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HUMAN SETTLEMENTS TECHNOLOGY IN LATIN AMERICA



## HUMAN SETTLEMENTS TECHNOLOGY IN LATIN AMERICA

In February 1977 a co-operation agreement was signed by the United Nations Environment Programme and the Office of the Executive Secretary of CEPAL, with the aim of carrying out a Programme on Human Settlements Technology designed to:

(i) advance the knowledge of human settlements technology (HST) within the region;

(ii) promote the research, development and dissemination of HST;

(iii) establish permanent links between users and producers of HST;

(iv) exchange specialized information within the region and with the rest of the world, and

(v) advise the countries of the region in matters dealing with HST and help national institutions to obtain the assistance of international efforts.

In order to achieve these objectives, UNEP and CEPAL established a joint operational unit which operated for more than two years in the CEPAL subregional office in Mexico City. The activities of the group followed four main lines: formation of regional machinery for scientific exchanges among research and development centres in the field of HST; HST demonstration projects; training in this field, and basic research on HST. The present document provides a summary of progress in the Programme, which is scheduled to end in December 1979.

### I. SUMMARY OF ACTIVITIES IN THE PROGRAMME

#### 1. Regional network for scientific exchanges

On the basis of a survey carried out under the Programme, the foundations were laid for an exchange network among HST producer and user institutions. A first directory covering 160 institutions was published in October 1978; at present there is an updated version based on the response to the first publication, and improved as a result of progress in the Programme.

/The survey.

The survey also made it possible to identify some priority areas for research. Subsequently, a consultative meeting, held in August 1978 and grouping together various regional institutions involved in this field, provided an opportunity to engage more broadly and thoroughly in this exercise. Detailed consideration of the situation in one of these areas (low-cost earthquake-proof buildings), discussed in a meeting of experts in August 1979, made it possible to make progress towards the institution of a specialized network for scientific exchanges. A range of papers have also been prepared which attempt to review the present state of knowledge in various of the priority areas identified and deal with the following subjects: heat control, wood construction, solar energy, wind energy, use of adobe in construction, treatment of waste water, water supply, use of rain water, and biogas. All these papers will be distributed among the bodies listed in the directory.

Finally, a list has been drawn up of the research and development projects and the training programmes in the field of HST currently being carried out in the region. The results of these studies will also be distributed through the network.

## 2. Demonstration projects on human settlements technology

In order to generate new experience related to important subjects for research and training in human settlements technology, two demonstration projects on technologies for settlement in the humid tropics and experimental training of middle-level staff for the dissemination of appropriate technologies were prepared in co-operation with a national body.

## 3. Seminars on ecotechnologies for human settlements in the humid tropics

In view of the substantial increase in settlements in areas in the humid tropics at present being recorded in the Latin American region, it was considered important to encourage a discussion between professional and research personnel in the countries which include bioclimatic zones with these characteristics concerning the appropriateness of present patterns of settlement and construction for this environment. To that end a series of texts and visual aids were prepared which served as an input for the discussion of this set of problems and related subjects in seminars. Two

/activities were

activities were carried out in this regard, one in Mexico and one in Cuba, sponsored by national bodies in each host country. In the second case, in addition to Cuban staff, the participants included an official from the Division of Human Settlements and Socio-Cultural Environment in UNESCO, Paris, and various professionals from six other Latin American countries, who received scholarships from the International Centre for Training in Environmental Sciences (CIFCA). Talks have also been held with the Jamaican government concerning the possibility that Jamaica might host a third seminar for the English-speaking countries of the region.

#### 4. Basic research

Since human settlements technology is a new topic in discussion of human settlements in the region, it was deemed important to carry out studies which would make it possible to achieve more rigorous conceptualization of HST and its relationship with the process of settlement and the production of its physical infrastructure. For that purpose contributions were secured from various consultants, who prepared documents on different aspects of the subject. In turn, the information obtained by means of the survey made it possible to draw up a panoramic view of the present state of knowledge in HST. The document was published in preliminary form in May 1978, and subsequently thoroughly revised.

Within the context of this activity it proved desirable to have a methodology for the selection of appropriate technologies which could serve as a support in political decision-making. Thus the fundamental criteria were prepared for a general methodology on the basis of which the countries could draw up their own specific methodologies in the light of their own needs and priorities.

