ECLA/POS 71/2
Distribution: Restricted
Date: 29 January 1971

14

ECONOMIC COMMISSION FOR LATIN AMERICA
Office for the Caribbean

REPORT OF MISSION

ON

PORTS AND HARBOURS DEVELOPMENT

AND PLANNING IN

EAST CARIBBEAN COUNTRIES

1 November 1970 to 31 January 1971

by

H. W. APPEL
PORTS AND HARBOURS ADVISER

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

Terms of Reference

This assignment was undertaken within the terms of a Special Service Agreement for a period of three months. The general terms of reference regarding the assignment may be summarised as follows:

> Under the supervision of the Director of the ECLA Office for the Caribbean, the expert shall examine and evaluate existing conditions, and current plans and projects concerning port infrastructure, installations and equipment, in member countries of the Caribbean Free Trade Association (CARIFTA), and in particular in territories of the East Caribbean Common Market (ECCM); and shall submit conclusions and recommendations for their improvement.

The Agreement commenced on 1 November 1970 and terminated on 31 January 1971.

2. It was originally envisaged that a two-man team comprising a Port Harbours Engineer, and a Port Management Expert, would jointly examine the problems of ports in the East Caribbean countries. For various reasons, it was not possible for the Port Management expert to assume duties as scheduled; this report therefore covers the activities of the Port Engineer only.

3. In view of the short term nature of this assignment, it was necessary to define more specifically the terms of reference. This required the establishment of priorities to ensure that some tangible results would emerge. Consequently, detailed discussions were held with the Director of the ECLA Office to determine how best to approach the problems. During these discussions, it was agreed that emphasis should be placed on a short term improvement of the physical facilities of harbours in the ECCM countries with the following priorities:

"(i) requirement for immediate improvements, with possibly St. Lucia repair of wharf as first priority;

(ii) new infrastructure, Dominica, St. Kitts-Nevis-Anguilla construction of new wharves and jetty, perhaps as second priority;

(iii) jetty for Montserrat could be a third priority and then facilities at St. Vincent taking a medium priority". 1/

Geographic Area

4. An important consideration in this study was to examine the subject from the point of view of its integration aspects. At present the English-speaking countries of the Caribbean have signified their intention of embarking on a programme of economic co-operation, and are all signatories of the CARIFTA Agreement. These countries may be grouped as follows:-

(i) the independent sovereign states of Barbados, Guyana, Jamaica and Trinidad and Tobago;

(ii) the West Indies Associated States of Antigua, Dominica, Grenada, St. Kitts-Nevis-Anguilla, St. Lucia and St. Vincent, plus the dependent territory of Montserrat.

The latter group is again united under a separate integration treaty and form the East Caribbean Common Market. Based on the priorities established during discussions in the ECLA Office, specific attention was given to the harbour problems in these states.

1/ See summary of discussions held in ECLA Office for the Caribbean on 2 September 1970.

Calendar of Survey

5. During the thirteen weeks of this assignment, more than three weeks were spent in travel to the islands of the East Caribbean for on-the-spot observations and study. The programme for such travel was drawn up in such a way as to enable the Regional Adviser on Maritime Transport to accompany me on the first two missions. During the last mission I was accompanied by the Deputy Director of the Office so as to facilitate follow up work that might be necessary. A detailed timetable of activities connected with this programme of work is given in Appendix A.

Reference Documents

6. The documents reviewed for this study are enumerated in Appendix B. These are subdivided into general documentation on the area, and documentation relating specifically to individual states. A list of people with whom discussions were held in connection with this study is also given in this Appendix. The exchange of ideas with them was very useful in formulating opinions and conclusions, and I am extremely grateful for the cooperation they have extended to me. Without their assistance it would have been impossible to cover the range of work involved in this study during the short period.

Framework of Report

7. The frame adopted for preparation of this report has certain basic objectives. In the context of the range of specialised functions carried out by the Office, the subject has been examined from the point of view of the major fields of study which have an impact on port development and planning. Moreover, the country sub-divisions used facilitate easy regrouping so that the reports relating to individual states can be presented in self-contained form.

8. In defining priority ratings and the establishment of an overall investment programme, consideration has been given to an integrated approach for regional development. This implied a more in-depth study of longer term development with broad outline planning than had been anticipated when terms of reference were drawn up. However, this approach has facilitated a proper evaluation of the short term improvements required, since in the majority of cases these measures need to be considered against a 3 to 4 year time lag between the present obsolete and sometimes dangerous situation, and the completion of new facilities as envisaged.

CHAPTER II

SUMMARY AND RECOMMENDATIONS

General

9. In view of the short duration of the assignment, conclusions arrived at, particularly those relating to longer term development and improvement, need refinement and re-appraisal. This task can be undertaken at a later stage when additional expertise is available for a longer period, conceivably as part of a regional transport survey.

10. As discussed with ECLA's Port of Spain Office, the harbour of Antigua has not been given detailed consideration. The facilities at the recently completed (1967) modern St. John's harbour consist of 1200 feet of wharf, a draft of 35 feet, and a 100' x 400' transit shed. Congestion occurs only in winter time, since absolute priority is given to cruise/passenger ships, and problems involved refer almost exclusively to managerial aspects. Two modern berths with facilities for an annual general cargo movement of under 100,000 metric tons are considered to be more than adequate. Once the contemplated expansion with a third berth takes a more definite shape, consideration should also be given to an inter-island vessel berth, since the present pier abreast the town with a draft of only 6 feet is in a very poor state.

11. It is suggested that under the ECLA-Dutch Technical Assistance Programme, study of ports and harbours in the East Caribbean should be further extended. Apart from the Port Management expert to be made available, the following studies should, as a first step, be carried out by the Hydraulics Laboratory of the Technical University of Delft.

(i) Analysis of sea and swell conditions for the ports of St. Kitts (Basseterre harbour), Montserrat (Plymouth harbour), and Dominica (Roseau harbour). The existing meteorological

and hydrographical data generally available, complemented by those obtained from studies carried out for Saba and the Virgin Islands, will be used as the basis.

Estimated costs for these are between US$2,500 and $3,500.

(ii) Swell dissipation slope stability and hurricane resistance tests in the wind flume of the Hydraulic Laboratory of Delft on the jetty type structures as designed by Coode and Partners for Dominica[1/] and St. Lucia. Estimated costs are between US$8,000 to $13,000.

The results of these tests can be used to advantage in the cases of St. Kitts and Montserrat, if the final designs for these territories also indicate this jetty type structure as the most appropriate for the conditions prevailing there.

(iii) Field measures and observations to be carried out on littoral drift and current measures for St. Kitts (Basseterre harbour) and Montserrat (Plymouth harbour); and as a possible second priority, for St. Vincent (Kingstown harbour).

The latter should commence after the reclamation scheme has been completed, and soundings to be carried out by the St. Vincent Government indicate its necessity.

First phase appraisal costs are estimated at US$15,000.

Functions of Ports in Integrated Development

12. In examining this subject, extensive use has been made of the thoughts as laid down in the UN publication 1969 No. TD/B/C.4/42/Rev. 1. In this document ports are considered as links in the

---

1/ During the joint meeting convened by the Government of Dominica, the Consultants, Coode and Partners, indicated that they had at their disposal a laboratory report adequate in all respects. They promised to forward a copy of this report to the Government for consideration.

transport chain and their development must be approached in this context. Thus, they must function as consistent operational units at the beginning and/or at the end of a relatively long voyage.

13. In the case of the Caribbean, and in particular of the ECCM countries, there are a variety and great number of ports in the transport chain which provide different and sometimes limited types of facilities. For example, some ports provide only lighterage facilities and small vessel anchorages, whilst others provide feeder services for domestic cargo and to a certain degree also for overseas cargo.

14. The relative geographical location of these territories is such that physically they form to a large extent the transport chain itself. Consequently, any improvements leading to efficient and cost reducing sea transport can only be achieved by an integrated and synchronised approach. Operational improvement in any single port hardly effects ship's time spent in all other ports together, and benefits derived from investment in one of these ports only are therefore limited, when viewed from the integration aspects.

15. In the case of shuttle services in particular, ship's time spent in ports is proportionately considerably higher when compared with normal trans-ocean transport, in which basically one or two ports of origin and destination are involved. Also, the beneficial effects of competition from one efficiently operated port over another, cannot play a role since every port serves an island state, and this defines geographically its own hinterland, unless a system of main trans-shipment ports is introduced. Attractive as this solution seems to be in respect of incoming cargo, in the light of export commodities of a basically agricultural nature, it should not be advocated.

16. Finally, the philosophy adopted by the liner conferences to apply average rates over a group of ports, also points to the necessity for an integrated, regional port development programme

through the Caribbean as a whole, and for the ECCM countries in particular. It should be noted that these latter territories in the majority of cases, do not possess appropriate facilities. If free movement of goods and services within CARIFTA is an ultimate goal, not only the financial barriers between the states should be removed, but also the physical ones, for physical barriers can constitute an even more rigid constraint on the flow of goods between the different states.

Basic Concepts for Integrated Development

17. On the basis of the functions ports within the area should fulfil, as outlined above, the basic elements underlying the integrated port development programme should be;

(i) provision of proper harbour unit facilities, ensuring minimum services even for the smallest of all ports;

(ii) when cargo movements exceed the minimum quantity justifying major facilities, plan for a standard, normal draft port;

(iii) adapt on-shore facilities to the specific requirements of types of outgoing cargo and incoming cargo;

(iv) provide adequate port equipment, designed to cope efficiently with the types of exports and imports; and

(v) efficient organization of port management and port operations; this requires appropriate legislation and implementation.

18. At present, Trinidad and Tobago, Barbados, Grenada, St. Vincent, Antigua and Jamaica possess the basic maritime unit facilities permitting the entrance of ships with a draft varying from 28 to 33 feet. This draft can be considered adequate for standard operations in smaller ports. Ports which satisfy the requirements outlined under ii above should provide similar maritime facilities. The ports of Dominica and St. Lucia belong to this group.

19. Commensurate on-shore facilities and services are an integral part of the development programme. These include up-to-date equipment for loading and unloading, adequate in-port transportation, properly designed storage and warehousing space, and efficient management. Once these have been established, the basic goal has been reached, and ships and cargo can move within one unified, standard and streamlined operation throughout the Caribbean.

20. Where there is insufficient cargo traffic, this may necessitate the design of an anchorage or lighterage port, a control loading point or tower, mostly for bulk cargo, or a medium draft facility receiving trans-shipment cargo directly. In addition the traditional inter-island vessels traffic which now exists in the Caribbean accounts for between 15 and 25 thousand metric tons of general cargo movement in every port annually. This form of transport plays a major role in defining the type of small ports, since it is a major instrument in the development of regional maritime transport. Moreover, it has a continuing role to play in facilitating future communications between the smaller islands, particularly where they have administrative links with a larger island. The port of Montserrat falls within this group, whereas St. Kitts finds itself on the margin, in view of its bulk operations on sugar exports, and relatively small quantity of general cargo movements.

21. Finally, consideration should be given in the other ports with standard drafts for provision of separate moderate draft facilities for inter-island traffic; this is necessary to secure a continuation of the chain-link pattern.

Harbour Projects by Countries and Overall Investment Programme

22. The harbour projects for each individual country has been sufficiently detailed in the technical section of the respective countries. Where necessary a sub-division has been made in short-term improvements and new harbour construction. For proper rounding off now, a third group will be introduced which constitute the short-term improvement works for the more modern and (recently) constructed harbours. The provisional estimated costs involved in the different projects have been analysed in the financial section of the respective countries, to which one is referred for further details.

23. In summary, the total capital costs and investment program in thousand WI$, is as follows:-

		Short-term improvement Years					
Countries	Total	1971	1972	1973	1974	1975	1976
Grenada	-	-	-	-	-	-	-
St. Vincent	-	-	-	-	-	-	-
St. Lucia	2,465	-	650	927	165	560	163
Dominica	360	48	312	-	-	-	-
St. Kitts	290	50	183	57	-	-	-
Montserrat	191	146	45	-	-	-	-
Total	-	244	1,190	984	165	560	163
Cumulative Total	3,306	244	1,434	2,418	2,583	3,143	3,306

CHAPTER III

ECONOMIC SECTION

GENERAL ECCM PATTERN

24. In the preparation and design of infrastructure for transportation, information on past, current and projected goods and passenger [1] movements is indispensable for proper planning. Information on goods movements should be expressed in weight/tons, since all cargo, port equipment, road vehicles, designs for wharves, bridges, etc., assume basic weight element, and specifications for their supply and design are made exclusively in these units.

25. In the early stages of information collection, value units are used so as to facilitate financial assessment of revenue estimates, and this practice is still widespread in the ECCM countries. Consequently, the infrastructure transportation planner is in a weak position because information on the basic weight unit is not available. Further, even where data exist, they are not comparable, and this introduces an element of uncertainty in the planning process. Another difficulty is the lack of information on intra-ECCM cargo movements, even in value terms. To meet these difficulties and facilitate infrastructure planning, it would be useful for ECCM countries to initiate collection of uniform statistics; in this regard the basic statistical approach as suggested by the ECLA is relevant. [2]

1/ Passenger movements are of minor importance here in port planning; consequently, these are not analysed.

2/ Forms have been designed by the ECLA for uniform and systematic collection of basic statistics on cargo movements in the Caribbean. These have been circulated to Governments.

26. To demonstrate the incompleteness in this respect, the available data have been collected from different sources and efforts made to compare them. Table I which gives a tabulation for the different islands, covered in this report shows clearly the substantial deviation in recording of the imports and exports by the different sources.

27. In an effort to convert data expressed in value terms, to goods movement in weight, an analysis has been made, and a correlation coefficient established for an island with closest similarity, and on which both weight and value figures were reasonably available. In this case Barbados was chosen. The calculations in Table II show the results of this exercise.

28. It is worth noting that an overall fairly constant correlation has been found throughout a number of years; then there was a radical change in the import and export pattern in subsequent years. If a breakdown by commodity - groups is used, then the results show less reliable correlation factors, than for the overall pattern.

29. Finally, a provisional analysis has been made on imports and exports of agricultural commodities since considerable emphasis is placed on the policy of import substitution. See Table III. The figure shown is far from being complete, but the trend is clearly marked. Many thousands of tons are still imported annually, and if the policy of import substitution is actively implemented, this will benefit the inter-island vessel trade.

30. Considering the above in the light of projections on goods movement, the absence of a well analysed and long-term development programme with set sectorial targets of production, framed within the intra-regional concept of the CARIFTA and ECCM Agreements, is clearly felt and merits full attention. As a first priority an overall agricultural and industrial development programme at the regional level appears to be most appropriate.

Projected Exports

31. On the basis of the above projections, Coode & Partners have analysed the expected goods movement on exports over the port Castries, on the assumption that the present distribution pattern between Vieux Fort and Castries will remain unchanged. The following information on exports is expressed in revenue tons, but since bananas is the major item, it represents approximately also the export in weight tons:

	1970	1975	1980	1985	
high	54,300	63,000	73,100	84,800	revenue tons
likely	53,800	59,200	63,100	71,600	" "
low	52,750	52,750	52,750	52,750	" "

32. It will be appreciated that such a possible deviation in forecasts on future projections will substantially effect not only the physical plans of the harbour, but much more so its economic appraisal. Clearly the harbour planning should be highly flexible as to meet at least, probable variations.

Projected Imports

33. The projected imports over Castries harbour as analysed in the Coode & Partners report are presented in the table below. In the calculations they introduced a division between Castries and Vieux Fort, with the former presently handling 83%; this proportion is expected to decrease gradually to 79% by 1985. Further, they introduced a conversion coefficient of 0.69 to derive weight tons from revenue tons.

	1970	1975	1980	1985	
high	54,600	79,500	101,200	129,300	weight tons
likely	53,700	75,600	88,500	105,100	" "
low	53,100	73,600	80,600	88,300	" "

GRENADA

34. As early as 1964 when the 5-year Development Plan was prepared by the Development Programme Commission, a major section was dedicated to the development of ports. Special attention was given to warehouse spacing, schooner traffic, and harbour equipment.

35. Although this Plan stated inter alia[1]:

> "that there is no chronic shortage of berths can be seen from the fact that on an average cargo vessels arriving in the port stays only 24 hours; that about once a month 3 ships may be in port at once and one or the other of the ships must wait 12 hours or so for a berth. Berth congestion is invariably experienced when there is in port one of the Gheest banana boats";

and further on:

> "on the question of the shortage of berthing facilities all evidence points to the fact that greatest inconvenience is caused when large tourist liners arrive in port to final say, a large banana boat occupying the berth",

they still come to the conclusion that:

> "In spite of the fact that the delays providing berths for ships are not excessively long and that there are days when no ships use the port the overall situation require the provision of one additional berth".

36. The cost estimates then prepared by the Government envisaged a 500 feet berth to be constructed at a value of WI$900,000, exclusive of equipment, warehouse spacing and roads. It seems that some exercise is required to update this estimate, and re-appraise the cost/benefit results. Such an exercise might throw considerable light on the problem, as construction costs have risen considerably since, and the present goods movement of some 85,000 metric tons,

---

1/ Five Year Development Plan, Grenada: 1964-1968. Page 153.

exclusive of the movements by the inter-island vessels, does not appear to justify further extension. Unless another long-term projection of cargo movement shows a considerable increase in traffic through St. George's harbour in the near future the project would require scaling down.

37. However, it might quite well be justified to extend the existing 800 feet long wharf, which at present is often incapable of berthing of 2 ships. An analysis of the benefits to be derived from this extension must take into account the number of ships which could have been berthed had there been additional facilities of a 150ft. section towards the Careenage.

38. A provisional cost estimate of the extension, to be revised after boring results become available, indicates an amount of about WI$375,000. Government is advised to prepare a separate benefit appraisal for the section handling general cargo, in order to justify additional warehousing and harbour equipment, and another one for the construction of the basin for inter-island traffic to handle some 20,000 to 25,000 tons of cargo. This latter will alleviate the present situation in the Careenage, which presents substantial non-quantifiable, intangible benefits.

ST. VINCENT

39. The Five Year Plan 1968-1970 for St. Vincent makes no separate provision for port expansion. Kingston Harbour has facilities for cargo handling which appear to be adequate. The major problem, however, refers to complaints made by users of the Port, and efforts are now being made to correct them. Consequently, analysis of economic conditions in St. Vincent would not be useful for the purposes of this study.

40. The basic problems involved are dealt with fully in the technical section. It is advisable, however, for the Government to conduct cost/benefit analyses on the future phases of the overall construction scheme they have recently embarked upon, in case external financing is sought.

ST. LUCIA

Overall Economy

41. As has been analysed in the Robson, Morrow & Co.'s report, St. Lucia's present economy, and in particular its projected growth, is heavily based on agriculture, (mainly bananas) and tourism. Agriculture was mainly responsible for the growth of St. Lucia's GDP by 10% per annum in the sixties, whilst tourism is making an increasing contribution.

