



The Sea is our Garden

a report on a study of institutional and technical options
for improving coastal livelihoods in Laborie, Saint Lucia

Caribbean Natural Resources Institute (CANARI)
Saint Lucia
2003

This publication is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

This document should be cited as: CANARI. 2003. The Sea is our Garden: a report on a study of institutional and technical options for improving coastal livelihoods in Laborie, Saint Lucia. CANARI Technical Report No. 322. 146 pp.

Front cover: Xystus Clerice and crew processing a sea urchin harvest. Photo credit: Allan Smith

Table of contents

TABLE OF CONTENTS.....	3
LIST OF TABLES	4
LIST OF FIGURES	4
CHAPTER 1: INTRODUCTION.....	5
THE REPORT.....	5
THE PROJECT	6
THE PLACE.....	7
CHAPTER 2: THE CONTEXT	11
POVERTY AND THE ENVIRONMENT	11
COASTAL ZONE MANAGEMENT	12
MARINE PROTECTED AREAS.....	13
CO-MANAGEMENT	13
PARTICIPATION.....	14
CHAPTER 3: PROJECT MANAGEMENT.....	16
KEY INSTITUTIONAL PARTNERS	16
STEERING COMMITTEE	16
RESEARCH FORUM.....	17
RESEARCHERS AND RESOURCE PERSONS	18
PARTICIPATION AND INVOLVEMENT OF RESOURCE USERS	19
PHASES IN PROJECT IMPLEMENTATION	22
CHAPTER 4: METHODS.....	23
OVERVIEW	23
ASSESSMENT AND BASELINE SURVEYS	24
<i>Assessment of bio-physical environment.....</i>	<i>24</i>
<i>Stakeholder identification and analysis</i>	<i>26</i>
<i>Livelihood and poverty baselines.....</i>	<i>27</i>
MONITORING PROGRAMMES	28
EXPERIMENTS AND CASE STUDIES	30
<i>Selection of experiments and case studies.....</i>	<i>30</i>
<i>Cultivation and marketing of Gracilaria</i>	<i>30</i>
<i>Awareness of the impact of sewage pollution on coastal water resources and livelihoods</i>	<i>33</i>
<i>Management options for the sea urchin harvest</i>	<i>36</i>
<i>Options for tourism development.....</i>	<i>39</i>
INSTITUTIONAL AND PROCESS ANALYSIS	40
<i>Institutional analysis.....</i>	<i>40</i>
<i>Process analysis.....</i>	<i>41</i>
LINKAGES AND COMPARISONS.....	42
CHAPTER 5: OUTPUTS	43
DOCUMENTATION PLAN.....	43
PUBLICATIONS FROM THE PROJECT	45
OTHER PROJECT OUTPUTS.....	46

CHAPTER 6: RESULTS	48
ASSESSMENT AND BASELINE SURVEYS	48
<i>The biophysical environment</i>	48
<i>Employment, poverty and demographic baselines</i>	52
<i>The reefs and their contribution to livelihoods</i>	54
EXPERIMENTS AND CASE STUDIES	56
<i>Cultivation and marketing of Gracilaria</i>	56
<i>Awareness of the impact of sewage pollution on coastal water resources and livelihoods</i>	59
<i>Management options for the sea urchin harvest</i>	61
<i>Options for tourism development</i>	65
ANALYSIS	69
<i>Institutional analysis</i>	69
<i>Institutional analysis: seamoss cultivation</i>	71
<i>Institutional analysis: sea urchin harvesting</i>	72
<i>Institutional analysis: marine-based tourism development</i>	73
PROCESS ANALYSIS	74
PROJECT IMPACTS	77
<i>Environmental impacts</i>	77
<i>Poverty reduction and livelihood impacts</i>	79
<i>Institutional impacts</i>	80
CHAPTER 7: DISCUSSION	82
PROJECT METHODOLOGY	82
RESOURCE MANAGEMENT	84
PARTICIPATORY PLANNING	88
PARTICIPATORY RESEARCH	90
INSTITUTIONAL ARRANGEMENTS FOR COASTAL CONSERVATION AND MANAGEMENT	91
LOCAL GOVERNANCE	93
POVERTY AND THE ENVIRONMENT	95
CHAPTER 8: CONCLUSIONS	97
CHAPTER 9: BEYOND THE PROJECT	99
DOCUMENTATION AND DISSEMINATION	99
SUCCESSION PLAN	99
RECOMMENDATIONS FOR NRSP UPTAKE STRATEGY	100
APPENDICES	101
APPENDIX 1: REFERENCES	101
APPENDIX 2: LOGICAL FRAMEWORK	105
APPENDIX 3: SAMPLE OF INVITATION TO RESEARCH FORUM	108
APPENDIX 4: WORK PLAN FOR THE INITIAL PHASE OF ASSESSMENT AND ANALYSIS	109
APPENDIX 5: METHODS USED IN BASELINE HOUSEHOLD SURVEY	115
APPENDIX 6: WORK PLAN FOR THE ANALYSIS OF THE NATURAL CAPITAL	117
APPENDIX 7: DRAFT MONITORING FRAMEWORK	119
APPENDIX 8: SELECTED BIBLIOGRAPHY ON SEAWEED RESOURCES IN THE CARIBBEAN	121
APPENDIX 9: ISSUES AFFECTING THE DEVELOPMENT OF SEAMOSS PRODUCTION	126
APPENDIX 10: SURVEYS OF PERCEPTIONS OF WATER QUALITY ISSUES AMONG ORGANISATIONS	132
APPENDIX 11: NEWSPAPER ARTICLE ON SEA URCHIN MANAGEMENT AND DOF 2002 HARVEST ANNOUNCEMENT	138
APPENDIX 12: VISION AND PROGRAMME FOR TOURISM DEVELOPMENT	141

List of abbreviations and acronyms

BELfund: The James Belrose Micro Enterprise Development Fund Inc.
BOS: Bureau of Standards
CAMRIS: Computer Aided Mapping and Resource Inventory System
CANARI: Caribbean Natural Resources Institute
CDB: Caribbean Development Bank
CEHI: Caribbean Environmental Health Institute
CFG: Caribbean Focus Group
CZM: Coastal Zone Management
DFID: Department for International Development of the United Kingdom
DOF: Department of Fisheries
EC: European Commission
FTR: Final Technical Report
GCRMN: Global Coral Reef Monitoring Network
GIS: Geographical Information System
GPS: Global Positioning System
IDS: Institute of Development Studies
IFAD: International Fund for Agricultural Development
LCCU: Laborie Co-operative Credit Union
LDF: Laborie Development Foundation
LDPC: Laborie Development Planning Committee
LFCC: Laborie Fishers and Consumers Co-operative (formerly Laborie Fishermen's Co-operative)
LVC: Laborie Village Council
MPA: Marine Protected Area
MRAG: Marine Resources Assessment Group
NRSP: Natural Resources Systems Programme
OECS: Organisation of Eastern Caribbean States
PRF: Poverty Reduction Fund
PRSP: Poverty Reduction Strategy Paper
SDP: Social Development Policy
SFA: Special Framework of Assistance
SLASPA: Saint Lucia Air and Seaports Authority
SLHTP: Saint Lucia Heritage Tourism Programme
SLREP: Saint Lucia Rural Enterprise Project
SMMA: Soufriere Marine Management Area
UPS: Uptake Promotion Strategy
USD: United States Dollar
XCD: Eastern Caribbean Dollar

List of tables

TABLE 1: SUMMARY OF PROJECT OUTPUTS.....	43
TABLE 2: PERCENT COVER OF REEF SUBSTRATE CATEGORIES.....	50
TABLE 3: EMPLOYMENT BY SEX AND AGE, 1991 AND 2001	52
TABLE 4: POPULATION TRENDS AMONG SELECTED AGE GROUPS	52
TABLE 5: DOUBLING TIME OF SEAMOSS SPECIES UNDER CULTIVATION	56
TABLE 6: DEVELOPMENT PLAN FOR SEAMOSS IN LABORIE: SHORT TERM ACTIONS	58
TABLE 7: NUMBER OF COLONY FORMING UNITS (CFU) PER 100ML OF WATER.....	60
TABLE 8: REPRODUCTIVE STATUS OF URCHINS IN 2002.....	63
TABLE 9: NATURAL AND CULTURAL ASSETS AVAILABLE IN SUPPORT OF TOURISM DEVELOPMENT	65
TABLE 10: SUMMARY OF RESULTS OBTAINED FROM CASE STUDY OF TOURISM DEVELOPMENT	66
TABLE 11: ENVIRONMENTAL IMPACTS	77
TABLE 12: POVERTY REDUCTION AND LIVELIHOOD IMPACTS	79

List of figures

FIGURE 1: LOCATION MAP, THE EASTERN CARIBBEAN	7
FIGURE 2: LOCATION MAP, SAINT LUCIA AND LABORIE	8
FIGURE 3: LABORIE BAY	9
FIGURE 4: WORKSHOP OF THE STEERING COMMITTEE AT THE VILLAGE MARKET	17
FIGURE 5: PROJECT SIGN ON WALL OF CO-OPERATIVE OFFICE AND GAS STATION, LABORIE VILLAGE	20
FIGURE 6: WENCESS DUBOIS AND ALVIN LOUIS MONITORING SEA URCHIN GROWTH	38
FIGURE 7: REEFS IN LABORIE BAY	49
FIGURE 8: DISTRIBUTION OF LIVE CORAL AND MACROALGAE ON REEFS IN LABORIE BAY	51
FIGURE 9: PHILLIP SIMEON AND ALLAN SMITH WEIGHING SEAMOSS HARVEST AT EXPERIMENTAL FARM	57
FIGURE 10: SAMPLING STATIONS FOR COLIFORM BACTERIAL LEVELS IN LABORIE BAY	60
FIGURE 11: <i>TRIPNEUSTES</i> SIZE FREQUENCY, FLATLAND, 31 AUGUST 2001	62
FIGURE 12: <i>TRIPNEUSTES</i> SIZE FREQUENCY, FLATLAND, 10 OCTOBER 2001	62
FIGURE 13: HARVESTER XYSTUS CLERICE PREPARING SEA URCHINS FOR SALE	64
FIGURE 14: ORGANISATIONS IMPACTING ON COASTAL LIVELIHOOD INCOME (BUTTLER 2002)	70

Chapter 1: Introduction

The report

This report is the scientific annex to the Final Technical Report (FTR) on the project entitled: *Coastal livelihoods in the Caribbean: institutional and technical options (reference: R7559)*. It is the product of the collective efforts of all those directly involved in the research activities conducted as part of this project. A first draft of the report was prepared in February 2003 by Yves Renard and Allan Smith, for submission to a workshop that was held in Sapphire, Laborie, Saint Lucia on Saturday 8 March 2003. This workshop was attended by Ulric Alphonse, Lydia Charlemagne, Sylvester Clauzel, Julian Dubois, Juliette Gustave, Rudy John, Yves Renard and Allan Smith, and it provided the basis for the preparation of a second draft. This draft was then reviewed and augmented by all participants in the workshop of 8 March 2003, as well as by Gillian Cooper, Lucius Ellevic, Sarah George and Dr. Stephen Koester. Prof. Melissa Leach provided comments on two successive drafts. Yves Renard and Allan Smith took responsibility for the preparation of the final version of the report. The bibliographies were prepared with the assistance of Celina Fessal.

This report is organised in ten parts. Following this brief introductory chapter, the report will cover the following areas:

- The second chapter places this project and its findings within the context of a number of current research and development agendas, looking at the issues and sectors to which this research is relevant, and identifying the development and resource management approaches and processes to which its findings and conclusions could contribute.
- In the third chapter, the project is described, with a presentation of the various institutions and processes that were involved in project design and implementation.
- Chapter 4 describes the methods used in this research.
- In the fifth chapter, the direct outputs of the project are listed, in the form of a bibliography, a documentation plan and a list of other outputs.
- Chapter 6 presents the results of this project, relating them to the various published and unpublished outputs. It also summarises the impacts generated by the project at the local level, looking specifically at the impacts on the environment, on poverty reduction and livelihoods, and on institutions.
- In chapter 7, the report provides a discussion of these results and impacts, looking at lessons learned, and linking these to the context described in chapter 2.
- Chapter 8 contains the main conclusions drawn from the project.
- The ninth chapter looks beyond the life of the project, outlining a succession plan, and formulating specific recommendations for the Natural Resources Systems Programme's Uptake Promotion Strategy (UPS) for the Caribbean.
- The tenth section of the report includes a number of appendices that provide additional details on the methods and results.

This report is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

The project

This project originated from a call for concept notes issued by the Natural Resources Systems Programme (NRSP) of the Department for International Development (DFID) in July 1999. The Caribbean Natural Resources Institute (CANARI) responded to this call by inviting the Department of Fisheries (DOF) in the Government of Saint Lucia's Ministry of Agriculture, Forestry, and Fisheries, the Laborie Development Planning Committee (LDPC) and the Institute of Development Studies (IDS) at the University of Sussex in the United Kingdom to collaborate in a focused research initiative aimed at testing and documenting institutional arrangements and technical approaches to support sustainable coastal livelihoods. The project's logical framework, as modified following the mid-term review, is reproduced in Appendix 2.

The project built on the experience of CANARI and other organisations in the field of participatory natural resource management over the past two decades. It recognised that the policy context, in Saint Lucia and other parts of the Caribbean region, had become more favourable to participatory approaches, that there was an explicit demand among resource management and development agencies for methods and tools which they can use in their efforts towards establishing participatory management regimes and implementing pro-poor approaches to natural resource management, and that the region has accumulated a wealth of experience which it should begin analysing, distilling and disseminating. The project also recognised that the rationale for participation needs to be refined, and that the impact of participatory approaches on the fundamental goals of poverty reduction, environmental sustainability and social equity needs to be assessed. Against this background, the project was initiated with three sets of goals.

The primary focus of the project was on testing and developing specific tools and methods, as applied to the management of reefs and reef resources, in two main areas:

- participatory institutions: the project aimed at testing, developing, refining and documenting methods that increase the effective participation of stakeholders in all stages of planning and management.
- sustainable use: the project also sought to explore and document technologies and management tools which can enhance the social and economic benefits derived from the sustainable use of coastal resources, and particularly from the reef fishery, sea urchin harvesting, seaweed cultivation and heritage tourism.

The second focus of this project, as stated in initial project documents, was an evaluation of the impact of participation on the sustainability of resource use and on the livelihoods of people. While it was recognised that time and resources available to this project would be too limited to undertake a comprehensive evaluation exercise, the project sought to identify and monitor concrete linkages between institutional and technological change on the one hand, and the well-being of both the people and the reefs on the other.

Thirdly and perhaps more importantly, the project aimed at providing guidance towards the identification of alternatives to Marine Protected Areas. Throughout the developing tropical world, coastal conservation and development initiatives have tended to emphasise Marine Protected Areas (MPAs) as the most appropriate management instrument. While it is true that these Areas have made and continue to make a significant contribution to biological conservation and sustainable development, it is now becoming increasingly evident that they are not appropriate in all circumstances. Typically, in Saint Lucia and other parts of the region, Marine Protected Areas are established in the coastal regions of greatest biological diversity and economic potential, especially in the tourism sector, while other coastal zones continue to suffer from inadequate management. There is therefore a need for management instruments that are suited to the conditions of coastal areas where the resource may not warrant, nor be able to support, Marine Protected Areas.

The place

Laborie, the project site, is a village located on the southwest coast of Saint Lucia, one of the Windward Islands in the Caribbean (see Figure 1).

Figure 1: Location map, the Eastern Caribbean

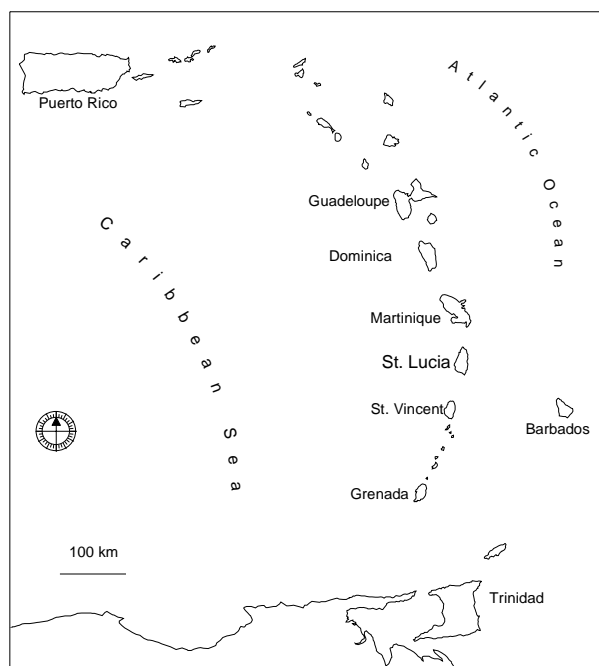
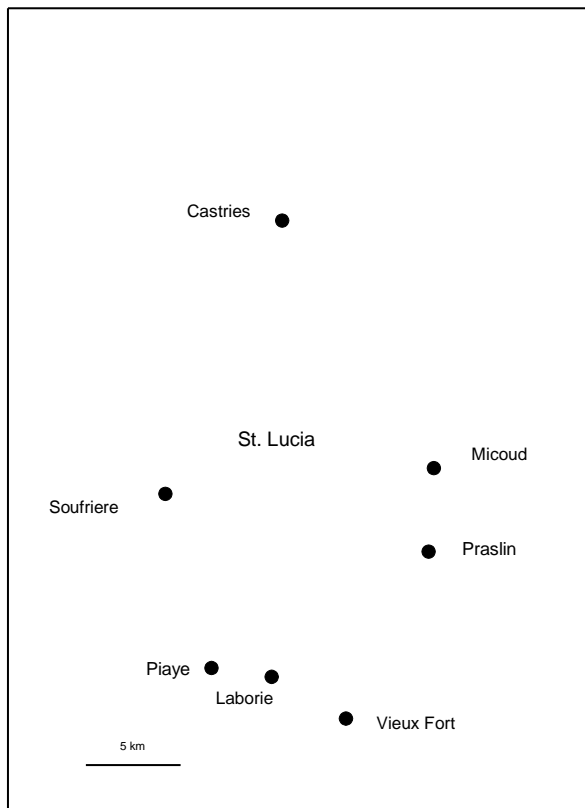


Figure 2: Location map, Saint Lucia and Laborie



Saint Lucia is an island of 616 km², with a total population of 157,775 in 2001. It gained its independence from Britain in 1979, and it is a member of the Organisation of Eastern Caribbean States (OECS). Its modern history mirrors that of most of the other islands in the region, with European colonisation having resulted in the almost complete elimination of indigenous Amerindian populations, in the installation of the plantation system based on the intensive use of slave labour and in the radical transformation of the natural environment. Sugar cane production dominated the local economy until the 1950s, when bananas became the main commercial crop, and when tourism began to develop. Over the past decade, the country has witnessed profound transformations, with services contributing significantly to economic outputs, and with the traditional banana sector having lost much of its importance because of the impact of trade liberalisation.

The project site is a coastal area that includes three small bays on the southwest coast of the island. The coastal village of Laborie is at the centre, with Sapphire Bay to the west and Titwou Bay to the east, giving a total of 3.2km of coastline. The bays have sandy beaches and are separated by rocky outcrops. There are no permanent rivers that drain directly into the Laborie Bay, but several gullies and ravines drain into the sea during the wet seasons. Two of these drain into a small basin mangrove adjacent to Sapphire Bay. The hills surrounding the Laborie village have moderately steep terrain, rising to a maximum of 280m above the Laborie Bay watershed

approximately 1.0km inland. They are covered by low scrub and dry forest vegetation and have not been severely affected by recent clearing for agriculture. The small Laborie watershed is surrounded by two larger watersheds, Black Bay and Piaye, which culminate on Morne Grand Magazin. Higher elevations are covered by rainforests, while the middle and lower parts of these watersheds are cultivated and include several rural settlements, including those of Banse, La Grace, Augier and MacDiarmed.



Photo credit: Allan Smith

Figure 3: Laborie Bay

The local society and economy are characterised by mixed livelihood strategies. Laborie has traditionally been a fishing village and a small commercial centre serving a number of surrounding rural communities. Following the major social and economic transformations of the mid 19th Century (abolition of slavery; industrial revolution and advent of new technologies, notably steam power; influx of European capital in the Caribbean; and resulting concentration of land and industry into large sugar estates and central factories), Laborie and its environs witnessed a number of profound changes. Because of the topography of the area, large-scale sugar cane cultivation was abandoned, and many estates were fragmented and devoted to mixed agricultural production, including subsistence farming by small holders, squatters and tenants. The expansion of banana farming in the 1960s and 1970s brought tangible social and economic benefits to the area, with bananas being produced on small farms.

The economic decline of the past ten years, which is due largely to the changes in trading arrangements for Caribbean bananas, has had severe negative impacts on these communities. At

present, employment opportunities are scarce. Fishing continues to support a significant number of households, but a number of people have had to seek work in the manufacturing, tourism, commercial and construction sectors in other parts of the island. Remittances constitute an important source of local revenue. Unemployment is high, and emigration has been, and remains, one of the popular responses to economic difficulties. Consequently, there has been continued contraction of the population over the past three decades. Tourism has been identified as a potential sector of growth, while efforts are also being made to diversify agricultural production, and to develop the manufacturing sector in the industrial estates of nearby Vieux Fort.

Local socio-economic and environmental conditions therefore resemble those of many coastal settlements in the insular Caribbean, with traditional livelihoods being threatened by global, regional and national changes in economic and trade arrangements, and with natural resources being threatened by a range of internal and external impacts. This site was selected for this project precisely because it is representative of Caribbean coastal communities, and because its resources, and especially its reefs, are not exceptional. For this reason, this site would be less subject to the dominant international conservation agenda than other places, and would thus offer a better opportunity to study, test and develop a livelihoods-based approach to reef resource conservation and management.

Indeed, this project has provided an interesting opportunity to compare natural resource management approaches used and developed in this locality (Laborie) with the experience of the nearby town of Soufriere, an extraordinarily picturesque location and a major attraction for tourism. In Soufriere, a multi-stakeholder management institution known as the Soufriere Marine Management Area (SMMA) was established in 1995, following a participatory planning and conflict management process that involved a wide range of actors. The SMMA is currently managed by a local organisation called the Soufriere Marine Management Association. The recurrent costs of managing the SMMA are covered by revenue generated primarily from diving and mooring fees. This experience has been described as one of the most innovative and effective institutional arrangements for coastal conservation in the Caribbean region (Brown *et al.* 2002; Geoghegan *et al.* 1999; Wilkinson 1998).

Laborie also offered the opportunity to insert this research project within a broader community-led process of planning and development. Between 2000 and 2002, this community was engaged in a strategic planning process that now provides the basis for economic and social development and for the strengthening of local institutions. This has led to the publication of a strategic development plan (LDPC 2001) and to the creation of a new community-based organisation called the Laborie Development Foundation (LDF). This research project was conceived both as a contribution to and as a by-product of these local development processes, by enhancing participatory approaches, developing technologies for sustainable natural resource use, and building the local capacity to manage.

Chapter 2: The context

This project has been informed by, and has also sought to contribute to, a number of current debates on critical issues of sustainable development. Some of these debates concern resource management and development issues, while others concern responses, approaches and methods.

Poverty and the environment

The project comes against the background of an increased understanding of the relationship between poverty and the environment, and at a time when some of the basic assumptions that have been made about that relationship are being questioned. In debates on this subject, it has frequently been argued that increases in poverty inevitably result in increases in unsustainable uses of resources, especially in situation where livelihoods depend on common property natural resources. The project saw an interesting opportunity to confront this hypothesis with some of its findings.

A second dimension of this issue, and one that requires determined attention on the part of policy makers and development planners, is the need to optimise the contribution of natural assets, and especially common property natural resources, to employment creation, revenue generation and economic subsistence. While much of the work on natural resource management in the past few decades has focused on environmental sustainability and conservation, it has now become clear that poverty issues cannot be tackled without a more effective use of these assets.

This question is particularly relevant to the Caribbean, where production systems, whether they were inherited from colonisation or introduced more recently as part of processes of globalisation, have for the most part failed to capitalise on the diversity of natural assets. With the growth of poverty and the collapse of traditional economic sectors, the need for alternative livelihoods has become extremely urgent. More systematic explorations of the potentials of new sectors such as nature and heritage tourism and aquaculture, as well as the diversification of agriculture and fisheries, should be high on the agendas of Caribbean countries.

In this search for alternatives sources of livelihood, there is a need for further research, first to develop the required technologies and tools, but also to identify the policy and institutional requirements without which these alternatives would not be beneficial or sustainable. In this regard, one issue of direct relevance to the insular Caribbean is that of nature and heritage tourism, because many countries, including Saint Lucia, have recognised its potential, but now need to put in place the policy framework that will ensure that the sector provides tangible benefits to people, especially the poor.

Poverty is commonly defined as a situation where individuals, households and communities do not have sufficient income and purchasing power. Conventional measures define individual poverty as when people live with less than USD 2.00 per day (with extreme poverty corresponding to a spending power of less than USD 1.00 per day).

But poverty is not only about income, and the project agreed that its definition should be expanded to include conditions where people, households and community lack:

- Assets: these include physical assets (e.g. land, buildings, and equipment) as well as intangible assets (education and skills).
- Access to social services, principally health, water, sanitation and education.
- Livelihood security: poverty can be the result of vulnerability, either to economic shock or to disasters, including natural disasters (with hurricanes and floods representing the main threats in the coastal zones of the Caribbean).
- Dignity, pride and self-esteem.
- Autonomy, capacity of choice and opportunity to participate in decision-making and development processes.

Poverty and livelihood issues in the coastal zone have not been extensively studied, especially in the Caribbean. Much of the recent literature that examines the relationship between poverty and the environment draws from fieldwork and experiences in rural and forest-based systems, particularly in Africa and Asia, or from studies of urban environments. Small-scale and natural resource dependent coastal livelihoods, such as those that characterise the area covered by this project, are less known, and deserve increased attention by researchers, planners and development workers.

Coastal zone management

Coastal zone management in small-island developing states illustrates the diversity and complexity of issues of sustainable development. While definitions of the coastal zone may vary greatly, there is a consensus among researchers and development practitioners that it incorporates resources and areas that are subject to the influence of both marine and terrestrial factors. It is a zone that is characterised by complexity and uncertainty, by the multiplicity of uses, resources and stakeholders, and by the intensity of economic and ecological pressures. In many respects, it is a microcosm of the challenges faced by peoples and institutions in their efforts to promote sustainability and equity. Natural and human impacts may interact in complex ways and leave legacies over different timescales, making assessments of cause, and therefore of appropriate management response, particularly difficult.

Indeed, for the ever-increasing proportion of the world's population that relies on a sustained flow of goods and services from the world's coastal seas and margins, there is much at stake (Brown *et al.* 2002). There is therefore a need and an expressed demand, at many levels, for integrated approaches to coastal zone management that reconcile conservation and development objectives and that include all stakeholders. In light of pressing social and economic issues, there is also a need for approaches to coastal zone management that incorporate a pro-poor agenda and that focus on the sustainability of coastal livelihoods.

Coastal zone management is multi-faceted and complex. It may focus on direct human impacts on habitats such as coral reefs, for instance the level of exploitation of a specific resource or the effects of a pollutant introduced to the system, but the second-order pressures resulting from land and water use can have major effects that are not fully considered, such as floods that may be either controlled or exacerbated by human activity. Also, given the increasing evidence of the effects of disease, bleaching, and climate change on coral reefs, assessments of impacts based on local anthropogenic factors are becoming increasingly difficult to interpret.

Marine Protected Areas

Over the past three decades, Marine Protected Areas (MPAs)¹ have been promoted as a suitable approach to the conservation and management of coral reefs and other resources. But many of the initiatives to establish and manage MPAs in the region have focused on areas of outstanding value, such as the Belize Barrier Reef, the Tobago Cays in the Grenadines, Soufriere in Saint Lucia or the Grand Cul de Sac Marin in Guadeloupe. Some of these areas have been generally successful in achieving their management objectives, but this success has depended, to a large extent, on their ability to generate funding through user fees and other tourism-related mechanisms. At the same time, the operation of these protected areas has, in almost every instance, required the creation of new, autonomous organisations vested with lead responsibility for management. Such arrangements are clearly not suited to all situations.

Marine protected areas have also generally failed to address broader social and economic development concerns, including poverty issues. This situation suggests that there is a need for institutional arrangements that are appropriate for more common and frequent situations, such as that of the Laborie Bay, and that incorporate a broader social and economic development agenda. In a recent study, 72 Marine Protected Areas in the region were characterised, and it was noted that economic benefits are not always equitably shared, with the tourism industry benefiting most².

This reality does not negate the value and usefulness of MPAs, but it suggests that there is a need for alternative and complementary approaches that can be better suited to the majority of situations. It also suggests that efforts targeted at MPAs over the past decades may have diverted attention and resources away from integrated coastal resource management, and that it would now be timely for Caribbean countries to broaden perspectives of and approaches to coastal issues.

Co-management

This research project also needed to be aware of and informed by current discourse and practices in the field of co-management. Co-management, defined as the formal sharing of management authority among two or more partners, has been actively promoted within the past few decades as an instrument of empowerment and participation, and as an institutional arrangement capable

¹ The definition of MPA, as enunciated by IUCN, is: 'any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment'.

² This study provided a number of other important conclusions, including the following:

- education is not given sufficient importance in MPA planning and management;
- effective zoning and ongoing consultation can mitigate conflicts among resource users of MPAs, particularly in the fishing, tourism and recreational sectors;
- shared management and stakeholder participation may result in better management;
- cooperation among relevant agencies and stakeholder groups results in more efficient management (Geoghegan *et al.* 2001).

of increasing the efficiency and effectiveness of conservation and natural resource management initiatives (Borrini *et al.* 2000). All over the world, there are exciting and innovative initiatives based on the formal sharing of management authority among state and civil society partners.

While the merits of co-management cannot be disputed, experience has shown that co-management may not be suited to all situations, and that it can bring undesirable and perverse impacts. By definition, co-management requires formal partnerships, and it therefore requires formal organisations, bringing the danger of excluding those who are not organised. Global experience also suggests that co-management arrangements may be difficult to put in place in situations where the potential partners are not obvious and where management systems and institutions are particularly complex. This is particularly true where these institutions are based on informal as well as formal arrangements, and where social and gender differences in uses and values of natural resources are pronounced.

Research on co-management is therefore needed, and it should be based, in part, on the documentation and analysis of concrete experiences in various parts of the world. It was therefore felt that this project could, albeit indirectly, contribute to this research agenda by providing a case study in which some of the premises of and approaches to co-management could be tested and evaluated, in relation to findings from the institutional analysis approach used by the project.

Participation

These various debates must be seen against the background of a growing interest, in all parts of the world, in new institutional arrangements that facilitate citizen participation in governance. The commitment to participation has permeated through the discourses of most development organisations. In the field of natural resource management and sustainable development, participation is now commonly perceived both as a goal and as a means. The rationale for participation, as enunciated by many practitioners, is that it integrates diverse systems of knowledge, it builds on traditional management systems, it is more efficient and effective than centralised technocratic systems, and it contributes to empowerment, capacity-building and the realisation of people's rights as citizens.

Interest in participation has been translated in a great volume of theoretical and applied research, much of which has focused on the development of methods for participation. In the field, researchers and development practitioners have tested and refined approaches and tools, and they have documented processes in which people and their institutions have been more directly involved. A wide range of actors involved in development in all parts of the world make a commitment to participation, and claim the use of participatory methods.

Against this background, participation has been described as a new orthodoxy, and has even been critiqued as a new tyranny (Cooke and Kothari 2001). Firstly, it is suggested that participation is too often presented as a panacea that will resolve or redress many of the problems associated with the conventional approaches to development. Secondly, experiences in participation have generally failed to demonstrate and document the actual benefits they have generated. While the rationale for participation is clear and laudable, there remains a need for tangible demonstrations

of the difference it makes. Thirdly, much of the literature on participation presents and discusses methods, but there is still insufficient work devoted to the wider processes of participation and the place they occupy in the broader systems of governance and the overall functioning of society.

Because of its commitment to participation and empowerment, this project offered an opportunity to examine some of the issues associated with participation, and to test some hypotheses and some methods. While this project could not look at participation as the primary object of its research, it offered a good terrain where some of these ideas could be explored, and where some of the impacts of participation could actually be documented and analysed.

Chapter 3: Project management

Key institutional partners

This project was managed and implemented through the active collaboration of four organisations, namely the Caribbean Natural Resources Institute (CANARI), the Institute of Development Studies (IDS) at the University of Sussex in the United Kingdom, the Department of Fisheries (DOF) in the Ministry of Agriculture, Forestry and Fisheries in the Government of Saint Lucia, and the Laborie Development Planning Committee (LDPC). The roles of the four partners were defined as follows:

- CANARI assumed primary responsibility for project management and coordination, including relations with DFID, liaison with all project partners, facilitation of events and processes, and preparation of project outputs. CANARI also provided two researchers who worked on the project on a part-time basis, Yves Renard³ and Allan Smith.
- IDS provided guidance to project design and analysis, through the contribution of Professor Melissa Leach, who visited the project site on two occasions (October 2000 and January 2003), and who provided advice, ideas and information on methods, processes and results throughout the course of the project.
- DOF was involved at all stages of this project, particularly through the participation of Sarah George, Deputy Chief Fisheries Officer (Ag.), in the work of the Steering Committee, and through the provision of technical and human inputs at all stages.
- LDPC served as the umbrella for the inputs of a number of community organisations and leaders who were part of the Steering Committee and who contributed to project design, and to the conduct of many activities, including the analysis of results and findings.

Saint Lucia's Ministry of Social Transformation, Culture and Local Government also participated directly in the project, and assigned its Community Development Officer, Julian Dubois, to serve as its representative on the Steering Committee. Mr. Dubois was an active participant in many project activities, and played a central role in facilitating the inputs of local actors.

Several other organisations in the project site, and particularly the Laborie Village Council (LVC) and the Laborie Fishers and Consumers Co-operative (LFCC), were involved in specific project activities. These organisations contributed directly to project design and implementation, and were the recipients of information, recommendations and technical assistance from the project.

Steering Committee

The project was managed by a Steering Committee comprising representatives of LDPC and other community organisations, the Department of Fisheries and CANARI. The functions of the Steering Committee were to:

- Assist with the co-ordination of project activities.

³ Yves Renard left full-time employment with CANARI at the end of 2001, but remained an Associate of the Institute until March 2003. In this capacity he retained the function of Project Leader for this project.

- Design specific research activities, and assist with the selection of methods.
- Facilitate communication with national and local stakeholders.
- Conduct the analysis of research results and impacts.

The Steering Committee met on a number of occasions, either for short meetings dedicated to project management issues, or for longer workshops in which research instruments were developed and results analysed. The Committee was particularly active at the beginning and at the end of the project. All meetings of the Committee were documented through minutes and other products. A number of different venues were used for meetings of the Committee, including the CANARI offices in Vieux Fort, and schools and restaurants in Laborie.



Photo credit: Julian Dubois

Figure 4: Workshop of the Steering Committee at the Village Market

Research Forum

In order to provide a mechanism for communication and participation, the project also established a Research Forum, as an occasional open meeting that served the triple purpose of:

- providing a space and an opportunity for stakeholders to contribute to the design of project activities;
- allowing for the sharing of views, opinions, information and project results within the broader Laborie community;
- discussing the implications of this information for research, management and development.

