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### PROCEEDINGS OF THE 18TH CARIBBEAN WATER ENGINEERS' CONFERENCE WATER AND SANITATION IN THE CARIBBEAN BEYOND 1990

Volume I

Basseterre, St. Kitts, West Indies  
1-3 November 1989

ENVIRONMENTAL HEALTH PROGRAM

WASHINGTON, D.C.

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PROCEEDINGS OF THE  
18th CARIBBEAN WATER ENGINEERS' CONFERENCE

Water and Sanitation in the Caribbean Beyond 1990

Volume I

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## LIST OF ABBREVIATIONS

CBWMP	Caribbean Basin Water Management Project
CDB	Caribbean Development Bank
CEHI	Caribbean Environmental Health Institute
CIMH	Caribbean Institute for Meteorology and Hydrology
HRD	Human Resources Development
PAHO/WHO	Pan American Health Organization/World Health Organization
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
UNDICD	United Nations Department of Technical Cooperation for Development

## ACKNOWLEDGMENT

The Conference is part of a global effort, the primary objective of which is for the developing countries to design effective water supply and sanitation strategies for the 1990's. The Conference gratefully acknowledges all those whose support has led to its successful realization, in particular the Collaborative Council of External Support Agencies of which WHO is the Secretariat for its guidance and financial support. The Conference also acknowledges the contribution of the Caribbean Development Bank for sponsoring the participants from the Eastern Caribbean countries and the Pan American Health Organization/World Health Organization (PAHO/WHO) for organizing and managing the Conference. Special acknowledgment is given to the Government of St. Christopher/Nevis for hosting the Conference and for the courtesies extended to all the participants.

## EXECUTIVE SUMMARY

i) The 18th Caribbean Water Engineers' Conference jointly sponsored by the Water Department of St. Christopher-Nevis, PAHO/WHO, Caribbean Development Bank, Collaborating Council of External Support Agencies, was convened at the Fort Thomas Hotel in Basseterre, St. Kitts, West Indies, on 1-3 November 1989.

ii) Representatives from sixteen countries of the Caribbean Region participated in the Conference. The International Organizations represented at the Conference included: the World Health Organization (WHO), the Pan American Health Organization (PAHO), the United Nations Development Program (UNDP), and the World Bank. UNICEF was unable to attend the Conference, but in a message to the Conference, UNICEF reaffirmed that in collaboration with other agencies it will continue its support to the water supply and sanitation sector in the Caribbean Region. Regional institutions: Caribbean Community Secretariat (CARICOM), the Caribbean Development Bank (CDB), the Caribbean Institute for Meteorology and Hydrology, the Caribbean Environmental Health Institute (CEHI), involved in the development of the water supply and sanitation sector played an active role at the Conference. Private companies and manufacturers were represented by staff from their head office abroad and/or from their offices in the Region. The complete list of participants is attached as Annex 1.

iii) Conference's documentation included: Consultant Report on the Water Supply and Sanitation Sector in the Caribbean; specialized reports by the Pan American Health Organization and the Caribbean Development Bank; technical papers on relevant Caribbean issues; external support agencies statements; and country statements on National Status of Water and Sanitation and priority issues and programs for 1990's. The latter which provide up-to-date information on the water supply and sanitation sector in the countries of the Region are part of Volume II of the Conference proceedings.

iv) Conference's methodology consisted of plenary sessions and working group discussions on the following four topics: (1) Program Support: institutional and human resources development, information, community participation (Group I); (2) Financing, Cost Recovery (Group II); (3) Water Resources and Quality Management; and (4) Waste Water Management (Group IV), in accordance with Conference's Agenda which is appended as Annex 2.

v) The Conference defined the objectives to be achieved for the countries in the Caribbean during the 1990's as follow:

Program Support: institutional and human resources development, information, and community participation: to provide the water supply and sanitation agencies with trained manpower in terms of categories, number, and quality required to deliver services as an important contribution to institutional development; establish a centralized, computerized data bank as a tool of management to collate, store, retrieve and disseminate relevant information; and further promote public education to ensure community involvement and participation prior to the formulation of project proposals.



**Financing Cost Recovery:** to ensure the following: the sustainability of agency; funding of capital cost investment; expansion of facilities; achievement of financial autonomy by the agency; provision of improved service to consumers; and establish systems for identifying the cost of the service provided in order to ascertain that revenues generated are adequate to support sector operation and remain in the sector.

**Water Resources and Quality Management:** to ensure State control of exploitation of water resources; reduce unaccounted-for water to a maximum of 25 percent over the next Decade; develop a centralized inventory of water resources to facilitate accurate planning, design and allocation of water resources; ensure the supply of safe water to the consumer; and optimize the use of developed water resources.

**Waste Water Management:** to improve public health by reduction of water pollution and excreta related diseases; protect surface and ground waters, as well as coastal and marine ecosystems; protect fisheries; preserve the tourist industry; and improve public awareness and community involvement.

vi) Conference's concluding statements and major recommendations are as follows:

**Institutional and Human Resources Development, Information and Community Participation.** The Conference asserted that these are important considerations which need to be reemphasized in all water supply and sanitation programs and projects contemplated for execution during the 1990's, and recommended, inter-alia that the following be undertaken: formulation of HRD policy aimed at achieving objective of responsible agency; promote manpower planning to determine categories, number, quality of employees required to deliver services; clearly define mandates of agency which, in turn, should concentrate on core functions; elaboration of agency's personnel management system as an important input to institutional development; carry out investigations to determine existing manpower resources and turnover rates; establish centralized, computerized data bank as a tool of management; and further promote public education to ensure community involvement prior to the formulation of project proposals.

**Financing, Cost Recovery:** The Conference affirmed that financing and cost recovery are important for the water supply and sanitation sector to ensure the sustainability of the agency, in line with the above objective. To this end, the following recommendations are made: establish statutory status for water utility/agency; aiming at financial, autonomy/self-sufficiency; design of uniform methodology for developing tariff structures; and examination of comparative costs of water in the Caribbean.

