess and must accept the introduction of measures to prevent further damage. The cost of repairing the damage may reduce the flow of aid to them while the prevention of further damage may involve the creation of barriers to their progress that the rich countries were able to avoid. There is a further parallel here in the argument about who should pay for pollution that has taken place recently in Britain. Most forms of environmental disruption occur as a result of industrial processes and while the profit from these processes accrues to the industry, the hidden environmental cost is passed on to the community as a whole.

Environment and Poverty

This fundamental difference between those who seek to protect the environment and those whose aim is to improve the living conditions of the peoples of the non-industrial countries is real and it is evident throughout the background paper prepared for Subject Area V of the Stockholm Conference. Indeed, the Founex Report¹, on which the Secretariats' understanding of the problems of the poorer parts of the world is based, develops the framework for a reconciliation of perspectives, and focuses attention on these "opportunities for a beneficial and growing partnership between the less industrialised countries and the industrialised world" (para. 2). By para. 20 the paper has become more specific: "One of the principal questions that arises from the increased concern with the human environment is what the cost to achieve various higher levels of

environmental quality will be—since our knowledge of the magnitude of these costs is still limited at present—and how the costs should be distributed among the nations of the world. Developing countries are understandably concerned that, because of their inherently weak position in international trade and control of technology, they may be forced to bear an unfairly heavy share of these costs". The note of alarm is carried into the recommendations: "All countries present at the Conference agree not to invoke environmental concerns as a pretext for discriminatory trade policies or for reduced access to markets and recognise further that the burdens of the environmental policies of the industrialised countries should not be transferred, either directly or indirectly, to the developing countries" (para 32). The rich are rich and the poor are poor and no amount of eloquent concern over the Future of Man, or the Protection of the Biosphere, however accurate and well-founded it may be scientifically, will bridge the gulf, far less remove it. The poor see no legitimate reason why they should forego their right to share in what could be the general prosperity. So, they must industrialise, they must produce and sell manufactured commodities and they are unwilling to accept any constraints. "Development is a cure for most of these problems, rather than their cause," says the paper in its "Statement of Issues" (para. 7). "Only the process of development can remove many of the factors which at present endanger not merely the quality of life but threaten life itself in many parts of the developing world". Their attitude is not irresponsible. If they add a little to the damage that has been done to the planet already, should not the rich countries accept this, just as they, the poor, have had

to accept the damage done by the rich?

Put this way it would seem the debate must end there and that there can be little point in holding the Stockholm Conference at all. In order that discussion may continue, let us look more closely at the gap. The fear felt by the non-industrial countries, and the Labour politician, is real, but is it realistic? Does it take account of the change that has taken place in the environment movement within the industrial countries, where governments are being urged to enact major programmes of reform that would curtail further industrial growth and eventually reduce current levels of industrial activity? Does it take account of the nature of the environmental crisis itself?

The disagreement may be based on a misunderstanding about the nature of the industrialisation that took place in Europe and North America. It assumes that this industrialisation occurred in a co-ordinated fashion in order to achieve a popular goal. Thus, non-industrial countries may establish goals which can be achieved by a replication of the industrialisation process. This is quite misleading. The early steps in industrialisation, which set the pattern that has been followed elsewhere, were the result of a series of historical accidents, responses to particular and immediate stimuli and the application of existing scientific knowledge to the solving of immediate problems. It was a hand-to-mouth process based on no discernible plan. However, having presumed the existence of such a plan it is further assumed that the process was successful in achieving its goals and that it will continue to do so. These goals are seen as full employment at high wage rates, high levels of consumption of resources and energy, economic security and a high standard of material comfort for the majority of the population. Yet even the most cursory glance at any industrial country and its economy will show that these goals have not been achieved. There are gross disparities between the prosperity of different sections of the community and while it may appear that the fruits of industrialisation are enjoyed by all, in so far as a large gap remains between poverty as it is understood in rich and poor countries, it should be remembered that beyond

a level of bare subsistence poverty is a condition related to the local community, not to the world as a whole. Industrial and economic growth do not guarantee full employment and the older and weaker members of the community often fare worse than they would in an agrarian society in a non-industrial country. So the hope of expanding this process to the entire world is based on false assumptions regarding its likelihood of achieving the goals it is erroneously credited with seeking.

Agribusiness

How efficient is industry? Since the most pressing problem in the world as a whole at the present time is the provision of food, the industrialisation of agriculture is in the forefront of the extension of industry, and the introduction of European and North American agricultural technology in the non-industrial countries forms the basis of the FAO's development programmes. This is an expensive technology and may be less efficient than it seems.

The British taxpayer spends about £300 million a year on subsidies to agriculture and, in addition, guarantees the commodity prices paid to the farmer to cushion him against the effects of over-production. The farming community itself invests similar amounts in capital improvements and raw materials, including agricultural chemicals and feedstuffs for livestock. Since 1945, agricultural productivity in Britain has increased by about 35 per cent. Yields of the major arable crops have not increased for several years and there is strong evidence for believing that farming now experiences diminishing returns for increases in certain inputs and zero returns for others. The heavy use of pesticides has caused serious ecological imbalances, so creating further pest and weed problems. Insects, and to a lesser extent weeds, are acquiring resistance to pesticides. Soil structure is deteriorating. Pollution is causing increasing concern. Current farming systems may undergo major modification within the next few years because they cannot be sustained.

In spite of all that has been invested, Britain claims to produce only half of the temperate foodstuffs it consumes. This figure is certainly too high, for it does not take account of

the raw materials imported for food production. Apart from the nitrogen extracted from off-shore deposits of natural gas that are used to manufacture nitrogenous fertiliser, and the potash reserves (not being mined to any extent at the present time) beneath one of its National Parks, Britain imports materials to produce all of its agricultural chemicals and most of its concentrate feedstuffs. In 1969/70, for example, British livestock consumed 1,983,000 tons of protein concentrate, of which 1,693,000 tons were imported. The figure includes 900,000 tons of high protein cake and meal and 371,000 tons of fishmeal, imported from non-industrial countries. If these imports are deducted, total output is sufficient to feed less than half the existing population even allowing for changes in dietary patterns that would permit more efficient utilisation of the food available. No one has calculated the efficiency of British agriculture in terms of energy input and output, but it is possible that input exceeds output. This obvious inefficiency is masked by an economic system which allows agriculture to appear profitable and therefore efficient. No doubt similar appraisals could be made in respect of other industries. British farmworkers are paid less than their colleagues in factory industry and their working conditions are inferior and living standards lower.

Does it work?

It is not likely that this technology and the economic framework within which it operates would satisfy the food requirements of countries with more urgent needs and it is certain that it would not satisfy their social requirements for improved living standards in rural areas. Even if it were more efficient in terms of productivity its high investment and operating costs might drain capital from other areas of need, such as education, health, housing and welfare.

Hopes of exporting this kind of industrialisation on a large scale ignore the basis of the current environmental crisis. This is that as world population increases, the pressure on the planet's resources increases proportionately if the additional people are to be catered for even at present levels. However, as efforts intensify to increase material prosperity by industrialisation, the actual rate of increase

on pressure on resources, and the environmental disruption associated with industrialisation, are much higher, so that while the world's population is increasing at a rate of 1.9 per cent each year, industrial expansion proceeds at between 5 and 7 per cent. It is reasonable to ask whether the planet possesses the resources of land, air, water, minerals, fossil fuels and other energy sources to meet the demand of existing populations for a living standard, measured in terms of consumption, equivalent to that in the rich countries. It is clear that it does not. It is not possible for the planet to provide for its present human population if all of them are to employ the industrial and technological processes of the industrial countries. Moreover, as numbers and expectations increase in the years immediately ahead, the impossibility of closing the gap between rich and poor will grow even more apparent and the effort even to maintain current standards will become more and more arduous.

It is reasonable to ask, also, whether the biological cycles of the planet will be able to absorb the waste products of global industrialisation. There is evidence that the discharge of certain by-products already exceeds the planet's absorptive capacity so that such an extension of industrialisation might lead to ecological disruptions on such a scale as to threaten the survival of many higher life forms, including man.

The crucial question

The question the Stockholm Conference should be asking is not whether the way of life of the industrial nations can be globalised, but for how much longer the industrial nations themselves will be able to afford it and for how much longer the world community will permit them to do so.

Development and environment makes a brave attempt to resolve a conflict that need not exist if we are prepared to challenge its assumptions that the way of life in the industrial countries was planned for the benefit of the peoples themselves, that it is efficient in satisfying their social, material, psychological and spiritual needs at minimum cost, and that it is possible to extend it to cover the entire planet. None of these assumptions can be justified. That being so,

the aim of much of the paper, to achieve industrialisation while avoiding the environmental mistakes made in the industrial countries, may not be relevant.

Unless we challenge this assumption, it seems the conflict cannot be resolved anyway. The paper's recommendations make little attempt to do so, the proposed action consisting mainly of monitoring, studying, exchanging information and implementing existing legislation. While it accepts (para. 22) that the non-industrial countries are becoming disillusioned "with the pursuit of narrowly conceived economic growth", all that it can suggest is that they should treat environmental concerns "as an added dimension of planning, and not merely as a further claim on limited resources" in the hope that (para. 35) "it should be possible to avoid or mitigate such risks (of environmental damage) by adequate planning, location and use of proper techniques." The heavy use of agricultural chemicals will cause soil deterioration and pollution. There is no proper technique. The generation of large amounts of power will deplete resources and cause pollution. Again, there is no proper technique. We cannot escape from the fact that the concentration of heavy industries and the intensification of industrial processes causes damage.

If the introduction of large-scale industry throughout the world is neither desirable nor possible, what can be done?

Clearly it should be possible to achieve a more equitable distribution of the world's wealth and access to its resources. It is possible to devise workable schemes that would bring about a major redistribution of wealth without increasing the total damage to the global environment or increasing the overall level of industrial activity. The aim would be to spread existing industry and the products more widely. The current concern in industrial countries about the motor car, for example, might be resolved by the imposition of controls on the use of cars in crowded cities, coupled with improvements in public transport services. The unemployment this would cause in the motor industry could be offset for a number of years if the industry were to produce vehicles and equipment to be donated to non-

industrial countries in order to increase the efficiency with which they could distribute food and materials within their territories. The environment of the industrial country would be improved by having fewer cars, there would be no immediate rise in unemployment, non-industrial countries would benefit and since the whole of the cost would be borne by the industrial countries this would represent a redistribution of wealth. If the industrial countries are sincere in their concern about the effects of certain agricultural chemicals, so that they plan to forbid them to be used or residues of them consumed within their territories, then presumably they recognise that alternatives exist. Their concern should extend to the provision of these alternatives to poorer countries in order to prevent the use on a global scale of the harmful products. This assistance might take the form of direct donations of capital or materials, or the adjustment of tariffs to favour the preferred products. As the industrial countries develop more sophisticated technologies that avoid environmental disruption and that conserve resources, they should provide the means of ensuring their adoption elsewhere. All of these measures would protect the environment while redistributing wealth.

Dependency

While such reforms would doubtless achieve the desired aims, it would be naive to presume that they are likely to happen. The economies of the industrial countries are to a large degree dependent on the resources and materials of the non-industrial countries and it would be a mistake to underestimate the internal political difficulties involved in taking large,



positive steps of this kind. It is not that politicians are ignorant of the need, or are dishonest, but simply that to take action that would be unpopular among their constituents would lead to their removal from office and the election of more popular governments. The first need, then, is for major educational programmes within the industrial countries, for it is there that the cause of the environmental crisis lies.

The non-industrial countries might consider at a greater depth the true nature of their goals, bearing in mind that the introduction of industrialisation on the European and North American pattern in order to satisfy these goals is based on concepts that did not underlie industrialisation in the areas that have experienced it. Thus, it may not be the only course of action that is possible. At the simplest level, increasing employment is only one way of distributing wealth; health, welfare and educational services already do this in other ways, as do price controls and subsidies to producers. In *Development and Environment* the word "development" is used in different senses by different contributors. What does it mean? The problems of non-industrial countries are stated (para. 6) as those of poverty—"unsafe water, malnutrition, inadequate housing and sanitation, ill health and natural disasters". These, it says, are "problems of inadequate development". So development is the process by which they will be eliminated. "Development is a necessary precondition for overcoming many of the environmental problems of poor societies" (para. 7). This suggests that development comes first, the solving of the problems second. Para. 7 goes on, "this is not to say that such problems could be automatically and spontaneously resolved by the mere acceleration of economic growth." The Founex Report (Annexe I, para. 6) says that "a new emphasis is being placed on the attainment of social and cultural goals as part of the development process". It is not clear whether any direct relationship exists between development and the solving of the problems listed earlier. What has happened, of course, is that "development" has become confused with "industrialisation", based on the introduction of techniques that cause problems which "are clearly likely to gain

in significance as the process of development gathers momentum" (Annex I, para. 19).

Global Balance

The need is to improve the quality of life for the peoples of industrial and non-industrial countries. It can be satisfied only by the creation of situations in which populations achieve a stable, sustainable relationship with their environment. Food must be produced by systems of husbandry that enhance the structure and fertility of soils; industry must be based on raw materials and sources of power that will continue to be available for prolonged periods of time; pollution must not be permitted to exceed the levels that can be absorbed and detoxified by natural processes. These are fundamental physical and biological restraints and where human activities break them, this cannot be called "development". It is regression, even though it may appear to offer short-term advantages. From a biological point of view the need may be expressed in terms of modifying the environment and human activities in order to render the environment more hospitable to man. Modifications that make it less hospitable make no sense.

There is no clear dividing line between man and his environment; they are the same thing, linked together in the planet's cyclical processes. If man damages his environment he damages himself and his children. Because of the local damage caused by industrialisation the industrial nations have been forced to acknowledge this rather obvious fact and much of their concern at present aims to repair the damage they have done to themselves and to achieve a stable ecological context within which they may continue. They have rendered their own environment, and to some extent the global environment, less hospitable. At the same time they have been forced to realise that even if it were possible, a repetition of their own history on a global scale would magnify the disruption so as to threaten human survival.

