

Coastal resources and livelihoods in the Grenadine Islands: Facilitating change in self-organising systems

ROBIN MAHON¹, SHARON ALMERIGI², PATRICK McCONNERY³,
CECIL RYAN⁴ AND BRIAN WHYTE⁵

¹*Center for Resource Management and Environmental Studies (CERMES), UWI,
Barbados*

²*People Dynamics Associates, Barbados*

³*Coastal and Marine Management Program (CaMMP), Caribbean
Conservation Association (CCA), Barbados*

⁴*Projects Promotion Ltd., St. Vincent and the Grenadines*

⁵*Carriacou Environmental Committee, Carriacou, Grenada*

The Grenadine Islands lie on the Grenadine Bank extending some 120 km between Grenada and St. Vincent, and occupy about 1,500 km² of the bank. This area supports the most extensive coral reefs and related habitats in the south-eastern Caribbean. The international boundary between Grenada and St. Vincent and the Grenadines lies about midway down the bank. The largest islands have towns and communities. Others are resort islands. Most are visited by yachters, and fishers. Tourism and fishing are the major sources of employment in the area. Tourism development is proceeding apace, while fishery resources appear to be fully or overexploited. Governments of both countries perceive their Grenadine Islands as having high potential for tourism and associated development. They also recognise the vulnerability of the marine and terrestrial ecosystems of the area to environmental degradation and that sustainable development depends on conservation of the resources. There the emerging view that the entire area should be a transboundary World Heritage Site. The Tobago Cays Marine Park has been established and other MPAs are planned, but a broader approach is needed. Achieving sustainable livelihoods from marine and coastal resources will need organisational change at many levels. There is a complex interplay of local and international private interests, local, national and international NGOs as well as tensions between main island government and local inhabitants. Therefore, conventionally planned change is difficult to implement. The model of organisational change that is most likely to be applicable is one based the science of complex adaptive systems and chaos theory. Intervention should employ 'containers', 'significant differences' and 'transforming exchanges' to increase the capacity for self-organisation among stakeholders. Understanding of other chaos elements such as boundaries, butterfly effects, coupling and attractors can be used to encourage self-organisation

Key words: Caribbean, coastal, livelihoods, co-management, transboundary, self-organisation, complex adaptive systems, chaos theory

Mahon, R., S. Almerigi, P. McConney, C. Ryan and B. Whyte. 2004. Coastal resources and livelihoods in the Grenadine Islands: Facilitating change in self-organising systems. *Proceedings of the Gulf and Caribbean Fisheries Institute* 55: 56-67.

INTRODUCTION

The Grenadine Islands

The area to be addressed in this project includes the Grenadine islands which lie on the Grenadine Bank extending some 120 km between Grenada and St. Vincent and the adjacent marine habitats of the bank itself (Figures 1a and b). In this area, there are over 20 islands, of which 9 have permanent settlements. The largest islands – Bequia, Canouan, Mayreau, Union I., Petit

