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WATER RESOURCE DEVELOPMENT: PROGRESS IN THE IMPLEMENTATION OF
THE MAR DEL PLATA ACTION PLAN AND THE INTERNATIONAL
DRINKING WATER SUPPLY AND SANITATION DECADE IN
LATIN AMERICA AND THE CARIBBEAN

Note by the Secretariat

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A. BACKGROUND

At the eighteenth session of the Economic Commission for Latin America and the Caribbean, held in La Paz in April 1979, it was resolved to entrust the permanent responsibility for the promotion of the implementation in Latin America of the Mar del Plata Action Plan adopted by the United Nations Water Conference to a Sessional Committee which would have the following functions:

- "(a) to assume the central role referred to in the Mar del Plata Action Plan, by reviewing relevant aspects of the work carried out and planned in the various water programmes of the United Nations system and other international organizations;
- (b) to encourage and undertake research to improve knowledge of water resources and the possibilities of developing them;
- (c) to encourage and conduct training activities on topics related to water resources" (resolution 411 (XVIII)).

The second meeting of the Sessional Committee on Water took place during the twentieth session of the Commission in Lima, Peru, in April 1984. At this meeting, the Committee considered and adopted the work programme to be followed by the Secretariat in continuing its activities in support of the implementation of the Mar del Plata Action Plan at the regional level and specifically recommended that priority should be given to activities in support of the International Drinking Water Supply and Sanitation Decade and horizontal co-operation.

B. WORK IN THE FIELD OF WATER RESOURCES SINCE THE MEETING OF
THE SESSIONAL COMMITTEE AT THE TWENTIETH SESSION

The work of the Secretariat over the last two years has been concentrated in the following areas: (i) follow-up to the implementation of the Mar del Plata Action Plan at the regional level; (ii) identification and promotion of horizontal co-operation in the field of water resources; (iii) support for the co-ordination of activities on water resources at the regional level; (iv) promotion of the achievement of the objectives of the International Drinking Water Supply and Sanitation Decade (IDWSSD); (v) undertaking of a study of water resource management in mountain watersheds, and (vi) support for governments in water resource development in Central America.

1. Follow-up of the implementation of the Mar del Plata
Action Plan

At the twentieth session of the Commission, the Secretariat presented to the Committee a report on progress made in the application of the Mar del Plata Action Plan in Latin America and the Caribbean. After the meeting, the report was revised in the light of comments received from governments and has now been issued in the series "Estudios e Informes".1/

Unfortunately, due to the loss of the regional adviser post the number of missions carried out by the Secretariat dropped compared with the previous period although the Secretariat has nevertheless carried out missions or visited the following countries of the region: Argentina, Chile, Colombia, Costa Rica, Haiti, Netherlands Antilles, Peru and Uruguay.

As requested at the last session, the Secretariat has prepared a report aimed at "supporting national and regional projects relating to the planning and administration of water resources at the national level".^{2/} The report is based on a comparative analysis of national or regional water resource management plans, at different levels of preparation, from the following countries: Brazil, Colombia, Dominican Republic, El Salvador, Honduras, Jamaica, Mexico, Peru and Venezuela. In general, the analysis is limited to multisectoral plans but reference is also made to sectoral plans, especially for water supply, energy and agriculture.

ECLAC hopes that this study will facilitate water management in the countries of the region by increasing knowledge of the experience of others. The Latin American Centre for Economic and Social Documentation has prepared a summary of the plans consulted, for publication in its series PLANINDEX.

At the ninth session of the Committee on Natural Resources of the United Nations Economic and Social Council it was decided that, at the tenth session of the Committee, water resources would be the main subject of discussion. The Secretariat has been asked to contribute to the preparation of a report on the progress made in the implementation of the Mar del Plata Action Plan. In the past, the preparation of these reports has been based on questionnaires circulated to governments. It has been decided, however, that it would not be desirable to follow the same procedure for this report. Previously, replies to questionnaires provided information on general trends, but the analysis that could be made was always rather superficial. The Secretariat would like to ask governments, therefore, to consider the possibility of preparing a short report on the situation regarding the implementation of the Mar del Plata Action Plan in their country before the end of 1986. On the basis of these reports the Secretariat would then prepare a summary for inclusion in the global report to the Committee on Natural Resources.