Within non-industrial countries the need for change arises as a result of cultural disruptions brought about by the past colonial policies of European nations. This places a clear moral obligation on the developed nations to

ensure, not that the replication of their own experience is attended by less ecological damage, but that different, more efficient and satisfactory solutions are applied. This must imply that the initiative comes largely from the non-industrial countries whose particular requirements will vary from area to area and from cultural pattern to cultural pattern.

The conflict between development and environment is unrealistic. Development must be defined as the improvement of the environment, without which the quality of life cannot improve. Many of the techniques exist and must be applied. Where they do not exist they must be designed.

Michael Allaby

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Air Pollution and Health

A REPORT FOR THE ROYAL COLLEGE OF PHYSICIANS

What is the effect of the carbon monoxide given off in a street jammed with cars?

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Pitman Medical

Comments on Social Aspects

An Alternative to Imperialist Development

This report provides a reasonable assessment of some of the priorities of non-industrialised countries. It admits that many of their problems, the elimination of poverty and unemployment have been aggravated by badly thought out development policies.

Both aid by, trade with, and the transfer of technology from industrialised countries have not always been to the advantage of the developing ones.

The report calls on the latter to state their own requirements and insists on international arrangements to protect their interests. Poverty, the report warns, has reached such a scale that it is not only threatening the "quality of life" but life itself.

The need for a common strategy is emphasised and it calls for joint action to solve this problem.

It is admitted that existing institutions, both national and international, have not up till now been responsive to indigenous needs. Local leaders are advised to rectify this at national levels.

This is a very vague admonition. No guide-lines are laid down for the sort of institutional changes required, nor is information provided that might lead one to suppose that it is within the power of many of the present political leaders to bring about such changes within countries for the most part already subjected to all sorts of socio-political stresses.

In the meantime it is suggested that countries try to solve their problems within the framework of existing economic, political and social institutions.

A basic assumption made by the report is that it can only be through industrialisation that the developing countries can solve their many problems. Even though, as it has been ad-

mitted, aid, trade and the transfer of technology have increased many of these, the former must nevertheless be encouraged, since presumably, it is only thereby that industrialisation can proceed at a sufficient pace.

As a note of caution it is suggested that political leaders should be inspired by their natural heritage and historical values. If necessary, United Nations Agencies and regional organisations concerned with development should collaborate with them in drawing up development guide-lines that take this into account. Such guide-lines should also take into account environmental requirements. International agencies can contribute towards this by helping sponsor ecologically sound technologies and training people in their use. All this is very vague.

On the subject of the social impact of development the report admits that deviant social behaviour emerges as a result of the consequent breakdown of traditional life. In spite of this, the report states that many countries still display a high degree of social organisation and are characterised by a strong sense of community, even in urban areas, and that the traditions responsible for this happy state of affairs must be preserved. On the other hand changes initiated by colonial rule must be accommodated. Thus the principle of the centralised national state is not questioned nor are the present often arbitrary frontiers nor the capitalist market-economy—all of which are foreign importations which it is difficult to reconcile with traditional ways of life. How such a reconciliation can be achieved is not dealt with.

The report constitutes an advance on other documents of this sort dealing

with Development Economics, in that it admits that the blind pursuit of the conventional growth pattern of industrial nations is not the right goal for the developing ones.

Development must not be equated with mere economic growth, nor can it be measured exclusively in terms of the gross national product (GNP). Growth, it is recognised, does not necessarily solve social problems, in fact, in many countries high growth rates have been associated with increasing unemployment, rising social tensions and disparities in incomes both within nations and among them and in general there has been considerable social and cultural deterioration.

In spite of this there is no suggestion that growth be abandoned as the principal priority of development policy, it is merely recommended that within such a policy a new emphasis be placed on the attainment of social and cultural goals, and also that a new definition of Development should include such things as fair income distribution, full employment and a provision of social services. It also suggests that a new emphasis be placed on traditional methods of welfare such as those normally provided by the "extended family".

Once more we are faced with very vague suggestions with no attempt to determine to what extent they are achievable within the existing political and economic framework. Is there a precedent for instance that might lead one to suppose that socio-cultural goals can, in an industrialised society, be given precedence over short-term economic ones? Also, how is it possible to preserve the extended family when the trend has always been, as industrial-

isation proceeds, for it to give rise to the nuclear family which in turn tends to break down more and more under the combined onslaught of urbanisation, mobility, state welfare and the erosion of traditional values by the mass media?

On the crucial question of employment, the report warns that the towns will not be able to provide enough jobs if industrialisation proceeds at the current pace.

It follows that a substantial number of new jobs will have to be found in rural areas. Clearly this will not be possible if the current trend towards the mechanisation of agriculture is allowed to continue. However the report does not call for an end to this very dangerous trend. This would mean calling into question the Green Revolution itself on which is pinned the hopes of the United Nations to prevent world starvation in the next decade. Yet what is the point of increasing agricultural production, by dubious methods which may make it a short-term expedient only, when it must lead to urbanisation, unemployment and the growth of intolerable shanty towns?

Nevertheless the report calls for the development of labour-intensive technologies as a means of relieving unemployment. The development of such technologies it is assumed might permit a new industrial synthesis, one in which the industrial state is reconciled with human values, one in which the technological society can be realised without the social disruption and alienation that have so far accompanied it.

But is such reconciliation really possible? Is this report not just an attempt to provide the best possible politically acceptable solution? But are not the problems the world is suffering from of too serious a nature for there to be any politically acceptable solution?

The world is finite, as are its usable resources. The best available forecasts make it clear that there are not enough to go around if all countries are to achieve the standard of living of western Europe. The rich countries will have to reduce their share of the cake. The USA for instance can clearly not be allowed to use approximately 40 per cent of world resources when it has only 6 per cent of its population. Is there any precedent, however, for supposing that the rich will agree to be

less rich?

In any case, is there any reason to suppose that industrial growth would improve the lot of the developing countries?

Economic growth is increasing world wide at about 6 per cent per annum but most of it—about 80 per cent—is occurring in already industrialised countries.

GNP per capita in the poor countries is increasing very slowly (in India by 1 per cent, in Indonesia by 0.8 per cent while in Nigeria it is in fact falling by 0.3 per cent. Contrast this with the 9.9 per cent increase per annum in Japan and 5.8 per cent in the USSR).

If current trends continue, the disparity between rich and poor can only increase.

According to Meadows, in the year 2000 GNP per capita in India would be 140 Dollars as against 100 today, in Indonesia 130 as against 100 today, while in Nigeria it would have fallen from the present 70 to 60 during this period. In the meantime it would have increased in Japan from 1190 to 23,200 and in the USSR from 1100 to 6,330. Even though it is very unlikely that these trends will continue for so long, these figures illustrate the fact that industrialisation favours the rich rather than the poor. However, even if this were not so, to what extent does a rising GNP eliminate poverty?

In the USA, the richest country in the world, with a per capita GNP at present more than 56 times higher than in Nigeria, there is still a serious problem of poverty.

In 1971, a US Government survey revealed that malnutrition, even starvation, was not uncommon in different parts of the country.

Senator George McGovern, of South Dakota, estimates that there are 25 million hungry people in the USA, over 10 per cent of the population. It appears to be largely associated with family breakdown. People are so demoralised in the urban slums that they can no longer act responsibly.

According to the *Financial Times* "Television sets and hunger can be found side by side". We might do well to reflect that poverty was almost unknown in pre-colonial Africa. There was no over-population and an equitable system of land tenure provided each family with the land required to feed its members. Each family also regarded it as its sacred duty to look after its

members incapable of looking after themselves.

On the other hand it is easy to see how industrialisation can give rise to poverty.

Apart from causing the social disruption associated with poverty in the USA, urbanisation, which is already increasing very noticeably in such places as the townships that have developed around the major cities of South Africa, the Zambian copper belt, and the growing cities of West Africa, also leads to a concentration of land in a few hands. This land is either given over to mining companies, or turned over to the production of cash crops for export. Thus vast areas which could be used for feeding the local population are producing coffee or cocoa or rubber or tea which are sold for manufactured goods that often play no part in relieving poverty.

In the meantime the excited peasants drift to the cities and the shanty towns continue to grow. The notion that industrialisation can eradicate poverty is thus but a pious hope.

On the other hand there is every reason to suppose that poverty can be reduced by developing a society which has as much in common as possible with the traditional society of pre-colonial days.

Needless to say this must mean a radical change in our priorities, and must give rise to an integrated programme of change that is unlikely to provide a politically acceptable solution to current problems.

It is difficult for local political leaders to initiate the new type of development suggested by the report when the industrial machine they have to contend with is mainly in the hands of foreign companies. It is unlikely that these can be persuaded to subject their purely economic considerations to social and ecological ones. Are they likely, for instance, to introduce labour-intensive, small-scale technologies to provide world *over-employment*? Are they likely to contribute towards the maintenance of traditional patterns of behaviour which the report admits to be so important? Surely they will seek above all to be internationally competitive, and if local conditions do not permit this, they will simply tend to move off to greener pastures.

Many, let us not forget, are involved in activities which by their very nature can only be of short duration. When

there is no copper left in Zambia for instance, the companies will move elsewhere. In the meantime populations will have left their original home areas to work in the mines, they will have been trained for work associated with mining and will have forgotten their traditional occupations. Indeed the economic colonialism that seems to be associated with industrialisation may be as harmful as the political colonialism that has only just been suppressed.

Technological imports

The introduction of technological devices into production processes has become an end in itself in the industrialised countries, since the more they are introduced the higher must be the GNP. It is thus tacitly assumed that the works of man are preferable to those of nature. Yet the former make use of rarer sources, cause pollution, disrupt ecological and social systems, while the latter appear to be designed to ensure maximum stability.

As technological undertakings become ever more adventurous and on an ever bigger scale, so the disruption that they can cause increases proportionately. Take the case of large-scale irrigation works. The dams built on the Volta and at Kariba and Aswan have caused many serious problems. As Claire Sterling writes the latter has "greatly impoverished an already destitute nation, driven the fish from the Eastern Mediterranean, exposed the whole Egyptian coast to erosion, endangered every bridge and barrier dam astride the Nile from Aswan to the sea, robbed Egyptian soil of the silt that has made it the most fertile on earth, threatened millions of acres with the blight of salinity, set off an explosion of water-borne disease and squandered the very water it was meant to save."

There is every reason to believe that many of the problems it has given rise to are the unavoidable features of large-scale undertakings of this sort. This knowledge however does not seem to deter developers in any way. The Cabora Bassa dam is going ahead in Mozambique, and the most ambitious project of this sort of all times is planned for the Mekong river. Such projects appear to be self-justifying in the eyes of the developers.

It is clear that the approach to technology must change very radically. It must be judged in terms of a much

more realistic set of criteria. For instance it must have the lowest possible impact on ecosystems, and it must enhance rather than disrupt the life of rural communities. This means that it must be on a much smaller scale and of a much subtler type than that employed lately.

Aid

Aid programmes which the report regards as essential are unfortunately double edged: they make the recipient nations ever more dependent on the donors, they ensure that the recipients become ever more caught up in the treadmill of industrialisation, ever more involved in a way of life which, it is becoming ever more apparent, is likely to be short-lived. Self reliance is a prerequisite of stability, and in order to achieve it, dependence on foreign aid should be reduced rather than increased.

Foreign trade

The trading relationships between the poor and the rich countries are much the same as during the colonial era. The latter continue to supply raw materials in return for manufactured goods. The prices of these commodities, however, are very artificial.

They take no account of the fact that these resources are finite and that at the current rate of consumption they will be exhausted in a very short time.

The poor countries will then have been deprived of important non-renewable resources in exchange for manufactured consumer goods often of doubtful utility.

Worse still, products badly required to satisfy local needs are sold to the industrialised nations to buy manufactured products which are not really required.

Clearly this pattern of trade is against the interests of the poor nations, yet what other pattern is possible?

The only alternative that poor nations have is to develop trade among themselves and also to lay greater emphasis on self reliance.

Political stability

The report calls for greater political participation of the masses in decision making, but again is vague as to how this can be achieved. Before there can be economic stability, there must be political stability, and it is this that many poor nations lack.

Political instability is inherent to the artificial centralised nations that have been allowed to develop on the western model. These do not correspond to real nations but to random assemblages of totally distinct nations.

The frontiers were imposed during colonial rule. They bear little relevance to the natural political landscape of language, culture and traditions. In Africa this is leading to endless civil strife, as different nations try to break away from states into which they have been arbitrarily merged, and seek to join up with countries with which they have more in common, or alternatively to seek their own independence.

It is clear that if political stability is to be achieved, the different national groups should be allowed to develop separately without fear of political domination by an alien group.

Once this fear is removed, full economic, social, cultural and military co-operation could lead to that unity which so far has eluded most of these countries.

It must be remembered that "a nation cannot be created by the edict of a politician nor by the pen of a lawyer", nor for that matter by the barrel of a gun.

It can only be the product of slow and gradual evolution, and until this basic fact is understood peace is unlikely to return to the continent of Africa.

To achieve the sort of development which is proposed by the report within the existing economic and political framework that has been imposed on non-industrialised countries by the industrialised ones is simply not possible.

The poor countries need to develop on their own. They must invest their traditional concepts with new meanings, but they must not slavishly accept the standards of the industrialised nations. Each must develop an economic system, an appropriate technology, pattern of trade and political institutions that are best suited to its own specific requirements.

A knowledge of what was achieved in the past is worth all the efforts to achieve it. Poor countries were stable before the imposition of foreign culture. If they want to return to a position of stability, then they must do away with foreign culture and develop according to their own indigenous cultural heritage.

Jimoh Omo-Fadaka

International Organisational Implications of Action Proposals

The Bureaucrat and the Biosphere

What new institutional arrangements are being proposed at Stockholm to deal with international environmental problems? This question is the concern of the final Subject Area paper offered to governments by the UN's Environment Secretariat.

