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Development strategies with moderate energy requirements

Problems and approaches

*Ignacy Sachs**

In this short article, the author seeks to outline his central ideas on the energy crisis. Fundamentally, he stresses that the crisis has three dimensions: the finiteness of natural resources and the deterioration of the environment, criticism of the "consumer society" and the rising cost of petroleum. Under these circumstances, it is urgent to formulate and implement development strategies based on moderate energy requirements.

The possible options are varied, as are the policy measures which might be applied; in this connexion, he describes six levels for acting upon the demand for energy, ranging from the elimination of waste to a profound change in values which would make possible a 'different type of development' based on the transformation of the prevailing life styles. Among other actions aimed at affecting the demand for energy (to which he attaches the greatest importance), he mentions those relating to spatial organization and the readaptation of transport systems.

With regard to actions to influence supply, he stresses the importance of technological pluralism which would allow energy sources to be developed and utilized in the manner best suited to each national, regional or local situation by avoiding the uncritical adoption of inappropriate energy strategies. It is not easy to formulate and carry out innovative strategies which combine the characteristics of efficiency, viability and sustainability in the economic, socio-political and ecological spheres, but this is an unavoidable necessity for the present.

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I

The three energy crises

The energy crisis is on the agenda of all discussions regarding the future of the world economy, the New International Economic Order and national development strategies. In fact, we are facing three separate but coincident crises.

The ecological awareness which developed over the last two decades made it very clear that, in the final analysis, the ecological limits to uninterrupted economic growth may be manifested through undesirable and dangerous changes in climate and in the major natural cycles as a result of the excessive amount of carbon dioxide released into the atmosphere by the combustion of fossil fuels. Nuclear energy in turn raises well-known questions, to which we are far from having reliable and reassuring answers.

There is no reason to accept the apocalyptic vision of the imminent disappearance of conventional energy resources, nor to announce that ecological disaster is nigh. We are still a long way from the outer limits, if they exist. Nevertheless, on ecological grounds a drastic change must take place in man's behaviour in the use of fuels and all other potentially scarce, non-renewable resources whose extraction requires increasing quantities of energy due to the depletion of more conveniently located, high-content mineral reserves. We must draw the necessary conclusions from the finiteness of our planet, of which we have become vividly aware, in a historical paradox, as a result of man's first flights to the moon. In the long term, the survival of the human race will depend on its ability to moderate and make more efficient the use of fuels, and to replace them by other forms of renewable energy.

Our period marks the start of a transition to an industrial civilization based on the direct or indirect use of solar energy, which alone can be used continuously. The challenge is whether this transition will represent a step backwards in terms of social justice and the material well-being of all present and future inhabitants of the planet. This implies more equitable access to both renewable and non-renewable re-

sources, and their rational use from a very broad social standpoint based on ethical principles of synchronic solidarity with the present generation as well as diachronic solidarity with future generations, thus transcending the narrow, profit-oriented approaches and predatory attitudes to resources stemming from the pursuit of immediate economic gains that do not take social and ecological costs into consideration.

The second crisis, closely connected with the first, is that of the 'consumer society' based on the squandering of abundant and cheap energy resources without which both the large-scale production of fairly abundant manufactured articles and life styles characterized by the private automobile and the widespread use of air transport would be impossible. International cultural and consumption patterns have had an enormous demonstration effect on the élites of the Third World, with well-known social consequences: the transplanting of highly capital- and energy-intensive technologies, which are the only ones available for producing this basket of consumer goods and which displace the labour force and aggravate still further the inequitable distribution of income. Thus, within the periphery the imitative model of growth may be seen to incorporate an element of structural crisis which the availability of cheap energy has accentuated in the extent to which it led to the replacement of locally abundant factors of production by other imported ones.

Significantly, the consumer society began to be questioned even in the central countries, although for ethical and ideological reasons there, because of its inability to solve pressing social problems despite radical changes in styles and standards of living caused by unprecedented economic expansion during the second half of the twentieth century, as well as the high ecological and psychological cost of accelerated urbanization.

Quality of life is not necessarily a function of income levels or per capita energy consumption, although these factors should not be underestimated. The industrialized countries confronted the latest recession without solving various structural problems: the trend towards

chronic unemployment, which is also the result of the excessive replacement of labour by energy and the lack of social control over the direction of technological progress; the high cost and inefficiency of welfare state institutions; the disorientation of educational systems; a general sense of alienation, etc. Far from being an exclusive characteristic of the Third World, the negative aspects of development are universal and may coexist perfectly well with periods of rapid growth, high average levels of income and a type of energy consumption which places thousands of 'mechanical slaves' at the service of each citizen.