2. Horizontal co-operation in the field of water resources

With generous assistance from the Government of the Federal Republic of Germany, the Secretariat is undertaking a project entitled "Co-operation of Developing Countries in Latin America and the Caribbean on the Management of Water Resources - Phase I". The objectives of the project are:

(i) identification of possible alternatives for implementing technical co-operation among national bodies responsible for the operation of water resource projects; (ii) evaluation of options for improving project management training in the region by promoting the organization of regular training courses, to be given in existing specialized international and national centres. These courses should emphasize operation and maintenance

and the conservation of natural resources, especially water, the soil, plants and animals; (iii) study of the possibility of establishing an information systems on water resource project management, with emphasis on the operation and maintenance of water system and the management and conservation of natural resources related to the project.

Work has begun on the project to:

(i) identify the most significant features in the operation of water management systems which could be included, at the request of interested governments, in a system of horizontal co-operation;

(ii) undertake a comparative study of the main operational features of selected water systems, with emphasis on the operational aspects of the management of large infrastructure works constructed for water control and of the natural resources associated with these works.

It is planned to complete the draft final reports on the studies by early 1987 and to hold meetings to discuss the formation of a system for co-operation in the management of complex water systems in the light of these reports later in the same year.

The Secretariat has also begun the development of a project to promote co-operation among the countries of Latin America and the Caribbean in the development of appropriate software for microcomputers in the field of water resources.

A preliminary survey, by questionnaire, of the degree of application of computer processes to the field of water resources was made in 1984. A further questionnaire was sent out in 1985.

A report on the results of the first survey has been prepared and distributed among the institutions included in the survey. A copy of this report is appended to this note as Annex 1.

The results of this survey show that, although at the time of the survey computers were not used in a quarter of the institutions surveyed, they are of increasing importance in the work of water management and planning institutions of the region. The institutions which did not have computers nevertheless recognized the need to acquire them. The survey also shows the potential gains from co-operation among the countries and institutions of the region given the wide variations in access to computers and the related software.

During this biennium, on the basis of the results of the two surveys, it is planned to develop a project for the promotion of co-operation in this area.

3. Support for the co-ordination of activities on water resources at the regional level

Contacts have been maintained with the United Nations and other international agencies active in the field of water resources in Latin America and the Caribbean for the purpose of better co-ordination of activities. Due to general budgetary restrictions it has not proved possible to hold a meeting of the Inter-Secretariat Working Group, but a meeting will be held within the session of the Commission.

Members of the secretariat have participated in meetings of the ACC Inter-Secretariat Working Group for Water.

4. Promotion of the achievement of the objectives of the International Drinking Water Supply and Sanitation Decade (IDWSSD)

In general, despite the negative impact of the recession on levels of public investment, progress towards the achievement of the goals of the IDWSSD has continued, although it is true that the activities undertaken within the IDWSSD in most countries of the region have been built on progress made since the early 1960s rather than on the launching of new initiatives.

The situation varies from country to country, but in most countries of the region the priority given to the sector has increased; this is reflected, particularly, in the expansion of rural water supply and urban sanitation. Generally speaking, less progress is to be observed in urban water supply (however, provision of this service is already relatively high) and in rural sanitation, where few organized programmes exist in the region.

The actions being taken in relation to the IDWSSD are not limited to the extension of water supply and sanitation services, important though this is. There has been much action in other areas, such as institutional improvement, better use of existing infrastructure through improved maintenance, and increased staff training at all levels. At the same time, despite the progress, there is no reason to be too optimistic. Many of the constraints identified at the beginning of the IDWSSD remain, including weaknesses in the institutional infrastructure (particularly for rural areas), severe limitations on resources (including lack of external assistance), shortages of trained personnel, failure to promote community awareness and participation in water supply and sanitation concerns, and a general lack of comprehension of the importance of water supply and sanitation for environmental health and as an important element in primary health care.

The Secretariat has maintained close contact with the Pan American Health Organization and the United Nations Development Programme and participated in joint activities related to the IDWSSD such as seminars, workshops and joint missions. The importance of improving programmes

directed towards the rural population, and especially that part of the rural population living dispersed in the countryside, has been an area of particular concern.^{3/}

5. Water resource management in mountain watersheds

With the aid of the Government of Italy, ECLAC is conducting a project on "Planning and management of water resources and mountain watersheds in Latin America".