**Water Resources and Quality Management:** The Conference asserted that it is imperative that the State exercise its authority for the protection and ownership of water resources. This is to be achieved through the following: formulation of policy for the protection of ground water, water conservation; enactment of legislation to define surface water rights; licensing for extraction of ground water and the disposal of wastewater, including the identification of agency or determination of mechanism for enforcing legislation; and preparation and implementation of leak detection and public health education programs.

vii) Waste water management, including excreta disposal have been given low priority because of the economic conditions of the Caribbean countries, lack of understanding of the adverse environmental impacts created, and lack of knowledge of available technologies which have resulted in the degradation of the human and natural environment, hence, the pressing need to tackle this problem during the 1990's; more specifically, the Conference recommended the following: development of policy and master plan; examination of potential of waste water as a resource, e.g., reuse; design some effective strategy to deal with waste water disposal created by developments such as hotels; development of uniform quality standards for the marine environment.

viii) Foremost among the recommendations made by the Conference is the need to include disaster preparedness in planning water supply and sanitation projects which are contemplated for execution during the 1990's.

ix) Activities for follow-up and periodic evaluation include: (1) early preparation of Conference proceedings for submission, within a month, to CARICOM, WHO/Headquarters in Geneva, and countries; (2) early designation of a Task Force or Steering Committee to translate Conference recommendations into a meaningful action plan to be presented to the Caribbean Consultative Forum.

## CHAPTER I

### 1. INTRODUCTION

#### 1.1 Particulars of the Conference

##### 1.1.1 Venue, participants and sponsors

The 18th Caribbean Water Engineers' Conference jointly sponsored by the Water Department of St. Kitts/Nevis, PAHO/WHO, Caribbean Development Bank, Collaborating Council of External Support Agencies was convened in Basseterre, St. Kitts, and attended by: (a) representatives from sixteen countries of the Region; (b) staff of WHO/PAHO, UNDP and CDB; (c) personnel of regional institutions such as CARICOM, CIMH, CEHI; (d) representatives from external support agencies: Canadian High Commission, Commission of European Communities, French Mission of Cooperation and British Development Division in the Caribbean; and (e) private companies and manufacturers representatives.

##### 1.1.2 Background

Water supply and sanitation has a long and progressive history of development in the Caribbean Region. As early as the mid-1960's, yearly meetings were convened and attended by water engineers to discuss specific topics and exchange information and experiences on the water supply and sanitation sector. This collaborative effort was further strengthened ever since the United Nations launched the International Drinking Water Supply and Sanitation Decade (IDWSSD) in November 1980. In response to IDWSSD, the developing countries of the world committed themselves together with donor agencies and external support agencies (ESA) to promoting water supply and sanitation developments as a top priority.

##### 1.1.3 Conference's objectives

The objectives of the Conference were: (a) "to examine water/sanitation sector achievement during IDWSSD, including analysis of sector support activities in the Caribbean; (b) to recommend an action program for improving sector effectiveness and for maintaining and accelerating momentum of activities of national and regional interest during the 1990's involving external support agencies (ESA) as well as countries." Additionally, Conference's recommendations are to provide support to: (i) the Collaborative Council Meeting which will convene in Sophia, Antipolis, France, on 28 November - 1 December 1989, in which a representative of the Caribbean Region, jointly sponsored by Canadian International Development Agency (CIDA) and the Caribbean Development Bank (CDB) will participate, and (ii) to the global meeting scheduled to take place in New Delhi, India, in September 1990, at which a strategy for the 1990's will be formulated.

#### 1.1.4 The Opening Session

Mr. A. Rawlins, Manager, Water Engineer of St. Kitts and Nevis' Government chaired the opening ceremony. Seated at the head table with him were: Mr. Ryden Benjamin, Assistant to the Honourable Minister of Communications, Works and Public Utilities; Mr. A. Rotival, UNDP/WHO Coordinator of IDWSSD and Chairman of the Collaborative Council; Mr. O. K Yhap, Project Manager, Caribbean Basin Water Management Project (CBWMP), Caribbean Development Bank; and Mr. R. Reid, PAHO Regional Advisor, Environmental Health Program (HPE) and PAHO'S Coordinator of the Conference.

##### 1.1.4.1 Chairman speech

As Chairman of the Conference, Mr. Rawlins of the host country welcomed the water engineers from the Region and the participants from overseas and wished them all a pleasant stay in St. Kitts. He emphasized the importance of this Conference, the primary purpose of which is to formulate an action plan for the Caribbean Region beyond 1990. He then expressed the wish that the Conference would discuss the effects of natural disasters (hurricanes and earthquakes) on water supply installations. He extended words of welcome to the International Organizations represented at the Conference for their support in the past which, he hoped, will continue in the future (copy of his address is included as Annex III).

##### 1.1.4.2 Statement by Mr. A. Rotival, UNDP/WHO Coordinator, IDWSSD, Chairman, ESA Collaborative Council

Mr. Rotival referred to the two faces of the Decade as it approaches its termination in 1990. On the negative side he indicated that the prime objective of service coverage of population with potable water supplies and adequate sanitation has not been met, and identified the factors that have contributed to the shortfall. Asserting that only approximately 50 percent of the population in the developing countries will have potable water supply by 1990, he indicated that the Caribbean countries have done much better than the global average. With regard to rural sanitation, Mr. Rotival spoke of the "disgraceful figure of 14 to 15 percent during the ten years of the Decade." Investments in sanitation in contrast to investments in water supply "must be characterized The Cinderella of the Water Decade." On the positive side, Mr. Rotival mentioned: the major financing to develop appropriate technology; a development of cost effective and community manageable technology; an understanding of the primacy of the role of the community and the pivotal "role of women in rural water supply, and rural and peri-urban sanitation. The unique facet of the Decade, he said, "has been the exchange of information between developing countries and the ESA community," including "the role of Government in coordinating sector activities" which has resulted in the ESA's harmonizing their policies and approach. He concluded his address by suggesting that the message of this Conference will be a valuable input to two important forthcoming meetings: (a) the Meeting of the ESA Collaborative

Council scheduled to take place at Sophia Antipolis (France), on 28 November - 1 December 1989; and (b) the UNDP'S sponsored Global Consultation in India in 1990 for the formulation of strategy for the 1990's. Mr. Rotival's address is included in report as Annex IV.

