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THE WATER SUPPLY SITUATION IN THE LDC'S OF THE EAST
CARIBBEAN AT THE BEGINNING OF THE INTERNATIONAL
DRINKING WATER SUPPLY AND SANITATION DECADE

- A Brief Note -

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- A Brief Note -

The Lesser Developed Countries of the English-speaking Caribbean (the concern of this paper) comprise seven small island states: Antigua, Dominica, Grenada, Montserrat, St. Kitts-Nevis, St. Lucia and St. Vincent. These islands are situated in the eastern section of the Caribbean Sea stretching in a gentle arc roughly between latitude 12° and 18° North and longitude 61° and 63° West and are consequently in the hurricane belt. The northernmost island is Antigua and Grenada the southernmost. Except for Antigua all the islands are of volcanic origin, the former being partly volcanic and partly coral. The topography varies from hilly to mountainous; Antigua the main exception being relatively flat. Several islands are dominated by peaks with many spurs stretching toward the coast and fairly deep valleys between. Because of the size of the islands and the few plains, rivers are necessarily short and flow swiftly to the sea.

Owing to historical factors and natural endowment, the countries, except for Antigua, are agricultural. Antigua depends on tourism and other services although all of the other islands have been attempting to develop tourism in more recent years.

The population is, generally speaking, large compared to land area with the resulting relatively high rates of population density. Increasing movements of people from rural to urban areas has increased the pressure on water utilities.

The purpose of this brief note is to focus attention on the general water supply situation in these seven islands of which only five are independent, the first gaining this status only six years ago. In this connection it should be noted that water supply systems in the islands are old, the incidence of water-borne diseases is relatively high and the demand for water growing with increasing population, urbanization and industrialization. There are many competing needs for the scarce financial resources of the islands and the economic and financial resource base for

generating revenues is small. It would appear that special assistance is warranted in the circumstances if these countries are ever to become economically viable and be able to meet water needs.

Water Resources

Taken quite literally there is an abundance of water in the islands of the East Caribbean. Water occurs in the form of (i) precipitation; (ii) surface water; (iii) ground water and (iv) sea water. However, this relative abundance is conditioned by two major factors which considerably affect the quantity of water available at any particular time. These are the topography of the islands and seasonality of precipitation. The mountainous islands attract and retain a considerable quantity of water, however typically the run off is considerable especially in the rainy season. Dominica, Grenada, Montserrat and St. Vincent fit this pattern. Other islands such as Antigua, St. Kitts-Nevis may be almost devoid of surface water and rely more on ground water and catchment areas. These latter islands tend to be of chalk and limestone formation and ground water retention ability appear to be limited.

Typically, the rainy season occurs in the latter part of the year though in some cases rains begin as early as May. In few instances such as in St. Vincent and Dominica there may be considerable precipitation at times during the "dry" season as well. There is also considerable variation in rainfall from place to place even on a small island. Some idea of the mean high and low precipitation is given in Table I attached. Precipitation may exceed 200 cm. p.a. in the high mountain reaches of Dominica.

In addition there is both the extreme of precipitation namely hurricanes and the opposite droughts. The hurricane season occurs in the rainy months May to December and water and sanitation facilities can be severely affected by their occurrences. It may be noted in this connexion that St. Vincent's water supply has not yet recovered from the effects of severe flooding during May 1981. During periods of drought the risk is from contamination and water-borne diseases. Antigua is one country that historically suffered from periods of long droughts which recur in a cyclical manner. The country has undergone a considerable period since the beginning of the 1970's without a major drought.

It will be noted in Table I that there are no rivers in Antigua, St. Kitts-Nevis and the Grenadines. Antigua relies largely on groundwater while in the Grenadines public and private catchment predominates. While main reliance

is on surface water there is evidence of groundwater in some islands which could be tapped to augment existing supplies.

Although sea water is abundant desalination is not popular. Obviously cost is a major factor, especially energy costs since 1974. Desalination was done for a while in Antigua and at least one distillation plant has operated in one of the Grenadines. (The Netherlands Antilles and the Bahamas have been the major users of desalinated water in the English-speaking Caribbean).

