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REGIONAL PLAN OF ACTION ON NEW AND RENEWABLE SOURCES OF ENERGY

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CONTENT

/INTRODUCTION

INTRODUCTION

In convening a Conference on New and Renewable Sources of Energy, the United Nations General Assembly has established its objectives as elaborating measures for concerted action designed to promote the development and utilization of these sources of energy. These measures would be adopted with a view to meeting overall energy requirements, especially those of the developing countries, and in the context of efforts aimed at accelerating the development of these countries.1/

The plan of action presented here is in line with these objectives and it aims - after discussion, improvement and adjustment by the governments - to reflect a common Latin American position on the Conference's subject matter.

According to the General Assembly resolution, there are two broad frames of reference, extending beyond the sources of energy under consideration, within which the proposed action must fall: the need to meet the overall energy requirements of the developing countries, and efforts aimed at accelerating their development processes. This broader context, moulded by current energy and development problems in Latin America, is examined in chapter I of this proposal.

Chapter II presents the conceptual bases of the Regional Plan of Action formulated in this document, which serve as a framework for analysing the potential for the development and utilization of new and renewable sources of energy in Latin America. The conceptual bases include the dynamic nature of the potential of these sources of energy and the need to seek their widespread application.

On the basis of this general overview, chapter III sketches out a strategy for the accelerated development of new and renewable sources of energy in Latin America based on national efforts supported by regional and international co-operation.

In chapter IV, following a brief presentation of some general considerations, a concrete proposal for regional programmes of action is

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1/ United Nations General Assembly, A/RES/33/148, 1 March 1979.

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made. The regional programmes are of an integral nature, and this chapter details their characteristics and fields of action and attempts to order them on the basis of the priorities expressed by the countries of the region, their impact on the regional energy situation and programmes currently underway. These priorities will be one of the central topics of discussions by the governments at the Latin American Regional Preparatory Meeting for the Conference.

I. THE CONTEXT: ENERGY AND DEVELOPMENT IN LATIN AMERICA

Less than ten years have elapsed since the world became aware that the energy resources upon which modern civilization is based are scarce, and that many of them may be exhausted in the relatively near future. The cost of energy has increased considerably, and energy itself has become one of the fundamental themes in development and international relations. The situation is especially difficult for the energy-deficit developing countries, since they must obtain the energy they need within a system of international economic relations of which they are the weakest part.

All analyses of the current energy situation reaffirm the fact that a process of fundamental changes in our energy base has been begun. In 1980, world consumption of primary commercial energy was around 50 billion barrels of petroleum equivalent, of which 23 were petroleum, 10 gas, 15 coal and 2 hydroelectricity and nuclear energy.2/ These figures should be compared with the world's fossil fuel reserves, which are as follows:3/

	Billions of barrels of petroleum equivalent
Petroleum (proven reserves)	640
Gas (proven reserves)	460
Heavy crude oil (estimated reserves)	3 010
Shale (orders of magnitude)	3 264
Coal (technically and economically recoverable)	3 125
Coal (geological resources)	49 725

2/ World Bank, Energy in the Developing Countries, Washington, D.C., table 6, p. 12.

3/ Ibid., pp. 80-85.

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For the 1980s, annual growth rates of 2.1% for world petroleum consumption and of 3.5% for the consumption of fossil fuels as a whole are predicted.4/ If the same growth rates continue after 1990, these petroleum reserves will last only until the year 2002, and those of all the economically recoverable fossil fuels until the year 2040. There are two extremely important factors, however, which make it possible to extend the time estimates beyond these limits. Firstly, reserves and resources are economic variables, not mere physical quantities, and they will tend to increase as prices rise, technologies are perfected, and exploration is promoted. The second factor is the obvious expectation that the growth rates of primary energy use will continue to decline, likewise due to higher costs, and that the reduction will be achieved through greater efficiency in the production and use of energy and through changes in lifestyles.

In short, humanity's energy problem may be reduced to two fundamental dimensions or challenges, each of which uncovers many other horizons which may affect society in the future with respect both to economic and social aspects and to lifestyles.

The first challenge is the inescapable need to change the current world energy balance because it is highly dependent on hydrocarbons which, irrespective of the estimated reserves, will tend to run out as a result of current consumption patterns and future demand from both the developed and developing countries.

The second challenge rests essentially in the fact that higher and growing costs will increase the economic weight of energy in consumption, investment, communications, international trade, etc., which will naturally be reflected in development opportunities and policies and, consequently, in the very lifestyles of society in the future.

In this connexion, one need only take the example of what may be expected in the case of investments. From 1965 to 1975, the petroleum-importing developing countries invested an annual average of US$ 12 billion in the production and processing of commercial energy. In currency of

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4/ Ibid.; the calculations were based on the figures in table 6.

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the same value (1980 dollars), they devoted US$ 34.4 billion to this purpose in 1980 and will make an annual investment of US$ 54.4 billion from 1981 to 1985 and US$ 82.2 billion from 1986 to 1990.

