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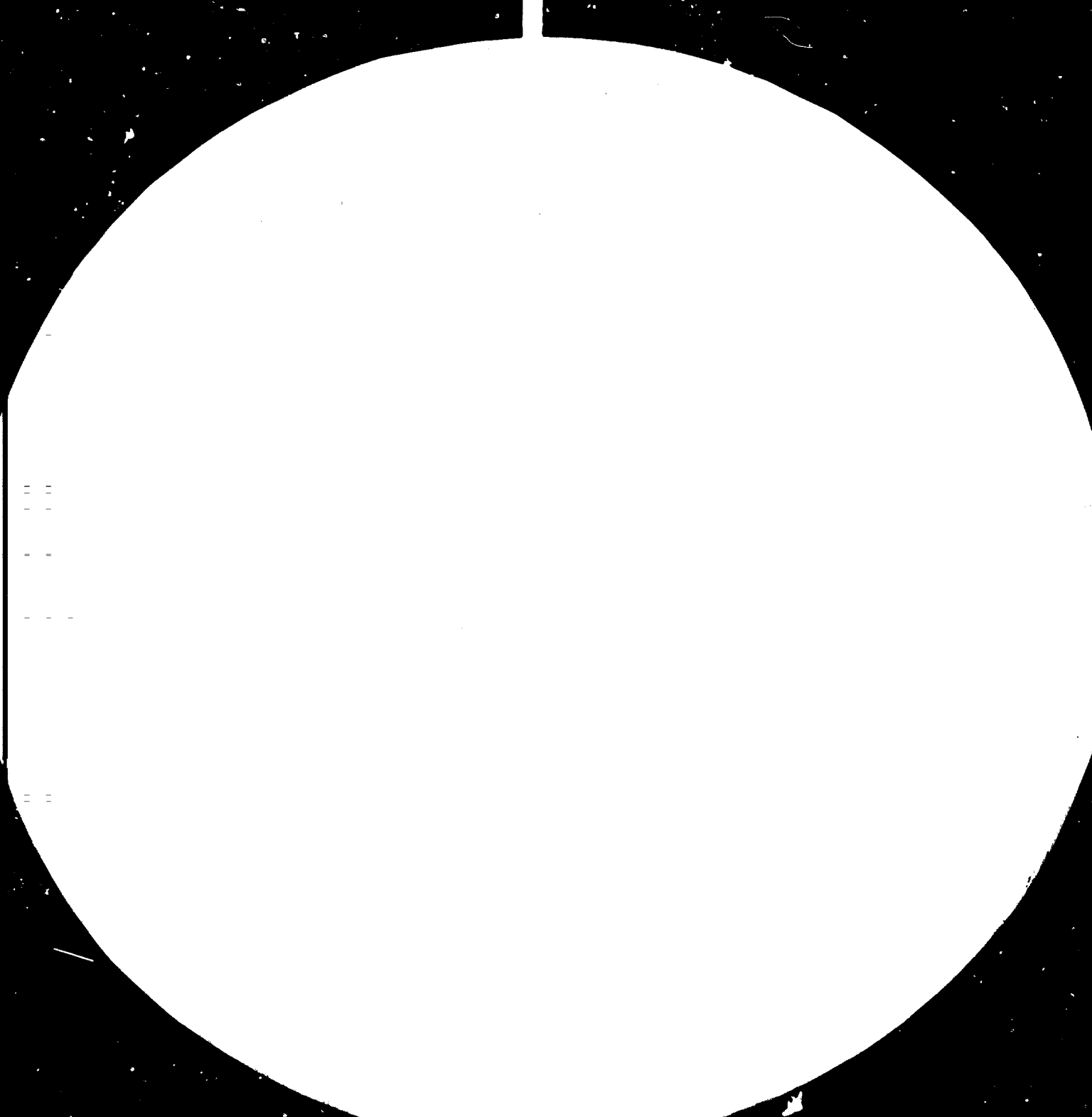
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COMMENTS REGARDING THE ESTABLISHMENT OF
A NETWORK SYSTEM AND A REGIONAL CENTRE FOR MINI AND SMALL HYDROPOWER,
FOR THE ESCAP COUNTRIES, TAKING INTO CONSIDERATION
THE EXPERIENCES OF LATIN AMERICA *

by

Enrique Indacochea**

* The views expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

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FOREWORD

At the request of UNIDO, this document was prepared by Enrique Indacochea, Head of the Regional Program of Small Hydro Power Stations of OLADE, for the Senior Expert Group Meeting on Mini and Small Hydro Power (Hangzhou, People's Republic of China, July 12-17, 1982).

In spite of the fact that for the preparation of this paper, the experience of the Latin American Energy Organisation (OLADE) has been taken into consideration, the views, opinions, and recommendations included herein do not necessarily represent the position of OLADE but rather are the entire responsibility of the author.

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1. INTRODUCTION

The main purpose of this paper is to present some of the experiences of the Latin American countries, within the framework of OLADE, in the establishment of cooperation schemes for the development of Small Hydro Power Stations in the region and to suggest some guidelines for the establishment of a Regional Network and a Regional Centre for mini and small hydro development in Asia and the Pacific.

Chapter Five presents schematic lists of requirements for mini and small hydro development at the national level and identifies lines of action for technology development, equipment production and training, also at the national level.

This document has been prepared at the request of UNIDO, as a contribution to the discussions to be held during the meeting of senior officials from the ESCAP countries (in Hangzhou, People's Republic of China during July 12-17, 1982) with the purpose of establishing a Regional Centre for Mini and Small Hydro Power Stations for Asia and the Pacific, with cooperation from the ESCAP Regional Energy Development Programme and UNIDO, and with support from the UNDP.

There is a growing awareness among developing countries and international organizations as to the advantages of the exchange of experiences and cooperation among countries and regional organizations, in light of the fact that there are fundamental similarities in the problems and possible lines of action to be adopted for promoting development in Third World countries-- in spite of the fact that there are obvious historical, cultural, social, economic, and political differences that should be taken into consideration, but these are also frequently present among countries of the same region.

