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REPORT OF THE EXECUTIVE SECRETARY
ON THE ACTIVITIES OF THE COMMISSION

PROGRESS MADE IN THE IMPLEMENTATION OF THE
PROGRAMME OF WORK FOR THE BIENNIUM 1990-1991

Report on

The implementation of projects formulated
in the course of the biennium 1988-1989
on renewable sources of energy

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I. INTRODUCTION

Several renewable-energy projects were formulated during the biennium 1988-1989. The documents prepared during this biennium covered a wide range of renewable-energy areas. Some projects aimed at identifying priority areas for utilizing suitable renewable-energy technologies. To this end, a number of pilot projects were prepared with the objective of: promoting the utilization of renewable-energy technologies for water pumping and desalination, developing agro-industrial farms, improving local capabilities for manufacturing and maintenance of equipment, and providing basic energy needs of rural and remote areas.

Other projects had as their primary objective the improvement of the data collection and analysis process, and the promotion of sub-regional and regional cooperation in the exchange of information and experience in the field of renewable energy. The formulation of a project document for solar- and wind-measuring networks in selected countries of the Economic and Social Commission for Western Asia (ESCWA) and the establishment of a regional information network on new and renewable sources of energy were among the most prominent features of the Energy Programme's orientations in this field. The special formats for collecting information on experts in the field of renewable energy, institutions dealing with the development of renewable energy sources, and renewable-energy projects were used by a number of ESCWA countries, and relevant data were made available through a "host centre" selected for that purpose.

Of particular importance has been the special attention paid to training on renewable-energy technologies and the improvement of knowledge and technical capabilities for appropriate technology transfer. In this respect, detailed project documents have been formulated on training workshops and courses for different categories of personnel -- planners, managers, technicians, and extension workers -- with special reference to training needs for construction, operation and maintenance of renewable-energy systems.

The interest shown by many ESCWA member countries and regional and international organizations following the formulation and circulation of the renewable-energy projects gave ESCWA secretariat an impetus to widen the scope of those projects and to make intensive efforts to implement at least the most relevant ones.

The difficulties encountered in implementing the renewable-energy projects formulated in the course of 1988-1989 and planned for 1990-1991 were immense, and were owing to the recent events in the region, lack of financing, and inadequate coordination of activities on the regional level.

II. FORMULATION OF THE REGIONAL PROGRAMME FOR THE DEVELOPMENT OF RENEWABLE SOURCES OF ENERGY

The primary objective of this regional programme is to promote the use of renewable energy sources, mainly solar, wind and biomass, and assist ESCWA member countries in the application of mature renewable-energy technologies in rural and remote areas, particularly in desert and scattered coastal areas

where there is a pressing need for providing basic energy requirements for a potable water supply, irrigation, electricity generation, and medicine and food preservation.

The programme is designed to be of regional relevance and expected to provide scope for further action by the countries of the ESCWA region. It consists of three major components or subprogrammes:

1. Resource assessment. Activities planned under this subprogramme include the establishment of a database and preparation of data handbooks to be made available to ESCWA member countries for training on data collection and analysis. It is also proposed to arrange for organizing regional technical meetings to discuss the possibilities of adopting common methodologies in the assessment of non-conventional energy resources.

2. Training on renewable-energy technologies. The subprogramme on training is considered of paramount importance, as its main objective is to provide the technical requirements for the proper utilization of mature renewable-energy technologies and for appropriate technology transfer and its adaptation to the specific conditions of the region.

Activities envisaged under this subprogramme cover the publication of technical studies and the organization of workshops where nationals from ESCWA member countries can be trained on the design and construction as well as management, operation and maintenance of renewable-energy plants.

In order to achieve such objectives, it is planned that part of the regional programme will be devoted to the development of appropriate syllabuses, training equipment and skills in technical as well as socio-economic aspects of the use of renewable energy, particularly solar, wind and biogas energy. This subprogramme also envisages the build-up of regional training facilities and the implementation of accelerated training programmes of new staff and complementary training of staff on board.

An example of this is the project on the dissemination of programmes on do-it-yourself, small-scale equipment in remote areas of the ESCWA region. The objectives set for this project include: the development of modular designs and production of small-scale, low-cost solar equipment such as water stills, cookers, water heaters and crop dryers using local materials and skills in remote areas; the improvement of local capabilities in manufacturing, installation, operation and repair of solar systems; and training of the population in remote areas on the use of solar equipment. It is also envisaged in this project to install, in selected remote areas, simple solar systems produced locally for demonstration purposes.