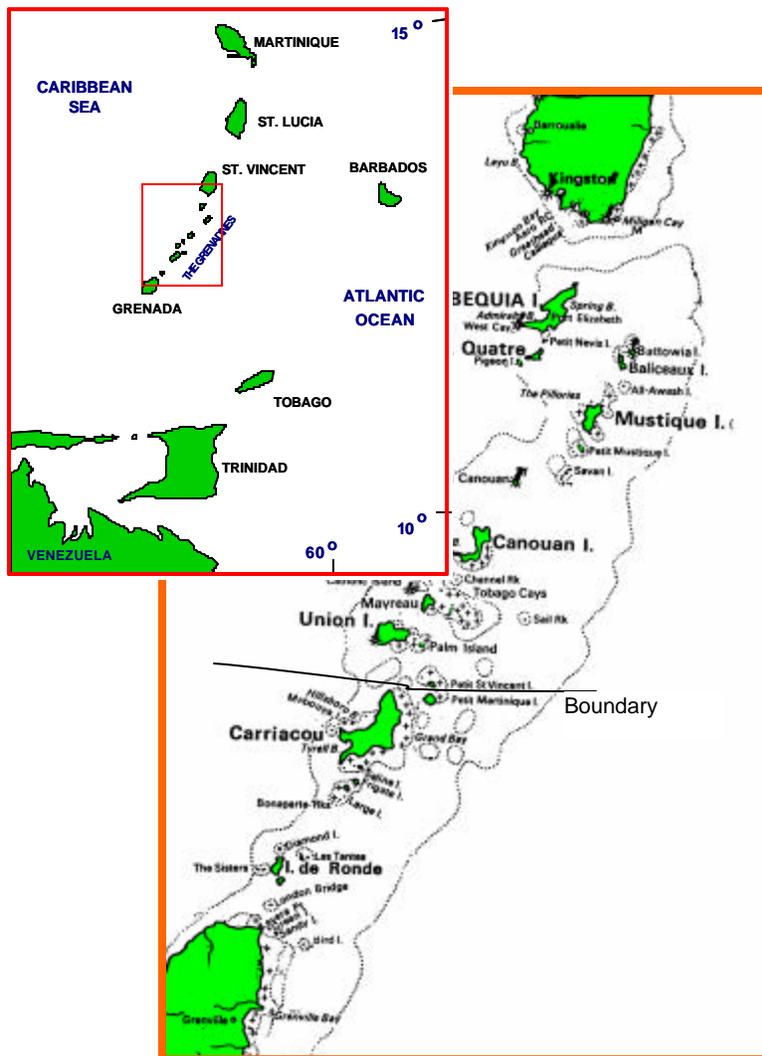


Figure 1. Location and details of the Grenadine Islands

Martinique and Carriacou have towns and communities with public (schools, clinics, utilities) and private supporting infrastructure (Table 1). Others are resort islands – Palm I, Petit St. Vincent. Most others are visited by yachters, and fishers.

There is access by air to Bequia, Mustique, Canouan, Union I., and Carriacou which have airstrips for small commuter aircraft. The area is also served by two passenger and vehicle ferry systems: one between St. Vincent and the islands of St. Vincent and the Grenadines (SVG); the other between Grenada and its two Grenadine Islands. Small cargo vessels and water taxis (speedboats) operate throughout the area.

The area of bank occupied by the Grenadine Islands is about 1,500 km² most of which is shallower than 50 m. Thus, the area supports the most extensive coral reefs and related habitats in the south-eastern Caribbean. All islands have a variety of surrounding fringing, patch and barrier reefs, and there are numerous offshore reef shoals on the bank. There are reef-related seagrass and lagoon habitats and areas of extensive mangrove forests.

The international boundary between Grenada and St. Vincent and the Grenadines runs east to west across the bank between Petit Martinique and Petit St. Vincent (Figure 1). Nonetheless, the linkages among all the Grenadine Islands on both sides of the boundary are historically strong and continue to be active. Fishing, informal trade, tourism and island social life proceed with little attention to the boundary. In both countries ‘mainlanders’ concede that the connections among the Grenadine islands are in most cases stronger than those with the main island.

Development potential and problems

The entire Grenadines area is noted for its beautiful scenery, spectacular beaches and diverse marine habitats that include coral reefs, mangroves and seabird colonies. There, the emerging view by many is that the entire area be declared a transboundary World Heritage Conservation Site.

Marine-based activities are the mainstay of the economy of the area. Tourism is a major source of employment and tourism development is proceeding apace. Private sector activities include: resorts, hotels, guest houses, restaurants, SCUBA dive operators, day and longer-term cruise operators, crafts and shops (Table 2). There are also under-utilised land-based opportunities for

Table 1. The inhabited Grenadine Islands.

Island	Area (km ²)	Population (approx.)
Bequia	8.1	4400
Mustique	5.2	1300
Canouan	7.8	1800
Mayreau	2.6	200
Union I.	8.3	1900
Palm I.	0.5	Resort I.
Petite St. Vincent	0.5	Resort I.
Petite Martinique	2.3	600
Carriacou	33.7	8,000
Total	67.0	18,200

earnings through cultural and heritage developments that would diversify the tourism sector.

Fishing is the other major source of employment in the area and has long been a source of exports to neighbouring islands (Table 2).

Table 2. Main source of income for residents in three Grenadine Island communities (from Canada/SVG Fisheries Development Project. 1992)

Source of income	Paget Farm - Bequia	Canouan	Clifton Union I.
Tourism	25%	25%	38%
Fishing	33%	25%	8%

The Governments of both countries perceive their

Grenadine Islands as having high potential for earning foreign exchange through tourism and associated development. Both Governments also recognise the high vulnerability of the marine and terrestrial resource systems of the area to environmental degradation and the dependency of sustainable development on conservation of the resources.

