1993 EVALUATION OF COSALC I
BEACH AND COASTAL STABILITY IN THE LESSER ANTILLES

Anguilla
Antigua and Barbuda
British Virgin Islands
Dominica
Grenada
Montserrat
Nevis
St.Kitts
St. Lucia

by
Dr. Gillian Cambers

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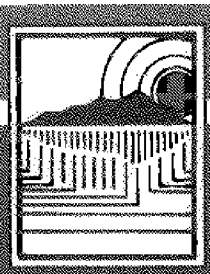

1993 EVALUATION OF COSALC I

BEACH AND COASTAL STABILITY IN THE LESSER ANTILLES

ANGUILLA

ANTIGUA AND BARBUDA

BRITISH VIRGIN ISLANDS

DOMINICA

GRENADA

MONTSERRAT

NEVIS

ST. KITTS

ST. LUCIA

BY

DR. G. CAMBERS

DECEMBER 1993

UNESCO - COMAR

UNIVERSITY OF PUERTO RICO
SEA GRANT COLLEGE PROGRAM

LIST OF CONTENTS

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LIST OF TABLES

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LIST OF ABBREVIATIONS

BVI	British Virgin Islands
CFD	Conservation & Fisheries Department, British Virgin Islands
COSALC	Coastal Marine Systems of Latin America and the Caribbean
DCA	Development Control Authority, Antigua
DFMR	Department of Fisheries & Marine Resources, Anguilla
DOF	Department of Fisheries, St. Lucia
ENCORE	Environmental and Coastal Resources Project
MATE	Ministry of Agriculture, Trade & the Environment, Montserrat
NGO	Non Government Organization
NSTC	National Science & Technology Council, Grenada
OAS	Organization of American States
OECS	Organization of Eastern Caribbean States
OECS-NRMU	Organization of Eastern Caribbean States - Natural Resources Management Unit
SEPB	Southeast Peninsula Board, St. Kitts.

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1. EXECUTIVE SUMMARY

This report evaluates the performance of a programme entitled "Beach and Coastal Stability in the Lesser Antilles" (COSALC I) during the year 1993. COSALC I was started in 1985 with the support of UNESCO. Within this programme, beach monitoring programmes have been established in many of the Eastern Caribbean Islands. This report evaluates the progress of the beach monitoring programmes in nine islands: Anguilla, Antigua, British Virgin Islands, Dominica, Grenada, Montserrat, Nevis, St. Kitts, St. Lucia. The programmes in all of these islands are ongoing and most are on schedule. However, in Dominica there is a need to retrain personnel and re-establish the regular monitoring, while in St. Lucia, following a workshop held in October, 1993, it is anticipated that the monitoring will be re-started early in 1994. The programme in Grenada was re-established in December 1993 after a three year break. The data record in the nine islands varies from 1-7 years.

Also relevant to this programme is a series of in-country workshops being held in 1993-4 by the Organization of Eastern Caribbean States Natural Resources Management Unit. These workshops aim to provide training in the application of the beach monitoring data to coastal decision making. Two workshops have been held, in Nevis and St. Lucia.

Assistance was provided by the Department of Finance and Management Sciences, St. Mary's University, Canada, in updating the Beach Analysis software. Version 2 of this software is now being used in the islands.

Since August 1993 the University of Puerto Rico Sea Grant College Program have been providing all the administrative support for the programme as well as assistance with awareness and publicity. During 1994 it is anticipated that this assistance will extend to technical areas of the programme.

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2. INTRODUCTION

The Lesser Antilles Beach Monitoring Programmes were set up under the UNESCO COMAR Project (Major Inter Regional Project on Research and Training Leading to the Integrated Management of Coastal Systems). A sub-project, COSALC, deals with Coastal Marine Systems of Latin America and the Caribbean. COSALC I deals with "Beach and Coastal Stability in the Lesser Antilles". This is a long term regional project which commenced in 1985 and has to date consisted of four phases :

Phase 1 Evaluation of status of coastal stability and coastal zone management in the OECS islands, January 1985.

Phase 2 In-country workshops in the OECS Islands for Government officials to promote awareness and discuss problems relating to coastal stability and coastal zone management, July, 1985.

Phase 3 Preparation of audio visual aids individual to each island on the subject of coastal stability in that island. (These consisted of slides, pre-recorded cassette and booklet), these were prepared in 1986 and distributed in 1987.

