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UNDP/UNEP Meeting of Government Experts for  
Developing a Co-operative Programme on the  
Practical Applications of Renewable Sources  
of Energy in the Mediterranean Region

Malta, 9 - 13 October 1978

Items 4 and 5 of the Provisional Agenda

A POSSIBLE APPROACH TO RENEWABLE SOURCES OF ENERGY IN THE  
MEDITERRANEAN REGION AND POSSIBLE ELEMENTS FOR DEVELOPING A  
REGIONAL CO-OPERATIVE PROGRAMME ON THEIR PRACTICAL APPLICATIONS  
INCLUDING INSTITUTIONAL ARRANGEMENTS

Document prepared by three consultants at the request of UNDP and UNEP

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## I INTRODUCTION

1. At the Intergovernmental Review Meeting of Mediterranean Coastal States on the Mediterranean Action Plan held in Monaco, 9 - 14 January 1978, the Governments expressed their interest in possibly launching a co-operative programme in the practical applications of renewable sources of energy as stated in paragraph 33 of the report of the Meeting:

"The Meeting took note of the initiative taken by the Government of Malta in conjunction with UNDP/UNEP/ECE to study the possibility of establishing a Malta-based project for the development of practical applications of non-conventional sources of energy. Most delegations stressed the importance of this field and the interest of their countries in participating in co-operative programmes in this area. The Meeting agreed to request UNEP/UNDP to convene a meeting of Government experts which would develop a co-operative programme in the field of non-conventional sources of energy among interested Mediterranean countries. The representative of Malta informed the Meeting that his country would be willing to host this expert meeting."

Such a meeting of Government experts will be held in Malta, 9 - 13 October 1978.

2. The purpose of the present document is to provide some background elements which might assist Government experts in outlining a co-operative programme in the field of renewable sources of energy. It first gives a tentative possible approach to renewable sources of energy and provides some definitions which have been considered as potentially useful. The document then examines possible elements of a co-operative programme as well as possible institutional arrangements which might support the programme.

## II A POSSIBLE APPROACH AND DEFINITIONS

### A possible approach

3. The setting up of a co-operative programme on the practical applications of renewable sources of energy in the Mediterranean region pre-supposes the elaboration of an approach which would be specifically adapted to the particular character of these sources of energy and to that of the region itself. It is suggested that the following points might be taken into consideration:

- (a) Definition of renewable sources of energy as viewed within the context of the general energy field;

- (b) assessment of the potentials for the most readily exploitable forms of renewable sources of energy in the Mediterranean region (direct or diffused solar radiation, wind, hydraulic, biomass and geothermal power);
- (c) determination of the actually usable potentials of renewable sources of energy, in quantity and quality in the short and the long terms;
- (d) determination of the motives which might be considered by Mediterranean coastal States as favouring the use of renewable sources of energy;
- (e) determination of quantitative and qualitative needs in the short term or according to forecasting plans;
- (f) confrontation of energy needs with the potentials of renewable sources of energy, from which problems of adaptation, priorities and guidelines for research and development work might be deduced.

4. On the basis of these points, the meeting of Government experts may wish to discuss the following specific topics which are related to a practical regional co-operation:

- (g) promotion of practical applications;
- (h) testing and standardizing equipment and products;
- (i) documentation and information;
- (j) technical assistance and training;

and to determine the most appropriate means to launch a rational co-operative programme (see chapter III) and institutional arrangements which might support the implementation of such a programme (see chapter IV).

A. Definition of renewable sources of energy

5. A possible co-operative programme could deal principally with sources of energy primarily resulting from solar energy, the renewal of which is brought about by natural processes and in a relatively short period. Prior consideration might be given to those sources whose potential at the present time and in the present state of knowledge would be of significant value from the point of view of their physical exploitation.