The project's objective is to foster technical co-operation among countries of the Andean zone with a view to improving planning and management machinery for the utilization and regulation of water resources in mountain watersheds. To this end, the countries of the Andean zone were the first working sites to be considered, especially Peru, Ecuador, Colombia and Venezuela.

Project activities include the following:

(i) identifying and classifying the major Andean-zone programmes and projects whose purpose, either directly or indirectly, is to improve the utilization and regulation of water resources in mountain watersheds;

(ii) assessing, on the basis of case studies, the planning and execution of such programmes and projects;

(iii) conducting a comparative analysis of the different planning and management methods used, with a view to formulating recommendations for transmitting experience from one programme to another;

(iv) drafting a methodological guide on planning and management in mountain watersheds;

(v) calling together a group of experts to determine the possibility of setting up technical co-operation machinery.

The project has made considerable progress in a number of areas: these include establishing contacts and securing commitments to participation among experts and specialized institutions; preparing and adopting a frame of reference for the drafting of a manual on the development and management of Andean watersheds; formulating a frame of reference for country case studies, and providing general technical assistance in connection with watershed development and management.

Some of the most significant advances which have been made are the following:

(i) co-ordination between ECLAC and the Board of the Cartagena Agreement (JUNAC) as regards carrying forward various phases of the project which are of common interest;

(ii) an assessment and diagnostic study of programmes and/or projects designed and conducted for the purpose of promoting the utilization of mountain watersheds in Peru;

(iii) support in connection with the holding of a seminar on development strategies for the Peruvian Sierra.

6. Water resource development in Central America

Work in this biennium has concentrated on the evaluation of water resources in Central America, 1970-1990. A final report on this project is under preparation. Support has been given to the execution of a study to assist in the preparation of a regional programme for Central America, on irrigation and drainage, while advisory missions have been sent to individual countries.

C. THE WORK PROGRAMME 1986-1987 4/

In response to suggestions made during the twentieth session of the Commission, the presentation of the work programme in water resources has been simplified. For the next two bienniums, and perhaps from then on, the programme will only contain two elements. These two elements, however, subsume all the activities reflected in separate elements in earlier years.

1. Follow-up of the implementation of the Mar del Plata Action Plan

During this biennium activities under this element of the work programme will concentrate, at the request of governments, on the provision of assistance in carrying out activities related to the implementation of the Action Plan at the regional level in the areas of policies, planning and the rational use of water resources.

It is planned to continue support for activities related to the IDWSSD, particularly in the promotion of the diffusion of policies for the supply of drinking water and sanitation services to the dispersed rural population.

In addition, efforts will continue with a view to improving the co-ordination of the relevant activities carried out in the field of water resources in Latin America and the Caribbean by the specialized agencies of the United Nations and other international and regional organizations in support of the Mar del Plata Action Plan (MAP).

Contributions will also be made to reports on the implementation of the MAP prepared for the Committee on Natural Resources of the Economic and Social Council of the United Nations and other activities of the Inter-Secretariat Working Group for Water Resources.

2. Horizontal co-operation in the field of water resources

The activities of the Water Resources Unit will give major emphasis to the promotion of horizontal co-operation in this period. The projects to be carried out have already begun:

(a) Planning and management of water resources in mountain watersheds in Latin America, with support of the Italian Government.

(b) Co-operation of developing countries of Latin America and the Caribbean in the management of water resources - Phase I, with the support of the Government of the Federal Republic of Germany.

At the same time, efforts will continue with a view to promoting co-operation in the development of appropriate software for the use of micro-computers in the water resources field.

D. PROPOSED WORK PROGRAMME 1988-1989

The priority areas will be the development and dissemination of methodologies for integrated water management, the development of an information system on relevant water resource development activities of the international agencies in order to improve co-ordination at the regional level, and the implementation, in co-operation with and at the request of governments, of a training programme to impart new techniques of water management.

1. Follow-up of the implementation of the Mar del Plata Action Plan

In this biennium, work will concentrate on the preparation of reports for the Water Committee at the Twenty-second session of the Commission in 1988, production of a new edition of "The Water Resources of Latin America and the Caribbean and their Utilization", and execution of a study of the progress achieved in the region during the IDWSSD, to mark the end of the Decade.