Phase 4 Setting up of Beach Monitoring Programmes in each island. These programmes have been set up according to the following schedule which was determined by specific requests from the islands for assistance :

1987	Dominica
1988	St. Kitts
1988	Nevis
1990	St. Lucia
1991	Antigua
1992	Anguilla.
1993	Grenada

This phase also involves giving continual support to the beach monitoring programmes in terms of data analysis, technical advice, programme review and evaluation. Phase 4 is still in progress.

Phase 5 This involves the establishment of a regional coordinating centre for COSALC I and is at present underway.

Phase 6 Expansion of the scope of the beach monitoring programmes particularly in terms of the

application of the monitoring data to planning decisions; and expansion into other areas of physical process monitoring such as currents, waves, sea level etc.

This report outlines the work completed in 1993, which consisted of re-establishing the programme in Grenada, assisting with the ongoing programmes in Anguilla, Antigua, British Virgin Islands, Dominica, Montserrat, Nevis, St. Kitts and St. Lucia. The work done in cooperation with St. Mary's University, Halifax, in developing Version 2 of the Beach Analysis software is described. In 1993, the University of Puerto Rico Sea Grant College Program has provided full administrative support to the programme and will also be providing technical and other support in the future.

This report follows a similar format to previous Evaluation Reports, outlining for each island the progress made, the future action needed and an overall assessment. Detailed descriptions and analysis of the data are contained in technical reports that are prepared for each country on an individual basis.

3. EVALUATION OF THE ISLANDS' PROGRAMMES

3.1 Anguilla

Progress

A visit was made to Anguilla from 19-21 September, 1993 and meetings were held with the Department of Fisheries and Marine Resources (DFMR). Field measurements of the beaches had been conducted in February and June by the DFMR and the Lands and Surveys Department and a third set were due to be completed later in September, 1993. The data had been partially analysed.

The DFMR had acquired their own computer, so Version I of the Beach Analysis Programme was installed and staff from the DFMR were trained in the use of the programme by entering and analysing the data for February and June, 1993.

Some advice, in the form of a short report, was provided to the Director of Lands & Surveys in 1993 concerning a seawall at Sile Bay.

Further Action Needed

a) Once the final set of measurements have been completed

for 1993, the first year's data can be interpreted and a short technical report compiled. This work is scheduled for the first half of 1994.

b) In addition the Lotus software at the DFMR requires updating to version 2.2 or higher so that Version 2 of the Beach Analysis Programme can be installed. This will speed up the data analysis.

Overall Assessment

The Beach Monitoring Programme in Anguilla is now entering its second year and is on schedule. The counterparts in Anguilla are proficient in the data collection and analysis.

3.2 Antigua

Progress

A visit was made to the Fisheries Division in Antigua from 1-2 November, 1993. In February 1993, a short technical report of the first year's data (1991-2) had been compiled, Cambers (1993a). During this period most of the beaches were stable or showed accretion with the exception of three beaches where erosion was evident. Two of these beaches, Darkwood and Fort James, had a history of beach sand mining.

Beach data had been collected regularly in 1993, measurements had been made in January, April and July/August. A final set of measurements were due in early November, 1993. The data had all been analysed using Version 1 of the Beach Analysis Programme.

During the visit a meeting was held with the staff from the Fisheries Division and the Environmental Officer of the Development Control Authority (DCA). The DCA were interested in seeing the Beach Monitoring Programme expanded to include more areas impacted by development. This would assist them in planning future development away from the more sensitive environmental areas. It was agreed that during the November field measurements, additional sites for measurement would be investigated by the Fisheries Division and the DCA, and possibly additional sites would be established, these additional areas were : Jolly Beach, Redhill, Five Islands, Mamoran Bay and Lord Nelson Hotel.

During the visit, Version 2 of the Beach Analysis Programme was demonstrated and the new software was left with the Fisheries Division. They planned to start using this

with the 1994 data.

Discussions were held about extending the beach monitoring programme to Barbuda, but it was decided to leave this for later given existing resources. The Fisheries Division were also interested in expanding the programme to include measurements of waves and currents.

The Historical and Conservation Commission are working on preparing a Beach Inventory in connection with the development of a protected areas system. Some guidelines based on similar beach inventories in Dominica and the British Virgin Islands were provided.

