

UNITED NATIONS
ECONOMIC
AND
SOCIAL COUNCIL



LIMITED
E/CEPAL/Conf.73/L.2/Rev.3
March 23, 1981
ENGLISH
ORIGINAL: SPANISH

CEPAL

Economic Commission for Latin America

Regional Preparatory Meeting for the
United Nations Conference on New and
Renewable Sources of Energy

Mexico City, Mexico 16-18 March 1981

REGIONAL PLAN OF ACTION ON NEW AND RENEWABLE SOURCES OF ENERGY

Resolution

The Regional Preparatory Meeting for the United Nations
Conference on New and Renewable Sources of Energy at the Ministerial
Level

Resolves:

1. To adopt the Regional Plan of Action on New and Renewable Sources of Energy;
2. To transmit the Regional Plan of Action to the Latin American Group at United Nations Headquarters in New York in order for the Group to follow its guidelines during the preparations for the United Nations Conference on New and Renewable Sources of Energy;
3. To submit the Regional Plan of Action to the Latin American Energy Organization (OLADE) as a significant contribution to the Latin American Energy Co-operation Programme and its immediate action programmes in the field of new and renewable sources of energy;
4. To instruct the Executive Secretariat of the Economic Commission for Latin America (CEPAL) and request United Nations organizations and agencies to co-ordinate the implementation of their activities and programmes regarding promotion, research and development in the field of new and renewable sources of energy in Latin America with the Latin American Energy Organization (OLADE);
5. To take note with satisfaction of the offers to initiate concrete actions to implement regional programmes made by Argentina regarding energy planning and wind power; Brazil regarding liquid fuels, firewood and charcoal; Cuba regarding the programme on vegetable residues and energy efficiency for agro-industry; and Mexico regarding geothermal and solar energy;
6. To express its gratitude to the Government of Mexico for the hospitality, which is traditional in this exemplary and beautiful country, extended to the delegations participating in the Meeting.

Regional Plan of Action on new and renewable sources of energy

I N T R O D U C T I O N

1. 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 "... 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/

2. The Latin American countries strongly reaffirm their desire to seek formulas that will make it possible to achieve progress in their socio-economic development. These countries are of the opinion that the principal responsibility for their economic development lies in themselves and that international economic co-operation constitutes a fundamental instrument for aiding such development. Accordingly, co-operation among developing countries is an important element in strengthening their overall bargaining power, while at the same time it contributes directly to promoting their development.

3. The Latin American countries are of the opinion that the use of new and renewable sources of energy constitute part of the tasks linked to their development. In this perspective the United Nations Conference on New and Renewable Sources of Energy represents an opportunity to make progress on a global scale with respect to international economic co-operation and also a new stage in international economic negotiation, presently directed towards a portion of the extensive field of energy within the general context of development problems.

4. The plan of action presented here is in line with these objectives and it aims to reflect a common Latin American position on the Conference's subject matter.

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

1/ General Assembly 33/148 of 20 December 1978.

6. Chapter II presents the conceptual bases of the Regional Plan of Action formulated in this document, which serve as a framework for analyzing 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.

7. 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.

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

I. THE CONTEXT: ENERGY AND DEVELOPMENT IN LATIN AMERICA

1. Less than ten years have elapsed since the world became aware that the energy resources upon which the present-day patterns of consumption are 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, like raw materials, trade, finance and technology, has become one of the fundamental themes in development and international relations. The situation is especially difficult for the energy-deficit developing countries, in view of the prevailing system of international economic relations, that affects the entire developing world in the same way.

2. 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. 1/ These figures should be compared with the world's fossil fuel reserves, which are as follows: 2/

	<u>Billions of barrels of petroleum equivalent</u>
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

3. 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. 3/ If the same growth rates continue after 1990, these proven petroleum reserves will last only until the year 2002, and those of all the economically recoverable fossil fuels until the year 2040. These are two extremely important factors, however,

1/ World Bank, Energy in the Developing Countries, Washington, D.C. Table 6, n. 12.

2/ Ibid., pp. 80-85. See also: UNDP/OLADE, Requerimientos futuros de fuentes no convencionales de energía en América Latina. June, 1979.