Even where it was considered desirable, the consumer society model lost a great deal of its viability due to the third energy crisis after 1973 caused by the considerable increase in relative petroleum prices and, by extension, the cost of all energy sources as a result of the action taken by OPEC. The time of cheap energy came to an end. Following the latest decisions by OPEC (1980), the relative price of petroleum more than made good the losses suffered between 1950 and 1973, and everything indicates that the trend towards moderate increase will continue.

An initial result of the growing cost of petroleum was to make several alternative energy sources, both conventional and non-conventional, economically viable. Trends in the installation costs of nuclear power stations are a case in point. Solar energy, for its part, will never be cheap; its ecological and social advantages must be offset by a fairly high economic price. Thus, a fundamental characteristic of the current transition is that, for the first time in history, the replacement of one source of energy by another will be the opposite of what took place in the past with coal in relation to firewood, and subsequently, with petroleum in relation to coal: the new energy sources will be considerably more expensive.

Under these circumstances, energy must be saved and we must learn to use it efficiently and to take advantage of its alternative sources in all countries; this applies even to the major oil producers and exporters which are interested in maximizing their foreign exchange earnings and/or preserving hydrocarbon reserves

with a view to future price increases. The argument applies *a fortiori* to the countries which import petroleum, many of which face balance-of-payments difficulties due to the growing cost of importing energy resources.

The current situation accordingly generates a great deal of tension between the Third World countries affected by the high cost of energy imports and the smaller group of major petroleum exporters among them. This tension may be lessened, if not totally eliminated, by more decisive solidarity from OPEC aimed at assisting the most hard-hit countries. At the same time, however, a double platform of common interests among all the Third World countries is emerging. On the one hand, OPEC's action has political implications which go far beyond the problem of petroleum prices: it fosters new conditions for the Third World's difficult struggle for effective control over its natural resources. On the other, the Third

World could very well use this transition towards renewable energy sources and the use of biomass as raw material in order to create the basis for a new tropical industrial civilization adapted to its ecosystems and founded on local technologies, or at least less dependent for technology on the major industrial centres which previously achieved world domination through the coal and petroleum civilization, and are now trying to maintain it through a monopoly of nuclear technologies. With the financial resources from sales of petroleum and the human resources already available in several Third World countries, a broad international research and experimentation programme could be set up aimed at new and innovative forms of using renewable natural resources to satisfy social needs within an eco-developmental perspective, that is to say, socially desirable, economically viable and ecologically sound development.

II

Energy and development strategies

It's an ill wind that blows nobody good. The energy resource crisis calls for a comprehensive overhauling of development strategies rather than sectoral responses. Actions aimed at improving supply are certainly an important aspect of the problem, but by no means the only one. Actions with respect to demand have perhaps even greater potential. In other words, it is not a question merely of replacing expensive and/or scarce petroleum by the provision of other energy resources in a classic operation of import substitution, accepting the coefficient of elasticity of demand for energy resources, estimated using past performance, as a limit. On the contrary, an effort must be made to dissociate the growth rate of the economy from the rate of increase of the demand for energy resources. This implies that the global strategy must be redefined, for the simple reason that energy plays a part in all human activities and consequently it is part of any development process, sound or unsound. Consequently, our

problem becomes that of identifying development strategies with moderate energy resource requirements.

The first task is to determine the levels at which the options will be explored and wherein lie the principal variables linking socioeconomic development objectives with those involving the moderate use of energy. We will begin by presenting a possible approach to the analysis of the various ways to moderate demand, a subject which deserves attention for two reasons: it is much less developed than the study of the range of alternative energy supplies, and it is a good way in which to approach the overall problems which interest us here. Next we will discuss the energy implications of models of territorial occupation and of relations between higher and lower economic levels. Finally, we shall talk about technological pluralism in energy production and the criteria which must govern the selection of technology. We do not aim to provide a solution in these

pages, but rather to furnish a list of problems connected with the formulation of strategies with moderate energy resource requirements.

1. Six levels of action to affect demand

How far is it possible to restrict the demand for energy products without simultaneously requiring from the population radical changes in life styles and austerity for which it is not prepared?