Future Action Needed

a) Following completion of the field measurements, a short technical report will be compiled. This will interpret the 1991-1993 data and this work is scheduled for the first half of 1994. It is likely that such data interpretation may be done in Antigua in the future, although some additional training may be necessary.

b) A second set of equipment will be needed in 1994 if additional sites are to be monitored by the DCA.

Overall Assessment

The programme in Antigua is on schedule and expanding to better fulfill the country's needs. The interest of the DCA is particularly important as regards future application of the monitoring data to coastal development policies. There is, perhaps, a need for improved coordination between the key agencies : Fisheries Division, Development Control Authority and the Historical and Conservation Commission.

3.3 British Virgin Islands

Progress

No specific visit was made to the British Virgin Islands (BVI) in 1993, since the Consultant was resident there until July 1993 as Head of the Conservation and Fisheries Department (CFD). The beach sites in the BVI were measured regularly at three monthly intervals by the CFD throughout 1993. During the first half of 1993, the data for the four year period 1989-1992 were compiled and a technical report was produced, Cambers et al (1993). This report showed that the beaches on six of the seven islands monitored were narrowing (eroding) at a rate varying between 0.2 and 1.0 m/yr.

During review of this report it was decided there was a need to quantify the effect of beach sand mining by determining the overall sediment budget for a mined beach and a control beach. Possible sites to be investigated were Josiahs Bay and Rogues Bay on the north coast of Tortola. This would require frequent measurement (at least monthly), longer profiles extending out beyond the first offshore bar, and at least three measurement sites on each beach. It was hoped that such a monitoring system could be established during the second half of 1993, although there might be problems with the longer profiles during the winter groundseas.

Version 2 of the Beach Analysis Programme is being used by the CFD.

Future Action Needed

a) The 1993 data needs to be incorporated into the trends developed from the 1989-1992 data and a short technical report compiled.

b) Establish the more detailed monitoring schedule at a mined and control beach site.

c) Since the BVI now has a significant data span, there is a need to begin to apply the results to coastal development control.

Overall Assessment

The programme in the BVI is proceeding well and there is now a significant data record. There is a need to revise the existing coastal development setback guidelines bearing in mind the results from the Beach Monitoring Programme.

3.4 Dominica

Progress

The Organization of Eastern Caribbean States - Natural Resources Management Unit (OECS-NRMU) planned to hold a workshop in Dominica on Coastal Development and Beach Sand Mining in the latter part of 1993. One of the aims of this workshop was to explore ways to apply the data collected in the Beach Monitoring Programme to coastal zone management problems. It was planned to conduct the review visit to Dominica at the same time. However, this workshop had to be postponed several times, and is now scheduled for early 1994. As a result, Dominica has not been visited in 1993.

However, several developments have taken place in Dominica. In March, 1993, a technical report covering the six years data from 1987-1992 was produced, Cambers & James, 1993. This showed that the average erosion rate was -1 m per year. Erosion rates on the east coast were significantly higher than the west coast. The data period covered two major hurricanes in 1989, these events had a lasting effect on the beaches, which did not recover to their pre-hurricane levels. The data also indicated that at one site beach sand mining had more than doubled the rate of erosion. This technical report is shortly to be published as a paper in UNESCO's Marine Sciences Series.

The last complete survey of Dominica's beaches was conducted in March 1992. A partial survey of some of the island's beaches was carried out in July 1993.

Under the OECS ENCORE Project (Environmental & Coastal Resources Project), two special projects are to be set up in Dominica, one at Soufriere-Scotts Head and the second at Portsmouth-Prince Rupert Bay. These projects will include beach monitoring and Mr. James, Director of the Forestry Department, is in the process of training the ENCORE personnel in the beach measurement techniques. As soon as the necessary equipment arrives, quarterly beach monitoring and daily wave observations will commence at these two sites.

Future Action Needed

a) It is necessary to restart the Dominica Beach Monitoring Programme. An initial review of the sites indicates that they should all be continued with possibly the exception of Dubuc Bay on the south coast.

b) New personnel need to be trained in the beach measurement and data analysis techniques, it is tentatively planned to conduct this work after the proposed OECS-NRMU workshop on Coastal Development and Beach Sand Mining early in 1994.

Overall Assessment

While there is a good data record in Dominica from 1987-1992, there is an urgent need to train new personnel and restart the monitoring, this should be given high priority in 1994.