Work will continue in support of water resource management in Central America.

2. Horizontal co-operation in the field of water resources

It is expected that the major projects undertaken in 1986-1987 will be completed by the end of that biennium. It is also expected, however, that the co-operation networks established through these projects will generate follow-up activities and studies.

In addition, it is anticipated that a new form of co-operation will be developed in relation to software for microcomputers.

Notes

1/ ECLAC, The Water Resources of Latin America and the Caribbean and their Utilization, "Estudios e Informes de la CEPAL" series, No. 53, 1985.

2/ ECLAC, The Formulation of Water Resource Management Plans in Latin America and the Caribbean, LC/G.1391 (SES.21/20).

3/ See for example, ECLAC, Drinking Water Supply and Sanitation for the Dispersed Rural Population in Latin America (LC/R.444), 17 June 1985.

4/ The resources to be devoted to the programme are shown in Annex 2.

Annex 1

**REPORT ON THE USE OF COMPUTERS BY INSTITUTIONS ENGAGED IN THE MANAGEMENT,
USE AND CONSERVATION OF WATER RESOURCES IN
LATIN AMERICA AND THE CARIBBEAN**

USE OF COMPUTERS BY INSTITUTIONS ENGAGED IN THE MANAGEMENT,
USE AND CONSERVATION OF WATER RESOURCES IN
LATIN AMERICA AND THE CARIBBEAN

At present the development of low-cost microcomputers makes it possible for them to be put into general service in the administration of water resources at any level in the countries of Latin America and the Caribbean. Unquestionably there will be a steady increase in the use of microcomputers in the field of water, which means that the demand for programmes adapted to the needs of the countries of the region on information systems, mathematical models and other applications needed to improve the management of water systems will also increase. Furthermore, for some time now (with the help of international bodies) many activities related to the introduction and application of computer processes for the analysis of problems related to water, data processing and storage and the preparation of various kinds of models have been carried out within the countries.

With a view to determining the degree of application of computer processes to the field of water resources as a result of these efforts, ECLAC recently carried out a survey on the subject among institutions working in this field in the region. The findings of this survey are analysed below.

I. INSTITUTIONS SURVEYED

Table 1 shows that answers were received from institutions belonging to 17 (65.4%) of the 26 countries to which the survey was sent.

Considering the institutions separately, we see that 36 (37.5%) of the 96 institutions to which the questionnaire was sent provided the information requested.

The institutions selected to receive the questionnaire are engaged in a broad range of activities connected with the various aspects of water management and use, so that the replies obtained do not reflect the activities carried out but rather show how widely computers are used in connection with water resources in the region (see table 2).

The majority of the institutions indicate that they have responsibilities or carry out activities at national level within the country. Thus, they are institutions of sufficient importance to support the assumption that the opinions expressed by them through the questionnaire are representative of the general situation in Latin America and the Caribbean.

Table 1

QUESTIONNAIRES SENT AND REPLIES RECEIVED,
BY COUNTRIES AND INSTITUTIONS

Country	Number of institutions	
	Surveyed	Responding
Argentina	6	1
Barbados	2	-
Bolivia	5	1
Brazil	6	2
Chile	2	1
Colombia	5	5
Costa Rica	5	3
Cuba	2	-
Dominican Republic	4	1
Ecuador	8	2
El Salvador	6	2
Guatemala	4	-
Haiti	1	-
Honduras	4	2
Jamaica	1	-
Mexico	4	2
Nicaragua	4	2
Panama	3	1
Paraguay	2	-
Peru	9	6
Saint Lucia	1	-
Saint Vincent	1	-
Suriname	1	-
Trinidad and Tobago	2	1
Uruguay	6	2
Venezuela	2	2
Total	96	36

Table 2

INSTITUTIONS WORKING IN THE FIELD OF WATER
RESOURCES, BY SUBSECTOR

Subsector	Number of institutions active in the subsector <u>a/</u>
Planning	16
Agriculture and stock raising	12
Health (drinking water)	15
Data collection and processing	9
River basin management	12
Energy	10
Industry	1
Unspecified	1

a/ Some institutions are active in more than one subsector.