Invitations to these meetings were given to specific participants, but it was also made clear to all people involved in these processes that these meetings were open to the public. A sample of the invitation notice is provided in Appendix 3. The characteristics of the venue (an open market building, located in the village near the beach in an area accessible to all) encouraged broad-based participation and allowed passers-by and other interested persons to view and follow the meeting without necessarily entering the building. The main benefits of using this venue were that: (a) it allowed for broad inclusion, and involved people who would not normally attend meetings and other formal functions, and (b) it created conditions of transparency, as people not directly concerned or involved could still be aware of the process and note the various steps taken.

Researchers and resource persons

The project benefited from the inputs of several researchers:

- Allan Smith of CANARI designed and led a number of project activities, notably those that required natural science expertise. He took direct responsibility for the design and implementation of natural resource monitoring activities, and he played a lead role in the design and conduct of all case studies and experiments. He served as a member of the Steering Committee.
- Yves Renard, also of CANARI, facilitated the inputs of the various project partners, as well as most of the local participatory processes. He was also directly involved in research activities on tourism and sea urchin management. He served as a member of the Steering Committee.
- Aretha Darcheville and Vijay Krishnarayan, both also of CANARI, assisted the project in its initial assessment phase, especially with the conduct of a stakeholder analysis.
- Sarah George of the Department of Fisheries provided on-going input into the design and conduct of resource monitoring and resource management activities, and provided the main channel of communication between the Department and other project participants. She served as a member of the Steering Committee.
- Other members of the Department of Fisheries, and notably Susanna De Beauville-Scott, Marcellus Edwin, Christopher James, Fabian Jules, Thomas Nelson and Dawn Pierre-Nathaniel contributed to specific project activities, assisted in field work, and participated, at one point or another, in the work of the Steering Committee.
- Other members of the Steering Committee, especially Ulric Alphonse, Lydia Charlemagne, Sylvester Clauzel, Augustine Dominique, Julian Dubois and Juliette Gustave, contributed to specific studies, and gathered and analysed data.
- Rudy John, also a member of the Steering Committee, assisted in the analysis of results and played a central role in facilitating the involvement of fishers in a number of project activities.
- Chris Buttler, student at IDS, carried out a useful parallel study of local fishing institutions and contributed to the institutional analysis approach used in the project.
- Gem Hutchinson, student at Queen Mary and Westfield College, University of London, carried out water quality analysis and community surveys as part of an independent geographic study for an undergraduate degree.

Two external researchers provided extremely valuable guidance to the project. Prof. Melissa Leach of the Institute for Development Studies at the University of Sussex served as a resource person, providing feedback on design and methods, helping to supervise the internship by IDS M. Phil student Chris Buttler, and assisting with the analysis of results. Dr. Stephen Koester of the University of Colorado helped with specific design issues, and provided input into the preparation of this final report.

Participation and involvement of resource users

The project made an early commitment to the use of participatory approaches and methods. The rationale for the adoption of participatory approaches in the design and conduct of these research activities was expressed at three levels:

- the primary purpose of the project was precisely to study the link between participation, resource use and sustainability. The project therefore made a commitment to supporting the development of participatory institutions;
- the project also aimed at developing a sharper understanding of the meaning of participation, the processes involved, and the impacts it has on various stakeholders;
- organisations and individuals involved in the design and conduct of this project were all committed to participation as an indispensable ingredient of all development processes, and were of the view that non-participatory approaches could have negative impacts on people and institutions.

The project further identified a number of principles and guidelines for the selection, design and implementation of research activities. These were as follows:

- the needs and expectations of all stakeholders should be taken into account in the design of research activities, and expected benefits should be made clear to all parties;
- research activities should contribute to the realisation of the community's own vision, and the momentum of research should be guided by the needs and priorities of intended beneficiaries;
- beneficiaries of the proposed management interventions should be involved at all levels and all stages, from the design of the research activity to the use of its results;
- results of research should be redistributed to informants and made available to all potential users;
- methods and tools of research (language, setting, technology) should be designed, and researchers (origin, sex, language skills, attitude) should be selected, in order to permit the optimal participation of all stakeholders, notably those who do not normally have the opportunity to participate in development processes;
- the pace and volume of research activities should be such that they permit the continued participation of all. Irrespective of the constraints created by project schedules, longer time frames and long-term objectives should be followed;
- research activities should include, to the maximum extent possible, a capacity-building component that will benefit the current and intended beneficiaries of management. They should also make use, whenever possible and appropriate, of local skills and resources;
- in the identification of stakeholders and the mobilisation of participation in research activities, consideration should also be given to past and potential users and uses;

- all participatory research activities should be informed and guided by the context in which they are designed and implemented, and notably the dynamics of social change which affect the conditions, extent and nature of participation.



Photo credit: Julian Dubois

Figure 5: Project sign on wall of Co-operative office and gas station, Laborie village

Resource user and local stakeholder participation in project design and implementation was facilitated through the following mechanisms:

- The Steering Committee: the main purpose of this Committee was to guide project design and implementation, and it was neither conceived nor set-up as an instrument of direct stakeholder participation. It nevertheless played an important role in facilitating local involvement, because: (a) it included community leaders and members of organisations who have a central role to play in natural resource governance and development in the project site, and who were therefore able to benefit directly from the learning and capacity-building processes generated by the project, and (b) its members were individuals who are closely in touch with and aware of local development processes, and were therefore able to place project design within a context of relevance.
- The Research Forum: this was a key instrument of participation, because it served as a mechanism for transparency and agenda setting. It involved a wide range of participants and afforded them the opportunity to discuss issues, frame research questions, receive research results, share and confront knowledge and information, and formulate recommendations. Because of its flexible format and thanks to the fact that it included a wide range of stakeholders, it served as one of the project's main mechanisms for participation.⁴

⁴ These meetings were held initially at the Laborie Boys' Primary School and subsequently at the local market, and a total of 14 meetings were held (11 as evening meetings and 3 as all-day workshops). The reason for the change of

- Specific meetings: in addition to gatherings of the Research Forum, a large number of meetings were held to discuss specific issues, present and analyse research results, and formulate plans and recommendations. Particularly important among these was the commemoration of Fisher's Feast in June 2002, when Project Leader Yves Renard was invited to address the Feast's main ceremony.
- Mapping and GIS: the use of GIS tools allowed people to discuss natural resource distribution and use in relation to their locations, in a way that had not been possible before. The use of airphotos in particular gave people a new perspective of their environment, as indicated by comments from some of the fishermen.
- Exhibitions: two exhibitions were mounted to support the planning process for sea urchin management.
- In addition to members of the Steering Committee, local people served as members of research teams. For example, Grelle Joyeux, a professional diver, participated in the research on tourism (Clauzel and Joyeux 2001), Ravie Chiquot, a teacher, conducted two surveys as part of the study of pollution, and Phillip Simeon, a seamoss farmer, played a central role in the experiment on seamoss cultivation.
- Members of the local community also participated in data gathering and analysis. This included Alvin Louis, a highly experienced diver who provided technical support to many of the monitoring activities.
- While the project convened a large number of meetings, it also attached much importance to on-going informal individual and small-group discussions between community members, members of the Steering Committee, external researchers and other actors.
- Project panels: soon after the initiation of the project, four panels were prepared and placed at various locations in the project site, in order to inform people that this project was on-going and to present its purpose and objectives.
- Field trips: at the beginning and at the end of the project, field visits were organised with a glass-bottom boat, in order to introduce the wider community, and especially school children, to the reefs and their importance to local livelihoods.
- Polo shirts: the project produced polo shirts bearing a project logo and slogan, and distributed them, at no cost, to people who were contributing, in one form or another, to the research work.
- Media coverage: throughout the project, efforts were made to ensure that its activities would be publicised and that interest would be generated locally and nationally.

All these communication and participation activities were helped and supported by the fact that the project had selected an easily recognisable name, *People and the Sea*, as well as a meaningful slogan, *Lanmè-a sé jaden nou*⁵

venue from the school to the market was that some people appeared reluctant to attend, or to participate fully in, meetings held at the school, because this venue was perceived as formal and not inclusive. Following this change, it became obvious that the market, which had not been previously used for meetings in this community, provided a more appropriate space that most people felt comfortable with.

⁵ "The sea is our garden" in Creole. This project slogan was suggested by Mr. George Wilfred, a prominent and highly respected fisherman from Laborie. In rural Caribbean societies, the "garden" has important historic, symbolic and economic significance. It refers to the plot of land that people can farm on their own primarily for subsistence

Phases in project implementation

The project began in February 2000 and was structured in four main phases:

- During the initial phase (March 2000 to October 2000), baseline studies and assessments were conducted. These aimed at providing a basis for evaluating change and assessing impacts, and at building the information base necessary to design specific interventions (see Appendix 4). During this period, the Steering Committee met at least once a month, assuming lead responsibility for the design of instruments and the supervision of the process. This phase ended in October with an intensive week of analysis and planning that included a public exhibition and two workshops, attended by local stakeholders and external resource persons, including Prof. Melissa Leach.
- During its second phase (late 2000 to late 2002), the project conducted two parallel sets of research activities: the first set involved a range of experiments and case studies, while the second set focused on monitoring activities. All field research activities took place during this period, including internships by two university students. In June 2001, the first meeting of the Research Forum was convened. Meanwhile, the Steering Committee met approximately once per quarter during this period.
- In December 2002 and January 2003, the project conducted a participatory analysis of results, convening a number of workshops, organising an exchange with Barbados to compare outcomes and lessons learned in sea urchin management in the two countries, and compiling research data and results. Prof. Melissa Leach visited the project and assisted with this analysis.
- In February and March 2003, work focused on the preparation of this scientific annex and the Final Technical Report (FTR), with a number of meetings and workshops of the Steering Committee. During this period, Dr. Stephen Koester visited the project and assisted with the preparation of the report.

While the project formally ended on 31 March 2003, it is expected that many of the processes that it initiated will be continued, as described in Chapter 9.

Chapter 4: Methods

Overview

Within the overall framework described in Chapter 3, and using a range of participatory approaches and tools, the project employed a variety of methods appropriate to the whole project and to specific activities. While the project was designed to produce research outputs that would contribute to achieve the overall purpose of the Natural Resources Systems Programme, most of the methods and instruments used in this project remain relevant and applicable to local development research and development initiatives in coastal zone management.

Methods for data collection were generally characterised as follows:

- The project accessed and used published sources available, including publications, maps and statistical data available from other agencies.
- The study and description of the natural systems and resources used a range of methods, including mapping, laboratory analysis and field sampling.
- Most social surveys used purposive sampling (Patton 1990), i.e. selecting people with information and knowledge relevant to the research question. In one instance, however, the project used a randomised sample, to study local perceptions of water pollution.
- These social surveys used both questionnaires and guided interviews.
- In addition, the project relied on participant observation, especially to record the outcomes of processes initiated and facilitated by the project.
- Participant observation was used as the preferred method to monitor changes in institutions and governance.

Methods for analysis included:

- Mapping.
- Constitution of computerised data sets.
- Tabulation and statistical analysis of results of questionnaires.
- Coding of interviews and field notes for themes and patterns.
- Workshops to share, confront and formulate additional results and conclusions.

Participation was part of all the methods used, especially through:

- The involvement of the Steering Committee in identifying research questions and in designing surveys and questionnaires.
- The involvement of a wide range of stakeholders in the selection of the actual topics and issues to be addressed in the project experiments and case studies. This was done at workshops convened specifically for the purpose of designing project activities, as well as during the regular sessions of the Research Forum.
- The use of local researchers to conduct interviews and to administer questionnaires. In many instances, these were not professional researchers, but teachers and other community members who have a basic understanding of research principles and methods, and who have an intimate knowledge of the local community.

- The distribution and discussion of emerging findings and results throughout the project, particularly through presentations at the Research Forum, but also through project documents, flyers and interviews with the media.
- The involvement of stakeholders in the interpretation and analysis of data and results.
- The constitution of a computerised data base and geographical information system that has allowed for easy access to, and interpretation of, data and information.

Assessment and baseline surveys

Assessment of bio-physical environment

The purpose of this assessment was to locate and describe the main features of the Bay, focusing particularly on the distribution of reefs and seagrass beds. An overall workplan for the assessment of natural capital was formulated (see Appendix 6) and most of these activities were implemented. Those that focus more specifically on mangroves and beaches were not considered essential to this project but have been included in a plan for future work (see Chapter 9).

The assessment began with the identification of whatever information was available on marine and coastal habitats. In the Eastern Caribbean there are a few examples of detailed marine habitat mapping, such as for the British Virgin Islands, the United States Virgin Islands, and Anguilla but for many islands the key marine habitats have not yet been mapped. It was soon evident that there was little published information on Laborie Bay. The intention, therefore, was to collect existing information of any type and complement it with data gathered in the field.

This assessment identified the following:

- Reproductions of various historical maps with little or no detail of marine features.
- Original hand-painted maps from the mid 18th Century indicating soundings, reefs and anchorages.
- Topographic maps at 1:2,500, 1:10,000, 1:25,000 and 1:50,000, the most recent compiled in 1995 from a 1992 aerial survey.
- Navigational charts showing general reef distribution but at a very coarse level of detail, intended only to identify the seaward boundary of reefs as potential navigational hazards and mainly based on 19th Century surveys.
- Aiphotos made for land cartography but including marine features to a distance of approximately 1.25 km from shore, from series made in 1941, 1966, 1977 and 1992.

An appropriate mapping and GIS application was needed to use the available maps and airphotos, and to generate new maps to include information that would be gathered during the project. The following criteria were used in selecting a GIS application for the project:

- Ability to exchange spatial data with GIS applications already in use in the country.
- Ability to use both raster and vector formats.
- Ability to calibrate (georeference) raster images.
- Affordability at startup, without costly annual maintenance and upgrade fees.

- Ability to use GPS data.
- Ability to convert among raster file formats.
- Availability of these features in one program without the need for costly add-on modules or third-party software.

Following a consideration of various tools available, including ArcView, Computer Aided Mapping and Resource Inventory System (CAMRIS) and Map Maker, the Map Maker mapping and GIS programme was selected based on relative importance of mapping versus GIS capability in the context of the project, cost, and ease of use given the potential for later use by the community.

Hard copies of topographic maps were scanned at 150 d.p.i. in JPEG format to keep file sizes reasonably small while providing sufficient detail. These were calibrated (georeferenced) in Map Maker using Cartesian coordinates of the British West Indian grid. Airphotos of Laborie Bay were also scanned and calibrated, using multiple control points whose coordinates were established from features in the topographic maps that were visible in the photos. The airphotos were scanned at 600 d.p.i. in TIFF format. In all cases the calibration data were stored in Map Maker format, whereby the data are contained within the raster file. This avoids the potential for losing calibration when the data are stored in the separate world files that are used by other GIS applications.

A hand-held GPS was initialised to use the British West Indies grid to which maps were calibrated. The use of GPS technology was greatly enhanced when the degradation of the satellite signals (through Selective Availability) for public use was discontinued shortly before the start of the project. Position errors were reduced from around 100m to the 15m resolution of most hand-held GPS receivers without differential correction. Depending on satellite geometry, Estimated Position Error computed by the GPS was commonly between 3m and 4m. While precision was increased, accuracy presents a problem in the area and GPS data need some form of correction or post-processing. One option was to compare known coordinates and GPS coordinates for a number of locations and compute datum transform functions, such as the Molodensky transformation. Five factors could be calculated and used by Map Maker to improve accuracy, and while this was partly successful there are insufficient known sets of coordinates in the south of Saint Lucia to make the best use of this option. Transform functions are most effective the closer the determination points are to the study site and functions determined from stations in the north of the island were found not to be helpful.

Instead a second method was tested. A set of 10 – 12 waypoints were gathered at obvious landmarks and downloaded onto a calibrated 1:2500 topographic map. The process was repeated at three different times to include temporal variations in signal quality. In each case it was evident that the displacement of the waypoints relative to the landmarks on the map was uniform in distance and direction. By moving the waypoint thematic layer as a whole by a calculated distance and direction all waypoints could be seen to match their corresponding landmarks with a mean error of around 5m. This approach was therefore used to correct the GPS data collected on the water.

The colour airphotos from 1992 provided the initial information on the general distribution of different marine habitats, including sand, seagrass, reef and mangrove areas. Interpretation of some of the features was aided by photographs taken at lower altitude from a helicopter. Benthic surveys of reef habitats were conducted using the Reef Check protocol (Reef Check Foundation 2003) which had been selected by the Global Coral Reef Monitoring Network (GCRMN) as the community-level reef assessment tool. The protocol quantifies relative cover of 10 different substrate types including live coral and macroalgae as indicators of reef condition. The method involves laying a 100m transect line across the reef. This is subdivided into four 20m sections, separated by 5m gaps. In each 20m section substrate type is recorded every 0.5m, to give a total of 160 data points per survey. Data are entered into prepared standardised Reef Check spreadsheets which automatically check for typographic errors in the substrate codes and calculate the percentage of each substrate type in the survey.

While some reefs could be clearly delineated from the airphotos, more detailed description required ground truthing and popular knowledge. This began with boat trips with people familiar with the area. Airphotos were enlarged and laminated and, together with GPS, were used to document the names of the reefs and anecdotal information on their history and uses. The information was used to compile maps but it was found that the airphotos were a more effective tool for exchanging information and as a reference for discussion. People who were not familiar with using line-drawn maps, for example, would very easily orient themselves to features in the airphotos despite never previously having had access to such a perspective of their environment.

Once the main reefs had been identified, a large painting depicting a vertical view of the Bay was prepared on a 4ft X 8ft sheet of plywood. This was used in planning activities and in public meetings as a centre for discussion which allowed people to contribute information related to specific locations. For evening meetings held in the village marketplace, annotated airphotos used with an LCD projector were found to be particularly effective in encouraging useful and instructive discussion.

Stakeholder identification and analysis

Early in the process, the project sought to identify who the stakeholders were, with the understanding that *identification* and *analysis* are two distinct steps in the process. The first step of identification was done by the Steering Committee, based on its knowledge of the area and of the users of its natural resources. In order to ensure that all stakeholders were identified, the area's natural resources and their various functions were listed, and, for all resources and functions, the following questions were asked:

- Who uses the resource?
- Who used the resource in the past?
- Who impacts on the resource, even without deriving direct benefits?
- Who does not use the resource?
- Who benefits indirectly?

On this basis of this identification, a workshop was held with members of the Steering Committee, key informants and resource persons to conduct an analysis of these stakeholders. This workshop asked the following questions in relation to each stakeholder group:

- What are the main patterns of behaviour, what are the formal and informal rules that determine the ways that they behave (among themselves and with others) towards the resource?
- Are there organisations that serve, support or bring together the stakeholders? What are their main characteristics? What impacts do they have on management?

The results of the workshop were then tabulated and summarised, in a manner that provided useful background to all subsequent project activities.

Livelihood and poverty baselines

The purpose of these baseline surveys and initial studies was to provide an understanding of the place of natural resources within local livelihood strategies, to identify key issues of natural resource governance, and to provide the basis upon which the results and impacts of the project could be identified and evaluated.

Preliminary assessments were made by identifying and conducting open interviews with key informants, by observing human activities, and by getting a general sense of the place and the issues affecting it. The Steering Committee played a key role in this process, with two one-day workshops held for the specific purpose of compiling and analysing preliminary observations, and extracting key issues. From this informal process, important observations and descriptions were made, and a preliminary assessment of resource use patterns and livelihood strategies was arrived at.

The project also prepared a small number of case studies of selected people, representing a diversity of occupations, gender, place of residence and relationship to the resources of the Laborie Bay, as an instrument to describe human relationships with reef resources. Criteria were identified in order to provide a representative group, and a questionnaire was prepared to guide interviews with the persons. Constraints of time and human resources however prevented the project from conducting all the case studies planned. The project also intended to prepare case studies of places, and identified the criteria to be used in the selection of these sites. Unfortunately, time constraints in the initial phase did not allow for the preparation of these studies.

A survey of the fishing community was conducted to gather background information on the reef fishery in the Bay (Hutchinson *et al.* 2000). A survey questionnaire was developed by the Department of Fisheries, based on survey instruments used in previous studies. The survey was conducted with 52 registered fishermen to gather information on the fishers, fishing methods and locations, observed trends in the fishery and organisational issues in the fisheries sector. The results of this survey were tabulated and analysed by the three persons who were involved in the survey, and subsequently presented to and discussed by the Steering Committee.

A baseline assessment of Laborie Fishermen's Cooperative was conducted, using an interview guide with current and past leaders of the Co-operative as well as other Co-operative members, for the purpose of:

- Examining the underlying causes of a management crisis that was threatening the Co-op's existence.
- Assessing perceptions of the Co-operative among the wider community.
- Identifying its current and potential role in coastal resource management.

A brief analysis of the community's human and financial capital was conducted by members of the Steering Committee, together with an analysis of the roles and capacities of key organisations involved in development at the local level. This was done by a small group of Committee members, who used their knowledge of the project site to answer a range of questions and tabulated the responses obtained.

A household livelihood survey was conducted to assess current livelihood strategies, and the place that reefs and other coastal resources occupy in these strategies. The purpose of this assessment was to provide an overview of livelihood strategies and issues, as well as a basis for a qualitative evaluation of changes in the place and contribution of the Bay's resources to livelihood strategies. The results of this survey were first tabulated in order to allow for a synthesis and comparison of results. They were then used to prepare a summary report (Alphonse *et al.* 2001).

In addition, the project relied on data obtained from the 2001 Population and Household Census carried out in Saint Lucia under the auspices of the Organisation of Eastern Caribbean States (OECS)⁶. Having obtained a copy of the census questionnaire and a list of all enumeration districts, the project was able to request the Department of Statistics in the Ministry of Finance to produce data that would be directly useful and relevant to its research.

Monitoring programmes

The Steering Committee and all participating organisations recognised that monitoring was an indispensable component of this research project. Monitoring was needed at two levels:

- at the level of individual experiments and case studies (four in all).
- for the entire project.

At the level of the overall project, the purpose of monitoring was to:

- identify change that occurred as a result of project interventions;
- provide information that would allow for an end-of-project evaluation of the causes and impacts of that change.

Monitoring at the level of the overall project was based on a framework articulated along general monitoring questions, themselves based on the project's research objectives (see Appendix 7).

In order to implement this framework, a programme to monitor changes in the status or health of reefs was established using elements of the Reef Check protocol, described above, which is one of three levels of the Global Coral Reef Monitoring Network (GCRMN), coordinated by the Australian Institute of Marine Science. Surveys focused on the description of the reef benthic

⁶ Census Day was 22 May 2001.

communities and on the identification of substrate types that can be used to recognize trends in health, such as increase in recently dead coral and change in the relative abundance of live coral and macroalgae. CANARI serves as an Eastern Caribbean node of GCRMN and provided training in the Reef Check protocol to staff of the Department of Fisheries both before and during the project. Laborie is now one of 10 sites around the island that will be surveyed annually by the Department. In addition to their use for local management, results are submitted to the Reef Check Foundation and GCRMN and included in their regular publications on the status of reefs worldwide.

A number of monitoring activities were conducted as part of the case studies and the experiments and were considered to be sufficient description of status or change in ecological indicators, given that change in the status of reefs themselves would not be detectable over the project time period. These included levels of bacterial pollution, distribution and abundance of sea urchin stocks, and seamoss growth trials. As with the Reef Check activities, it is expected that these monitoring programmes will be continued and used for ongoing management.

With respect to broader and less measurable changes in perceptions, attitudes and institutional arrangements, the Steering Committee played a particularly important role, using the opportunity of its meetings to examine and discuss changes.

Experiments and case studies

Selection of experiments and case studies

Following the conclusion of the first phase of the project, a number of activities were organised in October 2000, for the purpose of presenting, discussing and validating the results of the initial studies and surveys, and of selecting the issues and topics on which the project would focus. This selection was done in three steps. Firstly, a week-end exhibition was organised at a local primary school, in which some of the results were presented through short lectures, panels and exhibits, including a presentation by a class of a local school. At the same time, the views of the visiting public were sought, in writing through the use of boards on which people could provide views and suggestions, and also in informal and guided small group discussions, using the large painted map of the Bay as background.

Secondly, a half-day workshop was convened, with approximately 40 people representing a range of experiences and perspectives, in order to discuss the findings and to formulate specific recommendations. For each resource and resource use sector, priority issues and resource use patterns and trends were described and discussed. This exercise provided a sharper analysis of the issues of concern to local and national stakeholders, as well as more precise background on these issues. From this workshop, preliminary directions emerged, including the need for the project to focus on pollution issues.

All this information was then taken to a workshop of the Steering Committee, which reviewed the original project objectives and expected outputs, analysed the views and recommendations formulated by the consultations, developed criteria for the selection of specific activities, and concluded that the project should focus its work on four experiments and case studies, and should use the results of these to answer its initial research questions. These four activities are presented below.

Cultivation and marketing of Gracilaria

Various species of red algae are used in the region to prepare drinks and puddings. All contain either agar or carrageenan and are popularly known as seamoss. By the 1980s the natural stocks in some islands had been depleted through overharvesting and a project was implemented in Saint Lucia to investigate the possibility of cultivation of some of the species. By the 1990s commercial cultivation of a fast-growing species of *Gracilaria* was well established. This was soon followed by the cultivation of the Caribbean carrageenophyte *Eucheuma isiforme*. While these two species have been cultivated for some years, others in demand by the processing industry are still only available from limited natural stocks.

The objectives of this experiment were to determine the feasibility of cultivating species of edible red algae that are known to have market potential in the region, to assess the economic feasibility of cultivation, and to identify the conditions under which the technology can be adopted as a means of income generation for disadvantaged people in the Laborie community.

The experiment was based on the following background:

- A variety of seaweeds is in demand in the region for use as food but natural stocks are susceptible to overharvesting.
- The technology for the commercial cultivation of edible seaweeds in the Caribbean that was first developed in Saint Lucia in the 1980s has been transferred to, and adopted by coastal communities in a number of countries in the region as a viable and appropriate income-generating activity.
- Commercial processing of seaweed products has diversified in the region in recent years but is commonly limited by availability of raw material of the desired type and quality.
- Species most in demand by processors are comparatively slow growing and farmers have focused on two faster growing species despite their lower market demand resulting in difficulty in selling crops.
- Development of methods for cultivation of those species most in demand by processors could enhance the economic benefits to farmers.

The experiment involved eight activities:

- A base line survey of the status of seamoss production.
- A review of the information available on the response to cultivation of different species in the region, and the selection of species for testing in Laborie Bay.
- The testing of different propagation methods and materials.
- Collaboration with a commercial farmer in establishing cultivation trials in an existing farm.
- Discussions with appropriate individuals and organisations in transferring any new developments in technology.
- Monitoring the effectiveness of technology transfer.
- An analysis of the results emphasising lessons learned, including the policy implications of seamoss cultivation.
- The formulation of a short-term plan for the development of the industry.

The experiment began in early 2001, with three activities. Firstly, a questionnaire survey of the Laborie and Piaye communities was conducted to gather information on the history and current status of the harvest of seamoss from wild stocks in the area (Smith and Gustave 2001).

Additional information was gathered through interviews conducted by a community member familiar with all aspects of seamoss production. The purposive sample included informants most likely to have knowledge of the history and trends in the seamoss industry in the area. The survey was supplemented by the compilation of a bibliography on seaweed resources in the Caribbean.

Secondly, appropriate seaweed species were selected for the experiment based on past experience and on initial cultivation trials in Saint Lucia. The two species most in demand are the agarophytes *Hydropuntia crassissima* and *H. cornea*, due to the comparatively high quality of their phycocolloid content. Quality in the local processing industry is judged by the amount of dry seamoss required to produce a drink of the appropriate consistency and, more importantly, the gelling ability when bottled as a concentrated agar extract. At the start of research on seaweed cultivation in Saint Lucia these species were known as *Gracilaria crassissima* and *G. debilis* respectively, and as those specific epithets have entered common usage they will be used here for simplicity.

Early trials with *crassissima* had shown that the growth under cultivation conditions was extremely slow and it was therefore not considered for further investigation. The situation with *debilis* was less clear. While growth rates were lower than those of the two species currently being cultivated in Saint Lucia, early trials suggested that, unlike *crassissima*, cultivation was possible and that there was potential for enhancing production through strain selection. Planting material was collected from natural populations of *debilis* in a nearby bay.

Three methods of propagation were tested. The first involved tying plants to floating longlines which were anchored at each end and kept afloat by attached plastic bottles. The tying method is widely used in Asia for the cultivation of *Eucheuma* and *Kappaphycus* but was not successful with *debilis*. The second method involved inserting thalli into split-film polypropylene rope, which is the method most commonly used for propagating *Gracilaria* species and *Eucheuma isiforme* in the region and which is described in detail in a guide to cultivation (Smith 1997). The brittleness of *debilis* thalli made seeding ropes a very time-consuming process and plants tended to break loose before being harvested. The third method involved inserting plants into a net tube of 25mm mesh. This proved to be a very efficient method when plants were introduced into the net through a length of PVC pipe. The plants were held securely as they grew out through the mesh. A length of rope was threaded through the net tube for added strength and buoyed and anchored in the typical floating long line method.

Thirdly, planting trials were conducted with *debilis* to test propagation methods in different locations in Laborie Bay. The cultivation trials were conducted in collaboration with a commercial seamoss farmer and test lines were set up within a large *Eucheuma* farm 100m from shore. Based on the initial results it was decided that water motion was insufficient for this species. Most *debilis* plants from natural populations are abundantly branched forming stiff inflexible clumps. When planted in calm water these rapidly become fouled with epiphytic algae, particularly fine filamentous species which in turn trap silt. This fouling is difficult to remove and makes the crop unusable. In order to find more suitable conditions, a second *debilis* plot was established in an area of greater wave action 500m from shore.

Successful cultivation of red seaweeds has often depended on the selection and vegetative propagation of superior strains, based on such factors as growth rate, morphology, chemistry and resistance to epiphytes. The experimental plot was monitored regularly to identify individual plants that responded best and to select these for further propagation, while removing those that did not grow well. Selection was based primarily on the ability of plants to remain free of fouling, which was most likely to be seen in morphotypes with longer, more flexible and loosely-branched fronds.

The quality of an agarophyte used in the extractive industry is primarily determined by its gel strength, described as the force required for a plunger of known diameter to rupture the surface of a gel of known concentration. While exact standards are not used in seamoss processing, the ability of a species to produce a gel is the most important characteristic in deciding its market potential. The *Gracilaria* species most widely cultivated in Saint Lucia has very low gel strength and a solution of the standardised concentration of 1.5% agar commonly thickens but fails to form a gel. Laboratory analysis of *debilis* agar carried out as part of the initial research on cultivation had shown that while its gel strength of 74g.cm^{-2} was lower than that of commercial

agars, it was well suited to applications in the food industry. Precise analysis of gel strength was not possible in the project as there was no suitable gelometer available. However, a simple testing apparatus was improvised which allowed comparisons among extracts from different species. Replicated tests showed that results were sufficiently reliable to ensure that any selected strains retained a gel strength comparable to that of the natural stock.

Methods for broader technology transfer and monitoring were designed after discussions with the Saint Lucia Rural Enterprise Project (SLREP), a rural development and poverty reduction initiative funded by the International Fund for Agricultural Development (IFAD), the Caribbean Development Bank (CDB) and the Government of Saint Lucia. The role of SLREP was to identify potential new farmers, to convene meetings to pass on background information on farming, and to lead field trips to identify areas for establishment of farms.

On the basis of the results obtained, a workshop was held on 18 December 2002 for the purpose of analysing lessons learned, identifying issues and constraints that have hampered the development of the seamoss industry, and making recommendations for future expansion of the sector (see Appendix 9). A second workshop was held on 25 March 2003 to develop an action plan to address the priority issues.

Awareness of the impact of sewage pollution on coastal water resources and livelihoods

The objectives of this experiment were to study how increased awareness of, and access to, information on the status, causes and potential impacts of a local environmental issues – in this instance water pollution – can contribute to a change in behaviour, and to identify the processes by which these changes occur.

In the past decade there has been an increasing focus on the decline in the status of coral reefs in many parts of the tropical world, and on the need for more information to be able to evaluate these trends. Nearshore reefs adjacent to population centres are the most impacted, primarily by human impacts. These include the input of agricultural fertilizers and pesticides, siltation and untreated sewage, over-fishing and coastal development. While pollution by agrochemicals remains a concern in some areas of Saint Lucia, their use is declining due to the changes in the type and extent of agriculture in the country, particularly the decline in banana production. Meanwhile the problem of sewage pollution continues to increase as coastal communities expand without adequate wastewater treatment facilities. This can result in elevated nutrient levels and eutrophication of coastal waters.

In addition, a recent study has for the first time linked faecal coliform bacteria with coral disease (Patterson *et al.* 2002). The study concluded that the enteric species *Serratia marcescens* was the cause of the white pox disease in the elkhorn coral *Acropora palmata* and further that untreated sewage is the main reason for the death of coral reefs in the Caribbean. While the relative effects of the various causes of coral death will vary with size and proximity of urban areas and susceptibility of watersheds to erosion and runoff, the implications of the study justify further investigation.

Laborie residents have long been concerned with the decline in water quality in the Bay but no previous surveys had been conducted and there were no data available on the type and level of contamination. As the present experiment aimed to assess the outcome of access to information on water quality, it was not necessary to cover all aspects of pollution, but rather to focus on one key issue in the community, namely the level of bacterial contamination that could be attributed to sewage pollution. A second consideration in this selection was the high costs and equipment requirements associated with most water quality tests, such as nutrient, chlorophyll and agrochemical levels. Assessment of bacterial contamination was comparatively simple and cost-effective, as described below.

The experiment began in mid 2001, with a base line study that involved four components:

- Analysis of water samples for thermotolerant (i.e. faecal) coliform bacteria at 16 stations in the Bay between June and September of 2001.
- A study of community perceptions of the status of water quality carried out in August and September 2001. The aim was to find out whether people believed the water to be polluted and if so whether it could pose a health hazard, what were the possible sources of any existing pollution and the possible solutions, and who should be responsible for implementing them.
- A survey of the perceptions of management agencies (Laborie's District Representative, Ministry of Planning, Laborie Village Council, Laborie Development Planning Committee, Ministry of Health, Ministry of Communications and Works, National Conservation Authority, Department of Fisheries).
- An analysis of the direct and indirect factors and conditions responsible for pollution.

The experiment involved six activities:

- The base line surveys, as described above.
- The periodic collection of data on water quality in the Laborie Bay, with an identification of issues, trends and impacts.
- The dissemination of that information to project participants, through meetings of key stakeholders, and to key management agencies.
- The observation and recording of actions taken by management agencies with respect to the control of sewage pollution during the course of 2002.
- A post-campaign survey of perceptions of management agencies.
- An analysis of lessons learned and results obtained.

The study of perceptions of residents was done through the administration of a structured questionnaire, with open-ended responses, to 102 households that were selected through a random sample stratified to include households in all parts of the village, adjacent to the beach and further inland. (Hutchinson 2001). The roles and perceptions of management agencies regarding water quality issues were assessed through use of another questionnaire administered to representatives of targeted management agencies.

Levels of bacterial contamination of seawater were determined using methods consistent with World Health Organisation specifications for detection of faecal coliform bacteria (Robens Institute 1993), as an indicator of sewage pollution. Seawater samples for analysis were taken at 15 stations along the shore and up to 700m offshore. Freshwater samples were taken from five of

the ravines draining into the Bay. All samples were paired replicates. The activity was designed as an undergraduate research project and carried out by a Saint Lucian student as partial requirement for a B.Sc. degree in geography from a UK university. The test kit produced by the Robens institute was used for analysis. This compact kit consists of all equipment needed for the process, including:

- Collection and 0.45µm membrane filtration of water samples.
- Preparation and sterilisation of equipment and lauryl sulphate nutrient medium.
- Incubation of samples at a temperature of 44°C required for determination of thermotolerant coliform bacteria.