/II. REGIONAL

## II. REGIONAL NETWORK FOR SCIENTIFIC EXCHANGES

From the first discussions on the establishment of the joint UNEP/CEPAL project, it became clearly necessary to establish machinery to link together all those with shared interests in human settlements technology (research and development institutions, agencies devoted to financing, constructing and operating human settlements, individual users and small contractors, and so on).

The project document mentions as immediate objectives "to survey the 'State of the Art' through field work to assess the installed and potential capacity of research centres in the region compared with the present and future users of HST, in order to identify priority areas for action".<sup>1/</sup> In addition, item (vi) of the same section mentions the following objective: "to collect, evaluate and classify information on HST and 'translate' this into a pragmatic form so that its practical application according to the needs of the region is assured".<sup>2/</sup> The efforts towards the establishment of a regional network for scientific exchanges would fall within the framework of the objectives and recommendations forwarded to the Executive Director by the UNEP meeting of experts (Advisory Group Meetings, Nairobi, 6 to 8 October 1975), which included the following: "to identify a global network of leading institutions in the field of HST to be organized on an ecosystem and regional basis; to establish the necessary mechanisms for co-ordinating and promoting the activities of these institutions, and to collect, and disseminate, and make all data in the field readily available".<sup>3/</sup>

Finally, the project description in the same document refers to the following objectives: "to promote the research, development and dissemination of HST; to establish (permanent) links between users and producers of HST, and to exchange specialized information within the region and with the rest of the world".<sup>4/</sup>

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<sup>1/</sup> United Nations Environment Programme, section 2.2.

<sup>2/</sup> Ibid.

<sup>3/</sup> Ibid., section 3.1.

<sup>4/</sup> Ibid., section 3.2.

### 1. Concept and scope of the regional network

The principal objective of the HST/UNEP project is to co-operate with the countries of the region in order to establish permanent machinery for research and development of appropriate technologies for human settlements. In this way, the regional network of producers and users is conceived as an instrument for the achievement of these objectives, capable of creating the necessary conditions for the establishment of flexible machinery between producers and users of HST and to represent a means for the circulation of important information for an interest group.

The network should be progressively built up in the light of the real needs to be identified with a contribution from institutions and experts interested in the subject.

Internally, the network was regarded from the outset as a focus of all the activities developed or aimed at by the Programme or activities which are related to the network or served by it.

### 2. Objectives of the regional network

The following specific objectives have been identified:

- (a) to establish an efficient and practical channel for personal and institutional contacts;
- (b) to facilitate the collection, analysis and dissemination of information related to HST;
- (c) to supply appropriate channels for the dissemination of demonstration and research projects;
- (d) to promote joint activities among centres with common interests;
- (e) to identify national initiatives and provide them with assistance and support, and
- (f) to provide a permanent forum for discussion of technological concepts and criteria appropriate for human settlements.

### 3. Completed stages

To date the Programme has carried out the following activities:

- a regional survey of institutions dealing with the subject;
- preparation of an index of institutions which has been distributed in the region;

/- listing

- listing of research projects on HST;
- preparation of a documentary archive on alternative technologies which concentrates and systematizes specialized information on priority subjects;
- holding of two regional meetings, one consultative in nature (Mexico City, 1978), for the conceptual examination of HST, and the other aimed at establishing a specialized network on low-cost earthquake-proof buildings (Lima, August 1979) and finally,
- a series of contributions received on the subject of the discussions on the formulation of a regional human settlements technology information service project.

(a) Directory of institutions related to human settlements technology

Concerning the objectives of the regional network, the directory facilitates the establishment of efficient, practical and direct contacts among the institutions, in addition to providing a channel for the collection and dissemination of information relevant to HST, and serves as a means for promoting co-operation among similar institutions. Lastly, an updated directory and a standardized system for the handling and classification of information are two of the requirements for the establishment of a regional information system, towards which a number of steps have already been taken.

The first activity of the national network involved a survey of installed and potential capacity of institutions devoted to HST. These institutions included research agencies, HST users and other bodies dealing with the subject. In all interviews were held with 350 officials and researches belonging to 97 institutions. The first version of an index made up of 160 articles was prepared in October 1978, and distributed to more than 300 institutions in the region.