42. More emphasis needs to be placed on the diversification of agriculture, which, in the context of the CARIFTA and ECCM Agreements, is expected to replace to a large extent imports of agriculture commodities from outside the area, as well as to increase exports of those commodities which are particularly suited to conditions in St. Lucia and in which the other territories are deficient. The fact that 22 commodities are included in the CARIFTA Agreement to stimulate the regional import substitution in agricultural commodities is basically important. However increased production in these commodities should be regarded as a first step only, and more diversified agriculture should be the goal. This may require in-depth study by a team to be assigned specifically for this purpose.

43. The Tables in the Statistical Section show the substantial amounts of agricultural produce still imported from outside the region.

44. The development of this sector is sensitive to the activities of the inter-island vessels and therefore, in the harbour development, this section merits major attention.

45. Finally, the special provisions within the CARIFTA for possible preferential location of some industrial plants within the ECCM countries, should lead to an industrial development with intra-regional importance, and in turn the complementary inter-island traffic. Therefore when detailing the harbour layouts, the necessary provisions should be made for these types of industries, the economic success of which is highly dependent upon transportation costs of imputs and final products.

Economic Growth

46. Insufficient basic data are available for St. Lucia, and no long-term sectorial development plan with targets set against the background of regional integration has been prepared. Coode & Partners, when projecting future goods movement, had to utilise a provisional form of sectorial projection, of which the basic outlines are as follows:

Imports:	Projected annual export growth rate in %								
Sector:	until 1975			until 1980			until 1985		
	high	likely	low	high	likely	low	high	likely	low
Consumption	4.5	3.5	2.5	4.5	3.5	2.5	4.5	3.5	2.5
Construction		12.0		8.0	6.0	4.0	8.0	6.0	4.0
Agric. Machinery and Fertilizers	-	9.0	-	-	2.0	-	-	2.0	-
Pesticides	-	20.0	-	-	2.0	-	-	2.0	-
Feedstuff	-	9.0	-	-	9.0	-	-	2.0	-
Miscell. Agric.	-	5.0	-	-	5.0	-	-	2.0	-
Transport	16.0	14.0	12.0	10.0	8.0	6.0	10.0	8.0	6.0
Manufacturing	-	10.0	-	-	10.0	-	-	5.0	-

Source: Coode & Partners Report, Volume II, Pages 63-70.

Regarding exports, bananas account for 93% in weight/tons; Coode & Partners themselves based their calculation on the growth projections as prepared by Dr. Petric of the British Development Division. Along their lines they adopted the figures of 3, 2, and 0% for respectively high, likely, and low growth rates.

DOMINICA

Overall Economy

48. The economic report prepared by Robson, Morrow & Co., states that no information is available on inter-sectorial purchases and sales, and no G.D.P. estimates have been prepared for the period after 1966. Consequently they built up their projections by assuming that Dominica's present economy is based on four leading sectors, i.e. export agriculture, including fruit products, other agriculture, mining and manufacturing, and tourism. Growth in the remaining sectors was presumed to take place parallel with the big four.

49. Export agriculture is dominated by bananas, providing 80% by value of 1968 exports. The recent increase in yield to 2.8 tons/acres, mainly induced by increased use of fertilizers, is expected to increase still further.

50. More emphasis should be given in Dominica to further diversification and extension of the agriculture with particular attention to import substitution within the context of the Carifta and ECCM Agreements. The fact that 22 commodities are included in the ECCM Agreement to stimulate regional import substitution is basically important; however it should be regarded as a first step only, requiring much more basic spadework possibly by a team assigned specifically for this purpose. The Tables in the Statistical Section illustrate the extent to which agricultural products are still imported from outside the region. The development of this sector is highly sensitive to the activities of inter-island vessels and therefore in the harbour development, this factor merits careful attention.

51. The recently established Dom./Can. timber industry and the Dominica Mining Company producing pumice, are two examples of export produce requiring adequate port facilities. Other industries like coconuts and lime juice are important for intra-regional supply and export outside the region. The special provisions within the CARIFTA for possible preferential location of some industrial plants within the ECCM countries should lead to industrial development with intra-regional importance and, in turn, the complementary inter-island traffic.

When detailing the harbour layout provisions in the port area should be made for these types of industries, whose economic success is dependent upon transportation costs of inputs and finished products.

Economic Growth

52. Insufficient data are available on Dominica, and no long-term sectorial development plan with targets set against the background of the regional integration has been drawn up. Coode & Partners, when projecting future goods movement had utilised a somewhat provisional form of sectorial projection on G.D.P. growth, of which the basic outlines are as follows:

Table XXV1

$ Million (E.C.)

PROJECTED GROWTH DOMESTIC PRODUCT 1970-1985

SECTOR	1970	1975	1980	1985
Export Agriculture	7.9	9.0	10.4	11.7
Other Agriculture	4.7	5.4	6.3	7.3
Forest Products	2.1	4.2	5.3	5.3
Mining and Manufacturing	2.4	2.9	3.6	4.4
Tourism[1/]	1.0	1.9	4.7	9.5
Government	5.8	7.4	9.4	12.0
Construction and Engineering	3.2	4.6	6.8	10.0
Transport	1.3	1.7	2.1	2.7
Finance	0.8	1.0	1.3	1.7
Rent of Dwellings	3.9	5.0	6.3	8.1
Services and Professions	1.5	1.9	2.4	3.1
Distribution	2.2	2.8	3.6	4.5
TOTAL G.D.P.	36.8	47.8	62.2	80.3

Source: Coode & Partners Report, Vol. II, Page 72.

1/ Assumes no cruise ship facility provided.

Every sector was analysed in further detail to arrive at final estimates in volume and weight. Regarding exports, bananas accounted for 86% of its export value, and Coode & Partners projected a growth rate of 2%.

Projected Exports

53. On the basis of the above projections, Coode & Partners estimated the expected goods movement on exports over Roseau Harbour. They assumed that once the westroad has been completed bananas, at present shipped via Portsmouth, would all be channelled through Roseau. The Government did not share this opinion, and therefore goods movement of bananas should be corrected by assuming, that the present distribution ratio between Portsmouth and Roseau will be maintained.

54. The table below expresses projected exports in revenue tons, but since bananas is the main item, it also represents approximately the exports in weight tons: 1/

	1970	1975	1980	1985
High	62,000	94,000	117,000	129,000 revenue tons
Likely	62,000	78,000	103,000	128,000 revenue tons

Projected Imports

55. On the basis of the projections, Coode & Partners arrived at the following projected goods movement over Roseau port, assuming that Roseau's participation in the import would be as high as 96%, and that Roseau would be the only deep water port in Dominica.

	1970	1975	1980	1985
High	74,000	100,000	140,000	205,000 revenue tons
Likely	72,000	92,000	122,000	161,000 revenue tons
Low	71,000	82,000	100,000	127,000 revenue tons

For a conversion factor to weight tons, Coode & Partners used 0.69; this figure, when used for the most likely projection for 1985, would give exports in weight tons 111,090.

56. It will be appreciated that a possible deviation on future projection as shown in the above table will substantially affect not only the physical plans of the harbour, but much more so its economic appraisal, timing and phasing of construction and extension.

1/ Corrected Coode and Partners' figures by deducting banana exports through Portsmouth, maintaining the present distribution ratio.

ST. KITTS

Overall Economy

59. The economic appraisal for the deep water harbour has been carried out as a desk study by the Economic Associates Ltd., London, in October 1970, on the basis of the available data as received by them from the Crown Agents. In the absence of an overall economic and long term development plan for the area with sectorial targets, they have made their own sectorial forecast for the period 1970-1995.

60. At present St. Kitts' exports depend almost exclusively on sugar. On the other hand, an important start has been made in the establishment of small industries close to the proposed site of the new harbour area by the Curtis Mathes Co. Ltd. Further, the development of the Frigate Bay area for the tourism will contribute to a more diversified economy, generating more imports on construction materials and consumable goods. Some agricultural expansion on cash crops might possibly be generated for both tourist consumption and supply to the other tourist islands, mainly Antigua. Well equipped inter island vessels should therefore play an important role in this development.

Economic Growth, Projected Exports and Imports

61. The Economic Associates Ltd. projected a slight decline in exports during the first 15 years mainly because of a slight drop in sugar and molasses production, the latter being caused by the construction of the new distillery. In summary, export projections were as follows:

	1970	1975	1980	1985	1990	1995
In thousand metric tons	48.1	44.8	43.1	41.4	41.4	41.4

Such long-range forecasts are necessarily subject to a wide margin of error, but they were used by the economist because of the long pay-out period of costs required when analyzing benefits over costs.

62. The projections for imports were made in the absence of any other indication by estimating arbitrarily the increase in foreign exchange on plans for 5 major foreign exchange earners, i.e., notably exports, tourism, private and public capital. Once these figures were established a conversion factor was introduced to arrive at the amount of each

E.C. dollar to be spent on imported goods. This conversion factor varied with time from a high 0.853 in 1970, to a low 0.663 in 1995. From the value of imports thus estimated, and subtracting an estimated amount for oil, they applied a conversion factor of EC$500 per ton, to arrive at the projected imports in tons.

63. It is interesting to note that the conversion factor, calculated by them at .455 over the years 1965-1967, is somewhat similar to the exercise done for Barbados in this study. However, the same exercise shows how substantial fluctuations can occur when the import pattern is changed. Even group commodities show a rather wide variation, and imports based on conversion from financial figures should therefore be considered as giving a general indication of trends only. Total export projections given by Economic Associates Ltd. in thousand metric tons are as follows:

	1970	1975	1980	1985	1990	1995
General cargo	33.4	43.5	54.7	56.3	68.5	85.0
Oil	11.0	20.1	30.7	34.4	45.3	56.2

A further projection was made on estimated cruiseship passengers and cruise ship calls. This shows an increase from 7,696 on passengers and 28 on cruise ships in 1970 to a high of 72,556 on passengers and 145 on cruise ships for the year 1995. Another analysis on arrivals for tankers, freighters, inter-island and sailing vessels completed the forecast projection.

MONTSERRAT

64. On the basis of the present goods movement of some 17,000 tons exclusive of oil, and a difficult, if not almost impossible future projection, a proper economic evaluation of the project can hardly be drawn up. The project evaluation as proposed by the British Development Division in the Caribbean is based upon a goods movement projection, in which exports are negligible, and imports are expected to grow by 10% per annum, or alternatively, 12% per annum. This resulted in total cargo imports of 79,700 metric tons and 102,400 metric tons respectively, by 1981.

65. This situation in which imports are projected to increase substantially then, results in the balance of trade deficit. It is possible to offset this deficit only in specific cases such as foreign balance of payment aids, boom in tourism or capital imports. The latter is stimulated at present by house-building for North American visitors and retiree persons. It would be noted, however, that there has been an increasing visible trade balance deficit, from WI$1.7 million in 1960 to WI$7.5 million in 1968.

66. Conclusions are difficult to draw from the historical trends, since only a few years of goods movement are available and mentioned in the report of the British Development Division. These data are given below:

Year	Total Imports	Imports excl. oil
1964	13,595 m. tons	11,386 m. tons
1965	21,351 m. tons	19,286 m. tons
1966	22,352 m. tons	18,800 m. tons
1967	21,026 m. tons	16,835 m. tons

The Overseas Trade Book 1968 has recently been issued, but no information on total tonnage are available as yet.

CHAPTER IV

TECHNICAL SECTION

General Meteorological and Maritime Conditions of the Area

67. These data are basic elements in the planning of harbours even though all the ports of the ECCM countries and Barbados considered under this study are located at the leeward side of the island; therefore they are not subject to extreme conditions, except in the case of hurricanes. Nevertheless due consideration should be given to their characteristics to secure proper and adequate port operation.

68. Unless voluntarily accepted and known prior to its construction, we should endeavour to avoid conditions such as those indicated in the West Indies Pilot for the recently completed harbour of Antigua:

> "Saint John's harbour - It is exposed to rollers, which frequently break over the jetties and inflict serious damage". 1/

In the available studies insufficient in-depth information has been compiled.

69. The most important basic information is available in the "Seapilots for the West Indies" and the "Oceanographic Atlas of the North Atlantic Ocean" from the U.S. Naval Oceanographic Office. However, conditions near the coast or in bays may differ substantially from the basic off-shore data, and on-the-spot observations and measurements are therefore in the majority of cases urgently required in deciding on the final design of ports.

1/ Volume II, Eleventh Edition. Page 183.

70. Maps in the Oceanographic Atlas illustrate by means of roses the frequency distribution of winds, seas, and swells for various directions and intensity over twenty miles from the coast on a monthly basis. Near the coasts conditions become progressively modified. Squalls are relatively common in the region especially in association with thunderstorms. They are more frequent near the coasts than at sea, and are most common near the leeward coasts of the islands, especially near high grounds.

71. Rollers are swell waves which grow in height as they move into shallower water. They are frequently experienced among the Virgin Islands and other islands north-westward of Guadeloupe. They set in mainly between east and north, and are chiefly felt in places exposed to these directions. They are, however, subject to refraction or bending on approaching shallows, according to the configuration of the shallow. Because of this, they may, for example, come in from the north-west on to a coast facing in this direction, even though originating as a north-easterly swell at sea. Rollers are less common farther south, but are sometimes experienced on coasts facing north and east, chiefly in the period December through March.

Tropical Storms and Hurricanes

72. The West Indian hurricanes, similar to typhoons of the West Pacific or cyclones of the Bay of Bengal, are violent whirls with associated winds of a force 12 and over. Between 12 and 8 it is called a tropical storm and below 8, a tropical depression.

73. Despite the fact that hurricanes have caused in the Caribbean greater destruction and losses of life than any other natural phenomenon, and that different harbours have suffered more or less serious damage,1/ insufficient attention has been given to this aspect in the design of the ports.

1/ For example, St. Lucia's West Wharf was damaged in September 1963, and St. Vincent's old jetty in 1955.

74. In cases of infrastructural projects it is good engineering practice to introduce security on the basis of probabilities. The greater the magnitude of the project, the lower is the accepted occurrency on probability. For example a small bridge in a feeder road is generally designed to withstand flood occurrency of 25 years, and a major bridge for a highway for 100 years flood probability. In dam designs, an occurrency of one in every 500 or 1000 years for the spillway is quite normal. Port construction in the Caribbean should consequently take into account the force and frequency of hurricanes.

75. The fact that the Governments of Barbados, St. Vincent and Antigua insured their deep water harbours in London provides sufficient proof that area Governments are aware of the risk involved. However except possibly in the case of the Port of Bridgetown, sufficient technical information is not always available to Governments to allow for proper evaluation of the risk of damage by hurricanes.[1/]

76. For the period 1901-1963 the Seapilot recorded a total of 290 hurricanes, with the following monthly distribution:

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
0	0	1	0	1	13	20	79	111	54	10	1	290

The average frequency with which hurricanes affect the various islands of the West Indies increases northwards. During the period 1901-1963 only one hurricane passed south of Trinidad, whereas the expectation for Barbados is one in every 26 years, Martinique and Guadeloupe one in 5 years, and Puerto Rico one in 4 years. The occurency pattern is however very irregular. Annexe I in this section illustrates more typical hurricane tracks in the months August and September.

1/ It should be noted that where the risks of hurricane damage are carefully considered in the design, insurance coverage becomes relatively simpler.

77. A recent UNDP study on hurricanes in the Caribbean carried out in September 1970 by Francis T. Wyckoff 1/ A. "Caribbean Hurricane and Tropical Storm Insurance Scheme" has thrown more light on the subject. The study which covered a 50 year period produced the following results:

440 Storms	261 Hurricanes	126 Struck or passed within 100 miles	78 affected countries 48 no
		135 did not	
	170 tropical storms	65 direct hits	48 affected countries
		114 no hits	17 no

78. In the light of these data, and taking into account the maritime and hydrographic conditions at port locations, it is imperative that structures comprising the port facilities should withstand a certain hurricane intensity. For this analysis it would be useful to utilise the services of a hydraulic laboratory. In this regard, the tentative criteria to be adopted in structure of ports are outlined in paragraphs 83 to 86.

Currents

79. The general circulation pattern of currents in the area is shown in Annexe II. The figures at the tail of each arrow give the average rate of current in miles per day. The great majority of the currents in the Caribbean Sea have a westerly component;

1/ Study of the Feasibility of Establishing, with the Participation of the Governments Concerned, A Caribbean Hurricane and Tropical Storm Insurance Scheme.

currents setting due north or south, and currents with easterly components may occur in any part of the sea. Whilst some of these are weak, many of them have rates up to one knot, and some may reach the rate of about two knots. In the vicinity of a tropical revolving stream, the set and drift of current may be markedly different from that normally to be expected. When a tropical storm approaches or crosses an extended coastline, such as that of Florida, a strong gradient current parallel with the coast will be produced by the piling up of water against the coast, and the sea-level may rise by as much as from 8 to 15 feet on such an occasion.

Tidal Streams

80. Except in a few shallow or constricted passages, the rates of the tidal streams are not large, one to one and a half knots being about the usual maximum rate. This simple tidal flow is complicated by the currents described in the previous paragraph, which usually flow through many of the channels toward the Caribbean.

81. Although the above data on waves and currents do give an indication as to the possibility and duration of accretion or siltation to be expected through bed transport of sediments, particular conditions, generally at each selected location might call for complementary field investigations and eventual laboratory scale model test with movable beds. Factors affecting each particular port and complementary observations to be made and studied, because of insufficient in-depth information presented in the present available studies, are further detailed under the technical sections for those ports.

Earthquakes

82. Combined with the above outlined structural security against hurricane attack, similar measures should be taken to meet seismic conditions. The islands of the Caribbean are all subject to earthquakes and volcanic eruptions, and there is scarcely one in which some memorial of disaster from these causes does not exist.

Basic Maritime Design Criteria

83. The typical maritime conditions on the leeward side of the islands affect the type of marine structures to be chosen. The so-called break-waters, when required to protect harbour operations at the leeward side, should have more the characteristics of a swell breaker in order to reduce unworkable days inside the port, rather than to turn heavy seas and storms. It should however be capable of resisting a tidal wave from a hurricane, or at least reduce damage to a reasonable level of repair costs thereafter.

84. Similar considerations as mentioned in the previous paragraph, should also apply to the wharf structures.

85. The following basic design data are proposed for the final design:

(i) Marine Structures	protected	10 feet wave attack of short duration 10 feet tidal wave under and over pressure
	open	20 feet wave attack of short duration 20 feet tidal wave under and over pressure

(ii) On-shore facilities - withstand winds of 120 miles per hour.

(iii) For further structural technical details, the usual rules for maritime construction should be followed.

86. Although less pertinent data are available on earthquakes than for hurricanes, the chance that this phenomenon will coincide with a hurricane should be considered so remote, that consideration should only be given to everyone of the conditions separately. In working out the final design it is suggested that maritime structures should be constructed to withstand an acceleration of 0.05g.