Unplanned development and unregulated use of terrestrial and marine habitats and resources have already led to significant degradation in many areas. There are problems with:

- Overfishing,
- Near shore habitat destruction and degradation,
- Terrestrial devegetation and overgrazing,
- Sedimentation,
- Solid waste disposal from land and boat sources,
- Sewage disposal from land and boat sources,
- Recreational abuse of coral reefs.

There is no integrated framework within which to pursue development and conservation. Local governmental and non-governmental organisations lack the capacity to develop the framework or to participate fully in its development.

Biodiversity and marine resource conservation

Marine resource and biodiversity conservation are fundamental to sustainable livelihoods in the Grenadines. These are in turn affected by the land use practices on the islands. Thus, it necessary to consider both terrestrial and marine resource use practices in planning for biodiversity conservation.

The Government of SVG (GoSVG) has established the Tobago Cays Marine Park (TCMP) as both a major attraction and a means of conserving marine biodiversity. The TCMP is the focus of marine aquatic recreation (diving, day sailing, yachting) for the entire area. Private yachts visit the park and the area in general mainly from throughout the eastern Caribbean but also from beyond.

The TCMP was declared a regulated area in 1987 under the Fisheries Act, then supported by a Marine Parks Act in 1997, and regulations in 1998.

There is Board of Directors, a Park Manager and a Management Plan. However, there has been little progress with implementing the Plan and enforcing the regulations. The extent of involvement of local NGOs in the park and the capacity of the board and management unit are of concern for the success of the TCMP. Other Marine Protected Areas (MPAs) are being considered in other parts of the SVG Grenadines.

Several MPAs have also been identified as desirable for the Grenada Grenadines. These are proposed in an Integrated Physical Development and Environmental Management Plan for Carriacou and Petit Martinique prepared in 1998. Implementation of this plan has been hindered by lack of stakeholder buy-in and participation, and the capacity of NGOs to take part. One NGO, The Carriacou Environmental Committee, has taken the lead in establishing one of the MPAs off Hillsborough, Carriacou. Support through linkages with other MPAs, organisational capacity building and access to technical information on MPAs would greatly facilitate its progress with the MPA.

Summary of the situation

Inhabitants of the Grenadine Islands area are highly dependent on the marine environment for sustainable livelihoods. The area has the potential to sustain these livelihoods while contributing to the national economies and to regional and global biodiversity conservation. These potentials are presently being eroded by unplanned and uncoordinated development and continuing negative impacts of the resource users, both extractive and non-extractive. There is a need to reorient the stakeholders in the Grenadines towards sustainable use of the marine resources. Land-use issues have bearing on this too, and a holistic approach is needed. This reorientation will involve full engagement of the stakeholders in the process, including strengthening their capacity to take part in planning and decision-making processes, as well as in the implementation of the plans.

THE PROJECT

A project to facilitate change is being developed. The goal of the project is: **The integrated sustainable development of the Grenadine Islands area for the social and economic well being of the people who live there, as a contributor to the national economies, and to conserve their biodiversity.**

The primary purpose of this project is: **To develop a participatory integrated sustainable development planning framework for the area and to implement those components of the plan that are directly associated with uses of the marine resources and environment.**

A secondary purpose is: **To develop a model for participatory integrated sustainable development in small island systems that can be adapted and applied elsewhere.**

The goal and purpose are entirely consistent with and guided by several of the “Principles of environmental sustainability in the OECS” (OECS 2001).

The project approach

The project is conceived for implementation in two phases:

Phase 1 -- Stakeholder assessment and participatory project development -- will involve stakeholder assessment and mobilisation, including an appraisal of Government and NGO capacity for participation. A participatory strategic planning process will be used to develop an integrated framework, and to generate the information required to prepare the proposal for the 5-year program to be implemented in Phase 2.

The outputs from Phase 1 will be:

- Increased stakeholder awareness and commitment for involvement;
- Information on the relative interests and capacities of stakeholders;
- Strategic and action plans;
- Identification of the stakeholder alliances needed to effect continuous change towards sustainable development in the Grenadines;
- Proposal for funding of the of the 5-year core project;
- Related activities identified for subsequent proposal development.