Water and Sanitation Services

It may be reasonably deduced from the above that if potable water resources in the Eastern Caribbean are not naturally abundant they may at least be categorized as adequate. But what is important is how much of this water reaches people, hence the distribution system becomes of paramount interest.

Historically, water supply has been regarded as a social service in the Caribbean and not an economic "good". (This is important as will be seen later in considering finances.) All systems are now old, some were installed 40 to 50 years ago.^{1/} The same is true for liquid waste and excreta disposal facilities. The systems were installed by foreign engineers who frequently did not leave diagrams and drawings. Typically Government Public Works departments make extensions to systems and local boards control them fixing and collecting rates with the approval of the Central Government. During the 1960's with the assistance of PAHO/WHO action was set in train to create water utilities. In St. Vincent, the Water Authority was established around 1970 with the assistance of CIDA.

^{1/} Caribbean Health Strategy, Caribbean Community Secretariat, Georgetown, Guyana.

Water supply systems are generally riddled with leaks^{2/} - a situation brought about by the low level of investment in water supply facilities over the past two decades thus water available for consumption is much lower than the potential. Most of the recent investment has been concentrated in the towns and other areas to facilitate tourism and industrial development. Rural systems have been receiving very little attention and the use of streams and springs and simple household systems as sources of water for domestic consumption is common. The incidence of water-borne disease is high (by Caribbean standards) in at least three of the seven islands. Data on typhoid and gastro-enteritis is given in Table III. The Caribbean Health Strategy^{3/} summarized the situation as follows in 1978:

- (a) the urban population has good access to water through house connections;
- (b) the rural population has poor access to water and is available mainly through public standpipes;
- (c) both rural and urban areas experience regular daily shortages in supply;
- (d) the rural systems are normally very rudimentary, and produce poor quality water which does not always meet acceptable minimum standards;
- (e) the use of chlorination as a final form of treatment is increasing, but it has not yet been generalised.

The position appears to have deteriorated, a conclusion indicated by the partial data furnished by an ECLA mission in 1981.

^{2/} Leakage is assessed as high as 40 per cent in some cases. See Caribbean Health Strategy; Caribbean Community Secretariat, Georgetown, Guyana 1978.

^{3/} Ibid.

The situation is virtually the same in sanitation in relation to age of systems, manner of installation and characteristics of maintenance and operation. Generally, the disposal of household sewerage is by septic tanks, soakaways, pit latrines and "night-soil" collection. In urban centers waste-water is fed into the old sewerage systems and finally emptied through outfalls into the sea. It should be noted that in 1978 as much as 50 per cent of the population of one of these countries was reported to be served by no liquid waste and excreta disposal system.^{4/}

Sector Problems

In these islands, there are four major constraints to the achievement of the targets of the International Drinking Water Supply and Sanitation Decade -

- (a) inadequate definition of government water supply and sewerage disposal policies;
- (b) institutional weaknesses, particularly in areas of technical and financial management;
- (c) the lack of adequate local financial resources for investment in water supply;
- (d) the difficulty of obtaining external financing because of the absence of well prepared projects and the general inability to meet the criteria of aid agencies;
- (e) shortage of trained manpower and difficulty in recruiting and retaining suitable personnel.

^{4/} Ibid page 31.

Problems in the area of Policies and Planning

There is not evidence of clearly defined and fully articulated government policies on water supply and sewerage disposal and this makes it very difficult for these seven countries to initiate "Decade" planning activities. Policies have to be deduced ex post facto. Thus it has been concluded^{5/} that "governments have endeavoured to provide water in adequate quantities and of good quality..." "However, the policy has been such that the supply of water remains a social service, where business principles are not practised." It has also been stated that these countries have indicated a desire to have waste-water systems installed, especially in built-up areas and areas designated for tourism development. Given the financial constraints and many competing demands, water and sanitation have not been given the priority they deserve.