The case of mini and small hydro power stations is typical. When we delve into the problems of promoting their application in developing countries, we find a certain common pattern, whether we are studying the

problems associated with the evaluation of resources and demand; institutional requirements; project development and engineering capacity; community participation; construction, operation and maintenance; technology development and adaptation; supply of equipment; and training requirements. Therefore, it is conceivable that a relatively common pattern can be identified in terms of possible solutions, or at least, that the problems and experiences of groups of developing countries in one region can be analyzed and made available for countries in other regions of the developing world.

Bearing in mind the foregoing comments, the author has dared to suggest some guidelines for the implementation of a Network System and a Regional Centre for Asia and the Pacific, based only on the experiences of Latin America and the Caribbean. In this case, the "Network System" and the "Regional Centre" correspond to the Regional Programme of Small Hydro Power Stations and the cooperation of the member countries in this field falls within the framework of the Latin American Energy Cooperation Programme (PLACE-Programa Latinoamericana de Cooperación Energética), approved by the Twelfth Ordinary Meeting of Ministers of OLADE in November 1981. This Programme establishes guidelines for promoting the joint action of the member countries in their energy development efforts and institutionalizes the procurement of funds from international sources, employing a "seed fund" generated by the member countries themselves, of which the largest share is financed by the largest countries of the region.

Finally, it must be stressed that even though the experiences and activities of OLADE are an important input into this document, the opinions and suggestions herewith included are the exclusive responsibility of the author and do not necessarily correspond to the official position of the Organization.

2.- THE CASE OF LATIN AMERICA

As was mentioned before, there are a number of aspects which determine a certain resemblance of the situation and perspectives of mini and small hydro development in Asia and Latin America, but also very important differences should be considered.

SIMILARITIES BETWEEN THE ASIAN AND LATIN AMERICAN REGIONS IN MINI AND SMALL HYDRO DEVELOPMENT.

- Extreme geographical and physical variations within the region (mountains, plains, jungles, deserts; extremely high and low hydrological features).
- Large seasonal variations in the hydrological regimens.
- Important small hydro potential in a large part of the region.
- Significant part of the rural population does not have an adequate supply of energy.
- Low productivity in the rural areas.
- The region includes very large and very small countries.
- Important differences among countries within the region, in terms of socio-economic and political structures.
- A number of countries in each region have traditions of community cooperation supporting the development of projects.
- Similar variations in the level of development of mini and small hydro among countries (technology, manufacturing of equipment, project development, etc.)

On the other hand, the main differentiating factors that should be considered for the reciprocal applicability of the experiences in Asia and Latin America are described in the following summary:

DIFFERENCES BETWEEN ASIA AND LATIN AMERICA THAT SHOULD BE CONSIDERED

- Asia has a larger population and higher demographic density than Latin America.
- Considerable differences in history, culture and religion, in spite of some common experiences regarding development problems.
- Latin America is internally more homogeneous than Asia in languages, traditions and history, in spite of the fact that there are also considerable differences between Latin America and the Caribbean.
- The Asian and Pacific region have ESCAP as a regional agency of the UN for promoting regional energy development. Latin America has OLADE as an intergovernmental regional organization to promote cooperation on energy matters, besides the Economic Commission for Latin America (ECLA), which is the regional UN body for this area.

Bearing in mind the similarities and differences between Asia and Latin America from the point of view of small hydro development, we continue by presenting the case of Latin America. Even though the situation is not the same for all the countries in the region, it is possible to outline the main factors affecting the development of small hydro power stations in Latin America.

PERSPECTIVES AND PROBLEMS FOR SMALL HYDRO DEVELOPMENT IN
LATIN AMERICA

1. HYDRO RESOURCES

- Varied physical features (high, medium and low heads).
- In general very large hydro resources, but unknown in their magnitude for small-scale applications.
- Considerable variations in hydrological regimens, over time.
- Difficult geological, geomorphological and topographic features.

2. ENERGY REQUIREMENTS

- Large part of the rural areas do not have electricity supplies.
- Widespread use of small thermal units (diesel and gasoline) for electricity generation, with problems of high operating costs (fuels, lubricants, maintenance and spare parts, and short life term.
- Limited extension of the grid to rural and isolated areas; frequently they are very costly because of large distances, difficult terrain and small demand.
- Limited use of electricity for productive activities in the rural areas; "rural electrification" schemes oriented to illumination and services.
- Limited incomes of rural population restrict the self supporting capacity of small hydro schemes.
- Electricity supply is a complementary requirement for rural development; main problems are associated with the socio-economic structure.
- Small hydro can contribute to increased productivity, add value to the agricultural production, improve the living conditions and support cultural development.
- Small hydro can have a limited environmental impact. It can improve environmental conditions (forestation, water control).
- Small hydro can be complementary to irrigation and potable water schemes.

3. ECONOMIC AND FINANCIAL ASPECTS

- Excessive costs of pre-investment studies and implementation because of considering small hydro plants as large hydro schemes on a reduced scale.
- Deficient financial schemes; limited resources for small hydro development.
- Excessive requirements (studies) for financing projects.
- Limited prospects for investment returns and even for self-supporting operations.

4. INSTITUTIONAL ASPECTS OF PROJECT DEVELOPMENT.

- Poor definition of institutional responsibility for evaluation of resources and demand, planning and specific project development.
- Lack of organization for employing young engineers for project development: use of traditional consultancy schemes determining high cost of studies.
- Important regional experience in hydroenergy development.

5. INSTITUTIONAL ASPECTS OF OPERATION AND MAINTENANCE

- Deficient institutional schemes for operation of plants; either excessive centralization by the competent utilities or community enterprises without technical and administrative support.
- Insufficient use and training of local operators.
- Lack of maintenance support on decentralized basis.
- Adoption of rigid tariff schemes without consideration of specific conditions. High overhead costs of tariff collection.