6. They would seem to be mainly as follows:

- (1) solar energy: immediate conversion of incident, direct or diffused, radiation, utilization of the immediate secondary effects, such as evaporation, ocean temperature gradients, etc;
- (11) wind energy: immediate conversion of wind power;
- (i11) hydropower: not only in its traditional sense but mainly its exploitation by "micro-hydro" plants, or by means of artificial systems such as, for example, helio-hydro-electric plants;
- (1v) biomass energy: utilization of secondary effects of solar radiation through photosynthesis, either directly or after decomposition, fermentation, pyrolysis. The raw materials can either be grown for energy purposes or be various types of wastes reused for that specific purpose;
- (v) geothermal energy: in certain geographically localized conditions and in view of its innovative character, and despite the fact that its renewable character might be arguable, geothermal energy could also be taken into consideration. This seems all the more justified in that "natural geothermal energy" can be compared with some storage processes usable for products of the thermal conversion of solar energy and at present being studied;
- (vi) other forms of renewable sources of energy: tidal energy, a particular form of gravitational energy, has been considered in several areas in the world but seems to be of no importance, from the energy viewpoint, in the Mediterranean region. Sea currents and ocean temperature gradients, potential sources of energy derived from the sun, also appear to be of very limited interest in the area.

B. Determination of the theoretical potentials for the most readily exploitable forms of renewable sources of energy

7. Data regarding solar radiation and wind in the Mediterranean region and in nearly all countries in the world were only gathered and exploited with a view to obtaining information on meteorological conditions and for weather forecasting.

8. On a very localized basis meteorological stations have been adapted for data recording in order to obtain information on the actually usable potentials of renewable sources of energy. The work that it might be advisable to accomplish further would mainly relate to:

- increasing the number of stations recording data relevant to renewable sources of energy in conformity with the standards defined by the World Meteorological Organization (WMO) and recently adapted to the needs of energy specialists (see Report WMO No. 477, Solar Energy, Geneva, August/Sept. 1976);
- taking them into consideration within a specially conceived network linked to a centre for reference, intercalibration and utilization of data;
- co-ordinating undertakings aimed at establishing and utilizing correlation methods which would allow a provisional evaluation of the actually usable potentials on the basis of existing data (e.g. estimation of energy values on the basis of the number of sunshine hours).

9. The evaluation of hydraulic power and biomass potentials is clearly within the competence of the interested countries. However, a co-ordination might be envisaged with regard to evaluation methods leading to findings which are at least comparable on a regional scale. The question of the share of the total potential which is actually usable has been examined above. Without prejudging the means that might be recommended by the meeting of experts it appears certain that enlarging the knowledge of the actually usable potentials of renewable sources of energy is a task which could best be carried out harmoniously and rationally in the framework of co-operative activities.

C. Determination of the actually usable potentials: possibilities for, and limitations to, utilizing renewable sources of energy

10. This fundamental research, based on a scientific, technical and economic examination of the specific characters of renewable sources of energy would principally depend on:

- (i) the relative quantitative availabilities of the various sources;
- (ii) the type of primary conversions chosen for these sources, and of the directly usable forms of energy to which these conversions lead (electricity, heat at different temperature levels, mechanical energy, chemical forms of energy: fuels);
- (iii) the comparative examination of the sources according to economic criteria including those related to conventional sources of energy: for example, a comparison based on the ability of a renewable source of energy to be substituted for a conventional source of energy in a conventional system; in fact this system, established on criteria specific to the

exploitation of fossil or nuclear fuels, is not necessarily suitable for the rational utilization of a different source;

- (iv) the assessment, for these conversions, of the really exploitable fraction of the available sources. Indeed, only the fraction likely to be converted in any adapted process should be taken into account. The choice of the most efficient adaptation of any type of conversion device is an important factor for the development of renewable sources of energy;
- (v) the intervention of socio-economic factors related to an intensive reliance on an energy innovation: the occurrence of an existing distribution network under amortization, the type of planning (town or rural), the traditional socio-cultural aspects, etc., are constraints in the same way as the type of geographical or climatic environment is another;
- (vi) the evaluation of the socio-economic and environmental consequences of an intensive and decentralized reliance on renewable sources of energy.

11. This analysis could be undertaken without any co-operation; it is being carried out in fact by some of the Mediterranean countries. In these instances it could lead to conclusions which would be closely associated with the specific features of the countries concerned. Therefore the straight transposition of these conclusions to another community differing in various aspects might give rise to misinterpretations and could lead potential users into error. A co-operation, or at least a co-ordination, on this topic could help towards avoiding such difficulties.