Unlike the five discussed above, this final Paper is an overtly political document, though it is scarcely racy reading. It discusses General Assembly Resolutions, and organisational precedents. It treats of the numerous existing United Nations Organs and Agencies that have for many years been carrying out work which is today included under the rubric of "environment". It is supported by another impressive report, entitled *The UN System and the Human Environment*, which describes, very usefully, what these multifarious programmes are (under the headings of the Conference agenda).

This second document, prepared not by the Stockholm Secretariat but by a Committee of the UN's Specialised Agencies, sets out to reassure the reader that the UN's various environmental protection activities—in agriculture, forestry, fisheries, education, science and culture, health, labour and employment, etc., etc.—amount to a systematic approach. It is, we are told, "not intended to imply that arrangements for cooperation work perfectly in all cases, or that no difficulties ever arise... but... that considering the complexity and variety of questions that are handled by them, (the Agencies) they provide an effective and dynamic mechanism". (para. 257).

This tone of self-justification is maintained throughout the UN Agencies document. Even the complete layman, however, reading this document together with the new Environment Secretariat's proposals, cannot fail to be impressed by their contrast of emphasis. If the UN

System, as it stands, is indeed "an effective and dynamic mechanism" one is led to wonder why the Environment Secretariat in its report remarks (para. 11) that, "It could even be argued that the existing system of functional decentralisation of responsibilities does not lend itself to the most effective management in this context."

It is all too easy, of course, to criticise a set of international institutions which, like the national governments which they serve, have grown up on an ad hoc basis. In fact, of course, anyone within national governments or the UN will readily admit that the machinery that we now have is inevitably inadequate, as it was never designed to handle the interrelated problems of management with which the planet as a whole is now faced.

The Rationale of "Realism"

Yet only the most modest supplementary institutional arrangements are proposed by the Stockholm Secretariat to tackle the increasingly obvious need for international management of planetary population, pollution and natural resources. Apart from continued reliance on the UN's Specialized Agencies whose inefficiency and capacity for mutual frustration through jurisdictional squabbling is proverbial among international commentators, the Stockholm Secretariat, in the name of political realism, has felt forced to recommend the establishment of a new inter-governmental body within the UN (reporting either directly, or indirectly to the UN's General Assembly) backed by a small international Secretariat managing a modest new international fund.

Inevitably the first and strongest impression that will strike the environmentally conscious lay-reader of the Environment Secretariat's report is the

minimal scale of new institutional arrangements proposed. (Population is excluded in these institutional proposals for a perfectly valid reason, namely that this is one field where the UN has recently evolved flexible and potentially effective machinery in the form of the UN Fund for Population Activities.)

Yet the Secretariat's modest-seeming proposals were based, after much sounding-out of both governments and existing international agencies, on a shrewd assessment of the dictates of political realism. U Thant's call for a UN Superagency for the Environment in a speech delivered in the early days of Stockholm preparations clearly had fallen on a complete set of deaf ears. Such a proposal could only be introduced over the assembled dead bodies of the UN's Byzantine bureaucracies (all of which, in fact, become remarkably lively when it comes to jurisdictional infighting) and of all member governments whose capacity for dispute over departmental empires and budgets today replaces more overt and externalised forms of organised warfare.

The Ecologist reader may be tempted to characterise these proposals as an attempt to lever the planet from the brink with a toothpick. However, in a world of jealous sovereignties and of total political, economic, social, and cultural diversity, attempts by a global agency to perform major supranational management functions would be instantly doomed to hopeless failure. And even if such a superagency were politically possible, it would so depend upon national governments for mutual support that it is likely that its thrust would be toward greater and greater centralisation of decision-making at a time when many commentators, particularly among the environmentally aware, are calling for a world-wide

return to decentralised political control at the local level.

The Secretariat's Line

Throughout the process of intensive consultation which preceded the preparation of the "institutions" document, the Secretariat took the line that it is no use deciding precisely what form a new institution should take until there is intergovernmental agreement on the new functions to be performed by the UN. This means after governments' response to the Action Plan is known. So the Secretariat's proposals are set forth in the form of alternatives, with a mild indication of preference for one solution.

The new functions which the UN is to perform, and the kind of institutions required to undertake them are obviously conditioned by the sort of political commitment which governments are prepared to make to the United Nations, rather than other international groupings. The fact that the environment is inevitably a global issue, and therefore one obviously requiring action by the world's only global organisation, has had only limited appeal to many governments. "Rich" nation governments have serious misgivings over committing their major diplomatic initiative to an arena in which developing country assent can probably only be bought with a number of *quid pro quos*. Moreover, they see a real danger that the speed of the global convoy of nations—all of which tend to head in different directions anyway,—will be just too slow for resolute and urgent international action if that is, in fact required. The collective suspicion of the poor countries regarding rich nations' environmental intentions is only likely to slow down the convoy still further. These considerations, combined with widespread cynicism among rich nation governments as to the effectiveness of the UN and its Agencies generally, are bound to limit both their hopes and their generosity.

American and British Views

The two countries that took the lead during the Stockholm preparations in canvassing their ideas on international environmental institutions were the United States and Britain. This was not surprising as they are the countries which combine relatively advanced public awareness of environ-

mental problems with a leading role in the UN as permanent members of the Security Council. Both have sought to restrict the size of new institutions set up in the UN framework. Britain wants an absolute minimum, with no new funds for UN environmental work, and a minimal intergovernmental body to designate which of the existing UN agencies should take the lead in coordinating UN action on any specific problem. The United States has been more forthcoming. It sees the need for a new environment fund to be administered by a "high level" Secretariat under an intergovernmental committee, the Secretariat's head or Administrator also being chairman of an Environmental Coordinating Board composed of senior executives in charge of the existing environmental programmes of the various Agencies of the UN System. Furthermore, President Nixon has proposed an Environment Fund to be contributed voluntarily by UN members with a five-year target of \$100 million.

The level of anticipated contribution was obviously all-important to the Secretariat in deciding what a new environmental mechanism could or could not do. If \$100 million is to be forthcoming and there is at least a reasonable chance that it will be, as the United States will contribute its usual UN "share" of about 40 per cent, then central resources of around \$20 million a year would be adequate to conduct the kind of new functions which the Secretariat's paper envisages. This is what is meant by realism.

What are those new functions? They are, of course drawn from the recommendations at the end of each of the five preceding reports. They fall under four headings

- knowledge acquisition and assessment;
- environmental quality management;
- prevention and settlement of disputes;
- international support to help less developed countries to perform the first two functions.

A UN Earthwatch

As regards the knowledge acquisition and assessment function, it is, of course, acknowledged that a great deal of international work is already being done by the United Nations System. There are, in fact, over thirty official

international networks in existence already for the monitoring of air, water, and various pollutants, many of which were established through one or other of the UN's agencies. But most of these networks are little more than gossamer-webs rendered ineffectual by their lack of solid resources. The new function that is now seen as necessary is that of coordinating a global *Earthwatch*: of choosing which of the globe's many pulses must now be comprehensively taken, centralising the information from the pressure-points and interpreting it so that the policy implications of danger (or safety) signals may be taken into account by the international community. This, to quote the Secretariat's paper (para. 26) involves "giving proper perspectives and calling the attention of governments to significant trends, pointing out present and potential problems and opportunities of international importance as well as possibilities for corrective, preventive or anticipatory action". No such role currently exists within the UN System. It "can only be performed by an international body that is not tied to any sectoral or operational responsibilities" so that it "is able to take an objective overall view" (para 27). This, then is what the Secretariat means by "knowledge assessment".

As regards *acquisition* of knowledge, there also exists an important need for a new international initiative, not in actually undertaking new research, but in pinpointing needs for knowledge which are common to a number of countries. This can best be handled by cooperative use of laboratories, personnel, etc., by organizing the necessary multinational support for such programmes, and by keeping a close watch on all existing research programmes so that opportunities can



be spotted to improve governments' and international agencies' use of available knowledge and resources.

Finally, the environmental knowledge assessment and acquisition function involves the classification, storage and dissemination of all such knowledge and information.

"Managing" Environmental Quality

The second function, "environmental quality management" sounds exciting. But it does not mean anything like a major regulatory role, which would, of course, be far beyond the bounds of present political possibility. Instead, the Secretariat sees this function as "goal setting"—that is, producing non-mandatory recommendations and guidelines, proposing uniform national codes of environmental conduct, the setting of standards through preparation of Treaties, Conventions, etc., and the provision of a forum for consultations on proposed national actions with international repercussions, and for hammering out international environmental agreements.

Handling Disputes

A third function, the prevention and settlement of disputes, is restricted in the Secretariat's document to "good offices" in getting countries together who appear to be about to fall out over some environmental issue. It might also involve receipt and review of periodic reports from governments to the UN Secretary-General on all their (or their nationals') activities that are liable to have a significant environmental impact beyond their borders.

Environmental Aid

The final function proposed is likely to be the most controversial. "Internation-

al supporting actions required to help countries both to acquire and assess knowledge and to improve environmental management" must become, at many points, indistinguishable from the kind of technical assistance already provided under development funds. Moreover, under this heading, the range of activities is so wide—from "formulation of appropriate environmental guidelines for international and national development programmes", and "provision of the resources necessary to integrate environmental considerations into development programmes" to support for environmental education and training and public information services—that it seems likely that the monied contributors to the UN's economic and social activities may insist that this last function be regarded not as a necessary new and separate activity but as an activity that should be included in any properly environmentally aware development programme.

In fact the Secretariat anticipates this reaction. In its chapter on Funding (paras. 92-97) it recommends that in practice, with the exception of technical help in preparing the basis for regional agreements between countries on sharing the costs of environmental protection associated with a development scheme (which it regards as a legitimate charge on a central environmental fund) the international costs of improving environmental management in the Third World must be borne by existing international development programmes, and it specifically refers to the World Bank and the United Nations Development Programme.

This is a point over which we may expect to see some of the toughest bargaining at Stockholm. For unless the developing countries can get some assurance of increased aid flows to make up the extra costs of more environmentally sensitive development, it is clear that they must face, in the short term at least, further cuts in the already emasculated flows of foreign aid that go to raising living standards in the short term. The Secretariat's dilemma, however, is equally clear. Many of the donors, who may or may not contribute the essential funds for assessment of international environmental damage and fostering cooperation, have made it clear that they will certainly not contribute the money if

the Third World majority at Stockholm, or thereafter, votes to spend it, or most of it, on environmental safeguarding of their development activities.

A UN Environment Council

Assuming that the Stockholm Conference weathers the storms that threaten over this question of who pays for the addition of environment considerations to short-term development priorities, what central organisation within the UN System is needed, and at what level? As the Secretariat puts it (para. 50) "there seems to be widespread agreement on the need for an intergovernmental body to perform the functions of central policy review and coordination". There does indeed. At the time of writing this, however, no agreement has been reached on the level or the location of such a body within the UN intergovernmental hierarchy of Commissions, Boards and Councils, though it seems likely that the body will be comparable in status to UNTAD.

Weak Proposals for a Top-Flight Secretariat

Where the intergovernmental body is placed is a great deal less important than the quality of its Secretariat, for this is where the initiatives must come from and the vital work must be done. First of all its head must be, as the Secretariat paper suggests, an Under-Secretary, reporting only to the Secretary-General. Next it is vital that the future environment Secretariat be staffed with top flight people, and be as independent as possible from the regular UN bureaucracy's mortmain.

This is where the detailed recommendations of the Secretariat's paper are important. A strong case could be developed, (but isn't) for this new Secretariat having at least the degree of independence in staffing and recruitment from the UN's geographical requirements that the UN Development Programme enjoys. Instead the paper's line is to play it safe, suggesting that what is most important is that the Secretariat has the assurance of permanence that comes with financing from the UN's regular budget (theoretically mandatory upon governments).

This would suit old Secretariat hands who might like to move over into these fresh pastures, but who value their security of tenure above all



else. However, it seems the wrong option for two reasons. First, because these days the UN's regular budget is probably *not* more secure than voluntary funds, especially voluntary funds for so appealing an issue as the environment. Second, because the quality of staff must be paramount, and freedom from the UN's present hide-bound recruitment policies will be vital to attract the best people. Such people do not, of course, spend much time worrying about their security of tenure.

Finally—a technicality, but a vital one—if the new environment Secretariat is financed out of UN's regular budget operations, although it could be given a separate budget item and thus remove it from direct competition with all other departments for desperately scarce funds, its operations would be brought under the scrutiny of the General Assembly's Fifth Committee. This Fifth Committee is a morose and "tunnel visioned" gathering of political and financial accountants who review the UN's finance and personnel matters. It can fairly be credited with a sizeable share of responsibility for the present low morale and efficiency of most parts of the UN's Secretariat. To consign scrutiny of the planet's first staff of central environmental advisors to these men would be to accept a grave responsibility indeed for jeopardising posterity.

Institutional Proposals for Science

Finally, the paper's line on the relations of the Secretariat with the scientific community seems a sensible one. There have been many discussions of world scientific centres for the environment, and it may well be that ICSU's Scientific Committee on Problems of the Environment (SCOPE) will evolve into the major independent centre for global scientific evaluation that is clearly needed. However, to incorporate such a non-governmental research and review facility into the UN's international arrangements in the forms that have been proposed at this stage (i.e. a government-financed centre with laboratories, etc., perhaps in Geneva) would invite immense problems of competition for staff and resources with the great existing national scientific centres. Moreover there could, under such incorporation, be no real

assurance that the scientists' governmental connection would not influence their view.

The Secretariat's more pragmatic and flexible approach of using the environment fund to call together the world's top experts to look into problems on an *ad hoc* basis, certainly seems for the moment preferable. It also seems practicable judging from the great authority and astonishing speed with which an *ad hoc* group of scientists and climatologists were assembled in 1971 by MIT to produce the Study of Man's Impact on Climate.¹

The Oceans: A Problem of Special Urgency

The Secretariat is right, in its paper to stress the need to regard organisation to deal with the oceans and marine pollution as a special problem. (See Annex, paras. 1–22). They are right because of the surpassing urgency of the need for more marine pollution research and regulation, especially over dumping toxic wastes. They are also right because next year, at the UN's Law of the Sea Conference, perhaps the largest and most portentous single organisational issue in history will be raised: namely, how the world should govern the more than two-thirds of its surface that is covered by oceans and outside any national jurisdiction.