After incubation the membrane filters were examined to determine the number of bacterial colonies that had developed. Water samples were typically 10ml and therefore the counts were multiplied by 10 to give a figure of colony forming units (CFU) per 100ml of water, for comparison with published standards. In some cases a 10ml water sample contained too many bacteria for accurate counts and sample volume was reduced. However, it was found that at small sample volumes the results were inconsistent and colonies were still too numerous for accurate counts.

The dissemination of the information was planned and organised according to a framework which recognised that:

- An awareness campaign needs to be organised in four consecutive stages: the problem, the sources of the problem, the causes of the problem, and the possible solutions of the problem.
- Each stage would require its own message, participation objectives, target groups, messenger(s), medium/media, and means of verification.
- These would be defined, at the end of each stage, based on the results obtained.
- The result of each phase would become the research assumption of the following stage.

The monitoring of actions and behaviour of management agencies was done by (a) informal observations of activities and projects, (b) examination of the minutes of meetings of the Laborie Village Council, and (c) end of project interviews with agencies and their representatives.

Results of the study were presented and discussed at community meetings and meetings of the Research Forum. The first formal presentation was made at a meeting of key organisations that was held at the Laborie Cooperative Credit Union. At this meeting it was decided by participants that broad dissemination of information describing the pollution levels in the Bay would not be productive unless there was an indication of plans to address the issue.

Following the presentation at the meeting at the Laborie Cooperative Credit Union, a meeting was requested by, and held at, the Ministry of Health in January 2002, and attended in addition by staff of the Laborie Village Council and the Department of Fisheries. The results of the study were presented to senior staff of the Ministry.

Management options for the sea urchin harvest

The white-spined sea urchin, *Tripneustes ventricosus*, locally known as the sea egg, is widely exploited in the Caribbean region for its edible roe. A national management programme was implemented in Saint Lucia by the Department of Fisheries in 1986, in response to overexploitation and declining stocks (Smith and Berkes 1991). Stocks at sites in the south of the island, including Laborie, were monitored by DOF in collaboration with CANARI and sea urchin harvesters in order to determine an appropriate management strategy (George and Joseph 1994). The resulting co-management arrangement functioned well for a number of years until stocks declined severely in the mid 1990s. The extent of this decline suggested that it was not the result of mismanaged harvesting and was more likely due to a combination of natural population fluctuations and severe weather conditions generated by tropical storms, particularly in 1994. The harvest was closed by the Department of Fisheries to allow for stock recovery and was still closed at the time the project began. The monitoring efforts that were resumed in the *People and the Sea* project followed the methods described in the earlier studies cited above.

The experiment aimed to determine how the harvest of the sea urchin can be managed to provide continued benefits to the community, and was based on the following assumptions:

- sea urchins can be an economically important resource.
- sea urchins are vulnerable to over fishing if exploitation is unmanaged.
- fishery regulations alone are not an effective management measure.
- participatory approaches have the potential to result in effective management.
- access to information is essential for effective participation.

The first activity was a survey of key informants to gather information on the sea egg fishery in Laborie to supplement the limited existing information and to assess the past and present importance of the resource to the community. Open-ended interviews were conducted with sea urchin harvesters and individuals involved with harvesting and selling sea urchins in the past. Interview notes were coded for themes that included the history of the harvest, trends in the methods of harvesting and marketing, trends in the status of the resource and in management and legislation of the harvest, and responses on options for future management (Smith and Koester 2001).

An initial assessment of current status of stocks was conducted through public meetings in 2000, and discussed in light of the results of the community survey. At that time the fishery had been closed for a number of years due to a severe decline in stocks. The reason for the decline was not clear but was apparently not the result of over-harvesting, firstly because illegal harvesting at that level would have been evident and secondly because a similar decline had been reported in other islands. In these initial meetings divers reported that sea urchin population levels were beginning to rise for the first time since 1994. This reappearance in 2000 showed that larval recruitment had been successful in 1999.

Monitoring of population structure, abundance and distribution was started in October 2000. Field work was conducted with the assistance of a diver and harvester from the community, using a two-man kayak, as follows:

- Size frequency was determined by random sampling of the population for measurement of test diameter. A diver in the water collected 100 - 200 urchins which were measured on board to the nearest 5mm with a caliper designed for the purpose. The main urchin population at the area known as Flatland was sampled every two to three months and results were used at public meetings to demonstrate population characteristics such as growth, recruitment, life history and longevity. The data were also used to demonstrate the existence and significance of urchin size classes, which were used for managing the harvest based on size limits.
- Abundance was determined by means of randomly-placed 1m² quadrats. Quadrats were constructed from half inch diameter PVC pipe filled with cement to reduce buoyancy. The quadrats were dropped blindly from the kayak to avoid subjectiveness in selecting locations, and the number of urchins in each quadrat was recorded by a diver in the water. Abundance was estimated from the mean of 100 quadrats.
- In 2002 the population was sampled every three months to assess reproductive status. This involved taking a sample of 25 urchins, selected to include the range of sizes present in the population. Test diameter was measured and the urchins were then opened and the five skeins of roe were removed and placed in jars in a cooler for transport to the laboratory. The roe samples were weighed and identified as male or female based on the colour of the roe. Male roe is yellow and female roe is orange at maturity and for a few weeks after spawning, after which both turn brown. Roe smears were examined under the microscope to determine reproductive maturity, indicated by the egg diameter in females and motile sperm in males.
- Monitoring sites were mapped using GPS and relocated using waypoints.

Monitoring activities and meetings to discuss results were held, with meetings facilitated by the Laborie Fishers and Consumers Cooperative. The results and information provided by meeting participants, including harvesters, DOF and CANARI, were used to assess the feasibility of opening a harvest season in the latter half of 2001. The harvest was formally opened by DOF in September of that year, during which meetings were held with harvesters to discuss the progress of the harvest, its impact on the resource, the effectiveness of the management strategy and harvest conditions, and possible options for future harvests.

The need for increased public awareness of the nature, importance and potential of the resource was identified by participants in public meetings in 2001. Accordingly, a public exhibition was planned, intended to raise awareness in advance of a possible harvest in 2002, and held in August of that year. This included poster presentations of the biology, ecology, status and management options, a live exhibit, and interpretation for visitors by scientists and resource users. At the same time, DOF conducted a number of public awareness activities at the national level, which helped to involve users and to generate general support for management initiatives (see example of a newspaper article in Appendix 11).



Photo credit: Julian Dubois

Figure 6: Wencess Dubois and Alvin Louis monitoring sea urchin growth

Results of ongoing monitoring on the status of the stocks in 2002, by project staff, DOF and sea urchin harvesters, were submitted with recommendations to the Department of Fisheries in writing and orally in community meetings and incorporated into the national information base that was then used to formulate the harvesting conditions for 2002. The harvest season was opened in September and prior to the closure a meeting was held to review its progress and identify key issues affecting its success or otherwise. This identified limited marketing options as the constraint to economic benefits and the need to find options to overcome these. The recommendation from participants was to organise a public event around the harvest, scheduled for the final day. This was publicised on radio as *Lafèt chadon*⁷ and despite the short notice was successful in focusing attention on the involvement of the Laborie community in the management of the resource, in providing harvesters and processors with an opportunity to increase their economic benefits from the harvest, and in demonstrating the value and potential of improved and innovative marketing arrangements.

Following a second phase of harvesting in October an assessment of the social and economic impacts of the 2002 harvests was conducted through semi-structured interviews with 107 village residents selected for a diversity of age, sex, income levels and places of residence (Burt 2002).

⁷ “Sea-urchin Festival” in Creole.

Options for tourism development

This research focused on one central question: how can marine and coastal based tourism bring benefits to people, especially the poor? In other words, it sought to explore the possibility of establishing a form of tourism that does not mirror the dominant dynamics and relationships of the larger political economy.

This study was based on a number of premises:

- tourism is a major economic sector, and it is the only growth sector in the eastern Caribbean at this time. In a global, regional and national context that is impacting negatively on traditional economic sectors in Saint Lucia, and especially on the banana industry that has been the mainstay of the economy for three decades, tourism offers one of the only economic options available to small island Caribbean states.
- in its present, dominant form, tourism often brings negative social, cultural and environmental impacts, and may not be economically sustainable (Payne and Sutton 2001).
- the natural and cultural assets of small Caribbean communities, including those of the coastal zone, provide a valuable resource for the development of an alternative product.

A base line study was conducted to describe the natural and human capital available in the community and to assess the impact of tourism on local livelihoods (Clauzel and Joyeux 2001). Information on the past and current features of tourism in Laborie was gathered via interviews, questionnaires and a review of relevant documents. This baseline also examined Saint Lucia's past experience in pro-poor tourism, described past and current features of tourism in the project site, and identified current tourism-related skills and interests.

Aware that actual changes and improvements in livelihoods associated with the tourism sector would require a longer time frame than was available under this project, the process focused on a participatory planning exercise that involved:

- visioning: looking at various options and models of tourism development, but without developing full scenarios, a vision and programme for tourism development for Laborie was formulated by the Laborie Development Planning Committee, through a series of community workshops (see Appendix 12).
- accessing information and enhancing knowledge: the project sought to enhance the community's understanding of the local, national and international context of tourism, through one workshop, one public lecture and panel discussion, and several one-on-one discussions.
- designing institutional arrangements: very early in the process, it was recognised that work in tourism development in this community would depend, to a large extent, on the existence and effective operation of suitable institutional arrangements. Efforts were therefore made to support the process to establish the Laborie Development Foundation (LDF), to bring key organisations such as the Laborie Village Council or the Laborie Fishers and Consumers Co-operative (LFCC) into the visioning and planning process, and to create linkages and alliances among these various actors.

At the same time, close contacts were maintained throughout the course of the project with the Saint Lucia Heritage Tourism Programme (SLHTP), an initiative of the Ministry of Tourism funded by the European Commission (EC) and the Government of Saint Lucia. This programme aims at developing community-based tourism activities and at maximising the impacts of the tourism sector on people and communities. The programme is committed to pro-poor policies and actions (Renard 2001) and it has had significant impacts on both policy and practice in the country over the past four years. The Programme has also impacted significantly on policy at the regional level, as it has provided the most advanced example of a systematic approach towards community-based tourism development.

Institutional and process analysis

Institutional analysis

The project reviewed the various tools of analysis available from the literature. In this review, it found particular interest and relevance in the work of the IDS Environment Group on institutional dynamics in natural resource management, with the understanding that institutions can be simply defined as ‘regularised patterns of behaviour’. The *People and the Sea* project first used the IDS framework for institutional analysis in the work done by Chris Buttler (2002).

On the basis of this work, simplified frameworks of analysis were developed for three of the project components (seamoss, sea urchin and tourism), using three ‘levels’ of institutions (or lack of institutions, as this would be equally significant):

- Those that govern access (in all senses of the term) to natural resources.
- Those that govern and determine the ability of people to turn these natural resources into economic and social resources, i.e. products, goods and functions.
- Those that govern and determine the ability of people to convert these economic and social resources into tangible benefits, and into household welfare (income, food, other goods and social services).

The institutional analysis was used in this project as an instrument to understand natural resource governance. Its purpose was: (a) to identify the factors of un/sustainability and in/equity, (b) to identify the significant determinants of resource use and the factors of conflict, (c) to guide management interventions, and (d) to monitor the impact of institutional change interventions. With this instrument, the project sought to identify the institutions which create and perpetuate inequalities and exclusions (or inclusions) of various kinds.

This institutional analysis became the principal instrument to identify and guide interventions on social differences, and it proved useful in incorporating a number of important dimensions, including gender. The project thus decided that it would not need specific instruments to conduct gender analysis or conflict analysis, as these would be adequately covered in the institutional analysis.

This approach recognises that people normally relate to and are influenced by multiple institutions, and that the conventional approach to natural resource management (management plans, single-purpose management agencies) does not suit social and ecological realities

(multiple institutions, ecological uncertainty, economic volatility, social change). Institutions will apply differently to and impact differently on different people, and this framework, if applied to various groups/types, can help to understand social difference.

This institutional analysis was also conceived as a guide to management, a template for the identification of interventions required for management and institutional change. This is true especially when the approach/philosophy is to promote change in order to reach a desirable situation, as opposed to designing and “setting-up” the desirable situation (i.e. the classical approach to management planning).

Process analysis

Towards the end of the project, the research team conducted an analysis of the process and the results obtained, using two sets of questions.

Questions related to the process were examined at a one-day workshop (November 2002) and in several subsequent small workshops and meetings. These questions were:

- How and by whom was the participatory process initiated?
- Who participated, and which others did they claim to represent? Who did not participate?
- How did the hosts of the process, and the different participants, perceive the value of the process? What did 'participation' mean to them and what were their criteria of 'successful' participation?
- What forms of knowledge, expertise and definition of the problem framed the process? To what extent did exchange of knowledge or learning about each other's perspectives take place?
- What styles of deliberation occurred? Consensus-building? Conflict? Latent or hidden conflict? Domination by certain views? What strategies did different participants deploy to make their positions felt?
- How did particular methods shape these styles of deliberation, and facilitate inclusion or exclusion of certain people and views?
- How did this 'invited space' for participation relate to other spaces - including traditional community organisations and forums, and state institutions? How did the dynamics in each impinge on and shape the other, with what consequences?

At the same time, the impact of each project activity on livelihoods, governance and sustainability was examined through the following questions:

- What was the baseline situation regarding natural resources and environmental quality? What processes of change and outcomes have been recorded during the project? How do these relate to longer-term changes? What can be said about the causality of these (e.g. what is the balance between natural and management factors in explaining changes in sea urchin stocks)? How sustainable are the resources in question, and on what does sustainability depend?
- What do we know about the poverty and livelihood baseline in Laborie prior to the project and about livelihood trends over time? What specific processes of livelihood change have been initiated, who have they affected so far, and who have they the potential to affect? Who is excluded?

- What was the institutional baseline (national/local, formal/informal) both generally and for specific issues/resources? What processes of institutional change have been set in motion by the project, whether directly or indirectly? How 'participatory' are these emergent governance arrangements?

This second set of questions was explored by three small teams, each comprising two members of the Steering Committee, who reviewed project results, interviewed key informants and prepared presentations that were reviewed at a project workshop on 9 January 2003.

Linkages and comparisons

The project sought to maintain communication and collaboration with other research initiatives concerned with similar issues, including projects implemented under the auspices of NRSP. This was facilitated by the fact that CANARI had also been involved in the characterisation of Marine Protected Areas carried out as the first step in project R7696 (*Institutional evaluation of Caribbean MPAs and opportunities for pro-poor management*).

On 30 and 31 January 2003, the project hosted an exchange between organisations and communities involved in the project and the Caribbean Coastal Co-management Guidelines Project team from Barbados. On the evening of 30 January, a public meeting was held at the Laborie market, during which presentations were made and information was exchanged. Approximately 50 people attended the meeting. The following day, a workshop brought together a smaller group of persons to conduct a comparative analysis of co-management arrangements in the sea urchin fisheries of Barbados and Saint Lucia, using a framework provided by Dr. Patrick McConney, who is currently compiling the results of the workshop, and will integrate them in results and discussion of project R8134.

Chapter 5: Outputs

The methods described in Chapter 4 resulted in a number of products and outputs in which many of the results of the project are presented.

Documentation plan

At the beginning of the project's final year, an overall plan for the documentation and dissemination of project results and outputs was developed, as presented in Table 1. This plan integrated the outreach and dissemination activities already planned and implemented at the time, those that would be carried out in the final phase, including the preparation of this scientific annex, as well as those that will be implemented after the completion of the project.

Table 1: Summary of project outputs

Target audience	Requirements from project	Media
Laborie residents and resource users, including schools	Validation of and support to local sustainable practices Information on and demonstration of opportunities for development Analysis of and reflection on participation and local governance Opportunities for learning	Research Forum and research partnerships between research agencies and resource users (organised regularly as part of project, will require some form of continuation) Participatory analysis of project processes and findings (January to March 2003) Distribution of case studies and base line documents Placement of full collections of project documents in locations where they will be accessible (village library and all schools) Replacement of the four project panels by exhibits presenting key project results Brief public exhibition of all project materials, including the four panels mentioned above Presentations to organisations and special interest groups, using popular media when preferable and possible
Organisations involved in supporting development work in Laborie	Information on and demonstration of opportunities for development Concrete plans for resource management and development in specific sectors (tourism, seamoss, sea-urchin, pollution control) Analysis of and reflection on participation and local	Research Forum (organised regularly as part of project, will require some form of continuation) Participatory analysis of project processes and findings (January to March 2003) Distribution of case studies and base line documents (done) Presentations to organisations and special interest groups (Village Council, Development Foundation, Fishers and Consumers Co-

Target audience	Requirements from project	Media
	governance	<p>operative)</p> <p>Dissemination of seamoss development plan</p> <p>Dissemination of working paper on local governance</p> <p>Distribution of results of research on pollution (Village Council, Member of Parliament, Ministry of Health)</p>
National organisations involved in coastal zone management, poverty reduction and related development work	<p>Strategies for coastal management and development that benefit the poor</p> <p>Lessons and implications for policy</p>	<p>Preparation and distribution of working paper on local governance and use of that paper in the national PRSP and social development policy processes</p> <p>Video documentary on project process and results, focusing on sea urchin management</p> <p>Presentation of project results and policy implications to staff of relevant agencies, using video mentioned above and Power Point presentation</p> <p>Workshops (30-31 January) to share and compare lessons in sea urchin management between Barbados and Saint Lucia</p> <p>Distribution of project documents, and placement of these documents in National Documentation Centre and other libraries</p>
Regional organisations involved in coastal zone management, poverty reduction and related development work	<p>Methods for participatory planning and management</p> <p>Strategies for coastal management and development that benefit the poor</p> <p>Lessons and implications for policy</p>	<p>Published paper on seaweed farming, submitted to regional scientific journal</p> <p>Preparation of special issue of CANARI's Moss Bulletin and placement on CANARI's website</p> <p>Local production of video documentary on case study of sea urchin management</p>
Training institutions and professionals involved in coastal management and development, participatory processes and research	Lessons, processes and methods used in and developed by the project	<p>Scientific annex to the final report, with the possibility of turning this into a working paper or a book chapter and of contributing to a Caribbean book of NRSP project outputs, looking particularly at alternatives to protected areas</p> <p>Working paper (option of publishing in PLA Notes) on information management, based on functioning system in Laborie, with the possibility of submitting a paper to a journal at a later stage</p> <p>Published paper on sea urchin management, possibly based on comparison with Barbados,</p>

Target audience	Requirements from project	Media
		submitted to international scientific journal
All audiences	Main lessons learned with respect to the relationship between participation, coastal livelihoods and sustainability	Production of TVE/BBC World documentary on coastal livelihoods Local production of video documentary on case study of sea urchin management Complete bibliography of project outputs

Publications from the project

Burt, M. 2002. A study of the social and economic impacts of sea urchin harvesting in 2002 in Laborie, St. Lucia. CANARI LWI Project Document no. 7. CANARI Technical Report no. 318. 7 pp.

Buttler, C. 2002. Assessing marine resources: institutions and institutional development in Laborie, St. Lucia. CANARI LWI Project Document no. 6. CANARI Technical Report no. 305. 56 pp.

CANARI. 2003. The Caribbean moss bulletin. Issue 9. 2 pp.

Clauzel, S. and G. Joyeux. 2001. Tourism in Laborie, St. Lucia: baseline study and identification of potential for development. CANARI LWI Project Document no. 3. CANARI Technical Report no. 293. 15 pp.

Hutchinson, G. 2001. Water quality in the Laborie Bay. CANARI LWI Project Document no. 5. CANARI Technical Report no. 301. 10 pp.

Hutchinson, G., S. George and C. James. 2000. A description of the reef fishery of Laborie, St. Lucia. CANARI LWI Project Document no. 1. CANARI Technical Report no. 291. 10 pp.

Smith, A.H. and J. Gustave. 2001. A description of the harvest of wild seamoss in Laborie, St. Lucia. CANARI LWI Project Document no. 2. CANARI Technical Report no. 292. 4 pp.

Smith, A.H. and S. Koester. 2001. A description of the sea urchin fishery in Laborie, St. Lucia. CANARI LWI Project Document no. 4. CANARI Technical Report no. 294. 8 pp.

Smith, A.H. and Y. Renard. 2002. Seaweed cultivation as a livelihood in Caribbean coastal communities. Paper presented at the *ICRI Regional Workshop for the Tropical Americas: Improving Reef Condition Through Strategic Partnerships*. Cancun, Mexico, June 2002. CANARI Communication no 309:8 pp.

Other project outputs

- Alphonse, U., A. Dominique and J. Dubois. 2001. Results of a household survey of livelihoods in Laborie, Saint Lucia. Unpublished ms. 95pp.
- Hutchinson, G. 2002. Sources, distribution and effects of faecal contamination in Laborie Bay, St. Lucia. Unpublished B.Sc (Hons) Thesis. Queen Mary and Westfield College, University of London. UK. 80 pp.
- Renard, Y. 2001. NRSP/LWI project R7559. Improving coastal livelihoods: institutional and technical options. Poster presented at NRSP workshop *Common pool resources, developing management strategies that can benefit the poor*. Heslington Campus, University of York, 2-3 October 2001.
- Renard, Y. 2002. Participation and coastal livelihoods. *Policy matters* 10:111-112.
- Renard, Y. and A.H. Smith. 2003. Building the foundation for sustainable coastal conservation in the Caribbean. *Sea Grant in the Caribbean* (in press.)
- Renard, Y., A. Smith and V. Krishnarayan. 2000. Do reefs matter? Coral reef conservation, sustainable livelihoods and poverty reduction in Laborie, St. Lucia. Paper presented at the regional conference *Managing Space for Sustainable Living in Small Island Developing States*. Port of Spain, Trinidad and Tobago, 16-17 October 2000. CANARI Communication No. 274:6 pp.
- Smith, A.H. 2001. A study of coastal livelihoods in Laborie, St. Lucia – social, human and financial capital. How different resources are used and integrated into household strategies of different stakeholder groups (R7559). Proceedings of the NRSP workshop *Improving the poverty focus of NRSP's research on the management of natural resources*. Rothamsted Harpenden, UK. 28 November -1 December 2000.
- Smith A.H. and Y. Renard. 2002. Seaweed cultivation as a livelihood in Caribbean coastal communities. Paper presented at the *International Coral Reef Initiative Regional Workshop for the Tropical Americas*. Cancun, Mexico, 12 -14 June 2002. CANARI Communication no 309:8 pp.
- Notes for discussion submitted to the NRSP workshop *Strategic experience of participatory methods and processes for the improvement of natural resources management*. University of Reading, September 2002.
- One of five examples of water management in a programme entitled Net Profits, produced by TVE for the BBC World Hands On series.
- 18 minute video entitled People and the Sea: Managing our sea urchin harvest.

Data on coral reef communities distributed to regional data management centre at University of the West Indies, Jamaica.

Project highlighted on the CANARI web site at <http://www.canari.org/proj.html>

Article on project submitted to NRSP Highlights, published in second quarter of 2003.

Chapter 6: Results

Assessment and baseline surveys

The biophysical environment

The study site includes three bays, Laborie Bay itself, Sapphire to the west and Titwou to the east. Reefs are found in all three, and extend to approximately 1.5km offshore in the first two. Immediately west of Sapphire point is a small mangrove, covering 2.7ha and dominated by white mangrove, *Laguncularia racemosa*. The Laborie watershed covers approximately 100ha, with drainage limited to a number of small seasonal streams plus man-made drains running through the village.

There is little published information on Laborie Bay and coastline. Some of the earliest maps of Saint Lucia, produced in the 17th Century, do not identify the Bay, but in the more detailed maps from the mid 18th Century the Bay is identified as Anse a Charles, which included an island towards the eastern end of the Bay called Islet a Caret which was evidently a turtle nesting site. This was presumably a sand bank and even when it was described in 1787 it was already being washed away by the sea (Jesse 1986). Surveys by the British Navy in the late 19th Century added some details on reef distribution and water depth but these were still not sufficient to identify individual reefs.

More recently, scientific studies of reef communities in Saint Lucia have focused on the west coast, principally in the Soufriere Marine Management Area, an MPA established in 1995. While these are the best known reef areas, they consist primarily of veneers on volcanic rock (Smith *et al.* 2000). Data from monitoring programmes have indicated a decline in live coral cover due to sedimentation and physical damage from tropical storms and hurricanes, loss of live coral cover due to coral disease. The low numbers of key fish species is typical of many reefs around the island and can be attributed to the combined effects of inshore reef decline and overfishing. The only previous description of the reefs in the south of Saint Lucia (Roberts 1972) identified reefs of the southeast coast as being the most developed in the island, and provided detailed information on their flora and fauna. Their structure and community composition have altered over the past three decades, with a loss of live coral cover, particularly of large branching corals. Saint Lucia's steep underwater topography limits coral reef development around much of the coast and the distribution of shallow habitats (<15m) as much as 1.5km from shore is thus atypical of the island.

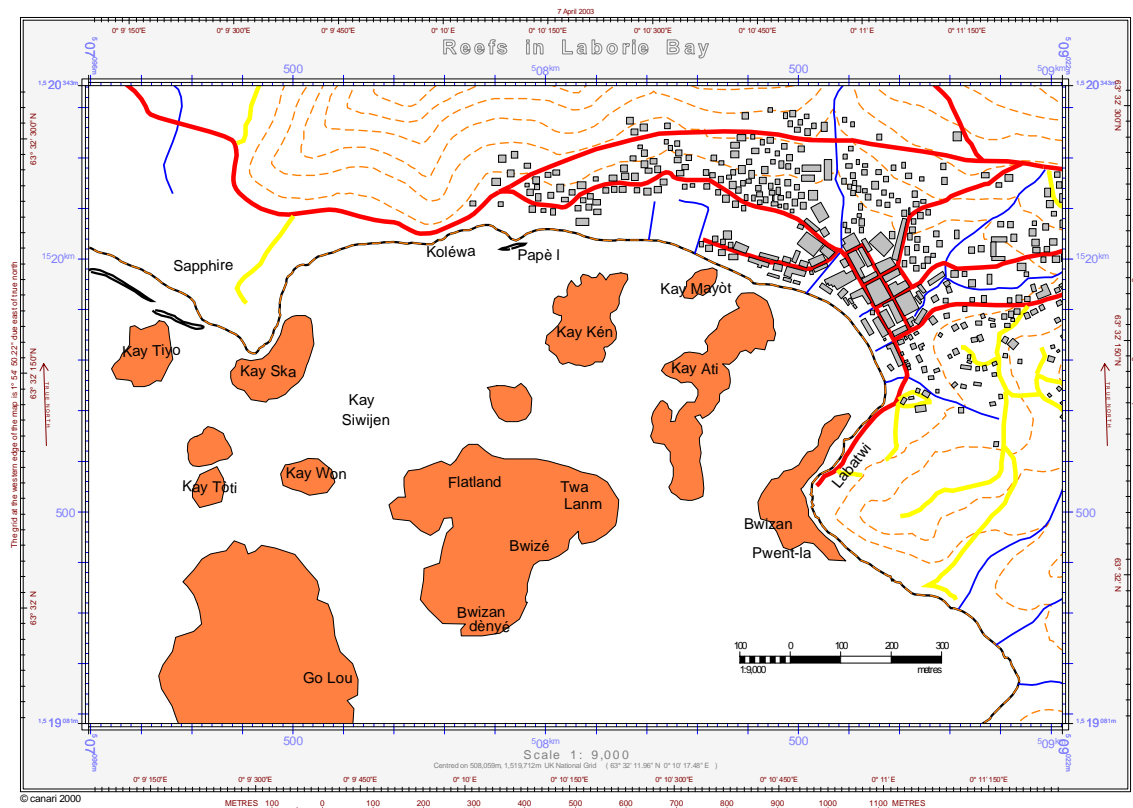


Figure 7: Reefs in Laborie Bay

Many of the reefs and other features in the Bay are known by name. Reefs close to shore are often named after fishermen who live nearby. Kay Kén, for example, refers to the name by which Mr. George Wilfred is commonly known. Kay Siwijen refers to a reef known for its surgeonfish.

Table 2 shows the percent cover of 10 substrate types used in the Reef Check monitoring protocol. It should be noted that the category of dead coral includes only those colonies that show recent mortality, i.e. less than a year. Older dead colonies are classified as rock, a category that includes any hard substrate. The purpose is to detect recent changes in mortality in subsequent surveys. The results show that inshore reefs, particularly Kay Kén and Kay Ati (Figure 7) have low live coral cover, and are dominated by macroalgae.

Table 2: Percent cover of reef substrate categories

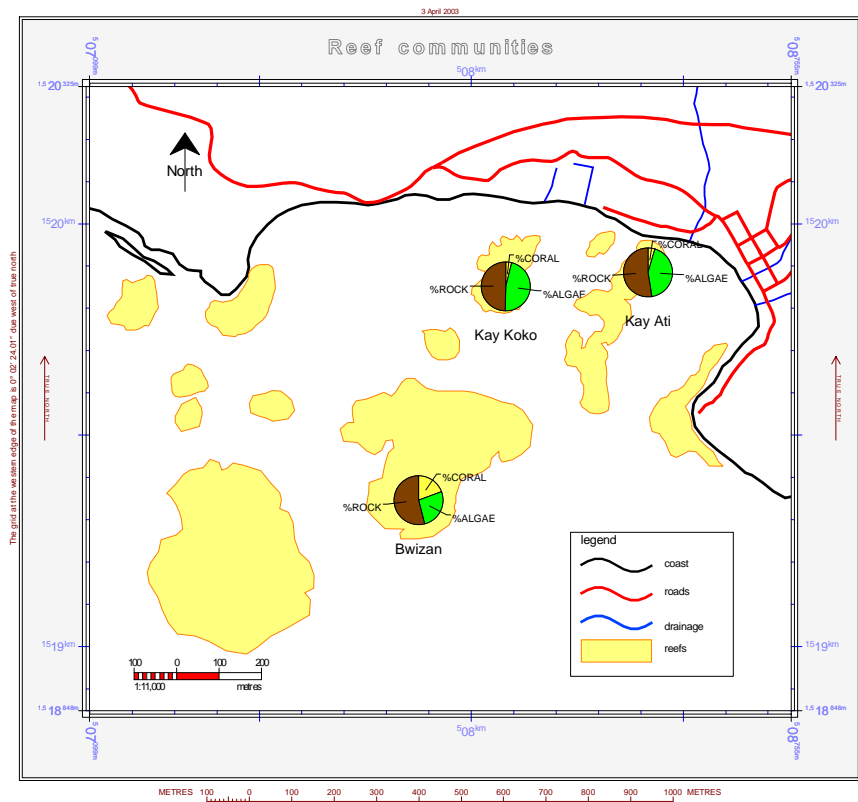
	Reef						
	Kay Kén, inner	Kay Kén, outer	Kay Ati, outer	Bwizan	Flatland	Reef at 1.12km	Bwizan dènyé
% Substrate type							
Live coral	3.8	7.5	4.4	18.1	21.6	31.4	14.4
Soft coral	0.6	0.0	0.6	0.0	1.0	0.0	0.0
Dead coral	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Macroalgae	45.0	55.0	41.3	25.0	17.0	13.5	12.5
Sponge	0.0	0.0	0.0	0.0	0.0	0.5	1.8
Rock	48.1	31.3	50.6	50.6	49.8	45.2	57.1
Rubble	1.3	0.0	0.6	0.0	1.7	4.6	8.1
Sand	1.3	5.0	2.5	6.3	8.9	4.8	5.2
Silt	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.0	1.3	0.0	0.0	0.0	0.0	0.9

Table 2 shows the percent cover of 10 substrate types used in the Reef Check monitoring protocol. It should be noted that the category of dead coral includes only those colonies that show recent mortality, i.e. less than a year. Older dead colonies are classified as rock, a category that includes any hard substrate. The purpose is to detect recent changes in mortality in subsequent surveys. The results show that inshore reefs, particularly Kay Kén and Kay Ati (Figure 7) have low live coral cover, and are dominated by macroalgae.

Although there are no earlier quantitative data, anecdotal information suggests that coral cover and fish diversity and abundance were higher in the past and have declined over the past two to three decades. The pattern of coral and algal distribution in the Bay indicates that elevated nutrient levels are the cause and have resulted in the proliferation of a number of species of green algae associated with eutrophication, including *Dictyosphaeria cavernosa*, *Ulva lactuca*, *Codium isthmocladum*, and *Enteromorpha* spp., as well as various species of cyanobacteria. The pattern of circulation in the Bay is such that large amounts of drift filamentous green algae accumulate in the eastern corner of the Bay. Water in the area is usually highly turbid and samples from there showed the highest levels of coliform bacteria found in the Bay.

The Reef Check substrate category rock includes any hard substrate covered by turf algae and this was the most common type of this category. With increasing distance from shore, live coral cover increases and macroalgal and turf cover both decrease. Some reefs at approximately 1 km from shore have extensive stands of the major reef-building species *Montastrea annularis*. In shallow high-energy areas offshore there are healthy stands of elkhorn coral, *Acropora palmata*, the major reef-building species in the region prior to the 1970s and now much less abundant due to region-wide mortality of unknown cause. Both species appeared healthy and showed no evidence of the diseases or seasonal bleaching that have been recorded in recent years on west coast reefs. Another notable feature of offshore reefs is the abundance of soft corals, particularly the sea fans *Gorgonia* spp. which form extensive populations between 5 and 15m on rocky substrates. These species have been greatly reduced on many west coast reefs where they were collected as souvenirs.

Figure 8: Distribution of live coral and macroalgae on reefs in Laborie Bay



In addition to reefs, the Bay has extensive seagrass beds of mixed *Syringodium filiforme* and *Thalassia testudinum*. These were reported to have been damaged by Hurricane Allen in 1980 but have subsequently recovered and now provide an important habitat for the white-spined sea urchin. Seagrass beds are also a habitat for the queen conch, *Strombus gigas*, but the Laborie conch fishery is now based on stocks found only in deeper water further offshore and accessible only with SCUBA.

Three stations in Laborie Bay have been incorporated into the national coral reef monitoring programme managed by the Department of Fisheries. The programme involves annual monitoring of reefs using the Reef Check protocol. In addition to the applications for local management, the results will be incorporated in the national, regional and global status reports of the Reef Check Foundation and GCRMN, and will contribute to the regional coral reef database managed by the University of the West Indies in Jamaica.

Employment, poverty and demographic baselines

The project has produced a number of important results in relation to the poverty and livelihood baseline in Laborie prior to the project, about livelihood trends over time, and about changes that have taken place over the past three years. Unfortunately, income and household expenditure data that were gathered as part of the 2001 National Population and Household Census are not yet available from the local Department of Statistics. In order to describe livelihood strategies and to assess changes over time, the project has therefore had to rely on other data available from the 2001 census, results of the project's household survey (Alphonse *et al.* 2001), individual project studies and other field observations.

These sources indicate that unemployment is high and has been growing significantly over the past few years, and that it affects young people in particular. For example, there was in 2001 an equal number of working people and job seekers in the 15-19 age group. Another important demographic feature of the area is the high rate of emigration, to other parts of the country and to other countries. This has resulted in the contraction of the overall population, and in a dramatic decrease in the number of young people, especially men. For example, Table 4 shows that there were 206 boys aged between 5 and 9 in 1991; ten years later, there were only 79 males aged between 15 and 19. These patterns are not unique to Laborie, and they have been observed in all the coastal villages in the country that have similar socio-economic characteristics.