6. COMMUNITY PARTICIPATION

- Widespread tradition of community participation in the execution of projects in many countries.
- Lack of organization and economic evaluation of community participation in projects.
- Limited technical skills in the rural areas limit the participation in the supply of aggregate materials, local transport and unskilled labour.
- The process of construction can facilitate technical development in the community.
- Limited experience at the community level for the operation stage of the plant.

7. TECHNOLOGY AND EQUIPMENT

- Technology development and adaptation can contribute to reducing investment costs, and to increasing the use of local equipment and materials.
- A considerable number of research institutions, universities and public utilities are carrying out activities of technology development and adaptation, in some cases there is a lack of official support and coordination with institutions in charge of project development and industry.
- Important technological achievements have been developed in the region.
- In a number of countries there are established industries producing equipment for small hydro plants -- in some cases with adequate quality, but in some other cases with poor design and workmanship.
- Lack of standardization of equipment,
- Excessive dependence on imports of equipment
- Technology transfer agreements limited to assembly and manufacture of minor components; high royalty costs, restrictive practices to effective transfer of knowledge
- Limited intra regional transfer of technology .
- Good prospects for regional cooperation in technology development and adaptation.

8. TRAINING

- The region has adequately qualified professionals, but insufficient in number for massive project implementation,
- Lack of technicians and skilled labour for small hydro development,
- Lack of practical training at project development, construction and operation levels,
- Lack of support for post-graduate studies in hydroenergy ,
- Insufficient training of operators of local origin,

In order to promote the development of small-scale hydro in Latin America, in 1980 OLADE established a Regional Programme of Small Hydro Power Stations (SHPS). Before describing the programme, it is convenient to make a brief presentation of the Organization.

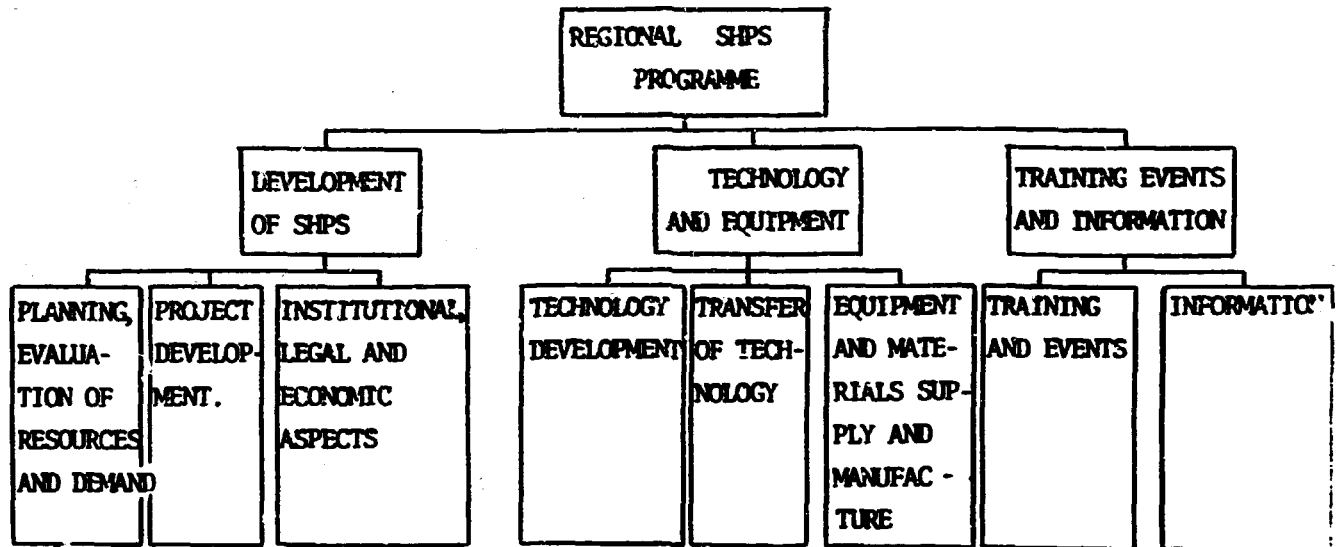
The Latin American Energy Organization -OLADE (Organización Latinoamericana de Energía) is an intergovernmental body composed of Latin American and Caribbean countries. It was established in 1972 (Lima Agreement) and has its Permanent Secretariat located in Quito, Ecuador. The highest authority of the organization is the "Meeting of Ministers" integrated by the Ministers of Energy, or their equivalent, from the member countries.

The main objectives of OLADE are to promote the solidarity and cooperation of its member countries in the use, defense, exploration and exploitation of their energy resources, to coordinate regional energy policies, to promote technical cooperation and to provide technical assistance.

The Regional SHPS Programme was defined on the basis of 1) the identification of the problems and perspectives of small hydro development in the region and 2) a strategy for promoting the development of this energy source.

The Regional Programme of OLADE can be seen as a "Regional Centre" and also a "Network System", considering that a number of its activities are conducted and coordinated by its technical team, established within the Permanent Secretariat; but most of the actions are executed jointly with various institutions and experts throughout the region.