Basic Operational Criteria

Lights, Buoyage

87. Leading lights should meet the basic technical requirements for safe navigation in terms of:

(i) Location and altitude as to mark a proper approach;

(ii) Intensity as to ensure sufficient visibility;

(iii) System as to ensure uninterrupted operation. One should possibly avoid remarks such as those in the Seapilot for Kingstown Bay, St. Vincent; "It has been reported that, when approaching St. Vincent from eastward, this light is not visible until it bears more than 297°". 1/

Buoys should be properly anchored, location accurately reported to the Marine Authorities and regularly checked as to possible creeping or slipping of anchor. Consultants, when drawing up specifications for the purchase of lights and buoys, should be requested to look into this matter seriously and consult the Marine Authorities and Coastal Guard.

Pilotage

88. In view of the excessive time spent in port by the ships in the Caribbean because of the relative short sailing time between ports, it is advisable to provide a 24-hour pilotage service so as to bring in ships at all times. When viewed in connection with the problems associated with cargo handling, considerable time may be thus saved.

Cargo Handling

89. Where practical, separate operations are advocated for the different types of bulk and general cargo, and, depending on the type of commodity, an appropriate subdivision may be required.

1/ West Indies Pilot, Volume II, Eleventh Edition. Page 289.

Bananas have been up till now one of the special items, but this will cease when boxing brings it under the terms of general cargo. On the other hand, fish products and others might still have to be accorded special treatment at a later stage. Sufficient flexibility in the final port design should therefore allow for such changes.

90. The situation relating to stevedores and port labour is the most difficult situation to be organised. Despite the difficulties involved, it is appropriate to lay down a few guidelines. The organization should permit at least sixteen hours per day loading/unloading operations, with adequate provisions for possible Saturday/Sunday work; this is strongly recommended, since total voyage time through the Caribbean can thus be substantially reduced. Only in this way full profit can be derived from mechanical cargo handling, and the expert to study port operation and management should give full attention to this aspect of the operation.

Transit Sheds and Warehousing

91. It is suggested that the different systems now in use throughout the Caribbean should be standardised to a uniform and general procedure. The number of free days should be uniform throughout the Caribbean, but when counted after the ship has been completely unloaded (and sometimes unloading takes five days), the first tranch of unloaded cargo may enjoy as much as eight days of free storage. The consignments for the ECCM islands, however, are generally not large, so that unloading in one day could be completed with mechanical equipment, and the generally accepted 3 days of free storage can then be implemented unambiguously.

92. These free days should be followed by two to three stages of two days each with increasing transit shed rent for each stage. This is the general practice throughout the islands, although both price escalation and rates should be synchronised, and a uniform practice adopted for the different ports. Thereafter,

however, indiscriminate transfer to the warehouses should take place, and rehandling costs separately charged to the consignee. This extra charge will work as an incentive to ensure timely removal of cargo. Once goods are transferred to the warehouses, reasonable and commercial rates should be applied, until the time that public auction is legally imposed for not taking delivery.

93. Mechanical equipment should be used to the maximum extent in all the operations, including transfer to warehouses and delivery to the consignee. Time studies should indicate the most appropriate routing and handling system to be introduced in each port separately, and the number and types of equipment thus required. Similar attention should be paid to the delineation of cargo handling by tractors and trailers, or with forklifts, since the latter are basically transit shed and warehouse type equipment meant for vertical transportation operation, and thus for receiving, storing and delivery of goods.

GRENADA

Maritime Conditions

94. A modern wharf has been constructed on the leeward coast of Grenada at St. George's harbour within a reasonably protected bay. Therefore considerations regarding martime conditions should only be given insofar as they affect either future extension plans, or require improvement because of unsatisfactory present operation conditions.

95. When approaching St. George's harbour there are a number of shoals with depths of less than 36 feet, but the entrance channel clearly marked by leading lights presents no problems, and pilotage is not even compulsory, though advisable.

96. The Careenage, an inlet or bay located at the northern end of St. George's harbour, is the only part of the harbour available for anchorage with depths varying from 30 to 66 feet. From November to March, however, ground swells are experienced, sometimes causing swells in the Careenage; but these are not dangerous for the ships at anchor.

97. The above indicates that the present conditions are sufficiently satisfactory from the martime point of view, and do not require any improvement and/or protection works at present. Extension of the harbour is a subject which now comes into the focus of attention, not because St. George's Harbour's present goods movement call for an increase of berth length, but the Government seriously considers the construction of a jetty for inter-island motor vessels trade, the correct location of which certainly affects the overall future layout of the harbour. Preferably these motor vessels should have a separate berth over which goods traded within the terms of the CARIFTA Agreement can be handled with a minimum of paper formalities and customs procedures.

98. This project not only merits full support from ECLA from the intra-regional aspects and motives outlined previously, but the present practice whereby inter-island vessels unloading at both the innerside of the jetty head and the approach pier, jeopardises the normal cargo operations at the main berths. This situation calls for an immediate solution. Thus a short-term improvement is called for which falls within the context of the longer term objectives of this study.

99. Suggestions focussed on long-term development of the harbour appear to be inappropriate until the Government takes a firm decision, based on one of the available alternatives. In the absence of a suitable solution, the Government at present is considering the idea of a new harbour located north of Fort George Point, in front of the market at an open coastline.

100. Apparent problems in the present location are that the Careenage and the Lagoon, a shallow water at the south, should be left out of consideration for preserving both its picturesque and touristic aspects, and the yacht activities and marine facilities. Maritime conditions call for an extension at the southern part of the bay, and its phasing in with the other requirements are further detailed in the section entitled "Physical Implementation and Programme of Harbour Development".

Shipping Conditions

101. These are governed by the basic trend in the development of transportation methods of the main export and import commodities, agricultural produce with emphasis on bananas and general cargo respectively. A further important aspect is the inter-island motor vessel traffic, in which Grenada, being geographically close to one of the main centres of gravity in the Caribbean, Trinidad, claims a second place with a total of 20 ships and a registered shipping tonnage of 921 registered tons in 1968.

102. When discussing banana exports with the shipping advisers of the Geest Lines in St. Lucia, it became clear that in an effort to reduce overall transport costs, they envisage shipment of boxed bananas on pallets, the latter coming in with pre-palletized cargo. Also, other shipping lines show their preference for this type of cargo handling, and ships have been recently observed occasionally unloading general cargo in Trinidad with as much as 75% to 90% pre-palletized and pre-slung.

103. Therefore the bulk of general cargo movements, including bananas, will be increasingly pre-palletized or pre-slung. The ships bringing in this type of cargo will generally not exceed 30 ft. in draft. Further, a cargo ship fully laden with general cargo, will normally remain 3 to 5 feet above its maximum mark.

Cargo Handling

104. Although the aspect of cargo loading and general port management will be covered by a specialized expert, general observations, insofar as they effect short-term improvement, should be mentioned in a provisional way here, within the context of this report.

105. Except for pre-palletized and pre-slung cargo as mentioned previously, no major changes are expected within the foreseeable future in the pattern of cargo handling[1/]. Further, no special measures are recommended to be taken with regard to roll-on/roll-off and major size container activities, although in planning the harbour, it is precedent to make provision for sufficient free space and flexibility within the harbour area.

1/ However, an Atlantic Line mini-container ship has been observed unloading 26 ton containers at St. George's harbour.

106. The almost complete absence of mechanical cargo handling equipment is one of the two main reasons why this newly built port is still on a relatively low operational performance. The Government has therefore correctly reserved in their 1969-1971 development plan an amount of WI$88,200 for improving cargo handling. Although the management expert should advise in detail on the appropriate equipment to be purchased, on the basis of in-port transport cycle studies, it is urgently recommended to incorporate under the short-term development programme the equipment as proposed in the section, "Physical Implementation and Harbour Development Programme". This list deviates slightly from the one as foreseen by the Government in their 1969-1971 development plan.

Sheds and Warehouses

107. Applying the outlines set forth under the section Basic Operational Criteria, the required transit shed space for general cargo should be calculated according to the following formula[2/]:

$$S = \frac{C \times d \times s}{360 \times t \times f}, \text{ in which:}$$

S = surface in square feet

C = annual general cargo movement in metric tons

d = number of days prior to compulsory transfer of goods to warehouses

s = seasonal variations, which in the Caribbean appears to vary between 1.50 and 1.75

t = tonnage load allowed per square feet, normally 0.2 to 0.25 metric tons/sq. feet

f = free space factor for moving of cargo equipment, normally 0.50 to 0.65

2/ This statement is made subject to in-depth study by the port management adviser.

A similar formula applies in defining the required warehouse spacing in which:

d = will be the number of days prior to legal auction for not taking delivery of goods

s = o, being the estimated overflow coefficient of goods from transit shed to warehouse

Therefore $S = \frac{C \times d \times o}{360 \times t \times f}$

It will be appreciated that only after a detailed study, paired with information obtained on local habits regarding overflow and the establishment of warehouse rates, an appropriate answer can be given on the space to be provided in the final design.

108. Reverting to the layout scheme of the harbour,[1/] it has been foreseen that tentative provisions should be made for transit sheds of 200 ft. by 75 ft. at the main berth and a 200 ft. x 50 ft. at the inter-island vessel berth, so as to alleviate present congestion conditions. This shortage has also been recognized by the Government, since they introduced in their 1969-1971 development plan, the construction of three sheds at respectively 200 ft. x 100 ft, 100 ft. x 50 ft. and 100 ft. x 50 ft.

Harbour Organization and Management

109. This subject will be dealt with in full detail by the expert studying this section. Amongst other things this study should incorporate appropriate legislation, tariffs, organisation, management, cargo handling and storage.

Physical Implementation and Programme of Harbour Development

110. On the basis of the terms of reference for this study, only short-term improvement proposals should be considered.

1/ See attached diagrammatic layout.

In the case of Grenada this refers basically to providing:

i) Extension of main wharf;

ii) additional cargo storage space;

iii) mechanical cargo handling equipment; and

iv) an inter-island vessels basin.

As already outlined in the previous sections, the proper planning of the location of the inter-island jetty in the case of Grenada is related to the perspective for future long-term harbour development, with its limitations on both sides in respect of the Careenage for scenic beauty, and the lagoon for marina activities.

111. The attached diagrammatic layout for future long-term port extension is a proposal to unify and bring under one denominator the apparent conflicting conditions to be met; i.e.

i) Leave Careenage basin and Lagoon area untouched;

ii) avoid the need to provide harbour extensions at another location; and

iii) short-term improvements, in particular on inter-island vessels trade, should fit into the overall scheme.

Unfortunately, no detailed information is as yet available on the extent, thickness, and hardness of the coral bank located at the southern side of the harbour and the entrance to the lagoon. Further the results of borings are not available to ECLA, so as to permit a proper judgment on the existing sub-soil conditions. The above information, along with a proper lay-out of the total harbour area and adjacent grounds, are indispensible in detailed planning of harbour development.

112. The above outline of the project is based on the following principles:

i) The short-term improvement, the so-called phase I for inter-island traffic facilities, is still orientated towards the existing harbour, thus concentrating improvement on increased warehouse spacing and provision of new mechanical equipment in one single area.

Optionally, this plan can still be carried out in two stages, when considered appropriate, and implementation is recommended as follows:

- Stage A with 425 feet berth length with 20 feet draft; and

- Stage B with an additional 500 feet of of berth.

Stage B can be executed and/or omitted independently from the main harbour development requirements, and geared to the exclusive requirements of the inter-island vessel trade;

ii) the long-term deep-water harbour development, sub-divided into two phases; the so-called phases II and III, with separate access located at the southern side of the "Spout" promontory, skirting the northern border of the Lagoon.

Its situation allows for substantial future flexibility as regards draft and harbour area required. In defining the Phase III of the extension, it has been considered necessary to protect the harbour by the construction of a breakwater, with its root end at the foremost south-western corner of Fort George Hill, running through shallow water with its head situated on a rocky patch of only 17 feet water. That stage most probably requires laboratory tests prior to its final implementation.

113. We are confident that the above scheme fits into the long-term requirements of space and flexibility, and suggest early implementation of the short-term construction phases within that basic framework. Even if future trends should fundamentally change present shipping conditions, this scheme presents sufficient flexibility as to programme a new,

but again long-term harbour layout. Any such changes resulting from unforeseen circumstances would not require demolition of newly erected structures.

114. The estimated costs involved for the above short-term plan are shown in the Financial Section.

ST. VINCENT

115. A modern wharf of 900 feet length and a draft varying from 27 to 30 feet has recently been constructed on the leeward coast of St. Vincent at Kingstown harbour in a relatively protected, but open bay. Consideration should therefore only be given as to how far future extension plans can be properly implemented, and whether unsatisfactory present operating conditions call for improvement.

116. Apparently the only major complaints at present refer to:

(i) the improper operation of, and consequent damage to, the fender system, a problem which is at present dealt with by a report from a firm of consulting engineers;

(ii) insufficient storage area; and

(iii) insufficient cargo handling equipment, because of constant repair of the present units.

117. A recent report on harbour operations by the consulting engineer, Jacques L. Dery, commissioned by the Canadian International Development Agency (CIDA), came to the following basic conclusions:

- berthing facilities are more than adequate;
- covered storage area is short by 50% (300 ft. x 50 ft.);
- wave reflection on the rip-rap of the reclaimed area causes rolling of ships;
- there are no facilities for chartered yachts and this situation should be remedied, because this activity represents a considerable source of foreign currency;
- harbour equipment should be improved by the purchases of 12 new forklift trucks; and
- schooners carried 21% of the total cargo in 1969.

118. The Canadian Government contracted a harbour manager for a period of two years to assist the Government of St. Vincent in streamlining the present harbour operations. Finally, the U.N. Physical Planning Office in Barbados has been in constant touch with the Government and prepared various alternative development schemes, which included a reclamation scheme at the far northeast part of the bay, a cruise ship berth, and various harbour basins for cargo vessels (2 berths), inter-island vessels and yachts. This resulted in the engagement of a contractor recently, who initiated work several months ago. His contract for the construction of the reclamation and harbour extension is sub-divided into four phases viz:

- reclamation of 300,000 cubic yards, protected by a rubble mounted dike. Total estimated costs WI$1,000,000 financed through the issue of debentures; construction period - 11 months;

- installation of sewers for the major part of the city with a construction period of 11 months, partially over-lapping phase 1; plus construction of roads and other services with a construction period of 7 months, partially over-lapping the previous phases;

- adaptation of present wharf for berthing of cruise ships through an extension of the existing pier by 176 feet; and

- construction of an inter-island jetty some 375 feet long, 25 feet wide and a draft of 20 feet.

For the last three phases the Government intends to approach the Caribbean Development Bank for financing.

119. Considering the stage of implementation of existing plans in the harbour development, ECLA's contribution can be of a limited nature only, mainly focussed upon general advice. Bearing in mind that the present reclamation over the whole inside of the bay has disrupted the natural equilibrium of the present shoreline,

chances are that this will generate bed-transport, thus reducing draft in front of the wharf. This wharf at the N.W. corner already experiences a draft of only 27 feet, apparently because of deposits carried by the river into the harbour.

120. It is suggested that after the completion of the reclamation scheme, regular soundings should be taken over some 500 feet of width in front of, and adjacent to, the N.W. corner of the wharf. Once appreciable accretion is observed, field measures on current and drift should be initiated so as to define on the basis thereof, what appropriate measures should be taken. Consequently, as proposed in Chapter II, Summary and Recommendations, measures should be carried out by a Hydraulic Laboratory.

121. Under the present contract for construction, an important decision has to be made as to the location of the inter-island jetty, for which the design has been completely worked out by the Consultant, with a total length of 375 feet, a width of 25 feet and draft of 20 feet. A disadvantage is that trucks cannot turn when on the wharf. An obvious location is the N.E. corner in a kind of harbour basin dredged to -20 feet. However, adequate on-shore facilities should be provided for, which in turn may lead to discontinuance of the present land lease for the fertilizer mixing plant, at present, out of operation.

122. The area south of the inter-island vessel basin is recommended to be reserved exclusively for future extension of the commercial harbour, since almost no other alternative is available. Against the same background, it is not recommended that marine and yacht harbour facilities should develop whilst physically almost no space is really available. In this respect, a worthwhile alternative to be considered it the development of the Lagoon, situated S.E. of Caliagua where a certain development nucleus has taken place already. Facilities exclusively meant to complete paper formalities for the yachts can be provided for at the inter-island vessel basin.

123. Unfortunately, insufficient information is at present available regarding construction costs for the last three phases of the programme, neither is a cost/benefit analysis of the programme available. However, the reclamation which is already directly financed through the Governments own initiative, as well as the sewerage scheme, both of which have relatively little to do with harbour development as such could be dealt with separately.

124. As a tentative and provisional short-term harbour improvement scheme, the following may be considered:

(i)	the adaptation of the present wharf for berthing of cruise ships by extending the pier by 176 feet, at a roughly estimated cost of	WI$ 440,000
(ii)	an inter-island jetty 275 feet long and located in an inner harbour to be dredged. Estimated costs	WI$ 880,000
(iii)	purchase of 12 new 4,000 lbs. forklift trucks	WI$ 120,000
	Total short-term improvement	WI$1,410,000

ST. LUCIA

Maritime Conditions

125. On its west coast St. Lucia has several safe and commodious bays to locate a harbour. Its principal port, Castries, situated in the bay entered between Vigie Point and Tapion rock, is one of the most secure natural harbours in the West Indies. There are depths of from 36 feet to 66 feet on the approach line of the leading structures, and several banks and shoals with less depth bordering it; these are all properly marked. Coode and Partners in their report considered additional dredging only optional, and estimated the amount involved at EC$200,000.

126. Despite the fact that the bay enjoys proper natural protection, Castries harbour has suffered periodically from hurricanes. In 1963 Hurricane Edith caused substantial damage to the Western wharf; the extent of this damage was described in detail in the 1964 report of the Consulting Engineers, Coode, Binnie and Preece. In the preparation of the final design for this harbour, it is therefore recommended that the structures should meet the requirements in respect of resistance to tidal waves and wave attack of a short duration proposed under section, Basic Maritime Design Criteria.

127. One significant disadvantage is the debouch of the Castries River inside the bay, carrying large quantities of silt when flooding. With the evergrowing urbanisation of the area, the run-off coefficient appears to have increased substantially, and flooding of parts of the town as observed during one of the visits, was, according to information, never so seriously experienced in the past. No quantitive information regarding expected siltation is available. However, an old sounding plan of 1886 prior to the construction of Castries Harbour, combined with the new Admiralty Chart leads to the opinion that consideration should be given to this aspect in

determining the final layout of the harbour for construction.

128. The May 1963 report of Coode, Binnie and Preece on the harbour development schemes in St. Lucia in this respect states:

> "We were asked to consider a proposal to construct a wharf between the mouth of the Castries River and Point Bananas" and further on:
> "_____ we could still not recommend a berth in this position because:
>
> (a) Its position at the point of greatest siltation in the harbour should create a dredging problem of considerable magnitude".

