

10th ANNUAL GRADUATE STUDY PROGRAMME * GENEVA

THE HUMAN ENVIRONMENT

The following is a rewritten version of part of the report of working group III "The economics of the environment".

R. E. Marks

Economics and the Environment

Man's increasing control over nature has been accompanied by an increasing impact on his surroundings. With the spread of the industrial revolution across the world, this effect has become so wide-spread and marked that all countries now accept that urgent action will soon be needed lest mankind drown in the rising tide of his own filth, having exhausted the stock of raw materials. Together with the deterioration of the "human environment" can be seen imperfections in the "mixed" economies of the West (i.e., market economies with government intervention). It can be argued that this deterioration is inevitable with industrialisation. The author feels that this is true to some extent; however this report will discuss how much of the existing deterioration of the environment is due to these imperfections and whether or not existing economic policy tools are sufficient to deal with them in attempting to halt the deterioration. That is, is the existing economic system, common (in various forms) to most Western countries incompatible with a healthy environment or can existing policy tools in this system deal adequately with the causes of the deterioration?

This part of the report will consider the relationship between the traditional mixed economy and the environment. The author will attempt to produce a series of policy recommendations to attempt to overcome the deterioration of the natural environment.

Natural Resources

Traditionally, the production process transforms natural resources into finished goods. In some cases the basic natural resources are renewable (for example, timber - which can grow again, and soil - whose fertility can be retained), but increasingly modern technology depends on non-renewable natural resources, such as minerals and hydrocarbon deposits, which are being extracted without thought of replacement. This is exploitation: use without due regard for the welfare of future generations. One reason for this apparently selfish and dangerous course of action is the high rate at which future wealth and welfare are discounted - implicitly in an economy with market-determined prices, or explicitly in a planned economy. In the long run, as Keynes said, we are all dead, and it is this realisation together with the attitude of regarding many of the earth's resources as unlimited and thus with zero price (apart from extraction and transport costs) that has led to the present exploitation.

The enormous change in mentality needed in coming to grips with the fact that the earth is not unlimited but is finite ("the spaceship Earth") with a limited capacity for sustaining life has made it difficult to accept that within a generation, at present rates of increase of consumption levels, many of the non-renewable natural resources will virtually be depleted and some non-renewable sources of energy will be in very short supply.

Pollution

The processes of production, consumption, and distribution of goods generate wastes. The profitability of these economic activities is increased if no money is spent on the disposal or treatment of these wastes. The dumping of industrial and consumption wastes has led to air and water pollution and to land spoiling. The traditional mixed economy has in most cases failed to develop markets for waste, and even in planned economies the decision-makers have often opted for more goods and less amenity.

Differential Development

As well as pollution and exploitation of natural resources in industrialised societies, the author feels that poverty, malnutrition, and starvation, especially in underdeveloped countries, should be considered to be an unacceptable situation in the world. With few exceptions there is a large and growing gap between the material standards of living in developed and underdeveloped countries, and traditional economies seems to offer no automatic mechanism to narrow and close this differential, indeed it can be argued that the action of the profit motive is to widen the gap, and to keep the poor poor.

Population Growth

Traditional economies, both mixed and planned, welcome population growth as supplying both more workers and more consumers and thus helping the economy to grow; growth, together with low unemployment, a stable currency, and a small balance-of-payments, is one of the four traditional goals of post-Keynesian governmental economic management. But the earth's population has reached a level where more people means more congestion, where per capita standards of living fall rather than rise with more mouths to feed, where greater demands are made on natural resources.

Until the recent awareness of the importance of the deterioration of the human environment, these four factors were given little if any consideration by national administrators and planners, who were more concerned with the four traditional goals of economic management. Environmental considerations played little part in shaping economic policy.

Policy Recommendations

The world has finite supplies of resources. Economic activities which use up these resources will have to be modified so as to use recycled resources or will have finally to end. Further, although levels of pollution are perhaps no higher now than in the past (for example, the filth, disease, and smoke of mediaeval London), the wide-spread distribution of modern pollution and its rate of growth mean that the threshold might be being approached when the balance of the life-support systems is shifted. At any rate it seems desirable to reduce levels of pollution to a minimum.

This paper attempts to show that the existing traditional economic policy tools and institutions are sufficient to control the situation, or that existing economic systems require only minor modifications to deal with the problem. There might exist other systems to achieve the same ends, in which case this is just one of several approaches possible. The characteristics of this particular approach are that it preserves some of the essential features of the existing system - features such as markets and the price mechanism, the "economic freedom" of the individual, the profit motive, and limited private ownership - and uses many existing institutions in achieving the desired changes. But while the modifications might seem relatively minor, the results are radical. Given the inertia to change of society, the measures outlined below can be thought of as efficient in the sense of achieving specific goals quickly and painlessly.