3. Execution of pilot projects. The regional programme also includes a number of specific renewable-energy projects proposed for execution in cooperation with ESCWA member countries and regional and international organizations. All the proposed projects aim at promoting the development of renewable sources of energy and diffusing renewable-energy technologies in rural and remote areas of the ESCWA region. The ultimate objective is to meet

the basic energy needs of communities living in desert, remote mountainous or coastal areas. The following brief description of these projects reflects ESCWA orientation in this field:

(a) Solar and wind energy for water pumping in rural and remote areas

It is proposed that this project be implemented in cooperation with Egypt, Oman, Saudi Arabia, Syria, the United Arab Emirates and the Yemen Republic.

In many ESCWA countries, direct mechanical pumping systems are used to supply water to rural and remote communities. However, the results of this experience in the region have not been encouraging. The inappropriateness of sites selected and wind energy-conversion systems, as well as insufficient awareness on the part of the users, figured among the main reasons for the failure of many projects implemented in the region. Bearing in mind these considerations, this project starts by assessing the experience of the region in the use of solar and wind energy for water pumping and gives special attention to the selection of sites where solar- and wind-energy systems can be appropriately installed, as well as to the utilization of the most suitable technologies. The project also foresees a monitoring programme for testing the performance of the installed systems from the technical as well as socio-economic angles.

(b) Solar and wind energy for desalinating brackish water in remote areas of the ESCWA region

The member countries expected to be involved in the implementation of this project are Bahrain, Egypt, Oman, Saudi Arabia, the United Arab Emirates and the Yemen Republic.

The project is intended to serve communities located in remote and isolated desert and coastal areas. It is planned that a number of reverse-osmosis desalination units and hybrid systems for brackish water desalination will be installed in selected locations. This project also contains programmes for monitoring the performance of the systems installed and for training local manpower.

(c) Demonstration of solar/wind ice-making in scattered fishing communities in the ESCWA region

It is expected that this project will be implemented in cooperation with Egypt, Oman, Saudi Arabia and the Yemen Republic.

The project is intended to serve scattered fishing communities located far from the main power distribution lines and also from markets. In this pilot project, hybrid photovoltaic/wind systems are planned for installation in selected coastal areas. It is also planned that the performance of the systems installed will be assessed and their socio-economic benefits evaluated.

Monitoring the performance of these systems and identifying technical problems encountered will provide basic information for future improvement. In order to facilitate the monitoring procedures, the activities to be carried

out under this project also include the preparation of a technical guide on the various criteria for selection of sites and use of appropriate technologies.

(d) Settlement of herders, based on solar energy

It is planned that this project will be implemented in cooperation with Egypt, Iraq, Jordan, Oman, Qatar, Saudi Arabia, Syrian Arab Republic and the Yemen Republic.

This multi-purpose project is highly relevant to the economic, social and environmental conditions in many parts of the ESCWA region, where herder communities continue to move across the desert in search of water and pasture. At least three major objectives can be overcome through the implementation of this type of project: From the pure economic standpoint the settlement of herder communities can contribute considerably to promoting rural development in desert areas and consequently the overall development of the agricultural sector. Socially, the implementation of such projects is a prerequisite for the integration of the desert and nomad population into well-established agricultural and rural communities. Environmentally, the settlement of herder communities with all the activities it involves is in certain areas the most efficient solution in combating desertification, and may by far surpass in achievement the patches of projects undertaken in some remote locations.

The project starts with a thorough assessment of the socio-economic conditions of herder communities -- including their population patterns -- in the countries involved in the project. The other components of the project consist of identifying sites, assessing energy needs in each location, and preparing the layout of the settlements; this includes the provision of water points, access roads and resources required for promoting and diversifying the economic and social activities of the newly-established communities.

(e) Solar agro-industrial demonstration farm

The member countries expected to participate in the implementation of this project are Egypt, Iraq, Jordan, Oman, Syrian Arab Republic and the Yemen Republic.

Most ESCWA countries have launched large-scale agricultural reform projects. Many of those projects are mainly concerned with land reclamation, water resources and power supply. However, in most cases, little attention has been given to the role of agro-industries in the development of the agricultural and rural sector. This project therefore aims at enlarging the scope of agricultural reform, to introduce agro-industries as an integral part of agricultural and rural development schemes.

The creation of agro-industrial activities to replace the traditional techniques in use in many rural communities can contribute enormously to improving productivity of rural communities and can enhance social interaction between remote and urban areas.