129. This aspect has a bearing on our recommendations with respect to the layout of the harbour, as set forth in detail, under section, Physical Implementation and Programme of Harbour Development.

130. With regard to wind, the above mentioned report states:

> "The direction of the prevailing wind is such that once a ship berthed at the proposed wharf would be pinned against it and have difficulty in moving out without tugs, of which there are none in Castries."

131. Having observed the mooring and unmooring of vessels tied up at the North Wharf, which is in a similar position to the new wharf under consideration, and after discussing this subject with the pilots of Castries Harbour, we do not believe that this aspect should be a major factor against construct - ing a wharf between Point Bananas and the mouth of Castries River.

Shipping Conditions

132. The type of commodities being exported/imported in St. Lucia through Castries, combined with the modern trend in shipping and cargo handling, define basically the shipping conditions of the port. Exports being almost exclusively bananas (93%), and imports mainly general cargo, it can be understood that the West wharf has been almost exclusively dedicated to

banana loading, and the North wharf used for general cargo. The eastern end of this wharf is used regularly by inter-island vessels, and schooner unloading facilities are located at the inner basin, south of the West wharf. This aspect of the shipping requires full attention in planning the layout of the harbour as outlined in Chapter II.

133. The ECLA study [1] on small vessel shipping indicates, that in 1968 a total of 15 ships with a nett register tonnage of 834 were registered in St. Lucia; this indicates that St. Lucia ranks third in this type of vessel, after St. Vincent and Grenada.[2] Unfortunately, no long range figures are available but it is conceivable that, considering both the increasing intra-CARIFTA trade and improved shipping techniques, an overall increase of cargo moved by inter-island vessels can be expected.

134. A recent discussion in Castries with the shipping advisers for the Geest Line revealed their strong preference for boxed bananas on pallets, the latter coming in with pre-palletised general cargo. Also other shipping lines have the tendency to favour more palletised and pre-slung cargo, and recent unloading at Castries have indicated change.

135. It can be expected therefore that general cargo landed at Castries will be handled almost exclusively by pre-slung or palletised methods; this is so even in the case of bananas. Also the types of general cargo ships coming into the port are not expected to exceed a draft of 30 feet; and even if a ship is loaded to its full capacity with general cargo, it is still some 3 to 5 feet below its maximum mark. It is therefore

---

1/ See ECLA/POS 70/6/Rev. of November 1970.

2/ Comparable figures for St. Vincent and Grenada are 1,306 and 921 nett register tons respectively. In this regard it may be noted that the nett register tonnage tends to decrease as the distance for Trinidad and Tobago, the centre of gravity, increases.

recommended that the draft of the new wharf area should not exceed 32 feet; this includes due allowance for clearance under the bridge.

Cargo Handling

136. Although this subject requires separate study by a port management expert, general principles in so far as they affect the physical planning and layout of the harbour within the context of this report, should be provisionally examined.

137. Except for the pre-palletised and pre-slung cargo as mentioned above, no drastic changes are expected in the present trend of cargo handling. No special measures are now suggested for roll-on/roll-off and major size containers activities, although in planning the harbour sufficient free space and flexibility should be provided.

138. Almost complete absence of machanical cargo equipment is one of the main drawbacks in Castries Harbour. Utilisation of a Public Works crane for handling of heavy cargo,and consignee - and agents - owned small trailers and tractors, are improper operating conditions, a situation which is severely aggravated by the extreme shortage of cargo storage space. Although the port management expert should provide specific advice on the appropriate equipment to be purchased for the new harbour on the basis of in-port transport cycle studies, it is urgently recommended that a first tranch should be incorporated under the short-term development improvement programme as outlined in the section, "Physical Implementation and Harbour Development Programme".

Sheds and Warehouses

139. Applying the outlines set forth in the section, Basic Operational Criteria, the required transit shed space for general cargo [1] should be calculated according to the following

---

1/ Subject to in-depth studies by the port management expert.

formula;

$$S = \frac{C \times d \times s}{360 \times t \times f}$$, in which;

S = surface in square feet

C = annual general cargo movement in metric tons

d = number of days prior to compulsory transfer of goods to warehouses

s = seasonal variations, which in the Caribbean appears to vary between 1.50 to 1.75

t = tonnage load allowed per square feet, normally 0.2 to 0.25 metric tons/sq. feet

f = free space factor for moving of cargo equipment, normally 0.50 to 0.65

A similar formula applies in defining the required warehouse space in which;

d = the number of days prior to legal action for not taking delivery of goods to warehouses

s = o, being the estimated overflow coefficient of goods from transit shed to warehouse.

This gives the following formula;

$$S = \frac{C \times d \times o}{360 \times t \times f}$$

140. It will be appreciated that only after a detailed study, paired with information obtained on local habits regarding overflow and the establishment of warehouse rates, an appropriate answer can be given to the space to be counted for in the final design. This factor requires careful consideration, in particular when defining the requirements behind the difficult area of the North and West wharf, despite the fact that the cable berth has been recently evacuated.

Harbour Organization and Management

141. This subject will be dealt with in full detail by the expert on port management. Amongst other things, special attention should be given to appropriate legislation, tariffs, organisation, management, cargo handling and storage.

Physical Implementation and Programme of Harbour Development

142. Bearing in mind the time which elapses between agreement on design and the actual operation date of the new port to be constructed is from 3 to 4 years,[1] it is necessary to consider short-term improvements, which is the basic object of this study. Taking into account that the present status of West and North wharves which are both in urgent need of repair, it will be appreciated that a minimum level of services in the present harbour operation cannot be properly maintained throughout that period, unless substantial short-term improvement works have been urgently carried out.

143. The North wharf which was built between 1886 and 1888, has withstood the ravages of time, and the shock of a Canadian ship torpedoes when berthed at the wharf and the heavy seas caused by hurricane Edith in the autumn of 1963.[2] Designed for a draft of 27 feet, with a coping elevation of +5 feet above low water and a foundation depth of -39 feet, (or 12 feet below the designed draft) it has a length of 650 feet; these facilities permit the berthing of one large ship and one inter-island motor vessel, or two medium sized cargo ships, simultaneously. Apparently a change in datum level has occurred, since the 1963 report by Coode, Binnie and Preece states:

> "the berths themselves were designed to have a maximum of 27 feet alongside, based on the old datum, or 26 feet below the present datum."

144. As far as available documents indicate, concern about the wall appears to have started in 1948, when at the British Conference on Civil Engineering Problems in the Colonies, it was stated:

> "---- after 60 years of constant use, a recent report upon the conditions of the wharf states",

---

1/ The consultant has been commissioned to prepare semi-detailed design on the basis of sub-soil investigations and hydrographic surveys to be carried out in the area.

2/ It should be noted that hurricane Edith caused substantial damage to the West wharf, but the North wharf remained intact.

that

> "---- (it is)"
>
> "adequate for the purpose for which it was designed. In view of the fact that the island is subject to occasional earthquakes, it is gratifying to learn that no cracks have appeared in the structure."

On the other hand, no doubts as to its condition have been expressed later on by Coode, Binnie and Preece, Consulting Engineers from Canada in their reports of May 1963 and June 1964 on development and improvement of Castries Harbour.

145. In judging the true present conditions of the North wharf far too little basic information is available, mainly because no "as built" drawings are available. The necessity for provision of "as built" drawings must be emphasized particularly on marine structures.

146. The survey carried out on 28 February 1970 demonstrates the presence of a bulge in the alignment of the wharf, mainly between bollards 4 and 7, but to what extent this has been caused by a deviation, when constructing, is not known. The bulge can be clearly observed, and yet its origin cannot be recalled. Persons working in the harbour area, when consulted, differed in their statements as to time when this situation was first observed. Inspection revealed no cracks,neither has any depression in the backfill been observed, except on the places where the presence of drains should create such a depression.

147. Further measurements as suggested by Coode and Partners remained the only possible approach; however, this work is practically paralysed by the ever present harbour activities and cargo stacking on the apron. Further observations have been made on 8 February, 4 December 1970 and 7 January 1971, both on batter and offset of a straight line (apparent forward movement) in an effort to determine and split the horizontal forward movement and the tilt. In addition soundings as carried

out on 2 November 1970 in front of the wharf show a maximum local dredged depth of 33 feet, with an overall average of some 29 feet. Unfortunately, no firm conclusions can be drawn as yet, and further observations to be carried out at monthly intervals, are recommended.

148. The situation requires careful consideration, and therefore the Consultant should be invited to provide statistical calculations on the basis of soil mechanical data obtained from deep soundings and or borings, whilst measurements to be continued by the Government, should also be taken into consideration.

149. Generally speaking, a repair maintaining a draft of 27 feet is still within technical possibilities. A tentative repair design is attached hereto based upon a protective sheet pile curtain driven at the toe of, and a relieving platform behind, the wharf. This could be eventually combined with excavation behind the wall and backfill with proper granulated material. Total lateral pressure will thus be substantially reduced.[1/]

150. The West wharf with a total length of 550 feet and a draft varying from 22 to 25 feet, is used almost exclusively for loading bananas. It is in a more deplorable state because of damage which resulted from the hurricane Edith in 1963. This was described by Coode, Binnie and Preece as follows:

> "---- the West wharf at Castries suffered a failure in an area some 200 feet from the southern end, where three king piles moved outwards at the toe. The backing slabs in this area have disappeared, and there has been a loss of fill behind the wall leaving a sizable hole. There are at least two holes at other places where fill has been lost as a result of these slabs having been displaced and the cope beam has broken and moved outwards over a length of some 40 feet",

it has never been properly repaired. In this context, we refer to the conditions which marine structures should be

1/ During the round table conference held in St. Lucia on 18 and 19 January, the consultants accepted the possibility of repairing the wharf such that a 27 feet draft could be maintained.

designed to meet. (See Basic Maritime Design Criteria). A proper repair design more difficult than for the North wharf, because of the absence of both the "as built" drawings, and the original construction design itself. The rate of deterioriation during the last months however increased, so that a temporary repair had to be undertaken immediately so as to secure temporary, the continuation of banana loading operations. A scheme has been prepared in collaboration with the Ministry of Public Works, and the costs involved are estimated at WI$35,000 on the basis of direct labour only. Work has already been initiated on these repairs.

151. The definite repair project as prepared by Coode and Partners in their 1970 report is recommended for execution, provided it meets the technical requirements set forth. In view of the urgency of this programme the consultant commissioned with the final design of the port should be requested to commence the design immediately, utilising the results of the soil investigations carried out by Warnock Hersey Soil Investigation Ltd.

152. The full repair scheme, inclusive of the project for the new wharf as prepared by Coode and Partners, has been commented upon by the respective parties involved;

- The Government of St. Lucia;
- The British Development Division, Barbados; and
- The U.N. Physical Planning Team, Barbados.

and replies thereon have been submitted in October 1970. A final decisive round-table conference was held in 18 January 1971, in which the Caribbean Development Bank and ECLA participated. On the basis of the discussions, the Consultants have been instructed via the Overseas Development Ministry to ensure immediate soil investigations are carried out, and a semi-detailed design with bills of quantities is prepared within six months. ECLA's contribution to, and alternative suggestions

designed to meet. (See Basic Maritime Design Criteria). A proper repair design more difficult than for the North wharf, because of the absence of both the "as built" drawings, and the original construction design itself. The rate of deterioriation during the last months however increased, so that a temporary repair had to be undertaken immediately so as to secure temporary, the continuation of banana loading operations. A scheme has been prepared in collaboration with the Ministry of Public Works, and the costs involved are estimated at WI$35,000 on the basis of direct labour only. Work has already been initiated on these repairs.

151. The definite repair project as prepared by Coode and Partners in their 1970 report is recommended for execution, provided it meets the technical requirements set forth. In view of the urgency of this programme the consultant commissioned with the final design of the port should be requested to commence the design immediately, utilising the results of the soil investigations carried out by Warnock Hersey Soil Investigation Ltd.

152. The full repair scheme, inclusive of the project for the new wharf as prepared by Coode and Partners, has been commented upon by the respective parties involved:

- The Government of St. Lucia;
- The British Development Division, Barbados; and
- The U.N. Physical Planning Team, Barbados.

and replies thereon have been submitted in October 1970. A final decisive round-table conference was held in 18 January 1971, in which the Caribbean Development Bank and ECLA participated. On the basis of the discussions, the Consultants have been instructed via the Overseas Development Ministry to ensure immediate soil investigations are carried out, and a semi-detailed design with bills of quantities is prepared within six months. ECLA's contribution to, and alternative suggestions

designed to meet. (See Basic Maritime Design Criteria). A proper repair design more difficult than for the North wharf, because of the absence of both the "as built" drawings, and the original construction design itself. The rate of deterioriation during the last months however increased, so that a temporary repair had to be undertaken immediately so as to secure temporary, the continuation of banana loading operations. A scheme has been prepared in collaboration with the Ministry of Public Works, and the costs involved are estimated at WI$35,000 on the basis of direct labour only. Work has already been initiated on these repairs.

151. The definite repair project as prepared by Coode and Partners in their 1970 report is recommended for execution, provided it meets the technical requirements set forth. In view of the urgency of this programme the consultant commissioned with the final design of the port should be requested to commence the design immediately, utilising the results of the soil investigations carried out by Warnock Hersey Soil Investigation Ltd.

152. The full repair scheme, inclusive of the project for the new wharf as prepared by Coode and Partners, has been commented upon by the respective parties involved;

- The Government of St. Lucia;
- The British Development Division, Barbados; and
- The U.N. Physical Planning Team, Barbados.

and replies thereon have been submitted in October 1970. A final decisive round-table conference was held in 18 January 1971, in which the Caribbean Development Bank and ECLA participated. On the basis of the discussions, the Consultants have been instructed via the Overseas Development Ministry to ensure immediate soil investigations are carried out, and a semi-detailed design with bills of quantities is prepared within six months. ECLA's contribution to, and alternative suggestions

made during, this conference are summarised below.

i. Concern that the present situation of both wharves cannot be maintainted another 3 to 4 years according to the present programming, without taking to the risk that Castries might one day be without a port.

ii. Comments of all parties concerned with regard to the high construction costs in the Consultants' report.

153. The attached working programme, in which the construction schedule as prepared by the Consultant, and that suggested by ECLA as an alternative, show diagramatically the basic outlines of the time element saving; this is summarised as follows:

Consultant Scheme:	North Wharf	temporarily repaired for secondary services only	6 months
	New Wharf	completed	21 months
	West Wharf	fully repaired	43 months
ECLA's Scheme:	North Wharf	western half fully repaired	12 months
		eastern half fully repaired	18 months
	New Wharf	completed	31 months
	West Wharf	completed	31 months

154. In summary the proposed alternative foresees basically:

i. reduction in risk by keeping the wharves as short as possible in their present condition; and

ii. have all the berths available at a much earlier date.

As discussed in the preceeding paragraphs, the short-term improvement programme as recommended by ECLA bears down to the following works for which the tentative cost estimate is as follows:

i.	Full repair of the North wharf with a draft of 27 feet	WI$	950,000
ii.	Full repair of the West wharf as proposed by the Coode Report		960,000
iii.	Purchase of a first tranch of harbour equipment		127,000
iv.	Increase stacking space behind the North wharf as proposed by Coode Report with additional 19,000 sq. feet.		265,000
v.	Miscellaneous and unforeseen		163,000
	Grand total (Short-term improvement costs)		2,465,000

Regarding the first tranch of harbour equipment to be purchased, the following equipment is included in the above cost estimate;

- one 6 tons mobile crane
- one 6,000 lbs. forklift truck
- three 4,000 lbs. forklift truck
- four 17 h.p. pneumatic wheeled industrial tractors
- twelve 2-tons trailers.

In respect of the increase in stacking area, it has been assumed that the unit price of WI$15 per sq. foot in effect, will not be paid, except possibly for the tourist office. Adequate storage and office space should be provided for within the estimated amount under iv above.

155. The total Coode and Partners proposal for the Castries harbour development programme, and its pertinent costs can be summarized as follows;

-	North wharf; provisional repair to -25 ft. draft and use for inter-island vessels only with assumed low super-imposed load behind the wharf	WI$	232,320
-	West wharf; full reconstruction		960,000
-	New wharf with a draft of 36 ft. and a length of 630 ft.		1,998,500

-	Bridge	WI$ 464,700
-	Dredging, reclamation etc.	1,988,900
-	Transit shed	198,000
-	Cruise berth	557,800
	Grand Total	WI$6,400,220

For purposes of comparison, soil investigation, engineering and supervision fees to a total of WI$736,000 have not been included.

156. Considering the detail overall planning of the harbour development as proposed by Coode and Partners, the cost reduction proposals of the parties involved as mentioned before can be basically sub-divided into:

- technical aspects: To this belongs the choice of draft and to whether the North wharf can be fully repaired and used.
- operational aspects: This refers to the introduction of a cruise berth.
- financial aspects: To this belongs the proposed reduction on reclamation, the length of the new wharf and the method of repair of the West wharf.

157. Obviously the crucial bottleneck is caused by the fact that the North wharf is condemned almost to full inactivity, and this aspect leads automatically to considerations relating to the required draft in the harbour. All parties concerned consider a draft of some 30 feet adequate, but ECLA suggested a draft of 32 feet to allow for sufficient clearance under the bilge siltation from the Castries river.

158. This figure of 32 feet has been accepted; consequently, substantial saving can be realised by not dredging the turning circle as proposed by the Consultants. It should be borne in mind that dredging of a quantity less than 500,000 cubic yards is a rather expensive operation, and dredging operation itself would seriously interfere with the normal port operations. Rendezvous shoal and the small patch W.S.W. from it can be removed by Public

Works own dredging barge.

159. Removal of the necessity to dredge leads in two ways to a different location of the new wharf; namely, in Phase 2 instead of in Phase 1 of the Coode and Partners drawings. First, the turning circle can be removed more westward, thus removing the need for dredging for that reason. Secondly, the area around the mouth of the Castries river, which includes the Phase 1 area, can function as a silt trap in which maintenance dredging, even by a bucket or suction dredger when required, will not interfere with normal harbour operations. Dredging records inclusive of the sounding plans, should be carefully kept, since this information is valuable when deciding at a later date upon a further extension of the harbour.

160. In respect of the reclamation of the new harbour area, a first survey of the bottom of the sea indicated the presence of suitable, coarse-graded hydraulic fill. This is found near the oil loading installation at the N.W. corner of banana bay. Available quantities should be clearly confirmed by wash borings to be commissioned to the firm carrying out the soil investigations for the new harbour.

161. Regarding repair of the West wharf, one should not revert to less resistant material such as timber; instead reinforced concrete should be used. For the cruise berth, it appears that the government has given preference to, and already partly initiated the construction of, landing facilities for tenders in Trou Garnier. The construction of dolphins can be postponed to a later stage, a principle which was accepted during the round table conference.