Phase 2 -- Implementation of the main elements of the 5-year core program -- is expected to include a substantial institutional capacity building component for local NGOs and government departments. It will focus on the establishment of management and co-management systems required for sustainable resource use and management. There may be some elements of infrastructure development. It will also include the preparation of proposals for related elements that exceed the budget and immediate scope of the core project.

The desired impact of the project

This integrated project is expected to have broad positive impacts on the conservation of marine resources and biodiversity in the Grenadines and on the sustainability of the livelihoods of the people who depend on those resources. It is expected to achieve this by:

- Strengthening the capacity of NGOs, government and the private sector to work together to develop and implement projects;
- Demonstrating the benefits of comanagement arrangements where NGOs can become partners in the management of resources, such as fisheries and MPAs;
- Increasing, throughout the Grenadines, an awareness of their dependency of marine resources, the vulnerability of the marine environment and commitment to conservation and sustainable use;
- Enhancing the environment for sustainable economic opportunities and development of both human and physical capital;

- Providing multi-faceted linkages between individual, community, national and transboundary developmental goals and the means of achieving their specific objectives;
- Improving understanding by ‘main island’ government partners in St. Vincent and Grenada of the issues and special needs in the Grenadines;
- Promoting the Grenadines nationally, regionally and globally as a well-managed area of special scenic beauty and biodiversity.

CHANGE IN SELF-ORGANISING SYTEMS

Increasingly, the field of organization development is being influenced by breakthroughs in physics, biology, chemistry, and chaos theory which spans several disciplines. A turning point was in 1977 when Ilya Prigogine won the Nobel Prize in 1977 for demonstrating how certain chemical systems (dissipative structures) will regenerate to higher levels of self-organization in response to environmental demands.

Self-organization in human systems is explored by Olson and Eoyang (2001) in *Facilitating Organizational Change*. In *Coping with Chaos*, Eoyang (1997) makes the point that the 17th century Newtonian world view no longer applies to today’s fast-paced organizational dynamics (Figure 2). From the old view, managers tended to separate organisations into hierarchical parts, rely on exerting force for change, and to plan for a world that was expected to be predictable.

Newtonian perspective		Complex perspective
Machine-like	↔	Organism-like
Linear	↔	Non-linear
Predictable	↔	Surprising
Orderly	↔	Patterned
Controlled or controlling	↔	Adaptable or adapting
Designed	↔	Emergent or self-organising

Figure 2. Characteristics of the common Newtonian perspective and the complexity perspective on organisational systems (after Eoyang 1997).

Through the new sciences a different world view is emerging – one that focuses on patterns and connections, and one that regards the whole of things and the importance of relationships (Wheatley 1992). When this is applied to human organizations, change can be seen as a spontaneous, evolving, iterative process in which patterns emerge and influence behavior which then generate new patterns which influence further change.

Olson and Eoyang (2001) note that self-organization represents the tendency of a system to generate new structures and patterns based on its own internal dynamics. Pattern, in this context, refers to any coherent structure that emerges from a self-organizing process. In this mode, organization change patterns are not imposed from above or outside but emerge from the interactions of the agents of the system.

Because of human pressures and practices in the Grenadines Islands there has been some concern about whether patterns of sustainable development are emerging fast enough to offset environmental degradation. The agents of the system in the Grenadine Islands are its stakeholders: Government, private sector and civil society (individuals and NGOs). This project aimed to bring these agents together and to stimulate the process of self-organization.

Left alone, organizations and groups will self-organize, but there is no guarantee that those changes will be desirable; i.e. towards sustainable development in the context of this initiative. However, with an understanding of systems dynamics a change agent, who is internal or external to the system may consciously influence the direction in which the system self-organizes.

Conventional change measures based on the Newtonian view are leader driven, or top-down, however these measures often fail when they meet resistance from other participants in the system. In a self-organizing system the leader plays an important role, but long-lasting, meaningful change depends on the work of many individuals at different levels of the system.

Change agents who want to influence a system toward new and innovative patterns can formulate their inputs with reference to three system characteristics that are critical determinants of self-organization: **‘container’**, **‘significant difference’**, and **‘transforming exchanges’** (Eoyang 2001).

The concept of the **‘container’** refers to the limits that define the self-organizing system or its sub-systems. A ‘container’ may be physical, as in a geographical area, organizational as in an NGO, or conceptual as in an identity, a shared vision or an operating procedure. A system may comprise several containers which may overlap, awareness of these is crucial to influencing change.