The activities of the programme are schematically classified as follows:



The above basic activities are divided into the following specific activities or lines of activities:

PLANNING AND EVALUATION OF RESOURCES AND DEMAND

- Manuals for planning and decision-making.
- Manuals and methodologies for evaluation of resources and demand;
- Technical assistance for developing national plans and construction programmes;
- Technical assistance for the establishment and execution of national programmes on evaluation of resources and demand,
- Overall regional evaluation of resources and demand,

PROJECT DEVELOPMENT

- Design manuals
- Guidelines for the formulation and scope of pre-investment studies
- Technical assistance for evaluation of projects and studies,
- Execution of pre-investment studies for projects in relatively less-developed countries in the region,
- Construction of demonstration plants in relatively less-developed countries in the region,
- Technical assistance and development of special studies regarding integral projects, (multiple use of water), and of productive use of the energy generated,
- Technical assistance in the application of non-conventional technologies,
- Technical assistance for operation and maintenance of plants,

INSTITUTIONAL, LEGAL AND ECONOMIC ASPECTS

- Outline of various institutional schemes for planning; evaluation of resources and demand; design, construction and operation of plants.
- Technical assistance for the definition of institutional schemes and their organization,
- Gathering of experiences on communal participation in projects and proposal of alternative schemes.
- Compilation and comparison of official regulations and laws in various countries regarding the use of water, land, electricity generation and distribution, applicable to small hydro development,
- Costs Manual (investment and operation),
- Development of alternatives for project financing.
- Providing assistance to the countries in the procurement of international financing of projects,

TECHNOLOGY DEVELOPMENT

- Development of non-conventional technologies for the construction of plants;
- Development of equipment design technology with emphasis on standardization;
- Technical assistance and support of national technology development programmes;
- Identification of technology development activities in the region;
Profiles of technology development projects.
- Technical assistance in the organization of national technology development programmes;
- Manuals on equipment design and standardization;
- Follow-up of the international technology development situation.
- Construction of pilot plants.

TECHNOLOGY TRANSFER

- Identification of technologies available at the industrial level in the region.
- Promotion of intra-regional technology transfer;
- Guidelines and orientation regarding technology acquisition contracts;
- Technical assistance in technology contracts.

EQUIPMENT AND MATERIALS SUPPLY AND MANUFACTURE

- Guidelines for establishing productive capacities for the manufacture of equipment and materials;
- Methodologies for testing and acceptance of equipment and materials;
- Directory of manufacturers of equipment and materials in the region;
- Promotion of contacts among project development institutions and suppliers of equipment;
- Technical assistance in the acquisition of equipment.

TRAINING AND EVENTS

- Regional courses (design and construction of plants, design of equipment, etc.)
- Regional Seminars
- Working Groups (meeting of experts to develop a specific task);
- Advisory Groups (to assist the organization in the evaluation and programming of activities).
- Participation in extra-regional events.
- Support of national events.
- Preparation of didactic materials for regional and national courses.
- Co-ordination with academic and training institutions.
- Conferences and lectures.

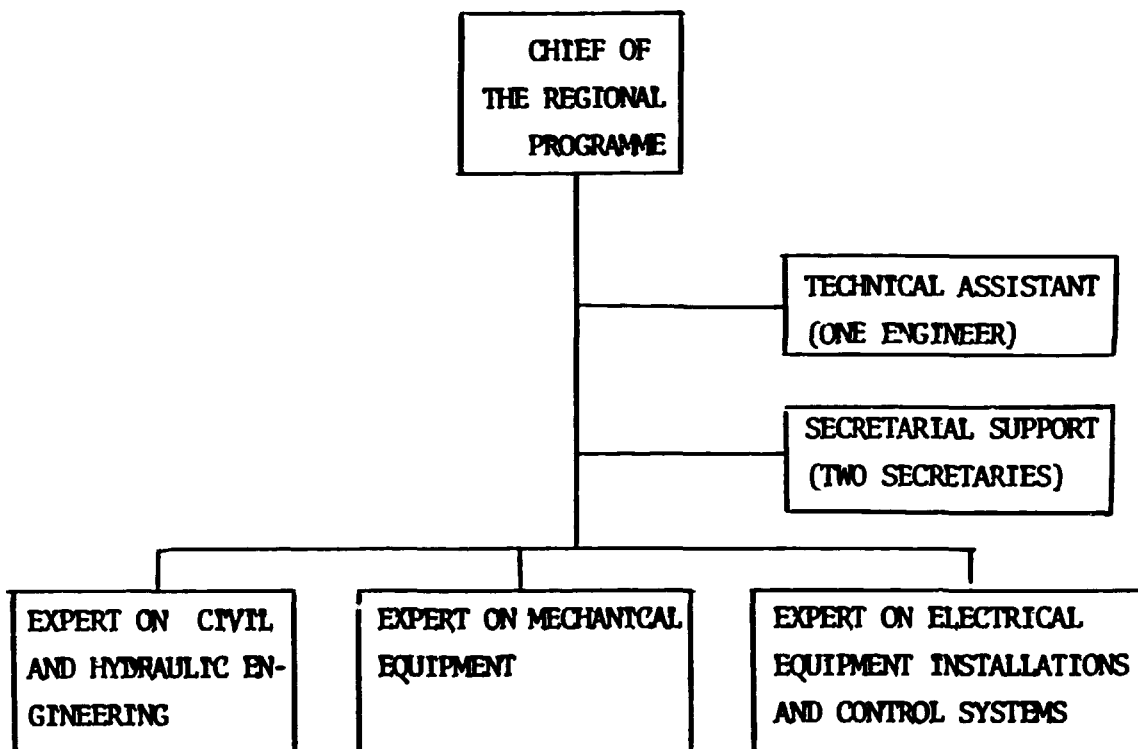
INFORMATION

- Network of regional institutions
- Network of individual contacts
- Development of audiovisual materials (slides, films, etc).
- Establishment of a bulletin
- Organization and establishment of a library of SHPS documents
- Establishment of a bibliographical reference system
- Establishment of an information exchange system.
- Diffusion of the documents prepared by OLADE

Most of the activities shown have been initiated, and are in the process of execution, whilst some have already been completed ; but it is beyond the scope of this document to present a report on the execution of activities of the regional programme of OLADE. However, it should be pointed out that all of them have been executed with the combined effort of the technical team of the Permanent Secretariat, public utilities, research institutions, universities and individual experts of the region, and in some cases with the support of international organizations such as UNIDO.

The guiding principle of OLADE is that in each regional programme, the technical unit of the Secretariat should complement its efforts, capacities and activities with all the support that can be gathered from the member countries and their institutions.