3.5 Grenada

Progress

A visit was made to Grenada from 5-11th December, 1993. The purpose of this visit was to re-establish the monitoring programme. A Beach Monitoring Programme had been established in Grenada in 1985 with the assistance of the Organization of American States (OAS). The beach and wave monitoring had continued until 1991, when the programme was incorporated into COSALC I. However, the beach monitoring had ceased in March 1991, due to the loss of trained personnel, although collection of wave data by paid observers continued. During the 1991 and 1992 COSALC I visits it had been decided to try and re-establish the programme.

In Grenada the programme is co-ordinated by the National Science & Technology Council (NSTC). Staff from the NSTC, Fisheries Division, Lands & Survey Department and the Land Use Department were trained in the field and data analysis techniques in December, 1993. Eight persons were trained in the techniques. At the outset a short seminar was held to review the results of the original programme. It was decided to re-establish measurements at nine beaches, these would include important tourism sites and beaches used for sand mining. The beaches and the number of sites per beach are shown in Table 1. As can be seen, most of these sites were previously measured sites. In many cases it was possible to locate the old reference points so that it will be possible to maintain the data record from 1985, although there will be a gap from 1991 to 1993.

TABLE 1 LIST OF BEACHES TO BE MONITORED IN GRENADA

Beach Location	Number of Sites	Status (newly established or old site)
La Sagesse	2	Old
Westerhall	3	Old
Magazin	1	New
Grande Anse	5	Old
Grand Mal	1	Old
Palmiste Bay	2	Old
Mount Rodney	1	Old
Sauteurs	2	Old
Lower Telescope	2	Old
Grenville	2	Old

During December, 1993, the sites were revisited, the reference marks repainted (and in some cases relocated) and the profiles were measured. Training was also provided in the data analysis techniques using the computer at the Fisheries Division and Version 2 of the Beach Analysis software.

In addition the Fisheries Division have been measuring important sea turtle nesting beaches on the east coast since the beginning of 1992. They had been using the Emery pole method which is somewhat similar to the techniques used in this programme. Sites were measured quarterly at the following locations : Levera (5 stations), Bathway (7 stations), Upper Telescope-Pearls Beach (10 stations). The data had been entered into a spreadsheet, but not fully calculated yet. Since the Fisheries Division indicated they were going to continue this monitoring, no further sites were established on these beaches.

The NSTC will continue to coordinate the programme, however, it will be necessary to develop a schedule for the monitoring so that the workload can be divided between the various agencies. To this end, the Head of the NSTC is to hold a meeting with the other Heads of Department early in 1994.

Further Action Needed

a) The data from 1985-1992 needs to be compiled and interpreted in a technical report, it is planned to undertake this work in 1994.

b) The monitoring programme for 1994 needs to be finalised and the agencies informed of their participation. In this respect the coordinating role of NSTC is especially important.

c) Grenada was supplied with an additional set of equipment, so that they now have two complete sets, however, if four agencies are involved in the monitoring, then it will be necessary to provide further equipment.

d) The Government Agencies in Grenada felt there was a need to inform the public and senior decision-makers about the effects of sand mining and erosion on the beaches. One of the mechanisms through which this could be achieved is an in-country workshop on Coastal Development and Beach Sand Mining, similar to those which were held in 1993 in Nevis and St. Lucia.

e) The wave data from 1985-1993 needs to be compiled and analysed.

Overall Assessment

The Beach Monitoring Programme has been re-established in Grenada. Since several different Government agencies are involved in the monitoring, the role of the NSTC in programme coordination is critical. However, the programme now has a firm technical basis and is no longer dependant on just one trained person.

3.6 Montserrat

Progress

A visit was made to Montserrat from 4-5 October, 1993. Meetings were held with persons from the Ministry of Agriculture, Trade and the Environment (MATE), the Montserrat National Trust and the Ministry of Finance.

This beach monitoring programme was established in March 1990 with the assistance of the OECS-NRMU. The Montserrat programme has now been incorporated into COSALC I. Measurements had been made at three monthly intervals over the period 1990-1993 by staff from the MATE. The data had all been analysed graphically. Two staff members from the MATE were trained in the use of Version 2 of the Beach Analysis Programme and a copy of the software was left in Montserrat. Data from 1990-1993 were to be re-analysed using this software because of its greater accuracy.