Table 3: Employment by sex and age, 1991 and 2001

	Laborie 1991		Laborie 2001	
	Whole district	Village	Whole district	Village
Total work force	2781	1849	3210	1532
Male work force	1375	895	1573	721
Female work force	1406	954	1637	811
Total unemployed seeking jobs	120	104	342	155
Total inactive	981	680	1286	596
Unemployed, age 15-19	47	45	69	27
Working, age 15-19	204	101	69	33
Unemployed, age 20-24	27	19	53	19
Working, age 20-24	300	185	184	73

Source: Department of Statistics, Ministry of Finance

Table 4: Population trends among selected age groups

	Total 1991	Female 1991	Male 1991	Total 2001	Δ n	Female 2001	Δ n	Male 2001	Δ n
Laborie whole, all age groups	4490	2217	2273	4661	+171	2360	+143	2301	+28
Laborie village, all age groups	2948	1488	1460	2205	-743	1152	-336	1053	-407
Laborie whole, age 5-9	647	314	333	353	-294	173	-141	180	-153
Laborie village, age 5-9	409	203	206	139	-270	71	-132	68	-138

	Total 1991	Female 1991	Male 1991	Total 2001	Δ n	Female 2001	Δ n	Male 2001	Δ n
Laborie whole, age 15-19	499	239	260	389	-110	177	-62	212	-48
Laborie village, age 15-19	293	148	145	160	-133	81	-67	79	-66
Laborie whole, age 25-29	392	188	204	283	-109	142	-46	141	-63
Laborie village, age 25-29	272	136	136	93	-179	56	-80	37	-99
Laborie whole, age 35-39	207	109	98	253	+46	126	+17	127	+29
Laborie village, age 35-39	149	76	73	110	-39	59	-17	51	-22

This emigration has affected all sectors and groups in the community. Of particular relevance to the sustainability of coastal livelihoods has been the emigration of people with marine-based skills, many of whom are presently working in the tourism sector in other parts of the country, or outside Saint Lucia. Clauzel and Joyeux (2001) identified twelve people from the Laborie Village working in senior positions in water sport departments at some of the island's main hotels.

Similarly significant in demographic terms is the aging of the population. While the total population has decreased between 1991 and 2001 (see Table 4), the number of people above the age of 70 has increased over the same period from 226 to 264. This increase in the number of older persons has taken place and continues to take place in a general context of economic contraction and growth of poverty, worsened by the general weakening of formal and informal social support systems and networks available to older persons, and by the absence of adequate safety nets.

In Laborie, as in other communities in Saint Lucia and in the Caribbean region, the well being of older persons is a major source of concern, and it is a concern that is directly relevant to natural resource use and governance, because of the dependence of many of these older persons on near-shore coastal resources. Indeed, the surveys and interviews conducted as part of this project have revealed that the Bay and its resources play an important role in supporting the livelihoods of older persons, including older fishers who are no longer able to fish for pelagic species far from shore and to take the physical punishment inherent in deep sea fishing.

Among a broad range of social development and human health issues, field observations and interviews with key informants have revealed the significant negative impact of substance abuse on poverty. Cocaine (crack) and alcohol are the main addictive substances that affect people in this coastal community. Most of the victims of substance abuse are poor men, many of whom depend on marine-related activities (occasional fishing and resource harvesting, fish cleaning, illegal sand mining, occasional labour at the service of fishers and other coastal resource users) to sustain themselves.

The reefs and their contribution to livelihoods

Baseline surveys and other studies carried out as part of this project indicate that the resources of the Laborie Bay support multiple livelihood strategies, and that most people in the area are dependent, to some extent, on these resources. The Bay is particularly important for pot-fishing, spear-fishing (mainly by people from surrounding rural areas) and for casting nets (although there has been a marked decline of this activity in recent years, and this is attributed to the fact that ‘sardines’ (clupeid species) are no longer available). Other fishing techniques include trolling for offshore pelagic species. The fisheries sector contributes significantly to the local economy (André-Bigot 1998).

The Laborie reef fishery was described by Hutchinson *et al.* (2000). This study confirmed the social and economic importance of the fishing sector in the area, and it described the main fishing practices, methods and gears used. This study emphasised the importance of recent technological changes, including the introduction of the fibreglass pirogue, replacing the dug-out canoe which was reported to make up 80% of the fishing fleet six years earlier (André-Bigot *et al.* 1995). It also expressed the view of many fishers that reef resources are being degraded and that this is having negative impacts on the reef fishery. It was noted that some species are now rarely seen, such as goatfish (Mullidae), grunts (Haemulidae) and angelfish (Pomacentridae). Overall it was felt that the average size of landed reef fish has decreased, that the catch consists of more poorer-quality species, and that pot fishermen now depend more heavily on the lobster fishery.

Sea-urchin harvests also provide an important source of cash, and have had historical importance in the area (Smith and Koester 2001). Seaweeds constitute another economically important resource, and seaweed harvests have been important sources of income for decades, especially to people from the nearby community of Piaye, see Figure 2 (Smith and Gustave 2001). The use and importance of these two resources are described in more detail below.

Laborie Bay has been one of the sites where experiments in seamoss cultivation were conducted in the early 1990s, at a time when research in Saint Lucia suggested that this new industry had economic potential. A number of people were trained in cultivation methods and trial plots were established close to shore at Labatwi and Sapphire. At that time only one seamoss species (*Gracilaria* GT) was being cultivated in the island. This species had not previously been harvested or used as seamoss in Saint Lucia and this, plus the fact that its gelling ability was comparatively poor, meant that marketing of the dried product was difficult. However, from 1994 to 1996 cultivated GT supplied a cottage industry that produced bottled seamoss concentrate that was sold in shops and supermarkets. In 1996 a project was conducted on the southeast coast to test the cultivation of *Eucheuma isiforme*. This proved to be fast-growing and less susceptible to the epiphyte infestation that was a seasonal problem with cultivated GT. By 1998 *Eucheuma* had been introduced to Laborie Bay and commercial cultivation resumed. This was the only species being cultivated in Laborie Bay at the start of the *People and the Sea* project.

In all these marine-based activities, marketing was identified as a major constraint. For example, people who had been involved in early initiatives in seaweed farming have mentioned that

marketing arrangements were inadequate and did not allow them to generate sufficient revenue to sustain these initiatives. Similarly, fishers expressed concern about the effectiveness of current marketing arrangements for fish (Hutchinson *et al.* 2000).

There is a small informal commercial sector that is socially and economically important, and that is growing. Within this sector, vending is a major source of income for a small number of people, and this activity is directly dependent on tourism and recreation events. According to the Department of Statistics, there were only 6 persons in Laborie village involved in road side vending as a main source of income in 1991; there are now more than 20 persons in this category.

The Laborie Bay and its beaches are important for recreational purposes, although survey respondents indicate that fewer people use the beach for recreational purposes now than in the past. An important recent development in recreation has been the development of a beach facility known as the Rudy John Beach Park, located at the northern end of the Laborie Bay.

The Laborie Bay and its resources are particularly important to young persons, as the place where a number of marine-based skills and rules are learned. It is in this Bay that young people from the community learn to swim and fish, but it is also there that many of them learn how to manage and share resources, how to collaborate, and how to avoid and manage disputes and conflicts.

Baseline surveys and field studies have provided a good understanding of the status of the tourism sector in the area (Clauzel and Joyeux 2001). They also have revealed strong local expectations that tourism could bring substantial social and economic benefits to the community, and that the proposed reconstruction of a jetty would be particularly beneficial, and would create investment opportunities for some. One of the features of local perceptions at the initial stage of the project was that there appeared to be a very limited understanding of the realities of the tourism sector.

The area has also seen the growth of drug trading activities and of an informal illegal economy in recent years. This activity is significant in many respects, because of the revenue it brings to a number of households and the community as a whole, because of the conflicts and factors of insecurity associated with it, and because of the changes it brings to social networks and institutions.

Saint Lucia's reefs and coast have been impacted by extreme natural events in recent years. In 1980, Hurricane Allen passed over the south of the island and the resulting rough seas caused considerable damage to coral communities and seagrass beds in Laborie Bay. During Tropical Storm Debbie in 1994, 20cm of rainfall were recorded over a period of only four hours at nearby Vieux Fort. Wind gusts were low so there was little physical damage but siltation from erosion and run-off was severe around the island. No quantitative data are available for Laborie but some west coast reefs lost as much as 50% of live coral cover as a result of sedimentation (Nowlis *et al.* 1997).

Experiments and case studies

Cultivation and marketing of Gracilaria

The survey of the history and current status of seamoss harvesting (Smith and Gustave 2001) identified the following:

- The harvest of natural populations was a significant economic activity in the past, particularly for people in the nearby community of Piaye, and targeted two species, *G. debilis* and *G. crassissima*.
- The harvest has declined in the past two decades and few people are now involved in the activity on a commercial level. This decline was attributed to a depletion of stocks due to overharvesting and to the impact of pollution on environmental quality and natural productivity.
- Commercial production of seamoss in Laborie Bay is now based on cultivation, primarily of the carrageenophyte *Eucheuma isiforme*, occupying an area of 0.32ha.

Growth trials with *debilis* using different propagation methods at different sites gave the following results:

- Net tubing reinforced with rope proved to be the most suitable propagation method for *debilis*
- *Debilis* grown adjacent to the *Eucheuma* farm over a shallow reef became covered with epiphytes and silt within three to four weeks, plants fragmented and growth was poor. This was believed to be due to insufficient water motion.
- Relocation of lines to an outer reef with more water motion resulted in much less epiphytism and siltation of most plants, and growth was improved.
- Morphology and growth of plants collected from natural populations showed great variability under cultivation.
- Best results were obtained with a single morphotype identified in early 2002, showing faster growth and producing long loosely branched fronds. Growth of this strain was markedly higher than all other *debilis* plants in the experimental plot.
- Faster growth rate within a species may be correlated with lower gel strength and this relationship needs further investigation.
- *Debilis* can be cultivated but strain selection, for both productivity and agar quality, will be essential for commercial success.

Table 5: Doubling time of seamoss species under cultivation

	Species			
	<i>Eucheuma</i>	<i>Gracilaria</i> GT	<i>Debilis</i> wild	<i>Debilis</i> strain
Doubling time (days)	12.4	15.0	65.0	24.5

Table 5 shows the average time taken for plants to double in fresh weight. The results show that *debilis* collected from wild stocks grows slowly but that selection of faster growing strains can

enhance productivity considerably. A 0.2ha plot of the faster growing strain has been established and the first harvests took place at the end of March 2003. Preliminary analysis of the agar extract of the debilis strain indicated that the gel strength is comparable to that of plants from natural populations and the strain will therefore meet the requirements of the processing industry.

Using the lessons learned from the experience in Laborie, as well as the information available from an exhaustive review of literature, a workshop was convened to identify the issues affecting development of the seamoss industry. The results of this workshop are tabulated in Appendix 9. The key issues that were identified include:

- Availability of information on market demands and requirements, and on marketing procedures.
- Absence of organisations dedicated to the provision of technical and marketing assistance.
- Need for policies that preserve the rights and interests of the poor, e.g. secure tenure and access, assistance to small scale producers to access planting materials and extension and marketing services, and involvement of producers in management and governance.
- Identification of, access to, and management of, suitable space, in terms of suitability of environmental conditions, potential conflicts of use, rights of access, and the formal leasing of areas for mariculture.
- Quality control of marketed products and management of the implications of declining water quality with potential for bacterial and fungal contamination of products.
- Need for continued technical assistance in all aspects of production and marketing.



Photo credit: Julian Dubois

Figure 9: Phillip Simeon and Allan Smith weighing seamoss harvest at experimental farm

The final planning workshop convened by the project aimed to use this assessment of the seamoss industry to identify issues requiring immediate attention and to develop a plan of action for the appropriate agencies. Coordination was seen as a critical element in the implementation of a development plan. To address this it was decided to re-establish the Seamoss Task Force, which had been effective in the expansion of seamoss production in the east coast community of Praslin in the late 1990s. The activities that were selected for immediate action are shown in Table 6.

Table 6: Development plan for seamoss in Laborie: short term actions

Issue	What needs to be addressed	Action	Lead agency/When
Coordination	Coordinating role needed	Re-establish the Seamoss Task Force Update Terms of Reference, led by DOF	DOF, LDF, SLREP, Ministry of Agriculture, LFCC, LCU/April
Zoning	Access rights	Map existing farms Define criteria for zoning Propose and negotiate zoning	CANARI, DOF, SLASPA/March
	Site selection	Identify areas available for cultivation	LDF and DOF/to be determined
	Water quality and pollution	Determine health standards for dried seamoss and products	Bureau of Standards/April
		Test samples for contamination	To be determined by BOS
Marketing research	Demand analysis for raw material	Conduct market testing, with distribution of samples of different species	Ministry of Agriculture, SLREP, Ministry of Commerce/May – July
	Product demand	Conduct market survey	Ministry of Agriculture, SLREP, Ministry of Commerce/May – July
	Establishment of product standards	Provide guidelines to producers	Bureau of Standards/May-July
Investment and financing	Availability of materials (rope and net)	Identify sources and arrange duty-free import and sale	LFCC/April
	Finance	Identify potential sources of funding, e.g. SFA/Credit Unions/Banks/BEL.fund	Task Force/May-July
Management systems	Theft	Expand the Sale of Produce Act to include mariculture products	Ministry of Agriculture/DOF/District Police

Issue	What needs to be addressed	Action	Lead agency/When
	Storm management	Develop strategy for mitigating losses and facilitating recovery	Task Force
	Tenure and rights of access	Finalise procedures for leasing areas and licensing farmers	DOF
	Training and technical assistance	Sustain availability	DOF

Awareness of the impact of sewage pollution on coastal water resources and livelihoods

The community survey on the status of water quality in the Bay carried out in 2001 revealed the following perceptions:

- The primary concern was contamination by untreated sewage from humans and domestic animals.
- Additional impacts resulted from inadequate solid waste management.
- The most polluted area (and hence the source) was the eastern corner of the Bay known as Labatwi.
- Water quality had been declining over a long period of time.

Analysis of water samples, and reef surveys, indicated the following:

- Inshore reefs show high levels of macroalgal cover and low levels of live coral cover compared with offshore reefs, which suggests two possible impacts: (1) eutrophication due to nutrient input from land-based sources, (2) a reduction in the level of herbivory by fish and invertebrates.
- Levels of thermotolerant faecal coliform bacteria are variable within the Bay, but highest levels were recorded inshore in the eastern corner of the Bay. The results in Table 7 are expressed as the number of colony forming units (CFU) per 100ml of water.
- Bacterial levels were high in most ravines running into the Bay, suggesting that the source of input was not limited to the eastern end where seawater levels were highest as many people believed.

Figure 10 shows the location of the water sampling stations in the Bay. The results show that bacterial contamination tended to be highest in the eastern corner of the Bay, and decreased further east and west and with increasing distance from shore. Analysis of water in five of the ravines that drain into the Bay indicated that all had high levels of bacteria, suggesting that contamination was derived from the village as a whole, and not only from drainage into the eastern corner of the Bay.

Surveys of perceptions of eight organisations were conducted in March 2002 and March 2003 (see Appendix 10) to assess their perceptions of water quality in Laborie Bay. In 2003 two of the organisations reported that they knew nothing about it, compared with four in 2002. There was a greater awareness that the ravines and gullies were the main source of sewage pollution.

Increased public awareness was seen as a key element in addressing pollution issues and the Laborie Development Foundation (LDF) has assisted in sensitizing the public using the information generated by the project. Of the four organisations that were aware of water quality issues in the Laborie Bay in 2003, only one plays an active on-going role in maintaining water quality by coordinating beach clean-ups and monitoring. Lack of budgets remained an issue for all organisations, apart from the limited budget allocated for the weekly beach cleanups by the Laborie Village Council.

Figure 10: Sampling stations for coliform bacterial levels in Laborie Bay

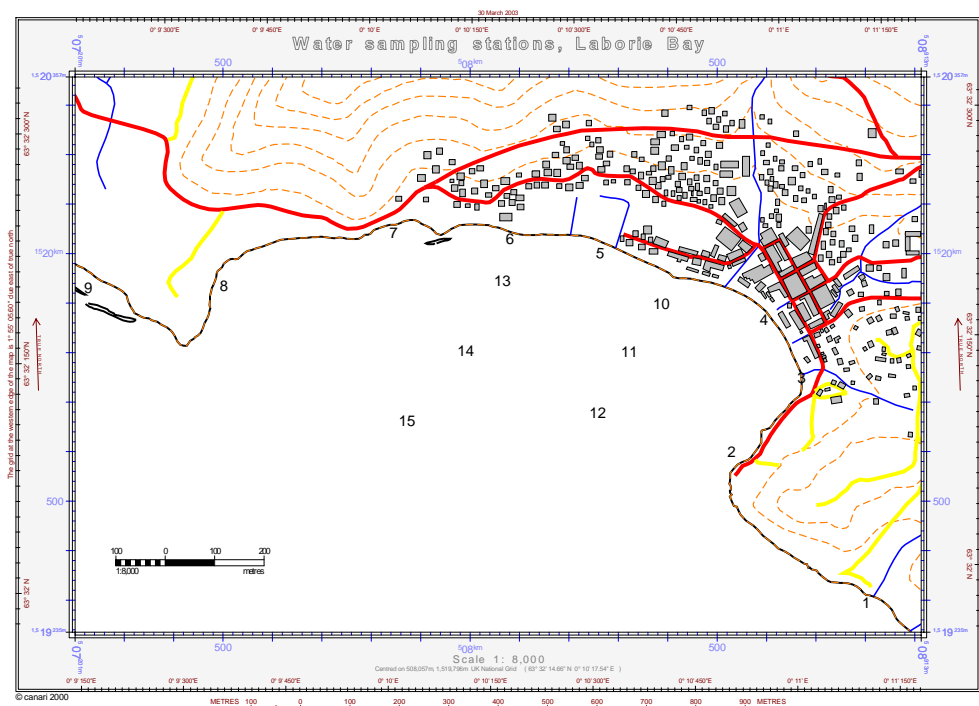


Table 7: Number of colony forming units (CFU) per 100ml of water

A. Stations 1 -15 in Laborie Bay

	Stn 1	Stn 2	Stn 3	Stn 4	Stn 5	Stn 6	Stn 7	Stn 8	Stn 9
Date	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU	CFU
5/4/01	0	0	0	10	85	3280	0	155	0
17/4/01	0	0	95	175	315	5	0	0	0
1/6/01	0	0	0	0	0	0	0	0	0
22/6/01	0	0	315	5	50	0	0	0	5

27/6/01	930	725	3235	1270	360	620	1295	120	70
4/7/01	0	95	1240	1215	165	35	30	10	5
11/7/01	55	40	1290	1915	195	150	590	25	10
18/7/01	170	145	860	420	55	0	5	15	10
25/7/01	40	35	6105	3330	775	335	240	120	20

	Stn 10	Stn 11	Stn 12	Stn 13	Stn 14	Stn 15
Date	CFU	CFU	CFU	CFU	CFU	CFU
31/8/01	990	15	5	25	25	0
7/9/01	5	785	795	4	0	0

B. Stations 1 – 6 in freshwater from ravines and drains entering Laborie Bay
(tntc = too numerous to count)

	Stn 1	Stn 2	Stn 3	Stn 4	Stn 5
Date	CFU	CFU	CFU	CFU	CFU
20/2/02	tntc	1200	1800	940	1770
3/7/02	840	3600	Tntc	tntc	tntc
3/9/02	tntc	tntc	2570	4340	tntc

The meetings held among key organisations to review and discuss the implications of the results of this research confirmed:

- the commitment of the Ministry of Health to address environmental health issues in Laborie, but noted the Ministry's limited manpower at present.
- that the Environmental Health Department of the Ministry would collaborate with the Laborie Development Foundation in guiding the implementation of the Strategic Plan for Laborie.
- that a formal contact person would be identified in the Ministry for liaison with the LDF.

Management options for the sea urchin harvest

Surveys conducted by DOF and CANARI in the mid-1990s showed an almost complete absence of the white-spined sea urchin in Laborie Bay and similar results were reported elsewhere in Saint Lucia and neighbouring islands. The extent of the decline suggested that overharvesting was not the principal cause and that environmental conditions were more likely to have been responsible. The decline in Saint Lucia coincided with the severe sedimentation of inshore habitats resulting from runoff caused by Tropical Storm Debbie in 1994 but it is not certain if this was responsible for subsequent lack of recruitment. The first indications of a recovery of the stocks were seen in 2000, suggesting a successful recruitment in 1999.

Survey data from late 2000 showed a population dominated by one-year old urchins distributed throughout the Bay, on both seagrass beds and algal-covered reefs. The abundance of this size class confirmed that recruitment had been successful in 1999. Sampling in the area of Flatland, a traditional harvesting area, in October 2000 showed a density of 1.95 urchins.m⁻².

By August 2001 the population density was slightly lower at 1.8 urchins.m⁻² and consisted of both one and two year old urchins, representing the recruitments of 2000 and 1999 respectively, indicated by the two modes in Figure 11.

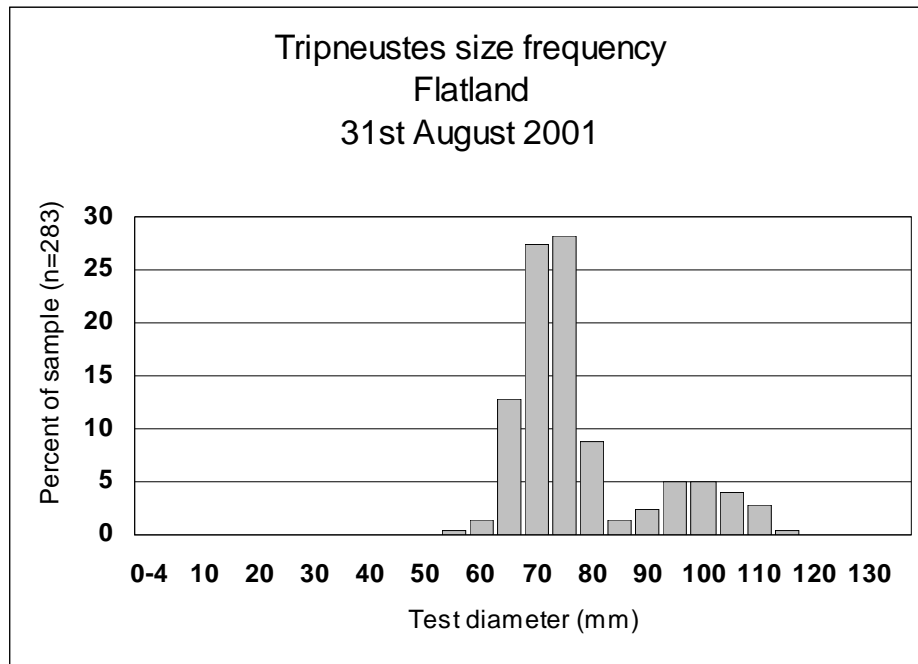


Figure 11: *Tripneustes* size frequency, Flatland, 31 August 2001

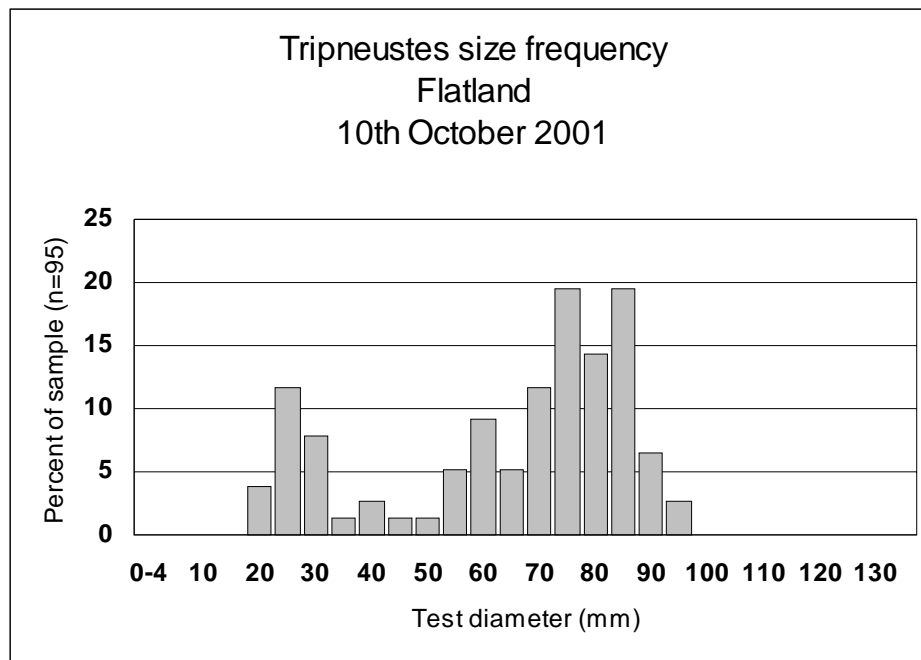


Figure 12: *Tripneustes* size frequency, Flatland, 10 October 2001

By October 2001 the new recruits from the 2001 spawning season were evident in the population, which had a density of 2.5 urchins.m⁻² and the two year old size class was largely depleted by the harvest the previous month (see Figure 12).

Populations of sea urchins are subject to large variations in annual recruitment and hence abundance at maturity. Causes of these fluctuations are still unclear. When this is coupled with the impacts of harvesting and of unpredictable environmental impacts from storms, it is clear that management plans and decisions need to be flexible and adaptive to take this variation into account. Decisions on whether or not to open the harvest and on the timing and conditions in 2001 and 2002 were based on data collected each year. In 2002 the process of data collection and monitoring, information sharing and participatory planning demonstrated an effective approach to adaptive management.

A gonosomal index was calculated, expressed as the fresh weight of roe divided by test diameter (Table). The index increased during the year, as gonads developed, but microscopic examination showed that there were ripe, i.e. reproductively mature, urchins in the population as early as March. By October all urchins in the sample had spawned but gonad index had continued to increase. At that time the gonads consisted of nutritive cells that would later be reabsorbed.

Table 8: Reproductive status of urchins in 2002

Date	gonad wt/test diam	% ripe
8/3/02	0.02	14
4/4/02	0.03	29
24/6/02	0.04	28
22/10/02	0.06	0

Results of monitoring of the stock during 2002 were presented and discussed at community meetings and were submitted formally to the Department of Fisheries, with the recommendation that a harvest season be opened in September. The data were included in the report prepared by the DOF biologists for the Chief Fisheries Officer, endorsing the recommendation from Laborie. The decision to open the harvest, and its timing and conditions (see Appendix 11) clearly reflected the discussions at the public meetings.

Meetings and discussions around the issues of sea urchin management raised the matter of access rights, with a number of people, especially the younger harvesters, advocating formal rules to guarantee exclusive rights to nearby stocks by local harvesters. This generated heated and difficult debates, with more experienced harvesters and other fishers expressing the view that such exclusion would not be desirable, because the people from other communities who would be excluded would inevitably retaliate and prevent access to another fishery. In the end, it was agreed by all parties that formal exclusion was not possible, but that all should be done to ensure that local stocks would be available, in priority, to local harvesters.

Based on further survey data that indicated that there were sufficient stocks following the September 2002 harvest, DOF agreed to open a second harvest in October. In both cases harvesters observed the closing dates and there was evidently an overall satisfactory compliance with harvest seasons and conditions in Laborie. This was in strong contrast to the situation elsewhere on the island. On the southeast coast for example, the provisions of the close season were not respected, and sea urchins were still being offered for sale in Vieux Fort in January 2003.



Photo credit: Allan Smith

Figure 13: Harvester Xystus Clerice preparing sea urchins for sale

A meeting was held during the September 2002 harvest season to assess its progress. It was evident that there was a large stock of urchins and that the harvest had begun successfully. However, a number of participants noted that because of the level of production, marketing options for the processed sea urchins needed to be improved. A specific sea urchin event was proposed, to be held on the last day of the open season, and advertised nationally as *Lafèt Chadon*. The event was used to promote a variety of sea urchin dishes and resulted in a significant increase in sales. In a subsequent review of the event it was decided that it should be held annually and be given wide promotion. The study conducted in November 2002 to assess the economic impact of the two harvests (Burt 2002) noted the following:

- The potential for diversifying the product.
- The importance of adding value to the resource.

- The importance of providing an opportunity to everyone in the community which resulted in benefits to more people compared with the 2001 harvest, notably unemployed youth and women.
- The potential for linking natural resource management with an authentic tourism product that includes local cuisine and local events such as *Lafèt chadon*.

Options for tourism development

The baseline study conducted in 2001 (Clauzel and Joyeux 2001) provided a number of important conclusions. From this study and the various meetings and consultations held on the subject of tourism, it appeared that:

- While this small community cannot be labeled as a tourism destination, there is already a small tourism sector that is based on domestic tourism and on the promotion of natural and cultural assets. This sector provides employment and revenue generating opportunities to a number of people.
- While this area does not possess exceptional features, it has the potential to develop a tourism product that is attractive and marketable (see Table 9).
- The area also possesses significant human and financial capital that can play a key role in support of tourism development.
- In the process of tourism development, there will be a need for management instruments, processes and institutions that preserve environmental quality and sustainability and enhance equity in access to and benefits from the use of resources.
- The community needs a clear vision and plan to guide its efforts in tourism development.
- Current national policies on tourism would not all be favourable to the development of small-scale tourism sector.
- The promotion of a small-scale environmentally friendly and socially conscious tourism in Laborie would have the potential to influence national policy.

Table 9: Natural and cultural assets available in support of tourism development

Type of resource	Current tourism use	Management issues
Overall landscape	Attractive to all visitors	Deforestation, architectural quality
Rainforest and trails	Very occasional	Trail development, and promotion
Waterfalls	Occasional, primarily by locals	Water quality, deforestation
Farms and rural landscapes	No use, but plans being formulated by Black Bay Farmers Association	Product development and promotion
Coral reefs	No use	Pollution and poor water quality near shore, risks of overfishing
Beaches	Extensive use by locals, especially at Rudy John Beach Park, and by residents of local hotel and guest houses	Pollution and poor water quality, user conflicts, sand mining, waste management
Bays	Occasional use for windsurfing, small but regular use by yachts	Need for moorings for yachts

Type of resource	Current tourism use	Management issues
Morne Leblanc site	Occasional, primarily by locals, picnics and family outings	Need for additional facilities, land ownership issue
Architecture and village life	Very little, primarily by passengers on yachts moored in the Bay and residents of local hotel and guest houses	Preservation of architectural quality
Cultural events	Important but few	Need for calendar of activities and promotion of events

On the basis of this initial analysis, the project was able to provide support to:

- A participatory visioning and planning process that led to the formulation of the strategic development for Laborie (LPDC 2000), including specific recommendations on tourism (see Appendix 12).
- Information and education activities, including an evening lecture, a workshop and several informal discussions, to provide stakeholders with a better understanding of the context and constraints of tourism development in Saint Lucia and in the Caribbean region as a whole.
- The participation of community members in training activities aimed at enhancing skills relevant to tourism development.
- The facilitation of negotiations among community organisations in order to foster collaboration and to prevent or mitigate conflicts over responsibilities and authority.

In addition, the project continued to test a number of hypotheses, and obtained the following results.

Table 10: Summary of results obtained from case study of tourism development

Propositions	Project interventions	Indicators	Results
<p>The dissemination of information on the potential benefits to be gained from tourism activities leads to:</p> <p>(a) expansion of business and employment opportunities</p> <p>(b) increased revenue</p>	<p>Dissemination of base-line study of tourism in Laborie (Clauzel and Joyeux 2001)</p> <p>One public lecture and panel discussion, one workshop, and several one-on-one encounters to discuss potentials of tourism and issues affecting its development</p>	<p>Tourism investments</p> <p># of jobs</p> <p>Performance of existing businesses</p> <p># and nature of tourism-related projects supported by the local Credit Union</p>	<p>In this short time frame, the project would not have been able to achieve measurable results. The following results were however recorded:</p> <ul style="list-style-type: none"> • Opinion leaders, tourism operators and other actors have a better understanding of the context and conditions of tourism development • Several persons have expressed interest in, and have made steps towards, investing in small-scale tourism initiatives • The Credit Union has expressed interest in supporting small-scale tourism development and is involved in negotiations with potential clients

Propositions	Project interventions	Indicators	Results
As investment opportunities increase, powerful stakeholders will more readily take advantage of these opportunities, and patterns of power and resource distribution may necessitate specific measures to increase equity in access	Technical assistance and training provided to small-scale entrepreneurs to develop tourism-related activities Mobilisation of, and dissemination of information to, very small-scale entrepreneurs (e.g. vendors)	Profile of investors and business initiatives Activities of beneficiaries of training and technical assistance activities	
Poor and marginalised people can benefit from tourism development if they are given secure access to common property resources	Identification of requirements to guarantee access to Bay's resources Participatory development of a management plan for the Rudy John Beach Park Identification and promotion of other policies to secure tenure	Profile of investors and business initiatives	Agreement among community organisations to proceed with the participatory formulation of a plan for the development and management of the Rudy John Beach Park Confirmation of the need for improved arrangements for local governance, in order to permit the vesting of management authority for key common property resources to local agencies
In order to succeed, (community-based) tourism must offer a product of quality, based on the uniqueness of the cultural and natural heritage of host communities	Technical assistance to product development Training in specific areas Participatory development of standards	Levels of satisfaction of visitors and users of specific products	Small number of tour guides trained Agreement to proceed with development of standards Several products improved
The creation of business and employment opportunities demands that (the right type of) tourists be brought to the community, and that the distance between product and visitor be reduced	Technical assistance to the development of local accommodation	# of rooms # of jobs created by these rooms	All relevant community organisations are now concerned with and interested in tourism development Linkages have been established with relevant national agencies at both policy and programme levels

Propositions	Project interventions	Indicators	Results
Community and stakeholder involvement in planning tourism development will lead to better and more viable decisions	<p>Sharing of information on tourism at Research Forum</p> <p>Provision of support to the involvement of local organisations in tourism matters</p> <p>Lobbying and advocacy with governmental agencies to increase their involvement in the community and encourage them to review and modify their roles and involvement</p>	<p>Involvement of community organisations in tourism matters:</p> <ul style="list-style-type: none"> • at the local level • at the national level 	

More generally, the project concluded that coastal resources can provide important support to the development of alternative and better integrated forms of tourism. The project also validated the ideas and directions formulated in the Strategic Development Plan for Laborie. The main result of the project, in many respects, is that it helped change the dominant policy discourse on tourism in the area, from one that assumed that benefits could and would come from the insertion of this community into the mainstream tourism, to one that embraces the vision of a different, more authentic and better integrated sector that could bring more tangible and more sustainable benefits to people, especially the poor.

The project also concluded that four parallel and complementary directions are needed to realise the vision for tourism contained in the Strategic Development Plan for Laborie, namely:

- Product development, in order to develop a product of quality that is attractive, meaningful and marketable, and that meets international standards. Such a product should include a mix of public and private assets. (In this instance, one missing but essential component of the product is the accommodation; this provides the opportunity to develop small-scale and locally-owned facilities.)
- Policy development, in order to provide for the minimal standards of quality, to facilitate and secure assets to key assets by poor people, and to prevent privatisation of important resources and services.
- Governance and capacity-building, in order to develop meaningful partnerships between state agencies, local stakeholders and the private sector, in order to vest much of the planning and management functions in local organisations, and in order to equip local actors with the skills and resources they need to perform their roles effectively and efficiently.
- Marketing, bringing the visitor (both national and foreign) closer to the product, and ensuring that the product is sold under terms that are truly beneficial to the host communities.