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

which make it possible to extend the time estimates beyond these limits. Firstly reserves and resources are economic variables, not merely fixed physical quantities, and they will tend to increase as prices rise, technologies are perfected, and exploration efforts are increased. The second factor is the obvious expectation that the growth rates of primary energy will continue to decline, likewise due to higher prices, and that the reduction will be achieved through greater efficiency in the production and use of energy and through positive changes in lifestyles. The third factor is the participation of new and renewable energy sources within the world energy balance that may be expected. The exploitation and use of these sources could be one of the principal factors in extending the estimated time limits.

4. The Latin American countries are fully aware of and support the concept of transition, in the sense of an orderly, progressive, integral and just change over from one era, based mainly on the consumption of hydrocarbons, to another, capable of making available and utilizing a multiplicity of energy sources. The process of energy transition is interrelated with modifications in the economic structure that would lead in the future to differences in the production systems of the developing countries, owing to the multiplicity of energy sources. They are also aware of the need to make careful use of natural resources and to protect the environment in carrying out this energy transition, within the context of economic development.

5. In short, humanity's energy problem may be reduced to two fundamental dimensions, 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.

6. The first dimension is the inescapable need to change the current world energy balance, highly dependent on hydrocarbons which, irrespective of the estimated reserves, will tend to run out as a result of current consumption patterns that include elements of wasteful consumption, especially in the industrialized countries, and of future demand from both the developed and the developing countries.

7. The second dimension is much broader in scope and is related to the very concept of development—especially the need for profound changes in future economic structures, based on the new energy, technological, financial and monetary realities, of development, within the framework of the objectives pursued by the developing countries through the New International Economic Order.

8. In the 1970s, developing countries as a whole, and especially those with an energy deficit, faced a situation marked by rapidly growing costs for their investment projects that stemmed from the higher prices of such factors as the technology, energy,

equipment and financing involved. ^{4/} Under these circumstances, developing countries will find themselves in a situation where their imports for development will be more and more difficult to finance, the pressures on their balances of payments will increase, and they will find greater difficulty in making investments in other sectors that could ensure continued development, the creation of jobs and improvements in the living standards of the population. Up to the present time, these countries have attempted to overcome such difficulties by recurring to external indebtedness and to a reduction in their economic growth rates.

9. As part of the process of structural reforms in the international economy, the world will have to carry out a number of extensive transformations in its energy base, which will affect mankind as a whole. In the past, energy substitution was governed by powerful economic forces. Coal was cheaper than firewood, petroleum cheaper than coal, natural gas cheaper than other sources in many cases. Problems in the functioning of the economic system in effecting these changes were no greater than those occasioned by any other large-scale substitution, such as railways for animal traction in transportation or electronic data-processing for manual processing in business operations.

10. The energy substitution which lies ahead will differ qualitatively, as it involves the use of what may be more expensive alternatives. Presently available international institutional and political decision-making machinery was not designed to handle situations like this one that call for great foresight in the taking of decisions. The foregoing demands adequate planning, which will acquire unprecedented importance as it will involve approaches and methodologies differing from the traditional ones.

11. In this order of ideas, energy planning should take into account the costs of all types of energy, not only conventional but also new and renewable, which in the case of conventional energy reflects the growing scarcity of fossil fuel resources, particularly as regards petroleum. These rising costs, together with the measures taken to prevent energy waste in the industrialized countries, will in turn result in a prolongation of the useful life of known fossil fuel reserves, as well as in an increase in these, that will make it possible to extend the energy transition period referred to previously. Therefore, the foregoing factors should also lead to the adoption of a new concept of energy planning designed to cover both supply and demand, particularly as regards provisions for the optimal use and

^{4/} An example of the manner in which the inflation in the world economy during the past decade has influenced these investments may be seen in the following statistics: The total value of energy imports of the Latin American countries in 1978 increased by US\$ 14,500 million as compared to what they would have cost at 1970 prices, whereas imports of manufactures increased by US\$ 25,300 million in the same year as compared to what they would have cost in 1970 prices.

preservation of all energy sources, especially the fossil or non-renewable fuels, and for a significant increase in the contribution made by new and renewable energy sources, all within the framework of efforts to improve the quality of life and to protect of the environment. It should also be borne in mind that technologies are changing more and more rapidly. Planning horizons are no longer defined by the time it taken to construct a supply system, but rather by the time that is left for effecting far-reaching changes in the entire social infrastructure.