In 1993 the beaches in Montserrat had been closed to sand mining, mainly because of the large scale depletion of the beaches especially on the east coast at Trants. There was one prosecution case pending in October 1993. The alternative product being promoted in Montserrat was crusher dust from the Government quarry, this was being used for all building purposes. However, enforcement of the beach sand mining ban was a major problem.

Montserrat had also embarked on a Beach Enhancement Programme to beautify the beaches, provide facilities and prevent illegal activities such as mining etc. The programme started with a workshop in February 1993 and the plan is to start with Foxes Bay where the MATE will work with NGOs and other groups to obtain funding and implement the project.

Further Action Needed

a) Re-analyse the data for 1990-1993 using the Beach Analysis Programme, Version 2.

b) Prepare a technical report interpreting the four years

data, it is planned to complete this early in 1994.

Overall Assessment

The Montserrat programme has been maintained over a four year period with very little external assistance. The priority now is to interpret the data to determine trends and applications to beach management decisions, as well as to continue the monitoring.

3.7 Nevis

Progress

A visit was made to Nevis from 4-7 July, 1993. During this time a workshop sponsored by the OECS-NRMU was held on Coastal Development and Beach Sand Mining. The programme review was carried out during and after this workshop.

The monitoring in Nevis is continuing and is on schedule, monitoring is conducted every three to four months and the data are analysed in Nevis.

In April, 1993, a technical report was produced, Cambers (1993b). This analysed all the data collected for Nevis between 1988 and 1992. The erosion was most severe on the west coast, particularly at Gallows Bay and Pinneys Beach. However, in 1992, the erosion at one west coast site, Mariners Cades, was reversed and there was accretion. This change has been tentatively linked to the cessation of beach sand mining at the nearby Fort Ashby. Monthly data had also been collected and analysed in 1991 and showed the expected seasonal pattern.

A summary of the 1992 data was also prepared for the Fisheries Division. Some advice and a short report was provided to the Fisheries Department on a new development proposal for Longhaul Bay.

During the OECS-NRMU workshop in July, 1993, the problems associated with beach sand mining were discussed. These problems are recognized in Nevis. A general plan of action was prepared which could then be presented to the political directorate. This plan included establishing a price (user fee) for sand, establishing incentives for using alternatives to beach sand, and a full investigation of the available alternatives.

Further Action Needed

a) Continue the regular beach monitoring and incorporate the

1993 data into the long term trends, this should be done early in 1994.

b) Use the beach monitoring data to continue to advocate for serious controls in the mining of beach sand as were outlined in the July 1993 workshop.

Overall Assessment

The programme in Nevis is proceeding on schedule, however, there is a continuing need to apply the data and use it in coastal decision making such as beach sand mining. One of the major constraints limiting such applications is the shortage of trained physical planners in Nevis and also in some other islands.

3.8 St. Kitts

Progress

A visit was made to St. Kitts from 09-10 February, 1993. Meetings were held at the Department of Agriculture, the Fisheries Division and the Southeast Peninsula Land Development and Conservation Board (SEPB).

The Fisheries Division and the Conservation Officer had collected the data for 1992 on a quarterly basis for all the sites except the Southeast Peninsula. The data had been filed and analysed at the Fisheries Division using Version 1 of the Beach Analysis Programme. However, there was a small correction needed to maintain a constant standard vertical drop. This could not be done during the visit because the computer was down. As soon as the corrected data is received it will be possible to prepare a short interpretation report on the first 1-2 years data. Version 2 of the Beach Analysis Programme was sent to St. Kitts during the latter half of 1993.

The SEPB had been collecting data on a monthly basis for 20 sites in the Peninsula. The data up until 31st July 1992, had been analysed and discussed in a technical report, Southeast Peninsula Board (1992). This report was discussed during the visit and some advice was provided on how to analyse and interpret the data. There was some concern about the continuation of the beach monitoring in the Southeast Peninsula after the summer of 1993 due to staff changes. The programme in St. Kitts was provided with a new tape measure.

Further Action Needed

a) The data for the main part of St. Kitts for 1992, 1993, needs to be compiled into a short technical report, this

can be done as soon as the corrected data is received.

b) The data for the Southeast Peninsula can be included in the same report, much of this data has already been interpreted by the SEPB staff.