II. COMPUTERS

Seven of the 36 institutions which answered the survey do not have a computer (see table 3). The other 29 have one or more computers ranging from main-frame, small or medium-sized to microcomputers (see table 4). In addition, some institutions have access to computers in other government or university departments, either directly or by means of remote terminals. For example, in Argentina the Ministry of Public Works and Services has an interconnected system consisting of four Digital VAX-11/780 and 760 main-frame computers, which are used within the Ministry itself and in the National Institute of Water Science and Technology, in addition to other computers located in various departments of the Ministry.

Table 3

INSTITUTIONS AND COMPUTERS

Institutions	Number	Relative distribution (%)
With computer	29	80.6
Without computer	7	19.4
Total	36	100.0

Table 4

KINDS OF COMPUTERS

Size of computer	Number	Relative distribution (%)
Main-frame	18	15.4
Small or medium-sized	53	45.3
Microcomputer	46	39.3
Total	117	100.0

In table 5 it may be observed that in general there are more computers in the central offices than in departments, except in the case of medium-sized computers, a larger percentage of which are found in the latter. This, however, is because one institution, in Mexico, has 31 mini-computers in its departments, so that this percentage cannot be regarded as representative. It should also be noted that one institution, in Colombia, is installing 16 microcomputers in its departments. These cases illustrate the demand for data processing by microcomputer.

Table 5

DISTRIBUTION OF COMPUTERS AMONG CENTRAL OFFICES
AND DEPARTMENTS

Size of computer	Total number	Location			
		Central office		Departments	
		Number	(%)	Number	(%)
Main-frame	18	13	72.2	5	27.8
Small or medium-sized	53	14	26.4	39	73.6
Microcomputers	46	39	84.8	7	15.2
Total	117	66	56.4	51	43.6

Finally, table 6 shows the distribution of existing computers by memory capacity. It may be seen that the large majority of computers have a capacity of at least 515 kilobytes, reflecting the predominance of mini- and microcomputers. Many makes of microcomputers are represented here (see table 7). It should be noted that such a large variety may preclude the exchange of software programmes.

Table 6

CAPACITY OF EXISTING COMPUTERS

Declared memory capacity (kilobytes)	Main-frame	Small or medium-sized	Micro
Over 5 000	1	-	-
5 000	3	-	-
4 000	4	-	-
3 000	-	-	-
2 000	6	-	-
1 000	3	3	-
512-1 000	1	1	2
512	-	42	1
256	-	3	3
128- 152	-	-	1
128	-	1	-
84	-	-	2
64	-	1	12
48- 64	-	1	-
48	-	1	3
32	-	-	4
Unspecified	-	-	18
Total	18	53	46

Table 7

MAKES OF MICROCOMPUTERS

Microcomputers used	Absolute frequency
RADIO SHACK TRS-80	10
COBRA 305, 400	8
HEWLETT PACKARD Models: 30, 85 and 87 9830, 9850A	7
APPLE II	4
CROMENCO	2
TEXAS PC	2
WANG 2000 MVP	2
NCR 199, 399	2
DIGITAL PDP 11/34	1
DIPEX LCT-1123	1
FUJITSU MICRO	1
IBM - PC	1
KINSLEY 32K	1
NEC/APL	1
OSBORNE I	1
PRIME 550	1
TECTRONIC	1
Unspecified	1
Total	46

III. KINDS OF PROCESSING PERFORMED

The computers are used for various kinds of processing within institutions concerned with water resources, but close to 50% of the functions for which they are used involve the processing of technical, scientific or mixed technical-scientific data. The other area in which their use is concentrated is administration (see table 8).

Table 8

DISTRIBUTION OF PROCEDURES PERFORMED ON COMPUTERS

Procedures performed	Number of times mentioned
Processing technical and/or scientific information	28
Management and/or administration	16
Word processing and data printing	6
Other kinds of processing	4
Total number of institutions (of the 36 surveyed) which use mathematical models	26

Within the various types of data processing there is also a wide variety of applications, which probably reflect the specific interests of the different institutions (see table 9).