This entire situation is made even more uncertain by the almost total lack of complete diagnoses, quantitative studies and reliable statistics on many of the new and renewable sources of energy.

12. Such energy planning should be included within a proper approach to global economic development that takes into account all the elements related to the principal inputs required for development. The growing cost and relative scarcity of food should also be given particular consideration, in addition to the increasing costs of other inputs required for development, such as financing and the acquisition of technology and capital goods for industry and agriculture, which represent a preponderant proportion of the outlays for imports on the part of the developing countries as a whole.

13. Energy planning requires future images to be set as goals. Such images have so far been influenced by the style of development originated by the industrialized countries, consisting of a certain type of urban structure and services, automobile highway transportation, mechanized agriculture that employs large amounts of chemical inputs, capital-intensive industry and mining, the intensive use of petroleum, and the like. The industrialized countries have already built the infrastructure and the material base they require for this style of development, and are thus able to meet the needs of all, or almost all, their populations. Such infrastructure and material bases make intensive and wasteful use of energy, a pattern that became established at a time when energy was cheap. For the developing countries, however, it will be increasingly difficult to imitate this style of development, since the infrastructure required for it is far from complete and it would be unrealistic to attempt to create it according to the same model.

14. Another serious energy problem of developing countries must be brought up: the supply of firewood vis-à-vis deforestation. This has been called "the other energy crisis", and is a situation which affects populations with extremely low income, mainly rural, that use firewood and charcoal as energy sources and account for at least 25% of primary energy consumption in Latin America. 5/

5/ Estimates made by CEPAL on the basis of firewood consumption in the domestic sector. This figure rises to around 40% or more in some countries.

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. 6/

To this must be added the pressures created by the opening up of agricultural frontiers, the inappropriate industrial exploitation of wood, and forest fires. In practice, kerosene and liquified petroleum gas are the only substitutes available for firewood, and the rise in their prices tends to increase other types of demand for firewood, such as domestic, urban and industrial. 7/

15. All energy planning efforts should be founded on the inescapable duty of all States to recognize and respect the full and unrestricted permanent sovereignty of States over their natural resources. Consequently, energy planning and policy should at the present time assign high priority to future objectives, which extend beyond the strict objective of ensuring economic growth to the autonomous decision-making capacity of each country, proper use of natural resources, preservation of the environment, development of native scientific and technological capacity, and improvement of the quality of life of the population.

In this perspective, and bearing in mind that in the short and medium term traditional energy resources will continue to constitute the energy base for the development of the developing countries, energy planning should pay particular attention to:

6/ UNDP / OLADE, Fundamentación y apéndices a la propuesta del plan de acción latinoamericano 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.

7/ 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.

- (a) Rationalizing the transition process and gradually replacing hydrocarbons used as fuels with these sources of energy so that the former may be applied to higher-level economic uses.
- (b) Reducing the technological dependence of the developing countries and promoting national capacity for scientific research and technological development, especially with respect to the manufacture of capital goods associated with the use of new and renewable sources of energy.
- (c) Using energy sources efficiently - particularly non-renewable sources - and taking the measures required to ensure energy conservation.

16. This planning must also take into account the search for a new style of development able to ensure better living conditions for marginal groups, in conjunction with a rational use of energy at all levels without detriment to economic growth. In this context, joint Latin American action is of prime importance for generating appropriate technology, designing products compatible with existing resources and exchanging experiences with regard to technical and organizational matters.

17. Problems of financing constitute a substantial restriction in achieving the effective development of new and renewable sources of energy. The magnitude of financial requirements is such that a considerable challenge is faced by developing countries in obtaining sufficient funds opportunely for this purpose.