162. The technical considerations as set forth above lead to the following changes in regard to cost of the project as suggested by ECLA during the round table conference. There appears to be no reason justifying the cost of Castries wharf being WI$3,170 per linear feet, as against WI$2,500 in the case of Dominica. This additional cost may be explained by the rubble

slope in the case of Dominica being 1:$1^1/_2$ (except for the upper part) against 1:$2^1/2$ in the case of St. Lucia. This in turn leads also to a much wider jetty. If sub-soil conditions should be the motive for it, consultant should be invited to analyse other more appropriate structures, such as caissons or other types suitable to meet weaker sub-soil conditions. At least, when tendering, the contractor should be allowed to submit an alternative design.

163. Accepting therefore a reduction from consultants' cost estimate of WI$1,998,500 to WI$1,500,000, ECLA's estimate in this respect costs will be as follows:

(a)	Short-term improvement as above, inclusive of full repair of both West and North wharves, and purchase of equipment (1st tranch)		WI$2,465,000
(b)	new wharf, inclusive of siting:		
	deep water wharf	WI$1,500,000	
	bridge	464,700	
	dredging, reclamation	988,900	
	transit shed 250'x100'	198,000	3,151,600
		Grand total	WI$5,616,000

This estimate also excludes soil survey and engineering fees. As previously mentioned, Consultants have been instructed to submit detailed cost estimates with supporting bill of quantities and unit prices within six months.

164. The round table conference agreed on the necessity of constructing a new berth within the present port development programme. Considering that goods movements now fluctuating between 120,000 and 140,000 metric tons of general cargo only should reach an estimated 204,000 tons by 1985 (Coode's report), and taking into account that:

1. the eastern part of the North wharf is intended to continue its function as inter-island vessel berth, a system advocated throughout all the other ECCM ports;

ii. the area behind both the north and western wharfs is not sufficiently large to provide for a proper storage of goods even after additional provisions have been made;

iii. both berths provide draft up to 27 feet only; and

iv. the present level of cargo movement is already slightly in excess of what both the West and North wharfs could handle;

the extension with one new berth is therefore considered justified. Further, it should be borne in mind that a decision on final design taken now, would mean that the new berth will become operational only after four years.

DOMINICA

Maritime Conditions

166. The leeward coast of Dominica presents one of the most difficult maritime situations in the E.C.C.M. countries. In the absence of well protected natural bays, one is on the edge of a choice between a sheltered or non-sheltered harbour.

166. Since annual general cargo movements have passed the 100,000 metric tons mark, one has to consider the most appropriate way of transforming the present open roadstead/lighterage operation in Roseau Bay to a modernized and efficient port. The present facilities consist of an L-shaped jetty head about 100 feet long with actual depths in front varying from 15 feet at its N.W. end to 19 feet at the S.E. corner.

167. Unfortunately, sufficient basic data on swell conditions have not been collected under the previous studies, and in the absence of swell roses indicating frequency distributions and heights from various directions for different months or seasons, it is difficult to assess with any degree of accuracy, the number of unworkable days during which harbour operations will be impeded. It has to be recalled that wave heights over 2 feet seriously impede loading/unloading operations and in particular on palletized cargo. Only these data can lead to a proper decision with regard to the choice of a sheltered or non-sheltered harbour.

168. Prior to final design the information on wave height occurrencies should be made available. At the recent round conference at Roseau, the Government formally requested, through ECLA, that the suggested Summary and Recommendations, for wave and swell studies to be carried out by a Hydraulic Laboratory of Holland should be followed for swell studies on Roseau harbour.

169. If this study should indicate the necessity of resorting to a protected harbour because of an unacceptable and excessive number of unworkable days to be expected during the year, a tentative and alternative harbour development scheme has been drawn up for further consideration. The physical aspects of the scheme are shown in the

..... attached drawing.

170. Should the results of the study show that the number of unworkable days remains within the acceptable limits of operation-interruption, and the Coode & Partners design adopted, the Consultants undertook during the Research round table conference to submit the laboratory report of the model test on the jetty for consideration prior to the final design being definitely approved for construction.

Shipping Conditions

171. The shipping conditions are basically governed by the trend to be expected in the way of transportation of Dominica's main export commodities. These are traditionally bananas, and recently timber and pumice, whilst general cargo represents the main import item.

172. A recent discussion with the shipping advisers for the Geest Lines in St. Lucia revealed their strong preference for exporting boxed bananas on pallets, the latter being brought in with palletized general cargo. There is also a strong indication that other shipping lines will increasingly advocate palletized and pre-slung cargo. This brings banana and general cargo almost under one denominator of cargo handling in the utilization of berths.

173. As regards pumice, with a current exporting quantity of some 100,000 cu. yds. annually, the report of Coode & Partners forsees a continuation of the present loading operation through the Dominica Mining Company's own jetty, even if exports to the U.S.A. are transported in larger ships than the present 15 feet draft schooners, and even if the company should have to extend their jetty so as to accommodate the larger ships. Since, however, low transportation rates play a dominant role for this commodity, and its export does contribute to the economy of the country, sufficient flexibility should be provided in the final design so as to permit a possible future switch to separate loading facilities within the harbour.

174. Coode & Partners also mention in their report that timber production of the Dom-Cen Timber Co.[1/] has great potential, provided

1/ This Company has been in operation since August 1968.

several initial problems have been overcome and a wider market captured. Considering that the contract with the Government provides a minimum production of 12 million board feet, it can be expected that the Company will seriously endeavour to reach a high level of production. In view of the fact that pumice and timber are loaded in relatively smaller ships, and considering the necessity to provide facilities for the inter-island vessels, at the same round table Conference, the consultant was instructed to analyse layout and costs for these facilities.

175. As mentioned previously, general cargo is expected to be handled palletized or pre-slung and brought in by ships not exceeding drafts of some 30 feet. A draft of 32 feet should be adequate when it is considered that even a fully laden general cargo ship stays 3 to 5 ft. above its maximum mark. However, considering swell, during the round table Conference a draft of 36 ft. was finally adopted.

Cargo Handling

176. Although the aspect of cargo handling and general port management will be covered by a specialized export, some general observations are made in so far as they would affect the physical planning of the harbour.

177. It is not to be expected that within the foreseeable future drastic changes will take place in the pattern of cargo handling except for the provisions as mentioned above. Although sufficient open space should always be provided in the harbour area, no special measures are recommended to be taken now with regard to roll-on roll-off and major size containers activities. Some containerization is at present observed in the smaller E.C.C.M. ports, but on a very small and incidental basis only.

178. As far as equipment for cargo handling is concerned, the separate study on port management should advise in detail on the equipment to be utilized in the new port on the basis of timestudies on in-port transport cycles. Still a first tranch is recommended to be incorporated under the short term development improvement programme as outlined in the section,

"Physical implementation and harbour development programme."

Sheds and Warehouses

179. Applying the outline set forth in the section, Basic Operational Criteria, the required transit shed space for general cargo is given by the following formula:[1/]

$$S = \frac{C \times d \times s}{360 \times t \times f}$$, in which:

S = surface in square feet

C = annual general cargo movement in metric tons

d = number of days prior to compulsory transfer of goods to warehouses

s = seasonal variations, which in the Caribbean appears to vary between 1, 50 and 1, 75

t = tonnage load allowed per square feet, normally 0.2 to 0.25 metric tons/sq. feet

f = free space factor for moving of cargo equipment, normally 0.50 to 0.65

A similar formula applies in defining the required warehouse space in which:

d = will be the number of days prior to legal auction for not taking delivery of goods

s = o, being the estimated overflow coefficient of goods from transit shed to warehouse. This gives the following formula:

$$S = \frac{C \times d \times o}{360 \times t \times f}$$

It will be appreciated that only after a detailed study, paired with information obtained on local habits regarding overflow and the establishment of warehouse rates, that an appropriate answer can be given on the space to be provided in the final design.

1/ Subject to in-depth study by a port management expert.

Harbour Organization and Management

180. This subject will be dealt with in full detail by the expert studying port management. Amongst other things, the study should include appropriate legislation, tariffs, organization, management, cargo handling, and storage.

Physical Implementation and Programme of Harbour Development

181. On the basis of the terms of reference for this study, and considering the fact that the time which elapses between decision on the final design and the actual operation of the new port to be constructed will be in the range of from 3 to 4 years, it will be appreciated that a minimum level of service in the present harbour operation cannot be properly maintained throughout that period, unless certain short-term improvements have been carried out.

182. Present operation is effected through a privately owned lighterage service, discharging at an L-shaped jetty, which projects about 164 feet abreast of the town. There is a landing stage 97 feet long with a present depth in front ranging from 15 to 19 feet from its N.W. to its S.E. corner.

183. As compared to draft at the time of construction in 1956, it appears that some accretion has taken place of the order of 3 to 5 feet respectively at its N.W. and S.E. ends, from sediments deposited by the Roseau river. Total transit shed space, divided over three transit sheds, at present amounts of 17,115 sq. feet, and of which 11,540 sq. feet is almost equally divided over two floors in transitshed No. 1. Queen's warehouse space counts only for 1,311 sq. feet. Finally, the port has the following cargo equipment.

- one 5-ton mobile Linkbelt crane
- one 3-ton mobile Coles crane
- four motor tractors
- twelve 1-ton trailers
- one 4,000 lbs. Malbro fork lift truck

184. When visiting the harbour, lighter unloading took place at the innerside of the approach end of the jetty, whilst simultaneously a motor vessel from Puerto Rico berthed at the landing stage was discharging cement from one hatch only. With relatively minor costs, the total operation can be reasonably improved. The following measures for short-term improvement are suggested.

i) Extend the present landing stage with 100 feet at its S.E. end so as to provide more surface for cargo landing, and to provide simultaneously possibilities for unloading over two hatches by the smaller motor vessels. Although a timber structure would fulfil the purpose of a temporary type solution, it is recommended that steelsheet piling should be used instead; this will avoid major problems when piledriving due to the conditions of the subsoil. The total structure still keeps its value for whatever future operational purpose.

ii) Carry out dredging operations by simple means in front of the existing jetty so as to provide for an overall depth of 20 feet. If no local contractor is available to carry out this job, purchase of a clamshell or grab is recommended; this can be mounted to the Linkbelt or Coles crane to be adapted for this purpose.

iii) Have the open passages between the transit shed No. 1 and the Tariff Department as well as the one between the Agricultural Marketing Board and Transit shed No. 2 covered by extending the second floor of the adjacent buildings. In this way some additional 5,900 sq. feet of offices and warehouse surface will be obtained. This space will maintain its value in the future for commercial purposes, even when the new harbour at its new location is put into operation.

iv) Acquire now a first tranch of harbour equipment to improve the present situation; this equipment can be transferred directly to the new port when in operation. It also allows for training and preparation of additional operators to act as instructors in the new port. Tentatively, the purchase of the following additional equipment is suggested:

- one 6,000 lbs. forklift truck
- one 4,000 lbs. forklift truck
- three 17 hp pneumatic wheeled industrial tractors
- eight 2-tons trailers

Repairs of the approach jetty should be undertaken immediately to secure continued operations.

v) Summarising, the short-term proposal for improvement and the tentative estimates involved, are as follows:

i)	Prolongation of existing jetty head with 100 ft.	WI$ 175,000
ii)	Dredging in front of the existing jetty	25,000
iii)	5,900 sq. feet additional office and storage space	70,000
iv)	First tranch of harbour equipment	57,000
v)	Maintenance and repairs to existing jetty	23,000
	Grand Total	WI$ 360,000

..... 185. On the attached drawing an overview is given of the different basic layouts as prepared by Coode & Partners in 1965, the one prepared in 1970, and finally the alternative suggestion by ECLA, in case the results of the laboratory analysis should indicate unacceptable swell conditions. During the Roseau meeting Coode & Partners submitted an alternative design, after consultation with the Caribbean Development Bank, principally along the same lines as the 1965 project, except for a draft of 36 feet instead of 33 feet and a wharf length of 1,200 feet, including two mooring dolphins.

186. The 1965 project is based on a non-sheltered marginal multi T-type of open wharf on piles construction, situated parallel to and protruding from the coastline as to reach the 33 feet depthline. Short approach jetties connect this jetty head with the backfilling of the area between these approach jetties and the shoreline so as to create some - acres of harbour area. The total wharf length considered was some 650 feet, providing berthing facilities for one large and one smaller vessel. Two alternative locations close to each other were analysed, with estimated 1965 costs being WI$2,379,000 and WI$2,693.00 respectively, inclusive of the necessary on-shore facilities, but excludes engineering fees for final design and submit investigation.

187. The 1970 project of Coode & Partners provides a main cargo berth of the open-file type with a draft of 36 feet, and a length of

1,200 feet, allowing 2 large ships to be berthed simultaneously. A small basin with a draft of from 15 to 20 feet provides a total berthing length of 600 feet for inter-island vessels. Total cost of this project was estimated at EC$7,500,000, exclusive of soil investigation and engineering fee. The Government developed a project with a total developed berth length of 1,800 feet, a draft of 30 feet, 2 dolphins and the necessary on-shore facilities. They arrived at a total cost estimate of EC$5,868,280, exclusive of engineering and soil investigation costs. The design accepted during the Roseau meeting has been described above and its cost is expected to fall within WI$5,000,000. The consultant was instructed to prepare this design in a semi-detailed manner with accompanying bill of quantities and unit prices. Additionally, inter-island vessels berths and mooring dolphins would be analysed separately.

188. ECLA's project is fundamentally guided by the principle of providing sufficient protection and as a best second target to reduce costs within the possible technical limits, so as not to jeopardise its economic feasibility. Outlines of this project are shown on the attached drawing.

ECLA's alternative is tentatively estimated at:

Main breakwater	EC$ 3,500,000
Auxiliary dike (annex fingerpier)	600,000
Main berth	1,000,000
Sheds	288,000
Roads, fencing, etc.	550,000
Dredging, hydraulic fill	660,000
Grand total	EC$ 6,598,000

ST. KITTS

Maritime Conditions

189. St. Christopher or St. Kitts, is one of three islands which form the State of St. Kitts-Nevis-Anguilla. The first two islands are situated very closely to each other; they have no harbours, and only indifferent roadsteads which are unsafe during the hurricane seasons.

190. The states' main, and practically only, port of entry is Basseterre, the capital of St. Kitts, which is located at the southern side of the island in a kind of open bay. A shallow coastal bank about half a cable off-shore, bordering the beach, causes a heavy surf, especially when rollers prevail. Studies of the harbour have been carried out as early as March 1964 by the consultants, Coode and Partners, and later complemented by those from Messrs. Brimer, Martin, Maggs, Keeble and Partners in mid-July 1968, Messrs. Wallace Evans and Partners in May 1969, and finally by the Crown Agents.

191. Regarding swell conditions, the Consultants, Messrs. Brimer, Martin, Maggs, Keeble and Partners state as follows:

> ... "The roadstead is exposed and the bay is therefore subject to ground swells from the south and south west. Winds blow in the main from the east and north east side of the bay and the evidence of wind direction and strength from Golden Rock Airport indicate that ocean going vessels could berth alongside an unprotected wharf on 95% of the days during the year and with the provision of the facilities normally associated with a deep water harbour could do so at all times except when the harbour might become untenable to big ships, even if protection were to be provided, owing to the high seas from the west associated with hurricane conditions in the area. Winds otherwise, with the exception of squalls, are generally light to moderate force 5 when wave and swell conditions are likely to range between 2 ft. to 6 ft. in the open roads based on observations made at the existing pier facilities, Factory Piers and Basseterre Treasury and Warehouse Jetties.

> Shoaling in the proximity of the Basseterre jetties causes wave range of one foot to four feet during calm and choppy seas as compared with 6" to 2 ft. in the proximity of the Factory Piers. Ground swells at Basseterre are usually biggest with the influence of the trade wind and are approximately five feet high coming from the south and south west into the bay". 1/ ...

It has been necessary to quote extensively from this document because, not only the question of swell dominates to a large extent the physical layout and planning of the harbour, but also there appears to be some inconsistency in the following statements that

> ... "berthing alongside an unprotected project on 95% of the days" ...

and

> ... "wave and swell conditions are likely to range between 2 ft. to 6 ft. in the open roadstead", ...

since loading/unloading operations are seriously affected by waves over 2 ft. For this reason it was recommended in paragraph 11 (i) that a study should be carried out by a Hydraulic Laboratory on the sea and swell conditions of the area.

192. On the problems of currents and siltation, Messrs. Brimer, Martin, Maggs, Peeble and Partners state inter alia,

> ... "There are no known currents in the bay of any great order and as the ground contours of the sea bed do not contain any ravine like formations which would normally be associated with littoral currents and loose to firm sand, the influence of currents has been taken to be negligible"...

and

> ..." The location and degree of siltation could only be determined from scale model experiment but it would only be prudent at the planning stage to make some allowance in the estimated cost for the construction required in this event by providing for an extension or bulbing on the end of the head"...

1/ Report by Messrs. Brimer, Martin, Maggs, Keeble & Partners. Pages 6-7.

193. Also in this respect, prior to a decision on final design, it is recommended that field measures be carried out on currents and littoral drift by a competent consultant, or possibly by the above mentioned Hydraulic Laboratory. In the cost-operation estimation of the newly designed harbour, the Crown Agent assumed as a first approximation for these costs, the following:

> "In calculating likely costs for maintenance dredging we have assumed an accretion of 3 inches per annum over the whole dredged area". 1/

This must be considered insufficient for final design.

Shipping Conditions

194. The shipping conditions are basically governed by the trend to be expected in the way of transportation of commodities. Exports consist mainly of sugar in bulk which at present accounts for almost half of the total goods movement at the port. The remainder of the goods moved refers mainly to imported general cargo.

195. Improved conditions for bulk loading of sugar calls for a deep water loading point or tower; this will avoid present double handling by means of lighters. The balance of goods moved, mainly general cargo in the range of 30,000 to 40,000 metric tons, justifies only a berthing facility, when combined with the sugar loading tower for export loading. Considering, however, that this general cargo is expected to come in more and more in a super - palletized and pre-slung form, a wharf capable of mechanical cargo handling, should be seen as a basic need if one is going to avoid difficult unloading operation in lighters as is the present case.

1/ Crown Agents Report: January 1970. Page 10.

196. The purchase of large, flat deck lighters, capable of loading several hundred tons of palletized cargo at one time, could be usefully considered as an alternative; however a separate solution must then be found for the direct loading of sugar in bulk.

197. Taking into account that ships at present calling at the Island carrying general cargo do not exceed 30 feet in draft, and that these ships if loaded fully with general cargo still are 3 to 5 feet below their maximum mark. In addition, the present ships for bulk sugar also draw less than 30 feet. Consequently, a draft at the berth of 32 feet is recommended; this figure includes due allowance for some swell and clearance under the bilge.