The outcome of the legal questions regarding exploitation and control of the seabeds and ocean floors is uncertain and may be long delayed. Moreover it is not yet known whether governments will, if they establish an ocean regime, transmit to it all the matters under review by its Preparatory ("Seabed") Committee, which include the preservation of the marine environment as a whole. For the time being, the urgent research and monitoring needed in the oceans should be conducted under the auspices of the proposed world environment body, working in close collaboration with the International Oceanographic Commission (IOC) and the international Group of Experts for Study of Aspects of Marine Pollution (GESAMP).

What can one say, in summary, about these modest and cautious but "realistic" organisational proposals?

Many committed environmentalists will see as derisible the suggestion that a new inter-governmental com-

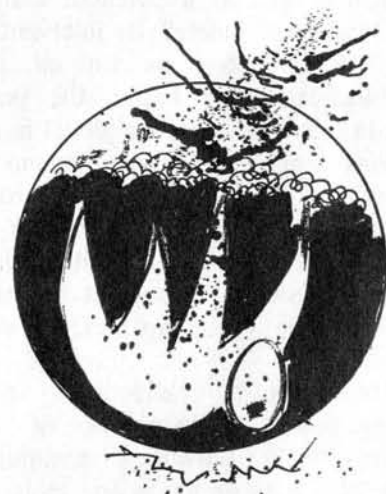
mittee and its Secretariat should be fitted into an established order largely dedicated to increasing industrialisation, and hence environmental disruption. How can such action be equated with the views of leading British scientists who signed the *Blueprint for Survival* or with the *Limits to Growth* timeframe of possible global environmental catastrophes within 100 years?

Yet the inter-governmental acceptability of such proposals should concentrate the minds of environmental activists on the realities of present world politics. They can at least support the admirable stress on flexibility of arrangements with an eye to future expansion, which the Secretariat's Paper continually stresses. At the same time, rather than reject these first faltering institutional steps out of hand, ecologists should regard them as a benchmark of present political realities, and realise that more powerful and effective international machinery will only emerge from manifest public pressures on many governments simultaneously.

An Alternative Institutional Initiative

There remains however the more fundamental question: Can governments alone tackle the immense international changes that the environmental crisis demands?

For several years now, groups ranging from traditional international relations commentators and lawyers to functional specialists, have questioned the view that the infinitely complex problems of a global society can feasibly be managed by governments alone. With every increase in the order of magnitude of inter-society problems, the degree of speciality of view of



governments becomes more apparent. The political deadlock that at the time of going to press seems certain to exclude nations representing 27 per cent of the planets' industrial capacity from Stockholm, is only one, albeit a vivid, instance.

Governments may still claim to speak, after a fashion, for the whole societies that they represent. But increasingly they speak mainly for the special interests of the civil servants and bureaucrats that make up those governments. What are those special interests? Essentially they are the interests of overwhelmed managers who lack the capacity to control what they purport to manage. Their understandably human reaction to complexity and loss of control is to narrow their concern. This does not mean, however, that they can narrow the problems which they face.

What are the alternatives, or rather the other possible additional organisational frameworks which, with governments, could restore the failing equation of power with responsibility? In the course of the *Pacem in Maribus* Conference preparations, Elizabeth Mann Borghese of the Santa Barbara (California) Centre for the Study of Democratic Institutions, conceived of a "quadriga" structure, in which governments shared responsibility in international relations with three other stables of horses: science, industry and the consumer.

What might be the nature of these stables? What functions, tasks and relations should they aim to assume or evolve? The recent activities of the Club of Rome, in particular the preparation of the world dynamics model in conjunction with MIT, add a suggestion of substance to Elizabeth Borghese's idea. Might not the Club of Rome rank as a potential foal in the "industry" stable? Its intervention has so far been on an *ad hoc* problem-examining basis: the problem in this case being the global implications of continuing economic growth. The great philanthropic Foundations might together rank as another such "foal", while others might be sectoral groupings of firms, such as the oil companies, or steel producers.

The most effective non-governmental interventions of the international scientific community have also been on an *ad hoc* basis, the

two most notable examples being the *Study of Critical Environmental Problems* (SCEP report) carried out in part under the auspices of the International Council of Scientific Unions' recently created Scientific Committee on Problems of the Environment (SCOPE) and the above-mentioned *Inadvertent Climate Modification* report of the Study of Man's Impact on Climate (SMIC) carried out by 30 scientists from 14 countries (including the USSR, Hungary, Israel and India.)²

As a consultant to the United Nations Stockholm Conference Secretariat, I can vouch for the usefulness of these two reports and for the extent of their influence on international environmental thinking. Moreover, in considering various proposals for the creation of an International Institute of Environmental Sciences, which was favoured by many proposers of post-Stockholm international institutional arrangements, the Stockholm Conference secretariat, as well as a number of government delegates, were impressed by the quality of such conference-based reports. One wondered how many years and millions of dollars it might have taken for a newly-created International Institute of Environmental Sciences—either within or outside the United Nations—to come up with such authoritative and clearly-framed conclusions.

A Scientific "Stable"

International scientific cooperation has a long history, and many possibilities, though science's involvement with national government is more intimate, perhaps, than that of any other potential "stable". Nevertheless, this "stable", as witnessed by the SMIC report, may have relatively little difficulty in bridging the East-West gap. The North-South gap is, however, quite another matter. The implications of the fact that barely 1.5 per cent of global expenditure on research and development takes place in less developed countries must be faced. A far more serious effort must be made to build up a scientific infrastructure of both knowledge and people in the underdeveloped, and particularly tropical countries before there can be any serious claim that a world scientific community exists. Here, in fact, there may well be a case for new global institutional arrangements, specifically

designed to study Third World and southern hemisphere environmental problems and in so doing to transfer knowledge and research capacity to scientific institutions in the Third World.

An Industry "Stable"

The industrial stable potentially contains a variety of horses, adapted to different tasks. Clearly there would be, for this stable, a very serious East-West relations problem. Yet this may not be as insuperable at the non-governmental level as might at first be imagined. A meeting organized in Vienna early in 1971 by the *Business International* organization produced a remarkably lively and fruitful dialogue between East European industrial managers and Western businessmen on environmental problems. It was the first such meeting of its kind, but *Business International* is organizing others, and in so doing may shift its focus more and more from US-based "multinationals" to the experience of "trans-ideologicals" such as FIAT. If such colloquia between Western businessmen and Eastern managers proliferate, as seems inevitable, what will the attitudes of Western governments be?

Problems abound, of course, with the concept of an industrial stable. Many of these are internal ones of the individual corporate structure. There is, for example, the question of community representation in the individual corporate decision-making process. An important ruling of the US Securities and Exchange Commission in 1970 relaxed the former barrier against the inclusion, in US company proxy statements, of "general economic, political, racial, religious or similar issues". In effect, this ruling has potentially turned US corporations' annual meetings into arenas in which directors and officers of companies may be obliged to defend their views on a wide range of issues. The response of General Motors to this ruling and to pressure from the *Project on Corporate Responsibility* was to put Dr. Leon Sullivan, a black clergyman and businessman, onto its board in 1971. However, Dr Sullivan was not officially invited onto the board as an ethnic group representative but, like other directors, as a representative of General Motors stockholders. Thus, while powerful forces may have begun a shift in the social responsiveness of

US corporate boards, there is no sign that board membership will expand as it has done in West Germany, for example, beyond stockholder representation. The representative quality of the boards of international corporations is still, it must be emphasized, extremely limited in total population terms. This will continue to be so (because of the block votes of major interests) even when and if Europe and Japan achieve the "stockholding revolution" of the United States, where in 1970 the direct (votable) shareholding population included about one quarter of all adults.³

Another major problem for the industry stable is that of representation on their boards of the developing countries. This may be the hardest one to solve under present regimes of near-total expatriate ownership and control of multinational companies' operations in developing countries. A prerequisite of a genuinely global "stable" representing international business would be representation on multinationals' boards of individuals (who would, inevitably, usually be government appointees) from the developing countries in which the multinationals had operations.

Business and Labour in a Single Stable?

I have raised the problem of representativeness in the industry stable, not because I believe it to be a condition of the successful operation of the quadriga idea that each stable be literally representative of all the interests concerned with its operations (this clearly could not be true in the case of the science or consumer stables) but simply because each of the stables have special characteristics, and the leading characteristics of the industrial stable are its flexibility and its pre-eminent scope, power and importance. If, for example, a major contribution from the other side of industry—the international trades union movement—were likely to be forthcoming, the question of corporate representativeness would matter less.

There have in recent years been some significant new intersociety initiatives by labour. The 1966 Detroit Declaration of automobile workers from 14 countries, organized by the International Metal Workers' Federation was an example of important *ad hoc* international action.

Another example was the support by foreign workers of Ford workers in the United Kingdom in 1971. Similar action may soon be taken on environmental grounds. New forms of association between the international trades union movement with the industrial stable and with consumers and scientists may help to provoke such action. In this connection the ILO's tripartite structure of management, labour and government should be studied for the light that it may throw on political realities in this sphere.

However, when one examines the overall record of international trades union collaboration (for example, the level of accord and initiative achieved by the International Conference of Free Trades Unions) it seems evident that, for the moment at least, not much leadership can be expected from this quarter. This picture may, of course, change rapidly if national unions become more responsive to the problem of the environmental protection of their memberships.

Here is an example, perhaps, of where a productive interplay of interests might be engendered precisely through the formal linkage of the various stables on a problem-by-problem basis. If, for example, consumers' unions were to exert on trades unions a fraction of the pressure that they devote to getting industrial managements to reform industrial and commercial practices from the point of view of protection of the environment, the vast bargaining power of the trades union movement might be more fully and beneficially directed from the environmental point of view.

This possibility will, however, only become evident when the realisation spreads that the chief sufferers from environmental despoliation are invariably the working classes who lack the resources to escape from depressing and unhealthy environments.

A Consumer "Stable"

Transnational consumer cooperation has virtually no history at all. True, there exists a Union of Consumers' Unions. There is also the Inter-Parliamentary Union, which might be won back to the representation of parliamentary electorates' interests, rather than, as at present, those of partisan parliamentarians. "Naderism", the present apogee of the consumer movement, continues to switch its emphasis

from "consumerism" to "conserverism". *Friends of the Earth*, as a grass-roots international action movement which has close connections with "Naderism", may have a major potential if they can achieve the "take-off" of substantial support and develop a working alliance with the myriad other non-governmental conservation and amenity associations in each country.

The Government "Stable"

Finally, there are the governments themselves, Mrs. Borghese's fourth component. What type of relationship should governments have with the other stables? Should theirs be a leading role with science, industry and the consumer acting as a kind of subordinate apotic? Such an approach would seem illogical in view of the analysis which produced the quadriga prescriptions in the first place. Should governments meet internationally, on an *ad hoc* environmental problem basis, on an equal footing with the other horses of the quadriga? This too seems problematic. The basis for initiative would remain unresolved, and governments are not likely to be willing to give any prior undertaking that they will meet on a schedule of others' choosing to discuss agendas over which they have no control.

How Might it Work?

A third alternative would be for the other three horses—the troika of industry, science and consumers—to meet *ad hoc* to discuss international environmental problems and offer proposed solutions which they would then raise publicly with governments, and invite governments to help them to implement.

But is the common denominator of agreement between these three horses likely to be any higher than that between governments which claim to represent them all? In traditional bargaining theory the answer would be no. The more separate interests represented round a table, the slower the negotiation and more constrained the consensus is likely to be. The argument against this, and in favour of the troika (and quadriga) approach is that the bureaucracy of national government acts as a bottleneck in which the upsurging separate interests within the nation converge and block each other.

This is the crux of the matter: how much international agreement is held

back by the deadlocking of interests represented formally by each sovereign government and how much is held back by bureaucratic inertia, inability to coordinate and focus, and above all, shortage of suitable personnel and resources—under the constraints of tight budgets—to examine and deal effectively with an exponentially-growing welter of international problems?

If the blockage is primarily one of *interests*, then clearly rather than action, education should be the present top international priority: the troika/quadrige approach will be of little, if any, avail. If the blockage results more from the problems of bureaucracy, however, then a conciliar problem-defining and decision-making process among a quadrige—and perhaps, initially, a troika—is likely to inject new dynamism into inter-state relations and to give a truer picture of the relative values of various international transactions in relation to the perceived interests of electorates.

Another major impact of such a change might be that the present overwhelming priority accorded by national governments to their own special interest—defence and security—would tend to be abated. This change in itself, if it took the form of a diminution of the present \$200 billion being spent annually on largely unusable weapons of total environmental destruction could make available much greater official resources for the enormous tasks of environmental redevelopment and restoration which all nations now face.

Target: An Oceans and Atmosphere Regime

Finally it seems clear that while troika arrangements might prove invaluable, on a *ad hoc* basis, as a means of helping prod and draw governments together, governments are very unlikely to sit down on an equal footing with other groups in international society unless there is a new field in which to try out the experiment.

The global environment *as a whole* is *not* that field. It is too large and ill-defined. Nor is it new any more. Governments have tramped over it extensively if not systematically in the course of three years of preparation for Stockholm and of making other regional and sub-regional arrange-

ments for a variety of environmental purposes.

If it is to be tried, the quadrige arrangement should be launched, as was proposed by Mrs. Borghese, as a world regime for the area of ocean (and, I would add, atmosphere) beyond the limits of national jurisdiction. We have already seen in the arrangements for Stockholm that the non-governmental organizations will be directed to a stadium half a mile from where governments will be sitting. This separation is symbolic of present realities. The most constructive way forward may now be for business, science and the consumer first to cultivate each other and then, together, to get governments into harness with them.