#### D. Determination of motives

12. Investigations have revealed that most of the Mediterranean countries take a marked interest in the practical applications of renewable sources of energy. The motives which seem to underlie this interest are most diverse and stem from a number of preoccupations of Governments such as the balance of payments or the creation of new jobs, etc. They could also arise from longer-term socio-economic considerations such as a rational management of the national energy patrimony, a trend towards some form of energy independence, the development of virgin territories, the limitation of migratory movements of people, the improvement of living conditions for least favoured populations, the struggle against disproportionate regroupings, the fight against desertification, etc.

13. For the second set of motives in particular it might appear that the Mediterranean coastal States could benefit from an effective co-operation especially when elaborating means for integrating renewable sources of energy into national energy strategies.

### E. Determination of needs

14. The rational utilization of the different harnessable forms of energy from renewable sources of energy presupposes an awareness of quantitative and qualitative needs. The aims of this determination of needs, inter alia, would be to avoid a wastage of national resources and facilitate the choice of the most suitable tapping means for meeting these needs and therefore to promote the most favourable utilization of the different energy potentials. For instance, the temperature level required for maintaining a comfortable ambience in the greater part of the Mediterranean region generally lies a few degrees centigrade above or below the outside temperature; techniques which would satisfy such a need and require high-temperature conversion seem ill-adapted and by that very fact would constitute a waste of energy in contradiction with sound management of resources.

15. Determining quantitative and qualitative needs is obviously within the competence of each individual country. However, common principles which might apply to the evaluation of these needs could be elaborated in view of the experience acquired and be a topic for a co-operative regional action.

### F. Confrontation of energy needs with the potentials of renewable sources of energy

16. The findings of undertakings outlined in sections C and E (above) might throw light on areas where harnessing of technologies could best meet certain energy needs. Thus, for example:

- flat-plate collectors (heliothermal converters) are perfectly suited to the satisfaction of domestic hot water needs;
- solar photovoltaic cells allow the production of electricity in micro and small-scale power stations for well-defined specific uses;
- aerogenerators are suitable for the production of mechanical energy, and even electricity, in remote areas;
- hydraulic energy allows the production of electricity in large units; but small hydropower plants are also often felt to be suitable for providing mechanical or electrical energy to local users;
- agriculture and forestry residuals constitute a noteworthy boiler fuel;
- animal residue digesters allow easy production of combustible gas, utilizable in numerous applications, etc.

17. There is no doubt that a certain order of priority comes about and, balanced for economic reasons (notably the investment/exploitation ratio), a correlation can be envisaged. Yet this correlation is likely to prove

imperfect and cause certain gaps to appear in the satisfaction of needs, either because the required forms of energy do not correspond to the immediate potentials of renewable sources of energy, or because they would imply an over-sophisticated implementation, or because the improvement of the necessary conversion means has yet to be carried out, or the availability/needs regulation over a period of time is difficult, etc.

18. Consequently a certain effort remains to be made:

- in development: for example, priority might be given to solar collectors in the framework of a development scheme for a given tourist region, or in meeting domestic hot water needs when these constitute a significant part of the national energy consumption; or again: to photo-electric generators for telecommunications in desertic and isolated areas; or again: pumping stations for meeting the needs of marginal areas or for the development of areas which otherwise would not have been cultivated, etc;
- in research: for example, to discover, improve or perfect conversion systems capable of filling the gaps observed, or systems of storage and regulation of the energy produced, etc.

19. It would seem desirable, in these two fields, that these priority actions should be co-ordinated in order to avoid duplication of effort in the search for solutions of identical problems; an international discussion on a regional basis concerning more or less identical problems, but which occur in different conditions, would doubtless offer appreciable advantages.

20. The study of means (chapter III, below) as well as the examination of the possible institutional arrangements (chapter IV below) to support the co-operative project would constitute the essential subject of debate. To help towards setting up this debate a certain number of possible elements have been gathered together and form the subject of the subsequent chapters of this document.