1.1.4.3 Statement by Mr. O. K. Yhap, Project Manager, Caribbean Basin Water Management Project, Caribbean Development Bank

Mr. Yhap first thanked the Chairman for his kind and complimentary introduction. On behalf of CDB, he expressed appreciation for being involved in the Conference. CDB, he said, is cosponsoring the representatives from 13 regional countries to the Conference, through the Caribbean Basin Water Management Training Project which has enjoyed financial support from the Canadian International Development Agency (CIDA) starting from about the mid-1970's. In conclusion, he underlined the importance of "commitment," "commitment by all of us to our jobs, our water institutions, and on the whole to the whole to the water and sanitation sector." Mr. Yhap's statement is included in this report as Annex V.

1.1.4.4 Address of Mr. Royden Benjamin, Assistant to the Honourable Minister of Communications, Works and Public Works

The thrust of Mr. Benjamin's address is the emphasis he placed on the need of potable water supply and sanitation to improve overall living conditions, particularly public health, since, in some countries disease incidence up to 80 percent could be attributed to unsafe water and poor sanitation. Making reference to Hurricane Hugo which struck St. Kitts, Mr. Benjamin praised the work performed by the Water Department to restore damaged water supply installations and provide services in the shortest possible time. Mr. Benjamin then gave a brief account of the Government effort in its pursuit of attaining the objectives of the Decade of service coverage of population with potable water supplies and adequate sanitation. More importantly, he reiterated Government commitment to continue collaboration with other regional countries and institutions with a view to ensuring and strengthening sector effectiveness during the 1990's.

1.1.4.5 Expression of thanks

The opening ceremony ended after Mr. P. Braithwaite, Water Manager, Antigua Public Utilities, thanked on behalf of the Caribbean participants in the Conference, all the ESA's for their sustained support and for their presence at the meeting.

## CHAPTER II

### 2. CONFERENCE'S METHODOLOGY AND TOPICS DISCUSSED

The Conference consisted of plenary and working groups sessions. The topics discussed are listed in Annex II (Conference's agenda). What follows is a summarized account of the critical issues arising out of discussions on the presentation of technical papers, as well as statements made at plenary sessions, and in particular those identified and discussed by the working groups.

#### 2.1 Plenary sessions - Wednesday, 1 November and Friday, 3 November

##### 2.1.1 Host country statement and overview of the situation of water and sanitation sector, and progress of Decade, including approaches to achieve Decade's objectives

In the introduction of his paper, Mr. Rawlins indicates that the economic growth of the country is dependent upon the accelerated development of agriculture and tourism, which, in turn, must rely on a well-structured program of water resources development. The water supply and sanitation project is principally constrained by the lack of funds, affecting in particular the programs of maintenance and operation of existing installations, and of expansion of the water supply systems. Mr. Rawlins then provided the Conference with information on the achievements at the Water Department during IDWSSD, and on programs that were contemplated for the future. Making reference to hurricane Hugo, he mentioned the problem of pollution of water resources. Mr. Reid, made a brief review of the circumstances which have led to the establishment of IDWSSD, emphasizing in particular, the beneficial effects of water supply and sanitation on the life and well-being of the poor in the developing world. He underlined the basic principles of IDWSSD and, more importantly, emphasized the need for the Conference to design an effective strategy and new approaches to accelerate program development in the 1990's.

Two critical issues were identified, following the host country statement and the presentation made by Mr. R. Reid, PAHO Regional Adviser, Coordinator of the Conference. These were: (i) organic pollution of water sources, and (ii) degradation of the situation with regards to maintenance and operation of installed water supply and sanitation systems. To overcome these deficiencies, it was recommended that the problem of organic pollution should be an important consideration in the development of projects during the 1990's, and the development of operation and maintenance programs that are readily applicable to local conditions.

### 2.1.2 Situation and economics perspective of area and sector

The paper presented Mr. C. Pemberton, Project Officer, CDB, is included in Volume II of the Conference Proceedings. The paper's introductory statement suggests that, while it is recognized that water is essential not only to the promotion of health and living conditions of communities, but also for sustained economic growth, its availability and use for supply purposes in the Caribbean Region is severely constrained by: current economic climate; pollution due to improper disposal of waste water (from households, industries, hotels, agricultural runoff); improper watershed management. Each one of these topics is discussed in details in the paper. The outcome of this discussion is reflected in some of the author's concluding statements, which read: "It is imperative from a public health perspective, that the achievements of the Water Supply and Sanitation Decade be sustained, and attention be now focussed on setting new goals for the 1990's and beyond. With respect to the economic activities in the Region, water must not be a deterrent to development, nor must the waste water derived from present and future development be a public health hazard or be a pollutant to the environment."

### 2.1.3 Statements by selected countries (Suriname and Haiti)

Arising out of the discussions that followed the statements from the participants from Suriname and Haiti, information on major areas of concern, and suggestions to overcome these, is summarized as follows:

<u>Areas of Concern</u>	<u>Suggestions</u>
- multiplicity of Government Ministries and agencies, and a countless number of NGO's involved in sector development, each one operating independently;	- establishment of a high level Government Committee, and/or an appropriate mechanism to ensure coordination of sector activities;
- lack of basic information on many factors and parameters which influence sector development;	- develop a data base and/or an information system;
- sporadic effort in carrying out community participation activities, and lack of follow-up.	- elaboration of a community participation program within sector development program, and allocation of resources for its implementation; and exchange of ideas and experiences on both information system and community participation.