Role of a Central UN Body

What might be the role of a central United Nations body in relation to the troika of business, science and consumers? It should be remembered here that, according to the United Nations Charter, the United Nations and its Specialised Agency secretariats are not simply the creatures of governments. The international secretariats are of course the servants of the governments who created them, but under international treaty they are permitted some degree of initiative and a far smaller amount of discretionary spending power. In the case of the central environmental body of the United Nations that is likely to emerge from the Stockholm Conference, the degree of possible initiative may be quite considerable, even though the scale of discretionary spending is likely to be minimal. Moreover, this central initiative, at the information-gathering level, is something that the non-governmental stables of industry, science and the world's consuming publics, whose *forte* is more likely to be in specific *ad hoc* interventions, could *not* effectively perform.

It would be neither practicable nor, probably, desirable for any central United Nations body to initiate or organize troika or quadrige meetings. Even if initiative in this area were given to it by governments, it would inevitably feel forced to reject any attempt at a supra-governmental function, and for the sake of self-preservation act in a strictly inter-governmental spirit.

Instead, the United Nations environment unit should use its authority to communicate the findings of its ongoing monitoring directly to non-governmental groups, and thus help them in their task of defining what the highest priority international environmental problems are, where they occur most severely and how they might be tackled. If, however, such a secretariat is to be denied access to national governments' data as regards environmental performance and objectives, the troika may feel forced to use its non-governmental relationships to build up research, monitoring and information-exchange capabilities of its own. This would not be an ideal or even an appropriate task for a troika. But, failing full governmental cooperation with a central UN body, it might provide the basis for serving the interests of the peoples of the United Nations in whose name the United Nations Charter was signed.

Brian Johnson

References

- ¹ *Inadvertent Climate Modification. A Study of Man's Impact on Climate*, MIT Press, 1971.
- ² Sponsored by MIT and hosted by the Royal Swedish Academy of Sciences, and the Royal Swedish Academy of Engineering Sciences.
- ³ Meanwhile, the rapid institutionalisation of stock ownership had put 40 per cent of listed corporate shares into the hands of professional fund managers. These managers are, presumably, also subject to fund-holder pressure, and could, if it became sufficient, pass such pressure on to corporate management with considerable "leverage" effect.



An Action Plan for the Human Environment

The recommendations of the six Secretariat documents prepared for Government are summarised in a set of Action Proposals—the Action Plan of the Stockholm Conference. This document was provided to enable the Governments to identify areas of major international concern and to agree on specific measures to deal with them, which should include the allocation of resources and the assignment of responsibilities for their co-ordination and implementation.

The Plan has three components: a proposed global environmental assessment programme, or *Earthwatch*, environmental management activities, and measures to support national and international action of assessment and management, as described in the article on Agenda Item No. 6.

All this activity is essential if governments are to be drawn together in common research activities, and into acceptance of a framework of principles for international behaviour, especially the essentially new concept of “environmental aggression.”

Again, it must be stressed, that this programme represents a skilful presentation of the politically possible. But what if the politically possible is biologically or socially impossible? The argument that we do not know what is politically possible or impossible is not an argument that will appeal to Nature, if we strain the absorptive capacity of our natural systems too far. Pascal came up with the reasonable proposition that, if you don't know whether God exists or not, it is sensible to try to believe in him in case he does.

Internationally sponsored research is essential to guide the scale and scope of protective action, but it does not itself constitute such action. Similarly, with the establishment of principles for future international agreements, the approach to the Action Plan is an essential first step and eminently reasonable, given the belief that

a planetary environmental crisis is pending rather than present, and that it can be dealt with by calibrated adjustments of the controls, rather than by a radical change of course. But if, to use Robert Allen's analogy, we are already falling from our aircraft, a parachute is called for rather than the Secretariat's proposed altimeter.

The governmental participants at Stockholm apparently do not, according to the Action Plan, “believe that international controls and management of the environment are necessary, at least for the present.” Yet all the analyses contained in the Secretariat's six documents discussed in this issue, lead one to the conclusion that such controls and management are vital. Clearly this is a matter of policy. Surely, however, the nations gathered at Stockholm might agree to take one leaf from the United States' legislative book. In that country, each agency of the Federal Government is now required by law to produce “an environmental impact statement” related to any new activity which has implications for environmental quality. Each agency must produce such a statement sufficiently “in advance” of any proposed activity to enable the Presidents' Council on Environmental Quality and the Environmental Protection Agency to examine, and, if necessary, require revision of that agency's plans.

This requirement applies to international as well as national activities and includes the United States Agency for International Development's aid activities in the Third World. Admittedly this requirement has so far tended to produce an avalanche of documentation which serves—indeed may be intended—to overwhelm rather than to inform. Yet the simple fact of each agency having to go through this exercise in self-justification *must* be salutary, if only because it requires the involvement of ecologists and other environmental scientists in every new deployment of developmental effort.

Should not an international plan of environmental action include a parallel proposal? Developing countries receiving US aid must already submit to such scrutiny to satisfy the US Congress. Would it be repugnant for them to submit to similar scrutiny by the United Nations? Of course, such a proposal would cost a lot of money, and the rich nations do not appear

willing to meet such costs, while the poor nations argue, with justice, that they should not, or cannot, do so. The proposal is thus “unrealistic”. But can one question whether the claim of “unrealism” is an adequate exemption from at least an international debate over the question?

Frequently, throughout these six Secretariat documents, and in the Action Plan, the statement is made that current environmental problems are unprecedented. Surely, then, they call for unprecedented solutions? One that has been suggested in this issue is for a series of high-level initiatives for co-operative action to be taken by trans-national strata of international society, below—or apart from—governments.

The obvious focus for such initiative by business, labour, science and users, or consumers, is those 5/7ths of the earth's surface not yet appropriated by nation states.

Such initiative may seem impracticable today, but if our overarching concern is with survival, it should, in the name of ecological realism, at least be tried.

Edward Goldsmith

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Two Skeletons in Stockholm's Cupboard

1. Population: the issues they can't talk away

The Stockholm Conference will not be discussing population growth. This is due to the prejudice of a few member states who believe it is either immoral or unnecessary (or both) to control population size. However, the following three points are addressed not to the prejudiced few, but to the short-sighted many in the delegations of the United Nations, who believe that the answer to the global environmental crisis lies simply in massive shipments of loops and condoms to the developing world.

First, the threatened collapse of the world's ecosystem and the exhaustion of its resources is mainly due to the consumption pattern of the rich countries. In 1968, their one billion inhabitants consumed 82 per cent of the world's energy production, and the figures for metals, minerals and fertilisers are of the same order. *Per Capita* consumption of energy in the rich countries as a whole was 10 times that of the poor, and in North America it was 35 times that of Africa. Thus each additional individual born in these over-developed nations represents at least 10 times the threat to mankind's survival, as does his counterpart in the undeveloped world.

Population control should thus be a greater priority in the rich countries than the poor. Yet no government of a rich country has so far committed itself to even a stabilisation, let alone a reduction, of its population.

Secondly, the current "population explosion" is due to falls in death rates, particularly among infants, brought about by improved medical facilities. The suggestion that one way of controlling population growth would be to cut back on the expansion of such facilities, thus increasing in particular the infant mortality rate, will be greeted

with cries of "genocide" or "cold-blooded murder". Yet decisions are taken every day by governments, with the complete acquiescence of their electorate, which constitute precisely this step. Decisions to buy 20 kidney machines and build 20 houses, rather than 100 machines and no houses, mean the people will die. The decision to buy even one hundred machines that 500 here at home may live rather than spending the same money to save 5,000 from cholera in their distant land, means that people will die. Presumably those who cry "murder" place equal value on every human life, wherever that may be?

Now it *would* be murderous if those with the medicines (the rich) refused help to the poor because they felt their fated wealth threatened by the latter's numbers. This prescription for reducing population growth must not be used as an excuse by the rich to substitute the halo of economic cost benefit analysis for the harsh realities of their currently inadequate response to the needs of two-thirds of humanity.

However, Governments would do well to be honest and recognise that preserving life has its costs, and that saving babies for a living death of poverty and starvation, or maintaining human vegetables with money so desperately needed elsewhere is not a rational use for scant resources.

Thirdly, because the human being cannot reproduce for the first 13 years of its life, and because it lives on beyond its reproductive years there will be a time-lag between the achievement of the "two-child family" and the eventual stabilisation of population size. This lag is due to the population growth of the immediate past which has provided us with proportionally more young than middle-aged people. What this means is that even if between now and the year 2000 the replacement sized family gradually became universal, the 5.8 billions of that year would continue to grow until about 2075, when it would finally stabilise at 8.2 billion. A delay of only 14 years in the achievement of such zero growth by the developing countries would mean stabilisation only slightly later, but at a world population of 15.5 billions.

Are the policy makers aware, when they mouth their platitudes about "a world fit for our grandchildren", that they must take radical decisions *now* if the world population is even to

stabilise during the lives of their children's children.

A failure to meet this challenge now is only comparable in its long-term implications for mankind to a decision to launch a full-scale nuclear conflict.

Bruce Mackay

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Two Skeletons in Stockholm's Cupboard

2. Defence Vs. Environment

On the Agenda of the Stockholm Conference one important item is missing. There is no report on the pollution hazards of some modern weapons developments.

It can be argued, of course, that to include such a controversial item on an already overloaded agenda could vitiate consensus on action to deal with other equally disturbing environmental problems.

Yet it has its place, if only to remind member states that, though the ultimate danger to mankind may still be the bang of a nuclear super-power confrontation, the peace-time developments of weapons of mass destruction can also contribute to the deterioration of the environment.

The British United Nations Association has, in fact, submitted papers to HM Government in connection with the UN Conference urging that this matter should be inscribed on the Agenda of the Conference, and that the Secretary-General of the UN be asked to set up a Committee of Experts to examine and report on the situation as a matter of urgency.

The heart-searching in Congress and the protests of environmental and other groups in the United States, Canada and Japan prior to the five-megaton explosion at Amchitka on 6 November 1971 was an indication that public concern on this matter is growing. The arguments developed into a clear confrontation between those who feared violation of the environment and the alleged needs of American defence. (The outside world, of course, knew nothing about the even larger Soviet underground explosion some months earlier until it had happened.) Attempts were made in the lower courts and even the Supreme Court to stop or postpone the test on the grounds that it contravened the Environment Policy Act, in that it might damage wild life, pollute the sea, vent radiation into the

atmosphere, trigger off an earthquake and cause *tsunami* or tidal waves. At the time of the explosion, Hawaii was even put on alert in case a tidal wave occurred.

In an earlier report to the White House¹ the US Atomic Energy Commission had claimed that any ground water contaminated by radiation leaks from the underground test would take 1,000 years to find its way to the Bering Sea, but, in certain circumstances, the radiated water could be released to the sea in 100 years, and even (though very unlikely) in three years after the test. If this last event occurred, the AEC conceded, the radiated water would be discharged from the test site into the ocean for the next 130 years. The water would be 1,200 times more radioactive at the time of the first discharge than water containing the maximum safe concentration of radiation.

Despite the fears and protests, James Schlesinger, Chairman of the Atomic Energy Commission, told a press conference on 27 October 1972² that "Some objections have been raised on environmental grounds. In the careful examination of these issues within the executive branch, environmental damage has been extensively considered, and overriding requirements of national security have, of necessity, taken precedence." In this case the "overriding requirements" were to test the Spartan anti-ballistic missile.

In the event the explosion took place. It registered 7.0 on the Richter seismic scale but appeared, as the AEC had confidently predicted, to have no immediate environmental effect. Two days later, as also predicted, the earth round the test site collapsed into a huge crater with a thud that registered 5 on the Richter scale.

The defence pundits appear to have won the argument, but the protests were not in vain. They undoubtedly forced the AEC to take even greater care than they might otherwise have done to safeguard the effects of the explosion, and Administration officials have hinted that perhaps no more such tests need be conducted.³

Yet the fears of the environmentalists were not entirely unfounded. The US Committee for Environmental Information quotes studies⁴ confirming that nuclear tests do set off earthquakes at the time and place of under-

ground tests, though, normally, these are within a small radius of the explosion. Even if an underground test does not cause an earthquake, it may affect the timing of one due to occur through natural causes. This was thought to be particularly so in a geologically unstable area such as Amchitka. In the absence of any impartial study the possibility that underground tests may, in certain cases, trigger off distant earthquakes or *tsunami* remains an unresolved question. Writing in *The Times* of 31 July 1970, Pearce Wright noted that there had been an unprecedented number of deaths caused by earthquakes during the year, that all took place within two or three days of nuclear tests.

There appears to be a need for an international study of the relationship (if any) of nuclear testing and earth tremors, particularly if testing continues on its present scale into the future.

According to the Stockholm International Peace Research Institute (SIPRI)⁵ the annual average of all tests by all nations before the Test Ban Treaty of 1963 (which prohibited testing in space, the atmosphere and the sea, and to which China and France are not parties) was 40; by 1970 it was 48, and increasing year by year. In 1971, up to the end of October, according to figures supplied by the Foreign and Commonwealth Office, the French had detonated explosions in the Pacific; the USSR had exploded 11 underground tests, and the USA seven, with the Amchitka explosion still to come. No Chinese tests were reported until 18 November, although in the past China has detonated about a dozen in the atmosphere.

Radioactive Fall-out

Although the Test Ban Treaty of 1963 was *supposed* to limit the development of nuclear weapons—it was also an anti-pollution measure in that fear of the effect of radioactive fall-out from above-ground tests contributed to its ratification by the United States, the Soviet Union and Britain. Here the Treaty has proved more successful. Since 1963/4 there has been a drastic reduction in the global deposition of fission products, such as Strontium 90, but the continuation of testing as indicated above, still gives cause for environmental concern.