### III POSSIBLE ELEMENTS OF A CO-OPERATIVE PROGRAMME

21. Taking into account the diversity of the possible topics of regional collaboration in the field of renewable sources of energy, it would seem to be out of the question to determine from among the usual methods of co-operation the one that would be likely to constitute the most versatile instrument capable of supporting the whole body of co-operative actions which might be desired by the Mediterranean States. These actions can indeed belong to fields as different as:

- general energy policy making (at Government level);



- development strategies and their socio-economic, cultural and juridical impacts (at the level of national decision-making authorities and specialized bodies);
- scientific knowledge (at the level of national research and development institutions);
- industrial development (at the level of planning and development organizations, firms and industrial enterprises);
- land use planning and the development of unexploited regions (at the level of organizations concerned with land use planning, building, agriculture and equipment);
- education and the training of personnel.

22. It is evident that for each of these fields there might be both a level and a method of collaboration which would seem especially suited to the desired co-operation. It appears therefore pointless to look for one single solution for all the facets of the particular problem.

23. To be pragmatic and with a concern for efficiency, it seems possible to attempt to determine the possible elements of collaboration and to combine with them the most suitable methods of co-operating. It might thus be hoped to see the emergence from diversity of some common elements capable of helping in the choice of the number and the nature of satisfactory solutions.

24. This choice belongs of course to the Governments of Mediterranean coastal States wishing to establish a regional co-operation and they alone are in a position to judge the advantages and drawbacks of such and such a mode of action from their own point of view. However, it would seem clear that certain common elements could be found in nearly all fields and therefore appear to constitute a minimum structure for any practical development of a co-operative programme. There is no doubt about the need to define a minimum co-ordinating unit charged with ensuring the material operations that are indispensable for the functioning of most of the actions which could be envisaged. This unit, from a broader point of view, might see itself being entrusted with a more responsible vocation regarding the whole, or a part, of the actions undertaken.

#### A. Energy in general

25. This possible field of co-operation might meet the wish expressed by many of the Governments visited to exchange views and information on the ways and means of managing energy resources in general and, more particularly, the management of renewable sources of energy.

26. Governments might feel it appropriate to establish, as a way of co-operating in this field, a body meeting periodically which would gather together specialists and decision makers in the field of energy policy

making from Mediterranean coastal States. The very broad mandate of such a body might, inter alia, cover the following areas which would seem to be in particular conformity with the general preoccupations of the Mediterranean countries:

- giving its true worth to the effective potential of energy resources in the Mediterranean region with particular emphasis on renewable sources of energy such as solar power;
- diversification of energy sources and ways and means of exploiting them in the most rational and economic manner;
- effects of energy options, particularly of renewable energy systems on the improvement of people's living conditions;
- environmental consequences and effects of various types of energy options, especially those related to renewable sources of energy, as well as the effects of policies aimed at protecting the environment on various energy systems.

B. Determination of the theoretical potentials of renewable energy sources

27. This possible field of co-operation would essentially, at least in the first phase, be founded on scientific approaches, would depend heavily on new technological achievements and would be based on data available or that will become available in the various national institutions carrying out monitoring programmes (e.g. meteorological services, universities, etc.). This activity would aim at specifying the pertinent measurements necessary to allow a sound assessment of the renewable sources of energy potentials (such as total, direct and diffused, solar radiation monitoring, wind speed and direction monitoring, evaluation of hydropower potential, etc.); determining the most appropriate methodology for the acquisition, treatment and presentation of data; reinforcing facilities for the standardization and intercalibration of equipment; and promoting the common utilization of the results obtained.

28. This type of co-operative activity could also lead to the preparation and regular updating of maps and charts plotting the renewable sources of energy for the whole of the Mediterranean basin.

29. It might appear appropriate to Governments to establish a permanent activity based on the work being done in Mediterranean scientific institutions and monitoring stations, and which would be carried out in conjunction with existing activities within the Specialized Agencies of the United Nations system (such as, for example, in WMO for solar and wind energy). This type of activity might best be organized on the basis of a monitoring network oriented towards the acquisition of previously defined data obtained through methodologies recommended by WMO or by institutions from the Mediterranean coastal States.