For each dollar invested in energy in 1970, seven must be spent in 1990. In addition to the enormous savings effort which this requires, the petroleum-deficit countries will find themselves faced with increasingly burdensome petroleum imports, growing balance-of-payments pressure and greater difficulty in making investments in other sectors which would ensure the continuance of development, the provision of employment and the improvement of the population's living conditions. Up to now, these countries have avoided difficulties through structural changes and adjustments in their domestic economies at the expense of their exports, and through external indebtedness, principally through private banks which recycle the surplus from the petroleum-exporting countries.

The world must carry out an extensive substitution process in its energy base that will affect all of humanity. In the past, energy substitution was stimulated by powerful economic forces. Coal was cheaper than firewood, petroleum cheaper than coal, and natural gas cheaper than other sources in many uses. The economic system's functioning created no greater problems in achieving these changes than those entailed by any other large-scale substitution, such as that of the railway for animal traction in transport, or that of the electronic processing of data for manual processing in business management.

The energy substitution which lies ahead will differ qualitatively since, perhaps for the first time in history, it will use more expensive alternatives.5/ Our institutional and political decision-making machinery was not designed to handle a situation like this, which will require great foresight in the taking of decisions. It is a question of a transition from an essentially hydrocarbon-consuming era to one of greater energy pluralism, and machinery must be sought which will guarantee that this transition is fair and orderly. The energy substitution process is

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5/ Wolfgang Sassin, "Energy", Scientific American, September 1980, pp. 119-132.

/undoubtedly one

undoubtedly one of the most important aspects of the New International Economic Order. Planning, which is nothing more than forward-looking decision-making, will acquire unprecedented importance and will have to be carried out with approaches and methodologies differing from the traditional ones.

In the past, energy planning consisted simply of projecting demand and selecting projects for supply from well-known sources, within the context of easily predictable costs and prices. It was basically a technical exercise which could be carried out in relative isolation from the rest of society by the electrical or petroleum enterprises. It is no longer possible to pursue energy planning in this way. Not only supply but also demand must be planned, and traditional as well as new sources must be taken into account. Although it is inconstant, the trend in prices suggests an upward curve. Technologies are changing more and more rapidly, and planning horizons are no longer defined by the time it would take for a supply project to be constructed, but rather by the time left for making far-reaching changes in the entire social infrastructure.

For planning, clear images of the desired future are necessary. These images have been affected by the style of development which characterized the industrialized countries: their type of urban structure and services, transport by automobile over highways, mechanized agriculture making great use of chemical inputs, capital- and petroleum-intensive industry and mining, and many more factors. The industrialized countries have already constructed the infrastructure and material base needed for this style of development, and can service all or nearly all of their populations. These infrastructures and material bases make intensive use of energy and were constructed during an era when the cost of energy was low. For the developing countries, however, it will be increasingly difficult to reproduce this style of development, since the necessary infrastructure is far from finished. It would be utopian to try to build it according to the old model in a world of expensive energy, where it will be necessary to compete for energy with the industrialized countries.

Finally, another serious energy problem of the developing countries must be brought up: the supply of firewood vis-à-vis deforestation, and

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the impact upon these problems of the high cost of petroleum. This has been called the "other" energy crisis, and is a situation which affects populations with extremely low income, mainly rural, which use firewood and charcoal as energy sources and which account for at least 13% of primary energy consumption in Latin America.6/ The levels of consumption expressed in terms of usable energy are usually very low, and the population barely survives. Moreover, the technologies, especially those used in domestic consumption, are traditional and are characterized by extremely low efficiency and high firewood inputs. This, together with the increased demand for firewood in the cities, is creating very serious deforestation, erosion and desertification problems in many areas. The productive capacity of the land and agricultural productivity are gravely endangered. It has been estimated that if the trends of the past continue, 8.2% of Latin America's existing forests will have disappeared by 1995 due to these energy pressures.7/ To this must be added the pressure created by the opening up of agricultural frontiers, the industrial exploitation of wood, and forest fires.

The high cost of commercial energy has helped to aggravate both the social and the environmental problems caused by this "other" energy crisis. In practice, kerosene and liquefied petroleum gas are the only substitutes available for traditional fuels, and the rise in their prices tends to accelerate the above processes and to increase other types of demand for firewood, such as domestic, urban and industrial. Furthermore, the higher cost of fertilizers derived from petroleum also tends to hamper agricultural output and productivity. Finally, this entire state of affairs is even

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6/ Estimates made by CEPAL on the basis of firewood consumption in the domestic sector and sugar cane bagasse consumption in the sugar industry. This figure rises to around 40% or more in some countries.

7/ UNDP/OLADE, Fundamentación y apéndices a la propuesta de plan de acción latinoamericana para el desarrollo de la energía no convencional, Quito, October 1979, mimeographed version, p. 17. The two subregions with the highest indices are Mexico-Central America-Panama and the Caribbean; the figures for them are 15.8% and 21.5%, respectively.

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more difficult due to the nearly total lack of complete diagnoses, quantitative studies and reliable statistics on this complex situation.8/

The foregoing considerations allow us to state that energy planning and policy must now establish new objectives for the future which transcend the above-mentioned goal of ensuring economic development. These new objectives would be as follows:

(a) Guaranteeing each country's self-determination.

(b) Using natural resources carefully and conserving the environment.

(c) Ensuring the steady improvement of the population's quality of life.