198. With regard to the inter-island vessel traffic, in the context of the relatively small cargo movement to be expected, facilities can, for the time being, be provided at the same berth as the other general cargo ships. The only way to provide a kind of double berthing facility, without increase in costs, is to construct a type of pier with an approach jetty and head, at the inside of which inter-island vessels can berth. A marginal wharf as such, in particular that of the gravity type of wall, does not provide this possibility. In designing, however, sufficient flexibility should be provided as to make possible future extension and adaptations to changed conditions.

Cargo Handling

199. As seen from the foregoing section, cargo handling will be orientated towards pre-palletized and pre-slung general cargo, and berth loading for sugar; this calls for mechanical harbour equipment for general cargo, and a conveyor belt/loading tower device for sugar in bulk. Further details are given in the section "Physical Implementation and Programme of Harbour Development".

Sheds and Warehouses

200. Applying the outlines set forth under the section, "Basic Operational Criteria," the required transit shed space for general cargo, should be calculated from the following formula: 1/

$$S = \frac{C \times d \times s}{360 \times t \times f}$$, in which:

S = surface in square feet.

C = annual general cargo movement in metric tons.

d = number of days prior to compulsory transfer of goods to warehouses.

s = seasonal variations, which in the Caribbean appears to vary between 1, 50 and 1, 75.

t = tonnage load allowed per square feet, normally 0.2 to 0.25 metric tons/sq. ft.

f = free space factor for moving of cargo equipment, normally 0.50 to 0.65.

201. A similar formula applies in defining the required warehouse spacing in which:

d = will be the number of days prior to legal action for not taking delivery of goods.

s = o, being the estimated overflow coefficient of goods from transit shed to warehouse.

This gives the following formula: $S = \frac{C \times d \times o}{360 \times t \times f}$.

202. It will be appreciated that only after a detailed study, paired with information obtained on local habits regarding overflow and the establishment of warehouse rates, an appropriate answer can be given to the space to be provided in the final design.

1/ This suggestion is made subject to the in-depth study to be undertaken by the Port Management expert.

Harbour Organization and Management

203. This subject will be dealt with in full detail by the expert studying this section. Amongst others this should cover appropriate legislation, tariffs, organisation, management, cargo handling, and storage.

Physical Implementation and Programme of Harbour Development

204. As already outlined in the previous paragraphs and subject to prior detailed studies to be carried out by a Hydraulic Laboratory on swell and sea-bed transport, the layout of the port points to an "L" type of fingerpier, permitting berthing at both sides, with a draft of 32 feet. The attached drawing shows diagramatically the different solutions proposed; i.e.:

(i) the so-called scheme A of the Crown Agents, consisting basically of a marginal wharf of 1000 feet length, situated at an open inshore harbour basin of the same length and 700 feet of width, connected to the 30 feet depthline by 1000 feet long dredged access channel of 400 feet width. In addition on-shore facilities have been provided for;

(ii) the so-called Scheme B of the Crown Agents, having basically the same location and alignment as proposed by Coode & Partners in 1964, offering 30 feet of draft at both sides of the pierhead with a berthing length of 500 feet. Provision has been made at the approach jetty for berthing at both sides 500 feet ships with a draft of up to 24 feet. The rootend of the approach jetty is located at the beginning of the factory pier, and onshore facilities provided there;

(iii) ECLA's alternative is located more S.E. of alternative ii and, assuming swell studies do show this location at least equally favourable to the Crown Agents Scheme B, provides two berths, one at the outside and the other at the inside of the pierhead. In addition easy future extension is possible by direct extension of its pierhead and the construction of additional approach jetties. In this way no traffic congestion is likely to occur. Moreover, the reclaimed

area provides additional harbour space, for uses other than harbour facilities, which in the light of the industrial zone in this area might be advantageous.

A disadvantage is the distant location from the present sugar jetty, involving a rather long extension of the present conveyor belt. On the other hand, this location is closer to the existing industrial site, which require additional space for expansion.

205. In so far as short-term improvement is concerned, the following is considered indispensable, since, at least four years will elapse between the agreement on final design and putting the new harbour into operation:

(i)	Repairs to the Treasury Pier as detailed in the report and recommendations of the Consultants, Wallce Evans & Partners. (They favour these repairs, because cost of repairs of the existing warehouse pier appears to be almost four times as expensive).	WI$ 168,000
(ii)	A first tranch of harbour equipment, consisting of:	
	- one 6,000 lbs. forklift truck	
	- one 4,000 lbs. forklift truck	
	- three 17 hp pneumatic wheeled industrial tractors.	
	- eight 2 - tons trailers	57,000
(iii)	Purchase and erection of dismountable timber shed of 100' x 50'.	50,000
(iv)	Repairs to existing warehouses, miscellaneous	15,000
	Total	WI$ 290,000

Total costs of Scheme A is estimated by the Crown Agents at	WI$ 5,941,440.00
Total costs of Scheme B is estimated by the Crown Agents at	4,010,400.00
Total costs of ECLA alternative is provisionally estimated at	3,600,000.00

Detailed estimates are given in the Financial Section.

MONTSERRAT

Technical Section

206. In harbour construction, Montserrat is faced with the two difficult factors: of low annual goods movement and adverse maritime conditions. There is no sheltered bay, and the Port of Plymouth is subject to swells throughout the year which become worse during the hurricane season. However, there is a literal drift reported to cause changes in the shoreling at the existing jetty, building up some 150 feet during a certain part of the year (November through March). Further adverse conditions as outlined in the report of the Consulting Engineers, Coode & Partners include high occurrency hurricanes (once every 30 years) and probability of earthquakes.

207. The present port operations by means of lighters over the existing jetty with a depth of 11 feet alongside its head might be adversely affected in the future, since the Director of Public Works detailed report indicates that the jetty is in a state of disrepair. Solutions to improve the present situation have been studied as early as March 1966 by the Consulting Engineers, Coode & Partners, and the project has been modified and updated recently by Montserrat's Ministry of Trade and Production. In addition, the British Development Division in the Caribbean prepared a detailed project evaluation in July 1968. It is understood that the British Government decided to embark upon the project and that technical advice by the ECLA would be appreciated.

208. Against this background it has been suggested therefore under Chapter II, Summary and Recommendations, that a Hydraulic Laboratory should carry out an analysis of Sea and Swell conditions within the area, and possibly as a second priority field measures on littoral drift.

209. Sea and Swell once known, with indication on frequency, direction and height, represent basic conditions for the layout and physical concept of the harbour. Regarding the latter it has been suggested that the British Development Division, should initiate the construction of relatively cheap groins of short length as to build up with time the necessary beach reclamation. In this way, without incurring high costs, the problem of lack of sufficient harbour area will be gradually solved. Further, it is quite possible that by the time construction of the new jetty will have been completed, sufficient harbour space would have been provided. However, it should be borne in mind that a change in the shoreline might generate other changes with regard to the depthlines, and that due consideration will have to be given to this aspect; it could possibly be studied by a Hydraulic Laboratory on the basis of field measures carried out on currents and littoral drift.

210. Without anticipating the studies still to be carried out on the maritime conditions of the area, it appears appropriate both from a technical as well as from a financial angle, to provide a draft not exceeding 20 to 22 feet. In this way, a consistency is maintained throughout the islands regarding berthing for the inter-island vessels, which are considered an important instrument in the gradual development of the economic integration by providing adequate and relatively cheap maritime transport. Moreover, it can take the majority cargo ships which are likely to be half-loaded when including Montserrat in their itinerary.

211. A different concept, although affecting the principles of the inter-island vessels trade, should not be excluded entirely. Under this denominator falls the provisions of loading/unloading on a large, flat-deck, self-propelled lighter, capable of handling amongst others several hundred tons of general, palletized cargo, and possibly unloading at a shallow, but protected landing facility.

This consideration is governed by the tendency of shipping companies to bring in more and more of their general cargo in a palletized and pre-slung form. The British Development Division used in their analysis three alternative projects viz:

i) Scheme A, representing the "without case", orientated only towards the widening of the main street.

ii) Scheme B, involving the building of a new L-shaped jetty, along the lines of the Coode & Partners report, but amended to take the jetty to the 30 feet contour.

iii) Scheme C, which is essentially the same as Scheme B except that the area reclaimed would be extended to provide for development of the waterfront area and the realignment of the marine road.

The estimated capital costs involved in the different projects are:

- Scheme A, including Street, South reclamation and warehouse at a cost of WI$2,311,000. WI$2,412,000

- Scheme B, including engineering fee and contingencies. WI$3,640,000

- Scheme C, as above. WI$3,780,000

CHAPTER V

FINANCIAL SECTION

GRENADA

212. The costs involved in the short-term improvement in St. George's harbour as outlined in the section "Physical Implementation and Programme of Harbour Development", is provisionally estimated according to the breakdown below. Adjustment is required when sub-soil data become available.

Main Harbour:			
Extension main wharf by 150 ft.	WI$	375,000	
Main transit shed 200 ft. x 75 ft.		180,000	
Harbour equipment consisting of:			
one 6-tons mobile crane			
two 6,000 lbs. forklifts trucks			
two 4,000 lbs. forklifts trucks			
twelve 2-tons trailers			
eight 1-ton trailer			
four industrial tractors		124,000	679,000
Inter-island basin:			
475 ft. inter-island berth, with 20 ft. draft	WI$	475,000	
dredging of basin, fill		350,000	
warehouse 200 ft. x 50 ft.		110,000	935,000
			WI$1,614,000

213. The inter-island basin appears to be disproportionately expensive as compared to the proposed main harbour extension, but it should be considered that:

- dredging costs spent in the inter-island basin provide future extension for another 500 ft. of berth, more than doubling the total length at present recommended; and

- warehouse space will with the gradual decrease of custom barriers become increasing available for storage of cargo of the main harbour.

214. Detailed cost-benefit analysis is suggested to be prepared by the Government along the quantifiable tangible benefits as follows:

- saving in turn-around time of ships;
- additional cruise ship berthing generated;
- additional tourist spending, disembarking in St. George's harbour;
- saving in handling costs of cargo when mechanized;
- saving in insurance costs because of reduced damage and pilferage on cargo.

Considering the time elapsing in finalizing application for financing, the following tentative investment programme is suggested:-

	1972	1973	1974	1975
Extension of main wharf	75,000	300,000		
Extension of main tourist shed	-	100,000	80,000	-
Dredging and filling small basin	-	300,000	50,000	-
Inter-island berth	-	75,000	300,000	100,000
Inter-island warehouse	-			110,000
Harbour equipment	60,000	64,000	-	-
Total	135,000	839,000	430,000	210,000
Accumulative total	135,000	974,000	1,404,000	1,614,000

ST. VINCENT

Financial Section

215. As has been analysed in the section, Physical Implementation and Programme of Harbour Development, total cost of short-term improvement has been estimated at WI$1,440,000.

216. Considering the time involved in securing finance, particularly external financing, this amount is tentatively programmed as follows:

Year 1972	-	WI$ 250,000
Year 1973	-	800,000
Year 1974	-	310,000

It is left for the Government to prepare a cost/benefit analysis if external finance is to be sought.

FINANCIAL SECTION

ST. LUCIA

Constructions Costs

217. As already mentioned in Chapter IV, Coode & Partners estimated the cost of their project at WI$6,400,220, exclusive of costs for soil investigation and engineering fee; these amount to WI$736,000.

218. ECLA's alternative consists basically of a reduction in draft from 36 to 32 feet, non-dredging of the turning circle, a more economic cross-section for the new jetty and omission of the cruise berth, but inclusive of costs for full repair of the North Wharf, a first tranch of harbour equipment and an unforeseen element. Separate estimates are given below for short-term improvements recommended, and for the construction of the new wharf:

Short-Term Improvement:	Repair North Wharf	WI$950,000
	Repair West Wharf	WI$960,000
	Purchase of Equipment	WI$127,000
	Costs involved in increase of Stocking Area	WI$265,000
	Unforeseen	WI$163,000
	Sub Total	WI$2,465,000
New Wharf Construction, 630 Feet:	Wharf Proper	WI$1,500,000
	Bridge	WI$464,700
	Dredging, Hydraulic Fill	WI$988,900
	Transit Shed	WI$198,000
	Sub Total	WI$3,151,600
	Grand Total ECLA	WI$5,616,600

Engineering fees and cost of subsoil investigations should, on this new basis, be reduced from WI$736,000 to WI$657,660.

Benefits

219. The tangible benefits derived from the partly reconstructed, partly new harbour, as analysed by Coode & Partners refer to:

- reduction in cargo handling costs;
- reduction in ships turn round times;
- reduction in insurance claims;
- increased revenues on port operation, based upon projected goods and cruise ships movement;
- increased revenues from lease or sale of reclaimed land.

Non-tangible benefits as mentioned in Coode & Partners report were:

- induced traffic;
- increased land values adjacent to the new wharf.

Benefit-Cost Ratio

220. Using the following tentative depreciation periods for:

Land	- No depreciation
Wharves	- 60 years
Transit Sheds	- 15 years
Machinery and Equipment	- 10 years,

considering the operation cost elements of wages and salaries, repairs and maintenance, dredging and other pertinent charges; and finally 7% interest rate on the loan; Coode & Partners prepared a cash flow diagram, showing a cumulative cash portion of WI$257,000 in the first year 1970, increasing to WI$2,153,000 by 1985.

FINANCIAL SECTION

DOMINICA

Construction Costs

223. As already mentioned under Physical Implementation and Programme of Harbour Development of Chapter 4, the total costs for the project, exclusive of costs for soil investigation and engineering fee, as discussed and agreed upon during the Round Table Conference in Dominica on January 20, was estimated at WI$5,000,000. This figure should be re-appraised by the Consultants, Coode and Partners, within 6 months, based upon a semi-detailed project with supporting bill of quantities and unit prices.

224. Total costs incurred for the ECLA suggestion, including short-term improvements, will thus be:

Short-Term Improvement:	WI$360,000
New Wharf Construction:	5,000,000
Total investment as proposed by ECLA:	WI$5,360,000

Engineering fee and subsoil investigations should, on this new basis, be reduced from WI$800,000 to WI$550,000.

Benefits

225. The tangible benefits derived from the new harbour as originally analysed by Coode and Partners refer to:

- reduction in cargo handling costs;
- reduction in ships turn round times;
- reduction in insurance claims;
- increased revenues on port operation, based upon projected goods and cruise ships movement;
- increased revenues from lease or surplus of reclaimed land.

Non-tangible benefits as mentioned in Coode & Partners report were:

- induced benefits to importers, ship operators and Roseau population;
- increased land values adjacent to the new wharf.

Benefit - Cost Ratio

226. Using the following, tentative depreciation periods for:

Land	-	No depreciation
Wharves	-	60 years
Transit Sheds	-	15 years
Machinery and Equipment	-	10 years;

considering the operation cost elements of wages and salaries, repairs and maintenance, dredging and other pertinent charges; and finally 7% interest rate on the loan; Coode and Partners prepared a cash flow diagram, showing a cumulative cash portion of WI$396,000 in the first year 1970, increasing to WI$7,485,000 by 1985.

227. Apparently the Caribbean Development Bank, when recently discussing the feasibility of the new harbour, arrived at an acceptable cost-benefit ratio, when construction costs did not exceed WI$5,000,000. No information is available as to how the Bank arrived at their conclusion, neither what benefit-cost ratio should still be acceptable to them. Whatever calculations used by the Bank, it will be uniform and standard for all the port projects under consideration with the Bank.

228. However, depending on Consultants advising on the different harbours, different calculations might have been used, leading to confusing, non-comparable results. As a suggestion, existing U.S. standards on economic and technical soundness, analysis on capital projects, and on benefit-cost evaluations could be adopted. These are:

- Amortization

Wharves	50 years
Warehouses	50 years
Equipment	Varying with type

- Calculation of cost-benefit ratio

  On the basis of "present worth" values of annual primary benefits and "single payment present worth" factor for discounting of replacement in the annual costs calculations.

Investment Program

229. On the basis of ECLA's short-term improvements and provisionally agreed cost estimate for the new harbour, the investment programme appears to be as follows:

	1971	1972	1973	1974	1975
Short-term improvement	48,000	312,000			
New harbour		500,000	1,500,000	2,000,000	1,000,000
Total	48,000	812,000	1,500,000	2,000,000	1,000,000
Accumulated Total	48,000	860,000	2,360,000	4,360,000	5,360,000

FINANCIAL SECTION

ST. KITTS

Construction Costs

230. As already mentioned in Chapter IV, Technical Section, the construction costs for the new harbour as analysed by the Crown Agents were as follows:

Scheme A	WI$ 6,027,840
Scheme B	WI$ 4,010,400

These figures included provisions for the extension of the sugar conveyor belt, but excluded repair costs on the warehouse pier.

231. Using the above cost analysis the cost estimate for ECLA's layout is WI$ 3,600,000. It would be recalled that this layout is similar to that of Scheme B, but has a shorter approach jetty, and longer sugar conveyor belt. This cost estimate is 10% lower than the Scheme B estimate above, but it must be pointed out that this figure is not based on any detailed breakdown, but merely a target figure in which it is felt that the engineering design can fit.

Benefits and Benefits/Cost Ratio

232. The tangible benefits considered and quantified by the Economic Associates Ltd. in their October report refer to:

- reduction of costs in cargo handling;
- additional cargo generated by the new facilities;
- incidental benefits:

A further analysis showed the following figures:

savings in lighterage costs	£	1,150,000
savings in ship's time in port		1,412,000
savings in pilferage and breakage		166,000
Value in land (29 acres)		127,000
	£	2,855,000 or
	WI$	13,740,000

233. Based upon a discounted present worth for both benefits and costs and a 50-year lifetime, they arrived at the following benefit/cost ratio figures:

$\frac{2,855}{2,285} = \underline{1.25}$: this figure included provisions for cruise liners in costs only.

Exclusive of these provisions, pure cargo handling cost/benefit ratio has been calculated at:

$\frac{2,855}{1,752} = \underline{1.63}$

It is not clear in this calculation how gross capital costs of the scheme as have been supplied by the Crown Agents could amount to £1,743,600 or WI$8,369,280; this figure is not consistent with that quoted above.

234. Finally, it is understood, that the Caribbean Development Bank, when analyzing the data as submitted by the St. Kitts Government, arrived at an acceptable cost/benefit ration, when construction costs should not exceed WI$3,000,000. It is suggested that the Government should embark upon a further detailing of the cost/benefit aspect of the scheme; thereafter a Consultant should be commissioned to work out a further detailed engineering plan to be submitted to the Bank for final approval for construction.