Following the Chinese and French atmospheric explosions between September 1969 and October 1970, there was an increase of the long-lived fission products Cs-137 and Sr-90 in air in the United Kingdom in the first half of 1970, about 20 per cent greater than for the first half of 1969, though this was only about one-tenth of the levels reached in 1963/4⁶; and 70 per cent of this long-lived activity resulted from the Chinese explosion in September 1969. Measurements of air in the Southern Hemisphere showed that in mid-1970 about 80 per cent of the long-lived activity was contributed by the French tests held in the South Pacific in 1968. In 1969 the annual deposition of Sr-90 in the southern hemisphere exceeded that in the north for the first time, although the cumulative deposit in the south at the end of 1969 was less than one-third of that in the northern hemisphere.

American scientists have also voiced concern over venting from US underground tests, about 12 of which appear to have vented radiation between October 1963 and December 1970⁷. It has been suggested⁸ that the amount of radiation released from American underground testing has varied from 200 to one million curies per explosion, the latter being comparable to the radioactivity released in an above-ground explosion of the size of the Hiroshima bomb (20 kilotons). There are believed to be similar leakages from Soviet tests, but hard information is difficult to obtain. Sweden complained in April 1971⁹, however, that a Soviet underground nuclear explosion in the Urals on 23 March had leaked radioactivity that later reached Scandinavia.

This does not mean, of course, that the release of this radioactive material is necessarily dangerous, in that there is always some small natural "background" level of radioactivity everywhere in nature, differing widely from place to place. The position with underground explosions is, however, a different hazard. If, despite precautions, they "vent" through soil and rock fissures, releasing, for example, radioactive steam this may lead to subsequent fall-out miles away depending on wind and rain conditions, but may also contaminate underground water which then seeps gradually into far distant rivers and reservoirs.

There is, as yet, no conclusive evi-

dence of this, nor of the claims that have been made that radioactive emissions from underground tests cause foetal and infant mortality and cancer. But bearing in mind the reluctance of authority to admit in the early days of atmospheric testing, that the release of radioactive materials into the atmosphere in large quantities was of serious consequence, the need for an impartial survey of these hazards seems overwhelming. Only then can the public decide on the evidence whether the risks of environmental pollution from testing justify further military experiment in terms of national defence, particularly as, according to a recent SIPRI report, the importance of testing is exaggerated. Stockpiled weapons in the United States and the Soviet Union, at least, have such "overkill" capacity that more can hardly add to deterrent capability¹⁰.

Chemical and Biological Weapons

But environmental hazards are not confined to nuclear weapons development. Since 1966 the prohibition of chemical and biological weapons has occupied an important place on the agenda of the Conference of the Committee on Disarmament (CCD) in Geneva. This is in part due to the public outcry that arose after revelations from scientists and others of the possible effects of the use of chemical and biological agents in warfare and to the extensive use of herbicides in Vietnam.

In 1969, the British Government tabled a draft convention which went much further than the 1925 Geneva Protocol concerning biological weapons in that it demanded not only an obligation not to use biological weapons in war, but provided undertakings not to produce or otherwise acquire, or assist in or permit the production or acquisition of, microbial or other biological agents of types and in quantities that had no dependent justification for prophylactic or other peaceful purposes, as well as banning ancillary equipment or vectors—the purpose of which is to facilitate the use of such agents for hostile purposes; not to conduct, assist or permit research aimed at production of the kind prohibited above; to destroy, or divert to peaceful purposes, within three months after the convention comes

into force for a given party, any stocks of such agents or ancillary equipment or vectors as have been produced or otherwise acquired for hostile purposes.

Although these proposals were first spurned by the CCD on the grounds that they did not include chemical weapons, a change of mind by the Russians in March 1971 enabled an agreed Convention to be completed and sent to the General Assembly on 30 September. Although not so far-reaching, the operative provisions of the Convention are similar to those first put forward by Britain, and which over 70 countries have so far signed.

Meanwhile, the United States, following announcements by President Nixon in November 1969 and February 1970, has unilaterally begun to destroy existing stocks of biological weapons. On 18 October 1971¹¹ President Nixon announced the conversion of a former biological warfare research centre at Fort Detrick into a centrepiece of the Government's crusade against cancer.

Even so, past experiments with biological weapons have left part of the proving grounds at Dugway, Utah, unusable for many years, and the island of Guinard is still uninhabitable after experiments there with such bio-contaminants as anthrax.

The problem of production, testing and disposal of chemical weapons still remains, and it could be years before a convention for these agents is agreed. The accidental escape from the Dugway Testing Grounds in March 1968 of the chemical VX, which killed over 6,000 sheep, is an example of one hazard. It took only a tiny fraction of a gram of this nerve gas to kill each sheep exposed and, if the wind that carried the agent outside the testing ground had been blowing in a different direction, it might have been people and not sheep that suffered.

Disposal of Waste and Obsolete Stocks

But a major peacetime environmental hazard of the development of both nuclear and chemical weapons is the disposal of waste and obsolete stocks.

The problem of radioactive waste is not, of course, confined to or mainly concerned with nuclear weapons plant. It has been estimated that by the year 2000 the world's civil nuclear power



reactors will be producing 4,000,000 MWe of electricity compared with 25,000 MWe today, but already the accumulation of intensely radioactive wastes, including by-products of the manufacture of nuclear weapons, has achieved colossal proportions. One does not know how the USSR handles her radioactive waste, but in the USA it is estimated at 75 million gallons, three-quarters of which is stored in buried tanks in Washington State¹². These tanks are alleged to contain as

much radioactive material as would be released in a nuclear war. In the tanks with fresh wastes, the heat of radioactive decay keeps the stored liquid boiling and continual artificial cooling is required to keep the pressure of the boiling waste from bursting the tanks. An earthquake, even if it did not damage the tanks themselves might damage the cooling systems or the pipes which lead into the tanks.

Similar problems for dealing with these radioactive wastes applies to all

countries developing nuclear weapons and, increasingly, to those utilising nuclear reactors for peaceful purposes. Britain is still experimenting with methods of solidifying radioactive waste. In the United States a start has been made, but solidifying the existing accumulation of waste will take perhaps centuries to complete. Meanwhile there is also the possibility of leakage from buried tanks and of the wastes finding their way through underground waters into rivers.

The alternative appears to be the sea, and low-level radioactive waste is known to have been dumped there but how much is unknown. The sea has also been used extensively as a dumping ground for obsolete chemical weapons. Dr Bernt Dybern, the senior marine biologist at the Institute of Marine Research of the Swedish Fishery Board at Lysekil, has referred to it as one of the biggest pollution problems¹³. There, canisters of mustard gas, dumped on British and Russian orders after the Second World War, are causing an increasing number of injuries to Swedish and Danish fishermen. The gas containers have become rusty and when they are caught in fishing trawls they break easily and spill their contents.

In 1970 there was a big outcry, and not only in America, against the decision of the US army to sink nearly 3,000 tons of nerve gas in 418 containers in 16,000 feet of water 280 miles off Cape Kennedy. Partly as a result of this, Mr. Melvin Laird, US Defence Secretary announced in February 1971¹⁴ that in a move designed to protect the environment there would be no more dumping of obsolete gas and explosive weapons in the sea. But Britain, France and the USSR have all used the sea for a similar purpose.

Anxiety regarding the long-term effects of dumping radioactive and other wastes in the sea is confirmed in a recent UN booklet¹⁵. It points out that though registration of dumpings has been recommended and studied in the past, Governments have been reluctant to reveal what they dump and where they dump it. Dumpings have certainly been going on for a long time, and to date the extent of damage from containerised wastes appears to have been minor. But the booklet goes on to give a warning: "Perhaps the greatest potential danger from containerised wastes arises from the uncertainty of when and how the material in the container will be dispersed in the marine environment. Containers are usually made of strong materials, often concrete or steel, or both. Concrete, however, does crumble and steel rusts. Earthquakes on the ocean floor can break open any containers known. No one expects the containers to last for ever, even those who make them. The usual expectation appears to be that materials will escape from the container slowly and be diluted in vast

quantities of sea water. No one can guarantee that this will happen and, even if it does, that marine life will not be contaminated."

New Means of Destruction

Apart from the demands of military planners, technological momentum itself contributes to the evolution of new weapons of mass destruction today. Charles Foley, writing in the *Observer* of 20 June 1971, referred to a new weapons system being tested by the US army which "employs an awesome array of sensing devices, laser beams, night-seeing automata and computers to create an electromagnetic environment in which, according to reports "nothing hostile can survive".

Nigel Calder, summing up a symposium of writers in *Unless Peace Comes—A Scientific Forecast of New Weapons*¹⁶ said "The possibilities of geophysical warfare, aimed at producing subtle or catastrophic modifications in the condition of the Earth or its atmosphere, are largely speculative. But it is important to understand that the impediments arise more from ignorance of natural processes, which leave the long-term effects of particular actions incalculable, than from any basic incapacity for human interference with the environment....

"For example, economic attrition by drought might be brought about by systematic seeding of clouds in a prevailing airstream, to remove moisture. Hurricanes might be guided towards an opponent's coastline. Remote triggering of a major earthquake is not entirely incredible, nor is the creation of artificial tsunami by tipping loose material off the edge of the continental shelf. As an extreme form of geophysical warfare, one can imagine deliberate inauguration of a new Ice Age by interference with the Antarctic ice cap."

More Research Needed

The object of this article is to indicate, on such scanty evidence as is available that, quite apart from their use, the development and disposal problems of modern weapons of mass destruction can offer a threat to the environment. Inevitably, most of the data quoted is based on US experience, as that of the Soviet Union seems impossible to obtain.

There appears to be a case, how-

ever, for a proper systematic survey so that public opinion can be made more aware of choices facing it between contamination of the environment and the proper needs of defence.

In the past the United Nations has produced surveys by experts on the effects of the possible use of nuclear and of chemical and biological weapons, but has ignored the more present dangers of their testing, development, and disposal. Now perhaps it should be asked to undertake a new survey taking account of these matters. NATO has set up a Committee on the Challenges of Modern Society which appears to be concerning itself with many aspects of environmental hazard and pollution except that of weapons development, on which one might think it would be well fitted to comment.

Public concern for the environment has already had some effect on thinking about arms control and disarmament. It is essential that the pressures should not only be maintained, but increased. T. S. Eliot once foretold that the world will end not with a bang, but with a whimper. Our object is to avoid both.

Peggy Crane

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Books

Disaster postponed

THE LIMITS TO GROWTH. Meadows et al. (Earth Island, London, 1972.)

For all of modern man's easy acceptance of the fruits of technology, he has an uneasy feeling that technology is running away with him. Nothing alarms him more than the suggestion that any aspect of his fate is being decided by the output from a computer. It is all the more fascinating, then, that the latest output of the computer by a group of systems analysts at Massachusetts Institute of Technology has the laudable objective of quantitatively examining the predicament of man and that many scientists, sociologists and economists, for whom the computer is an everyday tool, are up in arms at what it says.

The cause of this brouhaha is a slim 205 page volume entitled the *Limits to Growth*, first published on March 2, 1972 in New York.¹ What it concludes is quite simply that man is heading quickly for disaster if overall mankind does not learn to limit economic growth.

That such a thesis would be unpopular with most economists was to be expected. All their training, their research and their ethos has been concerned with ways in which the economy can be stimulated and expanded. Practically no economist has given serious thought to the problems of economic stability. For one thing stability is read as stagnation, and for another it is hard to find an employer who is interested in economic equilibrium. It has no appeal to governments, politicians, board chairmen, company presidents or even to used car salesmen. As one economist remarked, "If Meadows is right, then we've been wasting our time."

One simple way for economists to deal with Meadows' book would be to

ignore it. But it has been far from shunned. On the day of its publication the influential *Washington Post*² carried a 1,000 word criticism by two distinguished economists, Alan Kneese and Ronald Ridker of Resources for the Future, a top level private American 'think tank' institution. The English magazine *The Economist* took Meadows to task in a virulent attack in its March 11 issue,³ devoting two whole pages to debunking what it titled "The Limits to Misconception". The highly respected and widely read weekly of the American Association for the Advancement of Science, *Science*,⁴ devoted three pages in its March 10 issue to describing the book, the work, and the whole meeting at the Smithsonian Institute's Woodrow Wilson International Center for Scholars, Washington, where the book was launched. Many lesser papers carried reviews, some critical, some credulous, while some leapt on it with the fervour of the converted. In conversation one tends to find that people have taken up positions without even having read the book, or its precursor, *World Dynamics* by J. Forrester, Professor of Management at MIT.⁵ Some reject it simply because Meadows' conclusions come from a computer output, some because his conclusions are unacceptable, some because of their misinterpretation that the study permitted prediction a century ahead, some because they dislike to see societal problems being resolved in a quantitative way and some because of the deliberate publicity it was given. The environmentalists on the other hand, welcome it as a piece of quantitative proof of what they have long argued. "You have made us respectable" said Stewart Udall, former Secretary of the Interior and author of *Agenda for Tomorrow*.

Perhaps one reason the book and the work behind it is being taken suffi-

ciently seriously to justify an all-out attack on it, is that some distinguished people have supported it. *The Economist* petulantly asks, "Is there any value in this sort of exercise when it can apparently lead such very clever people into such misconceptions?" Such people it seems include Alexander King, Director of Science and Technology in the OECD, Phillipe de Seynes, UN Under-secretary General for Economic Affairs, Lester Brown of the Overseas Development Council, Professor Carrol Wilson of MIT and others. The purpose of this review is to consider both sides of the question, and to reach some conclusion as to what follows next.

The World Model

The work has its origin in the Club of Rome, a group of prominent industrialists, scientists and economists, who under the leadership of the Italian industrialist Aurelio Peccei, initiated a project on the Predicament of Mankind. They were led to the idea of making a systems analysis of the world through the creation of a dynamic world model linking such factors as population, pollution, resources, land, and capital generation. Jay Forrester, MIT Professor of Management and a systems analyst took on the job. The group met in Cambridge (Mass.) for two weeks to thrash out the elements of the model and the relations between the key parameters, and Forrester then went ahead and created it. The basic concept is that any system responds to a feedback from results of the operation of that system. This is no esoteric concept, but a daily experience for every living creature, whether it be a bee seeking nectar, putting a spoon in one's mouth, deciding how quickly to brake a car in traffic, or considering to what extent crowding modified the birthrate. The model is created and the computer simply follows a man-made programme. If one puts garbage in, then one gets garbage out—the "gigo" principle. For the output to have value the model must be sound and the data realistic.