The objective of guaranteeing each country's self-determination implies, firstly, reaffirming the sovereignty of each country over its natural resources, including energy resources, and its right to plan their use in accordance with its economic and social development plans. Second, faced with the need to use imported energy resources, security of supply and the problems of external financing take on special importance for the energy-importing countries.

This objective is also linked to the growing technological dependency in the energy field which must be expected in the case of developing countries with very limited research capabilities. Through Mexico and Venezuela's Programme of Energy Co-operation with the Caribbean and Central American countries, Latin America has shown that the region's self-determination may be financed through joint action in supply and financing.

The objective of using natural resources carefully and conserving the environment is linked with the very roots of the current energy situation, with respect to both the fossil fuels which are being depleted and the renewable sources (forests, high ground within river basins) which are being destroyed. Joint action in this field may be of enormous value for providing studies, methodologies, technologies and personnel training

8/ See the report (submitted to the current Regional Preparatory Meeting) of the Technical Meeting on Firewood and Charcoal: their Incorporation into Energy Planning and Policy (Managua, Nicaragua, 23-27 February 1981). This meeting was part of the Latin American preparations for the United Nations Conference on New and Renewable Sources of Energy.

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to countries which lack them and sense that their resources and the security of their future supply are threatened.

The objective of ensuring the steady improvement of the population's quality of life is linked to the impact of the energy situation on each member of society. In this respect, the problem of meeting the most pressing needs of the lowest-income groups, whose existence is precarious and involves the use of firewood and charcoal, must first and foremost be kept in mind. Second, there is the longer-term problem regarding society as a whole, which must find a new development style capable of ensuring good living conditions with a moderate consumption of energy. In this connexion as well, joint Latin American action may be extremely important for generating appropriate technologies, designing products suited to existing resources and cultural patterns and exchanging experience in technical and organizational matters.

The future energy policies of the Latin American countries must seek to strike a balance between their economic development objectives, self-determination, environmental protection and improvement of the quality of life, taking special care not to try to achieve one at the expense of the others. It is towards the harmonious accomplishment of these four objectives that each of the actions taken within the three major fields of efforts in energy use must be geared, attempting to:

(a) Rationalize and plan the growth rate of consumption of primary energy and the increase in the availability of usable energy (light, heat, motive force, etc.) by greatly increasing the efficiency of the entire energy system.

(b) Continue to use conventional energy sources, searching for new resources and improving the efficiency of extraction and conversion.

(c) Accelerate the exploration and use of new and renewable sources of energy.

The achievement of the third of these tasks in a manner and using a combination of sources which suits the resources and needs of each country may be, for many Latin American countries, the only possible method of progressing towards the achievement of the four objectives noted above. The proposals in this document offer concrete measures and actions to further this task through co-operative efforts and joint actions among all the countries of the region.

/II. POTENTIAL

II. POTENTIAL FOR THE DEVELOPMENT AND UTILIZATION OF NEW AND RENEWABLE SOURCES OF ENERGY

This Regional Plan of Action for new and renewable sources of energy is based upon two fundamental concepts:

- that the potential for the use of new and renewable sources of energy is of a dynamic nature, and
- that the effective development of these sources involves applying them on a massive scale.

This chapter presents and expands upon these concepts, laying the foundations for the strategy and actions proposed in succeeding chapters.

The potential for the use of new and renewable sources of energy changes in magnitude with time. It depends not only on resources but also on needs and possible uses and technological progress. The potential must constantly be recalculated and brought up to date and is a basic reference point for planning the development of these sources.

Effective use of these sources involves applying them on a massive scale, and hence it is not sufficient to test new technologies and demonstrate their possibilities for use: the plant and equipment for them must also be produced industrially and disseminated on a large scale. Here we must point out that widespread application also requires that patterns of consumption and production be adapted socially and economically. Any such adaptation encounters a process of social inertia, which must be taken into account in drawing up the programme for the use of these sources. Integral programmes are the most efficient method of promoting these activities.

1. Dynamic view of the potential for the use of new and renewable sources of energy

One of the increasingly fundamental activities in the new type of energy planning described in the preceding chapter will be determining the potential of new and renewable sources. The size of this potential is not fixed, but changes with time. In many cases it may seem small today, but there are factors which should increase it steadily in the future. Firstly, the cost of conventional sources is increasing and the availability of

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some of them will soon begin to be limited. This will gradually allow new and renewable sources of energy to become economically competitive in many of their applications. Second, technologies for generating and using energy from these sources are advancing extremely rapidly, and the position of the new sources in relation to conventional ones is likewise improving for this reason. Furthermore, there are signs that consumption habits inherited from an era when energy was cheap are beginning to change, thus clearing the way for new forms of energy use suited to some of the new and renewable sources, particularly the decentralized ones. Finally, in many cases these sources furnish new ways to meet unsatisfied energy needs, particularly in rural areas.

All of these factors must be taken into account in order properly to estimate the potential for the use of new and renewable sources. Any planning that is concerned only with sources which today are economical for centralized energy systems may be committing serious errors of judgement regarding energy prospects in the future and needs for current action. The potential must be understood as an interaction between current and future resources, current and future technologies, and current and future energy needs.9/ It is quite certain that a potential viewed in this manner will be more valid and action-inducing than one which takes account only of incompletely-known resources, the few technologies available on the market, and current demands which reflect the development style of the era of cheap and plentiful petroleum.