18. The future energy policies of Latin American countries must attempt to maintain a balance among planned objectives, taking special care not to try to achieve one at the expense of the others.

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

1. 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 requires decided support for research, demonstration and the generalized use of technologies that have attained a certain degree of maturity and that such development should be directed towards large-scale application of such technologies.

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

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

3. In order to achieve effective utilization of these sources it is equally important, on the one hand, to support research and development, and, on the other, to promote large-scale application of technologies. Here it must be pointed 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 programmes 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

4. One of the activities in the energy planning described in the preceding chapter will be determining the potential for the use of new and renewable sources. In many cases it may seem small today, but factors exist that will increase it steadily in the future. Firstly, the cost of conventional sources is increasing and the availability of some of them will soon begin to be limited. Second, technologies for

/...

generating and using energy from these sources are advancing extremely rapidly, which reduces their cost. Consequently, 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.

5. All of these factors must be taken into account in order properly to estimate the potential for the use of new and renewable sources of energy. 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 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.

6. Determination of the potential for the use of new and renewable sources of energy should include the following elements:

- (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 estimate of costs and environmental impacts.
- (b) A study of the country's energy needs, including final and alternative uses. These needs include effective demand indicated by purchasing power as well as unsatisfied requirements that may be covered by special social development policies.
- (c) The preparation of descriptions or technical and economic profiles of available technologies for using new and renewable sources of energy.
- (d) Utilization of the results of research and demonstration of developing technologies.
- (e) The combination of the above elements into one or more scenarios that are considered feasible for the energy future, and evaluation of the economic, social and environmental consequences which each scenario would have for the countries.

7. 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.

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. 8/

8. Bearing in mind the above-mentioned considerations, it may be concluded that a significant potential in new and renewable sources of energy can be attained if the actions undertaken up to the present are increased. This suggests that efforts in the development of these sources should be directed towards the use of appropriate technologies that are economically viable for the countries of the region. In this context, alternative uses should be channelled not to the sources in general, but rather to specific areas (source-final use combinations), thereby facilitating identification of action priorities.

2. Generalized use of new and renewable sources of energy through integral programmes

9. Generalized utilization of new and renewable sources of energy through integral programmes requires knowledge of the source, final use and the appropriate technology that links them. The identification of appropriate technology requires carrying out several activities, such as research and demonstration, industrialization, personnel training, establishment of incentives and support systems for the users and manufacturers, evaluation of projects, mobilization of financing, standardization and commercial distribution. These activities are intensely interdependent and their implementation requires a high degree of co-ordination.

10. On the basis of the priority areas identified by each of the countries, integral programmes should be established that incorporate the three previously mentioned elements: source, final use and appropriate technology.

8/ This is the theme of one of the Latin American meetings preparatory to the Conference convened to examine "Criteria for the Evaluation of Research and Investment Projects Regarding 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 present Regional Preparatory Meeting.

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

1. 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 subregional, 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, subregional and international levels.

2. Activities at the subregional level are especially important in contributing to satisfy the requirements of the smallest member countries, in particular those that have a limited range of new and renewable energy sources and a limited potential for their application in view of the distribution of their resources and existing energy patterns. In addition, the small size of these countries imposes serious restrictions upon the availability of human, financial and other resources which could be assigned to the solution of the energy problem nationally. Consequently recognition and encouragement must be given to the existing and proposed subregional efforts of co-operation and collaboration in generating solutions to energy problems. These activities must be closely co-ordinated with whatever measures are taken at the regional level.

3. Following is a group of activities to be undertaken nationally, sub-regionally, regionally and globally. These activities must not be regarded as consequent steps in a process, but as activities to be undertaken simultaneously.

1. Action at the national level

(a) Institutional responsibilities

4. Establishment of appropriate co-ordination at the national level with regards to energy planning.

(b) Progress in understanding the pattern of energy use

5. 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

6. 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

7. 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 energy requirements picture

8. The existence of a resource is not enough. In order for it to be usable there must be a requirement for it, or the possibility that this requirement will exist in the future. This requirement 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 necessity. The term "requirements" covers both types of demand.