Analysis

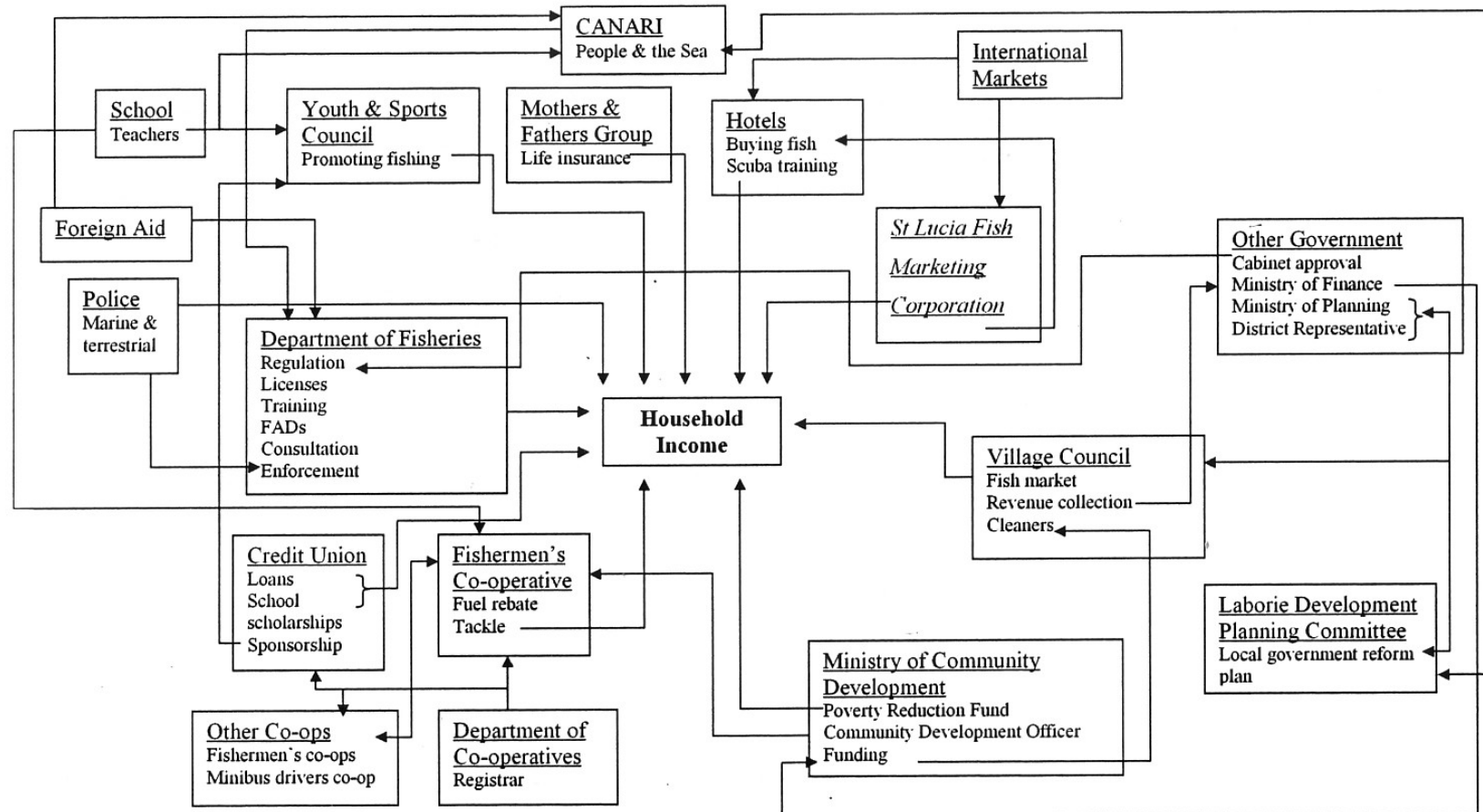
Institutional analysis

The project identified a number of key issues and characteristics of the institutional landscape of coastal resource governance in this project site. The main results obtained in this regard are as follows:

- As shown in Figure 14 (Buttler 2002), there are a number of formal organisations relevant to coastal resource governance and management.
- Before the advent of this project, there were few opportunities for people and informal institutions to participate in the management process.
- Community organisations, including the Laborie Fishermen's Co-operative (recently renamed the Laborie Fishers and Consumers Co-operative), were not directly involved in natural resource governance prior to the activities initiated by this project.
- The severe conflicts that existed within the leadership and membership of the Fishermen's Co-operative were rooted in old family feuds and exacerbated by political divisions.
- Coastal resources in the area are all in public ownership. There is no *de jure* restriction of access, but there are informal territories and rules of access.
- The primary institutional constraint to optimising economic benefits from coastal resource use is the weakness of marketing institutions, and the absence of organisations specifically dedicated to the business, product development and marketing aspects of natural resource use.
- Gender roles and relations impact directly on local livelihoods. Most fishers and harvesters of marine resources are men, with a small number of women playing direct roles in marketing and processing. Resources such as sea urchins and seaweeds however provide more opportunities for the involvement of women.
- Gender relations within households determine the well-being of women. Many women in households that are dependent on coastal and marine resource indicate that the benefits from these resources are not shared equally, in spite of the fact that these women carry the burden of raising children and managing the household.
- The fishing households that are the most successful, in economic (revenue, quality of housing, spending power) and social terms (education of children), are those where the woman plays the central role in managing revenue and assets.
- Generally, there are not many open conflicts over natural resource use in the area.

The three tables below present the results of the application of the institutional analysis framework to the cases of seamoss cultivation, sea urchin management and tourism development.

Figure 14: Organisations impacting on coastal livelihood income (Buttler 2002)



Institutional analysis: seamoss cultivation

Sources: Smith and Gustave 2001 Project meetings and workshops	Issues (equity, conservation and sustainability, livelihood and poverty, capacity)	Directions for change	Indicators of change
<p><i>Access and rights to marine resources.</i> informal division/ allocation of space based on local knowledge</p> <p>provisions of the Fisheries Act governing leases for aquaculture (not applied at present) attitudes to innovation and risk-taking perceptions that women can be affected by work in the sea lack of a coordinating management agency and absence of sustained extension services, yet need for on-going support</p> <p>need for craft to access offshore farming sites Fisheries Act and Regulations governing harvesting of wild stocks</p>	<p>local knowledge required potential conflicts with other coastal uses no security of tenure</p> <p>obstacles to the entry of poor people (capital and risk) exclusion of women</p> <p>obstacles to and absence of incentives for the entry of new producers, including the poor</p> <p>obstacles to the entry of poor people who do not own boats</p>	<p>providing public information on potential benefits, and publicizing successes (with emphasis on the roles of and benefits to women)</p> <p>advocating for the identification of an organisation that assumes direct management responsibility at the national level building local capacity for extension and support services providing encouragement to the use of traditional raft</p>	<p>entry of new farmers into industry entry of new processors into industry</p> <p>entry and involvement of women</p> <p>roles of national and local agencies in seamoss industry</p> <p>ability of farmers to access planting materials</p>
<p><i>The ability to convert natural resources into economic resources</i> absence of effective extension and technical support services weak marketing arrangements, that leave much of the marketing responsibility to the farmer/producer market demands (some species more than others) and standard requirements for exports and for commercial trade</p>	<p>obstacles to and absence of incentives for the entry of new producers, including the poor</p> <p>obstacles to expansion for commercial trade and export</p>	<p>advocating for the identification of an organisation that assumes direct management responsibility at the national level building local capacity for extension and marketing services diversifying species under production</p>	<p>cultivation of <i>G. debilis</i></p>

Institutional analysis: sea urchin harvesting

Sources: Smith and Berkes 1991 and 2001 Project meetings and workshops	Issues (equity, conservation and sustainability, livelihood and poverty, capacity)	Directions for change	Indicators of change
<p><i>Access and rights to marine resources</i></p> <p>open access</p> <p>knowledge, experience and established practice that exists within some families</p> <p>cultural practices and technologies involved in harvesting</p> <p>local rules governing conditions of harvest</p> <p>community property institution at Laborie village level</p> <p>Fisheries Act and Regulations governing open seasons and conditions of harvest</p>	<p>“self-enforcement” and compliance with Regulations in 2002 harvest</p> <p>no community involvement in formulating management decisions (until 2002 harvest)</p> <p>absence of established mechanism to represent the interest of resource users</p> <p>timing and length of open season may result in exclusion of some harvesters (need for boats to access more distant stocks)</p>	<p>reinforcing the institutions of collective decision-making and management</p> <p>building local ownership of decision-making processes, even if decision-making remains the responsibility of state agency</p> <p>empowerment of local organizations and persons to influence management decisions</p>	<p>involvement of local organisations in facilitating negotiations between harvesters and DOF</p>
<p><i>The ability to convert natural resources into economic resources</i></p> <p>marketing arrangements (regulations governing storage and sale outside of harvesting season; regulations governing export; weak local marketing arrangements)</p> <p>processing structures and arrangements</p>	<p>illegal exports part of marketing arrangements</p> <p>fluctuating prices at peak harvest times</p> <p>current arrangements allow for the involvement of large numbers of people, including non-harvesters</p>	<p>improved marketing arrangements to stabilise prices and increase sales</p> <p>market and outlet diversification (e.g. <i>Lafèt chadon</i>)</p> <p>schedule and manage open season in ways that are favourable to poor harvesters</p>	

Institutional analysis: marine-based tourism development

Sources: Clauzel and Joyeux 2001 Working group	Issues (equity, conservation and sustainability, livelihood and poverty, capacity)	Directions for change	Indicators of change
<p><i>Access and rights to marine resources.</i></p> <p>institutions governing access and conflict management (informal arrangements for allocation of sea space, customary rights over beach areas)</p> <p>tenure of and rights to resources that support economic activities that are important to the poor</p> <p>local perceptions and understanding of tourism and its potential impacts on local livelihoods</p> <p>overall public policy environment that governs tourism development (product definition, marketing strategies, incentives and other fiscal policies)</p>	<p>no secure access to common property resources that have the potential to yield economic benefits (e.g. Rudy John Beach Park)</p>	<p>introduce policies that secure and govern access to public resources by the poor (vending at public events, concessions at public facilities, provision of tourism related services)</p>	<p>adoption of policies</p>
<p><i>The ability to convert natural resources into economic resources</i></p> <p>overall public policy environment that governs tourism development (product definition, marketing strategies, incentives and other fiscal policies)</p> <p>cultural factors that influence business and economic enterprise development</p> <p>market demands, including standards</p>	<p>dominant policy discourse not yet favourable to community-based tourism</p> <p>perception that alternative forms of tourism cannot bring significant benefits</p> <p>striking the balance between uniqueness and authenticity of “product”, and international standards and market demands</p>	<p>modify policy discourse</p> <p>provide information and generate debate</p>	<p>business initiatives</p>

Process analysis

The analysis of the processes used in the project provided the following results:

- The overall process was initiated by CANARI, in partnership with the Department of Fisheries. The early involvement of the Laborie Development Planning Committee and the participation of community leaders in the Steering Committee contributed to give legitimacy to the process. Individual case studies and experiments were initiated by the project following a range of consultations and preliminary analyses. Many people and organisations were involved in initiating these individual processes.
- Results obtained in the various case studies and experiments indicate that the topics and issues selected were important and significant. In this regard, one should note the case of the work on pollution, which had not been envisaged at the origin of the project, was included in response to a specific request from local residents, and turned out to be particularly relevant, useful and interesting.
- A large number of people participated in actual project activities. The main moment and space of participation was the Research Forum, where many of the decisions regarding the directions of research were taken.
- The primary participants in the project and its various components were users of coastal resources, including the people who would have most to gain from improved management and governance.
- The least involved groups were: (a) the leaders of established and dominant community organisations, and (b) the very poor and vulnerable, including the elderly.
- Men participated more than women, but women were involved in many processes, and a number of deliberate steps were taken by the project to ensure that women could participate.
- In all phases, the project did not seek to involve people who were not directly concerned with the issues being researched. The project did not try to have as many participants as possible; it tried to reach the “right” participants.
- Organisations played a relatively small role in the participatory process, and most people participated in their individual capacity. But members and leaders of organisations brought with them the legitimacy and strength of their respective organisations.
- To most of the resource users who participated actively, this project was a rare opportunity to become involved in decision-making processes, it allowed them to express views and share knowledge, and it raised their profile in the community. To some of the most marginal people, who are normally not part of formal processes, this was “the only project that [did] not have a political agenda”, and this gave it legitimacy and credibility in their eyes.
- To most resource users, participation was perceived as effective primarily because their views were taken into account.
- The involvement of local people in data collection was beneficial in many ways, particularly because it built local ownership.
- The process also gained much credibility and legitimacy from the fact that it generated tangible economic benefits for a large number of persons, particularly through the sea urchin harvests. It demonstrated a clear link between improved governance and direct household benefits, and it demonstrated the value of monitoring and information management.

- The process was able to integrate and confront different types of knowledge. In most instances, it did not seek to establish “truth”, but simply to facilitate the flow of knowledge and information.
- The participatory processes sought, as much as possible, to separate information sharing activities from decision-making exercises. The project made a deliberate effort to encourage participants to distinguish between “learning” phases, where diverse views would be expressed, and “deliberating” phases, where decisions or recommendations would be made.
- The process was greatly helped by the fact that the participatory process was not led by governmental agencies, but by local organisations, with facilitators who were perceived as independent.
- Scientific information played an important part in the process. In most instances, it was produced and presented in response to needs generated by participants in the project. Appropriate media, including the use of maps projected onto screens at public meetings, were used to redistribute the results of that research. As much as possible, simple and accessible formats were used to present and discuss information and results.
- While the Research Forum and other events proved useful in facilitating inclusion and participation, the project benefited from a number of other factors of participation. Participation, it seems, was as much the result of the credibility of the organisations involved, the new accessibility of information, the respect shown for popular perceptions and knowledge, and the transparency of the decision-making processes originated by the project. In the words of one participant, “more happened outside of meetings than inside the meetings”.
- The project undoubtedly created a new and more favourable space for participation. It was a physical space, thanks to the Research Forum and the other participatory activities. It was an institutional space, thanks to the new networks and partnerships created by the project. And it was a political space, thanks to the legitimacy and status of the project, its linkages with national and regional organisations, and its deliberate efforts to include people and sectors that are normally excluded from formal processes.
- While within the project context these spaces were used primarily for participation around natural resource issues, they also enabled spin-offs into broader processes of community planning and governance reform.

With specific reference to methods, the project found out that the use of appropriate mapping and GIS applications can be an effective tool both for project activities and for different applications for the ongoing benefit of the community:

- It helps in gathering and sharing information at both formal and informal meetings.
- It provides a teaching aid for educational programmes for schools (thus helping in the quality and relevance of teaching aids and topics) and the wider community.
- It serves as a repository and a source of validation for popular knowledge.
- It provides information that can be directly applicable to fisheries management.
- It provides and interprets information for new entrants into activities such as seamoss cultivation.
- It supports information and interpretation for both local and tourism uses.
- It facilitates communication among people with different backgrounds, therefore serving as an instrument of dialogue and negotiation.

- It helps in recording the history of places and events.
- It helps to manage monitoring data and to provide a proof that change can make a difference.
- It can be a source of community pride.

In order to facilitate the transfer of the information management and GIS capability to the community, the project desktop computer was installed in an office of the Laborie Village Council in October 2002. Two teachers from the community were identified to take charge of the system and were provided initial training in the GIS program. The computer holds all project documents, reports and digitised airphotos and maps. The further development of the system as a community resource is included in the succession plan described at the end of this report.

Project impacts

The project has had significant impacts on the host community and on the natural resources that support its livelihoods. These impacts can be summarised as follows:

Environmental impacts

While the time frame of the project would not have been sufficient to detect significant changes to the marine systems, a number of observations on trends were possible and are summarised below.

Table 11: Environmental impacts

IMPACTS	Impacts from sea-urchin management	Impacts from tourism planning	Impacts from pollution awareness	Impacts from seaweed production	Impacts from the overall project
What was the baseline situation regarding natural resources and environmental quality?	<ul style="list-style-type: none"> - stocks recovered from previous low levels - adequate seagrass habitat, recovered from past storm damage 	<ul style="list-style-type: none"> - survey and mapping showed outer reefs suitable for diving and inner reefs for glass-bottom boats - suspected decline in water quality confirmed 	<ul style="list-style-type: none"> - clear perception of reduced water quality and reef condition over a long time - degradation confirmed by water analysis and reef survey 	<ul style="list-style-type: none"> - natural stocks overharvested - overharvested species not being cultivated because of lower productivity 	<ul style="list-style-type: none"> - accessible information now available on the Bay's resources and their status, and in an up-datable format
What processes of change and outcomes have been recorded during the project?	<ul style="list-style-type: none"> - return to annual recruitment; - resumption of harvesting and improved compliance with conditions - greater exchange of information and its use in planning and management - greater public awareness of the resource's potential and management needs (e.g. <i>Lafèt chadon</i>) 		<ul style="list-style-type: none"> - increased awareness of water quality issues and their impacts on natural systems in targeted organisations 	<ul style="list-style-type: none"> - re-introduction of one overharvested species to cultivation - direct involvement of producers in experimentation and development of culture methods (potential capacity building) 	<ul style="list-style-type: none"> - adaptive approach to project planning and implementation (valuable experience for people/stakeholders involved) - greater community awareness of the role of different organisations regarding NRM - increased capacity of community to for monitoring and interpretation
How do these relate to longer-term changes?	<ul style="list-style-type: none"> - established process and information base for adaptive management as fundamental to sustainable resource use 	<ul style="list-style-type: none"> - baseline information can contribute to planning tourism development 	<ul style="list-style-type: none"> - potential for use of information to address causes and mitigate impacts at agency and community levels 	<ul style="list-style-type: none"> - potential for greater production of more marketable species - use of new skills in farm management - potential for involvement of 	<ul style="list-style-type: none"> - relevance to other local and national government programmes - positive contribution to Laborie's strategic development plan - database transferred to community with training in its

IMPACTS	Impacts from sea-urchin management	Impacts from tourism planning	Impacts from pollution awareness	Impacts from seaweed production	Impacts from the overall project
				new producers - potential for less dependence on natural stocks	management
What can be said about the causality of these (e.g. what is the balance between natural and management factors in explaining changes in sea urchin stocks)	- initially a natural process of recruitment and stock recovery - maintenance of stocks at least partly due to managed harvests - effectiveness of management partly due to nature of the resource, e.g. seasonality of urchin development	- lack of integrated zoning - failure to address water quality issues through management of land-based activities	- lack of awareness of sources and causes, and the contribution of the wider community to the problem	- lack of holistic approach to seamoss production (e.g., wild stock conservation and cultivation promotion and management)	- greater awareness of the importance and opportunities of the NR base for existing and potential livelihoods
How sustainable are the resources in question, and on what does sustainability depend?	- harvest is potentially sustainable - depends on habitat quality and suitable weather conditions (no severe storms) - depends on adaptive management based on information, - support for compliance	- sustainable if carrying capacity of different activities understood, land-based pollution reduced, - use of natural (and other) resources to develop a unique product	- sustainability threatened if pollution issues are not addressed - planning and development controls needed - greater community awareness and action needed - adequate government policy and resources needed	- integration of mariculture into a broader development plan for the industry - integration into a broader development and zoning plan for the Bay - addressing critical issues other than environment and technology, particularly marketing - maintenance of adequate environmental health and water quality	- sustainability of project approach depends on dissemination of appropriate information and materials to govt. and community development organisations

Poverty reduction and livelihood impacts

In order to assess these impacts, the project examined the specific processes of livelihood change that have been initiated. The main results are summarised in the table below.

Table 12: Poverty reduction and livelihood impacts

Impacts from sea-urchin management	Impacts from tourism planning	Impacts from pollution awareness	Impacts from seaweed production	Impacts from the overall project
<p>Income from sea urchin harvests (2001 and 2002, with variations)</p> <p>Income at time (school opening) that is particularly critical for poor households</p> <p>Income for young persons who have few sources of income</p> <p>Increased revenue generated through marketing event at the end of the harvest season (following identification of marketing as a limiting factor)</p> <p>Marketing event linked to (national) tourism</p>	<p>Potential of tourism to have a significant impact on employment and income (probably much greater potential than any other sector)</p> <p>Other resource uses, as long as they are sustainable, contribute to tourism (e.g. seamoss as part of the tourism product)</p> <p>Income from vending (current and potential)</p> <p>Income from yachting (current and potential)</p> <p>Limited opportunities as long as there is insufficient accommodation for visitors (awareness of this)</p> <p>Publicly-owned assets (beach park, beaches, sea, streets, etc.) offer main opportunities for income for poor persons, but need to guarantee and secure access</p>	<p>Awareness of the severity of the pollution issue, and of the some of its causes</p> <p>Action taken by local and national agencies to address problem</p> <p>Commitment to act</p>	<p>Demonstrated economic potential</p> <p>Technical feasibility</p> <p>Potential source of income and part-time employment</p> <p>Compatibility with other components of coastal livelihood strategies</p> <p>Establishment of one commercial farm</p> <p>Training of several people</p> <p>Policy requirements to protect the needs of the poor producers identified</p>	<p>Greater awareness of the importance of the Bay, in general, and to specific groups (older persons)</p> <p>No evidence of increased resource use or increases in unsustainable resource use practices as a result of economic difficulties</p> <p>Demonstrated livelihood benefits from improved natural resource management</p> <p>Overall strategy identified and implementation begun</p>

Institutional impacts

The impacts of the project on local institutions, policies and policy processes, and governance, can be summarised as follows.

The project has impacted positively on the national policy process, by:

- Confirming, to the Department of Fisheries and other actors, the benefits to be gained from participatory processes.
- Encouraging and facilitating the implementation of policy, especially with respect to sea urchin management and seaweed farming.
- Strengthening the case for integrated coastal zone management at the national level.

With respect to the content of policy:

- The project has not yet impacted on national tourism policy, but the project site has the potential to have a significant impact on such policy, as long as the work that has been initiated continues.
- It has also strengthened policies that favour decentralisation and collaboration, particularly as it pertains to the involvement of fishers' organisations in natural resource management and coastal development activities and processes.
- In support of decentralisation policies, it has demonstrated some of the roles that local organisations, including fishers' co-operatives, can play in management and local development.
- The project has not yet had any direct impact on local governance policy, but the experiences of *People and the Sea* and the Laborie Development Foundation will soon feed into national debates and policy processes related to local governance (Poverty Reduction Strategy Paper and National Social Development Policy).

The impacts of the project on local participation in natural resource governance have been:

- An increased role of the LFCC in resource management and development (recognising seamoss farming potential, serving as a broker and facilitator in sea urchin management, mobilising fishers, supporting heritage tourism initiatives, and getting involved in marketing and business aspects).
- An increased awareness and involvement of the Laborie Village Council, and its commitment to pursue work in tourism and pollution control.
- The widespread realisation among project participants that there is a need for local involvement and for increased local capacity in marketing, production and business aspects associated with natural resource use and coastal development.

Turning to broader impacts of the project on governance, partnerships and collaboration, the project has:

- Increased local demand for transparency and participation.
- Strengthened linkages among a variety of actors.

The project has also impacted positively on organisational capacity at the national and local levels, by:

- Transferring research, facilitation and planning skills to local actors.

- Increasing the ability of DOF to deliver its resource management and development mandate, in spite of resource constraints, thanks to partnerships with community and other stakeholders.

With respect to local development initiatives, the project has:

- Helped build a vision and a foundation for alternative approaches to tourism development, and raised the profile of Laborie as a candidate for future work in collaboration with Saint Lucia Heritage Tourism Programme (SLHTP)
- Increased focus and attention on environmental health and water quality issues at the local and national levels.
- Confirmed the potential of seamoss as a viable industry, provided support to experimental farms, and produced a comprehensive development plan.
- Placed coastal resource management closer to the centre of the concerns of community and national development agencies.
- Built an information base and a data management system that can continue to support resource management and development initiatives at the local level.
- Inspired a search process where people and organisations in Laborie are now evaluating their endowments to determine how best they can be used to improve livelihoods.

Chapter 7: Discussion

Project methodology

The overall approach used by the project contributed directly and effectively to the achievement of project objectives. In this project, research and development work were closely integrated, as specific research activities were directly relevant to local natural resource management and development needs. To many local actors and observers, *People and the Sea*, as the project was known, was a development project, one that aimed at addressing issues of direct concern to poor people. Yet, the project was able to retain its focus on broader research questions and to use these local development initiatives as case studies and sources of data and broader lessons.

The project also benefited from a good range and mix of research activities, with the use of both quantitative and qualitative methods, and with a good integration of research into local development processes. Thanks to this diversity of approaches, the project was able to benefit from a range of disciplines, to use rigorous research methods and to maintain its relevance to local needs and conditions, without losing sight of its broader research agenda.

The project however encountered some difficulties and setbacks. The main obstacle to the achievement of original objectives was, without any doubt, the short duration of the project and its inability, within a time frame of three years, to produce measurable changes on the ground. Reef conditions that are affected by sewage pollution do not recover in such a short period of time, and it takes more than a few months to generate employment from a radically new approach to tourism development. For this reason, the project was not really able to use and improve the monitoring framework that it developed (see Appendix 7), and it is now unable to provide many measured impacts on livelihoods and sustainability.

This does not however mean that the project was not able to generate broad conclusions, but it means that these conclusions are derived more from the processes that have been facilitated than from the direct results of these processes. It also means, and this is perhaps one of the greatest achievements of this project, that measurable results will become available at a later stage, because most of the processes initiated by the project have been incorporated in the work and programmes of local organisations, and will therefore be continued beyond the life of this project (see Chapter 9).

One of the main weaknesses of the project came from a lack of clarity, at least in the early stages of the project, on the possible and desirable place of participation within the processes and activities that it initiated. In many respects, the project suffered from what has been called the tyranny of participation (Cooke and Kothari 2001), having been made to believe that all its activities had to be participatory. Consequently, the project undertook activities that were not needed, and it tried to introduce participatory methods and approaches in steps and activities that in retrospect did not need to be participatory.

This observation suggests that the project actually had two levels of research, and that each level had its specific participation requirements, based on who the stakeholders were. One level was

the broader research on participation and sustainable livelihoods, and the stakeholders in that research were NRSP, DOF, CANARI, IDS and local people interested in the analysis of natural resource governance issues. These stakeholders shared a research agenda, reflected in a logical framework and a project document, and they all had to be involved in implementing that agenda. The second level was that of the specific case studies and experiments, and these field research activities included a much larger variety of stakeholders, i.e. the people and organisations who had an interest in, and could be affected by, the outcomes of these activities, whether in pollution control, tourism development or mariculture.

This point can be illustrated through an examination of the respective roles of the Steering Committee and the Research Forum, as described in Chapter 3. The Steering Committee was not conceived as an instrument of direct stakeholder participation, while the Research Forum was. The Steering Committee was an instrument of participation among a limited range of stakeholders (NRSP, DOF, CANARI, IDS and the small group of local colleagues), giving them the opportunity and responsibility to guide the entire process and to learn from it. The Research Forum, on the other hand, quickly became an instrument of participation for a wide range of stakeholders, which included members of the Steering Committee. It is indeed interesting to note that the Steering Committee was particularly active in the early and final stages of the project (design and analysis), while it faded out during the main implementation phase, giving space to the Research Forum as the main formal mechanism for consultation and exchange.

The project benefited greatly from the broad and diverse range of human resources placed at its disposal. Thanks to IDS, DOF and CANARI, it brought highly qualified scientific expertise to this process. Meanwhile, community leaders and local development activists in Laborie contributed their intimate knowledge of their community, a passionate commitment to local development and empowerment, and an impressive range of formal and informal research skills. By involving several local people in research, the project further demonstrated the role that non-scientists can play in research projects and processes, and it confirmed that research could be an important instrument of local capacity-building.

This project also served to highlight the role that communities and other intended beneficiaries could and should play in defining research agendas and framing research questions. When given the opportunity to define priorities, people do focus on issues that are relevant to them and to the wider society. When given the opportunity to participate in the various phases of a research initiative, they shape that initiative, they make it responsive to their needs, and they demand results. Even when formal science suggests opposite directions, they do not fail to insist on the issues that are of concern to them.

The integration of scientific data and popular knowledge can be a powerful tool of management. In the study on sea urchin management, this integration provided an effective means of establishing the timing and conditions of harvests and probably played an important part in the high level of compliance with the regulations that was seen in Laborie. If local knowledge had been ignored, people would have responded in different ways to the rules and conditions that were set.

The process of gathering information on the biophysical aspects of the study area demonstrated the effectiveness of some of the tools in GIS applications. GIS has had only limited application to the marine environment in Saint Lucia and there has been little mapping of marine resources. It was evident that the costly GIS programmes most commonly used were not needed but that any digital information developed in the project should be compatible with existing databases. The main requirement was to be able to use existing maps and airphotos as the basis for mapping new information on resources and their use in the study area. The GIS program selected for this, Map Maker, was particularly versatile in its capacity to work with both raster and vector files and was found to be an excellent mapping tool. Despite having many advanced and powerful GIS features, the program is relatively easy to learn and it is therefore appropriate system for ongoing use for information management by local organisations.

Resource management

Mapping and surveys of the reefs in the study area have confirmed local perceptions of a decline in environmental health. The abundance and species composition of the algae that dominate the inshore reefs are indicative of pollution by nutrients, in this case from land-based sources. The recent studies on the effects of sewage pollution on corals, and the evidence of such pollution in Laborie suggest that this may be another cause of the low level of live coral cover close to shore. While the project time period was too short to detect changes in reef community composition, it provides a baseline description of reef condition. The inclusion of some of the reefs in the national reef monitoring programme will provide the long-term data that will allow the detection of future changes that may result from management interventions.

The study confirmed the community's perceptions about the types of pollution that affect water quality in the Bay, particularly the presence of sewage pollution. While the study showed that the levels of bacteria associated with sewage pollution vary with place and time, some areas show consistently high levels. This study concluded in particular that while the pollution was concentrated in the south-east corner of the Bay, the entire settlement contributes to pollution. It therefore contradicted the dominant perception in the community that the Labatwi community was the source of the problem. In light of the social status of this community, created at the beginning of this Century by people who came from a nearby estate, it is possible that this environmental phenomenon was used by the larger community to forge, strengthen and change its social perceptions. Considering dominant forms of racial and social prejudice in Caribbean societies, it is not surprising that the wider community found it convenient to blame the people from Labatwi for a problem that was considered serious and potentially dangerous.

The many meetings, discussions and presentations that took place as part of this experiment revealed or highlighted a number of important issues concerning the role and responsibilities of the project, with implications relevant to research projects of this type elsewhere.

The issue of sewage pollution, which local residents had identified as a primary concern and as a priority for research, was shown to be a very serious issue indeed. Moreover, it is an issue that is of immediate concern to poor people and households, as it affects the health and the quality of life of all. While local people and organisations were aware of the problem, they could not assess

its extent and severity, and thus greatly welcomed data that validated many of their perceptions and gave weight to their claims. Thanks to this process of testing and validation, it has become clear to all organisations concerned with community development in the project site that this issue of sewage pollution requires priority attention, especially in light of the community's desire and commitment to develop tourism as an economic activity.

Information on levels of coastal pollution in Saint Lucia are not generally available to the public and the only readily accessible data concern levels of sedimentation at coral reef sites that are monitored on the west coast of the island. It was initially planned that the results of water quality analysis from Laborie Bay would be widely disseminated. However, it was soon realised during presentations of the data to the Research Forum that this dissemination, and the results themselves, could be wrongly interpreted as meaning that the condition is unusually severe and specific to Laborie. It was felt that a plan of action to investigate options for reducing sewage pollution in Laborie should first be developed through the collaboration of community organisations and the Ministry of Health. Any dissemination of information on pollution would then include a message indicating the steps being taken by the community to address a situation that no doubt affects all coastal communities on the island.

The results showed that while pollution levels tended to be higher in one area of the Bay, the sources of pollution were more widely spread among various ravines and drains leading into the Bay. The investigation of options for reducing pollution will therefore address issues concerning the whole community and not focus only on the area of poorest water quality.

This research brought to the fore a number of critical questions that are currently being examined by organisations in the community. In cases where information dissemination can be controversial or damaging, it is not easy, but it is essential, to determine what could and should be done with the information, who should get it, and in what form.

While the status of inshore reefs was known, at least in qualitative terms, there was less information on reefs further from shore as fewer people visit them as divers. It was therefore encouraging to see the abundance of healthy corals away from shore. Despite the reefs being dominated by the star coral *Montastrea annularis*, presently the main reef builder in the Caribbean, there are also extensive patches of the elkhorn coral *Acropora palmata*. This species was a major reef builder in the past, particularly in shallow high-energy areas, but has suffered region-wide mortality. It was also widely harvested for the production of lime but that practice has ceased in Laborie. Laborie Bay also has extensive patches of sea fans which are largely absent from most of the easily accessible reefs elsewhere on the island, due to harvesting and the impacts of storms. In general, the offshore reefs in Laborie Bay offer opportunities for recreational diving that compare favourably with the most popular sites on the west coast of the island.

Saint Lucia has been a centre for research on seaweed cultivation for over 20 years and the first commercial plots were established in 1984. The results of the project have shown that further work is still needed in both technical and economic aspects. The issue of most concern is the need to improve marketing of seamoss and its products. Diversifying the species under

cultivation to include species in greatest demand should contribute significantly to this. This has been addressed in many tropical countries by introducing exotic species of proven quality and productivity, notably species of *Eucheuma* and *Kappaphycus*. The present project has demonstrated that there is still potential to develop indigenous species without risking the inherent danger of introductions. Although the majority of problems caused by invasive and exotic seaweed species has involved accidental introductions of species of no commercial value, there is still concern regarding the introduction of exotic crop species. The principal concern is that exotic species may spread from farms, with negative impacts on benthic communities, particularly coral communities. In the present case, the cultivated species are readily consumed by urchins and herbivorous fish. In earlier experiments to test the effect of proximity to substrate on production, seaweed lines on the substrate were completely denuded within 24 hours. In addition to the potential for uncontrolled spread of an introduced species, there is also the potential for the introduction of additional pest species as epiphytes.

Another potential negative impact of seaweed farming which has been seen in various Indo-Pacific locations, is the rapid expansion of farmed areas that exclude or limit other uses of inshore environments. Those examples, however, involve very large-scale production of low-cost raw material for the phycocolloid processing industry. In comparison, the high price and relatively limited local and regional applications of seamoss mean that farming on much smaller scales can be profitable. In addition, the establishment of seaweed farms in Saint Lucia is regulated by the Department of Fisheries and the St. Lucia Air and Seaports Authority to ensure that appropriate areas are used.

Negative social and economic impacts have also been caused by the introduction of seaweed farming, for example in Tanzania, where the technology was intended solely for the production of an export crop in areas where there was no tradition of seaweed exploitation. In Caribbean communities such as Laborie the cultivation of seamoss is considered an appropriate activity.

Strain selection for faster growth rates has proved to be an important factor in successful seaweed cultivation but this can have unforeseen results. A strain selected for an improved feature may show poorer qualities in others. Fortunately in the case of *Gracilaria debilis* the selected strain maintained the gelling ability of the wild type, which is the principal requirement of the processing industry.

Despite the developments in production technology, including the improved method of seeding lines, the number of other issues that were identified that have hindered the expansion of seamoss cultivation showed that much remains to be done. In this regard the reconstitution of a Seamoss Task Force is an important development. The short term action plan developed under the project shows that a number of agencies have important roles to play and that a coordinating function is therefore critical to progress.