A proper estimate of the potential for the use of new and renewable sources of energy should include the following basic aspects:

(a) A study and inventory of the country's principal natural resources and of the residues generated by industrial and agricultural activities which may serve as energy sources. The study should include an analysis of extraction costs and the effects on the environment and should discuss alternative uses.

9/ This is how the European Economic Community's biomass potential has been estimated, for example. Cf. P. Chartier, "Prospects for Energy from Biomass in the European Community", Energy from Biomass, International Conference, Brighton, U.K., 4-7 November 1980.

/(b) A

(b) A study of the country's energy needs which could be met by using new and renewable sources of energy. These needs include effective demand indicated by purchasing power as well as unsatisfied human demand which may be covered by special social development policies.

(c) The preparation of descriptions or technical and economic profiles of technologies already available or in course of development for generating and using new and renewable sources of energy.

(d) The combination of the above elements into one or more scenarios that are considered feasible for the energy future.

(e) Evaluation of the political, economic, social and environmental consequences which each scenario would have for the countries. Each of the scenarios will be an estimate of the potential for the use of new and renewable sources.

It must be pointed out that a central aspect of the final stage is the evaluation of scenarios for the future. This evaluation could indicate the extent to which each scenario and the sources, uses and technologies included in it facilitate achieving the development objectives which were presented in the preceding chapter - economic development, self-determination, environmental protection and improvement of the quality of life. Consequently, the evaluation must not limit itself to the usual economic and financial criteria, but must also include social and environmental concerns. The same should take place with the evaluation of all projects for the use of new and renewable sources of energy and with the criteria applied by national and international development financing organizations.10/

One estimate of the potential of new and renewable sources of energy in Latin America has noted that, discounting hydroelectricity, 11% of total primary energy could come from them. Their principal forms of application

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10/ This is the topic of one of the Latin American technical meetings held in preparation for the Conference: "Criteria for evaluating projects for research on and investment in new and renewable sources of energy" (Barbados, 16-20 February 1981). This meeting was organized with the support of the Caribbean Development Bank, and its final report has been submitted for the consideration of the current Regional Preparatory Meeting.

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and relative sizes (expressed as a percentage of the total of the new and renewable sources mentioned) are as follows:11/

1. Firewood and charcoal for rural domestic use	15.0%
2. Solar radiation for industrial use	14.0%
3. Vegetable residues for agroindustrial use	11.8%
4. Solar radiation for urban residential use	8.2%
5. Firewood and charcoal for industrial use	7.0%
6. Firewood and charcoal for urban domestic use	5.9%
	61.9%

Several factors must be kept in mind in order to interpret these figures correctly. Firstly, in accordance with the dynamic concept of potential, all estimates reflect the perceptions of the moment when they were made, and this one is already four years old. An estimate made today, based on the experience of recent years, would have given a higher place to alcohol fuel for transport, which in this case was placed below the last item on the list. Second, this study laid greater emphasis on requirements than on the other two aspects of potential: resources and technologies. Finally, these figures do not necessarily reflect the relative importance of each form of application. The importance depends upon how much each application contributes to the achievement of the major objectives mentioned above, and these contributions are not necessarily in proportion to the total primary energy required for each application.

Keeping these considerations in mind, at least two important conclusions may be drawn from these figures. Firstly, there are several applications which apparently could be used quite extensively in the region and regarding which there is still at present virtually no action underway, such as firewood for rural domestic use, solar energy for industrial use, and others. Second, a very large portion of the potential is concentrated

11/ UNDP/OLADE, Requerimientos futuros de fuentes no convencionales de energía en América Latina. Summary of a study prepared for the United Nations Development Programme by the Bariloche Foundation (Argentina), Quito, June 1979, approximately 300 pages. The study was made from 1977 to 1978. Firewood and charcoal are considered non-conventional in it only when used highly efficiently. "Traditional" firewood still constitutes 6.1% of total primary energy in the scenario for 1995.

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in only a few applications. This suggests that development efforts should be directed not at sources in general but at specific applications (source-use combinations): for example, solar energy for industry rather than solar energy for just any use. It is easy to see that this method of determining the potential may have great practical importance in defining priorities for action.

2. Large-scale use of new and renewable sources of energy through integral programmes

Once the priority areas have been established on the basis of study of the potential, measures to use new and renewable sources must be put into practice; specifically this means achieving their widespread application. Widespread application is the true objective of the use of these sources of energy, a fact which is often lost from view when almost exclusive emphasis is placed on the search for technology. Again, technology is only one of three basic aspects; in addition, the supply of resources and the supply of equipment must be developed, and personal and production needs must be translated into effective demands.

To achieve the widespread application of energy from these sources, the equipment and tools necessary for their use must be produced on an industrial scale, and they must be distributed widely among their potential users. The effort to use new and renewable sources of energy must be aimed at fulfilling these two requirements, and numerous and varied activities must be carried out in order to achieve this: various types of studies, personnel training, establishment of incentives and support systems for the users, adaptation or improvement of technolgies, evaluation of projects, mobilization of financing, and many others. These activities are intensely interdependent and their implementation requires a high degree of co-ordination. The best way of doing this is through integral programmes.