Natural Resources

The most efficient instrument of rationing non-renewable natural resources is to raise their prices, by regulation or by direct nationalisation of the extractive industries or the deposits themselves. This would have several effects: firstly, it would slow down the rate of depletion by providing an

incentive to economise in both production and consumption, and recycling would immediately become more profitable. It seems ironic and extremely disturbing that many countries have resource depletion allowances for extractive industries: such measures act as incentives to exploit resources further. A complete reversal of existing policy is required: if subsidies are to be paid, they should be designed to lower the prices of renewable resources (such as timber, wool, and natural rubber) and to encourage further the substitution of natural for synthetic raw materials. (This would have the additional effect of reducing pollution since natural renewable resources generally cause less pollution.)

Raising the prices of the natural resources used as inputs of production will raise the price of finished goods as long as close substitutes cannot be found or developed. As the price of final goods increases, consumption and the associated wastes and pollution are reduced. But since this reduction is likely to be partial only, a later section will discuss measures to eliminate consumption pollution specifically.

The exact extent of the price rise necessary for any raw material is not at first clear, but it is suggested that the price be set at such a level that the rate of extraction is reduced to a level judged to be commensurate with the potential of replacement through the development of substitutes based on renewable resources.

Pollution

Since the costs of pollution are external to the price system it can be thought of as an economic externality. The most obvious and simplest way of tackling the problem is to internalise the externalities: the so-called "polluter pays principle", the PPP, is one way of doing this. The author feels that, properly implemented, this principle is an efficient and equitable way of stopping pollution. But proper implementation requires accurate and comprehensive calculation of the costs of pollution - these are not merely those inflicted upon other production units (for example, a factory on a river depriving another factory downstream of fresh water); rather the costs of pollution mean the full social costs, including not only damage to health and amenity but also future damages and costs. There is always the possibility, however slim or hard to establish, that a particular action will prove to be the trigger mechanism in upsetting such things as the global weather patterns, and theoretically these probabilities should be included in analysis.

point is that some pollution is probably desirable

The author feels that if the true costs are calculated, no matter how rough or conservative the estimates, it will never be profitable for a factory to pollute and pay compensation - rather there will be an overwhelming incentive to stop polluting.

As mentioned above, consumption activities, as well as production activities, pollute. Hence the PPP must be applied to consumption too. For instance, car owners must pay the full social costs of the pollution and congestion they cause. In the rare case when an externality benefits another economic actor, this individual should pay for the benefit.

Population

In a finite world, greater population means greater congestion and less resources for others. Congestion is analogous to pollution: it adds to production costs and lowers the quality of the environment. Thus the decisions of women or couples to have children affects other members of society, just as do the decisions of individuals to own and drive cars - externalities are involved.

Can overpopulation be avoided by internalising the externalities through application of the PPP as in the case of pollution? Parents would be licenced or charged a fee for having children, and economic constraints would limit the growth of families. Outcry at this rather drastic scheme could be somewhat stilled if contraceptives, abortions, and sex education were universally available and if the penalty fell only on the parents, not on the child. This implies some sort of cooperative for child-raising, since it is hard to imagine how fining the parents could not affect the child's welfare within the traditional household.

may differ

OL

What is implicit in the above discussion is that there exists a tradeoff between the individual's freedom of action and the sum of human welfare: as mankind becomes both more numerous and more powerful, the actions of any one person can affect not only all people living, but future generations as well. If survival of the race, of life on earth, is seen as the most important goal, then the human population level will have to be limited, somehow.

In order to avoid the inequity of an equal fine for unlicensed children born to rich or poor parents, a progressive scale might be used, in which the fine is proportional to the total income and wealth of the parents.

The fine might vary for mother and father in any couple. But the problem of equity should be considered whole, and not treated piece-meal. We already have the means to overcome inequity, what is needed is the will to use them.

Underdevelopment

The author feels that the reluctance of developed countries to provide reasonable amounts of aid to underdeveloped countries is indefensible. Further, barriers (such as excise taxes and tariffs) to imports from developing countries must be abolished and aid, including techniques as well as capital, must flow generously.

An additional effect is as follows: the developing countries are supplying a large and increasing proportion of the natural resource requirements of the industrialised countries. Depending on demand elasticities, the net effect of raising the prices of raw materials might be to cause revenues from rich countries to poor countries to rise, that is, a redistribution of income.

Since pollution is a world-wide problem and since developing countries might have suffered from pollution originating in industrial countries (such as contaminated fish), strict application of the PPP might improve the lot of people in developing countries. If compensation is paid for previous environmental damage, there is an additional source of development funds for the underdeveloped countries.

But not all underdeveloped countries possess natural resources in economic quantities, and increases in the price of raw materials will not benefit these nations - on the contrary. For international equity, further compensation (lump sum payments) will have to be paid these countries to allow for the increased costs of non-renewable resources.