C. Determination of the actually usable potentials of renewable sources of energy

30. This possible field of co-operation would first aim at drawing up an inventory of the real potentials of the utilization of various renewable sources of energy and of the means of allowing their rational exploitation. The fraction of the total actually utilizable potential would in fact depend largely on the means brought into operation and, possibly, on the energy vectors used. The purpose of this activity would be to avoid simply transferring the patterns of systems characteristic of fossil or nuclear fuels to renewable sources of energy and thus provide Governments with information and background elements which might help avoiding certain possible errors (for instance, choosing a single energy vector with sole regard to convenience and standardization).

31. This possible co-operative activity could be carried out by a group of experts (energy specialists) meeting on a not too frequent but regular basis in order to take into account technological progress-and therefore determine the changes in the potentials. A distinction should be made between immediate and medium- or long-term applications. This type of activity might also be sub-contracted to a competent institution in one of the coastal States of the Mediterranean provided that assurances could be given that the particular conditions of each community and geographical area were duly taken into consideration and that the intervention of private interests, the interpretation of which might give rise to controversy, would be excluded. In this instance it would be highly advisable to establish and maintain a close liaison with other national or regional institutions involved in similar or related activities.

D. Integration of renewable sources of energy into national energy strategies

32. This possible area of co-operation would in fact represent a part of the activity suggested before in section A above, and to which a particular emphasis would be given, although the level at which the co-operative work was carried out would be quite different. The purpose of this activity would be to provide help to national study and planning institutions in giving due attention to the potentials for renewable sources of energy in considering national energy strategies and development plans. Co-operation could be carried out mainly at the exchange-of-information level on national plans, strategies and objectives, on national legislations and adopted or planned incentives related to renewable sources of energy, on legislative or administrative obstacles encountered, as well as on any other related topic Governments might feel it appropriate to examine under the general heading.

33. This co-operation might best be carried out through an ad hoc group of experts in energy and economics who are closely associated with national study and planning institutions such as Ministries of Planning or other similar national institutions. Once its mandate had been completed this ad hoc Group of Experts could meet again temporarily in order to update its previous findings.

E. Determination of quantitative and qualitative needs

34. Possible co-operation in this field should certainly not aim at replacing existing national activities directed towards determining quantitative and qualitative needs at the national level but, rather, provide information and assistance to responsible national bodies in determining the qualities of the energy utilized in order to allow Governments to derive the maximum benefit from the potentials of renewable sources of energy at their disposal. A real co-operation at the regional level might however prove difficult to establish in this field, but at least a general harmonization would appear useful regarding common principles most likely to lead to an easy utilization of results as well as to the possibility of comparing them.

35. It seems that the most appropriate means of carrying out such a co-operative activity would be a group of experts or, failing that, a Specialized Agency or a Body of the United Nations system which would undertake such an activity in conjunction with organizations having already conducted similar investigations.

F. Confrontation of energy needs with the potentials of renewable sources of energy

36. This possible field of co-operation appears in fact to be the central point of a rational utilization of renewable sources of energy. Indeed, once the assessments of the potentials of renewable sources of energy (examined in section C, above) and the quantitative and qualitative energy needs (section E, above) have been completed, it appears possible to evaluate and determine the real role which could be played by renewable sources of energy, more or less in the same way as there is a need to adapt production and utilization diagrams in a conventional distribution network. Some energy needs could be met easily by renewable sources of energy but others would certainly require adaptations of the energy system or in the industrial sector, compromises or further research work. It should be underlined that the wider the scope the sounder this type of activity appears to be. Furthermore, the satisfaction of some types of needs might be considered to have priority as decided in national plans and development strategies.

37. A co-operative activity on methods, priorities, choices, and other similar topics related to this field would certainly appear beneficial at the regional level inasmuch as it might induce effects on areas not

directly related to the energy sector alone, such as for example land use planning, legislation, industrial infrastructure, building technology and socio-economic factors. A Multi-disciplinary Group of Experts might appear to be the most appropriate means to carry out such a co-operative activity at the regional level. This Group should meet regularly and maintain constant liaison with the relevant national bodies in order to take national strategies into full consideration, in particular those related to the legislative sector.