‘Significant differences’ are the differences that occur normally in systems; namely heterogeneity or diversity. These ‘significant differences’ may relate to power, levels of expertise, gender, race, educational background and so forth. The nature of these ‘significant differences’, as well as the level to which they are appreciated may greatly influence the emergence of patterns and structure that are beneficial.

‘Transforming exchanges’ consist of the active connections between participants in a system. These exchanges may include information, money, energy or other resources that flow from person to person resulting in each of them being transformed in some way. Examples of transforming exchanges include meetings, emails, financial transactions, phone calls, etc. Feedback loops, or bidirectional exchanges are particularly high impact ‘transforming exchanges’.

The conditions that are most favourable for self-organisation are high diversity and active feedback (Figure 3). The Grenadines appears to be in a state of moderately high diversity and low feedback.

	High diversity	Low diversity
Active feedback loops	Self-organisation	Reinforcement and revitalisation
No feedback loops	Unresolved conflict	Organisational rest

Figure 2. Organisational outcomes resulting from various combinations of organisational diversity and feedback (adapted from Eoyang 1997)

The proposed approach to ‘Sustainable Integrated Development and Biodiversity Conservation in the Grenadine Islands’ will seek to encourage sustainable development by influencing the above three conditions for Grenadines stakeholders or system agents. Many of those stakeholders have been working toward sustainable development in isolation from each other. In particular, the larger system which spans the two countries to which the Grenadines belong is a recognisable, but poorly defined container.

To address the diffuse nature of the efforts thus far, this project will attempt to define or enhance ‘containers’ within which the system agents can be brought together. ‘Containers’ may include the project framework itself, subprojects, meetings and various interest groups. Appreciation of the value of ‘significant differences’ will be enhanced by bringing together a number of people with different perspectives, experiences and levels of expertise. ‘Transforming exchanges’ will be facilitated by an emphasis on participatory planning processes (generation of ideas and consensus building), and on communication networks.

Other aspects of chaos and complexity science can be applied when trying to facilitate change toward sustainable development. (Table 3). Facilitators of change towards sustainability through self-organisation in complex systems such as the Grenadines islands can benefit from an understanding of chaos and complexity science as applied to organisations.

Table 3. Elements of chaos theory that are relevant to organisational change and how they may be used by change agents (based on Eoyang (1997)).

Chaos element	Explanation	Example of possible by change agent
‘Butterfly effect’	A small change that can have a profound positive or negative effect on a system An example would be a rumour.	Seek ways to prevent the spread of negative butterflies and look for ways to enhance positive ones.
‘Boundaries’	The area that lies between parts of a system that have	A change agent can increase awareness in the system of

	<p>different characteristics. Organisational examples: cultural backgrounds, learning styles, gender and committee distinctions. Changes resulting from them can be pleasant or unpleasant. Types include: clear and distinct, indistinct, partially permeable and impermeable. 'Boundaries' can overlap, and they can shift.</p>	<p>boundaries and their nature. This can serve to increase information flows across boundaries. Indistinct boundaries between very different system elements can be areas of innovation and creativity.</p>
'Attractors'	<p>Attractors can be used to describe and understand the behaviour of complex systems. 'Point attractors' focus activities to a single point. 'Periodic attractors' indicate repetition of behaviour at regular time intervals. 'Strange attractors' indicate apparently random behaviour in a system that can ultimately be recognised as a pattern.</p>	<p>Goal setting can provide productive 'point attractors' for an organisation. Regular financial record keeping is an example of a 'periodic attractor'. Although 'strange attractors' are harder to identify in organisations a change agent can be observant to behaviour that is slightly different or more complex than usual and reinforce it toward the benefit of the system.</p>
Coupling	<p>Parts of a system may be coupled in various ways. 'Tightly coupled' components change greatly, but not necessarily predictably, when there is a change in the other component. 'Loose couples' respond more gradually to information exchange. 'Uncouples' have little or no influence on each other.</p>	<p>Awareness of coupling can assist in determining where a system may be most effectively influenced. 'Tight couples' can be managed to enhance transforming feedback and minimise the effects of disruptive unpredictable responses. Attention can be paid to enhancing coupling in uncouples that would benefit from coupling.</p>

ACKNOWLEDGEMENTS

This work was supported by The Lighthouse Foundation, Hamburg, Germany. Glenda Eoyang's comments on the paper were much appreciated.

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