## 2.1.4 Water supply in the Caribbean: needs and improvement

### 2.1.4.1 Overview of current situation

There are features common to the water supply services in six of the small islands covered in the paper presented by Mr. Emile Warner, PAHO/WHO Temporary Adviser, including in particular, the high percentage of population served through house connections and public standpipes. Yet, water demands and services, as well as management of water resources differ in each of the islands. Worthy of mention are the following: (i) master plans have been prepared in both Antigua and Montserrat; (ii) the use of sea water as a source of supply in Antigua; (iii) privatization of the water utility in Dominica where, in addition, arrangements are being made to sell water to neighboring islands, at the rate of 100,000 gallons/day. (Mr. Warner's paper is in Volume II of the Conference Proceedings).

### 2.1.4.2 Improvement of service quality in the 1990's

A broad range of activities are contemplated for implementation with a view to improving service quality in the 1990's not only in the islands covered in the paper, but also in the Caribbean Region as a whole. The major activities include: preparation of Master Plans; ground water exploration; monitoring pollution of ground and surface waters; leak detection and water wastage investigations; studies and investigations to determine adequate tariffs; training of professionals in specific areas of expertise (management of water resources, leak detection, etc.). These were identified at plenary sessions, and were discussed more extensively by working Group III. The outcomes of the discussions of the group are detailed later in this report.

## 2.1.5 Waste water collection and disposal: status and strategies

### 2.1.5.1 Overview of current situation

The most common methods of disposal of waste water are through septic tanks and pit privies. Available 1985 data show that 80 percent of the population of the Caribbean Region are served by these two methods of disposal. Septic tank effluents are not treated before their disposal into soakage pits, rivers, streams or the ocean, thus, contributing to the pollution of ground and surface water, and to gross marine and coastal areas pollution. This, in turn, represents a threat to tourism on which most of the islands depend for their economic growth. In the windward islands, the disposal of waste water is through septic tank and collection systems, with the exception of Dominica, Saint Lucia, and Grenada where sewerage systems were constructed during the period 1940-1982. The collection systems are old, pipelines are broken, so are the marine outfalls. The experience with package sewage treatment plants at hotels is most disheartening because of poor operation and maintenance (unavailability of spare parts and dearth of trained manpower). Few countries of the Region have sewerage systems serving only nine percent of the population. Eleven percent of the population of the



Region have no facilities for the disposal of waste water. There are few instances in which Water Authorities are entrusted with the responsibility to manage, operate and maintain sewerage system, but the sewerage sector is invariably subsidized by the water sector. (Paper presented by Mr. A. Archer, Temporary Advisor PAHO/WHO, is included in Volume II of the Conference Proceedings).

#### 2.1.5.2 Proposed strategy

Fundamentally, the development of a strategy, including its implementation, is dependent upon: (i) political awareness, and Governments' commitment; (ii) availability of external financial and technical assistance, the composite components of which include, inter-alia: formulation of regional/subregional and national policies; enactment of legislation; preparation of comprehensive plans for the densely populated urban and coastal areas to attract external financing; establishment and/or strengthening of Water and Sewerage Authorities; manpower training in specialized areas of expertise; investigation and research for the identification of appropriate technology (least cost solutions) and the establishment of effluents standards. These were identified at plenary sessions, and were more extensively discussed by Working Group IV. The outcomes of the discussions of the Group are detailed later in this report.

#### 2.1.6 Water resource management in small Caribbean States (Plenary session on Thursday, 2 November 1989)

The paper, prepared by Dr. Bernard Clement, United Nations Chief Technical Adviser, Water Resources Management in Small Caribbean States, and presented by Mr. K. Suthakar, Water Engineer, UNDTCD, is well documented and of interest to all parties involved in water resources management in the Caribbean region, and in other developing regions of the world. The paper which is included in Volume II of the Conference Proceedings, provides a detailed account of activities of the technical assistance project, its broadened scope, and impact which is evidenced "in the fact that the project has assisted in the preparation of projects involving over US\$35 million of follow-up capital investment much of which has been generated from donor agencies." Employing a team of UN Associate Experts and Volunteers, dispersed throughout the Region, and managed and coordinated by UNDTCD staff out of Barbados, the project operates in the majority of the smaller English speaking islands." The paper provides also a strategy for the improvement of the regional water sector over the next Decade.

#### 2.1.7 Statement by Dr. N. Singh, Senior Scientist, Caribbean Environmental Health Institute (CEHI)

Starting with a brief review of events that have led to the establishment of CEHI, Dr. Singh defined the functions, capabilities, as well as future development and the role of CEHI in implementation of the Environmental Health Improvement Project. His summarized statement and the

Port of Spain Accord on the Management and Conservation of the Caribbean Environment, Port of Spain, Trinidad and Tobago, 31 May - 2 June 1989, are included in Volume II of the Conference Proceedings.

2.1.8 Address of Mr. G. Davila, Coordinator, Environmental Health Program, PAHO/WHO

The summarized version of Mr. Davila's address is as follows:

Drinking Water Supply and Sanitation - Principal Areas for Future Attention (Beyond 1990)

Organization of the Sector

- National water supply and sanitation systems should be established to integrate all the elements involved in facilitating the delivery of services by this sector.
- Particular attention should be given to the financial system.
- The policies of decentralization and municipalization have made it urgent to establish national systems in which planning will be especially important.
- Urban coverage will have precedence and will demand the greatest investments. Particular attention should be given to the low-income population on the outskirts of the cities.
- Permanent programs should be established for the development of human resources at all levels. Such programs should have continuity and, thus, regular and permanent funding.

Optimization and Recovery of Installed Capacity

Here it is well to emphasize the concept of "efficient water use," which involves such facets as:

- Reduction of current high levels of consumption, streamlining of services delivery (including the review of design standards), and "humanization" of engineering through a social approach.
- Use of water-saving plumbing fixtures (toilets, etc.). Regulations should be drafted requiring that they be used.
- Establishment and application of appropriate pricing policies. It will be necessary to eliminate "political control" of rates.