9. As in the case of resources, here we must have a "requirements map" 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. In addition, the concept of final use must be taken into account as the optimum means of designing the best systems of distribution. 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

10. 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.

/...

11. 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 and scientific development needs

12. 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 that purpose. It is to be expected that the possible areas of interest will expand with scientific and technological change.

13. It is necessary to begin, however, by defining the areas of interest and then proceed to identify the technical development needs in each area. Scientific and 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) Financing

14. It must be recognized that the possibility of obtaining financing to back the development of new and renewable energy sources depends not only on the need for such sources, but also on the characteristics of each project with regard not only to its yield and risk, but also to its social profitability. Consequently, at the national level, direct financing and the indirect support of governments would stimulate the development of these sources.

(i) Synthesis and priorities

15. 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 subregional and regional level

16. The objectives and programmes set forth in this Plan of Action open up possibilities for fruitful subregional and regional co-operation. The long tradition of regional and subregional economic co-operation could acquire renewed vigour under concerted programmes in this field, 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.

17. In this respect, the region already possesses a valuable institutional framework in the form of OLADE to put this co-operation into effect. OLADE has been fulfilling this function and is preparing a Latin American Energy Co-operation Programme for which the Energy Ministers of Latin America have taken note of its general guidelines, which deal with the development of new and renewable sources of energy.

18. Within the above-mentioned programme, the identification of properly planned and politically supported actions and projects is of the greatest importance. To this end it will be necessary to count on the United Nations broad institutional infrastructure at the CEPAL level and the United Nations system's agencies and organizations, whose collaboration could provide rapid and efficient support in view of their respective fields of specialization and their human and technical resources.

19. For this full-scale and massive mobilization of existing resources, it would be very important to promote 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.

20. This Plan of Action contains comprehensive programmes which should combine the following specifications: precision in their objectives; temporal and spatial objectives; responsibilities assumed by the governments, organizations and agencies of Latin America; mutual co-operation exchange of experience and appropriate mechanism for financing and co-ordination.

21. Priority will be assigned to the co-ordination of regional and subregional actions and programmes through the existing specialized regional and subregional organizations in Latin America in collaboration with CEPAL and other agencies and organizations of the United Nations system, thus ensuring the participation of all the countries in the region. The Plan of Action is envisaging activities in the following areas:

(a) Support for planning

22. Actions 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) Scientific research and technological development

23. First of all, bilateral and multilateral actions aimed at the advancement of research and the development of regional technology in the field of new and renewable sources of energy. Likewise, such

/...

actions will be directed towards the acquisition, dissemination, transfer, adaptation and improvement of already developed technology in Latin America.

24. It is also advisable to follow up research and technical development activities outside the region with a view to selecting and transferring effectively appropriate technology to the socio-economic conditions of Latin America.

(c) Support for mass application

25. Actions 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 actions will cover aspects related to industrial production of equipment and devices for the development of new and renewable sources of energy and to their dissemination and marketing.

(d) Dissemination of information

26. Actions 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

27. Actions designed to prepare the necessary personnel to implement programmes concerning new and renewable sources of energy in technical, administrative and social fields. These actions could be supported by national centres of an international scope.

(f) Financing

28. The political decision should be reaffirmed in Latin America of establishing a financial mechanism to be administered by OLADE as support for the implementation of the Latin American Energy Co-operation Programme in an attempt to ensure the effective participation of all the Latin American countries. The administration of this mechanism must remain separate from all extraregional interference and must possess sufficient capacity to secure national, regional or extraregional funds without conditions or diminution of their free use and destination.

29. The growing indebtedness of the Latin American countries and the high cost of servicing the debt that affects their balance of payments will require a large net flow of external funding for the development of energy sources, granted under optimal conditions and repayment terms, and preferably, even in the nature of donations and bequests. Obviously developing countries lack do not have the financial resources required to ensure meeting their energy needs as planned.

3. Action at the world level

30. International co-operation should make an effective contribution to the building of the New International Economic Order, in which co-operation in the energy sector, and new and renewable sources of energy should play an important part.