There is no easy response to this question because in societies characterized by pronounced social asymmetry it is hardly possible to speak of the population as a homogeneous whole. The austerity imposed on the minority may be the prerequisite for improving the consumption patterns of the majority. On the other hand, it is simplistic to think that the reduction of the demand for energy requires either a radical change in life styles or a decrease in consumption. The dissociation of economic growth rates from energy demand may be achieved through the six types of action outlined below:

(a) The elimination of waste in the strict sense of the term, through increased social and individual discipline;

(b) Improvement of the functioning of existing production and consumption systems through more efficient organization, education with social content, application of software, organization of time, etc.

(c) The restructuring of the production system with a view to saving energy, either directly through new technology or indirectly through the materials use;

(d) The restructuring of the consumption system¹ by designing products (automobiles, electrical household appliances, dwellings, etc.) meeting lower energy-consumption standards;

(e) The exploration of alternative means of meeting the same social needs; for example,

alternative systems of transport or collective or individual housing.

(f) Finally, a change in values, which may modify behaviour and consequently the structure of social demand. Included here are all efforts to promote voluntary austerity, self-limitation of the currently excessive levels of material consumption, migration back to rural areas by groups of urban residents, etc.

Various types of actions are appropriate at different levels. Levels (a) and (b) in principle do not require any significant investment: they belong to the sphere of 'pure' technological and organizational progress. On the other hand, the types of technological progress envisioned in levels (c) and (d) do require changes in plant and equipment and a continuous effort to research and develop new processes and products. Consequently, they correspond to situations of rapid growth and add two new dimensions to the criteria for evaluating technology: the energy content of the products and the energy consumption standards of the goods produced. Level (e) has common characteristics with (d) and (f). Like level (f), it already implies a change of values, but it also depends on the design of new consumption systems, that is to say, an extension of the approach applied to the design of new products. In practice, an important dimension to consider is the comparison between systems of collective and individual transportation, housing and organization of services, although there is also room to imagine new individual systems, from the widespread use of the bicycle to the invention, in countries already possessing an extensive road infrastructure, of a new urban vehicle, electrical or mechanical, and much smaller and more economical than the automobile. This last level is by far the most important from the point of view of ethics and ideology; simultaneously, however, it is the most difficult to change in view both of the conservative dynamism of the élites in power and the force of attraction exercised by the consumerist model on those still living far below the levels of even basic satisfaction of their material needs, and who rightly aspire to a minimum of comfort. This attraction explains the distortions in the consumption patterns of the urban population in Latin America, where

¹The introduction of the concept of the consumption system is justified by symmetry with the production system and by the fact that the household goods it comprises reduce savings by competing with investment in the production sector.

durable goods, including a used automobile, are often acquired at the expense of a sacrifice involving an even greater deterioration in the already low levels of nourishment. The proposal of following a path differing from the historical experience of the industrialized countries, and thus avoiding the dead ends of consumerism while finding a different type of development, seems to be the greatest challenge, and an alternative to the technological optimism of the advocates of mimetic growth. But criticism of technological optimism must not lead to exaggerated social optimism. The road leading to a different type of development will be rough and long. The significance of the questioning of the consumerist model in the industrial countries themselves is enhanced in this world context.

2. Spatial organization and the energy field

Space is a key variable in the energy field, especially in countries with large areas, because the transport sector is a great consumer of energy since the volume of freight and the distance over which it is transported depends on the spatial configuration of the economy and the society. This situation is aggravated by the type of transport selected, as Latin America suffers from underdevelopment in the field of railway, river and maritime transport, whereas both the truck and the plane occupy an unwarranted position as a result of a mistaken and imitative conception of modernity. For these reasons, it is necessary to analyse transport flows, combining the approaches of socioeconomic planning and spatial organization so as to isolate the points at which intervention is possible. The geography of transport must not be accepted as immutable; on the contrary, it must be changed by eliminating redundant transportation as far as possible. Here we see another instance where action to affect demand is of greater importance than more traditional action to affect supply and the technological restructuring of transport systems.

How does one define redundant freight flows? To do so would require an in-depth study on the degree of internal articulation in local economies and the nature of their external relations with the regional, national and world

economy. The extreme models, both equally harmful, are an archipelago of totally autarkic local economies, and the centre-periphery model, not only on a world scale but also reproduced at the national level. The periphery is completely subordinated, and trade is asymmetrical: the periphery provides raw material and depends heavily on the centre with regard to consumption, including that of basic foodstuffs. This results in an extremely high volume of transport, and consequently of consumption of energy resources, which could be reduced through the consolidation of the local economies so as to take maximum advantage of the complementary nature of various primary and secondary activities, while at the same time enhancing the degree of processing in the case of raw materials.