From the outset the directory was conceived as a flexible instrument which could easily be updated in view of the changing conditions in the institutions listed. As a result it has been possible, using about 100 replies, to update the information on many institutions, and contact has been established with many others. The directory now covers almost 250 institutions. Its format will permit constant updating.

/(b) Listing



(b) Listing of HST research projects

Once the institutions whose activities cover HST research and development had been identified, it was necessary to seek further knowledge of their activities, and particularly the lines of research they are pursuing, with the aim of avoiding overlapping and gaps in research, and making it possible to identify joint activities between two or more centres on specific subjects.

To this end questionnaires were distributed among 60 or 80 institutions carrying out technological research activities in the field of human settlements. The response from the institutions was satisfactory; more than a hundred questionnaires were received covering research projects on wood technology, adobe, economic housing, non-conventional energy and seismology.

The responses were classified using the UNITERMINO system so as to include the following information:

- title of the research project;
- institution and official in charge of the project;
- aims of the research;
- results and appraisal;
- staff committed, time, costs, etc.

The Programme will identify one of the appropriate regional bodies so that it can centralize the activities and assume responsibility for keeping the information and operating the network on a permanent basis.

(c) Documentary archive on alternative technologies for human settlements

The establishment of a technological information service in the field of human settlements for Latin America and the Caribbean presupposes the collection and systematization of existing data. One of the areas where it is most urgently necessary to gather information is that of appropriate technologies. A technology is regarded as appropriate when it is best suited to national and local conditions, especially as regards costs, suitability for the climate, use of local resources and skills, and degree of dependence on distant sources of supply.

/The relativity

The relativity which is characteristic of this definition imposes a need for criteria for the selection of technologies, and this makes it necessary to possess information on alternative technologies, among which it is possible to choose by applying specific criteria. The purpose of the documentary archive will be to expand as much as possible the inventory of knowledge available on the subject of alternative technologies for human settlements.

In addition, the information to be accumulated in this archive must be easily transferable to various classes of user within the countries of the region. It is assumed that the users will be research centres, government agencies responsible for public sector programmes, universities and other educational institutions, and institutions for promotion and development whose aim is to make knowledge available to the communities and groups with lower technical skills.

The archive will be made up of series of papers containing information on specific technologies (see the list in the annex), prepared by specialized researchers. Each paper includes:

- a definition of the subject;
- a description of the state of the art in the given technology in the world;
- principal documentary references identified;
- bibliographical references, and
- references to persons and institutions studying the subject.

In order to secure relatively extensive knowledge of an appreciable number of these alternative technologies within a fairly short time, the Programme is preparing an archive with 15 to 20 sections, which it is hoped to complete before the end of 1979. To that end, the time for the preparation of each of the papers has been limited to 2 to 3 months. It is hoped that new research activities can be carried out in the future in order to keep the archive up to date.

The criterion used for the selection of the papers currently in progress was strictly pragmatic, since it depended on the availability of researchers and information. The research subjects in each of these papers refer strictly to alternative technologies for human settlements, especially

/those that

those that deal with building, infrastructure, urban and rural roads, public services, non-conventional energy applied to human settlements and construction materials.

By agreement with CAVEIS-SEHA information on housing technology and design will be handled by that regional institution.

On these subjects the research will be aimed at identifying innovative technologies within and outside the region, including the so-called empirical technologies which can represent alternatives to the conventional technologies which exist in those fields.

(d) Regional meetings

Within the framework of the regional network, the regional meetings play the role of a forum for the discussion of concepts, criteria and experience in human settlements technology, in addition to constituting a highly efficient mechanism for the establishment of institutional and personal contacts.

In addition, and in relation to specialized regional meetings, this activity makes it possible to identify initiatives which can provide guidance and support in the future, and makes it possible for similar institutions to consider possible co-operative projects in research, training and information.

Regional Consultative Meeting on Human Settlements Technology

The objective of this meeting, which was held in Mexico City from 31 July to 4 August 1978, was to gather together a group of specialists engaged in HST research and development and persons connected with operational programmes for the production and distribution of goods and services in order to:

- analyse and discuss the problems involved in the concept and use of human settlements technology in the region;
- to examine the relationship between technological research and the overall development policies of the countries of the region, and
- to recommend forms and arrangements for interagency and international co-operation in this field.