While all of the islands have master plans for the island-wide development and distribution of water, the plans in all cases predate the year 1970 and have not been updated since then. The master plans, therefore, have no usefulness as a basis for developing decade investment programmes.

Institutional Problems

The water supply sector in six of the seven islands is managed by a single statutory corporation and in the seventh island (St. Kitts) by a department of the Ministry of Public Works. The sanitation sector in all of the islands is managed by the Ministry of Health. Three of the islands operate small public sewerage systems serving small, highly built-up and largely commercial areas. There are variations in the pattern of water supply organizations. For example, Antigua has a Public Utilities Authority which is also responsible for areas other than water. St. Vincent has a Water and Sewerage Authority. In some countries water development programmes are managed separately from the distribution programme. In general, the areas of technical and financial

^{5/} Ibid pp. 24 and 32.

management exhibit the major weaknesses; not so much because of the way in which they are structured (although it would seem desirable to have combined water and sewerage facilities and technical and distribution functions under one organization) but because of the small quantum of finances and few personnel of the required levels of expertise.

Financial Resources

Very limited data on revenues and expenditures related to water supply were available at the time of preparing this note. It will be clear from the table below that there was a considerable financial deficit during the last two years on water supply operations in St. Lucia and St. Vincent. Other available information indicate that the situation applies also to the other five countries and for previous years as well. The prospect for the next few years is that the situation will worsen.

Traditionally financing was provided by the United Kingdom in the form of grants; more recently financing takes the form of a combination of grants and loans for capital development. In any case the water supply has to be subsidized by governments. Difficulties have been experienced with meeting local counterpart funding for loans and special grants from aid agencies and bi-lateral sources have been used to ameliorate this problem. Needless to say raising of loans from local sources in these small countries is virtually if not completely impossible. It must also be borne in mind that water supply and sanitation facilities are only two of a wide range of activities requiring funding. The basic economic position of these countries is such that they have only limited fiscal base on which to draw and potential government revenue sources are nearly all being exploited at present.

The problem of a lack of financial resources, and the difficulty in attracting external finance is, to a large extent also, linked with institutional weaknesses and the lack of trained manpower. Gross receipts from tariffs are inadequate to cover costs much less to generate funds for investment. There is public resistance to raising rates beyond certain levels and the ageing water supply systems which are getting more inefficient cannot generate enthusiasm for increases neither from consumers nor policy-makers. Combined with this are inefficiencies in the billing and collecting procedures. Operation and maintenance procedures suffer also from lack of

TABLE I

SELECTED DATA ON WATER SUPPLY
EXPENDITURE AND RECEIPTS

<u>Year</u>	<u>Expenditure</u>				<u>Receipts collected</u>
	<u>By Water Authority</u>	<u>By Government</u>	<u>By Water Authority</u>	<u>By Government</u>	<u>from Consumers</u>
	<u>Recurrent Capital</u>	<u>Recurrent Capital</u>	<u>Recurrent Capital</u>	<u>Recurrent Capital</u>	<u>for Water</u>
	<u>('000 EC dollars)</u>				
<u>St. Lucia</u>					
1979	3,051	621	n.a. ^{1/}	n.a.	2,212
1980	3,630	904	n.a. ^{1/}	n.a.	3,211
<u>St. Vincent</u>					
1979/80	n.a.	n.a.	163 ^{2/}	Nil	221
1980/81 ^p	1,200 ^p	n.a.	133	Nil	341
<u>Montserrat^{3/}</u>					
1979/80	<u>3/</u>	<u>3/</u>	747	66	493 ^{4/}
1980/81 ^p	<u>3/</u>	<u>3/</u>	1,068	140	805 ^{4/}

p = provisional

1/ Government recurrent expenditure approximately EC\$50,000 annually.

2/ Administrative and General expenses excluded.

3/ Montserrat data covers Water Authority and Government.

4/ Figures refer to 1979 and 1980 respectively.