### Development and Use of Appropriate Low-Cost Technologies

It will be necessary to establish an attitude in planning and in engineering design whereby low-cost technologies are adopted as normal practice. In this regard, it will be important to modify existing traditional programs in sanitary engineering education so that they will foster a mentality that is more in line with present realities.

- Attention should be given to innovation and adaptation based on applied research in order to contribute to knowledge and to encourage development of the new technologies that concern us.
- Community participation should be optimized so that there will be a commitment to technological changes that favor less costly services, an area that is so critical for the sector, and also promote and reinforce the concept of paying for the use of the water. We ask: Should not water services be considered an important element in the list of household costs for calculating minimum wages in order to meet the basic needs of families?
- Increased productivity of the services through programs for controlling physical and commercial losses should be the basis for operation and maintenance of the services as well as the key to administrative and institutional development.

### Water Quality - Pollution

- It is important to recognize that water resources are finite and are already being overused.
- The quality of water resources for human use should be given high priority. Biological contamination and the growing risk of chemical contamination are cause for concern; actions should address both surface and groundwater. It is essential to launch vigorous programs to protect water sources giving attention to all the factors that cause pollution, including solid waste, industrial waste, contamination of agricultural origin, etc.
- . It is necessary to plan effectively for the utilization of water resources wherever sanitary uses are important.
- . The quality of drinking water should be zealously controlled and monitored with full attention to the health risks posed by pollution.
- . Since we live in a world in which there is close contact with human excreta, health care demands that this situation be given urgent attention and that the topic be assigned high priority.

- Water and sanitation companies should rank health concepts according to their importance and should endeavor to improve their services on this basis.

### Concept of Universal Coverage

Although it may seem that we are raising an issue which is a "lost cause," since there have been repeated references to the impossibility of addressing the high cost of such an ambitious goal, I would say that, even given the restrictions, today more than never, we should attempt to regain our optimism with regard to this task. It is desirable, and I believe productive, for us to look toward a future in which every person in the Americas has the benefit of minimum water supply and excreta disposal services, in the interest of his or her health and well-being, thus, permitting access to a better quality of life than we have in 1989.

The availability of financial resources by itself is not the answer to our problems. What will count will be the adoption and implementation of the concepts mentioned above, together with those resulting from the present meeting.

The 1990s will bring more urgent demands than we had in the 1980s, and we should be very seriously concerned lest the year 2000 finds us at the same sanitary level as we have in 1990 — or worse. I believe that sanitary engineers and other professionals in Latin America and the Caribbean have the experience and the conditions to exercise an influence, through their actions, at both the community and the government level to mobilize future action that is consistent with the concerns and development efforts of our countries.

#### 2.1.9 Presentation of Mr. Lowen on ground water exploration

Ground water exploration in the Caribbean. In his presentation, Mr. D. Lowen shared his experience in ground water exploration in the Caribbean with the participants in the Conference. The objectives he pursues are: to locate sources of ground water resources. He went on describing some of the techniques he applies to predict subsurface conditions, including the use of electrical current in the ground. Mr. Lowen's paper was not available up to the time of writing this report, but will appear in Volume II of the Conference's proceedings.

#### 2.1.10 Participation of external support agencies

Representatives of External Agencies offering technical assistance to the Caribbean Region attended the Conference. These agencies included: Canadian High Commission; Commission of European Communities; French Mission Cooperation and the British Development Division in the Caribbean (BDDC). BDDC's statement made by Mr. M. Sergeant, Senior Engineering Adviser, BDDC, is included in Volume II of the Proceedings.

#### 2.1.11 Participation of private companies and manufacturers

As many as 10 companies attended the Conference (see Annex 1: List of Participants). Available statements made by Mr. P. Grayson, General Manager, Kent Meters, Puerto Rico, and by the representative of General Engineering Corporation are included in Volume II of the Conference Proceedings.

#### 2.2 Working Groups discussions

Guidelines for the working groups discussions centered around the following: identification of major issues/constraints, formulation of plan of action, identification of agency(ies) responsible for the implementation of plan of action, and for follow-up, and time (year or period time required to initiate and/or complete activities contemplated. Working Groups reports are shown in Tables 1, 2, 3 and 4.

TABLE 1

## GROUP 1

PROGRAM SUPPORT: INSTITUTIONAL AND HUMAN RESOURCES DEVELOPMENT, INFORMATION, COMMUNITY PARTICIPATION

<u>Issues and Constraints</u>	<u>Action Plan</u>	<u>Responsible Organizations</u>	<u>Time</u>	<u>Follow-up</u>
1. <u>Human Resources Development</u> - absence of policy; - lack of manpower plan.	- Formulate manpower policy; - Promote manpower planning, beginning with inventory of existing personnel, including education and training institutions, current personnel administration procedures and turnover rates; and forecasting future needs in relation with programs and projects.	Water Utilities	1990-1992	Water Utilities in conjunction with regional agencies and international organizations.
2. <u>Institutional Development</u> - poor image of the sector; - inadequate personnel management system; - scarcity of trained personnel and high turnover rates.	- Develop and implement public relation program; - Establish an efficient personnel management system so that the utilities can attract potential employees and maintain a well motivated workforce in a working environment of growth and development.	Water Utility Water Utility	1990 1990-1992	Water Utilities in conjunction with regional agencies and international organization.
3. <u>Information</u> - scarcity of pertinent data; - scattered information and lack of an appropriate mechanism to disseminate information.	- Establish a centralized computerized data bank that will provide management with a clear status of the water supply and sanitation sector situation (including human resources, technologies), and will facilitate the formulation of a strategy for the 1990s.	Water Utility	1990-1992	Water Utilities in conjunction with regional agencies and international organization.
4. <u>Community Participation</u> - late involvement of the community; - limitations of programs.	- Initiate discussions with community before formulation of project proposals, reemphasizing the public health benefits and the aspects of operation and maintenance.	Water Utilities	1990-1991	Water Utilities in conjunction with regional agencies and international organization.