III. STRATEGIES FOR THE USE OF NEW AND RENEWABLE SOURCES OF ENERGY

In this chapter, a strategy is proposed for fostering the conditions required for the rapid and efficient development of the potential of new and renewable sources of energy in Latin America and helping to achieve the overall objectives mentioned above. The strategy is based on national efforts and action and co-operation at the regional and international levels, as well as on the basic principles mentioned above, one being the dynamic nature of the potential of these sources of energy, and the other, the need to seek their widespread application through integral programmes. It is considered desirable that each country should undertake action at the national, regional and international levels.

1. Action at the national level

(a) Institutional responsibilities

Designation of a single focal point or national co-ordinator for activities in the field of energy planning.

(b) Progress in understanding the pattern of energy use

Each country must gain knowledge of the distribution of energy from both the input and the final use point of view (energy balance).

(c) Knowledge of the dynamics of the energy scene

The planning of energy supply and demand should be aimed at developing, improving and consolidating a methodology for the formulation and analysis of simulated energy scenarios for the future which include new and renewable sources of energy.

(d) Resource evaluation

Each country must round out its information on resources which may serve as new and renewable sources of energy. This evaluation should indicate whether the resource exists or not, where it is found, what its physical characteristics are, and how large it is. This information may be used to compile an inventory or "resource map", and will also facilitate identifying the sources and geographical areas in respect of which other resource evaluation projects may be mobilized in the future.

/(e) The

(e) The energy requirements picture

The existence of a resource is not enough. In order for it to be usable there must be a demand for it, or the possibility that this demand will exist in the future. The demand may arise out of industrial, transport, domestic or agricultural energy needs. If we are referring to actual needs for which there is purchasing power, we speak of effective demand; the opposite case is called unsatisfied demand. The term "requirements" covers both types of demand.

As in the case of resources, here we must have a "requirements map" by sector of use which sums up current knowledge about the problem: existence of the requirement, geographical location, temporal location (present or future), physical characteristics (e.g., low-temperature heat, illumination, etc.) and order of magnitude. It will then be possible to identify tentatively the uses and geographical areas for which demand evaluation projects must be initiated.

(f) Areas of interest for application

New and renewable sources of energy can be put to practical application when the presence of a resource coincides with the presence of a requirement. Consequently, areas of interest may be identified by juxtaposing the "maps" devised in the two preceding stages. For example, one area of interest could be the heating of low-temperature water for industrial use (requirement) through direct solar radiation (resource). The areas of interest must be pinpointed in space and also in time, if requirements expected for the future are involved.

This action will also make it easier to identify resource application projects which the countries should initiate. These projects will generally include both the industrial production of some plant and equipment and the development of incentives and support machinery for mass marketing and distribution.

(g) Technological development needs

The identification of an area of interest presumes that a technology for its practical application is available or that one may be adapted or

/developed for

developed for that purpose. It is to be expected that the possible areas of interests will expand with technological change.

It is necessary to begin, however, by defining the areas of interest and then proceed to identify the technical development needs in each area. Technological research should correspond to application needs, and not to solely academic criteria. In many countries, this process could contribute greatly to the orientation of research activities towards the country's real needs. At this stage, then, research and development projects in this field which could be implemented in the country will be identified.

(h) Synthesis and priorities

The above elements will give rise to a large number of initiatives, which must then be systematized and ordered in terms of priorities. In some countries, these efforts could be the foundation for a national policy on new and renewable sources of energy.

2. Action at the regional level

The regional action and programmes derived from the above-mentioned national activities and the priorities indicated by governments of the region are presented in chapter IV.

This Regional Plan of Action contains integral programmes providing for projects in the following areas:

(a) Support for planning

Projects aimed at assisting the governments concerned in their future activities for resource evaluation, demand evaluation, the study of the economic, social and environmental impacts of the use of new and renewable sources of energy, and the elaboration of policies and programmes.

(b) Technological development

Multinational projects for the acquisition, dissemination, adaptation and development of technologies for the use of new and renewable sources of energy or for following up extraregional research on them.

(c) Support for mass application

Projects designed to assist Governments which want to make practical use on a large scale of some new and renewable energy sources to meet some important need. These projects will cover aspects related to industrial production and to dissemination and marketing.

/(d) Dissemination

(d) Dissemination of information

Projects designed to promote the dissemination of different types of information on new and renewable energy sources to various kinds of users. Depending on the priorities indicated by governments, this could be achieved through regional scientific publications, technical information services, information and education of the general public and other similar activities.

(e) Training

Projects designed to prepare the necessary personnel to implement programmes concerning new and renewable sources of energy both in technical and administrative and social fields and areas.

(f) Concerted regional action

The objectives and programmes set forth in this Plan of Action open up possibilities for fruitful regional co-operation. The long tradition of economic co-operation in the region could acquire renewed vigour under concerted regional co-operation programmes, which should cover co-operation in the field of energy as a whole, with special attention to co-operation in respect of new and renewable sources of energy.

Regional co-operation could be strengthened by supporting it institutionally from two angles.