The technical team of OLADE that carries out the Regional Programme of SHPS is organized as follows:



The team is constituted from 3 basic specialization fields; however, the personnel has been selected in such a way, that they have a broad enough knowledge and experience to integrate various disciplines and work jointly with experts in specific areas.

3. SUGGESTIONS FOR THE ESTABLISHMENT OF A REGIONAL NETWORK SYSTEM

3.1 CONCEPT AND SCOPE

The establishment of a regional network system could have as fundamental objectives the promotion of co-operation among the member countries, for the development of mini and small hydro power stations in the region; the execution of activities and projects of common interest; and channeling technical assistance to the national programmes.

The system should have a technical co-ordination unit and its activities will be executed with the support of national institutions of the member countries, and the Regional Centre to be established.

The scope of the system could consider the following functions:

- Provision of technical assistance to member countries.
- Preparation of manuals and methodologies.
- Development of specific pilot projects of regional interest.
- Promotion of the co-operation among member countries.
(bilateral and multilateral)
- Training and events (organization at regional level and participation in extra-regional activities).
- Information (documentation centre and exchange of information).

On the other hand, the field of activities of the system could be classified in the following areas: ~~development, technology and equipment.~~

The specific activities to be developed could be placed as parts of a matrix of "functions" against "areas" as shown in the following item (3.2).

3.2 ACTIVITIES OF THE SYSTEM

In the following diagram a matrix of "functions" and "areas" is shown. This form of presentation is considered particularly relevant, not only for the purpose of classifying the activities to be developed, but also for the organization of the system, as will be shown in the next item (3.3).

A R E A S		F U N C T I O N S
1. DEVELOPMENT	<u>1.1. PLANNING AND EVALUATION OF RESOURCES AND DEMAND</u> <u>1.2. PROJECT DEVELOPMENT</u> <u>1.3. INSTITUTIONAL ASPECTS</u> <u>1.4. COMMUNITY PARTICIPATION AND SOCIAL ASPECTS</u> <u>1.5. ECONOMIC AND FINANCIAL ASPECTS</u> <u>1.6. OPERATION AND MAINTENANCE</u>	
2. TECHNOLOGY AND EQUIPMENT	<u>2.1. TECHNOLOGY DEVELOPMENT AND ADAPTATION</u> <u>2.2. TECHNOLOGY TRANSFER</u> <u>2.3. MANUFACTURE OF EQUIPMENT AND MATERIALS</u> <u>2.4. ACQUISITION OF EQUIPMENT AND MATERIALS</u>	

- A. TECHNICAL ASSISTANCE
- B. PREPARATION OF MANUALS AND METHODOLOGIES
- C. DEVELOPMENT OF PILOT PROJECTS
- D. CO-OPERATION AMONG MEMBER COUNTRIES
- E. TRAINING AND EVENTS
- F. INFORMATION (BANK AND EXCHANGE)
- G. MISCELLANEOUS

All the activities that could be programmed for the network could be similar to the ones considered within the regional programme of OLADE; however, we are herewith presenting a tentative list of initial activities that could be programmed for the system.

ACT	AREA	FUNCTION	A C T I V I T Y	E X E C U T I O N
1.	1.1.	A	Tech asst. to some countries for drafting a national plan for small hydro development and evaluation of resources and demand (Result: Plan & Inventory of projects).	Technical Unit of the system. Contracted experts, National institutional counterparts.
2.	1.1.	B	Methodology for evaluation of resources and demand, preparation of inventories of projects and general guidelines for national planning of small hydro development	Technical unit of the System. Experts from member countries and externally contracted experts.
3.	1.1.	E	Working group meetings for preparing terms of reference and revision of Act. No.2	Technical Unit and Experts from institutions in member countries.
4.	1.1.	E	Seminar on Evaluation of Resources and Demand, inventory of projects and planning of small hydro development.	Technical Unit delegates from institutions of member countries external participants.
5.	1.2.	B	Regional Manual on Design of Small Hydro Power Stations	Technical Unit and contracted experts.
6.	1.2.	A	Technical asst. to some countries for developing pre-investment studies for specific projects.	Technical Unit and contracted consultants. National counterpart.

ACT No.	AREA	FUNCTION	ACTIVITY	EXECUTION
7	1.2.	C	Development of a number of demonstration plants in specific countries	Technical Unit contractors National counterpart.
8.	1.2.	D (F)	Directory of regional engineering and consultancy capacity available.	Technical Unit and National Counterparts.
9	1.2.	C	Course on design of Small Hydro Power Stations (engineering level)	Technical Unit-Regional Centre.
10	1.3.	A	Tech. assistance to some countries to set up their own institutional schemes for small hydro development	Technical Unit-Experts.National counterpart.
11	1.3	B	Document: Institutional and organizational alternatives for small hydro development and operation.	Technical Unit Experts
12	1.4.	B	Gathering of regional experiences in community participation in small hydro projects.	Technical Unit Experts. National Counterparts.
13	1.4.	B	Gathering of regional experiences on operation and maintenance	Technical Unit Experts National Counterparts.
14.	1.5.	C	Methodologies for project formulation and criteria for technical and economic assesment.	Technical Unit Experts.
15	1.5.	D	Promotion of the opening of credit lines for financing small hydro projects in the region.	Technical Unit International agencies.

ACT. No.	AREA	FUNCTION	ACTIVITY	EXECUTION
16	1.6.	A	Technical and assistance to countries in testing, and acceptance of equipment.	-Technical Unit -Experts -National Counterpart -Regional Centre
17	1.6.	B	Procedures for testing and acceptance of equipment.	-Technical Unit -Experts -National Counterpart -Regional Centre
18	1.6.	A	Operators' Reference Manual	-Technical Unit -Experts,
19	1.6.	A	Reference texts for training rural operators.	-Technical Unit -Experts -Regional Centre
20	2.1.	A	Tech. Assistance to national institutions carrying out research and development (mainly for organization or specific cases).	-Technical Unit -Regional Centre -Experts -National counterparts.
21	2.1.	C	Support to national institutions for manufacture and testing of equipment prototypes.	-Technical Unit -Regional Centre -National counterparts.
22	2.1.	C	Development of regional technology development projects and pilot-plants.	-Technical Unit -Regional Centre -National counterparts.
23	2.1.	B	Manuals on design and standardization of equipment to complement existing information available.	-Technical Unit -Regional Centre -Experts.