The study of sea urchin management demonstrated the need for flexibility in management strategies. Stocks can vary greatly from year to year, as shown by the rapid increase in abundance immediately prior to the start of the project following five years of little or no recruitment in Laborie or elsewhere around the island. Management decisions therefore need to

be guided each year by information from monitoring. The data on population structure were used in 2001 and 2002 to inform discussions and the resulting management decisions in Laborie, as well as contributing to the national programme for urchin management. The co-management arrangement for the harvest that operated in Saint Lucia in the 1990s was based on a size limit for harvestable urchins. At the start of the harvest each September the stock consisted of one and two year old urchins and the size limit allowed harvesting of the older size class, or cohort, only. The same approach was used in 2001 and 2002 and proved to be effective in Laborie. Harvest conditions based on allowable catch and spatial rotation, which have been applied to sea urchin species elsewhere in the world, require a level of surveillance that is not possible in this case. Assuming an adequate level of compliance by the harvesters, a size limit based on clearly distinguishable cohorts has proved to be an effective and efficient approach.

Restricting the harvest to one of two cohorts may also have the advantage of enhancing recruitment. Studies of other tropical urchin species have shown that larval settlement is cued by the presence of adults. Settlement of larvae, which typically occurs soon after the harvest season, would therefore be cued by the unharvested one year old cohort.

The rapid increase in abundance of the urchin raised some concerns when grazing pressure resulted in a decline in the density of seagrass beds at various sites around the island. However, grazing is beneficial to the health of seagrass beds as it reduces the settlement of organic matter and nutrients which can promote an increase in seagrass diseases and can reduce oxygen levels. In addition, the seagrass rhizome system remains undisturbed below the substrate and readily replenishes the grazed biomass.

It should also be noted that while the abundance of urchins increased to harvestable levels during the period of study, at no time did the densities reach the levels recorded in the same locations in the 1980s. At that time, densities were three to four times higher in the latter part of each year following annual recruitment. The data from the earlier studies also showed that there was a steady decline in abundance following the recruitment peaks and that at the time of harvesting in September, numbers were comparable to those found in the present study.

The results from assessment of reproductive maturity were valuable in interpreting people's perceptions of the resource. In biological terms, urchins are ripe when gametes are mature. At this stage urchins are induced to spawn when they are handled, as during sampling. After spawning the gonads remain large and firm and consist primarily of the nutritive cells that supported the development of the gametes. These cells are gradually reabsorbed and the gonads shrink until the onset of the next year's reproductive cycle. Harvesters describe these phases somewhat differently. Roe that releases gametes when handled is described as melting, and is considered immature. Roe is considered mature if it maintains its firmness when extracted, which corresponds to the post-spawning phase. This has an obvious advantage as harvesting targets the population after most urchins have spawned. As urchins spawn first in their first year, this means that the preferred harvesting strategy allows all cohorts to reproduce each year.

The prevalence of illegal harvesting seen elsewhere, particularly in Vieux Fort, suggests that management measures developed in one area are not always applicable to others. Too often,

resource managers define and adopt measures that cannot be transferred from one location to another. Solutions specifically tailored to a particular place or community may be more difficult to design, but easier to enforce.

Early work on the management of the sea urchin harvest in Saint Lucia encouraged the formalisation of harvester groups with identified representatives for negotiation with the management agencies. The present study has demonstrated that a formal transfer of management authority is not always appropriate or necessary. It has also demonstrated that even when resource use practices are well-established, there is potential to enhance economic returns through new and diversified marketing arrangements, such as the *Lafét chadon* event held in 2002.

Participatory planning

In participatory planning, information is critically important, as an instrument of empowerment, as a mechanism to combat unequal power relations, and as the foundation that stakeholders need in order to assess options and make decisions. The outcome of participatory planning processes depends on the quality of the information available, it depends on the process used to gather that information, and it depends on the extent to which that information has been shared, validated and interpreted. In practice, this means that participatory planning processes need places and moments in which all types of information can be shared and debated, even confronted if necessary.

Scientific investigation has an important role to play in participatory planning, and its usefulness can be greatly enhanced if it addresses existing concerns, and raises questions instead of simply providing answers. At the same time it is not the only source of information needed for planning. Popular knowledge and people's perceptions have an equally important place, not only because of the information they hold, but also because the incorporation of that information is an essential and empowering part of the participatory process. This is not to say that all popular knowledge is accurate or correct, and its validation should be an important part of scientific methods. Indeed, the process of integrating these sources of information can be a very effective way of facilitating dialogue among different perspectives.

In many respects, the purpose of acquiring and disseminating information is to create and promote equality in the negotiation process, as this equality requires equality in information. As illustrated this project's experience, the scientist needs to hear and respect the fisher's knowledge, and the fisher needs access to the information gathered by the biologist. They will also become more equal partners in the research and planning process if they can pose and frame the questions together, even if they provide separate answers to these questions. Their knowledge may remain different, their systems of knowledge may remain different, but they will come to the negotiating table on a more equal footing than if the information and knowledge they possess had not been shared.

This project has also revealed the importance of forms and formats in deliberative and participatory planning and management processes. In this case, one critical factor of success has

been the use of the local village market place as the venue for regular project meetings and other events, including the Research Forum. Indeed, meeting venues, language, attitudes, formats of discussions, arrangements of meeting rooms or the use of informal interaction are all factors that can hinder or promote involvement in a process.

The project also confirmed the need for deliberate methods and efforts to include those who are normally excluded. Meetings at times become mere symbols of participation, and projects and processes that claim to be participatory because they hold workshops and meetings are deceiving themselves. In a way, these conventional participatory methods appear specifically designed for healthy middle-aged men, but they typically exclude many stakeholders. For a start, there are ways of organising and scheduling meetings in a manner that facilitates the involvement of women, and managers of planning processes must be cognisant of this fact, by selecting the most appropriate date, time and venue, by ensuring that the duration of a meeting does not preclude participation by some people, or by offering transportation in the evening at the end of the meeting. There are also activities, such as the glass-bottom boat trips that this project organised, that can help to involve children, who are not normally part of these processes.

But regardless of the quality of the attention paid to the form and format of planning events, events are not sufficient. The very poor, the elderly or those who live on the margins of society do not and cannot participate in formal processes. This requires informal discussions to seek the views of those who do not attend meetings, it requires conscious efforts to reach those who are normally excluded, and it requires a constant consciousness of these factors of exclusion on the part of facilitators of processes. It also requires that tangible yet non-confrontational efforts be made to reduce the social and structural factors that tend to exclude certain people from participating. At all times, it requires an awareness of the fact that the meeting or the workshop is only one event in a process that needs many other instruments and approaches if it wants to be truly participatory. The project's use of surveys sought to get the opinions of, and to provoke discussion and thought by, the wider range of Laborie society, and to increase the breadth of awareness of the project.

The literature on deliberative and inclusionary processes (Holmes and Scoones 2000; Brown *et al.* 2002) actually places much emphasis on events, i.e. citizen's juries, workshops, or focus groups. The experience of this project bring two main lessons in this regard: (a) events cannot be fully inclusive, and they inevitably exclude some people on the basis of social status, culture, sex, age or abilities; and (b) beyond the events, there are many other factors of inclusion and effectiveness of deliberation, such as transparency, legitimacy, and information dissemination.

This project has also allowed for some reflection on the distinction between direct participation as opposed to representation. It suggests that whenever people are represented by others, there is a danger of domination by vested interests and powerful individuals. There is therefore always a need for processes and methods that give people an opportunity to express their voices directly, rather than being represented. There is also a need to recognise the importance of personalised participation. People and places have names, histories and relationships, but planning processes often ignore this reality and artificially reduce places to a zone on a map and people to numbers in tables.

In this instance, the project also noted a general lack of trust in the formal, representative processes. In Caribbean societies, people generally feel excluded from decision-making processes, and this exclusion has often been one of their own weapons of resistance against domination. If they are to participate in formal processes, they need assurances that their involvement will be welcome and meaningful. Participatory processes must be aware of this reality, and must refrain from raising expectations that they will not be able to meet.

Using the definitions and criteria of deliberative and inclusionary processes provided by Holmes and Scoones (2000), the results of this project suggest that participatory processes can be fully inclusionary and deliberative, even when they do not lead to changes in the formal allocation of management responsibility and authority. In the case study of sea-urchin management conducted as part of this project, the property rights were not changed, yet the power relations were changed. In many instances, there is nothing wrong with the property rights (and with the fact that common property resources are held by the state and its agencies), but there is something wrong with the weight of the various rights, and the resulting abuse of power by some.

Participatory research

The rationale for participation in research and the place of participatory research within broader participatory planning processes need to be clearly established. On the basis of the results and experience of this project, two main considerations can be offered here:

- If people and institutions are to be involved in research, they must be involved in the decision to conduct the research in the first place, and this research – as well as the questions it asks -- must be relevant to their needs and interests. In many respects, participatory research cannot exist by itself, it must be a part of a process of development planning and implementation that addresses issues of concern to people.
- In order to contribute to participatory management, research does not however need to be participatory, and there are dangers of imposing participatory methods when they are not needed. Indeed, “classical” research can contribute very directly to empowerment processes, as long as its results are properly disseminated.

In participatory research, there is a need for a constant review of hypotheses, based on learning. There is also a need to respect and integrate local perceptions on what is important and relevant, and to share the knowledge coming from different systems and from different standpoints. In many respects, participatory research provides a channel of entry for different forms of knowledge and expertise. In this project, people were involved in deciding which issues and cases the project should focus on. They were also involved in framing research questions along the way, and each Research Forum generated new questions that had to be explored and answered. In the absence of such involvement, participation runs the risk of remaining a mere rubber-stamping of external agendas.

The project also confirmed that participation in research, whenever it takes place, does not mean participation in all phases and actions of research. Too often, participatory research in natural resource management is understood as local participation in data collection, i.e. involving resource users and other local stakeholders in data gathering. Such participation is useful, of course, as it is efficient, it facilitates the incorporation of local knowledge, it empowers participants and it enhances their skills and capacity. But this is not necessarily the most important or the most effective way to involve stakeholders, and involving people in data collection alone is definitely insufficient.

In summary, this research suggests that the most critical requirements for research to contribute to participation and empowerment are: (a) the framing of research questions, the involvement of people in developing the research agenda; (b) the use of research activities and processes as instruments of capacity building, social dialogue and community awareness; and (c) the availability of results, the sharing of data and the involvement of people in the analysis of results.

Institutional arrangements for coastal conservation and management

This project provides a few useful lessons on the concept and practice of co-management, defined as the formal sharing of authority between state and other actors. By definition, co-management requires formal partnerships, and it therefore requires that formal organisations of resource users be established. But formal organisations are not always appropriate, as they inevitably introduce new power relations and modes of exclusion within social groups, and as they often fail to embrace the complexity and uncertainty of the systems and issues they are concerned with. This suggests that co-management may be well-suited to define and govern partnerships between states and homogenous social groups, but that they are less suited to situations where there are multiple boundaries, multiple players and stakeholders, and complex systems. Even in a small place such as Laborie, there is a danger of simplifying institutional arrangements, and there is a need to understand that management requires a variety of institutions, that may include resource-specific co-management agreements that fall within multi-stakeholder institutional arrangements.

The project has also provided a few interesting lessons with respect to property rights. In the case of sea urchin management, there was no *de jure* exclusive right of access vested in the Laborie community. Most resource users recognised that such exclusive access would be undesirable, that it would be impossible to enforce, and that it would create conflicts over the use of other resources. Yet, there was a *de facto* exclusive use for one resource (the sea urchin), which appears to have been based on the legitimacy of local decision-making and management processes. In effect, people from surrounding communities recognised the rights of harvesters from Laborie, even if these rights had not been formalised in legal instruments.

The experience in sea urchin management also suggests that transparency of decision-making is critical. In many instances, what is needed for effective and equitable natural resource governance is not necessarily a devolution of management or policy-making authority, but it is transparency in the decision and policy-making process, as well as the legitimacy of the persons and the organisations involved. This observation contradicts Brown *et al.* (2002) who say, “*It is*

only when deliberative and inclusive decision-making moves away from consultation and towards sharing responsibility and changing the underlying property rights that power relations actually change". Power relations definitely change when governmental decision-makers become legitimate and accountable, when information is sought from and made available to all stakeholders, when the views of all parties are taken into account, and when the decision-making processes are transparent and inclusive. The state does not need to transfer property rights for good governance to occur.

But "enlightened leadership" by resource management agencies does not happen automatically, it requires advocacy and a constant monitoring of the performance of these agencies. The experience of this project suggests that there are instances where civil society organisations and resource users would be better advised to invest their time and resources in advocating and facilitating good governance by governmental agencies, instead of working towards a formal devolution of authority from the state to community entities.

In designing new and improved systems of natural resource governance, there are existing organisations that are fully legitimate and have the potential to embrace broader agendas, or to participate in alliances to serve other agendas. In the case of Laborie, there is no new organisation vested with natural resource governance, and it appears that there is no need for such an organisation. But, three years after the commencement of the *People and the Sea* project, a new institutional landscape has undoubtedly emerged.

With specific reference to reef conservation and coastal zone development in the insular Caribbean, these observations suggest that, in order for management to be effective, there is not always need for new organisations to be created and vested with management authority. While a Soufriere Marine Management Area and a Soufriere Marine Management Association may be well suited to the conditions of that locality, the objectives of conserving reefs and sustaining livelihoods in many Caribbean coastal communities can be achieved through existing organisations, with improved capacities, new mandates and enhanced mechanisms for co-ordination, co-operation and participation.

The results of the project also suggest that the traditional approach to coastal zone planning, with the formulation of comprehensive plans destined to govern all aspects of management, is no longer appropriate. There is simply too much ecological, social and economic uncertainty and complexity to make such planning effective. Instead of these management plans that have dominated the lives of coastal zone management and development agencies in the Caribbean for the past two decades, there is perhaps a need for more innovative and flexible instruments. There is also a need for institutional arrangements that allow a wide range of stakeholders to move towards a common vision, to adapt and respond to changing conditions, to learn from their experience on the ground, and to define, at every step along the way, the actions required to achieve management objectives.

Under these new and more flexible institutional arrangements, zoning has its place, but there is also a need to recognise that there is a danger in zoning everything. In coastal development planning, zones may be needed to protect specific uses or manage specific conflicts, they may be

required when activities could affect a given use such as navigation (as in the case of establishing seamount farms), or they can be useful in securing access for a specific group of people.

Local governance

This project has provided a number of important lessons that concern local governance and that may be applicable beyond the spheres of natural resource management and conservation.

The first evidence gathered from this project is that *local governance* is a system that involves a multiplicity of actors and institutions, both formal and informal, it is much more than simply having one local government agency. With specific respect to natural resource management, actors in local governance include:

- The local government agencies (the Laborie Village Council in this instance).
- The decentralised agents and officers of central government agencies (in Saint Lucia, these include the Department of Fisheries, the Ministry of Health, and the Ministry of Communications, Works, Transport and Public Utilities).
- The officers of government specifically charged with local development responsibilities (in this instance the Community Development Officer of the Ministry of Social Transformation, Culture and Local Government).
- Elected District Representatives (Members of Parliament) and local branches of political parties.
- National and regional civil society organisations involved at the local level.
- Community-based groups and organisations.
- Schools and their various organisations.

In this context, key issues of local governance include issues of co-ordination, coherence, capacity and efficiency.

The experience of this project, confronted with lessons learned from other locations and processes, stresses the need for integrated planning at the local level, for institutional arrangements that integrate the various actors. In many instances however, as in the case of Laborie, the national institutional and legal framework is inadequate and does not permit such co-ordination. At the same time, integrated planning also requires integrated implementation, and there is a need for organisations that have this responsibility (this is one of the major considerations that prompted the creation of the Laborie Development Foundation in this instance).

Processes of local development in this project site over the past few years also point to some serious limitations of the dominant political structure and culture. As illustrated by the experience of the reconstruction of the jetty, the vacuum and inadequacies of existing systems of local governance can give too much power and space to the political process, resulting in actions that are motivated more by the desire to impress the electorate with tangible and visible achievements than by the genuine development needs of the people.

In the instance of this project, it was concluded that there would be no real need and no space for a specific natural resource management organisation. In contexts where civil society organisations find difficulty in financing themselves and in light of the factors of complexity and uncertainty mentioned earlier, it would not be advisable to recommend the setting up of new organisations specifically dedicated to natural resources. Local-level natural resource governance does not necessarily need local-level natural resource organisations, but it needs local-level organisations and networks that embrace issues of natural resource governance. In cases, a gap in local governance can be met through linkages and partnerships between two or more existing organisations, instead of creating a new one.

The experience of this project, with its specific focus on natural resource governance, also suggests a broader need for spaces and moments for sharing, discussing, formulating views and guiding decisions. Local governance is a process, and this process needs to be facilitated and supported by deliberation and inclusion. Concretely, institutions of local governance cannot be truly democratic and effective if they do not provide for the flow of information, for transparency and accountability, and for participatory decision-making.

Pro-poor and integrated approaches to coastal management and development demand that some of the institutional roles be changed, recognising that there are both gaps and overlaps in the distribution of these roles. One key gap concerns the provision of services and other forms of support to business development, production and marketing. In the new systems of local governance that need to be designed and implemented, much more attention needs to be paid to the functions that result in employment creation and revenue generation, especially for the poor. In these governance systems, there will also be a need for improved knowledge production and information management.

This project has also provided support to the view that natural resource management, and especially common property resource management, has the potential to promote collective action, to allow for local revenue generation, to empower people to participate in decisions that affect their lives, and to give power and relevance to local agencies. In countries and societies where there is a desire or a commitment to strengthen local governance, natural resource management issues, while they deserve consideration for their own sake, can also serve as useful channels to demonstrate needs and channel processes of change.

Natural resource governance can therefore be a good point of entry for wider improvements in governance. More specifically, natural resource and common property resource management can play an important part in the transition to strong local government. Since natural resources are public resources, it is most appropriate to devolve their management to a public institution, or, at least, to an institution that is accountable to the public. But these institutions of local governance must be legitimate and empowered. This process of transition towards stronger local governance will however always find limits and obstacles, especially with respect to entrenched political structures and cultures. Local government means accountable representation and delegation of power, not just one of the two.

Poverty and the environment

This project has led to three sets of tentative conclusions in relation to poverty and the environment, with specific reference to coastal resources and livelihoods.

Over the course of the present project there has been no evidence of increased resource use or increases in unsustainable resource use practices as a result of economic difficulties. This suggests that increases in poverty and unemployment in a locality do not automatically lead to increased resource use and resource degradation. It is possible that the presence of the project, and its tangible and expected social and economic benefits, influenced changes in behaviour. These hypotheses that requires further investigation, possibly incorporating threshold effects, and this project site provides a good opportunity for continuing research on these questions.

The second suggested conclusion is that even very poor people can manage natural resources effectively and sustainably when the institutions are right. In the case of sea urchin management, all harvesters, included the poor, participated fully in the management process and complied with the conditions of harvest. In their analysis of this experience, project participants concluded that this was due to (a) the opportunity to be meaningfully involved in the planning process, and (b) the attention given to what had been identified as the most critical institutional constraint and one that impacted directly on livelihoods, i.e. marketing.

The third conclusion, this one more definite than the previous two, is that there are means to increase the social and economic benefits that poor people derive from the use of coastal resources, through appropriate technology, product enhancement and improved marketing. Coastal resource governance is therefore about control, protection and access, but it also about marketing, new technology, product development and sustainable use.

With specific respect to tourism and its potential contribution to poverty reduction and sustainable development, the project concluded that:

- there is a need for a different form of tourism, one that (a) provides economic opportunities for all stakeholders, including the poor and socially marginalised, (b) offers a product of quality, based on the uniqueness of the cultural and natural heritage of host communities, (c) contributes to the conservation and sustainable use of natural and environmental resources, (d) respects and enhances, when appropriate, local forms of artistic and cultural expressions, (e) strengthens social capital, promotes equity and social justice, and assists social integration, and (f) involves all stakeholders in the process of developing and managing the sector.
- there are many obstacles to the realisation of this type of tourism (Ashley *et al.* 2001), including limited access to tourism assets, limited access to markets, the strength of established large-scale tourism operations, inadequate public policies, limited skills and capacities, absence of collaboration mechanisms, and lack of commitment on the part of key actors, including government agencies.

- the development of an alternative approach to tourism therefore requires changes in a number of domains: (a) the creation and enhancement of a competitive tourism product of high quality based on the assets available to host communities, especially the poor, (b) the generation of demand for this product, by getting tourists closer to the product, and by improved marketing efforts, (c) the adoption of policies that secure access, limit the dominance of large-scale operators, and eliminate social barriers to entry in the sector, (d) the development of local capacity, and (e) the establishment of participatory and collaborative management arrangements.

Chapter 8: Conclusions

Four main conclusions can be extracted from the results, findings and discussion of this research project.

In many instances, coastal zone conservation requirements could and should be addressed in a used marine space without a specific management status. Marine Protected Areas are not the only way to conserve coastal resources, and there are situations where these MPAs would actually be inappropriate

Multiple-stakeholder institutions that integrate conservation and development objectives can be capable of achieving management objectives without the need to establish new organisations. In coastal zone conservation and management, there is a need for flexible and adaptive management, guided by information from monitoring and ongoing sharing of information, particularly when resources are vulnerable to unpredictable environmental and biological variability. At the same time, empowerment and participation in management can happen without the transfer of management authority from the state to communities or the private sector, and without changes in the allocation of property rights.

Participation is not an end, it is a means, an instrument of good governance that must be used wisely and effectively.

Much of the discourse and literature on participation defines it as a requirement for good governance and participation. In this literature, there is an underlying assumption that until methods of participation are brought into a development process, there is no participation. The reality appears different. Every society or community has its system of governance, within which some form of participation, however limited it may be, takes place. The purpose of development work is not to introduce participation at any cost, as if it were the panacea that would resolve all problems of governance, it is to enhance systems of governance to make them more equitable, more sustainable and more productive.

For each natural resource issue, there is a variety of institutions involved with resource access, and governing the conversion of these resources into economic resources and wellbeing. These institutions can be formal as well as informal. They are embedded in power relations and some have the effect of excluding or undermining the opportunities of particular social groups. By understanding these realities, it is possible to focus effectively on two key aspects, namely:

- the institutional factors that determine the main conditions and outcomes of natural resource governance, and
- the key institutional issues that require change, intervention or action at some level.

Conventional approaches to community ‘organising’ can have negative and perverse impacts on participation, social and power relations, and democracy.

In the past few decades, the literature and the dominant discourses on development and natural resource management have emphasised the need for users of natural resources to be organised, in

order for them to play a meaningful role in management. While there are benefits to be gained from organisation, experience shows that there are dangers inherent in such processes, because they introduce modes of exclusion and power relations that may be detrimental to the weak. Participation can take place without formal organisations.

There is a need for pro-poor approaches to coastal resource management and governance.

The main characteristics of pro-poor coastal management are that:

- management should deal with what concerns people, and should work towards meeting their needs.
- there should be non-threatening, empowering use of science, in a way that relates positively to popular knowledge and perceptions.
- when there are several options, those that are favourable to the poor should take priority.
- technology should be used to improve livelihoods while enhancing resource sustainability.
- there is a need to protect uses, activities and opportunities from the threat of privatisation by more powerful interests (example of tourism)
- management must be relevant, personified, dealing with real issues affecting real people, anchored in the local culture.
- some agencies should be vested with the responsibility and equipped with the capacity to do development work (marketing, job creation, etc.), not only resource management.
- alliances should be built, and other agencies should be made aware of the benefits of pro-poor approaches.

Chapter 9: Beyond the project

Documentation and dissemination

According to the project's documentation plan presented in Chapter 5, the following outputs will be delivered following the formal closure of the project on 31 March 2003:

- Paper on seamoss farming to disseminate technical and institutional results of this research.
- Paper on local governance to contribute to national PRSP process.
- Paper on information management, with specific reference to GIS and mapping as instruments of empowerment and participation in management.
- Paper on sea urchin management, focusing on the lessons learned from this project and other management initiatives in Saint Lucia and the region.
- Paper on the mapping exercise, compiling documents obtained and possible applications.

Project personnel also remain committed, if opportunities arise, to contributing to books that would benefit from the results of this research.

Succession plan

The project has initiated or supported a number of local processes that need to be continued and strengthened for the benefit of the host community, but also to support further research, documentation and analysis. Following the completion of the project on 31 March, the following processes and activities will therefore be implemented:

- Institutional strengthening of the Laborie Development Foundation.
- Continuation and expansion of a distinct People and the Sea programme under the auspices of the LDF, the LVC and the LFCC.
- Hosting of the Research Forum, and examination of opportunities for expanding its scope to other development issues and processes.
- Use of the Laborie experience to inform debates and decisions on local governance as part of a national social development policy process being conducted by the Ministry of Social Transformation, Culture and Local Government.
- Implementation of a project for pollution control and sewage management, assisted by the Ministry of Health. This will require identification of appropriate systems to reduce bacterial contamination of waste water, and ongoing monitoring to assess the effects of management intervention.
- Incorporation of three Laborie reef sites in the national reef monitoring programme implemented by the Department of Fisheries, and submission of the results for the GCRMN global status report on reefs in 2004.
- Establishment of a working group (LFCC, LDF and DOF) to implement the seamoss development initiative.
- Capacity-building and integration of the LFCC as a key player in resource management, community development and hence sustainable livelihood generation.
- Establishment of the project database and GIS tools as a community-managed resource for information management.

- Implementation of tourism development plan, under the auspices of the LDF, as described in the Strategic Development Plan for Laborie (LDPC 2001).

Based on the experience gained from this project, the case of Laborie will also be used to develop a permanent research and monitoring framework that guides future work and identifies priorities, opportunities and resource requirements. This framework will be particularly useful to this locality, but it will also provide a case study that could help inform the development of similar local-level programmes in other locations.

Recommendations for NRSP uptake strategy

In 2002, NRSP decided to develop an Uptake Promotion Strategy (UPS), with the aim to: Promote the wider (i.e. beyond immediate targets of projects) uptake and incorporation of the products of the research by other target institutions in the Caribbean and beyond; and Validate the approaches and products developed, implementing them with defined target institutions.

Within this UPS, and under the auspices for the Caribbean Focus Group (CFG) that has been established to design and implement the strategy, this project suggests that the following activities be considered for implementation over the next two years:

- Development of guidelines and best practices based on results of several NRSP-funded projects.
- Use of the tourism case as a teaching case study for regional universities.
- Provision of financial and technical support to the succession plan identified above.

In addition, it is hoped that NRSP will be in the position to support a participatory review of impacts of the project and its activities in 2005.

APPENDICES

Appendix 1: References.

- André-Bigot, H. 1998. D'eaux et de rêves, une identité en transformation: trois générations de pêcheurs de Sainte-Lucie (West Indies). Thèse d'Anthropologie Sociale et d'Ethnologie de l'E.H.E.S.S. présentée en vue de l'obtention du Doctorat Nouveau Régime. 713 pp.
- André-Bigot, H., B. Gobert, S. George and F. Narcisse. 1995. Socio-economic survey of the St. Lucian fishing industry: analysis of the fishermen and fishing boats registration data collected by the Fisheries Department of St. Lucia in 1994. ORSTOM and Department of Fisheries, St. Lucia. 33 pp.
- Ashley, C., D. Roe and H. Goodwin. 2001. Pro-poor tourism strategies: making tourism work for the poor. Russel Press, Nottingham, U.K. 54 pp.
- Berkes, F. and A.H. Smith. 1995. Coastal marine property rights: the second transformation. Pages 103-113 in M.A. Junio-Meñez and G. Newkirk, eds., Philippine coastal resources under stress. Coastal Resources Research Network, Dalhousie University, Halifax, Canada, and Marine Science Institute, University of the Philippines, Diliman, Quezon City, Philippines.
- Borrini-Feyerabend, G., M.T. Farvar, J.C. Nguingiri and V.A. Ndangang. 2000. Co-management of natural resources: organising, negotiating and learning by doing. GTZ and IUCN, Kaspark Verlag, Heidelberg, Germany. 95 pp.
- Brown, K., E.L. Tompkins and W.N. Adger. 2002. Making waves: integrating coastal conservation and development. Earthscan Publications Ltd., London, U.K. 164 pp.
- Brown, N.A. 1999. Finding their legs for seawater: women and seamoss mariculture in Praslin, St. Lucia. CANARI Technical Report no. 257:16 pp.
- Burt, M. 2002. A study of the social and economic impacts of sea urchin harvesting in 2002 in Laborie, St. Lucia. CANARI LWI Project Document no. 7. CANARI Technical Report no. 318. 7 pp.
- Buttler, C. 2002. Assessing marine resources: institutions and institutional development in Laborie, St. Lucia. CANARI LWI Project Document no. 6. CANARI Technical Report no. 305. 56 pp.
- Clauzel, S. and G. Joyeux. 2001. Tourism in Laborie, St. Lucia: baseline study and identification of potential for development. CANARI LWI Project Document no. 3. CANARI Technical Report no. 293. 15 pp.
- Cooke, B. and U. Kothari, eds. 2001. Participation: the new tyranny? Zed Books, New York, USA. 210pp.
- CTE. 1987. Report and findings on a survey to determine the market potential of Caribbean seamoss. Cadaran Trading Enterprises, Inc, Ottawa, Canada. Unpublished report to ICOD.
- Department of Fisheries. 1992. Business manual for seamoss farmers. Government of St. Lucia. 14 pp.
- Dawes, C.P. 1995. Suspended cultivation of *Gracilaria* in the sea. Journal of Applied Phycology 7:303-313.
- Geoghegan, T., Y. Renard, N. Brown and V. Krishnarayan. 1999. Evaluation of Caribbean experiences in participatory planning and management of marine and coastal resources. CANARI Technical Report no. 259. 52 pp.
- Geoghegan, T., A.H. Smith and K. Thacker. 2001. Characterization of Caribbean marine protected areas: an analysis of ecological, organizational, and socio-economic factors. CANARI Technical Report no. 287. 27 pp.

- George, S. 1999. Fisheries sector review for Saint Lucia. Organisation of Eastern Caribbean States, Natural Resource Management Unit, Castries, St. Lucia. 42 pp.
- George, S. and W. Joseph. 1994. A new participatory approach towards sea urchin management in Saint Lucia, West Indies. *Proc. 46 Gulf and Caribb. Fish. Ins.* 46:197-203.
- Holmes, T. and I. Scoones. 2000. Participatory environmental policy processes: experiences from north and south. IDS Working Paper 113, Institute of Development Studies, University of Sussex, Brighton, UK.
- Hutchinson, G. 2001. Water quality in the Laborie Bay. CANARI LWI Project Document no. 5. CANARI Technical Report no. 301. 10 pp.
- Hutchinson, G. 2002. Sources, distribution and effects of faecal contamination in Laborie Bay, St. Lucia. B.Sc (Hons) Thesis, Queen Mary and Westfield College, University of London, UK. 80 pp. [unpublished]
- Hutchinson, G., S. George and C. James. 2000. A description of the reef fishery of Laborie, St. Lucia. CANARI LWI Project Document no. 1. CANARI Technical Report no. 291. 10 pp.
- Jesse, C. 1986. Outlines of St. Lucia's history. Saint Lucia Archaeological and Historical Society, Castries, Saint Lucia. 99 pp.
- LDPC. 2001. Strategic development plan for Laborie. Laborie Development Planning Committee. 32 pp.
- Leach, M., R. Mearns and I. Scoones. 1999. Environmental entitlements: dynamics and institutions in community-based natural resource management. *World Development* 27(2):225 - 247.
- Lee Lum, L. 1995. Results of preliminary field and laboratory culture trials of seamoss (*Gracilaria cervicornis*). Institute of Marine Affairs, Trinidad and Tobago. 24 pp.
- Nightingale, A.J. 1988. Seamoss cultivation in St. Lucia: appropriate technology? Unpublished thesis. Sidney Sussex College, Cambridge University, England.
- Nowlis, J.S., C.M. Roberts, A.H. Smith and E. Siirila. 1997. Human-enhanced impacts of a tropical storm on nearshore coral reefs. *Ambio* 26(8):515-521.
- Patterson, K.L., J.W. Porter, K.B. Ritchie, S.W. Polson, E. Mueller, E.C. Peters, D.L. Santavy and G.W. Smith. 2002. The etiology of white pox, a lethal disease of the Caribbean elkhorn coral, *Acropora palmata*. *Proc. Natl Acad. Sci. USA* 99(13):8725-30.
- Patton, M.Q. 1990. Qualitative evaluation and research methods (2nd ed.) Sage Publications, Newbury Park, CA, USA.
- Payne, A. and P. Sutton. 2001. Charting Caribbean development. MacMillan, London. 284 pp.
- Reef Check Foundation. 2003. Reef Check survey instruction manual. Retrieved from the World Wide Web: <http://www.reefcheck.org/manual.pdf>
- Renard, Y. 2001. Practical strategies for pro-poor tourism: a case study of the St. Lucia Heritage Tourism Programme. PPT Working Paper no. 7:23 pp.
- Rincones Leon, R.E. 1989. Experimental cultivation of an agarophyte alga: *Gracilaria cornea* in the northwest coast of Venezuela. Pages 65-67 in E.C. de Oliveira and N. Kautsky, eds Cultivation of seaweeds in Latin America. University of São Paulo, Brazil.

- Robens Institute. 1993. OXFAM-DELAGUA water test kit – users manual. University of Surrey, UK. 60 pp.
- Roberts, H.H. 1972. Coral reefs of St. Lucia, West Indies. *Carib. J. Sci.* 12(3-4):179-190.
- Smith, A.H. 1990. Commercial cultivation of *Gracilaria* spp. used for food in the West Indies. Pages 75-78 in E.C. de Oliveira and N. Kautsky, eds. *Cultivation of seaweeds in Latin America*. University of São Paulo, Brazil.
- Smith, A.H. 1992. Farming edible seaweeds in the Caribbean. *Applied Phycology Forum* 9(1):1-2.
- Smith, A.H. 1992. Seaweed cultivation in the West Indies. Pages 337-351 in K.E. Mshigeni, J. Bolton, A. Critchley and G. Kiangi, eds. *Proceedings of the First International Workshop on Sustainable Seaweed Resource Development in Sub-Saharan Africa* Windhoek, Namibia March 22-29, 1992.
- Smith, A.H. 1997. Seamoss cultivation in the West Indies. CANARI Guidelines Series no. 1:23 pp.
- Smith, A.H. 1998. Seaweed resources of the Caribbean. Pages 324–330 in A.T. Critchley and M. Ohno, eds. *Seaweed resources of the world*. JICA, Yokosuka, Japan.
- Smith, A.H., M. Archibald, T. Bailey, C. Bouchon, A. Brathwaite, R. Comacho, S. George, H. Guiste, M. Hastings, P. James, C. Jeffrey-Appleton, K. de Meyer, L. Nurse, C. Petrovic and P. Phillip. 2000. Status of coral reefs in the Eastern Caribbean: the OECS, Trinidad and Tobago, Barbados, the Netherlands Antilles and the French Caribbean. Pages 315-330 in C. Wilkinson, ed. *Status of coral reefs of the world: 2000*. Australian Institute of Marine Science, Townsville, Australia.
- Smith, A.H. and F. Berkes. 1991. Solutions to the “Tragedy of the Commons”: sea urchin management in St. Lucia, West Indies. *Environmental Conservation* 18(2): 131-136.
- Smith, A.H. and J. Gustave. 2001. A description of the harvest of wild seamoss in Laborie, St. Lucia. CANARI LWI Project Document no. 2. CANARI Technical Report no. 292. 4 pp.
- Smith, A.H., A. Jean and K. Nichols. 1986. An investigation of the potential for commercial mariculture of seamoss (*Gracilaria* spp., Rhodophycophyta) in St. Lucia. Pages 4-11 in F. Williams, ed. *Proceedings of the thirty-seventh annual Gulf and Caribbean Fisheries Institute*.
- Smith, A.H. and S. Koester. 2001. A description of the sea urchin fishery in Laborie, St. Lucia. CANARI LWI Project Document no. 4. CANARI Technical Report no. 294. 8 pp.
- Smith, A.H., K. Nichols and J. McLachlan. 1984. Cultivation of seamoss (*Gracilaria*) in St. Lucia, West Indies. *Hydrobiologia* 116/117:249-251.
- Smith, A.H. and Y. Renard. 1987. Seamoss mariculture in the Eastern Caribbean. Pages 93-102 in B. Challenger and C. Williams, eds. *Report of the First OECS Workshop on Fisheries Management and Development*. St. Vincent and the Grenadines, August 1987. OECS Fishery Report no. 1.
- Smith, A.H. and Y. Renard. 2002. Seaweed cultivation as a livelihood in Caribbean coastal communities. Paper presented at the *ICRI Regional Workshop for the Tropical Americas: Improving Reef Condition Through Strategic Partnerships*. Cancun, Mexico, June 2002. CANARI Communication no 309:8 pp.
- Stake, R. E. 1998. Case Studies. Pages 86-109 in N.K. Denzin, and Y. S. Lincoln, eds. *Strategies of qualitative inquiry*. Sage Publications, Thousand Oaks, London, New Delhi.
- Wilkinson, C., ed. 1998. *Status of coral reefs of the world*. Australian Institute of Marine Science, Queensland, Australia. 184 pp.