31. In that spirit, the United Nations Conference on New and Renewable Sources of Energy should constitute a concrete instrument for the achievement of the New International Economic Order and the promotion of new and renewable sources of energy.

32. International co-operation, implemented through the Conference's Plan of Action, should:

- (a) Grant technical and financial support to the work of evaluation and planning done in developing countries for the purpose of speeding up the introduction of new and renewable sources of energy into their respective energy balances.
- (b) Support activities in the field of training and education with respect to new and renewable sources of energy in order to satisfy the need for the training and preparation of human resources in the developing countries.
- (c) Promote the flow of technological and financial assistance from developed countries to developing countries, for the purpose, inter alia, of strengthening the technological capacity of the latter and of facilitating the adaptation and dissemination of existing technologies, as well as supporting scientific and technological research carried out at subregional, regional and national levels related to the generation, transfer and adaptation of technologies appropriate to developing countries and regions.

33. For greater efficiency in the accomplishment of its purposes, international co-operation should to the greatest extent possible make use of and support both regional and subregional organizations and their subregional and regional programmes, as an effective means of strengthening national programmes in the field of

new and renewable sources of energy. These should be accompanied by measures of an inter-regional nature taken to foster exchanges among the developing countries.

34. The development of new and renewable sources of energy should also be based on activities among developing countries for promoting, inter alia, technological, scientific and team exchanges, thus helping to strengthen the developing countries' capacity for joint action. International co-operation should lend its fullest support to such horizontal co-operation initiatives among developing countries.

35. The Conference Plan of Action should:

- (a) Urge multilateral financing agencies and institutions to participate in bilateral co-operation efforts and urge regional and subregional banks and other institutions for development co-operation to revise the approach they have hitherto employed in carrying out financing co-operation programmes and projects with developing countries in the field of new and renewable sources of energy. This should be done in such a way as not to hamper the development plans of these countries, adapting the new approach to the priorities set by the developing countries.

This co-operation should be extended to the programmes on evaluation of resources and planning, technological development, training and information, as well as to preinvestment and investment activities required for rapid introduction of new and renewable sources of energy into the energy balance of the developing countries.

- (b) Strengthen the United Nations system's capacity for action in the field of new and renewable sources of energy through financial contributions on the part of the industrialized countries to the development of new and renewable sources of energy. For such purposes, the United Nations Development Programme, through the Interim Fund for Science and Technology and the Energy Account or the United Nations Revolving Fund for the Exploration of Natural Resources, could become focal points, without precluding contributions for financing programmes at the regional level.
- (c) Urge the developed countries and donating institutions to increase their financial contributions and support for international organizations and bilateral co-operation agencies for the purpose of significantly expanding their energy co-operation programmes, especially those concerned with the development of new and renewable sources of energy.

/...

- (d) Include the discussion of international co-operation in new and renewable sources of energy and its follow-up by governments within the scope of an appropriate United Nations agency, so as to ensure the ongoing orientation and identification of priorities for international co-operation. The establishment of new agencies for such purposes shall be avoided.
- (e) To ensure broad, effective and co-ordinated participation of the organizations of the United Nations system, and of the intergovernmental institutions that develop programmes in the field of new and renewable sources of energy, steps should be taken in implementing the Conference's Plan of Action to ensure the provision of means of inter-agency co-operation within the present institutional infrastructure. Intergovernmental organizations in the field of energy, as well as OIADE for Latin America, should also participate for these purposes.

The United Nations Secretariat, with its existing resources, should lend its logistical and substantive support to these endeavours.

IV. REGIONAL ACTION PROGRAMMES

1. General observations

1. The process of transforming the energy base of the world productive structure is well under way; however, its duration, scope and consequences remain to be seen. In this perspective, flexible criteria must be adopted in selecting action programmes and projects, particularly in the field of new and renewable sources of energy.

2. Furthermore, it is essential to bear in mind that the great majority of the Latin American countries are initiating inventories of energy resources with a view towards improved energy evaluation and planning. Particular flexibility is required in defining objectives, policies and programmes in the field of new and renewable sources of energy.

3. 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 priority 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 Latin America 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.

4. 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.