/The subjects

The subjects of the debates, and the results achieved at the meeting, which involved 62 participants, appear in the annex.

#### Meeting of Experts on Low-cost Earthquake-proof Buildings

The purposes of this specialized meeting, which was held in Lima from 13 to 16 August 1979, were:

- to review the state of knowledge in this subject;
- to identify areas of knowledge which have not yet been studied and define priorities for future research in this field, and
- to examine possible lines of co-operative action among the institutions represented.

Invitations to the meeting were issued to a number of specialists from institutions in various countries, who, together with a group of Peruvian experts and participants from various international agencies, examined the agenda items. On the basis of the replies to a questionnaire distributed previously, a summary document was prepared which guided the proceedings. Furthermore, each institution invited offered an outline of its experience in order to facilitate the preparation of a single final information document.

### III. DEMONSTRATION PROJECTS

In accordance with the objective of the Programme, the demonstration projects seek to explore practical ways of linking technological innovation with the real processes of production, in circumstances which are as close as possible to reality. At the same time, it is hoped to obtain results within a relatively short period to permit, in the first place the formulation of recommendations concerning the feasibility of applying the experience generated on a larger scale, and, in general, an addition to the stock of practical knowledge on this subject in the region.

The two demonstration projects described below arose as a result of agreements with the Human Settlements and Public Works Secretariat of Mexico. In this way it was possible to form two joint working groups which were entrusted with the implementation of the projects. In general, the two projects proceeded with some difficulties, which were reflected principally in the delays incurred compared with the original timetable of activities.

#### /1. Ecotechnologies

1. Ecotechnologies for Human Settlement in the Humid Tropics in Mexico (PD Mex I)

In 1977 the General Directorate of Urban Ecology in the Human Settlements Sub-secretariat of Mexico expressed a wish to co-operate with the United Nations Environment Programme (UNEP) in the study and development of ecotechnologies appropriate for population settlements. In that regard, UNEP recommended that the operation should be implemented within the framework of the UNEP/CEPAL Programme on Human Settlements Technology.

The restriction of the project to the humid tropics is a reflection of the growing importance of these zones for the development of the country. Since they constitute a traditionally poorly populated area, the humid tropics in Mexico possess substantial natural resources. Currently the exploitation of these resources has given rise to a high concentration of economic activity in these regions, which have become magnets for large numbers of migrants. This phenomenon involves a type of large-scale settlement in an ecological and cultural environment different from that which has so far served for the majority of the population of Mexico.

For the purposes of the project, the area was defined as that which includes the coast of the states of Veracruz and Tabasco and the Isthmus of Tehuantepec. Within this area, a smaller area was identified for the studies which require more detailed information: the sphere of influence of the towns of Coatzacoalcos and Minatitlán, which will in the near future be the site of a substantial proportion of the industrial activities generated by oil development and the establishment of new related industries.

In general terms, the project aims to obtain in the short term indicative results on the use of ecotechnologies for human settlements in the humid tropics in Mexico. More specifically, the project plans to develop standards and principles for economic design which are culturally and ecologically appropriate for the humid tropics, together with strategies for the application of these standards and principles.

The completed project includes a collection of socio-economic data on the area; a study of empirical techniques developed on the Mexican Gulf coast; an examination of exogenous techniques which can be transferred

/or adapted

or adapted to the area; the identification of specific technological requirements which ought to be reflected in the development of appropriate techniques for the area; practical recommendations for the choice of materials and the development of construction techniques, and strategies for the dissemination of these recommendations.

2. Experimental Training of Middle-Level staff  
for Human Settlements (PD Mex II)

This Project, like the previous one, is being developed jointly with the Human Settlements Sub-Secretariat of Mexico, and the same arrangements have been adopted for its operation - the formation of a joint team to be responsible for the project.

The aim of the project is the establishment, in one of the Mexican states, of an experimental technical assistance network for the communities which provide their own housing, urban infrastructure and services, and an experimental programme for the training of staff required to operate the network (instructors and monitors, community administrators and technical staff for self-help building). The Project also contains provision for a series of training courses, both for the personnel responsible for technical assistance activities and for members of the communities participating in the construction of their habitat.