Yin, R. K. 1994. Case study research, design and methods. Sage Publications, Thousand Oaks, London, New Delhi.
171 pp.

Appendix 2: Logical framework

Narrative summary	Objectively verifiable indicators	Means of verification	Important assumptions
Goal			
Improved resource-use strategies in coastal zone production systems developed and promoted.	<p>By 2002, new approaches to integrated natural resource management and prevention of pollution which explicitly benefit the poor validated in two targeted areas</p> <p>By 2004, these new approaches incorporated into strategies for the management of coastal resources and adopted by target institutions in two targeted countries.</p>	<p>Reviews by Programme Manager.</p> <p>Reports of research team and collaborating / target institutions.</p> <p>Appropriate dissemination products.</p> <p>Local national and international statistical data.</p> <p>Data collected and collated by the Programme Manager.</p>	<p>Target beneficiaries adopt and use strategies.</p> <p>Enabling environment exists.</p> <p>Budgets and programmes of target institutions are sufficient and well managed.</p>
Purpose			
Technical understanding and methods for management of coastal zone habitats improved	<p>New technologies for sustainable resource use are applied in at least five coastal communities in the region</p> <p>Participatory institutional arrangements are in place in the project site</p>	<p>Field surveys and reviews</p> <p>Monitoring data on reef status and uses</p> <p>Project reports</p>	<p>Policy environment allows for the establishment of new institutional arrangements</p> <p>Natural disasters do not prevent the conduct of field experiments and extension</p>
Outputs			
1. Methods for participatory planning and management in small coastal communities tested and documented	<p>By the end of year 2, a range of participatory planning methods tested and documented</p> <p>By the end of project, new institutional arrangements in place in at least one project location</p>	<p>Reports</p> <p>Training materials</p> <p>Community strategic plans</p> <p>Sectoral development plans</p> <p>Management agreements</p>	<p>Readiness of the host community to conduct broad participatory planning processes</p> <p>Willingness of formal resource management and development agencies to participate in process</p>
2. Technologies for sustainable resource use identified, tested and refined	<p>By the end of year 1, detailed work plans prepared for at least three experiments</p> <p>By the end of the project, results of at least three experiments documented, and available for dissemination</p>	<p>Field reviews</p> <p>Project reports</p>	<p>Natural disasters do not prevent the conduct of field experiments and extension</p>
3. Methods and technologies for enhancing coastal livelihoods while reducing coral reef degradation disseminated	<p>By the end of project, learning from outputs 1 and 2 used in publications and training programmes of CANARI and IDS</p>	<p>Training schedule and notices</p> <p>Reports</p> <p>Publications</p>	

4. Capacity of research institutions involved in participatory natural resource management for sustainable development enhanced	Throughout project, effective relationship established between IDS and CANARI	Project reports	
---	---	-----------------	--

Narrative summary	Project milestones	Important assumptions
Activities		
1. Detailed research design and training of personnel (all outputs)	Seminars held with IDS, CANARI, host government agencies and community representatives Report produced and shared with stakeholders by month 4	
2. Identification and analysis of stakeholders (outputs 1 and 2)		
3. Conduct of a participatory assessment of livelihood resources (output 1)	Community workshops held, literature reviews completed, reports on strengths and weaknesses produced by month 6	
4. Conduct of a participatory review of institutional landscape (output 1)	Workshops held, studies done, and report produced by month 6 Field work completed and report produced by month 9	
5. Establishment of a baseline on the status of reef resources, including benthic community structure and status of harvested species (outputs 1 and 2)	Field work completed and report produced by month 9	
6. Study of historical and current uses, issues of tenure and access, and pre-existing management arrangements (outputs 1 and 2)	Workshop held and report produced by PM9	
7. Workshop to analyse data and assessments and design experiments (output 1)	On-going activities, beginning at month 7, involving on-site training, technical assistance, field experiments, with initial work plans and six-monthly progress reports	
8. Conduct of research and provision of extension services in support of resource management (selected target species) and seaweed cultivation (output 2)	Six-monthly evaluation studies Regular collection and treatment of data, redistribution to community and management agencies	Readiness of two host communities to conduct broad participatory planning processes
9. Monitoring and evaluation of the social and economic impact of these management and cultivation activities (output 2)		
10. Monitoring of the status of reef resources (outputs 1 and 2)	Monitoring data gathered at regular intervals, and redistributed to relevant stakeholders	

Activities continued	Project milestones continued	Important assumptions
<p>11. Analysis of the relationship between participatory planning and management activities and trends in the status of reef resources (outputs 1 and 2)</p> <p>12. Distribution of research results to stakeholders in both locations (outputs 1, 2 and 3)</p> <p>13. Synthesis of research results (output 3)</p> <p>14. Use of research results in on-going training and advocacy programmes of CANARI and IDS (output 3)</p> <p>15. Conduct of seminars, during project implementation, to provide training to researchers, and review research methods and results (outputs 3 and 4)</p> <p>16. On-going collaboration between CANARI and IDS in the design and conduct of research activities (output 4)</p>	<p>Participatory exercise to summarise and interpret monitoring data, and compare it with trends in other locations. Conduct of specific studies, during year 3, to investigate the linkages between management activities and trends</p> <p>On-going distribution of results through public meetings, publications and reports</p> <p>Report</p> <p>Preparation and use of case studies, guidelines and other materials in years 2 and 3</p> <p>Seminars at project initiation, ends of years 1 and 2, and end of project</p> <p>Sharing of materials and resource people. Conceptual back-up to project provided by IDS on on-going basis</p>	

Revised August 2001

Appendix 3: Sample of invitation to Research Forum.

**People and the Sea
Research Forum**

INVITATION

Over a year ago, the Caribbean Natural Resources Institute (CANARI), the Department of Fisheries and the Laborie Development Planning Committee began a research project that looks at the contribution of reefs and other coastal resources to the past, present and future well-being of the Laborie community. As part of the project, public meetings are held in order to share results obtained, to inform the community about on-going research activities, to allow the public to express needs, views and concerns, and to provide an opportunity for the exchange of opinions and ideas.

**You are invited to attend and contribute to
the third meeting of the Research Forum
to be held on Saturday 3 November at 3:00pm
at the Laborie Boys' Primary School**

This meeting will be exclusively dedicated to sea-based tourism activities, with a presentation of a report on the baseline study (by Sylvester Clauzel and Grelle Joyeux) and an identification of the research activities for the next few months.

Lanmè-a sé jaden-nou

Together, we explore the contribution of the sea to our community's well-being

Attend the Research Forum and let your views be heard!

Appendix 4: work plan for the initial phase of assessment and analysis.

Following the development of a Framework for Analysis, which was presented in the minutes of the second meeting of the project steering committee (25 and 26 April 2000), a work plan has been developed. It is based on the conclusions of the meetings of the committee held on 18 May and 26 June, various meetings of individual research teams, written comments received from Dr. Melissa Leach at the Institute of Development Studies (IDS), and recommendations formulated by Dr. Stephen Koester of the University of Colorado, who visited the project and worked with members of the committee between 17 and 27 June. Brief notes on methodological considerations were developed by Dr. Koester and are included in Appendix 1.

The assessment phase should be considered as building the foundation for more in depth, on-going research to be conducted throughout the entire project. In this sense it is ‘preliminary’ data collection, and the analyses should generate more in-depth questions that the project participants can continue to explore throughout the study’s course. In addition, this stage can be used to identify potential problems that will need to be addressed. For example, work may reveal that methods need to be modified or that particular questions are consistently misinterpreted.

1. Analysis of the natural capital (July to September)

A detailed work plan has been developed for this activity, and it is presented in Appendix 2.

The **map of resources and resource uses** is nearing completion, and this will be done during the week of 10 July, following the helicopter flight which was used to produce a photographic coverage of the area, and following another field visit to map the boundaries of the outer reefs.

A general **questionnaire on the reef fishery** has been prepared by Sarah George. It has been agreed that it should be kept simple and short, and that the primary purpose of this survey will be to introduce the project and give an overview of perceptions, attitudes and issues. The survey questionnaires will be delivered by students attached to Fisheries and CANARI. Questionnaire delivery will take place between 6 and 21 July. Analysis of results will be done by Sarah George in early August.

2. Analysis of the human, social and financial capital (July - August)

There is need for all participants to agree on the meaning of these terms. This should be discussed at the next meeting of the Steering Committee. This analysis will be carried out by a team facilitated by Lucius Ellevic and comprising Lydia Charlemagne, Julian Dubois, Gem Hutchinson and Vijay Krishnarayan. It will involve three main activities.

The first activity will be a **compilation of background information on the Laborie community**, which is being carried out by the Laborie Development Planning Committee, and will be supported by this project. This documentation should include basic data on demographics, land ownership and use, economic activities and social organisation. A substantial amount of information has already been gathered by Lydia Charlemagne and Flora Murphy, and it needs to be edited and augmented. Gem Hutchinson will assume primary responsibility for this task over the months of July and August.

The second activity will develop an **analysis of human, social and financial capital**, following the format presented at Appendix 3. The first task is to develop a set of questions, and this has been started by Lucius Ellevic and Stephen Koester. It will be completed on 8 July at a meeting of the team responsible for this aspect of the project. The questions will then be answered at a workshop which will bring together a group of people who are representative of the various sectors and interests involved. At the workshop, a simple set of questions will be posed and discussed. The attached table will not be used in these discussions, but the table will serve for the compilation of answers. Venn diagrams and other tools will be used to depict and analyse relationships.

The third activity will involve the preparation of four **case studies of institutions**:

- C a case study of the Laborie Fishermen's Co-operative (Julian Dubois and Lucius Ellevic will carry out the study)
- C a case study of the Laborie Co-operative Credit Union and its involvement in activities and projects linked to the use and management of reef resources (Julian Dubois and Lucius Ellevic will carry out the study)
- C a case study of the Mothers and Fathers Group and its involvement in activities and projects linked to the use and management of reef resources (Lucius Ellevic will review the literature and documentation available, and will advise on the conduct of the study)
- C a study of the *pwatik*, which involves networks of exchanges and distribution between fishers and other people (Christopher James will carry out preliminary interviews and advise on the potential of this study)

Guidelines for case study on the Laborie Fishermen's Co-operative

What does it do? Who belongs to it? Who doesn't? How is this membership determined? Why? What are the benefits of membership? What is the role of women? Who 'controls' the Co-op? Are they fishermen? What issues, if any, is the Co-op involved in? What else could the Co-op be involved in? Does it have a role in marine resource management? If so, describe it. Does the Co-op play a role in promoting conflict resolution, or, on the other hand, in creating or exacerbating conflicts between fishermen? Between fishermen and others? Within fishing households? Between fishermen and the Department of Fisheries? If so, can we provide stories illustrating such conflicts?

Guidelines for case study of the Laborie Co-operative Credit Union

How does it work? What kinds of local projects and businesses does it finance? How does it support them? Loans? Grants? Technical assistance? What kinds of projects associated with the marine environment does it support? Describe a local effort supported by the Credit Union. What doesn't it support? Why?

What role could it play in the sustainable use of coastal resources?
In poverty alleviation?

Guidelines for case study of Mothers and Fathers Group

What is its role? Who are its members? What is the proportion of fishermen in its membership? What are the profiles of the fishermen and other members of fishing families involved in the Group? What benefits does it bring to its members? Is the Group involved in issues directly affecting fishermen? Women in the fisheries sector? Is the Group involved in marine resources management? If so, how, why, and since when?

3. Identification and analysis of stakeholders (July - August)

On the basis of a preliminary list (see Appendix 4), the Steering Committee will consult key informants and will develop a more complete **listing of stakeholders**. It is however understood that the list of stakeholders will be in constant evolution, and will be amended and augmented as appropriate during the course of the assessments.

The **analysis of the rights, responsibilities, rewards and (power) relationships of the various stakeholders** (Who are they? What are their relationships to the reefs and coastal environment? What kind of relationships exist between members of the same stakeholder groups, and between different stakeholder groups?) will then be carried out by a focus group comprising members of the steering committee and other key informants. Venn diagrams and other tools will be used to depict the results of this analysis.

4. Preliminary identification and analysis of the issues (August - September)

This part of the project will involve three sets of activities:

The first will be the conduct of **case studies of individual places** (i.e. a reef, a portion of the beach, a section of the coastline). The purpose of these site studies will be to describe use and management patterns and to provide primary data for the subsequent analysis of management issues.

Questions to be asked in these studies include: What is this place called? How is this place used? By whom? For what purposes? When do these activities occur? Is this place owned or controlled by someone or some group? By whom? Is it managed by someone or some group? How is it managed? How was it managed in the past? How would you describe the 'health' of this place? How is it different from when you first made use of it? Has it changed? How? Why do you think these changes have occurred? What kinds of things do you think affect this place? How? What could happen here, and how could this place be used in the future? Are there

other places like this one? *NOTE: Asking if a place has changed, and if so how, and then asking why the interviewee thinks it has changed, is a more neutral, less subjective way to ask questions, than if we ask if the informant thinks the resource has been depleted.*

Informants could also be asked to tell a story about this place, an event that occurred here. This exercise may lead to descriptive narratives revealing information about the resource, the genesis of its use, of conflicts around it and their resolution. Such stories may reveal power relations between groups: who was involved, role of 'outside' institutions in resolution, informal and formal arrangements used in previous conflicts, etc....

The second set of activities will involve the conduct of **case studies of people**, as an in-depth and 'intimate' way to describe the use of a place and its resources and to link it directly to the life of an individual and his/her household. By telling 'the story' of people representing different stakeholder groups and different livelihood strategies, we can find out what these places and resources 'mean' to people. This approach will illustrate how people are tied to resources and to different, sometimes competing stakeholder groups. Case studies of individual and household economic strategies and social relations will help reveal the complex relations between people and their environment.

Questions might focus on a person and their household's use of places and resources. How different resources are used and integrated into household strategies. How households adjust to change, and how individuals and households ensure access to resources.

Several committee members will be involved in the conduct of both sets of studies, including Ulric Alphonse, Lydia Charlemagne, Augustin Dominique, Yves Renard and Allan Smith. In order to ensure that methods are consistent, the first of each set of studies will be done collectively by these people. The next task required is to develop criteria for the selection of the people and places which will be the focus of these studies, and to make this selection.

The third activity will be a **desk study of policy context and factors**. The purpose of this study will be to understand the extent and manner in which formal and informal policies, including laws, international agreements, and public sector programmes and projects determine the behaviour of people and their relations to reef resources. The study will therefore examine how institutional policies influence the status of coastal resources (particularly the reefs), their use and management, and their potential use.

5. Communications

In order to maintain communication with stakeholders and to enhance the participatory dimension of the project, the following activities will be undertaken:

- C “**block sessions**” with fishermen and others to present the project, receive feedback and begin the process of analysis (these will be done between 12 and 20 July at three locations, i.e. *Labatwi*, *An Hòl-la* and *Anba Bwapen*, facilitated by Terrance Charlemagne, Julian Dubois and Yves Renard);
- C design and erection of a **project sign** which describes the objectives and process and invites collaboration;
- C preparation, printing and distribution of a **flyer** describing the project;
- C collaboration with the **print and electronic media** in the dissemination of articles and the broadcasting of programmes presenting the project and some of its results. This should begin with an article in *The Mirror*, and a documentary with the Government Information Service (GIS);
- C conduct of informal **one-to-one and small group discussions**, whenever the opportunity arises, to discuss the project.

6. On-going review of results and analysis of process

The project steering committee will hold regular bi-monthly meetings to review results obtained to date, address methodological problems which may have arisen, and conduct a preliminary identification of issues. These meetings will also serve as fora for critical self-assessments.

Questions to be asked by the committee to itself will therefore include:

- C where are we/what have we learned?
- C what information do we still need to collect?
- C what new questions have emerged?
- C what problems (methodological, etc.) have surfaced?
- C where do we go from here?

7. Synthesis and definition of research plans (October)

During the first half of October, the project will carry out an intensive programme of activities aimed at summarising results, distilling lessons learned on methods, and identifying the experiments that will be carried out over the following two years (as well as the indicators by which these experiments will be monitored and measured).

This process of analysis will be structured around four main moments.

During a period of one week (29 September to 5 October), under the guidance of Dr. Koester, **the research team will conduct field work**, review the materials gathered, probe the results obtained to date, and begin an analysis of the issues and concerns. At the same time, a small number of focus group meetings will be organised to advance the process of analysis of the main management issues.

The second moment will involve a number of public events aimed at redistributing research results, conducting a participatory analysis of results, and identifying preliminary directions for further research. Dr. Melissa Leach and Dr. Stephen Koester will be present for and serve as resource people for these activities.

These events will be:

- a **public exhibition**, presenting research results, and creating a space for discussion, exchange and debate around the information that it will disseminate. This exhibition will be staged in a public building in the village of Laborie, and will run over a period of three days (6 to 8 October). Schools should be involved in the design, mounting and running of the exhibition;
- a **public opening of the exhibition** (6 October), to generate public attention, interest and support, and to facilitate the involvement of policy makers;
- a day of **concurrent workshops** (7 October), to conduct a more detailed analysis of research results. Possible themes for these workshops include: analysis of policy context, review of results of case studies, presentation of testimonies and oral histories, and analysis of the environmental impacts of land and marine based activities on coastal activities and livelihoods;
- an **evening of entertainment** (evening of 7 October), which will serve to strengthen cohesion and enhance communication among participants in the process;
- an **open-day on the sea** (afternoon of 8 October), during which fishermen and other boat operators will be available to take people from the community on tours of the reef areas and to share their knowledge, concerns and expectations. One of the crafts used will be a glass-bottom boat, to permit the observation of the reefs.

The third moment will be a **two day workshop** (10 and 11 October) of the steering committee and resource people (Leach and Koester) which would conduct a summary analysis of results to date (day 1), following the Framework of Analysis developed at the meeting of the steering committee held on 25 and 26 April, and contained in the minutes of this meeting. On the basis of these results, the workshop will then define the research programme of the following two years (day 2).

The fourth moment will involve informal discussions among researchers (9 and 11 October) to begin the process of distilling **lessons learned on process and methodology**.

30 June 2000

Appendix 5: Methods used in baseline household survey

1. Characterisation of poverty and livelihood strategies

Households were classified and described in terms of two main characteristics - household income and household assets, also taking into account the risk factors associated with them. These were separated subjectively into high, medium and low categories, giving a total of 9 categories, as follows:

		Income		
		High	Medium	Low
Assets	High			
	Medium			
	Low			

2. Baseline of livelihood strategies

2.1 Sampling design

The sample population included households in the village of Laborie, bounded by the watershed.

Livelihood strategies were described in terms of the same two characteristics, income (revenue and spending power) and assets (property, education, skills), rated as high, medium or low, and included an assessment of vulnerability. In addition, the sample was divided into households whose strategies either do or do not involve the use of the Bay. An initial review of the households in Laborie revealed that there were no households that would fit in the low/high or high/low categories. The system therefore resulted in 14 categories, as follows:

	Income					
	High		Medium		Low	
	Users	Non users	Users	Non users	Users	Non users
A High	1	1	1	1		

s						
s	Medium	1	1	2	1	2
e						
t	Low			2	1	4
s						2

Households representing each of these categories were selected by purposive sampling (Patton 1990), based on the researchers' knowledge of the community. Because of the need to focus on poverty, the sampling included a larger number of households in some of the categories. The number of households surveyed therefore totaled 21, with the number for each category having been noted in the corresponding cell above.

2.2 Sample selection

Households were selected by the project Steering Committee based on personal observations and other information already known, including: household composition, income, symptoms and causes of poverty, location and education.

2.3 The questionnaire

Interviews were then conducted with one or more members of the 21 households, with questions addressing three main topics.

1. Use of the Bay by the household

- do you make a living from the Bay?
- what other members of the household are involved?
- how do you use the Bay?
- are there ways in which you would like to use the Bay but are unable to do so now?

2. Perceptions of the value of the Bay

- what is it used for?
- who benefits most?
- which of its resources are important to you?

3. Management issues

- should the use of resources be managed?
- what management exists now?
- what could be done to help manage?
- are there any problems that could come from management?
- who impacts most on the resource?

Appendix 6: Work plan for the analysis of the natural capital.

Research Activities	People and the sea. LWI Laborie project activities for natural capacity assessment. 2000											
	July				August				September			
1. Mapping	1	2	3	4	1	2	3	4	1	2	3	4
helicopter flight	AS JD											
-field mapping		AS	AS	AS								
2. Reef variability												
-interviews re impacts and trends						AS SG CJ	AS SG CJ					
- underwater survey						AS SG	AS SG					
select and initiate reef stations								AS SG KW				
3. Sea Urchin												
-seagrass mapping		AS										
-interviews re harvest and trends												
assessment of abundance			AS KM ME CJ			AS SG ME CJ			AS SG ME CJ			AS SG ME CJ
Data analysis						AS SG						
4. Wild Seamoss												
-interviews re distribution and trends												
-field mapping and monitoring? (tbd)												

5. Seamos cultivation												
design monitoring protocol		AS PS										
6. Reef Fishery												
interviews re present fishery (users, catch, gear and vessels, methods) and trends	GH CJ ME	GH CJ ME	GH CJ ME	GH CJ ME								
-select indicator species and sampling strategy						SG AS CJ						
7. Mangroves												
-field assessment	AS CJ											
-assessing exploitation (e.g., crabs, wood)? (tbd)	AS CJ											
8. Beaches												
interviews re seasonal changes/trends in sand mining? (tbd)												
monitoring profiles (tbd)	By school if possible											
9. Water quality												
Select stations for sediment traps				AS								

Initials: ME = Marcellus Edwin, SG = Sarah George, GH = Gem Hutchinson, CJ = Christopher James, KM = Keith Mortley, AS =Allan Smith,

Appendix 7: Draft monitoring framework.

Indicators were selected according to the following criteria:

- both qualitative and quantitative
- use of several indicators when needed to establish validity
- revealing and valid
- measurable and verifiable
- comparable over time and with other situations
- simple and convenient
- relevant and meaningful
- suitable to establish relationship (cause to effect) with experiments and case study interventions
- using results and data from case studies and experiments whenever possible

The indicators would therefore be identified:

- from data contained in the various base line studies;
- through consultation with stakeholders.

The framework for monitoring that was developed was as follows:

Monitoring question	Base line data available	Indicators
Status of the natural resource		
Habitat conservation	* mapping of habitats in the Bay * description of habitats * Hutchinson report	extent of reef cover turbidity presence and abundance of selected fish species algal abundance
Conservation of commercial species	* maps	tbd
Sustainability of the uses of the natural resources	* maps	tbd
Livelihoods		

Employment	Alphonse/Dominique/Dubois study Clauzel and Joyeux study Population and Household Census	# of jobs directly based on the use of coastal and marine resources # of jobs in the tourism sector # of businesses directly based on the use of coastal and marine resources # of businesses in the tourism sector statements of intentions to establish businesses
Environmental goods	Alphonse/Dominique/Dubois study	tbd
Environmental services	Alphonse/Dominique/Dubois study	tbd
Access to resources	Alphonse/Dominique/Dubois study	tbd
Equity in the distribution of benefits from resource use	Alphonse/Dominique/Dubois study	tbd
Participation in management institutions		
Power relations and opportunities for participation	Buttler study	
Processes of decision-making	Field notes	Indicator of structure of decision-making Changes in the relationships and cooperation between organisations Involvement of community organisations in resource management issues and decision-making processes
Capacity of individual organisations	Initial observations and interviews with key informants Report on strategic planning and management issues in Fishermen's Co-operative	Culture of individual organisations Human, technical and financial resources of individual organisations

Appendix 8: Selected bibliography on seaweed resources in the Caribbean.

- Abbot, I.A. and J.N. Norris, eds. 1985. Taxonomy of economic seaweeds: with reference to some Pacific and Caribbean species. California Sea Grant College Program, University of California, La Jolla, California. T-CSGCP-011. 167 pp.
- Anon. 1986. The demand for seamoss. The Trinidad Express, April 16, 1986. 1 pp.
- Areces, A.J. and N. Céspedes. 1992. Potencialidad productiva de algunas caragenófitas del Indopacífico en aguas del Caribe. Bolitin de la red de acuicultura 6(2):13-16.
- Barbaroux, O., R. Pérez and J.P. Dréno. 1984. L'algue rouge *Eucheuma spinosum* possibilités d'exploitation et de culture aux Antilles. Science et Pêche, Bull. Inst. Pêches Marit. 348:2-9.
- Berkes, F. and A.H. Smith. 1995. Coastal marine property rights: the second transformation. Pages 103-113 in M.A. Junio-Meñez and G. Newkirk, eds. Philippine coastal resources under stress. Coastal Resources Research Network, Dalhousie University, Halifax, Canada, and Marine Science Institute, University of the Philippines, Diliman, Quezon City, Philippines.
- Bird, C.J. and E.C. de Oliveira F. 1986. *Gracilaria tenuifrons* sp. nov. (Gigartinales, Rhodophyta), a species from the tropical western Atlantic with superficial spermatangia. Phycologia 25(3):313-320.
- Bird, C.J., E.C. de Oliveira and J. McLachlan. 1986. *Gracilaria cornea*, the correct name for the western Atlantic alga hitherto known as *G. debilis* (Rhodophyta, Gigartinales). Can. J. Bot. 64:2045-2051.
- Burkholder, P.R., L.M. Burkholder and L.R. Almodóvar. 1971. Nutritive constituents of some Caribbean marine algae. Botanica Marina 14:132-135.
- CANARI. 1996. Report on the training workshop on the cultivation and processing of seamoss/Irish moss. CANARI Technical Report no. 232:16 pp.
- Challenger, B. and C. Williams. 1988. Report of the first OECS workshop on fisheries management and development. OECS Fishery Report No. 1. OECS, Fishery Unit, Cane Garden, St. Vincent. 135 pp.
- Charpentier Esquivel, C. 1980. Variaciones estacionales en la composicion quimica de cinco algas de la costa Caribe de Costa Rica y su posible utilizacion. Unpublished M.Sc. thesis, University of Costa Rica. 76 pp.
- Chu Cheong, L. 1990. Seasonality of seamoss (*Gracilaria* spp.) at Kilgwyn Bay, Tobago. Caribbean Mar. Stud. 1(2):88-93.
- Critchley, A. and M. Ohno, eds. 1998. Seaweed resources of the world. Japan International Cooperation Agency, Yokosuka, Japan. 431 pp.
- CTE. 1987. Report and findings on a survey to determine the market potential of Caribbean seamoss. Cadaran Trading Enterprises, Inc, Ottawa, Canada. Unpublished report to ICOD.
- Dawes, C.J.. 1987. The biology of commercially important tropical marine algae. Pages 155-190 in K.T. Bird and P.H. Benson, eds. Seaweed cultivation for renewable resources. Elsevier Science Publishers, Amsterdam, Netherlands.
- Dawes, C.P. 1995. Suspended cultivation of *Gracilaria* in the sea. J. appl. Phycol. 7:303-313.

- Dawes, C.J. and E.W. Koch. 1988. Physiological acclimation of the Caribbean seaweeds *Eucheuma isiforme* and *Solieria filiformis* (Rhodophyta, Gigartinales) in culture. *Caribbean Journal of Science* 24(3-4):89-94.
- de Oliveira, E. C. 1984. Taxonomic criteria in the genus *Gracilaria* Grev. (Rhodophyta): an experience with the western Atlantic species. *Hydrobiologia* 116-117:55-58.
- de Oliveira, E.C. and N. Kautsky, eds. 1990. Cultivation of seaweeds in Latin America. Proceedings of a workshop on Cultivation of Seaweeds in Latin America. 2-8 April 1989, Sao Paulo, Brazil. 141 pp.
- de Oliveira, E.C., C.J. Bird and J. McLachlan. 1983. The genus *Gracilaria* (Rhodophyta, Gigartinales) in the Western Atlantic. *Gracilaria domingensis*, *G. cervicornis*, and *G. ferox*. *Canadian Journal of Botany* 61(12):2999-3008.
- Deboer, J.A. 1981. The marine plant resources and their aquaculture potential in the Bahamas. Report to the Fisheries Training and Development Project (BHA/78/001) Nassau, Bahamas:49 pp.
- Devi Prasad, P.V. 1986. A seasonal study of the red seaweeds *Solieria tenera* and three species of *Gracilaria* from Jamaica. *Hydrobiologia* 140:167-171.
- Diaz-Piferrer, M. 1961. Taxonomía, ecología y valor nutrimental de algas marinas cubanas:III. Algas productoras de agar. Inst. Cubano de Invest. Tecnol., ser. Estud. Trav. De Invest. No. 17:1-84.
- Diaz-Piferrer, M. 1967. Los recursos marinos de Venezuela. Algas de importancia económica. *El Farol* 29(222):18-22.
- Diaz-Piferrer, M. and Caballer de Perez. 1964. Taxonomía, ecología y valor nutrimental de algas marinas de Puerto Rico. Admin. Fomento Económico. Hato Rey, Puerto Rico. 145 pp.
- Dréno, J.P., R. Pérez and O. Barbaroux. 1984. L'algue rouge *Eucheuma spinosum*: un essai de culture intensive en milieu enrichi. *Science et Pêche, Bull. Inst. Pêches Marit.* 348:10-20.
- Duckworth, M., K.C. Hong and W. Yaphe. 1971. The agar polysaccharides of *Gracilaria* species. *Carbohydrate Research* 18:1-9.
- Espeut, P. A. 1992. The cultivation of seamoss and Irish moss in the Caribbean: social and economic perspectives. CANARI Technical Report no. 68:99 pp.
- Espinoza-Avalos, J. 1994. Seaweed as food in the Caribbean. *Applied Phycology Forum* 11(3):13.
- Evans, G.F. 1995. A socioeconomic analysis of the seamoss industry in St. Lucia. Unpublished thesis, University of the West Indies, Barbados. 180 pp.
- FAO. 1988. Report on the group training in seamoss cultivation TCP/RLA/6651 aquaculture diversification and training. 30 May - 3 June 1988, Vieux Fort, Saint Lucia. 35 pp.
- FAO. 1990. Report on the training course in seamoss cultivation, Kingston, Jamaica, 17-21 September 1990. RLAC/91/03-PES-21:9 pp.
- Fisheries Division, Trinidad. 1997. Literature search on Caribbean seaweed resources.
- Freile-Pelegrín, Y. and D. Robledo. 1997. Effects of season on the agar content and chemical characteristics of *Gracilaria cornea* from Yucatán, Mexico. *Botanica Marina* 40:285-290.
- George, S. 1999. Fisheries sector review for Saint Lucia. Organisation of Eastern Caribbean States, Natural Resource Management Unit, Castries, St. Lucia. 42 pp.

- Gibson, J., M. Toure and A.H. Smith. 1997. Integrated coastal management (ICAM) for the Caribbean with special reference to fisheries and aquaculture. Pages 111-120 in ACP-EU Fisheries Research Report 3, European Commission, Brussels.
- Goldstein, M.E. 1973. Regeneration and vegetative propagation of the agarophyte *Gracilaria debilis* (Forsskål) Børgesen (Rhodophyceae). *Botanica Marina* 16:226-228.
- Goreau, T.J., P.D. Goreau, S.H. Goreau, A.H. Macfarlane, P.V. Devi Prasad, B. Lapointe and J. Ryther. 1986. Jamaican back reef Springs: some aspects of their ecology and mariculture potential. Proceedings of the Association of Island Marine Laboratories of the Caribbean, 19th Meeting, St. Croix, USVI.
- GOSL. 1999. Plan for managing the marine fisheries of St. Lucia. Draft. 46 pp.
- Government of Trinidad and Tobago. 1993. Revised executive summary of the Eastern Northern Range Plan in Trinidad (1991-1995) Part 1.
- Guist, G.G., Jr., C.J. Dawes and J.R. Castle. 1982. Mariculture of the red seaweed, *Hypnea musciformis*. *Aquaculture* 28:375-384.
- Hay, M.E. and J.R. Norris. 1984. Seasonal reproduction and abundance of six sympatric species of *Gracilaria* Grev. (Gracilariaceae; Rhodophyta) on a Caribbean subtidal sand plain. *Hydrobiologia* 116/117:63-94.
- Hay, M.E., T. Colburn and D. Downing. 1983. Spatial and temporal patterns in herbivory on a Caribbean fringing reef: the effects on plant distribution. *Oecologia* 58:299-308.
- Herrera, A.F. 1989. Evaluacion de las macroalgas rodofitas de importancia económica que podrían ser utilizadas en cultivos, en siete localidades del litoral Caribe. Universidad Nacional de Costa Rica. Unpublished thesis. 45 pp.
- Lahaye, M. and M. Yappe. 1989. The chemical structure of agar from *Gracilaria compressa* (C. Agardh) Greville, *G. cervicornis* (Turner) J. Agardh, *G. damaecornis* J. Agardh and *G. domingensis* Sonder ex Kützinger (Gigartinales, Rhodophyta). *Botanica Marina* 32(4):396-377.
- MacFarlane, A.H. 1991. The mariculture potential of *Gracilaria* species (Rhodophyta) in Jamaican nitrate-enriched back-reef habitats: growth, nutrient uptake and elemental composition. Unpublished M. Sc. thesis, University of Miami: 96 pp.
- McLachlan, J. and C.J. Bird. 1984. Geographical and experimental assessment of the distribution of *Gracilaria* species (Rhodophyta: Gigartinales) in relation to temperature. *Helgol. Meeresunt.* 38:319-334.
- Michanek, G. 1975. Seaweed resources of the ocean. FAO Fisheries Technical Paper No. 138:127 pp.
- Murano, E., R. Toffanin, C. Pedersini, A. Carabot-Cuervo, G. Blunden and R. Rizzo. 1996. Structure and properties of agar from two unexploited agarophytes from Venezuela. *Hydrobiologia* 326/327:497-500.
- Mussington, J.R. 1987. Barbuda seamoss mariculture project. Unpublished report. 37 pp.
- Nightingale, A.J. 1988. Seamoss cultivation in St. Lucia: appropriate technology? Unpublished thesis. Sidney Sussex College, Cambridge University, England.
- Norris, J.N. 1985. *Gracilaria* and *Polycavernosa* from the Caribbean and Florida: key and list of the species of economic potential. Pages 1-113 in I.A. Abbott and J.N. Norris, eds. Taxonomy of economic seaweeds. Report no. T-0CSGCP-011, California Sea Grant College Program, La Jolla.