On the one hand, a focal point is needed to help the governments of the region to formulate programmes and policies designed to promote broad co-operation in the field of enerby by highlighting the political interests and will which determine priorities and mobilize action at the national level.

In this connexion the region has a valuable instrument in the form of the Latin American Energy Organization (OLADE), which is already carrying out that function and is formulating a programme of goals and priorities for co-operation in energy in a broad sense, including concrete action in the field of programmes for the development of new and renewable energy sources.

/The identification

The identification of action programmes in terms of specific problems or sources is of great importance; once they have been formulated, and provided they enjoy the necessary political support, their implementation could benefit from the broad institutional infrastructure already in existence in both the United Nations family (the CEPAL system and the various specialized agencies and organizations) and regional systems, which, if suitably co-ordinated, could provide rapid and efficient support through their respective specialized fields of activity and human and technical resources.

For this full-scale and massive mobilization of existing resources, it would be very important to promote horizontal co-operation among the countries of the region, which are in a position to provide immediate support because of the experience each of them has acquired in very specific fields relating to new and renewable sources of energy.

3. Action at the world level

World co-operation is the most important factor for ensuring that the transition to a new era, one of whose main characteristics will be the pluralistic, stable and just organization of energy resources, takes place without mankind having to pass through a period of tremendous danger. The United Nations Conference on New and Renewable Sources of Energy is one of the most viable channels for concrete measures to guarantee a smooth transition.

During the next few months, the international community will be working to formulate a World Plan of Action on new and renewable sources of energy within the context of co-operation in the field of energy as a whole. It is of great importance that the Latin American Plan of Action in the field of new and renewable energy sources should be prepared bearing in mind that World Plan and the contributions that can be made by the governments of the region during its formulation.

IV. REGIONAL ACTION PROGRAMMES

1. General observations

In this chapter the action programmes making up the regional proposal will be presented. The field of action of the source/final use combination is presented, and the framework of planned activities is indicated. Finally, the programmes considered to be of priotity in the region are presented, with a brief explanation of the criteria used to identify them. The raison d'être of these programmes is the decision of governments of the region to draw up their national strategies for the development of new and renewable sources of energy and to put them into practice. The programmes themselves only supplement the activities and programmes which the governments decide to carry out in their countries. They are intended to support rather than replace national efforts.

The programmes proposed provide for action which supports at every point the formulation and implementation of the national strategies, along the lines described in previous chapters. The action is organized in integral programmes, considered to be the most appropriate mechanism owing to their multidisciplinary and inter-agency nature.

An integral programme has the objective of achieving mass application in one given area, and to that end organizes all the necessary activities under a single management. There can be integral programmes in any area which shows promise after study of its potential. The area should be defined precisely as to source and use: for example, solar heat for industry or alcohol fuel for transport.

2. Framework of activities

This Regional Plan of Action envisages activities for developing all the energy sources considered by the United Nations Conference on New and Renewable Sources of Energy, namely:

/(a) Hydroelectricity

(a) Hydroelectricity

(b) Geothermal energy

(c) Wood and charcoal

(d) Solar energy

(e) Wind energy

(f) Ocean energy

(g) Biomass energy

(h) Peat

(i) Bituminous shale

(j) Animal power.

Similarly, thought must be given to the specific application of each source for purposes of meeting a given need in the following sectors:

(a) Industrial

(b) Agricultural

(c) Transport

(d) Urban residential

(e) Rural residential.

The main activities to be carried out under an integral programme on these new and renewable sources of energy are as follows:

(a) Detailed study of the energy resources to be used.

(b) Detailed study of the needs and demands to be met.

(c) Economic, social and environmental evaluation of the proposed mass application, taking the known technological alternatives into account.

(d) Determination of the needs for the adaptation or development of technology raised by the proposed mass application.

(e) Performance of the necessary research and technological development.

(f) Revision of the economic, social and environmental evaluations on the basis of the results of the technological activities.

(g) Studies on national industrial capacity, or import alternatives, for supplying the necessary plant and equipment.

(h) Prefeasibility and feasibility studies on the industrial production of the above-mentioned plant and equipment.

/(i) Study

(i) Study of the economic, social, cultural and technical characteristics of the population or production activity whose energy demand is to be met.

(j) In the case of centralized supply, design of the modifications which must be made in the distribution networks to be used (for example, a network parallel to the gasoline network for the distribution of alcohol).

(k) In the case of decentralized supply, design of the extension and support systems required for the mass diffusion of plant and equipment: training, information, conservation, user financing, etc. (example: system for the diffusion of biogas in the stockbreeding sector or of efficient wood burning cookers in rural areas).

(l) Mobilization of financial resources to establish the industrial activities and extension and support systems required.

Among these activities, attention should be drawn to the basic importance of the economic, social and environmental evaluation of the envisaged mass application. Integral programmes of the type proposed are mechanisms for generating investment projects which can give guarantee to financial bodies and mobilize resources with relative ease.

3. Priority programmes

The range of possible energy source/final use combinations is enormous, and an order of priority must be assigned to them.