Since most of the rural and remote areas in the ESCWA region enjoy high solar-radiation rates, solar thermal and photovoltaic systems can be used to develop various agro-industrial activities.

The project proposed here is a pilot one aimed at providing a successful example for further applications of solar-energy technologies in as many rural and remote areas as possible. Hence, the project is designed to develop solar agro-industrial systems suitable for rural areas in a number of ESCWA countries, also taking into consideration the socio-economic aspects of the introduction of such systems.

Two other components of the project are particularly worth emphasizing: one deals with the development of local technical capabilities in manufacturing parts of the solar-energy systems through intensive teaching and training. The second relates to the monitoring of the systems' performance and the comprehensive assessment of their economic viability and social benefits.

As in the case of the other projects of the regional programme, this one contains recommendations for further applications and also includes the preparation of a technical guide for the use of local manpower in the construction, operation, maintenance and repair of solar-energy systems.

(f) Assessment of mini-hydropower potential in the ESCWA region

Four ESCWA member countries, namely: Egypt, Iraq, Syrian Arab Republic and the Yemen Republic are expected to participate in the implementation of this project.

Large-scale hydropower stations are in use in several ESCWA countries. However, only limited assessment and evaluation of the potential of water canals, barrages and main river streams for power generation has been carried out, in spite of the fact that many locations have been identified for possible utilization in mini-hydro systems. This project's main objectives therefore include the assessment of the potential for mini-hydropower plants in a number of ESCWA countries and the design, installation and testing of pilot plants in selected sites with different water heads and ecological conditions. Evaluation of the economic viability of the plants and their social and agricultural development benefits is also one of the components of this project.

In addition to providing a cheap and clean source of energy, the development of mini-hydropower systems is expected to lead to the establishment of an industrial infrastructure for manufacturing hydropower turbines.

III. PREPARATION OF THE DIRECTORY ON NEW AND RENEWABLE SOURCES OF ENERGY

As indicated earlier, intensive efforts have been deployed to facilitate the exchange of information and experience and the coordination of activities among ESCWA member States in the field of new and renewable sources of energy. The establishment of a Regional Information Network on New and Renewable Sources of Energy is an example reflecting ESCWA activities in that direction. Several countries of the region have shown interest in joining the network and expressed their willingness to cooperate with its "host centre" through regular exchange of information on the various activities carried out

for the development of new and renewable sources of energy. However, only three countries, namely Egypt, Iraq, and Jordan, can be considered as active members of the network. Allocation has been therefore made available during the biennium 1990-1991 to the host centre to tour the region and discuss with the national authorities concerned the possibilities of widening the scope of the network in terms of activities as well as membership. The ESCWA secretariat has continued to cooperate with the host centre of the network through regular meetings, discussions, and provision of recent information and data on various aspects of new- and renewable-energy development. The host centre has been kept informed of any new developments known to ESCWA secretariat inside and outside the ESCWA region.

The most tangible outcome of cooperation with the host centre, however, is the issuance of the Directory on New and Renewable Sources of Energy. This directory includes details on renewable-energy projects and lists of specialists or experts in the field of renewable-energy technologies and their applications, as well as relevant organizations. The projects included in the directory cover various renewable-energy areas. Some focus on methodologies and techniques of data collection, processing and standardization; others deal with projects aimed at promoting the development of solar, wind, biomass and geothermal sources of energy.

1. Renewable-energy projects dealing with solar thermal conversion applications. These include water heating, heating and cooling, power generation, water desalination, greenhouses, cooking and crop drying.

As it is beyond the scope of this report to review these projects in detail, some selected examples may illustrate:

(a) Development of flat-plate collectors for domestic and large-scale water heaters. The main objective of such projects is to set national standards for various types of flat-plate collectors and develop optimum hot-water supply systems for households and large consumers.

(b) Greenhouse projects. Such projects include the establishment of greenhouses for research on heating, cooling, and soil sterilization and soil reclamation by using solar-energy technologies.

(c) Heating with solar energy. In addition to the numerous projects in this field, several others have been implemented to demonstrate the feasibility of heating buildings by using flat-plate collectors or solar-assisted heat pumps.

(d) Projects on different types of irrigation systems, the effects of solar energy on soil properties and the evaluation of agricultural energy technologies.

2. Projects on photovoltaic applications. The directory highlights the progress achieved by a number of ESCWA countries in the field of photovoltaic applications. Such activities include design and testing of photovoltaic water-pumping systems and their evaluation in comparison with pumping systems powered by diesel motors; they also include implementation of projects on the use of solar energy to produce electricity for driving vertical-drainage pumps.