ACT No:	AREA	FUNCTION	ACTIVITY	EXECUTION
24	2.2.	A	Technical assistance to the countries in negotiating and evaluating technology acquisition.	-Technical Unit -Experts -National counterpart.
25	2.2.	B	Directory of research institutions and research projects in the region	-Technical Unit -National Counterpart -Regional Centre
26	2.2.	B	Recommendations and checklists for technology acquisition.	-Technical Unit -Experts.
27	2.2.	D	Promotion of regional technology transfer	-Technical Unit -National counterparts
28	2.3.	A	Technical assistance for equipment manufacturing	-Technical Unit -National counterpart -Industry -Regional Centre
29	2.3.	B	Specific studies in selection of materials and manufacturing processes for small hydro equipment.	-Technical unit -Regional centre -Experts.
30	2.3.	B	Directory of equipment and materials manufacturers in the region.	-Technical Unit -National counterpart -Regional centre
31	2.4.	B	Study on the application of available non-conventional materials in small-hydro projects.	-Technical Unit -Regional-Centre -Experts -Industry.

ACT No.	AREA	FUNCTION	ACTIVITY	EXECUTION
32	2.4.	B	Models for tendering and evaluation of quotations for small hydro equipment.	-Technical Unit -Experts
33	ALL	F	Establishment of a library and data bank on small hydro; Establishment of an information exchange system.	-Technical Unit. -Technical Unit.

This group of initial activities are indicative only, considering that the first stage, after the establishment of the network system, will be to define the initial group of activities to be developed.

Each one of the activities chosen should have a detailed profile of its scope, participating institutions, schedules requirements of human and material resources, budget and financial sources.

3.3. ORGANIZATION AND APPLICATION IN THE MEMBER COUNTRIES

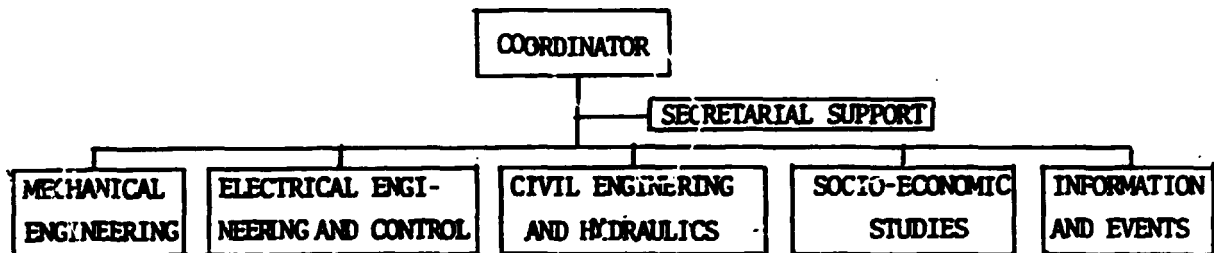
There can be many approaches and concepts as to the organization of the system proposed, therefore the suggestions that are herewith put forward, are of an indicative nature only. For deciding the organizational structure, the objective of establishing a Regional Centre for R&D and training should also be considered; therefore, the organization and scope of the network system should take into consideration the organization and scope of the regional centre.

A further comment is that the suggestions of the author are closely related to his experiences with the Regional Programme of GLADE, therefore some of the ideas could be incompatible with the regional objectives for Asia and the Pacific countries--even though that in the case of Latin America, the Regional Programme is in a way a Network System and a Regional Centre, but without an experimental infrastructure and within the scope of a regional organization.

If we assume that the Network System will be established within the institutional setup of ESCAP, with the support of UNIDO and other agencies, the first thing to do would be to constitute a TECHNICAL UNIT, or Executive Unit, that could have the following tasks:

- To co-ordinate the Network System
- To propose the activities to be executed
- To execute specific technical activities that will not be developed by other institutions in the network.
- To select and incorporate experts on a temporary basis, for executing specific activities.
- To organize events in cooperation with other institutions in the network
- To provide spot technical assistance to member countries and their institutions.
- To organize a specialized information system (library, data bank and exchange of information).
- To develop the network of institutional and individual contacts.

The Technical Unit could have the following organizational structure:



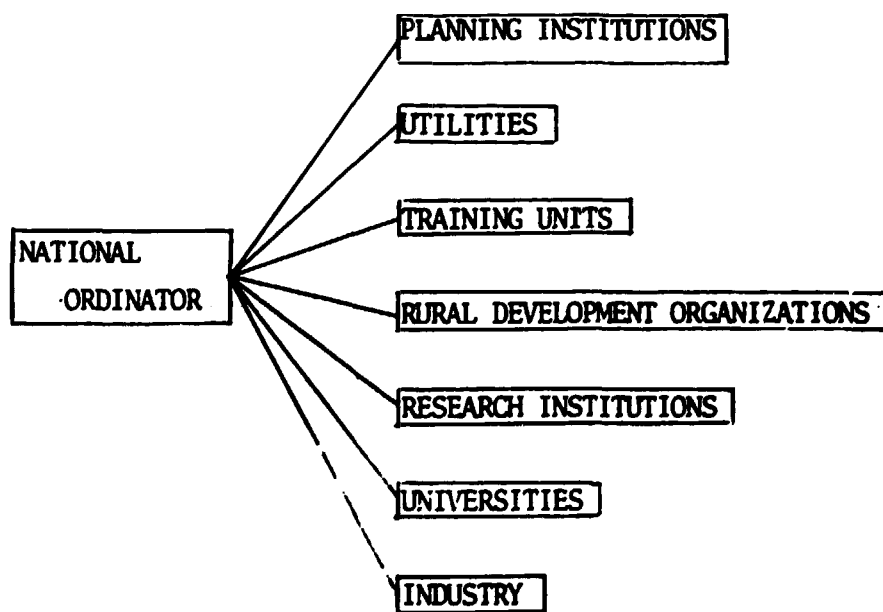
At the beginning, the unit could have a more restricted structure, beginning with a co-ordinator, a secretary and a technical assistant.