5. 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.

6. 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 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.

7. 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.

/...

2. Priority programmes

8. The range of possible energy source/final use combinations is enormous, and an order of priority must be assigned to them. It should be noted that since OLADE is the specialized organization for co-operation and for the co-ordination of actions concerning energy in Latin America, any specific plan of action for the use of new and renewable sources of energy should be included within its Latin American Energy Co-operation Programme, without prejudice to any other energy plans formulated by the Latin American countries.

9. 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) Subregional programmes approved by participating countries and co-ordinated by appropriate subregional institutions.
- (c) Regional programmes promoted by OLADE now underway (energy balances, geothermal energy, biogas, wind energy and small hydroelectric power stations);
- (d) Estimates of the potential of the different applications of new and renewable energy sources in Latin America.

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

Regional Basic Support Programmes:

- (a) Energy planning programme
- (b) Information and dissemination programme
- (c) Training programme

Integral Regional Programmes:

- (a) Hydroelectric development programme
- (b) Firewood and charcoal programme
- (c) Liquid fuel production programme

- (d) Solar energy programme
- (e) Programme for vegetable residues and energy efficiency for agro-industry
- (f) Geothermal energy programme
- (g) Biogas programme
- (h) Wind power programme

11. 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 integral 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.

12. The programmes proposed all provide for mutual 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 Latin America.
- (b) Contracting an institution from another country in Latin America for carrying out studies, research or laboratory tests required by one or more countries.
- (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) Seeking, adapting, developing disseminating and applying technology for the production, transformation, transportation and use of new and renewable sources of energy.

/...

- (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) Pre-investment and feasibility studies.
- (k) Facilitating the joint implementation of investment projects relating to new and renewable energy sources in the region.
- (l) Facilitating the transfer of technology related to those resources within the region.
- (m) Promoting the use of equipment and tools produced in the region, thereby giving impetus, in the Latin American industrial sector and particularly in small and medium-size businesses, to the production of equipment and devices designed to collect, produce, transform and use new and renewable sources of energy.
- (n) Exploration and inventories of resources.
- (o) Channeling and rationalizing the provision of external technical assistance in the region.

13. As far as the Regional Plan of Action is concerned, it is proposed that interested countries in Latin America should assume the responsibility for formulating specific programmes in the short term in accordance with established priorities and in co-ordination with OLADE and CEPAL. The studies should include recommendations on action strategies and cost estimates for their implementation. These reports could be submitted by the interested countries to OLADE and CEPAL in order for the conclusions and recommendations contained therein be submitted directly to the Nairobi Conference. For this purpose, the Latin American Energy Co-operation Programme being prepared by OLADE in accordance with the mandate of its Second Special Meeting will be taken into account.

14. Participation in these programmes will be open to all the governments of Latin America, 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.

15. Every programme must have a period of detailed preparation of varying length depending on its nature, bearing in mind the need for co-ordinating and integrating such programmes with projects and programmes which may be undertaken or formulated by virtue of

subregional agreements. During this period the regional governments and international institutions at regional, subregional or other levels will indicate their interest in participating and their priorities and needs for support from the programme, and also the contributions they are prepared to make for the benefit of countries taking part in the programme. Also during the preparatory period, the necessary financing and the technical assistance needed for the programme, both from Latin America and from abroad, will be negotiated in order to support OLADE's financial mechanism within the framework of the Latin American Energy Co-operation Programme. The project document and the contracts concluded during this period will detail all the activities planned and any reciprocal commitments undertaken by participating countries and the executory organizations.

16. A very brief description follows of the programmes identified as being of a priority nature. They have been grouped into two categories. The first consists of regional basic support programmes aimed at promoting the incorporation of new and renewable sources of energy into the energy policies of the participating countries and reinforcing the institutional structures required for their implementation. The second includes integral regional programmes aimed at promoting and supporting national integral programmes in the participating countries.

3. Regional basic support programmes

17. (a) Energy planning programme

(i) Objectives

- To provide concerned Governments with methodological tools for formulating their national energy development plans and strategies, particularly with regard to new and renewable sources of energy.
- To facilitate the exchange of experience in this field and of technical and economic data among the countries of the region.