The project is made up of two phases: the first involves the establishment of the technical assistance system and the preparation of the training programme, and the second experiments and evaluation. The first phase of the project has been carried out; the second is to be entrusted to SAHOP, with advisory services possibly to be provided by an international co-operation agency.

IV. SERIES OF SEMINAR COURSES ON HUMAN SETTLEMENTS  
ECOTECHNOLOGIES IN THE HUMID TROPICS

The series of seminar courses on Human Settlements Ecotechnologies in the Humid Tropics has three types of objective:

- testing of new forms of training of human resources for the identification and selection of appropriate technologies and the dissemination of technological knowledge applied to human settlements;

/- assembling

- assembling of contributions from specialists for the improvement of a methodology to permit identification of appropriate technologies for the humid tropics in Latin America and the Caribbean; and
- dissemination of existing knowledge on a subject which is little known in Latin America despite its considerable ecological, social and economic implications for the region.

The theoretical conceptualization, the preparation of the course material (texts and visual aids) and the conduct of the seminar-courses fell under the direct responsibility of the technical staff of the Programme. For each of the seminar-courses institutional arrangements were made in the host countries with the aim of securing the support required for the holding of the courses.

The seminar-courses were organized in the following way:

In the first phase (one week), the participants were offered theoretical and practical knowledge presented by means of texts and audio-visual material designed to pass on experience drawn from reality and basic theoretical formulations required for its interpretation. This knowledge was reviewed at round tables with the purpose of bringing all the concepts involved into line.

The practical experience (case studies) was presented by the use of films supplied by Visión Hábitat, and slides prepared by technical staff from the Programme. They related to concrete experience in contexts with similar characteristics, so as to permit an evaluation of different degrees of appropriateness of technology to the framework in which it is applied. The theoretical foundation of the material is contained in a number of texts specially prepared for the purpose: Tecnología para el asentamiento humano; Ecología y tecnología de los asentamientos humanos; Desarrollo y hábitat, and Participación comunitaria y tecnología de los asentamientos humanos.

The second phase contains provision for a practical exercise in which the participants will encounter an experience intermediate between theory and practice, through the simulation of a hypothetical case. The exercise in question endeavours to simulate a process in which the participants, divided into groups, act as experts responsible for drawing up technological guidelines to be applied to the construction of a new settlement.

/This activity

This activity is organized on the basis of a document which defines a "scenario", describes the characteristics of a hypothetical context and sets out a series of rules which lay down the conditions and form of organization of the work of the groups into which the participants are split.

Of the series of activities planned - a total of three (Mexico, Cuba and Jamaica) - the first two were carried out between September and October 1978 and in November 1978.

The organization of the first seminar-course benefited from co-operation from the Human Settlements and Public Works Secretariat of Mexico. The seminar carried out in Havana benefited from co-operation from the International Centre for Training in Environmental Sciences (CIFCA) and the Cuban Centro de Estudio y Control de Desarrollo de la Vivienda (CECONDEVI), which assumed responsibility not only for the organization of the seminar-course, but also for the preparation of the educational material and the exhibitions on the theme "Community participation and human settlements technology".

In the seminar-course held in Mexico City, 29 professionals participated representing 19 Mexican institutions connected with the subject of human settlements. The Havana seminar-course was attended by 26 professionals (16 from Cuba and 10 from other Caribbean countries).

In both cases the programme was implemented. Nevertheless, the results of the final operations in the experiments touched upon more technical and operational aspects in the Mexican case, and macro-structural aspects in the Cuban case. In the case of Jamaica the theme of alternative technologies for the production and replacement of construction materials which consume a large amount of conventional energy was defined.

#### V. BASIC RESEARCH

The discussion and dissemination of knowledge mentioned among the objectives of the Programme made it necessary to assign technical staffs to basic research work simultaneously with the rest of their activities. However, this exercise demonstrated its practical usefulness in that the concepts of human settlements and habitat technology are new conceptions which must be theoretically defined on the basis of knowledge of the situation in the region.

/Accordingly, the



Accordingly, the aim of this line of activity was to form a consistent and organized body of ideas, reflections and hypotheses on the basis of the experience and information built up, to permit the study of human settlements technology, its implications and determinants within the Latin American and Caribbean context.