Investment Program

235. The following tentative programme is considered, based upon ECLA's provisional cost estimates:

Cost Item	1971	1972	1973	1974	1975	1976
Short Term Improvement	50,000	183,000	57,000			
New Construction	-	300,000	2,000,000	1,300,000	-	-
Total	50,000	483,000	2,057,000	1,300,000	-	-
Accumulated Total	50,000	533,000	2,590,000	3,890,000	-	-

MONTSERRAT

Financial Section

236. As already briefly mentioned under the Technical Section, the total cost of the project consisting only of Schemes B and C is as follows:

	Scheme B	Scheme C
- Wharf including jetty head, approach jetty, northern arm as to avoid siltation and mooring dolphin	2,189,200	2,189,200
- Reclamation, revetment, etc.	625,000	414,200
- Rubble bank retaining wall	-	276,500
- Southern reclamation	220,200	220,200
- Warehouse	60,000	60,000
- Drainage and soil investigation	36,000	36,000
- Engineering fee and contingencies	488,400	498,600
- Additional roads and car parking	-	60,000
Total	3,629,800	3,775,700
Round Figures:	3,640,000	3,780,000

237. On the basis that (a) half of the capital investment will be covered by paid-up shares in a company operating the harbour, earning 15% profit, and (b) the other half is financed by a bank loan at an interest rate of 8% an analysis has been made on cash net flow statements, for 10% and 12% annual increase separately, and on the alternative Schemes A (without case), B and C.

238. The net benefit has been calculated over an 11 year period by comparing the "with" over the "without" case, and introducing a residual value, representing the discounted value of future earnings beyond that period. The return on investment arrived at for Scheme C was 9.4% and 11.8% respectively for the 10% and 12% annual increase on imports. In this exercise,

revenues have been calculated according to the recommendations made by Dr. O'Laughlin upon harbour dues more than double over the present level; however, a slight reduction was introduced on L.S.D. charges on a sliding basis with varying quantity of tonnage annually handled, from WI$10 - $9 over a present rate of WI$11 per ton.

239. ECLA will defer its economic appreciation and cost/benefit calculation until the project has moved into a more final and definite engineering stage.

240. Regarding the short-term improvement to be recommended, and considering the fact that even when a new harbour arrangement should be carried out effectively several years will have passed, the following items, partially enumerated in the "without case", Scheme A, of the report are provisionally suggested:

- major overhaul of jetty	WI$ 80,000
- overhaul harbour equipment	21,000
- warehouse	deferred
- reclamation initiated along the lines as suggested under the technical section by the construction of short groins along the beach	90,000
Total short-term improvement	**WI$ 199,000**

It is suggested that this amount should be distributed as follows:

1971	WI$ 146,000
1972	WI$ 45,000

The 1972 figure represents half of the value of construction of the groins which is suggested to be carried out in two phases.

Appendix A

A Detailed Timetable of Activities Connected with Travel to Islands of the East Caribbean

Discussions in Port of Spain for assessment of study programme.	27 August
Discussions New York service agreement	15 October
Discussions Santiago service agreement	20 and 30 October.
Briefing, background documentation, in Port of Spain	2-8 November
Visit to Barbados and Consultation of U.N. Physical Development Planning Project and British Development Division	9-11 November
Visit to St. Lucia, familiarisation discussion and field measures of North Wharf	12-14 November
Studying in Port of Spain of existing and newly gathered documentation during visits	15-30 November
Visit to St. Kitts, familiarisation and discussion	1-2 December
Visit to Montserrat, familiarisation and discussion	2-3 December
Visit to St. Lucia, field measures of North Wharf, provisional repair scheme of West Wharf	4-6 December
Visit to St. Vincent, familiarisation and discussion	6-8 December
Visit to Grenada, familiarisation and discussion	8-9 December
Studying in Port of Spain of new documentation of harbours visited on this second trip, elaboration, drafting and typing of report, correspondence with Governments and U.N. Physical Development Plan	10 December to 17 January
Round the table conference on port development for St. Lucia with Government representatives, U.N. Physical Planning Office, British Development Division and Consulting Engineers, Coode & Partners	18-19 January

Identical round the table conference in Dominica	20-21 January
Round the table conference with Government representatives and U.N. Physical Planning Office in Grenada	22-23 January
Finalising and typing of report in Port of Spain	23-29 January
Return flight Holland	30 January

Appendix B

a. OFFICIALS MET

BARBADOS

Mr. C.M. Thompson, Permanent Secretary, Ministry of Communications and Works

Mr. H. Williams, Senior Economist

Miss E. Bentham, Economist

Mr. K. A. Hall, Port Manager

Mr. B. F. Johnson, Port Superintendent

Mr. Thornley Dyer, UN Physical Planning Division

Mr. J. Stempski, UN Physical Planning Division

Mr. K. Hardaker, British Development Division

Mr. A.L. Burnett, British Development Division

Mr. Wason, Caribbean Development Bank

Mr. D. Coode, Consulting Engineer

DOMINICA

Hon. E.O. Le Blanc, Premier

Hon. R.O.P. Armour, Deputy Premier and Minister of Finance

Mr. John, Minister of Communications and Works

Mr. D.K. Burton, Permanent Secretary, Ministry of Communications and Works

Mr. C.A. Sorhaindo, O.B.E.,Permanent Secretary, Ministry of Finance

Mr. J. J. Robinson, O.B.E., Permanent Secretary, Ministry of Trade and Industry

Mr. F.V.M. James, Collector of Customs

Mr. Louis Martin, Harbour Master

GRENADA

Hon. H.J. Preudhomme, Minister of Communications and Works

Mr. E.F. Cherman, Permanent Secretary, Ministry of Communications and Works

Mr. L. Wilson, Permanent Secretary of Finance

Mr. R. R. Banfield, Assistant Secretary, Ministry of Finance

Mr. D. Fletcher, Senior Economist, Ministry of Finance

Mr. S. McNeilly, Harbour Master

Chief Technical Officer

Technical Officer

MONTSERRAT

Hon. D.R. Gibbs, Administrator

Mr. George Cabey, Permanent Secretary of Public Works and Communications

Mr. Derek Brown, Director of Public Works

Miss P. Dawson, (V.S.O.) Economist

Mr. A.J. Jacobs, Harbour Master and Controller of Customs

ST. KITTS

Hon. C.A.P. Southwell, Deputy Premier and Minister of Finance, Trade and Production

Mr. G. Ward, Permanent Secretary, Ministry of Trade and Production

Dr. Marthol, Planning Officer

Mr. H. Hanley, Comptroller of Customs

Mr. Robinson, Harbour Master

ST. LUCIA

Hon. J.G.M. Compton, Premier

Hon. D. Bousquet, Minister of Public Works

Dr. F. Louisy, Permanent Secretary, Ministry of Public Works

Mr. G. Girard, Permanent Secretary, Ministry of Finance

Mr. C. Cadet, Permanent Secretary, Ministry of Planning

Mr. L. Augier, Chief Engineer, Ministry of Public Works

Mr. Eudoxie, Controller of Customs

Mr. C.B. Crick, Port Officer

Mr. L. Dubonlay, Chief Pilot

ST. VINCENT

Hon. J.F. Mitchell, Minister for Agriculture, Trade and Tourism

Hon. R.F. Marksman, Minister for Housing and Community Development

Hon. H.K. Tannis, Minister for Education and Health

Hon. L.C. Latham, Minister for Communications, Works and Labour

Mr. G. Lisle Fraser, Port Officer

Mr. A.W. Dalrymple, Chief Technical Officer

Mr. M.V. Williams, Permanent Secretary, Ministry of Communications, Works and Labour

Mr. J.H. Falby, Executive Officer, Port and Marine

b. DOCUMENTS CONSULTED

i. GENERAL

- UN Yearbook of International Trade Statistics
- UN Statistical Yearbook

- FAO Trade Yearbook

- Report of the Tripartite Economic Survey of the Eastern Caribbean

- UNIDO Study on Industrial Development in the Member Countries of CARIFTA

- UNCTAD, Development of Ports

- Organisation of American States, Decisions taken at meetings in the Port Programme

- Cargo flow Commonwealth Caribbean Area, Saguenay Research Division

- Feasibility Study of Shipping Services in the Commonwealth Caribbean by Royal Netherlands Steamship Co.

- West Indies Pilot, Volume II

- Oceanographic Atlas of the North Atlantic Ocean, U.S. Naval Oceanographic Office

- Study of the Feasibility of Establishing Caribbean Hurriance and Tropical Storm Insurance Scheme (UNDP)

- Feasibility Studies for Inter-island and Feeder ship Services

  - Small Vessels, ECLA/POS 70/6/Rev.

  - CARIFTA Area ECLA/POS 70/1/Rev.1

- CARIFTA and ECCM Agreements

- Developments in the process of integration among the CARIFTA Countries (ECLA/POS 70/2)

ii. COUNTRY

BARBADOS

Report on Deepwater Harbour Proposed Extension, Coode and Partners, 1965

Government's comments on 1965 report by Coode and Partners

Site Reconnaissance Survey Deepwater Harbour Extension Bridgetown, by Stevenson, Hardtke Associates Ltd.(Nov.1970)

DOMINICA

Report on the Development of a Deepwater Harbour by Coode and Partners/Robson, Morrow & Co. (4 volumes)

Comments and Alternatives prepared by the Dominican Government

British Development Division, UN Physical Planning Office, Barbados

Proposed Deepwater Wharf facilities at Roseau by Coode and Partners

GRENADA

Reclamation Scheme as prepared by UN Physical Planning Office, Barbados

Grenada 5-Year Development Plan 1964-1968

MONTSERRAT

Montserrat Development Plan 1966-1970

Extract: Coode and Partners' Reports

Harbour Layout as prepared by the Government

ST. KITTS

Feasibility Report of Messrs. Brimer, Martin, Maggs, Peebles and Partners

Report of Messrs. Wallace, Evans and Partners

Report on Proposed Deepwater Wharf at St. Kitts, Crown Agents

Economic Appraisal Study for St. Kitts Deepwater Harbour, by Economic Associates Ltd.

ST. LUCIA

Report on Harbour Development by Coode and Partners/ Robson, Morrow & Co.

Comments and Alternatives prepared by the British Development Division, and UN Physical Planning Office, Barbados

Table I - 1

COMPARATIVE GOODS MOVEMENT DATA EXCL. FUELS FROM DIFFERENT SOURCES IN THOUSAND METRIC TONS

COUNTRIES/ SOURCES	1960		1961		1962		1963		1964		1965		1966		1967		1968	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
BARBADOS																		
UN Statis. Yearbook	n.r.		n.r.		n.a.		n.a.		n.a.		220[x]	42[x] / 262	226[x]	180[x] / 406	245[x]	185 / 430	xxx	xxx
Codeca, P. Rico[1]					153	13 / 166	182	13 / 195	188	11 / 199								
Saguenay Study																		
Inter-island[2]													16	43	21	48		
Motor-ships													204	147	233	152		
Fuels													-	187 / 410	-	362 / 454		
UN Yearbook of[3] International Trade Statistics	n.a.	136	n.a.	122	n.a.	135	n.a.	169	n.a.	179	n.a.	174	n.a.	185	n.a.	137	n.a.	174
GRENADA																		
UN Statis. Yearbook	16	37[o] / 53	17	51[o] / 68	19	48[o] / 67	22	45[o] / 67	21	53[o] / 74	30	35[x] / 65	26	63[x] / 89	30	74[x] / 104		
Codeca, P. Rico[1]	16	43 / 59	17	58 / 75	19	56 / 75	22	54 / 76	21	63 / 84								
5-Year Develop. Progr.																		
Inter-island[2]	n.a.	9	n.a.	10														
Motor-ships	n.a.	40	n.a.	38														
Fuels	n.a.	4	n.a.	10														
Saguenay Study																		
Inter-island													-	15				
Motor-ships													25	34				
Fuels													-	15 / 74				

See footnotes on ultimate page

COUNTRIES/ SOURCES	1960		1961		1962		1963		1964		1965		1966		1967		1968	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
ST. VINCENT																		
UN Statis. Yearbook	35	45[o/]	31	42[o/]	33	33[o/]	37	36[o/]	37	46[o/]	41	40[x/]	38	50	37	44	46	37[o/]
	80		73		66		73		83		81		88		81		83	
Codeca, P. Rico[1/]	33	47	29	45	32	37	37	42	37	50								
	80		74		~~69~~		79		87									
Saguenay Study																		
Inter-island													6	13				
Motor-ships													32	17				
Fuel													-	6				
													68					
ST. LUCIA																		
UN Statis. Yearbook	38	38[o/]	53	53[o/]	56	62[o/]	60	54[o/]	67	72[o/]	90	73[x/]	85	70[o/]	75	73[x/]		
	76		106		118		114		139		163		155		148			
Codeca, P. Rico[1/]	39	43	54	59	57	69	60	64	67	80								
	82		113		126		124		147									
Saguenay Report[2/]																		
Inter-Island															4	13		
Motor vessels															75	35		
Fuels															-	7		
															127			
Coode & Partners[4/]																		
Inter-island							(		(		(		(		-	22[xx/]	-	18
Motor Vessels							(57	31	(66	42	(86	43	(83	49	79[xx/]	30[xx/]	76[xx/]	28
Fuels							-	8	-	8	-	11	-	14	-	14		13
							88		108		129		132		131		122	

See footnotes on ultimate page

COUNTRIES/ SOURCES	1960		1961		1962	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
DOMINICA						
UN Statis. Yearbook	not available					
Codeca, P. Rico[1/]	23	31	33	38	43	40
	54		71		83	
Saguenay Report[2/]						
Inter-island motor-vessels	33	35	44	37	36	37
Fuels	-	3	-	3	-	7
In revenue tons	68		81		73	
Est. in weight tons[xx/]	57		70		62	
Coode & Partners						
Inter-island[xx/]						
Motor-vessels[xx/]						
Fuels[xx/]						
Total in freight tons						
Est. in weight tons[xx/]						
Conversion 1, 0 in exports						
Conversion 0, 7 in imports						
MONTSERRAT	1959					
UN Statis. Yearbook	1[x/]	2[x/]	not available			
	3					
Codeca, P. Rico[1/]						
Br. Develp. Div. '68 Report on harbour development						
Saguenay Study						
Inter-island[2/]						
Motor-ships						
Fuels						

See footnotes on ultimate page

Table I - 3

1963		1964		1965		1966		1967		1968	
Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
				50[x]	19[x]	52[x]	19[x]	50[x]	20[x]		
				69		71		70			
36	43	53	65								
79		118									
52	57	59	51	46	53	64	54	59	54		
-	8	-	14	-	9	-	12	-	11[xx]		
109		110		98		118		103			
92		95		83		102		97			
				-	8	-	10	-	12	-	12
				62	43	50	47	61	40	67	46
				-	14	-	9	-	12	-	11
				113		107		113		125	
				98		90		97		108	
				2[x]	3[x]	2[x]	3[x]	3[x]	3[x]		
				5		5		6			
		13	13								
		26									
		-	11	-	19	1	19	-	17		
		11		19		20		17			
		n.a.	11	n.a.	19	-	7	-	6	-	5
						1	12	-	11	1	13
		n.a.	2	n.a.	2	-	5	-	4	-	4
		11[xx]		19[xx]		20		17		19	

Table I - 4

COUNTRIES/ SOURCES	1960 Exp.	1960 Imp.	1961 Exp.	1961 Imp.	1962 Exp.	1962 Imp.	1963 Exp.	1963 Imp.	1964 Exp.	1964 Imp.	1965 Exp.	1965 Imp.	1966 Exp.	1966 Imp.	1967 Exp.	1967 Imp.	1968 Exp.	1968 Imp.
ST. KITTS																		
UN Statis. Yearbook	1959																	
	57[x]	5[x]							50	48[xx]	47	51[xx]	44	47	40	47	39	54
	62								98		98		91		87		93	
Codeca, P. Rico[1]	51	54	50	50	52	56	52	57	51	56								
	105		100		108		109		107									
Brimer, Martin, Maggs, Keeble & Partners, 5-1968																		
Inter-island[2]			1	5	10	14												
Motor-vessels			47	34	47	32												
Tankers			-	18	-	16												
Total in freight tons			87		103													
Conversion export 1, 0																		
Conversion import 0, 7																		
Total in weight tons			75		89													
Saguenay Report																		
Inter-island													7	8				
Motor-vessels													38	24				
Fuels													-	8				
													77					
ANTIGUA																		
UN Statis. Yearbook	1959																	
	23[x]	30[x]	not available								25[x]	83[x]	2[x]	31[x]	5[x]	24[x]		
	53										108		33		29			
Codeca, P. Rico[1]	22	67	22	54	22	81	26	92	12	117								
	89		76		103		118		129									
Saguenay Report																		
Inter-island													-	12	-	11		
Motor-vessels													2	36	-	33		
Fuels													-	218	21	217		
													50		44			
Saguenay Report (From local authorities)																		
Inter-island					-	3	-	3	-	2	-	-	-	-	1	3		
Motor-vessels					22	53	21	53	23	60	13	69	8	85	5	71		
Fuels					-	35	-	46	-	50	-	69	-	53	-	66		
					78		77		85		82		93		80			

See footnotes on ultimate page

NOTES:

1/ Corporacion de Desarrollo Economico del Caribe, Nov. 1968, San Juan, Puerto Rico, Original sources are UN Statistical Yearbook and abstract of Statistics of the Leeward Islands, Windward Islands and Barbados, Barbados 1964. These figures include fuel.

2/ Inter-island, inter-regional, schooner and or sailing traffic, are grouped hereunder as to arrive at an appreciation of goods movement effected and/or possibly effected by the smaller inter-island vessels. Total export or import figures however occur with those recorded under the different sources.
(For 1968 figures see Small Vessel Shipping in the Eastern Caribbean, ECLA/POS - 70/6 rev. of 10 November 1970).

3/ Totals do not represent true totals, since only available weight figures are totalled. (See similar remark on annexes No. ---------- and ----------).

4/ Coode & Partners report's original sources were Customs and Development Planning and Statistic Division of St. Lucia.

5/ Expressed in revenue tons.

o/ Subtraction for fuels by arbitrarily estimate and interpolation between 1959 and 1965/67 UN figures, because not available at ECLA Office.

x/ Official UN estimate.

xx/ Estimate of writer.

n.r. Not recorded.

n.a. Not available.