(ii) Expected output

- 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.

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

18. (b) Information and dissemination programme

(i) Objectives

- Support of Governments interested in establishing effective mechanisms for transmitting specialized information at national, regional and subregional levels.
- Creation of public awareness of new and renewable sources of energy in interested countries within the scope of the communications media and educational systems.

(ii) Expected output

- Provision of advisory services on these topics to Governments requiring them.
- Preparation of periodical publications of regional interest, such as technical information bulletins, regional scientific magazines, directories of researchers and institutions, and the like.
- Establishments of a regional technical information system on new and renewable sources of information, including access to international data banks.
- Preparation of educational material and training of teachers in this subject area.
- Preparation of material for the communications media and training of journalists in this subject area.

19. (c) Training programme

(i) Objectives

- To contribute to the training of the human resources required in the region for effective development of new and renewable sources of energy.

/...

(ii) Expected output

- Identification of personnel training needs at national and subregional levels for various specialization levels and areas.
- Determination of existing institutional capacity at national, regional and subregional levels for the training of human resources.
- Promotion of additional training mechanisms as required, which might include academic programmes, specialization courses at various levels, in-service training, seminars and the like.

4. Integral regional programmes

20. The general characteristics of these programmes have already been described in paragraphs 5, 6 and 7. This section will provide only specific aspects not already mentioned.

21. (a) Hydroelectric development programme

Objectives

- To complete evaluation of hydroelectric potential for small and large-scale use.
- To strengthen the ability to prepare small and large scale hydroelectric projects.
- To promote standardization and quality control to stimulate the production of equipment for small scale hydroelectric power plants.
- To provide support to governments in the realization of hydropower projects.

22. (b) Firewood and charcoal programme

Objectives

- To determine the social, environmental and economic characteristics and effects of the present use of firewood and charcoal in Latin America and its prospects for the future.
- To promote formulation of an inventory of forest resources in the region, including zoning according to use.

/...

- To promote the development of new forest resources for energy use and the proper management of existing resources.
- To promote the development and widespread application of highly efficient domestic devices for the use of charcoal in rural areas.
- To promote the development, manufacture and widespread dissemination of equipment for the production and efficient use of charcoal on small and large scales.

23. (c) Programme for the production of liquid fuels

Objectives

- To provide support to Governments interested in the production of ethanol and vegetable oils to replace liquid fuels, especially for transportation purposes.
- To co-operate in determining the potential for producing ethanol and vegetable oils from various crops.
- To transfer technologies for the growing of plants for the manufacture of ethanol and vegetable oils for distribution and use in interested countries.

24. (d) Solar energy programme

Objectives

- To determine the potential for the use of solar energy in participating countries.
- To promote the development and exchange of technologies, designs and projects for various applications in this field.
- To facilitate regional follow-up of world scientific and technological advances in this area.

25. (e) Programme for vegetable residues and energy efficiency for agro-industry

Objectives

- To determine the potential of various agriculture, forest and agro-industry residues available in the participating countries as sources of energy, including their possible use in generating electricity.

/...

- To acquire, adapt, create and transfer technology for the use of vegetable and forest residues as sources of energy and for improvements in the energy efficiency of agro-industry.

26. (f) Geothermal energy programme

Objectives

- To determine the potential for the use of geothermal energy in interested countries for generating electricity, for use in agro-industry and decentralized applications.
- To support the development of projects for the use of geothermal energy in interested countries.
- To facilitate regional follow-up of world scientific and technological advances in this field.

27. (g) Biogas programme

Objectives

- To determine and develop the energy potential of rural and urban wastes that can be transformed into biogas, and the potential for the production of organic fertilizers.
- To contribute to environmental sanitation and to provide a new element for improving the living standards in rural and urban areas.

28. (h) Wind power programme

Objectives

- To identify the most promising areas for the development of wind power in interested countries and to determine its potential.
- To promote development, technological exchanges and widespread application of wind power in participating countries.
- To facilitate regional follow-up of world scientific and technological advances in this field.