- Ohno, M. and A.T. Critchley, eds. 1993. Seaweed cultivation and marine ranching. Japan International Cooperation Agency, Yokosuka, Japan. 151 pp.
- Ortiz Sotomayor, A. and L.R. Almodóvar. 1982. El género *Gracilaria* (Gigartinales: Rhodophycophyta) y su posible potencial como agarófita a escala industrial. *Carib. J. Sci.* 18(1-4):49-57.
- People Dynamics Associates. 1999. Participatory coastal zone management in Barbados. Barbados Coastal Conservation Programme (Phase 1), Demonstration Projects. 30 pp.
- Price, W.S. and P.G. Price. 1998. Nearshore marine resources of Carriacou, Petite Martinique and outlying islands: status, concerns and recommendations. Report prepared for the Physical Planning Unit of the Government of Grenada. 113 pp.
- Racca, E., R. Hurtado, C. Dawes, C. Balladares and J. Rubio. 1993. Desarrollo de cultivo de Gracilarias en l Península de Araya (Venezuela). Pages 33-38 in J.A. Zertuche González, ed. Situación actual de la industria de macroalgas productoras de ficocoloides en América Latina y el Caribe. Proyecto AQUILA II, Documento de Campo No. 13. FAO, Rome, Italy.
- Renoux-Meunier, A. 1978. Inventaire des algues marine des côtes d'Haïti. Rapport preliminaire de la mission effectuée pour la FAO. Project HAI/78/004. 16 pp.
- Richardson, W.D. 1958. Preliminary investigations on the utilisation of marine algae in the Caribbean. *Abstr. Int. Seaweed Symp.* 3:49-50.
- Richardson, W.D. 1975. The marine algae of Trinidad, West Indies. *Bulletin of the British Museum (Natural History)* 5(3). 143 pp.
- Rincones, R.E. 1989. Experimental cultivation of an agarophyte alga: *Gracilaria cornea* in the northwest coast of Venezuela. Pages 65-67 in E. C. de Oliveira and N. Kautsky, eds. Cultivation of seaweeds in Latin America. University of São Paulo, Brazil.
- Rincones, R.E., J.N. Rubio d E.C. Racca. 1992. Gracilaria pilot farming in Venezuela. Pages 309-318 in K.E. Mshigeni, J. Bolton, A. Critchley and G. Kiangi. (eds.). Sustainable seaweed resource development in Sub-Saharan Africa. University of Namibia, Windhoek.
- Robledo, D. and Y. Freile-Pelegrín. 1997. Chemical and mineral composition of six potentially edible seaweed species of Yucatan. *Botanica Marina* 40:301-306.
- Rodríguez de Ríos, N. 1986. El genero *Polycavernosa* Chang y Xia (Gracilariaceae, Rhodophyta), con descripción de una nueva especie. *Ernstia* 38:12-31.
- Rodríguez de Ríos, N. 1986. Sobre la verdadera identidad de la llamada *Gracilaria verrucosa* (Hudson) Papenfuss en Venezuela. *Ernstia* 38:32-39.
- Smith, A. 1986. A guide to seamoss cultivation in the West Indies. Caribbean Conservation Association, Bridgetown, Barbados. 20 pp.
- Smith, A.H. 1986. Seamoss species and marketing in St. Lucia, St. Vincent and Grenada. Ocean Research and Conservation Association, Communication no. 5: 4 pp.
- Smith, A.H. 1986. Seamoss farming in St. Lucia: from research to reality. *St. Croix Avis* No. 86. 2 pp.
- Smith, A.H. (comp.). 1990. Annotated bibliography of seaweeds used for food in the West Indies. OECS Fishery Unit, St. Vincent and the Grenadines. OECS Fishery Report No. 3. 76 pp.

- Smith, A.H. 1990. Commercial cultivation of *Gracilaria* spp. used for food in the West Indies. Pages 75-78 in E.C. de Oliveira and N. Kautsky, eds. Cultivation of seaweeds in Latin America. University of São Paulo, Brazil.
- Smith, A.H. 1992. Farming edible seaweeds in the Caribbean. *Applied Phycology Forum* 9(1):1-2.
- Smith, A.H. 1996. Assessment of the feasibility of seaweed (*Eucheuma* and *Gracilaria*) cultivation in Belize. Report to FAO Regional Office for Latin America and the Caribbean, Port of Spain, Trinidad and Tobago. CANARI Technical Report no. 226:10 pp.
- Smith, A.H. 1997. Seamos cultivation in the West Indies. CANARI Guidelines Series no. 1:23 pp.
- Smith, A.H. 1997. Finding better crops for seaweed farmers in the West Indies. *Out of the Shell* 6(1):12-13.
- Smith, A.H. 1998. The seaweed resources of the Caribbean. Pages 324-330 in A.T. Critchley and M. Ohno, eds. Seaweed resources of the world. Japan International Cooperation Agency, Yokosuka, Japan.
- Smith, A.H. and J. Gustave. 2001. A description of the harvest of wild seamos in Laborie, St. Lucia. CANARI LWI Project Document No. 2. CANARI Technical Report no. 292:4 pp.
- Smith, A.H., A. Jean and K. Nichols. 1986. An investigation of the potential for commercial mariculture of seamos (*Gracilaria* spp., Rhodophycophyta) in St. Lucia. Pages 4-11 in F. Williams, ed. Proceedings of the thirty-seventh annual Gulf and Caribbean Fisheries Institute.
- Smith, A.H., K. Nichols and J. McLachlan. 1984. Cultivation of seamos (*Gracilaria*) in St. Lucia, West Indies. *Hydrobiologia* 116/117:249-251.
- Smith, A. and Y. Renard. 1987. Seamos mariculture in the Eastern Caribbean. Pages 93-102 in B. Challenger and C. Williams, eds. Report of the First OECS Workshop on Fisheries Management and Development. St. Vincent and the Grenadines, August 1987. OECS Fishery Report no. 1.
- Smith, A.H. and Y. Renard. 2002. Seaweed cultivation as a livelihood in Caribbean coastal communities. Paper presented at the ICRI Regional Workshop for the Tropical Americas: Improving Reefs Condition Through Strategic Partnerships. Cancun, Mexico, June 2002. CANARI Communication no. 309:8 pp.
- Stone, R.D. 1991. Wildlands and human needs: reports from the field. World Wildlife Fund, USA. 151 pp.
- Taylor, D. 1989. Seamos farming in the Caribbean. *Southern Boating*, December 1989. 2 pp.
- UNDP/TCDC/CARICAD. 1999. Sharing innovative experiences vol. 2: small island developing states. UNDP, Trinidad and Tobago. 260 pp.
- Whyte, J.N.C. and S.P. Hosford. 1981. Composition and properties of a red alga from St. Lucia. Technological Research Laboratory Report. Technology Services Branch, Department of Fisheries and Oceans, Vancouver. (Unpublished ms).
- Wynne, M.J. 1989. The reinstatement of *Hydropuntia* Montagne (Gracilariaceae, Rhodophyta). *Taxon* 38:476-479.
- Wynne, M.J. 1986. A checklist of benthic marine algae of the tropical and subtropical western Atlantic. *Can. J. Bot.* 64(10):2239-2281.
- Wynne, M.J. 1998. A checklist of benthic marine algae of the tropical and subtropical western Atlantic: first revision. *Nova Hedwigia* 116:1-155.
- Zertuche Gonzalez, J.A. 1993. Situación actual de la industria de macroalgas productoras de ficocoloides en América Latina y el Caribe. FAO, Proyecto Aquila II, Documento de Campo 13. 56 pp.

Appendix 9: Issues affecting the development of seamoss production.

The issues affecting the development of seamoss production in Laborie				
Sector	Issues	What has been learned	Implications for Laborie	Policy requirements
The environment	Site selection	Farming may conflict with other uses of marine space Large-scale coastal developments can conflict with seaweed farming	Site location needs agreement among different users, e.g. boat mooring vs farming inshore; a broader zoning system for activities in the Bay may be needed	Policy on zones suitable for farming, based on water quality, compatibility with other uses, access conditions, etc. (Explore possibility of using the Physical Planning and Development Act of 2001. Consider need for an organisation to lead the zoning process.) Guidelines for leases (contents and process) to be issued under the provisions of the Fisheries Act (these guidelines should cover social, environmental and other aspects) Environmental Management Systems for farms and other units of production, based on acceptable standards (ISO 14000) Licensing of farmers to ensure compliance with lease and zoning conditions
		Inshore space may not be available due to boat mooring or recreation and offshore sites may be better suited to some species	Non-swimmers or people without the use of boats may be unable to access suitable sites for farming (Brown 1999) Arrangements may be needed to facilitate access to farms by people who do not have access to boats	
	Water quality and pollution	High faecal coliform counts near shore (Hutchinson 2001) may contaminate dried seamoss and may have implications for products processed at low temperatures	Potential health impacts and limits to exports due to unacceptable levels of contamination Need for access to facilities for analysis and certification of products	Environmental Management Systems and standards for production areas and local and export markets (e.g. for bacteria and fungal spores) Good Aquaculture Practices?

The issues affecting the development of seamoss production in Laborie				
Sector	Issues	What has been learned	Implications for Laborie	Policy requirements
	Potential for negative environmental impacts	Farming operations can result in littering of beaches with discarded ropes and floats, e.g. at Aupicon	Proper disposal procedures are needed for waste materials	Environmental Management Systems
		Propagation of indigenous species has no evident negative impact on reef community structure	Continue to focus on Caribbean species only	Environmental Management Systems Good Aquaculture Practices?
		Tropical seaweed cultivation now focuses mainly on introduced species but impacts are still not clearly demonstrated		
		Negative visual impact of surface floats used in mariculture has been criticised in some countries	Expansion of current farming systems affects the appearance of the Bay	Environmental Management Systems
	Access to the natural stock resource	Harvest of wild stocks has not been sustainable in the past (Smith and Gustave 2001) and is now discouraged by DOF (George 1999)	Seamoss businesses must be based on cultivated crops	Effective measures for the protection of wild stocks Discouragement of wild harvest
		Strain selection for farming requires seed material from wild stocks	Continued access to wild stocks in Laborie and nearby bays is still necessary for propagation purposes	Preservation of access to wild stocks for genetic diversity of planting materials
Cultivation	Species selection	The implications of introducing exotic species are still unclear	Limit cultivation trials to Caribbean species as a precaution	Environmental Management Systems

The issues affecting the development of seamoss production in Laborie				
Sector	Issues	What has been learned	Implications for Laborie	Policy requirements
		Gel quality varies greatly among species, with fast growth correlated with poor gel quality (Smith 1989). The differences affect marketability, with debilis and crassissima most in demand because of high gel quality	Need to focus on higher quality crops even if growth rates and productivity are lower than other farmed species	
		Gel quality varies significantly within species, e.g. best growth of debilis in Laborie correlates with low gel strength, and vice versa from cultivation elsewhere in the region (Rincones Leon 1989)	Farmers need to continue strain selection to optimise both productivity and gel quality to meet market demand	
	Cultivation methods	Essential materials such as rope and netting may become unavailable in the country	Possible direct import by Fishermen's Coop could stabilise supply and avoid the high costs of importation by individual farmers	
	Alternative cultivation systems	Cultivation in tanks and raceways on land allow optimisation of culture conditions and avoid the risks of cultivation in the open sea, but have not proved practicable or cost-effective in the region (Lee Lum 1995)	Focus on low-cost methods in the sea, although on-land holding tanks for short-term maintenance may be practicable, as demonstrated in Barbados	

The issues affecting the development of seamoss production in Laborie				
Sector	Issues	What has been learned	Implications for Laborie	Policy requirements
	Entry into farming business	<p>Most people, especially the poor, are unable or reluctant to innovate and to take risks</p> <p>There are a number of cultural factors that prevent the entry of women into the farming business</p> <p>New farmers require sustained technical, financial and moral support in order to succeed</p>	So far, only one person has remained in production, while a number of persons who had begun farming and processing have abandoned production	<p>Education and training programmes to strengthen entrepreneurial skills and attitudes</p> <p>Use of established businesses and ventures, both locally and outside the country, as models for motivation and demonstration</p> <p>Use of other “success stories” to extract lessons and guidelines</p> <p>Improved access to information on the viability of an enterprise</p>
Processing	Cost of equipment and infrastructure	Financial support for setup can be accessed in St. Lucia	A development plan is needed to determine the feasibility of establishing processing facilities	
	Processing skills	Skills are available but are mainly limited to a few common products	Need to explore options for new products and processing skills	
	Quality control	Occasionally poor quality of dried seamoss on sale has adversely affected the local market (CTE 1986)	Establishing and maintaining a reputation for quality is essential in order to be competitive	
Marketing	Availability of information on markets and marketing procedures	Marketing is the key limiting factor to expansion and information from past studies is limited and outdated	<p>Marketing is by far the main constraint to the expansion of production</p> <p>Seaweed farming and seaweed products can be part of Laborie’s overall tourism product</p>	<p>Research to determine costs of production and processing</p> <p>Market research to determine demand, based on product, species,</p>

The issues affecting the development of seamoss production in Laborie				
Sector	Issues	What has been learned	Implications for Laborie	Policy requirements
	Access to existing markets for traditional uses	<p>Difficulty in selling the crop quickly discourages new farmers (Berkes and Smith 1995)</p> <p>Generally, the people who get involved in production do not have advanced marketing skills, these are two different professions</p>	New farmers need guidance	<p>taste, etc.</p> <p>Research to determine packaging and labeling requirements for local and export markets</p> <p>Marketing strategy and plan</p>
	Promotion and advertising	<p>Promotion and advertising have been very limited but are essential for increasing sales (CTE 1986)</p> <p>Advertising is costly for individual producers</p>	Cooperation among producers and joint advertising may be more cost-effective but may not be acceptable in light of competition for limited markets at present	
	Possible potential for export for industrial applications	Quality of agars is too low in any species that are likely to be cultivated (Smith 1992) and prices for industrial use are significantly lower than for traditional uses in the region	Need to focus on supplying the traditional seamoss market	
Management systems and procedures	Overall coordination	There is need for an active coordinating mechanism, and for policy and technical support in a wide range of domains	Development work at the community level cannot succeed in the absence of suitable arrangements at the national level	Institutional arrangements to provide for the effective coordination of and support to seamoss production activities
	Training and technical assistance, for the benefit of suitable target groups	Fishers are typically not suitable; so far, successful farmers have been underemployed men and women diversifying income sources	Appropriate groups can be identified if marketing opportunities justify an increase in production	<p>Implementation of national and local marketing plans and strategies</p> <p>Management of all information required to support the development of the activity</p>

The issues affecting the development of seamoss production in Laborie				
Sector	Issues	What has been learned	Implications for Laborie	Policy requirements
	Availability of technical advice and assistance	The technology is still evolving and both new and established producers need access to technical expertise and assistance, in addition to initial training and transfer of technology	Under the right conditions for expansion, technical assistance must be readily available to the people who have already been trained in cultivation and processing methods	Provision of training and assistance to women to facilitate their entry into farming, processing and marketing Zoning plan and leasing guidelines (see above)
	Tenure and rights of access	The Fisheries Act provides for leasing of areas of seabed for mariculture (GOSL 1984). It has had limited application but may be essential as the extent of farming increases (Smith and Berkes 1995)	Zoning of areas suitable for mariculture is necessary but needs to be integrated into a broader development plan for the Bay	Improved access to information on the economics of production Improved access to credit and equity financing, with increased role for the Laborie Co-operative Credit Union
	Installation of floating structures may be a hazard to navigation	Farming over shallow reefs avoids hazard to navigable channels	See above	Media coverage of seamoss production, and increased public awareness of its potential
	Theft	Theft of crops and culture materials has been a major issue in some countries but in St. Lucia has not caused any farmers to give up	Plants washed ashore in rough weather are seen by the community (but not by farmers) as common property	
	Storm losses	No system exists for responding to storm warnings;	Need to develop methods to reduce losses, e.g. improved anchoring or temporary transfer of lines to sheltered areas	
		Damage to farms may mean lost markets due to inability to supply at short notice (e.g. Praslin in Oct 2002)	Collaboration among different production sites may improve stability of supply	
		Farmers have not been able to insure farms in the past	A reserve fund based on contributions from sales may aid re-establishment of farms Membership in the Fishermen's Coop could give access to a distress fund	

Appendix 10: Surveys of perceptions of water quality issues among organisations.

Perceptions of organisations about water quality in Laborie Bay, March 2002.

Organisations						
	Condition of water in Laborie Bay	Factors affecting water quality	Role in dealing with water quality	Budget	What else could be done – by whom?	Barriers to implementation
District Representative	Good	Pollution, faecal matter	Allocating resources for beach sanitation programme	Yes, don't know how much	Public education, systematic beach cleanup	Lack of funds, failure to recognise value of beaches and their role in development
Laborie Development Planning Committee (LDPC)	Has deteriorated over time Quality is better as one moves westward	Indiscriminate disposal of solid waste, especially in ravines and defecation on parts of the beach	Mobilising residents to formulate plans and approaches to solving problems in the future	None	Whatever is necessary. Need for a coordinated approach among agencies concerned and LDPC could facilitate this	Absence of coordinating body

Organisations						
	Condition of water in Laborie Bay	Factors affecting water quality	Role in dealing with water quality	Budget	What else could be done – by whom?	Barriers to implementation
Laborie Village Council (LVC)	Not very good	Garbage and faecal matter	Weekly garbage collection and beach cleanup and periodic monitoring for illegal activities, e.g. sand mining	For beach cleanup	Periodic testing of water by Ministry of Health Fishermen should be discouraged by the LFCC from dumping fish entrails on beach or in the sea New legislation	Limited financial resources. Insufficient collaboration between LVC and Environmental Health Office. Failure of Environmental Health Officer to do site visits or respond to appeals for assistance
Ministry of Communication & Works (VFT)	Not very good	Garbage from households. Human faeces	None directly but provides for site cleanups after completion of public works projects	None directly	Increased awareness of present conditions and how that can be improved	Individuals and groups from Laborie do not seriously address pollution and water quality concerns
Ministry of Health (Public Health Office VFT)	Don't know	Don't know	None, concerned with municipal water supply	None, budget only for monitoring public drinking water supply	Not sure	Not sure
National Conservation Authority	Don't know	Don't know	None	None directly. Laborie Bay not included in beach clean up	Don't know	Don't know
Sustainable Development Unit (Ministry of Planning)	Don't know but believe CEHI has carried out tests	Don't know	None	None	Not sure	Not sure

Organisations						
	Condition of water in Laborie Bay	Factors affecting water quality	Role in dealing with water quality	Budget	What else could be done – by whom?	Barriers to implementation
Water Resources Management Unit	Don't know and not familiar with Laborie Bay	Don't know	None	Small	Don't know	Don't know

Perceptions of organisations about water quality in Laborie Bay, March 2003.

Organisations							
	Condition of Water in Laborie Bay	Factors affecting water quality	Role in dealing with water quality	What is being done	Budget	What else could be done – by whom?	Barriers to implementation
District Representative	Not interviewed						
Laborie Development Planning Committee (LDPC)	High level of faecal coliform	Disposal of solid and liquid waste into the Bay; siltation due to run-off	Sensitization to effect behavioural changes Searching for solutions in collaboration with other partners e.g. Ministry of Health Coordinating efforts at reducing pollution	Awareness campaign of conditions of Bay in collaboration with DOF, CANARI, etc. through <i>People and the Sea</i> Project Presentation of findings on water quality to stakeholders CANARI presently documenting findings on water quality in Laborie Bay	None	Use of documented findings for future solutions - LDF Assessing effectiveness of sewage system recommended by Department of Health, LDF Water quality monitoring by schools Stop waste disposal in waterways	Not a priority, consequently Government does not allocate resources needed to address problem
Laborie Village Council (LVC)	Improved, not as much waste as last 10 or so years Not sure about actual water quality, it looks clearer	Pig rearing, and perhaps sewage runoff Informal discussions among people, particularly fishermen	LVC workers clean beach reducing volume of garbage reaching sea Discussions with fishermen to bury fish entrails rather than throwing into sea	LVC ensures regular beach clean-up and garbage collection Also assigns specific areas to particular workers to ensure effective clean-ups	None	Education by all agencies, LDF, LVC, CANARI, schools, and other sectors PRF and other agencies can assist in getting toilets into private homes	Lack of resources Local stakeholders have no resources Absence of toilets in several homes

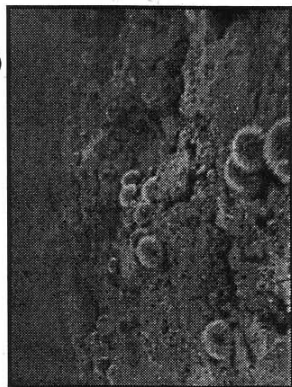
Organisations							
	Condition of Water in Laborie Bay	Factors affecting water quality	Role in dealing with water quality	What is being done	Budget	What else could be done – by whom?	Barriers to implementation
Ministry of Communication & Works (VFT)	Some areas are polluted, not sure where	Lack of awareness of impact of garbage disposal in Bay	None directly	Nothing Don't know	None	Not sure, perhaps LVC could get people to stop throwing garbage in sea	Not sure
Ministry of Health (Public Health Office VFT)	Not sure Some level of pollution, higher than PAHO recommendations	Septic tanks draining into Bay Defecation on beach Pig pens drain into trenches and rivers	Officer used to collect water samples and do bacterial analysis in past; not sure this is being done at present	Water Quality Unit responsible for disposal of liquid waste, making recommendations for construction of buildings and waste disposal systems Project recently tested water in Laborie Bay	Indirectly	Monitoring for and analysis of bacterial/ pathological elements and examination of sources of contamination Enforcement of health regulations Could be done by Department of Health	Issue is not a priority for relevant authorities
National Conservation Authority	Don't know	Don't know	None, not responsible for water; deals with security for visitors and beautifying country	Don't know, deals with Piaye and Vieux Fort, not Laborie	None	Don't know	Don't know

Organisations							
	Condition of Water in Laborie Bay	Factors affecting water quality	Role in dealing with water quality	What is being done	Budget	What else could be done – by whom?	Barriers to implementation
Sustainable Development Unit (Ministry of Planning)	Not good, polluted	<p>Sedimentation from rivers, drains, canals</p> <p>Discharge from sewage</p> <p>Garbage waste</p>	None at present	<p><i>People and the Sea</i> project, awareness and water testing</p> <p>Ministry of Planning finalising Coastal Zone Management Policy with specific recommendations, within a national framework for more informed activity at local level. Will facilitate remedial work and address pollution</p>	None	<p>Address sources of pollution, more continuous monitoring of water quality, better drainage on land, better waste management facilities, sensitization and public awareness, More collaboration among community groups and other agencies e.g. Department of Health</p>	<p>Lack of money</p> <p>Not a priority</p> <p>Ministries too sector focused, need to integrate sectors</p> <p>Need for coordinating body, e.g. LDF</p> <p>Need for strengthening of LDF</p> <p>Need to decentralize, too much top-down decision making</p>
Water Resources Management Unit	Not interviewed						



The Story of Sea Urchins. Playing Our Part

**From the
1980s
to 2002**



Sea Eggs (Urchin) on seabed.

The white spine sea urchin, *Tripanosaster vancouvericus*, is known locally as the 'sea egg'. It is found mainly in shallow waters either on seagrass beds, or red or rubble areas of the island shelf. This urchin species belongs to the family of marine organisms known as Echinodermata, meaning 'spiny skin'. At first sight, it may not be clear how these 'prickly' creatures can move about, yet they do so over the sea bottom by using special soft, surcing structures known as 'tube feet'. White spine sea urchins are often referred to as 'the lawnmowers of the sea' as they can heavily graze areas, mainly consuming types of sea grass and also algal turf growing on rock surfaces.

Like all other living creatures, sea urchins need to breed and produce young (reproduce). In order for the population to survive over time. To reproduce, female and male sea urchins shed eggs and sperm into the water column. Fertilization occurs here, producing tiny, floating larvae that eventually grow and undergo physical changes to eventually reach a stage that can settle on the sea floor, in suitable nearshore areas. The gonads or "eggs" of the sea urchins are in fact what we eat here in St. Lucia. This is regarded by many as a delicacy.

Sea urchins are easy to obtain, since they are found in relatively shallow waters and are slow moving creatures. High levels of demand and the eventual over-harvesting of this important marine resource here in St. Lucia, led to a drastic decline in the number of sea urchins, and eventually in December 1987, a ban on harvesting was put in place.

During this period of closure for the fishery, a new management approach was developed for the resource and the fishery, (see box), one which could better take into account the biological nature of this sea urchin species and its susceptibility to over-harvesting.

The Department of Fisheries provides the following guidelines to encourage traditional harvesters and the general public to play their part in the sustainable management of sea urchins:

- Participate in pre- and post harvest surveys with the Department of Fisheries;

- Attend consultations organised by the Department of Fisheries to discuss sea urchin management;

- Harvest sea urchins only during the legally declared harvest period;

- During the legally declared harvest period, only harvest sea urchins at and above the legal size;

- Dispose of sea urchin remains in the manner prescribed by the Department of Fisheries;

- Do not buy sea urchins outside of the authorized fishery periods:

- Inform the Department of Fisheries or the District Police if you observe anyone selling sea urchins during the survey period.

- Refuse to buy sea urchins below the legal size:

- If you are unsure of any action to take with regard to issues relating to sea urchins, contact the Department of Fisheries and Aquaculture.

- Provide a clean environment for sea urchins by

disposing of all your waste

appropriately.

SEA URCHINS ARE
OUR BUSINESS!

- 1987-1990. Ban on harvesting in force and monitoring of the recovery of the resource undertaken.
- 1990-1993. Ban lifted for short harvest period each year (e.g., 2 weeks), based on the increase in the number of sea urchins.
- Continued monitoring of population numbers by the Department of Fisheries in collaboration with traditional harvesters, showed population on the decline again.
- 1993. Joint management decision made by the Department of Fisheries and the sea urchin harvesters to re-impose a ban on harvesting.
- 1995. Based on the level of recovery, a short but highly restricted harvest period was allowed in the southern part of the island.
- 1995-2000. Monitoring activities revealed very low population numbers in most areas in St. Lucia, and in other Eastern Caribbean Islands as well and low levels of settlement of new sea urchins to nearshore areas. The management team (Department of Fisheries and harvesters) again agreed not to harvest sea urchins. To date, there are no known reasons for the low levels of settlement of new sea urchins, but large-scale ocean conditions (e.g., water currents, water temperature) may have played a role in creating this situation.
- 2000-2001. Sea urchin population monitoring now revealed an unusually high level of recruitment (settlement of new baby urchins from the water column) in all areas. By now, adult sea eggs had also become quite abundant compared to previous years. These conditions were considered favourable for allowing a harvest period.
- 2001. In Anse Ger, a small number of persons were granted harvest permits for the period September 4-6.
- Shortly after the close of the Anse Ger harvest period, a short one-time harvest period was opened for the public at large. This decision was based on the large number of adult sea urchins in areas that caused over grazing of sea grass beds and urchins to die of starvation. There was also a need to reduce sea urchin numbers to allow sea grass areas to recover and let new urchins settle for future harvests.
- The Department of Fisheries monitored landings to ensure that persons were only harvesting urchins above a stipulated size, (to prevent the harvesting of juveniles), and to estimate quantities brought in.
- 2001-2002. Monitoring of sea urchin populations continued and populations have remained at high levels.
- September 9-22, 2002. An island-wide two-week harvest period was declared and was successfully executed.

Sea Urchin Open Period 9-22 September, 2002

In light of the numbers of sea urchins observed during the Department of Fisheries ongoing monitoring activities and requests received regarding permission to harvest white sea urchins (sea eggs), the Ministry of Agriculture, Forestry and Fisheries is authorizing a two-week islandwide harvest period to take place from Monday 9th to Sunday 22nd September, 2002, both days inclusive.

Sea Egg Harvesting Conditions

All harvesters are required to adhere to the following conditions:

All persons must harvest only eggs that are at least 3.5 inches (9.0cm) in diameter (measured at the widest length across the body of the animal);

No one is to harvest in any Marine Reserve such as the Maria Islands Nature Reserve and the reserves within SMMA and CAMMA;

No Scuba gear is to be used for harvesting of sea urchins;

All urchins must be brought to shore for breaking and processing (no such activities are to be carried out at sea);



All harvesters and cleaners must make available to the Department of Fisheries any data on sizes and weights, as requested;

No exportation of sea urchins are permitted without first obtaining the required export permit from the Department of Fisheries. Only export for personal consumption will be entertained (i.e., quantities of less than 10 Lbs).

Department of Fisheries
Pointe Seraphine
Castries
St. Lucia

Phone: 468-4143/468-4135

Fax: 452 3853

Email: deptfish@slumaffe.org

Appendix 12: Vision and programme for tourism development

Extracted from LDPC (2001):

“We envision a tourism product that is:

- locally owned (in economic, social and cultural terms)
- economically, socially, culturally and environmentally beneficial to all
- well distributed geographically
- authentic and vibrant
- unique and competitive
- based on local economic, environmental and cultural assets

We envisage that the development of the sector would contribute to the development of the national tourism sector, and would have direct economic benefits on the local community. It would also impact positively on:

- human health
- environmental quality
- infrastructural development

In order to realise this vision we propose that tourism development be based primarily on culture and cultural expression.

The primary components of our future tourism product should therefore include:

- artistic performances
- artistic production (recording studio for example)
- preservation of the architectural and industrial heritage
- interpretation of the various aspects of the cultural heritage
- interaction between visitors and the community
- local food and culinary arts
- traditional village life and culture, in its various expressions

The complementary components of this product include:

- overall environmental quality and attractiveness
- water sports
- natural sites and attractions
- exchanges with communities and organisations in other parts of the island
- sporting events
- other forms of entertainment, particularly nighttime entertainment
- initiatives aimed at increasing the number of rooms available in and around the community

There is need to define the clientele which this product seeks to attract. It is proposed that:

- initial emphasis should be on domestic tourism, i.e. nationals as well as visitors who reside in other parts of the island, at least in the first instance
- this clientele should be complemented by visitors residing in hotels and guesthouses in the Laborie area.

Objectives	Measures and Projects	Activities
Development and management of the cultural product	<p>Architectural preservation and interpretation</p> <p>Provision of support to performing artistes</p> <p>Co-ordination of events Development of cultural tourism packages</p>	<p>Inventory of buildings of architectural significance</p> <p>Sensitization of land owners</p> <p>Provision of architectural advice</p> <p>Provision of incentives to preservation and restoration</p> <p>Catalogue of existing colonial architectural styles</p> <p>Preservation of sugar and military ruins</p> <p>Inventory of artistes and performers, and identification of development needs (equipment, training, etc.)</p> <p>Establishment of a funding mechanism for cultural production</p> <p>Purchase and management of a pool of instruments for use by local musicians</p> <p>Calendar of events: Jazz in the South Solèy Kouché Fishermen's Feast La Rose La Marguerite Independence Activities LabFest Rotaract Annual Easter Bazaar Emancipation Day</p>

Objectives	Measures and Projects	Activities
	<p>Transmission of traditional skills and technology</p> <p>Strengthening of cultural organisations</p>	<p>Christmas New Year Carnival? Jounen Kweyol Sporting Activities Cricket, Football Basketball, etc.</p> <p>Sessions with schools & workshops run by local artists & artisans</p> <p>Tour of traditional technology / skills</p> <p>Membership drive and retreat for cultural organisations</p>
Development and management of complementary products	<p>Provision of incentives to landowners and other persons to develop sites and attractions</p> <p>Preservation and management of natural sites for recreational purposes</p> <p>Provision of a jetty</p> <p>Establishment of a museum or interpretation centre(s)</p>	<p>Inventory and catalogue of potentially marketable sites, features, talents and activities</p> <p>Setting up road signs and street names</p> <p>Provision of comfort stations and related facilities</p> <p>Jetty design, in consultation with stakeholders, and construction</p> <p>Collection of items for display</p>
Promotion of culture-related businesses	<p>Marketing of cultural products</p> <p>Education and sensitisation</p> <p>Encourage and provide incentives for private initiatives</p>	<p>Formulation of marketing strategy</p> <p>Dissemination of information on the benefits that can be gained from culture-related businesses</p> <p>Establishment of a ‘unique’ nightclub</p> <p>Establishment of ‘disco-school’ of traditional dances</p> <p>Establishment of an ‘aesthetic centre’ with focus on flora, fauna, dance, and food (Augier)</p>

Objectives	Measures and Projects	Activities
	Support handicraft development	<p>Inventory of skills and resources in the handicraft sector</p> <p>Development of marketing arrangements</p> <p>Provision of training and assistance with quality standards</p>
Establishment or improvement of facilities	Venues for cultural performances	<p>Study of options for the development of venues</p> <p>Beautification and clean-up of Rudy John Beach park</p> <p>Provision of parking space and other comfort facilities</p> <p>Construction of toilet & shower facilities, and changing rooms at Rudy John Beach Park</p> <p>Provision of garbage bins and other waste disposal facilities and services</p> <p>Enhancement of Morne Le Blanc Nature Heritage Site. Development of hiking trails at Morne Le Blanc</p> <p>Construction of a jetty</p> <p>Development/enhancement of waterfall at Mc Diamed</p>
Maintenance of the quality of the product	Formulation and application of standards for events, sites, attractions and businesses (i.e. restaurants & accommodation sector)	<p>Research to identify suitable standards, and application of these standards</p> <p>Seminars for members of cultural groups</p>
Provision of accommodation for visitors	<p>Expectation of construction of large hotels in the vicinity (Soufriere and Vieux Fort)</p> <p>Provision of support to the creation of medium size hotels in selected locations (particularly Ti Tou and Sapphire)</p>	<p>Promotion to potential investors, provision of technical assistance in design and project development</p>

Objectives	Measures and Projects	Activities
	<p>Provision of support and incentives to the creation of small facilities, such as cottages and lodges</p> <p>Development of camping sites</p>	<p>Conduct of a feasibility study to explore the potential of small hotels, cottages and bed-and-breakfasts projects in and around Laborie</p> <p>Establishment of a bed and breakfast programme</p> <p>Feasibility study of camping sites</p>
Provision of security and peace	<p>Education of the public on the importance of security and peace</p> <p>Involvement of law enforcement agencies</p> <p>Establishment of systems of self-regulation</p>	<p>Campaign to raise awareness of these issues, and consultation to identify solutions</p>
Preservation and enhancement of environmental quality	<p>Educational awareness</p> <p>Provision of alternative sanitation facilities</p>	<p>Anti-litter campaign</p> <p>Campaign against inappropriate disposal of sewage/faeces</p> <p>Provision of toilet facilities to serve individual homes or small number of homes</p> <p>Establishment/expansion of scheme of roadside caretakers</p>
Training and capacity-building	<p>Training programme to develop skills and attitudes required by the sector</p>	<p>Hospitality / customer service training seminars</p> <p>Apprenticeship programme in tourism related jobs - chefs, barmen, maids, etc.</p>
Education and advocacy	<p>Sensitization of policy-makers on the potentials of tourism and the requirements for the development of the sector</p> <p>Education of the Laborie community on the realities of tourism</p>	<p>Public meetings</p> <p>Sensitization visits to other countries</p> <p>Publication of information on tourism in Laborie</p> <p>Television, radio, and newspaper</p>

Objectives	Measures and Projects	Activities
	Development of new attitudes	<p>supplements and advertisements and articles on tourism</p> <p>Community awareness programme on interacting positively with foreigners / being hospitable</p>