#### G. Promotion of practical applications

38. The purpose of this possible area of co-operation could be regarded as a means to facilitate a rapid dissemination of various ways of tapping renewable sources of energy in the Mediterranean region. Certain difficulties might indeed be encountered with respect to competitive interests and licensing questions but it would seem that a regular "Forum" or a "Fair" devoted to immediate or very short-term applications associated with demonstrations of equipment developed and manufactured in the Mediterranean region could be held regularly in various Mediterranean countries.

#### H. Testing and standardizing equipment and products

39. In view of the innovative character of most of the technologies related to renewable sources of energy, a need might very soon be felt to standardize components and systems intended for utilization in the region. However, their operation being closely tied to local conditions, equipment for measuring and harnessing renewable sources of energy should be adapted and tuned to the particular situation of the users. There might therefore be a considerable interest in the comparative testings and adaptation of equipment and systems intended for tapping renewable sources of energy to particular situations; this activity might even lead to the creation of new systems based on specific technologies specially adapted for specific working conditions.

40. In view of the fact that the general meteorological and climatic conditions of the Mediterranean region are fairly comparable, there might be a real interest in co-operating on these questions. The means which might be devoted to such an activity could be various and directly carried out by a network of participating national institutions or indirectly by one or several experimental or testing centre(s) which would be jointly supported and would serve the needs of the whole of the region.

#### I. Documentation and information

41. There is no doubt that there is a great need for an evaluation and the transfer of documentation and information at the regional level. The means

by which such co-operative activities could be undertaken are well known and one of the most easily operational would seem to be a Regional Documentation and Information Centre.

42. It is worth stressing that such a Centre should not be restricted to a library but should also be staffed by experts able to interpret and communicate information to all potential users in the region. Technical translation facilities would also certainly prove very useful at the regional level. The Centre should, in addition, directly or indirectly, undertake the preparation of a Directory of Mediterranean Renewable Sources of Energy Research and Development Institutions. The regular issuing of a bulletin on new developments concerned with renewable sources of energy in the Mediterranean region might also prove useful and could fall within the competence of the Centre.

#### J. Technical assistance and training

43. This possible area of co-operation should by no means be considered as an attempt to organize a simple transfer of technology from industrialized to less industrialized countries of the region but rather as a possible means to meet a request made by several Mediterranean Governments and institutions wishing to benefit from the various types of technological innovations related to renewable sources of energy. In fact most of these innovations resulted from the experience acquired when conceiving and building prototypes and running full-scale pilot installations either in coastal States of the Mediterranean or in countries outside the region.

44. One of the possible means for the practical achievement of such a task might be to establish a technical assistance and training centre which should, ideally, be closely associated with an Information Centre. It should be staffed with specialists in a position to solve the problems raised by users or at least able to provide them with adequate information for them to solve the problems themselves.

45. Furthermore, as most countries have asked for training to be associated with technical assistance, regional courses and fellowships should be organized, according to Governments' wishes, in a way similar to that being applied for the UNEP Mediterranean Pollution Monitoring and Research Programme.

*A summary of the possible areas and means of co-operation is given on the next page which could be detached for ease of reference.*