The World Model is not easy to formulate, but it is relatively easy to comprehend. In *World Dynamics*, Forrester painstakingly explains the logic behind each of its feedback loops, and how one inter-connects

with another. Those who wish to criticise the model have really no alternative but to plough through Forrester's book. The model is, he says, "tentative...because a truly final model is unlikely ever to be achieved...only broad aspects are studied, not the difficulties of implementing changes...most of the concepts...reflect the attitudes and motivations of the recent past and present...it does not incorporate possible changes in human aspirations."

Forrester defends the value of the World Model by remarking that "Man acts at all times on the models he has available. Mental images are models. We are now using those mental models as a basis for action". Later he observes "that though the model may seem oversimplified... (it) is probably more complete and explicit than the mental models now being used as a basis for world and national planning". His point is that the human mind is not adapted to considering the dynamics of the various societal interactions, and warns "If we follow intuition, the trends of the past will continue into deepening difficulty".

What comes out of *World Dynamics*? Essentially, having developed the model, written it down as a dynamic simulation, used what slim data were available to relate the variables, he has written it as computer program, and then tested it. His testing takes the form of examining the effect of letting any one of five basic parameters be the limiting ones for growth. These are: population, pollution, crowding, food supply and land, and natural resources. He makes no claim that his relationships are correct or that his time scales are true. He freely admits the great need of better data. So when his computer output shows a crisis situation sooner or later no matter what turns out to be the limiting factor, he is neither predicting the magnitude of the disaster nor the date of its occurrence. Nevertheless on the basis of the existing data which are as good as are available to anyone else, and if current behaviour continues, then certain catastrophes are inevitable within a century. He is the first to agree that the basic data are not good enough, but says that "assumptions can be checked against available information and can be rapidly improved".

He argues, "Our social systems are far more complex and harder to understand than our technological systems. Why, then, do we not use the same approach of making models of social systems, and conducting laboratory experiments on those models before we try new laws and government programs in real life? The answer is often stated that our knowledge of social systems is insufficient for constructing useful models. What justification... (have we)... to design new social systems by passing laws and starting new social programmes?"

The Limits to Growth

Meadows' book is not simply a popularization of Forrester's. Meadows and his team have refined some of the data and the model. There are many weaknesses, which are admitted. It is almost impossible to correlate pollution to its effect on deaths, or environmental clean-up, and still harder to put a reasonable figure on the time delay between the loosing of a pollutant, and its effect on the environment. But the very discussion of this time delay serves to highlight a crucial factor in dynamic interaction. For a dynamic model serves to show in a very clear way the importance of the time delay. For example a simulation of delays in the transference of DDT along biological chains, and its slow degradation, shows that DDT levels in fish can be expected to continue to rise for more than ten years after DDT use is cut back. The act of cutting back DDT use therefore does not in any way guarantee that environmental effects of DDT will be instantaneously reduced.⁶ Equally, a conclusion today based on an assessment of given DDT levels in comparison with rate of use, is somewhat half-baked unless coupled to a dynamic simulation model.

Meadows' thesis is that in order for mankind to survive without an intervening catastrophe he must of his own free will impose a limit on his economic growth. He argues that growth must stop because in the end there are no longer technical solutions to the problems. He points to New York, a city whose core area is now losing population because there is now no technical means of keeping it alive at that size and complexity. Here he joins hands with Professor Garret Hardin, whose ideas expressed in his

celebrated *Tragedy of the Commons*⁷, have so irritated liberally minded academics.

But it is upon just this aspect of conceivable technical solutions that the economists attack Meadows. The critics from Resources for the Future² grumble that "the authors overload their case by letting some things grow exponentially, and others not. Population, capital, pollution, grow (in Meadows' model) exponentially... but technologies for expanding resources and controlling pollution are permitted to grow, if at all, only in discrete increments". *The Economist* in a furious paragraph claims that the Meadows' team "pumped into its computer so many dear, dead assumptions. It falls with both eyes open into the central trap... (that is that) ever since economic growth really began with the industrial revolution 200 years ago, any scientist has always had to forecast world disaster if he plots existing exponential economic growth against elasticities of supply and substitution for particular things as assumed within known technology. Since it is exponential growth in technology that is spurring exponential growth in income, of course your computer tells you that you are heading for a breakdown, if you tell it to assume continuance of the effect without continuance of the cause."

It is clear *The Economist's* writer had no time for Meadows' conclusions, and insufficient time to mug up on the theory of non-linear feedback systems. Indeed a central argument adopted by resistant economists is that there is absolutely no proof that resources are running or even will run into deficiency. Here the objective observer definitely finds himself in difficulty. Barnett and Morse's famed book *Scarcity and Growth*⁸ is often quoted as sound point of origin for any one seeking enlightenment. Published in 1963 it proved that the raw material element in manufactured goods was, if anything, dropping in price. This was taken to suggest no shortage of resources, or, in economic jargon, an elasticity of supply. The exception, timber, was regarded as no counter proof, perhaps because it is actually a renewable resource, and so less critical. But 1963 is not 1972. In spite of *The Economist's* exaggeration that "every oil drill pushed down into the North Sea finds oil reserves that

nobody 15 years ago had suspected" there is absolutely no doubt in oil men's minds that the global oil reserves are very limited indeed, and every forward looking oil company is buying itself as fast as it can into other energy fields, and turning itself into an energy company. The price of energy is rising fast. Here is one exception to Barnett and Morse's thesis. Even *The Economist*, thrilled by the computer, says "It would also be welcome if computer studies could be turned to trying to check what things are coming into inelastic supply", impractically ignoring that what finds oil in the North Sea is not computer studies, save as models of the North Sea sediments, but time, money, and energy expended on drilling holes in the sea bed.

Another count upon which the economists can hopefully attack the World Model, is on the grounds that it is too "aggregative." "This highly aggregated model" say the men from the *Resources for the Future*,² "obscures the dramatic differences between the developing and the developed world." But this is just Meadows' point. The conclusion of

the World Model project points to a mean maximum GNP/head counted globally of \$1800. Thus those present day countries with higher than that level are going to have to concede their standard of living if the less developed countries can hope to have a fair share. Clearly it is not a popular suggestion, and certainly not one to be warmly welcomed by politicians seeking office in most developed countries.

But the argument that the model is too aggregative will not stand inspection. After all the world is the world. It is true that economists make their predictions upon considerably simpler static models based on elements of the whole—say the USA rather than the world, but this does not make them more accurate. Such a model is surely unrealistically simple, or to resort to jargon, dis-aggregated. It is hard to suppress the conclusion that Meadows has essentially pulled the carpet out from beneath the economists. Because it deals with dynamic interactions, then given equal access to data, the systems analysis approach must of necessity be a more faithful representation of future trends. Economists can scarcely complain. The techniques are open to

anyone. In a recent article examining why it was that in spite of high unemployment there were rising prices in the UK, Maurice Rose, Professor of Economics at Queen Mary College, London, concluded that "since economists were unable to identify the disease they could scarcely propose the remedy."

Nevertheless, the economists will continue to retain an arguable point in suggesting that there is unlikely to be resource shortage because new technology will make available more resources. It is doubtful if any conclusion will be arrived at till after a shortage or shortages actually develop. If Meadows is right, it will then be too late. There is, however, one way in which the argument could be resolved, in advance of real events. It takes energy to drive the economy. Indeed there is a remarkably close relation between GNP per head and energy consumption per head. Up till 1965 (two years after Barnett and Morse's book) the energy consumption per dollar of GNP at constant prices had steadily fallen. Indeed it seemed so inevitable that it was a part of the economic lore that this state of

The Blueprint for Survival

is the subject of AN INTERNATIONAL SYMPOSIUM published in the
June issue 1972, Volume VII, No. 2 of

THE TEILHARD REVIEW

The Symposium, under the general title of, CHANGE OR DECAY?, brings together twenty-three distinguished contributors from a variety of fields. They ask questions about the factual accuracy of the **Blueprint**, its 'philosophy', the possibility of its implementation, alternative futures, and the place of human values in the debate. The Symposium provides invaluable guidance for both specialists and members of the general public through the maze of problems raised by ecology and future-research at a time when the report, **The Limits to Growth**, under the auspices of the Club of Rome, has amassed evidence that mankind faces an extremely urgent and critical situation in which decisive steps must be taken during the next half-decade. Contributors to the Symposium include: H. R. H. **The Duke of Edinburgh**, Margaret Mead, Stafford Beer, Hans Mislin, Gerald Feinberg, Hugh Montefiore, Bernard Towers, G. R. Dunstan, R. H. Preston, Meghnad Desai, E. L. Mallalieu M.P. and Edwin Robertson.

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affairs was the inevitable result of increasing GNP. It was a concept totally consistent with Barnett and Morse's thesis. But for the past seven years in the USA the energy per unit of GNP has risen.⁹ Whether this is profligacy on the part of the US citizens, laziness, the fast rising cost of energy, exhaustion of rich ores, or the energy cost of pollution control, no economist has yet clearly analysed. It is an interesting pointer, and one which marries with the views expressed and noted earlier both by *The Economist* and Kneese and Ridker that as resources become used up, one moves to leaner ores. This is as true of mineral as of energy resources.

At \$10/ton there is scarcely enough uranium to fuel nuclear reactors to the year 2000 AD, but at \$100/ton, there is at least an order of magnitude more; given breeder reactors, one can multiply that by a hundred. But the energy cost of processing the leaner ore is greater. Lean ores produce more waste, and require more processing energy. And poor ores, which are not the same as lean, require more pollution control, which also takes energy. Indeed everything comes back to energy. Here we are in an area where the level of information is a great deal better, and where the rate of equations of the dynamic model are expressible with fair accuracy. It may be through a global energy model that we shall eventually get a reliable picture of the way the world system is heading. It's worth a try.

A scientist or technologist might be forgiven for thinking that Meadows' approach to the problem might have found some favour among sociologists. But here too he is to be disappointed. The study of society is so desperately complicated that the art (or science as sociologists themselves prefer to regard it) is still very much at the stage of enunciating generalities that are unquantifiable. They prefer, naturally, to stick to manageable parts of the whole. The result has been a great deal of bias—thus the rejection of the ineluctable logic of Garret Hardin, who tends to be dismissed as elitist, as if this was some fell disease that made him unfit for academic company. Meadows must incur a similar fate to Hardin, for his dynamic model simply denies much current liberal thinking. Earlier Forrester had shown in *Urban Dynamics*¹⁰ how

the creation of new housing for the poor in old cities merely perpetuated the housing crisis—a view that ill accords with liberal notions of what is right and should be done, but is substantiated by the evidence. Meadows points out how the Green Revolution “was designed to be a technological solution to the world's food problems. The planners of this new agricultural technology foresaw some of the social problems it might raise in traditional cultures... (they)... intended it to produce not only more food but to be labour intensive.” Technologically the Green Revolution has been successful, but “The ultimate effects of this socioeconomic positive feedback loop are agricultural unemployment and increased migration to the city...”

Meadows does not sit back, as is claimed, and spell out doom with a dry cackle. He proceeds to use his model to investigate solutions. In dynamic modelling there are two ways to do this. Either one chooses to weaken the positive feedback loops or one strengthens the negative feedback loops. Both will occur anyway, if the present world system persists, but only after nasty events happen first. His object is to seek equilibrium without the nasty effects. He explores the restriction of capital growth, the introduction of resource recycling on a major scale, population control, increased lifetime for capital and restoration of eroded or depleted soils. It is perhaps fortuitous that his ultimate equilibrium model comes out with a global GNP per head of \$1800 and a population of 7 billion, twice the present number. \$1800 is way above today's global average. It is a little below mean for most of Europe, and far below the USA. It must seem attractive to an Indian or Indonesian.

At the press conference held by Meadows' group in the Smithsonian Institute on March 2, the obvious question was asked by Senator Claiborne Pell, “You presume man is rational, but in our work he is emotional. How do you convert this into an action programme?”⁴ It is a very real problem, and neither in his book nor at the press conference was Meadows able to answer it. One can hardly visualise a 1972 US presidential candidate campaigning on a reduction to a \$1800/per head GNP. Meadows' work has been taken over by the Club of Rome, who are sending 12,000 free

copies of this book to selected world leaders. It's a sensible approach, but even were they convinced how would the leaders lead, and keep the lead?

Clearly the coming to pass of one or more of the impending catastrophes that Meadows' model predicts would be fairly effective in altering public opinion, but that is surely to be avoided. It is almost certainly impossible to create some international agreement at this stage on a transition to economic equilibrium, and if the forthcoming Stockholm Conference on the Human Environment is any guide, the differences of attitude between the Have and the Have Not countries may prove too divisive for action. The third world countries will fear that it is they who will be asked to make the sacrifices, not the developed countries. Actually Meadows' conclusion is the reverse of this. One is left with the conclusion that it will have to be by example if at all. This could very well work. The world is just full enough, nasty enough, crummy enough, violent enough, noisy enough for a growing body of people to want to seek out such a desirable state as an equilibrium economy, and at least give it a try. Since the rest of the world may be presumed to be going upon its age old path of economic greed, the experimenting territories will have to be inherently in balance and to enjoy the basic conditions of social stability.