Overall Assessment

The programme in St. Kitts is proceeding on schedule, by the end of 1993 there should be a two year data record which can begin to form the foundation for trends and decision making.

3.9 St. Lucia

Progress

A beach monitoring programme was established in St. Lucia in 1990 and ran until the end of 1991 when it had to be stopped due to a shortage of staff. A visit was made to St. Lucia in 1992 when assistance was provided with the data analysis. It was hoped that the monitoring could recommence in 1993, however, this did not happen.

A visit was made to St. Lucia from 6-9th October, 1993, to take part in a workshop on Sand Mining and Coastal Development sponsored by the OECS-NRMU. This workshop had three aims : firstly to re-establish the beach monitoring programme, secondly to provide training on the application of the beach monitoring data and thirdly to develop a strategy to manage beach sand mining.

During the workshop the participants were trained in the field techniques and Version 2 of the Beach Analysis Programme was demonstrated to the participants.

In relation to the beach monitoring, the objectives of the programme were re-defined as follows :

a) Determine the impact of mining on local beaches;
b) Determine the long term impact of development on selected beaches with an initial focus on the northwest coast;
c) Monitor control sites on the east and west coasts to determine natural changes.

It was decided to monitor Fond D'Or and Troumassee for sand mining, at Troumassee new sites will have to be established. These sites, together with Anse Ger, the control site, would be monitored on a monthly basis. The Department of Fisheries (DOF) would undertake to monitor these sites.

Pigeon Island Causeway, Reduit Beach, Vigie Beach and

Anse Cochon, all of which are sites established in 1990, would be monitored on a quarterly basis. The St. Lucia National Trust agreed to assist here and the DOF were going to approach other agencies for assistance. The DOF will coordinate the programme and will be responsible for data analysis. It was anticipated the monitoring could recommence in January 1994.

A Coastal Conservation Project started in St. Lucia in March 1993, this is being coordinated by the Ministry of Planning. The objective of this project is to prepare a Coastal Management Plan for the northwest coast. The data collection phase is at present underway.

The workshop participants recognized that wave data was also required to supplement the beach monitoring. However, it was decided to re-establish the beach monitoring first.

Further Action Needed

a) Re-establish the beach monitoring schedule on a regular basis. This will be coordinated by the DOF and will involve several agencies.

b) Provide additional sets of equipment so that each agency undertaking monitoring has a set of equipment.

Overall Assessment

By involving several agencies, it is hoped that the beach monitoring programme can be re-established on a sustainable basis. In view of St. Lucia's steps towards coastal zone management, the need for regular monitoring and a sound data base on which to make decisions become even more important.

3.10 St. Vincent & The Grenadines

St. Vincent & the Grenadines remain the only country in the OECS who have not yet established a beach monitoring programme. However, contact has been made with the Central Planning Unit recently, who have expressed interest in the programme.

3.11 Overall Evaluation

Table 2 summarises the status of the beach monitoring programmes in the nine islands. The length of the data record varies from one to seven years. There are now nine islands (eight territories) where the beaches are measured

TABLE 2

SUMMARY OF THE STATUS OF THE BEACH MONITORING PROGRAMMES

Country	Year Programme Established	Agency(s) Responsible	Number of Sites	Comments
Anguilla	1992	Department of Fisheries & Marine Resources & Lands & Surveys Dept.	22	On schedule 1 years record
Antigua	1991	Development Control Authority & Fisheries Division	30	On schedule 2 years record
British Virgin Islands	1989	Conservation & Fisheries Department	47	On schedule, 5 years record.
Dominica	1987	Forestry & Wildlife Department	22	6 years record, regular monitoring lapsed since March 1992.
Grenada	1985 (1993)	National Science & Technology Council,Land Use,Surveys, Fisheries	21	Programme re-established 1993, (7 years data 1985-1991)
Montserrat	1990	Ministry of Agriculture Trade & Environment	11	On schedule, 4 years record
Nevis	1988	Nevis Historical & Conservation Society & Fisheries Division	17	On schedule, 6 years record.

TABLE 2 CONTINUED

Country	Year Programme Established	Agency(s) Responsible	Number of Sites	Comments
St. Kitts	1988 (1991)	Southeast Peninsula Board,	20	On schedule, 2 years data
		Fisheries Division & Dept. of Agriculture	15	On schedule, 2 years data.
St. Lucia	1990	Fisheries Management Unit	14	1 years record, monitoring to recommence 1994

and the data analysed on a regular basis. This constitutes an invaluable data record and the counterpart staff are to be commended for the hard work involved.