The asymmetrical relations between the centre and the periphery and the dominant position of the major industrial and commercial systems have another consequence for the level of supply: the underestimation of the potential of local resources which, under economically satisfactory conditions, are able to sustain small-scale production which would decrease the degree of dependence on the exterior. This would certainly be the case in the production of energy resources. When, for example, a unified electricity grid fed by huge hydroelectric or nuclear power stations is envisioned, many local opportunities are overlooked: small hydroelectric plants, small-scale coal mining, organic residues from crop-farming and stock-raising production, urban residues, the specific biomasses of each ecosystem, geothermal energy and wind energy where climatic conditions permit, specific uses of solar energy, etc.

3. Technological pluralism

This leads us to the third group of variables in the field of energy supply. We should warn that single and perfect solutions do not and will not exist. It is necessary to learn to use the broadest possible range of technological pluralism, from the standpoint of primary energy sources, scales of production and the adaptation of specific forms of supply to a demand which has been thoroughly analysed in order to distin-

guish various types of useful energy. The analysis of energy options cannot be subordinated solely to narrow economic criteria. The social and ecological implications of the planned projects and programmes must also be considered, and conventional conclusions must be guarded against. Certain forms of utilizing renewable energy may have adverse ecological and social repercussions. Examples are hardly necessary: dams constructed without taking the necessary ecological precautions; large-scale use of biomass energy which may displace subsistence crops while making agriculture inordinately technical and capital-intensive; the formulation of ultrasophisticated centralized systems of tapping solar energy by satellites, etc. Technological determinism must not be accepted in any form. The dogma of economies of scale has already caused much harm in Third World countries, but this does not justify replacing it with the myth of 'soft' technology whose weaknesses are belied by alluring definitions.

An initial step in the desired direction would be to consider existing energy flows in such a way as to allow them to be rationalized from the standpoint both of demand (elimination of wastage, profitability of waste heat) and of supply (replacement of conventional energy by solar power; simultaneous generation of heat and electricity). It is likewise necessary to pursue technological research on non-conventional energy sources while the social sciences concentrate on the study of the institutional, economic and social obstacles to the introduction of new energy sources, and of the policy instruments that would be required to promote them effectively. The efficient management of technological pluralism will depend upon the strengthening of local autonomy in rural and urban zones. At the same time the harmonization of local initiatives calls for central planning capable of maintaining a global, long-term view of the problems and also able to support and promote local innovations by making the required resources available.

III

Conclusion: Notes towards a programme

Due to a series of circumstances, the difficult but essential task of mobilizing public opinion in favour of a 'different type of development' may take the form of a search for development strategies with moderate energy requirements. Meanwhile, we primarily need a better understanding of the links between the variables in the energy sphere, as they have been defined in this work. A good way to achieve this goal might be to consider the major production and consumption systems from this point of view, that is to say:

- (1) urban systems and their energy profiles;
- (2) industrial systems;
- (3) integrated food production systems;
- (4) energy systems, stressing the ecological, social and energy cost of producing and transporting energy;
- (5) strategies of territorial occupation, re-

suming the fundamental discussion launched by CEPAL fifteen years ago on vertical and horizontal development;

- (6) models of the use of social time, with particular reference to the forms of leisure which have important energy implications among the upper classes who are accustomed to leave the city during the weekends and spend their vacations abroad.

These studies may simultaneously serve as an introduction to the discussion on alternatives and to devise experiments on a natural scale designed to test the technical and ecological efficiency of alternative energy systems, the social, economic and ecological efficiency of alternative development strategies with moderate energy requirements, and the operational efficiency of decentralized institutional decision-making models supported by the selective intervention of the central authority.

The programme sketched out here is ambitious, but the starting point already exists in the seminars organized in 1979 by CEPAL and the other United Nations regional commissions, in collaboration with UNEP, on the subject of development styles and alternative models of resource use. It is now a question of pursuing the

same line of study, concentrating on the relation between development and its energy aspects and evaluating the solutions envisaged from the standpoint of social appropriateness, economic viability and ecological sustainability.