TABLE 2

GROUP II

FINANCING, COST RECOVERY

<u>Major Issues and Constraints</u>	<u>Plan of Action</u>	<u>Responsible Organization</u>	<u>Time</u>
- Lack of finance for initial capital investment, and high cost of providing services;	- Mobilize local money, and seek new ways of generating financing from external sources, emphasizing Decade concepts and health benefits;	Ministries responsible and Water Authority.	
- Limitations of Water Sanitation Authority attributable to: ill-defined mandate to Authority by political directorate, and politicians interference in tariff policy; and to:	- Establish statutory Water and Sanitation Authority, aiming at financial autonomy of the Authority;	Ministry responsible and Water Authority.	January 1993
. inadequate tariffs structures;	- Undertake socio/economic studies and investigations to determine consumers' ability/willingness to pay, and assess tariff/cost recovery practices in each country;	CARICOM Water Authority	December 1990
. high levels of unaccounted for water;	- Develop and implement programs and activities to reduce unaccounted for water to acceptable limit (25%), (including leak detection, metering, billing and improved revenue collection);	Water Authority	December 1991
. Lack of control of wastage;	- Formulate policy to control wastage and promote the use of water saving devices, and enact legislation for water conservation and protection of watersheds.	CARICOM/FAO and Water Authority	December 1992
. consumers' lack of interest.	- Education, motivation of consumers and public at large.	Water Authority	December 1990

TABLE 3

## GROUP III

## WATER RESOURCES MANAGEMENT

<u>Priority Areas and Constraints</u>	<u>Outline of Plan of Action</u>	<u>Responsible Organizations</u>	<u>Time</u>	<u>Follow-up</u>
1. <u>Legislation for the Protection and Control of Water Resources</u> - lack of clear ownership of water resources; - lack of control over exploitation of resources; - lack of effective legislation.	- Educate and convince the decision-makers of the importance and urgency of such legislation;	Water Utility	1990	Water Utility and annual evaluation of the Caribbean Water Engineers Conference.
	- Secure expertise for preparation of legislation;	Water Utility	1990	
	- Public education;	Water Utility	1991	
	- Passage of legislation.	Water Utility	1992	
2. <u>Unaccounted for Water</u> - leakage and wastage; - illegal connections; - inaccurate source and consumer meters; - erroneous meter readings and billing; - use by public institutions and standpipes.	- Public education;	Water Utility	1990-1992	Water Utility
	- Progressive metering, beginning with industrial/commercial and large consumers;		1990	
	- Review meter reading systems;		1990	
	- Repair all visible leaks and upgrade mapping;		1991-1993	
	- Construct meter testing and repair facilities;		1990-1992	
3. <u>Inventory of Water Resources</u> - lack of Central Data Bank; - lack of equipment and trained personnel; - lack of historical data.	- Establishment of a coordinating agency;	CIMH	1990	CIMH and annual evaluation at the Caribbean Water Engineers' Conference.
	- Determine extent of data collection required;		1990	
	- Secure necessary technical assistance and funding;		1991	
	- Obtain the commitment of governments to the CIMH;		1990	
	- Implement data collection.		1995	
4. <u>Monitoring and Control of Water Quality</u> - lack of sampling program; - lack of laboratory facilities; - lack of commitment to observing minimal drinking water standards; - lack of national standards.	- Secure technical assistance and funding;	Water Utility in conjunction with National Health Departments.	1990	PAHO/WHO Water Utility Water Utility
	- Assign and arrange for the training of personnel;		1990	
	- Ensure budgetary provisions are made for the operation of the laboratory.		1991	



TABLE 3 (Cont.)

<u>Priority Areas and Constraints</u>	<u>Outline of Plan of Action</u>	<u>Responsible Organizations</u>	<u>Time</u>	<u>Follow-up</u>
5. <u>Demand Control/Conjunctive Use</u>				
- Lack of knowledge of available water saving devices;	- Dissemination of information on water saving devices;		1990	Water Utility
- Lack of pressure zoning;	- Establish regulations governing the use of water especially during the dry season;	Water Utility	1990-1991	Water Utility
- inadequate public awareness about water conservation;	- Initiate studies and implement plans for conjunctive use.		1990-1993	Water Utility and evaluation at annual Caribbean Water Engineers Conference.
- lack of program to promote conjunctive use.				

TABLE 4

## GROUP IV

## WASTE WATER MANAGEMENT

<u>Priority Areas and Constraints</u>	<u>Plan of Action</u>	<u>Responsible Organization</u>	<u>Time</u>
1. <u>Financing</u> - high cost of conventional systems; - government financial limitations; - incapability of people to pay.	- Selection of affordable, sustainable and environmentally acceptable systems;	Water Utility	1990-1991
2. <u>Public Awareness</u> - people and politicians not aware; - lack of political commitment; - prevention rather than cure: need perspective.	- Promote environmental education in schools and to the public at large, and convene public participation in the decision making process with regards to technology and operational services in waste water and excreta disposal.	Water Utility	1990-1991
3. <u>Institutional arrangement</u> - responsible institutions (construction, operation and maintenance, regulatory); - insufficient trained staff; - unavailable ancilliary equipment: laboratory, vehicles, etc.	- Establishment and strengthening of an organization for developing mechanism of intersectoral coordination for preparatory work for the construction, operation and maintenance of waste water treatment and disposal systems; enforce legislation for property connections and collection of tariff revenues; strengthening of manpower resources, including the training of personnel.	Water Utility in collaboration with technical assistance agencies.	1990-1995
4. <u>Environmental conditions</u> - location of urban centers along the coast; - geology (limestone, volcanic); - flat terrain.	- Establishment of water pollution monitoring and assessment programs, and setting appropriate water quality guidelines to at least meet WHO/international accepted standards for the region.	Water Utility in conjunction with regional institutions.	1990-1992
5. <u>Technology</u> - few technologies known in area (sewerage, package plants, pit latrine, septic tanks); - lack of information on cost.	- Undertake an inventory of excreta disposal and recycling technologies which are relevant to local conditions, and promote demonstration projects which could receive financial support from donor agencies.	Water Utility	1990-1992

TABLE 4 (Cont.)