The priorities which have been suggested here comprise only a limited list of projects and therefore do not necessarily coincide with the priorities indicated individually by each government. They represent an attempt to find points where the views of the countries of the region coincide as to which of the regional programmes should be promoted. In setting this order of priorities the following criteria have been taken into account:

(a) Priorities indicated by governments during the process of preparing for the United Nations Conference on New and Renewable Sources of Energy;

(b) Regional programmes promoted by OLADE now underway (energy balances, geothermal energy, biogas, wind energy and small hydroelectric power stations);

/(c) Estimates

(c) Estimates of the potential of the different applications of new and renewable energy sources in Latin America.

It is suggested that priority be given to the following programmes:

(a) Energy planning programme

(b) Hydroelectric development programme

(c) Programme on firewood and the planting of trees for rural energy

(d) Programme on ethanol for transport

(e) Programme on solar energy for industry and housing

(f) Programme on plant residues for agro-industry

(g) Information programme to promote the development of new and renewable energy sources.

The planning programme will support national efforts to determine the potential for the development of new and renewable energy sources and to set priorities. This programme should seek to plan the rational use of energy as one of the main ways of increasing the availability of useful energy. The regional integral programmes are designed to support the national integrated programmes in those areas of application which seem to be of priority for the region as a whole. Other programmes of this type can be added in the future as requested by governments. The objective of the information programme is to facilitate the action of all the other programmes and to improve communications between governments, enterprises and experts working in this field throughout the entire region. All the information programmes include the efficient use of energy resources and training activities as important components. The programmes proposed all provide for mututal regional co-operation based on existing institutions in the countries concerned or on institutions to be established in them. The main function of each programme is to structure and facilitate co-operation among the national institutions in the corresponding area. To this end, it is proposed that activities such as the following should be carried out:

(a) Technical advice to a country by experts or technical services from another country in the region.

(b) Contracting an institution from another country in the region for carrying out studies, research or laboratory tests required by one or more countries.

/(c) Facilitating

(c) Facilitating the permanent exchange of technical and economic data among the participating countries.

(d) Organizing training activities jointly with suitable Latin American and/or extra-regional institutions.

(e) The issue of technical publications.

(f) Co-operation in seeking financing for national activities.

(g) The organization of joint pure and applied research projects among the participating countries.

(h) Facilitating access to and dissemination of technical data from other regions.

(i) Promoting and facilitating the participation of country experts in international events.

(j) Facilitating the joint implementation of investment projects relating to new and renewable energy sources in the region.

(k) Facilitating the transfer of technology related to those resources within the region.

(l) Promoting the use of plant and equipment produced in the region.

(m) Channelling and rationalizing the supply of extra-regional technical assistance to the region.

Participation in these programmes will be open to all the governments of the region, and each government will decide in which programme it wishes to participate and in which ones it does not. A government which decides to participate will enter into a firm undertaking to designate counterpart institutions, perform national tasks and allocate resources for these tasks in the manner specified when the corresponding programme is set up.

Each programme must be preceded by a period, whose length will vary according to the nature of the programme, in which detailed preparations shall be made for it. In this period the governments will indicate their interest in participating, their priorities and needs for support from the programme, and the contributions they are prepared to make for the benefit of the other countries. During the preparatory period the necessary financing for the programme will also be arranged. The project document and the contracts established at the end of this period shall specify in detail all the activities planned and the reciprocal commitments assumed by the participating countries and the executing agency or agencies.

/There follows

There follows a very brief description of each of the programmes identified as being of priority. Later on, if the governments deem it necessary, more detailed descriptions, including costs, can be prepared. It is felt, however, that the present degree of detail is enough for the purpose of establishing priorities.

(a) Energy planning programme

(i) Objectives

- To make it easier for the governments concerned to provide mutual support in the formulation of their national strategies for the development of new and renewable sources of energy, on the basis of the criteria referred to in chapter III.
- To facilitate the exchange of experience in this field and of technical and economic data among the countries of the region.

(ii) Expected output

- Development and use of methodologies for evaluating energy resources.
- Knowledge concerning the way in which the energy is used and distributed in the region, on the basis of the national balances referred to in chapter III, for which a regional methodology formulated by OLADE is already available.
- Development and use of methodologies for studying energy needs which may be met through new and renewable sources of energy.12/
- A clearer understanding of the energy scenarios which might arise in the region in the future as a result of the use of the methodologies referred to.
- Methodological guidelines for estimating the potential of new and renewable energy sources on the basis of surveys of resources and needs and information relating to technologies.
- Manual on the formulation and appraisal of investment projects in the field of new and renewable sources of energy.

12/ At the request of the Governments of Peru and Colombia, CEPAL has already begun the preparation of a manual on this subject, financed with technical assistance resources from the United Nations Conference on New and Renewable Sources of Energy.

/- Personnel

- Personnel trained in the application of the methodologies referred to above.
- The provision of advisory services in these subjects to governments which require them.
- Other publications, technical information exchange meetings and diverse activities.

Duration: 3 to 4 years.

(b) Hydroelectric development programme

This programme was formulated at the regional technical meeting entitled "The hydroelectric potential: an energy alternative and an industrial and financial challenge for Latin America", organized jointly by CEPAL and OLADE at Quito, Ecuador, from 2 to 6 February 1981. The report of that meeting has been submitted to this Preparatory Regional Meeting.