The progress achieved reflects not only the work of the Programme but also the contributions made by the staff in various technical meetings and publications within the region. This activity benefited from the contribution of consultants to clarifying concepts and preparing texts.

On the basis of the growing experience and information built up and the contributions of the consultants, a major effort has been made to organize and systematize ideas concerning the subject in order to draft the final document, which is to examine human settlements technology in the light of its wide range of aspects and implications in the context of Latin America and the Caribbean.

The basic research under the Programme contributed to the preparation of the following documents:

La tecnología aplicada al asentamiento humano en América Latina y el Caribe

This contains an overall view of the present state of knowledge on the subject within the region, installed capacity for technological research and development in the field of human settlements, and the conditions in which the work is taken place; the problems involved in the transfer, adaptation, recovery and generation of HST. An initial version of this document was circulated in the region in 1978. The current version contains substantial changes compared with the initial version.

Marco conceptual para el desarrollo de tecnologías apropiadas para el asentamiento humano

This document endeavours to draw up a position of principle as regards human settlements technology in the region and its social, economic and cultural implications. This essay is intended to stimulate a conceptual debate designed to develop definitions which enjoy support throughout the region.

/Ecología urbana

Ecología urbana y tecnológica

This document, which was presented to the Inter-American Conference on the Financing and Environmental Managements of Human Settlements, seeks to outline the relationship between the natural and social components within the human settlements process characteristic of the region by means of an environmental approach.

Human Settlements in the wider Caribbean

This document, prepared for the Caribbean Environmental Management Programme (ECLA/UNEP), sets out the evolution of the spatial distribution of population and the status of the man-made environment in the Caribbean regions.

Finally, as has already been mentioned, other works focus on the task referred to in this section, including the documents produced for the series of seminar-courses on HST in the humid tropics.

/ANNEX

ANNEX

PRELIMINARY LIST OF TECHNIQUES FOR HUMAN SETTLEMENTS

(Classification categories)

- 0 Information sources
  - 01 Complete indexes by institution (alphabetical)
  - 02 Alphabetical listing of abbreviations for institutions in the official languages, with translations into all the other languages
  - 03 Listing of institutions by areas of work
  - 04 Listing of institutions by country
  - 05 Technical glossaries and dictionaries
  
- 00 Techniques for planning, design, co-ordination and operations in general
  - 010 Planning techniques
  - 020 Design techniques
  - 030 Project co-ordination techniques
  - 040 Project co-ordination techniques
  - 050 Administrative techniques
  - 060 Conceptual framework of technology
  - 070 Technology and employment, labour
  - 080 Studies of costs
  
- 10 Construction techniques with stone materials and inorganic materials in general
  - 110 bricks
  - 120 adobes and similar materials
  - 130 concrete cement
  - 140 alternative cements
  - 150 sulphur technology
  
- 20 Techniques for earthquake-proofing, foundations, flooring and construction in general
  - 210 earthquake-proofing
  - 220 foundations
  - 230 roofs and coverings
  - 240 miscellaneous construction systems
  - 250 flooring

- 30 Construction techniques using wood, fibres and organic materials in general
  - 310 construction using solid wood
  - 320 construction using plywood and fibreboard
  - 330 construction using natural fibres
  - 340 protection and wood finishes
  
- 40 Techniques for the exploitation of energy sources
  - 410 fuels
  - 420 electricity
  - 430 solar energy
  - 440 wind energy
  - 450 energy from natural gases
  - 460 muscular energy
  
- 50 Techniques for water supply and treatment
  - 510 water supply
  - 520 use of rain water
  - 530 treatment of waste water
  
- 60 Techniques for the removal of excreta, the collection and processing of waste and the recycling of materials
  - 610 waste removal
  - 620 collection of solid wastes
  - 630 treatment of solid wastes
  - 640 techniques for recycling of materials
  - 650 use of recycled materials
  
- 70 Techniques of heat control and climatic control in general
  
- 80 Techniques for public transport and transport in general
  - 810 public transport
  - 820 private transport
  - 830 transport of non-perishable goods
  - 840 transport of perishable goods
  
- 90 Techniques for ecological development, rural technology and miscellaneous techniques
  - 910 urban agriculture
  - 920 ecodesign
  - 930 rural technology