The second basic element, once the Technical Unit is constituted, is to establish the network system itself, which will be the basis for regional cooperation between member countries of ESCAP in small hydro development, through the pertinent institutions in each country.

At a national level, the network should have a national co-ordinator designated by the pertinent authority, who would usually be a high level official of the Ministry of Energy or Planning, in some cases the co-ordinator could be the official responsible for small hydro development in the country. In any case, the person designated should have among his functions, specific high level responsibilities regarding small hydro development.

The network should be integrated by all the institutions that are currently developing or at least initiating activities related to small hydro development, such as planning, evaluation of resources and demand, project development, operation and maintenance, rural development, technology development, transfer of technology, manufacture and supply of equipment and materials, training and information.

Schematically, the participating units in each country could be seen as follows:



The process of applying the network in the member countries will be based on a reciprocal interaction between the members of the network and the Technical Unit, through the programme of activities.

The outline of the programme of activities should be flexible enough so as to incorporate projects and activities that are of interest to the member countries.

For the activities with a significant national interest component, it is important that the cooperation should not be restricted to a univocal relationship between the interested country and the Technical Unit, but also extended to promote direct links between the institutions belonging to the network, to strengthen the cooperation among the countries in the region.

4. SUGGESTIONS FOR THE MANAGEMENT AND OPERATION OF THE REGIONAL CENTRE

This chapter is of an indicative nature only, considering that the main objectives of the centre, if they have been already drafted, were not known by the author; therefore, it is possible that there could be some incompatibilities with the scope herewith proposed.

4.1. SCOPE

The Regional Centre should have an independent institutional structure but its activities should be closely coordinated with the Regional Network System described in chapter three, considering that the Centre should be an executing agency for the network in activities related to research and development and training.

The functions of the Centre could be divided into Research and Development, Experimental Infrastructure and Training, which are outlined in the following items.

4.1.1. Research and Development

In this field, the Centre could have the following functions:

- Identification of technology development projects of regional interest.
- Execution of technology development projects.
- Design and construction of prototypes
- Testing of prototypes and materials.

The specific fields of technology research that the centre should be capable of developing are:

1. PLANNING AND CIVIL WORKS CONSTRUCTION

- Development of hydrological evaluation methods and models.
- Development of autonomous and automatic pluviometric and hydro-metric stations.
- Typification of civil works components.
- Application of non conventional materials (for penstocks and civil works).

2. MECHANICAL EQUIPMENT

- Design and standardization of turbines.
- Design and standardization of auxiliary elements (gates, grills, valves, etc.)

3. ELECTRICAL SYSTEMS AND EQUIPMENT

- Design and standardization of generators.
- Applied research on design of transmission and distribution systems .
- Development of uniform standards for electrical installations.

4. CONTROL SYSTEMS

- Design and standardization of switch boards and security systems
- Design and standardization of speed regulators and overspeed protection.

5. USE OF ENERGY IN RURAL AREAS

- Development of technologies for productive use of energy (fertilizers, refrigeration, agroindustrial processes, etc.)
- Methodologies for increasing the efficient use of energy.
- Identification of technology development projects of regional interest.
- Execution of technology development projects.
- Design and construction of prototypes
- Testing of prototypes and materials

Some of the specific activities can be derived from the program outlined for the Network System.

It is obvious that the research activities of the Centre should be established taking into consideration the activities that may be carried out by national research institutions and universities of the member countries, to ensure that there is enough compatibility and to avoid duplication of efforts.

4.1.2. EXPERIMENTAL INFRASTRUCTURE

Under this heading are included the laboratory testing and workshop facilities that could be set up within the centre.

The main scope of the experimental capacity that could be developed as part of the Centre should be:

- To provide experimental capacity for supporting the technology development projects carried out by the centre, or by institutions of member countries.
- To provide workshop facilities for prototype manufacturing.
- To provide testing facilities for evaluating prototypes and for testing equipment when requested by the member countries.
- To provide reference standards for metrology and testing.

It is beyond the scope of this paper to define the laboratories and plants to be constructed; therefore, we will restrict ourselves to suggest some of the facilities that could be set up.

1. LABORATORIES

- Materials
- Testing of turbines
- Fluid mechanics
- Electricity (testing of generators and electrical systems and components)
- Electronics
- Control
- Metrology
- Corrosion and erosion

2. WORKSHOPS

- Mechanical shop
- Foundry
- Electrical shop
- Electronic systems assembly

4.1.5. TRAINING FACILITIES

The main tasks of the Centre in terms of training should be :

- To carry on regular post-graduate courses.
- To develop short courses, seminars and meetings on specific matters, in coordination with the network system.
- To carry on regular courses to train teachers required for the national operators and maintenance technicians training programmes.
- To support selected doctoral-level research.
- Specific training of university and technical school professors in disciplines associated with small hydro development.

Also in this case, it would be beyond the scope of this paper, to describe in detail the facilities and services of the centre in terms of training activities; however, the Centre should have available the following:

- Classrooms
- Conference rooms
- Audio visual systems
- Drafting and copying facilities
- Auditorium
- Residential area for professors and students
- Recreational area and facilities
- General services
- Transport facilities.