(c) Programme on firewood and the planting of trees for the generation of energy in rural areas 13/

(i) Objectives

- To determine the social, environmental and economic characteristics and effects of the present use of firewood and charcoal in the rural areas of Latin America and its prospects for the future.
- To facilitate mutual support among governments interested in the large-scale application of appropriate forest species and domestic equipment of high efficiency for the production and use of firewood in rural areas.
- To facilitate the exchange of experience and regional technical information in this connexion.
- To help the region to keep abreast of world scientific and technological progress in this field.

13/ See the report of the Regional Technical Meeting on Firewood and Charcoal and their Inclusion in Energy Planning and Policy, held at Managua, Nicaragua, from 23 to 27 Feberuary 1981 as part of the regional activities in preparation for the Conference, under the auspices of CEPAL and the Nicaraguan Energy Institute. This report has been submitted to this Preparatory Regional Meeting for its consideration.

/(ii) Expected

(ii) Expected output

- Study to evaluate the present and future environmental impact of the use of firewood and charcoal in Latin America.
- Determination of the potential for the use of firewood and energy crops in each of the participating countries.
- Identification of genetically selected species and varieties and their multiplication and distribution to the participating countries for use in energy crop projects in the various ecological environments of Latin America.
- Techniques of forest management and cultivation of different species and varieties developed and disseminated in the participating countries.
- Development and dissemination in the participating countries of technologies for the efficient use of firewood and the production and efficient use of charcoal.
- Investment projects, formulated entirely in the participating countries, covering the planting of trees, the production of equipment and the large-scale popularization of their use.
- Technical personnel and extension workers trained in the participating countries.
- Provision of advisory services in this field to governments requesting them.

(d) Programme on ethanol for transport 14/

(i) Objectives

- To make it easier for interested governments to give each other mutual support in the mass application of ethanol in transport.
- To facilitate the regional exchange of experience and transfer of technologies in this field.

14/ See the regional document on the energy potential of sugar-cane El potencial energético de la caña de azúcar, prepared by the Instituto Cubano de Investigaciones sobre Derivados de la Caña de Azúcar as one of the preparatory activities for the Conference. This report has been submitted directly to this Preparatory Regional Meeting.

/- To

- To make it easier for the region to keep fully abreast of world scientific and technological progress in this field.

(ii) Expected output

- Determination of the potential for extracting ethanol from various crops grown in the participating countries.
- Transfer of technology to the participating countries which so request regarding the planting of crops for the production of ethanol and for its extraction and use in transport.
- Investment projects formulated entirely in the participating countries.
- Technical personnel and extension workers trained in the participating countries.
- Provision of advisory services in this field to governments which request them.

(iii) Duration: 4 years or more.

(e) Programme on solar energy for industry and housing 15/

(i) Objectives

- To make it easier for interested governments to give each other mutual assistance in the mass application of solar energy to industry and housing.
- To facilitate the exchange of technical and economic information in this field within the region.
- To make it easier for the region to keep fully abreast of world scientific and technological progress in this field.

(ii) Expected output

- Determination of the potential for applications in industry and housing in the participating countries.

15/ See the regional document on solar energy in Latin America Energía solar en América Latina, prepared by the Universidad Nacional Autónoma de México as one of the preparatory activities for the Conference. This document has been submitted to the Regional Preparatory Meeting for its consideration.

/- Technologies

- Technologies adapted to and defined for the participating countries regarding the application of solar energy in these fields.
- Fully formulated and evaluated projects for industrial investment, support systems and extension services.
- Training of technical personnel and extension workers.
- Provision of advisory services in this field to governments which request them.

(iii) Duration: 4 years or more.

(f) Programme on plant residues for agro-industry 16/

(i) Objectives

- To make it easier for interested governments to give each other mutual support in the large-scale utilization of plant residues (waste wood, bagasse, husks, etc.) for the generation of energy for agro-industrial use.
- To facilitate the exchange of technical and economic information in this field within the region.
- To make it easier for the region to keep fully abreast of world scientific and technological progress in this field.

(iii) Expected output

- Determination of the potential for the utilization of plant residues to generate energy for industrial use in the participating countries.
- Technologies for use in this area of application developed, adapted and identified in the participating countries.
- Formulation and evaluation of investment projects.
- Training of technical personnel and extension workers.
- Provision of advisory services to governments which request them.

(iii) Duration: 4 years or more.

16/ See the regional document on the energy potential of sugar cane, op.cit.

/(g) Information

(g) Information programme on the use of new and renewable energy sources

(i) Objectives

- To make it easier for Latin American countries to provide each other with mutual aid in the development of new and renewable sources of energy by establishing efficient communications mechanisms and disseminating technical information among decision-makers and specialists.
- To facilitate the access of all countries in the region to internationally available technical information on new and renewable sources of energy.

(ii) Expected output

- Monthly publication of a bulletin containing information on the current situation in Latin America with regard to research into and application of new and renewable sources of energy.
- Quarterly publication in Latin America of a high-quality scientific journal on these sources, edited by an editorial committee made up of highly-qualified technical and planning experts.
- Publication and yearly updating of a directory of persons, institutions and projects in the field of new and renewable sources of energy in the region.
- Establishment of a service to give all research workers and planners in this field in the region access to international data and reference banks through Latin American institutions associated with them.