(Solar pumps for vertical drainage are used to decrease the level of the water table and solve the problem of soil salinity.) Other projects, such as electricity generation by PV panels for irrigation pumps and solar car-park lighting, are also reported in the directory.

3. Projects on wind-energy applications. In several ESCWA countries such projects are aimed at promoting the utilization of wind-energy technologies to meet basic energy needs in rural and remote areas. In other member countries wind-energy projects are intended to evaluate the performance of windmills under local climatic conditions and the possibilities of manufacturing components of wind-energy systems locally.

4. Biomass conversion projects. Universities, research institutes and governmental departments in several ESCWA countries have been involved in implementing projects to use local materials to construct biogas units. The attention paid to the importance of biogas units in the region is due to the fact that in addition to the provision of a reliable source of energy, these units have many other environmental and social advantages.

5. Passive design projects. The directory contains descriptions of experimental projects carried out in several ESCWA countries for more efficient use of energy in residential buildings.

6. Projects on hydropower generation applications. The directory includes brief descriptions of hydropower projects in the region and the total electricity-production capacity of each project.

7. Oil shales and tar-sand applications projects. Mention is made in the directory of projects on oil shales and tar-sand; these are potential alternative sources of energy, for possible use as low-grade fuel in some countries of the region.

Issuing the directory was the first attempt to provide the members of the Regional Information Network on New and Renewable Sources of Energy with reliable information and data on activities undertaken in the region to develop new and renewable sources of energy, as well as on institutions, organizations and experts involved in such activities. It is recognized that this directory, while well designed to accommodate continuously updated information, is still far from being complete and falls short of providing the required information on renewable-energy projects carried out in the region. The list of experts and specialists does not comprehensively reflect the expertise and technical capabilities available in the region. Such shortcomings were, however, expected from the outset. Information and data are scattered, and the focal points designated to provide the host centre regularly with materials on developments in the field of renewable energy needed more time and closer cooperation on the part of national authorities concerned. The mere issuing of the directory in its present form will provide incentive for those involved in the field to update, correct and add new information for the next issues.

IV. TRAINING WORKSHOP ON DESIGN, CONSTRUCTION, OPERATION, AND MAINTENANCE OF BIOGAS PLANTS

Biomass is one of the most important sources of renewable energy, and the technologies of its utilization have proven to be reliable in providing many basic energy requirements, particularly in rural and remote areas.

Because of its vast experience in this field, ESCWA secretariat has taken the lead in assessing biomass resources and spreading biogas technology. Several studies of the various aspects of biomass energy have been conducted in the past few years. Seminars, technical meetings and study tours have been organized for nationals from within and outside the region with the objective of promoting the utilization of biogas technologies. ESCWA secretariat has also been directly involved in operational activities for constructing biomass digesters and monitoring their performance.

Of particular importance are the technical assistance rendered and the extensive advisory services provided to ESCWA member countries for the development of their biomass energy resources.

However, in assessing the feasibility of biogas projects and the performance of technologies used, it appeared that lack of local expertise is among the major obstacles to the widespread application of biogas technology. As the need for training has become very pressing, a training workshop on the design, construction, operation and maintenance of biogas plants was organized from 3 August to 4 September 1991 in Damascus, Syrian Arab Republic, in cooperation with the Syrian Ministry of Agriculture and Land Reclamation. The United Nations Development Programme contributed substantial financial support for the organization of the workshop.

Seventeen participants from Egypt, Jordan, Oman, Yemen and Syrian Arab Republic took part in the workshop; among them were four women, for whom training on biogas technology is of particular interest.

The four-week workshop consisted of lectures, exercise sessions, practical training and round-table discussions.

The lectures covered the theoretical aspects of training on biogas technology. They provided the participants with basic knowledge on the fermentation process, design of different biogas systems, utilization of outputs of biogas plants, economic viability of biogas systems, and prospects of the widespread utilization of biogas technologies in the ESCWA region.

Exercise sessions were organized for training on site selection and design of prototype family-size biogas plants appropriate for the needs of families and suitable for local climatic and environmental conditions. This included calculating the geometric dimensions of the digester and the quantities of building materials needed, and designing the gas transportation network.

The practical training included direct involvement in and follow-up on the construction and operation of an integrated biogas system.

The round-table discussions held during the workshop focused on the major issues of rural energy and the requirements for the introduction of biogas technologies and the generalization of their applications in the ESCWA region.