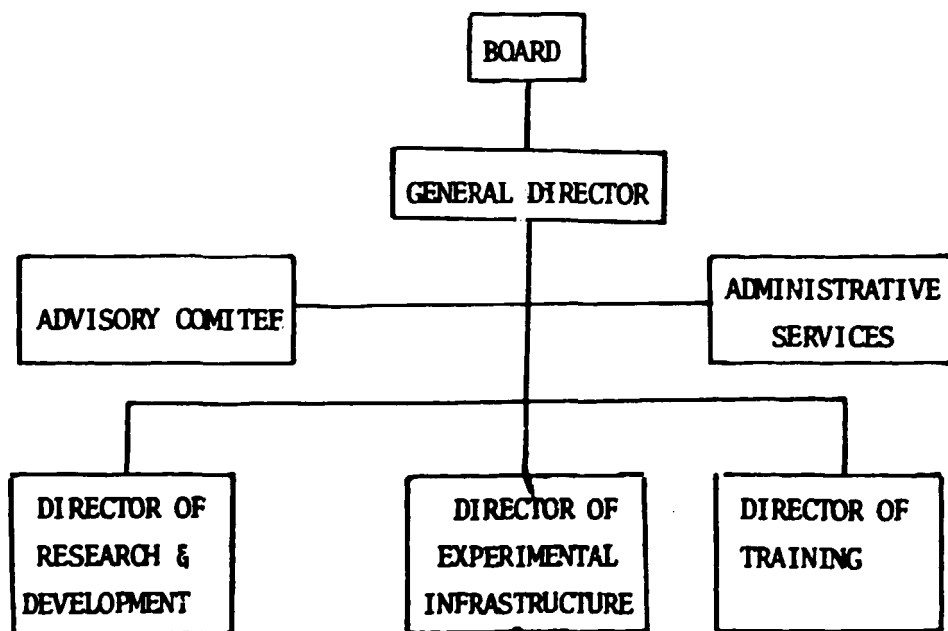
Some of the specific activities that could be initiated by the centre can be identified from the programme of activities proposed for the network system in Chapter 3.

4.2. MANAGEMENT AND OPERATION

The operation of the centre should be autonomous, but its policies and general supervision should be carried out by a board that could be designated by the supporting institutions, the host government and the governments of the participating countries of the region, with a significant representation of ESCAP through the Technical Unit of the Regional Network System. The proportions of the representation of the participants at the Board should be established by consensus.

There should be an executive head of the Centre, who is called "General Director" in this paper and who would be nominated by the Board for a given period of time, but with the possibility of an extended term.

Under the General Director, there would be a group of directors for the three different fields of activities: Research and Development, Experimental Infrastructure and Training.



The area of R & D could be further divided into specialized units of research and design units. The area of Experimental Infrastructure could be divided into various laboratories and shops.

The training area could, in turn, be divided into academic units and organizational units.

5. REQUIREMENTS AT THE NATIONAL LEVEL

The purpose of this chapter is to present check-lists of possible lines of activities at a national level; but to select which activities should be carried out in a given country, it will be necessary to consider the following aspects:

- National policies
- Prospects for development of Small Hydro Power
- Institutional set-up
- Engineering capacities
- Existing experience in the field of small hydro generation
- Research and development capacities and activities
- Industrial set-up and existing productions
- Economic and financial situation and perspectives
- Rural development and electrification.
- Tradition in community participation.
- Availability of materials

It should also be pointed out that some projects can be carried out on a regional basis as described before; some others, as a combination of efforts between different countries; and some, strictly on a national basis.

5.1. DEVELOPMENT OF PROJECTS

Under this heading we consider some of the activities that could be carried out at a national level for the development of investment projects; therefore, these activities range from planning, to actual construction and operation.

CHECK-LIST OF NATIONAL ACTIVITIES FOR PROJECT DEVELOPMENT

- National Plan for Mini and Small Hydro Power Stations
- Programme for evaluation of resources and demand, including specific adaptation of regional methodologies.
- Setting up of a project development unit.
- Promotion of engineering and consultant capacities.
- Definition of construction programmes within the national plan.
- Adaptation of existing design manuals to specific country conditions.
- Institutional and legal set-up for operation and maintenance.
- Promotion and evaluation of community participation in projects.
- Definition of scope and procedures for the preparation of pre-investment studies.

Most of these activities could be carried out by the institution or public enterprise in charge of small hydro development.

5.2 DEVELOPMENT OF TECHNOLOGY AND MANUFACTURE OF EQUIPMENT

The following activities could be considered:

CHECK-LIST OF NATIONAL ACTIVITIES IN TECHNOLOGY DEVELOPMENT AND MANUFACTURE OF EQUIPMENT.

a) Development of Technology

- Design and standardization of equipment:

Turbines

Generators

Speed regulators

Control systems

Auxiliary equipment

Transmission and distribution systems

Electrical components

- Research on materials, corrosion and erosion.
- Application and evaluation of non-conventional technologies and materials for construction:

Soil cement

Ferro-cement

Non-metallic penstocks

Typification and simplification of civil works design.

Auxiliary components (gates and grills)

b) Manufacture of Equipment

- Promotion of the expansion of manufacturing capacities (small and medium-size industries)
- Definition of productive capacity and equipment requirements.
- Establishment of testing facilities and procedures.
- Definition of the process to transfer technology development to the industrial sector.

These activities could be carried out by research institutions, universities and industry, or promoted by the public enterprise in charge of small hydro development.

5.3. INFORMATION AND TRAINING

The following activities could be considered:

CHECK-LIST OF NATIONAL ACTIVITIES IN THE AREAS OF INFORMATION AND TRAINING

a) INFORMATION

- Establishment of a bibliographical register of the existing information on the subject, in libraries, information centres, universities, research institutions and utility companies.
- Preparation of leaflets to promote small hydro development in rural areas.
- Promotion and support of publications on the subject.

b) TRAINING

- Promotion of the inclusion of subjects related to small hydro in the university curriculum.
- Promotion and support of the development of graduate theses, with emphasis on specific project development.
- Organization of short-term specialization courses at the national level.
- Organization of technical schools to train maintenance technicians.
- Organization of schools for operators from rural areas.