Table II - 1

SOURCE: YEARBOOK OF INTERNATIONAL TRADE STATISTICS UN

BARBADOS

IMPORTS BY COMMODITIES ACCORDING TO SITC CODE
IN THOUSAND METRIC TONS

	1960			1961			1962			1963			1964			
No.	Wt.	Fact.	Val.	Wt.	Fact.	Val.	Wt.	Fact.	Val.	Wt.	Fact.	Val.	Wt.	Fact.	Val.	Wt.
0	46.5[2]	.47	21.9	47.9[2]	.49	23.2	49.2[2]	.49	24.1	74.1	.36	26.9	74.9	.39	29.0	72.2
1	pm		2.1	pm		1.9	pm		2.0	pm		2.0	pm		2.1	pm
2	25.9[1]	.17	4.4	27.6[1]	.15	4.0	22.8[1]	.16	3.6	27.9	.16	4.3	20.0	.17	3.5	24.5
3	MINERAL FUELS LEFT OUT OF CONSIDERATION															
4	pm		.5	pm		.4	pm		.2	pm		.6	pm		.6	pm
5	11.9[3]	.51	6.0	11.4[3]	.56	6.4	29.3	.23	7.1	29.3	.24	7.0	36.7	.23	8.6	24.2
6	47.9[4]	.38	18.4	32.3	.55	17.4	30.9	.55	16.9	32.8	.55	18.7	42.7	.49	20.9	47.2
7	3.1	4.91	15.2	1.8	6.78	12.2	2.4	5.35	12.8	3.7	3.67	13.6	4.6	3.96	18.1	4.8
8	.4	19.6	7.8	.5	15.4	7.7	.5	16.8	8.4	.7	12.7	8.9	.3	3.67	11.0	1.0
9	pm		2.7	pm		2.7	pm		2.9	pm		3.3	pm		3.8	pm
0 to 9	135.7	.58 .52[6]	79.0	121.5	.62 .54[6]	75.9	135.1	.58	78.0	168.5	.51	85.3	179.2	.55	97.6	173.9

NOTE:

Totals do not represent true totals as only figures were added for which weights were available.

See footnotes on ultimate page

- continued -

	1965			1966			1967			1968		
No.	Wt.	Fact.	Val.	Wt.	Fact.	Val.	Wt.	Fact.	Val.	Wt.	Fact.	Val.
0	46.5[2]	.44	31.9	76.1	.45	34.1	54.7	.61	32.4	75.5	.51	38.6
1	pm		2.1	pm		2.4	pm		2.4	pm		3.3
2	25.9[1]	.16	3.9	25.4	.17	4.4	26.5	.19	5.0	29.8	.20	5.9
3	MINERAL FUELS LEFT OUT OF CONSIDERATION											
4	pm		.8	pm		.8	pm		1.1	pm		1.6
5	11.9[3]	.35	8.3	27.2	.36	9.8	7.6[5]	1.44	10.9	7.5[5]	1.65	12.3
6	47.9[4]	.49	23.2	51.8	.53	27.2	34.3	.80	27.2	42.8	.74	31.5
7	3.1	3.92	18.9	4.9	4.56	22.3	13.8	1.13	25.6	18.1	1.93	35.1
8	.4	11.3	11.3	.3	43.8	13.1	pm		13.8	pm		17.5
9	pm		4.0	pm		4.0	pm		4.2	pm		5.6
0 to 9	135.7	.60	104.4	185.7	.64	118.1	136.9	.92	122.6	173.7	.87	151.4

NOTE: Totals do not represent true totals as only figures were added for which weights were available.

1/ Including timber in cu. m., counted as tons

2/ Includes 05 group in value only, not in weight (vegetables)

3/ Mainly fertilizer, needs weight correct for '60 and '61 of resp. 17.1 and 20.1 thousand tons (est.)

4/ Mainly cement and steel (high figures for 1960)

5/ Reduction in fertilizer import

6/ After correction for fertilizer weight

Wt. = Weight in metric tons

Val. = Value

Fact.= Factor for conversion of weight to value

Table III - 1

SOURCE: F.A.O. TRADE YEARBOOK 1969 (Vol. 23)

E.C.C.M. COUNTRIES AND BARBADOS

TRADE IN AGRICULTURAL COMMODITIES IN 1000 M. TONS
CONDENSED ANNUAL SUMMARY FOR 1963

SITC NO.	BARBADOS		GRENADA		ST. VINCENT		ST. LUCIA		DOMINICA		MONTSERRAT		ST. KITTS		ANTIGUA	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
011		1.6		.1								.1				.4
012	-	2.7										-				.2
013	-	.9		.1		.1										.2
022	-	5.0	-	.3	-	-					-	-			-	.4
023	-	.5		.1								-				.1
024	-	.4		.1		-						-				.1
025		-		-												-
EX 04	.2	29.5		7.0		6.2		6.5				.9				6.6
051.1		1.8							.3							
051.2(2)		2.5							.8							
051.3	-		14.9		25.6		53.2		32.0							
054.1 plus ex 054.1	.3	4.9		.2												1.4
054.2 plus ex 054.5	.1	3.0		.3												.3
061.1(1) 061.2	181.9			2.2		2.7				2.2		0.4	38.4		26.7	.6
072.1			2.9				.3									
081.2 plus 081.3	.3	9.8		1.0											-	1.1
091.4	.8	-		.2												.1
TOTAL 0	183.6	62.6	17.8	11.6	25.6	9.0	53.5	6.5	33.1	2.2	-	1.3	38.4	-	26.7	10.5
221.2 (copra)		3.8			2.5		1.7		1.5							
411.3 (animal oil etc)		.9														
422.3 (coconut oil)	.4	.5		-			1.1									
TOTAL 0 + 2 + 4 (excl. fertilizers and tractors)	184.0	67.8	17.8	11.6	28.1	9.0	56.3	6.5	34.6	2.2	-	1.3	38.4	-	26.7	10.5

NOTE: TOTALS DO NOT REPRESENT TRUE TOTALS BECAUSE:

1. OMISSION OF COMMODITIES COVERING SMALL QUANTITIES
2. xxx FIGURES WERE NOT AVAILABLE
3. - FIGURES WERE NOT RECORDED
4. x FIGURES WERE ESTIMATED BY FAO/UN

Table III - 2

SOURCE: F.A.O. TRADE YEARBOOK 1969 (Vol. 23)

E.C.C.M. COUNTRIES AND BARBADOS

TRADE IN AGRICULTURAL COMMODITIES IN 1000 M. TONS
CONDENSED ANNUAL SUMMARY FOR 1964

SITC NO.	BARBADOS		GRENADA		ST. VINCENT		ST. LUCIA		DOMINICA		MONTSERRAT		ST. KITTS		ANTIGUA	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
011		1.8		xxx								.1				.5
012		2.9										-				.2
013	.1	1.2		xxx		.1										.2
022	-	5.1	-	.3	-	-					-	-			-	.4
023	-	.6		.1		.1						-				.1
024	-	.5		xxx		-						-				.1
025		.1		-												-
EX 04	.2	27.6		xxx		7.6		7.4				1.2				7.5
051.1		1.7						-	-							
051.2(2)		2.8							1.1[x]							
051.3	-		11.6		25.5		61.2		42.9							
054.1 plus ex 054.1	.1	5.0		xxx												1.2
054.2 plus ex 054.5	.1	3.2		xxx												.3
061.1(1) 061.2	151.6			2.6		3.2				2.3		.4	41.5		19.1	.3
072.1 (cocoa)			2.1				.1									
081.2 plus 081.3	.2	9.5		1.0											-	0.9
091.4	.7	-		.2												.1
TOTAL 0	153.0	62.0	13.7	4.2	25.5	11.0	61.3	7.4	44.0[x]	2.3	-	1.6	41.5		19.1	11.8
221.2 (copra)		3.5			2.5		2.4		1.4							
411.3 (animal oils etc)		.9														
422.3 (coconut oil)	.4	.5		xxx			.8									
TOTAL 0 + 2 + 4 (excl. fertilizers and tractors)	153.4	66.9	13.7	4.2	28.0	11.0	64.5	7.4	45.4	2.3	-	1.6	41.5		19.1	11.8

NOTE: TOTALS DO NOT REPRESENT TRUE TOTALS BECAUSE:

1. OMISSION OF COMMODITIES COVERING SMALL QUANTITIES
2. xxx FIGURES WERE NOT AVAILABLE
3. - FIGURES WERE NOT RECORDED
4. x FIGURES WERE ESTIMATED BY FAO/UN

Table III - 3

SOURCE: F.A.O. TRADE YEARBOOK 1969 (Vol. 23)

E.C.C.M. COUNTRIES AND BARBADOS

TRADE IN AGRICULTURAL COMMODITIES IN 1000 M. TONS
CONDENSED ANNUAL SUMMARY FOR 1965

SITC NO.	BARBADOS		GRENADA		ST. VINCENT		ST. LUCIA		DOMINICA		MONTSERRAT		ST. KITTS		ANTIGUA	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
011		2.8		.3								xxx				.3
012		2.9										xxx				.2
013	.5	2.0		.1		.1										.2
022	-	5.3	-	.5	-	-					-	-			-	.5
023	-	.6		.1		.1						xxx				.2
024	-	.5		.1		xxx						xxx				.1
025		.1		-												-
EX 04	.2	26.3[x]		7.9		6.5		xxx				1.0				8.0
051.1		1.6							-							
051.2(2)		2.2							1.2[x]							
051.3	-		21.0		28.9		81.7[x]		49.2[x]							
054.1 plus ex 054.1	.1	4.1		.2												1.2
054.2 plus ex 054.5	.1	3.0		.4												.3
061.1(1) 061.2	172.6			2.1		3.2				2.2		.4	34.8		10.3	1.0
072.1 (cocoa)			3.0				-									
081.2 plus 081.3	.3	6.9		0.9											-	1.1
091.4	.7	-		.2												.2
TOTAL 0	174.5	58.3[x]	24.0	12.8	28.9	9.9	81.7[x]	xxx	50.4[x]	2.2	-	1.4	34.8		10.3	13.3
221.2 (copra)		3.2			2.5		xxx									
411.3 (animal oil etc)		.9														
422.3 (coconut oil)	.5	.4		.1			1.1[x]		.9							
TOTAL 0 + 2 + 4 (excl. fertilizers and tractors)	175.0	62.8	24.0	12.9	31.4	9.9	82.8[x]	xxx	51.3[x]	2.2	-	1.4	34.8		10.3	13.3

NOTE: TOTALS DO NOT REPRESENT TRUE TOTALS BECAUSE:

1. OMISSION OF COMMODITIES COVERING SMALL QUANTITIES
2. xxx FIGURES WERE NOT AVAILABLE
3. - FIGURES WERE NOT RECORDED
4. x FIGURES WERE ESTIMATED BY FAO/UN

SOURCE: F.A.O. TRADE YEARBOOK 1969 (Vol. 23)

E.C.C.M. COUNTRIES AND BARBADOS

TRADE IN AGRICULTURAL COMMODITIES IN 1000 M. TONS
CONDENSED ANNUAL SUMMARY FOR 1966

SITC NO.	BARBADOS		GRENADA		ST. VINCENT		ST. LUCIA		DOMINICA		MONTSERRAT		ST. KITTS		ANTIGUA	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
011		2.5		.4								xxx				.6
012		2.6										xxx				.3[x]
013	1.4	2.1		.2		xxx										.2
022	-	4.5	-	.3	-	.1					-	-			-	.6
023	-	.6		.1		.1						xxx				.2
024	-	.5		.1		xxx						xxx				.1
025		.1		-												.1
EX 04	.1	26.4		8.8		xxx		xxx				xxx				5.3
051.1		1.7							-							
051.2(2)		1.6							1.4[x]							
051.3 (banana)	-		21.3		25.4		76.6		39.8							
054.1 plus ex 054.1	-	4.3		.3												1.4
054.2 plus ex 054.5	-	3.2		.4												.4
061.1(1) 061.2 (sugar)	169.2			1.8		3.0				2.8		xxx	35.1		-	1.2
072.1 (cocoa)			2.3				.3									
081.2 plus 081.3	.1	7.0		1.0											.1	1.0
091.4	.8	-		.3												.2
TOTAL 0	171.6	57.1	23.6	13.7	25.4	3.2	76.9	xxx	41.2[x]	2.8	-	xxx	35.1		.1	6.6
221.2 (copra)		3.5			2.3[x]		xxx		xxx							
411.3 (animal oils etc)		1.3														
422.3 (coconut oil)	.3	.6		.1			1.0[x]									
TOTAL 0 + 2 + 4 (excl. fertilizers and tractors)	171.9	62.5	23.6	13.8	27.7[x]	3.2	77.9[x]	xxx	41.2[x]	2.8	-	xxx	35.1		.1	6.6

NOTE: TOTALS DO NOT REPRESENT TRUE TOTALS BECAUSE:

1. OMISSION OF COMMODITIES COVERING SMALL QUANTITIES
2. xxx FIGURES WERE NOT AVAILABLE
3. - FIGURES WERE NOT RECORDED
4. x FIGURES WERE ESTIMATED BY FAO/UN.

SOURCE: F.A.O. TRADE YEAR BOOK 1969 (Vol. 23)

E.C.C.M. COUNTRIES AND BARBADOS

TRADE IN AGRICULTURAL COMMODITIES IN 1000 M. TONS
CONDENSED ANNUAL SUMMARY FOR 1967

SITC NO.	BARBADOS		GRENADA		ST. VINCENT		ST. LUCIA		DOMINICA		MONTSERRAT		ST. KITTS		ANTIGUA	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
011		3.4		xxx								xxx				.6
012		2.6										xxx				.2
013	.3	1.4		xxx		xxx										.2
022	-	3.5	-	xxx	-	xxx					-	-			-	.6
023	-	.7		.1		xxx						xxx				.1
024	-	.6		xxx		xxx						xxx				.1
025		.1		-												.1
EX 04	.1	32.4		xxx		xxx		xxx				xxx				4.4
051.1		1.7							-							
051.2(2)		1.5							1.5[x]							
051.3	-		26.0		24.5		63.2		47.6[x]							
054.1 plus ex 054.1	-	5.1		-												1.4
054.2 plus ex 054.5	-	3.0		xxx												.3
061.1(1) 061.2	187.2			1.6		xxx				xxx		xxx	39.3		-	1.9
072.1 (cocoa)			2.5				xxx									
081.2 plus 081.3	-	3.0		xxx											-	0.9
091.4	.7	.1		.2												.2
TOTAL 0	188.3	59.1	28.5	1.9	24.5	xxx	63.2	xxx	49.1[x]	xxx	-	xxx	39.3		-	11.3
221.2 (copra)		2.5			2.4[x]		xxx		xxx							
411.3 (animal oils etc)		1.2														
422.3 (coconut oil)	.2	.6		xxx			1.0[x]									
TOTAL 0 + 2 + 4 (excl. fertilizers and tractors)	188.5	63.4	28.5	1.9	26.9	xxx	64.2[x]	xxx	49.1[x]	xxx	-	xxx	39.3		-	11.3

NOTE: TOTALS DO NOT REPRESENT TRUE TOTALS BECAUSE:

1. OMISSION OF COMMODITIES COVERING SMALL QUANTITIES
2. xxx FIGURES WERE NOT AVAILABLE
3. - FIGURES WERE NOT RECORDED
4. x FIGURES WERE ESTIMATED BY FAO/UN

Table III - 6

SOURCE: F.A.O. TRADE YEARBOOK 1969 (Vol. 23)

E.C.C.M. COUNTRIES AND BARBADOS

TRADE IN AGRICULTURAL COMMODITIES IN 1000 M. TONS
CONDENSED ANNUAL SUMMARY FOR 1968

SITC NO.	BARBADOS		GRENADA		ST. VINCENT		ST. LUCIA		DOMINICA		MONTSERRAT		ST. KITTS		ANTIGUA	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
011		4.1		xxx								xxx				xxx
012		2.6										xxx				xxx
013	-	1.4		xxx		xxx									-	xxx
022	-	4.2	-	xxx	-	xxx					-	-				xxx
023	-	.7		xxx		xxx						xxx				xxx
024	-	.6		xxx		xxx						xxx				xxx
025		.1		-												xxx
EX 04	.2	26.6		xxx		xxx		xxx				xxx				xxx
051.1		2.2							-							
051.2(2)		0.4							xxx							
051.3	-		24.5		27.9		65.5		55.8[x]							
054.1 plus ex 054.1	-	5.8		-												xxx
054.2 plus 054.5	-	3.2		xxx												xxx
061.1(1) 061.2	139.7			xxx		xxx				xxx		xxx	34.9		-	xxx
072.1 (cocoa)			1.8[x]				xxx									
081.2 plus 081.3	-	2.8		xxx											-	xxx
091.4	.8	.8		xxx												xxx
TOTAL 0	140.5	56.5	26.3[x]		27.9	xxx	65.5	xxx	55.8[x]	xxx		xxx	34.9			xxx
221.2 (copra)		2.2			2.2[x]		xxx		xxx							
411.3 (animal oils etc)		1.7														
422.3 (coconut oil)		.8		xxx			xxx									
TOTAL 0 + 2 + 4 (excl. fertilizers and tractors)	140.5	61.2	26.3[x]	xxx	30.1[x]	xxx	65.5	xxx	55.8[x]	xxx		xxx				xxx

NOTE: TOTALS DO NOT REPRESENT TRUE TOTALS BECAUSE:

1. OMISSION OF COMMODITIES COVERING SMALL QUANTITIES
2. xxx FIGURES WERE NOT AVAILABLE
3. - FIGURES WERE NOT RECORDED
4. x FIGURES WERE ESTIMATED BY FAO/UN.

E.C.C.M. COUNTRIES AND BARBADOS

1963 - 1968 TRADE IN AGRICULTURE COMMODITIES (IN 1000 M. TONS)

CONDENSED ANNUAL TOTALS

YEARS	BARBADOS		GRENADA		ST. VINCENT		ST. LUCIA		DOMINICA		MONTSERRAT		ST. KITTS		ANTIGUA	
	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.
1963	184.0	67.8	17.8	11.6	28.1	9.0	56.3	6.5	34.6	2.2	-	1.3	38.4	-	26.7	10.5
1964	153.4	66.9	13.7	4.2	28.0	11.0	64.5	7.4	45.4	2.3	-	1.6	41.5		19.1	11.8
1965	175.0	62.8	24.0	12.9	31.4	9.9	82.8[x]	xxx	51.3[x]	2.2	-	1.4	34.8		10.3	13.3
1966	171.9	62.5	23.6	13.8	27.7[x]	3.2	77.9[x]	xxx	41.2[x]	2.8	-	xxx	35.1		.1	6.6
1967	188.5	63.4	28.5	1.9	26.4	xxx	64.2[x]	xxx	49.1[x]	xxx	-	xxx	39.3		-	11.3
1968	140.5	61.2	26.3[x]	xxx	30.1[x]	xxx	65.5	xxx	55.8[x]	xxx		xxx				xxx

SOURCE: F.A.O. TRADE YEARBOOK 1969
(Vol. 23)

NOTE: TOTALS DO NOT REPRESENT TRUE TOTALS BECAUSE:

1. OMISSION OF COMMODITIES COVERING SMALL QUANTITIES
2. xxx FIGURES WERE NOT AVAILABLE
3. - FIGURES WERE NOT RECORDED
4. x FIGURES WERE ESTIMATED BY FAO/UN

St. Lucia 5-Year Development Plan 1966-1970

Harbour Report of the Consultants, Coode, Binnie and Preece

Soil Investigations West Wharf, Report by Warnock, Hersey Soil Investigation Ltd.

ST. VINCENT

Reclamation Scheme as prepared by UN Physical Planning Office, Barbados

St. Vincent Development Plan 1969-1971

Harbour Operation Report by Jacques L. Dery.