It is to be noted that the training workshop was organized under the direct supervision of specialists in this field, with full involvement of experts from the host country, whose tasks also include monitoring and follow-up on the operation of the constructed digesters.

V. DIFFICULTIES FACING THE IMPLEMENTATION OF RENEWABLE-ENERGY PROJECTS

With the exception of a few cases, the share of renewable energy in the energy balances of ESCWA countries is still marginal. Renewable-energy projects carried out so far are mostly for research and demonstration, though significant progress in this field has been achieved in several member countries.

Encouraged by the keen interest of most member States in the development of their new and renewable sources of energy, ESCWA secretariat has sought time and again the cooperation of national, regional and international organizations, including the funding agencies, for the implementation of renewable-energy projects. However, ESCWA secretariat's efforts have been often obstructed by the lack of close cooperation with many entities dealing with renewable energy and the unavailability of adequate financing.

Regional cooperation is extremely limited. There are very few examples of joint projects, and a great deal of effort is wasted because activities are not coordinated on the sub-regional or regional level.

In many cases, financial allocations cannot provide even the basic requirements for research and experimental activities. Consequently, ESCWA secretariat has to bear the brunt of the financial burden of its operational activities.

Lack of adequate technical capabilities is another obstacle to the implementation of renewable-energy projects. This also creates difficulties in identifying suitable renewable-energy technologies, as selection, installation and adaptation of equipment require expertise in the field and well-trained manpower.

Weakness of the industrial infrastructure is also a handicap in several countries of the ESCWA region. Implementation of renewable-energy projects, including those carried out for research and demonstration, requires equipment and components which cannot be provided locally. And, apart from biogas and some components of solar- and wind-energy systems, expensive equipment and materials are often imported, with the total cost of the project ending up in some cases, out of all proportion to the benefits. In addition, many renewable-energy projects have ended in complete failure due to the transfer of inappropriate technologies and the lack of industrial know-how for their adaptation to local conditions.

In several cases, lack of awareness of renewable energy's importance by policy makers as well as the general public is an additional obstacle hindering ESCWA secretariat in its efforts to promote the implementation of renewable-energy projects. This has clearly manifested itself in the establishment of the Regional Information Network on New and Renewable Sources of Energy and the preparation of the directory. ESCWA secretariat had to sponsor a number of technical meetings, engage consultants, design special formats and finance the activities required for providing data; nevertheless, the network is still limited to a few member countries, and much more information and data are still needed to complete the directory.

In spite of all these impediments, the prospects of renewable-energy development in the ESCWA region are highly promising. The experience of ESCWA secretariat in the field of biogas is encouraging, and the projects implemented to develop biomass energy sources have yielded fruitful results. With more concerted efforts and closer cooperation, programmes for resource evaluation, manpower development, and identification of suitable technologies may be implemented without much difficulty. This by itself can constitute a solid background for improving the present status of renewable energy in the region and launching more appropriate renewable-energy projects.

VI. CONCLUSIONS

In implementing the renewable-energy projects developed in the course of the biennium 1988-1989, ESCWA secretariat has adopted a three-pronged approach:

It has, first, laid the foundations of close regional cooperation through the formulation of the comprehensive Regional Programme for the Development of Renewable Sources of Energy.

Placing the exchange of experience and information as one of its highest-priority areas of activities, ESCWA secretariat has allocated substantial resources to establish the Regional Information Network on New and Renewable Sources of Energy. The major achievement in this field has been the issuing of the Directory on New and Renewable Sources of Energy, which can be circulated to member States and to national and regional entities involved in developing new and renewable sources of energy for their own use and as a background for a reliable database.

The direct involvement in implementing renewable-energy projects is another characteristic of ESCWA secretariat's orientation in developing renewable energy sources of the region. The organization of the Training Workshop on Design, Construction, Operation and Maintenance of Biogas Plants in the second half of 1991 is a typical example of the effective operational activities carried out by ESCWA secretariat, judging from the increasing interest of member countries and the repeated requests for the implementation of similar projects.

As can be seen from the description of projects in this report, direct participation of member countries concerned is sought for every stage of

implementation. The success in implementing any project, therefore, depends to a large extent on the positive response of national and regional authorities concerned, and their willingness and readiness to be active partners.

Most, if not all, renewable-energy projects prepared by ESCWA secretariat have regional dimensions and require close cooperation and coordination among the member countries. It is hoped that this matter will be given special attention, as many difficulties in undertaking projects can only be overcome through close sub-regional and regional cooperation which ranges from regular contacts and exchange of information to full participation in joint activities.