Source: Data supplied CEPAL.

funds and financial agencies are wary about providing financial assistance for investment in facilities which will suffer from a lack of proper maintenance and operation.

Manpower Problems

The shortage of trained manpower is in fact the common denominator of all the aforementioned constraints. Of the seven islands, only four presently have a qualified engineer on staff. The engineer, however, also functions as the general manager and can devote very little attention to technical planning and control. Only three of the institutions have trained accountants. Of three engineers connected with the Water Authority in one country two are British only temporarily attached to that organization. In this same country of thirteen persons described as technical or managerial, three had no advanced academic qualification; in another country of four so listed two were without any academic qualifications.

The severe shortage of trained manpower at the managerial and technical levels, and the complete absence of any clearly defined government policies on water supply and sewerage disposal, make it difficult for the seven islands to initiate decade planning activities. This situation is compounded by an absence of reliable basic statistical data on service levels, water production and consumption (in most countries) and water quality.

Prospects for the Decade

On the immediate horizon loom many difficulties which will add to those referred to above. Included in this list are (i) Meeting the growing demand for water; (ii) Preventing further deterioration of the existing distribution systems; (iii) Coping with increased pollution.

The growing demand - During the decade 1970-1980 population increased, probably on the order of 10 per cent overall for these countries. United Nations projections indicate a 7 per cent increase^{6/} during the Water Decade; so that as a minimum countries will have to find 7 per cent more water to

^{6/} The medium variant. See United Nations, Department of Economic and Social Affairs, World Population Prospects as Assessed in 1973;... (Sales No. E.76.XIII.4).

remain at the same level of per capita consumption. But the demand will certainly be greater with continued urbanization and industrialization. Data for St. Lucia show that between 1977 and 1980 water consumption increased five-fold in agriculture (banana boxing plants) and nearly 40 per cent in beverage manufacturing.

Further deterioration of the distribution systems - Deterioration will be inevitable with the passage of time. With leakages estimated at 35-40 per cent at the beginning of the decade and with limited resources to devote to leak detection, repairs and replacement, the situation by 1990 could indeed be very bleak. It should not be overlooked that correcting leaks is one technique of water conservation and could go a far way to meeting the increased demand for water foreseen by the end of the "Decade".

Increased pollution - The relatively high incidence of certain water-borne diseases mentioned above is likely to worsen during the decade unless urgent measures are taken. Any corrective measures will require funds which are already in short supply. The paradox is that attempts to improve output almost inevitably includes the risk of pollution. New industries will increase effluents varying of course with the type of industry and the processes involved. Increased agricultural output will be generated with the use of chemicals. Continued urbanization and individual and collective untreated sewerage disposal will also have deleterious effects through seepage into streams, ground water reservoirs and the sea.

In short, the prospects for any improvement of the water and sanitation situation in these countries are very gloomy during the current decade.

CONCLUSION

In summary, the island states of the East Caribbean require urgent technical assistance in:

- (i) Advising governments in defining water supply and sanitation policies;
- (ii) Developing a data base on the present status of their water supply and sanitation systems;

- (iii) Upgrading the overall operational and planning efficiency of the institutions responsible for water supply and sanitation (include also manpower resources);
- (iv) Setting targets for the decade - which should follow from a comprehensive assessment of the water supply and sanitation sector;
- (v) Preparing specific projects for submission to funding agencies;
- (vi) Preparing an overall decade investment programme.

Allied to these is the requirement for considerable financial assistance on terms and conditions the countries can afford.