Table 9

USE OF MATHEMATICAL MODELS

Field of application of the mathematical models used	Number of times mentioned
Statistics and probabilities	22
Precipitation and flows	19
Operation of reservoirs	13
Ground water	13
Hydrogrammes	12
Linear programming	12
Hydraulic structures	11
Droughts and floods	10
Sediments	7
Other (unspecified)	13

The variety of application of the mathematical models used would appear to indicate that the models may also differ from country to country or from institution to institution.

As is shown in table 10, a high percentage of the models originate in the institutions themselves, which would indicate that the institutions have the scientific capacity needed to develop them. However, the degree to which

experience is exchanged among them or to which they co-operate is low at the regional level. There is more exchange with institutions in the United States and Europe.

Table 10

PLACE OF ORIGIN OF THE MATHEMATICAL
MODELS APPLIED a/

Place of origin of models	Number of times mentioned
The institutions itself	19
Other institutions in the country	3
Other institutions in Latin America	0
Institutions in other countries or regions:	
USA	11
Europe	8
Unspecified	10

a/ In some cases models with more than one place of origin are used.

Ten (27.8%) of the institutions which answered the questionnaire indicated that they are not using models. The reason they give is that they are unable to produce and operate them or that they do not know where to obtain them.

IV. FINAL COMMENTS

Although computers are not used in over one-fourth of the institutions surveyed, it may be concluded that they are very important in the development of the work of institutions dealing with water resources in Latin America and the Caribbean. The models applied and the programmes designed are undoubtedly of enormous help in conducting the activities of these institutions. This is shown by the fact that all those institutions which do not use models indirectly express a need for them. The fact that they cannot obtain, produce or operate them fully justifies the carrying out of activities for the exchange of experience, such as conducting surveys of the kind which gave rise to this preliminary report, disseminating the report itself, and carrying out surveys in the future, as well as holding courses or meetings of experts in which these methodologies can be explained. The lack of communication among institutions makes it all the more necessary for them to share their experience in this field.

Annex 2

WATER RESOURCES SUBPROGRAMME: RESOURCE
REQUIREMENTS, 1986-1987

WATER RESOURCES SUBPROGRAMME: RESOURCE
REQUIREMENTS, 1986-1987 a/

Regular budget: US\$ 550.300

Regular posts:	<u>Santiago</u>	<u>Mexico</u>
Professional	2	1
General Service	2	1
Total	<hr style="width: 100%; border: 0.5px solid black; margin-bottom: 2px;"/> 4	<hr style="width: 100%; border: 0.5px solid black; margin-bottom: 2px;"/> 2

Official travel:	<u>US\$</u>
Travel related to reseach in the water resources field and actions complementary to the execution of the Mar del Plata Action Plan	5 500
Travel related to the promotion of horizontal co-operation in water resources	9 000
Total	<hr style="width: 100%; border: 0.5px solid black; margin-bottom: 2px;"/> 14 500

a/ Taken from United Nations, Proposed Programme Budget for the Biennium 1986-1987, Volume 1, A/40/6.

Annex 3

DOCUMENTS PREPARED 1984-1985

DOCUMENTS PREPARED 1984-1985

A. Publications

- "The Water Decade and Development in Latin America", Water Quality Bulletin, Volume 9, No. 2, April 1984.
- The Water Resources of Latin America and the Caribbean and their Utilization, "Estudios e Informes de la CEPAL" series, No. 53, October 1985.

B. Documents

- Ordenamiento de recursos hídricos y modelos matemáticos en América Latina y el Caribe, (E/CEPAL/R.344/Rev.1), 19 January 1984.
- La Comisión Económica para América Latina y los recursos hídricos, (E/CEPAL/R.350), 1 February 1984.
- Women and the International Drinking Water Supply and Sanitation Decade in Latin America (E/CEPAL/R.329), 21 February 1984.
- Manual de desarrollo y manejo de cuencas alto andinas: Marco de referencia para su ejecución (E/CEPAL/R.364), 9 July 1984.
- Use of Computers by Institutions engaged in the Management, Use and Conservation of Water Resources in Latin America and the Caribbean, April 1985.
- Drinking Water Supply and Sanitation for the Dispersed Rural Population in Latin America (LC/R.444), 17 June 1985.
- Transacciones ambientales en el campo de los recursos hídricos (LC/L.364), 13 December 1985.