Priority Areas and Constraints	Plan of Action	Responsible Organization	Time
6. <u>Policy and legislation</u> - legislation for the protection of human and natural environment needs coordination; - clear policies required.	- Commitment by the countries should be given to waste water management and excreta disposal by allocating economic resources, and reviewing, developing and enforcing legislation.	Government and Water Utility.	1990-1992

### CHAPTER III

## 3. CONCLUSION, RECOMMENDATIONS AND FOLLOW-UP

### 3.1 Conclusions and Recommendations

Conference's conclusions and major recommendations are as follows:

3.1.1 Institutional and Human Resources Development: Information and Community Participation. The Conference asserted that these are important considerations which need to be reemphasized in all water supply and sanitation programs and projects contemplated for execution during the 1990's, and recommended, inter-alia that the following be undertaken: formulation of HRD policy aimed at achieving objective of responsible agency; promote manpower planning to determine categories, number, quality of employees required to deliver services; clearly define mandates of agency which, in turn, should concentrate on core functions; elaboration of agency's personnel management system as an important input to institutional development; carry out investigations to determine existing manpower resources and turnover rates; establish centralized, computerized data bank as a tool of management; and further promote public education to ensure community involvement prior to the formulation of project proposals.

3.1.2 Financing, Cost Recovery: The Conference affirmed that financing and cost recovery are important for the water supply and sanitation sector to ensure: the sustainability of the agency; funding of capital cost investments; expansion of facilities; achievement of financial autonomy by the agency; and provision of improved service to the consumers. To this end, the following recommendations are made: establish statutory status for water utility/agency; aiming at financial, autonomy/self-sufficiency; design of uniform methodology for developing tariff structures; and examination of comparative costs of water in the Caribbean.

3.1.3 Water Resources and Quality Management: The Conference asserted that it is imperative that the State exercise its authority for the protection and ownership of water resources. This is to be achieved through the following: formulation of policy for the protection of ground water, water conservation; enactment of legislation to define surface water rights; licensing for extraction of ground water and the disposal of wastewater, including the identification of agency or determination of mechanism for enforcing legislation; and preparation and implementation of leak detection and public health education programs.

3.1.4 Waste water management: including excreta disposal have been given low priority because of the economic conditions of the Caribbean countries, lack of understanding of the adverse environmental impacts created, and lack of knowledge of available technologies which have resulted in the degradation of

the human and natural environment, hence, the pressing need to tackle this problem during the 1990's. More specifically, the Conference recommended the following: development of policy and master plan; examination of potential of waste water as a resource, e.g., reuse; design some effective strategy to deal with waste water disposal created by developments such as hotels; development of uniform quality standards for the marine environment; and design of an effective strategy to deal with waste water disposal created by developments, such as hotels.

3.1.5 Foremost among the recommendations made by the Conference is the need to include disaster preparedness in planning water supply and sanitation projects which are contemplated for execution during the 1990's. Other recommendations made by the Conference are detailed in paragraph 3.2 entitled: Recommendations.

### 3.2 Follow-up

Activities for follow-up and periodic evaluation include: (1) early preparation of Conference proceedings for submission, within a month, to CARICOM, WHO/Headquarters in Geneva, and countries; (2) early designation of a Task Force or Steering Committee to translate Conference recommendations into a meaningful action plan to be presented to the Caribbean Consultative Forum.

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CONFERENCE'S AGENDA

Wednesday, 1 November

- 8:30 Registration
- 9:00 Opening Session  
Welcoming Remarks  
Objectives/Procedures
- 10:00 Coffee Break
- 10:15 Host Country Statement (A. Rollins)
- Situation of Water and Sanitation Sector, and Progress of Decade  
(R. Reid)
- 11:30 Situation and Economics Perspective of Area and Sector (CDB)
- 12:30 Lunch
- 2:00 Statements by Selected Countries
- 3:30 Coffee Break
- 3:45 Water Supply Program in the Caribbean: Needs and Improvement  
(Emile Warner)
- Wastewater Collection and Disposal: Status and Strategies  
(Arthur Archer)

Thursday, 2 November

- 8:30 Water Resource Management in Small Caribbean States  
(Bernard Clement)
- 9:30 Strategies for Improving Water Supply and Sanitation in the  
Caribbean in the 1990's  
John's
- Concurrent working groups on:
- Program support: institutional and human resources  
development; community participation and information (Group I)
  - Financing, cost recovery and privatization (Group II)
  - Water resources management (Group III)
  - Wastewater management (Group IV)
- 12:30 Lunch
- 3:45 Technical paper presentations

Friday, 3 November

- 8:30 Reports of working groups
- 10:00 Coffee break
- 10:30 Technical papers and manufacturers presentation
- 12:30 Lunch
- 2:00 Action program for activities of common interest in the Caribbean. Recommendations
- 3:30 Coffee break
- 3:45 First Meeting of the Caribbean Water and Wastewater Association (CWWA)

W E L C O M E   A D D R E S S

Mr. Royden Benjamin, Assistant to the Honorable Minister of Communications, Works and Public Utilities, other Distinguished Guests, Fellow Engineers, other participants, ladies and gentlemen.

It is my pleasant duty as Chairman of the Conference to welcome you here today to this Opening Ceremony of the 18th Caribbean Water Engineers' Conference. I wish to say a special word of welcome to the participants from overseas and to wish them a pleasant and profitable stay in St. Kitts.

Seated at this table with me are: Mr. Royden Benjamin, Assistant to the Honorable Minister of Communications, Works and Public Utilities; Mr. O. K. Yhap, Manager, CBWMP; Mr. Alexander Rotival, Chairman of the Collaborating Council of External Support Agencies; and Mr. Peter Braithwaite, Antigua Public Utilities Authority.