But this raises a further point: the increases in non-renewable resource prices and the stricter levels of pollution advocated here will lead to marked differences between the patterns of economic growth in underdeveloped countries and in developed countries - whereas the developed countries have reached their present levels of wealth with cheap raw materials and little thought or care for waste disposal, the developing countries will have a tough time, with slower growth. Clearly, this situation can only be justified by the threat of misery and death if mankind continues on its present, unregulated path. Perhaps education (or indoctrination - a sort of "keeping down with the Joneses") is needed to accustom people to a material standard of living lower than expected

in the underdeveloped countries, and lower than now experienced in the developed countries.

The proposed measures are likely to alter drastically both international trade and balance-of-payments. In order to facilitate short term adjustments, the author advocates floating currencies, or at least frequent up- or down- currency valuations. The use of Special Drawing Rights and cheap credit for underdeveloped countries could help balance-of-payments while the domestic industries reorganise in the face of the new comparative cost situation.

Conclusion

The measures suggested are evolutionary rather than revolutionary: they do not require radical change in existing economic structure, merely modification. For thirty years governments have had the policy tools to do the job, but for action to be taken there needs to be present a general desire for change. This is partly a matter of education, of telling people of the possible dangers of doing nothing, of making people realise the threat inaction brings, and partly a matter of making people in underdeveloped countries aware of their choice of private affluence and public squalor or a better quality of life overall.

As well as reducing pollution, the proposed measures would eke out the stock of nonrenewable resources. Some experts would challenge the notion of limits to growth - the flaws in the Forrester model have encouraged people to overlook the fact that unlimited growth is impossible in a finite world - they argue that the historical record justifies faith in technology. But history never quite repeats itself and the scale and complexity of the problems we are facing today should caution against overoptimism. It is not the timing but the fact that limits must exist in a finite system which is important. Unless positive action is taken soon, these constraints will become more and more obvious.

Energy and Resources

We can think of resources as being either renewable or non-renewable. Further, renewable resources can be thought of as being either naturally renewable or recycleable.

Non-renewable resources are those which are irreversibly transformed during the production/consumption process and which are not renewed by natural processes. Examples are uranium, helium, and coal (although see below).

Naturally renewable resources are those which can be renewed through the natural processes of nature (the ecosystem). Thus included are all organic matter and some inorganic resources. Examples are oxygen, all nutritional food-stuffs, weather, soil, and tides. However some naturally renewable resources, such as coal, oil, and some artesian water, can be considered for all practical purposes as non-renewable because of the length of the time of renewal. The energy used in the natural renewal process is the light and heat of solar radiation.

Recycleable resources are those which are not transformed so completely by the production/consumption process that man cannot reconstitute them through the recycling process with the addition of energy. Examples are ferrous and non-ferrous alloys, and paper. Note that the energy required in the recycling process is almost always of a concentration greater than solar energy.

On the spaceship earth are human beings, stocks of non-renewable and recycleable resources, and the live ecosystem supplying naturally renewable resources. There is an input of solar energy and an output of unrenewable waste including heat. But sources of energy are resources too. The fossil fuels are non-renewable resources, as is the active isotope of uranium. Hydro power is a naturally renewable resource. The Second Law of Thermodynamics forbids the efficient use of any energy sources which are recycleable.

In a steady-state economy, attempting to satisfy the basic needs of every man, with a surplus of production to allow possible life-fulfilment for everyone, some use of non-renewable resources each year is inevitable. This should be kept as low as possible. Whenever possible, naturally renewable resources should be substituted for recycleable resources, and the natural recycling process of decay protected. In the absence of any breakthrough to a method, such as thermonuclear fusion, of producing virtually unlimited high-grade energy (as opposed to heat energy, the ultimate degraded form), the economy should be labour-intensive and should attempt to use the current inflow of solar energy only. (Perhaps this leads to an ultimate measure of national wealth based on hours of sunlight per year times the national surface area.)

Dear Bob, I write down some of my impressions of your paper:

Natural Resources:

the ideas that in the long run we are all dead, and the one of the finite earth (the spaceship earth) are very clear and I like them, is the first time I ran into something like that, I consider them sharp.

Pollution:

I would rather stress the indifference of waste producers towards disposal or recycling, should be perhaps negligence.

Population growth:

It is interesting to think what a new baby in U.S. will cost in terms of resources and pollution compared with one in an underdeveloped country.

Policy:

Natural Resources:

will be there side effects due to the price increase of non renewable resources?

what about grants for research in the field of substitute

Population:

the idea of a tax for having children seems a lost of contact with reality, instead programs that stress the effects of population increase on the environment and birth control should be enforced.

Underdevelopment:

nice thoughts but they will never be a reality what about the pollution created in developed countries that reaches the underdeveloped ones - as oil in the oceans. polluted rivers that cross borders etc.