## SUMMARY

## Possible areas of co-operation \*/

| Possible areas of co-operation  | Duration type             | Appropriate action type  | Other types of action                                       | Possible liaison with:                         |
|---|---------------------------|--|---|--|
| (The lettering corresponds to letters given in chapter III as well as in the "possible approach" in chapter II)                                       |                           |  |   |  |
| A. Energy in general (page 8): renewable sources of energy in the general energy context  | permanent                 | periodic meeting of specialists and decision makers              |   | regional economic institutions                 |
| B. Determination of the theoretical potentials (page 9): establishment of stations, networks, correlation methods, utilization of existing data, etc. | permanent                 | network(s) of scientific institutions                            | sub-contract to a specialized institution                   | existing specialized bodies                    |
| C. Determination of actually usable potentials (page 10): possibilities, limitations, assessments, socio-economic factors                             | occasional with up-dating | meeting of experts   | sub-contract to a specialized institution                   | regional economic and scientific institutions  |
| D. Integration into national energy strategies (page 10): motives for promotion, administrative and legal incentives                                  | occasional or regular     | ad hoc group of experts on energy and economics                  |   | regional economic institutions                 |
| E. Determination of needs (page 11): quantitative and qualitative needs, methods for projections, etc.  | occasional with up-dating | ad hoc group(s) of experts                                       | sub-contract to a specialized institution                   | national bodies                                |
| F. Confrontation of needs with potentials (page 11)   | permanent                 | multi-disciplinary group of experts                              |   | national bodies regional institutions          |
| G. Promotion of practical applications (page 12): demonstration   | regular                   | "Forum" or "Fair", regional or sub-regional agreements           | sub-contract to a specialized institution or to an industry | industry                                       |
| H. Testing and standardizing equipment and products (page 12): comparative testing, adaptation to specific conditions, economics, etc.                | permanent                 | Research and Development Centre(s)                               | network(s) of scientific institutions                       | industry; economic and scientific institutions |
| I. Documentation and information (page 12): evaluation and transfer of documentation and information, translation, reproduction, bulletin, etc.       | permanent                 | Regional Documentation and Information Centre with a few experts | sub-contract to an existing Information Centre              | existing specialized bodies                    |
| J. Technical assistance and training (page 13): research facilities, fellowships, equipment, etc.   | permanent                 | Technical Assistance and Training Centre regional courses        | sub-contract to a specialized institution                   | existing specialized bodies                    |

\*/ according to consultants

## IV POSSIBLE INSTITUTIONAL ARRANGEMENTS SUPPORTING THE PROGRAMME

46. The purpose of this chapter is obviously not to list exhaustively or to draw up in any way a "catalogue" of the means which could be brought into operation in order to implement a co-operative programme on renewable sources of energy, but rather to outline briefly various forms of institutional arrangements that Governments might feel appropriate to support a concerted effort at the regional level.

47. The minimum course of action, which incidentally would correspond to the least centralized form of institutional arrangement, would be to entrust a co-ordinating mission to an existing national, regional, or international institution or organization, to give their true worth to the various co-operative actions and projects at present under way in Mediterranean coastal States and to facilitate the evolvement of programmes in the direction of the general interest of the region. This course of action would at least make it possible to ensure the co-ordination of co-operative actions such as: meetings, seminars, investigations, etc., the actual organization of which could be entrusted in turn to countries participating in the project. At a slightly higher level it could also ensure the correct utilization of activities which might have been sub-contracted to Specialized Agencies of the United Nations system or other international organizations.

48. A more elaborate structure corresponding to a higher degree of centralization could be based on the setting up of a network (or networks) of existing institutions. In each country a preliminary co-ordination of the various national institutions participating in the network would be ensured by a national focal institution nominated by the respective Governments. This, in its turn, would be linked with a regional co-ordinating body whose task would be, inter alia, to re-distribute results to the participating countries. This course of action could be organized either through a single network covering the entire field of co-operative actions or through several specialized networks each covering one or more groups of actions of the same nature.

49. Such means have been used in similar projects, both in the Mediterranean region (such as the UNEP Mediterranean Pollution Monitoring and Research Programme) and elsewhere (cf. networks of radiometric measurements) and have elicited active participation from the institutions taking part.

50. From a more centralized point of view and for certain types of action there could be a preference for the joint establishment of regional centres, financed by interested Governments and entrusted with a precise mission of regional interest (cf. documentation and information centre, for example). More complicated in structure, this system is nevertheless likely to have certain advantages, particularly higher efficiency, provided the mandate is sufficiently precise and the functioning supple enough to allow countries supporting it to benefit in a concrete and efficient way.



51. Even more centralized is the idea of establishing a single Regional Centre grouping together all or most of the activities that may be taken into consideration and ensuring the co-ordination of the other activities. Although equally complicated in structure, this arrangement nevertheless offers, in comparison with the former, the advantage of grouping together certain common means in one and the same place.

52. It should be stressed that these various forms are not mutually exclusive and it is very conceivable that use might be made of one alone or of several together simultaneously according to the diversity of the topics decided upon for a co-operative programme on the practical applications of renewable sources of energy.