As the programme has evolved it has been found that it is best to have several people and more than one agency involved in the monitoring. Thus the monitoring programmes can continue even with a high staff turnover rate.

Two in-country workshops have been held this year, in Nevis and St. Lucia, sponsored by the OECS-NRMU. The overall aim of these workshops was to assist the islands with the application of the monitoring data to coastal development decisions and sand mining issues. These workshops have been successful and it is hoped to conduct further workshops in other islands in 1994. However, one of the main constraints to this application process is the general weakness of physical planning in the region.

There are some records of waves in Nevis, Dominica and Grenada. The longest record exists in Grenada, where waves have been measured by paid observers over the period 1985-1993, however, the data have not yet been fully analysed.

There exists now an invaluable data record on beach changes in these islands which will become increasingly important in coastal planning as the individual countries attempt to deal effectively with the current problems caused by coastal development, tourism, and sand mining and the future predicted problems due to global climatic changes.

4. DEVELOPMENT OF SOFTWARE FOR DATA ANALYSIS

Version 1 of the Beach Analysis software was developed in 1991 by Dr. David Gray and Mr. Tracey Bean of the Department of Finance and Management Science, St. Mary's University, Halifax, Canada, Ms. Williana Joseph of the Department of Fisheries, St. Lucia and Mr. Peter Murray of the OECS Fisheries Unit. This software consists of a set of Macros in a Lotus Spreadsheet.

In March 1993, Dr. Cambers worked with Dr. Gray and Mr. Bean in Halifax to develop version 2 of this software. This second version has several improvements, it allows a standard vertical drop to be maintained for each profile site, it allows for several graphs to be overlaid on top of each other, and it allows for the files to be saved separate to the spreadsheet. A manual has been prepared and the improved software has been well received in the islands.

5. ESTABLISHMENT OF A COORDINATING CENTRE FOR COSALC I

Since August, 1993, the University of Puerto Rico Sea Grant College Program have provided the administrative and secretarial support for COSALC I. They have also assisted with awareness by including articles about the activities of COSALC I in the newsletter Sea Grant Boletin and are preparing and publishing a brochure describing the COSALC I programme. Further assistance will be provided in 1994 with the technical aspects of the programme in the islands.

One of the reasons for establishing the COSALC I programme in 1985 was to try and develop practical solutions to the problems related to coastal erosion. Thus it is hoped that the cooperation between COSALC I and the University of Puerto Rico Sea Grant College Program will help COSALC I achieve its objectives in the short and long term.

6. CONCLUDING REMARKS

In order for COSALC I to expand and to provide the necessary assistance to the existing islands in the programme, as well as to include new islands into the network, there is need for additional programme funding. To this end a three year work programme is being prepared which will be used to seek funding.

Knowledge is the key to successful and sustainable development in these islands. This programme is assisting the islands to understand more about their coastal environment, specifically their beaches, which in turn will

enable the islands to manage their beach resources in a sustainable manner for the benefit of their people. Despite the many constraints this programme has faced, its achievements must be viewed in an overall context. Ten years ago very little was known about beach changes in the islands and the little that was known was usually in reports compiled by overseas consultants. Yet now there is a network of local persons with a detailed, practical knowledge of beaches and their changes, the task ahead is to ensure that that network expands and achieves its maximum potential.

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References

Cambers, G. 1993a. Antigua Coastal Monitoring Programme. Analysis of Beach Changes Between 1991 and 1992. COSALC I, Antigua Report #2.

Cambers, G. 1993b. Nevis Coastal Monitoring Programme. Analysis of Beach Changes Between 1988 and 1992. COSALC I. Nevis Report # 3.

Cambers, G., Lima, H., Mason, A., Varlack, L. 1993. Beach Changes in the British Virgin Islands between 1989 and 1992. Conservation and Fisheries Department, Government of the British Virgin Islands, Technical Report # 21.

Cambers, G., James, A. 1993. Dominica Coastal Monitoring Programme, Beach Changes in Dominica 1987-1992. COSALC I, Dominica Report # 3.

Southeast Peninsula Board. 1992. St. Kitts Southeast Peninsula Coastal Monitoring Program. Report submitted to the Southeast Peninsula Board.

****