There is however, even inside those countries which are not committed to an imbalanced growth, a need for some form of new politics. The Old Left has embarked on social policies evolved intuitively through a belief in certain modes of human behaviour. The results have not justified the high hopes of the founders of the movement. Those parties that still embrace the concepts of capitalism and free enterprise have not wakened to the fact that this is 1972, and the world is too crowded for such freedom of action. Thus we find that Right and Left, while they make very different noises at an election, behave almost identically when in power. No one really believes that George Wallace is left of Richard Nixon or that Wilson would have created a significant difference to Heath? Already in the academic field we see the new separation. It is a horizontal one, between what Nigel Calder¹¹ calls the Technological Optimists on the one hand and the

Scientific Conservationists on the other. For the greater part the Optimists are to be found amongst the non-scientists. Theirs is the simpler creed, and will have great appeal. The new Party has not yet been formed, nor will it be until the opposition materialises. But in England anyway, the opposition is forming. There is a growing feeling voiced clearly in *The Ecologist's* "Blueprint for Survival" in January 1972,¹² that to pursue the views of Scientific Conservationism will need the force of a political party.

Meanwhile, whatever our political or disciplinary bias, this is a time for learning and exploring. The Forrester and Meadows' models have shown what sort of information needs to be garnered, and where research needs to be concentrated.

There is a need to create world models upon an energy basis. Almost always energy and economy flow in opposite directions. In analysing global interactions energy may prove a remarkably good substitute for money, and a lot more predictable. Meadows has even suggested that the logical unit of international currency would be the JOULE. But the problems of creating a political reality out of the needs is far from worked out. At a time when more and more people are becoming jaded with Left-Right politics, it may be that a new purpose in politics will emerge. One hopes so, for we need a formal relation between science, technology and society.

Michael Slessor

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Eco—Politics

ONLY ONE EARTH: THE CARE AND MAINTENANCE OF A SMALL PLANET. Barbara Ward and Rene Dubos (Andre Deutsch, 1972, £2.95).

A review of this book might be said to belong among the critiques of the Stockholm Conference documentation because, despite its popular treatment and vivid language, it is an unofficial report commissioned by the Secretary-General of the Stockholm Conference, written with the assistance of a 152-member Committee of Corresponding Consultants from 58 countries.

The reaction of a reader to this information alone might be that this "report" represents a further tract of political "realism" on global environmental problems. Yet the reputation and background of the two authors, a distinguished development economist and an eminent biologist as well as the book's essentially spiritual appeal for optimism mingled with caution, and its freedom from the obvious evasion and obfuscation that characterise the Conference's "diplomatic documentation" mark it off clearly from the official papers offered for consideration by governments.

It becomes clear, at once, that the book is not intended for the convinced environmentalist, much less for the "eco-activist". It is aimed at the unconvinced layman, detached from the "ecology debate" and confused by apparently quite contradictory evidence cited by the protagonists of "optimism" and "pessimism." Its Erastian line—weaving around the middle of the road—will not at many points please informed environmentalists.

In the first chapter the usual analysis of growth of population and energy use leads to the reasonable conclusion that an attempt to achieve US standards of material consumption for the 7 billion people we are likely to have soon after 2000 AD will probably be disastrous. From this one would expect the deduction that either the gap between rich and poor will have to widen steadily, or the developed countries will have to transform their way of life. It might have been better to end the book there, hand the 12 pages to the delegates to Stockholm to see whether

they agreed or not, and use their replies as a test of environmental sanity. The rest of the book inevitably weakens, rather than strengthens, the case which it makes for cautious, gradualist change, since among its complexities and qualifications (no doubt insisted upon by the 152-member Committee of Corresponding Consultants) it is easy to evade the brutally simple problem. The blurb provides a clue to this approach when it says, "It is shown that because this is a worldwide crisis, answers must be found that are politically and economically acceptable internationally: realistic answers rather than ideal ones." But suppose the answers that are "politically and economically acceptable" don't happen to solve the problem?

Like most books with one foot in political possibility and one in physical reality this one becomes increasingly ambivalent as the argument proceeds. The early chapters summarise the transformations wrought by technology and trade on the older order. Here the analysis of "the powerful trinity of forces—science, the market, the nation" contains brilliant insights and a vivid picture of the incredible momentum developed by their positive interaction upon each other. These chapters also attempt to summarise the evolving insights of science into life, matter and energy. Here, despite extreme compression, a fascinating panorama is offered of man's unfolding realisation of the ultimate unity of all energy and all matter in a single electro-magnetic spectrum, and it is clear that the authors' hope is that this vision of unity can—if widely grasped—reform our ingrained propensity to "tunnel vision". In the discussion of the physical sciences, there are a great number of factual errors, but none detract from this physical reality of unity.

The next section deals with the problems arising in developed countries from the use of high technology, and use of the land, and resource availability. This section contains much of value, particularly on problems of equity and redistribution implicit in environmental policies, though, perhaps inevitably, it suffers from the fragmentation of the subject into sub-areas, which has the effect of making each area look manageable by itself, thus obscuring the gravity of the interaction of the problems one upon another.

This tendency to sub-divide is most apparent in the chapter on "The Balance of Resources", which opens by asking how we can tell whether there is "enough to go round to meet all the human demands that seem to be surging up on Planet Earth", and goes on to say that an answer will need some kind of estimate of three factors: human numbers, demand for materials, and demand for energy. The omission of a fourth factor—how long a future we are planning for—is significant, since to raise this question would have necessitated accepting as an aim the attainment of the steady state defined by one of the authors (Rene Dubos) in an editorial in *Science* in November 1969. It is this fourth missing factor of time span, or sustainability, which raises serious problems for the next section of the book, which is concerned with development.

The same ambivalence affects the book's attitude to nuclear energy, perhaps reflecting the diametrically opposed views received from different consultants. The authors mention the "fusion torch"—a hypothetical device driven by an as yet unusable source of power—as perhaps an eventual way of recycling that will permit the economist's dream of a "sustained rate of growth". The later discussion of fission reactors may be seen as particularly unsatisfactory, with its warnings of "almost literally, the Promethean act of stealing fire from the gods", followed by its conclusion that we shall nevertheless have to do it to meet the basic needs of the world's peoples. The unresolved problem here, of course, being that in fact most of the projected increases are expected to go to the spendthrift developed countries anyway. No, the dangers are not those of being staked out on Mount Caucasus, but something much more real: What we are proposing to do, and are already in process of doing, is to exploit a source of energy that will leave the planet booby-trapped with several globally lethal doses of wastes, on the highly dubious assumption that our bloody-minded and only intermittently sane species will be able to maintain the continuity of civilisation needed to look after them, or even remember where they are, for several millennia. It often seems to me that a man's views on increased reliance on nuclear energy are a good test of whether he

has any interest in the long term future of humanity.

The survey of the problems of the developing countries which comes next also suffers from an overdose of technological optimism, including an amazingly optimistic estimate of the contribution that a cheap source of energy (which by no means means cheap delivered energy) can make, and it is no surprise to see even Alvin Weinberg's dream of the agro-industrial 'nuplex' put in an appearance. Emphasis is placed on the need to exploit minerals in developing countries to provide expanding wealth and particularly employment, with development envisaged as not too different from the history of the industrialised world. Here again the lack of a clear sense of the future as going on beyond 2000 to 2100, 2200, let alone to the year 5000 AD is apparent.

But if the list of reservations and criticisms is a long one, one is constantly reminded that this report is, as Secretary-General Maurice Strong explains in his preface, a conceptual framework in which the authors acted as "creative managers of a co-operative process... which engaged many of the world's leading authorities of a wide variety of shades of opinion in the multiple branches of environmental affairs". Seen in this light the book is a fascinating, at times depressing but often illuminating and even an inspiring, achievement. Perhaps it does, in many places, miss an opportunity—despite its political constraints—to move further forward: recent signs, such as Dr Mansholt's speeches on economic growth, show remarkable changes in official thinking. But the book's real message, and achievement, is more conceptual than practical. In their final section, *The Survival of Man*, the authors sum up this message. "It is even possible", they suggest, "that recognition of our environmental interdependence... could... give us that sense of community, of belonging and living together, without which no human society can be built up, survive and prosper".

The book's eloquent appeal for such a breadth of view in the face of every sort of division of ideology and interest speaks to the spirit. In the success of this and other books in doing so lies, perhaps, our only hope.

John Davoll

Coming events

1-6 June—Independent Conference on the Environment organised by Dai Dong to be based on the realisation that the whole world is facing an ecological crisis and that the present environmental crisis is really a manifestation of deeper political, economic and social ills. Conference to be held in Sweden. For further information: Janine Veto, Box 271, Nyack, New York 10960, U.S.A. (212) L08-8300/(947) 358-4601.

13-17 June—SEP-POLLUTION '72. Exhibition (previously arranged for 3-7 May). For further details: contact 35100 Padova, Via N. Tommaseo. Tel. 38.620.

22-28 June—Environmental Conservation Education in the School Curriculum in East-European Countries. International Seminar, (organised by the International Union for Conservation of Nature and Natural Resources) to be held in the border National Park "Pieniny", Poland-Czechoslovakia. Further details: Secretary, East-European Committee, Commission on Education, IUCN, 1110 Morges, Switzerland.

26-30 June—The Second International Parliamentary Conference on the Environment will follow the UN Conference on the Human Environment (Stockholm June 5-16) and is intended to complement the work of same, re-examining on an interparliamentary and interparty basis the recommendations obtained on an intergovernmental basis. It will be held in Vienna. Further information: John Yeoman, CPRE, 4 Hobart Place, London S.W.1 W OHY. Tel: 01-235 4771.

30 June-9 July—"UMWELT 72" ("Environment 72") First German Environment Exhibition for Stuttgart to be held under the patronage of Dr G. Heinemann, the West German President.

30 June-8 July—"Environment 72" Symposium co-ordinated by Dr Ing. Fritz Steimle of the Department of the Environment at Stuttgart University and held in conjunction with UNO. Further information: CES (Overseas) Ltd., Bridge House, 181 Queen Victoria Street, London, E.C.4. Tel: 01-236 0911, Inquiries in the US and Canada: Rudi Haussmann, 130 Willowdale Avenue, Suite 3, Toronto-Willowdale, Ontario, Canada. Tel: 223 8414.

Saturday, 1st July—Sierra Club members' conference, Buxton, Derbyshire. Michael McCloskey, Executive Director; Edward Goldsmith, Editor-*Ecologist* and others. Invitation to Club members, readers of *The Ecologist* and Friends of the Earth to attend. Details and invitation [limited] from Mr. G. D. Jones, Town Clerk, Buxton Borough Council. Buxton (0298-2061).

11-21 July—Methodology in Environmental Conservation Education. — International Northwest-European Training Course for Teachers. Levels: nursery, primary and secondary schools. The course will be held at "Buitencentrum Wilhelminaoord" in the Netherlands. Further details: Director, School and Children's Garden Service, Raaltestraat 4, Den Haag, Netherlands.

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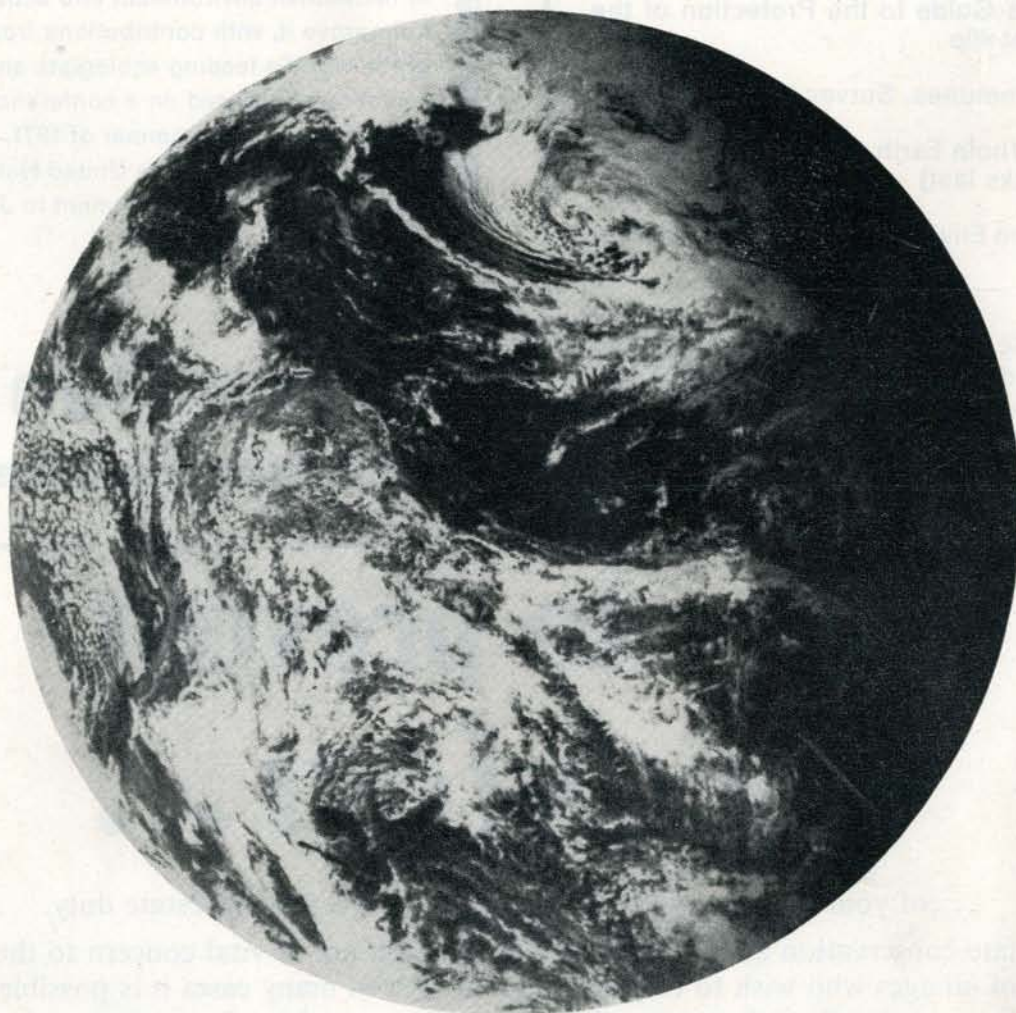
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