TABLE I
SELECTED DATA ON HYDRAULICS

Country	Major Rivers			Rainfall			Remarks
	Name	Length (km)	Flow Rate	No. of Measuring Sites	Mean Annual		
					Low (mm)	High (mm)	
Antigua	None	-	-	...	660	1651	Data available for 1965 to 1976
Dominica			(MGPD)	...	1651	2540	Data given for 1975, data are available for period 1965-1976
	Check Hall	...	5.83				MGPD - Flow rates given in millions of gallons per day
	Clyde	...	28.75				
	Batalie	...	11.67				
	Picard	...	13.75				
	Perdu Temps	...	4.75				
	Stuarts	...	2.25				
	Jack	...	1.25				
	Roseau	...	1.50				
Grenada		-	Not	Available	-		
Montserrat	Belham	24	...	4	965	1778	There are no large rivers but in the peak wet season flow is high. No records of flow rate.
	Bottomless						
	Ghant	19	...				
	Farms	32	...				
	Ghant						
	Maframey	27	...				
St. Kitts-Nevis	None	-	-	...	889	1168	Available data for 1972 to 1976

TABLE I (CONT'D)

SELECTED DATA ON HYDRAULICS

Country	Major Rivers			Rainfall			Remarks
	Name	Length (km)	Flow Rate	No. of Measuring Sites	Mean Annual		
					Low (mm)	High (mm)	
St. Lucia	...	-	-	...	1422	2667	Data available for 1965 to 1976
St. Vincent	South River	1651	2870	Data available for 1965 to 1976

... = Not available

Source: Energy Resources in CDCC Member Countries, (E/CEPAL/CDCC/65) ECLA Office for the Caribbean,
Port of Spain, Trinidad.

TABLE II

WATER SUPPLY DISTRIBUTION

COUNTRY	% POPULATION HOUSE CONNECTION	PUBLIC STAND- PIPE	TOTAL
Antigua	40	56	96
Dominica	24	56	80
Grenada	38	50	88
Montserrat	70	30	100
St. Kitts-Nevis	40	50	90
St. Lucia	34	42	76
St. Vincent	25	65	90

Source: Caribbean Environmental Health Strategy, Caricom Secretariat,
Georgetown, Guyana

TABLE III

CASES OF TYPHOID AND GASTRO-ENTERITIS

COUNTRY	No. of Cases			
	TYPHOID		GASTRO- ENTERITIS	
	1976	1977	1976	1977
Antigua	-	2	476	271
Dominica	23	48	359	251
Grenada	2	30	1,174	1,422
Montserrat	- No information received			-
St. Kitts-Nevis	-	-	327	999
St. Lucia	16	57	777	423
St. Vincent	-	-	469	197

Data relate to age group under 5 years reported to Caribbean Epidemiology Centre (CAREC).

- = No cases

Source: Caribbean Environmental Health Strategy, Caricom Secretariat, Georgetown, Guyana.

TABLE IV

LIQUID WASTE AND EXCRETA DISPOSAL^{1/}

COUNTRY	Per cent of Population Served by:		
	Wastewater System/Septic Tank	Pit Latrine	No System
Antigua	17	60	23
Dominica	19	31	50
Grenada	33	50	17
Montserrat	44	32	24
St. Kitts-Nevis	30	61	9
St. Lucia	18	49	33
St. Vincent	20	75	5

1/ Circa 1977.

Source: Caribbean Health Strategy, Caricom Secretariat, Georgetown, Guyana, 1978.

LIST OF REFERENCES

Small Farming in the Less Developed Countries of the Commonwealth Caribbean; Caribbean Development Bank, Barbados.

Energy Resources in the CDCC Member Countries (E/CEPAL/CDCC/65); United Nations ECLA Office for the Caribbean, Trinidad.

Caribbean Environmental Health Strategy (prepared at a Conference/Workshop, Grenada, 9-13 October 1978 for submission to the Fifth Conference of Ministers Responsible for Health, Antigua, 1979); CARICOM Secretariat, Guyana.

World Population Prospects as Assessed in 1973 (ST/ESA/SER.A/60); United Nations Headquarters, New York.

Water Consumption Patterns in the Caribbean (presented at the 12th Annual Caribbean Water Engineers Conference, Kingstown, St. Vincent); by H.M. Sanchez, St. Lucia Central Water Authority, Castries, St. Lucia.

Inventory of the Resources of the CARICOM Region; Ione Marshall (Consultant) UN-CRIAT, 1975, Port of Spain, Trinidad.

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