The Caribbean Water Engineers' Conference provides a forum once per year for the Water Engineers' of the Region to come together for the purpose of exchanging ideas, discussing common problems and reporting on the experiences of the intervening period between two conferences. This year, in addition, we wish to look specifically at Water and Sanitation in the Caribbean Beyond 1990. To do this, we wish to examine the Water and Sanitation Sector achievement during the International Drinking Water Supply and Sanitation Decade (IDWSSD) and to recommend an action program for improving sector effectiveness.

In planning for water in the Caribbean Beyond 1990, I am sure that this Conference perhaps in an open session would wish to discuss the effects of natural disasters whether on water supplies with specific reference to earthquakes and hurricanes. When we consider the devastation Hurricane Hugo has wrought on some of our islands and when we hear of the deaths resulting from the recent earthquakes, we are bound to give thought to these natural disasters whether our water supplies come from surface sources where they are affected by hurricanes or underground sources where they are affected by earthquakes.

Seated in this Conference Room are many participants from various international organizations. We are always glad to have them among us, especially in a gathering like this one, as it affords them the opportunity of meeting in one sitting with the professional voices of the Region. The support given and the interest shown in the past, have always been appreciated, and we look forward to their continued interest and assistance.

The Government of this country has demonstrated a strong interest in the development of our Water Resources and I am sure you will hear more about this from our guest speaker.

It is now my pleasant duty to call on Mr. Royden Benjamin, Assistant to the Honorable Minister of Communications, Works and Public Utilities to address you.



## Annex IV

### Statement by Alexander H. Rotival, UNDP/WHO Coordinator, IDWSSD, Chairman, ESA Collaborative Council (Opening Session, 1 November)

The Decade, in its 11th hour, as it approaches its termination in 1990 'John's has two faces. On the one side, the prime objective of service coverage of populations with potable water supplies and adequate sanitation has not been met. Highly optimistic goals for coverage levels, continued high population growth and migration from rural to urban areas, insufficient mobilization of financing within developing countries and in support by ESA's and insufficient adoption of sustainable systems have all contributed to the shortfall in meeting the goals in service coverage by 1990. Only approximately 50 percent will have potable water supplies (the Caribbean countries have done much better than the global average), and rural sanitation will have only gone from the disgraceful figure of 14 to 15 percent during the ten years of the Decade.

Sanitation, in contrast to investments in water supply must be characterized, "The Cinderella" of the Water Decade! How can one speak of 'Health for All in the Year 2000' if investment in sanitation lags so severely behind water supply.

The other positive side of the Decade refers to the major financing to develop appropriate technology in rural water supply and rural and peri-urban sanitation. The major breakthroughs in the development of cost-effective and community manageable technology have resulted in sustainable and replicable systems which married to an understanding of the primacy of the role of the community and in this, the pivotal role of women has coalesced into what is called 'The Decade Approach.'

Another positive and, perhaps, unique facet of the Decade has been the exchange of information between developing countries and the ESA community. The role of government in coordinating sector activities at the country level has been recognized and, perhaps, unlike any other development sector, the ESA's have worked together to harmonize their policies and approach rather than competing and overlapping in support of government programs.

Numerous ESA meetings during the Decade have consolidated. This principally culminating in November 1988 with the establishment at The Hague in The Netherlands of an ESA Collaborative Council to provide support in the 1990's for an accelerated program of support to developing countries for major increases in service coverage by the Year 2000.

The ESA's at their Meeting in Interlaken (Switzerland) in 1987, and again in The Hague in 1988 noted that while the goal of service coverage will not be met by the end of the Decade, appropriate technology within a 'Decade Approach' was available to achieve the goals in the context of sustainable and replicable systems. Hence, it was necessary to get on with the job!

The ESA's have furthermore noted the necessity to further integrate activities and programs in support of the sector to include, on the one hand, PHC and rural efforts in hygiene and, on the other hand, a greater recognition of such environmental factors as waste water recycling and surface water drainage which was related to the increasingly reoccupying problem of growth of urban slum and peri-urban populations which would represent the majority of developing country populations early into the 21st century.

It was up to the developing countries to define and arrive at a consensus on sector strategies for an accelerated program in the 1990's. UNDP was sponsoring a global consultation in India in 1990 of all developing countries for this purpose. Leading up to the India consultation, regional consultations were being organized to define strategies. This Caribbean consultation fell into this category and it was the hope that this Meeting would identify through its working groups a strategy for the 1990's which would reflect the problems, issues, opportunities and priorities specific to the Caribbean.

It was also hoped that this Meetings' message could be conveyed in an appropriate fashion to the forthcoming meeting of the ESA Collaborative Council at Sophia Antipolis (France) on 28 November - 1 December 1989.

Best wishes were expressed for the success of the Meeting in which the ESA Collaborative Council was pleased to be associated.

Statement by Mr. O. K. Yhap, Caribbean Development Bank (CDB)

Mr. Chairman, Distinguished Members of the Head Table, Ladies and Gentlemen.

Let me right away thank the Chairman for his kind and complimentary introduction.

On behalf of the Caribbean Development Bank (CDB), I wish to say how pleased we are to be involved with this important regional conference and to be cosponsoring the representatives from 13 regional countries to this meeting. These participants are being sponsored under the Caribbean Basin Water Management Training Program. Over the years, starting from about the mid-1970's, this program has had substantial financial support from the Canadian International Development Agency (CIDA). I am happy to report that the CDB has very recently concluded an Agreement with Canada for their continuing financial support for this training project for the next three years.

You will note that the long-term involvement in this training project by CIDA, PAHO and CDB indicates a deep commitment to the provision of training in the water and sanitation sector.

In conclusion, I would like to leave with you the thought of the importance of commitment -- commitment by all of us to our jobs, our countries, our water institutions and on the whole to the water and sanitation sector.

I thank you.